# Springbank Off-Stream Storage Project Preliminary Geotechnical Assessment Report

**Volume 2 of 4**

Prepared for:
Alberta Transportation
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Prepared by:
Stantec Consulting Services Ltd
Calgary, Alberta

Project No. 110773396

December 8, 2020

**"VOLUME 2, SPRINGBANK OFF-STREAM STORAGE PROJECT PRELIMINARY GEOTECHNICAL ASSESSMENT REPORT**

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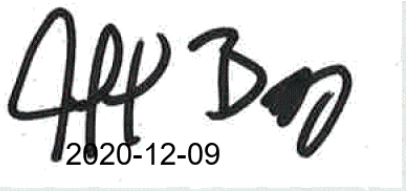


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# 1.0 Introduction

## 1.1 SCOPE

This report summarizes the data collected from the geotechnical and hydrogeological investigation undertaken for the Springbank Off-stream Storage Project (herein, referred to as SR1). This report contains the borehole records, cone penetration testing (CPT) report, laboratory testing results, and geophysical survey reports completed between March and November 2016 for the project.

The intent of this report is to document data that supports the preliminary and final design of the SR1 Project. This report contains no geological interpretations, site characterization, geotechnical parameter derivations or geotechnical design. These will be communicated in the Preliminary Design Report for the project.

The investigation was undertaken by Stantec for Alberta Transportation (AT) using the sub-contractors listed in Section 3.2. The Statement of General Conditions for this geotechnical investigation is contained in **Appendix A**.

## 1.2 PROJECT DESCRIPTION

The SR1 project is being developed by the Government of Alberta to divert and temporarily store floodwater from the Elbow River Basin. The project is located approximately 18 km west of Calgary (**Appendix C,** Figures 1-3).

The scope of this investigation was based on the conceptual design for the SR1 Project (Stantec, 2015). This comprises of:

- Off-stream storage earth-fill dam;
- Reservoir;
- Emergency spillway;
- Low level outlet (LLO) located in the unnamed creek;
- Diversion channel outlet structure;
- 4.2 km long diversion channel linking the diversion structures to the reservoir;
- Diversion structures (inlet and service spillway); and
- Floodplain berm and associated auxiliary spillway.

## 1.3 PHYSIOGRAPHY

The SR1 project is located within the Eastern Foothills of the Rocky Mountains. This terrain is characterized by NNW–SSE trending ridges with intervening valleys. The project site is typically prairie and is used for pasture or crops. The Elbow River Valley bounds the SR1 project site, which is bisected by Highway 22 and associated township roads.

Further information on the physiography can be found in the Project Description in the Environmental Impact Assessment (EIA), which is currently being prepared by Stantec.

# 2.0 Geological Setting

The SR1 Project Site is located within the eastern portion of the Foothills Belt (Osborn et al., 2006). The belt is a 40 km wide geological and topographical transition zone between the Rocky Mountains and the Plains. The Project Site is characterized by NNW–SSE trending ridges underlain by relatively resistant sandstones. The intervening valleys are underlain by weak mudstones, shales and siltstones of the Brazeau and Coalspur Formation. The terrain of the Project Site transitions eastward into the relatively flat Plains landscape, which is underlain by the gently dipping Paskapoo Formation.

## 2.1 SURFICIAL GEOLOGY

The following Alberta Geological Survey (AGS) maps were reviewed prior to the investigation:

- Sheet 150: Surficial Geology of Alberta Foothills and Rocky Mountains (AGS, 1980);
- Sheet 204: Calgary Urban Area (generated from the original map in Moran (1986);
- Sheet 207: Quaternary Geology of Southern Alberta (Shetsen, 1987);
- Sheet 601: Surficial Geology of Alberta (Fenton et al., 2013);
- Sheet 603: Sediment thickness (MacCormack, et al., 2015a) and,
- Sheet 604: Glacial landforms in Alberta (Atkinson, 2014)

The AGS mapping indicates that the SR1 dam, reservoir and diversion channel will be underlain by glaciolacustrine deposits and glacial tills of Pleistocene Age. The diversion structure and floodplain berm will be constructed within post- and para-glacial fluvial deposits associated with the Elbow River. Descriptions of the surficial units from AGS mapping are provided in **Table 1.**

## 2.2 BEDROCK

The following AGS maps were reviewed prior to the investigation:

- Sheet 560: Geology of the Alberta Rocky Mountains and Foothills (Pană and Elgr, 2013);
- Sheet 600: Bedrock Geology of Alberta (Prior et al., 2013); and,
- Sheet 602: Bedrock Topography (MacCormack et al., 2015b)

The AGS mapping indicates that the SR1 dam, the eastern part of the diversion channel and the reservoir will be underlain by the Paskapoo Formation. The diversion channel, river structures and floodplain berm will be underlain by the Coalspur and Brazeau Formations. Descriptions of the bedrock from AGS mapping are provided in **Table 2**.

**Table 1 Description of Surficial Units from AGS Mapping**

| Unit | Sheet 150 (AGS, 1980) | Bulletin 53 (Moran, 1986) | Sheet 207 (Shetsen, 1987) | Sheet 601 (Fenton et al., 2013) |
|---|---|---|---|---|
| Fluvial | Coarse stream alluvium: non-glacial fluvial sediment deposited along most streams in the Rocky Mountains and major stream in the Foothills; forms terrace and valley bottom deposits; sediment consists of gravelly sand to gravel; in places overlain by 0.25 to 2 m of fine alluvium; clasts are generally well rounded carbonates and quartzites in the mountains but in the Foothills contain some clasts derived from Mesozoic clastics.<br><br>Outwash plains: well sorted and rounded glacial-fluvial gravel confined to broad major valleys | Channel gravels and minor sands with localized fluvial overbank<br><br>Referred to as the Big Hill Creek Formation | Coarse sediment: gravel and sand, minor silt beds | Poorly to well sorted, stratified to massive sand, gravel, silt, clay and organic sediments occurring in channel or over-bank deposits |
| Glacio-lacustrine | Sediment deposited in glacial lakes; generally clayey silt with minor sand; majority of deposits are in the eastern foothills; flat to low relief | Offshore deposits; silt, clay and minor sand.<br><br>Referred to as the Calgary Lake Formation | Ice-contact lacustrine deposit:<br>sand, silt and clay, local till; up to 20 m thick; deposited supra-glacial and ice-walled lakes or in pro-glacial lakes floored by ice; undulating to hummocky terrain<br><br>Mapped as 6b 'Fine-sediment: silt clay' | Fine-grained, distal sediments deposited in or along margins of glacial lakes. These are a) offshore sediments; rhythmically laminated to massive fine sand, silt and clay, locally debris released from floating ice; or b) littoral or nearshore sediments; massive to stratified, well-sorted silty sand, pebbly sand and minor gravel |

**Table 1 Description of Surficial Units from AGS Mapping**

| Unit | Sheet 150 (AGS, 1980) | Bulletin 53 (Moran, 1986) | Sheet 207 (Shetsen, 1987) | Sheet 601 (Fenton et al., 2013) |
|---|---|---|---|---|
| Glacial Till | Slightly leached till of Cordilleran Provenance: silty sand till; clasts – carbonate and clastic rocks; leached 15-45 cm; ground moraine and lateral moraine; unit is present along the major valleys; likely late Wisconsin age | Lower Spy Hill Drift: Hard, dark grey, sandy silty clay. Clasts comprise dark carbonates and pink / purple quartzites. Grantic clasts are rare or absent | Draped moraine: till of even thickness, with minor amounts of water-sorted material and local bedrock exposures; up to 5m thick; includes areas of undifferentiated subglacially molded deposit with streamlined features; flat to undulating surface reflecting topography of underlying bedrock and other deposits<br><br>Draped moraine on bedrock uplands and plains: discontinuous till over bedrock surface slightly modified by ice and stream erosion; till is generally less than 3m thick; flat to undulating topography | Undivided moraine: consists of diamicton (till) deposited directly by glacial ice, and is a mixture of clay, silt, sand and minor pebbles, cobbles and boulders. Locally, this unit may contain blocks of bedrock, pre-existing stratified sediment and till, and/or lenses of glaciolacustrine and/or glacial fluvial sediment |

**Table 2 Description of Bedrock Formations from AGS Mapping**

| Formation | Sheet 560 (Pană and Elgr, 2013) | Sheet 600 (Prior et al., 2013) |
|---|---|---|
| Paskapoo Formation | Sandstone, fine to coarse grained, locally massive, cliff forming, buff weathering; shale; carbonaceous shale; siltstone; conglomerate; rare coal seams; shell beds | *Central Rocky Mountains and Foothills:* Recessively weathering, grey to greenish-grey mudstone and siltstone with subordinate (although generally better exposed) pale grey, thick- to thin-bedded, commonly cross-stratified sandstone; minor conglomerate, mollusc coquina, and coal; nonmarine |
| Coalspur Formation | Shale, grey to olive green coaly shale; siltstone; sandstone; numerous thin bentonite beds in the lower part, and coal seams of the Coalspur Coal Zone in the upper part | Sandstone (thin bedded to massive) siltstone, mudstone and coal; subordinate conglomerate and bentonite; thick coal seams occur locally; extent poorly defined in some areas; none-marine |
| Brazeau Formation | *Upper part:* mudstone; siltstone; sandstone, greenish grey; bentonite; thin coal seams towards the top<br>*Lower part:* sandstone, siltstone, laminated; mudstone, olive green; conglomerate, granule to pebble sized, chert and quartzite, plant debris; bentonite beds towards the top | Sandstone, laminated siltstone and olive green mudstone, chert- and quartzite bearing, granule to pebble conglomerate (lower part); overlain by greenish-grey to dark grey mudstone, siltstone and greenish grey sandstone; thin coal and coaly shale beds; numerous thin bentonites (upper part) |

# 3.0 FIELDWORK

## 3.1 DURATION OF FIELDWORK

The field exploration started on March 21 and was completed on August 25, 2016. This comprised 92 total drilling days based on a typical six-day week. Work was performed on Sundays where required by the terms of the land access agreements. Further field investigation is required to characterize the site subsurface conditions and fill in data gaps.

Several delays were encountered during the fieldwork, due to access restrictions with landowners (20 days) and inclement weather that made the work unsafe to continue (18 days). No test pits were undertaken at this time due to the sensitivities with landowners.

## 3.2 SUB-CONTRACTORS

The geotechnical explorations were executed using the following sub-contractors:

- The auger, ODEX and rotary coring was performed by All-Service Drilling Ltd;
- The sonic boreholes were completed by Mobile Augers and Research Ltd;
- The CPT explorations were completed by ConeTec Investigations Ltd;
- The seismic refraction survey and Multichannel Analysis of Surface Waves (MASW) survey were completed by DMT Geoservices Ltd;
- Specialized rock laboratory testing was completed by Trican Well Service Ltd; and
- Chemical laboratory testing was completed by Maxxam Analytics and Caro Analytical Services.

## 3.3 EXPLORATORY HOLE LOCATIONS

The fieldwork completed to date includes:

- 135 boreholes using auger, sonic, ODEX and rotary coring;
- 20 CPT locations at the dam and diversion channel footprint; and
- Seismic refraction survey and MASW survey at the diversion structure and Low Level Outlet locations.

The boreholes are referenced by the SR1 project components as follows:

- D# – Storage Dam
- DC# – Diversion Channel
- DS# – River Structures (Service Spillway and Diversion Inlet)
- FB# – Floodplain Berm
- BS# – Borrow Source
- H# – Highway embankment and bridge
- GW# – Groundwater wells

The borehole identification system follows a numerical sequence. Several boreholes proposed in the original Work Plan were deleted due to land access issues encountered during the program. The boreholes have not been renumbered, so there are some gaps in the numbers assigned to the completed boreholes. During the next phase of the geotechnical investigation, gaps in the borehole numbering will be filled in as remaining boreholes are completed.

Figures of the as-built exploratory hole locations are presented in **Appendix C** and summarized in **Appendix B**.

## 3.4 LOGGING AND DESCRIPTIONS

The site works were supervised by Stantec personnel. All boreholes were logged on site by Stantec personnel using the Modified Unified Soils Classification System (MUSCS). The logging terminology used is presented in **Appendix D**.

## 3.5 METHODOLOGY

### 3.5.1 Auger Drilling

One hundred and seventeen (117) boreholes across the project site were drilled by All-Service Drilling Ltd using either hollow- or solid-stem auger methods. A maximum of three (3) drilling rigs were on site at any one time. The following rigs were used:

- Acker Soil-Max Junior: drill rig is mounted on 24" tracks and is set up for hollow- and solid-stem augering, direct push and rotary core operations. The length of the rig is 6.9 m (22.6 feet) with a mast-down height of 2.9 m (9.6 ft).
- Acker Soil-Max: drill rig is mounted on a Go-Tract 1600 Carrier with 36" wide tracks and is set up for hollow- and solid-stem augering and rotary core operations. The length of the rig is 7.6 m (25 feet) with a mast-down height of 3.5 m (11.4 ft);
- Diedrich D50: drill rig is mounted on 24" tracks and is set up for hollow- and solid-stem augering and rotary core operations. The length of the rig is 6.9 m (22.6 ft) with a mast-down height of 2.9 m (9.6 ft); and,

- Strata Start 10: drill rig is mounted on an International 4400 Truck and is set up for hollow- and solid-stem augering and rotary core operations. The length of the rig is 7.6 m (25 ft) with a mast-down height of 3.7 m (12 ft).

The intervals of sampling varied depending on the encountered unit, location and (in some cases) land access restrictions. The following sampling methodology was used for these boreholes:

- Undisturbed Shelby tube samples were obtained to provide specimens for laboratory testing. Sampling was in accordance with ASTM D1587 'Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes'. After the tube was removed from the boring, the Stantec field representative measured the recovery, visually classified the soil, and recorded the information on the boring logs.
- Standard Penetration Testing (SPT) sampling (continuous or at specific intervals) was performed to characterize soil stiffness and relative density. SPT specimens were used for subsequent laboratory index testing to assist in characterizing the soil profiles. The sampling was performed in accordance with ASTM D1586 'Standard Test Method of Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils'.
- Bulk samples of representative auger cuttings were collected and bagged for use in the laboratory testing program.

All collected samples were stored in moisture-tight containers and delivered daily to the Stantec laboratory in Calgary for testing. Where bedrock was encountered during augering and SPT's, it has been identified as inferred on the borehole records.

The borehole logs developed from the auger drilling are presented in **Appendix D**.

### 3.5.2 Sonic Coring

Sonic drilling methods were used in four (4) boreholes completed by Mobile Augers Ltd. This method facilitated the recovery of a continuous core in the glacigenic units beneath the proposed dam footprint.

The borehole logs developed from the sonic coring are presented in **Appendix D**.

### 3.5.3 ODEX

ODEX methods were used for drilling fourteen (14) boreholes, mostly within the fluvial gravel and cobble deposits associated with the Elbow River. ODEX is a trade-marked, down-hole air hammer system that advances a casing as the hole is drilled. Sampling was undertaken at depths by removing the eccentric drill bit and leaving the casing in place. When the borehole reached the target depth, the casing was retrieved and could be reused. This system does not use drilling mud and reduces the risk of borehole caving in fluvial channel gravels and cobbles.

The borehole logs developed from the ODEX drilling are presented in **Appendix D**.

### 3.5.4 Rotary Coring

Ninety-seven (97) of the boreholes drilled using auger, ODEX and sonic methods were extended into bedrock using rotary coring. All-Service Drilling Ltd. used HQ3 triple-tube, wireline rock coring equipment to recover rock core specimens for logging and testing. This system uses a cable to retrieve the core barrel, which avoids the need for connecting rods. The core barrel assembly has inner and outer tubes. The inner tube collects the rock core sample during drilling and is independent of the outer tube. Coring was completed in accordance with the ASTM D2113 'Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation'.

The borehole logs developed from the rotary coring are presented in **Appendix D**.

### 3.5.5 Cone Penetration Testing

CPTs were completed by ConeTec at twenty (20) locations around the dam footprint and in the diversion channel. Testing involved pushing a cone penetrometer into the ground at a constant rate to provide a continuous subsurface soil profile. The cone tip resistance ($q_t$), pore-water pressure (u), and sleeve friction ($f_s$) are measured as the cone is advanced. CPT was completed in accordance with the ASTM Standard D5778-07, 'Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils'. Pore water dissipation and seismic shear wave velocity tests were performed at selected locations.

The report supplied by ConeTec upon completion of the work is presented in **Appendix H**.

## 3.6 GEOPHYSICAL SURVEY

Seismic refraction and Multichannel Analysis of Surface Waves (MAWS) surveys were completed by DMT Geoservices Ltd at the diversion structure and low level outlet. The methodology, survey locations and results of the surveys can be found in **Appendix I**.

## 3.7 LABORATORY TESTING

Laboratory tests were conducted on selected soil and rock samples at the Stantec laboratory in Calgary. The testing results are presented in **Appendix E**. A summary table of the laboratory testing quantities is included in **Appendix E**. Advanced rock testing was undertaken on selected rock cores by Trican Well Service Ltd. Their report can be found in **Appendix F**. Chemical analysis results for selected samples can be found in **Appendix E.9**.

**Table 3 Summary of Laboratory Testing**

| Test Symbol | Test | Standard |
|---|---|---|
| | Moisture content | ASTM D2216<br>CSA A23.2-11A |
| | Particle size distribution (sieve analysis) | ASTM D422 |
| | Particle size distribution (Hydrometer) | ASTM D422 |
| | Atterberg limits | ASTM D4818 Method B – 1 Point |
| k | Permeability test, flexible wall/falling head | ASTM D5084 |
| Y | Unit weight | ASTM D2166 |
| UU | Unconsolidated undrained triaxial | ASTM D2850 |
| CU | Consolidated undrained triaxial with Pore Pressure Measurements | ASTM D4767 |
| SW | Swell test | ASTM 4546 Method C |
| DS | Direct shear | ASTM 3080 |
| C | 1D consolidation | ASTM D2435 |
| PT | Standard proctor | ASTM D698 |
| | Thermal conductivity/resistivity Testing | |
| | Water soluble Sulphates | CSA A23.2-2B & 38 |
| | Organic content | |
| | pH | |
| Gs | Specific gravity | ASTM D854 |
| CR | Crumb test | ASTM D6572 |
| DH | Double hydrometer | ASTM D4221 |
| P | Pinhole test | ASTM D4647 |
| | Unconfined compressive strength test | ASTM D2938 |
| Qu | Unconfined compressive strength with strain measurements | ASTM D2166 |
| | Point load test | ASTM D5731 |
| | Slake durability | ASTM D4644 |

## 3.8 GROUNDWATER MONITORING

Standpipe piezometers were installed in thirty-four (34) locations. Most are single well installations, but six (6) are nested wells. Data loggers were installed in fifteen (15) wells. The well installation details and recorded water elevations are presented in **Table 4.** The groundwater monitoring program is ongoing.

**Table 4 Summary of Groundwater Monitoring**

| Borehole | Installation Details (El. m) | | | Target Unit | Data-logger installed | Groundwater Elevation (El. m) | |
|---|---|---|---|---|---|---|---|
| | Original Ground | Screen Top | Screen Base | | | Sept 8, 2016 | Sept 26-Oct 4,2016 |
| DC6 | 1230.1 | 1218.7 | 1215.6 | till | | 1217.9 | |
| DC7A | 1241.0 | 1221.8 | 1218.8 | till | | 1224.2 | |
| DC9A | 1227.4 | 1219.8 | 1216.8 | till | | 1226.0 | 1226.0 |
| DC15 | 1213.4 | 1209.7 | 1208.2 | clay | | | 1209.2 |
| DC15B | 1213.4 | 1202.9 | 1201.4 | till | | | |
| DC21 - shallow | 1215.8 | 1211.8 | 1210.3 | sand and silt | | 1212.5 | 1211.6 |
| DC21 - deep | 1215.8 | 1206.7 | 1205.2 | sedimentary bedrock | | 1212.8 | 1211.9 |
| DC25 - shallow | 1205.0 | 1198.9 | 1197.2 | silt | | | 1201.2 |
| DC25 - deep | 1205.0 | 1188.0 | 1186.5 | sedimentary bedrock | | | 1202.3 |
| DC27 | 1202.7 | 1185.6 | 1183.8 | sedimentary bedrock | | 1200.1 | |
| D02 | 1206.6 | 1186.8 | 1185.2 | sedimentary bedrock | | 1191.4 | 1191.4 |
| D09 | 1202.5 | 1193.5 | 1192.0 | sedimentary bedrock | | | 1193.7 |
| D12 | 1198.2 | 1190.6 | 1187.5 | till | | | |
| D19 | 1190.6 | 1173.8 | 1170.8 | till | | | |
| D27 | 1190.7 | 1167.8 | 1164.8 | till | | | 1182.8 |
| D36 - shallow | 1190.5 | 1178.0 | 1176.5 | silt and clay | | | 1186.7 |
| D36 - deep | 1190.5 | 1150.9 | 1147.8 | sedimentary bedrock | | | 1187.1 |
| D45 | 1185.1 | 1173.4 | 1172.0 | sedimentary bedrock | | | |

**Table 4 Summary of Groundwater Monitoring**

| Borehole | Installation Details (El. m) | | | Target Unit | Data-logger installed | Groundwater Elevation (El. m) | |
|---|---|---|---|---|---|---|---|
| | Original Ground | Screen Top | Screen Base | | | Sept 8, 2016 | Sept 26-Oct 4,2016 |
| D51 | 1194.4 | 1165.4 | 1163.9 | sedimentary bedrock | | | 1186.3 |
| D62 | 1190.7 | 1180.7 | 1177.7 | till | | | |
| BS3 | 1197.4 | 1191.3 | 1188.3 | till | | | 1190.5 |
| GW1 | 1211.7 | 1199.5 | 1196.5 | sedimentary bedrock | Yes | | 1207.8 |
| GW2 | 1206.0 | 1203.0 | 1199.9 | clay | Yes | | 1205.2 |
| GW3 | 1201.1 | 1197.4 | 1194.4 | clay and silt | Yes | | 1200.0 |
| GW4 | 1204.3 | 1185.7 | 1182.6 | sedimentary bedrock | Yes | | 1200.9 |
| GW5 | 1210.6 | 1202.3 | 1199.3 | sedimentary bedrock | Yes | | 1208.2 |
| GW6-shallow | 1196.5 | 1189.2 | 1186.1 | till | Yes | | 1196.5 |
| GW6 - deep | 1196.5 | 1177.6 | 1174.5 | sedimentary bedrock | Yes | | 1196.5 |
| GW7 | 1199.1 | 1197.0 | 1193.9 | till | Yes | | 1198.1 |
| GW8 - shallow | 1216.7 | 1210.6 | 1209.1 | silt | Yes | | 1210.6 |
| GW8 - deep | 1216.7 | 1200.3 | 1198.1 | sedimentary bedrock | Yes | | 1212.4 |
| GW9 | 1204.5 | 1200.2 | 1198.7 | clay and silt | Yes | | 1204.4 |
| GW10 | 1195.3 | 1183.1 | 1180.0 | till | Yes | | 1192.7 |
| GW11 | 1222.0 | 1210.4 | 1207.4 | silt | Yes | | 1221.4 |
| GW12 | 1189.9 | 1188.4 | 1186.9 | till | Yes | | 1187.2 |
| GW13 | 1222.3 | 1188.8 | 1185.8 | claystone | Yes | | 1222.3 |

**Table 4 Summary of Groundwater Monitoring**

| Borehole | Installation Details (El. m) | | | Target Unit | Data-logger installed | Groundwater Elevation (El. m) | |
|---|---|---|---|---|---|---|---|
| | Original Ground | Screen Top | Screen Base | | | Sept 8, 2016 | Sept 26-Oct 4,2016 |
| GW14 | 1203.6 | 1173.1 | 1170.1 | sedimentary bedrock | Yes | | 1177.2 |
| GW15 | 1189.7 | 1156.8 | 1155.2 | sedimentary bedrock | Yes | | 1172.6 |
| H6 | 1204.5 | 1188.6 | 1186.2 | sedimentary bedrock | | | 1204.5 |
| H9 | 1207.6 | 1197.6 | 1196.1 | sand and silt | | | 1207.6 |

## 3.9 PACKER TESTING

Thirty-seven (37) single packer permeability tests were conducted in five (5) boreholes to determine the permeability of the bedrock. The equipment used for these tests, provided by All Service Drilling, consisted of pneumatic packer assembly and related accessory equipment. Surface calibration tests were completed on the equipment at the start of each test to determine the friction loss in the system. The tests were completed at the base of the borehole, as the borehole was advanced. The results of these individual tests are presented in **Appendix G**.

# 4.0 Closure

This report has been prepared for the sole benefit of Alberta Transportation and their agents, and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and Alberta Transportation. Any use, which a third party makes of this report, is the responsibility of such third party. Use of this report is subject to the Statement of General Conditions provided in **Appendix A**. It is the responsibility of Alberta Transportation, who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec Consulting Ltd. should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Use of the report
- Basis of the report
- Standard of care
- Interpretation of site conditions
- Varying or unexpected site conditions
- Planning, design or construction

We trust the above information meets with your present requirements. Should you have any questions or require further information, please contact us. This report has been prepared by Jason Warners, P.Eng., Jamie Schweighofer, P.Eng. and Andrew Bayliss, M.Sc., P.Eng. and reviewed by Hugo Aparicio, Vincent Severance and John Menninger.

Respectfully submitted,

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# Appendix A

Statement of General Conditions

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec's present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec will not be responsible to any party for damages incurred as a result of failing to notify Stantec that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec, sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec cannot be responsible for site work carried out without being present.

# Appendix B
Borehole Summary

| Borehole ID | Surveyed Coordinates (3TM) | | Surveyed Elevation (masl) | Drilling Method | Depth Drilled | Installation | In-situ Testing |
|---|---|---|---|---|---|---|---|
| | Northing | Easting | | | | | |
| FB3 | 5654227 | -33399 | 1214.65 | ODEX/Rotary Coring | 7.8 | | |
| FB4 | 5654314 | -33531 | 1214.23 | ODEX/Rotary Coring | 7.5 | | |
| FB5 | 5654374 | -33408 | 1213.26 | ODEX/Rotary Coring | 7.7 | | |
| FB6 | 5654471 | -33472 | 1212.90 | ODEX/Rotary Coring | 7.7 | | |
| FB7 | 5654569 | -33538 | 1212.40 | ODEX/Rotary Coring | 15.0 | | |
| DS-1 | 5654611 | -33587 | 1210.45 | ODEX/Rotary Coring | 15.4 | | |
| DS-2 | 5654614 | -33612 | 1210.41 | ODEX/Rotary Coring | 15.4 | | |
| DS-3 | 5654631 | -33624 | 1210.44 | ODEX/Rotary Coring | 15.4 | | |
| DS-4 | 5654596 | -33645 | 1210.50 | ODEX/Rotary Coring | 9.4 | | |
| DS-5 | 5654546 | -33672 | 1211.30 | ODEX/Rotary Coring | 12.3 | | |
| DS-6 | 5654668 | -33673 | 1233.30 | Auger/Rotary Coring | 41.3 | | |
| DS-6A | 5654668 | -33673 | 1233.30 | Auger | 7.6 | | |
| DS-7 | 5654625 | -33704 | 1233.10 | Auger/Rotary Coring | 16.3 | | |
| DS-7A | 5654625 | -33704 | 1233.10 | Auger/Rotary Coring | 38.0 | | |
| DS-8 | 5654582 | -33713 | 1234.41 | Auger/Rotary Coring | 39.8 | | |
| DS-8A | 5654582 | -33713 | 1234.41 | Auger | 6.0 | | |
| DS-9 | 5654660 | -33603 | 1210.31 | ODEX/Rotary Coring | 9.3 | | |
| DS-10 | 5654634 | -33568 | 1210.24 | ODEX/Rotary Coring | 15.4 | | |
| DC-1 | 5654706 | -33749 | 1235.80 | Auger/Rotary Coring | 30.5 | | |
| DC-2 | 5654722 | -33618 | 1233.32 | Auger | 12.2 | | |
| DC-2A | 5654722 | -33618 | 1233.32 | Auger | 14.0 | | |
| DC-3 | 5654804 | -33806 | 1239.76 | Auger | 16.0 | | |
| DC-4 | 5654847 | -33657 | 1238.00 | Auger/Rotary Coring | 30.8 | | |
| DC-4A | 5654847 | -33657 | 1238.00 | Auger | 9.0 | | |
| DC-5 | 5654920 | -33742 | 1242.05 | Auger/Rotary Coring | 23.1 | | |
| DC-6 | 5654893 | -33490 | 1230.13 | Auger/Rotary Coring | 26.2 | 1" Well | |
| DC-7 | 5655025 | -33659 | 1240.99 | Auger/Rotary Coring | 27.6 | | |
| DC-7A | 5655025 | -33659 | 1240.99 | Auger/Rotary Coring | 36.4 | 1" Well | |
| DC-8 | 5655037 | -33532 | 1232.37 | Auger/Rotary Coring | 27.6 | | |
| DC-9 | 5655153 | -33452 | 1227.39 | Auger/Rotary Coring | 23.2 | | |
| DC-9A | 5655153 | -33452 | 1227.39 | Auger | 11.0 | 2" Well | |
| DC-10 | 5655287 | -33389 | 1225.84 | Auger/Rotary Coring | 21.6 | | |
| DC-11 | 5655542 | -33424 | 1224.04 | Auger/Rotary Coring | 23.2 | | |
| DC-12 | 5655745 | -33424 | 1221.97 | Auger/Rotary Coring | 26.2 | | |
| DC-13 | 5655943 | -33424 | 1219.14 | Auger/Rotary Coring | 20.1 | | |
| DC-14 | 5656070 | -33313 | 1215.00 | Auger/Rotary Coring | 22.0 | | |
| DC-15 | 5656141 | -33226 | 1213.43 | Auger | 11.2 | 2" Well | |
| DC-15A | 5656141 | -33226 | 1213.43 | Auger/Rotary Coring | 21.5 | | |
| DC-15B | 5656141 | -33226 | 1213.43 | Auger | 13.7 | 2" Well | |
| DC-16 | 5656222 | -33112 | 1213.87 | Auger/Rotary Coring | 18.5 | | |
| DC-17 | 5656288 | -33011 | 1213.39 | Auger/Rotary Coring | 11.0 | | |
| DC-18 | 5656375 | -32817 | 1213.88 | Auger/Rotary Coring | 12.5 | | |
| DC-19 | 5656515 | -32522 | 1217.63 | Auger/Rotary Coring | 17.0 | | |
| DC-20 | 5656631 | -32401 | 1216.26 | Auger/Rotary Coring | 15.4 | | |
| DC-21 D | 5656748 | -32404 | 1215.77 | Auger/Rotary Coring | 12.5 | 2" Well | |
| DC-21 S | 5656748 | -32404 | 1215.77 | Auger/Rotary Coring | 6.1 | 2" Well | |
| DC-22 | 5656930 | -32263 | 1211.94 | Auger/Rotary Coring | 12.5 | | |
| DC-23 | 5657060 | -32121 | 1213.89 | Auger/Rotary Coring | 12.5 | | |
| DC-24 | 5657234 | -31942 | 1211.20 | Auger/Rotary Coring | 11.1 | | |
| DC-25 | 5657338 | -31844 | 1205.05 | Auger/Rotary Coring | 15.5 | | |
| DC-25 D | 5657338 | -31844 | 1205.05 | Auger/Rotary Coring | 23.2 | 2" Well | |
| DC-25 S | 5657338 | -31844 | 1205.05 | Auger | 7.6 | 2" Well | |
| DC-26 | 5657318 | -31720 | 1203.84 | CPT | 10.8 | | |
| DC-27 | 5657263 | -31684 | 1202.74 | Auger/Rotary Coring | 23.2 | 2" Well | |
| DC-28 | 5657428 | -31635 | 1217.79 | Auger/Rotary Coring | 15.4 | | |
| DC-29 | 5657579 | -31512 | 1213.98 | CPT | 3.6 | | |
| DC-30 | 5657731 | -31469 | 1211.37 | Auger/Rotary Coring | 12.6 | | |
| DC-31 | 5657960 | -31448 | 1207.38 | CPT | 11.1 | | |
| DC-32 | 5657930 | -31415 | 1207.12 | Auger/Rotary Coring | 23.0 | | |

| Borehole ID | Surveyed Coordinates (3TM) | | Surveyed Elevation (masl) | Drilling Method | Depth Drilled | Installation | In-situ Testing |
|---|---|---|---|---|---|---|---|
| | Northing | Easting | | | | | |
| DC-33 | 5657180 | -31654 | 1199.48 | Auger/Rotary Coring | 15.6 | | |
| DC-34 | 5657113 | -31594 | 1198.48 | Auger/Rotary Coring | 17.1 | | |
| D1 | 5657424 | -31438 | 1209.77 | CPT | 7.5 | | |
| D2 | 5657499 | -31218 | 1206.57 | Auger/Rotary Coring | 21.5 | 2" Well | |
| D3* | 5657527 | -31028 | 1208 | Auger/Rotary Coring | 11.2 | | |
| D5 | 5657316 | -30682 | 1206.84 | Auger | 7.3 | | |
| D5B | 5657316 | -30682 | 1206.84 | Auger/Rotary Coring | 12.4 | | |
| D6 | 5657183 | -30503 | 1205.53 | Auger/Rotary Coring | 10.9 | | |
| D7 | 5657101 | -30325 | 1202.13 | Auger/Rotary Coring | 14.0 | | |
| D8 | 5657051 | -30325 | 1203.18 | Auger/Rotary Coring | 14.0 | | |
| D9 | 5657001 | -30358 | 1202.55 | Auger/Rotary Coring | 14.1 | 2" Well | |
| D10 | 5657000 | -30226 | 1200.68 | Auger/Rotary Coring | 23.1 | | |
| D11 | 5656973 | -30119 | 1199.59 | Auger/Rotary Coring | 13.9 | | |
| D12 | 5656944 | -30010 | 1198.15 | Auger/Rotary Coring | 27.6 | 2" Well | |
| D13 | 5656958 | -29898 | 1195.87 | Auger | 13.1 | | |
| D14 | 5657050 | -29792 | 1193.69 | Auger/Rotary Coring | 20.2 | | |
| D16 | 5656870 | -29781 | 1195.49 | Auger/Rotary Coring | 36.6 | | |
| D17 | 5656973 | -29676 | 1193.07 | Auger/Rotary Coring | 23.1 | | |
| D18 | 5656995 | -29568 | 1192.76 | Auger/Rotary Coring | 50.2 | | |
| D19 | 5656742 | -29470 | 1190.62 | Auger/Rotary Coring | 29.3 | 2" Well | |
| D20 | 5657144 | -29997 | 1195.85 | Auger/Rotary Coring | 50.1 | | |
| D26 | 5657133 | -29442 | 1192.03 | CPT | 18.8 | | |
| D27 | 5656909 | -29330 | 1190.71 | Auger/Rotary Coring | 35.4 | 2" Well | |
| D28 | 5657045 | -29452 | 1190.44 | Auger/Rotary Coring | 50.6 | | |
| D29 | 5657082 | -29334 | 1191.02 | Sonic/Rotary Coring | 42.7 | | Packer Testing |
| D30 | 5657199 | -29301 | 1192.01 | Auger/Rotary Coring | 44.5 | | |
| D31 | 5657045 | -29211 | 1191.00 | CPT | 20.8 | | |
| D32 | 5656996 | -29113 | 1190.66 | Auger/Rotary Coring | 35.4 | | |
| D34 | 5657183 | -29165 | 1190.89 | CPT | 14.7 | | |
| D35 | 5657228 | -29082 | 1190.61 | Auger/Rotary Coring | 44.2 | | Packer Testing |
| D36 D | 5657309 | -29020 | 1190.50 | Auger/Rotary Coring | 45.6 | 2" Well | |
| D36 S | 5657309 | -29020 | 1190.50 | Auger | 14.6 | 2" Well | |
| D37 | 5657115 | -28953 | 1190.70 | Sonic/Rotary Coring | 35.4 | | |
| D38 | 5657380 | -29073 | 1190.84 | Sonic/Rotary Coring | 45.7 | | Packer Testing |
| D39 | 5657254 | -28945 | 1191.43 | CPT | 13.1 | | |
| D40 | 5657387 | -28945 | 1191.05 | CPT | 15.8 | | |
| D41 | 5657472 | -28877 | 1186.35 | Auger/Rotary Coring | 50.5 | | |
| D41 | 5657472 | -28879 | 1186.58 | CPT | 5.4 | | |
| D42 | 5657273 | -28768 | 1191.96 | Auger/Rotary Coring | 35.2 | | |
| D43 | 5657489 | -28705 | 1186.53 | Sonic/Rotary Coring | 55.3 | | |
| D44 | 5657513 | -28743 | 1188.62 | CPT | 8.0 | | |
| D45 | 5657536 | -28839 | 1185.12 | Auger/Rotary Coring | 45.7 | 2" Well | |
| D46 | 5657593 | -28938 | 1187.18 | Auger/Rotary Coring | 39.6 | | |
| D47 | 5657562 | -28923 | 1187.42 | CPT | 6.3 | | |
| D48 | 5657602 | -28714 | 1191.25 | Auger/Rotary Coring | 46.0 | | |
| D49 | 5657660 | -28776 | 1187.29 | CPT | 6.8 | | |
| D50 | 5657694 | -28896 | 1189.77 | Auger/Rotary Coring | 49.1 | | |
| D50 | 5657688 | -28892 | 1188.61 | CPT | 11.8 | | |
| D51 | 5657740 | -28762 | 1194.40 | Auger/Rotary Coring | 30.8 | 2" Well | Packer Testing |
| D52 | 5657829 | -28684 | 1204.25 | Auger/Rotary Coring | 49.1 | | |
| D57 | 5657316 | -29385 | 1191.58 | CPT | 15.6 | | |
| D58 | 5657461 | -29145 | 1190.20 | Auger/Rotary Coring | 40.0 | | |
| D58 | 5657461 | -29145 | 1190.20 | CPT | 16.6 | | |
| D59 | 5657206 | -29444 | 1190.78 | Auger/Rotary Coring | 40.0 | | |
| D60 | 5657257 | -29224 | 1191.68 | Auger/Rotary Coring | 45.1 | | Packer Testing |
| D60 | 5657257 | -29224 | 1191.68 | CPT | 17.3 | | |
| D61 | 5657330 | -29131 | 1190.36 | CPT | 17.8 | | |
| D62 | 5657438 | -28988 | 1190.67 | Auger/Rotary Coring | 45.7 | 2" Well | |
| D63 | 5657181 | -29218 | 1191.66 | CPT | 18.6 | | |

| Borehole ID | Surveyed Coordinates (3TM) | | Surveyed Elevation (masl) | Drilling Method | Depth Drilled | Installation | In-situ Testing |
|---|---|---|---|---|---|---|---|
| | Northing | Easting | | | | | |
| D64 | 5657689 | -28698 | 1193.60 | CPT | 10.1 | | |
| D68 | 5657384 | -29238 | 1191.37 | Auger/Rotary Coring | 44.5 | | |
| BS1 | 5658021 | -28966 | 1198.92 | Auger | 15.4 | | |
| BS2 | 5658229 | -29022 | 1204.09 | Auger | 10.7 | | |
| BS3 | 5658231 | -29274 | 1197.45 | Auger | 9.3 | 2" Well | |
| BS4 | 5658398 | -29457 | 1199.44 | Auger | 12.2 | | |
| BS5 | 5657579 | -29358 | 1190.45 | Auger/Rotary Coring | 18.6 | | |
| GW1 | 5659966 | -33327 | 1211.70 | Auger/Rotary Coring | 16.8 | 2" Well | |
| GW2 | 5659717 | -31933 | 1206.03 | Auger | 13.7 | 2" Well | |
| GW3 | 5659072 | -31903 | 1201.06 | Auger | 7.6 | 2" Well | |
| GW4 | 5658718 | -32259 | 1204.25 | Auger/Rotary Coring | 22.9 | 2" Well | |
| GW5 | 5658166 | -31864 | 1210.56 | Auger/Rotary Coring | 22.9 | 2" Well | |
| GW6 D | 5658208 | -31083 | 1196.50 | Auger/Rotary Coring | 22.9 | 2" Well | |
| GW6 S | 5658208 | -31083 | 1196.50 | Auger | 10.7 | 2" Well | |
| GW7 | 5658895 | -31095 | 1199.10 | Auger | 9.1 | 2" Well | |
| GW8 D | 5659624 | -30875 | 1216.74 | Auger/Rotary Coring | 20.4 | 2" Well | |
| GW8 S | 5659624 | -30875 | 1216.74 | Auger | 7.9 | 2" Well | |
| GW9 | 5659077 | -30236 | 1204.47 | Auger | 6.1 | 2" Well | |
| GW10 | 5658475 | -30462 | 1195.26 | Auger | 18.3 | 2" Well | |
| GW11* | 5657743 | -30270 | 1222 | Auger | 15.2 | 2" Well | |
| GW12 | 5657859 | -29160 | 1189.92 | Auger | 12.2 | 2" Well | |
| GW13 | 5659064 | -29610 | 1222.34 | ODEX | 36.6 | 2" Well | |
| GW14 | 5659032 | -28585 | 1203.61 | ODEX | 33.5 | 2" Well | |
| GW15 | 5658219 | -27816 | 1189.67 | Auger/Rotary Coring | 35.1 | 2" Well | |
| H1 | 5656427 | -32713 | 1214.11 | Auger | 30.0 | | |
| H2 | 5656458 | -32713 | 1214.91 | Auger | 30.1 | | |
| H3 | 5656489 | -32714 | 1215.55 | Auger | 30.5 | | |
| H4 | 5656520 | -32714 | 1215.90 | Auger | 30.0 | | |
| H5 | 5658967 | -32699 | 1206.49 | Auger | 15.2 | | |
| H6 | 5659178 | -32703 | 1204.50 | Auger | 18.3 | 2" Well | |
| H7 | 5659357 | -32699 | 1202.02 | Auger | 16.8 | | |
| H8 | 5659585 | -32702 | 1205.31 | Auger | 18.3 | | |
| H9 | 5659766 | -32702 | 1207.64 | Auger | 18.9 | 2" Well | |
| H10 | 5655853 | -33314 | 1217.42 | Auger/Rotary Coring | 30.2 | | |
| H11 | 5655857 | -33415 | 1219.53 | Auger | 21.4 | | |
| H12 | 5655857 | -33377 | 1217.63 | Auger/Rotary Coring | 34.7 | | |
| H13 | 5655858 | -33347 | 1217.08 | Auger/Rotary Coring | 34.8 | | |
| *As-built not taken, drilled at approximate location based on hand-held GPS | | | | | | | |

# Appendix C
Borehole Layout Plan

Stantec

MATCHLINE

DC-13
H11
H13
H10
H12
DC-12
DIVERSION CHANNEL
(24M CHANNEL WIDTH, 3:1
SIDE SLOPES
DC-11
PIPELINE
CROSSING
11+000
DC-10
DC-9A
DC-9
DC-8
DC-7A
DC-7
DC-5
DC-6
DC-4
DC-4A
DC-3
DS-6A
DC-2A
DS-6
DC-2
DC-1
SERVICE
SPILLWAY/SLUICEWAY
DIVERSION INLET
DS-9
DS-3
DS-7
DS-10
DS-7A
DS-1
DS-8A
FB7
DS-8
DIVERSION
EMERGENCY
SPILLWAY
DS-4
10+000
FB6
DS-5
DS-2
FB5
FB4
FLOODPLAIN
BERM
FB3
9+000
ELBOW RIVER
1205
1210
1215
1220
1225
1230
1235
1240
1245
1250
1255
1260
1265
1270
1200

MAP KEY
MAP 4 | MAP 5
MAP 2 | MAP 3
MAP 1

LEGEND
AUGER BORING

PLAN
1:5000

THIS DRAWING MAY HAVE BEEN REDUCED.
ALL SCALE NOTATIONS INDICATED (i.e. 1:1000 etc) ARE
BASED ON 22" X 34" FORMAT DRAWINGS

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DEPARTMENT BAR CODE

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Project No.: 110773396
200 - 325 25th Street SE
Calgary AB Canada T2A 7H8
Tel. 403.716.8000
www.stantec.com

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DATE

CHECKER
DATE

Alberta Transportation

SPRINGBANK OFF-STREAM STORAGE PROJECT
SR1

GEOTECHNICAL EXPLORATION
BORING LAYOUT (1 OF 5)

| DATE | ALBERTA ENVIRONMENT AND PARKS CAPITAL PROJECTS NUMBER | SITE | SHEET | CONSULTANT DRAWING | TRANSPORTATION DRAWING |
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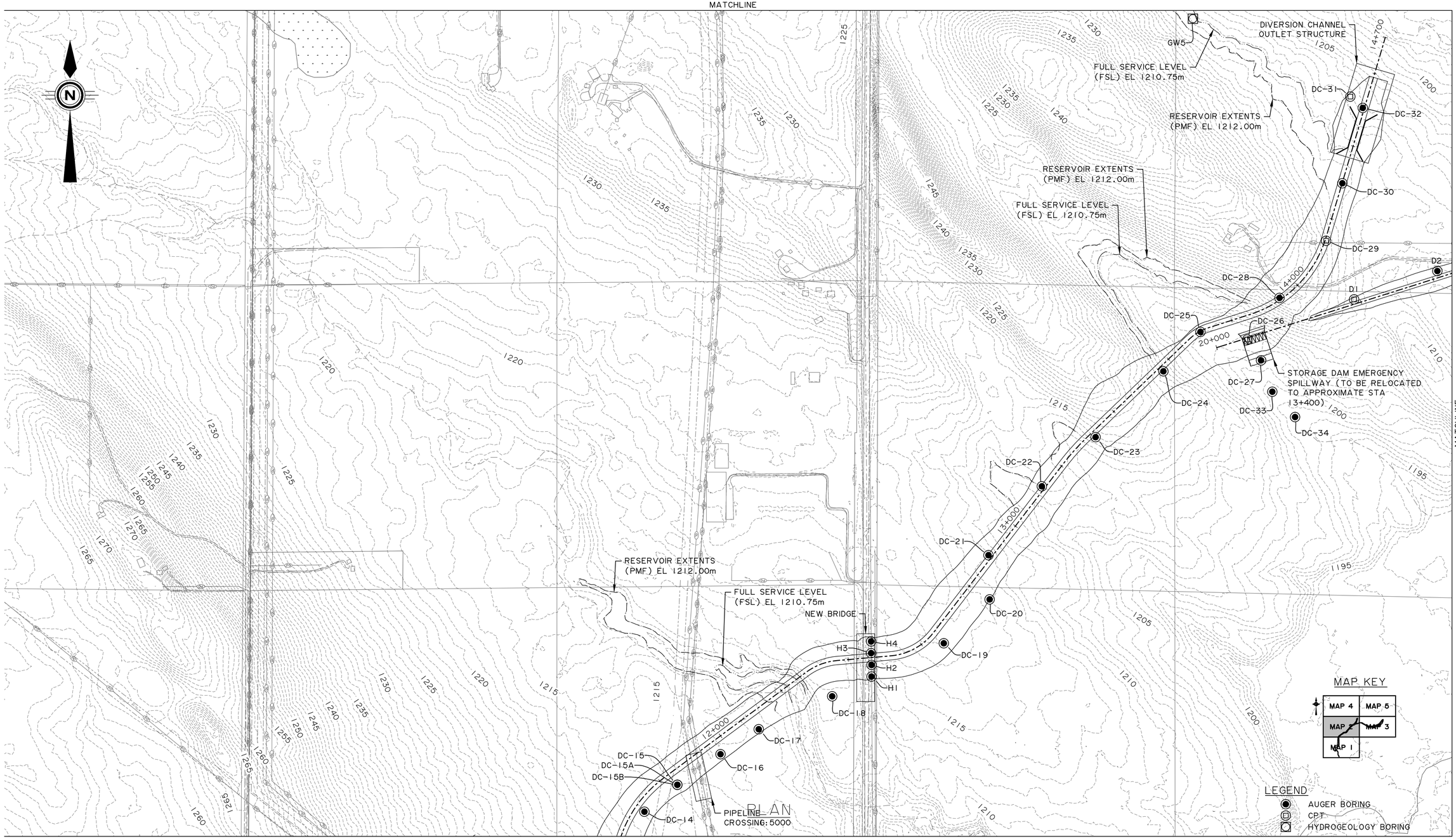


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MATCHLINE

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SPRINGBANK OFF-STREAM STORAGE PROJECT
SR1

GEOTECHNICAL EXPLORATION
BORING LAYOUT (2 OF 5)

| DATE | ALBERTA ENVIRONMENT AND PARKS CAPITAL PROJECTS NUMBER | SITE | SHEET | CONSULTANT DRAWING | TRANSPORTATION DRAWING |
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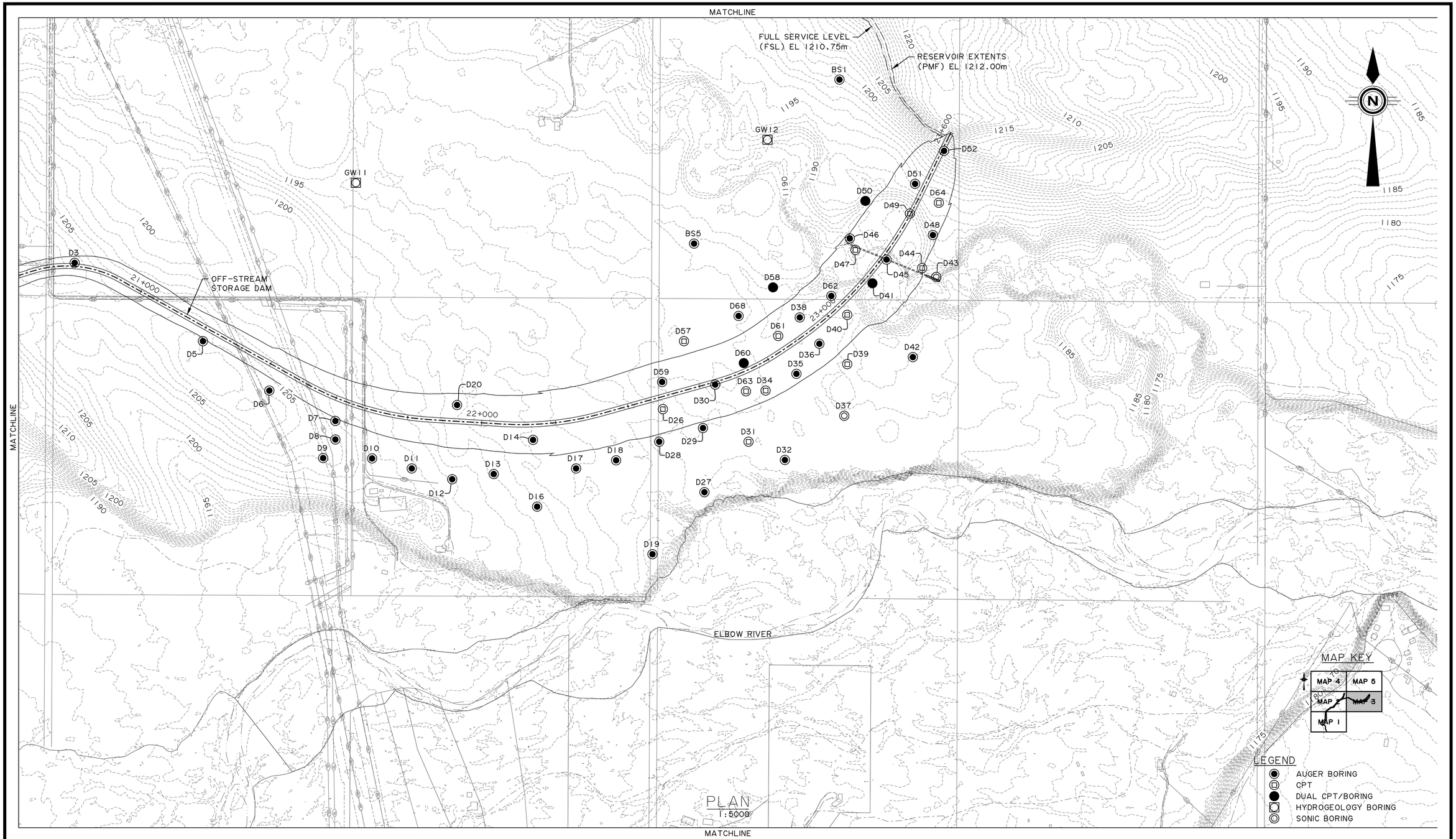


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DESIGNER DATE

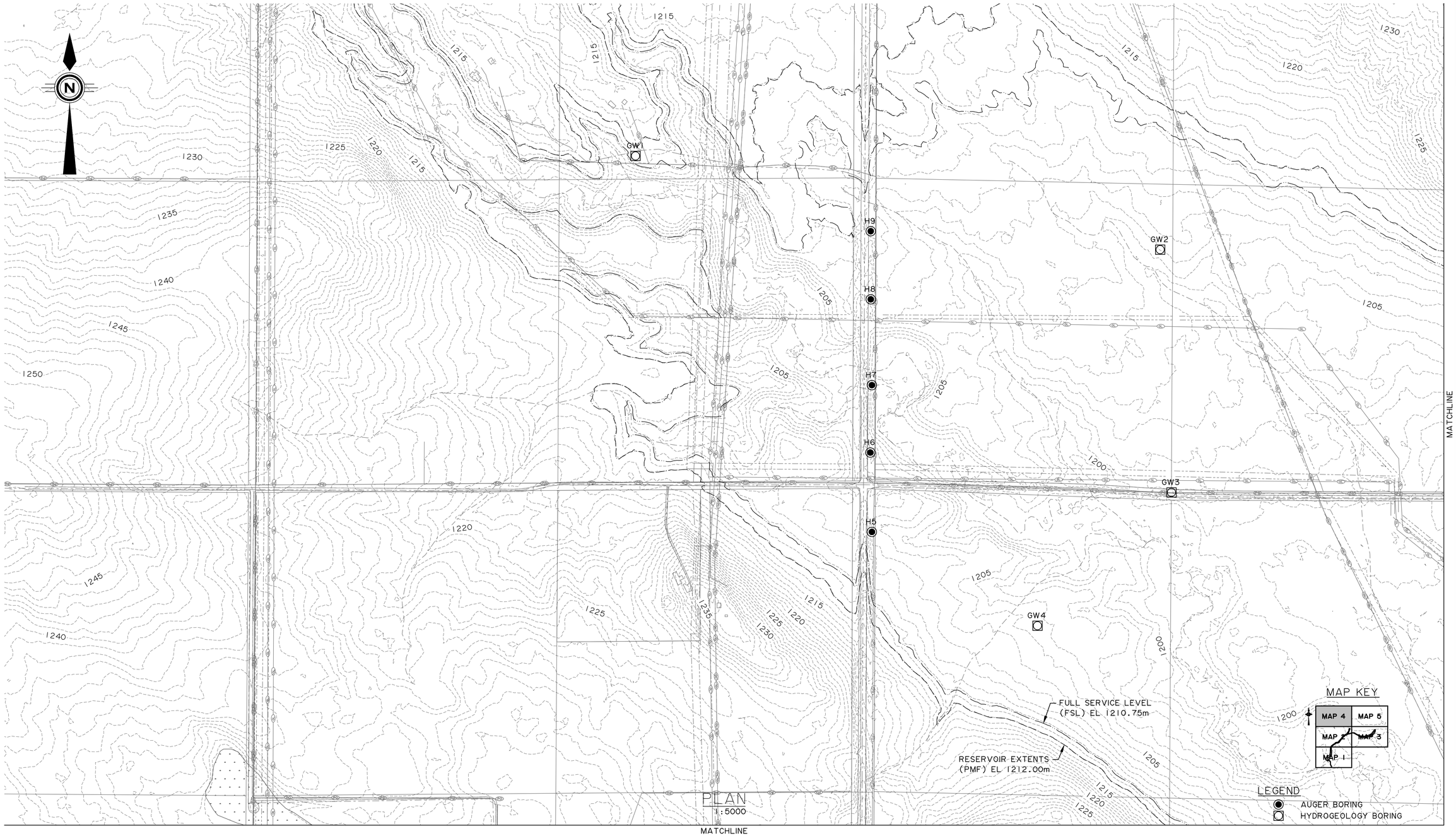
CHECKER DATE

Alberta Transportation

SPRINGBANK OFF-STREAM STORAGE PROJECT
SR1

GEOTECHNICAL EXPLORATION
BORING LAYOUT (3 OF 5)

| DATE | ALBERTA ENVIRONMENT AND PARKS CAPITAL PROJECTS NUMBER | SITE | SHEET | CONSULTANT DRAWING | TRANSPORTATION DRAWING |
|---|---|---|---|---|---|
| 2016-01-26 | - | - | | | |




PLAN
1:5000

THIS DRAWING MAY HAVE BEEN REDUCED.
ALL SCALE NOTATIONS INDICATED (i.e. 1:1000 etc) ARE BASED ON 22" X 34" FORMAT DRAWINGS

THINK SAFETY FIRST

DEPARTMENT BAR CODE

Stantec

Project No.: 110773396
200 - 325 25th Street SE
Calgary AB Canada T2A 7H8
Tel. 403.716.8000
www.stantec.com

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DATE

CHECKER
DATE

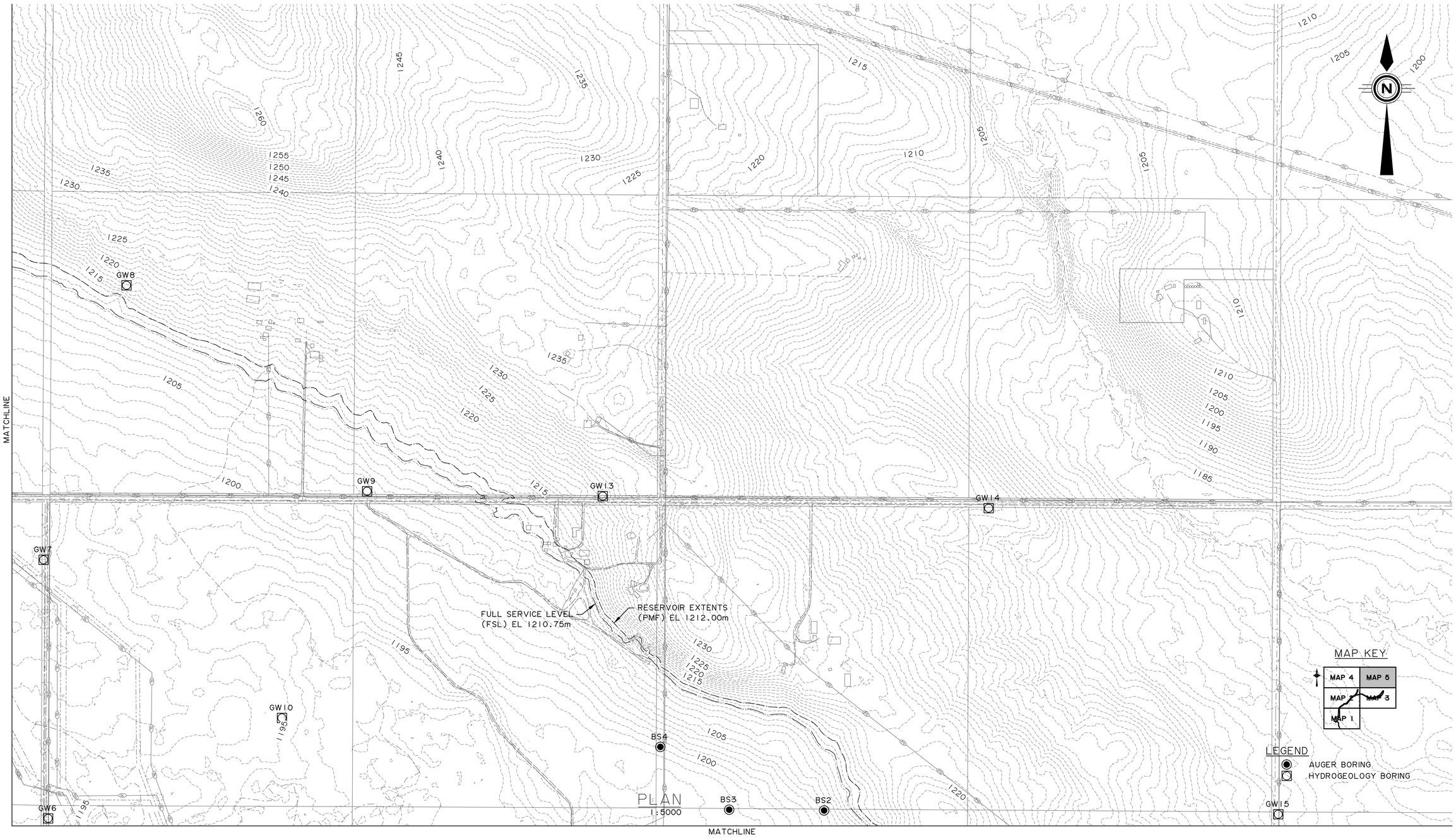
Alberta Transportation

SPRINGBANK OFF-STREAM STORAGE PROJECT
SR1

GEOTECHNICAL EXPLORATION
BORING LAYOUT (4 OF 5)

| DATE | ALBERTA ENVIRONMENT AND PARKS CAPITAL PROJECTS NUMBER | SITE | SHEET | CONSULTANT DRAWING | TRANSPORTATION DRAWING |
|---|---|---|---|---|---|
| 2016-01-26 | - | - | | | |

PlotDate: 2016.12.09 3:48 PM Login: Clinkenbeard, Adam
AUTOCAD FILE No. U:\110773396\CADWater\b_geotechnical\sheet_files\300_dc173396S-310.dwg TENDER No. ?

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| 1 | 2016-01-26 | ISSUED FOR | SS |

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DESIGNER DATE

CHECKER DATE

Alberta Transportation

SPRINGBANK OFF-STREAM STORAGE PROJECT
SR1

GEOTECHNICAL EXPLORATION
BORING LAYOUT (5 OF 5)

| DATE | ALBERTA ENVIRONMENT AND PARKS CAPITAL PROJECTS NUMBER | SITE | SHEET | CONSULTANT DRAWING | TRANSPORTATION DRAWING |
|---|---|---|---|---|---|
| 2016-01-26 | - | - | | | |

PlotDate: 2016.12.09 3:49 PM Login: Clinkenbeard, Adam
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# Appendix D
Borehole Logs

# SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

## SOIL DESCRIPTION

**Terminology describing common soil genesis:**

| | |
|---|---|
| *Rootmat* | - vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface |
| *Topsoil* | - mixture of soil and humus capable of supporting vegetative growth |
| *Peat* | - mixture of visible and invisible fragments of decayed organic matter |
| *Till* | - unstratified glacial deposit which may range from clay to boulders |
| *Fill* | - material below the surface identified as placed by humans (excluding buried services) |

**Terminology describing soil structure:**

| | |
|---|---|
| *Desiccated* | - having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc. |
| *Fissured* | - having cracks, and hence a blocky structure |
| *Varved* | - composed of regular alternating layers of silt and clay |
| *Stratified* | - composed of alternating successions of different soil types, e.g. silt and sand |
| *Layer* | - > 75 mm in thickness |
| *Seam* | - 2 mm to 75 mm in thickness |
| *Parting* | - < 2 mm in thickness |

**Terminology describing soil types**:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Prairie Farm Rehabilitation Association (PFRA) Modified version of the Unified Soil Classification System (USCS) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. See page 4 for definitions and other details.

**Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):**
Terminology describing materials outside of the PFRA Modified version of the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

| | |
|---|---|
| *Trace, or occasional* | Less than 10% |
| *Some* | 10-20% |
| *Frequent* | > 20% |

**Terminology describing compactness of cohesionless soils:**
The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

| Compactness Condition | SPT N-Value |
|---|---|
| *Very Loose* | <4 |
| *Loose* | 4-10 |
| *Compact* | 10-30 |
| *Dense* | 30-50 |
| *Very Dense* | >50 |

**Terminology describing consistency of cohesive soils:**
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

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

**ROCK DESCRIPTION**

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

**Terminology describing rock quality:**

| RQD | Rock Mass Quality |
|---|---|
| 0-25 | *Very Poor Quality* |
| 25-50 | *Poor Quality* |
| 50-75 | *Fair Quality* |
| 75-90 | *Good Quality* |
| 90-100 | *Excellent Quality* |

| Alternate (Colloquial) Rock Mass Quality | |
|---|---|
| *Very Severely Fractured* | *Crushed* |
| *Severely Fractured* | *Shattered or Very Blocky* |
| *Fractured* | *Blocky* |
| *Moderately Jointed* | *Sound* |
| *Intact* | *Very Sound* |

**RQD (Rock Quality Designation)** denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

**SCR (Solid Core Recovery)** denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

**Fracture Index (FI)** is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

**Terminology describing rock with respect to discontinuity and bedding spacing:**

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

**Terminology describing rock strength:**

| Strength Classification | Grade | Unconfined Compressive Strength (MPa) |
|---|---|---|
| *Extremely Weak* | R0 | <1 |
| *Very Weak* | R1 | 1 – 5 |
| *Weak* | R2 | 5 – 25 |
| *Medium Strong* | R3 | 25 – 50 |
| *Strong* | R4 | 50 – 100 |
| *Very Strong* | R5 | 100 – 250 |
| *Extremely Strong* | R6 | >250 |

**Terminology describing rock weathering:**

| Term | Symbol | Description |
|---|---|---|
| *Fresh* | W1 | No visible signs of rock weathering. Slight discoloration along major discontinuities |
| *Slightly* | W2 | Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored. |
| *Moderately* | W3 | Less than half the rock is decomposed and/or disintegrated into soil. |
| *Highly* | W4 | More than half the rock is decomposed and/or disintegrated into soil. |
| *Completely* | W5 | All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact. |
| *Residual Soil* | W6 | All the rock converted to soil. Structure and fabric destroyed. |

## STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.

Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Meta-morphic Bedrock | Sedi-mentary Bedrock

## SAMPLE TYPE

| | |
|---|---|
| *SS* | Split spoon sample (obtained by performing the Standard Penetration Test) |
| *ST* | Shelby tube or thin wall tube |
| *DP* | Direct-Push sample (small diameter tube sampler hydraulically advanced) |
| *PS* | Piston sample |
| *BS* | Bulk sample |
| *WS* | Wash sample |
| *HQ, NQ, BQ, etc.* | Rock core samples obtained with the use of standard size diamond coring bits. |

## WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

## RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

## N-VALUE

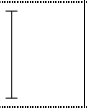
Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

## DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (305 mm) into the soil. The DCPT is used as a probe to assess soil variability.

## OTHER TESTS

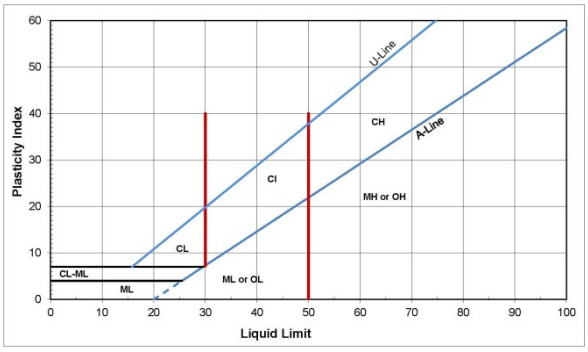
| | |
|---|---|
| *S* | Sieve analysis |
| *H* | Hydrometer analysis |
| *k* | Laboratory permeability |
| $\gamma$ | Unit weight |
| $G_s$ | Specific gravity of soil particles |
| *CD* | Consolidated drained triaxial |
| *CU* | Consolidated undrained triaxial with pore pressure measurements |
| *UU* | Unconsolidated undrained triaxial |
| *DS* | Direct Shear |
| *C* | Consolidation |
| $Q_u$ | Unconfined compression |
| $I_p$ | Point Load Index ($I_p$ on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm) |

| | |
|---|---|
|  | Single packer permeability test; test interval from depth shown to bottom of borehole |
|  | Double packer permeability test; test interval as indicated |
|  | Falling head permeability test using casing |
|  | Falling head permeability test using well point or piezometer |

## MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

| MAJOR DIVISION | | | GROUP SYMBOL | TYPICAL DESCRIPTION | LABORATORY CLASSIFICATION CRITERIA | |
|---|---|---|---|---|---|---|
| COARSE GRAINED SOILS | GRAVELS (MORE THAN HALF COARSE GRAINS LARGER THAN 4.75 mm) | CLEAN GRAVELS (LITTLE OR NO FINES) | GW | WELL GRADED GRAVELS, LITTLE OR NO FINES | $C_u = \frac{D_{60}}{D_{10}} > 4;\ C_c = \frac{(D_{30})^2}{D_{10}\ x\ D_{60}} = 1\ to\ 3$ | |
| | | | GP | POORLY GRADED GRAVELS AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES | NOT MEETING ABOVE REQUIREMENTS | |
| | | GRAVELS WITH FINES | GM | SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES | CONTENT OF FINES EXCEEDS 12% | ATTERBERG LIMITS BELOW 'A' LINE OR P.I. LESS THAN 4 |
| | | | GC | CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES | | ATTERBERG LIMITS ABOVE 'A' LINE OR P.I. MORE THAN 7 |
| | SANDS (MORE THAN HALF COARSE GRAINS SMALLER THAN 4.75 mm) | CLEAN SANDS (LITTLE OR NO FINES) | SW | WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES | $C_u = \frac{D_{60}}{D_{10}} > 6;\ C_c = \frac{(D_{30})^2}{D_{10}\ x\ D_{60}} = 1\ to\ 3$ | |
| | | | SP | POORLY GRADED SANDS, LITTLE OR NO FINES | NOT MEETING ABOVE REQUIREMENTS | |
| | | SANDS WITH FINES | SM | SILTY SANDS, SAND-SILT MIXUTRES | CONTENT OF FINES EXCEEDS 12% | ATTERBERG LIMITS BELOW 'A' LINE OR P.I. LESS THAN 4 |
| | | | SC | CLAYEY SANDS, SAND-CLAY MIXTURES | | ATTERBERG LIMITS ABOVE 'A' LINE OR P.I. MORE THAN 7 |
| FINE GRAINED SOILS | SILTS (BELOW 'A' LINE NEGLIGIBLE ORGANIC CONTENT) | $W_L$ < 50 | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY | CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW) | |
| | | $W_L$ > 50 | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS | | |
| | CLAYS (ABOVE 'A' LINE NEGLIGIBLE ORGANIC CONTENT) | $W_L$ < 30 | CL | INORGANIC CLAYS OF LOW PLASTICITY GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS | | |
| | | 30 < $W_L$ < 50 | CI | INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS | | |
| | | $W_L$ > 50 | CH | INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS | | |
| | ORGANIC SILTS & CLAYS (BELOW 'A' LINE) | $W_L$ < 50 | OL | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY | Note: WHENEVER THE NATURE OF THE FINE CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER 'F'. E.G. SF IS A MIXTURE OF SAND WITH SILT OR CLAY | |
| | | $W_L$ > 50 | OH | ORGANIC CLAYS OF HIGH PLASTICITY | | |
| HIGHLY ORGANIC SOILS | | | Pt | PEAT AND OTHER HIGHLY ORGANIC SOILS | STRONG COLOUR OR ODOR, AND OFTEN FIBROUS TEXTURE | |
| BEDROCK | | | BR | SEE REPORT DESCRIPTION | | |

NOTE: BOUNDARY CLASSIFICATION POSSESSING CHARACTERISTICS OF TWO GROUPS ARE GIVEN GROUP SYMBOLS, E.G. GW-GC IS A WELL GRADED GRAVEL MIXTURE WITH CLAY BINDER BETWEEN 5% AND 12%.




**NOTE:** PLASTICITY CHART IS FOR SOILS PASSING 425 µm SIEVE

**SOIL COMPENENTS BY PARTICLE SIZE DISTRIBUTION**

| FRACTION | | SIEVE SIZE (mm) | | DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS | |
|---|---|---|---|---|---|
| | | PASSING | RETAINED | PERCENT | IDENTIFIER |
| GRAVEL | COARSE | 75 | 19 | 50 – 35 | AND |
| | FINE | 19 | 4.75 | | |
| SAND | COARSE | 4.75 | 2.00 | 35 - 20 | ____Y/EY |
| | MEDIUM | 2 | 0.425 | | |
| | FINE | 0.425 | 0.075 | 20 - 10 | SOME |
| SILT (non-plastic) OR CLAY (plastic) | | 0.075 | | 10 – 1 | TRACE |
| OVERSIZE MATERIALS | | | | | |
| ROUNDED OR SUB-ROUNDED COBBLES 75 mm to 200 mm BOULDERS > 200 mm | | | | ANGULAR ROCK FRAGMENTS ROCKS > 0.75 $m^3$ IN VOLUME | |

**NOTE:** ALL SIEVE SIZES ARE REFERENCED TO U.S. STANDARD ASTM E.11 - ALTERNATE EQUAVALENT METRIC SIEVE SIZES IN ACCORDANCE WITH CGSB SPEC. 8-GP-2M TO APPLY WHEN PRESCRIBED

# D. 1
## Diversion Structure

Stantec

# BOREHOLE RECORD

**DS01**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/24

NORTHING 5654611
EASTING -33587
WATER LEVEL

PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1210.45 | Brown and grey silty GRAVEL (GM)<br>- some sand, inferred cobbles, damp | | | | | | | | | | | |
| | 1209.65 | | | | | | | | | | | | |
| 1 | 1209.25 | Very poor quality grey (inferred) SANDSTONE | | | | | | | | | | | |
| | | Bedrock encountered at 0.8 m<br>- Coring commenced at 1.2 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 15.4 m | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS01**

CLIENT Alberta Transportation NORTHING: 5654611 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33587 BH SIZE ODEX:150mm

DRILLING DATE 4/24/2016 to 4/24/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 209.7 | | | | | | | | | | | |
| 1 | | Very poor quality grey (inferred) SANDSTONE | | | | | | | | | | |
| | 209.3 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE/MUDSTONE - slightly to moderately weathered - extremely to very weak - coal seams - good quality below 1.7 m | | | RC 1 | 83 | 66 | 33 | | R0.5 | W2.5 | |
| 2 | | | | | RC 2 | 100 | 82 | 78 | | R0.5 | W2.5 | |
| 3 | 207.3 | | | | | | | | | | | |
| | | Fair quality grey SHALE/MUDSTONE - slightly to moderately weathered - extremely to very weak - coal seams | | | RC 3 | 100 | 89 | 71 | | R0.5 | W2.5 | |
| 4 | | | | | RC 4 | 83 | 66 | 66 | | R0.5 | W2.5 | |
| 5 | 205.5 | | | | RC 5 | 100 | 87 | 65 | | R2 | W2 | |
| | 205.1 | Fair quality grey SANDSTONE - slightly weathered - weak | | | | | | | | | | |
| | | Fair quality grey SHALE/MUDSTONE - slightly to moderately weathered - extremely to very weak - coal seams | | | RC 6 | 68 | 32 | 14 | | R0.5 | W2.5 | |
| 6 | 204.3 | | | | | | | | | | | |
| | | Poor quality grey CLAYSTONE - highly to completely weathered - extremely weak | | | RC 7 | 100 | 90 | 48 | | R0.5 | W2.5 | |
| 7 | 203.0 | | | | | | | | | | | |
| | | Poor quality grey SHALE - slightly weathered - very weak - good quality, and very weak to weak below 7.8 m | | | RC 8 | 100 | 97 | 80 | | R0.5 | W2.5 | |
| 8 | | | | | | | | | | | | |
| 9 | | - very poor quality below 8.8 m | | | RC 9 | 100 | 80 | 25 | | R0.5 | W2.5 | |
| | 201.2 | | | | | | | | | | | |
| | | Fair quality grey MUDSTONE/SHALE - slightly to moderately weathered - extremely weak to weak | | | | | | | | | | |
| 10 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:32 PM

Stantec

# BOREHOLE RECORD

**DS01**

CLIENT Alberta Transportation NORTHING: 5654611 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33587 BH SIZE ODEX:150mm

DRILLING DATE 4/24/2016 to 4/24/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | | | | | | | | | | | |
| | | Fair quality grey MUDSTONE/SHALE<br>- slightly to moderately weathered<br>- extremely weak to weak | | | RC10 | 100 | 95 | 51 | | R0.5 | W2.5 | |
| 11 | | | | | RC11 | 100 | 95 | 58 | | R1 | W2.5 | |
| | | - good quality below 11.3 m | | | RC12 | 100 | 95 | 75 | | R1 | W2.5 | |
| 12 | 198.4 | | | | | | | | | | | |
| | | Good quality grey SANDSTONE<br>- slightly weathered<br>- very weak to weak<br>- coal seams | | | RC13 | 100 | 100 | 78 | | R1.5 | W2 | |
| 13 | | | | | | | | | | | | |
| | | | | | RC14 | 100 | 97 | 97 | | R1.5 | W2 | |
| 14 | | | | | | | | | | | | |
| 15 | | - clay/claystone seams at 14.9 m | | | RC15 | 95 | 95 | 84 | | R1.5 | W2 | |
| | 195.1 | | | | | | | | | | | |
| | | End of borehole (15.4 m) | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 2:56:33 PM

Stantec

# BOREHOLE RECORD

**DS02**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/27

NORTHING 5654614
EASTING -33612
WATER LEVEL (0.0 m) 4/27/2016

PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1210.41 | Brown and grey silty GRAVEL (GM)<br>- some sand, inferred cobbles, damp | | ▼ | | | | | | | | | |
| 1 | 1208.71 | Very poor quality grey (inferred) MUDSTONE | | | | | | | | | | | |
| 2 | 1207.71 | Bedrock encountered at 1.7 m<br>- Coring commenced at 2.7 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 15.4 m<br>- Water at surface upon completion of coring | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS02**

CLIENT Alberta Transportation NORTHING: 5654614 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33612 BH SIZE ODEX:150mm

DRILLING DATE 4/27/2016 to 4/27/2016 WATER LEVEL (0.0 m) 4/27/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 208.7 | | | | | | | | | | | |
| 2 | | Very poor quality grey (inferred) MUDSTONE | | | | | | | | | | |
| | 207.7 | | | | | | | | | | | |
| 3 | | Excellent quality grey SHALE<br>- slightly weathered<br>- weak to very weak<br>- coal seams<br>- fair quality below 3.2 m | | | RC 1 | 100 | 100 | 95 | | R1 | W2.5 | |
| | 206.5 | | | | RC 2 | 96 | 76 | 65 | | R0 | W3 | |
| 4 | | Fair quality grey brown MUDSTONE<br>- moderately weathered<br>- extremely weak | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| | | - mudstone/sandstone below 5.3 m | | | RC 3 | 100 | 87 | 61 | | R0 | W3 | |
| 6 | 204.1 | | | | | | | | | | | |
| | | Fair quality brownish grey MUDSTONE/SHALE<br>- slightly to moderately weathered<br>- extremely weak to weak | | | RC 4 | 100 | 90 | 75 | | R1 | W2.5 | |
| 7 | | | | | | | | | | | | |
| 8 | 202.3 | | | | | | | | | | | |
| | | Poor quality grey CLAYSTONE<br>- moderately to highly weathered<br>- extremely weak | | | RC 5 | 87 | 78 | 50 | | R0 | W3 | |
| | 201.7 | | | | | | | | | | | |
| 9 | | Poor quality brownish grey MUDSTONE/SHALE<br>- slightly to moderately weathered<br>- extremely weak to weak<br>- 0.2 m thick claystone layer at 9.2 m | | | | | | | | | | |
| 10 | | | | | RC 6 | 100 | 90 | 83 | | R2 | W2 | |
| | | - excellent quality below 10.8 m | | | | | | | | | | |
| 11 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:34 PM

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# BOREHOLE RECORD

**DS02**

CLIENT Alberta Transportation NORTHING: 5654614 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33612 BH SIZE ODEX:150mm

DRILLING DATE 4/27/2016 to 4/27/2016 WATER LEVEL (0.0 m) 4/27/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | | | | | | | | | | | | |
| | | Poor quality brownish grey MUDSTONE/SHALE<br>- slightly to moderately weathered<br>- extremely weak to weak | | | RC 7 | 100 | 100 | 93 | | R2 | W2 | |
| 12 | 198.0 | | | | | | | | | | | |
| | | Excellent quality grey SANDSTONE<br>- slightly weathered<br>- medium strong to strong | | | RC 8 | 100 | 100 | 97 | | 5 | W2 | |
| 14 | 196.3 | | | | | | | | | | | |
| | | Good quality grey SHALE<br>- slightly weathered<br>- weak | | | RC 9 | 100 | 98 | 83 | | R2 | W2 | |
| 15 | 195.0 | | | | | | | | | | | |
| | | End of borehole (15.4 m)<br>- water at surface upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.2 m to 15.4 m | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:35 PM

Stantec

# BOREHOLE RECORD

**DS03**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/26

NORTHING 5654631
EASTING -33624
WATER LEVEL (0.0 m) 4/26/2016

PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1210.44 | Brown and grey silty GRAVEL (GM)<br>- some sand, inferred cobbles, damp | | ▼ | | | | | | | | | |
| 1 | 1209.34 | | | | | | | | | | | | |
| | 1209.14 | Very poor quality grey (inferred) MUDSTONE | | | | | | | | | | | |
| 2 | | Bedrock encountered at 1.1 m<br>- Coring commenced at 1.3 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 15.4 m<br>- Water at surface upon completion of coring | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS03**

CLIENT Alberta Transportation NORTHING: 5654631 PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33624 BH SIZE ODEX:150mm
DRILLING DATE 4/26/2016 to 4/26/2016 WATER LEVEL (0.0 m) 4/26/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | Overburden - See Soil Log for overburden description | | ▼ | | | | | | | | |
| 1 | 209.3 | | | | | | | | | | | |
| | 209.1 | Very poor quality grey (inferred) MUDSTONE | | | RC 1 | 100 | 92 | 54 | | R0 | W3 | |
| 2 | | Poor to fair quality grey MUDSTONE<br>- moderately weathered<br>- extremely weak<br>- oxidation seams at 1.7 m | | | RC 2 | 91 | 67 | 35 | | R1.5 | W2 | |
| 3 | 207.2 | | | | | | | | | | | |
| | | Good quality grey SHALE<br>- slightly weathered<br>- very weak to weak<br>- coal seams | | | | | | | | | | |
| | 206.8 | | | | | | | | | | | |
| 4 | 206.4 | Good quality grey SANDSTONE<br>- slightly weathered<br>- very weak to weak | | | RC 3 | 100 | 92 | 85 | | R1.5 | W2 | |
| | | Good quality grey SHALE<br>- slightly weathered<br>- very weak to weak<br>- coal seams | | | | | | | | | | |
| 5 | | | | | RC 4 | 100 | 93 | 87 | | R1.5 | W2 | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | RC 5 | 100 | 90 | 82 | | R1.5 | W2 | |
| 8 | | - claystone/mudstone from 7.7 m to 7.8 m<br>- fair quality below 7.8 m | | | RC 6 | 100 | 97 | 75 | | R1.5 | W2 | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 2:56:36 PM

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# BOREHOLE RECORD

**DS03**

CLIENT Alberta Transportation NORTHING: 5654631 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33624 BH SIZE ODEX:150mm

DRILLING DATE 4/26/2016 to 4/26/2016 WATER LEVEL (0.0 m) 4/26/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | | | | RC 7 | 100 | 88 | 55 | | R2.5 | W2 | |
| | 200.1 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak to medium strong | | | | | | | | | | |
| 11 | 199.3 | Poor quality grey SHALE<br>- slightly weathered<br>- very weak to weak<br>- coal seams | | | RC 8 | 96 | 62 | 35 | | R1.5 | W2 | |
| 12 | | | | | RC 9 | 100 | 100 | 0 | | R1.5 | W2 | |
| | | - good quality below 12.4 m | | | | | | | | | | |
| 13 | 197.4 | Good quality grey SANDSTONE<br>- slightly weathered<br>- very weak to weak | | | RC10 | 100 | 98 | 83 | | R1.5 | W2 | |
| 14 | | | | | | | | | | | | |
| | 196.0 | Good quality grey SHALE<br>- slightly weathered<br>- weak | | | RC11 | 100 | 100 | 89 | | R2 | W2 | |
| 15 | 195.0 | | | | | | | | | | | |
| | | End of borehole (15.4 m)<br>- water at surface upon completion<br>- borehole backfilled with cuttings and a bentonite placed from 0.2 m to 15.4 m | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:37 PM

Stantec

# BOREHOLE RECORD

**DS04**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/29
NORTHING 5654596
EASTING -33645
WATER LEVEL (0.0 m) 4/29/2016
PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1210.50 | Brown and grey silty GRAVEL (GM)<br>- some sand, inferred cobbles, damp | | ▼ | | | | | | | | | |
| | 1209.6 | | | | | | | | | | | | |
| 1 | 1209.2 | Very poor quality grey (inferred) MUDSTONE | | | | | | | | | | | |
| | | Bedrock encountered at 0.9 m<br>- Coring commenced at 1.3 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 9.4 m<br>- Water at surface upon completion of coring | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS04**

CLIENT Alberta Transportation — NORTHING: 5654596 — PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB — EASTING: -33645 — BH SIZE ODEX:150mm

DRILLING DATE 4/29/2016 to 4/29/2016 — WATER LEVEL (0.0 m) 4/29/2016 — DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | Overburden - See Soil Log for overburden description | | ▼ | | | | | | | | |
| | 209.6 | | | | | | | | | | | |
| 1 | | Very poor quality grey (inferred) MUDSTONE | | | | | | | | | | |
| | 209.2 | | | | | | | | | | | |
| | | Poor to fair quality grey MUDSTONE/SHALE<br>- slightly to highly weathered<br>- extremely to very weak | | | RC 1 | 100 | 100 | 50 | | R0.5 | W3 | |
| 2 | | | | | RC 2 | 86 | 82 | 78 | | R0.5 | W3 | |
| 3 | 207.2 | | | | | | | | | | | |
| | | Fair quality grey SHALE<br>- slightly to moderately weathered<br>- very weak to weak<br>- coal and mudstone seams | | | RC 3 | 100 | 92 | 73 | | R1.5 | W2.5 | |
| 4 | | | | | | | | | | | | |
| 5 | | - poor quality, slightly to moderately weathered, and very weak to weak below 4.7 m | | | RC 4 | 93 | 57 | 35 | | R1.5 | W2.5 | |
| 6 | 204.2 | | | | | | | | | | | |
| | | Poor quality grey CLAYSTONE/MUDSTONE<br>- highly to completely weathered<br>- extremely weak | | | | | | | | | | |
| 7 | 203.5 | | | | RC 5 | 100 | 88 | 47 | | R1 | W3 | |
| | | Poor quality grey SHALE<br>- slightly weathered<br>- weak<br>- coal and mudstone seams<br>- fair quality below 7.8 m | | | | | | | | | | |
| 8 | | | | | RC 6 | 100 | 93 | 70 | | R2 | W2 | |
| | 201.6 | | | | | | | | | | | |
| 9 | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 201.1 | | | | | | | | | | | |
| | | End of borehole (9.4 m)<br>- water at surface upon completion<br>- borehole backfilled with | | | | | | | | | | |
| 10 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:39 PM

Stantec

# BOREHOLE RECORD

**DS04**

CLIENT Alberta Transportation NORTHING: 5654596 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33645 BH SIZE ODEX:150mm

DRILLING DATE 4/29/2016 to 4/29/2016 WATER LEVEL (0.0 m) 4/29/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % (80 60 40 20) | RECOVERY SOLID CORE % (80 60 40 20) | R.Q.D. % (80 60 40 20) | FRACT. INDEX PER 1m (5 10 15 20) | ROCK STRENGTH INDEX (R5 R4 R3 R2) | WEATHERING INDEX (W1 W2 W3 W4 W5 W6) | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | cuttings and a bentonite placed from 0.2 m to 9.4 m | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:39 PM

Stantec

# BOREHOLE RECORD

**DS05**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/28

NORTHING 5654546
EASTING -33672
WATER LEVEL (0.0 m) 4/28/2016

PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1211.30 | Brown and grey silty GRAVEL (GM)<br>- some sand, inferred cobbles, damp | | ▼ | | | | | | | | | |
| 1 | 1210 | | | | | | | | | | | | |
| | 1209.8 | Very poor quality grey (inferred) MUDSTONE | | | | | | | | | | | |
| 2 | | Bedrock encountered at 1.3 m<br>- Coring commenced at 1.3 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 12.3 m<br>- Water at surface upon completion of coring | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS05**

CLIENT Alberta Transportation — NORTHING: 5654546 — PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB — EASTING: -33672 — BH SIZE ODEX:150mm
DRILLING DATE 4/28/2016 to 4/28/2016 — WATER LEVEL (0.0 m) 4/28/2016 — DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 210.0 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 209.8 | Very poor quality grey (inferred) MUDSTONE | | | | | | | | | | |
| 2 | | Very poor quality brownish grey/greyish brown MUDSTONE<br>- completely to highly weathered<br>- extremely to very weak<br>- coal seams | | | RC 1 | 46 | 10 | 0 | | R0.5 | W5 | |
| 3 | | - poor quality, highly weathered below 3.2 m | | | | | | | | | | |
| 4 | | | | | RC 2 | 73 | 40 | 27 | | R0.5 | W5 | |
| 5 | | - excellent quality below 4.7 m | | | RC 3 | 100 | 100 | 97 | | R0.5 | W5 | |
| 6 | | | | | | | | | | | | |
| 7 | | - fair quality below 6.3 m | | | RC 4 | 100 | 98 | 73 | | R0.5 | W5 | |
| 8 | 203.5 | Very poor quality grey SANDSTONE<br>- slightly to moderately weathered<br>- weak | | | RC 5 | 51 | 50 | 21 | | R1 | W4 | |
| | 202.7 | Very poor quality greyish brown MUDSTONE<br>- completely to highly weathered<br>- extremely weak | | | | | | | | | | |
| 9 | | - fair quality below 9.3 m | | | | | | | | | | |
| 10 | | | | | RC 6 | 100 | 88 | 73 | | R0 | W5 | |
| 11 | | - poor quality below 10.8 m | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**DS05**

CLIENT Alberta Transportation NORTHING: 5654546 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33672 BH SIZE ODEX:150mm

DRILLING DATE 4/28/2016 to 4/28/2016 WATER LEVEL (0.0 m) 4/28/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | | | | | | | | | | | | |
| | | Very poor quality greyish brown MUDSTONE<br>- completely to highly weathered<br>- extremely weak | | | RC 7 | 100 | 93 | 48 | | R0 | W5 | |
| 12 | 1199.0 | | | | | | | | | | | |
| | | End of borehole (12.3 m)<br>- water at surface upon completion<br>- borehole backfilled with cuttings and a bentonite placed from 0.2 m to 12.3 m | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**DS06**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/11

NORTHING 5654668
EASTING -33673
WATER LEVEL (0.0 m) 4/11/2016

PROJECT NO. 110773396
BH SIZE HS:200 mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1233.30 | | | | | | | | | | | | |
| | 1233 | TOPSOIL | | | SS | 1 | 250 | 9 | | | | | |
| | | Stiff, brown, medium plasticity CLAY (CI)<br>- trace sand, trace rootlets, damp | | | ST | 2 | 150 | | | | | | |
| 1 | | | | | SS | 3 | 400 | 14 | | | | | |
| | | - 0.4 m thick gravel layer at 1.8 m | | | | | | | | | | | |
| 2 | 1231.1 | | | | | | | | | | | | |
| | | Hard, brown, low plasticity clay (CL) TILL<br>- some sand, trace gravel, damp | | | ST | 4 | 300 | | | | | | |
| | | | | | SS | 5 | 25 | 50+ | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | - some gravel to gravelly, dry to damp below 3.9 m | | | SS | 6 | 350 | 40 | | | | | |
| | | | | | SS | 7 | 300 | 49 | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | SS | 8 | 400 | 50+ | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | SS | 9 | 300 | 37 | | | | | |
| 9 | | - grey below 9.1m | | | SS | 10 | 450 | 45 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS06**

CLIENT Alberta Transportation
NORTHING 5654668
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33673
BH SIZE HS:200 mm
DATES BORING 2016/04/11
WATER LEVEL (0.0 m) 4/11/2016
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, low plasticity clay (CL) TILL - some sand, trace gravel, damp | | | SS | 11 | 125 | 50+ | | | | | |
| 11 | 1221.5 | | | | | | | | | | | | |
| 12 | | Very dense, grey clayey gravel (GC) TILL - dry | | | SS | 12 | 200 | 50+ | | | | | |
| 13 | | | | | SS | 13 | 150 | 50+ | | | | | |
| 14 | 1219.2 | Bedrock encountered at 14.1 m - Coring commenced at 13.4 m (see rock coring log for details) - Borehole advanced in bedrock to 41.3 m - Water at surface upon completion of coring | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS06**

CLIENT Alberta Transportation NORTHING: 5654668 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33673 BH SIZE HS:200mm

DRILLING DATE 4/11/2016 to 4/11/2016 WATER LEVEL (0.0 m) 4/11/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | | | | | RC14 | | | | | R | W | |
| 14 | 219.2 | | | | | | | | | | | |
| | | Poor quality grey SHALE<br>- slightly to moderately weathered<br>- extremely to very weak | | | RC15 | 73 | 58 | 45 | | 2.5 | W2.5 | |
| 15 | | | | | | | | | | | | |
| | | - very poor quality below 15.4 m<br>- moderately to completely weathered, weak to medium strong below 15.8 m | | | RC16 | 59 | 35 | 18 | | R0.5 | W4 | |
| 16 | | | | | | | | | | | | |
| | | - fair to excellent quality below 16.8 m<br>- slightly to moderately weathered, very weak to weak | | | RC17 | 100 | 100 | 66 | | 2.5 | W2.5 | |
| 17 | | | | | | | | | | | | |
| | | | | | RC18 | 100 | 98 | 93 | | 2.5 | W2.5 | |
| 18 | | | | | | | | | | | | |
| | 214.7 | | | | | | | | | | | |
| | | Very poor quality dark grey SHALE/CLAYSTONE<br>- moderately to completely weathered<br>- extremely weak to weak | | | RC19 | 80 | 47 | 16 | | R0.5 | W4 | |
| 19 | | | | | | | | | | | | |
| | | | | | RC20 | 0 | 0 | 0 | | R0.5 | W4 | |
| 20 | | | | | | | | | | | | |
| | | - poor quality below 21.5 m | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| | | | | | RC21 | 100 | 50 | 32 | | R0.5 | W4 | |
| 22 | | | | | | | | | | | | |
| | 210.4 | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 2:56:43 PM

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# BOREHOLE RECORD

**DS06**

CLIENT Alberta Transportation NORTHING: 5654668 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33673 BH SIZE HS:200mm

DRILLING DATE 4/11/2016 to 4/11/2016 WATER LEVEL (0.0 m) 4/11/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | | Fair quality brown MUDSTONE<br>- highly to completely weathered<br>- extremely weak to weak<br>- coal seams and joint infill | | | RC22 | 93 | 90 | 55 | | R0.5 | W4 | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | RC23 | 100 | 100 | 65 | | R0.5 | W4 | |
| 26 | | - very poor quality below 26.1 m | | | RC24 | 38 | 38 | 20 | | R0.5 | W4 | |
| 27 | | - fair quality below 27.6 m | | | | | | | | | | |
| 28 | | | | | RC25 | 100 | 92 | 65 | | R0.5 | W4 | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | RC26 | 100 | 92 | 62 | | R0.5 | W4 | |
| 31 | | | | | RC27 | 98 | 87 | 62 | | R0.5 | W4 | |
| 32 | | - large amount of coal below 32.2 m, completely weathered, extremely weak | | | | | | | | | | |
| 33 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:43 PM

Stantec

# BOREHOLE RECORD

**DS06**

CLIENT Alberta Transportation — NORTHING: 5654668 — PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB — EASTING: -33673 — BH SIZE HS:200mm

DRILLING DATE 4/11/2016 to 4/11/2016 — WATER LEVEL (0.0 m) 4/11/2016 — DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | | Fair quality brown MUDSTONE<br>- highly to completely weathered<br>- extremely weak to weak<br>- coal seams and joint infill | | | RC28 | 100 | 100 | 0 | | R0.5 | W5.5 | |
| 34 | | - very poor quality below 33.7 m | | | RC29 | 20 | 20 | 0 | | R0 | W5.5 | |
| | | | | | RC30 | 43 | 33 | 23 | | R0 | W5.5 | |
| 35 | | - fair quality below 35.1 m | | | | | | | | | | |
| 36 | | | | | RC31 | 100 | 97 | 62 | | R0 | W5.5 | |
| 37 | | - good quality below 36.8 m | | | | | | | | | | |
| | 195.8 | Good quality grey SANDSTONE<br>- slightly weathered<br>- very weak to weak | | | RC32 | 93 | 92 | 77 | | R1 | W4 | |
| 38 | 195.0 | | | | | | | | | | | |
| | 194.8 | Fair quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 39 | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- very weak to weak | | | RC33 | 98 | 88 | 68 | | R1 | W4 | |
| | 193.8 | Fair to excellent quality brownish grey MUDSTONE<br>- highly to completely weathered<br>- extremely weak<br>- coal seams | | | | | | | | | | |
| 40 | | | | | RC34 | 100 | 100 | 90 | | R0 | W4.5 | |
| 41 | 192.0 | | | | | | | | | | | |
| | | End of borehole (41.3 m)<br>- water at surface upon completion<br>- borehole backfilled with cuttings and bentonite seals placed from 0.5 m to 1.8 m and 13.4 m to 41.3 m | | | | | | | | | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**DS06A**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/12

NORTHING 5654668
EASTING -33673
WATER LEVEL (dry) 4/12/2016

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1233.30 | | | | | | | | | | | | |
| | 1233 | TOPSOIL | | | | | | | | | | | |
| 1 | | Stiff, brown, medium plasticity CLAY (CI)<br>- silty, trace sand, trace rootlets, damp | | | BS | A | | | SG | 0.3 | 2.1 | 38.2 | 59.3 |
| | | - 0.4 m thick gravel layer at 1.8 m | | | ST | 1 | | | | | | | |
| 2 | 1231.1 | | | | | | | | | | | | |
| | | Hard, brown, low plasticity clay (CL) TILL<br>- sitly, some sand, trace gravel, damp | | | BS | B | | | SG | 6.6 | 17.4 | 51.7 | 24.4 |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| | | | | | BS | C | | | | 4.3 | 25.0 | 37.0 | 33.6 |
| 7 | 1225.7 | | | | | | | | | | | | |
| | | End of borehole (7.6 m)<br>- Borehole advanced to collect bulk samples as DS06 was completed with hollow stem augers<br>- Borehole slough to 6.6 m and dry upon completion<br>- Bentonite seal placed from 0.5 m to 1.2 m | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS07**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/04

NORTHING 5654625
EASTING -33704
WATER LEVEL (9.1 m) 4/5/2016

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1233.10 | | | | | | | | | | | | |
| | 1232.9 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, dark brown, medium plasticity CLAY (CI)<br>- trace sand, gravel, trace rootlets, moist | | | | | | | | | | | |
| 1 | 1231.9 | | | | SS | 1 | 250 | 14 | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, trace coal specks, damp to moist | | | ST | 2 | 375 | | | | | | |
| 2 | | | | | SS | 3 | 400 | 14 | | | | | |
| | | | | | SS | 4 | 100 | 50+ | | | | | |
| 3 | | | | | SS | 5 | 450 | 34 | | | | | |
| 4 | | | | | SS | 6 | 450 | 36 | | | | | |
| 5 | | | | | SS | 7 | 275 | 50+ | | | | | |
| | | - dark grey below 5.4 m | | | SS | 8 | 325 | 50+ | | | | | |
| 6 | | | | | BS | 9 | | | | | | | |
| | | | | | SS | 10 | 325 | 35 | | | | | |
| | | | | | BS | 11 | | | | 7.7 | 28.6 | 35.3 | 28.5 |
| 7 | | | | | SS | 12 | 200 | 34 | | | | | |
| | | | | | SS | 13 | 350 | 32 | | | | | |
| 8 | | | | | BS | 14 | | | | | | | |
| | | | | | SS | 15 | 300 | 47 | | | | | |
| 9 | | | | ▼ | | | | | | | | | |
| | | | | | SS | 16 | 450 | 47 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS07**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/04

NORTHING 5654625
EASTING -33704
WATER LEVEL (9.1 m) 4/5/2016

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, trace coal specks, damp to moist | | | SS | 17 | | 50+ | | | | | |
| | | | | | BS | 18 | | | | | | | |
| 11 | | | | | SS | 19 | 150 | 50+ | | | | | |
| | 1221.9 | | | | | | | | | | | | |
| | | Very dense, grey sandy GRAVEL (GM)<br>- some silt, trace clay, wet<br>- inferred seepage at 11.4 m | | | SS | 20 | 75 | 50+ | | | | | |
| 12 | | | | | BS | 21 | | | | 39.5 | 34 | 17.4 | 9.1 |
| | | - switch to hollow stem augering at 12.2 m due to sloughing | | | SS | 22 | 25 | 50+ | | | | | |
| 13 | | | | | SS | 23 | 10 | 50+ | | | | | |
| | 1219.4 | | | | | | | | | | | | |
| | 1219.3 | Poor quality grey (inferred) MUDSTONE<br>- extremely weak | | | SS | 24 | 75 | 50+ | | | | | |
| 14 | | Bedrock encountered at 13.7 m<br>- Coring commenced at 13.8 m (see rock coring log for details)<br>- Borehole abandoned at 16.3 m due to casing alignment. Coring continued in borehole DS07A to a depth of 38.0 m<br>- water at 9.1 m during drilling | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**DS07**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/6/2016 to 4/6/2016

NORTHING: 5654625
EASTING: -33704
WATER LEVEL (9.1 m) 4/5/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 219.4 | | | | | | | | | | | |
| 14 | | Poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC25 | 79 | 51 | 37 | | R0 | W6 | |
| 15 | | | | | RC26 | 43 | 0 | 0 | | R0 | W6 | |
| 16 | | | | | RC27 | 95 | 64 | 39 | | R0 | W6 | |
| | 216.8 | | | | | | | | | | | |
| 17 | | End of borehole (16.3 m)<br>- water at 9.1 m during auger drilling<br>- Borehole abandoned at 16.3 m due to casing alignment. Coring continued in borehole DS07A to a depth of 38.0 m | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 2:56:46 PM

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# BOREHOLE RECORD

**DS07A**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/08

NORTHING 5654625
EASTING -33704
WATER LEVEL (2.6 m) 4/8/2016

PROJECT NO. 110773396
BH SIZE SS:150mm; HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1233.10 | | | | | | | | | | | | |
| | 1232.9 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, dark brown, medium plasticity CLAY (CI)<br>- trace sand, gravel, trace rootlets, moist | | | | | | | | | | | |
| 1 | 1231.9 | | | | | | | | | | | | |
| | | Stiff, brown, medium plasticity clay (CI) TILL<br>- sandy, trace gravel, trace coal specks, damp to moist | | | | | | | | | | | |
| 2 | | | | | BS | A | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | - dry to damp below 4.8 m | | | BS | B | | | SG | 9.4 | 35.8 | 30.1 | 24.6 |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | BS | C | | | SG | 4.2 | 29.3 | 38.7 | 27.8 |
| 9 | 1224.1 | | | | | | | | | | | | |
| | | Very dense, grey, silty GRAVEL (GM)<br>- sandy, wet | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS07A**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/08
NORTHING 5654625
EASTING -33704
WATER LEVEL (2.6 m) 4/8/2016
PROJECT NO. 110773396
BH SIZE SS:150mm; HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very dense, grey, silty GRAVEL (GM)<br>- sandy, wet | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | 1220.1 | Bedrock encountered at 13.0 m<br>- Coring commenced at 10.7 m (see rock coring log for details)<br>- No recovery between 9.0 m and 13.0 m as sample was washing out of core barrel<br>- Borehole advanced in bedrock to 38.0 m<br>- Groundwater at 2.6 m and sloughing at 9.0 m | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS07A**

CLIENT Alberta Transportation NORTHING: 5654625 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33704 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/8/2016 to 4/8/2016 WATER LEVEL (2.6 m) 4/8/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 13 | 220.1 | Poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC 1 | 68 | 49 | 28 | | R0 | W6 | |
| 14 | | | | | RC 2 | 100 | 89 | 46 | | R0 | W6 | |
| 15 | | | | | RC 3 | 100 | 98 | 50 | | R0 | W6 | |
| 16 | | | | | | | | | | | | |
| 17 | 216.3 | Poor quality grey SANDSTONE<br>- completely weathered<br>- extremely weak | | | RC 4 | 98 | 85 | 63 | | R0 | W5 | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | RC 5 | 99 | 71 | 49 | | R0 | W5 | |
| 20 | | - good quality, moderatrely to slightly weathered, very weak below 19.5 m | | | RC 6 | 100 | 95 | 89 | | R1 | W2.5 | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | RC 7 | 100 | 95 | 84 | | R2 | W2.5 | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:47 PM

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# BOREHOLE RECORD

**DS07A**

CLIENT Alberta Transportation NORTHING: 5654625 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33704 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/8/2016 to 4/8/2016 WATER LEVEL (2.6 m) 4/8/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | | | | | | | | | | | | |
| | 211.1 | Good quality dark grey to black SHALE<br>- moderately to slightly weathered<br>- weak | | | | | | | | | | |
| 23 | | | | | RC 8 | 99 | 77 | 73 | | R2 | W2.5 | |
| 24 | | | | | | | | | | | | |
| | | | | | RC 9 | 99 | 99 | 92 | | R1.5 | W2.5 | |
| 25 | 208.1 | Excellent quality grey SANDSTONE<br>- moderately to slightly weathered<br>- very weak | | | | | | | | | | |
| | | | | | RC10 | 83 | 78 | 72 | | R1 | W2.5 | |
| 26 | | | | | RC11 | 100 | 97 | 97 | | R1 | W2.5 | |
| 27 | | | | | | | | | | | | |
| | 205.4 | | | | | | | | | | | |
| 28 | 205.0 | Good quality dark grey to black SHALE<br>- moderately to slightly weathered<br>- weak | | | RC12 | 96 | 72 | 45 | | R1.5 | W2.5 | |
| | | Poor quality black COAL<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| | | | | | RC13 | 31 | 23 | 19 | | R2 | W2 | |
| 30 | | | | | | | | | | | | |
| | 202.7 | Very poor quality light grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC14 | 100 | 76 | 44 | | R0 | W5 | |
| 31 | | | | | | | | | | | | |
| | | | | | RC15 | 100 | 73 | 40 | | R0 | W5 | |
| | 201.5 | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**DS07A**

CLIENT Alberta Transportation NORTHING: 5654625 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33704 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/8/2016 to 4/8/2016 WATER LEVEL (2.6 m) 4/8/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | | | | | | | | | | | | |
| | 201.0 | Poor quality brown SHALE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| | | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC16 | 100 | 84 | 71 | | R2 | W2 | |
| 33 | | - good quality below 33.5 m | | | | | | | | | | |
| | | | | | RC17 | 100 | 99 | 86 | | R2 | W2 | |
| 34 | | | | | | | | | | | | |
| | | - fair quality below 35.0 m | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| | | | | | RC18 | 100 | 95 | 74 | | R2 | W2 | |
| 36 | | | | | | | | | | | | |
| | 196.1 | | | | | | | | | | | |
| 37 | | Fair quality dark grey SHALE<br>- highly weathered<br>- weak | | | RC19 | 100 | 78 | 69 | | R2 | W2 | |
| | 195.1 | | | | | | | | | | | |
| 38 | | End of borehole (38.0 m)<br>- borehole slough to 9.0 m and water at 2.6 m upon completion<br>- borehole backfilled with cuttings, bentonite seals placed from 0.3 m to 0.5 m and 8.5 m to 9.0 m | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**DS08**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/06

NORTHING 5654582
EASTING -33713
WATER LEVEL (0.0 m) 4/6/2016

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1234.41 | | | | | | | | | | | | |
| | 1234.26 | TOPSOIL | | | SS | 1 | 200 | 12 | | | | | |
| | | Stiff to very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, damp | | | BS | 2 | | | | | | | |
| 1 | | | | | SS | 3 | 275 | 16 | | | | | |
| | | - trace coal specks below 1.3 m | | | BS | 4 | | | | | | | |
| | | | | | ST | 5 | 350 | | | | | | |
| 2 | | | | | SS | 6 | 275 | 18 | | | | | |
| | | | | | BS | 7 | | | | | | | |
| 3 | | | | | SS | 8 | 325 | 16 | | | | | |
| | | | | | BS | 9 | | | | | | | |
| | | - evidence of cobbles between 3.8 m - 4.1 m<br>- hard below 4.0 m | | | SS | 10 | 300 | 39 | | | | | |
| 4 | | | | | BS | 11 | | | | | | | |
| | | - dry to damp below 4.5 m | | | SS | 12 | 300 | 44 | | | | | |
| | | | | | BS | 13 | | | | | | | |
| 5 | | | | | SS | 14 | 400 | 40 | | | | | |
| | | | | | BS | 15 | | | | 5.1 | 26.3 | 34.9 | 33.7 |
| 6 | | | | | SS | 16 | 250 | 50+ | | | | | |
| | | | | | BS | 17 | | | | | | | |
| 7 | | | | | ST | 18 | 300 | | | | | | |
| | | | | | SS | 19 | 375 | 46 | | | | | |
| | | | | | BS | 20 | | | | | | | |
| 8 | | | | | SS | 21 | 400 | 40 | | | | | |
| | | | | | BS | 22 | | | | 5.6 | 24.3 | 38.0 | 32.1 |
| 9 | | | | | SS | 23 | 400 | 39 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS08**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/06

NORTHING 5654582
EASTING -33713
WATER LEVEL (0.0 m) 4/6/2016

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Stiff to very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, damp | | | BS | 24 | | | | | | | |
| | | | | | ST | 25 | 200 | | | | | | |
| | | | | | SS | 26 | 400 | 40 | | | | | |
| 11 | | | | | | | | | | | | | |
| | | | | | BS | 27 | | | | | | | |
| 12 | | | | | | | | | | | | | |
| | | - gravel layer from 12.4 m to 12.5 m | | | SS | 28 | 425 | 50+ | | | | | |
| 13 | | | | | | | | | | | | | |
| | 1221.01 | | | | | | | | | | | | |
| | | Very poor quality brown (inferred) MUDSTONE/CLAYSTONE<br>- completely weathered<br>- extremely to very weak | | | BS | 29 | | | | | | | |
| | | | | | SS | 30 | 400 | 50+ | | | | | |
| 14 | | | | | | | | | | | | | |
| | 1219.61 | | | | BS | 31 | | | | | | | |
| 15 | | Bedrock encountered at 13.4 m<br>- Coring commenced at 14.8 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 39.8 m<br>- Sloughing at 4.9 m upon completion | | | SS | 32 | 0 | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS08**

CLIENT Alberta Transportation NORTHING: 5654582 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33713 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/6/2016 to 4/6/2016 WATER LEVEL (0.0 m) 4/6/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 221.0 | | | | | | | | | | | |
| | | Very poor quality brown (inferred) MUDSTONE/CLAYSTONE<br>- completely weathered<br>- extremely to very weak | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| | 219.6 | | | | | | | | | | | |
| 15 | | Poor quality brown CLAYSTONE/MUDSTONE<br>- completely weathered<br>- extremely to very weak<br>- fair quality below 15.4 m | | | RC33 | 87 | 50 | 50 | | R0.5 | W5.5 | |
| 16 | | | | | RC34 | 100 | 67 | 52 | | R0.5 | W5.5 | |
| 17 | | - very poor quality, grey below 17.0 m | | | RC35 | 86 | 40 | 12 | | R0.5 | W5.5 | |
| 18 | | - very weak to weak below 18.4 m | | | RC36 | 81 | 55 | 8 | | R1.5 | W5.5 | |
| 19 | | - 0.4 m thick sandstone layer at 19.6 m | | | | | | | | | | |
| 20 | | - poor quality below 20.0 m | | | RC37 | 88 | 65 | 50 | | R1.5 | W5.5 | |
| 21 | | - very poor quality below 21.5 m | | | RC38 | 70 | 32 | 13 | | R0.5 | W5.5 | |
| 22 | | | | | | | | | | | | |
| | 211.5 | - 0.2 m shale layer at 22.7 m | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:50 PM

Stantec

# BOREHOLE RECORD

**DS08**

CLIENT Alberta Transportation NORTHING: 5654582 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33713 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/6/2016 to 4/6/2016 WATER LEVEL (0.0 m) 4/6/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- slightly to moderately weathered<br>- weak to medium strong | | | RC39 | 50 | 35 | 0 | | 2.5 | W2.5 | |
| 24 | 210.3 | | | | | | | | | | | |
| | | Very poor to good quality grey SHALE<br>- slightly to moderately weathered<br>- very weak to weak | | | RC40 | 25 | 25 | 0 | | R1.5 | W2.5 | |
| 25 | | | | | RC41 | 100 | 98 | 82 | | R1.5 | W2.5 | |
| 26 | | | | | | | | | | | | |
| | | | | | RC42 | 100 | 98 | 90 | | R1.5 | W2.5 | |
| 27 | | | | | | | | | | | | |
| | 206.8 | | | | | | | | | | | |
| 28 | | Fair quality grey CLAYSTONE<br>- moderately weathered<br>- extremely to very weak | | | RC43 | 100 | 77 | 63 | | R0.5 | W3 | |
| | 205.8 | | | | | | | | | | | |
| 29 | | Fair quality black ANTHRACITE/SHALE<br>- with heavy coal | | | | | | | | | | |
| | 205.3 | | | | | | | | | | | |
| | | Good quality grey SHALE<br>- slightly weathered<br>- weak<br>- coal seams | | | RC44 | 100 | 100 | 90 | | R2 | W2 | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | RC45 | 100 | 90 | 88 | | R2 | W2 | |
| 32 | | - extremely to very weak from 31.9 m to 32.6 m | | | | | | | | | | |
| 33 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 2:56:51 PM

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# BOREHOLE RECORD

**DS08**

CLIENT Alberta Transportation NORTHING: 5654582 PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33713 BH SIZE SS:150mm, HS:200mm
DRILLING DATE 4/6/2016 to 4/6/2016 WATER LEVEL (0.0 m) 4/6/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | | Good quality grey SHALE<br>- slightly weathered<br>- weak<br>- coal seams | | | RC46 | 98 | 88 | 75 | | R2 | W2 | |
| 34 | | - excellent quality below 33.7 m | | | RC47 | 100 | 100 | 92 | | R2 | W2 | |
| 35 | | - good quality below 35.3 m | | | RC48 | 98 | 87 | 75 | | R2 | W2 | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | RC49 | 98 | 82 | 70 | | R2 | W2 | |
| 38 | | - excellent quality, weak to medium strong below 38.3 m | | | | | | | | | | |
| 39 | | | | | RC50 | 100 | 100 | 93 | | 2.5 | W2 | |
| | 194.6 | | | | | | | | | | | |
| 40 | | End of borehole (39.8 m)<br>- water at surface and slough at 4.9 m upon completion<br>- borehole backfilled with cuttings, bentonite seals placed from 0.5 m to 1.2 m and 15.0 m to 39.8 m | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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Stantec

# BOREHOLE RECORD

## DS08A

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/06
NORTHING 5654582
EASTING -33713
WATER LEVEL (dry) 4/6/2016
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1234.41 | | | | | | | | | | | | |
| | 1234.26 | TOPSOIL | | | | | | | | | | | |
| | | Brown, medium plasticity clay (CI)<br>TILL<br>- silty, sandy, trace gravel, damp | | | | | | | | | | | |
| 1 | | | | | | | | | | | | | |
| 2 | | | | | BS | A | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | BS | B | | | PT, SG | 12.2 | 22.7 | 35.9 | 29.2 |
| 6 | 1228.41 | | | | | | | | | | | | |
| | | End of borehole (6.0 m)<br>- Borehole advanced adjacent to DS08 to collect large bulk samples<br>- Borehole open and dry upon completion | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS09**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/28

NORTHING 5654660
EASTING -33603
WATER LEVEL (0.0 m) 4/28/2016

PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1210.31 | Brown and grey silty GRAVEL (GM)<br>- some sand, inferred cobbles, damp | | ▼ | | | | | | | | | |
| 2 | 1208.21 | Very poor quality grey to brown (inferred) MUDSTONE | | | | | | | | | | | |
| | 1207.61 | Bedrock encountered at 2.1 m<br>- Coring commenced at 2.7 m (see rock coring log for details)<br>- Borehole advanced to 9.3 m in bedrock<br>- Water at surface upon completion of coring | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS09**

CLIENT Alberta Transportation NORTHING: 5654660 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33603 BH SIZE ODEX:150mm

DRILLING DATE 4/28/2016 to 4/28/2016 WATER LEVEL (0.0 m) 4/28/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 2 | 208.2 | Very poor quality grey to brown (inferred) MUDSTONE | | | | | | | | | | |
| | 207.6 | | | | | | | | | | | |
| 3 | | Very poor to poor quality grey MUDSTONE/CLAYSTONE<br>- highly to completely weathered<br>- extremely to very weak<br>- coal seams below 3.2 m | | | RC 1 | 100 | 79 | 21 | | R0.5 | W4.5 | |
| 4 | | | | | RC 2 | 100 | 88 | 27 | | R0.5 | W3 | |
| | 205.6 | | | | | | | | | | | |
| 5 | | Fair quality grey SHALE<br>- slightly weathered<br>- weak<br>- coal seams<br>- clay (CH), claystone seam at 5.2 m<br>- excellent quality below 5.2 m | | | RC 3 | 100 | 100 | 76 | | R2 | W2 | |
| 6 | | | | | RC 4 | 100 | 100 | 43 | | R2 | W2 | |
| | | - fair quality below 6.3 m | | | | | | | | | | |
| 7 | | | | | RC 5 | 100 | 95 | 78 | | R2 | W2 | |
| 8 | | | | | RC 6 | 100 | 87 | 76 | | R2 | W2 | |
| 9 | 201.0 | | | | | | | | | | | |
| | | End of borehole (9.3 m)<br>- water at surface upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 2.7 m to 9.3 m | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**DS10**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/25

NORTHING 5654634
EASTING -33568
WATER LEVEL (0.0 m) 4/25/2016

PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1210.24 | Brown and grey, silty GRAVEL (GM)<br>- some sand, inferred cobbles, moist | | | | | | | | | | | |
| 1 | 1209.04 | Poor quality grey (inferred) MUDSTONE | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| | 1207.44 | Bedrock encountered at 1.2 m<br>- Coring commenced at 2.8 m (see rock coring log for details)<br>- Borehole advanced to 15.4 m in bedrock<br>- Water at surface upon completion of coring | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DS10**

CLIENT Alberta Transportation — NORTHING: 5654634 — PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB — EASTING: -33568 — BH SIZE ODEX:150mm

DRILLING DATE 4/25/2016 to 4/25/2016 — WATER LEVEL (0.0 m) 4/25/2016 — DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | Overburden - See Soil Log for overburden description | | ▼ | | | | | | | | |
| 1 | 209.0 | | | | | | | | | | | |
| | | Poor quality grey (inferred) MUDSTONE | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| | 207.4 | | | | | | | | | | | |
| 3 | | Very poor quality grey MUDSTONE to SHALE<br>- slightly to highly weathered<br>- extremely to very weak<br>- coal seams/staining<br>- fair quality below 3.2 m | | | RC 1 | 100 | 35 | 23 | | R0.5 | W3 | |
| 4 | | | | | RC 2 | 95 | 80 | 67 | | R0.5 | W3 | |
| 5 | | | | | RC 3 | 95 | 87 | 57 | | R0.5 | W3 | |
| | | - 0.3 m thick claystone/ bentonite layer at 5.5 m | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | RC 4 | 94 | 72 | 65 | | R0.5 | W3 | |
| | | - clay/mudstone seam at 7.6 m | | | RC 5 | 100 | 67 | 0 | | R1.5 | W3 | |
| 8 | | - very poor quality shale, very weak to weak below 7.6 m | | | RC 6 | 100 | 96 | 72 | | R1.5 | W3 | |
| 9 | | | | | RC 7 | 100 | 100 | 73 | | R1.5 | W3 | |
| | | - good quality below 9.3 m | | | | | | | | | | |
| 10 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 2:56:54 PM

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# BOREHOLE RECORD

**DS10**

CLIENT Alberta Transportation NORTHING: 5654634 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33568 BH SIZE ODEX:150mm

DRILLING DATE 4/25/2016 to 4/25/2016 WATER LEVEL (0.0 m) 4/25/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | | | | RC 8 | 100 | 97 | 85 | | R1.5 | W2.5 | |
| | 199.7 | Good quality grey SANDSTONE<br>- slightly weathered<br>- very weak to weak<br>- coal seams | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| | 198.7 | Good quality grey SHALE<br>- slightly weathered<br>- very weak to weak<br>- coal seams | | | RC 9 | 100 | 97 | 85 | | R1.5 | W2 | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | RC10 | 100 | 95 | 90 | | R1.5 | W2 | |
| 14 | | - fair quality below 13.9 m | | | RC11 | 100 | 95 | 72 | | R1.5 | W2 | |
| | 195.3 | | | | | | | | | | | |
| 15 | | Fair quality grey MUDSTONE<br>- moderately to highly weathered<br>- extremely weak | | | | | | | | | | |
| | 194.8 | End of borehole (15.4 m)<br>- water at surface upon completion<br>- borehole backfilled with cuttings and a bentonite seal from 0.2 m to 15.4 m | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# D. 2
## Floodplain Berm

Stantec

# BOREHOLE RECORD

**FB03**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/03/24

NORTHING 5654227
EASTING -33399
WATER LEVEL (2.9 m) 3/24/2016

PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1214.65 | Compact, dark brown SILT (ML)<br>- sandy, frequent rootlets, occasional organics, damp to moist | | | SS | 1 | 250 | 11 | | | | | |
| | | | | | SS | 2 | 450 | 11 | | | | | |
| 1 | 1213.55 | | | | | | | | | | | | |
| | 1213.35 | Dark, brown silty SAND (SM)<br>- moist | | | | | | | | | | | |
| | | Dense to very dense, brown, grey and black well-graded GRAVEL (GW)<br>- sandy, trace silt, damp | | | SS | 3 | 250 | 50 | | | | | |
| 2 | | | | | SS | 4 | 450 | 50+ | | 52.5 | 36.3 | 9.8 | 1.4 |
| 3 | | | | | SS | 5 | 225 | 36 | | | | | |
| | 1210.95 | | | | SS | 6A | 700 | 50+ | | | | | |
| | | Very poor quality (inferred) SANDSTONE | | | SS | 6B | 50 | | | | | | |
| 4 | 1210.35 | | | | | | | | | | | | |
| | | Bedrock encountered at 3.7 m<br>- Coring commenced at 4.3 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 7.8 m<br>- Groundwater at 2.9 m and sloughing at 3.6 m<br>- Groundwater at 3.6 m during ODEX | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**FB03**

CLIENT Alberta Transportation
NORTHING: 5654227
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -33399
BH SIZE ODEX:150mm
DRILLING DATE 3/24/2016 to 3/24/2016
WATER LEVEL (2.9 m) 3/24/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 211.0 | | | | | | | | | | | |
| 4 | | Very poor quality (inferred) SANDSTONE | | | | | | | | | | |
| | 210.4 | | | | | | | | | | | |
| 5 | | Poor quality light brown SANDSTONE<br>- slightly weathered<br>- weak to very weak | | | RC 7 | 100 | 67 | 28 | | R2 | W2 | |
| 6 | | | | | RC 8 | 97 | 72 | 48 | | 2.5 | W2 | |
| 7 | | - grey below 7.0 m | | | RC 9 | 100 | 90 | 47 | | R2 | W2 | |
| | 206.9 | | | | | | | | | | | |
| 8 | | End of borehole (7.8 m)<br>- borehole slough to 3.6 m, and water at 2.9 m upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 2.0 m to 3.2 m | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**FB04**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/03/23

NORTHING 5654314
EASTING -33531
WATER LEVEL (2.5 m) 3/23/2016

PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1214.23 | | | | | | | | | | | | |
| | 1214.03 | Loose, dark brown SAND (SP)<br>- some silt, frequent organics, rootlets, moist to wet | | | SS | 1A | 275 | 44 | | | | | |
| | | | | | SS | 1B | | | | | | | |
| 1 | | Dense, brown well-graded SAND (SW)<br>- some gravel, trace silt, trace rootlets, damp<br>- no rootlets below 0.4 m | | | SS | 2 | 350 | 50+ | | | | | |
| | | | | | SS | 3 | 300 | 36 | | | | | |
| 2 | | | | | SS | 4 | 525 | 50+ | | | | | |
| | | | | | SS | 5 | 50 | 50 | | | | | |
| 3 | | | | | SS | 6A | 325 | 50+ | | | | | |
| | 1210.83 | | | | | 6B | | | | | | | |
| | | Poor quality brown to grey (inferred) SANDSTONE | | | | | | | | | | | |
| 4 | 1210.23 | | | | | | | | | | | | |
| | | Bedrock encountered at 3.4 m<br>- Coring commenced at 4.0 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 7.5 m<br>- Groundwater at 2.5 m and sloughing at 2.7 m<br>- Groundwater at 2.9 m during ODEX | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**FB04**

CLIENT Alberta Transportation
NORTHING: 5654314
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -33531
BH SIZE ODEX:150mm
DRILLING DATE 3/23/2016 to 3/23/2016
WATER LEVEL (2.5 m) 3/23/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 210.8 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | | Poor quality brown to grey (inferred) SANDSTONE | | | | | | | | | | |
| 4 | 210.2 | Very poor quality dark grey MUDSTONE<br>- highly weathered<br>- very weak | | | RC 7 | 72 | 17 | 0 | | R1 | W4 | |
| | 209.7 | Very poor quality dark brown CLAYSTONE<br>- extremely weak | | | RC 8 | 100 | 78 | 46 | | R0 | W5 | |
| 6 | 208.3 | Very poor to poor quality light grey MUDSTONE<br>- completely to highly weathered<br>- very weak<br>- dark grey below 6.5 m | | | RC 9 | 100 | 55 | 13 | | R1 | W4.5 | |
| 7 | 206.7 | | | | | | | | | | | |
| 8 | | End of borehole (7.5 m)<br>- borehole slough to 2.7 m, and water at 2.5 m upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 1.8 m to 2.4 m | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:46:54 PM

Stantec

# BOREHOLE RECORD

**FB05**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/03/23

NORTHING 5654374
EASTING -33408
WATER LEVEL (2.3 m) 3/23/2016

PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1213.26 | | | | | | | | | | | | |
| | 1213.16 | Brown silty SAND (SM)<br>- frequent organics, rootlets, moist | | | SS | 1 | 300 | 38 | | | | | |
| 1 | | Dense brown well-graded GRAVEL (GW)<br>- sandy, trace to occasional cobbles, damp | | | SS | 2 | 300 | 28 | | | | | |
| | | | | | SS | 3 | 350 | 30 | | | | | |
| 2 | | - damp to moist below 2.2 m | | | SS | 4 | 275 | 26 | | 59.0 | 33.1 | 6.1 | 1.9 |
| 3 | | - seepage at 2.9 m, wet below 2.9 m | | | SS | 5 | 150 | 24 | | | | | |
| | | | | | SS | 6 | 400 | 15 | | | | | |
| 4 | 1208.96 | | | | | | | | | | | | |
| | | Bedrock encountered at 4.3 m<br>- Coring commenced at 4.3 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 7.7 m<br>- Groundwater at 2.3 m and sloughing at 2.6 m<br>- Groundwater at 2.9 m during ODEX | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**FB05**

CLIENT Alberta Transportation
NORTHING: 5654374
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -33408
BH SIZE ODEX:150mm
DRILLING DATE 3/23/2016 to 3/23/2016
WATER LEVEL (2.3 m) 3/23/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 209.0 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- slightly weathered<br>- very weak | | | RC 7 | 100 | 71 | 46 | | R1 | W2 | |
| 5 | | | | | RC 8 | 24 | 0 | 0 | | R1 | W3 | |
| 6 | | | | | RC 9 | 100 | 95 | 26 | | R0.5 | W3.5 | |
| | | - 30 mm thick high plastic clay infill at 6.9 m<br>- 25 mm thick high plastic clay infill at 7.1 m | | | | | | | | | | |
| 7 | 206.1 | | | | RC10 | 100 | 78 | 35 | | R0 | W4 | |
| | | Very poor quality dark brown SILTSTONE<br>- highly weathered<br>- extremely weak<br>- 25 mm thick silt infill at 7.3 m<br>- 10 mm thick silt infill at 7.4 m<br>- 30 mm thick silt infill at 7.6 m | | | | | | | | | | |
| 8 | 205.4 | End of borehole (7.7 m)<br>- borehole slough to 2.6 m, and water at 2.3 m upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 1.8 m to 2.6 m | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:46:55 PM

Stantec

# BOREHOLE RECORD

**FB06**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/03/22
NORTHING 5654471
EASTING -33472
WATER LEVEL (2.0 m) 3/22/2016
PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1212.90 | | | | | | | | | | | | |
| | 1212.8 | Compact, brown SAND<br>- some silt, moist, rootlets | | | SS | 1 | 100 | 25 | | | | | |
| | | | | | SS | 2 | | | | | | | |
| | | Dense, brown, poorly-graded GRAVEL (GP)<br>- some sand, damp | | | | | | | | | | | |
| 1 | | | | | SS | 3 | 175 | 43 | | | | | |
| 2 | | | | ▼ | SS | 4 | | 33 | | 79.6 | 17.0 | 2.6 | 0.8 |
| | | - inferred seepage at 2.6 m | | ▽ | | | | | | | | | |
| 3 | | - wet below 3.0 m | | | SS | 5 | 260 | 43 | | | | | |
| | | | | | SS | 6 | 400 | 36 | | | | | |
| | 1209.1 | | | | SS | 7 | | | | | | | |
| 4 | | Poor quality grey (inferred) MUDSTONE/CLAYSTONE | | | | | | | | | | | |
| | 1208.7 | Bedrock encountered at 3.8 m<br>- Coring commenced at 4.2 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 7.7 m<br>- water at 2.0 m and sloughing at 2.9 m, | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**FB06**

CLIENT Alberta Transportation
NORTHING: 5654471
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -33472
BH SIZE ODEX:150mm
DRILLING DATE 3/22/2016 to 3/22/2016
WATER LEVEL (2.0 m) 3/22/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 209.1 | | | | | | | | | | | |
| 4 | | Very poor quality dark grey MUDSTONE<br>- highly weathered<br>- extremely to very weak | | | RC 8 | 100 | 44 | 0 | | R0.5 | W4 | |
| 5 | 207.7 | | | | | | | | | | | |
| | | Poor quality light grey SANDSTONE<br>- highly weathered<br>- weak | | | RC 9 | 88 | 70 | 28 | | R1 | W4 | |
| 6 | | - fair quality, highly to moderately weathered below 6.2 m | | | | | | | | | | |
| 7 | | | | | RC10 | 100 | 90 | 56 | | R2 | W3.5 | |
| | 205.2 | | | | | | | | | | | |
| 8 | | End of borehole (7.7 m)<br>- borehole slough to 2.9 m, and water at 2.0 m upon completion<br>- borehole backfilled with cuttings | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:46:56 PM

Stantec

# BOREHOLE RECORD

**FB07**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/03/22
NORTHING 5654569
EASTING -33538
WATER LEVEL (2.4 m) 3/22/2016
PROJECT NO. 110773396
BH SIZE ODEX:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1212.40 | | | | | | | | | | | | |
| | 1212.2 | Organic silty SAND (SM)<br>- moist, rootlets | | | | | | | | | | | |
| | | Very dense, brown and grey, poorly-graded GRAVEL (GP)<br>- some sand, dry | | | SS | 1 | 225 | 82 | | | | | |
| 1 | | | | | SS | 2 | 350 | 50+ | | 79.0 | 18.1 | 2.1 | 0.8 |
| 2 | | - inferred seepage at 2.6 m | | | | | | | | | | | |
| 3 | | | | | SS | 3 | 0 | 13 | | | | | |
| | 1208.95 | | | | SS | 4 | 600 | 38 | | | | | |
| | | Rafted (inferred) MUDSTONE | | | SS | 5 | | | | | | | |
| 4 | 1208.4 | | | | | | | | | | | | |
| | | Dense black, grey, and brown GRAVEL (GP-GW)<br>- some sand, saturated | | | SS | 6 | 50 | 45 | | | | | |
| | 1207.5 | | | | SS | 7 | | 50+ | | | | | |
| 5 | | Poor quality grey (inferred) | | | SS | 8 | | 50+ | | | | | |
| | 1207.2 | MUDSTONE/CLAYSTONE | | | | | | | | | | | |
| | | Bedrock encountered at 4.9 m<br>- Coring commenced at 5.2 m (see rock coring log for details)<br>- Borehole advanced in bedrock 15.0 m<br>- water at 2.4 m and sloughing at 2.4 m | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**FB07**

CLIENT Alberta Transportation NORTHING: 5654569 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33538 BH SIZE ODEX:150mm

DRILLING DATE 3/22/2016 to 3/22/2016 WATER LEVEL (2.4 m) 3/22/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 207.6 | | | | | | | | | | | |
| 5 | | Poor quality grey (inferred) MUDSTONE/CLAYSTONE | | | | | | | | | | |
| | 207.2 | Fair quality grey MUDSTONE - slightly to moderately weathered, very weak | | | RC 9 | 96 | 89 | 65 | | R1 | W2.5 | |
| 6 | | | | | | | | | | | | |
| | 206.2 | Fair quality grey SILTSTONE - slightly weathered, very weak to weak | | | RC10 | 100 | 84 | 58 | | R1 | W2.5 | |
| | 206.0 | Fair quality grey MUDSTONE - slightly to moderately weathered, very weak | | | | | | | | | | |
| 7 | 205.0 | Fair quality grey SILTSTONE - slightly weathered, very weak to weak - 100 mm thick rubble zone | | | RC11 | 100 | 85 | 62 | | R1.5 | W2 | |
| 8 | | | | | | | | | | | | |
| 9 | | | | | RC12 | 100 | 97 | 68 | | R1.5 | W2 | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | RC13 | 100 | 92 | 67 | | R1.5 | W2 | |
| 12 | 200.4 | | | | RC14 | 100 | 92 | 58 | | R2 | W2 | |
| | 200.3 | Fair to good quality SANDSTONE - slightly weathered, weak | | | | | | | | | | |
| | 200.1 | Poor to fair quality SILTSTONE - slightly weathered, very weak | | | RC15 | 99 | 81 | 75 | | R1 | W2 | |
| 13 | | Fair to good quality SILT SHALE - fresh to slightly weathered, very weak | | | | | | | | | | |
| | 198.9 | Fair to good quality SILTSTONE - fresh to slightly weathered, very weak | | | RC16 | 100 | 73 | 69 | | R1 | W1.5 | |
| 14 | | | | | | | | | | | | |
| 15 | 197.4 | End of borehole (15.0 m) - borehole slough to 2.4 m, and water at 2.4 m - borehole backfilled with cuttings and a bentonite | | | | | | | | | | |
| 16 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:46:57 PM

Stantec

# BOREHOLE RECORD

**FB07**

CLIENT Alberta Transportation NORTHING: 5654569 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33538 BH SIZE ODEX:150mm

DRILLING DATE 3/22/2016 to 3/22/2016 WATER LEVEL (2.4 m) 3/22/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % (80 60 40 20) | RECOVERY SOLID CORE % (80 60 40 20) | R.Q.D. % (80 60 40 20) | FRACT. INDEX PER 1m (5 10 15 20) | ROCK STRENGTH INDEX (R5 R4 R3 R2) | WEATHERING INDEX (W1 W2 W3 W4 W5 W6) | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | | seal placed from 0.6 m to 1.8 m | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:46:57 PM

# D. 3
## Diversion Channel

Stantec

# BOREHOLE RECORD

**DC01**

CLIENT Alberta Transportation
NORTHING 5654706
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33749
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/12
WATER LEVEL (artesian) 2016/04/12
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1235.80 | | | | | | | | | | | | |
| | 1235.6 | TOPSOIL | | | | | | | | | | | |
| | | Very stiff to hard, light brown, medium plasticity clay (CI) TILL - silty, some sand, trace gravel, mottled grey, moist | | | BS | A | | | 19.2 | 3.1 | 15.7 | 45.7 | 35.4 |
| 1 | | | | | ST | 1 | 435 | | | | | | |
| 2 | | | | | SS | 2 | 150 | 16 | 15.3 | | | | |
| 3 | | | | | ST | 3 | 250 | | | 3.2 | 16.9 | 47.6 | 32.3 |
| | | - dark grey below 3.2 m | | | SS | 4 | 450 | 45 | 12.4 | | | | |
| 4 | | - sandy below 3.7 m - light brown below 3.8 m | | | BS | B | | | 12.4 | 4.4 | 23.8 | 40.0 | 31.7 |
| 5 | | | | | SS | 5 | 450 | 50+ | 11.7 | | | | |
| | | | | | BS | C | | | 11.3 | 4.5 | 28.4 | 36.9 | 30.2 |
| 6 | | | | | SS | 6 | 450 | 45 | 11.5 | | | | |
| 7 | | | | | | | | | | | | | |
| | | | | | SS | 7 | 450 | 42 | 13.7 | | | | |
| 8 | | - some gravel below 8.1 m | | | BS | D | | | 12.7 | 11.1 | 24.6 | 36.8 | 27.5 |
| 9 | | - damp below 9.1 m | | | SS | 8 | 325 | 28 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC01**

CLIENT Alberta Transportation NORTHING 5654706 PROJECT NO. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING -33749 BH SIZE SS:150mm, HS:200mm

DATES BORING 2016/04/12 WATER LEVEL (artesian) 2016/04/12 DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | | | | | | | | | | | | |
| | 1225 | | | | | | | | | | | | |
| 11 | | Very poor quality (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | SS | 9 | 300 | 50+ | | | | | |
| | 1224.4 | Bedrock encountered at 10.8 m.<br>- Coring commenced at 11.4 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 30.5 m<br>- Groundwater was observed flowing over the top of the casing at the end of drilling<br>- Groundwater was noted at 2.5 m above ground surface | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$

STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC01**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/12/2016 to 4/12/2016

NORTHING: 5654706
EASTING: -33749
WATER LEVEL (artesian) 4/12/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 225.1 | | | | | | | | | | | |
| 11 | | Very poor quality (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 224.4 | | | | | | | | | | | |
| 12 | | Poor quality light grey MUDSTONE<br>- completely weathered<br>- extremely weak<br>- very poor quality below 11.4 m | | | RC10 | 72 | 14 | 0 | | R0 | W5 | |
| 13 | | - light brown below 12.5 m<br>- dark grey below 13.0 m | | | RC11 | 100 | 70 | 40 | | R0 | W5 | |
| 14 | | | | | RC12 | 98 | 37 | 17 | | R0 | W5 | |
| 15 | | | | | RC13 | 54 | 37 | 0 | | R0 | W5 | |
| | | | | | RC14 | 88 | 0 | 0 | | R0 | W5 | |
| 16 | | | | | RC15 | 89 | 42 | 15 | | R0 | W5 | |
| 17 | 218.7 | Very poor quality grey SHALE<br>- highly to moderately weathered<br>- weak | | | RC16 | 100 | 39 | 15 | | R2 | W3.5 | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | RC17 | 91 | 46 | 14 | | R2 | W3.5 | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:27 AM

Stantec

# BOREHOLE RECORD

**DC01**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/12/2016 to 4/12/2016
NORTHING: 5654706
EASTING: -33749
WATER LEVEL (artesian) 4/12/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | | | | | | |
| | | Very poor quality grey SHALE<br>- highly to moderately weathered<br>- weak<br>- dark grey below 20.0 m | | | RC18 | 100 | 48 | 22 | | R2 | W3.5 | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | RC19 | 100 | 52 | 34 | | R2 | W3.5 | |
| 23 | | | | | RC20 | 510 | 60 | 16 | | R2 | W3.5 | |
| | | - fair quality below 23.6 m | | | RC21 | 900 | 91 | 56 | | R2 | W3.5 | |
| 24 | | | | | | | | | | | | |
| 25 | | - poor to fair quality, slightly to moderately weathered below 25.0 m | | | RC22 | 1450 | 56 | 26 | | R2 | W2.5 | |
| 26 | | - coal seams between 26.0 m and 27.5 m | | | RC23 | 97 | 76 | 54 | | R2 | W2.5 | |
| 27 | | | | | | | | | | | | |
| | | - highly to moderately weathered below 27.5 m | | | RC24 | 100 | 66 | 43 | | R2 | W3.5 | |
| 28 | | | | | | | | | | | | |
| 29 | | - completely weathered, extremely weak below 29.0 m<br>- slightly weathered, weak below 29.5 m | | | RC25 | 100 | 56 | 23 | | R2 | W3.5 | |
| 30 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:28 AM

Stantec

# BOREHOLE RECORD

**DC01**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/12/2016 to 4/12/2016

NORTHING: 5654706
EASTING: -33749
WATER LEVEL (artesian) 4/12/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | 80 60 40 20 | 80 60 40 20 | 80 60 40 20 | 5 10 15 20 | R5 R4 R3 R2 | W1 W2 W3 W4 W5 W6 | |
| | 205.3 | End of borehole (30.5 m)<br>- borehole slough to 15.0 m<br>- Artesian conditions observed, with water levels recorded in hollow stem annulus up to 2.5 m above ground surface<br>- borehole backfilled with cuttings and a bentonite seal placed from surface to 9.1 m | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:28 AM

Stantec

# BOREHOLE RECORD

## DC02

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/07
NORTHING 5654722
EASTING -33618
WATER LEVEL (dry) 2016/04/7
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1233.32 | | | | | | | | | | | | |
| | 1233.02 | TOPSOIL | | | SS | 1 | 200 | 7 | | | | | |
| | | Firm to stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, trace rootlets, damp | | | BS | A | | | | 0.5 | 1.7 | 40.7 | 57.1 |
| 1 | | | | | SS | 2 | 400 | 15 | | | | | |
| 2 | 1231.12 | | | | | | | | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, dry to damp<br>- inferred cobbles below 2.9 m | | | BS | 3 | | | | | | | |
| 3 | | | | | ST | 4 | 400 | | CU, k, Y | | | | |
| | | | | | SS | 5 | 300 | 43 | | | | | |
| 4 | | | | | BS | 6 | | | | | | | |
| | | - some gravel below 4.6 m | | | SS | 7 | 300 | 43 | | 19.9 | 21.6 | 29.7 | 28.8 |
| 5 | | | | | | | | | | | | | |
| | | | | | BS | 8 | | | | | | | |
| 6 | | - brownish grey, trace gravel below 6.1 m | | | SS | 9 | 100 | 50+ | | | | | |
| | | | | | BS | B | | | PT | 8.8 | 22.9 | 39.3 | 29.0 |
| 7 | | | | | SS | 10 | 450 | 50+ | | 4.3 | 27.3 | 37.6 | 30.8 |
| | | - oxidized seam at 7.8 m | | | | | | | | | | | |
| 8 | | | | | BS | 11 | | | | | | | |
| 9 | | | | | SS | 12 | 150 | 41 | | | | | |
| | 1223.72 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC02

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/07
NORTHING 5654722
EASTING -33618
WATER LEVEL (dry) 2016/04/7
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very dense, brown and grey, clayey GRAVEL (GC)<br>- sandy, trace silt, dry<br>- inferred cobbles/boulders below 10.3 m | | | BS | 13 | | | | 56.1 | 25.1 | 10.2 | 8.6 |
| | | | | | SS | 14 | 150 | 50+ | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | 1221.12 | | | | | | | | | | | | |
| | | End of borehole (12.2 m)<br>- borehole dry and sloughing at 9.9 m<br>- borehole backfilled with cuttings and a bentonite seal from 0.5 m to 1.0 m<br>- drill rig moved over and re-drilled at DC02A due to sloughing | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC02A

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/12

NORTHING 5654722
EASTING -33618
WATER LEVEL (12.3 m) 2016/04/12

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1233.32 | | | | | | | | | | | | |
| | 1233.02 | TOPSOIL | | | | | | | | | | | |
| 1 | | Firm to stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, trace rootlets, damp | | | | | | | | | | | |
| 2 | 1231.12 | | | | BS | A | | | | | | | |
| 3 | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, dry to damp | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | - some gravel below 9.1 m | | | SS | 1 | 700 | 50+ | | 15.0 | 22.4 | 35.6 | 27.0 |
| 10 | 1223.42 | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC02A

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/12
NORTHING 5654722
EASTING -33618
WATER LEVEL (12.3 m) 2016/04/12
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very dense, brown and grey, clayey GRAVEL (GC)<br>- sandy, trace silt, dry | | | | | | | | | | | |
| | | | | | SS | 2 | 400 | 50+ | | | | | |
| 11 | | | | | | | | | | | | | |
| | | | | | BS | 3 | | | | 59.9 | 25.8 | 9.6 | 4.7 |
| 12 | | - seepage at 12.3 m | | ▼ | | | | | | | | | |
| | 1220.92 | | | | SS | 4 | 400 | 50+ | | | | | |
| | | Very poor quality (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | | |
| 13 | | | | | BS | 5 | | | | | | | |
| | 1219.37 | | | | SS | 6 | 250 | 50+ | | | | | |
| 14 | | End of borehole (14.0 m)<br>- borehole dry and sloughing at 13.0 m<br>- borehole backfilled with cuttings and a bentonite seal from 0.5 m to 1.2 m | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC03**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/13

NORTHING 5654804
EASTING -33806
WATER LEVEL (2.4 m) 2016/04/13

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1239.76 | | | | | | | | | | | | |
| | 1239.46 | TOPSOIL | | | | | | | | | | | |
| | | Stiff to hard, light brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, trace coal, mottled grey, moist | | | BS | A | | | | | | | |
| 1 | | | | | ST | 1 | 350 | | | | | | |
| 2 | | - grey below 1.9 m | | | SS | 2 | 400 | 12 | | | | | |
| 3 | | | | | ST | 3 | 290 | | | | | | |
| | | | | | SS | 4 | 250 | 42 | | | | | |
| 4 | | | | | BS | B | | | | 7.5 | 30.4 | 35.0 | 27.1 |
| | | | | | ST | 5 | 350 | | SW | | | | |
| 5 | | | | | SS | 6 | 400 | 50+ | DS | | | | |
| 6 | | | | | SS | 7 | 450 | | | | | | |
| 7 | | - some gravel, dry below 7.0 m | | | BS | C | | | PT | 12.8 | 26.4 | 35.7 | 25.2 |
| 8 | | | | | SS | 8 | 450 | 37 | | | | | |
| 9 | 1230.66 | | | | | | | | | | | | |
| | | Very dense GRAVEL (GP)<br>- sandy, some silt, some clay, saturated | | | SS | 9 | 100 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC03**

CLIENT Alberta Transportation
NORTHING 5654804
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33806
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/13
WATER LEVEL (2.4 m) 2016/04/13
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very dense GRAVEL (GP)<br>- sandy, some silt, some clay, saturated | | | BS | D | | | | 38.9 | 29.9 | 18.6 | 12.7 |
| 11 | 1228.36 | | | | SS | 10 | 300 | 50 | | | | | |
| 12 | | Very poor quality, light brown (inferred) MUDSTONE<br>- extremely weak | | | SS | 11 | 100 | 50+ | | | | | |
| 13 | | - grey below 13.0 m | | | BS | 12 | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | 1223.76 | | | | | | | | | | | | |
| | | End of borehole (16.0 m)<br>- Groundwater at 2.4 m and sloughing at 9.1 m<br>- borehole backfilled with cuttings and a bentonite seal near surface | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC04**

CLIENT Alberta Transportation
NORTHING 5654847
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33657
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/14
WATER LEVEL (4.1 m) 2016/04/14
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1238.00 | | | | | | | | | | | | |
| | 1237.8 | TOPSOIL | | | | | | | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to damp | | | SS | 1 | 200 | 15 | | | | | |
| 1 | | | | | BS | 2 | | | | | | | |
| | | | | | ST | 3 | 400 | | CU, k, Gs, γ | 8.9 | 17.4 | 37.5 | 36.2 |
| 2 | | | | | SS | 4 | 175 | 41 | | | | | |
| 3 | | | | | SS | 5 | 400 | 50+ | | | | | |
| | | - inferred cobbles/boulders below 3.4 m | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| | | | | | SS | 6 | 50 | 50+ | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | SS | 7 | 100 | 50+ | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | SS | 8 | 450 | 50+ | | | | | |
| 9 | | | | | SS | 9 | 75 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC04**

CLIENT Alberta Transportation
NORTHING 5654847
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33657
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/14
WATER LEVEL (4.1 m) 2016/04/14
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to damp | | | | | | | | | | | |
| 11 | | | | | SS | 10 | 225 | 42 | | | | | |
| 12 | | | | | SS | 11 | 300 | 37 | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | SS | 12 | 400 | 39 | | 14.6 | 27.3 | 30.7 | 27.4 |
| 15 | | - greyish brown below 14.4 m | | | | | | | | | | | |
| 16 | | | | | SS | 13 | 125 | 50+ | | | | | |
| 17 | 1220.8 | - seepage at 16.5 m | | | SS | 14 | 300 | 50+ | | 11.7 | 43.4 | 27.6 | 17.3 |
| 18 | | Very poor quality, grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak<br>- oxidation seams | | | | | | | | | | | |
| 19 | 1219.3 | | | | SS | 15 | 400 | 50+ | | | | | |
| 20 | | Bedrock encountered at 17.2 m.<br>- Coring commenced at 18.7 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 30.8 m<br>- Groundwater at 4.1 m and sloughing at 13.1 m | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC04

CLIENT Alberta Transportation
NORTHING 5654847
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33657
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/14
WATER LEVEL (4.1 m) 2016/04/14
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | GRAIN SIZE ANALYSIS: Sand (%) | GRAIN SIZE ANALYSIS: Silt (%) | GRAIN SIZE ANALYSIS: Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | - Borehole backfilled with cuttings and a bentonite seal from 0.5 m to 4.0 m<br>- Borehole DC04A advanced adjacent to DC04 to collect large bulk samples | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC04**

CLIENT Alberta Transportation NORTHING: 5654847 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33657 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/14/2016 to 4/14/2016 WATER LEVEL (4.1 m) 4/14/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 17 | 220.8 | Very poor quality grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak<br>- oxidation seams | | | | | | | | | | |
| 18 | 219.3 | Very poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC16 | 33 | 33 | 33 | | R0 | W5.5 | |
| 19 | | | | | RC17 | 100 | 100 | 0 | | R0 | W5.5 | |
| 20 | | - brownish grey, highly to completely weathered, extremely to very weak below 20.1 m | | | | | | | | | | |
| 21 | | | | | RC18 | 100 | 100 | 87 | | R0.5 | W4.5 | |
| 22 | 216.4 | Fair quality grey SHALE<br>- moderately to highly weathered<br>- extremely to very weak | | | RC19 | 98 | 83 | 67 | | R0.5 | W3.5 | |
| 23 | | - slightly to moderately weathered below 23.2 m | | | | | | | | | | |
| 24 | | | | | RC20 | 100 | 100 | 77 | | R0.5 | W2.5 | |
| 25 | | | | | RC21 | 96 | 85 | 73 | | R0.5 | W2.5 | |
| 26 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:30 AM

Stantec

# BOREHOLE RECORD

**DC04**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/14/2016 to 4/14/2016

NORTHING: 5654847
EASTING: -33657
WATER LEVEL (4.1 m) 4/14/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | | | | | | | | | | | | |
| | | Fair quality grey SHALE<br>- moderately to highly weathered<br>- extremely to very weak<br>- slightly weathered, very weak to weak below 26.2 m | | | | | | | | | | |
| 27 | | | | | RC22 | 100 | 100 | 95 | | R1.5 | W2 | |
| 28 | | | | | RC23 | 100 | 96 | 78 | | R1.5 | W2 | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | RC24 | 100 | 100 | 75 | | R1.5 | W2 | |
| | 207.2 | | | | | | | | | | | |
| 31 | | End of borehole (30.8 m)<br>- borehole slough to 13.1 m, and water at 4.1 m<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.5 m to 4.0 m | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:31 AM

Stantec

# BOREHOLE RECORD

## DC04A

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/15
NORTHING 5654847
EASTING -33657
WATER LEVEL (dry) 2016/04/15
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1238.00 | | | | | | | | | | | | |
| | 1237.8 | TOPSOIL | | | | | | | | | | | |
| | | Hard brown, medium plasticity, clay (CI) TILL<br>- silty, some sand, trace gravel, dry to damp | | | BS | A | | | PT | 5.3 | 12.0 | 40.4 | 42.3 |
| 1 | | | | | | | | | | | | | |
| 2 | | | | | BS | B | | | PT, k | 8.6 | 19.2 | 36.8 | 35.4 |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | BS | C | | | | | | | |
| 9 | 1229 | | | | | | | | | | | | |
| | | End of borehole (9.0 m)<br>- borehole dry and sloughing at 7.4 m<br>- borehole backfilled with cuttings and a bentonite seal from 0.5 m | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC04A

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/15
WATER LEVEL (dry) 2016/04/15
NORTHING 5654847
EASTING -33657
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | to 1.0 m | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC05

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/25

NORTHING 5654920
EASTING -33742
WATER LEVEL (15.5 m) 2016/05/25

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1242.05 | Topsoil | | | | | | | | | | | |
| | 1241.7 | Stiff to very stiff, brown, medium plasticity CLAY (CI)<br>- trace sand, mottled grey, moist | | | BS | 1 | | | | | | | |
| 1 | | | | | SS | 2 | 340 | 14 | | | | | |
| 2 | 1239.95 | Very stiff to hard, grey medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to moist | | | SS | 3 | 0 | 50+ | | | | | |
| 3 | | | | | SS | 4 | 0 | 50+ | | | | | |
| | | | | | SS | 5 | 25 | 50+ | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | SS | 6 | 200 | 32 | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | - seepage at 7.6 m | | | | | | | | | | | |
| 8 | | | | | SS | 7 | 390 | 42 | | 8.8 | 12.7 | 50.1 | 28.4 |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC05**

CLIENT Alberta Transportation NORTHING 5654920 PROJECT NO. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING -33742 BH SIZE SS:150mm, HS:200mm

DATES BORING 2016/05/25 WATER LEVEL (15.5 m) 2016/05/25 DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff to hard, grey medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to moist | | | | | | | | | | | |
| 11 | | | | | SS | 8 | 450 | 35 | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | SS | 9 | 450 | 39 | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| | 1225.45 | | | | | | | | | | | | |
| | | Bedrock encountered at 16.6 m<br>- Coring commenced at 16.6 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 23.1 m<br>- Groundwater was observed approximately 0.3 m above ground flowing over the top of the casing during drilling | | | SS | 10 | 50 | 50+ | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC05**

CLIENT Alberta Transportation
NORTHING: 5654920
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -33742
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 5/26/2016 to 5/26/2016
WATER LEVEL (15.5 m) 2016/05/25
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 225.5 | | | | | | | | | | | |
| 17 | | Very poor quality dark grey CLAYSTONE<br>- extremely weak to very weak<br>- moderately weathered<br>- very weak and highly weathered below 17.1 m | | | RC11 | 44 | 24 | 24 | | R0.5 | W3 | |
| | | | | | RC12 | 38 | 0 | 0 | | R1 | W4 | |
| 18 | | | | | RC13 | 77 | 30 | 23 | | R0.5 | W4 | |
| 19 | | - poor quality, light grey, and slightly to moderately weathered below 20.1 m | | | RC14 | 100 | 89 | 45 | | R0.5 | W2.5 | |
| 20 | | - very poor quality, extremely weak to very weak, and moderately to highly weathered below 20.1 m | | | RC15 | 93 | 47 | 7 | | R0.5 | W3.5 | |
| 21 | | - bentonite seam at 21.45 m<br>- weakand slightly weathred below 21.6 m | | | RC16 | 100 | 97 | 23 | | R1 | W2 | |
| 22 | | | | | | | | | | | | |
| 23 | 219.0 | End of borehole (23.1 m)<br>- borehole open upon completion<br>- borehole backfilled with cuttings and bentonite seals placed from 0.3 m to 0.6 m and 16.8 m to 23.1 m | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:32 AM

Stantec

# BOREHOLE RECORD

## DC06

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/22

NORTHING 5654893
EASTING -33490
WATER LEVEL (12.2 m) 2016/09/08

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1230.13 | | | | | | | | | | | | |
| | 1229.83 | TOPSOIL | | | | | | | | | | | |
| | | Stiff to very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, moist | | | BS | A | | | | | | | |
| 1 | | | | | ST | 1 | 270 | | | | | | |
| 2 | | | | | SS | 2 | 450 | 18 | | 0.4 | 2.8 | 31.2 | 65.6 |
| 3 | 1226.83 | | | | ST | 3 | 350 | | | | | | |
| | | Hard, dark brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, dry to damp | | | SS | 4 | 450 | 36 | | 6.3 | 21.2 | 38.0 | 34.5 |
| 4 | | | | | BS | B | | | PT | | | | |
| | | | | | SS | 5 | 300 | 42 | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | SS | 6 | 450 | 43 | | | | | |
| 7 | | | | | | | | | | | | | |
| | | - damp to moist below 7.6 m | | | SS | 7 | 450 | 36 | | | | | |
| 8 | | | | | | | | | | 8.4 | 19.8 | 36.1 | 35.7 |
| | | | | | BS | C | | | k | | | | |
| 9 | | | | | SS | 8 | 425 | 38 | | 7.9 | 23.6 | 37.8 | 30.7 |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC06**

CLIENT Alberta Transportation
NORTHING 5654893
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33490
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/22
WATER LEVEL (12.2 m) 2016/09/08
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, dark brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, dry to damp | | | | | | | | | | | |
| 11 | | | | | SS | 9 | 450 | 45 | | | | | |
| | 1218.33 | | | | | | | | | | | | |
| 12 | | Very dense, brown, poorly graded SAND (SP)<br>- some silt, wet | | | SS | 10 | 100 | 50+ | | | | | |
| | 1217.78 | - seepage at 12.2 m | | | | | | | | | | | |
| 13 | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, trace sand, gravel, damp | | | BS | D | | | | 1.6 | 5.3 | 55.8 | 37.3 |
| | 1216.83 | | | | | | | | | | | | |
| | 1216.43 | Fair quality grey (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | SS | 11 | 100 | 50+ | | | | | |
| 14 | | Bedrock encountered at 13.3 m<br>- Coring commenced at 13.7 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 26.2 m<br>- Groundwater at 1.2 m and sloughing at 11.0 m<br>- Groundwater observed at 12.2 m during drilling | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC06

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/22/2016 to 4/22/2016

NORTHING: 5654893
EASTING: -33490
WATER LEVEL (12.2 m) 9/08/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | | | | | | | | | | | |
| | 216.8 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | | Fair quality grey (inferred) MUDSTONE - completely weathered - extremely weak | | | | | | | | | | |
| | 216.4 | | | | RC12 | 98 | 98 | 72 | | R0 | W5 | |
| 14 | | Fair quality grey MUDSTONE - completely weathered - extremely weak | | | | | | | | | | |
| | | | | | RC13 | 92 | 21 | 0 | | R0 | W5 | |
| 15 | | | | | | | | | | | | |
| | 214.4 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE - completely weathered - very weak | | | RC14 | 89 | 30 | 19 | | R1 | W5 | |
| 16 | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 17 | 213.0 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE - completely weathered - extremely weak | | | RC15 | 88 | 30 | 11 | | R0 | W5.5 | |
| | | | | | RC16 | 94 | 51 | 0 | | R0 | W5.5 | |
| 18 | | | | | | | | | | | | |
| | 211.4 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE - moderately weathered - extremely weak | | | | | | | | | | |
| 19 | 210.8 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE - completely weathered - extremely weak | | | RC17 | 93 | 56 | 40 | | R0 | W4 | |
| 20 | | | | | | | | | | | | |
| | 209.9 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE - moderately to highly weathered - extremely weak | | | | | | | | | | |
| 21 | | | | | RC18 | 100 | 90 | 86 | | R0 | W2.5 | UCS |
| 22 | | | | | RC19 | 100 | 86 | 74 | | R0 | W2.5 | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**DC06**

CLIENT Alberta Transportation NORTHING: 5654893 PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33490 BH SIZE SS:150mm, HS:200mm
DRILLING DATE 4/22/2016 to 4/22/2016 WATER LEVEL (12.2 m) 9/08/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | | Fair quality grey SANDSTONE<br>- moderately to highly weathered<br>- extremely weak | | | | | | | | | | UCS |
| 24 | | | | | RC20 | 100 | 87 | 65 | | R0 | W2.5 | |
| | | - poor quality below 24.7 m | | | | | | | | | | |
| 25 | | | | | RC21 | 96 | 55 | 28 | | R0 | W2.5 | |
| | 204.4 | Poor quality dark grey SHALE<br>- slightly to moderately weathered<br>- extremely weak | | | | | | | | | | |
| 26 | 203.9 | | | | | | | | | | | |
| | | End of borehole (26.2 m)<br>- borehole slough to 25.7 m<br>- 25 mm standpipe piezometer slotted from 11.4 m to 14.5 m<br>- annulus backfilled with sand and cuttings with bentonite seals at 0.3 m to 0.5 m and 11.0 m and 10.5 m | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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Stantec

# BOREHOLE RECORD

## DC07

CLIENT Alberta Transportation
NORTHING 5655025
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33659
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/18
WATER LEVEL (1.2 m) 2016/04/18
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1240.99 | | | | | | | | | | | | |
| | 1240.69 | TOPSOIL | | | | | | | | | | | |
| | | Very stiff to hard, dark brown, medium plasticity clay (CI) TILL - silty, some sand, trace gravel, dry to damp | | | ST | 1 | 250 | | | | | | |
| 2 | | | | | SS | 2 | 100 | 23 | | 10.0 | 20.4 | 34.1 | 35.5 |
| 3 | | | | | ST | 3 | 280 | | | | | | |
| | | | | | SS | 4 | 100 | 49 | | | | | |
| 5 | | | | | SS | 5 | 600 | 50+ | | | | | |
| 6 | | | | | SS | 6 | 200 | 50+ | | | | | |
| 7 | | - frequent oxide staining below 7.2 m | | | | | | | | | | | |
| 8 | | | | | SS | 7 | 550 | 50+ | k | | | | |
| | | | | | BS | B | | | PT | | | | |
| 9 | | | | | SS | 8 | 250 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**DC07**

CLIENT Alberta Transportation NORTHING 5655025 PROJECT NO. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING -33659 BH SIZE SS:150mm, HS:200mm

DATES BORING 2016/04/18 WATER LEVEL (1.2 m) 2016/04/18 DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff to hard, dark brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to damp | | | | | | | | | | | |
| 11 | | - sandy, trace to some gravel, damp, below 10.7 m | | | SS | 9 | 450 | 42 | | | | | |
| 12 | | | | | SS | 10 | 400 | 49 | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | SS | 11 | 0 | 50+ | | | | | |
| 15 | | | | | SS | 12 | 450 | 45 | | | | | |
| 16 | | | | | SS | 13 | 225 | 49 | | 12.5 | 23.0 | 34.9 | 29.6 |
| 17 | | - damp to moist below 16.8 m | | | SS | 14 | 450 | 48 | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | SS | 15 | 450 | 50+ | | | | | |
| 20 | | | | | SS | 16 | 150 | 24 | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC07

CLIENT Alberta Transportation
NORTHING 5655025
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33659
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/18
WATER LEVEL (1.2 m) 2016/04/18
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1220.29 | | | | | | | | | | | | |
| 21 | 1219.69 | Very poor quality grey (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | SS | 17 | 100 | 50+ | | | | | |
| 22 | | Bedrock encountered at 20.7 m<br>- Coring commenced at 21.0 m (see rock coring log for details)<br>- Borehole terminated at 30.5 m due to swelling clay layers from 23.1 m to 25.3 m and from 26.7 m to 27.2 m<br>- Rock coring continued at borehole DC07A<br>- Groundwater at 1.2 m and sloughing to 20.3 m | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC07**

CLIENT Alberta Transportation
NORTHING: 5655025
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -33659
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 4/18/2016 to 4/18/2016
WATER LEVEL (1.2 m) 4/18/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 220.3 | | | | | | | | | | | |
| 21 | | Very poor quality grey (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC18 | 85 | 27 | 0 | | R0 | W5 | |
| | 219.7 | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC19 | 58 | 9 | 0 | | R0 | W5 | |
| 22 | | | | | | | | | | | | |
| 23 | 217.9 | Very poor quality light grey BENTONITE<br>- completely weathered<br>- extremely weak | | | RC20 | 79 | 1 | 0 | | R0 | W5 | |
| 24 | | | | | RC21 | 94 | 56 | 41 | | R0 | W5 | UCS |
| 25 | | | | | RC22 | 76 | 20 | 0 | | R0 | W5 | |
| | 215.7 | Poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC23 | 89 | 67 | 49 | | R0 | W5 | |
| 26 | 214.8 | Very poor quality grey SHALE<br>- completely weathered<br>- very weak | | | RC24 | 73 | 15 | 0 | | R1 | W5 | UCS |
| | 214.3 | Poor quality light grey BENTONITE<br>- completely weathered<br>- extremely weak | | | RC25 | 88 | 52 | 50 | | R0 | W5 | |
| 27 | 213.8 | Very poor quality dark grey to black SHALE<br>- completely weathered<br>- very weak | | | RC26 | 27 | 0 | 0 | | R1 | W5 | |
| | 213.4 | End of borehole (27.6 m)<br>- borehole slough to 20.3 m, and water at 1.2 m<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.3 m to 0.6 m | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

## DC07A

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/19

NORTHING 5655025
EASTING -33659
WATER LEVEL (16.8 m) 2016/09/08

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1240.99 | | | | | | | | | | | | |
| | 1240.69 | TOPSOIL | | | | | | | | | | | |
| | | Very stiff to hard, dark brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to damp | | | | | | | | | | | |
| 7 | | - frequent oxide staining below 7.2 m | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC07A

CLIENT Alberta Transportation
NORTHING 5655025
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33659
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/19
WATER LEVEL (16.8 m) 2016/09/08
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff to hard, dark brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to damp<br>- sandy, trace to some gravel, damp, below 10.7 m | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | - damp to moist below 16.8 m | | ▼ | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC07A

CLIENT Alberta Transportation
NORTHING 5655025
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33659
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/19
WATER LEVEL (16.8 m) 2016/09/08
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1220.29 | | | | | | | | | | | | |
| | | Bedrock encountered at 20.7 m<br>- Overburden soils not sampled borehole adjacent to DC07<br>- Coring commenced at 23.3 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 36.4 m<br>- Groundwater at 0.9 m and slough at 27.9 m | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC07A**

CLIENT Alberta Transportation NORTHING: 5655025 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33659 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/21/2016 to 4/21/2016 WATER LEVEL (0.9 m) 4/21/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 220.3 | | | | | | | | | | | |
| 21 | | Very poor quality grey (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 219.7 | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 22 | | - completely weathered below 22.0 m | | | | | | | | | | |
| 23 | 217.9 | | | | | | | | | | | |
| | 217.7 | Very poor quality light grey BENTONITE<br>- completely weathered<br>- extremely weak | | | RC 1 | 65 | 30 | 0 | | R0 | W5 | |
| 24 | | Very poor quality grey SANDSTONE<br>- completely weathered<br>- extremely weak | | | RC 2 | 82 | 74 | 68 | | R0 | W5 | |
| 25 | | | | | | | | | | | | |
| | 215.7 | Fair quality grey to white MUDSTONE/BENTONITE<br>- completely weathered<br>- extremely weak | | | RC 3 | 98 | 93 | 75 | | R0 | W4.5 | |
| 26 | | | | | | | | | | | | UCS |
| 27 | | - bentonite layer between 26.9 m and 27.2 m | | | RC 4 | 100 | 38 | 25 | | R0 | W5.5 | |
| 28 | 212.8 | | | | | | | | | | | |
| | | Very poor quality light to dark grey SILTSTONE<br>- slightly to moderately weathered<br>- weak | | | RC 5 | 98 | 44 | 0 | | R1 | W4 | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:38 AM

Stantec

# BOREHOLE RECORD

**DC07A**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/21/2016 to 4/21/2016
NORTHING: 5655025
EASTING: -33659
WATER LEVEL (0.9 m) 4/21/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | | | | | | | | | | | |
| | | Very poor quality light to dark grey SILTSTONE<br>- slightly to moderately weathered<br>- weak | | | RC 6 | 78 | 42 | 32 | | R0 | W2.5 | |
| 31 | 209.8 | | | | RC 7 | 100 | 78 | 47 | | R1 | W2.5 | |
| | | Poor quality dark grey SHALE<br>- slightly to moderately weathered<br>- weak | | | RC 8 | 76 | 63 | 50 | | R2 | W2.5 | |
| 32 | | | | | RC 9 | 100 | 68 | 47 | | R2 | W2 | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | RC10 | 98 | 70 | 44 | | R2 | W2 | |
| 35 | | | | | | | | | | | | |
| 36 | 204.6 | | | | RC11 | 97 | 85 | 65 | | R2 | W2 | |
| | | End of borehole (36.4 m)<br>- borehole slough to 27.9 m, and water at 0.9 m<br>- 25 mm standpipe piezometer slotted from 19.2 m to 22.2 m<br>- annulus backfilled with sand and cuttings with bentonite seals at 0.3 m to 0.5 m, 18.4 m to 19.2 m and 22.2 to 27.9 m | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:38 AM

Stantec

# BOREHOLE RECORD

## DC08

CLIENT Alberta Transportation
NORTHING 5655037
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33532
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/05/19
WATER LEVEL (18.3 m) 2016/05/19
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1232.37 | | | | | | | | | | | | |
| | 1232.07 | TOPSOIL | | | | | | | | | | | |
| | | Light brown, high plasticity CLAY (CH)<br>- silty, trace sand, mottled brown, dry<br>- dry to moist below 0.9 m | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 450 | | UU, Y | 0.2 | 7.4 | 37.8 | 54.7 |
| 2 | 1230.27 | | | | | | | | | | | | |
| | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace to some gravel, dry to moist<br>- dark brown below 2.5 m | | | SS | 3 | 130 | 20 | | | | | |
| | | | | | BS | 4 | | | | | | | |
| 3 | | | | | ST | 5 | 400 | | CU, Y | 15.2 | 22.0 | 34.9 | 27.9 |
| | | - hard below 3.6 m | | | SS | 6 | 380 | 50+ | P, CR, DH, k | 6.1 | 22.4 | 37.4 | 34.1 |
| 4 | | | | | BS | 7 | | | | | | | |
| | | | | | SS | 8 | 450 | 50+ | | 10.6 | 23.0 | 34.9 | 31.6 |
| 5 | | | | | | | | | | | | | |
| | | | | | BS | 9 | | | k | | | | |
| 6 | | | | | SS | 10 | 450 | 50+ | | | | | |
| 7 | | | | | | | | | | | | | |
| | | | | | BS | 11 | | | | | | | |
| | | | | | SS | 12 | 450 | 50+ | | | | | |
| 8 | | | | | | | | | | | | | |
| | | | | | BS | 13 | | | | | | | |
| 9 | | | | | SS | 14 | 450 | 50+ | | | | | |
| | | - some sand below 9.8 m | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC08**

CLIENT Alberta Transportation
NORTHING 5655037
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33532
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/05/19
WATER LEVEL (18.3 m) 2016/05/19
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace to some gravel, dry to moist | | | BS | 15 | | | | | | | |
| 11 | | | | | SS | 16 | 400 | 50+ | | 8.0 | 19.5 | 37.6 | 34.8 |
| 12 | | | | | BS | 17 | | | | | | | |
| 13 | | | | | SS | 18 | 400 | 50+ | | | | | |
| 14 | | | | | BS | 19 | | | | 23.3 | 18.6 | 32.1 | 26.0 |
| 15 | | | | | SS | 20 | 350 | 47 | | | | | |
| 16 | | | | | BS | 21 | | | | | | | |
| 17 | | - inferred cobbles at 16.8 m | | | SS | 22 | 340 | 50+ | | | | | |
| 18 | | - gravelly, light brown below 17.5 m | | | BS | 23 | | | | | | | |
| 19 | 1213.67 | | | | SS | 24 | 0 | 50+ | | | | | |
| | 1213.37 | Very poor quality light grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak | | | BS | 25 | | | | | | | |
| | | Bedrock encountered at 18.7 m<br>- Coring commenced at 19.0 m (see | | | SS | 26 | 370 | 50+ | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC08

CLIENT Alberta Transportation
NORTHING 5655037
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33532
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/05/19
WATER LEVEL (18.3 m) 2016/05/19
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | rock coring log for details)<br>- Borehole advanced in bedrock to 27.6 m<br>- Groundwater at 18.3 m during drilling. Borehole open upon completion | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC08**

CLIENT Alberta Transportation NORTHING: 5655037 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33532 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 5/19/2016 to 5/19/2016 WATER LEVEL (18.3 m) 5/19/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | Overburden - See Soil Log for overburden description | | ▼ | RC27 | | | | | R | W | |
| | 213.7 | | | | | | | | | | | |
| 19 | 213.4 | Very poor quality light grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC28 | 100 | 100 | 100 | | R0 | W3.5 | |
| 20 | | Fair to good quality dark grey CLAYSTONE<br>- moderately to highly weathered<br>- extremely weak<br>- very poor quality, very weak, slightly to moderately weathered below 20.0 m | | | RC29 | 100 | 89 | 100 | | R1 | W2.5 | |
| 21 | | | | | | | | | | | | |
| 22 | | - light grey mottling from 21.6 m to 22.4 m | | | RC30 | 100 | 98 | 77 | | R1 | W2.5 | |
| 23 | | - very weak to weak below 23.1 m | | | | | | | | | | |
| 24 | | - mottled with coal below 23.8 m | | | RC31 | 78 | 78 | 40 | | R1.5 | W2.5 | |
| 25 | | - fair quality and dark brown below 24.6 m | | | RC32 | 100 | 98 | 70 | | R1.5 | W2.5 | |
| 26 | | - poor quality and trace coal mottling below 26.1 m | | | | | | | | | | |
| 27 | | | | | RC33 | 100 | 100 | 39 | | R1.5 | W2.5 | |
| | 204.8 | | | | | | | | | | | |
| 28 | | End of borehole (27.6 m)<br>- borehole open | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:41 AM

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# BOREHOLE RECORD

**DC08**

CLIENT Alberta Transportation
NORTHING: 5655037
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -33532
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 5/19/2016 to 5/19/2016
WATER LEVEL (18.3 m) 5/19/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | | - borehole backfilled with cuttings and bentonite seals placed from 0.3 m to 0.6 m and 18.3 m to 27.6 m | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**DC09**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/16

NORTHING 5655153
EASTING -33452
WATER LEVEL (1.3 m) 2016/04/16

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1227.39 | | | | | | | | | |
| | 1227.09 | TOPSOIL | SS | 1 | 400 | 9 | | | | |
| | | Stiff, brown, high plasticity CLAY (CH)<br>- trace sand, trace rootlets, damp | | | | | | | | |
| 1 | | | SS | 2 | | | | | | |
| | | | ST | 3 | 375 | | | | | |
| 2 | 1225.39 | | | | | | | | | |
| | | Very stiff to hard, brownish grey, medium plasticity clay (CI) TILL<br>- some sand, trace gravel, dry to damp | SS | 4 | 375 | 13 | | | | |
| 3 | | | SS | 5 | 325 | 26 | | | | |
| 4 | | | | | | | | | | |
| | | | ST | 6 | 150 | | | | | |
| 5 | | | SS | 7 | 300 | 44 | | | | |
| 6 | | | | | | | | | | |
| | | | SS | 8 | 425 | 33 | | | | |
| 7 | | - some gravel below 7.2 m | | | | | | | | |
| | | | SS | 9 | 450 | 50+ | | | | |
| 8 | | | | | | | | | | |
| 9 | | | SS | 10 | 300 | 50+ | | | | |
| 10 | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC09

CLIENT Alberta Transportation
NORTHING 5655153
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33452
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/16
WATER LEVEL (1.3 m) 2016/04/16
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | - seepage at 10.5 m | | | SS | 11 | 200 | 50+ | | | | | |
| | 1216.59 | | | | | | | | | | | | |
| 11 | | Bedrock encountered at 10.8 m<br>- Coring commenced at 11.0 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 23.2 m<br>- Groundwater at 1.3 m and sloughing to 9.0 m<br>- Borehole DC09A completed adjacent for 50 mm monitoring well install | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC09**

CLIENT Alberta Transportation NORTHING: 5655153 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33452 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/16/2016 to 4/16/2016 WATER LEVEL (1.3 m) 4/16/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 216.6 | | | | | | | | | | | |
| 11 | 216.4 | Very poor quality (inferred) SANDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | | Fair quality brown MUDSTONE/CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC13 | 100 | 100 | 67 | | R0 | W5 | |
| 12 | | - very poor quality below 12.5 m<br>- fair quality below 12.8 m | | | RC14 | 100 | 100 | 0 | | R0 | W5 | |
| 13 | | | | | RC15 | 81 | 83 | 74 | | R1 | W3.5 | |
| 14 | | - grey below 13.9 m<br>- excellent quality below 14.0 m | | | RC16 | 100 | 100 | 100 | | R1 | W3.5 | |
| 15 | 212.4 | Excellent quality grey SHALE<br>- slightly to moderately weathered<br>- very weak to weak<br>- coal seams<br>- good quality below 15.5 m | | | RC17 | 100 | 100 | 77 | | R1.5 | W2.5 | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | RC18 | 100 | 91 | 82 | | R1 | W3 | |
| 18 | 209.3 | | | | | | | | | | | |
| | | Good quality brown MUDSTONE<br>- moderately to highly weathered<br>- extremely weak | | | | | | | | | | |
| | 208.7 | | | | | | | | | | | |
| 19 | | Poor quality grey SHALE<br>- slightly to moderately weathered<br>- very weak to weak<br>- coal seams<br>- inferred coal layer from 19.5 m to 19.9 m | | | RC19 | 75 | 68 | 47 | | R1.5 | W2.5 | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:43 AM

Stantec

# BOREHOLE RECORD

**DC09**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/16/2016 to 4/16/2016

NORTHING: 5655153
EASTING: -33452
WATER LEVEL (1.3 m) 4/16/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | | | | | | |
| | | - good quality below 20.1 m | | | | | | | | | | |
| | 207.0 | Good quality brown MUDSTONE<br>- moderately weathered<br>- extremely to very weak<br>- coal seam at 20.4 m | | | RC20 | 100 | 85 | 77 | | R1 | W2.5 | |
| 21 | 206.0 | Good quality grey SHALE<br>- slightly weathered<br>- very weak to weak | | | | | | | | | | |
| 22 | | | | | RC21 | 100 | 98 | 77 | | R1 | W2.5 | |
| | 204.8 | Good quality grey CLAYSTONE<br>- slightly to moderately weathered<br>- extremely to very weak | | | | | | | | | | |
| 23 | 204.2 | End of borehole (23.2 m)<br>- borehole slough to 9.0m, and water at 1.3 m<br>- standpipe installation monitored hydrogeology, refer to hydrogeology borehole records | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:43 AM

Stantec

# BOREHOLE RECORD

## DC09A

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/16

NORTHING 5655153
EASTING -33452
WATER LEVEL (1.4 m) 2016/09/08

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1227.39 | | | | | | | | | | | | |
| | 1227.09 | TOPSOIL | | | | | | | | | | | |
| 1 | | Stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, trace rootlets, damp | | | BS | A | | | PT | 0.0 | 1.5 | 31.5 | 67.0 |
| 2 | 1225.39 | | | | | | | | | | | | |
| | | Very stiff to hard, brownish grey, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to damp | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | BS | B | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | - some gravel below 7.2 m | | | | | | | | | | | |
| 8 | | | | | BS | C | | | PT | 7.7 | 17.3 | 39.9 | 35.2 |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC09A

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/16
NORTHING 5655153
EASTING -33452
WATER LEVEL (1.4 m) 2016/09/08
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | - seepage at 10.5 m | | | | | | | | | | | |
| | 1216.59 | | | | | | | | | | | | |
| | 1216.39 | Very poor quality (inferred) SANDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | | |
| 11 | | End of borehole (11.0 m)<br>- borehole dry and slough to 10.7 m upon completion<br>- 50 mm standpipe piezometer slotted from 7.6 m to 10.6 m<br>- annulus backfilled with sand between 7.0 m and 10.7 m, bentonite seal from 0.3 m to 7.0 m | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC10

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/23

NORTHING 5655287
EASTING -33389
WATER LEVEL (4.5 m) 2016/04/23

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1225.84 | | | | | | | | | | | | |
| | 1225.54 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, intermediate plastic clay (CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, moist | | | BS | A | | | | | | | |
| 1 | | | | | | | | | | | | | |
| | | | | | ST | 1 | 300 | | | | | | |
| 2 | | | | | SS | 2 | 300 | 10 | | 6.6 | 13.7 | 40.4 | 39.3 |
| | | | | | | | | | | | | | |
| 3 | | | | | ST | 3 | 340 | | | | | | |
| | | - very stiff, some sand to sandy below 3.5 m | | | SS | 4 | 450 | 26 | | | | | |
| 4 | | | | ▼ | | | | | | | | | |
| | | - hard below 4.6 m | | | SS | 5 | 450 | 41 | | | | | |
| 5 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 6 | | - dark brown to grey below 6.1 m | | | SS | 6 | 450 | 44 | | | | | |
| | | | | | BS | B | | | PT | 5.8 | 20.2 | 37.5 | 36.6 |
| 7 | | - dry to damp below 7.0 m | | | | | | | | | | | |
| | | | | | SS | 7 | 450 | 47 | | | | | |
| 8 | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| 9 | | | | | SS | 8 | 150 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC10**

CLIENT Alberta Transportation
NORTHING 5655287
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33389
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/23
WATER LEVEL (4.5 m) 2016/04/23
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Stiff, brown, intermediate plastic clay (CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, moist | | | | | | | | | | | |
| 11 | | - some gravel below 10.7 m | | | SS | 9 | 450 | 50+ | | 13.3 | 19.3 | 33.3 | 34.2 |
| 12 | 1213.44 | | | | SS | 10 | 150 | 50+ | | | | | |
| | | Bedrock encountered at 12.4 m<br>- Coring commenced at 12.6 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 21.6 m.<br>- Groundwater at 4.5 m and borehole open upon completion | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC10**

CLIENT Alberta Transportation NORTHING: 5655287 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33389 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/23/2016 to 4/23/2016 WATER LEVEL (4.5 m) 4/23/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | | | | | | | | | | | | |
| | 213.5 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 213.2 | Very poor quality light brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 13 | 213.0 | Good quality light grey SANDSTONE<br>- completely weathered<br>- extremely weak | | | RC11 | 100 | 92 | 77 | | R0 | W5 | |
| | 212.3 | Good quality light brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 14 | 211.6 | Good quality light gey SANDSTONE<br>- highly to completely weathered<br>- extremely weak | | | RC12 | 99 | 64 | 53 | | R0 | W5.5 | |
| 15 | | Fair quality light grey SILTSTONE<br>- completely weathered<br>- extremely weak<br><br>- poor quality, highly to completely weathered below 16.0 m | | | RC13 | 100 | 78 | 47 | | R0 | W4.5 | |
| 16 | 209.4 | | | | | | | | | | | |
| | 209.2 | Poor quality light grey SANDSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| 17 | | Poor quality dark grey SILTSTONE<br>- completely weathered<br>- extremely weak<br>- highly weathered, weak below 17.1 m | | | RC14 | 100 | 57 | 31 | | R2 | W4 | |
| 18 | | | | | | | | | | | | |
| 19 | | - very poor quality below 19.0 m | | | RC15 | 100 | 40 | 25 | | R0 | W4 | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | RC16 | 100 | 27 | 16 | | R0 | W4 | |
| | 204.2 | End of borehole (21.6 m)<br>- borehole slough to 21.5 m, | | | | | | | | | | |
| 22 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:44 AM

Stantec

# BOREHOLE RECORD

**DC10**

CLIENT Alberta Transportation
NORTHING: 5655287
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -33389
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 4/23/2016 to 4/23/2016
WATER LEVEL (4.5 m) 4/23/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | | and water at 4.5 m<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.3 m to 0.5 m | | | | 80 60 40 20 | 80 60 40 20 | 80 60 40 20 | 5 10 15 20 | R5 R4 R3 R2 | W1 W2 W3 W4 W5 W6 | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:45 AM

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# BOREHOLE RECORD

**DC11**

CLIENT Alberta Transportation
NORTHING 5655542
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33424
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/05/18
WATER LEVEL (1.3 m) 2016/05/18
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1224.04 | | | | | | | | | | | | |
| | 1223.84 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, medium plasticity CLAY (CI)<br>- silty, some gravel, trace sand, damp | | | BS | 1 | | | | | | | |
| | | | | | ST | 2 | 280 | | | | | | |
| | | - trace coal specks below 2.0 m | | | SS | 3 | 150 | 14 | | | | | |
| | 1221.74 | | | | | | | | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL<br>- some sand, trace gravel, damp | | | BS | 4 | | | | 16.3 | 6.3 | 31.0 | 46.4 |
| | | | | | ST | 5 | 280 | | | | | | |
| | | | | | SS | 6 | 400 | 10 | | | | | |
| | | | | | BS | 7 | | | | | | | |
| | | | | | ST | 8 | 300 | | | | | | |
| | | | | | SS | 9 | 200 | 50+ | | | | | |
| | | | | | BS | 10 | | | | | | | |
| | | - inferred cobbles at 6.1 m | | | SS | 11 | 10 | 50+ | | | | | |
| | | | | | BS | 12 | | | | | | | |
| | | - seepage at 7.6 m | | | SS | 13 | 450 | 43 | | | | | |
| | | | | | BS | 14 | | | | | | | |
| | | | | | SS | 15 | | 50+ | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC11

CLIENT Alberta Transportation NORTHING 5655542 PROJECT NO. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING -33424 BH SIZE SS:150mm, HS:200mm

DATES BORING 2016/05/18 WATER LEVEL (1.3 m) 2016/05/18 DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, medium plasticity clay (CI) TILL<br>- some sand, trace gravel, damp | | | BS | 16 | | | | | | | |
| | | - trace coal specks below 10.7 m | | | SS | 17 | 450 | 50+ | | | | | |
| 11 | | | | | BS | 18 | | | | | | | |
| 12 | | | | | SS | 19 | 150 | 50+ | | | | | |
| 13 | | | | | BS | 20 | | | | 22.2 | 17.3 | 32.5 | 28.1 |
| 14 | | | | | SS | 21 | 350 | 50+ | | | | | |
| 15 | | | | | SS | 22 | 400 | 50+ | CU | 7.2 | 18.5 | 43.3 | 31.1 |
| 16 | | | | | BS | 23 | | | | | | | |
| 17 | | | | | SS | 24 | 450 | 50+ | | | | | |
| 18 | | - inferred cobbles at 18.3 m | | | | | | | | | | | |
| | 1205.54 | | | | SS | 25 | 200 | 50+ | | | | | |
| 19 | | Bedrock encountered at 18.5 m<br>- Coring commenced at 18.1 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 23.2 m.<br>- Groundwater at 1.3 m and sloughing at 9.0 m<br>- Groundwater at 6.7 m during | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC11

CLIENT Alberta Transportation
NORTHING 5655542
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33424
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/05/18
WATER LEVEL (1.3 m) 2016/05/18
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | GRAIN SIZE ANALYSIS: Sand (%) | GRAIN SIZE ANALYSIS: Silt (%) | GRAIN SIZE ANALYSIS: Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | drilling. | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC11**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/18/2016 to 5/18/2016

NORTHING: 5655542
EASTING: -33424
WATER LEVEL (6.7 m) 5/18/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 205.5 | | | | | | | | | | | |
| 19 | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC26 | | | | | R | W | |
| | 204.5 | | | | | | | | | | | |
| 20 | | Very poor quality grey SILTSTONE<br>- highly weathered<br>- extremely weak | | | RC27 | 100 | | 0 | | R0 | W4 | |
| 21 | | | | | RC28 | 100 | | 13 | | R0 | W4 | |
| | 202.4 | | | | | | | | | | | |
| 22 | | End of borehole (21.65 m)<br>- borehole open, and water at 6.7 m<br>- borehole backfilled with cuttings and bentonite from 0.5 m to 0.8 m and 16.65 m to 21.65 m | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:46 AM

Stantec

# BOREHOLE RECORD

## DC12

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/27
NORTHING 5655745
EASTING -33424
WATER LEVEL (7.0 m) 2016/05/27
PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1221.97 | | | | | | | | | | | | |
| | 1221.72 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, medium plasticity CLAY (CI)<br>- silty, some sand, trace coal specks, moist | | | BS | 1 | | | | | | | |
| 1 | | | | | SS | 2 | 450 | 12 | | 0.4 | 10.7 | 42.1 | 46.8 |
| 2 | | | | | | | | | | | | | |
| | 1219.17 | | | | BS | 3 | | | | | | | |
| | | Stiff, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, trace coal specks, moist | | | SS | 4 | 450 | 13 | | | | | |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | BS | 5 | | | | 9.8 | 22.1 | 48.0 | 20.2 |
| | | - some gravel, dry to moist below 4.6 m | | | SS | 6 | 450 | 37 | | | | | |
| 5 | | | | | | | | | | | | | |
| | | | | | BS | 7 | | | CC | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | - seepage at 7.0 m | | | | | | | | | | | |
| | | | | | BS | 8 | | | | 17.2 | 25.6 | 33.8 | 23.4 |
| | | - hard below 7.6 m | | | SS | 9 | 300 | 50+ | | | | | |
| 8 | | | | | | | | | | | | | |
| | | | | | BS | 10 | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC12

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/27

NORTHING 5655745
EASTING -33424
WATER LEVEL (7.0 m) 2016/05/27

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Stiff, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, trace coal specks, moist<br>- some to frequent oxide staining below 10.7 m | | | BS | 11 | | | | | | | |
| 11 | | | | | SS | 12 | 450 | 47 | | | | | |
| | 1210.47 | | | | | | | | | | | | |
| | | Hard, grey, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, moist | | | BS | 13 | | | | 0.4 | 3.9 | 31.4 | 64.3 |
| 12 | 1209.47 | | | | | | | | | | | | |
| | | Hard, grey, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, moist | | | BS | 14 | | | CU | 4.6 | 19.9 | 43.2 | 32.3 |
| 13 | | | | | SS | 15 | 450 | 50+ | | | | | |
| 14 | | | | | BS | 16 | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | BS | 17 | | | | 5.7 | 18.5 | 40.7 | 35.1 |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | BS | 18 | | | | | | | |
| | | | | | SS | 19 | 420 | 50+ | | | | | |
| 19 | 1202.77 | | | | | | | | | | | | |
| | | Very poor quality dark grey (inferred) CLAYSTONE<br>- extremely weak to very weak | | | BS | 20 | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC12

CLIENT Alberta Transportation
NORTHING 5655745
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33424
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/05/27
WATER LEVEL (7.0 m) 2016/05/27
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Very poor quality dark grey (inferred) CLAYSTONE<br>- extremely weak to very weak | | | | | | | | | | | |
| 21 | | | | | BS | 21 | | | | | | | |
| | 1200.27 | | | | | | | | | | | | |
| 22 | | Bedrock encountered at 19.2 m<br>- Coring commenced at 21.7 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 26.2 m<br>- Groundwater at 7.0 m and borehole open upon completion | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC12

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/27/2016 to 5/27/2016
NORTHING: 5655745
EASTING: -33424
WATER LEVEL (7.0 m) 5/27/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 19 | 202.8 | | | | | | | | | | | |
| 20 | | Very poor quality dark grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely to very weak | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | 200.3 | Good quality grey SANDSTONE<br>- slightly weathered<br>- weak<br>- 0.35 m thick layer of claystone at 21.7 m | | | RC22 | 100 | 100 | 84 | | R2 | W2 | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | RC23 | 98 | 98 | 98 | | 3 | W2 | |
| 25 | 197.4 | Fair quality dark grey SILTSTONE/SHALE<br>- slightly weathetred<br>- weak to medium strong<br>- coal and white infilling | | | RC24 | 98 | 98 | 59 | | 2.5 | W2 | |
| 26 | 195.8 | | | | | | | | | | | |
| 27 | | End of borehole (26.2 m)<br>- borehole open and water at 7.0 m upon completion<br>- borehole backfilled with cuttings and bentonite seals placed from 0.6 m to 0.9 m and 21.7 m to 26.2 m | | | | | | | | | | |
| 28 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:48 AM

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# BOREHOLE RECORD

## DC13

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/17

NORTHING 5655943
EASTING -33424
WATER LEVEL (2.2 m) 2016/05/17

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1219.14 | | | | | | | | | | | | |
| | 1219.04 | TOPSOIL | | | | | | | | | | | |
| | | Brown, medium plasticity CLAY (CI)<br>- some sand, trace gravel, trace rootlets, dry to damp | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 320 | | | | | | |
| | 1217.19 | | | | | | | | | | | | |
| 2 | | Stiff to very stiff, brown, medium plasticity clay (CI) TILL<br>- silyt, some sand to sandy, trace gravel, trace coal specks, damp | | | SS | 3 | 300 | 19 | | | | | |
| | | | | | BS | 4 | | | | | | | |
| 3 | | | | | ST | 5 | 300 | | | | | | |
| | | | | | SS | 6 | 200 | 14 | | | | | |
| 4 | | | | | | | | | | | | | |
| | | - dark brown below 4.6 m | | | ST | 7 | 310 | | | | | | |
| 5 | | - hard below 5.0 m | | | SS | 8 | 450 | 36 | | | | | |
| | | | | | BS | 9 | | | | | | | |
| 6 | | | | | SS | 10 | 450 | 36 | CU | 3.8 | 21.1 | 37.6 | 37.4 |
| | | | | | | | | | | | | | |
| 7 | | | | | BS | 11 | | | | | | | |
| | | | | | SS | 12 | 0 | 47 | | | | | |
| 8 | | | | | | | | | | | | | |
| | | | | | BS | 13 | | | | | | | |
| 9 | | | | | | | | | | | | | |
| | | | | | SS | 14 | 450 | 44 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC13

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/17
NORTHING 5655943
EASTING -33424
WATER LEVEL (2.2 m) 2016/05/17
PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Stiff to very stiff, brown, medium plasticity clay (CI) TILL<br>- silyt, some sand to sandy, trace gravel, trace coal specks, damp | | | BS | 15 | | | | | | | |
| | | | | | SS | 16 | 450 | 49 | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | SS | 17 | 450 | 42 | | | | | |
| 13 | | | | | BS | 18 | | | | | | | |
| | | | | | SS | 19 | 450 | 50+ | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | SS | 20 | 450 | 37 | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | 1201.74 | | | | | | | | | | | | |
| | | Very poor quality light brown (inferred) MUDSTONE<br>- extremely weak | | | BS | 21 | | | | | | | |
| 18 | 1201.14 | | | | | | | | | | | | |
| | | Bedrock encountered at 17.4 m<br>- Coring commenced at 18.0 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 20.1 m.<br>- Groundwater at 2.2 m and sloughing at 18.3 m | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC13**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/17/2016 to 5/17/2016

NORTHING: 5655943
EASTING: -33424
WATER LEVEL (2.2 m) 5/17/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 201.7 | | | | | | | | | | | |
| | | Very poor quality light brown (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 18 | 201.1 | | | | | | | | | | | |
| | 200.9 | Poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC22 | 91 | 58 | 43 | | R2 | W3 | |
| | | Poor quality grey SANDSTONE<br>- moderately weathered<br>- weak<br>- fair quality below 18.6 m | | | | | | | | | | |
| 19 | | | | | RC23 | 96 | 83 | 65 | | R1 | W3.5 | |
| | 199.3 | | | | | | | | | | | |
| 20 | 199.0 | Fair quality grey SILTSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| | | End of borehole (20.1 m)<br>- borehole slough to 18.3 m and water at 2.2 m<br>- borehole backfilled with cuttings and bentonite from 1.5 m to 3.0 m and 16.8 m to 18.3 m | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:48 AM

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# BOREHOLE RECORD

## DC14

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/17

NORTHING 5656070
EASTING -33313
WATER LEVEL (5.8 m) 2016/05/17

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1215.00 | TOPSOIL | | | | | | | | | | | |
| | 1214.6 | Stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, damp to moist | | | BS | 1 | | | | | | | |
| 1 | | | | | | | | | | | | | |
| | | | | | ST | 2 | 370 | | UU, Y | 0.0 | 0.9 | 37.1 | 62.1 |
| 2 | | | | | SS | 3 | 450 | 13 | | | | | |
| | | | | | | | | | | | | | |
| 3 | | | | | ST | 4 | 300 | | UU, Y | 0.0 | 0.9 | 42.0 | 57.1 |
| | | | | | SS | 5 | 450 | 14 | | | | | |
| 4 | | | | | | | | | | | | | |
| | | | | | ST | 6 | 450 | | | | | | |
| 5 | 1209.95 | Very stiff, brown, low plasticity clay (CL) TILL<br>- trace sand, gravel, trace coal specks, damp | | | SS | 7 | 450 | 18 | | | | | |
| | | | | | | | | | | | | | |
| | | | | | BS | 8 | | | | | | | |
| 6 | | | | | SS | 9 | 325 | 28 | | | | | |
| | | | | | | | | | | | | | |
| 7 | | - interbedded silt, sand, and clay, moist between 6.8 m and 9.1 m | | | BS | 10 | | | k | | | | |
| | | - hard below 7.6 m | | | SS | 11 | 450 | 50 | | | | | |
| 8 | | | | | | | | | | | | | |
| | | | | | BS | 12 | | | | | | | |
| 9 | | | | | | | | | | | | | |
| | | - some sand below 9.1 m | | | SS | 13 | 450 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC14**

CLIENT Alberta Transportation NORTHING 5656070 PROJECT NO. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING -33313 BH SIZE SS:150mm, HS:200mm

DATES BORING 2016/05/17 WATER LEVEL (5.8 m) 2016/05/17 DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, low plasticity clay (CL) TILL<br>- trace sand, gravel, trace coal specks, damp | | | BS | 14 | | | | | | | |
| 11 | | - wet sand pocket at 11.0 m | | | SS | 15 | 450 | 50+ | | | | | |
| 12 | | | | | BS | 16 | | | | | | | |
| 13 | | | | | SS | 17 | 300 | 50+ | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | SS | 18 | 75 | 50+ | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | - grey below 17.2 m | | | BS | 19 | | | | | | | |
| 18 | | | | | SS | 20 | 150 | 50+ | | | | | |
| 19 | 1195.9 | | | | | | | | | | | | |
| | | Bedrock encountered at 19.1 m<br>- Coring commenced at 19.1 m (see rock coring log for details)<br>- Borehole advanced in | | | SS | 21 | 200 | 50+ | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC14

CLIENT Alberta Transportation
NORTHING 5656070
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33313
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/05/17
WATER LEVEL (5.8 m) 2016/05/17
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | bedrock to 22.0 m<br>- Groundwater at 5.8 m and sloughing to 21.6 m<br>- Groundwater noted at 6.4 m during drilling | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC14**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/17/2016 to 5/17/2016

NORTHING: 5656070
EASTING: -33313
WATER LEVEL (5.8 m) 5/17/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 19 | 195.9 | | | | | | | | | | | |
| | 195.4 | Very poor quality grey SILTSTONE<br>- completey weathered<br>- extremely weak | | | | | | | | | | |
| | | Very poor quality dark grey SHALE<br>- highly weathered<br>- extremely weak | | | RC22 | 63 | 14 | 0 | | R0 | W4 | |
| 20 | 194.5 | | | | | | | | | | | |
| | 194.2 | Poor quality grey SILTSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 21 | 194.0 | Poor quality grey SHALE<br>- moderately weathered<br>- weak | | | RC23 | 100 | 52 | 33 | | R1 | W4.5 | |
| | | Poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 22 | 193.0 | End of borehole (22.0 m)<br>- borehole slough to 21.6 m, water 5.8 m<br>- borehole backfilled with cuttings, bentonite from 0.5 m to 0.8 m and 19.1 m to 21.55 m | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:50 AM

Stantec

# BOREHOLE RECORD

## DC15

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/11

NORTHING 5656141
EASTING -33226
WATER LEVEL (4.6 m) 2016/05/11

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1213.43 | | | | | | | | | | | | |
| | 1213.23 | TOPSOIL | | | | | | | | | | | |
| | | Stiff to very stiff, brown, low to high plasticity (CL-CH) CLAY<br>- silty, trace sand, mottled brown, damp to moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 300 | | | | | | |
| 2 | | | | | SS | 3 | 250 | 17 | | | | | |
| | | - moist below 2.5 m | | | BS | A | | | PT | 0.0 | 0.8 | 38.4 | 60.8 |
| 3 | | | | | ST | 4 | 380 | | CU, Y | 0.0 | 0.9 | 41.2 | 57.9 |
| | | | | | SS | 5 | 450 | 11 | | | | | |
| 4 | | | | | BS | 6 | | | | | | | |
| | | | | | ST | 7 | 450 | | | | | | |
| 5 | 1208.33 | | | | | | | | | | | | |
| | | Stiff to very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, damp | | | SS | 8 | 400 | 13 | | | | | |
| | | | | | BS | B | | | | 5.3 | 14.3 | 45.4 | 35.1 |
| 6 | | | | | SS | 9 | 450 | 15 | | | | | |
| 7 | | | | | BS | 10 | | | | | | | |
| | | | | | SS | 11 | 450 | 22 | | | | | |
| 8 | 1205.23 | | | | | | | | | | | | |
| | | Hard, brown, silty clay (CL-ML) TILL<br>- trace to some sand, trace gravel, moist | | | | | | | | | | | |
| 9 | | | | | SS | 12 | 450 | 39 | | | | | |
| | | | | | BS | C | | | | 2.4 | 10.2 | 67.4 | 20.0 |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC15

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/11
NORTHING 5656141
EASTING -33226
WATER LEVEL (4.6 m) 2016/05/11
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, silty clay (CL-ML) TILL<br>- trace to some sand, trace gravel, moist | | | | | | | | | | | |
| 11 | 1202.28 | | | | SS | 13 | 450 | 39 | | | | | |
| | | End of borehole (11.15 m)<br>- groundwater at 10.1 m and sloughing at 10.1 m upon completion<br>- 50 mm standpipe piezometer slotted from 3.7 m to 5.2 m<br>- annulus backfilled with sand from 3.4 m to 5.3 m, bentonite seals from 1.0 m to 3.4 m and 5.3 m to 10.1 m<br>- Borehole DC15 terminated to complete 50 mm monitoring well install. Bedrock cored in DC15A | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC15A

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/16

NORTHING 5656141
EASTING -33226
WATER LEVEL (3.7 m) 2016/05/16

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION |
|---|---|---|
| 0 | 1213.43 | |
| | 1213.23 | Topsoil |
| | | Stiff to very stiff, brown, low to high plasticity (CL-CH) CLAY<br>- silty, trace sand, mottled brown, damp to moist |
| | | - moist below 5.1 m |
| 5 | 1208.33 | |
| | | Stiff to very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, damp |
| 8 | 1205.23 | |
| | | Hard, brown, silty clay (CL-ML) TILL<br>- trace to some sand, trace gravel, moist |
| 10 | | |

STRATA PLOT | WATER LEVEL | SAMPLES: TYPE, NUMBER, RECOVERY (mm), N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%), Sand (%), Silt (%), Clay (%)

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC15A**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/16

NORTHING 5656141
EASTING -33226
WATER LEVEL (3.7 m) 2016/05/16

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, silty clay (CL-ML) TILL<br>- trace to some sand, trace gravel, moist | | | | | | | | | | | |
| | | | | | BS | 1 | | | | | | | |
| 12 | | | | | SS | 2 | 450 | 40 | | | | | |
| | 1200.63 | | | | | | | | | | | | |
| | | Hard, dark brown, lean clay (CL) TILL<br>- silty, sandy, some gravel, trace coal specks, dry | | | | | | | | | | | |
| | | | | | BS | 3 | | | | 11.9 | 29.5 | 37.2 | 21.4 |
| 15 | | | | | SS | 4 | 375 | 50+ | | | | | |
| | 1197.43 | | | | | | | | | | | | |
| 16 | | Very poor quality grey (inferred) MUDSTONE<br>- extremely weak | | | | | | | | | | | |
| | | | | | BS | 5 | | | | | | | |
| | 1194.93 | | | | | | | | | | | | |
| | | Bedrock encountered at 16.0 m<br>- Coring commenced at 18.5 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 21.5 m<br>- Groundwater at 3.7 m and sloughing at 21.0 m<br>- Groundwater at 7.6 m during | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

## DC15A

CLIENT Alberta Transportation
NORTHING 5656141
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33226
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/05/16
WATER LEVEL (3.7 m) 2016/05/16
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | drilling<br>- Borehole DC15B advanced to complete 50 mm monitoring well install | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa): 40, 80, 120, 160
WATER CONTENT ATTERBERG LIMITS (%): $w_P$, $w$, $w_L$
STANDARD PENETRATION TEST, blows/0.30 m: 20, 40, 60, 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC15A**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/16/2016 to 5/16/2016
NORTHING: 5656141
EASTING: -33226
WATER LEVEL (3.7 m) 5/16/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 16 | 197.4 | Very poor quality grey (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| | 194.9 | Poor quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 19 | 194.4 | Poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC 6 | 100 | 56 | 33 | | R1 | W4.5 | |
| 20 | | Continued: poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC 7 | 100 | 65 | 42 | | R2 | W3 | |
| 21 | 191.9 | | | | | | | | | | | |
| | | End of borehole (21.5 m)<br>- borehole slough to 21.0 m, and to 11.0 m, water at 3.7 m<br>- borehole backfilled with cuttings, bentonite from 0.5 m to 0.8 m and 18.0 m to 21.0 m | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:51 AM

Stantec

# BOREHOLE RECORD

**DC15B**

CLIENT Alberta Transportation
NORTHING 5656141
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33226
BH SIZE SS:150mm
DATES BORING 2016/05/16
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION |
|---|---|---|
| 0 | 1213.43 | |
| | 1213.23 | TOPSOIL |
| | | Stiff to very stiff, brown, low to high plasticity (CL-CH) CLAY<br>- sitly, trace sand, mottled brown, damp to moist |
| | | - moist below 2.5 m |
| | 1208.33 | |
| | | Stiff to very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, damp |
| | 1205.23 | |
| | | Hard, brown, silty clay (CL-ML) TILL<br>- trace to some sand, trace gravel, moist |

STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | NUMBER | RECOVERY (mm) | N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%)

UNDRAINED SHEAR STRENGTH (kPa): 40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%): $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m: 20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC15B**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/16
WATER LEVEL
NORTHING 5656141
EASTING -33226
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, silty clay (CL-ML) TILL<br>- trace to some sand, trace gravel, moist | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | 1200.63 | | | | | | | | | | | | |
| 13 | | Hard, dark brown, lean clay (CL) TILL<br>- sandy, some gravel, trace coal specks, dry | | | | | | | | | | | |
| | 1199.73 | | | | | | | | | | | | |
| 14 | | End of borehole (13.7 m)<br>- sloughing to 11.0 m<br>- 50 mm standpipe piezometer slotted from 10.5 m to 12.0 m<br>- annulus backfilled with sand from 10.1 m to 12.0 m, bentonite seals from 2.0 m to 10.1 m and 12.0 m to 13.7 m | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC16

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/16

NORTHING 5656222
EASTING -33112
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1213.87 | TOPSOIL | | | | | | | | | | | |
| | 1213.47 | Very stiff, brown, medium plasticity (CI) CLAY<br>- trace sand, dry to moist | | | BS | 1 | | | | | | | |
| 1 | | | | | SS | 2 | 300 | 18 | | | | | |
| 2 | 1211.77 | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, mottled grey, moist | | | BS | 3 | | | | 2.4 | 11.9 | 47.0 | 38.7 |
| 3 | | | | | SS | 4 | 260 | 19 | | | | | |
| 4 | | | | | BS | 5 | | | | | | | |
| 5 | 1208.67 | | | | SS | 6 | 450 | 31 | | | | | |
| | | Dense to very dense, grey SILT (ML)<br>- trace gravel, moist | | | BS | 7 | | | CC | 0.8 | 7.3 | 78.0 | 13.8 |
| 6 | | | | | SS | 8 | 450 | 50+ | | | | | |
| 7 | | | | | BS | 9 | | | | | | | |
| | | - seepage at 7.6 m | | | SS | 10 | 410 | 25 | | | | | |
| 8 | 1205.27 | | | | | | | | | | | | |
| | | Hard, grey, silty clay (CL-ML) TILL<br>- sandy, gravelly, trace coal, wet | | | BS | 11 | | | CC | 23.9 | 30.8 | 35.1 | 10.3 |
| 9 | | | | | SS | 12 | 350 | 50+ | | | | | |
| | | - frequent coal below 9.8 m<br>- coal layer between 10.1 m | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC16**

CLIENT Alberta Transportation
NORTHING 5656222
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33112
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/05/16
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | and 10.8 m<br>Hard, grey, silty clay (CL-ML) TILL<br>- sandy, gravelly, trace coal, wet<br>- trace coal, dry below 10.8 m | | | BS | 13 | | | | | | | |
| | | | | | BS | 14 | | | | | | | |
| 11 | 1202.67 | | | | SS | 15 | 350 | 50+ | | | | | |
| | | Very poor quality grey (inferred) SILTSTONE<br>- completely to highly weathered<br>- extremely weak to very weak | | | | | | | | | | | |
| 12 | | | | | BS | 16 | | | | | | | |
| | 1201.17 | | | | SS | 17 | 200 | 50+ | | | | | |
| 13 | | Bedrock encountered at 11.2 m<br>- Coring commenced at 12.7 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 18.5 m | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC16**

CLIENT Alberta Transportation NORTHING: 5656222 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33112 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 5/16/2016 to 5/16/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 11 | 202.7 | | | | | | | | | | | |
| | | Very poor quality grey (inferred) SILTSTONE<br>- completely to highly weathered<br>- extremely weak to very weak | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| | 201.2 | | | | | | | | | | | |
| 13 | | Poor to fair quality grey SILTSTONE<br>- moderately weathered<br>- very weak<br>- coal seam at 12.9 m | | | RC20 | 72 | 72 | 48 | | R1 | W3 | |
| 14 | | - excellent quality, slightly weathered below 14.0 m | | | RC21 | 100 | 98 | 93 | | R1 | W2 | |
| 15 | | - very weak to weak below 15.5 m | | | | | | | | | | |
| | | - 0.15 m thick sandstone layer at 15.5 m | | | | | | | | | | |
| 16 | | | | | RC22 | 100 | 100 | 95 | | R1.5 | W2 | |
| 17 | | - 0.25 m thick sandstone layer at 17.0 m | | | | | | | | | | |
| 18 | | | | | RC23 | 100 | 97 | 97 | | R1.5 | W2 | |
| | 195.4 | | | | | | | | | | | |
| 19 | | End of borehole (18.5 m)<br>- borehole open upon completion<br>- borehole backfilled with cuttings, bentonite seals placed from 0.3 m to 0.6 m and 12.5 m to 18.5 m | | | | | | | | | | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:52 AM

Stantec

# BOREHOLE RECORD

## DC17

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/17

NORTHING 5656288
EASTING -33011
WATER LEVEL (dry) 2016/05/17

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1213.39 | | | | | | | | | | |
| | 1213.09 | TOPSOIL | | | | | | | | | |
| | | Very stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, dry to moist | BS | 1 | | | | 0.0 | 1.7 | 35.7 | 62.6 |
| 1 | | | ST | 2 | 360 | | | | | | |
| 2 | 1211.29 | | | | | | | | | | |
| | | Very stiff, brown, low plasticity clay (CL) TILL<br>- silty, trace gravel, sand, moist | SS | 3 | 260 | 25 | | | | | |
| | | - some sand, mottled grey below 2.6 m | BS | 4 | | | | | | | |
| 3 | | - some gravel below 3.0 m | SS | 5 | 380 | 21 | | | | | |
| | | - sandy below 3.7 m | | | | | | | | | |
| 4 | | | BS | 6 | | | | 13.2 | 24.8 | 46.6 | 15.4 |
| | | - inferred cobbles, trace coal specks below 4.6 m | ST | 7 | 250 | | | | | | |
| 5 | | | SS | 8 | 390 | 50+ | | | | | |
| | | - some gravel below 5.7 m | BS | 9 | | | | | | | |
| 6 | | - grey below 6.1 m | SS | 10 | 450 | 50+ | | 14.5 | 38.9 | 33.4 | 13.2 |
| | 1206.49 | | | | | | | | | | |
| 7 | | Very dense, grey, sandy silt (ML) TILL<br>- trace gravel, trace coal specks, dry to moist | BS | 11 | | | | | | | |
| | 1205.79 | | SS | 12 | 0 | 50+ | | | | | |
| | | Bedrock encountered at 7.6 m<br>- Coring commenced at 7.4 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 11.0 m | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC17**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/17/2016 to 5/17/2016
NORTHING: 5656288
EASTING: -33011
WATER LEVEL (dry) 5/17/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 205.8 | | | | RC13 | 82 | 75 | 40 | | R2 | W2 | |
| 8 | | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak<br>- fair quality, and weak to medium strong below 8.0 m | | | RC14 | 100 | 98 | 55 | | 2.5 | W2 | |
| 9 | | | | | | | | | | | | |
| 10 | | - good to excellent quality, and fresh to slightly weathered below 9.5 m | | | RC15 | 100 | 100 | 91 | | 2.5 | W1.5 | |
| 11 | 202.4 | End of borehole (11.0 m)<br>- borehole open, and dry<br>- backfilled with cuttings, bentonite seal placed from 0.3 m to 0.6 m and 7.4 to 11.0 m | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:53 AM

Stantec

# BOREHOLE RECORD

**DC18**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/17

NORTHING 5656375
EASTING -32817
WATER LEVEL (7.6 m) 2016/05/19

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1213.88 | | | | | | | | | | | | |
| | 1213.63 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, mottled grey, moist | | | BS | A1 | | | k, PT | 0.0 | 1.4 | 35.2 | 63.4 |
| 1 | | | | | BS | 1 | | | PT | | | | |
| | | | | | ST | 2 | 300 | | Y | 0.2 | 5.4 | 41.4 | 52.9 |
| 2 | | | | | SS | 3 | 380 | 13 | | | | | |
| | 1211.18 | | | | | | | | | | | | |
| | | Hard, low to medium plasticity clay (CL-CI) TILL<br>- silty, sandy, trace gravel, moist | | | BS | 4 | | | | | | | |
| 3 | | | | | ST | 5 | 500 | | Y | 5.8 | 22.9 | 44.4 | 26.9 |
| | | - trace coal specks below 3.6 m | | | SS | 6 | 400 | 40 | | | | | |
| 4 | 1209.68 | | | | | | | | | | | | |
| | | Dense to very dense, silty clay (CL-ML) TILL<br>- sandy, some gravel, trace coal specks, dry to moist | | | BS | 7 | | | | 21.9 | 26.7 | 38.3 | 13.0 |
| | | | | | SS | 8 | 450 | 50+ | | | | | |
| 5 | | | | | | | | | | | | | |
| | | | | | BS | 9 | | | | 14.8 | 31.2 | 40.4 | 13.7 |
| 6 | | | | | SS | 10 | 150 | 50+ | | | | | |
| | 1206.98 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| | 1206.48 | Very poor quality (inferred) SANDSTONE<br>- completely to highly weathered<br>- extremely weak to very weak | | | BS | 11 | | | | | | | |
| | | | | | SS | 12 | 50 | 50+ | | | | | |
| 8 | | Bedrock encountered at 7.2 m<br>- Coring commenced at 7.4 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 12.5 m<br>- Groundwater at 7.6 m during drilling, borehole open upon completion | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC18

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/17/2016 to 5/17/2016
NORTHING: 5656375
EASTING: -32817
WATER LEVEL (7.6 m) 5/19/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 7 | 206.7 | | | | | | | | | | | |
| | 206.5 | Very poor quality (inferred) SILTSTONE<br>- completely to highly weathered<br>- extremely weak to very weak | | ▼ | RC13 | 91 | 47 | 47 | | R1 | W3 | |
| 8 | | Poor quality olive green SILTSTONE<br>- moderately weathered<br>- very weak<br>- very weak to weak below 7.9 m | | | RC14 | 96 | 85 | 30 | | R1.5 | W3 | |
| | 205.1 | | | | | | | | | | | |
| 9 | | Fair to good quality grey SANDSTONE<br>- slightly to moderately weathered<br>- weak to medium strong | | | | | | | | | | |
| 10 | | | | | RC15 | 100 | 100 | 77 | | R1.5 | W3 | |
| | | - 0.2 m thick bentonite layer at 10.3 m | | | | | | | | | | |
| 11 | 202.9 | | | | | | | | | | | |
| | | Good quality dark grey SILTSTONE<br>- fresh to slightly weathered<br>- weak to medium strong | | | RC16 | 100 | 97 | 81 | | 2.5 | W1.5 | |
| 12 | | | | | | | | | | | | |
| | 201.4 | | | | | | | | | | | |
| | | End of borehole (12.5 m)<br>- borehole open, water at 7.6 m upon completion<br>- borehole backfilled with cuttings, bentonite seal placed at 0.3 m to 0.6 m and 7.4 m to 12.5 m | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:54 AM

Stantec

# BOREHOLE RECORD

**DC19**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/09

NORTHING 5656515
EASTING -32522
WATER LEVEL (0.0 m) 2016/05/09

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1217.63 | | | | | | | | | | | | |
| | 1217.38 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, light brown, high plasticity CLAY (CH)<br>- silty, mottled brown, damp | | | BS | 1 | | | | 0.0 | 0.3 | 34.9 | 64.8 |
| 1 | | | | | ST | 2 | 325 | | CU, Y | 0.0 | 1.0 | 30.5 | 68.5 |
| 2 | | | | | SS | 3 | 300 | 14 | | | | | |
| | | | | | BS | 4 | | | | 0.0 | 0.3 | 5.9 | 93.7 |
| 3 | 1214.63 | | | | | | | | | | | | |
| | | Very stiff, low plasticity clay (CL) TILL<br>- silty, some sand, trace gravel, damp | | | ST | 5 | 450 | | Y | 0.0 | 1.8 | 28.7 | 69.5 |
| 4 | | | | | SS | 6 | 375 | 29 | | | | | |
| | 1213.63 | | | | | | | | | | | | |
| | | Very dense, brown, clayey SAND (SC)<br>- some silt, trace gravel, damp | | | BS | 7 | | | | 5.6 | 64.9 | 17.3 | 12.3 |
| 5 | | - seepage at 4.8 m | | | SS | 8 | 425 | 50+ | | | | | |
| | 1212.23 | | | | | | | | | | | | |
| | 1211.83 | Very poor quality brown (inferred) SANDSTONE<br>- slightly to highly weathered<br>- very weak to weak | | | BS | 9 | | | | | | | |
| 6 | | | | | SS | 10 | 0 | 50+ | | | | | |
| | | Bedrock encountered at 5.4 m,<br>- Coring commenced at 5.8 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 17.0 m<br>- Groundwater at surface and sloughing at 4.8 m | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT
ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC19**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/9/2016 to 5/9/2016
NORTHING: 5656515
EASTING: -32522
WATER LEVEL (0.0 m) 5/9/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 212.2 | | | | | | | | | | | |
| | | Very poor quality brown (inferred) SANDSTONE<br>- slightly to highly weathered<br>- very weak to weak | | | | | | | | | | |
| | 211.8 | | | | | | | | | | | |
| 6 | | | | | RC11 | 100 | 75 | 35 | | R1.5 | W3 | |
| | | Poor quality grey SANDSTONE<br>- slightly to highly weathered<br>- very weak to weak<br>- good quality, slightly weathered, coal seams below 6.4 m | | | | | | | | | | |
| 7 | | | | | RC12 | 98 | 95 | 78 | | R1.5 | W3 | |
| 8 | | - excellent quality, oxidation on joints below 7.9 m | | | RC13 | 100 | 100 | 97 | | R1.5 | W3 | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | RC14 | 96 | 95 | 95 | | R1.5 | W3 | |
| 11 | | - fair quality below 10.9 m | | | RC15 | 100 | 88 | 73 | | R1 | W4.5 | |
| | 205.7 | | | | | | | | | | | |
| 12 | | Fair quality brown to grey MUDSTONE/CLAYSTONE<br>- highly weathered<br>- extremely weak<br>- oxidation seams | | | | | | | | | | |
| | 204.6 | | | | | | | | | | | |
| 13 | | Fair quality grey SILTSTONE<br>- slightly weathered<br>- weak to medium strong<br>- shell fragments | | | RC16 | 100 | 95 | 68 | | R1.5 | W3.5 | |
| 14 | | - good quality below 14.0 m | | | RC17 | 100 | 95 | 88 | | 2.5 | W2 | |
| 15 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:12:55 AM

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# BOREHOLE RECORD

**DC19**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/9/2016 to 5/9/2016

NORTHING: 5656515
EASTING: -32522
WATER LEVEL (0.0 m) 5/9/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | Fair quality grey SILTSTONE<br>- slightly weathered<br>- weak to medium strong<br>- shell fragments | | | RC18 | 100 | 100 | 90 | | 2.5 | W2 | |
| 16 | | | | | | | | | | | | |
| 17 | 200.6 | End of borehole (17.0 m)<br>- borehole slough to 4.8 m, and water at surface<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.5 m to 1.2 m | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

## DC20

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/10
WATER LEVEL

NORTHING 5656631
EASTING -32401

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1216.26 | | | | | | | | | | | | |
| | 1216.01 | TOPSOIL | | | | | | | | | | | |
| | | Brown, high plasticity CLAY (CH)<br>- silty, trace sand, trace rootlets, damp | | | BS | 1 | | | | 1.0 | 3.3 | 24.3 | 71.4 |
| 1 | 1214.76 | | | | | | | | | | | | |
| | | Hard, brown, silty clay (CL-ML) TILL<br>- sandy, trace gravel, dry to damp | | | ST | 2 | 350 | | | | | | |
| 2 | | | | | SS | 3 | 225 | 31 | | | | | |
| | | | | | BS | 4 | | | | 9.6 | 30.5 | 44.7 | 15.3 |
| 3 | | | | | SS | 5 | 200 | 50+ | | | | | |
| 4 | 1211.96 | | | | | | | | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL<br>- some sand, dry to damp | | | BS | 6 | | | | | | | |
| 5 | | | | | SS | 7 | 100 | 50+ | | | | | |
| | 1210.46 | | | | | | | | | | | | |
| 6 | | Bedrock encountered at 5.8 m<br>- Coring commenced at 4.8 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 15.4 m | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC20

CLIENT Alberta Transportation
NORTHING: 5656631
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -32401
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 5/10/2016 to 5/10/2016
WATER LEVEL
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 212.4 | | | | | | | | | | | |
| 4 | | Very poor quality brown (inferred) SEDIMENTARY BEDROCK | | | | | | | | | | |
| | 212.0 | | | | | | | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL<br>- some sand, dry to damp | | | RC 8 | | | | | R | W | |
| 5 | | | | | RC 9 | | | | | R | W | |
| | 210.5 | | | | | | | | | | | |
| 6 | | Fair quality grey SILTSTONE<br>- slightly to moderately weathered<br>- weak, oxidation on joints | | | | | | | | | | |
| | | | | | RC10 | 100 | 86 | 57 | | R2 | W2.5 | |
| 7 | 209.1 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 208.5 | | | | | | | | | | | |
| 8 | | Very poor quality brown grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 207.9 | | | | | | | | | | | |
| | | Very poor quality stratified brown/grey SILTSTONE and SANDSTONE<br>- slightly weathered<br>- weak<br>- oxidation on joints<br>- good quality below 9.3 m | | | RC11 | 100 | 70 | 23 | | R1 | W3.5 | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | RC12 | 100 | 96 | 80 | | R2 | W2 | |
| | 205.4 | | | | | | | | | | | |
| 11 | | Good quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 205.1 | | | | | | | | | | | |
| | | Good quality stratified brown/grey SILTSTONE and SANDSTONE<br>- slightly weathered<br>- weak<br>- oxidation on joints | | | RC13 | 100 | 98 | 83 | | R1 | W4 | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:57 AM

Stantec

# BOREHOLE RECORD

## DC20

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/10/2016 to 5/10/2016
NORTHING: 5656631
EASTING: -32401
WATER LEVEL
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | Good quality stratified brown/grey SILTSTONE and SANDSTONE<br>- slightly weathered<br>- weak<br>- oxidation on joints | | | RC14 | 97 | 93 | 68 | | R2 | W2 | |
| 14 | | | | | | | | | | | | |
| | | | | | RC15 | 100 | 95 | 68 | | R2 | W2 | |
| 15 | | - mudstone seam at 15.1 m | | | | | | | | | | |
| | 200.9 | End of borehole (15.4 m)<br>- borehole backfilled with cuttings and a bentonite seals placed from 0.5 m to 1.2 m and 4.4 m to 15.4 m | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC21**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/11

NORTHING 5656748
EASTING -32404
WATER LEVEL (3.0 m) 2016/09/08

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1215.77 | TOPSOIL | | | | | | | | | | | |
| | 1215.42 | Stiff, brown, high plasticity CLAY (CH)<br>- some sand, trace rootlets, damp | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 350 | | k, Y | 0.0 | 0.4 | 18.4 | 81.1 |
| 2 | | | | | SS | 3 | 175 | 14 | | | | | |
| | 1213.37 | Stiff, brown, low plasticity silty clay (CL-ML) TILL<br>- sandy, trace gravel, trace coal specks, damp | | | BS | 4 | | | | 4.7 | 28.5 | 46.2 | 20.6 |
| 3 | | | | | ST | 5 | 400 | | CU, Y | 12.6 | 27.4 | 42.0 | 18.0 |
| | | | | | SS | 6 | 250 | 13 | | | | | |
| 4 | | | | | BS | 7 | | | | | | | |
| | | - seepage at 5.0 m | | | ST | 8 | 375 | | | | | | |
| 5 | 1210.67 | Compact, brown, clayey sand (SC) TILL<br>- trace gravel, moist | | | SS | 9 | 0 | 13 | | | | | |
| | 1209.87 | | | | BS | 10 | | | | | | | |
| 6 | | Bedrock encountered at 6.0 m<br>- Coring commenced at 5.9 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 12.5 m<br>- Groundwater at surface upon completion | | | SS | 11 | 100 | 50+ | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC21**

CLIENT Alberta Transportation NORTHING: 5656748 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -32404 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 5/11/2016 to 5/11/2016 WATER LEVEL (3.0 m) 9/8/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 209.9 | | | | | | | | | | | |
| 6 | | Very poor quality brown MUDSTONE to grey SILTSTONE<br>- moderately to completely weathered<br>- extremely weak to very weak | | | RC12 | 33 | 11 | 0 | | R0.5 | W4 | |
| | 209.4 | | | | | | | | | | | |
| 7 | | Fair quality grey SILTSTONE<br>- slightly weathered<br>- very weak to weak<br>- oxidation on joints | | | RC13 | 100 | 88 | 57 | | R1 | W3.5 | |
| | 208.4 | | | | | | | | | | | |
| | 208.3 | Very poor quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 8 | | Fair quality brown SANDSTONE<br>- slightly weathered<br>- weak | | | RC14 | 100 | 95 | 75 | | R1 | W3.5 | |
| | 207.3 | | | | | | | | | | | |
| | 207.1 | Fair quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| | 206.6 | Fair quality brown SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 206.4 | | | | | | | | | | | |
| | | Fair quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 10 | | Fair quality grey SILTSTONE<br>- slightly weathered<br>- very weak to weak<br>- oxidation on joints<br>- very poor quality below 9.45 m<br>- fair quality, extremely weak to weak below 11.0 m | | | RC15 | 95 | 70 | 25 | | R1.5 | W2 | |
| 11 | | | | | RC16 | 100 | 98 | 67 | | R1 | W3.5 | |
| | 203.9 | | | | | | | | | | | |
| 12 | | Fair quality brown MUDSTONE/CLAYSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 203.7 | | | | | | | | | | | |
| | 203.3 | Fair quality grey SILTSTONE<br>- slightly weathered<br>- very weak to weak<br>- oxidation on joints | | | | | | | | | | |
| 13 | | End of borehole (12.5 m)<br>- borehole open, water at surface from coring, seepage observed at 5.0 m<br>- two inch standpipe piezometer installed, slotted from 9.1 m to 10.8 m<br>- backfilled with sand from 8.5 m to 10.8 m, bentonite seals placed from 10.8 m to 12.5 m and 0.3 m to 8.5 m | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:12:59 AM

Stantec

# BOREHOLE RECORD

## DC22

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/10

NORTHING 5656930
EASTING -32263
WATER LEVEL (2.4 m) 2016/05/10

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1211.94 | | | | | | | | | | | | |
| | 1211.74 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 340 | | | | | | |
| 2 | | | | | SS | 3 | 50 | 14 | | | | | |
| | | | | | BS | 4 | | | | 0.4 | 4.3 | 33.6 | 61.7 |
| 3 | | | | | ST | 5 | 370 | | UU, Y | 0.0 | 1.2 | 35.6 | 63.2 |
| | | | | | SS | 6 | 50 | 12 | | | | | |
| 4 | | - trace gravel below 3.9 m | | | BS | 7 | | | | | | | |
| | | | | | ST | 8 | 430 | | | | | | |
| 5 | 1206.84 | | | | | | | | | | | | |
| | | Very stiff, brown, low plasticity CLAY (CL)<br>- silty, sandy, trace gravel, moist | | | SS | 9 | 450 | 21 | | | | | |
| | | | | | BS | 10 | | | | 5.7 | 23.8 | 47.1 | 23.3 |
| 6 | | | | | SS | 11 | 450 | 50 | | | | | |
| | 1205.54 | | | | | | | | | | | | |
| | | Bedrock encountered at 6.4 m<br>- Coring commenced at 6.5 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 12.5 m<br>- Groundwater at 2.4 m and sloughing at 4.3 m | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC22**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/10/2016 to 5/10/2016
NORTHING: 5656930
EASTING: -32263
WATER LEVEL (2.4 m) 5/10/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 205.5 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC12 | 98 | 10 | 6 | | R0 | W5.5 | |
| 7 | | | | | | | | | | | | |
| | 204.3 | | | | | | | | | | | |
| | | Very poor quality brown to grey SILTSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 8 | 203.7 | | | | | | | | | | | |
| | 203.4 | Poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC13 | 93 | 37 | 33 | | R0 | W4.5 | |
| | | Poor quality grey SILTSTONE<br>- moderately weathered<br>- extremely weak | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | - fair quality below 10.0 m | | | RC14 | 100 | 80 | 71 | | R0 | W3 | |
| 11 | | | | | | | | | | | | |
| | | - poor quality, moderately to highly weathered below 11.3 m | | | RC15 | 97 | 59 | 25 | | R0 | W3.5 | |
| 12 | | | | | | | | | | | | |
| | 199.4 | | | | | | | | | | | |
| | | End of borehole (12.5 m)<br>- borehole slough to 4.3 m, and water at 2.4 m<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.3 m to 0.5 m | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:13:00 AM

Stantec

# BOREHOLE RECORD

**DC23**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/10

NORTHING 5657060
EASTING -32121
WATER LEVEL (9.0 m) 2016/05/10

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1213.89 | | | | | | | | | | | | |
| | 1213.69 | TOPSOIL | | | SS | 1 | 450 | 7 | | | | | |
| | 1213.29 | Firm, brown, low plasticity CLAY (CL) - trace sand, trace rootlets, moist | | | | | | | | | | | |
| 1 | | Stiff to very stiff, brown, medium plasticity (CI) CLAY - trace sand, moist | | | BS | 2 | | | | | | | |
| | | | | | ST | 3 | 380 | | | | | | |
| 2 | | | | | SS | 4 | 450 | 18 | | | | | |
| | 1211.19 | | | | | | | | | | | | |
| | | Very stiff to hard, brown, low plasticity clay (CL) TILL - silty, sandy, trace gravel, trace coal specks, moist | | | BS | 5 | | | | 9.7 | 21.8 | 46.6 | 21.9 |
| 3 | | | | | ST | 6 | 280 | | | | | | |
| | | | | | SS | 7 | 0 | 50+ | | | | | |
| 4 | | | | | | | | | | | | | |
| | 1209.29 | | | | BS | 8 | | | | | | | |
| | | Very dense, brown clayey SAND (SC) - trace gravel, trace coal specks, dry | | | SS | 9 | 450 | 47 | | | | | |
| 5 | | | | | | | | | | | | | |
| | | | | | BS | 10 | | | | | | | |
| 6 | | | | | | | | | | | | | |
| | | | | | SS | 11 | 25 | 50+ | | | | | |
| | 1207.29 | | | | BS | 12 | | | | | | | |
| | | Bedrock encountered at 6.6 m - Coring commenced at 6.6 m (see rock coring log for details) - Borehole advanced in bedrock to 12.5 m. - Groundwater at 9.0 m and sloughing at 9.3 m | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC23**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/10/2016 to 5/10/2016

NORTHING: 5657060
EASTING: -32121
WATER LEVEL (9.0 m) 5/10/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 207.3 | | | | | | | | | | | |
| 7 | | Poor quality grey SANDSTONE<br>- highly to moderately weathered<br>- weak | | | RC13 | 100 | 58 | 38 | | R2 | W3.5 | |
| 8 | | - very poor quality below 8.0 m | | | RC14 | 94 | 33 | 15 | | R2 | W4 | |
| | 205.3 | | | | | | | | | | | |
| 9 | | Very poor quality grey SILTSTONE<br>- highly to completely weathered<br>- weak | | ▼ | | | | | | | | |
| | 204.4 | | | | | | | | | | | |
| 10 | | Good quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC15 | 99 | 92 | 84 | | R2 | W2 | |
| 11 | | | | | | | | | | | | |
| 12 | | | | | RC16 | 100 | 93 | 82 | | R2 | W2 | |
| | 201.4 | | | | | | | | | | | |
| 13 | | End of borehole (12.5 m)<br>- borehole slough to 9.3 m, and water at 9.0 m<br>- borehole backfilled with cuttings and a bentonite seals placed from 0.3 m to 0.5 m, 3.3 m to 4.3 m and 6.6 m to 9.3 m | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:13:02 AM

Stantec

# BOREHOLE RECORD

**DC24**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/09

NORTHING 5657234
EASTING -31942
WATER LEVEL (4.0 m) 2016/05/09

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1211.20 | | | | | | | | | | | | |
| | 1210.8 | TOPSOIL | | | SS | 1 | 100 | 7 | | | | | |
| | | Soft, brown, low plasticity CLAY (CL)<br>- sandy, trace gravel, moist | | | ST | 2 | 420 | | | | | | |
| 1 | | | | | SS | 3 | 250 | 7 | | | | | |
| | 1209.4 | | | | | | | | | | | | |
| | | Loose, brown silty SAND (SM)<br>- trace gravel, trace coal specks, moist | | | ST | 4 | 320 | | | | | | |
| 2 | | | | | SS | 5 | 450 | 15 | | | | | |
| | 1208.5 | | | | | | | | | | | | |
| | | Dense, brown sandy silt (ML) TILL<br>- trace gravel, trace coal specks, moist | | | ST | 6 | 220 | | Y | 4.9 | 27.5 | 66.5 | 1.0 |
| 3 | | | | | SS | 7 | 450 | 32 | | | | | |
| | 1207.6 | | | | | | | | | | | | |
| | | Hard, dark brown, low plasticity clay (CL) TILL<br>- some sand, trace gravel, trace coal specks, damp<br>- dry to damp below 4.1 m | | | SS | 8 | 450 | 45 | | | | | |
| 4 | | | | | SS | 9 | 450 | 47 | | | | | |
| 5 | | | | | | | | | | | | | |
| | | | | | SS | 10 | 450 | 36 | | | | | |
| 6 | | | | | | | | | | | | | |
| | 1204.8 | | | | | | | | | | | | |
| | 1204.7 | Very poor quality grey (inferred) SANDSTONE<br>- completely weathered<br>- very weak | | | SS | 11 | 100 | 50+ | | | | | |
| 7 | | Bedrock encountered at 6.4 m.<br>- Coring commenced at 6.5 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 11.1 m<br>- Groundwater at 4.0 m and sloughing at 10.5 m | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC24**

CLIENT Alberta Transportation NORTHING: 5657234 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -31942 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 5/9/2016 to 5/9/2016 WATER LEVEL (4.0 m) 5/9/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6 | 204.8 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 204.7 | Very poor quality grey (inferred) SANDSTONE<br>- completely weathered<br>- very weak | | | | | | | | | | |
| 7 | 204.1 | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC12 | 93 | 40 | 0 | | R0 | W5 | |
| | | Very poor quality brown SANDSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| 8 | 203.1 | Very poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | RC13 | 31 | 4 | 0 | | R0 | W4 | |
| 9 | | - black below 9.3 m | | | RC14 | 100 | 87 | 33 | | R0 | W4 | |
| | 201.6 | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- extremely weak | | | RC15 | 97 | 68 | 17 | | R0 | W3 | |
| 10 | 200.5 | Very poor quality SILTSTONE<br>- moderately weathered<br>- extremely weak | | | | | | | | | | |
| 11 | 200.1 | End of borehole (11.1 m)<br>- borehole slough to 10.5 m, and at 2.1 m, water at 4.0 m<br>- borehole backfilled with cuttings and a bentonite seals placed from 0.3 m to 0.5 m and 4.5 m to 10.5m | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:13:03 AM

Stantec

# BOREHOLE RECORD

**DC25**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/07

NORTHING 5657338
EASTING -31844
WATER LEVEL (9.1 m) 2016/06/07

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1205.05 | | | | | | | | | | |
| | 1204.75 | TOPSOIL | | | | | | | | | |
| | | Stiff, light brown, high plasticity CLAY (CH)<br>- silty, trace sand, gravel, dry to moist | BS | 1 | | | | | | | |
| 1 | | | ST | 2 | 310 | | k, Y | 0.0 | 0.2 | 42.9 | 56.9 |
| 2 | | | SS | 3 | 170 | 15 | | | | | |
| | | - mottled grey below 2.5 m | | | | | | 0.0 | 0.5 | 44.5 | 54.9 |
| | | | BS | 4 | | | | | | | |
| 3 | | - moist below 3.0 | ST | 5 | 450 | | CU, Y | 4.6 | 2.2 | 35.7 | 57.5 |
| | | | BS | B | | | CU, PT | | | | |
| | | | SS | 6 | 380 | | | | | | |
| 4 | 1201.05 | | | | | | | | | | |
| | | Stiff, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, moist to wet | BS | 7 | | | | 5.0 | 18.4 | 46.8 | 29.8 |
| | | | SS | 8 | 450 | 16 | | | | | |
| 5 | | | | | | | | | | | |
| | | | BS | 9 | | | | | | | |
| 6 | | - very stiff below 6.1 m | SS | 10 | 450 | 28 | | | | | |
| 7 | | | | | | | | | | | |
| | | | BS | 11 | | | | | | | |
| | 1197.45 | | | | | | | | | | |
| | | Compact to dense, grey sandy SILT (ML)<br>- trace gravel, trace coal specks, moist to wet<br>- 75 mm thick layer of sand, seepage at 7.9 m | SS | 12 | 450 | 22 | | | | | |
| 8 | | | | | | | | | | | |
| | | | BS | 13 | | | | | | | |
| 9 | | - dense below 9.1 m | SS | 14 | 450 | 39 | | | | | |
| 10 | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC25**

CLIENT Alberta Transportation
NORTHING 5657338
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -31844
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/07
WATER LEVEL (9.1 m) 2016/06/07
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | | | | BS | 15 | | | | | | | |
| | 1194.35 | Very dense, brown silt (ML) TILL<br>- dry to moist | | | SS | 16 | 350 | 50+ | | | | | |
| 11 | 1193.55 | Very poor quality grey (inferred) SANDSTONE<br>- extremely to very weak | | | BS | 17 | | | | | | | |
| 12 | 1192.55 | | | | SS | 18 | 75 | 50+ | | | | | |
| | | Bedrock encountered at 11.5 m<br>- Coring commenced at 12.2 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 15.5 m.<br>- Groundwater at 9.1 m and borehole open upon completion | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC25**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/7/2016 to 6/7/2016

NORTHING: 5657338
EASTING: -31844
WATER LEVEL (9.1 m) 6/7/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 193.6 | | | | | | | | | | | |
| | | Very poor quality grey (inferred) SANDSTONE<br>- extremely to very weak | | | | | | | | | | |
| 12 | 192.9 | | | | | | | | | | | |
| | | Poor quality brown SANDSTONE<br>- completely to highly weathered<br>- extremely weak to weak | | | RC19 | 83 | 40 | 0 | | R0 | W5 | |
| 13 | | | | | RC20 | 82 | 33 | 30 | | R2 | W4 | |
| 14 | | - grey, very weak to weak, slightly to moderately weathered below 14.0 m | | | | | | | | | | |
| 15 | | | | | RC21 | 91 | 77 | 33 | | R1.5 | W2.5 | |
| | 189.4 | | | | | | | | | | | |
| | | End of borehole (15.5 m)<br>- borehole open, water at 9.1 m<br>- standpipe installation monitored hydrogeology, refer to hydrogeology borehole records | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

## DC27

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/08

NORTHING 5657263
EASTING -31684
WATER LEVEL (2.6 m) 2016/09/08

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1202.74 | TOPSOIL | | | | | | | | | |
| | 1202.29 | Stiff to very stiff, brown, low plasticity CLAY (CL)<br>- trace sand, dry to moist | BS | 1 | | | | | | | |
| 1 | 1201.24 | | | | | | | | | | |
| 2 | | Very stiff, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, dry to moist | ST | 2 | 390 | | Y | 2.1 | 14.4 | 47.6 | 35.9 |
| | | | SS | 3 | 175 | 18 | | | | | |
| 3 | | - trace coal specks below 2.6 m | BS | 4 | | | | | | | |
| | | - sandy below 3.0 m | ST | 5 | 440 | | CU, Y | 5.8 | 22.3 | 49.1 | 22.8 |
| 4 | | | SS | 6 | 350 | 18 | | | | | |
| | | | BS | 7 | | | | | | | |
| 5 | | | SS | 8 | 430 | 21 | | | | | |
| 6 | | | BS | 9 | | | | | | | |
| | 1196.44 | | SS | 10 | 450 | 15 | | 0.0 | 6.7 | 73.0 | 20.3 |
| 7 | | Compact, brown SILT (ML)<br>- trace sand, trace coal specks, moist to dry<br>- 5 mm thick sand seam at 6.45 m | BS | 11 | | | | | | | |
| | | - some sand below 7.6 m<br>- seepage at 7.6 m | SS | 12 | 450 | 17 | | 0.6 | 13.8 | 67.0 | 18.6 |
| 8 | 1194.64 | | | | | | | | | | |
| | | Dense, brown silt (ML) TILL<br>- some sand, trace gravel, wet | BS | 13 | | | | | | | |
| 9 | | | SS | 14 | 450 | 35 | | | | | |
| 10 | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC27

CLIENT Alberta Transportation
NORTHING 5657263
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -31684
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/08
WATER LEVEL (2.6 m) 2016/09/08
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1192.34 | | | | | | | | | | | | |
| | | Bedrock encountered at 10.4 m<br>- Coring commenced at 10.5 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 23.2 m.<br>- Groundwater at 7.6 m during drilling, borehole open upon completion | | | BS<br>SS | 15<br>16 | <br>0 | <br>50+ | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC27

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/8/2016 to 6/8/2016
NORTHING: 5657338
EASTING: -31844
WATER LEVEL (2.6 m) 9/8/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 194.7 | | | | | | | | | | | |
| 11 | | Poor to fair quality brown SANDSTONE<br>- slightly weathered<br>- weak | | | RC17 | 97 | 97 | 50 | | R2 | W2 | |
| | | - good quality, medium strong below 11.1 m | | | RC18 | 100 | 91 | 85 | | 3 | W2 | |
| 12 | | | | | | | | | | | | |
| | | - fair quality below 12.5 m | | | | | | | | | | |
| 13 | 191.9 | | | | | | | | | | | |
| | | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC19 | 95 | 87 | 57 | | R2 | W2 | |
| 14 | | - poor to fair quality, weak to very weak below 14.0 m | | | RC20 | 99 | 99 | 55 | | R1 | W2 | |
| 15 | | | | | | | | | | | | |
| | | - 0.3 m thick layer of sandstone at 15.8 to 16.1 m | | | RC21 | 96 | 87 | 48 | | R1 | W2 | |
| 16 | | | | | | | | | | | | |
| 17 | 188.1 | | | | | | | | | | | |
| | | Good to excellent quality grey SANDSTONE<br>- fresh<br>- medium strong | | | RC22 | 100 | 97 | 88 | | R1 | W3 | |
| 18 | | - 0.35 m thick layer of fresh, slighlty weathered siltstone at 18.25 to 18.6 m | | | | | | | | | | |
| | 186.5 | | | | | | | | | | | |
| 19 | | Fair quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>- very weak | | | RC23 | 100 | 100 | 63 | | R1 | W2.5 | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

## DC27

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/8/2016 to 6/8/2016

NORTHING: 5657338
EASTING: -31844
WATER LEVEL (2.6 m) 9/8/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | | | | | | |
| | | Fair quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>- very weak<br>- poor quality, very weak below 20.1 | | | RC24 | 95 | 89 | 33 | | R1.5 | W2.5 | |
| 21 | | | | | | | | | | | | |
| | | - fair to good quality, medium strong and fresh below 21.6 | | | | | | | | | | |
| 22 | | | | | RC25 | 99 | 99 | 74 | | R3 | W1 | |
| 23 | 181.9 | | | | | | | | | | | |
| | | End of borehole (23.2 m)<br>- borehole open upon completion<br>- standpipe piezometer slotted from 17.1 m to 18.9 m<br>- annulus backfilled with sand between 17.1 m and 18.9 m<br>- bentonite seals from 0 m to 17.1 m and 18.9 m to 23.2 m | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:13:05 AM

Stantec

# BOREHOLE RECORD

## DC28

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/13
WATER LEVEL
NORTHING 5657428
EASTING -31635
PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1217.79 | | | | | | | | | | | | |
| | 1217.69 | TOPSOIL | | | | | | | | | | | |
| | | Loose, light brown silty SAND (SM)<br>- trace gravel, dry | | | BS | 1 | | | | | | | |
| 1 | 1216.29 | | | | SS | 2 | 25 | 50+ | | | | | |
| | | Very poor quality brown (inferred) SANDSTONE<br>- Extremely to very weak | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| | | | | | BS | 3 | | | | | | | |
| 3 | 1214.49 | | | | SS | 4 | 225 | 50+ | | | | | |
| | | Bedrock encountered at 1.5 m<br>- Coring commenced at 3.3 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 15.4 m<br>- Borehole open upon completion | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC28

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/13/2016 to 6/13/2016
NORTHING: 5657428
EASTING: -31635
WATER LEVEL
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 1 | | | | | | | | | | | | |
| | 216.3 | | | | | | | | | | | |
| 2 | | Very poor quality brown (inferred) SANDSTONE<br>- Extremely to very weak | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| | 214.5 | | | | RC 5 | | | | | R | W | |
| 4 | | Fair quality brown SANDSTONE<br>- medium strong<br>- slightly weathered | | | RC 6 | 96 | 84 | 64 | | 3 | W2 | |
| | | - grey from 4.7 m to 4.9 m | | | | | | | | | | |
| 5 | | - oxidation on fractures below 4.9 m | | | RC 7 | 100 | 100 | 73 | | 3 | W2 | |
| 6 | | - excellent quality below 6.3 m | | | | | | | | | | |
| 7 | | - grey from 7.0 m to 7.6 m | | | RC 8 | 100 | 100 | 94 | | 3 | W2 | |
| 8 | | - good quality and fresh below 7.8 m<br>- grey from 7.8 m to 8.1 m | | | RC 9 | 100 | 100 | 79 | | 3 | W1 | |
| 9 | | | | | | | | | | | | |
| | | - poor to fair quality, slightly weathered below 9.4 m | | | | | | | | | | |
| 10 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**DC28**

CLIENT Alberta Transportation NORTHING: 5657428 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -31635 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/13/2016 to 6/13/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | | | | | | | | | | | |
| | | Fair quality brown SANDSTONE<br>- medium strong<br>- slightly weathered<br>- grey claystone layer from 10.5 m to 10.75 m<br>- grey claystone layer from 10.75 m to 10.9 m<br>- poor quality below 10.9 m<br>- grey claystone layer from 10.97 m to 11.25 m | | | RC10 | 100 | 89 | 50 | | 3 | W2 | |
| 11 | | | | | RC11 | 99 | 80 | 40 | | 3 | W2 | |
| 12 | | - grey claystone layer from 12.0 m to 12.4 m<br>- weak below 12.4 m | | | | | | | | | | |
| 13 | | | | | RC12 | 100 | 100 | 34 | | R2 | W3.5 | |
| | 204.3 | Very poor quality dark grey CLAYSTONE<br>- highly to completely weathered<br>- very weak | | | | | | | | | | |
| 14 | | | | | RC13 | 100 | 51 | 24 | | R1 | W4.5 | |
| 15 | 202.4 | | | | | | | | | | | |
| | | End of borehole (15.4 m)<br>- borehole open upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 2.5 m to 15.4 m | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:13:07 AM

Stantec

# BOREHOLE RECORD

**DC30**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/09

NORTHING 5657731
EASTING -31469
WATER LEVEL (4.0 m) 2016/06/09

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1211.37 | | | | | | | | | | | | |
| | 1211.17 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, damp | | | BS | 1 | | | | | | | |
| 1 | | | | | | | | | | | | | |
| | | | | | SS | 2 | 450 | 9 | | | | | |
| 2 | | | | | BS | A | | | PT | 0.0 | 0.2 | 32.8 | 67.0 |
| 3 | 1208.27 | | | | | | | | | | | | |
| | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, trace sand, gravel, trace coal specks, damp | | | ST | 3 | 410 | | | 5.1 | 9.2 | 49.8 | 35.9 |
| | | | | | SS | 4 | 400 | 19 | Y | | | | |
| 4 | | - some sand below 4.0 m | | | BS | B | | | CU, PT, k | 3.7 | 17.5 | 51.3 | 27.5 |
| | | | | | SS | 5 | 450 | 36 | | | | | |
| 5 | | | | | BS | 6 | | | | | | | |
| 6 | | | | | SS | 7 | 350 | 50+ | | | | | |
| 7 | | | | | BS | 8 | | | | | | | |
| | | | | | SS | 9 | 350 | 50+ | | 13.8 | 18.3 | 45.7 | 22.3 |
| 8 | 1203.27 | | | | | | | | | | | | |
| | | Bedrock encountered at 8.1 m<br>- Coring commenced at 8.1 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 12.6 m<br>- Groundwater at 4.0 m and sloughing at 12.0 m | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC30

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/9/2016 to 6/9/2016
NORTHING: 5657731
EASTING: -31469
WATER LEVEL (4.0 m) 6/9/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 8 | 203.3 | | | | | | | | | | | |
| 9 | | Very poor quality dark grey to grey SILTSTONE<br>- completely weathered<br>- extremely weak | | | RC 9 | 100 | 10 | 0 | | R0 | W5.5 | |
| 10 | | - moderately to highly weathered, weak to extremely weak below 9.6 m | | | RC10 | 100 | 54 | 15 | | R1 | W3.5 | |
| 11 | 200.0 | | | | | | | | | | | |
| 12 | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC11 | 100 | 90 | 57 | | R2 | W2 | |
| | 198.8 | | | | | | | | | | | |
| 13 | | End of borehole (12.6 m)<br>- slough to 12.0 m and water at 4.0 m<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.6 m to 0.8 m and 7.0 to 12.0 m | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/7/16 10:13:09 AM

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# BOREHOLE RECORD

## DC32

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/08

NORTHING 5657930
EASTING -31415
WATER LEVEL (0.6 m) 2016/06/07

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1207.12 | | | | | | | | | | | | |
| | 1206.92 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, medium plasticity CLAY (CI)<br>- silty, some sand, trace gravel, moist to damp | | | BS | 1 | | | | | | | |
| 1 | | | | | SS | 2 | 370 | 10 | | 3.6 | 12.7 | 49.2 | 34.5 |
| 2 | 1204.92 | | | | BS | 3 | | | | | | | |
| | | Hard. brown, low to medium plasticity clay (CL-CI) TILL<br>- sitly, sandy, trace gravel, trace coal specks, dry to damp | | | BS | A | | | PT | 16.2 | 12.4 | 41.4 | 30.1 |
| 3 | | | | | ST | 4 | 150 | | Y | 29.7 | 22.1 | 32.7 | 15.5 |
| | | | | | SS | 5 | 450 | 46 | | 6.0 | 26.7 | 44.5 | 22.9 |
| 4 | | | | | BS | B | | | | | | | |
| | | - dry below 4.6 m | | | SS | 6 | 450 | 50+ | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | BS | 7 | | | | | | | |
| | | | | | SS | 8 | 450 | 50+ | | 9.2 | 23.6 | 43.2 | 24.0 |
| 7 | | | | | BS | 9 | | | | | | | |
| | | | | | SS | 10 | 450 | 50+ | | | | | |
| 8 | | | | | BS | C | | | PT | 5.9 | 23.3 | 42.3 | 28.5 |
| 9 | | | | | SS | 11 | 450 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC32

CLIENT Alberta Transportation
NORTHING 5657930
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -31415
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/08
WATER LEVEL (0.6 m) 2016/06/07
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | | | | BS | 12 | | | | | | | |
| | 1196.42 | | | | SS | 13 | 25 | 50+ | | | | | |
| 11 | | Bedrock encountered at 10.7 m<br>- Coring commenced at 10.3 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 23.0 m<br>- Groundwater at 0.6 m and borehole open upon completion | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC32

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/8/2016 to 6/8/2016
NORTHING: 5657930
EASTING: -31415
WATER LEVEL (0.6 m) 6/7/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 196.5 | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak<br>- 0.1 m thick till layer at 11.0 to 11.1 m | | | RC14 | 66 | 0 | 0 | | R0 | W5 | |
| 11 | 196.0 | Very poor quality grey SANDSTONE<br>- slightly to moderately weathered<br>- weak to extremely weak<br>- fair quality, weak below 12.0 m | | | RC15 | 97 | 52 | 0 | | R1 | W2.5 | |
| 12 | | - 0.3 m thick layer of rubble zone with clay infill from 12.5 to 12.8 m<br>- poor quality, moderately to highly weathered, weak to extremely weak below 12.6 m | | | RC16 | 88 | 66 | 55 | | R2 | W2.5 | |
| 13 | 193.9 | Poor quality grey interbedded CLAYSTONE/SILTSTONE<br>- highly to moderately weathered<br>- extremely weak<br>- oxidized along fractured planes | | | RC17 | 95 | 72 | 33 | | R1 | W3.5 | |
| 14 | 193.1 | Very poor quality grey SILTSTONE<br>- highly to moderately weathered<br>- weak to extremely weak<br>- 0.3 m thick mudstone layer at 14.0 to 14.3 m | | | RC18 | 95 | 33 | 12 | | R1 | W3.5 | |
| 15 | | - 0.3 m thick mudstone layer at 15.0 to 15.3 m<br>- poor quality, extremely weak below 15.5 m | | | RC19 | 97 | 83 | 43 | | R0 | W3.5 | |
| 16 | | | | | | | | | | | | |
| 17 | 190.1 | Poor quality grey MUDSTONE<br>- highly to completely weathered<br>- extremely weak | | | | | | | | | | |
| | 189.4 | Poor quality grey SANDSTONE<br>- moderately weathered<br>- very weak | | | RC20 | 96 | 66 | 41 | | R0.5 | W4 | |
| 18 | | - 7 cm thick layer of bentonite at 18.89 to 18.96 m | | | | | | | | | | |
| 19 | 188.2 | Poor quality grey to dark grey CLAYSTONE<br>- highly weathered<br>- extremely weak | | | RC21 | 97 | 63 | 39 | | R0 | W4 | |
| 20 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

## DC32

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/8/2016 to 6/8/2016
NORTHING: 5657930
EASTING: -31415
WATER LEVEL (0.6 m) 6/7/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | | | | | | | | | | | |
| | | - very poor quality below 20.1 | | | | | | | | | | |
| | 186.6 | Very poor quality grey to dark grey SILTSTONE | | | RC22 | 100 | 66 | 22 | | R1 | W3 | |
| 21 | 186.1 | - highly to moderately weathered<br>- very weak | | | | | | | | | | |
| | | Very poor grey SANDSTONE<br>- slightly to moderately weathered<br>- weak<br>- fair quality, grey to drak grey below 21.6 m | | | | | | | | | | |
| 22 | | - 0.15 m thick claystone layer, highly weathered, extremely weak at 22 m to 22.15 m | | | RC23 | 100 | 79 | 61 | | R2 | W2.5 | |
| 23 | 184.1 | End of borehole (23.0 m)<br>- borehole open, water at 0.6 m upon completion<br>- borehole backfilled with cuttings, bentonite seal placed at 0.6 m to 0.9 m and 10.7 m to 23.0 m | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

## DC33

CLIENT Alberta Transportation
NORTHING 5657180
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -31654
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/09
WATER LEVEL (artesian) 6/9/2016
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1199.48 | TOPSOIL | | | | | | | | | | | |
| | 1199.13 | Stiff, brown, high plasticity CLAY (CH)<br>- silty, mottled grey, moist | | | BS | 1 | | | | | | | |
| 1 | | | | | | | | | | | | | |
| | | - trace sand below 1.5 m | | | ST | 2 | 350 | | CU, Y | 0.0 | 0.2 | 37.0 | 62.8 |
| 2 | | | | | SS | 3 | 430 | 13 | | | | | |
| | | | | | BS | 4 | | | | | | | |
| 3 | | | | | ST | 5 | 480 | | C | | | | |
| | 1195.58 | | | | SS | 6 | 450 | 15 | | | | | |
| 4 | | Very stiff, brown, medium plasticity clay TILL (CI)<br>- silty, some sand, trace gravel, mottled grey, moist<br>- trace coal specks below 4.2 m | | | BS | 7 | | | | | | | |
| | | | | | ST | 8 | 490 | | CU, Y | 10.6 | 15.2 | 43.6 | 30.6 |
| 5 | | | | | SS | 9 | 320 | 15 | | | | | |
| | | | | | BS | 10 | | | | | | | |
| 6 | | | | | SS | 11 | 450 | 30 | | | | | |
| | | - grey, seepage at 6.3 m | | | | | | | | | | | |
| 7 | | | | | BS | 12 | | | | 5.1 | 14.4 | 54.1 | 26.3 |
| | | - dry to moist below 7.6 m | | | SS | 13 | 450 | 25 | | | | | |
| 8 | | | | | | | | | | | | | |
| | | | | | BS | 14 | | | | 4.4 | 13.9 | 51.7 | 30.0 |
| 9 | | | | | SS | 15 | 440 | 29 | | 12.5 | 14.4 | 47.9 | 25.2 |
| | | - 0.5 m layer of silt at 9.6 m | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC33

CLIENT Alberta Transportation
NORTHING 5657180
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -31654
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/09
WATER LEVEL (artesian) 6/9/2016
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay TILL (CI) - silty, some sand, trace gravel, mottled grey, moist | | | BS | 16 | | | | | | | |
| | 1188.58 | | | | SS | 17 | 450 | 33 | | | | | |
| 11 | | Compact, grey SILT (ML) - sandy, moist to wet | | | | | | | | | | | |
| 12 | | | | | BS | 18 | | | | | | | |
| | 1187.08 | | | | SS | 19 | 75 | 50+ | | | | | |
| | | Bedrock encountered at 12.4 m - Coring commenced at 11.9 m (see rock coring log for details) - Borehole advanced in bedrock to 15.6 m - Groundwater at 0.6 m and borehole open upon completion | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC33**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/9/2016 to 6/9/2016

NORTHING: 5657180
EASTING: -31654
WATER LEVEL (artesian) 6/9/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 12 | 187.1 | | | | RC20 | | | | | R | W | |
| 13 | | Poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak<br>- moderately weathered and very weak below 12.6 m | | | RC21 | 100 | 91 | 36 | | R1 | W3 | |
| 14 | | - fair quality, slightly weathered, weak to medium strong below 14.1 m | | | RC22 | 100 | 100 | 74 | | 2.5 | W2 | |
| 15 | 183.9 | | | | | | | | | | | |
| 16 | | End of borehole (15.6 m)<br>- artesian conditions encountered in borehole<br>- borehole backfilled with cuttings and a bentonite seal placed from 7.5 m to 15.5 m | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:13:12 AM

Stantec

# BOREHOLE RECORD

**DC34**

CLIENT Alberta Transportation
NORTHING 5657113
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -31594
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/10
WATER LEVEL (artesian) 6/10/2016
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1198.48 | TOPSOIL | | | | | | | | | | | |
| | 1197.98 | Stiff, brown, high plasticity CLAY (CH) - silty, trace sand, mottled grey, moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 340 | | CU, Y | 0.0 | 1.5 | 23.0 | 75.5 |
| 2 | | | | | SS | 3 | 340 | 11 | | | | | |
| | | | | | BS | 4 | | | CR, DH, P | 0.0 | 9.4 | 46.4 | 44.1 |
| 3 | | | | | ST | 5 | 460 | | C, Y | 0.0 | 0.3 | 49.9 | 49.8 |
| 4 | | | | | SS | 6 | 390 | 16 | | | | | |
| | | | | | BS | 7 | | | | | | | |
| 5 | | | | | ST | 8 | 460 | | CU, Y | 0.2 | 2.8 | 34.1 | 62.9 |
| | | | | | SS | 9 | 450 | 11 | | | | | |
| | 1192.78 | Very stiff, brown, medium plasticity clay (CI) TILL - silty, trace sand, gravel, trace coal specks, mottled grey, moist | | | BS | 10 | | | | | | | |
| 6 | | | | | SS | 11 | 450 | 33 | | | | | |
| 7 | | | | | BS | 12 | | | | | | | |
| | | | | | SS | 13 | 340 | 26 | | | | | |
| 8 | | | | | BS | 14 | | | | | | | |
| 9 | | | | | SS | 15 | 450 | 21 | | 5.9 | 3.1 | 68.0 | 23.0 |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**DC34**

CLIENT Alberta Transportation
NORTHING 5657113
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -31594
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/10
WATER LEVEL (artesian) 6/10/2016
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, trace sand, gravel, trace coal specks, mottled grey, moist | | | BS | 16 | | | | | | | |
| 11 | | | | | SS | 17 | 450 | 34 | | | | | |
| | | - sandy below 11.5 m | | | | | | | | | | | |
| 12 | | | | | BS | 18 | | | | | | | |
| | | | | | SS | 19 | 350 | 29 | | 5.2 | 22.3 | 52.5 | 20.0 |
| 13 | 1185.38 | | | | | | | | | | | | |
| | | Very poor quality grey (inferred) MUDSTONE<br>- extremely weak | | | BS | 20 | | | | | | | |
| | 1184.68 | | | | SS | 21 | 125 | 50+ | | | | | |
| 14 | | Bedrock encountered at 13.1 m<br>- Coring commenced at 13.6 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 12.6 m<br>- Groundwater at 0.6 m and open upon completion | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## DC34

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/10/2016 to 6/10/2016
NORTHING: 5657113
EASTING: -31594
WATER LEVEL (artesian) 6/10/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 13 | 185.4 | Very poor quality grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely to very weak | | | | | | | | | | |
| | 184.7 | Poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak<br>- moderately weathered, and very weak below 14.1 m | | | RC22 | 88 | 48 | 28 | | R0 | W5 | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | RC23 | 74 | 59 | 26 | | R0 | W5 | |
| 16 | | - fair quality below 15.6 m | | | RC24 | 100 | 92 | 68 | | R0 | W5 | |
| 17 | 181.4 | End of borehole (17.1 m)<br>- borehole open upon completion<br>- artesian conditions observed<br>- borehole backfilled with cuttings and a bentonite seal placed from 4.5 m to 17.1 m | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/7/16 10:13:14 AM

# D. 4
Dam

Stantec

# BOREHOLE RECORD

**D02**

CLIENT Alberta Transportation
NORTHING 5657499
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -31218
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/10
WATER LEVEL (4.5 m) 2016/06/10
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1206.57 | | | | | | | | | | | | |
| | 1206.27 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, high plasticity CLAY (CH) - silty, trace sand, mottled grey, damp to moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 340 | | | | | | |
| | | | | | SS | 3 | 450 | 16 | | | | | |
| | | | | | ST | 4 | 340 | | C, Y | 0.0 | 0.3 | 29.9 | 69.8 |
| 2 | | | | | SS | 5 | 450 | 13 | | | | | |
| | 1204.17 | | | | | | | | | | | | |
| | | Very stiff, brown, low to medium plasticity clay (CI-CL) TILL - silty, trace to some sand, trace gravel, trace coal specks, damp | | | ST | 6 | 420 | | | | | | |
| 3 | | | | | SS | 7 | 450 | 23 | | | | | |
| | | | | | SS | 8 | 450 | 21 | | | | | |
| 4 | | | | | BS | 9 | | | | | | | |
| | | | | | SS | 10 | 250 | 22 | | | | | |
| 5 | | | | | BS | 11 | | | | | | | |
| | | | | | SS | 12 | 450 | 25 | | | | | |
| 6 | | | | | BS | 13 | | | | | | | |
| | | | | | SS | 14 | 450 | 27 | | | | | |
| 7 | | | | | BS | 15 | | | | 13.8 | 15.4 | 44.2 | 26.6 |
| | | | | | SS | 16 | 450 | 50+ | | | | | |
| 8 | | | | | BS | 17 | | | | | | | |
| | | | | | SS | 18 | 450 | 41 | | | | | |
| | 1197.77 | | | | | | | | | | | | |
| 9 | | Hard, brown, silty clay (CL-ML) TILL - sandy, trace gravel, trace coal specks, damp | | | BS | 19 | | | | | | | |
| | | | | | SS | 20 | 450 | 35 | | | | | |
| | | | | | BS | 21 | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D02**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/10

NORTHING 5657499
EASTING -31218
WATER LEVEL (4.5 m) 2016/06/10

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, silty clay (CL-ML) TILL<br>- sandy, trace gravel, trace coal specks, damp | | | SS | 22 | 450 | 50+ | | 7.8 | 37.3 | 42.1 | 12.8 |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | SS | 23 | 300 | 50+ | | | | | |
| 13 | 1193.17 | | | | | | | | | | | | |
| | 1192.87 | Very poor quality, grey (inferred) CLAYSTONE | | | | | | | | | | | |
| 14 | | Bedrock encountered at 13.4 m<br>- coring commenced at 13.7 m (see rock coring log for details)<br>- borehole advanced in bedrock to 21.5 m<br>- water at 4.5 m and open upon completion | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D02**

CLIENT Alberta Transportation NORTHING: 5657499 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -31218 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/10/2016 to 6/10/2016 WATER LEVEL (4.5 m) 2016/06/10 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 193.2 | | | | | | | | | | | |
| | | Very poor quality, grey (inferred) CLAYSTONE | | | | | | | | | | |
| | 192.9 | | | | RC24 | 80 | 26 | 24 | | R0 | W4 | |
| 14 | | Very poor quality dark grey to grey CLAYSTONE - highly weathered - extremely weak | | | | | | | | | | |
| | 192.4 | | | | RC25 | 93 | 60 | 0 | | R1 | W3 | |
| | | Very poor quality grey SILTSTONE - moderately weathered - weak | | | | | | | | | | |
| 15 | | | | | RC26 | 96 | 44 | 15 | | R1 | W3 | |
| 16 | | | | | RC27 | 100 | 73 | 37 | | R0.5 | W3.5 | |
| | 189.8 | | | | | | | | | | | |
| 17 | | Very poor quality grey CLAYSTONE - highly to moderately weathered - extremely weak | | | | | | | | | | |
| 18 | | | | | RC28 | 93 | 32 | 13 | | R0 | W4 | |
| 19 | | - fair quality below 18.7 m | | | RC29 | 100 | 70 | 54 | | R1 | W3 | |
| | 187.1 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE - slightly weathered - weak | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | RC30 | 100 | 97 | 98 | | R2 | W2 | |
| | 185.1 | | | | | | | | | | | |
| 22 | | End of borehole (21.5 m) - borehole open upon completion - two inch standpipe piezometer installed, slotted from 20.0 m to 21.45 m - backfilled with sand from 19.5 m to 21.45 m, bentonite | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:38 PM

Stantec

# BOREHOLE RECORD

**D02**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/10/2016 to 6/10/2016

NORTHING: 5657499
EASTING: -31218
WATER LEVEL (4.5 m) 2016/06/10

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | | seal placed at 1.2 m to 19.5 m | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:38 PM

Stantec

# BOREHOLE RECORD

**D03**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/30

NORTHING 5657527
EASTING -31028
WATER LEVEL (9.0 m) 2016/06/29

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1208 | | | | | | | | | | | | |
| | 1207.7 | TOPSOIL | | | | | | | | | | | |
| | | Very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, trace gravel, dry<br>- damp below 0.9 m<br>- mottled brown dark below 1.35 m | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 420 | | Qu, Y | 0.0 | 0.5 | 42.6 | 56.9 |
| | | | | | SS | 3 | 350 | 17 | | | | | |
| 2 | | | | | ST | 4 | 360 | | CU, Y | 0.1 | 2.8 | 44.8 | 52.3 |
| | 1205.3 | | | | SS | 5 | 420 | 17 | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace to some gravel, damp | | | ST | 6 | 310 | | CU, Y | 10.4 | 24.2 | 41.6 | 23.7 |
| 3 | | | | | SS | 7 | 450 | 50+ | | | | | |
| | 1204.25 | | | | SS | 8 | 450 | 50+ | | | | | |
| | | Very poor quality grey (inferred) SILTSTONE<br>- highly to completely weathered<br>- extremely to very weak | | | | | | | | | | | |
| 4 | 1203.4 | | | | | | | | | | | | |
| | | Bedrock encountered at 3.8 m<br>- coring commenced at 4.3 m (see rock coring log for details)<br>- borehole advanced into bedrock to 11.2 m<br>- water at 9.0 m and borehole open upon completion | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D03**

CLIENT Alberta Transportation NORTHING: 5657527 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -31028 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/30/2016 to 6/30/2016 WATER LEVEL (9.0 m) 2016/06/29 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 204.3 | | | | | | | | | | | |
| 4 | | Very poor quality grey (inferred) SILTSTONE<br>- highly to completely weathered<br>- extremely to very weak | | | | | | | | | | |
| | 203.4 | | | | RC 9 | 91 | 38 | 0 | | R0 | W5.5 | |
| 5 | | Very poor quality brown SILTSTONE<br>- completely weathered<br>- extremely weak<br>- slightly weathered and weak below 5.1 m | | | | | | | | | | |
| | 202.3 | | | | RC10 | 100 | 34 | 16 | | R0 | W5.5 | |
| 6 | | Very poor quality brown CLAYSTONE<br>- completely weathered<br>- extremely weak<br>- thin coal seams at 5.8 m<br>- oxidized fracture surfaces below 6.6 m | | | | | | | | | | |
| 7 | 200.8 | | | | RC11 | 100 | 52 | 33 | | R1 | W4 | |
| | | Poor quality grey SILTSTONE<br>- moderately weathered<br>- weak<br>- oxidized fracture surfaces below 7.2 m<br>- moderately to highly weathered, and extremely to very weak below 8.1 m<br>- thin clay infill layers at 8.4 m and 9.1m | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | ▼ | RC12 | 95 | 68 | 21 | | R0.5 | W3.5 | |
| | | - moderately weathered below 9.6 m | | | | | | | | | | |
| | 198.1 | | | | | | | | | | | |
| 10 | | Poor quality grey CLAYSTONE<br>- highly weathered<br>- extremely to very weak<br>- thin clay infill layers at 10.2 m and 10.7 m | | | RC13 | 99 | 46 | 33 | | R0.5 | W4 | |
| | 197.1 | | | | | | | | | | | |
| 11 | 196.8 | Poor quality grey SILTSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | | End of borehole (11.2 m)<br>- borehole open upon completion<br>- borehole backfilled with cuttings and bentonite seals placed from 0.5 m to 0.8 m and 3.0 m to 11.2 m | | | | | | | | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:40 PM

Stantec

# BOREHOLE RECORD

**D05**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/30

NORTHING 5657316
EASTING -30682
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1206.84 | | | | | | | | | | |
| | 1206.64 | TOPSOIL | SS | 1 | 220 | 13 | | | | | |
| | | Stiff to very stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, damp to moist | BS | 2 | | | | 0.0 | 0.7 | 43.5 | 55.9 |
| 1 | | | BS | 3 | | | | | | | |
| | | - mottled grey below 1.5 m | ST | 4 | 370 | | | | | | |
| 2 | | | SS | 5 | 450 | 17 | | | | | |
| | | | BS | 6 | | | | 0.4 | 1.6 | 19.8 | 78.2 |
| 3 | | | ST | 7 | 480 | | | | | | |
| | 1202.94 | | SS | 8 | 310 | 50+ | | | | | |
| 4 | | Very stiff to hard, brown, low plasticity clay (CL) TILL<br>- silty, some sand, some gravel, damp to moist | BS | 9 | | | | 22.2 | 13.4 | 38.1 | 26.3 |
| | 1202.04 | - evidence of cobbles and boulders below 3.9 m | ST | 10 | 390 | | k, Y | 6.2 | 8.8 | 52.7 | 32.2 |
| 5 | | | SS | 13 | 0 | 50+ | | | | | |
| | | Poor quality brown (inferred) SANDSTONE<br>- completely to highly weathered<br>- extremely to very weak | BS | 14A | | | | | | | |
| 6 | | | SS | 15A | 230 | 50+ | | | | | |
| | | | BS | 16A | | | | | | | |
| 7 | | | SS | 17A | 100 | 50+ | | | | | |
| | 1199.54 | | | | | | | | | | |
| | | End of borehole at 7.3 m due to auger refusal<br>- auger refusal previously encountered at 5.0 m in adjacent borehole<br>- borehole advanced with rotary core at location D05B (see rock coring log for details) | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D05B**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/01

NORTHING 5657316
EASTING -30682
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | GRAIN SIZE ANALYSIS: Sand (%) | GRAIN SIZE ANALYSIS: Silt (%) | GRAIN SIZE ANALYSIS: Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1206.84 | | | | | | | | | | | | |
| | 1206.64 | TOPSOIL | | | | | | | | | | | |
| | | Stiff to very stiff, brown, high plasticity CLAY (CH)<br>- trace sand, damp to moist | | | | | | | | | | | |
| 1 | | - mottled grey below 1.5 m | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | |
| | 1202.94 | | | | | | | | | | | | |
| 4 | | Very stiff to hard, brown, low plasticity clay (CL) TILL<br>- some sand, some gravel, damp to moist | | | | | | | | | | | |
| | 1202.04 | - evidence of cobbles and boulders below 3.9 m | | | | | | | | | | | |
| 5 | | Poor quality brown (inferred) SANDSTONE<br>- completely to highly weathered<br>- extremely to very weak | | | | | | | | | | | |
| | 1201.04 | | | | | | | | | | | | |
| 6 | | Bedrock encountered at 4.8 m in borehole D05<br>- coring commenced in borehole D05B at 5.8 m (see rock coring log for details)<br>- borehole advanced into bedrock to 12.4 m<br>- borehole open upon completion<br>- borehole dry during augering | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D05B**

CLIENT Alberta Transportation NORTHING: 5657316 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -30682 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 5/1/2016 to 5/1/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 202.0 | | | | | | | | | | | |
| 5 | | Poor quality brown (inferred) SANDSTONE<br>- completely to highly weathered<br>- extremely to very weak | | | | | | | | | | |
| | 201.0 | | | | | | | | | | | |
| 6 | | Poor quality brown to grey SHALE<br>- slightly to moderately weathered<br>- very weak to weak<br>- oxidation seams and stains | | | RC 1 | 100 | 42 | 37 | | R1.5 | W2.5 | |
| 7 | | | | | RC 2 | 97 | 78 | 41 | | R1.5 | W2.5 | |
| 8 | | | | | RC 3 | 100 | 86 | 33 | | R1 | W3 | |
| 9 | 197.8 | | | | | | | | | | | |
| | 197.6 | Poor quality brown MUDSTONE<br>- highly to completely weathered<br>- extremely weak<br>- coal seams | | | | | | | | | | |
| 10 | | Fair quality brown to grey SHALE<br>- slightly to moderately weathered<br>- very weak to weak<br>- oxidation seams and stains | | | RC 4 | 100 | 90 | 53 | | R1.5 | W2.5 | |
| | 196.2 | | | | | | | | | | | |
| | 196.1 | Fair quality brown MUDSTONE<br>- highly to completely weathered<br>- extremely weak<br>- coal seams | | | RC 5 | 100 | 80 | 53 | | R1.5 | W2.5 | |
| 11 | 195.5 | | | | | | | | | | | |
| | 195.4 | Fair quality brown to grey SHALE<br>- slightly to moderately weathered<br>- very weak to weak<br>- oxidation seams and stains<br>- clay seam at 11.0 m | | | RC 6 | 98 | 69 | 33 | | R0 | W5 | |
| 12 | 194.8 | | | | | | | | | | | |
| | 194.4 | Poor quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 13 | | Poor quality brown to grey SHALE<br>- slightly to moderately weathered<br>- very weak to weak | | | | | | | | | | |
| 14 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 4:18:41 PM

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# BOREHOLE RECORD

**D05B**

CLIENT Alberta Transportation NORTHING: 5657316 PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -30682 BH SIZE SS:150mm, HS:200mm
DRILLING DATE 5/1/2016 to 5/1/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | - oxidation seams and stains | | | | | | | | | | |
| | | Brownish grey MUDSTONE<br>- completely weathered, extremely weak | | | | | | | | | | |
| 15 | | End of borehole (12.4 m)<br>- borehole open upon completion<br>- backfilled with cuttings<br>- bentonite seals placed from 0.5 m to 1.2 m and from 5.8 m to 12.4 m | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D06**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/01

NORTHING 5657183
EASTING -30503
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1205.53 | | | | | | | | | | | | |
| | 1205.23 | TOPSOIL | | | SS | 1 | 150 | 12 | | | | | |
| | | Stiff to very stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, trace rootlets, dry to damp | | | BS | 2 | | | | 0.0 | 2.2 | 31.7 | 66.1 |
| 1 | | | | | SS | 3 | 175 | 17 | | | | | |
| | | | | | BS | 4 | | | | | | | |
| | | | | | ST | 5 | 400 | | | | | | |
| 2 | 1203.53 | | | | | | | | | | | | |
| | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, trace sand, dry to damp | | | SS | 6 | 175 | 25 | | | | | |
| | | | | | BS | 7 | | | | 0.0 | 4.0 | 53.6 | 42.4 |
| 3 | | | | | ST | 8 | 350 | | | | | | |
| | | | | | SS | 9 | 400 | 49 | | | | | |
| 4 | 1201.53 | | | | | | | | | | | | |
| | 1201.33 | Fair quality brown (inferred) MUDSTONE<br>- moderately weathered<br>- extremely to very weak | | | BS | 10 | | | | | | | |
| | | | | | SS | 11 | | 50 | | | | | |
| 5 | | Bedrock encountered at 4.0 m<br>- coring commenced at 4.2 m (see rock coring log for details)<br>- borehole advanced into bedrock to 10.9 m<br>- borehole open upon completion | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D06**

CLIENT Alberta Transportation NORTHING: 5657183 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -30503 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 5/1/2016 to 5/1/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 80 60 40 20 | 80 60 40 20 | 80 60 40 20 | 5 10 15 20 | R5 R4 R3 R2 | W1 W2 W3 W4 W5 W6 | |
| 3 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 4 | 201.5 | | | | | | | | | | | |
| | 201.3 | Fair quality brown (inferred) MUDSTONE<br>- moderately weathered<br>- extremely to very weak | | | RC12 | 100 | 100 | 62 | | R0.5 | W3 | |
| | 200.7 | Fair quality brown MUDSTONE to SHALE<br>- slightly weathered<br>- very weak to weak<br>- oxidation seams/staining | | | | | | | | | | |
| 5 | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- very weak to weak | | | RC13 | 100 | 95 | 73 | | R1.5 | W2 | |
| 6 | 199.4 | Fair quality grey SHALE<br>- slightly weathered<br>- very weak to weak | | | | | | | | | | |
| | 198.8 | Fair quality grey to brown SANDSTONE<br>- slightly weathered<br>- very weak to medium strong<br>- oxidation and coal seams | | | RC14 | 98 | 81 | 51 | | R2 | W2 | |
| 7 | | | | | | | | | | | | |
| 8 | 197.1 | | | | | | | | | | | |
| | 197.0 | Fair quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC15 | 100 | 86 | 65 | | R0.5 | W4 | |
| 9 | 196.5 | | | | | | | | | | | |
| | 196.4 | Fair quality grey to brown SANDSTONE<br>- slightly weathered<br>- very weak to medium strong<br>- oxidation and coal seams | | | | | | | | | | |
| | 195.7 | | | | | | | | | | | |
| 10 | 195.5 | Fair quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC16 | 100 | 0 | 0 | | R1 | W3.5 | |
| | 195.2 | | | | | | | | | | | |
| | 195.0 | Very poor quality Grey SANDSTONE<br>- slightly weathered<br>- very weak to medium strong | | | | | | | | | | |
| | 194.6 | Very poor quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 11 | | Very poor quality grey SHALE<br>- slightly weathered<br>- weak to medium strong | | | | | | | | | | |
| 12 | | Very poor quality brown MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | | Very poor quality grey SHALE<br>- slightly weathered<br>- weak to medium strong | | | | | | | | | | |
| 13 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D06**

CLIENT Alberta Transportation NORTHING: 5657183 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -30503 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 5/1/2016 to 5/1/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % (80 60 40 20) | RECOVERY SOLID CORE % (80 60 40 20) | R.Q.D. % (80 60 40 20) | FRACT. INDEX PER 1m (5 10 15 20) | ROCK STRENGTH INDEX (R5 R4 R3 R2) | WEATHERING INDEX (W1 W2 W3 W4 W5 W6) | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | End of borehole (10.9 m)<br>- borehole open upon completion<br>- backfilled with cuttings<br>- bentonite seals placed from 0.5 m to 1.2 m, and from 4.2 m to 10.9 m | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D07**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/02
WATER LEVEL

NORTHING 5657101
EASTING -30325

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1202.13 | | | | | | | | | | | | |
| | 1201.88 | TOPSOIL | | | SS | 1 | 150 | 8 | | | | | |
| | | Very stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, damp | | | BS | 2 | | | | | | | |
| 1 | | | | | ST | 3 | 375 | | | 0.0 | 2.3 | 26.5 | 71.2 |
| | | | | | SS | 4 | 175 | 20 | | | | | |
| 2 | | | | | BS | 5 | | | | | | | |
| | | - mottled light brown below 2.3 m | | | ST | 6 | 400 | | Y | 0.6 | 4.0 | 35.1 | 60.3 |
| 3 | | | | | SS | 7 | 100 | 21 | | | | | |
| | 1198.73 | | | | | | | | | | | | |
| | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- some sand, trace gravel | | | BS | 8 | | | | | | | |
| 4 | | | | | ST | 9 | 250 | | | | | | |
| | 1197.93 | | | | | | | | | | | | |
| | | Fair quality brown (inferred) MUDSTONE<br>- completely weathered<br>- extremely to very weak | | | BS | 11 | 400 | 50+ | | | | | |
| | 1197.23 | | | | SS | 10 | | | | | | | |
| 5 | | Bedrock encountered at 4.2 m<br>- coring commenced at 4.2 m (see rock coring log for details)<br>- borehole advanced into bedrock to 14 m<br>- borehole open and dry during augering | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D07**

CLIENT Alberta Transportation NORTHING: 5657101 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -30325 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 5/2/2016 to 5/2/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 4 | 197.9 | | | | | | | | | | | |
| | | Fair quality brown (inferred) MUDSTONE<br>- completely weathered<br>- extremely to very weak | | | RC12 | 62 | 58 | 58 | | R | W | |
| 5 | 197.2 | Very poor quallity brown to grey stratified SILTSTONE and SANDSTONE<br>- slightly weathered<br>- very weak to weak<br>- oxidation | | | RC13 | 93 | 78 | 21 | | R | W | |
| 6 | | - fair quality below 6.3 m | | | RC14 | 100 | 96 | 58 | | R | W | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | RC15 | 100 | 91 | 73 | | R | W | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | RC16 | 100 | 88 | 63 | | R | W | |
| 11 | | - several mudstone/clay seams at 10.4 m, 10.5 m, 10.6 m, 10.7 m, 11.0 m, 11.8 m, 12.1 m | | | RC17 | 98 | 81 | 63 | | R | W | |
| 12 | 189.9 | Excellent quality brown SANDSTONE<br>- fresh to slightly weathered<br>- weak | | | | | | | | | | |
| 13 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D07**

CLIENT Alberta Transportation NORTHING: 5657101 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -30325 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 5/2/2016 to 5/2/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | | | | | | | | | | | |
| | 188.9 | Excellent quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC18 | 100 | 100 | 100 | | R | W | |
| 14 | 188.1 | End of borehole (14.0 m)<br>- borehole open upon completion<br>- backfilled with cuttings<br>- bentonite seals placed from 0.5 m to 1.2 m and from 4.3 m to 6.2 m | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:45 PM

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# BOREHOLE RECORD

**D08**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/01

NORTHING 5657051
EASTING -30325
WATER LEVEL (2.3 m) 2016/05/01

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1203.18 | | | | | | | | | | | | |
| | 1203.03 | TOPSOIL | | | SS | 1 | 450 | 11 | | | | | |
| | | Stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand and gravel, trace rootlets, moist | | | | | | | | | | | |
| 1 | | | | | ST | 2 | 300 | | | | | | |
| | | - mottled grey below 1.4 m | | | SS | 3 | 350 | 19 | | 2.3 | 2.8 | 30.5 | 64.5 |
| | 1201.38 | | | | | | | | | | | | |
| 2 | | Stiff, brown, medium plasticity CLAY (CI)<br>- silty, some sand, trace gravel, trace coal specks, moist | | | ST | 4 | 310 | | C, Y | 3.4 | 18.4 | 48.0 | 30.3 |
| | | | | | SS | 5 | 450 | 26 | | | | | |
| 3 | | | | | SS | 6 | 425 | 22 | | | | | |
| | 1199.68 | | | | SS | 7 | | 36 | | 6.1 | 17.7 | 47.0 | 29.3 |
| | 1199.58 | Fair quality brown (inferred) SANDSTONE<br>- extremely weak | | | | | | | | | | | |
| 4 | | Bedrock encountered at 3.5 m<br>- coring commenced at 3.6 m (see rock coring log for details)<br>- borehole advanced into bedrock to 14.0 m<br>- water at 2.3 m upon completion | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D08**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/1/2016 to 5/1/2016
NORTHING: 5657051
EASTING: -30325
WATER LEVEL (2.3 m) 5/1/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 199.7 | | | | | | | | | | | |
| | 199.6 | Fair quality brown (inferred) SANDSTONE - extremely weak | | | | | | | | | | |
| 4 | | Very poor quality brown MUDSTONE - completely weathered - extremely weak | | | RC 8 | 100 | 0 | 0 | | R0 | W5 | |
| 5 | 198.2 | Very poor quality grey SANDSTONE - slightly weathered - weak | | | RC 9 | 98 | 73 | 22 | | R2 | W2 | |
| 6 | | | | | | | | | | | | |
| | | - poor quality below 6.5 m | | | RC10 | 100 | 90 | 44 | | R2 | W2 | |
| 7 | | | | | | | | | | | | |
| 8 | | - slightly to moderately weathered below 8.0 m | | | RC11 | 100 | 82 | 42 | | R2 | W2.5 | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | RC12 | 100 | 63 | 21 | | R2 | W2.5 | |
| 11 | | - very poor quality below 11.0 m | | | | | | | | | | |
| | 191.5 | | | | RC13 | 68 | 29 | 6 | | R1 | W3.5 | |
| 12 | | Very poor qualty grey MUDSTONE - completely weathered - extremely weak | | | | | | | | | | |
| | | - moderately weathered below 12.5 m | | | | | | | | | | |
| 13 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 4:18:47 PM

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# BOREHOLE RECORD

**D08**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/1/2016 to 5/1/2016

NORTHING: 5657051
EASTING: -30325
WATER LEVEL (2.3 m) 5/1/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | | | | | | | | | | | |
| | | Very poor qualty grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC14 | 100 | 64 | 36 | | R1 | W3 | |
| 14 | 189.2 | End of borehole (14.0 m)<br>- water at 2.3 m<br>- borehole backfilled with cuttings and bentonite seals placed from 0.3 m to 0.5 m and 3.5 m to 14 m | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D09**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/05/01

NORTHING 5657001
EASTING -30358
WATER LEVEL (9.1 m) 2016/05/01

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1202.55 | | | | | | | | | | | | |
| | 1202.35 | TOPSOIL | | | SS | 1 | 250 | 16 | | | | | |
| | | Very stiff, brown, medium plasticity CLAY (CI)<br>- some sand, trace gravel, damp | | | | | | | | | | | |
| 1 | 1201.2 | | | | ST | 2 | 225 | | | | | | |
| | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, damp | | | SS | 3 | 300 | 20 | | 3.4 | 18.4 | 48.0 | 30.3 |
| 2 | | | | | SS | 4 | 100 | 50+ | | | | | |
| | 1200.15 | | | | | | | | | | | | |
| | 1199.85 | Very poor quality brown (inferred) MUDSTONE<br>- extremely weak | | | SS | 5 | 150 | 50+ | | | | | |
| 3 | | Bedrock encountered at 2.4 m<br>- coring commenced at 2.7 m (see rock coring log for details)<br>- borehole advanced into bedrock to 14.1 m<br>- water at 9.1 m and open upon completion<br>- 50 mm standpipe piezometer slotted from 9.0 m to 10.5 m | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D09**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/1/2016 to 5/1/2016
NORTHING: 5657001
EASTING: -30358
WATER LEVEL (9.1 m) 5/1/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 2 | 200.2 | | | | | | | | | | | |
| | 199.9 | Very poor quality brown (inferred) MUDSTONE - extremely weak | | | | | | | | | | |
| 3 | 199.6 | Very poor quality brown MUDSTONE - completely weathered - extremely weak | | | RC 6 | 73 | 20 | 0 | | R0 | W5 | |
| | 199.0 | Very poor quality brown SANDSTONE - highly weathered - extremely weak | | | | | | | | | | |
| 4 | | Very poor quality brown MUDSTONE - completely weathered - extremely weak | | | RC 7 | 100 | 17 | 11 | | R0 | W4.5 | |
| | 198.2 | | | | | | | | | | | |
| | 198.0 | Very poor quality SILTSTONE - moderately weathered - weak | | | | | | | | | | |
| 5 | | Very poor quality brown MUDSTONE - completely weathered - extremely weak | | | | | | | | | | |
| | 196.9 | | | | | | | | | | | |
| | | Very poor quality brown SANDSTONE - slightly weathered - weak | | | RC 8 | 100 | 51 | 38 | | R1 | W4 | |
| 6 | 196.2 | Very poor quality SILTSTONE - highly weathered - very weak | | | | | | | | | | |
| | 195.7 | | | | | | | | | | | |
| 7 | | Very poor quality dark grey MUDSTONE - completely weathered - extremely weak | | | RC 9 | 100 | 43 | 22 | | R0.5 | W5 | |
| | 195.2 | Very poor quality grey SILTSONE - highly weathered - very weak | | | | | | | | | | |
| 8 | 194.3 | | | | | | | | | | | |
| | 194.0 | Very poor quality black SHALE - completely weathered - very weak | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE - moderately weathered - very weak | | ▼ | RC10 | 100 | 31 | 19 | | R0.5 | W4 | |
| 9 | | | | | | | | | | | | |
| | | - fair quality below 9.6 m | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| | 192.1 | | | | RC11 | 93 | 74 | 57 | | R1.5 | W2.5 | |
| | | Fair quality grey SILTSTONE - moderately weathered - very weak | | | | | | | | | | |
| 11 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D09**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 5/1/2016 to 5/1/2016
NORTHING: 5657001
EASTING: -30358
WATER LEVEL (9.1 m) 5/1/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | | | | | | | | | | | | |
| | 191.5 | Poor quality grey MUDSTONE<br>- highly weathered<br>- very weak | | | | | | | | | | |
| | 190.8 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC12 | 100 | 54 | 33 | | R1.5 | W3 | |
| 12 | 190.0 | Very poor quality grey MUDSTONE<br>- highly weathered<br>- very weak | | | | | | | | | | |
| 13 | 189.4 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- very weak | | | RC13 | 100 | 47 | 19 | | R1 | W3.5 | |
| 14 | 188.5 | End of borehole (14.1 m)<br>- water at 9.1 m<br>- 50 mm standpipe piezometer slotted from 9.0 m to 10.5 m<br>- borehole backfilled with cuttings, sand from 8.6 m to 10.8 m and bentonite seals placed from 0.9 m to 1.8 m and 10.8 m to 14.1 m | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:49 PM

Stantec

# BOREHOLE RECORD

**D10**

CLIENT Alberta Transportation
NORTHING 5657000
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -30226
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/30
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1200.68 | TOPSOIL | | | SS | 1 | 150 | 9 | | | | | |
| | 1200.33 | Very stiff, brown, high plasticity CLAY (CH) | | | BS | 2 | | | | | | | |
| 1 | | - silty, trace sand, trace rootlets, mottled grey/light brown, dry to damp | | | SS | 3 | 150 | 19 | | | | | |
| | | | | | BS | 4 | | | | | | | |
| | | | | | ST | 5 | 350 | | | | | | |
| 2 | | - trace gravel below 2.0 m | | | SS | 6 | 250 | 20 | | | | | |
| | | | | | BS | 7 | | | | 0.3 | 5.0 | 38.4 | 56.3 |
| 3 | | | | | ST | 8 | 400 | | CU, Y | | | | |
| | | | | | SS | 9 | 350 | 17 | | | | | |
| 4 | 1196.68 | Very stiff to hard, brown, medium plasticity clay (CI) TILL | | | BS | 10 | | | | | | | |
| | | - silty, some sand, trace gravel, trace coal specks | | | SS | 11 | 300 | 50+ | | | | | |
| 5 | | | | | BS | 12 | | | | | | | |
| | 1195.18 | | | | SS | 13 | 400 | 50+ | | 4.6 | 13.6 | 48.8 | 33.0 |
| | 1194.88 | Very poor quality light brown (inferred) MUDSTONE | | | BS | 14 | | | | | | | |
| 6 | | - extremely weak | | | | | | | | | | | |
| | | Bedrock encountered at 5.5 m | | | | | | | | | | | |
| | | - Coring commenced at 5.8 m (see rock coring log for details) | | | | | | | | | | | |
| 7 | | - borehole advanced into bedrock to 23.1 m | | | | | | | | | | | |
| | | - Borehole dry during augering | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D10**

CLIENT Alberta Transportation NORTHING: 5657000 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -30226 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/30/2016 to 4/30/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 195.2 | | | | | | | | | | | |
| | 194.9 | Very poor quality light brown (inferred) MUDSTONE - extremely weak | | | | | | | | | | |
| 6 | | Poor quality grey SHALE - slightly to moderately weathered - extremely weak to weak | | | RC15 | 100 | 70 | 45 | | R1 | W2.5 | |
| 7 | | | | | RC16 | 98 | 80 | 41 | | R1 | W2.5 | |
| 8 | | | | | RC17 | 100 | 73 | 28 | | R1 | W3.5 | |
| | 191.8 | | | | | | | | | | | |
| 9 | 191.6 | Poor quality brown MUDSTONE - highly to completely weathered - extremely weak | | | | | | | | | | |
| 10 | | Poor quality grey SHALE - slightly to moderately weathered - extremely weak to weak | | | RC18 | 100 | 63 | 21 | | R1 | W3.5 | |
| | 190.2 | | | | | | | | | | | |
| | 190.0 | Poor quality brown MUDSTONE - highly to completely weathered - extremely weak | | | | | | | | | | |
| 11 | | | | | RC19 | 100 | 100 | 93 | | R2 | W2 | |
| | | Fair quality grey SHALE - slightly weathered - extremely weak to weak - clay/claystone seam at 11.3 m | | | RC20 | 100 | 100 | 64 | | R2 | W2 | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | RC21 | 100 | 95 | 68 | | R2 | W2 | |
| 14 | | | | | RC22 | 100 | 86 | 42 | | R2 | W2 | |
| 15 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:52 PM

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# BOREHOLE RECORD

**D10**

CLIENT Alberta Transportation NORTHING: 5657000 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -30226 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/30/2016 to 4/30/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | Fair quality grey SHALE<br>- slightly weathered<br>- extremely weak to weak | | | | | | | | | | |
| 16 | | | | | RC23 | 100 | 100 | 83 | | R2 | W2 | |
| 17 | | - coal seam at 17.1 m | | | RC24 | 100 | 96 | 78 | | R1 | W3.5 | |
| | 182.9 | | | | | | | | | | | |
| 18 | 182.6 | Good quality grey CLAYSTONE<br>- highly to completely weathered<br>- extremely weak | | | | | | | | | | |
| | | Fair quality grey SHALE<br>- slightly weathered<br>- extremely weak to weak | | | | | | | | | | |
| 19 | | | | | RC25 | 100 | 98 | 53 | | R2 | W2 | |
| 20 | 180.7 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak to medium strong | | | | | | | | | | |
| 21 | | | | | RC26 | 98 | 96 | 72 | | 2.5 | W2 | |
| | 179.5 | | | | | | | | | | | |
| | 179.4 | Fair quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | | Fair quality grey SHALE<br>- slightly weathered<br>- weak<br>- clay joint infill/seams | | | | | | | | | | |
| 22 | | | | | RC27 | 100 | 95 | 68 | | R2 | W2 | |
| 23 | 177.6 | | | | | | | | | | | |
| | | End of borehole (23.1 m)<br>- borehole backfilled with cuttings and a bentonite seals placed from 0.5 m to 1.2 m and 5.8 m to 23.1 m | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:52 PM

Stantec

# BOREHOLE RECORD

**D11**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/15

NORTHING 5656973
EASTING -30119
WATER LEVEL (1.2 m) 2016/04/15

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1199.59 | | | | | | | | | | | | |
| | 1199.29 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, moist | | | ST | 1 | 290 | | | | | | |
| 1 | | | | | SS | 2 | 350 | 15 | | | | | |
| | | | | | ST | 3 | 365 | | C, Y | | | | |
| 2 | | | | | SS | 4 | 450 | 13 | | 0.1 | 1.8 | 29.6 | 68.5 |
| | | | | | SS | 5 | 450 | 15 | | | | | |
| 3 | | | | | SS | 6 | 450 | 13 | | 0.0 | 1.9 | 29.3 | 68.8 |
| | | | | | SS | 7 | 450 | 13 | | | | | |
| 4 | 1194.99 | | | | ST | 8 | 320 | | CU, Y | 0.0 | 0.7 | 44.0 | 55.3 |
| | | Stiff to very stiff, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace to some gravel, mottled rusty brown, moist | | | SS | 9 | 450 | 15 | | | | | |
| 5 | | | | | SS | 10 | 450 | 17 | | 4.7 | 18.1 | 45.4 | 31.8 |
| | | | | | ST | 11 | 370 | | Y | 12.7 | 19.0 | 42.1 | 26.2 |
| 6 | | - hard below 6.5 m | | | SS | 12 | 450 | 39 | | | | | |
| | | - coal specks below 7.0 m | | | SS | 13 | 450 | 44 | | 3.3 | 18.8 | 49.0 | 29.0 |
| 7 | 1191.99 | | | | | | | | | | | | |
| | | Very poor quality light brown (inferred) MUDSTONE<br>- extremely weak | | | SS | 14 | | 50+ | | | | | |
| 8 | 1191.19 | | | | | | | | | | | | |
| | | Bedrock encountered at 7.6 m<br>- coring commenced at 8.4 m (see rock coring log for details)<br>- borehole advanced into bedrock to 13.9 m<br>- water at 1.2 m and sloughing to 13.4 m upon completion<br>- borehole dry during augering | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT
ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D11**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/15/2016 to 4/15/2016
NORTHING: 5656973
EASTING: -30119
WATER LEVEL (1.2 m) 4/15/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 192.0 | | | | | | | | | | | |
| 8 | | Very poor quality light brown (inferred) MUDSTONE<br>- extremely weak | | | | | | | | | | |
| | 191.2 | | | | | | | | | | | |
| 9 | | Poor quality light brown MUDSTONE<br>- completely weathered<br>- extremely weak<br>- poor quality below 8.4 m | | | RC15 | 98 | 63 | 30 | | R0 | W5 | |
| | 190.2 | | | | | | | | | | | |
| 10 | | Poor quality grey SANDSTONE<br>- highly to moderately weathered<br>- weak | | | RC16 | 100 | 58 | 56 | | R2 | W3.5 | |
| 11 | | - moderately to slightly weathered below 10.9 m | | | RC17 | 96 | 62 | 34 | | R2 | W3.5 | |
| 12 | | | | | | | | | | | | |
| | 187.0 | | | | | | | | | | | |
| 13 | | Very poor quality grey SHALE<br>- highly to moderately weathered<br>- extremely weak to weak | | | RC18 | 100 | 46 | 8 | | R0.5 | W3.5 | |
| | 185.7 | | | | | | | | | | | |
| 14 | | End of borehole (13.9 m)<br>- borehole slough to 13.4 m, and water at 1.2 m<br>- borehole backfilled with cuttings and bentonite seals placed from 0.3 m to 0.5 m and 9.9 m to 13.4 m | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:53 PM

Stantec

# BOREHOLE RECORD

**D12**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/30

NORTHING 5656944
EASTING -30010
WATER LEVEL (1.2 m) 2016/04/30

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1198.15 | TOPSOIL | SS | 1 | 200 | 10 | | | | | |
| | 1197.65 | Stiff to very stiff, brown, high plasticity CLAY (CH) - silty, trace sand, damp | ST | 2 | 230 | | | | | | |
| 1 | | | SS | 3 | 450 | 17 | | 0.1 | 4.3 | 31.6 | 64.0 |
| | | | ST | 4 | 320 | | | | | | |
| 2 | | - mottled grey below 1.8 m | SS | 5 | 450 | 15 | | | | | |
| | | | ST | 6 | 370 | | C, Y | 0.0 | 1.8 | 31.2 | 67.0 |
| 3 | | | SS | 7 | 450 | 11 | | | | | |
| | | | | | | | | | | | |
| | | | ST | 8 | 360 | | CU, Y | 0.7 | 1.5 | 33.9 | 63.9 |
| 4 | | | SS | 9 | 380 | 14 | | | | | |
| | 1193.25 | | ST | 10 | 400 | | | | | | |
| 5 | | Very stiff, brown, medium plasticity clay (CI) TILL - silty, some sand, trace gravel, damp | SS | 11 | 400 | 15 | | 2.2<br>0.4 | 18.1<br>15.5 | 47.8<br>53.7 | 31.9<br>30.4 |
| | | | ST | 12 | 430 | | | | | | |
| 6 | | | SS | 13 | 450 | 15 | | | | | |
| | | | ST | 14 | 400 | | | | | | |
| 7 | | - moist below 7.0 m | SS | 15 | 450 | 16 | | | | | |
| | | | | | | | | | | | |
| 8 | | - some sand, damp, trace coal specs below 7.6 m | SS | 16 | 450 | 25 | | | | | |
| | | | | | | | | | | | |
| 9 | | - seepage at 9.1 m | SS | 17 | | | | | | | |
| | 1189.05 | | | | | | | | | | |
| | | Very poor quality grey to brown (inferred) MUDSTONE | SS | 18 | 100 | 50+ | | | | | |
| | 1188.55 | - extremely weak | | | | | | | | | |
| 10 | | Bedrock encountered at 9.1 m | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D12**

CLIENT Alberta Transportation
NORTHING 5656944
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -30010
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/30
WATER LEVEL (1.2 m) 2016/04/30
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) | UNDRAINED SHEAR STRENGTH (kPa) 40 80 120 160 / WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$ / STANDARD PENETRATION TEST, blows/0.30 m 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | - coring commenced at 9.6 m (see rock coring log for details)<br>- borehole advanced into bedrock to 27.6 m<br>- water at 1.2 m upon completion<br>- 25 mm standpipe piezometer slotted from 7.6 m to 10.7 m | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D12**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/30/2016 to 4/30/2016
NORTHING: 5656944
EASTING: -30010
WATER LEVEL (1.2 m) 4/30/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 9 | 189.1 | Very poor quality grey to brown (inferred) MUDSTONE - extremely weak | | | | | | | | | | |
| | 188.4 | Very poor quality brown MUDSTONE - completely weathered - extremely weak | | | | | | | | | | |
| 10 | | - sandstone seam between 10.3 m and 10.4 m | | | RC19 | 95 | 6 | 0 | | R1 | W5 | |
| 11 | | | | | RC20 | 97 | 17 | 9 | | R0 | W5.5 | |
| 12 | | - 0.1 m thick black shale band, highly weathered, extremely weak | | | RC21 | 100 | 31 | 7 | | R0 | W4.5 | |
| 13 | | | | | | | | | | | | |
| 14 | 184.1 | Poor quality grey SANDSTONE - moderately weathered - extremely weak | | | RC22 | 100 | 77 | 39 | | R0 | W3 | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | RC23 | 97 | 65 | 40 | | R1 | W3.5 | |
| 17 | | | | | | | | | | | | |
| | 180.7 | Poor qualtiy grey MUDSTONE - highly weathered - extremely weak | | | RC24 | 100 | 31 | 29 | | R0.5 | W3.5 | |
| 18 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:55 PM

Stantec

# BOREHOLE RECORD

**D12**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/30/2016 to 4/30/2016
NORTHING: 5656944
EASTING: -30010
WATER LEVEL (1.2 m) 4/30/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | Poor qualtiy grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| | 179.5 | | | | | | | | | | | |
| | | - Poor quality dark grey to black SHALE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| 19 | 179.2 | | | | RC25 | 100 | 57 | 43 | | R0 | W4 | |
| | | Poor qualtiy grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| 20 | 178.0 | | | | | | | | | | | |
| | 177.8 | Fair quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | | Fair quality MUDSTONE<br>- highly weathered<br>- extremely weak | | | RC26 | 99 | 71 | 58 | | R1 | W3.5 | |
| 21 | | | | | | | | | | | | |
| | 176.3 | | | | | | | | | | | |
| 22 | | Fair quality grey SANDSTONE<br>- moderately weathered<br>- weak<br>- 0.1 m shale layer at 22.3 m | | | RC27 | 99 | 93 | 74 | | R1 | W3.5 | |
| 23 | | | | | | | | | | | | |
| | | | | | RC28 | 100 | 88 | 58 | | R2 | W2.5 | |
| 24 | | | | | | | | | | | | |
| | 173.5 | | | | | | | | | | | |
| | | Very poor quality grey SHALE<br>- moderately weathered<br>- extremely weak | | | | | | | | | | |
| 25 | 172.8 | | | | RC29 | 98 | 53 | 0 | | R1 | W3 | |
| | | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 26 | | - fair quality below 26.1 m | | | | | | | | | | |
| | | | | | RC30 | 100 | 89 | 64 | | R1 | W3 | |
| 27 | | | | | | | | | | | | |
| | 170.8 | | | | | | | | | | | |
| | 170.6 | Fair quality grey MUDSTONE<br>- moderately weathered<br>- extremely weak | | | | | | | | | | |
| 28 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 4:18:55 PM

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# BOREHOLE RECORD

**D12**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/30/2016 to 4/30/2016
NORTHING: 5656944
EASTING: -30010
WATER LEVEL (1.2 m) 4/30/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | | End of borehole (27.6 m)<br>- Water at 1.2 m<br>- 25 mm standpipe piezometer slotted from 7.6 m to 10.7 m<br>- bentonite seals from 6.4 m to 7.0 m and 11.7 m to 27.6 m | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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Stantec

# BOREHOLE RECORD

**D13**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/30

NORTHING 5656958
EASTING -29898
WATER LEVEL (10.2 m) 2016/04/30

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1195.87 | | | | | | | | | | | | |
| | 1195.57 | TOPSOIL | | | SS | 1 | 350 | 7 | | | | | |
| | | Firm to stiff, brown, high plasticity CLAY (CH) - silty, trace sand, damp to moist | | | | | | | | | | | |
| 1 | | - trace sand below 0.9 m | | | BS | 2 | | | | | | | |
| | | | | | BS | 3 | | | | | | | |
| | | | | | ST | 4 | 310 | | UU, Y | 0.0 | 0.2 | 44.2 | 55.6 |
| 2 | | - very stiff below 2.1 m | | | SS | 5 | 450 | 18 | | | | | |
| | | | | | BS | 6 | | | | | | | |
| 3 | | | | | ST | 7 | 430 | | CU, k, Y | 0.0 | 3.6 | 33.2 | 63.2 |
| | | | | | SS | 8 | 450 | 15 | | | | | |
| 4 | | | | | BS | 9 | | | | | | | |
| | | | | | BS | 10 | | | | | | | |
| | | | | | SS | 11 | 350 | | | | | | |
| 5 | | | | | SS | 12 | 450 | 19 | | | | | |
| | | - grey, damp to moist below 5.7 m | | | BS | 13 | | | | | | | |
| 6 | | - mottled light grey below 6.1 m | | | ST | 14 | 450 | | CU, k, Y | 0.0 | 1.9 | 42.3 | 55.8 |
| | | | | | SS | 15 | 450 | 14 | | | | | |
| 7 | | | | | BS | 16 | | | | | | | |
| | | | | | BS | 17 | | | | | | | |
| | | | | | ST | 18 | 400 | | | | | | |
| 8 | 1187.67 | | | | | | | | | | | | |
| | | Very stiff to hard, grey, low to medium plasticity clay (CL-CI) TILL - silty, some sand, some gravel, trace coal specks, damp to moist | | | SS | 19 | 450 | 16 | | | | | |
| 9 | | | | | BS | 20 | | | | | | | |
| | | | | | ST | 21 | 480 | | CU, Y | 21.4 | 14.3 | 39.1 | 25.2 |
| 10 | | | | | SS | 22 | 450 | 36 | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D13**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/30

NORTHING 5656958
EASTING -29898
WATER LEVEL (10.2 m) 2016/04/30

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff to hard, grey, low to medium plasticity clay (CL-CI) TILL - silty, some sand, some gravel, trace coal specks, damp to moist | BS | 23 | | | | | | |
| 11 | | | SS | 24 | 350 | 50+ | | | | |
| | 1184.47 | | BS | 25 | | | | | | |
| | | Very poor quality grey (inferred) MUDSTONE - completely weathered - extremely weak | SS | 26 | 50 | 50+ | | | | |
| 12 | | | BS | 27 | | | | | | |
| | | | SS | 28 | 50 | 50+ | | | | |
| 13 | 1182.77 | | BS | 29 | | | | | | |
| | | | SS | 30 | 0 | 50+ | | | | |
| | | End of borehole (13.1 m) - water at 10.2 m - backfilled with cuttings and a bentonite seal | | | | | | | | |
| 14 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 16 | | | | | | | | | | |
| 17 | | | | | | | | | | |
| 18 | | | | | | | | | | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D14**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/23

NORTHING 5657050
EASTING -29792
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1193.69 | TOPSOIL | | | SS | 1 | 100 | 8 | | | | | |
| | 1193.34 | Stiff, brown, high plasticity CLAY (CH) - silty, trace sand, trace rootlets, damp | | | BS | 2 | | | | | | | |
| 1 | | | | | SS | 3 | 200 | 13 | | | | | |
| | | | | | BS | 4 | | | | | | | |
| | | | | | ST | 5 | 325 | | | | | | |
| 2 | | - trace gravel below 2.0 m | | | SS | 6 | 225 | 15 | | | | | |
| | | | | | BS | 7 | | | | 1.0 | 5.0 | 35.2 | 58.8 |
| 3 | | - mottled light brown below 3.0 m | | | ST | 8 | 425 | | | | | | |
| | | | | | SS | 9 | 350 | 13 | | | | | |
| 4 | | | | | BS | 10 | | | | 1.3 | 8.7 | 71.4 | 15.7 |
| | | | | | ST | 11 | 400 | | C, Y | | | | |
| 5 | | | | | SS | 12 | 450 | 11 | | | | | |
| | | | | | BS | 13 | | | | | | | |
| 6 | | | | | ST | 14 | 450 | | | | | | |
| | | | | | SS | 15 | 450 | 14 | | | | | |
| 7 | | - sand partings below 7.0 m | | | BS | 16 | | | | | | | |
| | | | | | ST | 17 | 500 | | | | | | |
| 8 | | - very stiff below 8.1 m | | | SS | 18 | 450 | 19 | | | | | |
| | | | | | BS | 19 | | | | | | | |
| 9 | | | | | ST | 20 | 500 | | | | | | |
| | | | | | SS | 21 | 450 | 15 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D14**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/23
WATER LEVEL

NORTHING 5657050
EASTING -29792

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, trace rootlets, damp | | | BS | 22 | | | | | | | |
| 11 | | | | | SS | 23 | 450 | 18 | | | | | |
| | | | | | BS | 24 | | | | | | | |
| | 1181.79 | | | | ST | 25 | 450 | | | | | | |
| 12 | | Very stiff, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, damp to moist | | | SS | 26 | 400 | 25 | | | | | |
| | | | | | BS | 27 | | | | 8.2 | 15.6 | 47.1 | 29.1 |
| 13 | | | | | SS | 28 | 450 | 23 | | | | | |
| | | | | | BS | 29 | | | | | | | |
| | | - seepage at 13.7 m | | | SS | 30 | 450 | 20 | | | | | |
| 14 | 1179.39 | | | | BS | 31 | | | | | | | |
| | 1178.89 | Very poor quality brown/grey (inferred) SANDSTONE<br>- completely weathered<br>- extremely weak | | | SS | 32 | 100 | 50+ | | | | | |
| 15 | | Bedrock encountered at 14.3 m<br>- coring commenced at 14.8 m (see rock coring log for details)<br>- borehole advanced into bedrock to 20.2 m | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D14**

CLIENT Alberta Transportation NORTHING: 5657050 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29792 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/23/2016 to 4/23/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | | | | | | | | | | | |
| | 179.4 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | | Very poor quality brown/grey (inferred) SANDSTONE - completely weathered - extremely weak | | | | | | | | | | |
| | 178.9 | | | | | | | | | | | |
| 15 | | Brown to grey SANDSTONE - slightly weathered - very weak to weak | | | RC33 | 100 | 100 | 91 | | R1.5 | W2 | |
| 16 | | | | | RC34 | 98 | 91 | 68 | | R1.5 | W2 | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | RC35 | 100 | 100 | 72 | | R1.5 | W2 | |
| | | - mudstone, completely weathered, extremely weak from 18.7 m to 18.8 m | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| | | - mudstone, completely weathered, extremely weak from 19.7 m to 19.8 m | | | RC36 | 95 | 91 | 68 | | R1.5 | W2 | |
| 20 | 173.5 | | | | | | | | | | | |
| | | End of borehole (20.2 m) - borehole backfilled with cuttings and a bentonite seal placed from 0.5 m to 1.2 m | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 4:18:58 PM

Stantec

# BOREHOLE RECORD

**D16**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/24

NORTHING 5656870
EASTING -29781
WATER LEVEL (9.0 m) 2016/04/24

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1195.49 | | | | | | | | | | | | |
| | 1195.19 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, high plasticity CLAY (CH) - silty, trace sand, mottled grey, moist | | | BS | A | | | | | | | |
| 1 | | | | | ST | 1 | 350 | | | | | | |
| 2 | | | | | SS | 2 | 200 | 15 | | | | | |
| 3 | | | | | ST | 3 | 370 | | C, Y | 0.3 | 2.0 | 37.3 | 60.4 |
| | | | | | SS | 4 | 450 | 17 | | | | | |
| 4 | | | | | BS | B | | | | | | | |
| | | | | | ST | 5 | 450 | | CU, Y | 0.1 | 1.5 | 40.9 | 57.5 |
| 5 | | | | | SS | 6 | 450 | 15 | | | | | |
| 6 | 1189.39 | | | | | | | | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL - sandy to some sand, gravelly to trace gravel, trace coal specks, dry to damp | | | ST | 7 | 400 | | | | | | |
| 7 | | | | | SS | 8 | 450 | 17 | | | | | |
| | | | | | BS | C | | | | 58.8 | 27.0 | 9.0 | 5.2 |
| | | | | | ST | 9 | 380 | | | | | | |
| 8 | | | | | SS | 10 | 450 | 39 | | | | | |
| | | | | | BS | D | | | | | | | |
| 9 | | | | | SS | 11 | 450 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D16**

CLIENT Alberta Transportation
NORTHING 5656870
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29781
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/24
WATER LEVEL (9.0 m) 2016/04/24
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, medium plasticity clay (CI) TILL<br>- sandy to some sand, gravelly to trace gravel, trace coal specks, dry to damp | | | | | | | | | | | |
| 11 | | | | | SS | 12 | 450 | 37 | | 10.1 | 13.4 | 47.5 | 28.9 |
| 12 | 1182.79 | | | | SS | 13 | 200 | 50+ | | | | | |
| 13 | | Bedrock encountered at 12.7 m<br>- auger refusal at 12.7 m, coring commenced at 12.6 m (see rock coring log for details)<br>- borehole advanced into bedrock to 36.6 m<br>- water at 9.0 m and sloughing at 36.4 m upon completion | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D16**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/24/2016 to 4/24/2016

NORTHING: 5656870
EASTING: -29781
WATER LEVEL (9.0 m) 4/24/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 182.8 | | | | | | | | | | | |
| 13 | | Very poor quality grey SANDSTONE<br>- completely weathered<br>- extremely weak | | | RC14 | 53 | 20 | 9 | | R2 | W2 | |
| 14 | | - slightly to modeately weathered below 14.2 m | | | RC15 | 100 | 43 | 24 | | R2 | W2.5 | |
| 15 | | | | | | | | | | | | |
| 16 | 179.5 | Very poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | RC16 | 97 | 61 | 22 | | R1 | W3 | |
| 17 | | | | | | | | | | | | |
| | 177.9 | | | | | | | | | | | |
| 18 | 177.5 | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC17 | 94 | 57 | 25 | | R1 | W3.5 | |
| | | Very poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| 19 | | | | | RC18 | 93 | 70 | 22 | | R0 | W3 | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | RC19 | 94 | 36 | 20 | | R0 | W3 | |
| | | - slightly to moderately weathered below 21.6 m<br>- bentonite layer between 21.7 m and 21.9 m | | | | | | | | | | |
| 22 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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Stantec

# BOREHOLE RECORD

**D16**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/24/2016 to 4/24/2016
NORTHING: 5656870
EASTING: -29781
WATER LEVEL (9.0 m) 4/24/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | | Very poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | RC20 | 98 | 51 | 24 | | R0 | W2.5 | |
| 23 | | - completely weathered, extremely weak below 23.1 m | | | RC21 | 98 | 6 | 0 | | R0 | W5 | |
| 24 | | - greenish grey below 24.4 m<br>- grey below 24.6 m<br>- highly to completely weathered, extremely weak below 24.7 m | | | RC22 | 100 | 44 | 26 | | R0 | W4.5 | |
| 26 | 168.7 | | | | RC23 | 100 | 91 | 78 | | R2 | W2 | |
| 27 | | Good quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 28 | | | | | RC24 | 100 | 99 | 86 | | R2 | W2 | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | RC25 | 96 | 96 | 72 | | R2 | W2 | |
| 31 | | - moderately weathered below 30.6 m | | | RC26 | 94 | 88 | 81 | | R2 | W3 | |
| 32 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:18:59 PM

Stantec

# BOREHOLE RECORD

**D16**

CLIENT Alberta Transportation
NORTHING: 5656870
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -29781
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 4/24/2016 to 4/24/2016
WATER LEVEL (9.0 m) 4/24/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | | | | | | | | | | | | |
| | 163.4 | Fair quality grey MUDSTONE<br>- moderately weathered<br>- very weak | | | RC27 | 96 | 76 | 67 | | R1 | W3 | |
| 33 | | | | | | | | | | | | |
| | | - poor quality, extremely weak below 33.6 m | | | RC28 | 96 | 69 | 47 | | R0 | W3 | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| | | | | | RC29 | 100 | 62 | 29 | | R0 | W3 | |
| 36 | | | | | | | | | | | | |
| | 158.9 | End of borehole (36.6 m)<br>- borehole slough to 36.4 m, and water at 9.0 m<br>- borehole backfilled with cuttings and bentonite seals placed from 0.3 m to 0.5 m and 24.2 m to 36.4 m | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:00 PM

Stantec

# BOREHOLE RECORD

**D17**

CLIENT Alberta Transportation
NORTHING 5656973
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29676
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/29
WATER LEVEL (2.1 m) 2016/04/29
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1193.07 | TOPSOIL | | | SS | 1 | 330 | 11 | | | | | |
| | 1192.62 | Very stiff, brown, high plasticity CLAY (CH) - silty, trace sand, mottled grey, moist | | | | | | | | | | | |
| 1 | | | | | ST | 2 | 180 | | Y | | | | |
| | | | | | SS | 3 | 150 | 14 | | | | | |
| 2 | | | | ▼ | ST | 4 | 360 | | Qu, Y | 0.0 | 3.7 | 25.9 | 70.4 |
| | | | | | SS | 5 | 400 | 14 | | | | | |
| 3 | | | | | ST | 6 | 300 | | | | | | |
| | | | | | SS | 7 | 400 | 16 | | | | | |
| 4 | | | | | ST | 8 | 350 | | Qu, Y | 0.1 | 2.8 | 40.2 | 56.9 |
| | | | | | SS | 9 | 325 | 11 | | | | | |
| 5 | | | | | ST | 10 | 380 | | k, Y | 0.0 | 2.3 | 42.6 | 55.1 |
| | | | | | SS | 11 | 350 | 13 | | | | | |
| | | | | | ST | 12 | 400 | | | | | | |
| 6 | | | | | SS | 13 | 350 | 14 | | | | | |
| | | | | | ST | 14 | 410 | | | | | | |
| 7 | | | | | SS | 15 | 450 | 14 | | | | | |
| | | | | | BS | 16 | | | | | | | |
| | | | | | SS | 17 | 450 | 16 | | | | | |
| 8 | | | | | | | | | | | | | |
| | | | | | BS | 18 | | | | | | | |
| 9 | | - seepage at 9.1 m | | | | | | | | | | | |
| | | | | | SS | 19 | 450 | 14 | | | | | |
| | 1183.47 | Compact, brown, SILT - some sand, trace gravel, wet | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D17**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/29

NORTHING 5656973
EASTING -29676
WATER LEVEL (2.1 m) 2016/04/29

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1182.37 | Compact, brown, SILT<br>- some sand, trace gravel, wet | | | | | | | | | | | |
| 11 | | Hard, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, dry | | | ST | 20 | 440 | | CU, Y | 4.7 | 9.8 | 55.4 | 30.2 |
| | | | | | SS | 21 | 400 | 20 | | | | | |
| 12 | | - sandy, some gravel below 11.6 m | | | BS | 22 | | | | | | | |
| | | | | | SS | 23 | 450 | 50+ | | 12.3 | 20.8 | 42.1 | 24.8 |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | SS | 24 | 450 | 50+ | | | | | |
| | 1178.77 | | | | | | | | | | | | |
| | | Very poor quality grey (inferred) MUDSTONE<br>- extremely weak | | | BS | 25 | | | | | | | |
| 15 | 1177.87 | | | | | | | | | | | | |
| | | Bedrock encountered at 14.3 m<br>- coring commenced at 15.2 m (see rock coring log for details)<br>- borehole advanced into bedrock to 23.1 m<br>- water at 2.1 m upon completion | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D17**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/29/2016 to 4/29/2016
NORTHING: 5656973
EASTING: -29676
WATER LEVEL (2.1 m) 4/29/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | | | | | | | | | | | |
| | 178.8 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | | Very poor quality grey (inferred) MUDSTONE<br>- extremely weak | | | | | | | | | | |
| 15 | 177.9 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC26 | 70 | 45 | 0 | | R2 | W3 | |
| 16 | 176.8 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC27 | 100 | 28 | 7 | | R1 | W4.5 | |
| 17 | | | | | | | | | | | | |
| | | | | | RC28 | 100 | 25 | 10 | | R1 | W4 | |
| 18 | 175.1 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- slightly to moderately weathered<br>- weak<br>- slightly weathered below 18.6 m | | | | | | | | | | |
| 19 | | | | | RC29 | 98 | 72 | 58 | | R1 | W3.5 | |
| | 173.6 | | | | | | | | | | | |
| | | Fair quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 20 | 173.2 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC30 | 100 | 86 | 56 | | R2 | W2 | |
| 21 | | | | | | | | | | | | |
| | 171.5 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC31 | 100 | 17 | 0 | | R0 | W5.5 | |
| 22 | | | | | | | | | | | | |
| 23 | 170.0 | | | | | | | | | | | |
| | | End of borehole (23.1 m)<br>- water at 2.1 m<br>- borehole backfilled with cuttings and bentonite seals from 0.3 m to 0.5 m | | | | | | | | | | |
| 24 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:03 PM

Stantec

# BOREHOLE RECORD

**D17**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/29/2016 to 4/29/2016
NORTHING: 5656973
EASTING: -29676
WATER LEVEL (2.1 m) 4/29/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | | and 12.7 m to 23.1 m | | | | 80 60 40 20 | 80 60 40 20 | 80 60 40 20 | 5 10 15 20 | R5 R4 R3 R2 | W1 W2 W3 W4 W5 W6 | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:03 PM

Stantec

# BOREHOLE RECORD

**D18**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/28

NORTHING 5656995
EASTING -29568
WATER LEVEL (6.1 m) 2016/04/26

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1192.76 | | | | | | | | | | | | |
| | 1192.56 | TOPSOIL | | | SS | 1 | 300 | 11 | | | | | |
| | | Stiff to very stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, mottled grey, moist | | | | | | | | | | | |
| 1 | | | | | ST | 2 | 310 | | | | | | |
| | | | | | SS | 3 | 300 | 16 | | | | | |
| 2 | | - shelby tube lost downhole at 1.8 m, fragments of tube prevented collection of SPTs and Shelby tubes between 2.3 m and 4.1 m | | | ST | 4 | 0 | | | | | | |
| | | | | | SS | 5 | 0 | | | | | | |
| 3 | | | | | ST | 6 | 0 | | | | | | |
| | | | | | SS | 7 | 0 | | | | | | |
| | | | | | BS | 8 | 0 | | | | | | |
| 4 | | | | | ST | 9 | 0 | | | | | | |
| | | | | | SS | 10 | 450 | 15 | | | | | |
| | | | | | SS | 11 | 450 | 15 | | | | | |
| 5 | | | | | | | | | | | | | |
| | | | | | ST | 12 | 420 | | | | | | |
| 6 | | | | | SS | 13 | 450 | 15 | | | | | |
| | | | | | ST | 14 | 420 | | Y | 0.0 | 4.5 | 39.9 | 55.6 |
| 7 | | | | | SS | 15 | 125 | 14 | | | | | |
| | | | | | BS | 16 | | | | | | | |
| | | | | | SS | 17 | 450 | 14 | | | | | |
| 8 | | | | | BS | 18 | | | | | | | |
| | | | | | | | | | | | | | |
| 9 | | | | | ST | 19 | 450 | | | | | | |
| | | | | | SS | 20 | 450 | 16 | | | | | |
| 10 | 1182.76 | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D18**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/28

NORTHING 5656995
EASTING -29568
WATER LEVEL (6.1 m) 2016/04/26

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, damp to moist | | | | | | | | |
| | | | SS | 21 | 450 | 28 | | | | |
| 11 | | | BS | 22 | | | | | | |
| 12 | | - hard below 12.2 m | SS | 23 | 450 | 45 | | | | |
| 13 | | | BS | 24 | | | 9.8 | 19.6 | 44.8 | 25.8 |
| | | - evidence of cobbles at 13.7 m | SS | 25 | 450 | 50+ | | | | |
| 14 | | - grey below 14.0 m | | | | | | | | |
| | | | BS | 26 | | | | | | |
| 15 | | | SS | 27 | 450 | 50+ | | | | |
| 16 | | | | | | | | | | |
| | 1175.96 | | ~~SS~~ | ~~28~~ | ~~25~~ | ~~50+~~ | | | | |
| 17 | 1175.56 | Very poor quality grey (inferred) MUDSTONE<br>- extremely weak | BS | 29 | | | | | | |
| | | Bedrock encountered at 16.8 m<br>- coring commenced at 17.2 m (see rock coring log for details)<br>- borehole advanced into bedrock to 50.2 m<br>- water at 6.1 m and borehole open upon completion<br>- borehole dry during augering | | | | | | | | |
| 18 | | | | | | | | | | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D18**

CLIENT Alberta Transportation NORTHING: 5656995 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29568 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/28/2016 to 4/28/2016 WATER LEVEL (6.1 m) 4/28/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 176.0 | | | | | | | | | | | |
| 17 | | Very poor quality grey (inferred) MUDSTONE - extremely weak | | | | | | | | | | |
| | 175.6 | | | | | | | | | | | |
| | | Very poor quality grey SILTSONE - highly weathered - weak | | | | | | | | | | |
| | 175.1 | | | | | | | | | | | |
| 18 | | Very poor quality grey MUDSTONE - completely weathered - extremely weak | | | RC30 | 100 | 17 | 0 | | R1 | W4 | |
| | 174.1 | | | | | | | | | | | |
| 19 | | Very poor quality grey SANDSTONE - moderately weathered - weak | | | RC31 | 100 | 26 | 14 | | R1 | W4.5 | |
| | 173.2 | | | | | | | | | | | |
| 20 | | Very poor quality grey MUDSTONE - completely weathered - extremely weak | | | RC32 | 100 | 28 | 8 | | R0.5 | W5 | |
| 21 | | | | | | | | | | | | |
| | 171.5 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE - highly weathered - very weak | | | | | | | | | | |
| | 170.9 | | | | | | | | | | | |
| 22 | | Very poor quality grey MUDSTONE - completely weathered - extremely weak | | | RC33 | 100 | 17 | 13 | | R0.5 | W5 | |
| 23 | | | | | | | | | | | | |
| | 169.7 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE - moderately weathered - very weak | | | | | | | | | | |
| | 169.2 | | | | | | | | | | | |
| 24 | | Very poor quality grey MUDSTONE - completely weathered - extremely weak | | | RC34 | 94 | 22 | 10 | | R0.5 | W4.5 | |
| | 168.1 | | | | | | | | | | | |
| 25 | | Very poor quality grey SANDSTONE - moderately weathered - very weak | | | | | | | | | | |
| | 167.4 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE - completely weathered - extremely weak | | | RC35 | 96 | 50 | 22 | | R0.5 | W4.5 | |
| 26 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D18**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/28/2016 to 4/28/2016

NORTHING: 5656995
EASTING: -29568
WATER LEVEL (6.1 m) 4/28/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 166.2 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC36 | 100 | 75 | 72 | | R1 | W4 | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| | 164.6 | | | | | | | | | | | |
| | | Fair quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | RC37 | 100 | 78 | 56 | | R1 | W3 | |
| | 164.2 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak<br>- excellent quality below 29.2 m | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | RC38 | 100 | 96 | 95 | | R2 | W2 | |
| | 162.3 | | | | | | | | | | | |
| | | Very poor quality MUDSTONE<br>- highly weathered<br>- very weak | | | | | | | | | | |
| 31 | | | | | RC39 | 98 | 30 | 0 | | R0.5 | W4 | |
| | 161.0 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak<br>- fair quality, slightly weathered below 32.2 m | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | RC40 | 98 | 89 | 69 | | R2 | W2 | |
| 34 | | | | | | | | | | | | |
| | | - thin mudstone layer at 34.3 m | | | RC41 | 99 | 85 | 75 | | R2 | W2.5 | |
| 35 | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 36 | 156.8 | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D18**

CLIENT Alberta Transportation — NORTHING: 5656995 — PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB — EASTING: -29568 — BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/28/2016 to 4/28/2016 — WATER LEVEL (6.1 m) 4/28/2016 — DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | | Poor quality grey SHALE<br>- highly weathered<br>- extremely weak<br>- sandstone layer at 36.6 m | | | RC42 | 99 | 62 | 43 | | R2 | W2.5 | |
| | 156.1 | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 37 | | | | | RC43 | 100 | 11 | 0 | | R0 | W5 | |
| 38 | 154.6 | Very poor quality grey to dark grey MUDSTONE/SHALE<br>- highly weathered<br>- very weak | | | | | | | | | | |
| | 154.0 | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC44 | 95 | 47 | 13 | | R1.5 | W3.5 | |
| 39 | 153.5 | Very poor quality grey MUDSTONE/SHALE<br>- moderately to highly weathered<br>- very weak | | | | | | | | | | |
| 40 | | | | | RC45 | 94 | 40 | 19 | | R1 | W3.5 | |
| 41 | 151.5 | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 42 | | | | | RC46 | 94 | 55 | 25 | | R1 | W3.5 | |
| | 150.6 | Very poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weak<br>- very weak below 42.7 m | | | | | | | | | | |
| 43 | | | | | RC47 | 100 | 50 | 36 | | R0.5 | W5 | |
| 44 | | - completely weathered, extremely weak below 43.5 m<br>- highly weathered, very weak below 44.2 m | | | | | | | | | | |
| | 148.1 | Poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 45 | | | | | RC48 | 100 | 72 | 42 | | R1.5 | W3.5 | |
| | | - fair quality below 45.7 m | | | | | | | | | | |
| 46 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D18**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/28/2016 to 4/28/2016

NORTHING: 5656995
EASTING: -29568
WATER LEVEL (6.1 m) 4/28/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | | Poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC49 | 100 | 77 | 60 | | R2 | W3 | |
| 47 | | - poor quality below 47.2 m | | | | | | | | | | |
| 48 | 144.6 | | | | RC50 | 96 | 56 | 36 | | R1.5 | W3.5 | |
| | | Poor quality dark grey SHALE<br>- highly weathered<br>- very weak<br>- fair quality, dark grey to black below 48.7 m | | | | | | | | | | |
| 49 | 143.7 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC51 | 100 | 84 | 64 | | R1.5 | W3.5 | |
| 50 | 142.6 | | | | | | | | | | | |
| | | End of borehole (50.2 m)<br>- borehole open, and water at 6.1 m<br>- borehole backfilled with cuttings and bentonite seals placed at 0.3 m to 0.5 m and16.0 m to 50.2 m | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:06 PM

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# BOREHOLE RECORD

**D19**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/22

NORTHING 5656742
EASTING -29470
WATER LEVEL (0.0 m) 4/22/2016

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.62 | Black/Brown TOPSOIL | | | BS | 1 | | | | | | | |
| | 1190.27 | Stiff to very stiff, brown, high plasticity CLAY (CH) - silty, trace sand, trace rootlets, damp | | | | | | | | | | | |
| 1 | | | | | BS | 2 | | | | | | | |
| | | | | | ST | 3 | 350 | | | | | | |
| 2 | | - end rootlets at 2.0 m | | | SS | 4 | 200 | 13 | | | | | |
| | | - mottled grey below 2.5 m | | | BS | 5 | | | | | | | |
| 3 | | | | | ST | 6 | 450 | | CU, Y | 0.0 | 2.4 | 34.3 | 63.3 |
| | | | | | SS | 7 | 450 | 19 | | | | | |
| 4 | | | | | BS | 8 | | | | | | | |
| | | | | | ST | 9 | 475 | | | | | | |
| 5 | | | | | SS | 10 | 450 | 18 | | | | | |
| | | | | | BS | 11 | | | | 0.0 | 2.7 | 37.3 | 60.0 |
| 6 | | | | | ST | 12 | 400 | | CU, Y | | | | |
| | | | | | SS | 13 | 450 | 19 | | | | | |
| 7 | | | | | BS | 14 | | | | | | | |
| | | | | | SS | 15 | 450 | 17 | | | | | |
| 8 | | | | | BS | 16 | | | | 0.0 | 6.3 | 31.7 | 62.0 |
| | 1182.12 | Very stiff to hard, brown, medium plasticity clay (CI) TILL - silty, some sand, trace gravel, damp | | | SS | 17 | 450 | 22 | | | | | |
| 9 | | | | | BS | 18 | | | | 0.0 | 12.0 | 53.8 | 34.1 |
| | | | | | SS | 19 | 350 | 29 | | | | | |
| 10 | | | | | BS | 20 | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D19**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/04/22

NORTHING 5656742
EASTING -29470
WATER LEVEL (0.0 m) 4/22/2016

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff to hard, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, damp | | | ST | 21 | 400 | | CU, Y | 10.8 | 19.9 | 44.6 | 24.8 |
| | | | | | SS | 22 | 375 | 35 | | | | | |
| 11 | | - brownish grey below 10.8 m | | | SS | 24 | 450 | 40 | | | | | |
| | | | | | BS | 25 | | | | 4.5 | 18.0 | 42.8 | 34.7 |
| | | | | | SS | 26 | 450 | 39 | | | | | |
| 12 | | | | | BS | 27 | | | | | | | |
| | | | | | ST | 28 | 375 | | CU, Y | | | | |
| 13 | | | | | SS | 29 | 400 | 48 | | | | | |
| | | | | | BS | 30 | | | | 1.7 | 13.9 | 47.5 | 36.8 |
| 14 | | | | | SS | 31 | 450 | 50+ | | | | | |
| | | | | | BS | 32 | | | | | | | |
| | | | | | SS | 33 | 400 | 50+ | | | | | |
| 15 | | | | | BS | 34 | | | | 3.7 | 15.9 | 45.3 | 35.1 |
| | | | | | SS | 35 | 150 | 47 | | | | | |
| 16 | | | | | BS | 36 | | | | | | | |
| | | | | | SS | 37 | 450 | 50+ | | | | | |
| | | | | | BS | 38 | | | | | | | |
| 17 | | | | | SS | 39 | 450 | 50+ | | | | | |
| | | | | | BS | 40 | | | | | | | |
| | | | | | SS | 41 | 425 | 50+ | | | | | |
| 18 | | | | | BS | 42 | | | | 8.2 | 15.6 | 43.8 | 32.3 |
| | | | | | SS | 43 | 450 | 44 | | | | | |
| 19 | | | | | BS | 44 | | | | | | | |
| | | - inferred rafted sandstone boulder from 19.2 m to 19.5 m | | | SS | 45 | 150 | 50+ | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D19**

CLIENT Alberta Transportation
NORTHING 5656742
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29470
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/04/22
WATER LEVEL (0.0 m) 4/22/2016
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1170.52 | Bedrock encountered at 20.1 m<br>- Coring commenced at 19.4 m due to rafted sandstone boulder at 19.2 m (see rock coring log for details)<br>- borehole advanced into bedrock to 29.3 m<br>- water at surface upon completion<br>- borehole dry during augering<br>- standpipe piezometer installed slotted from 16.8 m to 19.8 m | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D19**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/22/2016 to 4/22/2016
NORTHING: 5656742
EASTING: -29470
WATER LEVEL (0.0 m) 4/22/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 19 | 171.4 | | | | | | | | | | | |
| | 171.1 | Very poor quality tan (inferred) SANDSTONE - slightly weathered - weak to medium strong | | | RC46 | 100 | 75 | 0 | | R1 | W4.5 | |
| 20 | 170.5 | Hard brownish grey lean clay (CL) TILL - trace sand, trace gravel, bedrock fragments | | | RC47 | 44 | 36 | 0 | | R1 | W4.5 | |
| 21 | | Fair quality grey stratified MUDSTONE to SHALE - slightly to completely weathered - extremely weak to weak | | | RC48 | 74 | 57 | 51 | | R1 | W4.5 | |
| | 168.9 | | | | RC49 | 100 | 100 | 100 | | R1 | W4.5 | |
| 22 | | Good quality grey SANDSTONE - slightly weathered - very weak to weak | | | | | | | | | | |
| | 168.1 | | | | RC50 | 100 | 98 | 80 | | R1.5 | W2 | |
| 23 | | Good quality grey SHALE - slightly weathered - very weak to weak | | | | | | | | | | |
| 24 | | - coal layer from 24.1 m to 24.3 m | | | RC51 | 88 | 0 | 0 | | R0.5 | W4.5 | |
| | 165.9 | | | | | | | | | | | |
| 25 | | Fair quality grey SANDSTONE - slightly weathered - very weak to weak | | | | | | | | | | |
| | 165.2 | | | | RC52 | 96 | 88 | 63 | | R1.5 | W2.5 | |
| 26 | | Fair quality grey SHALE - slightly to moderately weathered - very weak to weak | | | | | | | | | | |
| | 163.8 | | | | | | | | | | | |
| 27 | | Good to excellent quality grey SANDSTONE - slightly weathered - very weak | | | RC53 | 100 | 83 | 77 | | R1.5 | W2.5 | |
| 28 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D19**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/22/2016 to 4/22/2016
NORTHING: 5656742
EASTING: -29470
WATER LEVEL (0.0 m) 4/22/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | | Good to excellent quality grey SANDSTONE<br>- slightly weathered<br>- very weak | | | RC54 | 100 | 100 | 100 | | R2 | W2 | |
| 29 | 1161.3 | End of borehole (29.3 m)<br>- water at surface<br>- standpipe piezometer installed, slotted from 16.8 m to 19.8 m<br>- borehole backfilled with cuttings and bentonite seals placed from 0.5 m to 1.2 m, 16.2 m to 16.5 m and 20.6 m to 29.3 m | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D19**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/22/2016 to 4/22/2016
NORTHING: 5656742
EASTING: -29470
WATER LEVEL (0.0 m) 4/22/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 19 | 171.4 | | | | | | | | | | | |
| | 171.1 | Very poor quality tan (inferred) SANDSTONE - slightly weathered - weak to medium strong | | | RC46 | 100 | 75 | 0 | | R1 | W4.5 | |
| 20 | 170.5 | Hard brownish grey lean clay (CL) TILL - trace sand, trace gravel, bedrock fragments | | | RC47 | 44 | 36 | 0 | | R1 | W4.5 | |
| | | Fair quality grey stratified MUDSTONE to SHALE - slightly to completely weathered - extremely weak to weak | | | RC48 | 74 | 57 | 51 | | R1 | W4.5 | |
| 21 | 168.9 | | | | RC49 | 100 | 100 | 100 | | R1 | W4.5 | |
| 22 | | Good quality grey SANDSTONE - slightly weathered - very weak to weak | | | | | | | | | | |
| | 168.1 | Good quality grey SHALE - slightly weathered - very weak to weak | | | RC50 | 100 | 98 | 80 | | R1.5 | W2 | |
| 23 | | | | | | | | | | | | |
| 24 | | - coal layer from 24.1 m to 24.3 m | | | RC51 | 88 | 0 | 0 | | R0.5 | W4.5 | |
| | 165.9 | | | | | | | | | | | |
| 25 | | Fair quality grey SANDSTONE - slightly weathered - very weak to weak | | | | | | | | | | |
| | 165.2 | Fair quality grey SHALE - slightly to moderately weathered - very weak to weak | | | RC52 | 96 | 88 | 63 | | R1.5 | W2.5 | |
| 26 | | | | | | | | | | | | |
| | 163.8 | | | | | | | | | | | |
| 27 | | Good to excellent quality grey SANDSTONE - slightly weathered - very weak | | | RC53 | 100 | 83 | 77 | | R1.5 | W2.5 | |
| 28 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D19**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/22/2016 to 4/22/2016
NORTHING: 5656742
EASTING: -29470
WATER LEVEL (0.0 m) 4/22/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | | Good to excellent quality grey SANDSTONE<br>- slightly weathered<br>- very weak | | | RC54 | 100 | 100 | 100 | | R2 | W2 | |
| 29 | 1161.3 | End of borehole (29.3 m)<br>- water at surface<br>- standpipe piezometer installed, slotted from 16.8 m to 19.8 m<br>- borehole backfilled with cuttings and bentonite seals placed from 0.5 m to 1.2 m, 16.2 m to 16.5 m and 20.6 m to 29.3 m | | | | | | | | | | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D20**

CLIENT Alberta Transportation
NORTHING 5657144
PROJECT NO. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29997
BH SIZE SS:150mm, HS:200mm

DATES BORING 2016/04/26
WATER LEVEL (5.5 m) 2016/04/26
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1195.85 | Black TOPSOIL<br>- some sand, dry to damp, trace rootlets | | | SS | 1 | | 8 | | | | | |
| | 1195.35 | Stiff to very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, gravel, moist | | | | | | | | 1.0 | 4.1 | 40.3 | 54.6 |
| 1 | | | | | ST | 2 | 290 | | | | | | |
| | | | | | SS | 3 | 100 | 15 | | | | | |
| 2 | | | | | ST | 4 | 290 | | | | | | |
| | | | | | SS | 5 | 300 | 15 | | | | | |
| 3 | | | | | ST | 6 | 310 | | C, Y | 0.0 | 11.6 | 39.7 | 48.7 |
| | | | | | SS | 7 | 350 | 15 | | | | | |
| 4 | | | | | ST | 8 | 430 | | CU, Y | | | | |
| | | | | | SS | 9 | 450 | 16 | | | | | |
| 5 | | | | | ST | 10 | 390 | | Qu, Y | | | | |
| | | | | | SS | 11 | 375 | 15 | | 1.5 | 6.6 | 34.9 | 57.0 |
| 6 | | | | | ST | 12 | 360 | | C, Y | | | | |
| | | | | | SS | 13 | 300 | 18 | | | | | |
| 7 | | | | | | | | | | | | | |
| | | | | | ST | 14 | 520 | | | | | | |
| 8 | | | | | SS | 15 | 450 | 16 | | 0.0 | 2.9 | 27.1 | 70.0 |
| 9 | | - low plastic below 9.1 m | | | ST | 16 | 420 | | | | | | |
| | | | | | SS | 17 | 450 | 19 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D20**

CLIENT Alberta Transportation NORTHING 5657144 PROJECT NO. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING -29997 BH SIZE SS:150mm, HS:200mm

DATES BORING 2016/04/26 WATER LEVEL (5.5 m) 2016/04/26 DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1185.65 | | | | | | | | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, trace coal specks, dry to damp, | | | SS | 18 | 350 | 50+ | | 10.2 | 21.1 | 39.7 | 29.0 |
| 11 | 1184.15 | | | | | | | | | | | | |
| | | Very poor quality brown (inferred) MUDSTONE<br>- extremely weak | | | BS | 19 | | | | | | | |
| 12 | 1183.65 | | | | | | | | | | | | |
| | | Bedrock encountered at 11.7 m<br>- coring commenced at 12.2 m (see rock coring log for details)<br>- borehole advanced into bedrock to 50.1 m<br>- water at 5.5 m and sloughing at 11.7 m<br>- borehole dry during augering | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D20**

CLIENT Alberta Transportation NORTHING: 5657144 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29997 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/26/2016 to 4/26/2016 WATER LEVEL (5.5 m) 4/26/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 184.2 | | | | | | | | | | | |
| 12 | | Very poor quality brown (inferred) MUDSTONE - extremely weak | | | | | | | | | | |
| | 183.7 | | | | | | | | | | | |
| | | Very poor quality grey SILTSTONE - moderately weathered - weak - poor quality, completely weathered, extremely weak to weak below 12.6 m | | | RC20 | 100 | 55 | 0 | | R1 | W4.5 | |
| 13 | | | | | RC21 | 84 | 48 | 27 | | R1 | W4.5 | |
| 14 | | | | | RC22 | 98 | 48 | 13 | | R1 | W4.5 | |
| 15 | 180.9 | Very poor quality grey SANDSTONE - highly to completely weathered - weak | | | | | | | | | | |
| | 180.4 | Very poor quality grey SILTSTONE - highly to completely weathered - extremely weak to weak | | | | | | | | | | |
| 16 | 179.8 | Very poor quality grey MUDSTONE - completely weathered - extremely weak | | | RC23 | 100 | 12 | 0 | | R1 | W5 | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | RC24 | 100 | 8 | 0 | | R0 | W5 | |
| | 177.1 | | | | | | | | | | | |
| 19 | | Very poor quality grey SILTSTONE - moderately weathered - weak | | | RC25 | 93 | 51 | 21 | | R2 | W3 | |
| | 176.1 | | | | | | | | | | | |
| 20 | | Very poor quality grey MUDSTONE - completely weathered - extremely weak | | | RC26 | 100 | 14 | 9 | | R0 | W5.5 | |
| 21 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:12 PM

Stantec

# BOREHOLE RECORD

**D20**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 4/26/2016 to 4/26/2016

NORTHING: 5657144
EASTING: -29997
WATER LEVEL (5.5 m) 4/26/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 21 | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 22 | | | | | RC27 | 100 | 23 | 14 | | R0 | W5.5 | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | RC28 | 100 | 19 | 12 | | R0 | W5.5 | |
| | 171.3 | | | | | | | | | | | |
| 25 | | Poor quality grey SILTSTONE<br>- moderately weathered<br>- weak | | | RC29 | 100 | 72 | 30 | | R2 | W3 | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | RC30 | 98 | 85 | 73 | | R2 | W2.5 | |
| | 168.5 | | | | | | | | | | | |
| 28 | | Poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely weak | | | RC31 | 98 | 68 | 50 | | R0 | W3 | |
| 29 | | - slightly weathered below 29.1 m | | | | | | | | | | |
| | 166.3 | | | | | | | | | | | |
| 30 | | Good quality grey green SANDSTONE<br>- slightly to moderately weathered<br>- weak<br>- poor quality, grey below 30.6 m | | | RC32 | 100 | 89 | 83 | | R1 | W2.5 | |
| 31 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:12 PM

Stantec

# BOREHOLE RECORD

**D20**

CLIENT Alberta Transportation NORTHING: 5657144 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29997 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/26/2016 to 4/26/2016 WATER LEVEL (5.5 m) 4/26/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | 164.7 | Poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely weak | | | RC33 | 100 | 76 | 45 | | R1 | W2.5 | |
| 32 | 163.4 | Fair quality grey SANDSTONE<br>- slightly to moderately weathered<br>- weak | | | RC34 | 100 | 82 | 71 | | R1 | W2.5 | |
| 33 | | | | | RC35 | 97 | 85 | 65 | | R1 | W3 | |
| 34 | 161.1 | Fair quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| 35 | 160.8 | Good quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC36 | 96 | 90 | 82 | | R2 | W2 | |
| 36 | | - fair quality, slightly to moderately weathered below 36.6 m | | | RC37 | 100 | 75 | 52 | | R2 | W2 | |
| 37 | 158.3 | Fair quality green grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| 38 | 157.6 | Good quality grey SANDSTONE<br>- slightly weathered<br>- extremely weak | | | RC38 | 98 | 89 | 83 | | R2 | W2 | |
| 39 | 157.1<br>156.9 | Good quality grey MUDSTONE<br>- moderately weathered<br>- extremely weak | | | | | | | | | | |
| | 156.5 | Good quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 40 | | Poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | RC39 | 100 | 72 | 49 | | R0 | W4 | |
| 41 | 155.2 | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:12 PM

Stantec

# BOREHOLE RECORD

**D20**

CLIENT Alberta Transportation
NORTHING: 5657144
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -29997
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 4/26/2016 to 4/26/2016
WATER LEVEL (5.5 m) 4/26/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 154.0 | | | | RC40 | 96 | 87 | 72 | | R1 | W3 | |
| 42 | | Fair quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| | 153.6 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 153.2 | | | | | | | | | | | |
| 43 | | Fair quality grey MUDSTONE<br>- slightly weathered<br>- very weak | | | RC41 | 96 | 81 | 66 | | R1.5 | W2 | |
| | 152.6 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 152.0 | | | | | | | | | | | |
| 44 | | Poor quality SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 151.1 | | | | RC42 | 98 | 71 | 37 | | R1.5 | W3 | |
| 45 | | Poor quality MUDSTONE<br>- highly weathered<br>- very weak | | | | | | | | | | |
| | 150.4 | | | | | | | | | | | |
| 46 | | Fair quality green to grey SANDSTONE<br>- slightly to moderately weathered<br>- weak | | | RC43 | 100 | 91 | 67 | | R2 | W2.5 | |
| 47 | 148.7 | | | | | | | | | | | |
| | | Fair quality grey MUDSTONE/SHALE<br>- slightly weathered<br>- very weak | | | | | | | | | | |
| | 148.0 | | | | RC44 | 95 | 80 | 73 | | R1.5 | W2 | |
| 48 | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 147.3 | | | | | | | | | | | |
| 49 | | Very poor quality MUDSTONE/SHALE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| | 146.5 | | | | RC45 | 97 | 74 | 21 | | R1.5 | W2.5 | |
| | | Very poor quality SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 50 | 145.8 | | | | | | | | | | | |
| | | End of borehole (50.1 m)<br>- borehole slough to 11.7 m, and water at 5.5 m<br>- borehole backfilled with cuttings and bentonite | | | | | | | | | | |
| 51 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D20**

CLIENT Alberta Transportation NORTHING: 5657144 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29997 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 4/26/2016 to 4/26/2016 WATER LEVEL (5.5 m) 4/26/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % (80 60 40 20) | RECOVERY SOLID CORE % (80 60 40 20) | R.Q.D. % (80 60 40 20) | FRACT. INDEX PER 1m (5 10 15 20) | ROCK STRENGTH INDEX (R5 R4 R3 R2) | WEATHERING INDEX (W1 W2 W3 W4 W5 W6) | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | | seals placed from 0.3 m to 0.5 m and 46.1 m to 52.1 m | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 57 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 59 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | |
| 61 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D27**

CLIENT Alberta Transportation
NORTHING 5656909
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29330
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/07/21
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.71 | TOPSOIL | | | | | | | | | | | |
| | 1190.31 | Very stiff, brown, high plasticity CLAY (CH) | | | BS | 1 | | | | | | | |
| 1 | | - silty, trace sand, gravel, dry | | | ST | 2 | 430 | | CU | | | | |
| | | | | | SS | 3 | 280 | 18 | | | | | |
| 2 | | - dry to moist below 1.7 m | | | ST | 4 | 330 | | CU, Y | 0.2 | 3.6 | 36.9 | 59.3 |
| | | - mottled light brown below 2.0 m | | | SS | 5 | 330 | 26 | | | | | |
| 3 | | - mottled grey, moist below 2.6 m | | | ST | 6 | 400 | | | | | | |
| | | | | | SS | 7 | 320 | 20 | | | | | |
| 4 | | | | | ST | 8 | 440 | | CU, Y | 2.8 | 7.5 | 41.6 | 48.1 |
| | | | | | SS | 9 | 450 | 16 | | | | | |
| | | - dark brown below 4.4 m | | | ST | 10 | 310 | | CU, Y | 0.2 | 3.8 | 43.1 | 53.0 |
| 5 | | | | | SS | 11 | 450 | 18 | | | | | |
| | | | | | ST | 12 | 460 | | | | | | |
| 6 | | | | | SS | 13 | 450 | 19 | | | | | |
| 7 | | | | | BS | 14 | | | | | | | |
| | | - seepage at 7.6 m | | | | | | | | | | | |
| 8 | | - moist to wet below 7.6 m | | | SS | 15 | 450 | 16 | | | | | |
| | | | | | BS | 16 | | | | | | | |
| 9 | | | | | ST | 17 | 460 | | CU, Y | 0.2 | 5.2 | 44.2 | 50.3 |
| | | | | | SS | 18 | 290 | 18 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D27**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/21
WATER LEVEL

NORTHING 5656909
EASTING -29330

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, high plasticity CLAY (CH) | | | BS | 19 | | | | | | | |
| | | - silty, trace sand, gravel, dry | | | | | | | | | | | |
| | | - trace coal specks below 10.7 m | | | | | | | | | | | |
| | 1179.81 | | | | SS | 20 | 450 | 16 | | | | | |
| 11 | | Very stiff to hard, brown, medium plasticity clay (CL) TILL | | | | | | | | | | | |
| | | - silty, some sand, trace gravel, dry to moist, trace oxides | | | | | | | | | | | |
| 12 | | | | | BS | 21 | | | | | | | |
| | | | | | ST | 22 | 500 | | Y | 0.6 | 5.5 | 48.4 | 45.5 |
| | | | | | SS | 23 | 450 | 50+ | | | | | |
| 13 | | - wet silt pocket from 12.9 m to 13.1 m | | | | | | | | | | | |
| | | | | | BS | 24 | | | | | | | |
| | | | | | SS | 25 | 370 | 50+ | | | | | |
| 14 | | | | | | | | | | | | | |
| | | | | | BS | 26 | | | | | | | |
| 15 | | | | | SS | 27 | 280 | 50+ | | | | | |
| | | | | | | | | | | | | | |
| 16 | | | | | BS | 28 | | | | | | | |
| | | - switch to hollow-stem augering at 16.8 m due to sloughing | | | | | | | | | | | |
| 17 | | | | | SS | 29 | 320 | 27 | | | | | |
| | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| | | | | | SS | 30 | 350 | 43 | | | | | |
| 19 | | | | | | | | | | | | | |
| | 1170.91 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D27**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/21
WATER LEVEL
NORTHING 5656909
EASTING -29330
PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Hard, brown, medium to high plasticity CLAY (CL-CH)<br>- some sand, trace gravel, mottled grey, moist | | | SS | 31 | 130 | 50+ | | | | | |
| 21 | 1169.41 | | | | | | | | | | | | |
| | | Very stiff, grey, medium plasticity clay (CI) TILL<br>- sandy, trace gravel, damp to moist | | | SS | 32 | 410 | 26 | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | SS | 33 | 370 | 28 | | | | | |
| 24 | | | | | | | | | | | | | |
| | | | | | SS | 34 | 310 | 27 | | | | | |
| 25 | | | | | | | | | | | | | |
| | 1164.81 | | | | SS | 35 | 25 | 50+ | | | | | |
| 26 | | Very poor quality brown (inferred) SANDSTONE<br>- completely weathered<br>- very weak | | | | | | | | | | | |
| | 1164.01 | | | | | | | | | | | | |
| 27 | | Bedrock encountered at 25.9 m<br>- coring commenced at 26.7 m (see rock coring log for details)<br>- borehole advanced into bedrock to 35.4 m | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D27**

CLIENT Alberta Transportation NORTHING: 5656909 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29330 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/21/2016 to 7/21/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 164.8 | | | | | | | | | | | |
| 26 | | Very poor quality brown (inferred) SANDSTONE<br>- completely weathered<br>- very weak | | | | | | | | | | |
| | 164.0 | Fair to good quality SANDSTONE<br>- slightly weathered<br>-weak | | | RC36 | 94 | 77 | 77 | | R2 | W2 | |
| 27 | 163.3 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | RC37 | 78 | 78 | 35 | | R1 | W3 | |
| 28 | 162.4 | - fair quality, slightly weathered below 27.6 m<br>Fair quailty grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC38 | 92 | 81 | 65 | | R2 | W2 | |
| | 162.0 | Fair quality grey CLAYSTONE<br>- slightly weathered<br>-very weak | | | | | | | | | | |
| 29 | | - very weak to weak, moderately weathered below 29.3 m | | | | | | | | | | |
| 30 | | | | | RC39 | 99 | 93 | 58 | | R1.5 | W3 | |
| 31 | | - fair quality, very weak to weak, moderately weathered below 30.8 m | | | RC40 | 99 | 94 | 73 | | R2 | W2 | |
| | 158.9 | Fair quality dark grey SANDSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 32 | 158.1 | Very poor quality dark grey CLAYSTONE<br>- moderately to highly weathered<br>- very weak | | | RC41 | 100 | 89 | 24 | | R1 | W3.5 | |
| 33 | | | | | | | | | | | | |
| 34 | 156.7 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 156.1 | | | | RC42 | 100 | 89 | 39 | | R2.5 | W2.5 | |
| 35 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D27**

CLIENT Alberta Transportation NORTHING: 5656909 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29330 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/21/2016 to 7/21/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | | | | | | 80 60 40 20 | 80 60 40 20 | 80 60 40 20 | 5 10 15 20 | R5 R4 R3 R2 | W1 W2 W3 W4 W5 W6 | |
| | | Poor quality dark grey CLAYSTONE<br>- moderately weathered | | | | | | | | | | |
| | 1155.3 | - weak | | | | | | | | | | |
| | | End of borehole (35.4 m)<br>- standpipe installation monitored by hydrogeology, refer to hydrogeology borehole records | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D28**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/09

NORTHING 5657045
EASTING -29452
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.44 | ~~1190.29~~ TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, medium to high plasticity CLAY (CI-CH) | | | | | | | | | | | |
| | | - silty, trace sand, trace gravel, moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 250 | | | | | | |
| | | - mottled grey below 1.0 m | | | SS | 3 | 270 | 12 | | | | | |
| 2 | | | | | ST | 4 | 500 | | CU, Y | 1.8 | 6.2 | 42.5 | 49.5 |
| | | - trace coal specks below 2.2 m | | | SS | 5 | 390 | 14 | | | | | |
| 3 | | | | | ST | 6 | 430 | | k, Y | 0.4 | 2.5 | 39.9 | 57.2 |
| | | | | | SS | 7 | 450 | 12 | | 0.4 | 0.4 | 38.8 | 60.5 |
| | | | | | ST | 8 | 420 | | C, Y | 1.4 | 0.8 | 43.3 | 54.5 |
| 4 | | | | | SS | 9 | 450 | 14 | | | | | |
| | | | | | ST | 10 | 470 | | CU, Y | 0.5 | 2.1 | 43.3 | 54.1 |
| 5 | | | | | SS | 11 | 450 | 14 | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | BS | 12 | | | | | | | |
| | | | | | SS | 13 | 450 | 14 | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | BS | 14 | | | | | | | |
| | | | | | ST | 15 | 530 | | CU, Y | 2.3 | 4.0 | 45.5 | 48.2 |
| 10 | | | | | SS | 16 | 450 | 13 | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D28**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/09
WATER LEVEL
NORTHING 5657045
EASTING -29452
PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Stiff, brown, medium to high plasticity CLAY (CI-CH) - silty, trace sand, trace gravel, moist | | | BS | 17 | | | | | | | |
| | 1179.44 | | | | SS | 18 | 450 | 22 | | | | | |
| 11 | | Compact, brown silt (ML) TILL - some sand to sandy, trace gravel, moist | | | | | | | | | | | |
| 12 | | | | | BS | 19 | | | | | | | |
| | | | | | SS | 20 | 440 | 34 | | | | | |
| 13 | 1177.14 | | | | | | | | | | | | |
| | | Hard, brown, low plasticity clay (CL) TILL - silty, some sand, some gravel, moist | | | BS | 21 | | | | 20.8 | 18.4 | 43.8 | 17.0 |
| 14 | | | | | SS | 22 | 450 | 35 | | | | | |
| | | - grey below 14.5 m | | | | | | | | | | | |
| 15 | | | | | BS | 23 | | | | | | | |
| | | | | | SS | 24 | 450 | 50+ | | | | | |
| 16 | | | | | | | | | | | | | |
| | | | | | BS | 25 | | | | | | | |
| 17 | | | | | SS | 26 | 420 | 50+ | | | | | |
| | 1172.64 | | | | BS | 27 | | | | | | | |
| | | Bedrock encountered at 17.8 m - Coring commenced at 17.8 m (see rock coring log for details) - borehole advanced into bedrock to 50.6 m | | | SS | 28 | 0 | 50+ | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D28**

CLIENT Alberta Transportation NORTHING: 5657045 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29452 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/9/2016 to 7/9/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 172.6 | | | | | | | | | | | |
| 18 | | Poor quality dark grey SANDSTONE<br>- slightly to moderately weathered<br>- medium strong | | | RC29 | 78 | 55 | 55 | | 3 | W2.5 | |
| | 171.6 | | | | | | | | | | | |
| 19 | | Poor quality dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | RC30 | 97 | 83 | 27 | | 3 | W2 | |
| 20 | | - 0.25 m thick layer of sandstone from 20.1 m to 20.35 m<br>- 0.15 m thick layer of sandstone from 20.5 m to 20.65 m | | | RC31 | 98 | 96 | 44 | | 3 | W2 | |
| 22 | | | | | RC32 | 100 | 85 | 70 | | 3 | W2 | |
| | 167.6 | | | | | | | | | | | |
| 23 | | Fair quality dark grey SANDSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 24 | | | | | RC33 | 100 | 97 | 56 | | 3 | W1 | |
| | 166.1 | | | | | | | | | | | |
| | 165.7 | Fair quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 25 | | Good quality dark grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | RC34 | 100 | 95 | 81 | | 2.5 | W2.5 | |
| | 164.8 | | | | | | | | | | | |
| 26 | | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 27 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:20 PM

Stantec

# BOREHOLE RECORD

**D28**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/9/2016 to 7/9/2016
NORTHING: 5657045
EASTING: -29452
WATER LEVEL
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | | | | | RC35 | 96 | 75 | 56 | | 2.5 | W2.5 | |
| | 163.1 | Fair quality grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 162.5 | | | | | | | | | | | |
| 28 | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC36 | 95 | 84 | 33 | | R2 | W3 | |
| 29 | | | | | | | | | | | | |
| | | - moderately to highly weathered below 29.3 m | | | | | | | | | | |
| 30 | | | | | RC37 | 100 | 76 | 18 | | R2 | W3.5 | |
| | | - medium strong below 30.8 m | | | | | | | | | | |
| 31 | | | | | RC38 | 100 | 96 | 35 | | R2 | W3.5 | |
| 32 | 158.4 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 33 | | | | | RC39 | 99 | 97 | 72 | | 3 | W2 | |
| | 156.7 | | | | | | | | | | | |
| 34 | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC40 | 88 | 71 | 46 | | R2 | W3 | |
| | 155.5 | | | | | | | | | | | |
| 35 | | Fair quality dark grey SANDSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| | 154.5 | | | | | | | | | | | |
| 36 | | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC41 | 100 | 100 | 70 | | 2.5 | W2 | |
| | 154.0 | | | | | | | | | | | |
| | | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 37 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D28**

CLIENT Alberta Transportation NORTHING: 5657045 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29452 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/9/2016 to 7/9/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | | | | | | | | | | | | |
| | | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC42 | 100 | 95 | 79 | | 3 | W2 | |
| 38 | 151.9 | | | | | | | | | | | |
| | | Fair quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>- weak to medium strong | | | RC43 | 100 | 100 | 60 | | 2.5 | W3 | |
| | 150.8 | | | | | | | | | | | |
| 40 | | Fair to good quality dark grey SANDSTONE<br>- fresh<br>- medium strong<br>- 0.22 m thick dark grey claystone layer, slightly weathered, and weak at 40.11 m | | | RC44 | 98 | 98 | 79 | | 3 | W1 | |
| 41 | | | | | | | | | | | | |
| | 148.5 | | | | | | | | | | | |
| 42 | | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC45 | 100 | 86 | 67 | | 2.5 | W1.5 | |
| | 148.1 | Fair quality dark grey SANDSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 43 | | | | | | | | | | | | |
| | 146.9 | | | | | | | | | | | |
| | | Good quality dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | RC46 | 100 | 94 | 78 | | 3 | W2 | |
| 44 | 146.3 | | | | | | | | | | | |
| | | Good quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 145.8 | | | | | | | | | | | |
| | | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC47 | 100 | 99 | 63 | | R2 | W2 | |
| 45 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| | 143.8 | | | | | | | | | | | |
| 47 | | | | | RC48 | 97 | 82 | 65 | | 2.5 | W2 | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D28**

CLIENT Alberta Transportation NORTHING: 5657045 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29452 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/9/2016 to 7/9/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | | | | | | | | | | | | |
| | 143.3 | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 142.6 | Fair quality dark grey CLAYSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 48 | | Good quality greenish grey SANDSTONE<br>- fresh<br>- medium strong | | | RC49 | 100 | 94 | 82 | | 3 | W1 | |
| 49 | 141.4 | Very poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 50 | | | | | RC50 | 88 | 71 | 10 | | R2 | W3 | |
| | 139.8 | End of borehole (50.6 m) | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 57 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D29**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/21
WATER LEVEL

NORTHING 5657082
EASTING -29334

PROJECT NO. 110773396
BH SIZE SONIC
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1191.02 | | | | | | | | | | | | |
| | 1190.92 | TOPSOIL | | | | | | | | | | | |
| | | Brown, medium to high plasticity CLAY (CI-CH) - silty, trace sand, trace gravel, damp | | | S | 1 | 900 | | | | | | |
| | | - trace gypsum at 3.7 m | | | S | 2 | 1500 | | CU, k | 1.4 | 4.7 | 44.9 | 49.1 |
| | | | | | S | 3 | 1500 | | | | | | |
| | | | | | S | 4 | 1500 | | | | | | |
| | | | | | S | 5 | 1500 | | | | | | |
| | | - 0.3 m thick layer of moist gravel from 9.6 m to 9.9 m | | | S | 6 | 1300 | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D29**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/21
WATER LEVEL

NORTHING 5657082
EASTING -29334

PROJECT NO. 110773396
BH SIZE SONIC
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, trace gravel, damp | | | | | | | | | | | |
| 11 | | | | | S | 7 | 1450 | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | S | 8 | 1400 | | | | | | |
| 14 | | | | | S | 9 | 1250 | | | | | | |
| 15 | 1175.82 | | | | | | | | | | | | |
| | | Brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, gravelly, sandy dry to damp | | | | | | | | | | | |
| 16 | | | | | S | 10 | 1050 | | | 29.3 | 29.0 | 30.3 | 11.5 |
| 17 | | - sand seam at 17.3 m | | | S | 11 | 1500 | | | | | | |
| 18 | | - brownish grey below 17.6 m | | | | | | | | | | | |
| | 1172.42 | | | | | | | | | | | | |
| 19 | | Brownish grey (inferred) MUDSTONE<br>- highly to completely weathered<br>- extremely weak | | | S | 12 | 1200 | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D29**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/21
WATER LEVEL
NORTHING 5657082
EASTING -29334
PROJECT NO. 110773396
BH SIZE SONIC
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Brownish grey (inferred) MUDSTONE<br>- highly to completely weathered<br>- extremely weak | | | S | 13 | 1100 | | | | | | |
| 21 | 1169.72 | | | | | | | | | | | | |
| | | End of Sonic borehole at 21.3 m<br>- bedrock encountered at 18.6 m<br>- sloughing at 20.0 m upon completion of sonic drilling<br>- borehole completed with rotary coring, coring commenced at 20.2 m (see rock coring log for details)<br>- borehole advanced in bedrock to 42.7 m | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D29**

CLIENT Alberta Transportation
NORTHING: 5657082
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -29334
BH SIZE HS:200mm
DRILLING DATE 8/17/2016 to 8/17/2016
WATER LEVEL (3.6 m) 8/17/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 172.4 | | | | | | | | | | | |
| 19 | | Brownish grey (inferred) MUDSTONE<br>- highly to completely weathered<br>- extremely weak | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | RC 1 | 79 | 43 | 25 | | R1.5 | W2.5 | |
| | 169.7 | | | | | | | | | | | |
| 22 | | Very poor quality grey MUDSTONE<br>- completely to highly weathered<br>- extremely to very weak | | | RC 2 | 95 | 20 | 7 | | R0.5 | W4.5 | |
| 23 | | | | | | | | | | | | |
| | 167.8 | | | | | | | | | | | |
| | | Very poor quality grey SILTSTONE<br>- slightly to moderately weathered<br>- very weak to weak | | | | | | | | | | |
| | 167.1 | | | | | | | | | | | |
| 24 | | Very poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely to very weak | | | RC 3 | 99 | 47 | 16 | | R1 | W3 | |
| 25 | | | | | RC 4 | 100 | 30 | 9 | | R0.5 | W3.5 | |
| | 165.1 | | | | | | | | | | | |
| 26 | | Very poor quality grey SANDSTONE<br>- slightly to moderately weathered<br>- very weak to weak | | | | | | | | | | |
| | 164.1 | | | | | | | | | | | |
| 27 | | Poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC 5 | 100 | 35 | 28 | | R2 | W2 | |
| 28 | 163.0 | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D29**

CLIENT Alberta Transportation
NORTHING: 5657082
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -29334
BH SIZE HS:200mm
DRILLING DATE 8/17/2016 to 8/17/2016
WATER LEVEL (3.6 m) 8/17/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | | | | | | | | | | | | |
| | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | RC 6 | 100 | 69 | 47 | | R2 | W2 | |
| | 162.1 | | | | | | | | | | | |
| 29 | | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC 7 | 92 | 71 | 31 | | R2 | W2 | |
| 30 | 160.5 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- moderately to slightly weathered<br>- extremely to very weak | | | RC 8 | 94 | 71 | 33 | | R0.5 | W2.5 | |
| 31 | 159.1 | | | | | | | | | | | |
| | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | RC 9 | 96 | 77 | 44 | | R1.5 | W2 | |
| 32 | 157.9 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- highly to slightly weathered<br>- extremely to very weak<br><br>-0.2 m thick sandstone layer at 34.0 m | | | RC10 | 86 | 51 | 35 | | R0.5 | W4 | |
| 33 | 156.2 | | | | | | | | | | | |
| | | Very poor to poor quality grey SANDSTONE<br>- slightly weathered<br>- very weak to weak | | | RC11 | 99 | 61 | 19 | | R1 | W2.5 | |
| 34 | 155.0 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely to very weak<br><br>- completely weathered from 36.7 m to 36.9 m | | | RC12 | 84 | 64 | 28 | | R1 | W3 | |
| 35 | 153.7 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:24 PM

Stantec

# BOREHOLE RECORD

**D29**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/17/2016 to 8/17/2016

NORTHING: 5657082
EASTING: -29334
WATER LEVEL (3.6 m) 8/17/2016

PROJECT No. 110773396
BH SIZE HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38 | | | | | | | | | | | | |
| | 152.8 | Very poor quality grey to dark grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC13 | 100 | 35 | 11 | | R0 | W5 | |
| 39 | 151.8 | Very poor quality grey SILTSTONE<br>- slightly weathered<br>- very weak to weak | | | | | | | | | | |
| 40 | | | | | RC14 | 85 | 59 | 12 | | R1.5 | W2 | |
| | 150.3 | Very poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 41 | 149.8 | Poor quality grey MUDSTONE<br>-moderately to highly weathered<br>- extremely to veryweak | | | | | | | | | | |
| | 149.1 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC15 | 93 | 55 | 28 | | R1 | W3 | |
| 42 | 148.3 | End of borehole (42.7 m)<br>- borehole slough to 12.2 m, after hollow stem auger removal and water at 3.6 m<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.3 m to 6.0 m and from 20.7 m to 42.7 m | | | | | | | | | | |
| 43 | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:24 PM

Stantec

# BOREHOLE RECORD

**D30**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/06
WATER LEVEL

NORTHING 5657199
EASTING -29301

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1192.01 | TOPSOIL | | | | | | | | | | | |
| | 1191.56 | Stiff to very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace to some sand, trace gravel, dry to moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 360 | | UU, Y | 0.3 | 5.4 | 45.3 | 49.0 |
| | | | | | SS | 3 | 290 | 16 | CC | | | | |
| 2 | | | | | ST | 4 | 320 | | C, Y | 6.5 | 6.8 | 42.2 | 44.5 |
| | | - moist below 2.2 m | | | SS | 5 | 360 | 10 | | | | | |
| | | | | | ST | 6 | 390 | | UU, Y | 5.0 | 5.5 | 41.1 | 48.4 |
| 3 | | - trace coal specks below 3.1 m | | | SS | 7 | 370 | 15 | | | | | |
| | | | | | ST | 8 | 440 | | UU, Y | 2.5 | 6.1 | 46.7 | 44.7 |
| 4 | | | | | SS | 9 | 450 | 19 | | | | | |
| | | | | | ST | 10 | 440 | | C, Y | 3.8 | 6.8 | 41.1 | 48.4 |
| 5 | | | | | SS | 11 | 450 | 19 | CC | | | | |
| | | | | | BS | 12 | | | | | | | |
| 6 | 1185.91 | Very stiff to hard, brown, low to medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, dry to moist | | | SS | 13 | 450 | 20 | | 12.5 | 13.0 | 38.3 | 36.1 |
| 7 | | | | | BS | 14 | | | | | | | |
| | | | | | ST | 15 | 420 | | Y | 8.3 | 15.1 | 38.0 | 38.6 |
| 8 | | | | | SS | 16 | 450 | 19 | | | | | |
| | | | | | BS | 17 | | | | | | | |
| 9 | | | | | SS | 18 | 450 | 17 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D30**

CLIENT Alberta Transportation
NORTHING 5657199
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29301
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/08/06
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff to hard, brown, low to medium plasticity clay (CI) TILL<br>- silty, sandy, trace gravel, dry to moist | | | BS | 19 | | | CC | | | | |
| 11 | | | | | SS | 20 | 450 | 30 | | 6.1 | 22.4 | 42.7 | 28.8 |
| 12 | | | | | BS | 21 | | | | | | | |
| | | | | | SS | 22 | 450 | 34 | CC | 8.4 | 27.0 | 43.7 | 20.9 |
| 13 | | - switch to hollow-stem augering at 12.7 m due to sloughing | | | | | | | | | | | |
| 14 | | - grey below 13.7 m | | | SS | 23 | 330 | 25 | | | | | |
| 15 | | | | | SS | 24 | 360 | 43 | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | - dry below 16.8 m | | | SS | 25 | 260 | 50+ | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | SS | 26 | 320 | 50+ | | | | | |
| | 1172.21 | | | | | | | | | | | | |
| 20 | | Bedrock encountered at 19.8 m | | | SS | 27 | 75 | 50+ | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D30**

CLIENT Alberta Transportation
NORTHING 5657199
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29301
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/08/06
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | - coring commenced at 19.8 m (see rock coring log for details)<br>- borehole advanced in bedrock to 44.5 m | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D30**

CLIENT Alberta Transportation NORTHING: 5657199 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29301 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/6/2016 to 8/6/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 172.2 | | | | | | | | | | | |
| 20 | 172.0 | Very poor quality grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC28 | 90 | 50 | 0 | | R2 | W3 | |
| | 171.6 | Very poor quality SANDSTONE<br>- moderately weathered<br>- medium strong | | | | | | | | | | |
| 21 | | Very poor quality grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC29 | 100 | 82 | 0 | | R2 | W3 | |
| 22 | | - very weak. highly weathered below 21.7 m | | | RC30 | 82 | 56 | 0 | | R1 | W4 | |
| 23 | 168.8 | | | | | | | | | | | |
| | | Fair quality dark grey SANDSTONE<br>- slightly to moderately weathered<br>- medium strong | | | RC31 | 100 | 89 | 51 | | 3 | W2.5 | |
| 24 | 167.5 | | | | | | | | | | | |
| | 167.3 | Fair quality CLAYSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 25 | | Good quality grey SANDSTONE<br>- medium strong<br>- fresh slightly weathered | | | RC32 | 99 | 94 | 79 | | 3 | W2 | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | RC33 | 96 | 93 | 78 | | 3 | W1.5 | |
| 28 | | - excellent quality, fresh below 27.8 m | | | | | | | | | | |
| | | | | | RC34 | 100 | 100 | 100 | | 3 | W1 | |
| 29 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D30**

CLIENT Alberta Transportation NORTHING: 5657199 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29301 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/6/2016 to 8/6/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | | Good quality grey SANDSTONE<br>- medium strong<br>- fresh slightly weathered | | | | | | | | | | |
| 30 | | | | | RC35 | 99 | 99 | 99 | | 3 | W1 | |
| 31 | | - good quality, slightly weathered below 30.9 m | | | RC36 | 100 | 91 | 84 | | 3 | W2 | |
| 32 | | | | | | | | | | | | |
| 33 | | - excellent quality, fresh below 32.4 m | | | RC37 | 100 | 100 | 100 | | 3 | W1 | |
| 34 | | | | | RC38 | 100 | 100 | 94 | | 3 | W1 | |
| 35 | | | | | | | | | | | | |
| 36 | | - fair quality, slightly weathered below 35.4 m | | | RC39 | 96 | 87 | 61 | | 3 | W2 | |
| | 155.7 | | | | | | | | | | | |
| 37 | | Fair quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC40 | 99 | 83 | 79 | | R2 | W3 | |
| 38 | | | | | | | | | | | | |
| | 153.4 | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D30**

CLIENT Alberta Transportation NORTHING: 5657199 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29301 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/6/2016 to 8/6/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | | | | | | | | | | | | |
| | | Good quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC41 | 99 | 97 | 84 | | 3 | W2 | |
| 40 | 151.9 | | | | | | | | | | | |
| | | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | RC42 | 97 | 90 | 52 | | 2.5 | W2 | |
| 41 | 150.5 | | | | | | | | | | | |
| | | Good quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 42 | 149.9 | | | | | | | | | | | |
| | | Fair to good quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>- medium strong | | | RC43 | 95 | 87 | 75 | | 3 | W2.5 | |
| 43 | 148.8 | | | | | | | | | | | |
| | | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC44 | 98 | 91 | 63 | | 3 | W2 | |
| 44 | 147.7 | | | | | | | | | | | |
| | 147.5 | Fair quality CLAYSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 45 | | End of borehole (44.5 m)<br>- borehole backfilled with cuttings, and a bentonite seal placed from 0.3 m to 0.6 m and from 19.8 to 44.5 m | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D32**

CLIENT Alberta Transportation
NORTHING 5656996
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29113
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/07/24
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.66 | TOPSOIL | | | | | | | | | | | |
| | 1190.21 | Stiff to very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- trace sand, trace organics, dry to moist<br>- mottled grey below 1.2 m | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 400 | | | | | | |
| | | | | | SS | 3 | 250 | 20 | | | | | |
| 2 | | | | | ST | 4 | 370 | | | | | | |
| | | | | | SS | 5 | 380 | 13 | | | | | |
| | | - some sand below 2.6 m | | | ST | 6 | 400 | | | | | | |
| 3 | | - trace coal specks below 3.0 m | | | SS | 7 | 440 | 18 | | | | | |
| | | | | | ST | 8 | 320 | | | | | | |
| 4 | | - mottled light brown below 4.8 m | | | SS | 9 | 390 | 13 | | | | | |
| | | | | | ST | 10 | 430 | | | | | | |
| 5 | | - trace gravel below 4.8 m | | | SS | 11 | 450 | | | | | | |
| | | | | | BS | 12 | | | | | | | |
| 6 | 1184.56 | Very stiff, brown, medium plasticity clay (CI) TILL<br>- some sand, trace gravel, moist | | | SS | 13 | 450 | 17 | | | | | |
| 7 | | | | | BS | 14 | | | | | | | |
| | | | | | ST | 15 | 470 | | | | | | |
| 8 | | | | | SS | 16 | 160 | 18 | | | | | |
| | | | | | BS | 17 | | | | | | | |
| 9 | | | | | SS | 18 | 390 | 16 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D32**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/24

NORTHING 5656996
EASTING -29113
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- some sand, trace gravel, moist | | | BS | 19 | | | | | | | |
| 11 | | | | | SS | 20 | 450 | 18 | | | | | |
| 12 | | | | | BS | 21 | | | | | | | |
| | | - sandy below 12.2 m | | | ST | 22 | 500 | | | | | | |
| 13 | | - silt seam at 12.8 m | | | SS | 23 | 450 | 27 | | | | | |
| | | - grey, dry to moist below 13.3 m | | | BS | 24 | | | | | | | |
| 14 | | | | | SS | 25 | 450 | 47 | | | | | |
| | 1176.36 | | | | | | | | | | | | |
| | | Dense, grey, sandy SILT (ML)<br>- trace gravel, dry to moist | | | | | | | | | | | |
| 15 | | | | | BS | 26 | | | | | | | |
| | | | | | SS | 27 | 280 | 38 | | | | | |
| 16 | 1174.46 | | | | | | | | | | | | |
| | | Very stiff to hard, grey, medium plasticity clay (CI) TILL<br>- some sand, trace gravel, moist | | | BS | 28 | | | | | | | |
| 17 | | | | | SS | 29 | 170 | 38 | | | | | |
| 18 | | | | | | | | | | | | | |
| | | | | | SS | 30 | 180 | 50+ | | | | | |
| 19 | | | | | | | | | | | | | |
| | 1170.86 | | | | | | | | | | | | |
| 20 | | Bedrock encountered at 19.8 m | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D32**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/24

NORTHING 5656996
EASTING -29113
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | - coring commenced at 19.8 m (see rock coring log for details)<br>- borehole advanced in bedrock to 35.4 m<br>- sloughing at 30.4 m | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D32**

CLIENT Alberta Transportation NORTHING: 5656996 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29113 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/24/2016 to 7/24/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 170.9 | | | | | | | | | | | |
| 20 | | Very poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- extremely weak<br>- highly to completely weathered below 20.2 m | | | RC32 | 65 | 65 | 0 | | R0 | W3 | |
| 21 | | | | | RC33 | 86 | 49 | 11 | | R0 | W3.5 | |
| 22 | | - highly weathered below 21.7 m | | | RC34 | 82 | 65 | 7 | | R0 | W4 | |
| 23 | 167.4 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC35 | 98 | 96 | 56 | | 3 | W2.5 | |
| 24 | 166.5 | | | | | | | | | | | |
| | | Fair quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| 25 | 165.4 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC36 | 100 | 98 | 53 | | 3 | W2 | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | RC37 | 97 | 81 | 54 | | 3 | W2 | |
| | 163.1 | | | | | | | | | | | |
| | | Fair quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>- weak to very weak | | | | | | | | | | |
| 28 | | | | | RC38 | 100 | 96 | 51 | | R1.5 | W2.5 | |
| 29 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D32**

CLIENT Alberta Transportation NORTHING: 5656996 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29113 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/24/2016 to 7/24/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | | | | | | | | | | | | |
| | 161.5 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 160.9 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC39 | 100 | 95 | 45 | | 2.5 | W2.5 | |
| 30 | 160.3 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 159.6 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC40 | 100 | 95 | 33 | | 2.5 | W2.5 | |
| 31 | 159.0 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 157.9 | Fair to good quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC41 | 96 | 94 | 76 | | R2 | W2 | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | - fair quality, slightly to moderately weathered below 33.9 m | | | RC42 | 100 | 93 | 59 | | R2 | W2.5 | |
| 35 | 155.3 | | | | | | | | | | | |
| | | End of borehole (35.4)<br>- borehole slough to 30.4 m upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.3 m to 0.9 m, and 19.8 m to 30.4 m | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:31 PM

Stantec

# BOREHOLE RECORD

**D35**

CLIENT Alberta Transportation
NORTHING 5657228
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29082
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/08/08
WATER LEVEL (8.5 m) 2016/08/08
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.61 | TOPSOIL | | | | | | | | | | | |
| | 1190.26 | Stiff, brown, medium to high plasticity CLAY (CI-CH) - trace rootlets, organics, damp to moist | | | BS | 1 | | | | | | | |
| 1 | | - trace sand, end of rootlets, mottled grey, damp below 0.8 m | | | ST | 2 | 400 | | | | | | |
| | | | | | SS | 3 | 450 | 13 | | | | | |
| 2 | | | | | ST | 4 | 450 | | | | | | |
| | | | | | SS | 5 | 450 | 15 | | | | | |
| 3 | | - trace gravel below 2.8 m | | | ST | 6 | 500 | | | | | | |
| | | | | | SS | 7 | 450 | 14 | | | | | |
| 4 | | | | | ST | 8 | 450 | | | | | | |
| | 1185.81 | | | | SS | 9 | 450 | 12 | | | | | |
| 5 | | Stiff, brown, medium plasticity clay (CI) TILL - trace sand, gravel, damp | | | ST | 10 | 500 | | | | | | |
| | | | | | SS | 11 | 400 | 13 | | | | | |
| 6 | | | | | ST | 12 | | | | | | | |
| | | - very stiff below 6.6 m | | | SS | 13 | 300 | 38 | | | | | |
| 7 | | | | | BS | 14 | | | | | | | |
| | | | | | SS | 15 | 330 | 32 | | | | | |
| 8 | | | | ▼ | | | | | | | | | |
| 9 | | | | | BS | 16 | | | | | | | |
| | | - brown to grey below 9.1 m | | | SS | 17 | 350 | 37 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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NORTHING 5657228
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BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/08/08
WATER LEVEL (8.5 m) 2016/08/08
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Stiff, brown, medium plasticity clay (CI) TILL<br>- trace sand, gravel, damp | | | BS | 18 | | | | | | | |
| 11 | | - trace coal specks below 10.7 m | | | SS | 19 | 350 | 30 | | | | | |
| 12 | | | | | BS | 20 | | | | | | | |
| 13 | 1177.51 | - damp below 12.2 m | | | SS | 21 | 420 | 50+ | | | | | |
| 14 | 1176.41 | Very poor quality brown (inferred) SANDSTONE<br>- extremely weak | | | SS | 22 | 100 | 50+ | | | | | |
| 15 | | Bedrock encountered at 13.1 m<br>- coring commenced at 14.2 m (see rock coring log for details)<br>- borehole advanced in bedrock to 44.1 m<br>- water at 8.5 m and sloughing at 12.2 m | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D35**

CLIENT Alberta Transportation NORTHING: 5657228 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29082 BH SIZE SS:150mm

DRILLING DATE 8/8/2016 to 8/8/2016 WATER LEVEL (8.5 m) 8/8/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 13 | 177.5 | Very poor quality brown (inferred) SANDSTONE - extremely weak | | | | | | | | | | |
| 14 | 176.4 | Very poor quality brown SANDSTONE - highly weathered - very weak | | | RC23 | 89 | 23 | 0 | | R0.5 | W5 | |
| 15 | 175.4 | Very poor quality brown to grey MUDSTONE - completely weathered - extremely weak | | | RC24 | 100 | 29 | 0 | | R1 | W5 | |
| 16 | 174.3 | Very poor quality brown SANDSTONE - highly weathered - very weak | | | | | | | | | | |
| 17 | 173.7 | Very poor quality dark grey SILTSTONE - moderately weathered - weak - highly to moderately weathered, weak to extremely weak | | | RC25 | 96 | 29 | 13 | | R0 | W5 | |
| 18 | 172.7 | Very poor quality dark grey MUDSTONE - completely weathered - extremely weak | | | | | | | | | | |
| 19 | 171.3 | Very poor quality dark grey SILTSTONE - fresh - weak to very weak | | | RC26 | 100 | 49 | 17 | | R1 | W5 | |
| 20 | 170.7 | Very poor quality grey MUDSTONE - completely weathered - extremely weak | | | | | | | | | | |
| 21 | 169.7 | Very poor quality light grey to brown SILTSTONE - moderately weathered - weak to very weak | | | RC27 | 96 | 56 | 14 | | R1.5 | W3 | |
| 22 | 169.0 | Por to very poor quality grey MUDSTONE | | | | | | | | | | |
| | 168.7 | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 4:19:34 PM

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# BOREHOLE RECORD

**D35**

CLIENT Alberta Transportation
NORTHING: 5657228
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -29082
BH SIZE SS:150mm
DRILLING DATE 8/8/2016 to 8/8/2016
WATER LEVEL (8.5 m) 8/8/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | | - highly to completely weathered<br>- very to extremely weak<br>Poor quality grey SILTSTONE | | | RC28 | 98 | 69 | 43 | | R1 | W3 | |
| 23 | 167.9 | - slightly to moderately weathered<br>- very weak | | | | | | | | | | |
| | 167.4 | Poor quality grey MUDSTONE<br>- highly to modeerately weathered<br>- very weak to extremely weak | | | RC29 | 88 | 21 | 7 | | R1.5 | W3 | |
| 24 | | Very poor quality brown to grey SILTSTONE<br>- moderately weathered<br>- weak to very weak | | | | | | | | | | |
| 25 | 165.6 | Very poor quality grey MUDSTONE<br>- highly to completely weathered<br>- very weak | | | RC30 | 93 | 37 | 13 | | R1 | W3.5 | |
| 26 | 164.4 | Very poor quality grey to brown SANDSTONE<br>- slightly weathered<br>- weak to very weak | | | RC31 | 63 | 38 | 0 | | R1.5 | W2 | |
| 27 | | | | | | | | | | | | |
| 28 | | - grey, fair quality, slightly weathered, weak below 27.7 m | | | RC32 | 99 | 78 | 56 | | R2 | W2 | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | RC33 | 100 | 70 | 54 | | R2 | W2 | |
| | 160.3 | Fair quality dark grey to black SHALE/MUDSTONE<br>- highly weathered<br>- very weak to extremely weak<br>- very poor quality highly to completely weathered, extremely weak below 30.7 m<br>- frequent shell fragments | | | | | | | | | | |
| 31 | | | | | RC34 | 75 | 15 | 0 | | R0 | W4.5 | |
| 32 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
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# BOREHOLE RECORD

**D35**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/8/2016 to 8/8/2016
NORTHING: 5657228 EASTING: -29082 WATER LEVEL (8.5 m) 8/8/2016
PROJECT No. 110773396 BH SIZE SS:150mm DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | | at 31.5 m | | | | | | | | | | |
| | 158.4 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak to very weak | | | RC35 | 81 | 15 | 0 | | R1.5 | W3 | |
| 33 | | | | | | | | | | | | |
| | | - very weak below 33.7 m | | | RC36 | 81 | 15 | 8 | | R1 | W3 | |
| 34 | | | | | | | | | | | | |
| 35 | 155.4 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC37 | 94 | 24 | 13 | | R0 | W5.5 | |
| 36 | | - fair quality, slightly weathered, very weak to extremely weak below 36.7 m | | | | | | | | | | |
| 37 | 153.4 | | | | | | | | | | | |
| | | Fair quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | RC38 | 100 | 91 | 67 | | R1 | W2 | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | RC39 | 100 | 80 | 54 | | R2 | W2 | |
| 40 | 150.3 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC40 | 96 | 80 | 63 | | R2 | W2 | |
| 41 | | | | | | | | | | | | |
| | 148.8 | | | | RC41 | 100 | 51 | 45 | | R1 | W2.5 | |
| 42 | | | | | | | | | | | | |

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# BOREHOLE RECORD

**D35**

CLIENT Alberta Transportation NORTHING: 5657228 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29082 BH SIZE SS:150mm

DRILLING DATE 8/8/2016 to 8/8/2016 WATER LEVEL (8.5 m) 8/8/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42 | | | | | | | | | | | | |
| | | Poor quality grey SILTSTONE<br>- slightly to moderately weathered<br>- weak to extremely weak | | | | | | | | | | |
| | 147.9 | | | | | | | | | | | |
| 43 | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong<br>- 0.3 m layer of grey siltstone, moderately to slightly weathered, weak at 43.25 m | | | RC42 | 97 | 81 | 67 | | R2 | W2 | |
| 44 | 146.5 | | | | | | | | | | | |
| | | End of borehole (44.2)<br>- borehole sloughing 12.2 m upon removal of casing and water at 8.5 m upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 1.5 m to 2.4 m, and 18.0 m to 43.2 m | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
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# BOREHOLE RECORD

**D36**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/25

NORTHING 5657309
EASTING -29020
WATER LEVEL (7.5 m) 2016/07/24

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.50 | | | | | | | | | | | | |
| | 1190.3 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, light brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, wet | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 330 | | CU, Y | 0.0 | 1.0 | 42.3 | 56.6 |
| | | - damp below 1.4 m | | | SS | 3 | 300 | 7 | | | | | |
| 2 | | | | | ST | 4 | 450 | | k, Y | 0.0 | 1.3 | 47.5 | 51.2 |
| | | | | | SS | 5 | 450 | 13 | | | | | |
| 3 | | | | | ST | 6 | 430 | | UU, Y | 0.3 | 8.9 | 47.0 | 43.8 |
| | | - very stiff, trace gravel, mottled grey below 3.1 m | | | SS | 7 | 380 | 19 | | | | | |
| 4 | | | | | ST | 8 | 350 | | CU, Y | 0.6 | 4.0 | 37.7 | 57.7 |
| | | | | | SS | 9 | 380 | 15 | | | | | |
| | 1185.55 | | | | ST | 10 | 450 | | C, Y | 0.5 | 11.1 | 47.7 | 40.6 |
| 5 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, trace to some sand, trace gravel, damp | | | SS | 11 | 125 | 35 | | | | | |
| 6 | | | | | SS | 12 | 450 | 24 | | | | | |
| 7 | | | | | BS | 13 | | | | | | | |
| | | | | | SS | 14 | 450 | 23 | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | BS | 15 | | | | 11.4 | 21.6 | 45.8 | 21.2 |
| | | | | | SS | 16 | 350 | 29 | | | | | |
| | | - grey below 9.7 m | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT
ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D36**

CLIENT Alberta Transportation NORTHING 5657309 PROJECT NO. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING -29020 BH SIZE SS:150mm, HS:200mm

DATES BORING 2016/07/25 WATER LEVEL (7.5 m) 2016/07/24 DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, trace to some sand, trace gravel, damp | | | BS | 17 | | | | | | | |
| 11 | | | | | SS | 18 | 450 | 19 | | | | | |
| 12 | | | | | BS | 19 | | | | | | | |
| | 1177.85 | | | | SS | 20 | 250 | 24 | | | | | |
| | | Brown SILT (M)<br>- trace sand, gravel, damp | | | | | | | | | | | |
| 13 | | | | | BS | 21 | | | | | | | |
| | 1176.6 | | | | | | | | | | | | |
| 14 | 1176.4 | Hard, grey, low plasticity clay (CL) TILL<br>- trace sand, gravel, mottled light grey, dry to damp<br>- inferred seepage at 13.9 m | | | SS | 22 | 450 | 36 | | | | | |
| 15 | | Very poor quality grey to brown (inferred) SILTSTONE/SANDSTONE<br>- highly to completely weathered<br>- extremely weathered | | | SS | 23 | 400 | 50+ | | | | | |
| 16 | 1173.9 | | | | | | | | | | | | |
| 17 | | Bedrock encountered at 14.1 m<br>- boring commenced at 16.6 m (see rock coring log for details)<br>- borehole advanced in bedrock to 46.6 m<br>- water at 7.5 m<br>- 50 mm standpipe piezometer installed slotted from 35.7 m to 37.2 m | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$

STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D36**

CLIENT Alberta Transportation NORTHING: 5657309 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29020 BH SIZE SS:150mm

DRILLING DATE 7/25/2016 to 7/25/2016 WATER LEVEL (7.5 m) 7/25/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 14 | 176.4 | Very poor quality grey to brown (inferred) SILTSTONE/SANDSTONE<br>- highly to completely weathered<br>- extremely weathered | | | | | | | | | | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | 173.9<br>173.5 | Very poor quality brown SANDSTONE<br>- moderately weathered<br>- weak | | | RC24 | 90 | 12 | 0 | | R0 | W5.5 | |
| 18 | | Very poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak<br>- completely to highly weathered | | | RC25 | 88 | 11 | 0 | | R0.5 | W4.5 | |
| 19 | 171.8<br>171.4 | Very poor quality grey SILTSTONE<br>- highly weathered<br>- very weak | | | | | | | | | | |
| 20 | | Very poor quality grey to dark grey CLAYSTONE<br>- completely weathered<br>- extremely weak<br>- moderately weathered, extremely to very weak below 20.15 m | | | RC26 | 71 | 14 | 0 | | R0.5 | W5 | |
| 21 | 169.7 | Very poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | RC27 | 94 | 14 | 13 | | R0.5 | W3 | |
| 22 | 168.7 | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC28 | 100 | 61 | 12 | | R2 | W3 | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 4:19:38 PM

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# BOREHOLE RECORD

**D36**

CLIENT Alberta Transportation
NORTHING: 5657309
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -29020
BH SIZE SS:150mm
DRILLING DATE 7/25/2016 to 7/25/2016
WATER LEVEL (7.5 m) 7/25/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | | | | | | | | | | | | |
| | 167.4 | Poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weathered | | | | | | | | | | |
| | 166.8 | Poor quality brown SANDSTONE<br>- slightly weathered<br>- weak | | | RC29 | 97 | 37 | 32 | | R1 | W3 | |
| 24 | 165.8 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak | | | RC30 | 98 | 75 | 24 | | R2 | W3 | |
| 25 | | | | | | | | | | | | |
| 26 | 164.4 | Very poor quality grey MUDSTONE<br>- highly weathered<br>- very weak to extremely weak | | | RC31 | 100 | 38 | 10 | | R0.5 | W4 | |
| 27 | | | | | | | | | | | | |
| | 162.8 | Poor quality grey SILTSTONE<br>- moderately weathered<br>- weak to very weak | | | RC32 | 90 | 56 | 40 | | R1.5 | W3 | |
| 28 | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | |
| | 161.0 | Very poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | RC33 | 91 | 31 | 11 | | R1 | W3 | |
| 30 | | | | | | | | | | | | |
| | 159.6 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC34 | 92 | 69 | 35 | | R1 | W3 | |
| 31 | | | | | | | | | | | | |
| | 158.7 | Poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely weathered | | | | | | | | | | |
| 32 | 158.4 | Very poor quality SILTSTONE<br>- slightly to moderately weathered<br>- weak to very weak | | | RC35 | 97 | 61 | 13 | | R1 | W3 | |
| | 157.9 | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:38 PM

Stantec

# BOREHOLE RECORD

**D36**

CLIENT Alberta Transportation NORTHING: 5657309 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29020 BH SIZE SS:150mm

DRILLING DATE 7/25/2016 to 7/25/2016 WATER LEVEL (7.5 m) 7/25/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 157.5 | Very poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely weak | | | | | | | | | | |
| | 156.9 | Very poor quality grey SILTSTONE<br>- slightly to moderately weathered<br>- weak | | | | | | | | | | |
| 34 | | Very poor quality grey MUDSTONE<br>- highly weathered<br>- very weak to extremely weak | | | RC36 | 99 | 48 | 8 | | R0.5 | W4 | |
| | 155.8 | | | | | | | | | | | |
| 35 | 155.5 | Very poor quality grey SILTSTONE<br>- slightly to moderately weathered<br>- weak | | | | | | | | | | |
| | | Very poor quality grey to dark grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC37 | 99 | 42 | 24 | | R0 | W5 | |
| 36 | 154.5 | Very poor quality grey SANDSTONE<br>- slightly weathered<br>- weak<br>- 0.2 m thick layer of claystone, highly weathered, extremely weak at 36.7 m<br>- poor quality below 36.9 m | | | | | | | | | | |
| 37 | 153.5 | | | | RC38 | 100 | 72 | 32 | | R2 | W2 | |
| | | Fair quality grey CLAYSTONE<br>- slightly weathered<br>- weak<br>- 0.2 m thick layer of claystone, highly weathered, extremely weak at 37.45 m | | | | | | | | | | |
| 38 | 152.1 | | | | | | | | | | | |
| | | Poor quality grey to dark grey MUDSTONE<br>- moderately weathered<br>- very weak to extremely weak | | | RC39 | 98 | 60 | 30 | | R1 | W3 | |
| 39 | 151.4 | | | | | | | | | | | |
| | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- weak<br>- slightly to moderately weathered, weak below 39.55 m | | | | | | | | | | |
| 40 | | | | | RC40 | 100 | 71 | 40 | | R2 | W2 | |
| 41 | | | | | | | | | | | | |
| | | | | | RC41 | 97 | 67 | 50 | | R2 | W2 | |
| 42 | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 43 | 147.5 | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D36**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/25/2016 to 7/25/2016

NORTHING: 5657309
EASTING: -29020
WATER LEVEL (7.5 m) 7/25/2016

PROJECT No. 110773396
BH SIZE SS:150mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | | Poor quality grey MUDSTONE<br>- moderately weathered<br>- very weak | | | RC 42 | 99 | 60 | 37 | | R1 | W3 | |
| 44 | 146.5 | Fair quality grey SILTSTONE<br>- slightly weathered<br>- very weak | | | RC 43 | 99 | 75 | 60 | | R1.5 | W3 | |
| 45 | 145.6 | Fair quality grey MUDSTONE<br>- highly to moderately weathered<br>- very weak | | | | | | | | | | |
| | 145.0 | End of borehole (45.6 m)<br>- water at 7.5 m upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.8 m to 35.0 m and from 37.8 m to 41.6 m<br>- 50 mm standpipe piezometer installed, solid from 0.0 m to 35.7 m, and slotted from 35.7 m to 37.2 m, sand from 35.0 m to 37.8 m | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:39 PM

Stantec

# BOREHOLE RECORD

**D37**

CLIENT Alberta Transportation
NORTHING 5657115
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -28953
BH SIZE SONIC
DATES BORING 2016/07/22
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.70 | | | | | | | | | | | | |
| | 1190.45 | TOPSOIL | | | | | | | | | | | |
| | 1190.3 | Brown, sandy SILT (ML)<br>- damp | | | | | | | | | | | |
| 1 | | Brown medium to high plasticity clay (CI-CH)<br>- trace sand, gravel, damp | | | S | 1 | 1150 | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | S | 2 | 1500 | | | | | | |
| 4 | | - mottled light/dark brown below 3.8 m | | | | | | | | | | | |
| 5 | | | | | S | 3 | 1500 | | | | | | |
| 6 | 1184.6 | | | | | | | | | | | | |
| | | Brown, low to medium plasticity clay (CL-CI) TILL<br>- some gravel, trace sand, damp | | | S | 4 | 1500 | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | S | 5 | 1500 | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | S | 6 | 1500 | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D37**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/22

NORTHING 5657115
EASTING -28953
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SONIC
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Brown, low to medium plasticity clay (CL-CI) TILL<br>- some gravel, trace sand, damp | | | | | | | | | | | |
| 11 | | | | | S | 7 | 1500 | | | | | | |
| | | - grey below 11.6 m | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | S | 8 | 1500 | | | | | | |
| | 1177.2 | | | | | | | | | | | | |
| | 1177.1 | Very poor quality (inferred) MUDSTONE | | | | | | | | | | | |
| 14 | | End of Sonic borehole at 13.6 m<br>- bedrock encountered at 13.5 m<br>- sloughing at 13.1 m upon completion of sonic drilling<br>- borehole completed with rotary coring, coring commenced at 16.6 m (see rock coring log for details)<br>- borehole advanced in bedrock to 35.4 m | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D37**

CLIENT Alberta Transportation NORTHING: 5657115 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28953 BH SIZE HS:200mm

DRILLING DATE 8/4/2016 to 8/4/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 177.1 | | | | RC 9 | 100 | 100 | 0 | | R0 | W5 | |
| 14 | | Very poor quality dark grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 176.0 | | | | RC10 | 99 | 94 | 0 | | R0 | W5 | |
| | 176.0 | Very poor quality SANDSTONE<br>- moderately weathered<br>- medium strong | | | | | | | | | | |
| 15 | | Very poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 174.7 | | | | RC11 | 98 | 50 | 0 | | R1.5 | W4.5 | |
| 16 | | Very poor quality brown SANDSTONE<br>- highly weathered<br>- very weak to medium strong | | | | | | | | | | |
| | 173.5 | | | | RC12 | 100 | 84 | 0 | | R0.5 | W4 | |
| 17 | | Very poor quality dark grey CLAYSTONE<br>- highly weathered<br>- very weak to extremely weak | | | | | | | | | | |
| 18 | | - poor below 18.6 m | | | | | | | | | | |
| | 171.5 | | | | RC13 | 100 | 87 | 29 | | 3 | W3 | |
| 19 | | Poor quality dark grey SANDSTONE<br>- moderately weathered<br>- medium strong | | | | | | | | | | |
| | 170.6 | | | | RC14 | 99 | 90 | 23 | | R1.5 | W3 | |
| 20 | | Very poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak to very weak | | | | | | | | | | |
| 21 | | - fair quality, weak, slightly weathered below 21.7 m | | | | | | | | | | |
| | 168.5 | | | | RC15 | 100 | 91 | 55 | | 2.5 | W2 | |
| 22 | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D37**

CLIENT Alberta Transportation NORTHING: 5657115 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28953 BH SIZE HS:200mm

DRILLING DATE 8/4/2016 to 8/4/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | | | | | | | | | | | | |
| | 167.4 | Very poor quality dark grey CLAYSTONE<br>- completely weathered<br>- extremely to very weak | | | RC16 | 100 | 74 | 7 | | R0.5 | W5 | |
| 24 | 166.0 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC17 | 100 | 94 | 47 | | 3 | W2 | |
| 25 | 165.0 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | 164.5 | Very poor quality dark grey CLAYSTONE<br>- medium strong to weak | | | | | | | | | | |
| 26 | 163.9 | Very poor quality SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC18 | 98 | 93 | 24 | | 3 | W2 | |
| | 163.7 | Very poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak<br>- fair quality, weak to medium strong below 27.8 m | | | RC19 | 100 | 89 | 54 | | 3 | W3 | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| 29 | | - very poor quality, very weak below 29.3 | | | RC20 | 100 | 95 | 19 | | R1 | W3 | |
| 30 | 159.9 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC21 | 100 | 95 | 60 | | 3 | W2 | |
| 31 | | | | | | | | | | | | |
| 32 | 158.3 | Poor quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 33 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:42 PM

Stantec

# BOREHOLE RECORD

**D37**

CLIENT Alberta Transportation NORTHING: 5657115 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28953 BH SIZE HS:200mm

DRILLING DATE 8/4/2016 to 8/4/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | | | | | | | | | | | | |
| | | Poor quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC22 | 78 | 82 | 30 | | R2 | W2 | |
| | 157.1 | Poor quality grey SANDSTONE<br>- moderately weathered<br>- medium strong | | | | | | | | | | |
| 34 | 156.8 | Good quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC23 | 99 | 97 | 87 | | 3 | W2 | |
| 35 | 155.3 | End of borehole (35.4 m)<br>- borehole open upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.3 m to 0.6 m and from 19.8 to 35.4 m | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:43 PM

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# BOREHOLE RECORD

**D38**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/04

NORTHING 5657380
EASTING -29073
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SONIC
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.84 | TOPSOIL | | | | | | | | | | | |
| | 1190.49 | | | | | | | | | | | | |
| | 1190.24 | Brown, sandy SILT (ML)<br>- trace rootlets, damp | | | S | 1 | 850 | | | | | | |
| 1 | | Dar,k brown to black, medium to high plasticity CLAY (CI-CH)<br>- trace sand, trace organics, moist | | | | | | | | | | | |
| | | - mottled light brown below 1.5 m | | | S | 2 | 1050 | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | S | 3 | 1400 | | | | | | |
| | 1187.24 | | | | | | | | | | | | |
| 4 | | Brown, low to medium plasticity clay (CI) TILL<br>- silty, trace sand, gravel, damp | | | | | | | | | | | |
| 5 | | | | | S | 4 | 1500 | | CU, k | 0.0 | 7.0 | 38.5 | 54.5 |
| 6 | | - some gravel below 6.1 m | | | | | | | | | | | |
| | | | | | S | 5 | 1250 | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | S | 6 | 1150 | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | S | 7 | 400 | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D38**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/04
WATER LEVEL

NORTHING 5657380
EASTING -29073

PROJECT NO. 110773396
BH SIZE SONIC
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Brown, low to medium plasticity clay (CI) TILL<br>- silty, trace sand, gravel, damp | | | | | | | | | | | |
| 11 | | - some sand, evidence of cobbles below 10.7 m | | | S | 8 | 1400 | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | S | 9 | 1500 | | | 17.2 | 17.6 | 49.3 | 15.9 |
| 14 | | | | | S | 10 | 700 | | | | | | |
| 15 | 1175.74 | | | | | | | | | | | | |
| | | Very poor quality light grey (inferred) SILTSTONE<br>- highly to completely weathered<br>- extremely weak | | | S | 11 | 1400 | | | | | | |
| 16 | 1174.64 | | | | | | | | | | | | |
| | | End of Sonic borehole at 16.2 m<br>- bedrock encountered at 15.1 m<br>- sloughing at 14.9 m upon completion of sonic drilling<br>- borehole completed with rotary coring, coring commenced at 15.9 m (see rock coring log for details)<br>- borehole advanced in bedrock to 45.7 m | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D38**

CLIENT Alberta Transportation NORTHING: 5657380 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29073 BH SIZE HS:200mm

DRILLING DATE 8/13/2016 to 8/13/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 15 | 175.7 | Very poor quality light grey (inferred) SILTSTONE<br>- highly to completely weathered<br>- extremely weak | | | | | | | | | | |
| 16 | 174.6 | Very poor quality grey MUDSTONE<br>- resdidual soil<br>- extremely weak | | | RC 1 | 100 | 18 | 0 | | R0 | W5 | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | RC 2 | 99 | 23 | 57 | | R0 | W5 | |
| | 172.4 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak to very weak | | | | | | | | | | |
| | 172.1 | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC 3 | 92 | 6 | 0 | | R0 | W5.5 | |
| 19 | | | | | | | | | | | | |
| 20 | | - highly to completely weathered, very weak below 20.2 m | | | | | | | | | | |
| 21 | | | | | RC 4 | 97 | 41 | 20 | | R1 | W4.5 | |
| 22 | 168.8 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>-weak to very weak | | | RC 5 | 100 | 32 | 16 | | R1.5 | W3 | |
| 23 | 167.7 | Very poor quality grey MUDSTONE<br>- highly to moderately weathered<br>- very weak to extremely weak | | | | | | | | | | |
| 24 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D38**

CLIENT Alberta Transportation NORTHING: 5657380 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29073 BH SIZE HS:200mm

DRILLING DATE 8/13/2016 to 8/13/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | | | | | RC 6 | 93 | 37 | 15 | | R0.5 | W3.5 | |
| | 166.1 | | | | | | | | | | | |
| 25 | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 165.6 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- moderately to slightly weathered<br>- very weak | | | RC 7 | 99 | 53 | 29 | | R1.5 | W3 | |
| 26 | | | | | | | | | | | | |
| | 164.1 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE<br>- moderately to slightly weathered<br>- very weak to weak | | | RC 8 | 99 | 77 | 42 | | R1 | W3 | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | RC 9 | 99 | 55 | 23 | | R1 | W3 | |
| | 162.4 | | | | | | | | | | | |
| | 162.1 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- extremely weak to weak | | | | | | | | | | |
| 29 | | Very poor quality grey MUDSTONE<br>- slightly to moderately weathered<br>- extremely to very weak | | | | | | | | | | |
| | | | | | RC10 | 97 | 41 | 13 | | R0.5 | W2.5 | |
| 30 | | | | | | | | | | | | |
| | 160.1 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC11 | 98 | 83 | 60 | | R2 | W2 | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| | | | | | RC12 | 97 | 80 | 53 | | R2 | W2 | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D38**

CLIENT Alberta Transportation NORTHING: 5657380 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29073 BH SIZE HS:200mm

DRILLING DATE 8/13/2016 to 8/13/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC13 | 99 | 93 | 81 | | R2 | W2 | |
| 35 | | - coal seams at 35.1 m<br>- poor quality below 35.2 m | | | | | | | | | | |
| | | | | | RC14 | 98 | 65 | 36 | | R2 | W2 | |
| 36 | | | | | | | | | | | | |
| | 154.1 | Poor quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 37 | | | | | RC15 | 98 | 67 | 37 | | R2 | W2 | |
| | 153.3 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 38 | 152.6 | | | | | | | | | | | |
| | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | RC16 | 93 | 71 | 29 | | R2 | W2 | |
| 39 | 151.1 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC17 | 100 | 81 | 38 | | R1 | W2 | |
| 40 | 150.4 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- slightly weathered<br>- extremely to very weak | | | | | | | | | | |
| 41 | 149.6 | | | | | | | | | | | |
| | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- very weak | | | | | | | | | | |
| | 149.2 | | | | | | | | | | | |
| | 148.8 | Poor quality grey MUDSTONE<br>- slightly to moderately weathered<br>- very weak | | | RC18 | 99 | 80 | 40 | | R1 | W2 | |
| 42 | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | | | | | | | | | | | | |
| 43 | 147.6 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- moderately to slightly weathered<br>- extremely to very weak | | | RC19 | 100 | 48 | 19 | | R0.5 | W2.5 | |
| | 146.9 | | | | | | | | | | | |
| 44 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D38**

CLIENT Alberta Transportation NORTHING: 5657380 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29073 BH SIZE HS:200mm

DRILLING DATE 8/13/2016 to 8/13/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 44 | | Very poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 146.3 | | | | | | | | | | | |
| 45 | | Very poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely to very weak | | | RC20 | 99 | 48 | 20 | | R0.5 | W3 | |
| | 145.1 | | | | | | | | | | | |
| 46 | | End of borehole (45.7 m)<br>- borehole slough to 24.4 m upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 1.5 m to 2.4 m and from 10.7 m to 12.2 m and from 15.2 m to 24.0 m | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D41**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/04

NORTHING 5657472
EASTING -28877
WATER LEVEL (4.1 m) 2016/07/04

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1186.35 | | | | | | | | | | | | |
| | 1186.05 | TOPSOIL | | | | | | | | | | | |
| | | Very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- some sand, trace gravel, trace rootlets, dry | | | BS | 1 | | | | | | | |
| 1 | | | | | SS | 2 | 50 | 28 | | | | | |
| | | | | | BS | 3 | | | | | | | |
| | 1184.55 | | | | | | | | | | | | |
| 2 | | Compact, brown, clayey GRAVEL (GC)<br>- sandy, silty, damp<br>- dense to very dense below 2.3 m | | | SS | 4 | 450 | 26 | | 31.3 | 27.9 | 30.9 | 9.9 |
| | | | | | BS | 5 | | | | | | | |
| 3 | | - evidence of cobbles and boulders below 2.7 m | | | SS | 6 | 350 | 50+ | | | | | |
| | | | | | BS | 7 | | | | | | | |
| | | - seepage at 3.5 m | | | | | | | | | | | |
| 4 | | | | | SS | 8 | 350 | 50+ | | | | | |
| | | | | | BS | 9 | | | | | | | |
| | | - switch to hollow stem augering at 4.6 m due to sloughing | | | SS | 10 | 450 | 50+ | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | SS | 11 | 0 | 50+ | | | | | |
| 7 | | | | | | | | | | | | | |
| | 1178.75 | | | | | | | | | | | | |
| | | Very poor quality (inferred) SANDSTONE<br>- extremely weak | | | SS | 12 | 450 | 50+ | | 7.0 | 27.0 | 54.4 | 11.6 |
| 8 | | | | | | | | | | | | | |
| | | | | | SS | 13 | 0 | 50+ | | | | | |
| 9 | | | | | SS | 14 | 400 | 50+ | | | | | |
| | 1176.75 | | | | | | | | | | | | |
| | | Bedrock encountered at 7.6 m<br>- coring commenced at 9.6 m (see | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D41**

CLIENT Alberta Transportation
NORTHING 5657472
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -28877
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/07/04
WATER LEVEL (4.1 m) 2016/07/04
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | rock coring log for details)<br>- borehole advanced in bedrock to 50.5 m<br>- water at 4.1 m and open upon completion | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D41**

CLIENT Alberta Transportation
NORTHING: 5657472
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -28877
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 7/4/2016 to 7/4/2016
WATER LEVEL (4.1 m) 7/4/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 178.8 | | | | | | | | | | | |
| 8 | | Very poor quality (inferred) SANDSTONE<br>- extremely weak | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| | 176.8 | | | | | | | | | | | |
| 10 | | Very poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC15 | 13 | 4 | 0 | | R0 | W5 | |
| 11 | | - grey to dark grey below 11.2 m | | | | | | | | | | |
| 12 | | | | | RC16 | 94 | 32 | 9 | | R0 | W5 | |
| | 173.6 | | | | | | | | | | | |
| 13 | | Very poor quality grey SILTSTONE<br>- highly weathered<br>- extremely weak | | | RC17 | 99 | 42 | 25 | | R0 | W4 | |
| 14 | | - completely to highly weathered below 14.25 m | | | | | | | | | | |
| 15 | | | | | RC18 | 100 | 31 | 6 | | R0 | W4.5 | |
| | | - 0.15 m layer of shale with coal seams at 15.8 m | | | | | | | | | | |
| | 170.5 | | | | | | | | | | | |
| 16 | | Poor quality grey SANDSTONE<br>- modrately weathered<br>- weak | | | | | | | | | | |
| | 170.0 | | | | | | | | | | | |
| | | Poor quality grey SILTSTONE<br>- highly weathered<br>- extremely weak | | | RC19 | 93 | 58 | 37 | | R0 | W4 | |
| 17 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D41**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/4/2016 to 7/4/2016
NORTHING: 5657472
EASTING: -28877
WATER LEVEL (4.1 m) 7/4/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | | Poor quality grey SILTSTONE<br>- highly weathered<br>- extremely weak<br>- moderately weathered, and very weak below 17.25 m | | | | | | | | | | |
| 18 | 168.1 | | | | RC20 | 98 | 71 | 29 | | R1 | W3 | |
| | | Poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 19 | | | | | RC21 | 100 | 61 | 27 | | R2 | W3 | |
| 20 | 166.4 | | | | | | | | | | | |
| | 166.1 | Poor quality grey SILTSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| | | Very poor quality dark grey to black MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC22 | 98 | 9 | 0 | | R0 | W5 | |
| 21 | 164.6 | | | | | | | | | | | |
| | | Very poor quality grey to dark grey CLAYSTONE<br>- highly weathered<br>- extremely weak | | | RC23 | 93 | 27 | 19 | | R0 | W4 | |
| 22 | | | | | | | | | | | | |
| 23 | 163.0 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC24 | 98 | 22 | 6 | | R0 | W5 | |
| 24 | 161.9 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE<br>- moderately weathered<br>- weak<br>- poor quality, and slightly weathered | | | | | | | | | | |
| 25 | 161.1 | | | | | | | | | | | |
| | | Poor quality grey to dark grey SILTSTONE<br>- moderately to highly weathered<br>- very weak | | | RC25 | 100 | 47 | 27 | | R1 | W3.5 | |
| 26 | 160.2 | | | | | | | | | | | |
| | | Very poor quality grey to dark grey CLAYSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| 27 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D41**

CLIENT Alberta Transportation
NORTHING: 5657472
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -28877
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 7/4/2016 to 7/4/2016
WATER LEVEL (4.1 m) 7/4/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | | Very poor quality grey to dark grey CLAYSTONE<br>- highly weathered<br>- extremely weak | | | RC26 | 98 | 21 | 0 | | R0 | W4 | |
| 28 | | - moderately to highly weathered below 27.75 m | | | RC27 | 97 | 27 | 17 | | R0 | W3.5 | |
| 29 | | - poor quality, and moderately weathered below 29.25 m | | | | | | | | | | |
| | 156.7 | | | | | | | | | | | |
| 30 | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- very weak | | | RC28 | 98 | 61 | 37 | | R0.5 | W2.5 | |
| | 155.5 | | | | | | | | | | | |
| 31 | | Very poor quality grey CLAYSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| | 155.1 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak<br>- 0.12 m thick layer of claystone at 31.8 m<br>- thin clay infill seam at 32 m | | | RC29 | 97 | 33 | 10 | | R1 | W3 | |
| 32 | 154.1 | | | | | | | | | | | |
| | | Very poor quality grey CLAYSTONE<br>- moderately to highly weathered<br>- extremely weak | | | | | | | | | | |
| 33 | | | | | RC30 | 99 | 43 | 24 | | R1 | W3 | |
| | 153.1 | | | | | | | | | | | |
| | | Very poor quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 152.6 | | | | | | | | | | | |
| 34 | 152.3 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | | Fair quality grey SILTSTONE<br>- slightly to moderately weathered<br>- weak | | | RC31 | 93 | 83 | 67 | | R2 | W2.5 | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | RC32 | 100 | 84 | 55 | | R2 | W2.5 | |
| 37 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:51 PM

Stantec

# BOREHOLE RECORD

**D41**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/4/2016 to 7/4/2016
NORTHING: 5657472
EASTING: -28877
WATER LEVEL (4.1 m) 7/4/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | 149.1 | | | | | | | | | | | |
| | | Very poor qualtiy grey SANDSTONE<br>- moderately weathered<br>- weak to medium strong | | | RC33 | 98 | 88 | 25 | | 2.5 | W3 | |
| 38 | 148.1 | | | | | | | | | | | |
| | | Poor quality dark grey to grey SILTSTONE<br>- moderately weathered<br>- weak | | | RC34 | 100 | 86 | 48 | | R2 | W3 | |
| 39 | | | | | | | | | | | | |
| | | | | | RC35 | 100 | 69 | 56 | | R2 | W3 | |
| 40 | | | | | | | | | | | | |
| | | | | | RC36 | 100 | 67 | 31 | | R2 | W3 | |
| 41 | | | | | | | | | | | | |
| | | | | | RC37 | 100 | 96 | 73 | | R2 | W3 | |
| 42 | | | | | | | | | | | | |
| | 142.2 | Fair quality grey MUDSTONE<br>- moderately weathered<br>- very weak to weak | | | RC38 | 90 | 76 | 73 | | R1.5 | W3 | |
| 43 | | | | | | | | | | | | |
| | 140.9 | Fair quality grey SILTSTONE<br>- moderately weathered<br>- weak | | | RC39 | 100 | 97 | 80 | | R2 | W3 | |
| 44 | | | | | | | | | | | | |
| | | - 0.2 m thick layer of mudstone at 46.3 m | | | RC40 | 100 | 71 | 31 | | R2 | W3 | |
| 45 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D41**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/4/2016 to 7/4/2016
NORTHING: 5657472
EASTING: -28877
WATER LEVEL (4.1 m) 7/4/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | | | | | | | | | | | | |
| | 139.0 | Fair quality grey SILTSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | 138.8 | Poor to fair quality grey SILTSTONE<br>- moderately weathered<br>- very weak to weak | | | | | | | | | | |
| 48 | | Poor quality grey MUDSTONE<br>- moderately to highly weathered<br>- very weak | | | RC41 | 100 | 78 | 39 | | R1 | W3.5 | |
| 49 | | | | | | | | | | | | |
| | | | | | RC42 | 98 | 88 | 57 | | R1.5 | W3 | |
| 50 | 136.2 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- moderatley weathered | | | | | | | | | | |
| | 135.9 | - weak | | | | | | | | | | |
| 51 | | End of borehole (50.5 m)<br>- borehole open and water at 4.1 m upon completion<br>- borehole backfilled with cuttings and bentonite seals placed from 1.2 m to 2.1 m and 12.2 m to 50.5 m | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 57 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D42**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/28

NORTHING 5657273
EASTING -28768
WATER LEVEL (10.2 m) 2016/06/27

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1191.96 | | | | | | | | | | | | |
| | 1191.71 | TOPSOIL | | | | | | | | | | | |
| | | Very stiff, brown, medium plasticity CLAY (CI-CH) | | | | | | | | | | | |
| | | - silty, trace sand, gravel, mottled grey, damp | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 300 | | CU, Y | 1.8 | 7.1 | 34.9 | 56.2 |
| | | | | | SS | 3 | 300 | 19 | CC | | | | |
| 2 | | | | | ST | 4 | 400 | | k, Y | 0.8 | 4.4 | 40.5 | 54.4 |
| | 1189.16 | | | | SS | 5 | 450 | 19 | | | | | |
| | | Very stiff to hard, brown, medium plasticity clay (CI) TILL | | | ST | 6 | 300 | | CU, Y | | | | |
| 3 | | - silty, some sand, trace gravel, trace coal specks, damp | | | SS | 7 | 425 | 18 | CC | | | | |
| | | | | | ST | 8 | 450 | | Y, k | 3.5 | 13.3 | 43.7 | 39.5 |
| 4 | | | | | SS | 9 | 150 | 22 | | | | | |
| | | | | | BS | 10 | | | | | | | |
| 5 | | | | | SS | 11 | 250 | 49 | | | | | |
| | | | | | BS | 12 | | | | | | | |
| 6 | | - sandy, some gravel below 6.1 m | | | SS | 13 | 400 | 36 | | | | | |
| | | | | | BS | 14 | | | | | | | |
| 7 | | | | | SS | 15 | 150 | 39 | | | | | |
| 8 | 1183.56 | | | | | | | | | | | | |
| | | Dense, brown SILT (ML) | | | | | | | | | | | |
| | | - sandy, trace gravel, damp to moist | | | BS | 16 | | | | | | | |
| 9 | | - inferred seepage at 9.1 m | | | SS | 17 | 450 | 50+ | | 12.3 | 28.3 | 52.8 | 6.6 |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D42**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/28

NORTHING 5657273
EASTING -28768
WATER LEVEL (10.2 m) 2016/06/27

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1181.26 | Dense, brown SILT (ML)<br>- sandy, trace gravel, damp to moist | | ▼ | BS | 18 | | | | 1.8 | 20.2 | 66.6 | 11.5 |
| 11 | | Dense, brown, poorly graded SAND (SP)<br>- trace silt, wet<br>- switch to hollow stem augering at 10.7 m due to sloughing | | | SS | 19 | 400 | 37 | | | | | |
| 12 | 1179.76 | | | | | | | | | | | | |
| 13 | 1178.26 | Hard, brownish grey, low plasticity clay TILL (CL)<br>- some sand, trace gravel, damp<br>- sand seam at 12.4 m | | | SS | 20 | 250 | 35 | | | | | |
| 14 | 1177.76 | Very poor quality grey (inferred) MUDSTONE/CLAYSTONE<br>- completely weathered<br>- extremely weak | | | SS | 21 | 350 | 44 | | | | | |
| 15 | | Bedrock encountered at 13.7 m<br>- coring commenced at 14.2 m (see rock coring log for details)<br>- borehole advanced in bedrock to 35.2 m<br>- sloughing at 34.6 m<br>- water at 10.2 m during augering | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D42**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/29/2016 to 7/29/2016
NORTHING: 5657273
EASTING: -28768
WATER LEVEL (10.2 m) 2016/06/27
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 178.3 | | | | | | | | | | | |
| 14 | | Very poor quality grey (inferred) MUDSTONE/CLAYSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 177.8 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE/CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC22 | 98 | 98 | 0 | | R0 | W5.5 | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | RC23 | 100 | 85 | 0 | | R0 | W5.5 | |
| 17 | | | | | | | | | | | | |
| | | - brown, oxidation below 17.2 m | | | RC24 | 98 | 58 | 39 | | R0 | W5.5 | |
| 18 | 173.9 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE<br>- fresh<br>- strong to medium strong | | | | | | | | | | |
| | 173.3 | | | | | | | | | | | |
| 19 | | Poor to fair quality grey interbedded CLAYSTONE/SILTSTONE<br>- completely to highly weathered<br>- very to extremely weak | | | RC25 | 100 | 81 | 53 | | R0.5 | W5 | |
| 20 | | | | | | | | | | | | |
| | | - 0.2 m thick coal seem from 20.3 to 20.5 m | | | | | | | | | | |
| 21 | | | | | RC26 | 88 | 66 | 34 | | R0.5 | W5 | |
| 22 | | | | | | | | | | | | |
| | 169.9 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong to weak | | | RC27 | 92 | 80 | 39 | | R1.5 | W3 | |
| | 169.1 | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D42**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/29/2016 to 7/29/2016
NORTHING: 5657273
EASTING: -28768
WATER LEVEL (10.2 m) 2016/06/27
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | | Poor quality grey CLAYSTONE<br>- highly to completely weathered<br>- very to extremely weak<br>- completely weathered mudstone/claystone with coal seem/ anthracite below 23.3 m | | | | | | | | | | |
| 24 | | | | | RC28 | 100 | 58 | 25 | | R0.5 | W5.5 | |
| 25 | | | | | RC29 | 85 | 51 | 24 | | R0.5 | W5.5 | |
| 26 | | | | | | | | | | | | |
| 27 | 164.9 | | | | RC30 | 81 | 32 | 14 | | R1 | W4 | |
| | | Very poor to fair quality grey SANDSTONE<br>- slightly weathered<br>- weak to medium strong<br>- fine grained (possibly siltstone) | | | | | | | | | | |
| 28 | 163.6 | | | | | | | | | | | |
| | | Very poor to poor quality grey CLAYSTONE/MUDSTONE<br>- completely to highly weathered<br>- very to extremely weak<br>- clay infill in joints (largely washed away) | | | RC31 | 90 | 63 | 58 | | R1 | W3 | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | RC32 | 78 | 44 | 0 | | R0.5 | W5 | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | RC33 | 97 | 80 | 39 | | R0.5 | W5 | |
| | | | | | RC34 | 100 | 91 | 73 | | R0.5 | W5 | |
| | 159.3 | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:56 PM

Stantec

# BOREHOLE RECORD

**D42**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/29/2016 to 7/29/2016
NORTHING: 5657273
EASTING: -28768
WATER LEVEL (10.2 m) 2016/06/27
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | | | | | | | | | | | | |
| | | Poor to fair quality grey SILTSTONE<br>- slightly weathered<br>- very to extremely weathered | | | RC35 | 85 | 85 | 50 | | R1.5 | W2 | |
| | 158.3 | | | | | | | | | | | |
| | | Poor quality grey CLAYSTONE<br>- slightly weathered<br>- very to extremely weak | | | | | | | | | | |
| 34 | 157.7 | | | | | | | | | | | |
| | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- very to extremely weak | | | RC36 | 86 | 75 | 46 | | R1.5 | W2 | |
| 35 | 156.8 | | | | | | | | | | | |
| | | End of borehole (35.2 m)<br>- borehole sloughed to 34.6 m<br>- borehole backfilled with cuttings, bentonite seal placed at 0.6 m to 4.3 m and 13.7 m to 34.6 m | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:56 PM

Stantec

# BOREHOLE RECORD

**D43**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/23
WATER LEVEL
NORTHING 5657489
EASTING -28705
PROJECT NO. 110773396
BH SIZE SONIC
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1186.53 | TOPSOIL | | | | | | | | | | | |
| | 1186.18 | | | | | | | | | | | | |
| | 1186.03 | Brown SILT (ML)<br>- sandy, trace rootlets, damp | | | S | 1 | 1350 | | | | | | |
| 1 | | Brown, low plasticity clay TILL (CL)<br>- sandy, damp | | | | | | | | | | | |
| 2 | 1184.43 | Very dense, light grey silt (ML) TILL<br>- dry | | | S | 2 | 1500 | | | | | | |
| 3 | 1183.38 | Brown, low plasticity clay (CL) TILL<br>- trace sand, gravel, trace coal specks, damp | | | S | 3 | 1500 | | | | | | |
| 4 | | | | | | | | | | | | | |
| | | - brownish grey below 4.6 m | | | S | 4 | 1500 | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | 1180.43 | Brown silty GRAVEL (GM)<br>- some sand, wet | | | S | 5 | 900 | | | | | | |
| | 1179.53 | Brown silty SAND (SM)<br>- moist | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | 1178.53 | - dry below 7.8 m | | | | | | | | | | | |
| | 1178.33 | Light grey (inferred) SILTSTONE | | | | | | | | | | | |
| | | Brown (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | S | 6 | 1500 | | | | | | |
| 9 | 1177.43 | | | | | | | | | | | | |
| | | End of Sonic borehole at 9.1 m<br>- bedrock encountered at 8.0 m<br>- sloughing at 8.3 m upon completion of sonic drilling | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D43**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/23
WATER LEVEL

NORTHING 5657489
EASTING -28705

PROJECT NO. 110773396
BH SIZE SONIC
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | GRAIN SIZE ANALYSIS: Sand (%) | GRAIN SIZE ANALYSIS: Silt (%) | GRAIN SIZE ANALYSIS: Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | - borehole completed with rotary coring, coring commenced at 9.6 m (see rock coring log for details)<br>- borehole advanced in bedrock to 55.3 m | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D43**

CLIENT Alberta Transportation NORTHING: 5657489 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28705 BH SIZE HS:200mm

DRILLING DATE 8/17/2016 to 8/17/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 8 | 178.5 | | | | | | | | | | | |
| | 178.3 | Light grey (inferred) SILTSTONE | | | | | | | | | | |
| | | Brown (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| | 176.9 | | | | | | | | | | | |
| | | Very poor quality brown SANDSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 10 | 176.3 | | | | RC 7 | 95 | 59 | 12 | | R1 | W3 | |
| | | Very poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- extremely weak | | | | | | | | | | |
| 11 | | | | | | | | | | | | |
| | | | | | RC 8 | 100 | 74 | 0 | | R0 | W3 | |
| 12 | | | | | | | | | | | | |
| | 173.6 | | | | | | | | | | | |
| | | Poor quality brown to grey SANDSTONE<br>- moderately weathered<br>- medium strong | | | RC 9 | 95 | 75 | 31 | | R1.5 | W3 | |
| 13 | | | | | | | | | | | | |
| 14 | 172.5 | | | | | | | | | | | |
| | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| | | | | | RC10 | 100 | 76 | 29 | | R1 | W3 | |
| 15 | | | | | | | | | | | | |
| | | - extremely to very weak below 15.6 m | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| | | | | | RC11 | 99 | 85 | 15 | | R1 | W3 | |
| 17 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:19:59 PM

Stantec

# BOREHOLE RECORD

**D43**

CLIENT Alberta Transportation NORTHING: 5657489 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28705 BH SIZE HS:200mm

DRILLING DATE 8/17/2016 to 8/17/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | | | | | | | | | | | | |
| | 169.3 | Poor quality grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | RC12 | 89 | 80 | 50 | | 3 | W2 | |
| 18 | | | | | | | | | | | | |
| 19 | 167.3 | Poor quality brown SANDSTONE<br>- moderately weathered<br>- medium strong | | | RC13 | 100 | 85 | 35 | | R2 | W2.5 | |
| | 166.6 | Poor quality dark grey SILTSTONE<br>- moderately weathered<br>- weak to medium strong | | | | | | | | | | |
| 20 | 166.2 | Very poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | RC14 | 92 | 49 | 0 | | R1 | W3 | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| | 164.0 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC15 | 93 | 63 | 41 | | R2 | W2.5 | |
| 23 | | | | | | | | | | | | |
| 24 | 162.5 | Poor quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>- very weak to medium strong | | | RC16 | 99 | 90 | 35 | | R2 | W2.5 | |
| 25 | | | | | | | | | | | | |
| | 160.9 | Poor quality dark grey SILTSTONE<br>- moderately weathered<br>- medium strong | | | RC17 | 100 | 93 | 44 | | 3 | W2.5 | |
| 26 | | - fair quality, slightly weathered below 26.4 m | | | | | | | | | | |
| 27 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:00 PM

Stantec

# BOREHOLE RECORD

**D43**

CLIENT Alberta Transportation NORTHING: 5657489 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28705 BH SIZE HS:200mm

DRILLING DATE 8/17/2016 to 8/17/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | | Poor quality dark grey SILTSTONE<br>- moderately weathered<br>- medium strong | | | RC18 | 100 | 89 | 73 | | 3 | W2 | |
| 28 | 158.4 | Poor quality dark grey CLAYSTONE<br>- highly weathered<br>- very weak | | | | | | | | | | |
| | 157.9 | Poor quality grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | RC19 | 100 | 82 | 45 | | 3 | W2 | |
| 29 | | - 0.2 m thick moderately weathered, weak claystone layer | | | | | | | | | | |
| 30 | | | | | RC20 | 99 | 83 | 46 | | R1.5 | W2.5 | |
| | 156.1 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak to weak<br>- very poor quality below 30.9 m | | | | | | | | | | |
| 31 | | | | | RC21 | 94 | 61 | 16 | | R1.5 | W3 | |
| 32 | | - poor quality, weak to medium strong below 32.5 m | | | | | | | | | | |
| 33 | | - 0.24 m thick slightly weathered, medium strong sandstone layer at 33.16 m | | | RC22 | 100 | 78 | 45 | | R2 | W3 | |
| 34 | | - very weak below 34.0 m | | | | | | | | | | |
| | 151.8 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC23 | 100 | 89 | 47 | | R2 | W2.5 | |
| 35 | 151.0 | Poor quality dark green CLAYSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| 36 | | | | | RC24 | 100 | 78 | 7 | | R1 | W3 | |
| 37 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:00 PM

Stantec

# BOREHOLE RECORD

**D43**

CLIENT Alberta Transportation NORTHING: 5657489 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28705 BH SIZE HS:200mm

DRILLING DATE 8/17/2016 to 8/17/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | | | | | | | | | | | | |
| | 149.0 | Poor quality dark green CLAYSTONE<br>- moderately weathered<br>- very weak<br>- slightly weathered,<br>weak to medium<br>strong below 37.0 m | | | RC25 | 100 | 92 | 43 | | 2.5 | W2 | |
| 38 | 148.4 | Poor quality dark grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | | Poor quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>-very weak to weak | | | RC26 | 100 | 82 | 40 | | R1.5 | W2.5 | |
| 39 | | | | | | | | | | | | |
| 40 | 146.5 | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC27 | 97 | 86 | 57 | | R2 | W2 | |
| 41 | 145.5 | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- very weak to medium strong | | | | | | | | | | |
| | 144.9 | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC28 | 100 | 95 | 54 | | 3 | W2 | |
| 42 | | | | | | | | | | | | |
| | 143.9 | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 43 | | | | | | | | | | | | |
| | 142.8 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC29 | 99 | 91 | 59 | | 3 | W2 | |
| 44 | | - good quality below 44.7 m | | | | | | | | | | |
| 45 | 141.3 | Good quality dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | RC30 | 100 | 95 | 79 | | 3 | W2 | |
| 46 | | | | | | | | | | | | |
| | 139.7 | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D43**

CLIENT Alberta Transportation NORTHING: 5657489 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28705 BH SIZE HS:200mm

DRILLING DATE 8/17/2016 to 8/17/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | | | | | | | | | | | | |
| | | Fair to good quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC31 | 100 | 96 | 75 | | 3 | W2 | |
| | 139.1 | | | | | | | | | | | |
| | 138.8 | Fair to good quality dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| | 138.0 | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC32 | 98 | 81 | 51 | | 3 | W2 | |
| 49 | | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | | | | | RC33 | 100 | 87 | 57 | | 3 | W2 | |
| 50 | | | | | | | | | | | | |
| | 136.2 | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 51 | 135.5 | Good quality dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong<br>- 0.1 m thick sandstone layer at 51.5 m | | | RC34 | 100 | 100 | 88 | | 3 | W2 | |
| 52 | | | | | | | | | | | | |
| | | | | | RC35 | 100 | 91 | 57 | | 3 | W2 | |
| 53 | 133.2 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 54 | 132.4 | Very poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak to medium strong | | | RC36 | 87 | 77 | 17 | | R2 | W3 | |
| 55 | | | | | | | | | | | | |
| | 131.2 | End of borehole (55.3 m)<br>- borehole open upon completion<br>- borehole backfilled with cuttings, bentonite seal placed at 0.0 m to 4.0 m and 9.1 m to 55.3 m | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 57 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:00 PM

Stantec

# BOREHOLE RECORD

**D45**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/08

NORTHING 5657536
EASTING -28839
WATER LEVEL (0.9 m) 2016/07/08

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1185.12 | TOPSOIL | | | | | | | | | | | |
| | 1184.32 | Very stiff medium plasticity CLAY (CI)<br>- silty, sandy, trace gravel, damp | | | BS | 1 | | | | 5.9 | 24.1 | 46.0 | 24.1 |
| 1 | | | | | ST | 2 | 280 | | Y | | | | |
| | | - seepage at 1.5 m | | | SS | 3 | 280 | 20 | | | | | |
| | | | | | BS | 4 | | | | | | | |
| 2 | | | | | SS | 5 | 280 | 26 | | | | | |
| | | | | | BS | 6 | | | | | | | |
| 3 | | | | | SS | 7 | 450 | 40 | | 3.4 | 22.2 | 39.0 | 35.4 |
| | 1181.42 | | | | BS | 8 | | | | | | | |
| 4 | | Very dense brown well-graded GRAVEL (GW)<br>- sandy, wet<br>- evidence of cobbles and boulders below 3.7 m | | | SS | 9 | 450 | 50+ | | | | | |
| | | | | | BS | 10 | | | | | | | |
| 5 | | - switch to hollow stem augering at 4.6 m due to sloughing | | | SS | 11 | 400 | 50+ | | 61.3 | 31.3 | 5.7 | 1.6 |
| 6 | | | | | SS | 12 | 0 | 50+ | | | | | |
| 7 | 1177.82 | | | | | | | | | | | | |
| | | Very poor quality grey (inferred) SILTSTONE<br>- completely weathered | | | | | | | | | | | |
| 8 | 1177.02 | - extremely weak | | | SS | 13 | 400 | 50+ | | 23.5 | 27.9 | 33.9 | 14.7 |
| | | Bedrock encountered at 7.3 m<br>- coring commenced at 7.4 m (see rock coring log for details)<br>- borehole advanced in bedrock to 45.7 m<br>- water at 0.9 m and sloughing at 42.6 m<br>- water at 1.5 m during augering | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D45**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/8/2016 to 7/8/2016
NORTHING: 5657536
EASTING: -28839
WATER LEVEL (0.9 m) 7/8/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 177.8 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 177.7 | Very poor quality grey (inferred) SILTSTONE<br>- completely weathered<br>- extremely weak | | | RC14 | 97 | 20 | 0 | | R0 | W5.5 | |
| 8 | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC15 | 100 | 0 | 0 | | R0 | W5.5 | |
| 9 | | | | | | | | | | | | |
| 10 | 174.8 | | | | RC16 | 100 | 27 | 7 | | R1 | W4.5 | |
| | | Very poor quality brown to grey SILTSTONE<br>- highly weathered<br>- very weak to weak | | | | | | | | | | |
| 11 | 173.8 | | | | | | | | | | | |
| | 173.3 | Very poor quality brown to grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC17 | 100 | 52 | 20 | | R1 | W5.5 | |
| 12 | | Very poor quality brown SANDSTONE<br>- highly to moderately weathered<br>- weak | | | | | | | | | | |
| 13 | 172.1 | | | | RC18 | 100 | 23 | 0 | | R1 | W4 | |
| | | Very poor quality grey to dark grey SILTSTONE<br>- highly weathered<br>- very weak | | | | | | | | | | |
| 14 | 171.0 | | | | | | | | | | | |
| | | Very poor quality grey to dark grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC19 | 100 | 10 | 0 | | R0 | W5.5 | |
| 15 | | | | | | | | | | | | |
| | | - grey mudstone, highly weathered, extremely weak to very weak | | | | | | | | | | |
| 16 | | | | | RC20 | 100 | 54 | 17 | | R0.5 | W4 | |
| | 168.3 | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:05 PM

Stantec

# BOREHOLE RECORD

**D45**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 7/8/2016 to 7/8/2016
NORTHING: 5657536
EASTING: -28839
WATER LEVEL (0.9 m) 7/8/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | | | | | | | | | | | | |
| | | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- very weak to weak | | | | | | | | | | |
| | 167.5 | | | | | | | | | | | |
| 18 | | Very poor quality grey MUDSTONE<br>- moderately to highly weathered<br>- extremely to very weak | | | RC21 | 93 | 57 | 19 | | R1 | W3 | |
| | 166.5 | | | | | | | | | | | |
| 19 | | Poor quality grey SANDSTONE<br>- moderately weathered<br>- weak<br><br>- 0.3 m thick layer of shale with coal seams at 19.3 m | | | RC22 | 100 | 72 | 43 | | R2 | W3 | |
| 20 | 165.0 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- highly weathered<br>- extremely weak | | | RC23 | 98 | 41 | 11 | | R0 | W4 | |
| 21 | 163.5 | | | | | | | | | | | |
| 22 | | Poor quality grey SILTSTONE<br>- moderately weathered<br>- Extremely weak to weak | | | RC24 | 100 | 67 | 43 | | R1 | W3 | |
| 23 | | - very poor quality below 23.1 m | | | | | | | | | | |
| | 161.7 | | | | | | | | | | | |
| | | Very poor quality grey CLAYSTONE<br>- highly weathered<br>- extremely weak | | | RC25 | 93 | 40 | 23 | | R1 | W3.5 | |
| 24 | 161.0 | | | | | | | | | | | |
| | | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak<br>- poor quality below 24.6<br>- 0.3 m thick layer of shale, highly weathered, and very weak at 24.7 m<br>- thin clay infill seam at 25.2 m | | | RC26 | 100 | 64 | 47 | | R2 | W3 | |
| 25 | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| | 158.7 | | | | | | | | | | | |
| | | | | | RC27 | 95 | 16 | 0 | | R0 | W5.5 | |
| 27 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:06 PM

Stantec

# BOREHOLE RECORD

**D45**

CLIENT Alberta Transportation NORTHING: 5657536 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28839 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/8/2016 to 7/8/2016 WATER LEVEL (0.9 m) 7/8/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | | Very poor quality grey to dark grey MUDSTONE<br>- completely weathered<br>- extremely weak<br>- moderately to highly weathered, and very weak below 27.6 m<br>- thin clay infill seam at 28.0 m<br>- 0.4 m thick layer of siltstone at 28.05 m | | | | | | | | | | |
| 28 | | | | | RC28 | 100 | 51 | 0 | | R1 | W3.5 | |
| 29 | | - highly weathered, and extremely to very weak below 29.10 m | | | RC29 | 100 | 33 | 17 | | R0.5 | W4 | |
| 30 | 154.9 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak<br>- poor quality below 30.6 m | | | | | | | | | | |
| 31 | | | | | RC30 | 100 | 71 | 49 | | R2 | W3 | |
| 32 | | - 0.25 m thick layer of shale at 31.35 m<br>- thin clay infill seam at 31.45 m | | | | | | | | | | |
| 33 | 152.6<br>151.9 | Very poor qulaity dark grey MUDSTONE<br>- highly weathered<br>- extremely to very weak | | | RC31 | 98 | 51 | 23 | | R1 | W3.5 | |
| | | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 34 | 151.2 | Very poor quality grey MUDSTONE<br>- completely to highly weathered | | | RC32 | 97 | 45 | 0 | | R0 | W4 | |
| 35 | 150.3 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak<br>- poor quality, moderately weathered, and very weak to weak below 35.2 m<br>- thin clay infill seam at 35.2 m<br>- thin clay infill seam at 35.9 m | | | | | | | | | | |
| 36 | | | | | RC33 | 98 | 78 | 36 | | R1.5 | W3 | |
| 37 | | - weak below 36.7 m | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D45**

CLIENT Alberta Transportation
NORTHING: 5657536
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -28839
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 7/8/2016 to 7/8/2016
WATER LEVEL (0.9 m) 7/8/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 37 | | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak | | | RC34 | 98 | 49 | 49 | | R2 | W3 | |
| 38 | | - thin clay infill seam at 37.7 m<br>- very weak to weak below 38.2 m | | | RC35 | 100 | 69 | 41 | | R1.5 | W3 | |
| 39 | | - thin clay infill seam at 39.0 m | | | | | | | | | | |
| 40 | | | | | RC36 | 100 | 71 | 50 | | R1.5 | W3 | |
| 41 | | - fair quality, moderately to slightly weathered, and weak below 41.2 m | | | | | | | | | | |
| 42 | | - thin clay infill seam at 42.2 m | | | RC37 | 96 | 83 | 62 | | R2 | W2.5 | |
| 43 | | | | | RC38 | 97 | 82 | 55 | | R2 | W2.5 | |
| 44 | | - good quality, slightly weathered, and weak below 44.2 m | | | | | | | | | | |
| 45 | 1139.4 | | | | RC39 | 100 | 81 | 81 | | R2 | W2 | |
| 46 | | End of borehole (45.7 m)<br>- borehole slough to 42.6 m and water at 0.9 m upon completion<br>- 50 mm standpipe piezometer installed, slotted from 11.7 m to 13.1 with bentonite seals placed from 0.0 m to 11.6 m | | | | | | | | | | |
| 47 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D45**

CLIENT Alberta Transportation NORTHING: 5657536 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28839 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/8/2016 to 7/8/2016 WATER LEVEL (0.9 m) 7/8/2016 DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % (80 60 40 20) | RECOVERY SOLID CORE % (80 60 40 20) | R.Q.D. % (80 60 40 20) | FRACT. INDEX PER 1m (5 10 15 20) | ROCK STRENGTH INDEX (R5 R4 R3 R2) | WEATHERING INDEX (W1 W2 W3 W4 W5 W6) | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | | and 13.1 m to 42.6 m | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 57 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:06 PM

Stantec

# BOREHOLE RECORD

**D46**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/22

NORTHING 5657593
EASTING -28938
WATER LEVEL (3.7 m) 2016/06/22

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1187.18 | TOPSOIL | | | BS | 1 | | | | | | | |
| | 1186.28 | | | | | | | | | | | | |
| 1 | | Very stiff to hard, brown, low to medium plasticity CLAY (CL-CI)<br>- silty, sandy, gravelly, dry | | | ST | 2 | 290 | | Y | | | | |
| | | | | | SS | 3 | 450 | 28 | | | | | |
| 2 | | | | | ST | 4 | 220 | | Y | 21.1 | 27.9 | 32.2 | 18.9 |
| | | | | | SS | 5 | 0 | 50+ | | | | | |
| | | - evidence of cobbles and boulders below 2.6 m<br>- damp below 2.7 m | | | SS | 6 | 450 | 36 | | | | | |
| 3 | | | | | BS | 7 | | | | | | | |
| | | | | ▼ | SS | 8 | 150 | 50+ | | | | | |
| 4 | | | | | BS | 9 | | | | | | | |
| | | - dark grey below 4.7 m | | | SS | 10 | 450 | 44 | | | | | |
| 5 | | | | | BS | 11 | | | | | | | |
| | 1181.68 | | | | | | | | | | | | |
| | | Hard, brown to grey, low plasticity CLAY (CL)<br>- sandy, gravelly, some silt, wet<br>- seepage at 5.8 m | | | SS | 12 | 420 | 50+ | CU | 47.0 | 25.9 | 17.0 | 10.1 |
| 6 | | | | | BS | 13 | | | | 47.9 | 35.4 | 11.9 | 4.7 |
| | | | | | SS | 14 | 100 | 50+ | | | | | |
| 7 | 1179.88 | | | | | | | | | | | | |
| | | Hard, brown, clayey SAND (SC)<br>- some gravel, wet<br>- switch to hollow stem augering at 7.3 m due to sloughing<br>- evidence of cobbles and boulders between 8.0 m and 8.8 m | | | SS | 15 | 150 | 45 | | | | | |
| 8 | | | | | SS | 16 | 0 | 50+ | | | | | |
| 9 | | | | | SS | 17 | 360 | 50+ | | 56.6 | 22.1 | 14.1 | 7.3 |
| 10 | 1177.18 | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D46**

CLIENT Alberta Transportation
NORTHING 5657593
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -28938
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/22
WATER LEVEL (3.7 m) 2016/06/22
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very poor quality grey (inferred) SANDSTONE | | | SS | 18 | 75 | 50+ | | | | | |
| | 1176.68 | - moderately weathered<br>- very weak | | | SS | 19 | 50 | 50+ | | | | | |
| 11 | | Bedrock encountered at 10.6 m<br>- coring commenced at 10.5 m (see rock coring log for details)<br>- borehole advanced in bedrock to 39.6 m<br>- water at 3.7 m and sloughing at 36.5 m<br>- water at 5.8 m during augering | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D46**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/22/2016 to 6/22/2016
NORTHING: 5657593
EASTING: -28938
WATER LEVEL (3.7 m) 6/22/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 10 | 177.2 | | | | | | | | | | | |
| | | Very poor quality grey (inferred) SANDSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| | 176.7 | | | | RC20 | 97 | 22 | 0 | | R2 | W3.5 | |
| 11 | | Very poor quality brown SANDSTONE<br>- moderately to highly weathered<br>- weak | | | RC21 | 87 | 50 | 11 | | R1 | W4 | |
| 12 | 175.1 | | | | | | | | | | | |
| | | Very poor quality brown MUDSTONE<br>- highly to completely weathered<br>- extremely weak<br>- grey below 12.6 m<br>- 0.1 m thick layer of siltstone at 12.7 m | | | RC22 | 100 | 28 | 7 | | R0 | W4.5 | |
| 13 | | | | | | | | | | | | |
| 14 | | - 0.2 m thick layer of siltstone at 13.9 m | | | | | | | | | | |
| | | - 0.2 m thick layer of siltstone at 14.65 m | | | RC23 | 100 | 17 | 7 | | R0 | W4.5 | |
| 15 | | | | | | | | | | | | |
| 16 | | | | | RC24 | 100 | 25 | 20 | | R0 | W4.5 | |
| | 170.4 | | | | | | | | | | | |
| 17 | 170.1 | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- completely to highly weathered<br>- extremely weak | | | RC25 | 100 | 26 | 10 | | R0 | W4.5 | |
| 18 | 168.8 | | | | | | | | | | | |
| | | Very poor to poor quality grey SANDSTONE<br>- moderately weathered | | | | | | | | | | |
| 19 | 168.2 | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D46**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/22/2016 to 6/22/2016
NORTHING: 5657593
EASTING: -28938
WATER LEVEL (3.7 m) 6/22/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | | - weak | | | | | | | | | | |
| | 167.9 | Poor quality black SHALE<br>- completely weathered<br>- weak | | | RC26 | 100 | 58 | 26 | | R1 | W4 | |
| | 167.5 | Poor quality grey SILTSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| 20 | 167.2 | Poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 166.6 | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC27 | 100 | 13 | 20 | | R1 | W4 | |
| 21 | | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 165.7 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak<br>- 0.25 m thick layer of mudstone at 21.9 m | | | RC28 | 97 | 77 | 53 | | R2 | W2 | |
| 22 | | | | | | | | | | | | |
| 23 | 164.1 | Very poor quality grey to dark grey CLAYSTONE/MUDSTONE<br>- highly weathered<br>- extremely weak<br>- thin coal seam at 23.5 m | | | RC29 | 93 | 13 | 0 | | R0 | W4 | |
| | | - grey below 24.6 m | | | RC30 | 94 | 56 | 19 | | R0 | W4 | |
| 24 | | | | | | | | | | | | |
| 25 | | - 0.25 m thick layer of siltstone at 25.6 m | | | | | | | | | | |
| 26 | | | | | RC31 | 95 | 33 | 25 | | R0 | W4 | |
| 27 | | | | | | | | | | | | |
| | 159.6 | Very poor quality grey SILTSTONE<br>- moderately to slightly weathered<br>- weak | | | | | | | | | | |
| 28 | 159.2 | Very poor quality grey CLAYSTONE<br>- highly weathered<br>- extremely weak | | | RC32 | 95 | 54 | 19 | | R1 | W3 | |
| | 159.0 | | | | | | | | | | | |
| | 158.3 | Very poor quality grey SILTSTONE | | | | | | | | | | |
| 29 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D46**

CLIENT Alberta Transportation
NORTHING: 5657593
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -28938
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 6/22/2016 to 6/22/2016
WATER LEVEL (3.7 m) 6/22/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | | | | | | | | | | | | |
| | 158.1 | - moderately to slightly weathered<br>- weak | | | | | | | | | | |
| | 157.9 | Very poor quality grey CLAYSTONE<br>- highly weathered<br>- extremely weak | | | RC33 | 99 | 37 | 8 | | R0 | W3.5 | |
| 30 | | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | 156.4 | Very poor quality grey CLAYSTONE<br>- highly to moderately weathered<br>- extremely weak | | | | | | | | | | |
| 31 | 156.0 | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC34 | 97 | 73 | 24 | | R0.5 | W3 | |
| | 155.5 | Very poor quality grey CLAYSTONE<br>- moderately to highly weathered<br>- extremely weak | | | | | | | | | | |
| 32 | 155.0 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- extremely weak | | | | | | | | | | |
| | 154.5 | Very poor quality grey CLAYSTONE<br>- moderately weathered<br>- extremely weak | | | RC35 | 100 | 60 | 24 | | R1 | W3 | |
| 33 | 154.1 | Very poor quality grey SILTSTONE<br>- slightly to moderately weathered<br>- weak | | | | | | | | | | |
| | 153.6 | Very poor quality grey CLAYSTONE<br>- highly weathered<br>- extremely weak<br>- 0.15 m thick layer of Shale with coal seams at 33.24 m | | | RC36 | 100 | 78 | 40 | | R2 | W2 | |
| 34 | | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 151.7 | Poor quality dark grey to grey SHALE<br>- moderately weathered<br>- extremely to very weak | | | RC37 | 97 | 51 | 25 | | R0.5 | W3 | |
| 35 | 150.6 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 150.2 | Fair quality grey MUDSTONE<br>- moderately weathered<br>- extremely weak | | | RC38 | 100 | 74 | 53 | | R1.5 | W2.5 | |
| 36 | 149.8 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | | | | | RC39 | 98 | 72 | 38 | | R2 | W2 | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:11 PM

Stantec

# BOREHOLE RECORD

**D46**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/22/2016 to 6/22/2016
NORTHING: 5657593
EASTING: -28938
WATER LEVEL (3.7 m) 6/22/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | | Fair quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 147.6 | End of borehole (39.6 m)<br>- borehole slough to 36.5 m and water at 3.7 m upon completion<br>- borehole backfilled with cuttings, and bentonite seals placed 0.5 m to 1.5 m and from 10.4 m to 36.5 m | | | | | | | | | | |
| 40 | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D48**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/15

NORTHING 5657602
EASTING -28714
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1191.25 | | | | | | | | | | | | |
| | 1191.05 | TOPSOIL | | | | | | | | | | | |
| | | Very stiff, brown, medium plasticity CLAY (CI)<br>- silty, some sand, trace gravel, dry | | | BS | 1 | | | | | | | |
| 1 | | - dry to moist below 1.5 m | | | ST | 2 | 310 | | k, Y | 2.6 | 13.6 | 46.0 | 37.7 |
| | 1189.3 | | | | | | | | | | | | |
| 2 | | Very stiff, brown, medium plasticity CLAY (CI)<br>- silty, some sand, trace gravel, dry to moist<br>- trace coal specks below 2.6 m | | | SS | 3 | 300 | 27 | | | | | |
| | | | | | BS | 4 | | | | | | | |
| 3 | | | | | SS | 5 | 330 | 20 | | 20.3 | 11.4 | 36.9 | 31.4 |
| 4 | | | | | BS | 6 | | | | | | | |
| 5 | | | | | SS | 7 | 450 | 16 | | 1.2 | 9.4 | 42.2 | 47.3 |
| 6 | | | | | BS | 8 | | | | | | | |
| | | | | | SS | 9 | 450 | 19 | | 3.5 | 11.3 | 45.4 | 39.8 |
| 7 | 1184.05 | | | | | | | | | | | | |
| | | Very stiff, brown, low to medium plasticity CLAY (CI)<br>- silty, some sand to sandy, trace gravel, moist | | | BS | 10 | | | | | | | |
| | | | | | ST | 11 | 220 | | Y | 9.5 | 20.5 | 42.1 | 28.0 |
| 8 | | - grey below 7.6 m<br>- brown below 7.9 m | | | SS | 12 | 450 | 50+ | | | | | |
| | 1182.85 | | | | | | | | | | | | |
| | | Very dense brown silty SAND (SM)<br>- trace gravel, dry | | | BS | 13 | | | | | | | |
| 9 | | - dry to moist below 9.1 m | | | SS | 14 | 100 | 50+ | | | | | |
| | | - some gravel below 9.5 m | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D48**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/15
NORTHING 5657602
EASTING -28714
WATER LEVEL
PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very dense brown silty SAND (SM)<br>- trace gravel, dry | | | BS | 15 | | | | | | | |
| | | - switch to hollow stem augering at 10.6 m due to sloughing | | | SS | 16 | 0 | 50+ | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | SS | 17 | 240 | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | SS | 18 | 25 | 50+ | | | | | |
| 15 | 1175.7 | | | | SS | 19 | 280 | 50+ | | | | | |
| 16 | 1175.65 | Very poor quality (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak to very weak<br>Bedrock encountered at 15.6 m<br>- coring commenced at 15.4 m (see rock coring log for details)<br>- borehole advanced in bedrock to 46.0 m | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D48**

CLIENT Alberta Transportation NORTHING: 5657602 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28714 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/15/2016 to 8/15/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 175.7 | | | | | | | | | | | |
| | 175.6 | Very poor quality (inferred) CLAYSTONE - completely weathered - extremely weak to very weak | | | | | | | | | | |
| 16 | | Very poor quality dark grey CLAYSTONE - highly weathered - extremely weak to weak | | | RC20 | 92 | 81 | 0 | | R1 | W4 | |
| 17 | | | | | | | | | | | | |
| | 174.0 | | | | | | | | | | | |
| | | Very poor quality brown SANDSTONE - moderately weathered - medium strong | | | | | | | | | | |
| | 173.5 | | | | | | | | | | | |
| 18 | | Very poor quality dark grey CLAYSTONE - moderately weathered - very weak | | | RC21 | 100 | 95 | 25 | | R2 | W3 | |
| | 173.1 | | | | | | | | | | | |
| | | Very poor quality brown SANDSTONE - moderately weathered - medium strong | | | | | | | | | | |
| 19 | | | | | RC22 | 100 | 86 | 19 | | R2 | W3 | |
| | 171.8 | | | | | | | | | | | |
| | | Very poor quality dark grey CLAYSTONE - moderately weathered - very weak - highly weathered below 20.0 m | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| | | | | | RC23 | 99 | 78 | 0 | | R1 | W4 | |
| 21 | | | | | | | | | | | | |
| | 169.7 | | | | | | | | | | | |
| | | Very poor quality dark grey SILTSTONE - moderately weathered - weak | | | | | | | | | | |
| 22 | | | | | RC24 | 99 | 79 | 10 | | R2 | W3 | |
| | 168.5 | | | | | | | | | | | |
| 23 | | Fair quality grey to brown SANDSTONE - slightly weathered - medium strong | | | | | | | | | | |
| | | | | | RC25 | 100 | 90 | 67 | | 3 | W2 | |
| 24 | | | | | | | | | | | | |
| | 166.6 | | | | | | | | | | | |
| 25 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D48**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/15/2016 to 8/15/2016

NORTHING: 5657602
EASTING: -28714
WATER LEVEL

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | | | | | | | | | | | | |
| | | Very poor quality dark grey CLAYSTONE<br>- highly weathered<br>- very weak | | | RC26 | 100 | 93 | 10 | | R1 | W4 | |
| | 165.5 | | | | | | | | | | | |
| 26 | | Very poor quality dark grey SILTSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | | | | | RC27 | 100 | 93 | 43 | | R2 | W2 | |
| 27 | 163.7 | | | | | | | | | | | |
| | | Fair quality grey to brown SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC28 | 98 | 91 | 63 | | R2 | W2 | |
| 28 | | | | | | | | | | | | |
| 29 | 162.1 | | | | | | | | | | | |
| | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC29 | 98 | 86 | 42 | | R2 | W3 | |
| 30 | | | | | | | | | | | | |
| 31 | | | | | RC30 | 100 | 82 | 21 | | R2 | W2.5 | |
| 32 | 159.0 | | | | | | | | | | | |
| | | Poor quality dark grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | RC31 | 100 | 80 | 37 | | 3 | W2 | |
| 33 | 158.0 | | | | | | | | | | | |
| | | Poor quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 34 | 157.0 | | | | | | | | | | | |
| | | Poor quality dark grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | RC32 | 100 | 79 | 41 | | 2.5 | W2.5 | |
| 35 | 156.3 | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D48**

CLIENT Alberta Transportation — NORTHING: 5657602 — PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB — EASTING: -28714 — BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/15/2016 to 8/15/2016 — WATER LEVEL — DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | | | | | | | | | | | | |
| | 156.1 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | 155.8 | Poor quality dark grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | RC33 | 100 | 93 | 24 | | R2 | W3 | |
| 36 | 155.5 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | 154.5 | Poor quality dark grey SILTSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| 37 | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC34 | 99 | 86 | 45 | | 2.5 | W2.5 | |
| | 153.5 | Poor quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 38 | 152.6 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | RC35 | 100 | 86 | 37 | | R1 | W3 | |
| 39 | | | | | | | | | | | | |
| 40 | | - very poor quality,<br>very weak to weak<br>below 39.9 m | | | RC36 | 100 | 75 | 10 | | R1.5 | W3 | |
| 41 | | | | | | | | | | | | |
| | | - highly weathered<br>below 41.4 m | | | | | | | | | | |
| 42 | | | | | RC37 | 94 | 76 | 12 | | R1.5 | W4 | |
| 43 | 148.1 | Poor quality grey SANDSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| | 147.5 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC38 | 95 | 75 | 41 | | 2.5 | W2 | |
| 44 | | - very poor quality<br>below 44.5 m | | | | | | | | | | |
| 45 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D48**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/15/2016 to 8/15/2016

NORTHING: 5657602
EASTING: -28714
WATER LEVEL

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC39 | 95 | 77 | 9 | | R2 | W3 | |
| 46 | 145.3 | End of borehole (46.0 m)<br>- borehole open<br>- borehole backfilled with cuttings, and bentonite seals placed from 0.3 m to 0.9 m and 13.7 m to 46.0 m | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D50**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/25

NORTHING 5657694
EASTING -28896
WATER LEVEL (11.6 m) 2016/06/25

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1189.77 | | | | | | | | | | | | |
| | 1189.47 | TOPSOIL | | | | | | | | | | | |
| | | Stiff to very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry<br>- evidence of cobbles/boulders below 0.7 m | | | BS | 1 | | | | | | | |
| 1 | | | | | SS | 2 | 300 | 29 | | 0.7 | 14.5 | 50.2 | 34.6 |
| | | -damp below 1.5 m | | | BS | 3 | | | | | | | |
| 2 | | - trace coal specks below 1.8 m | | | SS | 4 | 450 | 24 | | | | | |
| | | | | | BS | 5 | | | | 3.0 | 11.1 | 46.7 | 39.3 |
| | | | | | ST | 6 | 70 | | | | | | |
| 3 | | | | | SS | 7 | 450 | 14 | | | | | |
| | 1186.17 | | | | BS | 8 | | | | | | | |
| | | Very stiff to hard, brown, low plasticity clay (CL) TILL<br>- silty, sandy, some gravel, trace coal specks, damp | | | SS | 9 | 450 | 50+ | | | | | |
| 4 | | | | | BS | 10 | | | | 15.0 | 24.0 | 44.8 | 16.2 |
| | | | | | SS | 11 | 450 | 29 | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | BS | 12 | | | | | | | |
| | | - grey below 6.1 m | | | ST | 13 | 0 | | | | | | |
| 7 | | | | | SS | 14 | 450 | 25 | | | | | |
| | 1182.77 | | | | | | | | | | | | |
| | | Very dense, brown gravelly SAND (SP)<br>- some silt, trace clay, wet | | | BS | 15 | | | | | | | |
| 8 | | | | | SS | 16 | 450 | 50+ | | 40.8 | 41.4 | 14.0 | 3.7 |
| | 1181.57 | - switch to hollow stem augering at 8.1 m due to sloughing | | | | | | | | | | | |
| | | | | | SS | 17 | 100 | 50+ | | | | | |
| | | Hard, brown, low plasticity clay (CL) TILL<br>- silty, trace sand, damp | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D50**

CLIENT Alberta Transportation
NORTHING 5657694
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -28896
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/25
WATER LEVEL (11.6 m) 2016/06/25
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1179.52 | -grey below 9.9 m | | | SS | 18 | 300 | 50+ | | 0.0 | 2.3 | 65.6 | 32.1 |
| | 1179.37 | Very poor quality brown (inferred) SANDSTONE/MUDSTONE<br>- completely weathered<br>- extremeley weak | | | | | | | | | | | |
| 11 | | Bedrock encountered at 10.3 m<br>- coring commenced at 10.4 m (see rock coring log for details)<br>- borehole advanced in bedrock to 49.1 m<br>- water at 11.6 m and sloughing at 48.7 m<br>- borehole dry during augering | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D50**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/25/2016 to 6/25/2016
NORTHING: 5657694
EASTING: -28896
WATER LEVEL (11.6 m) 6/24/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 10 | 179.5 | | | | | | | | | | | |
| | 179.4 | Very poor quality brown (inferred) SANDSTONE/MUDSTONE<br>- completely weathered<br>- extremeley weak | | | RC19 | 34 | 9 | 0 | | R0 | W5 | |
| 11 | | Very poor quality SANDSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | 178.4 | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | ▼ | RC20 | 97 | 15 | 13 | | R0 | W5 | |
| 12 | | | | | | | | | | | | |
| | 177.0 | Poor quality grey SANDSTONE<br>- slightly to moderately weathered<br>- weak | | | RC21 | 100 | 61 | 44 | | R2 | W2.5 | |
| 13 | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| | 175.5 | Very poor quality SILTSTONE<br>- slightly to moderately weathered<br>- weak | | | RC22 | 100 | 24 | 19 | | R0 | W5 | |
| 15 | 174.7 | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | 174.1 | Poor quality grey SANDSTONE<br>- moderately weathered<br>- weak<br>- clay infill at 16.6 m | | | RC23 | 100 | 63 | 34 | | R2 | W3 | |
| 16 | | | | | | | | | | | | |
| | 173.2 | Poor quality grey SILTSTONE<br>- highly weathered<br>- very weak<br>-clay infill at 17.0 m | | | | | | | | | | |
| 17 | 172.6 | Very poor qulity grey to dark grey SILTSTONE<br>- completely weathered<br>- very to extremely weak<br>- thin coal seam at 18.0 m<br>- 0.1 m thick shale layer at 18.4 m<br>- circulation loss at 18.6 m<br>- fair quality below 18.6 m | | | RC24 | 100 | 21 | 0 | | R0.5 | W5 | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:21 PM

Stantec

# BOREHOLE RECORD

**D50**

CLIENT Alberta Transportation
NORTHING: 5657694
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -28896
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 6/25/2016 to 6/25/2016
WATER LEVEL (11.6 m) 6/24/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | | | | | | | | | | | | |
| | 170.5 | Fair quality grey SANDSTONE<br>- Slightly weathered<br>- weak<br>- 0.1 m thick layer of clay infill at 21.0 m | | | RC25 | 100 | 75 | 57 | | R1 | W3 | |
| 20 | 169.6 | Very poor quality SILTSTONE<br>- highly weathered<br>- very to extremely weak | | | RC26 | 100 | 40 | 24 | | R0.5 | W4 | |
| 21 | 168.5 | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | 168.0 | - clay infill at 21.75 m | | | | | | | | | | |
| 22 | | Very poor quality grey CLAYSTONE<br>- moderately weathered<br>- weak to extremely weak | | | RC27 | 100 | 63 | 50 | | R1 | W3 | |
| 23 | | - very poor quality below 23.0 m, moderately weathered, very to extremely weak<br>- 0.1 m thick clay infill at 23.0 m | | | RC28 | 98 | 11 | 0 | | R0.5 | W1 | |
| 24 | | - rubble bone 0.3 m thick at 24.6 m | | | | | | | | | | |
| 25 | | | | | RC29 | 96 | 45 | 17 | | R1 | W4 | |
| | 164.3 | Very poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 26 | | - poor quality, moderately weathered, weak below 26.1 m<br>- rubble zone at 26.4 m | | | RC30 | 97 | 79 | 30 | | R1.5 | W3.5 | |
| 27 | 162.8 | Poor quality grey SILTSTONE<br>- highly weathered<br>- very weak<br>-rubble zone at 27.1 m<br>-moderately weathered below 27.6 m | | | | | | | | | | |
| 28 | | - rubble zone at 28.3 m | | | RC31 | 99 | 58 | 41 | | R1 | W3 | |
| | | - 3 cm thick clay infill at 28.95 m | | | | | | | | | | |
| 29 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:21 PM

Stantec

# BOREHOLE RECORD

**D50**

CLIENT Alberta Transportation — NORTHING: 5657694 — PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB — EASTING: -28896 — BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/25/2016 to 6/25/2016 — WATER LEVEL (11.6 m) 6/24/2016 — DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | | Poor quality grey SILTSTONE<br>- highly weathered<br>- very weak<br>- fair quality, slightly weathered, weak below 29.1 m | | | RC32 | 98 | 81 | 55 | | R2 | W2 | |
| 30 | 159.0 | Very poor quality grey to dark grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC33 | 100 | 25 | 7 | | R0 | W5 | |
| 31 | | | | | RC34 | 100 | 7 | 0 | | R0 | W5 | |
| 32 | | | | | RC35 | 100 | 0 | 0 | | R0 | W5 | |
| 33 | 156.6 | Very poor quality grey SILTSTONE<br>- highly to moderately weathered<br>- extremely weak to weak | | | RC36 | 91 | 67 | 12 | | R1.5 | W3 | |
| 34 | | | | | RC37 | 100 | 25 | 17 | | R0 | W4 | |
| 35 | 155.1 | Very poor quality grey CLAYSTONE<br>- highly weathered<br>- extremely weak | | | | | | | | | | |
| 36 | 154.3 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- weak<br>- clay infill at 36.3 m | | | RC38 | 100 | 46 | 7 | | R2 | W3 | |
| 37 | | - poor quality, slightly weathered below 37.0 m | | | RC39 | 85 | 66 | 43 | | R2 | W2 | |
| 38 | 152.2 | - 0.1 m thick clay infill at 37.6 m<br>Very poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak<br>- clay infill at 38.1 m<br>- poor quality, highly weathered below 38.6 m<br>- 5cm thick clay infill at 38.8 m | | | RC40 | 100 | 21 | 0 | | R0 | W5 | |
| 39 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D50**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/25/2016 to 6/25/2016
NORTHING: 5657694
EASTING: -28896
WATER LEVEL (11.6 m) 6/24/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | | | | | | | | | | | | |
| | 150.6 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC41 | 100 | 86 | 44 | | R1 | W3 | |
| 40 | 149.7 | Poor quality grey CLAYSTONE<br>- moderately waethered<br>- very weak<br>- 2 cm thick clay infill at 40.25 m<br>- 5 cm thick rubble zone at 41.1 m | | | RC42 | 95 | 19 | 47 | | 3 | W1 | |
| 41 | | | | | | | | | | | | |
| 42 | 147.5 | Very poor quality black SHALE<br>- highly to completely weathered<br>- extremely weak | | | RC43 | 98 | 53 | 25 | | R1 | W4 | |
| | 147.1 | Very poor quality black SILTSTONE<br>- highly weathered<br>- weak | | | | | | | | | | |
| 43 | 146.7 | Poor quality dark grey to black SHALE<br>- moderately weathered<br>- extremely weathered<br>- shell fragments throughout sample | | | RC44 | 100 | 76 | 43 | | R0 | W3 | |
| 44 | 145.6 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- extremely weathered<br>- fair quality below 44.6 m | | | RC45 | 98 | 95 | 71 | | R2 | W2 | |
| 45 | | | | | | | | | | | | |
| 46 | | - poor quality below 46.1 m<br>- 0.03 m thick shale layer at 46.6 m | | | RC46 | 96 | 52 | 40 | | R2 | W2 | |
| 47 | | - large shells in sample at 47.1 m<br>- very poor quality below 47.6 m | | | | | | | | | | |
| 48 | 141.8 | Very poor quality grey SILTSTONE<br>- moderately weathered<br>- very weak | | | RC47 | 97 | 85 | 10 | | R1 | W3 | |
| 49 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D50**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 6/25/2016 to 6/25/2016

NORTHING: 5657694
EASTING: -28896
WATER LEVEL (11.6 m) 6/24/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49 | | | | | | 80 60 40 20 | 80 60 40 20 | 80 60 40 20 | 5 10 15 20 | R5 R4 R3 R2 | W1 W2 W3 W4 W5 W6 | |
| | 140.7 | End of borehole (49.1 m)<br>- borehole slough to 48.7 m and water at 11.6 m upon completion<br>- borehole backfilled with cuttings, bentonite seal placed at 0.5 m to 0.8 m and 10.7 m to 48.7 m | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | |
| 57 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | |
| 59 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D51**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/07/21

NORTHING 5657740
EASTING -28762
WATER LEVEL (10.0 m) 2016/07/21

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1194.40 | | | | | | | | | | | | |
| | 1194.1 | TOPSOIL | | | | | | | | | | | |
| | | Compact, brown SILT (ML)<br>- some sand, trace gravel, trace rootlets, dry | | | BS | 1 | | | | | | | |
| 1 | | | | | SS | 2 | 420 | | | | | | |
| | 1192.6 | | | | SS | 3 | | 17 | | | | | |
| 2 | | Very stiff, brown medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, damp | | | ST | 4 | 230 | | | | | | |
| | | | | | SS | 5 | 260 | 17 | | | | | |
| 3 | | | | | ST | 6 | 380 | | C, Y | 1.1 | 12.5 | 42.5 | 44.0 |
| | | - mottled grey below 3.2 m | | | SS | 7 | 390 | 15 | | | | | |
| 4 | | | | | ST | 8 | 370 | | CU, Y | 9.3 | 14.8 | 40.9 | 35.0 |
| | | | | | SS | 9 | 360 | 22 | | | | | |
| 5 | | | | | SS | 10 | 350 | 17 | | | | | |
| 6 | | | | | BS | 11 | | | | | | | |
| | | | | | SS | 12 | 450 | 20 | | | | | |
| 7 | | | | | BS | 13 | | | | | | | |
| | | | | | SS | 14 | 450 | 22 | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | BS | 15 | | | | | | | |
| | | | | | SS | 16 | 350 | 40 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D51**

CLIENT Alberta Transportation
NORTHING 5657740
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -28762
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/07/21
WATER LEVEL (10.0 m) 2016/07/21
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, damp<br>- evidence of cobbles below 10.7 m | | | BS | 17 | | | | | | | |
| | | | | | SS | 18 | | 50+ | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | BS | 19 | | | | | | | |
| | | | | | SS | 20 | 200 | 50+ | | | | | |
| 13 | 1181.3 | | | | | | | | | | | | |
| | | Very dense, grey to brown poorly graded SAND (SP)<br>- some gravel<br>- switch to hollow stem augering at 13.7 m due to sloughing | | | SS | 21 | 300 | 50+ | | | | | |
| 14 | 1179.6 | | | | | | | | | | | | |
| 15 | 1179.2 | Very poor quality brown (inferred) SILTSTONE<br>- completely weathered<br>- extremely weak | | | SS | 22 | 75 | 50+ | | | | | |
| | | Bedrock encountered at 14.8 m<br>- coring commenced at 15.2 m (see rock coring log for details)<br>- borehole advanced in bedrock to 30.8 m<br>- water at 10.0 m and borehole open upon completion<br>- water at 24.4 m during augering<br>- 50 mm standpipe piezometer slotted from 29.3 m to 30.8 m | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D51**

CLIENT Alberta Transportation NORTHING: 5657740 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28762 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 7/21/2016 to 7/21/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 179.6 | | | | | | | | | | | |
| 15 | | Very poor quality brown (inferred) SILTSTONE - completely weathered - extremely weak | | | | | | | | | | |
| | 179.2 | | | | RC23 | 100 | 37 | 0 | | R0 | W1 | |
| | 178.7 | Very poor quality grey SILTSTONE - completely weathered - extremely weak | | | | | | | | | | |
| 16 | | Very poor quality grey brown SANDSTONE - highly weathered - weak to very weak | | | RC24 | 97 | 50 | 20 | | R1.5 | W4 | |
| 17 | | - grey, poor quality, moderately weathered, weak to very weak below 17.2 m - 2 cm thick clay infill at 17.6 m and at 18.3 m | | | RC25 | 100 | 56 | 39 | | R1.5 | W3 | |
| 18 | | - brown below 18.3 m | | | | | | | | | | |
| 19 | | - very poor quality, highly to completely weathered, very weak to extremely weak below 18.7 m | | | RC26 | 67 | 18 | 7.3 | | R0.5 | W4.5 | |
| 20 | | | | | | | | | | | | |
| | 174.1 | Very poor quality grey SILTSTONE - highly to moderately weathered - very weak to extremely weak | | | RC27 | 99 | 32 | 13.3 | | R0.5 | W3.5 | |
| 21 | 173.2 | Very poor quality grey MUDSTONE - highly to completely weathered - extremely weak | | | | | | | | | | |
| 22 | | | | | RC28 | 100 | 27 | 7.3 | | R0 | W4.5 | |
| 23 | 171.2 | Very poor quality grey SILTSTONE - highly weathered - weak to extremely weak | | | | | | | | | | |
| 24 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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Stantec

# BOREHOLE RECORD

**D51**

CLIENT Alberta Transportation — NORTHING: 5657740 — PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB — EASTING: -28762 — BH SIZE SS:150mm, HS:200mm
DRILLING DATE 7/21/2016 to 7/21/2016 — WATER LEVEL — DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | | Very poor quality grey SILTSTONE<br>- highly weathered<br>- weak to extremely weak<br>- oxidized fractures at 24.3 m | | | RC29 | 100 | 52 | 12 | | R1 | W4 | |
| 25 | | | | | RC30 | 100 | 35 | 18 | | R1 | W4 | |
| 26 | 168.8 | Very poor quality grey CLAYSTONE<br>- completely to highly weathered<br>- extremely weathered | | | RC31 | 100 | 20 | 0 | | R0 | W4.5 | |
| 27 | 167.7 | Very poor quality grey SILTSTONE<br>- highly to moderately weathered<br>- weak to very weak | | | RC32 | 93 | 35 | 20 | | R1.5 | W3.5 | |
| 28 | | - moderately weathered, weak below 27.7 m | | | | | | | | | | |
| 29 | 166.2 | Very poor quality grey MUDSTONE<br>- completely weathered<br>- extremely weak | | | RC33 | 78 | 29 | 9 | | R2 | W3 | |
| 30 | 165.4 | Poor quality grey SANDSTONE<br>- moderately weathered<br>- weak | | | RC34 | 92 | 48 | 40 | | R2 | W3 | |
| | | | | | RC35 | 98 | 72 | 58 | | R2 | W2 | |
| 31 | 163.6 | End of borehole (30.8 m)<br>- borehole open and water at 10.0 m upon completion<br>- 50 mm standpipe piezometer installed, solid from 0.0 m to 29.3 m, slotted PVC from 29.3 to 30.8 m<br>- borehole backfilled with cuttings, and a bentonite seal placed from 0.5 m to 28.5 m | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:26 PM

Stantec

# BOREHOLE RECORD

**D52**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/27

NORTHING 5657829
EASTING -28684
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1204.25 | | | | | | | | | | | | |
| | 1203.95 | TOPSOIL | | | | | | | | | | | |
| | | Hard, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 350 | | Y | | | | |
| | | | | | SS | 3 | 230 | 41 | | 5.3 | 16.8 | 40.9 | 37.1 |
| | | | | | BS | 4 | | | | | | | |
| 2 | | | | | SS | 5 | 290 | 38 | | 0.0 | 8.9 | 51.3 | 39.8 |
| | 1201.95 | | | | | | | | | | | | |
| | 1201.55 | Very dense, brown, silty SAND (SM)<br>- trace gravel, dry | | | SS | 6 | 340 | 50+ | | | | | |
| | 1201.25 | Very poor quality brown (inferred) SANDSTONE<br>- completely weathered<br>- extremely to very weak | | | SS | 7 | 300 | 50+ | | | | | |
| 3 | | Bedrock encountered at 2.7 m<br>- coring commenced at 2.8 m (see rock coring log for details)<br>- borehole advanced in bedrock to 49.1 m | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D52**

CLIENT Alberta Transportation NORTHING: 5657829 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28684 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/27/2016 to 6/27/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 201.6 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 3 | 201.5 | Very poor quality brown (inferred) SANDSTONE<br>- completely weathered<br>- extremely to very weak | | | RC 8 | 92 | 92 | 0 | | R0 | W5 | |
| 4 | | Very poor quality brown SANDSTONE<br>- completely weathered<br>- extremely weak<br>- poor quality below 3.4 m | | | RC 9 | 89 | 63 | 51 | | R0 | W5 | |
| 5 | 199.4 | - Poor quality brown CLAYSTONE<br>- highly to completely weathered<br>- extremely to very weak | | | | | | | | | | |
| 6 | 198.9 | Poor quality brown SANDSTONE<br>- highly to completely weathered<br>- extremely to very weak | | | RC10 | 100 | 88 | 29 | | R0.5 | W4.5 | |
| 7 | 197.0 | | | | RC11 | 95 | 81 | 37 | | R0.5 | W4.5 | |
| 8 | 196.4 | Poor quality brown CLAYSTONE<br>- highly to completely weathered<br>- extremely to very weak | | | | | | | | | | |
| 9 | | Very poor quality brown SANDSTONE<br>- completely weathered<br>- extremely weak<br>- medium strong from 9.1 m to 9.5 m | | | RC12 | 95 | 89 | 25 | | R0 | W5 | |
| 10 | 194.7<br>194.2 | Very poor quality grey SILTSTONE<br>- slightly weathered<br>- very weak | | | | | | | | | | |
| 11 | 193.3 | Very poor quality dark grey CLAYSTONE<br>- highly to completely weathered<br>- very weak | | | RC13 | 100 | 96 | 14 | | R1 | W4.5 | |
| 12 | | Fair quality brown SANDSTONE<br>- slightly to moderately weathered<br>- medium strong | | | RC14 | 95 | 84 | 63 | | 3 | W2.5 | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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Stantec

# BOREHOLE RECORD

**D52**

CLIENT Alberta Transportation NORTHING: 5657829 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28684 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/27/2016 to 6/27/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | | | | | | | | | | | | |
| | 191.8 | Fair quality grey CLAYSTONE<br>- slightly weathered<br>- weak to medium strong | | | | | | | | | | |
| 13 | 191.3 | Fair quality brown SANDSTONE<br>- fresh to slightly weathered<br>- medium strong | | | RC15 | 94 | 81 | 66 | | 2.5 | W2 | |
| 14 | | | | | | | | | | | | |
| | 189.9 | Poor quality grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | RC16 | 100 | 95 | 37 | | 3 | W2 | |
| 15 | | | | | | | | | | | | |
| 16 | 188.3 | Very poor quality dark grey CLAYSTONE<br>- highly weathered<br>- very weak<br>- slickenside at 16.24 m | | | RC17 | 100 | 97 | 0 | | R1 | W4 | |
| 17 | | - poor quality below 17.1 m | | | | | | | | | | |
| | 186.4 | Fair quality SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC18 | 100 | 91 | 35 | | R2 | W3 | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | RC19 | 100 | 84 | 61 | | 3 | W2 | |
| 20 | | - excellent quality below 20.1 m | | | | | | | | | | |
| 21 | | | | | RC20 | 100 | 98 | 94 | | 3 | W2 | |
| | | - poor to fair quality below 21.7 m | | | | | | | | | | |
| 22 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D52**

CLIENT Alberta Transportation NORTHING: 5657829 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28684 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/27/2016 to 6/27/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | | | | | | | | | | | | |
| | 181.9 | Poor to fair quality dark grey CLAYSTONE<br>- moderately to highly weathered<br>- very weak | | | RC21 | 100 | 81 | 51 | | R2 | W3 | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | RC22 | 100 | 86 | 25 | | R2 | W3 | |
| 25 | | | | | RC23 | 99 | 85 | 63 | | R2 | W3 | |
| | 178.6 | Fair quality grey SILTSTONE/SANDSTONE<br>- slightly weathered<br>- weak to medium strong<br>- fair quality sandstone below 26.2 m | | | | | | | | | | |
| 26 | | | | | | | | | | | | |
| 27 | | | | | RC24 | 94 | 91 | 64 | | 3 | W2 | |
| 28 | | - fair to good quality, and fresh below 27.8 m | | | RC25 | 100 | 92 | 77 | | 3 | W1 | |
| | 175.5 | Fair to good quality grey CLAYSTONE<br>- slightly weathered<br>- weak to medium strong | | | | | | | | | | |
| 29 | 175.0 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 30 | | | | | RC26 | 100 | 83 | 58 | | 3 | W2 | |
| | 174.1 | Fair quality grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 173.5 | Good quality grey SANDSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 31 | | | | | RC27 | 99 | 99 | 89 | | 3 | W1 | |
| 32 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D52**

CLIENT Alberta Transportation NORTHING: 5657829 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28684 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/27/2016 to 6/27/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | | Good quality grey SANDSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 33 | | | | | RC28 | 96 | 96 | 87 | | 3 | W1 | |
| 34 | | - excellent quality below 33.9 m | | | RC29 | 98 | 98 | 98 | | 3 | W1 | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | RC30 | 95 | 95 | 89 | | 3 | W1 | |
| | 167.4 | | | | | | | | | | | |
| 37 | | Very poor to poor quality grey CLAYSTONE<br>- slightly weathered<br>- weak to medium strong | | | RC31 | 100 | 87 | 25 | | 2.5 | W2 | |
| 38 | | | | | | | | | | | | |
| | 165.8 | | | | | | | | | | | |
| | 165.5 | Poor quality grey SILTSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 39 | 165.2 | Poor quality grey CLAYSTONE<br>- slightly weathered<br>- weak to medium strong | | | RC32 | 100 | 90 | 50 | | 3 | W1.5 | |
| | 164.8 | Poor quality grey SILTSTONE<br>- medium strong<br>- fresh | | | | | | | | | | |
| 40 | 164.3 | Poor to fair quality grey CLAYSTONE<br>- slightly weathered<br>- weak to medium strong | | | | | | | | | | |
| | 163.8 | | | | | | | | | | | |
| | 163.4 | Good quality grey SILTSTONE<br>- fresh<br>- medium strong | | | RC33 | 98 | 93 | 78 | | 3 | W1 | |
| 41 | | Good quality grey CLAYSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 162.7 | | | | | | | | | | | |
| | 162.4 | Good quality grey SANDSTONE<br>- medium strong | | | | | | | | | | |
| 42 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D52**

CLIENT Alberta Transportation NORTHING: 5657829 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -28684 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/27/2016 to 6/27/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42 | | - fresh | | | | | | | | | | |
| | 161.8 | Fair quality grey SILTSTONE<br>- fresh<br>- medium strong | | | RC34 | 100 | 93 | 65 | | 2.5 | W1.5 | |
| 43 | | Fair quality grey CLAYSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 161.0 | Fair quality grey SILTSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 44 | | Very poor quality grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC35 | 100 | 77 | 20 | | R2 | W3 | |
| | 159.7 | Fair qualtiy grey SILTSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 45 | 159.0 | Fair quality grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC36 | 100 | 94 | 55 | | 2.5 | W1.5 | |
| | 158.6 | Fair quality grey SILTSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 46 | 158.2 | Excellent quality grey SANDSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 47 | | | | | RC37 | 99 | 99 | 99 | | 3 | W1 | |
| 48 | | | | | RC38 | 100 | 100 | 100 | | 3 | W1 | |
| 49 | 155.2 | End of borehole (49.1 m)<br>- borehole backfilled with cuttings, and a bentonite seal placed from 3.0 m to 49.1 m | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:29 PM

Stantec

# BOREHOLE RECORD

**D58**

CLIENT Alberta Transportation
NORTHING 5657461
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29145
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/06/22
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.20 | TOPSOIL | | | | | | | | | | | |
| | 1189.85 | Very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, trace gravel, dry to moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 330 | | k, Y | 11.7 | 10.5 | 40.1 | 37.7 |
| 2 | | | | | SS | 3 | 45 | 19 | | | | | |
| | | -mottled grey below 2.6 m | | | BS | 4 | | | | | | | |
| 3 | | | | | ST | 5 | 400 | | CU, Y | 1.1 | 6.4 | 39.6 | 53.0 |
| | | | | | SS | 6 | 450 | 19 | | | | | |
| 4 | 1186.1 | Hard, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, moist | | | BS | 7 | | | | | | | |
| 5 | | | | | ST | 8 | 350 | | | | | | |
| | | - some gravel below 5.2 m | | | SS | 9 | 430 | 38 | | | | | |
| | | | | | BS | 10 | | | | | | | |
| 6 | | - dark brown below 6.1 m | | | SS | 11 | 450 | 31 | | | | | |
| 7 | | | | | BS | 12 | | | | | | | |
| | | | | | SS | 13 | 380 | 37 | | | | | |
| 8 | | | | | BS | 14 | | | | | | | |
| 9 | | | | | SS | 15 | 450 | 33 | | 17.3 | 19.0 | 43.7 | 20.0 |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D58**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/22
NORTHING 5657461
EASTING -29145
WATER LEVEL
PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, moist<br>- dry to moist below 10.2 m<br>- greyish brown below 10.7 m | | | BS | 16 | | | | | | | |
| 11 | | | | | SS | 17 | 450 | 29 | | | | | |
| 12 | 1178 | | | | BS | 18 | | | | | | | |
| | | Very stiff, grey, low to medium plasticity CLAY (CL-CI)<br>- silty, some sand, trace to some gravel, moist<br>- seepage at 12.5 m | | | SS | 19 | 450 | 19 | | 1.9 | 10.9 | 43.8 | 43.4 |
| 13 | | | | | BS | 20 | | | | | | | |
| 14 | 1175.9 | | | | ST | 21 | 340 | | CU, Y | 16.0 | 19.3 | 51.1 | 27.9 |
| | 1175.5 | Hard, brown, low to medium plasticity clay (CL-CI) TILL | | | SS | 22 | 450 | 36 | | | | | |
| | 1175.3 | - some sand, trace gravel, moist | | | BS | 23 | | | | | | | |
| 15 | | Very poor quality grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely to very weak | | | | | | | | | | | |
| 16 | | Bedrock encountered at 14.7 m<br>- coring commenced at 14.9 m (see rock coring log for details)<br>- borehole advanced in bedrock to 40.0 m<br>- slough to 18.0 m upon completion<br>- water at 14.3 m during augering | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D58**

CLIENT Alberta Transportation NORTHING: 5657461 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29145 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/22/2016 to 6/22/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 175.5 | | | | | | | | | | | |
| | 175.3 | Very poor quality grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely to very weak | | | RC24 | 53 | 40 | 40 | | 3 | W2 | |
| 15 | 174.8 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 16 | | Poor quality grey CLAYSTONE<br>- highly weathered<br>- extremely to very weak<br>- very close to close joint spacing | | | RC25 | 100 | 100 | 51 | | R0.5 | W4 | |
| 17 | | - moderately weathered below 17.0 m | | | RC26 | 99 | 70 | 33 | | R0.5 | W3 | |
| 18 | | | | | | | | | | | | |
| 19 | | - weak and slightly weathered from 18.6 m to 19.4 m | | | RC27 | 100 | 89 | 52 | | R1.5 | W2.5 | |
| | | - very weak and moderately weathered below 19.4 m | | | | | | | | | | |
| 20 | 170.1 | Poor quality grey SANDSTONE<br>- slightly to moderately weathered<br>- medium strong | | | RC28 | 100 | 91 | 48 | | 3 | W2.5 | |
| 21 | | - dark grey claystone, very weak from 21.17 m to 21.6 m | | | | | | | | | | |
| | | - brown from 21.6 m to 22.3 m | | | | | | | | | | |
| 22 | | | | | RC29 | 100 | 91 | 39 | | 3 | W2 | |
| | 167.4 | | | | | | | | | | | |
| 23 | | Poor quality CLAYSTONE<br>- moderately weathered<br>- very weak<br>- 0.2 m thick layer of siltstone from 23.1 m to 23.3 m | | | RC30 | 100 | 93 | 33 | | R2 | W3 | |
| 24 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D58**

CLIENT Alberta Transportation NORTHING: 5657461 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29145 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/22/2016 to 6/22/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | | Poor quality CLAYSTONE<br>- moderately weathered<br>- very weak<br>- medium strong below 24.0 m | | | | | | | | | | |
| 25 | | | | | RC31 | 100 | 95 | 51 | | R2 | W2.5 | |
| | | - 0.57 m thick brown sandstone layer, medium strong at 25.5 m | | | | | | | | | | |
| 26 | | - weak, slightly weathered below 26.1 m | | | | | | | | | | |
| | | - 0.45 m thick layer of siltstone at 26.6 m | | | RC32 | 100 | 98 | 58 | | R2 | W2 | |
| 27 | | | | | | | | | | | | |
| 28 | | | | | RC33 | 95 | 77 | 43 | | R2 | W3 | |
| 29 | | - very poor quality from 29.1 m to 30.6 m<br>- 0.55 m thick layer of siltstone, medium strong and slightly weathered at 29.35 m | | | RC34 | 100 | 87 | 21 | | 2.5 | W2.5 | |
| 30 | | | | | | | | | | | | |
| 31 | | - 0.35m thick layer of sandstone, medium strong from 31.15-31.5 | | | RC35 | 99 | 91 | 57 | | R2 | W2 | |
| 32 | | | | | | | | | | | | |
| | | - poor quality, greenish grey, weak to medium strong from 32.2 m to 33.8 m<br>- 0.8 m thick layer of claystone, medium strong at 32.55 m | | | RC36 | 99 | 97 | 45 | | 3 | W2 | |
| 33 | | - moderately weathered below 33.8 m | | | | | | | | | | |
| 34 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:35 PM

Stantec

# BOREHOLE RECORD

**D58**

CLIENT Alberta Transportation NORTHING: 5657461 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29145 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/22/2016 to 6/22/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | | Poor quality CLAYSTONE<br>- moderately weathered<br>- very weak<br><br>- 0.6 m thick layer of claystone, greenish grey, medium strong at 34.7 m | | | RC37 | 100 | 97 | 60 | | 2.5 | W3 | |
| 35 | | | | | | | | | | | | |
| 36 | 154.3 | Poor to fair quality greenish grey SANDSTONE<br>- fresh<br>- moderatley strong | | | RC38 | 97 | 97 | 49 | | R2 | W2 | |
| | 153.7 | Poor to fair quality grey CLAYSTONE<br>- slightly weathered<br>- weak<br>-very poor quality below 36.9 m | | | | | | | | | | |
| 37 | 153.1 | Very poor quality greenish grey SANDSTONE<br>- moderately weathered<br>- medium strong | | | RC39 | 100 | 89 | 22 | | 3 | W3 | |
| 38 | | | | | | | | | | | | |
| 39 | 151.8 | Poor quality grey CLAYSTONE<br>- slightly weathered<br>- weak to medium strong | | | RC40 | 100 | 93 | 40 | | 3 | W1.5 | |
| | 150.8 | Poor quality grey SANDSTONE<br>- fresh<br>- medium strong | | | | | | | | | | |
| 40 | 150.2 | End of borehole (40.0 m)<br>- borehole slough to 18.0 m upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.3 m to 0.9 m and 15.2 m to 18.0 m | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:35 PM

Stantec

# BOREHOLE RECORD

**D59**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/29

NORTHING 5657206
EASTING -29444
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.78 | TOPSOIL | | | | | | | | | | | |
| | 1190.43 | Stiff to very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, gravel, mottled grey, moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 330 | | Y | | | | |
| | | | | | SS | 3 | 300 | 13 | | | | | |
| 2 | | | | | ST | 4 | 340 | | Y | 0.0 | 1.7 | 40.1 | 58.1 |
| | | | | | SS | 5 | 380 | 18 | | | | | |
| 3 | | | | | ST | 6 | 490 | | C, Y | 1.1 | 4.9 | 37.2 | 56.9 |
| | | | | | SS | 7 | 440 | 16 | | | | | |
| 4 | | | | | ST | 8 | 410 | | CU, Y | 1.1 | 5.7 | 45.2 | 48.0 |
| | | | | | SS | 9 | 410 | 13 | | | | | |
| | | | | | ST | 10 | 420 | | CU, k, Y | 0.6 | 4.0 | 46.8 | 48.6 |
| 5 | | - trace coal specks below 4.7 m | | | SS | 11 | 450 | 16 | | | | | |
| | | | | | BS | 12 | | | | | | | |
| 6 | | - grey below 6.1 m | | | ST | 13 | 390 | | CU, Y, CC | 0.4 | 3.4 | 48.6 | 47.7 |
| | | | | | SS | 14 | 450 | 16 | | | | | |
| 7 | | | | | BS | 15 | | | | | | | |
| | | | | | ST | 16 | 500 | | k, Y | 0.8 | 5.9 | 47.7 | 45.6 |
| 8 | | | | | SS | 17 | 450 | 18 | | | | | |
| | | | | | BS | 18 | | | | | | | |
| 9 | | | | | SS | 19 | 450 | 18 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D59**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/06/29
NORTHING 5657206
EASTING -29444
WATER LEVEL
PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Stiff to very stiff, brown, medium to high plasticity CLAY (CI-CH) | | | | | | | | | | | |
| | | - silty, trace sand, gravel, mottled grey, moist | | | BS | 20 | | | | | | | |
| 11 | | | | | SS | 21 | 450 | 20 | | 10.4 | 8.1 | 44.2 | 37.4 |
| | | - seepage at 11.5 m | | | | | | | | | | | |
| 12 | | | | | BS | 22 | | | | | | | |
| | | - 0.2 m thick grey silstone boulder from 12.1 m to 12.3 m | | | SS | 23 | 12 | 50+ | | | | | |
| 13 | | - moist to wet below 13.0 m | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | 1174.08 | | | | | | | | | | | | |
| 17 | | Bedrock encountered at 16.7 m | | | | | | | | | | | |
| | | - coring commenced at 12.1 m due to inferred bedrock interface when siltstone boulder encountered at 12.1 m (see rock coring log for details) | | | | | | | | | | | |
| 18 | | - borehole advanced into bedrock to 40.0 m | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D59**

CLIENT Alberta Transportation — NORTHING: 5657206 — PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB — EASTING: -29444 — BH SIZE SS:150mm, HS:200mm
DRILLING DATE 6/29/2016 to 6/29/2016 — WATER LEVEL — DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 174.1 | | | | | | | | | | | |
| 17 | | Very poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong<br>- fair to excellent quality below 17.1 m | | | RC27 | 99 | 99 | 78 | | 3 | W2 | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | RC28 | 98 | 93 | 71 | | 3 | W2 | |
| 20 | | - fresh below 20.2 m | | | | | | | | | | |
| 21 | | | | | RC29 | 100 | 100 | 95 | | 3 | W1 | |
| 22 | | | | | RC30 | 100 | 99 | 74 | | 3 | W1 | |
| 23 | | | | | | | | | | | | |
| 24 | 166.9 | Good quality grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC31 | 100 | 100 | 79 | | 2.5 | W1.5 | |
| 25 | | - poor quality, moderately weathered below 24.7 m | | | RC32 | 98 | 89 | 50 | | 2.5 | W2.5 | |
| 26 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D59**

CLIENT Alberta Transportation NORTHING: 5657206 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29444 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/29/2016 to 6/29/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | | | | | | | | | | | | |
| | 164.5 | Very poor quality greenish grey SILTSTONE<br>- medium strong<br>- slightly weathered | | | | | | | | | | |
| | 164.0 | Very poor quality greenish grey CLAYSTONE<br>- highly weathered<br>- very weak | | | RC33 | 96 | 85 | 18 | | R2 | W3 | |
| 27 | | - poor quality, weak, moderately weathered below 27.8 m | | | | | | | | | | |
| 28 | | | | | RC34 | 100 | 97 | 27 | | R2 | W3 | |
| 29 | 161.8 | Good quality grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 30 | | | | | RC35 | 99 | 99 | 89 | | 3 | W2 | |
| 31 | | - poor quality below 30.9 m | | | | | | | | | | |
| | 159.4 | Poor quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC36 | 99 | 90 | 38 | | 2.5 | W2 | |
| 32 | 158.8 | Poor quality grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 158.1 | Fair quality CLAYSTONE<br>- slightly weathered<br>- weak to medium strong | | | | | | | | | | |
| 33 | 157.7 | Fair quality grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | RC37 | 100 | 100 | 53 | | 3 | W2 | |
| | 156.9 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 34 | 156.2 | Good quality SILTSTONE<br>- slightly weathered<br>- medium strong | | | RC38 | 100 | 94 | 79 | | 3 | W2 | |
| | 155.9 | Good quality SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 35 | 155.7 | Poor to fair quality dark grey CLAYSTONE | | | | | | | | | | |
| | 155.2 | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D59**

CLIENT Alberta Transportation NORTHING: 5657206 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29444 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 6/29/2016 to 6/29/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | | - slightly weathered<br>- weak | | | RC39 | 92 | 79 | 49 | | 3 | W2 | |
| | 154.1 | Poor quality grey SILTSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 37 | | Very poor quality grey CLAYSTONE<br>- highly weathered<br>- very weak | | | RC40 | 89 | 58 | 13 | | R1 | W4 | |
| 38 | | | | | | | | | | | | |
| | | - fair quality, greenish grey, very weak to weak, slightly to moderately weathered below 38.5 m | | | | | | | | | | |
| 39 | | | | | RC41 | 100 | 80 | 70 | | R1.5 | W2.5 | |
| 40 | 150.8 | End of borehole (40.0 m)<br>- borehole open upon completion<br>- borehole backfilled with cuttings and bentonite seals placed from 0.3 m to 0.9 m and 12.1 m to 40.0 m | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D60**

CLIENT Alberta Transportation
NORTHING 5657257
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29224
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/08/02
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1191.68 | TOPSOIL | | | | | | | | | | | |
| | 1191.18 | Very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 350 | | | | | | |
| | | - mottled light brown, dry to moist below 1.3 m | | | SS | 3 | 330 | 15 | | | | | |
| 2 | | | | | ST | 4 | 340 | | k, Y | 0.0 | 0.6 | 40.7 | 58.7 |
| | | - mottled grey below 2.2 m | | | SS | 5 | 450 | 15 | | | | | |
| 3 | | | | | ST | 6 | 390 | | CU, Y | 0.1 | 2.7 | 44.3 | 52.9 |
| | | | | | SS | 7 | 450 | 9 | | | | | |
| | 1187.73 | | | | ST | 8 | 450 | | CU, Y | 0.1 | 4.5 | 35.9 | 59.4 |
| 4 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand to sandy, trace gravel, trace coal specks, moist | | | SS | 9 | 450 | 17 | | | | | |
| | | | | | ST | 10 | 380 | | CU, Y | 9.7 | 16.2 | 41.8 | 32.3 |
| 5 | | - dry to moist below 4.9 m | | | SS | 11 | 350 | 20 | | | | | |
| | | | | | BS | 12 | | | | | | | |
| 6 | | | | | SS | 13 | 450 | 20 | | | | | |
| 7 | | | | | BS | 14 | | | | | | | |
| | | - seepage at 7.6 m | | | ST | 15 | 480 | | | | | | |
| 8 | | | | | SS | 16 | 340 | 29 | | | | | |
| | | | | | BS | 17 | | | | | | | |
| 9 | | - hard below 9.1 m | | | SS | 18 | 200 | 30 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D60**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/02
WATER LEVEL

NORTHING 5657257
EASTING -29224

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand to sandy, trace gravel, trace coal specks, moist | | | BS | 19 | | | | | | | |
| 11 | | | | | SS | 20 | 410 | 31 | | | | | |
| 12 | | | | | BS | 21 | | | | | | | |
| 13 | | | | | SS | 22 | 450 | 30 | | | | | |
| 14 | 1177.68 | | | | BS | 23 | | | | | | | |
| | | | | | SS | 24 | 450 | 50+ | | | | | |
| | | Very dense, brown, silt (ML) TILL<br>- sandy, trace gravel, moist | | | | | | | | | | | |
| 15 | | | | | BS | 25 | | | | | | | |
| 16 | | | | | SS | 26 | 310 | 50+ | | | | | |
| | | - dry to moist below 16.3 m | | | | | | | | | | | |
| | 1174.88 | | | | BS | 27 | | | | | | | |
| 17 | | Hard, brown, low plasticity clay (CL) TILL<br>- some sand to sandy, trace gravel, moist | | | SS | 28 | 410 | 50+ | | | | | |
| 18 | | - grey below 17.6 m | | | BS | 29 | | | | | | | |
| | | | | | SS | 30 | 330 | 50+ | | | | | |
| 19 | | | | | | | | | | | | | |
| | 1171.88 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D60**

CLIENT Alberta Transportation
NORTHING 5657257
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29224
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/08/02
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) | UNDRAINED SHEAR STRENGTH (kPa) 40 80 120 160 / WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$ / STANDARD PENETRATION TEST, blows/0.30 m 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 1171.48 | Very poor quality grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak | | | SS | 31 | 200 | 50+ | | | | | | |
| 21 | | Bedrock encountered at 19.8 m<br>- coring commenced at 19.7 m (see rock coring log for details)<br>- borehole advanced in bedrock to 45.1 m<br>- sloughing at 19.8 m | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D60**

CLIENT Alberta Transportation NORTHING: 5657257 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29224 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/2/2016 to 8/2/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 171.9 | | | | RC32 | 88 | 68 | 0 | | R0 | W5 | |
| 20 | 171.5 | Very poor quality grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak<br>- fair quality, olive green below 20.1 m | | | | | | | | | | |
| | | Very poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC33 | 100 | 98 | 52 | | R0 | W5 | |
| 21 | 170.1 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE<br>- moderately weathered<br>- medium strong | | | RC34 | 97 | 81 | 29 | | 3 | W3 | |
| 22 | | | | | | | | | | | | |
| 23 | 168.4 | | | | | | | | | | | |
| | | Very poor quality grey CLAYSTONE<br>- moderately weathered<br>- weak | | | RC35 | 100 | 64 | 21 | | R2 | W3 | |
| 24 | | | | | | | | | | | | |
| | | - poor quality below 24.7 m | | | | | | | | | | |
| 25 | 166.5 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC36 | 98 | 83 | 49 | | 2.5 | W2.5 | |
| | 165.8 | | | | | | | | | | | |
| 26 | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak to very weak | | | | | | | | | | |
| | | | | | RC37 | 91 | 80 | 36 | | R1.5 | W3 | |
| 27 | | | | | | | | | | | | |
| | | - slightly weathered below 27.7 m | | | | | | | | | | |
| 28 | | | | | RC38 | 97 | 78 | 39 | | R2 | W2 | |
| 29 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:41 PM

Stantec

# BOREHOLE RECORD

**D60**

CLIENT Alberta Transportation NORTHING: 5657257 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29224 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/2/2016 to 8/2/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | | | | | | | | | | | | |
| | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak to very weak<br>- moderately weathered below 29.2 m | | | | | | | | | | |
| | 161.9 | | | | | | | | | | | |
| 30 | | Poor quality grey SILTSTONE<br>- highly weathered<br>- extremely weak | | | RC39 | 92 | 77 | 28 | | R1 | W3.5 | |
| | 161.3 | | | | | | | | | | | |
| | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| 31 | 160.5 | | | | | | | | | | | |
| | | Good quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC40 | 100 | 94 | 83 | | R2 | W2.5 | |
| 32 | 159.7 | | | | | | | | | | | |
| | | Fair quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| | 159.1 | | | | | | | | | | | |
| | | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC41 | 97 | 89 | 51 | | 3 | W2 | |
| 33 | | | | | | | | | | | | |
| | 157.8 | | | | | | | | | | | |
| 34 | | Fair quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>- weak | | | RC42 | 100 | 96 | 52 | | R2 | W2.5 | |
| 35 | | | | | | | | | | | | |
| | 156.3 | | | | | | | | | | | |
| | | Fair quality dark grey SANDSTONE<br>- slightly to moderately weathered<br>- medium strong | | | | | | | | | | |
| 36 | 155.6 | | | | RC43 | 99 | 89 | 63 | | R2 | W2.5 | |
| | 155.5 | Fair quality CLAYSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 154.9 | Fair quality SANDSTONE<br>- slightly to moderately weathered<br>- medium strong | | | | | | | | | | |
| 37 | | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak | | | | | | | | | | |
| | 154.3 | | | | RC44 | 96 | 89 | 41 | | 2.5 | W3 | |
| | | Poor quality grey SANDSTONE<br>- moderately weathered<br>- medium strong | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D60**

CLIENT Alberta Transportation NORTHING: 5657257 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29224 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/2/2016 to 8/2/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 39 | | | | | | | | | | | | |
| | 152.6 | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | RC45 | 100 | 97 | 59 | | R2 | W2 | |
| 40 | | | | | | | | | | | | |
| | 151.2 | Fair quality dark grey SANDSTONE<br>- fresh<br>- medium strong | | | RC46 | 100 | 99 | 57 | | 2.5 | W1.5 | |
| 41 | 150.3 | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 42 | | | | | RC47 | 100 | 91 | 57 | | R2 | W2 | |
| 43 | 148.5 | Fair quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC48 | 99 | 93 | 61 | | 2.5 | W2 | |
| 44 | 147.8 | Poor to fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 45 | 146.6 | | | | RC49 | 100 | 83 | 45 | | R2 | W2 | |
| | | End of borehole (45.1 m)<br>- borehole slough to 19.8 m and dry upon completion<br>- borehole backfilled with cuttings and a bentonite seal placed from 0.3 m to 0.6 m and from 16.8 to 19.8 m | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:42 PM

Stantec

# BOREHOLE RECORD

**D62**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/18

NORTHING 5657438
EASTING -28988
WATER LEVEL (4.6 m) 8/18/2016

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.67 | | | | | | | | | | | | |
| | 1190.47 | TOPSOIL | | | | | | | | | | | |
| | | Stiff to very stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- trace sand, gravel, dry | | | | | | | | | | | |
| 1 | | - damp below 0.9 m | | | BS | 1 | | | | | | | |
| | | | | | ST | 2 | 420 | | Y | 0.4 | 8.8 | 39.6 | 51.2 |
| 2 | | | | | | | | | | | | | |
| | | | | | BS | 3 | | | | | | | |
| 3 | | | | | ST | 4 | 400 | | Y | 4.2 | 2.2 | 30.7 | 62.9 |
| 4 | 1186.37 | | | | | | | | | | | | |
| | | Very stiff, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, damp<br>to wet<br>- 0.6 m thick cobble layer at 4.9 m | | | BS | 5 | | | | | | | |
| 5 | | | | | ST | 6 | 450 | | C, Y | 4.6 | 20.2 | 44.8 | 30.5 |
| 6 | | | | | BS | 7 | | | | | | | |
| | | | | | ST | 8 | 350 | | | | | | |
| 7 | | | | | BS | 9 | | | | | | | |
| | | | | | ST | 10 | 300 | | Y | 3.7 | 18.6 | 40.9 | 36.8 |
| 8 | | | | | SS | 11 | 250 | 35 | | | | | |
| 9 | | | | | BS | 12 | | | | 12.3 | 23.7 | 43.5 | 20.5 |
| | | - sandy, some gravel, grey<br>below 9.1 m | | | SS | 13 | 430 | 19 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D62**

CLIENT Alberta Transportation
NORTHING 5657438
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -28988
BH SIZE SS:150mm, HS:200mm
DATES BORING 2016/08/18
WATER LEVEL (4.6 m) 8/18/2016
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, damp to wet<br>- 0.3 m thick grey sandy silt layer at 10.4 m<br>- inferred seepage at 10.7 m | | | BS | 14 | | | | | | | |
| 11 | | | | | SS | 15 | 100 | 21 | | | | | |
| 12 | 1178.47 | | | | BS | 16 | | | | | | | |
| | | Grey silty CLAY (CL-ML)<br>- gravelly, some sand, damp | | | SS | 17 | 450 | 50+ | | 26.1 | 18.1 | 44.8 | 11 |
| 13 | 1177.37 | | | | BS | 18 | | | | | | | |
| | | Very poor quality grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak | | | SS | 19 | 450 | 47 | | | | | |
| 14 | 1175.77 | | | | | | | | | | | | |
| 15 | | Bedrock encountered at 13.3 m<br>- coring commenced at 14.9 m (see rock coring log for details)<br>- borehole advanced in bedrock to 45.7 m<br>- 50 mm standpipe piezometer slotted from 10.0 m to 13.0 m<br>- water at 4.6 m upon completion<br>- water at 10.7 m during augering | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D62**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/18/2016 to 8/18/2016
NORTHING: 5657438
EASTING: -28988
WATER LEVEL (4.6 m) 8/20/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | | | | | | | | | | | | |
| | 177.4 | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | | Very poor quality grey (inferred) CLAYSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| 14 | | | | | | | | | | | | |
| | 175.8 | | | | | | | | | | | |
| 15 | | Very poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC20 | | | | | R | W | |
| 16 | | | | | | | | | | | | |
| | 174.3 | | | | | | | | | | | |
| | | Very poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | RC21 | 50 | 0 | 0 | | R1 | W4 | |
| 17 | | | | | | | | | | | | |
| | 173.4 | | | | | | | | | | | |
| | | Poor quality light brown to grey SANDSTONE<br>- slightly to moderately weathered<br>- weak | | | RC22 | 95 | 66 | 30 | | R2 | W3 | |
| 18 | | | | | | | | | | | | |
| | 172.4 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely to very weak | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| | 171.5 | | | | | | | | | | | |
| | | Very poor quality dark grey SANDSTONE<br>- slightly to moderately weathered<br>- weak | | | RC23 | 89 | 32 | 9 | | R1 | W3 | |
| | 171.0 | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| | 170.5 | Very poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely to very weak | | | | | | | | | | |
| | 170.3 | | | | | | | | | | | |
| | | Very poor quality dark grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC24 | 100 | 28 | 18 | | R1 | W4 | |
| 21 | | | | | | | | | | | | |
| | 169.5 | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely to very weak | | | | | | | | | | |
| | 169.0 | | | | | | | | | | | |
| 22 | | Very poor quality grey CLAYSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely to very weak | | | RC25 | 94 | 58 | 37 | | R1 | W2.5 | |
| | 168.1 | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**D62**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/18/2016 to 8/18/2016
NORTHING: 5657438
EASTING: -28988
WATER LEVEL (4.6 m) 8/20/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | | Poor quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 167.0 | | | | | | | | | | | |
| 24 | | Poor quality grey MUDSTONE<br>- moderately to highly weathered<br>- extremely to very weak | | | RC26 | 75 | 44 | 26 | | R1 | W3 | |
| 25 | | - very poor quality, moderately weathered, and extremely weak to very weak below 24.7 m | | | RC27 | 90 | 37 | 16 | | R0.5 | W3 | |
| 26 | 164.5 | | | | | | | | | | | |
| | | Fair quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| | 164.0 | | | | | | | | | | | |
| 27 | | Fair quality grey MUDSTONE<br>- slightly weathered<br>- very weak | | | RC28 | 98 | 87 | 54 | | R1.5 | W2 | |
| | 163.4 | | | | | | | | | | | |
| | | Fair quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | | | | | | | | |
| 28 | | | | | | | | | | | | |
| | 162.4 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- moderately weathered<br>- extremely to very weak | | | RC29 | 88 | 66 | 41 | | R0.5 | W3 | |
| 29 | 161.6 | | | | | | | | | | | |
| | | Very poor quality SHALE<br>- moderately to highly weathered<br>- extremely weak to very weak<br>- coal seams | | | | | | | | | | |
| | 161.1 | | | | | | | | | | | |
| 30 | | Very poor quality grey MUDSTONE<br>- slightly to moderately weathered<br>- extremely to very weak | | | RC30 | 100 | 42 | 14 | | R0.5 | W3 | |
| | 160.2 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- slightly weathered<br>- weak<br>- good quality below 30.7 m | | | | | | | | | | |
| 31 | | | | | RC31 | 100 | 79 | 78 | | R2 | W2 | |
| 32 | | | | | | | | | | | | |
| | 158.1 | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

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# BOREHOLE RECORD

**D62**

CLIENT Alberta Transportation
NORTHING: 5657438
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -28988
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 8/18/2016 to 8/18/2016
WATER LEVEL (4.6 m) 8/20/2016
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | | | | | | | | | | | | |
| | | Very poor quality grey MUDSTONE<br>- slightly weathered<br>- very weak to weak | | | RC32 | 100 | 75 | 25 | | R2 | W2 | |
| | 157.3 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- slightly weathered<br>- weak<br>- excellent quality below 33.7 m<br>- 0.3 m thick layer of mudstone, slightly weathered, and very weak below 33.9 m | | | RC33 | 100 | 99 | 92 | | R2 | W2 | |
| 34 | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| | 155.5 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- slightly to moderately weathered<br>- extremely to very weak<br>- 0.2 m thick layer of poor quality grey siltstone, slightly weathered, weak at 36.0 m | | | RC34 | 86 | 60 | 45 | | R1 | W2 | |
| 36 | | | | | | | | | | | | |
| 37 | 153.6 | | | | | | | | | | | |
| | | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC35 | 100 | 76 | 52 | | R2 | W2 | |
| 38 | | - poor quality below 38.2 m | | | | | | | | | | |
| | 152.0 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- slightly weathered<br>- extremely to very weak | | | RC36 | 94 | 68 | 40 | | R1 | W2 | |
| 39 | | | | | | | | | | | | |
| | 151.0 | | | | | | | | | | | |
| | | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC37 | 94 | 76 | 50 | | R2 | W1.5 | |
| 40 | 150.0 | | | | | | | | | | | |
| | | Poor quality grey MUDSTONE<br>- slightly weathered<br>- very weak<br>- slightly to moderately weathered, and extremely to very weak below 41.2 m | | | RC38 | 100 | 54 | 6 | | R0.5 | W2.5 | |
| 41 | | | | | | | | | | | | |
| 42 | | - slightly weathered, extremely to very weak below 42.7 m | | | | | | | | | | |
| 43 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:46 PM

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# BOREHOLE RECORD

**D62**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/18/2016 to 8/18/2016
NORTHING: 5657438
EASTING: -28988
WATER LEVEL (4.6 m) 8/20/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | | | | | | | | | | | | |
| | 147.3 | Fair quality grey SILTSTONE<br>- slightly weathered<br>- weak | | | RC39 | 95 | 76 | 54 | | R2 | W2 | |
| 44 | 146.5 | Poor quality grey MUDSTONE<br>- slightly weathered<br>- very weak | | | | | | | | | | |
| | 146.1 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC40 | 100 | 75 | 50 | | R1.5 | W2 | |
| 45 | 145.0 | End of borehole (45.7 m)<br>- borehole slough to 19.8 m and water at 4.6 m upon completion<br>- standpipe piezometer installed, slotted from 10.0 m to 13.0 m<br>- borehole backfilled with sand and bentonite seals placed from 3.0 m to 9.6 m and 13.4 m to 45.1 m | | | | | | | | | | |
| 46 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:46 PM

Stantec

# BOREHOLE RECORD

**D68**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/10

NORTHING 5657384
EASTING -29238
WATER LEVEL

PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1191.37 | TOPSOIL | | | | | | | | | | | |
| | 1190.87 | Stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, gravel, moist | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 180 | | Y | 0.0 | 1.9 | 41.5 | 56.6 |
| | | | | | SS | 3 | 220 | 13 | | | | | |
| | | - mottled grey below 1.7 m | | | ST | 4 | 420 | | UU | 0.0 | 0.8 | 37.2 | 62 |
| 2 | | | | | SS | 5 | 380 | 13 | | | | | |
| | | | | | ST | 6 | 450 | | CU, Y | 1.7 | 7.1 | 42.7 | 48.5 |
| 3 | | | | | SS | 7 | 430 | 13 | | | | | |
| | | | | | ST | 8 | 450 | | k | 0.2 | 8.7 | 41.5 | 59.6 |
| 4 | 1187.37 | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to moist | | | SS | 9 | 450 | 17 | | | | | |
| | | | | | ST | 10 | 450 | | C, Y | 5.9 | 15.8 | 45.3 | 33.1 |
| 5 | | | | | SS | 11 | 160 | 20 | | | | | |
| | | | | | BS | 12 | | | | 2.0 | 16.1 | 47.3 | 34.5 |
| 6 | | | | | SS | 13 | 450 | 18 | | | | | |
| 7 | | | | | BS | 14 | | | | | | | |
| | | - seepage at 7.4 m<br>- moist to wet below 7.6 m | | | ST | 15 | 500 | | C, Y | 5.9 | 13 | 43.5 | 37.6 |
| 8 | | - wet below 8.1 m | | | SS | 16 | 450 | 12 | | | | | |
| | | | | | BS | 17 | | | | | | | |
| 9 | | | | | SS | 18 | 360 | 25 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D68**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/10
WATER LEVEL
NORTHING 5657384
EASTING -29238
PROJECT NO. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to moist<br>- hard, moist below 10.7 m | BS | 19 | | | | | | |
| 11 | | | SS | 20 | 340 | 43 | | | | |
| 12 | | - grey below 12.2 m | BS | 21 | | | | | | |
| | | | SS | 22 | 320 | 36 | | | | |
| 13 | | | BS | 23 | | | | | | |
| 14 | 1176.97 | | SS | 24 | 420 | | | | | |
| | | Hard, grey, medium to high plasticity CLAY (CI-CH)<br>- some sand, moist | BS | 25 | | | | | | |
| 15 | 1176.02 | | SS | 26 | 450 | 36 | | | | |
| | | Dense, grey silt TILL (ML)<br>- sandy, trace gravel, moist to wet | | | | | | | | |
| 16 | | | | | | | | | | |
| 17 | 1174.17 | | SS | 27 | 25 | 50+ | | | | |
| | 1173.87 | Very poor quality (inferred) SANDSTONE<br>- very weak | | | | | | | | |
| 18 | | Bedrock encountered at 17.2 m<br>- coring commenced at 17.5 m (see rock coring log for details)<br>- borehole advanced into bedrock to 44.5 m | | | | | | | | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**D68**

CLIENT Alberta Transportation NORTHING: 5657384 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29238 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/10/2016 to 8/10/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| 17 | 174.2 | | | | | | | | | | | |
| | 173.9 | Very poor quality (inferred) SANDSTONE - very weak | | | | | | | | | | |
| 18 | | Poor quality grey to brown SANDSTONE - moderately weathered - medium strong | | | RC28 | 97 | 56 | 40 | | 3 | W3 | |
| | | - very poor quality, brown below 18.4 m | | | | | | | | | | |
| 19 | | | | | RC29 | 79 | 55 | 24 | | 3 | W3 | |
| 20 | | - highly weathered below 20.1 m | | | | | | | | | | |
| 21 | | | | | RC30 | 79 | 17 | 9 | | 3 | W4 | |
| | 169.6 | | | | | | | | | | | |
| 22 | | Fair quality grey CLAYSTONE - slightly weathered - very weak | | | RC31 | 94 | 74 | 60 | | R1 | W2 | |
| 23 | 168.4 | | | | | | | | | | | |
| | 168.1 | Dark grey SANDSTONE - slightly weathered - medium strong | | | | | | | | | | |
| 24 | | Very poor quality dark grey CLAYSTONE - moderately weathered - very weak | | | RC32 | 94 | 70 | 11 | | R1 | W3 | |
| 25 | 166.3 | | | | | | | | | | | |
| | 166.0 | Very poor quality grey SANDSTONE - slightly weathered - medium strong | | | RC33 | 100 | 75 | 17 | | R1 | W3 | |
| 26 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:50 PM

Stantec

# BOREHOLE RECORD

**D68**

CLIENT Alberta Transportation NORTHING: 5657384 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29238 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/10/2016 to 8/10/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | | Very poor quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>- very weak to weak | | | | | | | | | | |
| 27 | | | | | RC34 | 96 | 81 | 24 | | R1.5 | W2.5 | |
| 28 | | - weak to medium strong below 27.7 m | | | RC35 | 100 | 91 | 49 | | 2.5 | W2 | |
| 29 | | | | | | | | | | | | |
| 30 | | | | | RC36 | 97 | 83 | 39 | | 2.5 | W3 | |
| 31 | 160.4 | Poor quality grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 160.1 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- weak to medium strong | | | RC37 | 100 | 86 | 38 | | 2.5 | W3 | |
| 32 | | - very weak to weak below 32.3 m | | | | | | | | | | |
| 33 | | | | | RC38 | 99 | 86 | 57 | | R1.5 | W3 | |
| | 157.8 | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 34 | | | | | RC39 | 100 | 97 | 73 | | 3 | W2 | |
| | 156.4 | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- very weak<br>- very poor quality, very weak at medium strong below 35.3 m | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:50 PM

Stantec

# BOREHOLE RECORD

**D68**

CLIENT Alberta Transportation NORTHING: 5657384 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29238 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/10/2016 to 8/10/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- very weak | | | RC40 | 99 | 87 | 23 | | R2 | W2 | |
| 37 | | - medium strong, slightly weathered below 36.8 m | | | RC41 | 96 | 93 | 54 | | 3 | W2.5 | |
| | 153.7 | Fair quality grey SANDSTONE<br>- moderately weathered<br>- medium strong | | | | | | | | | | |
| 38 | 153.4 | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 152.7 | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | RC42 | 100 | 81 | 53 | | 3 | W2 | |
| 39 | 151.6 | Dark grey CLAYSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 40 | 151.3 | Good quality grey SANDSTONE<br>- fresh<br>- medium strong | | | RC43 | 98 | 91 | 85 | | 3 | W1 | |
| 41 | 149.9 | Fair quality dark grey CLAYSTONE<br>- slightly to moderately weathered<br>- medium strong | | | RC44 | 95 | 78 | 63 | | 3 | W2 | |
| 42 | 148.8 | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| 43 | 148.2 | Fair quality dark grey CLAYSTONE<br>- slightly weathered<br>- weak to medium strong | | | RC45 | 100 | 97 | 75 | | 3 | W2 | |
| 44 | 147.5 | Fair quality dark grey SANDSTONE<br>- slightly weathered<br>- medium strong | | | | | | | | | | |
| | 146.9 | End of borehole (44.5 m)<br>- borehole open upon completion<br>- borehole backfilled with cuttings and a bentonite seals placed from 0.3 m to 0.6 m and 17.5 m to 44.5 m | | | | | | | | | | |
| 45 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:20:50 PM

# D. 5
## Highway

Stantec

# BOREHOLE RECORD

**H01**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24

NORTHING 5656427
EASTING -32713
WATER LEVEL (4.3 m) 2016/08/24

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1214.11 | | | | | | | | | | | | |
| | 1213.91 | TOPSOIL | | | | | | | | | | | |
| | | Very stiff, brown, low plasticity CLAY (CL)<br>- trace sand, gravel, trace coal specks, damp | | | BS | 1 | | | | 1.7 | 14.8 | 51.7 | 31.8 |
| 1 | | | | | SS | 2 | 450 | 16 | | | | | |
| 2 | 1211.71 | | | | | | | | | | | | |
| | | Very stiff, brown, low plasticity clay (CL) TILL<br>- silty, some sand, trace gravel, trace coal specks, damp | | | BS | 3 | | | | | | | |
| 3 | 1210.91 | | | | ST | 4 | 0 | | | | | | |
| | | Very dense, brown sandy SILT (ML)<br>- damp to wet | | | | | | | | | | | |
| 4 | | | | | BS | 5 | | | | | | | |
| 5 | | | | | SS | 6 | 450 | 45 | | | | | |
| 6 | 1207.96 | | | | BS | 7 | | | | | | | |
| | | | | | SS | 8 | 100 | 50+ | | | | | |
| | | Very poor to poor quality light grey (inferred) SILTSTONE<br>- completely to highly weathered<br>- very weak | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H01**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24

NORTHING 5656427
EASTING -32713
WATER LEVEL (4.3 m) 2016/08/24

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very poor to poor quality light grey (inferred) SILTSTONE<br>- completely to highly weathered<br>- very weak | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | SS | 9 | 0 | 50+ | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | BS | 10 | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H01**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24

NORTHING 5656427
EASTING -32713
WATER LEVEL (4.3 m) 2016/08/24

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Very poor to poor quality light grey (inferred) SILTSTONE<br>- completely to highly weathered<br>- very weak | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| | | | | | BS | 11 | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | 1185.11 | | | | | | | | | | | | |
| | | Very poor to poor quality grey (inferred) MUDSTONE<br>- completely to highly weathered<br>- very weak | | | | | | | | | | | |
| 30 | 1184.11 | | | | BS | 12 | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H01**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24

NORTHING 5656427
EASTING -32713
WATER LEVEL (4.3 m) 2016/08/24

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | End of borehole (30.0 m)<br>- Auger refusal not encountered during drilling<br>- Groundwater at 4.3 m and borehole open upon completion<br>- Borehole backfilled with cuttings, bentonite seal from 0.3 m to 1.5 m | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## H02

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/26
NORTHING 5656458
EASTING -32713
WATER LEVEL (10.0 m) 2016/08/26
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1214.91 | | | | | | | | | | | | |
| | 1214.71 | TOPSOIL | | | | | | | | | | | |
| | | FILL: dark brown to black, high plasticity clay (CL)<br>- trace sand, gravel, mottled black, damp | | | | | | | | | | | |
| 1 | 1213.36 | | | | BS | 1 | | | | | | | |
| | | Stiff, brown, low plasticity clay (CL) TILL<br>- trace sand, gravel, damp | | | SS | 2 | 420 | 13 | | | | | |
| 2 | 1212.81 | | | | | | | | | | | | |
| | | Very dense, brown, sandy SILT (ML)<br>- damp | | | BS | 3 | | | | | | | |
| 3 | | | | | SS | 4 | 450 | 50+ | | | | | |
| 4 | | | | | | | | | | | | | |
| | 1210.31 | | | | BS | 5 | | | | | | | |
| | | Hard, brown, low plasticity clay (CL) TILL<br>- sandy, trace gravel, damp | | | SS | 6 | 450 | 38 | | | | | |
| 5 | 1209.71 | | | | | | | | | | | | |
| | | Very dense, brown, sandy SILT (ML)<br>- damp | | | BS | 7 | | | | | | | |
| 6 | | | | | SS | 8 | 450 | 50+ | | | | | |
| | 1208.31 | | | | | | | | | | | | |
| | | - interbedded with clay between 6.1 m and 6.5 m | | | | | | | | 7.3 | 18.1 | 59.5 | 15.1 |
| 7 | | Very poor to poor quality brown (inferred) SANDSTONE<br>- completely weathered<br>- extremely weak<br>- inferred highly to completely weathered, extremely weak below 7.6 m | | | BS | 9 | | | | | | | |
| | | | | | SS | 10 | 100 | 50+ | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H02**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/26

NORTHING 5656458
EASTING -32713
WATER LEVEL (10.0 m) 2016/08/26

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1204.51 | | | | | | | | | | | | |
| | | Very poor to poor quality grey (inferred) SILTSTONE<br>- moderately to highly weathered<br>- very weak to weak | | | BS | 11 | | | | | | | |
| 11 | | | | | SS | 12 | 100 | 50+ | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | BS | 13 | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H02**

CLIENT Alberta Transportation
NORTHING 5656458
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -32713
BH SIZE SS:150mm
DATES BORING 2016/08/26
WATER LEVEL (10.0 m) 2016/08/26
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Very poor to poor quality grey (inferred) SILTSTONE<br>- moderately to highly weathered<br>- very weak to weak | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | 1192.91 | | | | | | | | | | | | |
| | | Very poor to poor quality (inferred) MUDSTONE<br>- moderately to highly weathered<br>- very weak | | | BS | 14 | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| | | | | | BS | 15 | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H02**

CLIENT Alberta Transportation
NORTHING 5656458
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -32713
BH SIZE SS:150mm
DATES BORING 2016/08/26
WATER LEVEL (10.0 m) 2016/08/26
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 1184.81 | End of borehole (30.1 m)<br>- Auger refusal not encountered during drilling<br>- Groundwater at 10.0 m and borehole open upon completion<br>- Borehole backfilled with cuttings, bentonite seal from 0.3 m to 1.5 m | | | BS | 16 | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H03**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/27

NORTHING 5656489
EASTING -32714
WATER LEVEL (4.6 m) 2016/08/27

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1215.55 | | | | | | | | | | | | |
| | 1215.35 | TOPSOIL | | | | | | | | | | | |
| | | FILL: dark brown, low plasticity clay (CL)<br>- silty, trace sand, gravel, frequent organics, damp<br>- bulk sample BSA from 0.5 m to 2.5 m | | | BS | 1 | | | | | | | |
| 1 | | | | | | | | | | | | | |
| | | - trace rootlets below 1.5 m | | | SS | 2 | 350 | 12 | CU, PT | 1.6 | 45.2 | 34.5 | 18.7 |
| 2 | | | | | | | | | | | | | |
| | | | | | BS | 3 | | | | | | | |
| 3 | 1212.55 | | | | | | | | | | | | |
| | | Very dense, brown, sandy SILT (ML)<br>- trace gravel, trace coal specks, damp<br>- bulk sample BSB from 3.2 m to 5.5 m | | | SS | 4 | 400 | 47 | | | | | |
| 4 | | | | | | | | | | | | | |
| | | | | | BS | 5 | | | | | | | |
| 5 | | | | | SS | 6 | 450 | 43 | | | | | |
| | | | | | | | | | | | | | |
| 6 | | | | | BS | 7 | | | | | | | |
| | | | | | SS | 8 | 400 | 50+ | | | | | |
| 7 | 1208.75 | | | | | | | | | | | | |
| | | Hard, brown, low plasticity clay (CL) TILL<br>- silty, trace gravel, trace oxidation, damp | | | BS | 9 | | | | 7.5 | 35.9 | 36.9 | 19.7 |
| | | | | | SS | 10 | 300 | 48 | | | | | |
| 8 | 1207.15 | | | | | | | | | | | | |
| | | Very poor to poor quality grey (inferred) SILTSTONE<br>- completely weathered<br>- extremely weak | | | BS | 11 | | | | | | | |
| 9 | | | | | | | | | | | | | |
| | | | | | SS | 12 | 75 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H03**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/27
NORTHING 5656489
EASTING -32714
WATER LEVEL (4.6 m) 2016/08/27
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very poor to poor quality grey (inferred) SILTSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | | |
| 11 | | - moderately weathered, very weak to weak below 11.0 m | | | | | | | | | | | |
| 12 | | | | | BS | 13 | | | | | | | |
| | | | | | SS | 14 | 50 | 50+ | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | 1197.55 | Very poor to poor quality grey (inferred) MUDSTONE<br>- completely weathered<br>- extremely to very weak | | | BS | 15 | | | | | | | |
| | | | | | SS | 16 | 100 | 50+ | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H03**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/27
WATER LEVEL (4.6 m) 2016/08/27
NORTHING 5656489
EASTING -32714
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Very poor to poor quality grey (inferred) MUDSTONE<br>- completely weathered<br>- extremely to very weak | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | 1192.55 | | | | | | | | | | | | |
| | | Very poor to poor quality grey (inferred) SILTSTONE<br>- moderately to slightly weathered<br>- very weak to weak | | | | | | | | | | | |
| 24 | | | | | BS | 17 | | | | | | | |
| | | | | | SS | 18 | 50 | 50+ | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | BS | 19 | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | 1186.55 | | | | | | | | | | | | |
| | | Very poor to poor quality grey (inferred) MUDSTONE<br>- completely to highly weathered<br>- extremely to very weak | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## H03

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/27

NORTHING 5656489
EASTING -32714
WATER LEVEL (4.6 m) 2016/08/27

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 1185.05 | | | | BS | 20 | | | | | | | |
| | | End of borehole (30.5 m)<br>- Auger refusal not encountered during drilling<br>- Borehole open upon completion<br>- borehole backfilled with cuttings, bentonite seal from 0.3 m to 1.5 m | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H04**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24
NORTHING 5656520
EASTING -32714
WATER LEVEL (9.3 m) 2016/08/24
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1215.90 | | | | | | | | | | | | |
| | 1215.7 | TOPSOIL | | | | | | | | | | | |
| | | FILL: brown, high plasticity clay (CL)<br>- silty, trace sand, gravel, frequent rootlets and organics, damp | | | | | | | | | | | |
| 1 | | | | | BS | 1 | | | | 2.9 | 8.8 | 34.6 | 53.7 |
| | 1214.15 | | | | SS | 2 | 450 | 14 | | | | | |
| 2 | | Stiff, brown, low plasticity clay (CL) TILL | | | | | | | | | | | |
| | 1213.7 | - trace sand, gravel, damp | | | | | | | | | | | |
| | | Dense, brown, sandy SILT (ML)<br>- wet | | | | | | | | | | | |
| 3 | | | | | BS | 3 | | | | | | | |
| | | | | | SS | 4 | 450 | 39 | | | | | |
| 4 | | | | | | | | | | 0.4 | 39.2 | 43.6 | 16.8 |
| | | | | | BS | 5 | | | | | | | |
| | | | | | SS | 6 | 450 | 30 | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | BS | 7 | | | | | | | |
| | 1209.5 | | | | SS | 8 | 400 | 50+ | | | | | |
| | | Very poor to poor quality brown (inferred) SANDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | 1207.7 | | | | | | | | | | | | |
| | | Very poor to poor quality grey (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | | |
| 9 | | | | | BS | 9 | | | | 1.6 | 56.9 | 28.1 | 13.3 |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H04**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24

NORTHING 5656520
EASTING -32714
WATER LEVEL (9.3 m) 2016/08/24

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very poor to poor quality grey (inferred) MUDSTONE<br>- completely weathered<br>- extremely weak | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | SS | 10 | 75 | 50+ | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | BS | 11 | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| | 1198.3 | | | | | | | | | | | | |
| 18 | | Very poor to poor quality grey (inferred) SILTSTONE<br>- moderately weathered<br>- very weak | | | BS | 12 | | | | | | | |
| | | | | | SS | 13 | 50 | 50+ | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## H04

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24
NORTHING 5656520
EASTING -32714
WATER LEVEL (9.3 m) 2016/08/24
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Very poor to poor quality grey (inferred) SILTSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| | 1187.1 | | | | | | | | | | | | |
| 29 | | Very poor to poor quality grey (inferred) MUDSTONE<br>- extremely weak | | | | | | | | | | | |
| | 1185.9 | | | | BS | 14 | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m

20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## H04

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24
NORTHING 5656520
EASTING -32714
WATER LEVEL (9.3 m) 2016/08/24
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | GRAIN SIZE ANALYSIS: Sand (%) | GRAIN SIZE ANALYSIS: Silt (%) | GRAIN SIZE ANALYSIS: Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | | End of borehole (30.0 m)<br>- Auger refusal not encountered during drilling<br>- Groundwater at 9.3 m and borehole open upon completion<br>- borehole backfilled with cuttings, bentonite seal placed from 0.3 m to 1.5 m | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H05**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/28

NORTHING 5658967
EASTING -32699
WATER LEVEL (3.0 m) 2016/08/28

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1206.49 | | | | | | | | | | | | |
| | 1206.29 | TOPSOIL | | | | | | | | | | | |
| | | FILL: brown, medium to high plasticity clay (CI-CH)<br>- trace sand, gravel, trace rootlets, damp<br>- bulk sample BSA from 0.2 m to 1.1 m<br>- 0.3 m thick organic clay layer at 1.1 m<br>- bulk sample BSB from 1.1 m to 1.5 m<br>- bulk sample BSC from 2.0 m to 3.0 m | | | SS | 1 | 450 | 9 | | | | | |
| 3 | | - trace wood fibers at 3.0 m | | | SS | 2 | 450 | 12 | | | | | |
| | 1202.99 | Very stiff, brown, medium to high plasticity clay (CI-CH)<br>- trace sand, gravel, trace coal specks, damp<br>- bulk sample BSD from 3.5 m to 4.6 m | | | SS | 3 | 450 | 16 | | | | | |
| | 1201.29 | Hard, brown, low to medium plasticity clay (CL-CI) TILL<br>- trace sand, gravel, damp | | | BS | 4 | | | | | | | |
| 6 | | - trace coal specks below 6.1 m | | | SS | 5 | 450 | 31 | | | | | |
| | | - bulk sample BSE from 6.5 m to 7.6 m | | | SS | 6 | 75 | 37 | | | | | |
| 8 | | - bulk sample BSF from 8.1 m to 9.5 m | | | | | | | | | | | |
| 9 | | - grey below 9.1 m<br>- inferred seepage at 9.1 m | | | SS | 7 | 450 | 20 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H05**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/28

NORTHING 5658967
EASTING -32699
WATER LEVEL (3.0 m) 2016/08/28

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, low to medium plasticity clay (CL-CI) TILL<br>- trace sand, gravel, damp | | | BS | 8 | | | | | | | |
| | 1195.59 | | | | SS | 9 | 450 | 25 | | | | | |
| 11 | | Dense, grey, sandy SILT (ML)<br>- damp to wet<br>- bulk sample BSG from 11.2 m to 12.2 m | | | | | | | | | | | |
| 12 | | | | | SS | 10 | 450 | 35 | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | SS | 11 | 300 | 34 | | | | | |
| | 1192.09 | | | | | | | | | | | | |
| 15 | | Very poor to poor quality grey (inferred) SANDSTONE<br>- moderately to slightly weathered<br>- weak | | | | | | | | | | | |
| | 1191.29 | | | | SS | 12 | 0 | 50+ | | | | | |
| | | End of borehole (15.2 m)<br>- Groundwater at 3.0 m and borehole open upon completion<br>- Borehole backfilled with cuttings, bentonite seal placed from 0.3 m to 1.5 m | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H06**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/29
WATER LEVEL (9.0 m) 2016/08/29
NORTHING 5659178
EASTING -32703
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1204.50 | | | | | | | | | | | | |
| | 1204.2 | TOPSOIL | | | | | | | | | | | |
| | | FILL: brown, medium to low plasticity clay (CI-CH)<br>- trace sand, damp | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 450 | | | | | | |
| | 1202.5 | | | | | | | | | | | | |
| 2 | | Stiff to very stiff, brown, medium to high plasticity clay (CI-CH)<br>- trace sand, gravel, trace coal specks, damp | | | BS | 3 | | | | | | | |
| 3 | | - mottled brown below 3.0 m | | | SS | 4 | 450 | 12 | | | | | |
| 4 | | | | | BS | 5 | | | | | | | |
| | | | | | ST | 6 | 450 | | | | | | |
| 5 | | | | | | | | | | | | | |
| | 1198.7 | | | | | | | | | | | | |
| 6 | | Hard, brown, low plasticity clay (CL) TILL<br>- some sand to sandy, trace gravel, trace coal specks, dry to damp | | | BS | 7 | | | | | | | |
| | | | | | SS | 8 | 220 | 35 | | | | | |
| 7 | | - inferred seepage at 7.3 m | | | BS | 9 | | | | | | | |
| | | | | | SS | 10 | 200 | 50+ | | | | | |
| 8 | | - dark brown, trace to some gravel below 8.1 m | | | | | | | | | | | |
| 9 | | | | | BS | 11 | | | | | | | |
| | | | | | SS | 12 | 25 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H06**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/29
WATER LEVEL (9.0 m) 2016/08/29
NORTHING 5659178
EASTING -32703
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Hard, brown, low plasticity clay (CL) TILL<br>- some sand to sandy, trace gravel, trace coal specks, dry to damp | | | BS | 13 | | | | | | | |
| 11 | | | | | SS | 14 | 75 | 50+ | | | | | |
| 12 | | | | | BS | 15 | | | | | | | |
| 13 | | | | | SS | 16 | 250 | 39 | | | | | |
| 14 | | | | | SS | 17 | 300 | 36 | | | | | |
| 15 | | - bulk sample BSA from 14.2 m to 15.2 m | | | | | | | | | | | |
| | 1189.3 | Very poor to poor quality grey (inferred) SILTSTONE<br>- highly weathered<br>- very weak | | | SS | 18 | 0 | 50+ | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | BS | 19 | | | | | | | |
| 18 | | | | | | | | | | | | | |
| | 1186.2 | End of borehole (18.3 m)<br>- Groundwater at 9.0 m and borehole open upon completion<br>- 50 mm standpipe piezometer slotted from 15.8 m to 18.3 m<br>- Bentonite seal placed from 0.3 m to 15.2 m, sand from 15.2 m to 18.3 m | | | BS | 20 | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H07**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/28
WATER LEVEL (9.1 m) 2016/08/28
NORTHING 5659357
EASTING -32699
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1202.02 | | | | | | | | | | | | |
| | 1201.82 | TOPSOIL | | | | | | | | | | | |
| | | FILL: brown, medium to high plasticity CLAY (CI-CH)<br>- trace sand, gravel, damp | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 330 | | | | | | |
| 2 | | - bulk sample BSA from 2.0 m to 2.7 m | | | | | | | | | | | |
| | | - trace wood fibres at 2.7 m | | | BS | 3 | | | | | | | |
| 3 | | | | | SS | 4 | 450 | 8 | | | | | |
| 4 | 1197.82 | | | | | | | | | | | | |
| | | Stiff, brown, low to medium plasticity clay (CI-CH)<br>- trace sand, gravel, trace coal specks, mottled dark brown, damp | | | BS | 5 | | | | | | | |
| 5 | | | | | ST | 6 | 300 | | | | | | |
| | | - inferred seepage at 5.2 m | | | | | | | | | | | |
| 6 | | | | | BS | 7 | | | | | | | |
| | | - bulk sample BSB from 6.2 m to 7.1 m | | | SS | 8 | 450 | 13 | | | | | |
| | 1195.42 | | | | | | | | | | | | |
| 7 | | Stiff, grey, low to medium plasticity clay (CL-CI) TILL<br>- some sand, trace gravel, trace coal specks, mottled brown, damp | | | | | | | | | | | |
| | | | | | ST | 9 | 450 | | | | | | |
| 8 | | | | | | | | | | | | | |
| | 1193.02 | | | | BS | 10 | | | | | | | |
| 9 | | Compact grey sandy SILT (ML)<br>- trace gravel, wet | | ▼ | SS | 11 | 450 | 27 | | | | | |
| | 1192.32 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H07**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/28
NORTHING 5659357
EASTING -32699
WATER LEVEL (9.1 m) 2016/08/28
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff to hard, grey low plasticity clay (CL) TILL<br>- sandy, trace gravel, damp | | | BS | 12 | | | | | | | |
| 11 | | - 0.2 m thick sandy silt layer at 10.7 m<br>- evidence of cobbles and boulders below 11.2 m | | | SS | 13 | 450 | 31 | | | | | |
| 12 | | | | | BS | 14 | | | | | | | |
| 13 | 1188.92 | | | | SS | 15 | 350 | 50+ | | | | | |
| | | Very poor to poor quality grey (inferred) MUDSTONE<br>- highly to moderately weathered<br>- extremely weak | | | BS | 16 | | | | | | | |
| 14 | | | | | SS | 17 | 100 | 50+ | | | | | |
| 15 | 1187.22 | Very poor to poor quality grey (inferred) SILTSTONE<br>- moderately weathered<br>- extremely weak | | | BS | 18 | | | | | | | |
| 16 | | | | | | | | | | | | | |
| | 1185.22 | | | | BS | 19 | | | | | | | |
| 17 | | End of borehole (16.8 m)<br>- Water at 9.1 m upon completion | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H08**

CLIENT Alberta Transportation
NORTHING 5659585
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -32702
BH SIZE SS:150mm
DATES BORING 2016/08/30
WATER LEVEL (10.0 m) 2016/08/30
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1205.31 | | | | | | | | | | | | |
| | 1205.11 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- trace sand, gravel, mottled dark brown, damp | | | | | | | | | | | |
| 1 | | | | | BS | 1 | | | | | | | |
| | | - bulk sample BSA from 1.6 m to 3.0 m | | | SS | 2 | 450 | 10 | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | ST | 3 | 480 | | | | | | |
| 4 | | | | | | | | | | | | | |
| | | - trace coal specks below 4.3 m | | | BS | 4 | | | | | | | |
| | | - grey below 4.6 m | | | ST | 5 | 450 | | | | | | |
| 5 | | | | | | | | | | | | | |
| | | - brown to grey below 5.2 m | | | | | | | | | | | |
| 6 | | | | | BS | 6 | | | | | | | |
| | | - bulk sample BSB from 6.2 m to 7.6 m | | | SS | 7 | 450 | 11 | | | | | |
| 7 | | | | | | | | | | | | | |
| | | | | | ST | 8 | 500 | | | | | | |
| 8 | 1197.11 | | | | | | | | | | | | |
| | | Brown to grey, low to medium plasticity clay (CL-CI) TILL<br>- trace sand, gravel, trace coal specks, damp | | | | | | | | | | | |
| 9 | | | | | BS | 9 | | | | | | | |
| | | | | | ST | 10 | 500 | | | | | | |
| | | - brown, some sand below 9.6 m | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H08**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/30

NORTHING 5659585
EASTING -32702
WATER LEVEL (10.0 m) 2016/08/30

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Brown to grey, low to medium plasticity clay (CL-CI) TILL<br>- trace sand, gravel, trace coal specks, damp | | | BS | 11 | | | | | | | |
| 11 | | | | | SS | 12 | 450 | 19 | | | | | |
| 12 | 1193.11 | | | | BS | 13 | | | | | | | |
| | | Dense to very dense, brown sandy SILT (ML)<br>- trace gravel, damp to wet | | | SS | 14 | 300 | 50+ | | | | | |
| 13 | | | | | BS | 15 | | | | | | | |
| 14 | | | | | SS | 16 | 50 | 41 | | | | | |
| | 1190.71 | | | | | | | | | | | | |
| | | Very poor to poor quality brown (inferred) SANDSTONE<br>- moderately weathered<br>- weak | | | SS | 17 | 0 | 50+ | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | BS | 18 | | | | | | | |
| 17 | | | | | | | | | | | | | |
| | 1187.51 | | | | | | | | | | | | |
| 18 | 1187.01 | Very poor to poor quality grey (inferred) MUDSTONE<br>- completely to moderately weathered<br>- extremely weak to weak | | | BS | 19 | | | | | | | |
| | | | | | SS | 20 | 25 | 50+ | | | | | |
| 19 | | End of borehole (18.3 m)<br>- Groundwater at 10.0 m and borehole open upon completion | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160

WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$

STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H09**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/30

NORTHING 5659766
EASTING -32702
WATER LEVEL (10.2 m) 2016/08/29

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1207.64 | | | | | | | | | | | | |
| | 1207.44 | TOPSOIL | | | | | | | | | | | |
| | | Stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- trace sand, gravel, mottled dark brown, damp | | | BS | 1 | | | | | | | |
| 1 | | | | | ST | 2 | 450 | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | BS | 3 | | | | | | | |
| | | | | | SS | 4 | 0 | 14 | | | | | |
| | | - bulk sample BSA from 3.5 m to 4.0 m | | | | | | | | | | | |
| 4 | | | | | BS | 5 | | | | | | | |
| | | - grey below 4.6 m | | | ST | 6 | 450 | | | | | | |
| 5 | | | | | | | | | | | | | |
| | 1202.04 | | | | | | | | | | | | |
| | | Stiff to very stiff, brown to grey, low to medium plasticity clay TILL (CL-CI)<br>- some sand to sandy, trace gravel, damp | | | BS | 7 | | | | | | | |
| 6 | | | | | SS | 8 | 300 | 16 | | | | | |
| | | - bulk sample BSB from 6.6 m to 7.6 m | | | | | | | | | | | |
| 7 | | - brown below 7.3 m | | | BS | 9 | | | | | | | |
| | | - trace sand, gravel below 7.6 m | | | ST | 10 | 450 | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | 1198.54 | | | | BS | 11 | | | | | | | |
| | | Compact to dense, brown sandy SILT (ML)<br>- damp | | | SS | 12 | 450 | 47 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H09**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/30
NORTHING 5659766
EASTING -32702
WATER LEVEL (10.2 m) 2016/08/29
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Compact to dense, brown sandy SILT (ML)<br>- damp<br>- inferred seepage at 10.0 m | | | BS | 13 | | | | | | | |
| 11 | | | | | SS | 14 | 450 | 18 | | | | | |
| 12 | 1194.94 | | | | SS | 15 | 450 | 27 | | | | | |
| 13 | | Hard, brown to grey, low to medium plasticity clay TILL (CL-CI)<br>- some sand to sandy, trace gravel, damp | | | BS | 16 | | | | | | | |
| 14 | | | | | SS | 17 | 300 | 46 | | | | | |
| 15 | 1191.84 | | | | SS | 18 | 450 | 41 | | | | | |
| 16 | | Very poor to poor quality grey (inferred) MUDSTONE<br>- extremely weak | | | BS | 19 | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | 1188.74 | | | | BS | 20 | | | | | | | |
| 19 | | End of borehole (18.9 m)<br>- Groundwater at 10.2 m and sloughing at 16.2 m<br>- 50 mm standpipe piezometer slotted PVC from 10.1 to 11.6 m | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H09**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/30
NORTHING 5659766
EASTING -32702
WATER LEVEL (10.2 m) 2016/08/29
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | GRAIN SIZE ANALYSIS: Sand (%) | GRAIN SIZE ANALYSIS: Silt (%) | GRAIN SIZE ANALYSIS: Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | - Bentonite seal from 0.0 m to 9.5 m, sand from 9.5 m to 11.6 m | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H10**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/22

NORTHING 5655853
EASTING -33314
WATER LEVEL (14.0 m) 8/22/2016

PROJECT NO. 110773396
BH SIZE SS:150mm; HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1217.42 | | | | | | | | | | | | |
| | 1217.17 | FILL: 40 mm pit run | | | | | | | | | | | |
| | 1216.82 | Stiff, brown, low plasticity CLAY (CL) - trace gravel, moist | | | BS | 1 | | | | | | | |
| 1 | | Stiff to very stiff, brown, medium plasticity CLAY (CI) - trace sand, moist - bulk sample BSA from 0.6 m to 1.5 m | | | BS | 2 | | | | | | | |
| | | - mottled dark brown below 1.5 m - bulk sample BSB from 1.5 m to 3.0 m | | | SS | 3 | 370 | 16 | | | | | |
| 2 | | - trace gravel below 2.5 m | | | BS | 4 | | | | | | | |
| 3 | | - bulk sample BSC from 3.0 m to 4.6 m | | | SS | 5 | 450 | 13 | | | | | |
| | 1213.82 | Stiff, brown, medium plasticity clay (CL) TILL - some sand, trace coal specks, moist | | | BS | 6 | | | | | | | |
| 4 | | - bulk sample BSD from 4.6 m to 6.1 m | | | SS | 7 | 430 | 13 | | | | | |
| 5 | | - dry to moist below 5.5 m | | | BS | 8 | | | | | | | |
| 6 | | - hard, trace gravel below 6.1 m - bulk sample BSE from 6.1 m to 7.6 m | | | SS | 9 | 440 | 40 | | | | | |
| 7 | | | | | BS | 10 | | | | | | | |
| 8 | | - sandy below 7.6 m - bulk sample BSF from 7.6 m to 9.1 m | | | SS | 11 | 450 | 50 | | | | | |
| 9 | | | | | BS | 12 | | | | | | | |
| | | | | | SS | 13 | 450 | 47 | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H10**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/22
NORTHING 5655853
EASTING -33314
WATER LEVEL (14.0 m) 8/22/2016
PROJECT NO. 110773396
BH SIZE SS:150mm; HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Stiff, brown, medium plasticity clay (CL) TILL<br>- some sand, trace coal specks, moist<br>- bulk sample BSG from 10.7 m to 12.2 m | | | | | | | | |
| 12 | | | BS | 14 | | | | | | |
| | | - bulk sample BSH from 12.2 m to 13.7 m | SS | 15 | 450 | 33 | | | | |
| 13 | | | BS | 16 | | | | | | |
| 14 | | - bulk sample BSI from 13.7 m to 15.2 m | SS | 17 | 120 | 43 | | | | |
| | 1203.27 | - inferred seepage at 14.0 m<br>Very dense, brown silty SAND (SM)<br>- trace gravel, moist to wet | | | | | | | | |
| 15 | 1202.42 | | | | | | | | | |
| | 1202.22 | Very poor to poor quality grey (inferred) SANDSTONE<br>- completely to highly weathered<br>- extremely to very weak | SS | 18 | 25 | 50+ | | | | |
| 16 | | Bedrock encountered at 15.0 m<br>- Coring commenced at 15.2 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 30.2 m | | | | | | | | |
| 17 | | | | | | | | | | |
| 18 | | | | | | | | | | |
| 19 | | | | | | | | | | |
| 20 | | | | | | | | | | |

ADVANCED LAB TESTS

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H10**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/22/2016 to 8/22/2016

NORTHING: 5655853
EASTING: -33314
WATER LEVEL (14.0 m) 8/22/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | Overburden - See Soil Log for overburden description | | ▼ | | | | | | | | |
| 15 | 202.4 | | | | | | | | | | | |
| | 202.2 | Very poor to poor quality grey (inferred) SANDSTONE<br>- completely to highly weathered<br>- extremely to very weak | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- highly weathered<br>- medium strong | | | RC19 | 31 | 8 | 0 | | 3 | W4 | |
| 16 | | - moderately to highly weathered below 16.4 m | | | | | | | | | | |
| 17 | | | | | RC20 | 93 | 67 | 0 | | 3 | W3.5 | |
| 18 | | - poor quality, dark grey, and moderately weathered below 17.9 m | | | RC21 | 100 | 83 | 25 | | 3 | W3 | |
| 19 | | | | | | | | | | | | |
| 20 | | - very poor quality below 19.4 m | | | RC22 | 100 | 83 | 9 | | 3 | W3 | |
| 21 | 196.5 | Poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | RC23 | 99 | 96 | 40 | | R1 | W3 | |
| 22 | | | | | | | | | | | | |
| 23 | 194.9 | Good quality dark grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC24 | 100 | 95 | 79 | | R2 | W2 | |
| 24 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:48:56 PM

Stantec

# BOREHOLE RECORD

**H10**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/22/2016 to 8/22/2016
NORTHING: 5655853
EASTING: -33314
WATER LEVEL (14.0 m) 8/22/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | | Good quality dark grey SANDSTONE<br>- slightly weathered<br>- weak<br>- poor quality, and weak below 24.0 m | | | RC25 | 98 | 88 | 44 | | R2 | W2 | |
| 25 | | | | | | | | | | | | |
| 26 | | - good quality below 25.6 m | | | RC26 | 98 | 98 | 83 | | R2 | W2 | |
| 27 | | | | | | | | | | | | |
| 28 | | - fair quality, and weak to medium strong below 27.2 m | | | RC27 | 100 | 91 | 56 | | 2.5 | W2 | |
| 29 | | - weak below 28.7 m | | | RC28 | 100 | 91 | 56 | | R2 | W2 | |
| 30 | 1187.2 | | | | | | | | | | | |
| 31 | | End of borehole (30.2 m)<br>- borehole open upon completion<br>- seepage at 14.0 m during drilling<br>- borehole backfilled with cuttings, and a bentonite seal placed from 1.0 m to 30.2 m | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:48:56 PM

Stantec

# BOREHOLE RECORD

## H11

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/25
NORTHING 5655857
EASTING -33415
WATER LEVEL (Dry) 2016/08/25
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1219.53 | | | | | | | | | | | | |
| | 1219.33 | FILL: 40 mm pit run | | | | | | | | | | | |
| | 1218.93 | Black, low plasticity organic CLAY (OL)<br>- trace sand | | | | | | | | | | | |
| 1 | | Stiff, brown, high plasticity CLAY (CH)<br>- silty, trace sand, gravel, trace coal specks, moist<br>- bulk sample BSA from 0.6 m to 1.5 m<br>- bulk sample BSB from 1.5 m to 3.0 m | | | BS | 1 | | | | | | | |
| | | | | | SS | 2 | 420 | 14 | | | | | |
| 2 | | | | | | | | | CU, PT | 0.2 | 3.1 | 38.9 | 57.8 |
| | | | | | BS | 3 | | | | | | | |
| 3 | 1216.53 | | | | | | | | | | | | |
| | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to moist<br>- bulk sample BSC from 3.0 m to 4.6 m<br>- trace coal specks below 3.5 m | | | ST | 4 | 400 | | | | | | |
| | | | | | SS | 5 | 240 | 16 | | | | | |
| 4 | | | | | BS | 6 | | | | | | | |
| | | - brown to grey, hard below 4.6 m<br>- bulk sample BSD from 4.6 m to 6.1 m | | | SS | 7 | 420 | 50+ | | | | | |
| 5 | | | | | | | | | CU, PT, k | 3.1 | 18.3 | 39.1 | 39.4 |
| | | | | | BS | 8 | | | | | | | |
| 6 | | - inferred seepage at 6.1 m<br>- grey below 6.1 m<br>- bulk sample BSE from 6.1 m to 7.6 m | | | SS | 9 | 450 | 46 | | | | | |
| 7 | | | | | BS | 10 | | | | | | | |
| | | - bulk sample BSF from 7.6 m to 9.1 m | | | SS | 11 | 390 | 47 | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | BS | 12 | | | | | | | |
| | | - bulk sample BSG from 9.1 m to 10.7 m | | | SS | 13 | 380 | 50+ | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H11**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/25
NORTHING 5655857
EASTING -33415
WATER LEVEL (Dry) 2016/08/25
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to moist<br>- bulk sample BSH from 10.7 m to 12.2 m | | | BS | 14 | | | | | | | |
| 11 | | | | | SS | 15 | 450 | 42 | | | | | |
| 12 | | | | | BS | 16 | | | | | | | |
| | | - bulk sample BSI from 12.2 m to 13.7 m | | | SS | 17 | 440 | 42 | | | | | |
| 13 | | | | | BS | 18 | | | | | | | |
| 14 | | | | | SS | 19 | 450 | 46 | | | | | |
| 15 | | | | | BS | 20 | | | | | | | |
| | | | | | SS | 21 | 400 | 50+ | | 6.1 | 18.3 | 44.3 | 31.3 |
| 16 | | | | | BS | 22 | | | | | | | |
| 17 | | | | | SS | 23 | 450 | 50+ | | | | | |
| 18 | | | | | BS | 24 | | | | | | | |
| 19 | | | | | SS | 25 | 450 | 40 | | | | | |
| | 1199.73 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H11**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/25
WATER LEVEL (Dry) 2016/08/25
NORTHING 5655857
EASTING -33415
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Very poor to poor quality brown to grey (inferred) CLAYSTONE<br>- completely to highly weathered<br>- extremely to very weak | | | | | | | | | | | |
| 21 | | | | | BS | 26 | | | | | | | |
| | 1198.13 | | | | SS | 27 | 25 | 50+ | | | | | |
| | | End of borehole due to auger and split spoon refusal at 21.4 m<br>- Borehole dry and open upon completion<br>- Borehole backfilled with cuttings, bentonite seal from 0.3 m to 21.4 m | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H12**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24
WATER LEVEL
NORTHING 5655857
EASTING -33377
PROJECT NO. 110773396
BH SIZE SS:150mm; HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1217.63 | FILL: 40 mm pit run | | | | | | | | | | | |
| | 1217.23 | Black, low plasticity organic CLAY (OL) - trace sand, moist | | | | | | | | | | | |
| 1 | 1216.63 | - bulk sample BSA from 0.4 m to 1.5 m | | | BS | 1 | | | | | | | |
| | | Stiff, brown, medium to high plasticity clay (CI-CH) - silty, trace sand, moist - bulk sample BSB from 1.5 m to 3.0 m | | | SS | 2 | 340 | 10 | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | BS | 3 | | | | | | | |
| | | - inferred seepage at 3.0 m - trace coal specks, mottled grey below 3.0 m | | | SS | 4 | 420 | 9 | | | | | |
| | | - bulk sample BSC from 3.0 m to 4.6 m | | | ST | 5 | 450 | | CU, Y | 0.6 | 4.7 | 41.8 | 52.9 |
| 4 | | - trace gravel below 4.2 m | | | BS | 6 | | | | | | | |
| | | - bulk sample BSD from 4.6 m to 6.1 m | | | SS | 7 | 450 | 15 | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | BS | 8 | | | | | | | |
| | | - bulk sample BSE from 6.1 m to 7.6 m | | | SS | 9 | 450 | 12 | | | | | |
| 7 | | | | | | | | | | | | | |
| | | | | | BS | 10 | | | | | | | |
| | 1210.03 | Very stiff, brown medium plasticity clay (CI) TILL - silty, some sand, trace gravel, dry to moist - bulk sample BSF from 7.6 m to 9.1 m | | | SS | 11 | 450 | 16 | | | | | |
| 8 | | | | | | | | | | | | | |
| | | | | | BS | 12 | | | | | | | |
| 9 | | - bulk sample BSG from 9.1 m to 10.7 m | | | SS | 13 | 450 | 24 | | | | | |
| | | | | | | | | | | | | | |
| 10 | | - trace coal specks, moist | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H12**

CLIENT Alberta Transportation
NORTHING 5655857
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -33377
BH SIZE SS:150mm; HS:200mm
DATES BORING 2016/08/24
WATER LEVEL
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | below 9.8 m<br>Very stiff, brown medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry to moist | | | BS | 14 | | | | | | | |
| 11 | | - dry to moist below 10.7 m<br>- bulk sample BSH from 10.7 m to 12.2 m<br>- grey below 11.3 m | | | SS | 15 | 450 | 15 | | | | | |
| 12 | | | | | BS | 16 | | | | | | | |
| | | - bulk sample BSI from 12.2 m to 13.7 m | | | SS | 17 | 430 | 34 | | 8.8 | 13.3 | 42.9 | 35.0 |
| 13 | | | | | BS | 18 | | | | | | | |
| 14 | | - bulk sample BSJ from 13.7 m to 15.2 m | | | SS | 19 | 450 | 41 | | | | | |
| 15 | | | | | BS | 20 | | | | | | | |
| | | - bulk sample BSK from 15.2 m to 16.8 m | | | SS | 21 | 450 | 40 | | | | | |
| 16 | | | | | BS | 22 | | | | | | | |
| 17 | | | | | SS | 23 | 450 | 44 | | | | | |
| | 1199.73 | | | | | | | | | | | | |
| 18 | | Very poor to poor quality grey (inferred) CLAYSTONE<br>- completely to highly weathered<br>- extremely to very weak | | | | | | | | | | | |
| 19 | | | | | BS | 24 | | | | | | | |
| | 1198.23 | | | | SS | 25 | 0 | 50+ | | | | | |
| 20 | | Bedrock encountered at 17.9 m<br>- Coring commenced at 19.4 m (see rock coring log for details) | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

## H12

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/24
WATER LEVEL

NORTHING 5655857
EASTING -33377

PROJECT NO. 110773396
BH SIZE SS:150mm; HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | - Borehole advanced in bedrock to 34.7 m | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H12**

CLIENT Alberta Transportation NORTHING: 5655857 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -33377 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/24/2016 to 8/24/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | 199.7 | | | | | | | | | | | |
| 18 | | Very poor to poor quality grey (inferred) CLAYSTONE<br>- completely to highly weathered<br>- extremely to very weak | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| | 198.2 | | | | | | | | | | | |
| 20 | | Very poor quality dark grey SANDSTONE<br>- highly weathered<br>- very weak | | | RC26 | 100 | 60 | 0 | | R1 | W4 | |
| 21 | | - fair quality, weak to medium strong, and slightly weathered below 20.9 m | | | RC27 | 99 | 93 | 68 | | 2.5 | W2 | |
| 22 | | | | | | | | | | | | |
| 23 | | - good quality, and medium strong below 22.5 m | | | RC28 | 100 | 100 | 79 | | 3 | W2 | |
| 24 | | - excellent quality, and fresh below 24.0 m | | | RC29 | 99 | 97 | 94 | | 3 | W1 | |
| 25 | | | | | | | | | | | | |
| 26 | | - fair quality, slightly weathered, and grey to green below 25.5 m | | | RC30 | 100 | 93 | 73 | | 3 | W2 | |
| 27 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:48:58 PM

Stantec

# BOREHOLE RECORD

**H12**

CLIENT Alberta Transportation
NORTHING: 5655857
PROJECT No. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING: -33377
BH SIZE SS:150mm, HS:200mm
DRILLING DATE 8/24/2016 to 8/24/2016
WATER LEVEL
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | | | | | | | | | | | | |
| | | Very poor quality dark grey SANDSTONE<br>- highly weathered<br>- very weak<br>- good quality below 27.0 m | | | RC31 | 100 | 95 | 79 | | 3 | W2 | |
| 28 | | | | | | | | | | | | |
| | | - fair quality, and grey below 28.5 m | | | RC32 | 100 | 97 | 72 | | 3 | W2 | |
| 29 | | | | | | | | | | | | |
| 30 | | - good quality, and dark grey below 30.0 m | | | RC33 | 100 | 99 | 80 | | 3 | W2 | |
| 31 | | | | | | | | | | | | |
| | | - fair quality below 31.5 m | | | | | | | | | | |
| 32 | | | | | | | | | | | | |
| | | - 0.25 m thick weak, and moderately weathered layer at 32.15 m | | | RC34 | 99 | 88 | 69 | | 3 | W2 | |
| 33 | | | | | | | | | | | | |
| | | - excellent quality, and fresh below 33.1 m | | | | | | | | | | |
| 34 | | | | | RC35 | 98 | 98 | 93 | | 3 | W2 | |
| | 182.9 | | | | | | | | | | | |
| 35 | | End of borehole (34.7 m)<br>- borehole open upon completion<br>- borehole backfilled with cuttings, and a bentonite seal placed from 1.0 m to 34.7 m | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:48:58 PM

Stantec

# BOREHOLE RECORD

**H13**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/23

NORTHING 5655858
EASTING -33347
WATER LEVEL (15.0) 8/23/2016

PROJECT NO. 110773396
BH SIZE SS:150mm; HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1217.08 | | | | | | | | | | | | |
| | 1216.78 | FILL: 40 mm pit run | | | | | | | | | | | |
| | 1216.38 | Black, low plasticity organic CLAY (OL) | | | | | | | | | | | |
| 1 | | Grey SILT (ML)<br>- trace sand, wet, trace organics<br>- bulk sample BSA from 0.7 m to 1.5 m | | | BS | 1 | | | | | | | |
| | 1215.58 | | | | | | | | | | | | |
| 2 | | Stiff, brown, medium to high plasticity CLAY (CI-CH)<br>- silty, trace sand, mottled grey, moist to wet<br>- bulk sample BSB from 1.5 m to 3.0 m | | | SS | 2 | 320 | 8 | | | | | |
| | | | | | BS | 3 | | | | | | | |
| 3 | | - moist below 3.0 m<br>- bulk sample BSC from 3.0 m to 4.6 m | | | SS | 4 | 450 | 12 | | | | | |
| 4 | | - trace gravel below 4.0 m | | | BS | 5 | | | | | | | |
| | | - bulk sample BSD from 4.6 m to 6.1 m | | | ST | 6 | 290 | | Qu, Y | 0.8 | 6.8 | 35.8 | 56.6 |
| 5 | | - trace coal specks below 5.1 m | | | SS | 7 | 450 | 12 | | | | | |
| | | | | | BS | 8 | | | | | | | |
| 6 | | - bulk sample BSE from 6.1 m to 7.6 m | | | SS | 9 | 450 | 13 | | | | | |
| 7 | | - very stiff below 7.0 m | | | BS | 10 | | | | 2.2 | 8.6 | 40.9 | 48.3 |
| | | - bulk sample BSF from 7.6 m to 9.1 m | | | ST | 11 | 320 | | CU, Y | | | | |
| 8 | | | | | SS | 12 | 450 | 20 | | | | | |
| | | | | | BS | 13 | | | | | | | |
| 9 | 1207.98 | | | | | | | | | | | | |
| | | Hard, grey, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry<br>- bulk sample BSG from | | | SS | 14 | 450 | 32 | | | | | |
| 10 | | | | | | | | | CU, k, PT | 4.2 | 19.6 | 41.0 | 35.2 |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H13**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/23
WATER LEVEL (15.0) 8/23/2016
NORTHING 5655858
EASTING -33347
PROJECT NO. 110773396
BH SIZE SS:150mm; HS:200mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | 9.1 m to 10.7 m<br>Hard, grey, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, dry<br>- bulk sample BSH from 10.7 m to 12.2 m | | | BS | 15 | | | | | | | |
| 11 | | | | | SS | 16 | 450 | 42 | | | | | |
| 12 | | | | | BS | 17 | | | | | | | |
| | | - bulk sample BSI from 12.2 m to 13.7 m | | | SS | 18 | 280 | 38 | | | | | |
| 13 | | | | | BS | 19 | | | | | | | |
| 14 | | - bulk sample BSJ from 13.7 m to 15.2 m<br>- dry to moist below 14.0 m | | | SS | 20 | 450 | 36 | | 2.4 | 18.9 | 44.5 | 34.3 |
| 15 | 1201.88 | - inferred seepage at 15.0 m | | ▼ | SS | 21 | 25 | 50+ | | | | | |
| | | Very poor to poor quality grey (inferred) SANDSTONE<br>- highly weathered<br>- extremely to very weak | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | BS | 22 | | | | | | | |
| 18 | 1198.78 | - auger refusal at 17.8 m | | | | | | | | | | | |
| | | Bedrock encountered at 15.2 m<br>- Coring commenced at 18.3 m (see rock coring log for details)<br>- Borehole advanced in bedrock to 34.8 m | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ w $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**H13**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/23/2016 to 8/23/2016
NORTHING: 5655858
EASTING: -33347
WATER LEVEL (15.0 m) 8/23/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | Overburden - See Soil Log for overburden description | | ▼ | | | | | | | | |
| 15 | 201.9 | | | | | | | | | | | |
| | | Very poor to poor quality grey (inferred) SANDSTONE<br>- highly weathered<br>- extremely to very weak | | | | | | | | | | |
| 16 | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| | 198.8 | | | | | | | | | | | |
| | | Very poor quality grey SANDSTONE<br>- moderately weathered<br>- medium strong | | | RC23 | 0 | 0 | 0 | | R | W | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | RC24 | 100 | 91 | 11 | | R2 | W3 | |
| | 196.7 | | | | | | | | | | | |
| | | Very poor quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| 21 | 196.0 | | | | | | | | | | | |
| | | Fair quality grey SANDSTONE<br>- highly weathered<br>- medium strong | | | | | | | | | | |
| | 195.7 | | | | | | | | | | | |
| | | Fair quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | RC25 | 99 | 75 | 52 | | R2 | W3 | |
| 22 | | | | | | | | | | | | |
| | | - poor quality below 22.6 m | | | | | | | | | | |
| 23 | | | | | RC26 | 99 | 95 | 46 | | R1 | W3 | |
| 24 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

**H13**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/23/2016 to 8/23/2016
NORTHING: 5655858
EASTING: -33347
WATER LEVEL (15.0 m) 8/23/2016
PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | | Fair quality dark grey CLAYSTONE<br>- moderately weathered<br>- very weak | | | | | | | | | | |
| | 192.5 | Fair poor quality dark grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC27 | 98 | 80 | 60 | | R1.5 | W2.5 | |
| 25 | | - poor quality, dark grey, moderately weathered, very weak below 25.7 m<br>- slightly weathered, medium strong below 26.25 m | | | RC28 | 100 | 80 | 46 | | R2 | W2,5 | |
| 26 | | - moderately weathered, very weak below 26.85 m<br>- good quality, slightly weathered, medium strong below 27.2 m | | | RC29 | 100 | 99 | 86 | | 3 | W2 | |
| 27 | | | | | | | | | | | | |
| 28 | | - fair quality, weak to medium strong below 28.7 m | | | RC30 | 100 | 96 | 67 | | 2.5 | W2 | |
| 29 | | | | | | | | | | | | |
| 30 | | - medium strong below 30.2 m | | | RC31 | 100 | 91 | 73 | | 3 | W2 | |
| 31 | | | | | | | | | | | | |
| 32 | | | | | RC32 | 97 | 94 | 66 | | 3 | W2 | |
| 33 | | - good quality below 33.3 m | | | | | | | | | | |
| 34 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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# BOREHOLE RECORD

## H13

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DRILLING DATE 8/23/2016 to 8/23/2016

NORTHING: 5655858
EASTING: -33347
WATER LEVEL (15.0 m) 8/23/2016

PROJECT No. 110773396
BH SIZE SS:150mm, HS:200mm
DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN
F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED
SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR
FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED
BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | | Fair poor quality dark grey SANDSTONE<br>- slightly weathered<br>- weak | | | RC33 | 100 | 98 | 78 | | 3 | W2 | |
| | 1182.3 | End of borehole (34.8 m)<br>- borehole open upon completion<br>- water observed at 15.0 m during drilling<br>- borehole backfilled with cuttings, and a bentonite seal placed from 1.0 m to 34.8 m | | | | | | | | | | |
| 35 | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | |
| 38 | | | | | | | | | | | | |
| 39 | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | | |
| 44 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

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TEST 12/5/16 4:49:01 PM

# D. 6
## Borrow Source

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# BOREHOLE RECORD

**BS1**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/12
WATER LEVEL

NORTHING 5658021
EASTING -28966

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1198.92 | TOPSOIL | | | | | | | | | |
| | 1198.52 | Very stiff, brown, medium plasticity CLAY (CI)<br>- silty, trace to some sand, trace gravel, dry<br>- bulk sample BSA from 0.4 m-1.5 m | BS | 1 | | | | | | | |
| 1 | | - bulk sample BSB from 1.5 m to 3.0 m | ST | 2 | 100 | | CU, Y | 0.5 | 4.5 | 41.3 | 53.7 |
| | | | SS | 3 | 320 | 29 | | | | | |
| 2 | | | | | | | PT | 1.2 | 13.1 | 44.6 | 41.1 |
| | | - dry to moist below 2.5 m | BS | 4 | | | | | | | |
| 3 | | - bulk sample BSC from 3.0 m to 4.6 m | SS | 5 | 330 | 23 | | | | | |
| | 1194.92 | | | | | | | 2.8 | 14.6 | 43.0 | 39.6 |
| 4 | | Very stiff, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, sandy, trace gravel, moist<br>- bulk sample BSD from 4.6 m to 6.1 m | BS | 6 | | | | | | | |
| | | | SS | 7 | 450 | 26 | | | | | |
| 5 | | | | | | | PT | 4.5 | 23.2 | 48.3 | 24.0 |
| | | | BS | 8 | | | | | | | |
| 6 | | - bulk sample BSE from 6.1 m to 7.6 m | SS | 9 | 420 | 26 | | | | | |
| | | | | | | | CU | 3.7 | 25.9 | 47.5 | 22.9 |
| 7 | | | BS | 10 | | | | | | | |
| | | - bulk sample BSF from 7.6 m to 9.1 m | SS | 11 | 450 | 20 | | | | | |
| 8 | | | | | | | k | 2.5 | 20.4 | 53.5 | 23.6 |
| | | | BS | 12 | | | | | | | |
| 9 | | | SS | 13 | 170 | 38 | | | | | |
| 10 | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS1**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/12
WATER LEVEL
NORTHING 5658021
EASTING -28966
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, sandy, trace gravel, moist | | | BS | 14 | | | | | | | |
| 11 | | | | | SS | 15 | 450 | 50+ | | 11.4 | 19.4 | 35.9 | 33.3 |
| 12 | | | | | BS | 16 | | | | | | | |
| | 1186.12 | | | | SS | 17 | 450 | 50+ | | | | | |
| 13 | | Very poor quality (inferred) CLAYSTONE<br>- completely to highly weathered<br>- extremely weak to very weak | | | BS | 18 | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| | 1183.57 | | | | SS | 19 | 50 | 50+ | | | | | |
| 16 | | End of borehole (15.4 m)<br>- Borehole dry and open upon completion<br>- Borehole backfilled with cuttings from surface to 11.3 m and bentonite from 11.3 to 15.4 m | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS2**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/18
NORTHING 5658229
EASTING -29022
WATER LEVEL
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | RECOVERY (mm) | N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1204.09 | TOPSOIL | | | | | | | | | |
| | 1203.64 | Brown, medium plasticity CLAY (CI)<br>- silty, trace to some sand, trace gravel, dry to moist | | | | | | | | | |
| 1 | | - bulk sample BSA from 1.1 m to 1.4 m | BS | 1 | | | | 2.8 | 12.4 | 47.4 | 37.4 |
| | | - bulk sample BSB from 1.5 m to 3.0 m | | | | | | | | | |
| 2 | | | | | | | CU | 8.0 | 13.0 | 37.5 | 41.5 |
| | | | BS | 2 | | | | | | | |
| 3 | | - bulk sample BSC from 3.0 m to 4.6 m | | | | | | | | | |
| | | | | | | | CU | 3.0 | 18.9 | 49.3 | 28.7 |
| 4 | | | BS | 3 | | | | | | | |
| | | - bulk sample BSD from 4.6 m to 6.1 m | | | | | | | | | |
| 5 | | - trace coal specks below 5.0 m | | | | | | | | | |
| | | | | | | | PT | 0.2 | 8.4 | 51.4 | 40.0 |
| 6 | 1197.99 | | BS | 4 | | | | | | | |
| | | Brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, some sand to sand, trace gravel, trace coal specks, moist | | | | | | | | | |
| 7 | | | | | | | CU | 4.4 | 20.0 | 49.6 | 26.0 |
| | | - bulk sample BSE from 6.1 m to 7.6 m | BS | 5 | | | | | | | |
| | | - bulk sample BSF from 7.6 m to 9.1 m | | | | | | | | | |
| 8 | | | | | | | | 3.2 | 19.1 | 44.4 | 33.3 |
| | | - dry to moist below 8.7 m | BS | 6 | | | | | | | |
| 9 | 1194.89 | | | | | | | | | | |
| | | Brown silty SAND (SM)<br>- dry | | | | | | | | | |
| 10 | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS2**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/18
WATER LEVEL
NORTHING 5658229
EASTING -29022
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 1193.39 | Brown silty SAND (SM)<br>- dry | | | BS | 7 | | | | | | | |
| 11 | | End of borehole (10.7 m)<br>- Auger refusal on inferred sandstone bedrock at 10.7 m<br>- Borehole dry and sloughing at 10.1 m upon completion<br>- Borehole backfilled with cuttings and a bentonite seal from 0.2 m to 3.0 m and from 7.1 m to 10.1 m | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS3**

CLIENT Alberta Transportation
NORTHING 5658231
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29274
BH SIZE SS:150mm
DATES BORING 2016/08/19
WATER LEVEL (7.0 m) 2016/09/28
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1197.45 | | | | | | | | | | | | |
| | 1197.15 | TOPSOIL | | | | | | | | | | | |
| | | Brown, high plasticity CLAY (CH)<br>- silty, trace sand, dry to moist<br>- bulk sample BSA from 0.3 m to 1.5 m | | | | | | | CU | 0.0 | 3.0 | 26.0 | 71.0 |
| 1 | | | | | BS | 1 | | | | | | | |
| | | - mottled grey below 1.5 m<br>- bulk sample BSB from 1.5 m to 3.0 m | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| | | | | | BS | 2 | | | | 0.7 | 4.2 | 36.6 | 58.5 |
| 3 | | - bulk sample BSC from 3.0 m to 4.6 m | | | | | | | | | | | |
| | | | | | | | | | k | 0.3 | 4.7 | 42.7 | 52.3 |
| 4 | | | | | BS | 3 | | | | | | | |
| | | - bulk sample BSD from 4.6 m to 6.1 m | | | | | | | | | | | |
| 5 | | | | | | | | | CU | 0.0 | 3.2 | 27.5 | 69.3 |
| 6 | 1191.35 | | | | BS | 4 | | | | | | | |
| | | Brown, medium plasticity clay (CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, mottled grey, moist | | | | | | | PT | | | | |
| 7 | | | | | BS | 5 | | | | 0.5 | 7.9 | 52.3 | 39.3 |
| 8 | | | | | | | | | CU | 1.9 | 9.2 | 44.7 | 44.2 |
| 9 | 1188.35 | | | | BS | 6 | | | | | | | |
| | 1188.15 | Poor quality grey (inferred) SANDSTONE<br>- highly weathered | | | BS | 7 | | | | | | | |
| | | End of borehole (9.3 m) | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS3**

CLIENT Alberta Transportation
NORTHING 5658231
PROJECT NO. 110773396
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
EASTING -29274
BH SIZE SS:150mm
DATES BORING 2016/08/19
WATER LEVEL (7.0 m) 2016/09/28
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES: TYPE | SAMPLES: NUMBER | SAMPLES: RECOVERY (mm) | SAMPLES: N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS: Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | - Borehole dry and open upon completion<br>- 50 mm standpipe piezometer slotted from 6.2 m to 9.3 m | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS4**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/18
WATER LEVEL
NORTHING 5658398
EASTING -29457
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | RECOVERY (mm) | N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1199.44 | TOPSOIL | | | | | | | | | |
| | 1199.04 | Brown, high plasticity CLAY (CH)<br>- silty, trace sand, trace coal specks, dry to moist<br>- bulk sample BSA from 0.4 m to 1.5 m | BS | 1 | | | | 0.0 | 2.2 | 40.2 | 57.6 |
| 1 | | - bulk sample BSB from 1.5 m to 3.0 m | | | | | | | | | |
| 2 | | - mottled grey below 2.0 m | BS | 2 | | | PT | 0.0 | 2.8 | 30.9 | 66.3 |
| 3 | | - bulk sample BSC from 3.0 m to 4.6 m | | | | | | | | | |
| 4 | 1194.84 | | BS | 3 | | | CU | 1.8 | 1.8 | 32.5 | 63.8 |
| 5 | | Brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, sandy, trace gravel, dry to moist<br>- bulk sample BSD from 4.6 m to 6.1 m | BS | 4 | | | | 0.1 | 11.5 | 49.3 | 39.0 |
| 6 | | - bulk sample BSE from 6.1 m to 6.6 m | BS | 5 | | | | 2.6 | 33.4 | 41.7 | 22.3 |
| 7 | | - bulk sample BSF from 6.6 m to 7.6 m | BS | 6 | | | CU | 5.6 | 24.4 | 49.4 | 20.5 |
| 8 | | - bulk sample BSG from 7.6 m to 9.1 m | | | | | | 9.1 | 25.5 | 40.4 | 25.1 |
| 9 | | - bulk sample BSH from 9.1 m to 10.7 m | BS | 7 | | | PT | | | | |
| 10 | | | | | | | CU, k | 4.5 | 20.4 | 47.7 | 27.3 |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS4**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/18
WATER LEVEL
NORTHING 5658398
EASTING -29457
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Brown, low to medium plasticity clay (CL-CI) TILL<br>- silty, sandy, trace gravel, dry to moist | | | BS | 8 | | | | | | | |
| 11 | | | | | BS | 9 | | | | | | | |
| | 1187.84 | | | | | | | | | | | | |
| 12 | | Very poor quality (inferred) CLAYSTONE<br>- completely to highly weathered<br>- extremely to very weak | | | BS | 10 | | | | | | | |
| | 1187.24 | End of borehole (12.2 m)<br>- Borehole dry and open upon completion<br>- Borehole backfilled with cuttings and a bentonite seal from 0.3 m to 0.6 m, and 9.2 m to 12.2 m | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS5**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/11
NORTHING 5657579
EASTING -29358
WATER LEVEL
PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1190.45 | | | | | | | | | | |
| | 1190.2 | TOPSOIL | | | | | | | | | |
| | | Stiff, brown, medium to high plasticity CLAY (CH)<br>- trace sand, moist<br>- bulk sample BSA from 0.25 m to 1.5 m | BS | 1 | | | | | | | |
| 1 | | - bulk sample BSB from 1.5 m to 3.0 m | ST | 2 | 270 | | | | | | |
| 2 | | | SS | 3 | 380 | 17 | PT | | | | |
| | 1187.95 | | | | | | | | | | |
| | | Very stiff, brown, medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, moist<br>- dry to moist below 3.0 m<br>- bulk sample BSC from 3.0 m to 4.6 m | BS | 4 | | | | | | | |
| 3 | | | SS | 5 | 450 | 28 | | | | | |
| 4 | | | | | | | CU, PT | 2.6 | 18.2 | 43.7 | 35.4 |
| | | | BS | 6 | | | | 5.2 | 17.5 | 46.0 | 31.3 |
| | | - bulk sample BSD from 4.5 m to 6.0 m | SS | 7 | 450 | 28 | | | | | |
| 5 | | | | | | | CU | 3.5 | 18.8 | 45.3 | 32.3 |
| 6 | | | BS | 8 | | | | | | | |
| | | | SS | 9 | 450 | 29 | | 5.4 | 17.8 | 46.9 | 29.9 |
| 7 | | | | | | | PT | | | | |
| | | | BS | 10 | | | | | | | |
| 8 | | | SS | 11 | 200 | 23 | | 4.9 | 15.6 | 47.4 | 32.1 |
| 9 | | | BS | 12 | | | | | | | |
| | | | SS | 13 | 450 | 30 | | | | | |
| 10 | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $W_P$ W $W_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS5**

CLIENT Alberta Transportation
PROJECT SR1 - Off Stream Reservoir, Springbank, AB
DATES BORING 2016/08/11
WATER LEVEL

NORTHING 5657579
EASTING -29358

PROJECT NO. 110773396
BH SIZE SS:150mm
DATUM Geodetic

| DEPTH (m) | ELEVATION (m) | SOIL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY (mm) | SAMPLES N-VALUE | ADVANCED LAB TESTS | GRAIN SIZE ANALYSIS Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | | Very stiff, brown, medium plasticity clay (CL-CI) TILL<br>- silty, some sand, trace gravel, trace coal specks, moist | | | BS | 14 | | | | | | | |
| 11 | | | | | SS | 15 | 450 | 21 | | 0.7 | 6.0 | 47.6 | 45.7 |
| | | - grey below 11.4 m | | | | | | | | | | | |
| 12 | | - moist below 11.8 m | | | BS | 16 | | | | | | | |
| | | | | | SS | 17 | 450 | 24 | | 1.5 | 7.8 | 42.3 | 48.4 |
| 13 | | | | | BS | 18 | | | | | | | |
| 14 | | | | | SS | 19 | | 50+ | | | | | |
| | | | | | SS | 20 | | 50+ | | | | | |
| | | - boulder between 14.6 m and 14.8 m | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | 1173.75 | | | | | | | | | | | | |
| | | Bedrock encountered at 16.7 m<br>- Coring commenced at 14.6 m due to auger refusal on boulder (see rock coring log for details)<br>- Borehole advanced in bedrock to 18.6 m | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | |

UNDRAINED SHEAR STRENGTH (kPa)
40 80 120 160
WATER CONTENT ATTERBERG LIMITS (%) $w_P$ $w$ $w_L$
STANDARD PENETRATION TEST, blows/0.30 m
20 40 60 80

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

Stantec

# BOREHOLE RECORD

**BS5**

CLIENT Alberta Transportation NORTHING: 5657579 PROJECT No. 110773396

PROJECT SR1 - Off Stream Reservoir, Springbank, AB EASTING: -29358 BH SIZE SS:150mm, HS:200mm

DRILLING DATE 8/11/2016 to 8/11/2016 WATER LEVEL DATUM Geodetic

FX-FRACTURE CL-CLEAVAGE SH-SHEAR VN-VEIN | F-FAULT JN-JOINT P-POLISHED S-SLICKENSIDED | SM-SMOOTH R-ROUGH ST-STEPPED PL-PLANAR | FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED | BC-BROKEN CORE CONT-CONTACT B-BEDDING FOL-FOLIATION

| DEPTH (m) | ELEVATION (m) | DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLE TYPE RUN No. | RECOVERY TOTAL CORE % | RECOVERY SOLID CORE % | R.Q.D. % | FRACT. INDEX PER 1m | ROCK STRENGTH INDEX | WEATHERING INDEX | LABORATORY TESTING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | Overburden - See Soil Log for overburden description | | | | | | | | | | |
| | | - inferred boulder between 14.6 m and 14.8 m | | | RC21 | | | | | R | W | |
| 15 | | | | | | | | | | | | |
| | | | | | RC22 | | | | | R | W | |
| 16 | | | | | | | | | | | | |
| | 173.8 | Very poor quality dark grey CLAYSTONE - very weak - highly weathered | | | | | | | | | | |
| 17 | | | | | | | | | | | | |
| | | | | | RC23 | 100 | 86 | 19 | | R2 | W3.5 | |
| | 172.6 | Very poor quality grey SANDSTONE - medium strong - moderately weathered | | | | | | | | | | |
| 18 | 171.9 | End of borehole (18.6 m) - borehole open upon completion - borehole backfilled with cuttings, and bentonite seals placed from 0.3 m to 0.6 m and from 12.8 m to 18.6 m | | | | | | | | | | |
| 19 | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |

(1) Approximate borehole locations surveyed by Stantec Consulting Ltd.
(2) Water may be influenced by drilling fluids/techniques; piezometer install shown, if applicable.

App'd by: AIB

TEST 12/5/16 4:14:08 PM

# D. 7
## Hydrogeology

Stantec

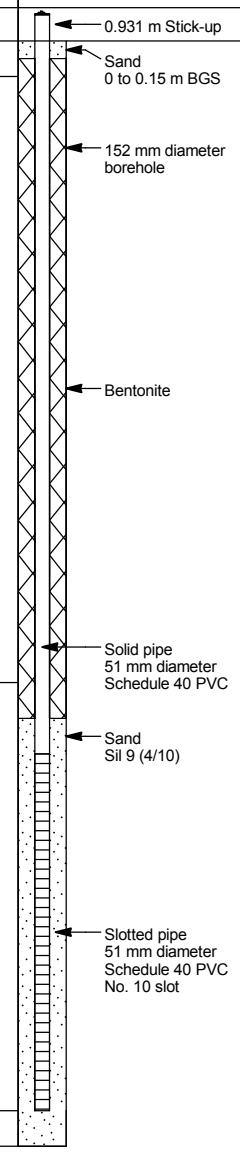
# Monitoring Well: BS3

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 19-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -29274.736 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5658230.981 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| 0 | 0 | | TOPSOIL | 0.00 |
| | | | SILTY CLAY<br>Light to medium brown, moist, medium plastic, some mottling | 0.30 |
| 5 | 2 | | | |
| | | | - @ 2.74 m: silt content decreases to 15-30% | |
| 10 | 4 | | | |
| 15 | | | - @ 4.88 m: silt content increases to > 40%<br>- below 5.18 m: trace gravel | |
| | | | SILT AND CLAY (TILL)<br>Medium brown, some very fine grained sand, some gravel, moist, medium plastic | 5.49 |
| 20 | 6 | | | |
| 25 | 8 | | | |
| 30 | | | CLAYSTONE<br>Light grey to brown, dry | 9.14 |
| | 10 | | End of Borehole | 9.45 |

INSTALLATION DETAILS




Screen Interval: 6.10 - 9.14 m BGS
Sand Pack Interval: 5.79 - 9.45 m BGS
Well Seal Interval: 0.15 - 5.79 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-25-9

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: D2

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger |
| **Client:** | Alberta Transportation | **Date started/completed:** | 10-Jun-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -31218.384 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5657498.57 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | SILTY CLAY<br>Light brown, moist, medium plastic | 0.30 |
| 5 | 2 | | | |
| | | | SILTY CLAY (TILL)<br>Mottled brown and grey, with very fine sand lenses (tend to be orangish brown and oxidized), with gravel, moist | 2.44 |
| 10 | 4 | | | |
| 15 | | | | |
| 20 | 6 | | | |
| | | | SILT<br>Medium brown, with clay, moist, crumbly | 7.32 |
| 25 | 8 | | | |
| 30 | | | - @ 9.45 m: beige, begins to contain some very fine sand lenses (150 mm thick) and some gravel, dry | |
| 35 | 10 | | | |
| | | | - @ 11.58 m: silt becomes dark brown to grey | |
| 40 | 12 | | | |
| 45 | | | SILTSTONE<br>Medium to dark grey, highly fractured, edges of large fractures have been weathered to silt, smaller fractures exhibit oxidation | 13.41 |
| 50 | 14 | | | |
| | 16 | | | |
| 55 | | | | |
| 60 | 18 | | | |
| 65 | | | SANDSTONE<br>Grey to dark grey, very fine to fine grained, with weak cross-bedding, few fractures | 19.51 |
| | 20 | | | |
| 70 | | | End of Borehole | 21.34 |
| | 22 | | | |
| 75 | | | | |

INSTALLATION DETAILS

Diagram

Description

- 0.746 m Stick-up
- Sand<br>0 to 1.22 m BGS
- Groundwater<br>1.93 m BGS<br>June 10, 2016
- Bentonite
- 152 mm diameter<br>borehole<br>from 0 to 13.41 m
- Solid pipe<br>51 mm diameter<br>Schedule 40 PVC
- 102 mm diameter<br>borehole<br>from 13.41 to 21.34 m
- Sand
- Slotted pipe<br>51 mm diameter<br>Schedule 40 PVC<br>No. 10 slot

Screen Interval: 19.81 - 21.34 m BGS
Sand Pack Interval: 4.27 - 21.34 m BGS
Well Seal Interval: 1.22 - 4.27 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-20-20

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Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

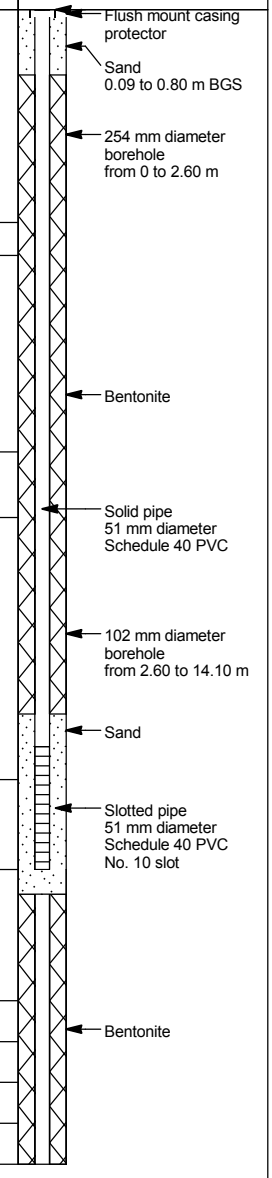
# Monitoring Well: D9

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 01-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -30383.805 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5656987.083 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | OVERBURDEN | 0.00 |
| 5 | 2 | | | |
| | | | SANDSTONE<br>Coarse grained, weathered, few fractures | 2.60 |
| 10 | 4 | | MUDSTONE AND CLAYSTONE<br>Interbedded, massive<br>- mudstone: brown, friable, has been weathered to clay along fractured<br>- claystone: grey to light grey, with minor fractures, oxidation on fractures | 3.00 |
| 15 | | | | |
| | | | SANDSTONE<br>Grey to brown, fine grained, well defined cross-bedding | 5.40 |
| 20 | 6 | | | |
| | | | SILTSTONE<br>Grey to brown, highly fractured and weathered, portions are highly friable and weathered to clay | 6.20 |
| 25 | 8 | | | |
| 30 | | | | |
| | | | SANDSTONE<br>Grey to brown, medium grained, planar laminated, competent core | 9.40 |
| 35 | 10 | | | |
| | | | SILTSTONE<br>Highly fractured with weathering to silt along fractures | 10.50 |
| 40 | 12 | | | |
| | | | SANDSTONE<br>Fine grained, finely cross-bedded, few fractures with oxidation along fracture surfaces | 12.10 |
| | | | SILTSTONE<br>Grey, highly fractured and weathered | 12.60 |
| | | | SANDSTONE<br>Fine grained, finely cross-bedded, few fractures | 13.10 |
| 45 | 14 | | SILTSTONE<br>Highly fractured and friable | 13.60 |
| | | | End of Borehole | 14.10 |

INSTALLATION DETAILS




Screen Interval: 9.00 - 10.50 m BGS
Sand Pack Interval: 8.60 - 10.80 m BGS
Well Seal Interval: 10.80 - 14.10 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-21-11

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

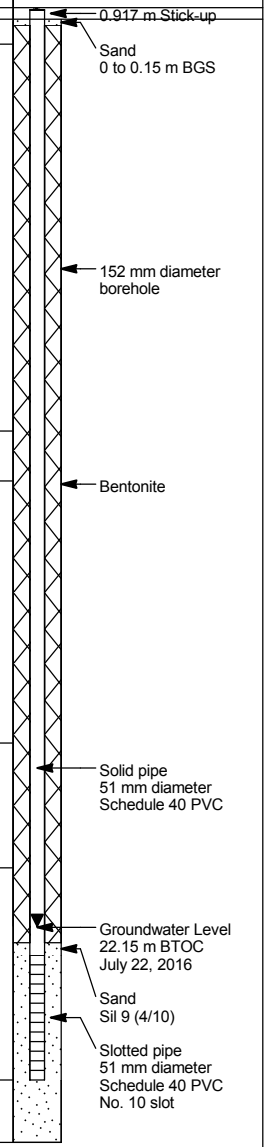
# Monitoring Well: D27

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 21-Jul-2016 / 22-Jul-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -29330.853 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5656907.343 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | ~~Ground Surface~~ | |
| | | | TOPSOIL | 0.00 |
| 5 | 2 | | CLAY<br>- from 0.61 to 2.44 m: beige to light brown, with silt, moist, high plastic | 0.61 |
| 10 | 4 | | - from 2.44 to 10.06 m: medium brown, trace fine grained sand, trace gravel, some silt, medium plastic | |
| 15 | | | | |
| 20 | 6 | | | |
| 25 | 8 | | | |
| 30 | 10 | | | |
| 35 | | | SILTY CLAY<br>Medium brown, some very fine grained sand, trace gravel, medium plastic, minor oxidation within sand stringers<br>- @ 11.28 m: sand content increases to 15-30%, gravel content increases to 5-15% | 10.06 |
| 40 | 12 | | SANDY SILT<br>Medium brown, with gravel, dry to moist, friable | 11.28 |
| 45 | 14 | | | |
| 50 | 16 | | - below 15.85 m: dry | |
| 55 | | | | |
| 60 | 18 | | SANDY SILT (TILL)<br>Medium to dark grey, some gravel, with clay, dry, medium plastic | 17.68 |
| 65 | 20 | | | |
| 70 | 22 | | SILTY CLAY (TILL)<br>Dark grey, with gravel, dry to moist, medium plastic | 20.73 |
| 75 | | | | |
| 80 | 24 | | | |
| 85 | 26 | | SILTSTONE<br>Light to medium grey | 25.91 |
| 90 | 28 | | End of Borehole | 27.43 |
| 95 | | | | |
| | 30 | | | |

INSTALLATION DETAILS




Screen Interval: 22.86 - 25.91 m BGS
Sand Pack Interval: 22.56 - 27.43 m BGS
Well Seal Interval: 0.15 - 22.56 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-22-26

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: D36D

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 24-Jul-2016 / 25-Jul-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -29019.349 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5657308.346 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| 5 | 2 | | CLAY<br>Light to medium brown, trace very fine grained sand, some silt, moist, medium plastic | 0.30 |
| 10 | 4 | | | |
| 15 | | | | |
| 20 | 6 | | SILTY CLAY (TILL)<br>Medium brown, with very fine grained sand, some gravel, moist | 4.88 |
| 25 | 8 | | | |
| 30 | 10 | | | |
| 35 | | | | |
| 40 | 12 | | SILT<br>Light brown, trace very fine grained sand, moist | 12.19 |
| 45 | 14 | | - @ 13.41 m: becomes wet | 13.72 |
| 50 | | | CLAY<br>Low plastic | 15.24 |
| 55 | 16 | | - from 13.72 to 14.02 m: some silt<br>- from 14.02 to 15.20 m: light grey, dry to damp, mottled | |
| 60 | 18 | | SANDSTONE<br>Medium brown, highly fractured | 17.00 |
| 65 | 20 | | CLAYSTONE<br>Grey, highly fractured, clay fracture gouge present | |
| 70 | | | | |
| 75 | 22 | | | |
| 80 | 24 | | SANDSTONE<br>Medium brown to grey | 23.15 |
| 85 | 26 | | SILTSTONE<br>Grey, some oxidation on fractured surfaces | 24.65 |
| 90 | | | | |
| 95 | 28 | | - from 28.05 to 28.45 m: highly fractured<br>- below 28.45 m: some bedding present | |
| 100 | 30 | | | |
| 105 | 32 | | SANDSTONE<br>Grey, fine grained | 30.90 |
| 110 | | | MUDSTONE<br>Grey to dark grey, fractured | 31.85 |
| 115 | 34 | | | |
| 120 | 36 | | | |
| 125 | 38 | | | |
| 130 | 40 | | SILTSTONE<br>Grey, fractured | 39.15 |
| 135 | | | - from 41.05 to 41.65 m: some bedding | |
| 140 | 42 | | MUDSTONE<br>Grey, fractured | 42.55 |
| 145 | 44 | | | |
| 150 | 46 | | End of Borehole | 45.72 |
| 155 | 48 | | | |

INSTALLATION DETAILS

Diagram / Description

- 0.764 m Stick-up
- Sand, 0 to 0.61 m BGS
- 152 mm diameter borehole
- Bentonite
- Solid pipe, 51 mm diameter, Schedule 40 PVC
- Sand, Sil 9 (4/10)
- Slotted pipe, 51 mm diameter, Schedule 40 PVC, No. 10 slot

Screen Interval: 39.62 - 42.67 m BGS
Sand Pack Interval: 39.01 - 45.72 m BGS
Well Seal Interval: 0.61 - 39.01 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-23-36

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

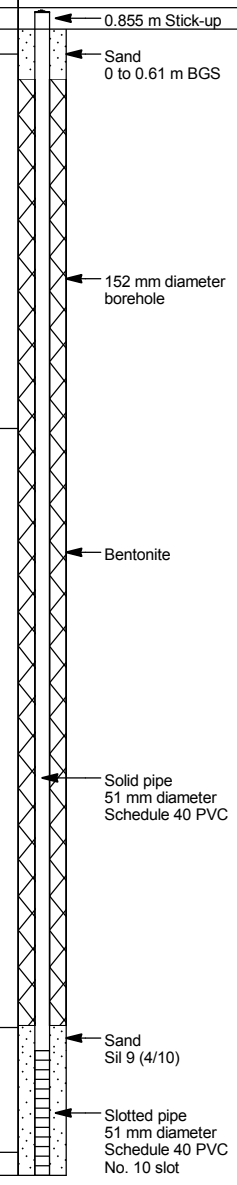
# Monitoring Well: D36S

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 24-Jul-2016 / 25-Jul-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -29019.682 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5657309.567 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | CLAY<br>Light to medium brown, trace very fine grained sand, some silt, moist, medium plastic | 0.30 |
| 5 | 2 | | | |
| 10 | 4 | | | |
| 15 | | | SILTY CLAY (TILL)<br>Medium brown, with very fine grained sand, some gravel, moist | 4.88 |
| 20 | 6 | | | |
| 25 | 8 | | | |
| 30 | 10 | | | |
| 35 | | | | |
| 40 | 12 | | SILT<br>Light brown, trace very fine grained sand, moist | 12.19 |
| | | | - @ 13.41 m: becomes wet | |
| 45 | 14 | | CLAY<br>Low plastic<br>- from 13.72 to 14.02 m: some silt | 13.72 |
| | | | End of Borehole | 14.00 |

INSTALLATION DETAILS




Screen Interval: 12.48 - 14.00 m BGS
Sand Pack Interval: 12.17 - 14.00 m BGS
Well Seal Interval: 0.61 - 12.17 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-23-14

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: D51

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger / Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 19-Jul-2016 / 20-Jul-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -28761.753 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5657740.483 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| 5 | 2 | | SILT<br>With sand, trace gravel, dry to damp | 0.30 |
| 10 | 4 | | CLAY<br>Medium brown, trace sand and gravel, low plastic, minor oxidation, mottled | 2.25 |
| 15 | | | | |
| 20 | 6 | | | |
| 25 | 8 | | | |
| 30 | 10 | | | |
| 35 | | | | |
| 40 | 12 | | - @ 11.9 m: becomes sandy | |
| 45 | 14 | | SAND<br>Some gravel, some clay, dry, oxidized | 13.70 |
| 50 | | | | |
| 55 | 16 | | SILTSTONE<br>Light to medium grey, areas with high fracture intensity, some oxidation along larger fractures | 15.20 |
| 60 | 18 | | SANDSTONE<br>Brown to grey, planar bedded | 17.20 |
| 65 | 20 | | | |
| 70 | 22 | | | |
| 75 | | | | |
| 80 | 24 | | SILTSTONE<br>Light to medium grey, areas with high fracture intensity, some oxidation along larger fractures<br>- below 24.08 m: fine planar laminations<br>- below 24.69 m: grainsize begins to decrease towards bottom of interval | 23.16 |
| 85 | 26 | | CLAYSTONE<br>Dark to medium grey, some fracturing, minor weathering along fractures | 25.30 |
| | | | SILTSTONE<br>Light to medium grey, highly fractured, faint laminations and cross-bedding<br>- below 27.13 m: some lenses of very fine grained sandstone | 26.21 |
| 90 | 28 | | CLAYSTONE<br>Medium grey, highly fractured and weathered to clay throughout interval | 27.43 |
| 95 | 30 | | SANDSTONE<br>Medium grey, very fine to fine grained, competent, few fractures | 28.96 |
| 100 | | | End of Borehole | 30.78 |
| 105 | 32 | | | |

INSTALLATION DETAILS

Diagram / Description

- 0.853 m Stick-up
- Sand, 0 to 0.61 m BGS
- 152 mm diameter borehole
- Groundwater Level, 8.39 m BTOC, July 20, 2016
- Bentonite
- Solid pipe, 51 mm diameter, Schedule 40 PVC
- Sand, Sil 9 (4/10)
- Slotted pipe, 51 mm diameter, Schedule 40 PVC, No. 10 slot

Screen Interval: 28.96 - 30.48 m BGS
Sand Pack Interval: 28.50 - 30.78 m BGS
Well Seal Interval: 0.61 - 28.50 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-24-30

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: DC-9

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 15-Apr-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -33453.625 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5655154.279 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| 0 | 0 | | SOIL<br>Some clay, organics | 0.00 |
| | | | SILT<br>Brown to beige, minor very fine sand, some clay | 0.30 |
| 5 | | | CLAY<br>Mottled beige to grey, minor silt, moist | 1.52 |
| | 2 | | | |
| 10 | | | | |
| | 4 | | | |
| 15 | | | | |
| | | | CLAY (TILL)<br>Some fine to very fine grained sand, some gravel, some silt, dry, friable | 5.18 |
| 20 | 6 | | | |
| 25 | | | | |
| | 8 | | | |
| 30 | | | | |
| | 10 | | | |
| 35 | | | SANDSTONE<br>Very fine grained, dry, weathered, crumbles under minor force | 10.36 |
| | | | End of Borehole | 10.97 |

INSTALLATION DETAILS

| Diagram | Description |
|---|---|
| | 0.914 m Stick-up |
| | Sand<br>0 to 0.30 m BGS |
| | 254 mm diameter borehole<br>from 0 to 10.36 m |
| | Bentonite |
| | Solid pipe<br>51 mm diameter<br>Schedule 40 PVC |
| | Sand<br>Sil 9 (4/10) |
| | Slotted pipe<br>51 mm diameter<br>Schedule 40 PVC<br>No. 10 slot |
| | 102 mm diameter borehole<br>from 10.36 to 10.97 m |

Screen Interval: 7.62 - 10.67 m BGS
Sand Pack Interval: 7.01 - 10.97 m BGS
Well Seal Interval: 0.30 - 7.01 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-16-11

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

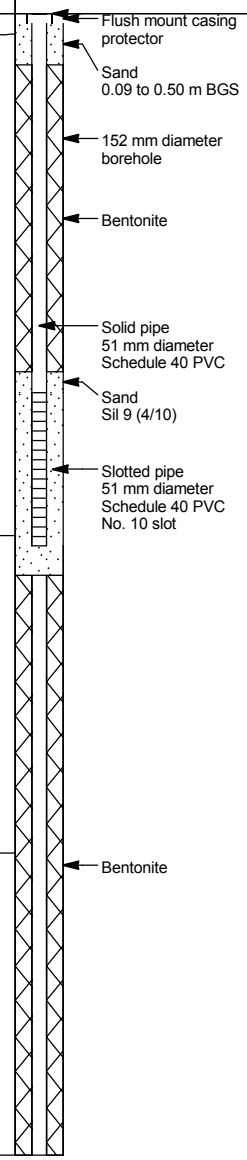
# Monitoring Well: DC-15

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 11-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -33226.452 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5656140.553 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | CLAY<br>Mottled brown<br>- from 0.2 to 2.5 m: minor silt, damp to moist, low to medium plastic | 0.20 |
| 5 | 2 | | - from 2.5 to 5.1 m: minor sand, some silt, moist, medium plastic | |
| 10 | 4 | | | |
| 15 | | | | |
| | 6 | | SILTY CLAY (TILL)<br>Minor sand, trace gravel, damp, some oxidation | 5.10 |
| 20 | | | | |
| 25 | 8 | | SILT<br>Brown, minor fine grained sand, trace gravel, some clay, moist | 8.20 |
| 30 | 10 | | | |
| 35 | | | | |
| | 12 | | End of Borehole | 11.15 |

INSTALLATION DETAILS




Screen Interval: 3.70 - 5.20 m BGS
Sand Pack Interval: 3.50 - 5.49 m BGS
Well Seal Interval: 5.49 - 11.15 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-17-5

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: DC-21D

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 11-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -32406.714 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5656750.577 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| 0 | 0 | | SILTY CLAY (TILL)<br>Brown, minor sand, moist, low plastic | 0.00 |
| 5 | 2 | | | |
| 10 | 4 | | - beginning @ 3.5 m: becomes sandy clay | |
| 15 | | | - from 4.8 to 4.9 m: rafted bedrock | |
| | | | SAND AND SILT<br>Light brown, medium grained, some gravel, moist | 5.10 |
| 20 | 6 | | SILTSTONE<br>Grey to greenish, some fractures, oxidation along fractures | 6.40 |
| 25 | 8 | | SANDSTONE<br>Grey to greenish, very fine grained, few fractures, oxidation on fratures surfaces | 7.90 |
| | | | CLAYSTONE<br>- from 8.5 to 8.63 m: brown, minor silt, moist, weathered to soft clay<br>- from 8.63 to 12.5 m: grey, oxidized fractures | 8.50 |
| 30 | 10 | | - @ 9.24 m: fracture intensity increases<br>- from 9.65 to 10.9 m: highly fractured, oxidation and some clay along fractures | |
| 35 | | | - from 10.36 to 10.63 m: altered to clay | |
| 40 | 12 | | - @ 12.10 m: becomes hard/cemented | |
| 45 | | | End of Borehole | 12.50 |

INSTALLATION DETAILS

Diagram

Description

- 0.774 m Stick-up
- Sand
  0 to 0.30 m BGS
- 254 mm diameter
  borehole
  from 0 to 6.40 m
- Solid pipe
  51 mm diameter
  Schedule 40 PVC
- Bentonite
- 102 mm diameter
  borehole
  from 6.40 to 12.50 m
- Sand
  Sil 9 (4/10)
- Slotted pipe
  51 mm diameter
  Schedule 40 PVC
  No. 10 slot

Screen Interval: 9.08 - 10.60 m BGS
Sand Pack Interval: 8.78 - 12.50 m BGS
Well Seal Interval: 0.30 - 8.78 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-18-10

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: DC-21S

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 11-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -32406.586 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5656749.506 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) | Diagram | Description |
|---|---|---|---|---|---|---|
| | | | Ground Surface | | | 0.816 m Stick-up |
| 0 | 0 | | SILTY CLAY (TILL)<br>Brown, minor sand, moist, low plastic | 0.00 | | Sand<br>0 to 0.30 m BGS |
| | 1 | | | | | 152 mm diameter borehole |
| 5 | | | | | | Bentonite |
| | 2 | | | | | |
| | 3 | | | | | Solid pipe<br>51 mm diameter<br>Schedule 40 PVC |
| 10 | | | SANDY CLAY | 3.50 | | Sand<br>Sil 9 (4/10) |
| | 4 | | | | | |
| 15 | | | - from 4.8 to 4.9 m: rafted bedrock | | | Slotted pipe<br>51 mm diameter<br>Schedule 40 PVC<br>No. 10 slot |
| | 5 | | SAND AND SILT<br>Light brown, medium grained, some gravel, moist | 5.10 | | |
| | 6 | | | | | Bentonite |
| 20 | | | End of Borehole | 6.10 | | |

Screen Interval: 3.97 - 5.49 m BGS
Sand Pack Interval: 3.50 - 5.64 m BGS
Well Seal Interval: 5.64 - 6.10 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-18-6

Stantec

Drawn By/Checked By: M. Kuhl / D. King

Sheet 1 of 1

STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: DC-25D

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 08-Jun-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -31684.489 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5657263.177 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| 5 | 2 | | SILTY CLAY (TILL)<br>Light to medium brown, some very fine grained sand, some gravel, few lenses of oxidized silt, moist, low plastic | 0.61 |
| 10 | 4 | | - @ 3.66 m: gravel content increases to 15-30% | |
| 20 | 6 | | SANDY SILT<br>Medium brown, very fine grained, wet | 6.40 |
| 25 | 8 | | | |
| 30 | 10 | | | |
| 35 | | | SANDSTONE<br>Light to medium brown, very fine to fine grained, few fractures, reddish orange oxidation | 10.36 |
| 40 | 12 | | - @ 12.50 m: becomes grey, few thin black stringers and minor cross-bedding | |
| 45 | 14 | | CLAYSTONE<br>Medium to dark grey, highly fractured, few 150 to 300 mm thick intervals of clay alteration in zones of intense fracturing | 13.11 |
| 50 | 16 | | - @ 15.54 m: 300 mm thick interval of green to greyish siltstone, minor bioturbation, few shell fragments | |
| 55 | | | - @ 16.76 m: 150 mm thick seam of anthracite present | |
| 60 | 18 | | SANDSTONE<br>Green to greyish, very fine to fine grained, planar bedding, few fractures, no oxidation | 17.07 |
| 65 | 20 | | CLAYSTONE<br>Medium grey to dark grey, highly fractured, clay alteration along fractures, friable | 18.59 |
| 70 | 22 | | - @ 21.64 m: becomes hard and cohesive, few fractures | |
| 75 | | | End of Borehole | 23.16 |
| 80 | 24 | | | |

INSTALLATION DETAILS

| Diagram | Description |
|---|---|
| | 0.913 m Stick-up |
| | Sand<br>0 to 0.61 m BGS |
| | 254 mm diameter borehole from 0 to 10.36 m BGS |
| | Groundwater<br>6.57 m BGS<br>June 08, 2016 |
| | Bentonite seal |
| | 102 mm diameter borehole from 10.36 to 23.16 m |
| | Solid pipe<br>51 mm diameter<br>Schedule 40 PVC |
| | Sand<br>Sil 9 (4/10) |
| | Slotted pipe<br>51 mm diameter<br>Schedule 40 PVC<br>No. 10 slot |
| | Bentonite |

Screen Interval: 17.07 - 18.59 m BGS
Sand Pack Interval: 16.76 - 18.67 m BGS
Well Seal Interval: 0.61 - 16.76 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-19-19

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: DC-25S

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger |
| **Client:** | Alberta Transportation | **Date started/completed:** | 09-Jun-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -31684.576 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5657262.245 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| 0 | 0 | | TOPSOIL | 0.00 |
| | | | SILTY CLAY (TILL)<br>Light to medium brown, some very fine grained sand, some gravel, few lenses of oxidized silt, moist, low plastic | 0.61 |
| 5 | 2 | | | |
| 10 | 4 | | | |
| 15 | | | | |
| 20 | 6 | | SANDY SILT<br>Medium brown, very fine grained, wet | 6.40 |
| 25 | 8 | | End of Borehole | 7.62 |

Diagram / Description:
- 0.925 m Stick-up
- Sand, 0 to 0.30 m BGS
- 152 mm diameter borehole
- Bentonite
- Solid pipe, 51 mm diameter, Schedule 40 PVC
- Sand, Sil 9 (4/10)
- Slotted pipe, 51 mm diameter, Schedule 40 PVC, No. 10 slot

Screen Interval: 6.10 - 7.62 m BGS
Sand Pack Interval: 5.79 - 7.62 m BGS
Well Seal Interval: 0.30 - 5.79 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-19-8

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW1

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 19-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -33327.478 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5659967.274 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) | Diagram | Description |
|---|---|---|---|---|---|---|
| 0 | 0 | | Ground Surface | | | 0.805 m Stick-up |
| | | | SAND AND GRAVEL<br>Fine to coarse grained | 0.00 | | |
| | | | SILT<br>Medium brown, with clay, moist, high plastic | 0.30 | | Sand<br>0 to 1.83 m BGS |
| 5 | 2 | | CLAY<br>Medium brown, trace silt, moist, high plastic, few intermittent <150 mm thick silt lenses | 1.52 | | |
| 10 | 4 | | | | | Groundwater<br>3.70 m BGS<br>May 19, 2016 |
| 15 | | | SILTY CLAY (TILL)<br>Medium brown, with very fine to medium grained sand, some gravel, moist | 4.88 | | 254 mm diameter<br>borehole<br>from 0 to 10.06 m |
| 20 | 6 | | | | | Bentonite |
| 25 | 8 | | | | | |
| 30 | 10 | | CLAY (TILL)<br>Dark brown to dark grey, with gravel, some silt, low plastic | 8.53 | | Solid pipe<br>51 mm diameter<br>Schedule 40 PVC |
| 35 | | | SILTSTONE<br>Grey to greenish grey, few fractures | 10.06 | | 102 mm diameter<br>borehole<br>from 10.06 to 16.76 m |
| 40 | 12 | | | | | Sand<br>Sil 9 (4/10) |
| 45 | 14 | | SANDSTONE<br>Medium grey, fine grained, moderate fracturing, minor oxidation and clay mineralization along fractures<br><br>- @ 13.11 m: sand becomes interbedded with alternating grey and brown fine grained layers | 12.19 | | Slotted pipe<br>51 mm diameter<br>Schedule 40 PVC<br>No. 10 slot |
| 50 | 16 | | | | | |
| 55 | | | End of Borehole | 16.76 | | |

Screen Interval: 12.19 - 15.24 m BGS
Sand Pack Interval: 11.58 - 16.76 m BGS
Well Seal Interval: 1.83 - 11.58 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-1-15

Stantec

Drawn By/Checked By: M. Kuhl / D. King



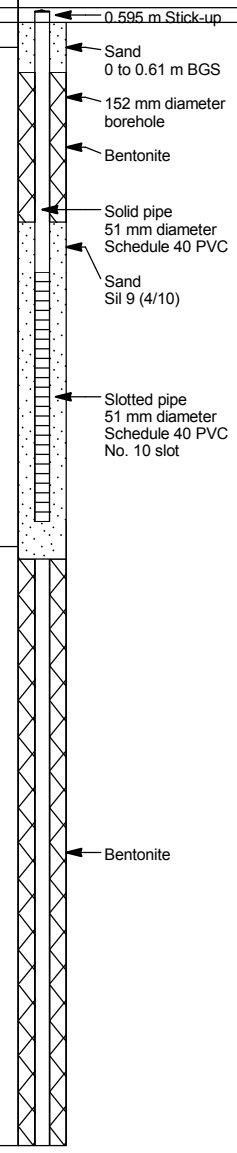
STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW2

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 26-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -31947.274 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5659623.886 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | Ground Surface | |
| | | | SOIL<br>Black to dark brown, moist | 0.00 |
| | | | CLAY<br>Brown to beige, some silt, moist, high plastic | 0.30 |
| 5 | 2 | | - @ 2.13 m: becomes mottled beige and grey, silt content increases to 15-30% | |
| 10 | 4 | | - @ 3.66 m: trace gravel and coal present | |
| 15 | | | | |
| 20 | 6 | | | |
| | | | SILT (TILL)<br>Light brown, some fine grained sand stringers, with gravel and clay, moist, low plastic | 6.40 |
| 25 | 8 | | | |
| 30 | | | | |
| 35 | 10 | | - @ 10.67 m: grades to gravelly silt | |
| 40 | 12 | | | |
| 45 | 14 | | End of Borehole | 13.72 |




Screen Interval: 3.05 - 6.10 m BGS
Sand Pack Interval: 2.44 - 6.55 m BGS
Well Seal Interval: 6.55 - 13.72 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-2-6

Stantec

Drawn By/Checked By: M. Kuhl / D. King



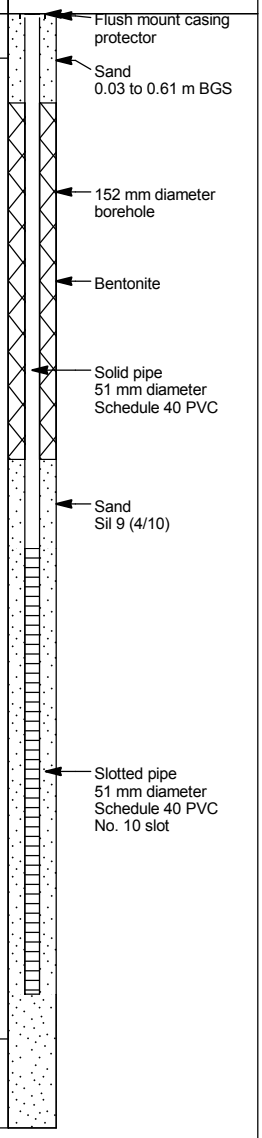
STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW3

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Truck mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 29-Jul-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -31904.435 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5659073.461 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | SAND AND GRAVEL (FILL) | 0.00 |
| | | | CLAY AND SILT<br>Medium brown, moist, medium plastic | 0.30 |
| 5 | 2 | | - @ 1.83 m: silt content decreases to 30-40%, high plastic | |
| 10 | 4 | | | |
| 15 | | | - from 5.18 to 6.10 m: layer of silt with clay, wet | |
| 20 | 6 | | | |
| | | | SILTY CLAY (TILL)<br>Medium brown, some very fine grained sand, with gravel, dry to moist, low to medium plastic | 7.01 |
| 25 | 8 | | End of Borehole | 7.62 |




Screen Interval: 3.66 - 6.71 m BGS
Sand Pack Interval: 3.05 - 7.62 m BGS
Well Seal Interval: 0.61 - 3.05 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-3-7

Stantec

Drawn By/Checked By: M. Kuhl / D. King



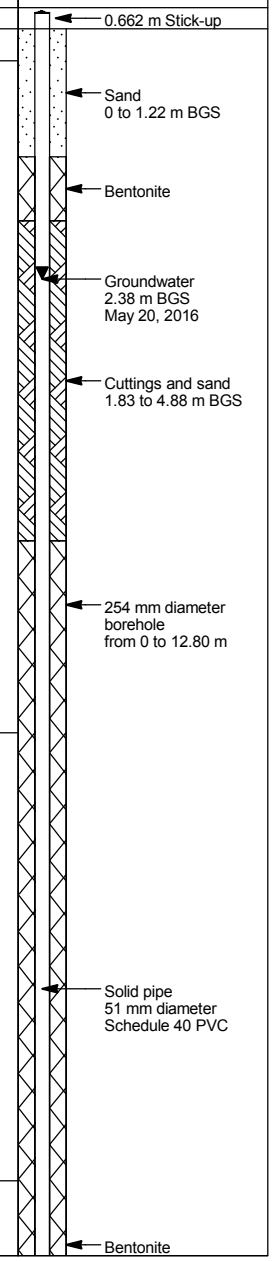
STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW4

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 20-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -32259.324 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5658717.399 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| 0 | 0 | | TOPSOIL | 0.00 |
| | | | CLAY<br>Light to medium brown, with silt, moist, high plastic | 0.30 |
| 5 | 2 | | | |
| 10 | 4 | | | |
| 15 | | | | |
| 20 | 6 | | | |
| | | | SILTY CLAY (TILL)<br>Medium brown, some very fine to fine sand, with gravel, moist, high plastic | 6.71 |
| 25 | 8 | | - @ 8.23 m: trace coal present | |
| 30 | 10 | | - @ 9.45 m: sand component increases to 15-30% very fine to fine sand | |
| 35 | | | SILT AND CLAY (TILL)<br>With very fine to fine sand, with gravel, dry to slighly moist, friable | 10.97 |




Screen Interval: 18.59 - 21.64 m BGS
Sand Pack Interval: 18.29 - 21.95 m BGS
Well Seal Interval: 21.95 - 22.86 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-4-22

Stantec

Drawn By/Checked By: M. Kuhl / D. King



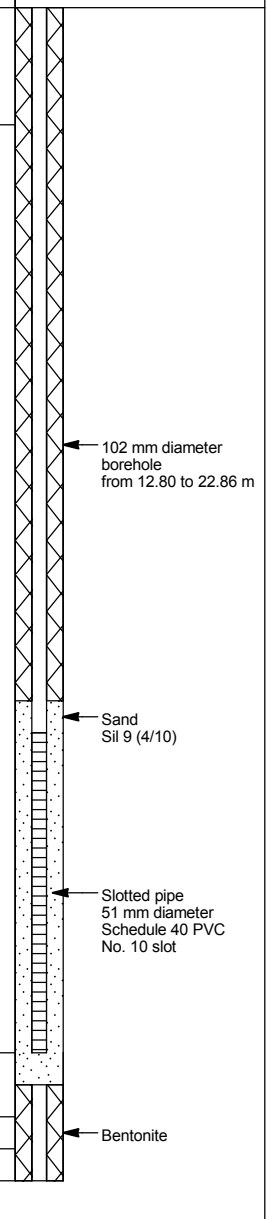
STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW4

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 20-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -32259.324 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5658717.399 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | SILT AND CLAY (TILL)<br>With very fine to fine sand, with gravel, dry to slighly moist, friable | |
| 40 | 12 | | | |
| | | | SANDSTONE<br>Medium grey, very fine to fine grained, few fractures, some oxidation on fracture surfaces, no structure, massive | 12.80 |
| 45 | 14 | | | |
| | | | - @ 14.94 m: sandstone becomes slightly banded with alternating light grey and dark grey layers, no oxidation present | |
| 50 | | | | |
| | 16 | | | |
| 55 | | | | |
| | | | - @ 17.98 m: medium grained layers interbedded with finer grained layers become present | |
| 60 | 18 | | | |
| | | | - @ 20.12 m: sand begins to coarsen to medium grained sandstone, some clay along fractures | |
| 65 | 20 | | | |
| 70 | | | | |
| | | | SILTSTONE<br>Dark grey, highly fractured and altered<br>- @ 21.95 m: clay mineralization along fractures | 21.64 |
| | 22 | | SANDSTONE<br>Medium grey, very fine grained | 22.25 |
| 75 | | | CLAYSTONE<br>Dark grey to black, few fractures | 22.56 |
| | | | End of Borehole | 22.86 |




Screen Interval: 18.59 - 21.64 m BGS
Sand Pack Interval: 18.29 - 21.95 m BGS
Well Seal Interval: 21.95 - 22.86 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-4-22

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

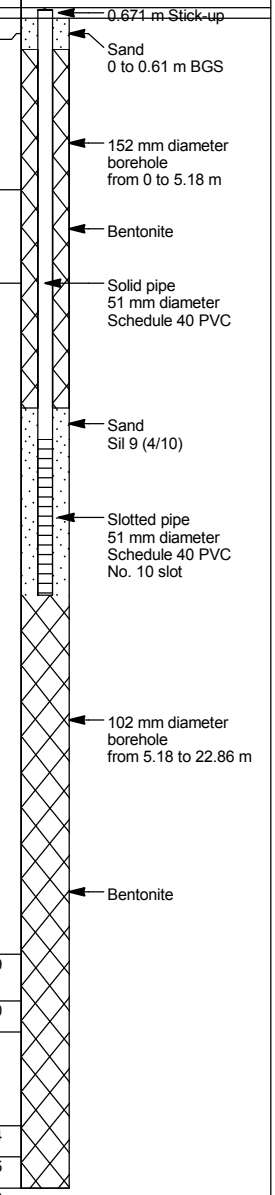
# Monitoring Well: GW5

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 09-Jun-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -31863.152 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5658164.716 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | SILTY CLAY (TILL)<br>Medium brown, some very fine grained sand, with gravel, moist, low plastic | 0.30 |
| 5 | 2 | | | |
| 10 | 4 | | CLAY<br>Mottled brown and grey, some gravel, some silt, moist, high plastic | 3.35 |
| 15 | | | | |
| 20 | 6 | | SANDSTONE<br>brown, very fine to fine grained, few fractures with minor oxidation, massive<br>- @ 5.49 : oxidized clay infill in 50 mm fracture | 5.18 |
| 25 | 8 | | - @ 7.01 m: becomes silty, finer grained, with dark and light brown cross-bedding<br>- @ 8.23 m: 50 mm coal seam, sandstone becomes massive again, few irregular coal stringers | |
| 30 | | | - @ 8.84 m: coarsens to a fine grained sandstone, very few fractures, weakly bedded | |
| 35 | 10 | | | |
| 40 | 12 | | | |
| 45 | 14 | | | |
| 50 | | | - @ 15.24 m: exhibits black and brown fine planar laminated beds, becomes very fine grained | |
| 55 | 16 | | - @ 16.15 m: beds become irregular and highly deformed, exhibits minor displacement along fractures, microfolds in some bedding | |
| 60 | 18 | | CLAYSTONE<br>Dark grey, highly fractured, altered to clay along fractures, brittle<br>- from 18.90 to 19.20 m: few 13 to 38 mm thick coal seams | 18.29 |
| | | | SANDSTONE<br>Grey, fine grained, becomes finer towards bottom of unit, weakly bedded | 19.20<br>19.81 |
| 65 | 20 | | CLAYSTONE<br>Dark grey, highly fractured, altered to clay along fractures, brittle | |
| 70 | 22 | | SANDSTONE<br>Green to greyish green, very fine grained, some shell fragments | 21.64 |
| | | | CLAYSTONE<br>Dark grey, highly fractured, altered to clay along fractures, brittle | 22.25 |
| 75 | 24 | | End of Borehole | 22.86 |

INSTALLATION DETAILS




Screen Interval: 8.23 - 11.28 m BGS
Sand Pack Interval: 7.62 - 11.28 m BGS
Well Seal Interval: 0.61 - 7.62 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-5-11

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW6D

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Truck mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 26-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -31100.423 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5658133.938 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | SILT<br>Light brown, some clay, moist to wet<br>- @ 1.22 m: clay content begins to increase | 0.30 |
| 5 | 2 | | | |
| | | | SILTY CLAY<br>Light brown to light grey, medium to high plastic, mottled | 2.44 |
| 10 | 4 | | | |
| 15 | | | - @ 4.88 m: clay content decreases to 15-30%, high plastic | |
| 20 | 6 | | | |
| 25 | 8 | | SILTY CLAY (TILL)<br>Medium brown, with very fine grained sand, some gravel, moist, medium plastic | 7.92 |
| 30 | 10 | | - @ 9.14 m: silt content increases to > 40% | |
| 35 | | | CLAYSTONE<br>- fom 10.36 to 18.90 m: light to medium grey, dry, medium to high plastic when wetted, some small intervals of soft clay fracture gouge throughout | 10.36 |
| 40 | 12 | | | |
| 45 | 14 | | | |
| 50 | | | | |
| | 16 | | | |
| 55 | | | | |
| 60 | 18 | | - from 18.90 to 20.42 m: black to dark grey, dry | |
| 65 | 20 | | | |
| | | | SILTSTONE<br>Light grey, weathered to silt | 20.42 |
| 70 | | | CLAYSTONE<br>Dark grey, dry | 21.34 |
| | 22 | | | |
| 75 | | | End of Borehole | 22.86 |
| | 24 | | | |

INSTALLATION DETAILS

Diagram

Description

- Flush mount casing protector
- Sand 0.03 to 0.61 m BGS
- 152 mm diameter borehole
- Bentonite seal
- Solid pipe 51 mm diameter Schedule 40 PVC
- Sand Sil 9 (4/10)
- Slotted pipe 51 mm diameter Schedule 40 PVC No. 10 slot

Screen Interval: 18.90 - 21.95 m BGS
Sand Pack Interval: 18.29 - 22.86 m BGS
Well Seal Interval: 0.61 - 18.29 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-6-20

Stantec

Drawn By/Checked By: M. Kuhl / D. King



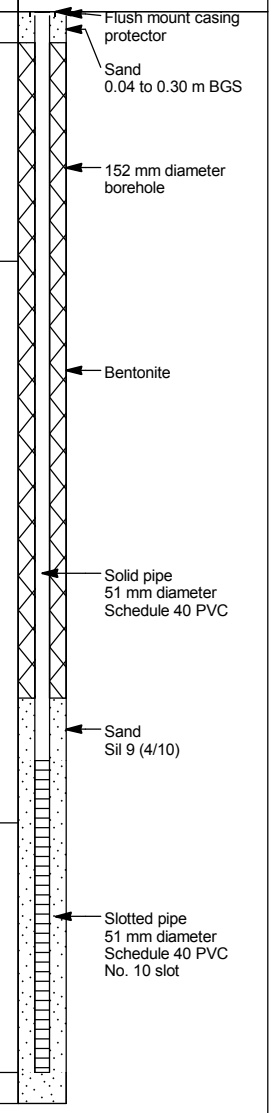
STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW6S

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Truck mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 26-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -31100.486 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5658135.293 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | SILT<br>Light brown, some clay, moist to wet | 0.30 |
| 5 | 2 | | - @ 1.22 m: clay content begins to increase | |
| | | | SILTY CLAY<br>Light brown to light grey, medium to high plastic, mottled | 2.44 |
| 10 | 4 | | | |
| 15 | | | - @ 4.88 m: clay content decreases to 15-30%, high plastic | |
| 20 | 6 | | | |
| 25 | | | | |
| | 8 | | SILTY CLAY (TILL)<br>Medium brown, with very fine grained sand, some gravel, moist, medium plastic | 7.92 |
| 30 | | | - @ 9.14 m: silt content increases to > 40% | |
| | 10 | | | |
| 35 | | | CLAYSTONE<br>Light to medium grey, dry, medium to high plastic when wetted | 10.36 |
| | 12 | | End of Borehole | 10.67 |




Screen Interval: 7.32 - 10.36 m BGS
Sand Pack Interval: 6.71 - 10.67 m BGS
Well Seal Interval: 0.30 - 6.71 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-6-11

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW7

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Truck mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 28-Jul-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -31098.792 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5658895.242 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | SILTY CLAY<br>Light to medium brown, moist, medium plastic | 0.30 |
| 5 | 2 | | | |
| 10 | 4 | | | |
| 15 | | | - from 4.57 to 5.18 m: trace fine grained sand, some gravel | |
| 20 | 6 | | | |
| | | | SILTY CLAY (TILL)<br>With very fine to fine grained sand (oxidized), with gravel, dry to moist, low plastic | 6.71 |
| 25 | 8 | | | |
| 30 | | | End of Borehole | 9.14 |
| | 10 | | | |

Diagram / Description:
- Flush mount casing protector
- Sand 0.05 to 0.61 m BGS
- 152 mm diameter borehole
- Bentonite
- Solid pipe 51 mm diameter Schedule 40 PVC
- Sand Sil 9 (4/10)
- Slotted pipe 51 mm diameter Schedule 40 PVC No. 10 slot
- Bentonite

Screen Interval: 2.13 - 5.18 m BGS
Sand Pack Interval: 1.83 - 5.19 m BGS
Well Seal Interval: 0.61 - 1.83 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-7-5

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW8D

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted)/ Coring |
| **Client:** | Alberta Transportation | **Date started/completed:** | 25-May-2016 / 26-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -30877.454 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5659641.18 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) | Diagram | Description |
|---|---|---|---|---|---|---|
| 0 | 0 | | Ground Surface | | | 0.529 m Stick-up |
| | | | SOIL<br>Black, dry | 0.00<br>0.30 | | Sand<br>0 to 0.61 m BGS |
| | | | SILT (TILL)<br>Brown to light brown, some gravel, with clay, dry, low plastic, friable | | | |
| 5 | 2 | | | | | 254 mm diameter borehole from 0 to 8.53 m |
| | | | - @ 2.44 m: some very fine grained sand seams become present | | | |
| 10 | | | | | | |
| | | | - @ 3.35 m: becomes moist | | | |
| | 4 | | | | | |
| 15 | | | | | | Groundwater<br>4.81 m BGS<br>May 25/26, 2016 |
| | | | - @ 5.79 m: red to orange, trace oxidized silt stringers | | | |
| 20 | 6 | | | | | Sand<br>Sil 9 (4/10) |
| | | | SILT AND SAND<br>Brown, very fine grained, saturated | 6.71<br>7.01 | | |
| 25 | 8 | | SILTY CLAY (TILL)<br>Light to medium brown, with gravel, dry, low plastic | | | |
| | | | SILTSTONE<br>Light brown to beige, dry, friable | 8.53 | | Bentonite |
| 30 | | | | | | |
| | 10 | | CLAYSTONE<br>Light to medium grey, few fructures | 9.45 | | |
| 35 | | | - @ 10.36 m: becomes highly weathered, with abundant fractures, orangish brown clay mineralization along fracture surfaces | | | Solid pipe<br>51 mm diameter<br>Schedule 40 PVC |
| | | | SILTSTONE<br>Grey to dark grey, finely interbedded light and dark layers, unfractured | 11.28 | | |
| 40 | 12 | | | | | |
| 45 | 14 | | - @ 14.02 m: thin very fine to fine grained sand layers become present | | | 102 mm diameter borehole from 8.53 to 20.42 m |
| 50 | | | | | | |
| | 16 | | | | | |
| 55 | | | SANDSTONE<br>Medium brown, fine grained, few fractures, minor oxidation and mineralization along fractures | 16.76 | | Slotted pipe<br>51 mm diameter<br>Schedule 40 PVC<br>No. 10 slot |
| 60 | 18 | | CLAY<br>Black, high plastic | 18.29<br>18.59 | | |
| | | | SILTSTONE<br>Grey to greenish grey, dry, friable, clay alteration along fracture surfaces | | | Bentonite |
| 65 | 20 | | | | | |
| | | | End of Borehole | 20.42 | | |
| 70 | | | | | | |

Screen Interval: 16.46 - 18.59 m BGS
Sand Pack Interval: 16.46 - 18.59 m BGS
Well Seal Interval: 0.61 - 16.46 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-8-19

Stantec

Drawn By/Checked By: M. Kuhl / D. King



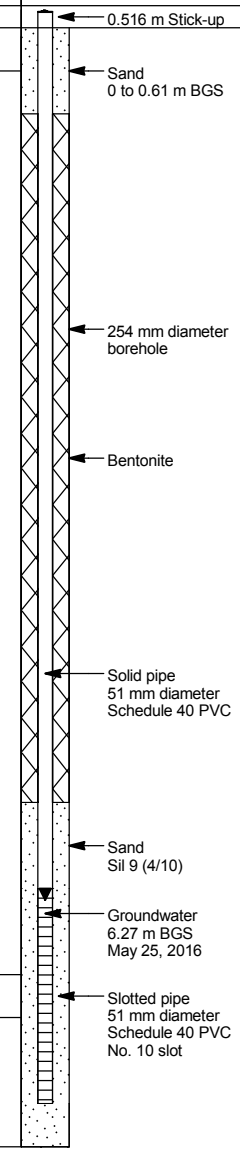
STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW8S

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Hollow-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 25-May-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -30875.717 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5659641.119 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| 0 | 0 | | SOIL<br>Black, dry | 0.00 |
| | | | SILT (TILL)<br>Brown to light brown, some gravel, with clay, dry, low plastic, friable | 0.30 |
| 5 | 2 | | - @ 2.44 m: some very fine grained sand seams become present | |
| 10 | 4 | | - @ 3.35 m: becomes moist | |
| 15 | 6 | | - @ 5.79 m: red to orange, trace oxidized silt stringers | |
| 20 | | | SILT AND SAND<br>Brown, very fine grained, saturated | 6.71 |
| | | | SILTY CLAY (TILL)<br>Light to medium brown, with gravel, dry, low plastic | 7.01 |
| 25 | 8 | | End of Borehole | 7.92 |




Screen Interval: 6.10 - 7.62 m BGS
Sand Pack Interval: 5.49 - 7.92 m BGS
Well Seal Interval: 0.61 - 5.49 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-8-8

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

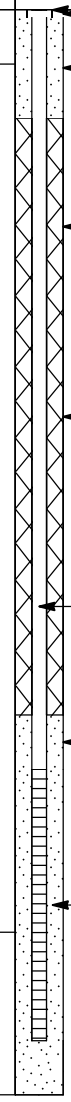
# Monitoring Well: GW9

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Truck mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 02-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -30236.405 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5659076.781 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | CLAY<br>Light to medium brown, with silt, moist, high plastic, mottled | 0.30 |
| | 1 | | | |
| 5 | | | | |
| | 2 | | | |
| | | | | |
| | 3 | | | |
| 10 | | | | |
| | | | - below 3.66 m: some seams of very fine grained sand (oxidized) | |
| | 4 | | | |
| 15 | | | - from 4.57 to 5.18 m: silt content increases to > 40% | |
| | 5 | | | |
| | | | SILTY CLAY (TILL)<br>with very fine to fine grained sand, with gravel | 5.18 |
| | 6 | | | |
| 20 | | | End of Borehole | 6.10 |

Diagram



Description

- Flush mount casing protector
- Sand 0.04 to 0.61 m BGS
- 152 mm diameter borehole
- Bentonite
- Solid pipe 51 mm diameter Schedule 40 PVC
- Sand Sil 9 (4/10)
- Slotted pipe 51 mm diameter Schedule 40 PVC No. 10 slot

Screen Interval: 4.27 - 5.79 m BGS
Sand Pack Interval: 3.96 - 6.10 m BGS
Well Seal Interval: 0.61 - 3.96 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-9-6

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

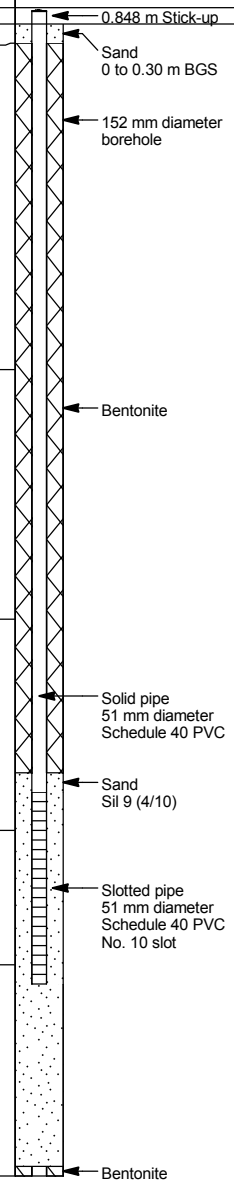
# Monitoring Well: GW10

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 10-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -30461.405 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5658478.167 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | SILTY CLAY<br>Light to medium brown, moist, medium to high plastic, mottled | 0.30 |
| 5 | 2 | | | |
| 10 | 4 | | - below 3.66 m: some very fine grained sand, some gravel | |
| 15 | | | | |
| | | | CLAYEY SILT<br>Light grey to medium brown, moist, high plastic, mottled | 5.49 |
| 20 | 6 | | | |
| 25 | 8 | | | |
| 30 | | | | |
| | 10 | | CLAY (TILL)<br>Medium brown, some very fine grained sand, some gravel, with silt, dry to moist, medium plastic | 9.45 |
| 35 | | | - @ 10.97 m: gravel content increases to 15-30% | |
| 40 | 12 | | | |
| | | | CLAYEY SILT (TILL)<br>Medium to dark grey, with very fine grained sand, some gravel, dry, low plastic | 12.80 |
| 45 | 14 | | | |
| 50 | | | SILTSTONE<br>Light to medium grey, dry | 14.94 |
| | 16 | | | |
| 55 | | | | |
| 60 | 18 | | End of Borehole | 18.29 |

INSTALLATION DETAILS




Screen Interval: 12.19 - 15.24 m BGS
Sand Pack Interval: 11.89 - 18.14 m BGS
Well Seal Interval: 18.14 - 18.29 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-10-15

Stantec

Drawn By/Checked By: M. Kuhl / D. King



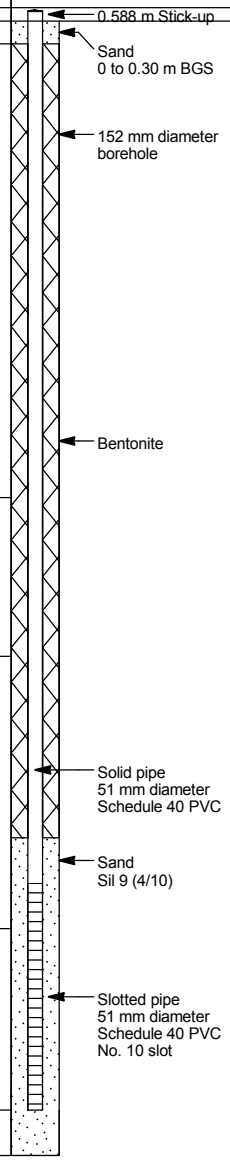
STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW11

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 30-Jun-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -30269.84 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5657742.889 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| 0 | 0 | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | CLAY<br>Light to medium brown, with silt, moist, high plastic, mottled | 0.30 |
| 5 | 2 | | - @ 2.13 m: silt content increases to 30-40%, mottled brown and grey | |
| 10 | 4 | | - @ 2.74 m: silt content decreases back to 15-30% | |
| 15 | | | | |
| 20 | 6 | | - @ 5.79 m: clay content begins to decrease towards bottom of interval | |
| | | | SILT<br>Medium brown, some clay, moist | 6.40 |
| 25 | 8 | | | |
| | | | SILT (TILL)<br>Medium brown, with fine to medium grained sand, with gravel, some clay, moist | 8.53 |
| 30 | 10 | | | |
| 35 | | | | |
| 40 | 12 | | SILT<br>Medium brown, some very fine grained sand, moist to wet | 12.19 |
| 45 | 14 | | | |
| | | | CLAY (TILL)<br>Medium to dark grey, some very fine grained sand, some gravel, with silt, low plastic | 14.63 |
| 50 | 16 | | End of Borehole | 15.24 |




Screen Interval: 11.58 - 14.63 m BGS
Sand Pack Interval: 10.97 - 15.24 m BGS
Well Seal Interval: 0.30 - 10.97 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-11-15

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

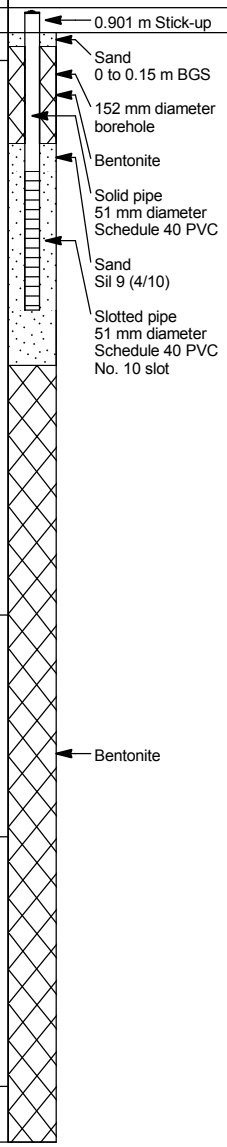
# Monitoring Well: GW12

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 19-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -29160.284 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5657858.348 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| 0 | 0 | | TOPSOIL | 0.00 |
| | | | CLAYEY SILT (TILL)<br>Medium brown, moist, high plastic | 0.30 |
| 5 | 2 | | - @ 1.83 m: sand content increases to 30-40%, fine to medium grained sand, some gravel | |
| 10 | 4 | | - @ 2.74 m: sand content decreases to 15-30% | |
| 15 | | | | |
| 20 | 6 | | SANDY SILT (TILL)<br>Medium brown, some gravel, with clay, dry to moist, crumbly | 6.40 |
| 25 | 8 | | | |
| 30 | 10 | | SANDY CLAY (TILL)<br>Medium to dark grey, some silt, dry to moist | 8.84 |
| 35 | | | | |
| 40 | 12 | | CLAYSTONE<br>Light grey to brown, dry | 11.58 |
| | | | End of Borehole | 12.19 |

INSTALLATION DETAILS




Screen Interval: 1.52 - 3.05 m BGS
Sand Pack Interval: 1.22 - 3.66 m BGS
Well Seal Interval: 0.15 - 1.22 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-12-3

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW13

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Air rotary auger (Truck mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 08-Aug-2016 / 09-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | n/a |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | n/a |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | GRAVEL (FILL) | 0.00 |
| 5 | 2 | | CLAYEY SILT (TILL)<br>Mottled light and medium brown, some very fine grained sand (slightly oxidized), dry to moist, medium plastic | 0.30 |
| | | | - @ 2.13 m: some gravel | |
| 10 | 4 | | - @ 3.66 m: sand content increases to 15-30% | |
| 15 | | | | |
| 20 | 6 | | | |
| 25 | 8 | | SANDSTONE<br>Very fine to fine grained, dry | 7.62 |
| 30 | | | - from 9.14 to 9.75 m: saturated | |
| | 10 | | CLAYSTONE<br>Medium brown, dry | 9.75 |
| 35 | | | - below 10.36 m: few moist zones weathered to clay | |
| 40 | 12 | | SILTSTONE<br>Light grey, dry, friable | 11.28 |
| 45 | 14 | | - @ 12.80 m: saturated | |
| 50 | | | | |
| 55 | 16 | | | |
| 60 | 18 | | CLAYSTONE<br>Medium grey to brown, some zones weathered to clay, other zones dry, friable | 17.37 |
| 65 | 20 | | - below 20.12 m: dry | |
| 70 | | | | |
| 75 | 22 | | | |
| 80 | 24 | | | |
| 85 | 26 | | SILTSTONE<br>Light to medium grey, in some zones fractured and weathered to silt | 24.99 |
| 90 | 28 | | | |
| 95 | | | | |
| 100 | 30 | | CLAYSTONE<br>Light to medium grey, dry, some fractured and weathered zones | 29.26 |
| 105 | 32 | | below 31.70 m: completely dry | |
| 110 | 34 | | | |
| 115 | | | SILTSTONE<br>Light grey, saturated | 34.75 |
| 120 | 36 | | CLAYSTONE<br>Light to medium grey | 35.97 |
| 125 | 38 | | End of Borehole | 36.58 |

INSTALLATION DETAILS

| Diagram | Description |
|---|---|
| | Flush mount casing protector |
| | Sand<br>0 to 0.30 m BGS |
| | 108 mm diameter borehole |
| | Bentonite grout |
| | Solid pipe<br>51 mm diameter<br>Schedule 40 PVC |
| | Sand<br>Sil 9 (4/10) |
| | Slotted pipe<br>51 mm diameter<br>Schedule 40 PVC<br>No. 10 slot |

Screen Interval: 33.53 - 36.58 m BGS
Sand Pack Interval: 32.92 - 36.58 m BGS
Well Seal Interval: 0.30 - 32.92 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW14

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Air rotary auger (Truck mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 09-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -28592.189 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5659018.428 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | GRAVEL | 0.00 |
| 5 | 2 | | CLAYEY SILT (TILL)<br>Brown, some very fine grained sand, moist, medium plastic | 0.30 |
| 10 | | | | |
| | 4 | | SANDSTONE<br>Light to medium brown, very fine grained sand, dry | 3.66 |
| 15 | | | | 4.27 |
| 20 | 6 | | CLAYSTONE<br>Medium grey, dry | |
| 25 | 8 | | | |
| 30 | | | SANDSTONE<br>Light to medium brown, very fine to fine grained | 8.53 |
| 35 | 10 | | | |
| 40 | 12 | | | |
| 45 | 14 | | SILTSTONE<br>Light grey, dry | 13.11 |
| 50 | | | | |
| 55 | 16 | | | |
| 60 | 18 | | | |
| 65 | 20 | | CLAYSTONE<br>Medium grey to brown, dry | 19.51 |
| 70 | | | | |
| 75 | 22 | | | |
| 80 | 24 | | SILTSTONE<br>Medium brown, saturated | 24.38 |
| 85 | 26 | | | |
| 90 | | | | |
| 95 | 28 | | | |
| 100 | 30 | | CLAYSTONE<br>Light to medium grey | 29.57 |
| 105 | 32 | | SILTSTONE<br>Light to medium grey, saturated | 31.09 |
| 110 | 34 | | CLAYSTONE<br>Light to medium grey | 33.22 |
| 115 | 36 | | End of Borehole | 33.53 |

Diagram / Description:
- Flush mount casing protector
- Sand 0.02 to 0.61 m BGS
- 108 mm diameter borehole
- Bentonite grout
- Solid pipe 51 mm diameter Schedule 40 PVC
- Sand Sil 9 (4/10)
- Slotted pipe 51 mm diameter Schedule 40 PVC No. 10 slot

Screen Interval: 30.48 - 33.53 m BGS
Sand Pack Interval: 29.87 - 33.53 m BGS
Well Seal Interval: 0.61 - 29.87 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-14-33

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: GW15

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem/ air rotary auger (Truck mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 27-Jul-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -27818.819 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5658214.931 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| 5 | 2 | | SILTY CLAY (TILL)<br>Beige to light brown, moist, medium plastic<br>- @ 1.83 m: some very fine grained sand stringers, some gravel | 0.30 |
| 10 | 4 | | SILTSTONE<br>Light beige, dry | 3.81 |
| 15 | 6 | | SANDSTONE<br>Light brown, very fine grained, dry | 5.49 |
| 20 | 8 | | | |
| 25 | 10 | | SILTSTONE<br>Light beige, dry, few thin sandstone layers throughout | 9.45 |
| 30 | 12 | | CLAYSTONE<br>Medium grey, dry | 11.58 |
| 35 | 14 | | SANDSTONE<br>Light brown, very fine to fine grained, dry | 12.50 |
| 40 | 16 | | SILTSTONE<br>Light grey to light brown, dry<br>- from 15.85 to 17.07 m: few seams of fine grained sand (oxidized) | 14.63 |
| 45 | 18 | | | |
| 50 | 20 | | CLAYSTONE<br>Medium to dark grey, dry | 18.90 |
| 55 | 22 | | | |
| 60 | 24 | | | |
| 65 | 26 | | - below 26.82 m: some siltstone layers | |
| 70 | 28 | | | |
| 75 | 30 | | - @ 31.09 m: light grey | |
| 80 | 32 | | | |
| 85 | 34 | | SILTSTONE<br>Light to medium greenish grey<br>- 32.92 m: saturated | 32.92 |
| 90 | 36 | | End of Borehole | 35.05 |

| Diagram | Description |
|---|---|
| | Flush mount casing protector |
| | Sand<br>0.02 to 0.61 m BGS |
| | 152 mm diameter borehole<br>0 to 3.81 m BGS |
| | 108 mm diameter borehole<br>below 3.81 m BGS |
| | Bentonite seal |
| | Solid pipe<br>51 mm diameter<br>Schedule 40 PVC |
| | Sand<br>Sil 9 (4/10) |
| | Slotted pipe<br>51 mm diameter<br>Schedule 40 PVC |

Screen Interval: 32.92 - 34.44 m BGS
Sand Pack Interval: 32.61 - 35.05 m BGS
Well Seal Interval: 0.61 - 32.61 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-15-34

Stantec

Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

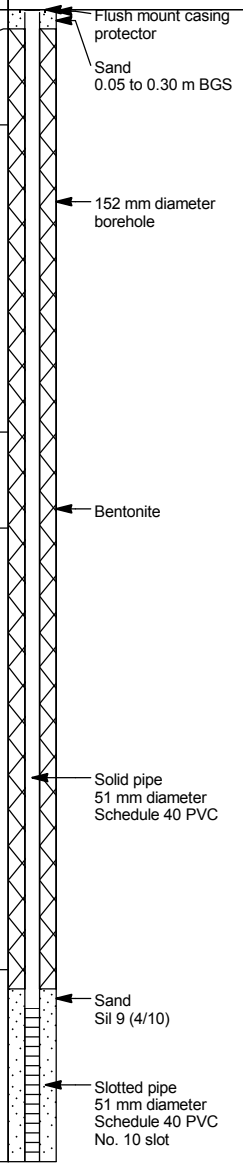
# Monitoring Well: H6

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 29-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -32702.727 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5659178.128 |

SUBSURFACE PROFILE

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | CLAY<br>Light to medium brown, with silt, moist, high plastic, mottled | 0.30 |
| 5 | 2 | | SILTY CLAY (TILL)<br>Medium brown, with very fine grained sand, some gravel, moist, medium plastic | 1.83 |
| 10 | 4 | | | |
| 15 | | | | |
| 20 | 6 | | | |
| | | | SAND AND SILT<br>Medium brown, very fine grained, moist<br>- @ 7.32 m: saturated | 6.71 |
| 25 | 8 | | | |
| | | | CLAY (TILL)<br>Dark grey, with very fine grained sand, with gravel, with silt, dry to moist, low to medium plastic | 8.23 |
| 30 | 10 | | | |
| 35 | | | | |
| 40 | 12 | | | |
| 45 | 14 | | | |
| 50 | | | CLAYSTONE<br>Grey, dry, crumbly | 15.24 |
| 55 | 16 | | | |
| | | | - from 17.37 to 17.98 m: fractured, saturated interval | |
| 60 | 18 | | End of Borehole | 18.29 |

INSTALLATION DETAILS




Screen Interval: 15.85 - 18.29 m BGS
Sand Pack Interval: 15.54 - 18.29 m BGS
Well Seal Interval: 0.30 - 15.54 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-26-18

Stantec

Drawn By/Checked By: M. Kuhl / D. King



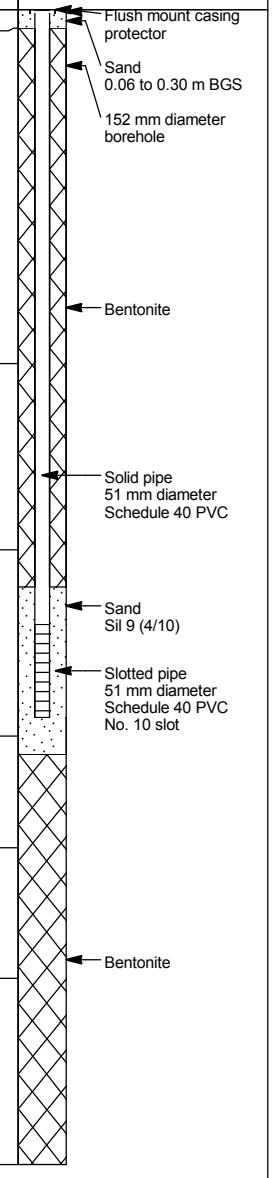
STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Monitoring Well: H9

| | | | |
|---|---|---|---|
| **Project:** | Springbank Off-Stream Reservoir Project (SR1) | **Drilling method:** | Solid-stem auger (Track mounted) |
| **Client:** | Alberta Transportation | **Date started/completed:** | 29-Aug-2016 |
| **Location:** | Rocky View County, Alberta | **Ground surface elevation:** | n/a |
| **Number:** | 110773396 | **Top of casing elevation:** | n/a |
| **Field investigator:** | D. Nisbet | **Easting:** | -32702.328 |
| **Contractor:** | All Service Drilling Inc. | **Northing:** | 5659766.161 |

SUBSURFACE PROFILE | INSTALLATION DETAILS

| Depth (ft) | Depth (m) | Graphic Log | Lithologic Description | Depth (m BGS) |
|---|---|---|---|---|
| | | | Ground Surface | |
| | | | TOPSOIL | 0.00 |
| | | | SILTY CLAY<br>Light to medium brown, moist, high plastic, mottled | 0.30 |
| 5 | 2 | | | |
| 10 | 4 | | - @ 2.74 m: silt content increases to > 40% | |
| 15 | | | | |
| 20 | 6 | | CLAY (TILL)<br>Some gravel, with silt, moist, high plastic | 5.79 |
| 25 | 8 | | | |
| 30 | | | SAND AND SILT<br>Medium brown, very fine grained, moist | 8.84 |
| | 10 | | - @ 10.36 m: saturated | |
| 35 | | | | |
| 40 | 12 | | SILT (TILL)<br>Medium brown, with very fine grained sand, with gravel, with clay, dry to moist, medium plastic | 11.89 |
| 45 | 14 | | CLAY (TILL)<br>Dark grey, with sand, with gravel, with silt, dry to moist, medium plastic | 13.72 |
| 50 | | | | |
| | 16 | | CLAYSTONE<br>Light grey, dry, some zones are highly fractured and saturated, crumbly | 15.85 |
| 55 | | | | |
| 60 | 18 | | | |
| | | | End of Borehole | 18.90 |
| 65 | 20 | | | |




Screen Interval: 10.06 - 11.58 m BGS
Sand Pack Interval: 9.45 - 12.19 m BGS
Well Seal Interval: 0.30 - 9.45 m BGS

Notes:
m AMSL - metres above mean sea level
m BGS - metres below ground surface
n/a - not available

mm - millimetres
Coordinate System - NAD 1983 3TM 114
Completed as Well MW16-27-9

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Drawn By/Checked By: M. Kuhl / D. King



STANTEC BOREHOLE AND WELL V2 110773396.GPJ STANTEC - DATA TEMPLATE.GDT 16/11/18 MKUHL

# Appendix E
Lab Testing

| Laboratory Test | Diversion Structure | Floodplain Berm | Diversion Channel | Dam | Highway | Borrow Source | Hydrogeology | TOTAL |
|---|---|---|---|---|---|---|---|---|
| **Atterberg Limits** | 7 | 4 | 117 | 170 | 20 | 37 | 35 | **390** |
| **Carbonate Content of Soils** | | | 3 | 7 | | | | **10** |
| **Crumb Test** | | | 2 | | | | | **2** |
| **Grain Size Analysis** | 10 | 4 | 110 | 159 | 19 | 37 | 35 | **374** |
| **Double Hydrometer** | | | 2 | | | | | **2** |
| **Standard Proctor** | 1 | | 16 | 1 | 4 | 10 | 1 | **33** |
| **Pinhole Test** | | | 2 | | | | | **2** |
| **Flexible Wall Hydraulic** | | | 13 | 17 | 2 | 3 | 1 | **36** |
| **Specific Gravity of Soil** | 5 | | 1 | | | | | **6** |
| **Swell Test** | | | 1 | | | | | **1** |
| **Consolidation Test** | | | 2 | 17 | | | | **19** |
| **Direct Shear Test** | | | 1 | 5 | | | | **6** |
| **Consolidated Undrained Triaxial** | | | 21 | 43 | 6 | 7 | 2 | **79** |
| **Unconsolidated Undrained Triaxial** | | | 5 | 6 | | | | **11** |
| **Slake Durability Index** | 9 | | 7 | | | | | **16** |
| **Unconfined Compressive (Rock)** | 2 | 1 | 3 | 19 | 3 | | | **28** |
| **Unconfined Compressive (Soils)** | | | 4 | 4 | 1 | | | **9** |

# E. 1
## Diversion Structure

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Date Received: | April 28, 2016 |
| Date Tested: | May 31, 2016 |
| Tested By: | C. Tollifson |


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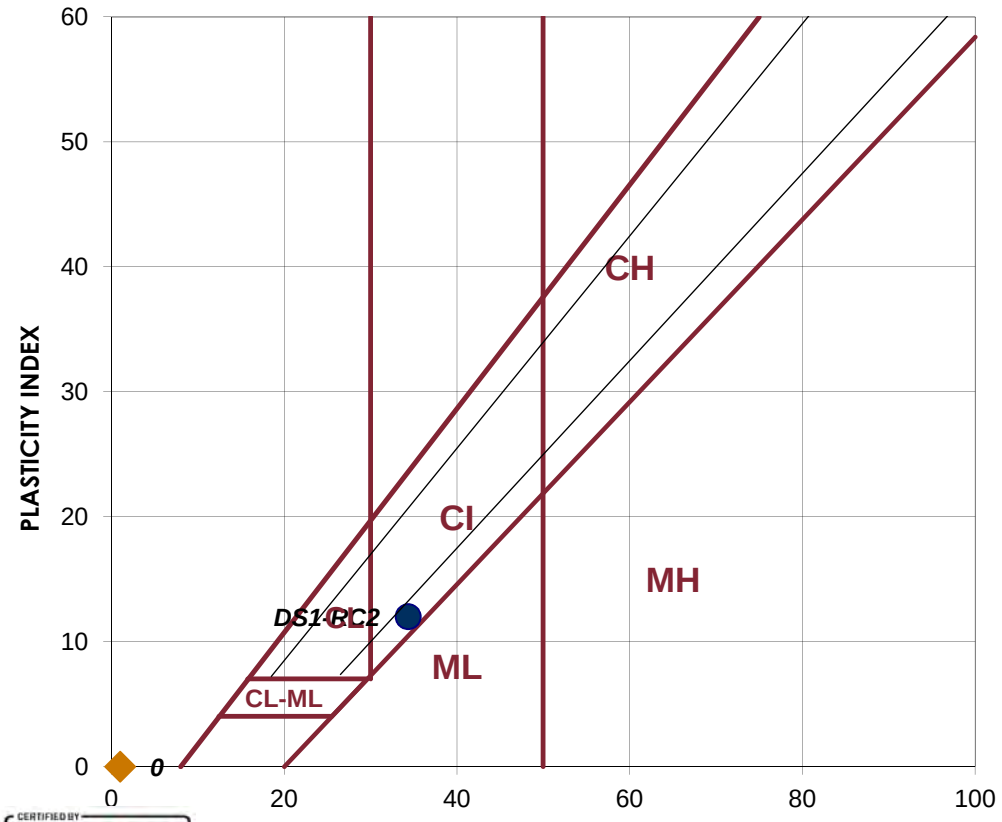
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DS1-RC2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 30 | 30 | Number of Blows | | |
| | | Container Number | | |
| 36.07 | 30.96 | Wt. Sample (wet+tare)(g) | | |
| 27.40 | 23.50 | Wt. Sample (dry+tare)(g) | | |
| 1.61 | 1.27 | Wt. Tare (g) | | |
| 25.8 | 22.2 | Wt. Dry Soil (g) | | |
| 8.7 | 7.5 | Wt. Water (g) | | |
| 33.6% | 33.6% | Water Content (%) | | |
| 34.4% | 34.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.03 | 11.1 | Wt. Sample (wet+tare)(g) | | |
| 10.08 | 9.36 | Wt. Sample (dry+tare)(g) | | |
| 1.34 | 1.22 | Wt. Tare (g) | | |
| 8.7 | 8.1 | Wt. Dry Soil (g) | | |
| 2.0 | 1.7 | Wt. Water (g) | | |
| 22.3% | 21.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 34 | | LL | |
| PL | 22 | | PL | |
| PI | 12 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Date Received: | April 12, 2016 |
| Date Tested: | April 23, 2016 |
| Tested By: | C.Tollifson |


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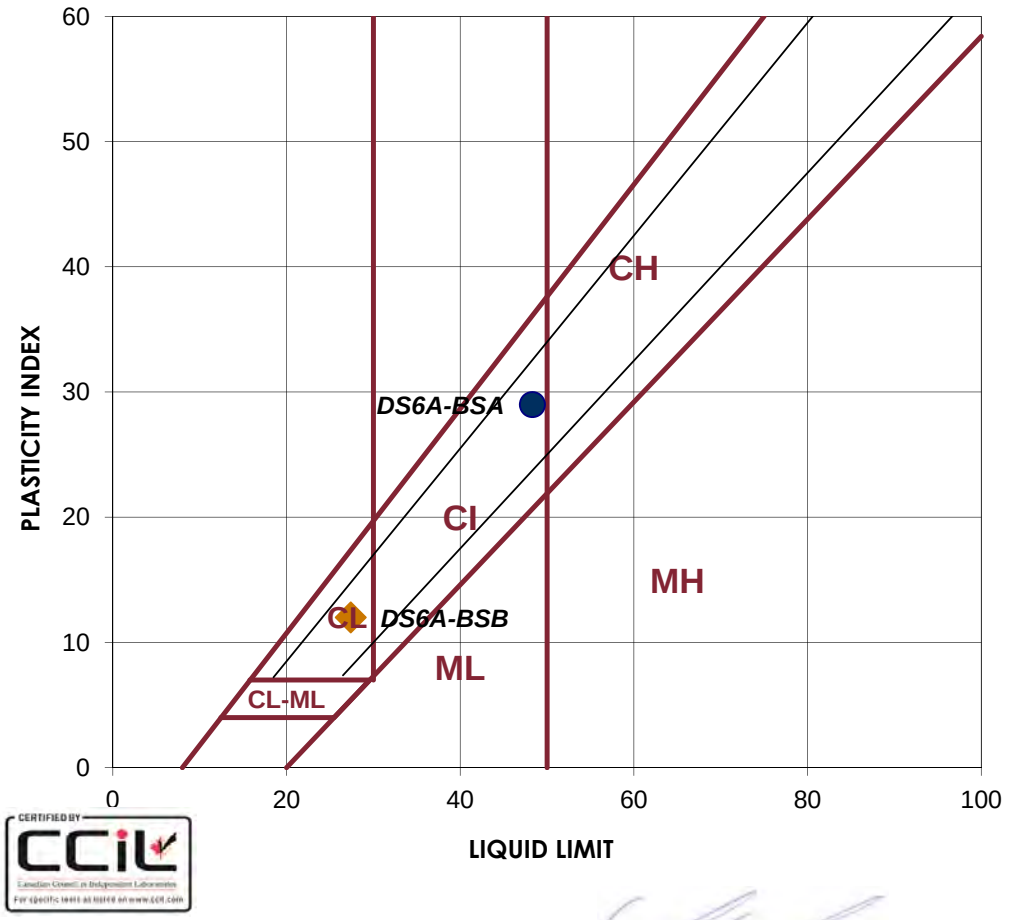
| Sample: DS6A-BSA | | | Sample: DS6A-BSB | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 20 | 20 | Number of Blows | 25 | 27 |
| | | Container Number | | |
| 26.17 | 19.54 | Wt. Sample (wet+tare)(g) | 31.04 | 33.28 |
| 17.96 | 13.53 | Wt. Sample (dry+tare)(g) | 24.71 | 26.48 |
| 1.44 | 1.40 | Wt. Tare (g) | 1.45 | 1.58 |
| 16.5 | 12.1 | Wt. Dry Soil (g) | 23.3 | 24.9 |
| 8.2 | 6.0 | Wt. Water (g) | 6.3 | 6.8 |
| 49.7% | 49.5% | Water Content (%) | 27.2% | 27.3% |
| 48.4% | 48.2% | Corrected Water Content (%) | 27.2% | 27.6% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.81 | 11.35 | Wt. Sample (wet+tare)(g) | 11.78 | 13.45 |
| 10.13 | 9.8 | Wt. Sample (dry+tare)(g) | 10.41 | 11.85 |
| 1.56 | 1.47 | Wt. Tare (g) | 1.43 | 1.46 |
| 8.6 | 8.3 | Wt. Dry Soil (g) | 9.0 | 10.4 |
| 1.7 | 1.6 | Wt. Water (g) | 1.4 | 1.6 |
| 19.6% | 18.6% | Water Content (%) | 15.3% | 15.4% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 48 | | LL | 27 |
| PL | 19 | | PL | 15 |
| PI | 29 | | PI | 12 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CH | | | CL | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Date Received: | April 8, 2016 |
| Date Tested: | April 24, 2016 |
| Tested By: | C.Tollifson |


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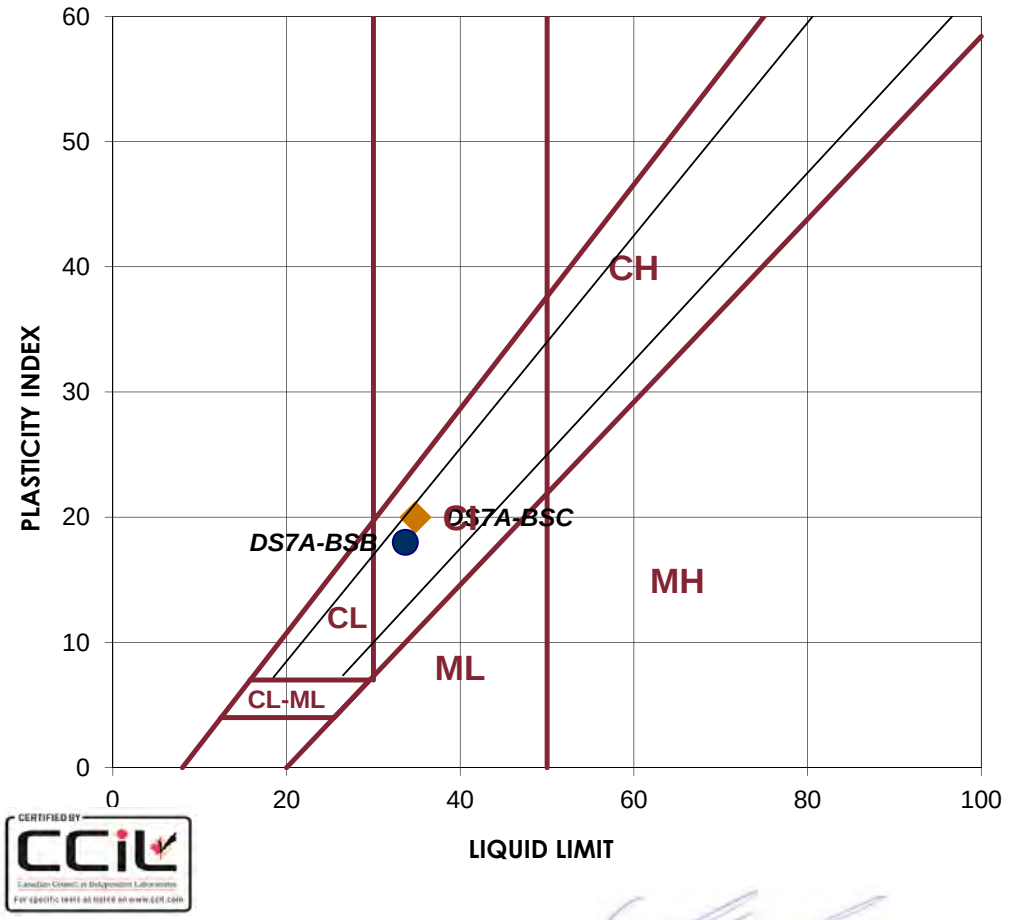
| Sample: DS7A-BSB | | | Sample: DS7A-BSC | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 30 | 28 | Number of Blows | 20 | 20 |
| | | Container Number | | |
| 28.43 | 33.85 | Wt. Sample (wet+tare)(g) | 28.76 | 27.32 |
| 21.75 | 25.81 | Wt. Sample (dry+tare)(g) | 21.49 | 20.48 |
| 1.52 | 1.54 | Wt. Tare (g) | 1.21 | 1.33 |
| 20.2 | 24.3 | Wt. Dry Soil (g) | 20.3 | 19.2 |
| 6.7 | 8.0 | Wt. Water (g) | 7.3 | 6.8 |
| 33.0% | 33.1% | Water Content (%) | 35.8% | 35.7% |
| 33.8% | 33.6% | Corrected Water Content (%) | 34.9% | 34.8% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.33 | 10.5 | Wt. Sample (wet+tare)(g) | 13.12 | 11.31 |
| 10.84 | 9.27 | Wt. Sample (dry+tare)(g) | 11.66 | 10.08 |
| 1.29 | 1.51 | Wt. Tare (g) | 1.66 | 1.64 |
| 9.6 | 7.8 | Wt. Dry Soil (g) | 10.0 | 8.4 |
| 1.5 | 1.2 | Wt. Water (g) | 1.5 | 1.2 |
| 15.6% | 15.9% | Water Content (%) | 14.6% | 14.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 34 | | LL | 35 |
| PL | 16 | | PL | 15 |
| PI | 18 | | PI | 20 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Date Received: | April 8, 2016 |
| Date Tested: | May 5, 2016 |
| Tested By: | B.Pelkey |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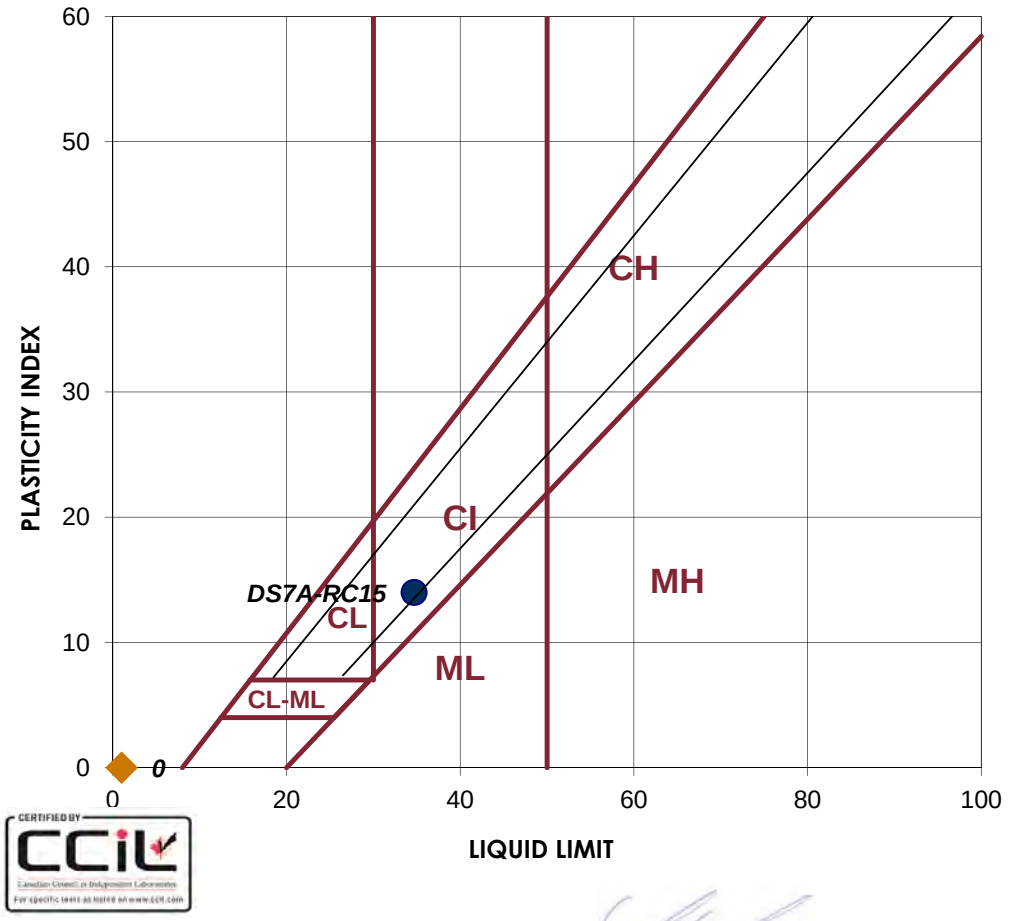
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DS7A-RC15 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 28 | Number of Blows | | |
| | | Container Number | | |
| 34.56 | 35.73 | Wt. Sample (wet+tare)(g) | | |
| 26.14 | 26.95 | Wt. Sample (dry+tare)(g) | | |
| 1.62 | 1.18 | Wt. Tare (g) | | |
| 24.5 | 25.8 | Wt. Dry Soil (g) | | |
| 8.4 | 8.8 | Wt. Water (g) | | |
| 34.3% | 34.1% | Water Content (%) | | |
| 34.8% | 34.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.06 | 12.36 | Wt. Sample (wet+tare)(g) | | |
| 10.27 | 10.43 | Wt. Sample (dry+tare)(g) | | |
| 1.53 | 1.15 | Wt. Tare (g) | | |
| 8.7 | 9.3 | Wt. Dry Soil (g) | | |
| 1.8 | 1.9 | Wt. Water (g) | | |
| 20.5% | 20.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 21 | | PL | |
| PI | 14 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Date Received: | April 6, 2016 |
| Date Tested: | April 23, 2016 |
| Tested By: | C.Tollifson |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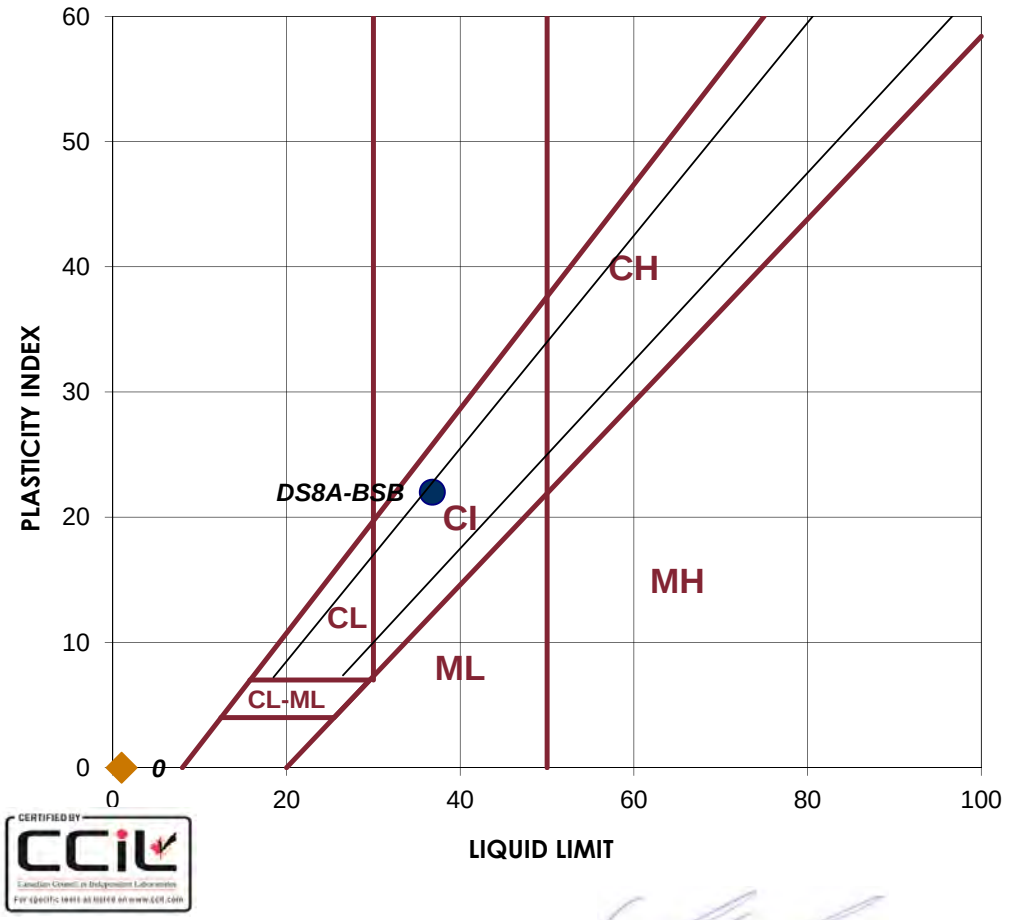
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DS8A-BSB | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 29 | Number of Blows | | |
| | | Container Number | | |
| 29.57 | 33.92 | Wt. Sample (wet+tare)(g) | | |
| 22.03 | 25.31 | Wt. Sample (dry+tare)(g) | | |
| 1.29 | 1.53 | Wt. Tare (g) | | |
| 20.7 | 23.8 | Wt. Dry Soil (g) | | |
| 7.5 | 8.6 | Wt. Water (g) | | |
| 36.4% | 36.2% | Water Content (%) | | |
| 36.7% | 36.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 14.94 | 11.74 | Wt. Sample (wet+tare)(g) | | |
| 13.15 | 10.35 | Wt. Sample (dry+tare)(g) | | |
| 1.5 | 1.4 | Wt. Tare (g) | | |
| 11.7 | 9.0 | Wt. Dry Soil (g) | | |
| 1.8 | 1.4 | Wt. Water (g) | | |
| 15.4% | 15.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | |
| PL | 15 | | PL | |
| PI | 22 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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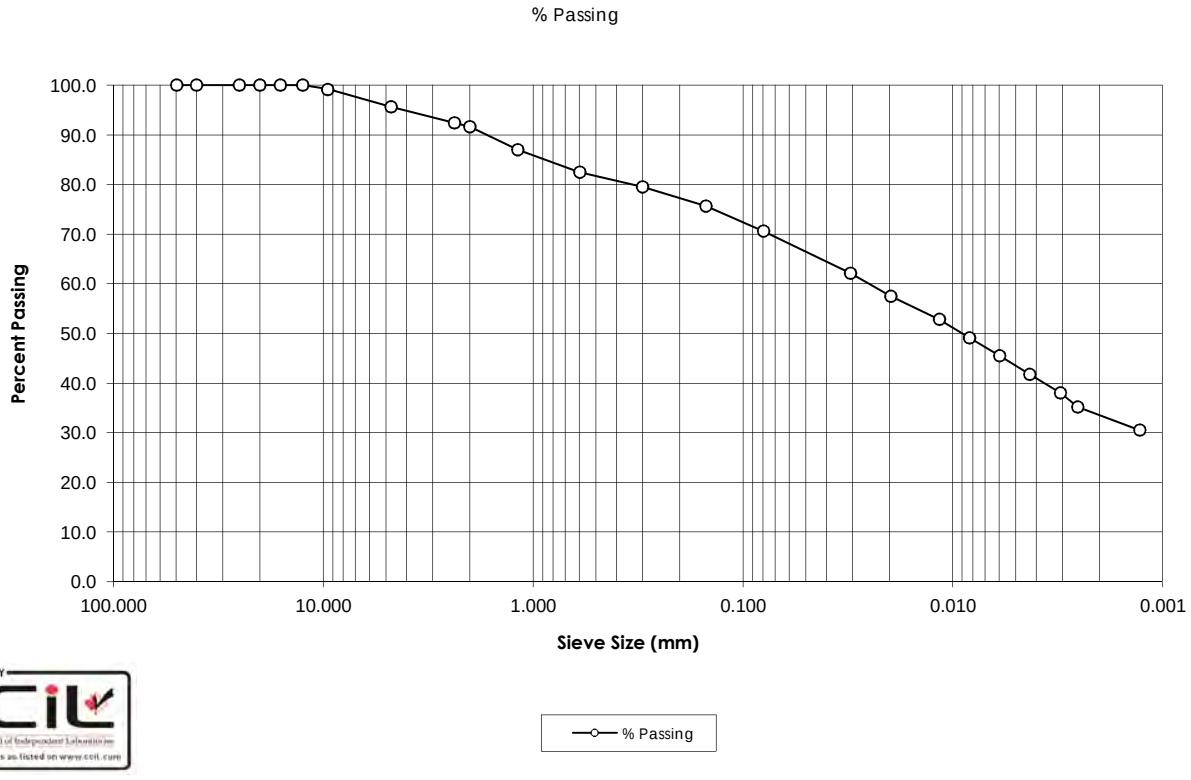
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210

SAMPLE No.: BSC
SOURCE: DS6A
TESTED BY: C.Oost

DATE TESTED: April 15, 2016
DATE RECEIVED: April 12, 2016
SAMPLE DESCRIPTION: Sandy Fines, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 45.5 |
| 40.0 | 100.0 | 0.0043 | 41.7 |
| 25.0 | 100.0 | 0.0031 | 38.0 |
| 20.0 | 100.0 | 0.0025 | 35.2 |
| 16.0 | 100.0 | 0.0013 | 30.6 |
| 12.5 | 100.0 | | |
| 9.5 | 99.2 | | |
| 4.75 | 95.7 | | |
| 2.36 | 92.4 | | |
| 2.00 | 91.6 | | |
| 1.18 | 87.0 | | |
| 0.600 | 82.5 | | |
| 0.300 | 79.6 | | |
| 0.150 | 75.7 | | |
| 0.080 | 70.7 | | |
| 0.0306 | 62.1 | | |
| 0.0197 | 57.5 | | |
| 0.0116 | 52.9 | | |
| 0.0083 | 49.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.3% | $D_{10}$: | - |
| Sand: | 25.0% | $D_{30}$: | - |
| Silt: | 37.0% | $D_{60}$: | 0.0257 |
| Clay: | 33.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size Analysis only.

Reviewed by:

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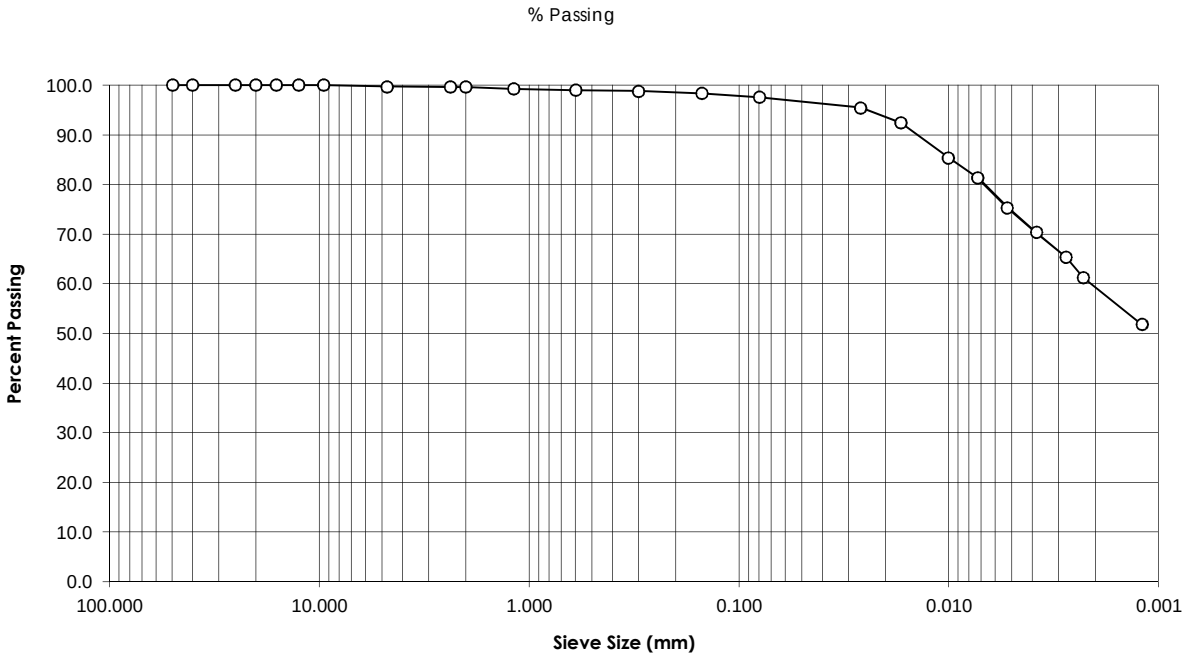
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.210

SAMPLE No.: BSA
SOURCE: DS6A
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 12, 2016
SAMPLE DESCRIPTION: Clay (CI-CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 75.3 |
| 40.0 | 100.0 | 0.0038 | 70.3 |
| 25.0 | 100.0 | 0.0028 | 65.3 |
| 20.0 | 100.0 | 0.0023 | 61.3 |
| 16.0 | 100.0 | 0.0012 | 51.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.7 | | |
| 2.36 | 99.7 | | |
| 2.00 | 99.6 | | |
| 1.18 | 99.2 | | |
| 0.600 | 99.0 | | |
| 0.300 | 98.8 | | |
| 0.150 | 98.4 | | |
| 0.080 | 97.6 | | |
| 0.0262 | 95.4 | | |
| 0.0169 | 92.4 | | |
| 0.0101 | 85.4 | | |
| 0.0073 | 81.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.3% | $D_{10}$: | - |
| Sand: | 2.1% | $D_{30}$: | - |
| Silt: | 38.2% | $D_{60}$: | 0.0021 |
| Clay: | 59.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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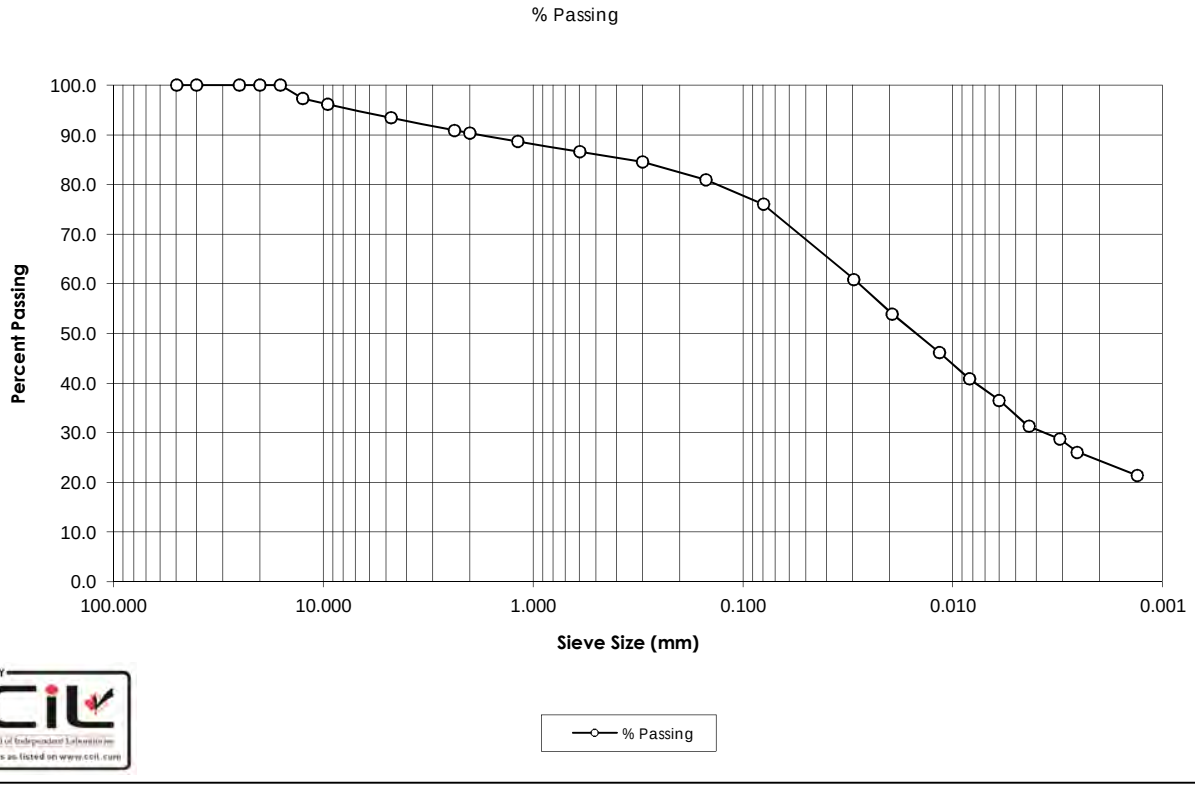
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.210

SAMPLE No.: BSB
SOURCE: DS6A
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 12, 2016
SAMPLE DESCRIPTION: Clay (CL), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0060** | **36.5** |
| **40.0** | **100.0** | **0.0043** | **31.3** |
| **25.0** | **100.0** | **0.0031** | **28.7** |
| **20.0** | **100.0** | **0.0026** | **26.1** |
| **16.0** | **100.0** | **0.0013** | **21.4** |
| **12.5** | **97.3** | | |
| **9.5** | **96.1** | | |
| **4.75** | **93.4** | | |
| **2.36** | **90.9** | | |
| **2.00** | **90.3** | | |
| **1.18** | **88.7** | | |
| **0.600** | **86.6** | | |
| **0.300** | **84.5** | | |
| **0.150** | **81.0** | | |
| **0.080** | **76.1** | | |
| **0.0296** | **60.9** | | |
| **0.0194** | **54.0** | | |
| **0.0116** | **46.1** | | |
| **0.0083** | **40.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.6% | $D_{10}$: | - |
| Sand: | 17.4% | $D_{30}$: | 0.0037 |
| Silt: | 51.7% | $D_{60}$: | 0.0283 |
| Clay: | 24.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.



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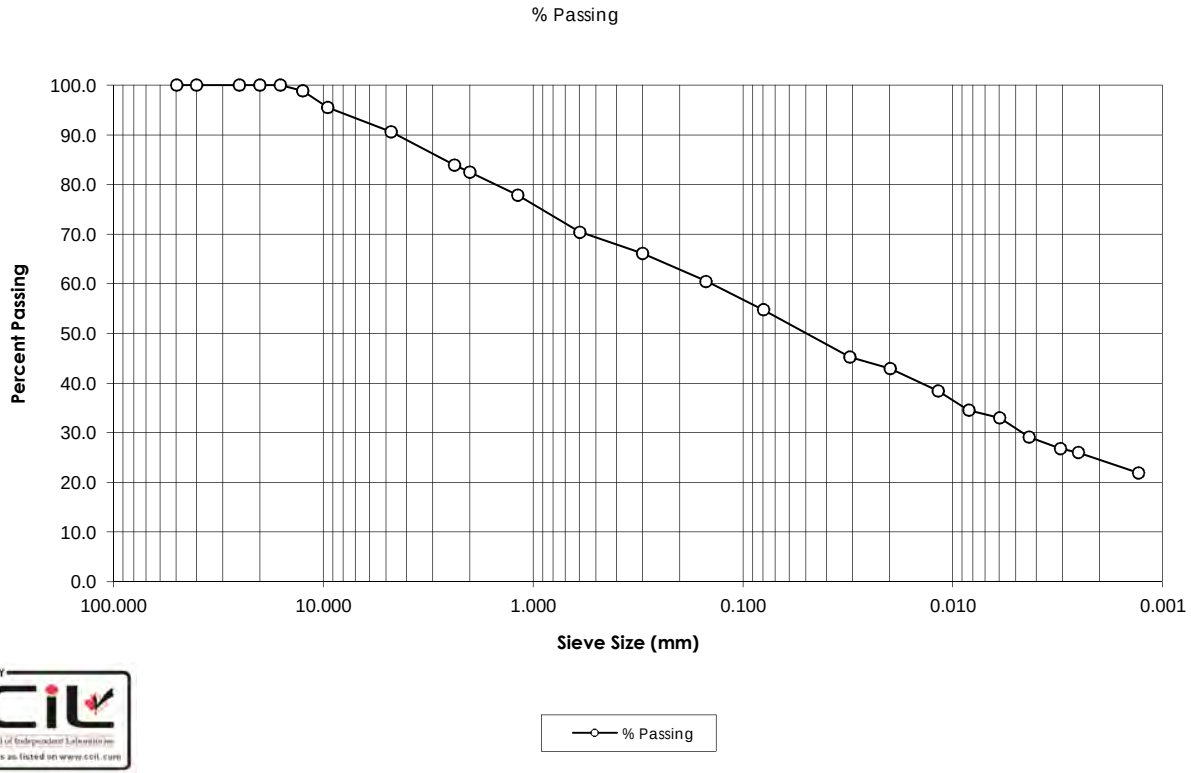
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.210

SAMPLE No.: BSB
SOURCE: DS7A
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 8, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 33.0 |
| 40.0 | 100.0 | 0.0043 | 29.2 |
| 25.0 | 100.0 | 0.0031 | 26.9 |
| 20.0 | 100.0 | 0.0025 | 26.1 |
| 16.0 | 100.0 | 0.0013 | 22.0 |
| 12.5 | 98.9 | | |
| 9.5 | 95.5 | | |
| 4.75 | 90.6 | | |
| 2.36 | 83.9 | | |
| 2.00 | 82.5 | | |
| 1.18 | 77.9 | | |
| 0.600 | 70.4 | | |
| 0.300 | 66.1 | | |
| 0.150 | 60.5 | | |
| 0.080 | 54.8 | | |
| 0.0308 | 45.3 | | |
| 0.0198 | 43.0 | | |
| 0.0117 | 38.4 | | |
| 0.0084 | 34.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.4% | $D_{10}$: | - |
| Sand: | 35.8% | $D_{30}$: | 0.0047 |
| Silt: | 30.1% | $D_{60}$: | 0.1440 |
| Clay: | 24.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.



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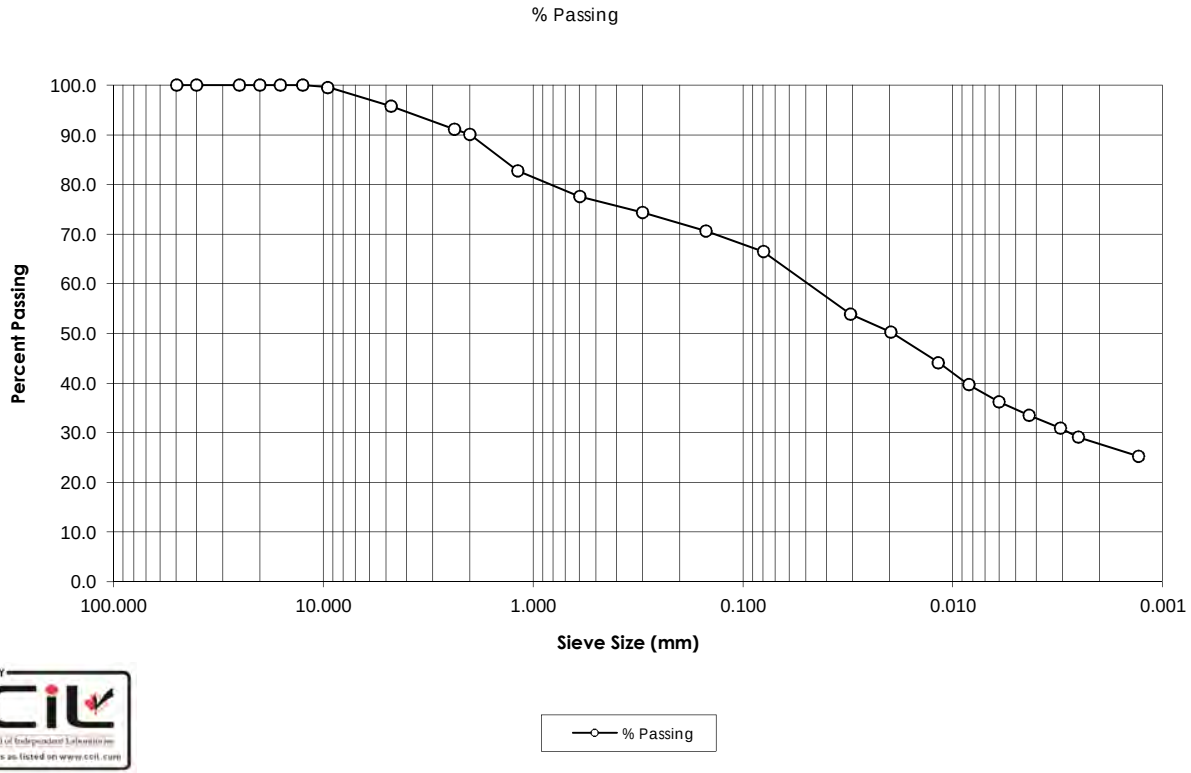
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.210

SAMPLE No.: BSC
SOURCE: DS7A
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 8, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 36.2 |
| 40.0 | 100.0 | 0.0043 | 33.6 |
| 25.0 | 100.0 | 0.0031 | 30.9 |
| 20.0 | 100.0 | 0.0025 | 29.1 |
| 16.0 | 100.0 | 0.0013 | 25.3 |
| 12.5 | 100.0 | | |
| 9.5 | 99.6 | | |
| 4.75 | 95.8 | | |
| 2.36 | 91.1 | | |
| 2.00 | 90.0 | | |
| 1.18 | 82.7 | | |
| 0.600 | 77.6 | | |
| 0.300 | 74.4 | | |
| 0.150 | 70.6 | | |
| 0.080 | 66.5 | | |
| 0.0306 | 53.9 | | |
| 0.0197 | 50.3 | | |
| 0.0117 | 44.1 | | |
| 0.0084 | 39.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.2% | $D_{10}$: | - |
| Sand: | 29.3% | $D_{30}$: | 0.0028 |
| Silt: | 38.7% | $D_{60}$: | 0.0559 |
| Clay: | 27.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.



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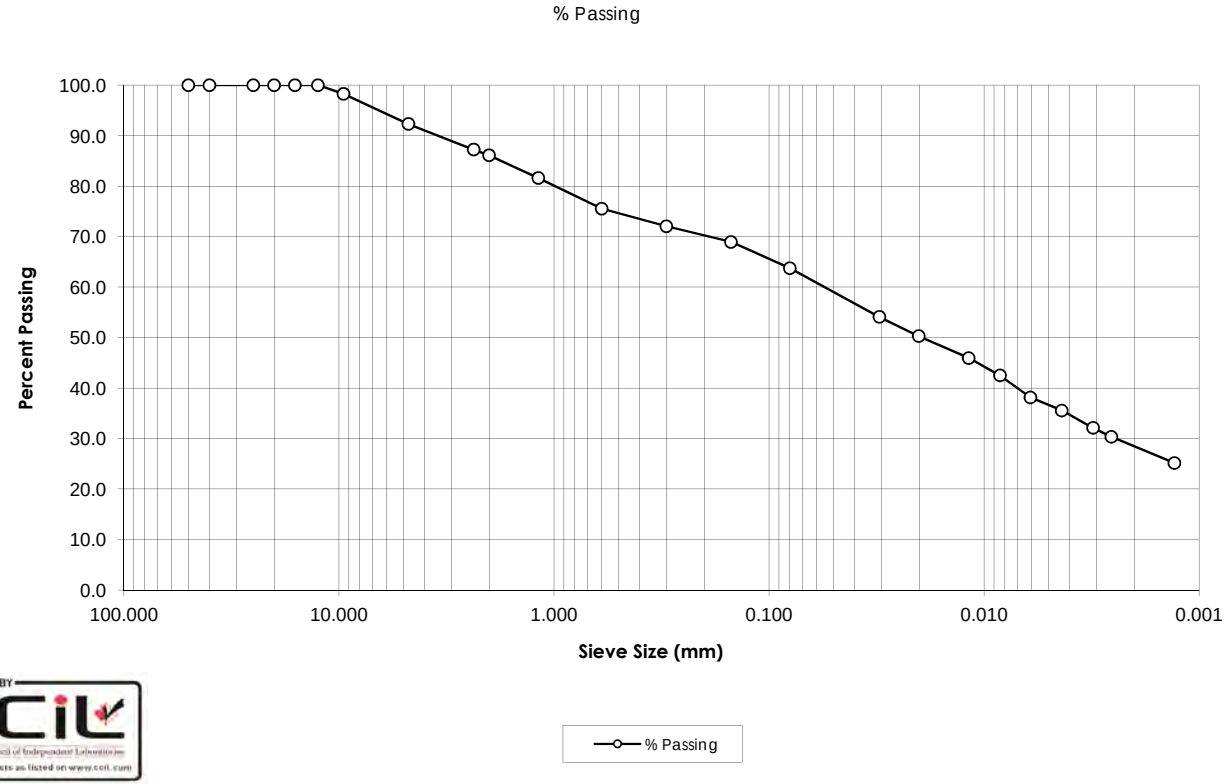
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210

SAMPLE No.: BS11
SOURCE: DS7
TESTED BY: C.Oost

DATE TESTED: April 15, 2016
DATE RECEIVED: April 4, 2016
SAMPLE DESCRIPTION: Sandy Fines, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 38.1 |
| 40.0 | 100.0 | 0.0043 | 35.5 |
| 25.0 | 100.0 | 0.0031 | 32.1 |
| 20.0 | 100.0 | 0.0026 | 30.3 |
| 16.0 | 100.0 | 0.0013 | 25.1 |
| 12.5 | 100.0 | | |
| 9.5 | 98.3 | | |
| 4.75 | 92.3 | | |
| 2.36 | 87.2 | | |
| 2.00 | 86.1 | | |
| 1.18 | 81.6 | | |
| 0.600 | 75.5 | | |
| 0.300 | 72.1 | | |
| 0.150 | 68.9 | | |
| 0.080 | 63.7 | | |
| 0.0306 | 54.1 | | |
| 0.0201 | 50.3 | | |
| 0.0118 | 46.0 | | |
| 0.0084 | 42.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.7% | $D_{10}$: | - |
| Sand: | 28.6% | $D_{30}$: | 0.0025 |
| Silt: | 35.3% | $D_{60}$: | 0.0618 |
| Clay: | 28.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size Analysis only.

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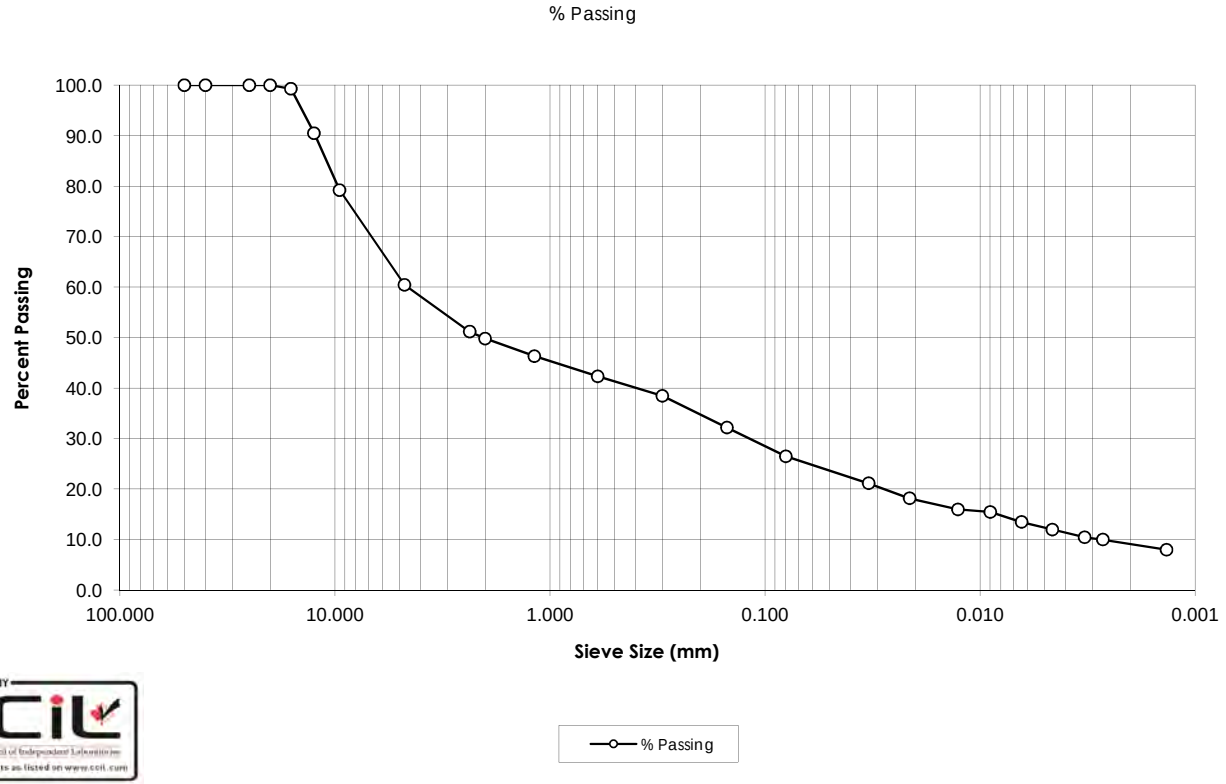
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210

SAMPLE No.: BS21
SOURCE: DS7
TESTED BY: C.Oost

DATE TESTED: April 15, 2016
DATE RECEIVED: April 4, 2016
SAMPLE DESCRIPTION: Sandy Gravel, Some Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0064 | 13.5 |
| 40.0 | 100.0 | 0.0046 | 12.0 |
| 25.0 | 100.0 | 0.0033 | 10.5 |
| 20.0 | 100.0 | 0.0027 | 10.0 |
| 16.0 | 99.3 | 0.0014 | 8.0 |
| 12.5 | 90.5 | | |
| 9.5 | 79.2 | | |
| 4.75 | 60.5 | | |
| 2.36 | 51.2 | | |
| 2.00 | 49.8 | | |
| 1.18 | 46.3 | | |
| 0.600 | 42.3 | | |
| 0.300 | 38.4 | | |
| 0.150 | 32.2 | | |
| 0.080 | 26.5 | | |
| 0.0329 | 21.1 | | |
| 0.0213 | 18.1 | | |
| 0.0127 | 15.9 | | |
| 0.0090 | 15.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 39.5% | $D_{10}$: | 0.0027 |
| Sand: | 34.0% | $D_{30}$: | 0.1249 |
| Silt: | 17.4% | $D_{60}$: | 4.6414 |
| Clay: | 9.1% | $C_u$: | 1704.27 |
| | | $C_c$: | 1.23 |

**Comments:** Sample description (MUSCS) derived from Grain Size Analysis only.

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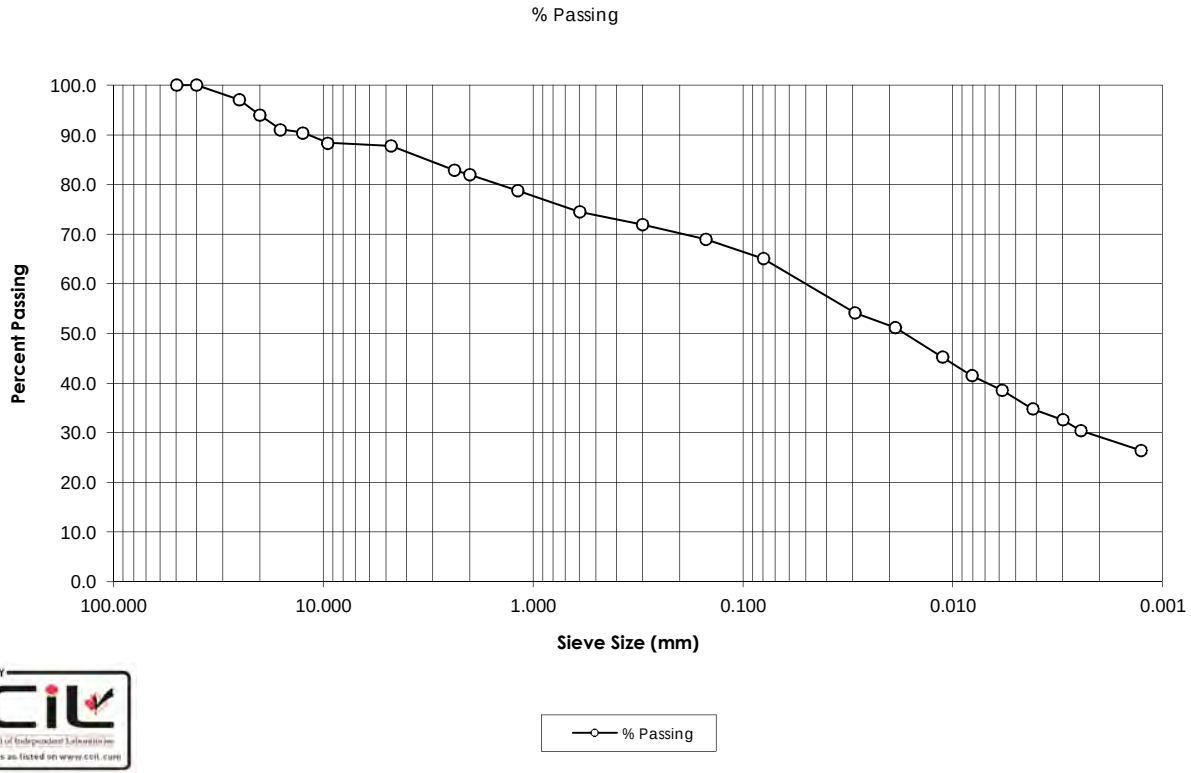
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.210

SAMPLE No.: BSB
SOURCE: DS8A
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 6, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 38.6 |
| 40.0 | 100.0 | 0.0042 | 34.8 |
| 25.0 | 97.1 | 0.0030 | 32.6 |
| 20.0 | 94.0 | 0.0025 | 30.4 |
| 16.0 | 91.1 | 0.0013 | 26.4 |
| 12.5 | 90.4 | | |
| 9.5 | 88.4 | | |
| 4.75 | 87.8 | | |
| 2.36 | 82.9 | | |
| 2.00 | 82.0 | | |
| 1.18 | 78.7 | | |
| 0.600 | 74.5 | | |
| 0.300 | 72.0 | | |
| 0.150 | 69.0 | | |
| 0.080 | 65.1 | | |
| 0.0291 | 54.1 | | |
| 0.0187 | 51.2 | | |
| 0.0112 | 45.2 | | |
| 0.0081 | 41.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.2% | $D_{10}$: | - |
| Sand: | 22.7% | $D_{30}$: | 0.0023 |
| Silt: | 35.9% | $D_{60}$: | 0.0576 |
| Clay: | 29.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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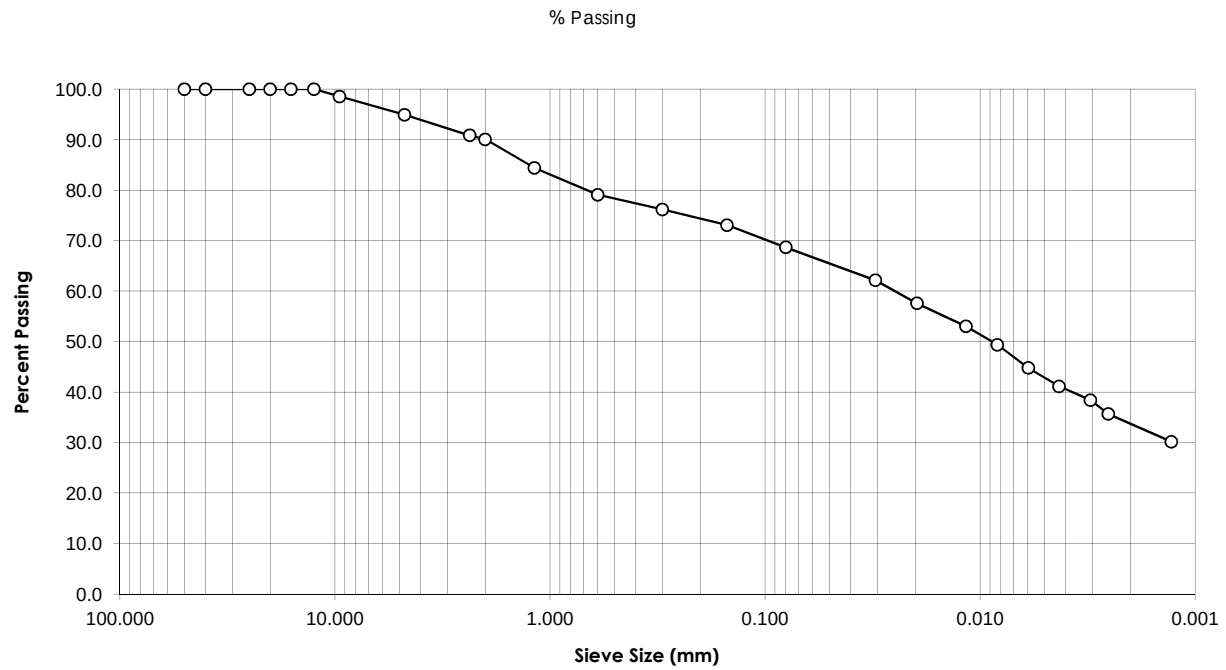
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210

SAMPLE No.: BS15
SOURCE: DS8
TESTED BY: C.Oost

DATE TESTED: April 15, 2016
DATE RECEIVED: April 4, 2016
SAMPLE DESCRIPTION: Sandy Fines, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 44.8 |
| 40.0 | 100.0 | 0.0043 | 41.1 |
| 25.0 | 100.0 | 0.0031 | 38.4 |
| 20.0 | 100.0 | 0.0025 | 35.6 |
| 16.0 | 100.0 | 0.0013 | 30.2 |
| 12.5 | 100.0 | | |
| 9.5 | 98.5 | | |
| 4.75 | 94.9 | | |
| 2.36 | 90.8 | | |
| 2.00 | 90.1 | | |
| 1.18 | 84.4 | | |
| 0.600 | 79.1 | | |
| 0.300 | 76.2 | | |
| 0.150 | 73.1 | | |
| 0.080 | 68.7 | | |
| 0.0306 | 62.1 | | |
| 0.0196 | 57.6 | | |
| 0.0116 | 53.0 | | |
| 0.0083 | 49.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.1% | $D_{10}$: | - |
| Sand: | 26.3% | $D_{30}$: | - |
| Silt: | 34.9% | $D_{60}$: | 0.0255 |
| Clay: | 33.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size Analysis only.

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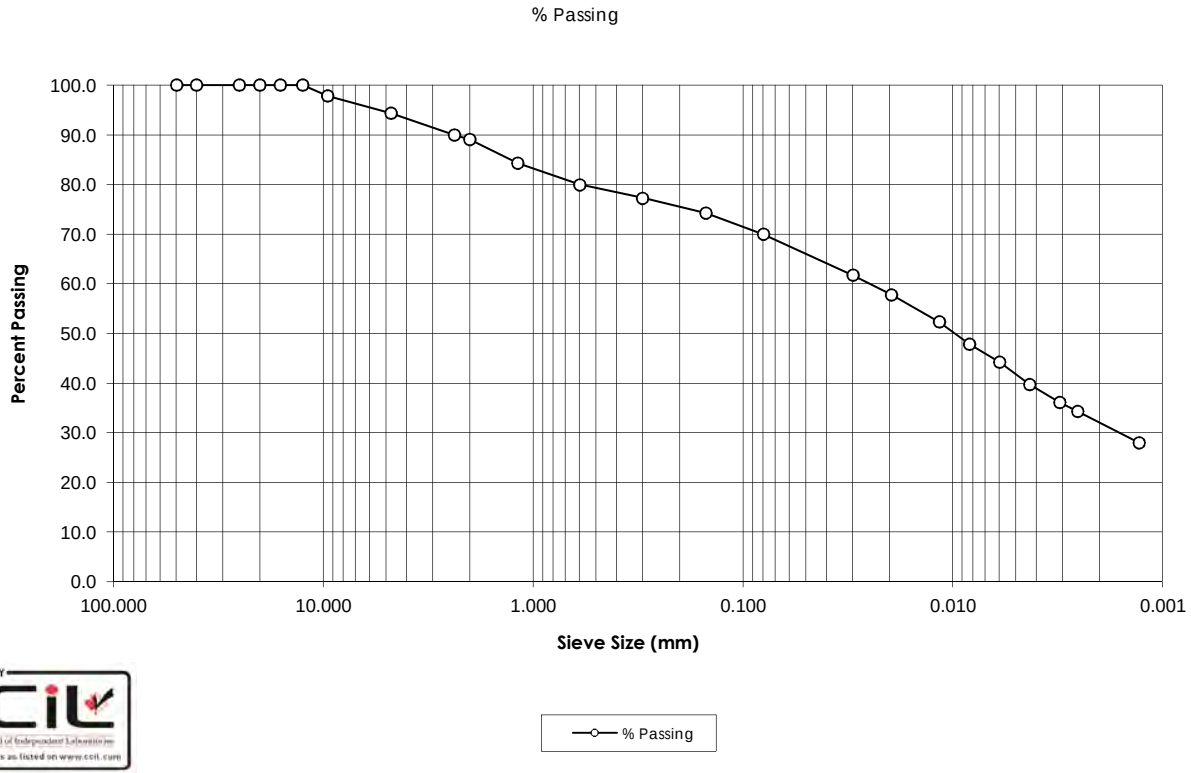
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210

SAMPLE No.: BS22
SOURCE: DS8
TESTED BY: C.Oost

DATE TESTED: April 15, 2016
DATE RECEIVED: April 4, 2016
SAMPLE DESCRIPTION: Sandy Fines, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 44.3 |
| 40.0 | 100.0 | 0.0043 | 39.7 |
| 25.0 | 100.0 | 0.0031 | 36.1 |
| 20.0 | 100.0 | 0.0025 | 34.3 |
| 16.0 | 100.0 | 0.0013 | 28.0 |
| 12.5 | 100.0 | | |
| 9.5 | 97.8 | | |
| 4.75 | 94.4 | | |
| 2.36 | 90.0 | | |
| 2.00 | 89.0 | | |
| 1.18 | 84.3 | | |
| 0.600 | 80.0 | | |
| 0.300 | 77.3 | | |
| 0.150 | 74.2 | | |
| 0.080 | 70.0 | | |
| 0.0299 | 61.8 | | |
| 0.0196 | 57.8 | | |
| 0.0116 | 52.4 | | |
| 0.0083 | 47.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.6% | $D_{10}$: | - |
| Sand: | 24.3% | $D_{30}$: | 0.0017 |
| Silt: | 38.0% | $D_{60}$: | 0.0254 |
| Clay: | 32.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size Analysis only.



Reviewed by:

Stantec

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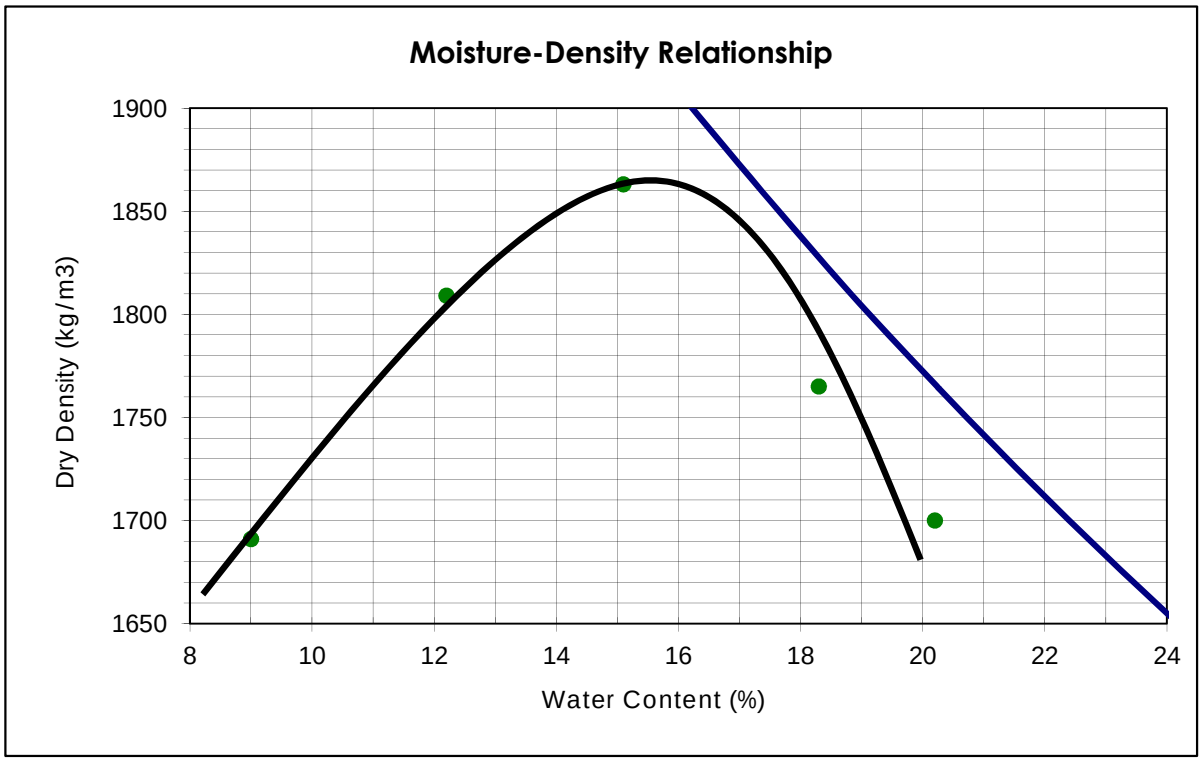
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | April 6, 2016 |
| Project Name: | SR1 | Date Tested: | April 20, 2016 |
| Project No.: | 110773396.302.702.210 | Tested By: | C.Oost |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1691 | 1809 | 1863 | 1765 | 1700 |
| MOISTURE CONTENT (%) | 9.0 | 12.2 | 15.1 | 18.3 | 20.2 |

**Source of Sample:** DS8A BSB (4.5-6.0m)
**Visual Soil Description:** Brown Clay, Trace Gravel
**Maximum Dry Density (kg/m3):** 1865kg/$m^3$
**Optimum M.C. (%):** 15.5%
**Natural M.C.(%):** 12.9%






Reviewed by: _____

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# Specific Gravity of Soil

ASTM D854 - Method A
Procedure For Moist Specimens

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.210
Soil Description: Clay and Silt Trace Sand
Notes: Max. Particle Size of Test Specimen = 4.75mm
Sample deaired using rapid boiling method

Sample: DS6A-BSA
Tested By: C. Tollifson
Date: 4/25/2016

| Soil Type | Minimum Specimen Dry Weight (g) |
|---|---|
| SP, SP-SM | 100 +/- 10 |
| SP-SC, SM, SC | 75 +/- 10 |
| Silt or Clay | 50 +/- 10 |

| Moisture Content (ASTM D2216) | | |
|---|---|---|
| Tare no. | CO | |
| Wet Wt. & Tare | 18.84 | g |
| Dry Wt. & Tare | 18.26 | g |
| Wt. of Water | 0.58 | g |
| Tare Wt. | 1.54 | g |
| Wt. of Dry Soil | 16.72 | g |
| Moisture Content | 3.50 | % |

{A} Calibration of Pycnometers (Revised 03-10-16)

| Pycnometer No. | | H1 | A | Z1 |
|---|---|---|---|---|
| Mean Mass of Pycnometer | | 161.40 | 166.32 | 170.46 |
| Mean Calibrated Volume of Pycnometer (g/mL) | Vp | 499.19 | 499.36 | 499.74 |

{B} Specific Gravity Determination

| | | *Trial # 1* | *Trial #2* | *Trial #3* |
|---|---|---|---|---|
| Mass of Pycnometer (g)* | | 161.40 | 166.33 | 170.45 |
| Mass of Tare (g) | | 403.20 | 435.40 | 400.70 |
| Mass of Tare & Soil (g) | | 452.70 | 485.40 | 447.20 |
| Mass of Oven-Dried Solids | Ms | 49.50 | 50.00 | 46.50 |
| Mass of Deaired Water, Pycnometer & Soil (g) | Mpws,ti | 691.24 | 696.77 | 700.94 |
| Temperature of Deaired Water, Pycnometer & Soil | $T_t$ | 20.90 | 20.90 | 20.80 |
| Density of Water @ $T_t$ (g/mL) | pw,t | 0.99802 | 0.99802 | 0.99804 |
| Mass of Water & Pycnometer at Test | Mpw,t | 2.77 | 2.79 | 2.77 |
| Conversion Factor for ($T_t$) | K | 0.99981 | 0.99981 | 0.99983 |
| Specific Gravity (0.001) | $G_t$ | 2.771 | 2.788 | 2.774 |

**max tolerance of 0.06g from calibration*

Average Specific Gravity 2.778
*(maximum tolerance of 0.02 between trials)*

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# Specific Gravity of Soil

ASTM D854 - Method A
Procedure For Moist Specimens

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.210
Soil Description: Clay and Silt Some Sand Trace Gravel
Notes: Max. Particle Size of Test Specimen = 4.75mm
Sample deaired using rapid boiling method

Sample: DS6A-BSB
Tested By: C.Tollifson
Date: 22-Apr-16

| Soil Type | Minimum Specimen Dry Weight (g) |
|---|---|
| SP, SP-SM | 100 +/- 10 |
| SP-SC, SM, SC | 75 +/- 10 |
| Silt or Clay | 50 +/- 10 |

| Moisture Content (ASTM D2216) | | |
|---|---|---|
| Tare no. | | |
| Wet Wt. & Tare | 16.76 | g |
| Dry Wt. & Tare | 16.61 | g |
| Wt. of Water | 0.15 | g |
| Tare Wt. | 1.44 | g |
| Wt. of Dry Soil | 15.17 | g |
| Moisture Content | 0.10 | % |

{A} Calibration of Pycnometers (Revised 03-10-16)

| Pycnometer No. | | H1 | A | Z1 |
|---|---|---|---|---|
| Mean Mass of Pycnometer | | 161.40 | 166.32 | 170.46 |
| Mean Calibrated Volume of Pycnometer (g/mL) | Vp | 499.19 | 499.36 | 499.74 |

{B} Specific Gravity Determination

| | | *Trial # 1* | *Trial #2* | *Trial #3* |
|---|---|---|---|---|
| Mass of Pycnometer (g)* | | 161.38 | 166.33 | 170.43 |
| Mass of Tare (g) | | 403.50 | 403.60 | 321.80 |
| Mass of Tare & Soil (g) | | 453.60 | 454.30 | 373.80 |
| Mass of Oven-Dried Solids | Ms | 50.10 | 50.70 | 52.00 |
| Mass of Deaired Water, Pycnometer & Soil (g) | Mpws,ti | 690.95 | 696.44 | 701.77 |
| Temperature of Deaired Water, Pycnometer & Soil | $T_t$ | 22.20 | 22.10 | 22.10 |
| Density of Water @ $T_t$ (g/mL) | pw,t | 0.99773 | 0.99775 | 0.99775 |
| Mass of Water & Pycnometer at Test | Mpw,t | 659.44 | 664.57 | 669.05 |
| Conversion Factor for ($T_t$) | K | 0.99952 | 399954.00000 | 0.99954 |
| Specific Gravity (0.001) | $G_t$ | 2.694 | 2.680 | 2.696 |

**max tolerance of 0.06g from calibration*

Average Specific Gravity 2.690

*(maximum tolerance of 0.02 between trials)*

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# Specific Gravity of Soil

ASTM D854 - Method A
Procedure For Moist Specimens

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.210
Soil Description:
Notes: Max. Particle Size of Test Specimen = 4.75mm
Sample deaired using rapid boiling method

Sample: DS7A-BSB
Tested By: C. Tollifson
Date: 4/26/2016

| Soil Type | Minimum Specimen Dry Weight (g) |
|---|---|
| SP, SP-SM | 100 +/- 10 |
| SP-SC, SM, SC | 75 +/- 10 |
| Silt or Clay | 50 +/- 10 |

| Moisture Content (ASTM D2216) | | |
|---|---|---|
| Tare no. | CO | |
| Wet Wt. & Tare | 23.03 | g |
| Dry Wt. & Tare | 22.48 | g |
| Wt. of Water | 0.55 | g |
| Tare Wt. | 1.55 | g |
| Wt. of Dry Soil | 20.93 | g |
| Moisture Content | 2.60 | % |

{A} Calibration of Pycnometers (Revised 03-10-16)

| Pycnometer No. | | H1 | A | Z1 |
|---|---|---|---|---|
| Mean Mass of Pycnometer | | 161.40 | 166.32 | 170.46 |
| Mean Calibrated Volume of Pycnometer (g/mL) | Vp | 499.19 | 499.36 | 499.74 |

{B} Specific Gravity Determination

| | | *Trial # 1* | *Trial #2* | *Trial #3* |
|---|---|---|---|---|
| Mass of Pycnometer (g)* | | 161.39 | 166.33 | 170.41 |
| Mass of Tare (g) | | 322.00 | 403.50 | 404.20 |
| Mass of Tare & Soil (g) | | 372.20 | 445.50 | 454.40 |
| Mass of Oven-Dried Solids | Ms | 50.20 | 42.00 | 49.70 |
| Mass of Deaired Water, Pycnometer & Soil (g) | Mpws,ti | 691.31 | 696.79 | 700.83 |
| Temperature of Deaired Water, Pycnometer & Soil | $T_t$ | 20.30 | 20.30 | 20.20 |
| Density of Water @ $T_t$ (g/mL) | pw,t | 0.99814 | 0.99814 | 0.99816 |
| Mass of Water & Pycnometer at Test | Mpw,t | 2.71 | 2.69 | 2.69 |
| Conversion Factor for ($T_t$) | K | 0.99994 | 0.99994 | 0.99996 |
| Specific Gravity (0.001) | $G_t$ | 2.707 | 2.692 | 2.692 |

**max tolerance of 0.06g from calibration*

Average Specific Gravity 2.697

*(maximum tolerance of 0.02 between trials)*

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# Specific Gravity of Soil

ASTM D854 - Method A
Procedure For Moist Specimens

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.210
Soil Description: Sandy Silty Clay Trace Gravel
Notes: Max. Particle Size of Test Specimen = 4.75mm
Sample deaired using rapid boiling method

Sample: DS7A-BSC
Tested By: C.Tollifson
Date: 23-Apr-16

| Soil Type | Minimum Specimen Dry Weight (g) |
|---|---|
| SP, SP-SM | 100 +/- 10 |
| SP-SC, SM, SC | 75 +/- 10 |
| Silt or Clay | 50 +/- 10 |

| Moisture Content (ASTM D2216) | | |
|---|---|---|
| Tare no. | | |
| Wet Wt. & Tare | 21.79 | g |
| Dry Wt. & Tare | 21.51 | g |
| Wt. of Water | 0.28 | g |
| Tare Wt. | 1.43 | g |
| Wt. of Dry Soil | 20.08 | g |
| Moisture Content | 1.40 | % |

{A} Calibration of Pycnometers (Revised 03-10-16)

| Pycnometer No. | | H1 | A | Z1 |
|---|---|---|---|---|
| Mean Mass of Pycnometer | | 161.40 | 166.32 | 170.46 |
| Mean Calibrated Volume of Pycnometer (g/mL) | Vp | 499.19 | 499.36 | 499.74 |

{B} Specific Gravity Determination

| | | *Trial # 1* | *Trial #2* | *Trial #3* |
|---|---|---|---|---|
| Mass of Pycnometer (g)* | | 161.38 | 166.32 | 170.44 |
| Mass of Tare (g) | | 367.70 | 43.60 | 435.10 |
| Mass of Tare & Soil (g) | | 418.40 | 455.50 | 485.80 |
| Mass of Oven-Dried Solids | Ms | 50.70 | 51.90 | 50.70 |
| Mass of Deaired Water, Pycnometer & Soil (g) | Mpws,ti | 691.52 | 697.35 | 701.01 |
| Temperature of Deaired Water, Pycnometer & Soil | $T_t$ | 21.30 | 21.50 | 21.40 |
| Density of Water @ $T_t$ (g/mL) | pw,t | 0.99793 | 0.99789 | 0.99791 |
| Mass of Water & Pycnometer at Test | Mpw,t | 2.71 | 2.71 | 2.69 |
| Conversion Factor for ($T_t$) | K | 0.99972 | 0.99968 | 0.99970 |
| Specific Gravity (0.001) | $G_t$ | 2.708 | 2.705 | 2.692 |

**max tolerance of 0.06g from calibration*

Average Specific Gravity 2.702

*(maximum tolerance of 0.02 between trials)*

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# Specific Gravity of Soil

ASTM D854 - Method A
Procedure For Moist Specimens

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.210
Soil Description: Sandy Clay and Silt Trace Gravel
Notes: Max. Particle Size of Test Specimen = 4.75mm
Sample deaired using rapid boiling method

Sample: DS8A-BSB
Tested By: C. Tollifson
Date: 4/27/2016

| Soil Type | Minimum Specimen Dry Weight (g) |
|---|---|
| SP, SP-SM | 100 +/- 10 |
| SP-SC, SM, SC | 75 +/- 10 |
| Silt or Clay | 50 +/- 10 |

| Moisture Content (ASTM D2216) | | |
|---|---|---|
| Tare no. | | |
| Wet Wt. & Tare | 28.02 | g |
| Dry Wt. & Tare | 27.87 | g |
| Wt. of Water | 0.15 | g |
| Tare Wt. | 1.37 | g |
| Wt. of Dry Soil | 26.50 | g |
| Moisture Content | 0.60 | % |

{A} Calibration of Pycnometers (Revised 03-10-16)

| Pycnometer No. | | H1 | A | Z1 |
|---|---|---|---|---|
| Mean Mass of Pycnometer | | 161.40 | 166.32 | 170.46 |
| Mean Calibrated Volume of Pycnometer (g/mL) | Vp | 499.19 | 499.36 | 499.74 |

{B} Specific Gravity Determination

| | | *Trial # 1* | *Trial #2* | *Trial #3* |
|---|---|---|---|---|
| Mass of Pycnometer (g)* | | 161.39 | 166.35 | 170.47 |
| Mass of Tare (g) | | 413.60 | 330.30 | 411.00 |
| Mass of Tare & Soil (g) | | 464.90 | 381.30 | 462.40 |
| Mass of Oven-Dried Solids | Ms | 51.30 | 51.00 | 51.40 |
| Mass of Deaired Water, Pycnometer & Soil (g) | Mpws,ti | 692.46 | 697.40 | 702.15 |
| Temperature of Deaired Water, Pycnometer & Soil | $T_t$ | 20.60 | 20.60 | 20.70 |
| Density of Water @ $T_t$ (g/mL) | pw,t | 0.99808 | 0.99808 | 0.99806 |
| Mass of Water & Pycnometer at Test | Mpw,t | 659.61 | 664.75 | 669.24 |
| Conversion Factor for ($T_t$) | K | 0.99987 | 0.99987 | 0.99985 |
| Specific Gravity (0.001) | $G_t$ | 2.780 | 2.779 | 2.780 |

**max tolerance of 0.06g from calibration*

Average Specific Gravity 2.78
*(maximum tolerance of 0.02 between trials)*

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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C.Tollifson |
| Project Name | SR1 | Date Tested | 5-May-16 |
| Project Number | 110773396.302.702.210 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | DS7A | **Sample ID:** | RC13 |
| **Depth (m):** | 30.1 | **Moisture Conent (%):** | 14.6 |
| **Sample Diameter (cm):** | 603 | **Sample Weight (g):** | 815.9 |
| **Load Rate (MPa/sec):** | 0.23 | **Sample Length (cm):** | 12.75 |
| **Peak Load (kN):** | 2.12 | **Unit Weight (kg/m3):** | 1955 |
| **Compressive Stregth (MPa):** | 0.7 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | DS7A | **Sample ID:** | RC16 |
| **Depth (m):** | 33.2 | **Moisture Conent (%):** | 4.8 |
| **Sample Diameter (cm):** | 6.08 | **Sample Weight (g):** | 941.2 |
| **Load Rate (MPa/sec):** | 0.16 | **Sample Length (cm):** | 12.99 |
| **Peak Load (kN):** | 82.05 | **Unit Weight (kg/m3):** | 2381 |
| **Compressive Stregth (MPa):** | 28.30 | | |



Reviewed by: _____

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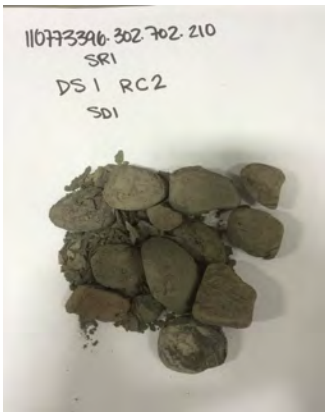
# Slake Durability Index

ASTM D4644

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Sample ID | DS1 RC2 |
| Tested By: | C. Oost |
| Date Tested: | 6-Aug-16 |

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 64.9 |
| Average Water Temperature ('C) | 23.1 |
| Insitu Moisture Content (%) | 4.9 |
| Fragment Type | 2 |



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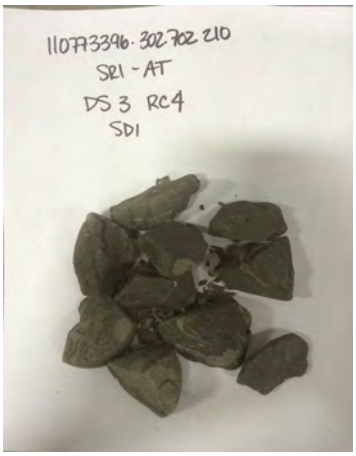
# Slake Durability Index

ASTM D4644

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Sample ID | DS3 RC4 |
| Tested By: | C. Oost |
| Date Tested: | 18-Aug-16 |

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 95.4 |
| Average Water Temperature ('C) | 23 |
| Insitu Moisture Content (%) | 3.0 |
| Fragment Type | 1 |



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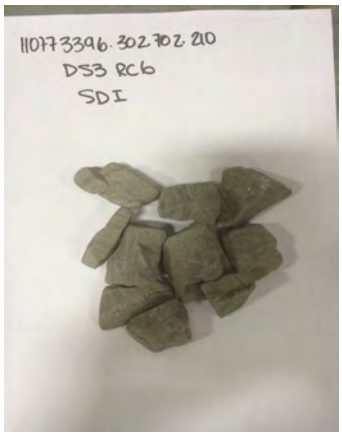
# Slake Durability Index

ASTM D4644

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Sample ID | DS3 RC6 |
| Tested By: | C. Oost |
| Date Tested: | 15-Aug-16 |

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 91.5 |
| Average Water Temperature ('C) | 23.2 |
| Insitu Moisture Content (%) | 4.5 |
| Fragment Type | 1 |



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# Slake Durability Index

ASTM D4644

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Sample ID | DS5 RC4 |
| Tested By: | C. Oost |
| Date Tested: | 10-Aug-16 |

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 0 |
| Average Water Temperature ('C) | 22.4 |
| Insitu Moisture Content (%) | 8.9 |
| Fragment Type | N/A |

No photo taken as no sample remains after second tumble



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# Slake Durability Index

ASTM D4644

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210
Sample ID DS5 RC4
Tested By: C. Oost
Date Tested: 10-Aug-16

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 100 |
| Average Water Temperature ('C) | 22.4 |
| Insitu Moisture Content (%) | 8.9 |
| Fragment Type | N/A |

No photo taken as no sample remains after second tumble



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# Slake Durability Index

ASTM D4644

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210
Sample ID DS6 RC27
Tested By: C. Oost
Date Tested: 22-Aug-16

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 31 |
| Average Water Temperature ('C) | 22.4 |
| Insitu Moisture Content (%) | 3.9 |
| Fragment Type | 2 |




Reviewed by:

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# Slake Durability Index

ASTM D4644

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Sample ID | DS7A-RC13 |
| Tested By: | C.Tollifson |
| Date Tested: | 5/6/2016 |

| | |
|---|---|
| Slake Durability Index - $I_d$(2) | 40.3 |
| Average Water Temperature ('C) | 22.0 |
| Insitu Moisture Content (%) | 14.8 |
| Fragment Type | 3 |

Type 3 - sample is exclusively small fragments



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# Slake Durability Index

ASTM D4644

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Sample ID | DS7A-RC16 |
| Tested By: | C.Tollifson |
| Date Tested: | 5/5/2016 |

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 96.6 |
| Average Water Temperature ('C) | 22.2 |
| Insitu Moisture Content (%) | 5.1 |
| Fragment Type | 1 |

Type I - sample remained virtually unchanged



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# Slake Durability Index

ASTM D4644

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210
Sample ID DS8-RC44
Tested By: C.Tollifson
Date Tested: 5/2/2016

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 97.8 |
| Average Water Temperature ('C) | 21.2 |
| Insitu Moisture Content (%) | 3.8 |
| Fragment Type | 1 |

Type I - sample remained virtually unchanged



Reviewed by:

# E. 2
## Floodplain Berm

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Date Received: | March 25, 2016 |
| Date Tested: | April 24, 2016 |
| Tested By: | C.Tollifson |


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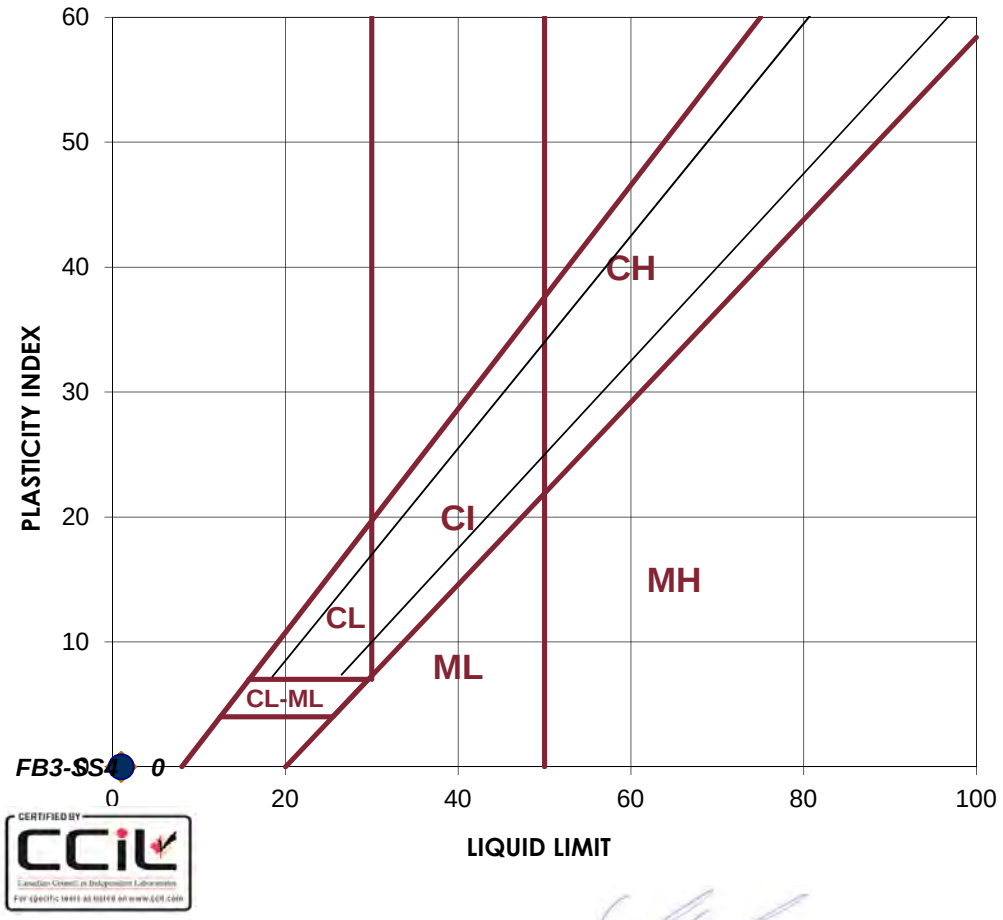
| Sample: | | | Sample: | |
|---|---|---|---|---|
| FB3-SS4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Number of Blows | | |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| | | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | | | LL | |
| PL | | | PL | |
| PI | | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| NON-PLASTIC | | | NON-PLASTIC | |

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Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Date Received: | March 23, 2016 |
| Date Tested: | April 24, 2016 |
| Tested By: | C.Tollifson |


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**LABORATORY**
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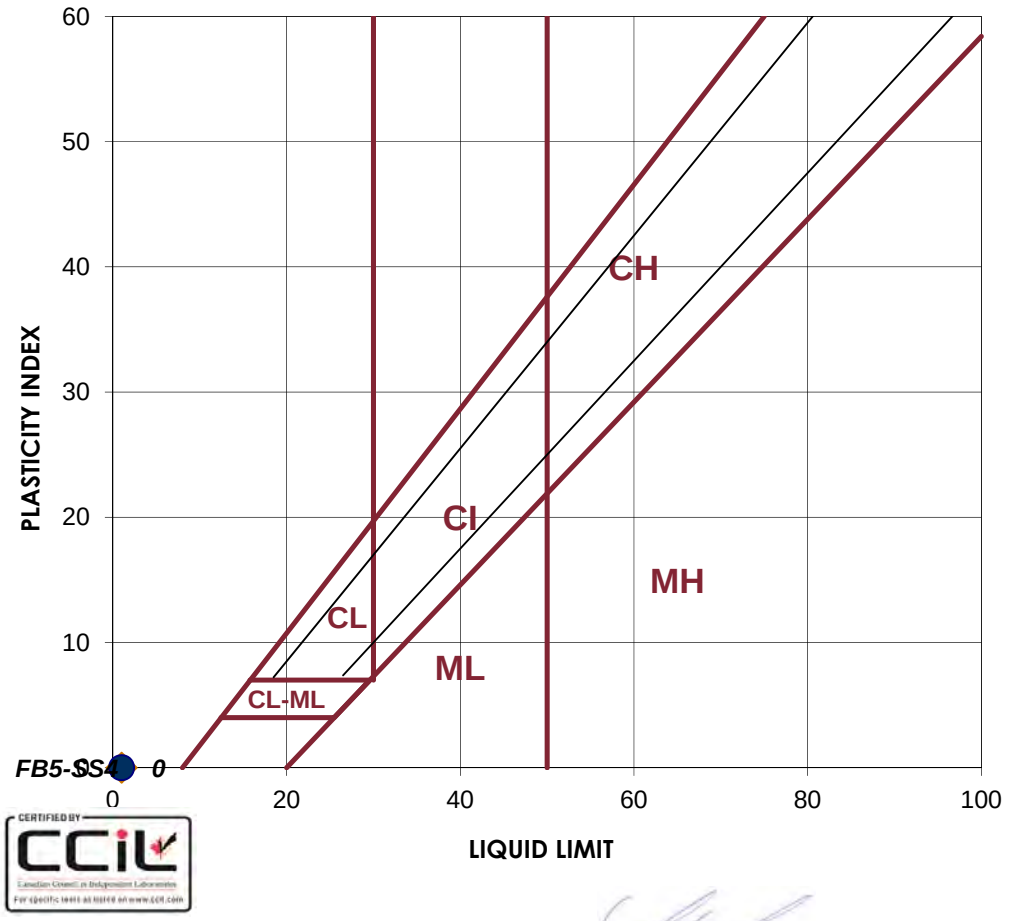
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| FB5-SS4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Number of Blows | | |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| | | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | | | LL | |
| PL | | | PL | |
| PI | | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***NON-PLASTIC*** | | | ***NON-PLASTIC*** | |

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Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Date Received: | March 22, 2016 |
| Date Tested: | April 24, 2016 |
| Tested By: | C.Tollifson |


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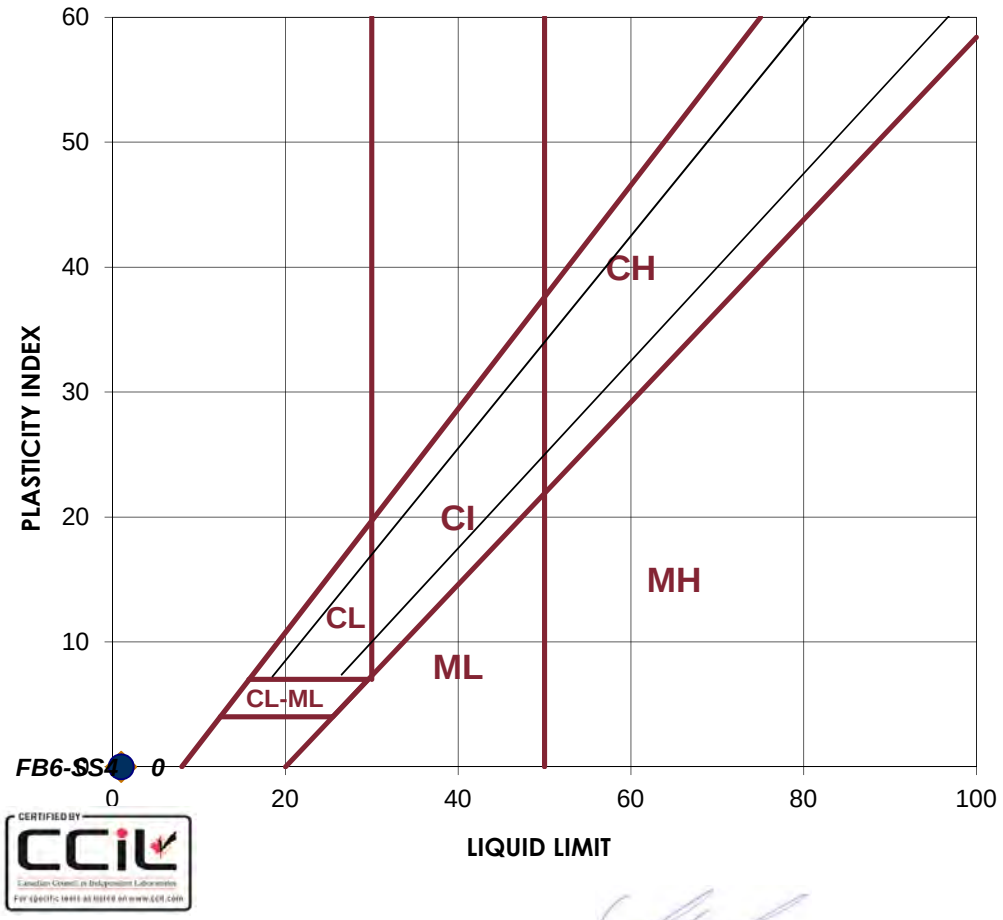
| Sample: FB6-SS4 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Number of Blows | | |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| | | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | | | LL | |
| PL | | | PL | |
| PI | | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***NON-PLASTIC*** | | | ***NON-PLASTIC*** | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.210 |
| Date Received: | March 22, 2016 |
| Date Tested: | April 24, 2016 |
| Tested By: | C.Tollifson |


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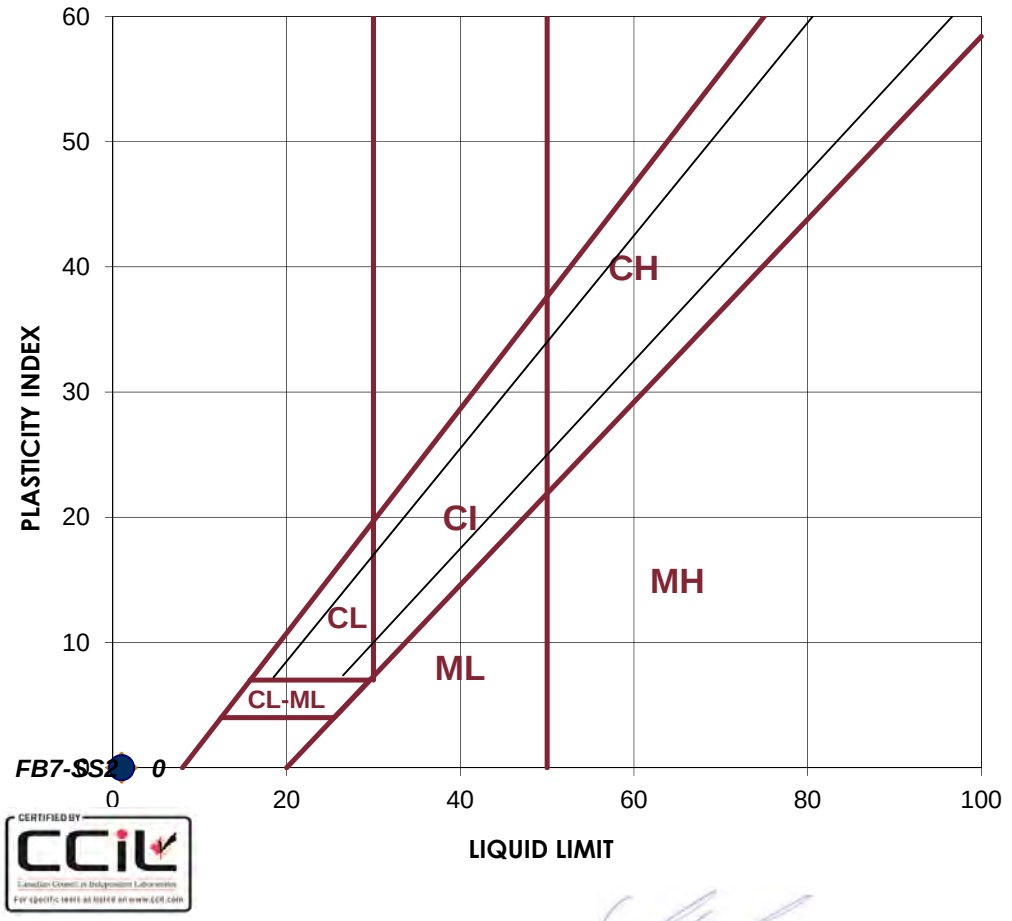
| Sample: | | | Sample: | |
|---|---|---|---|---|
| FB7-SS2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Number of Blows | | |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| | | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | | | LL | |
| PL | | | PL | |
| PI | | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***NON-PLASTIC*** | | | ***NON-PLASTIC*** | |

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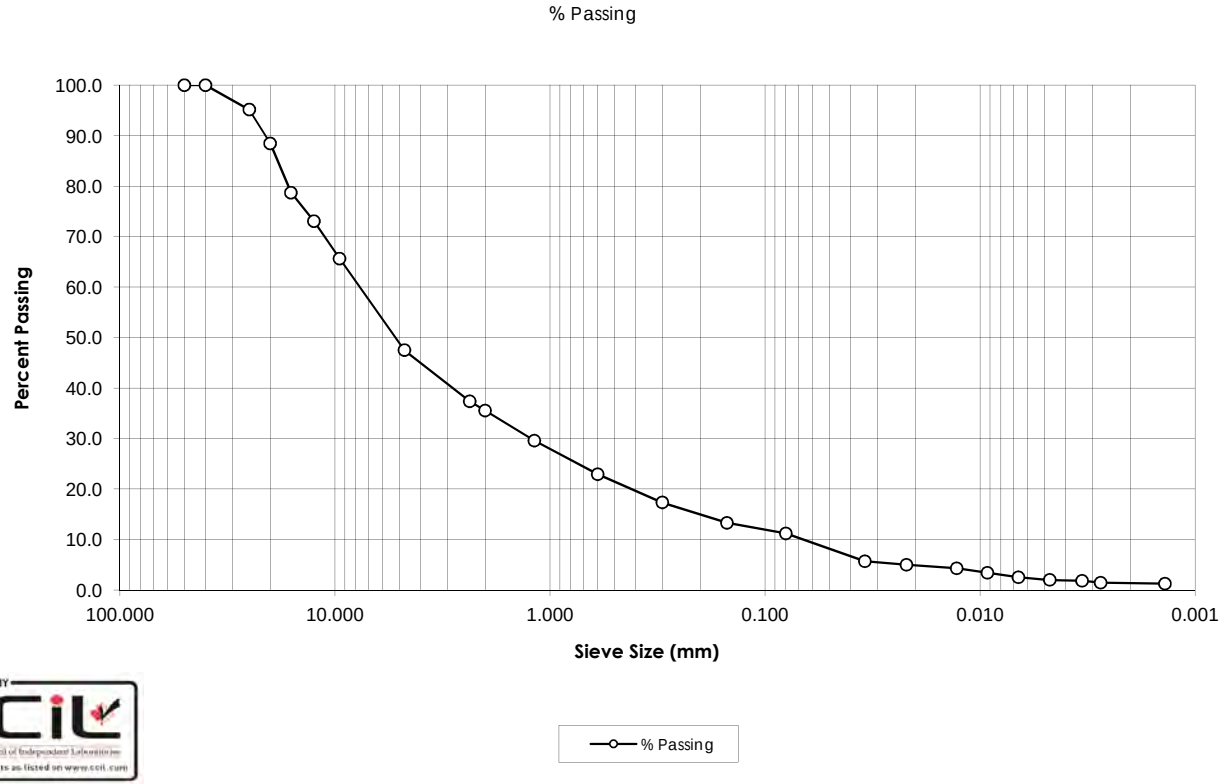
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210

SAMPLE No.: SS4
SOURCE: FB3
TESTED BY: C. Tollifson

DATE TESTED: April 25, 2016
DATE RECEIVED: March 25, 2016
SAMPLE DESCRIPTION: Gravel and Sand, Some Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0066 | 2.5 |
| 40.0 | 100.0 | 0.0047 | 2.0 |
| 25.0 | 95.1 | 0.0033 | 1.8 |
| 20.0 | 88.5 | 0.0028 | 1.5 |
| 16.0 | 78.7 | 0.0014 | 1.3 |
| 12.5 | 73.0 | | |
| 9.5 | 65.6 | | |
| 4.75 | 47.5 | | |
| 2.36 | 37.4 | | |
| 2.00 | 35.5 | | |
| 1.18 | 29.6 | | |
| 0.600 | 22.9 | | |
| 0.300 | 17.3 | | |
| 0.150 | 13.3 | | |
| 0.080 | 11.2 | | |
| 0.0343 | 5.7 | | |
| 0.0219 | 5.0 | | |
| 0.0128 | 4.3 | | |
| 0.0092 | 3.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 52.5% | $D_{10}$: | 0.0723 |
| Sand: | 36.3% | $D_{30}$: | 1.2450 |
| Silt: | 9.8% | $D_{60}$: | 8.1834 |
| Clay: | 1.4% | $C_u$: | 113.21 |
| | | $C_c$: | 2.62 |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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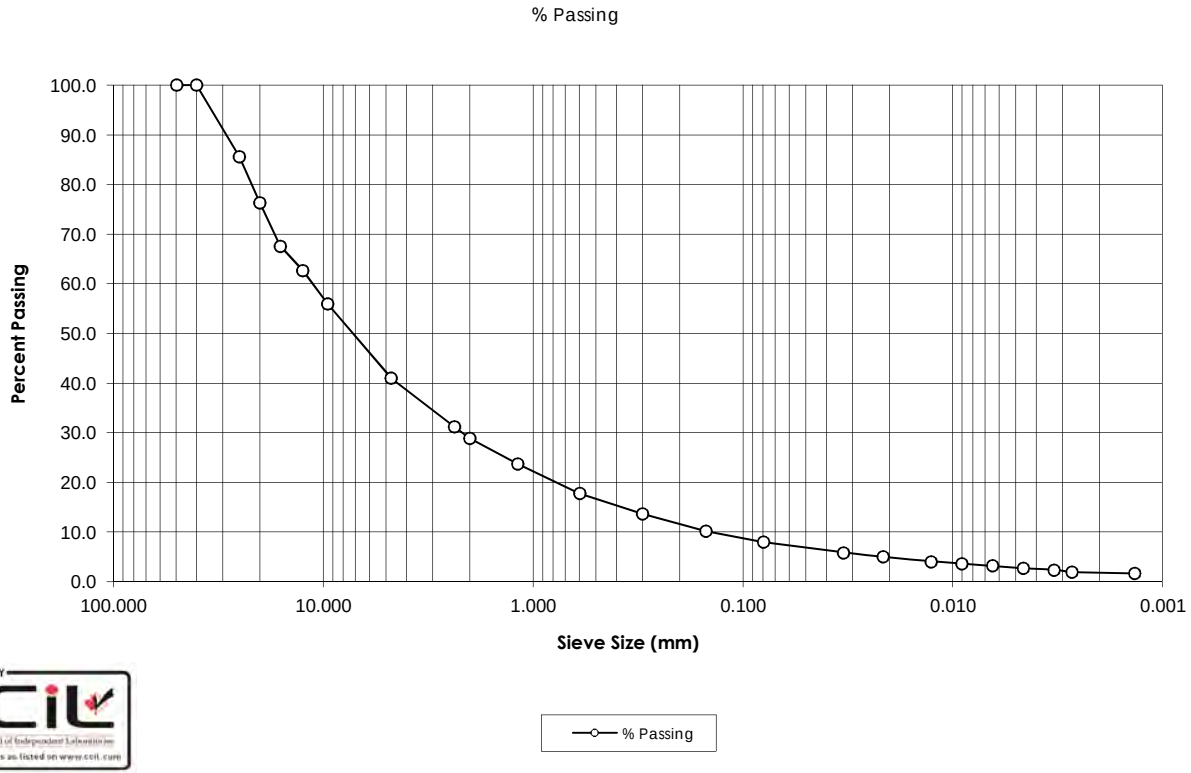
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210

SAMPLE No.: SS4
SOURCE: FB5
TESTED BY: C. Tollifson

DATE TESTED: April 25, 2016
DATE RECEIVED: March 23, 2016
SAMPLE DESCRIPTION: Sandy Gravel, Trace Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0065 | 3.2 |
| 40.0 | 100.0 | 0.0046 | 2.7 |
| 25.0 | 85.6 | 0.0033 | 2.4 |
| 20.0 | 76.3 | 0.0027 | 2.0 |
| 16.0 | 67.5 | 0.0014 | 1.7 |
| 12.5 | 62.7 | | |
| 9.5 | 55.9 | | |
| 4.75 | 41.0 | | |
| 2.36 | 31.2 | | |
| 2.00 | 28.9 | | |
| 1.18 | 23.8 | | |
| 0.600 | 17.8 | | |
| 0.300 | 13.6 | | |
| 0.150 | 10.2 | | |
| 0.080 | 8.0 | | |
| 0.0332 | 5.9 | | |
| 0.0214 | 5.0 | | |
| 0.0127 | 4.1 | | |
| 0.0090 | 3.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 59.0% | $D_{10}$: | 0.1441 |
| Sand: | 33.1% | $D_{30}$: | 2.1804 |
| Silt: | 6.1% | $D_{60}$: | 11.3526 |
| Clay: | 1.9% | $C_u$: | 78.78 |
| | | $C_c$: | 2.91 |

**Comments:** Sample Description (MUSCS) derived from Atterberg and Grain Size test results.



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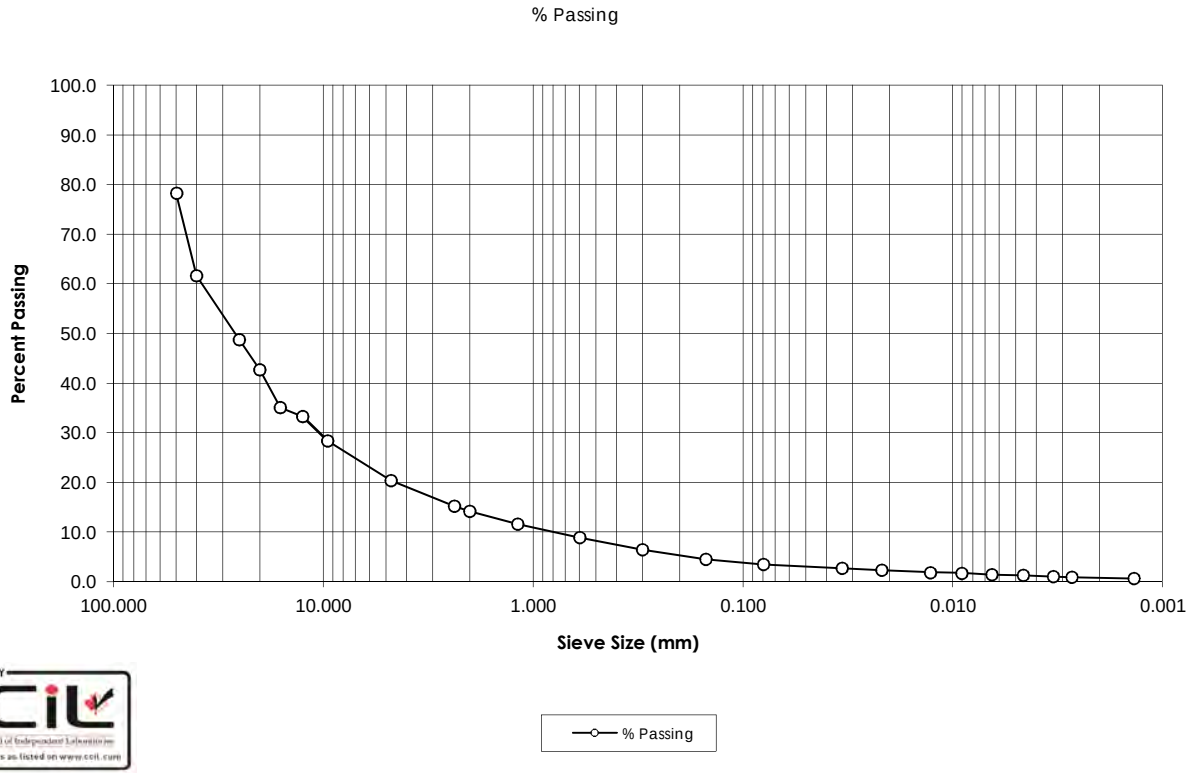
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210

SAMPLE No.: SS4
SOURCE: FB6
TESTED BY: C. Tollifson

DATE TESTED: April 25, 2016
DATE RECEIVED: March 22, 2016
SAMPLE DESCRIPTION: Gravel, Some Sand, Trace Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 78.3 | 0.0065 | 1.5 |
| 40.0 | 61.6 | 0.0046 | 1.3 |
| 25.0 | 48.7 | 0.0033 | 1.1 |
| 20.0 | 42.7 | 0.0027 | 0.9 |
| 16.0 | 35.1 | 0.0014 | 0.7 |
| 12.5 | 33.3 | | |
| 9.5 | 28.4 | | |
| 4.75 | 20.4 | | |
| 2.36 | 15.2 | | |
| 2.00 | 14.2 | | |
| 1.18 | 11.6 | | |
| 0.600 | 8.9 | | |
| 0.300 | 6.5 | | |
| 0.150 | 4.5 | | |
| 0.080 | 3.5 | | |
| 0.0336 | 2.7 | | |
| 0.0217 | 2.3 | | |
| 0.0128 | 1.9 | | |
| 0.0091 | 1.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 79.6% | $D_{10}$: | 0.8475 |
| Sand: | 17.0% | $D_{30}$: | 10.5608 |
| Silt: | 2.6% | $D_{60}$: | 31.5831 |
| Clay: | 0.8% | $C_u$: | 37.27 |
| | | $C_c$: | 4.17 |

**Comments:** Sample Description (MUSCS) derived from Atterberg and Grain Size test results.

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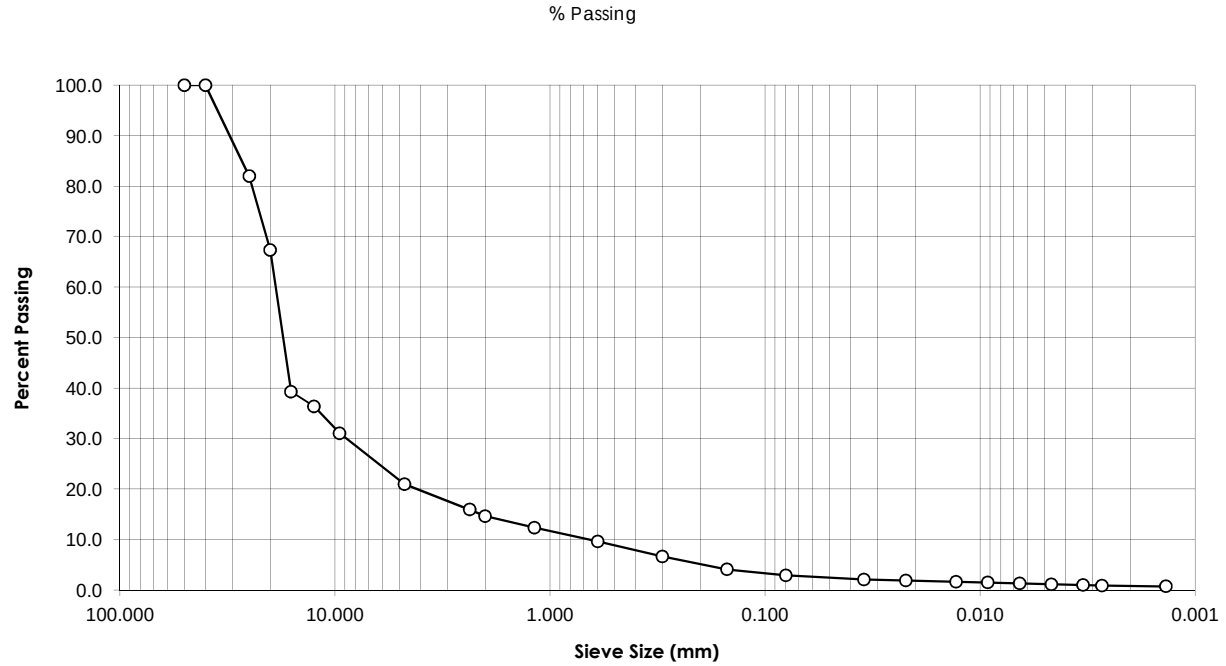
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.210

SAMPLE No.: SS2
SOURCE: FB7
TESTED BY: C. Tollifson

DATE TESTED: April 25, 2016
DATE RECEIVED: March 22, 2016
SAMPLE DESCRIPTION: Gravel, Some Sand, Trace Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0065 | 1.3 |
| 40.0 | 100.0 | 0.0046 | 1.1 |
| 25.0 | 82.0 | 0.0033 | 1.0 |
| 20.0 | 67.3 | 0.0027 | 0.9 |
| 16.0 | 39.3 | 0.0014 | 0.7 |
| 12.5 | 36.4 | | |
| 9.5 | 31.1 | | |
| 4.75 | 21.0 | | |
| 2.36 | 15.9 | | |
| 2.00 | 14.6 | | |
| 1.18 | 12.3 | | |
| 0.600 | 9.6 | | |
| 0.300 | 6.7 | | |
| 0.150 | 4.1 | | |
| 0.080 | 2.9 | | |
| 0.0347 | 2.1 | | |
| 0.0221 | 1.9 | | |
| 0.0129 | 1.6 | | |
| 0.0092 | 1.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 79.0% | $D_{10}$: | 0.6912 |
| Sand: | 18.1% | $D_{30}$: | 9.0790 |
| Silt: | 2.1% | $D_{60}$: | 19.1450 |
| Clay: | 0.8% | $C_u$: | 27.70 |
| | | $C_c$: | 6.23 |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C. Oost |
| Project Name | SR1 | Date Tested | 21-Jul-16 |
| Project Number | 110773396.302.702.210 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | FB6 | **Sample ID:** | RC10 |
| **Depth (m):** | 21.1 | **Moisture Conent (%):** | 1.2 |
| **Sample Diameter (cm):** | 6.05 | **Sample Weight (g):** | 984.9 |
| **Load Rate (MPa/sec):** | 0.85 | **Sample Length (cm):** | 13.37 |
| **Peak Load (kN):** | 89.67 | **Unit Weight (kg/m3):** | 2562 |
| **Compressive Stregth (MPa):** | 31.2 | | |



Reviewed by: _____

# E. 3
## Diversion Channel

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 9, 2016 |
| Date Tested: | April 25, 2016 |
| Tested By: | C. Tollifson |


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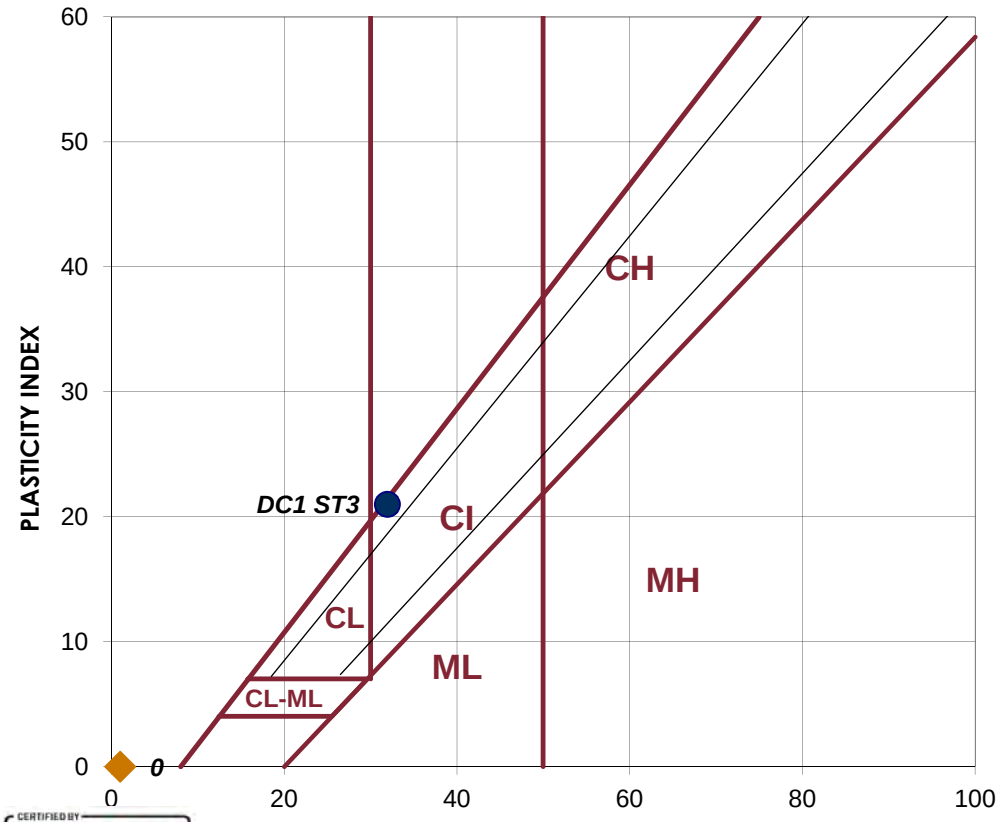
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC1 ST3 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | | |
| | | Container Number | | |
| 28.52 | 28.47 | Wt. Sample (wet+tare)(g) | | |
| 21.91 | 21.94 | Wt. Sample (dry+tare)(g) | | |
| 1.30 | 1.50 | Wt. Tare (g) | | |
| 20.6 | 20.4 | Wt. Dry Soil (g) | | |
| 6.6 | 6.5 | Wt. Water (g) | | |
| 32.1% | 31.9% | Water Content (%) | | |
| 32.1% | 31.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 10.81 | 11.86 | Wt. Sample (wet+tare)(g) | | |
| 9.82 | 10.82 | Wt. Sample (dry+tare)(g) | | |
| 1.31 | 1.55 | Wt. Tare (g) | | |
| 8.5 | 9.3 | Wt. Dry Soil (g) | | |
| 1.0 | 1.0 | Wt. Water (g) | | |
| 11.6% | 11.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | |
| PL | 11 | | PL | |
| PI | 21 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 9, 2016 |
| Date Tested: | April 24, 2016 |
| Tested By: | C.Tollifson |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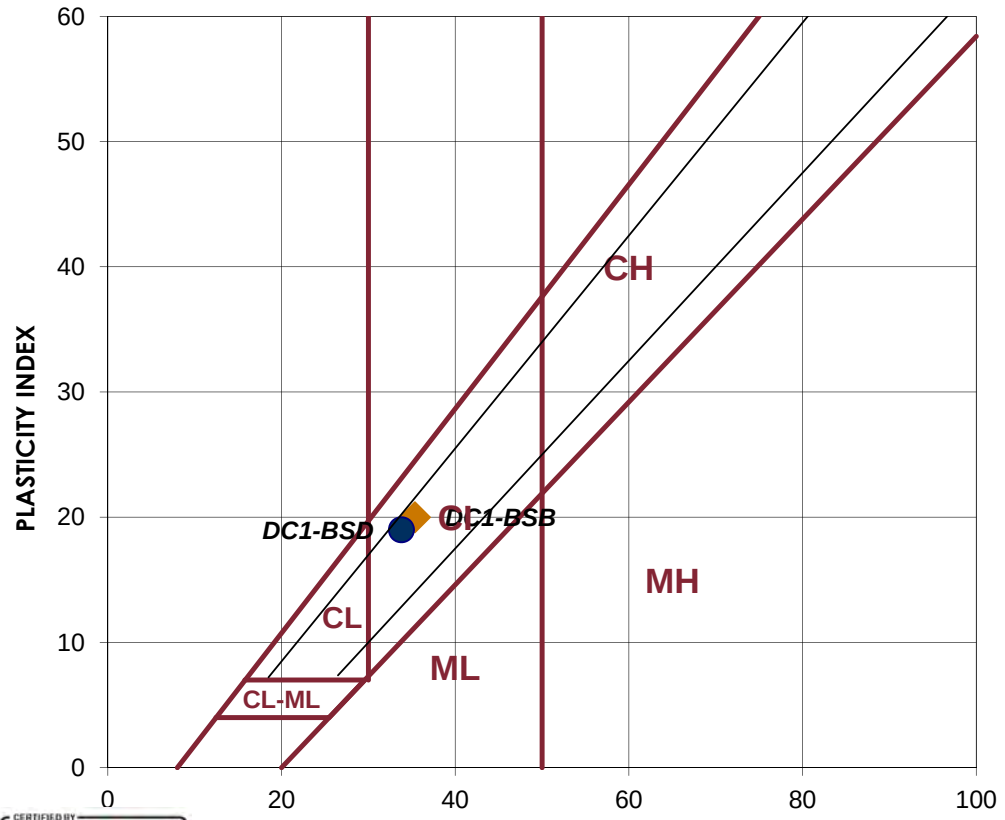
| Sample: DC1-BSD | | | Sample: DC1-BSB | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 20 | 21 | Number of Blows | 30 | 30 |
| | | Container Number | | |
| 31.31 | 27.47 | Wt. Sample (wet+tare)(g) | 31.02 | 28.69 |
| 23.55 | 20.77 | Wt. Sample (dry+tare)(g) | 23.43 | 21.63 |
| 1.20 | 1.36 | Wt. Tare (g) | 1.48 | 1.21 |
| 22.4 | 19.4 | Wt. Dry Soil (g) | 22.0 | 20.4 |
| 7.8 | 6.7 | Wt. Water (g) | 7.6 | 7.1 |
| 34.7% | 34.5% | Water Content (%) | 34.6% | 34.6% |
| 33.8% | 33.8% | Corrected Water Content (%) | 35.3% | 35.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.03 | 14.23 | Wt. Sample (wet+tare)(g) | 12.16 | 11.44 |
| 10.62 | 12.53 | Wt. Sample (dry+tare)(g) | 10.7 | 10.14 |
| 1.41 | 1.5 | Wt. Tare (g) | 1.54 | 1.31 |
| 9.2 | 11.0 | Wt. Dry Soil (g) | 9.2 | 8.8 |
| 1.4 | 1.7 | Wt. Water (g) | 1.5 | 1.3 |
| 15.3% | 15.4% | Water Content (%) | 15.9% | 14.7% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 34 | | LL | 35 |
| PL | 15 | | PL | 15 |
| PI | 19 | | PI | 20 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 12, 2016 |
| Date Tested: | April 23, 2016 |
| Tested By: | C.Tollifson |


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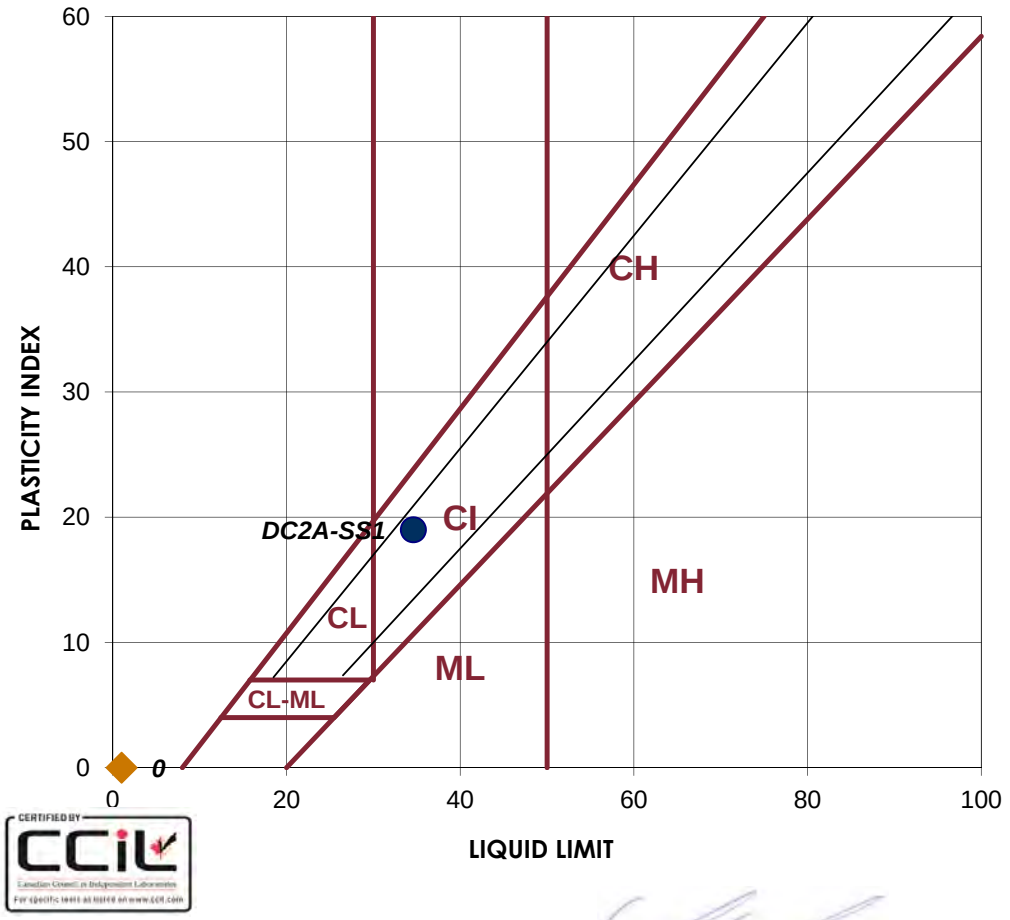
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC2A-SS1 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 27 | Number of Blows | | |
| | | Container Number | | |
| 32.59 | 29.20 | Wt. Sample (wet+tare)(g) | | |
| 24.62 | 22.18 | Wt. Sample (dry+tare)(g) | | |
| 1.20 | 1.67 | Wt. Tare (g) | | |
| 23.4 | 20.5 | Wt. Dry Soil (g) | | |
| 8.0 | 7.0 | Wt. Water (g) | | |
| 34.0% | 34.2% | Water Content (%) | | |
| 34.6% | 34.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.09 | 12.67 | Wt. Sample (wet+tare)(g) | | |
| 11.45 | 11.14 | Wt. Sample (dry+tare)(g) | | |
| 1.31 | 1.51 | Wt. Tare (g) | | |
| 10.1 | 9.6 | Wt. Dry Soil (g) | | |
| 1.6 | 1.5 | Wt. Water (g) | | |
| 16.2% | 15.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 16 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 7, 2016 |
| Date Tested: | April 23, 2016 |
| Tested By: | C.Tollifson |


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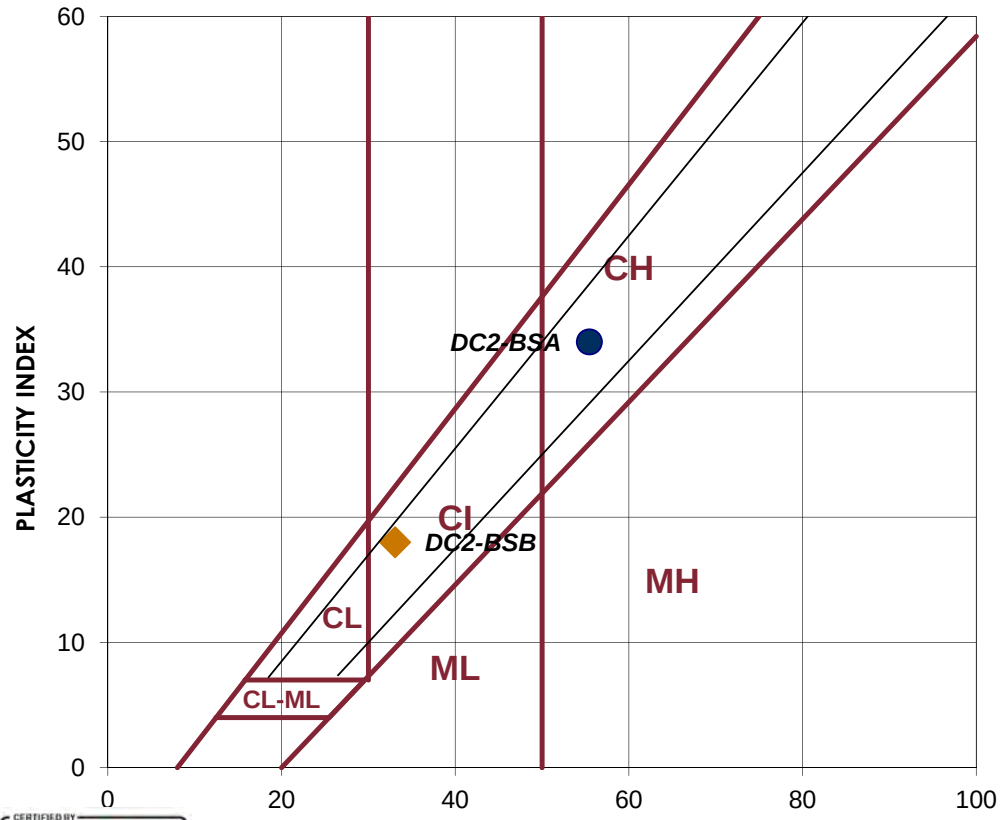
| Sample: DC2-BSA | | | Sample: DC2-BSB | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | 21 | 23 |
| | | Container Number | | |
| 31.96 | 29.77 | Wt. Sample (wet+tare)(g) | 33.43 | 27.57 |
| 21.05 | 19.65 | Wt. Sample (dry+tare)(g) | 25.40 | 21.00 |
| 1.45 | 1.41 | Wt. Tare (g) | 1.54 | 1.40 |
| 19.6 | 18.2 | Wt. Dry Soil (g) | 23.9 | 19.6 |
| 10.9 | 10.1 | Wt. Water (g) | 8.0 | 6.6 |
| 55.7% | 55.5% | Water Content (%) | 33.7% | 33.5% |
| 55.7% | 55.2% | Corrected Water Content (%) | 33.0% | 33.2% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.14 | 9.89 | Wt. Sample (wet+tare)(g) | 14.97 | 14.84 |
| 11.11 | 8.43 | Wt. Sample (dry+tare)(g) | 13.16 | 13.1 |
| 1.58 | 1.45 | Wt. Tare (g) | 1.24 | 1.62 |
| 9.5 | 7.0 | Wt. Dry Soil (g) | 11.9 | 11.5 |
| 2.0 | 1.5 | Wt. Water (g) | 1.8 | 1.7 |
| 21.3% | 20.9% | Water Content (%) | 15.2% | 15.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 55 | | LL | 33 |
| PL | 21 | | PL | 15 |
| PI | 34 | | PI | 18 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CI | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 12, 2016 |
| Date Tested: | May 3, 2016 |
| Tested By: | C.Tollifson |


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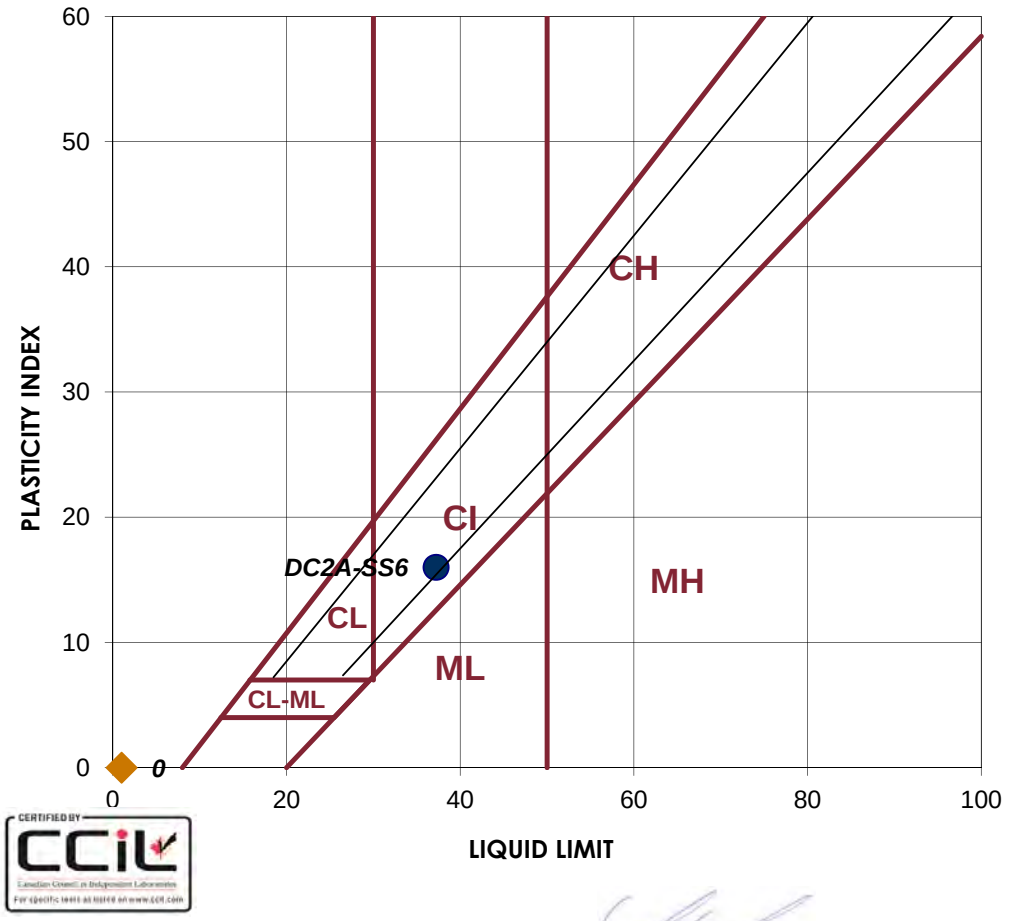
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC2A-SS6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 20 | 21 | Number of Blows | | |
| | | Container Number | | |
| 31.84 | 27.39 | Wt. Sample (wet+tare)(g) | | |
| 23.50 | 20.15 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.25 | Wt. Tare (g) | | |
| 22.0 | 18.9 | Wt. Dry Soil (g) | | |
| 8.3 | 7.2 | Wt. Water (g) | | |
| 37.9% | 38.3% | Water Content (%) | | |
| 36.9% | 37.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.08 | 14.6 | Wt. Sample (wet+tare)(g) | | |
| 11.03 | 12.27 | Wt. Sample (dry+tare)(g) | | |
| 1.34 | 1.37 | Wt. Tare (g) | | |
| 9.7 | 10.9 | Wt. Dry Soil (g) | | |
| 2.1 | 2.3 | Wt. Water (g) | | |
| 21.2% | 21.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | |
| PL | 21 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| *CI* | | | ***NON-PLASTIC*** | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 7, 2016 |
| Date Tested: | May 2, 2016 |
| Tested By: | B. Pelkey |


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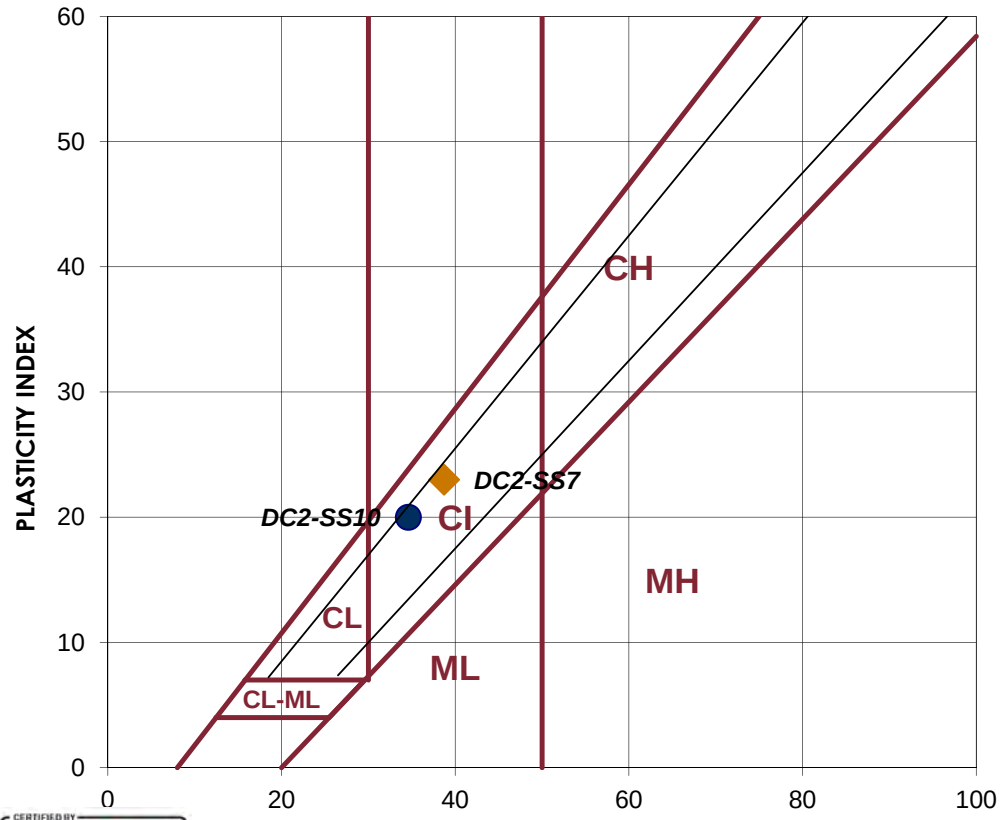
| Sample: DC2-SS10 | | | Sample: DC2-SS7 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | 28 | 27 |
| | | Container Number | | |
| 38.93 | 32.75 | Wt. Sample (wet+tare)(g) | 35.29 | 28.68 |
| 29.31 | 24.72 | Wt. Sample (dry+tare)(g) | 25.98 | 21.18 |
| 1.64 | 1.51 | Wt. Tare (g) | 1.62 | 1.61 |
| 27.7 | 23.2 | Wt. Dry Soil (g) | 24.4 | 19.6 |
| 9.6 | 8.0 | Wt. Water (g) | 9.3 | 7.5 |
| 34.8% | 34.6% | Water Content (%) | 38.2% | 38.3% |
| 34.8% | 34.4% | Corrected Water Content (%) | 38.7% | 38.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 14.96 | 13.93 | Wt. Sample (wet+tare)(g) | 15.77 | 16.84 |
| 13.24 | 12.32 | Wt. Sample (dry+tare)(g) | 13.84 | 14.73 |
| 1.57 | 1.51 | Wt. Tare (g) | 1.47 | 1.26 |
| 11.7 | 10.8 | Wt. Dry Soil (g) | 12.4 | 13.5 |
| 1.7 | 1.6 | Wt. Water (g) | 1.9 | 2.1 |
| 14.7% | 14.9% | Water Content (%) | 15.6% | 15.7% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | 39 |
| PL | 15 | | PL | 16 |
| PI | 20 | | PI | 23 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 12, 2016 |
| Date Tested: | April 24, 2016 |
| Tested By: | C.Tollifson |


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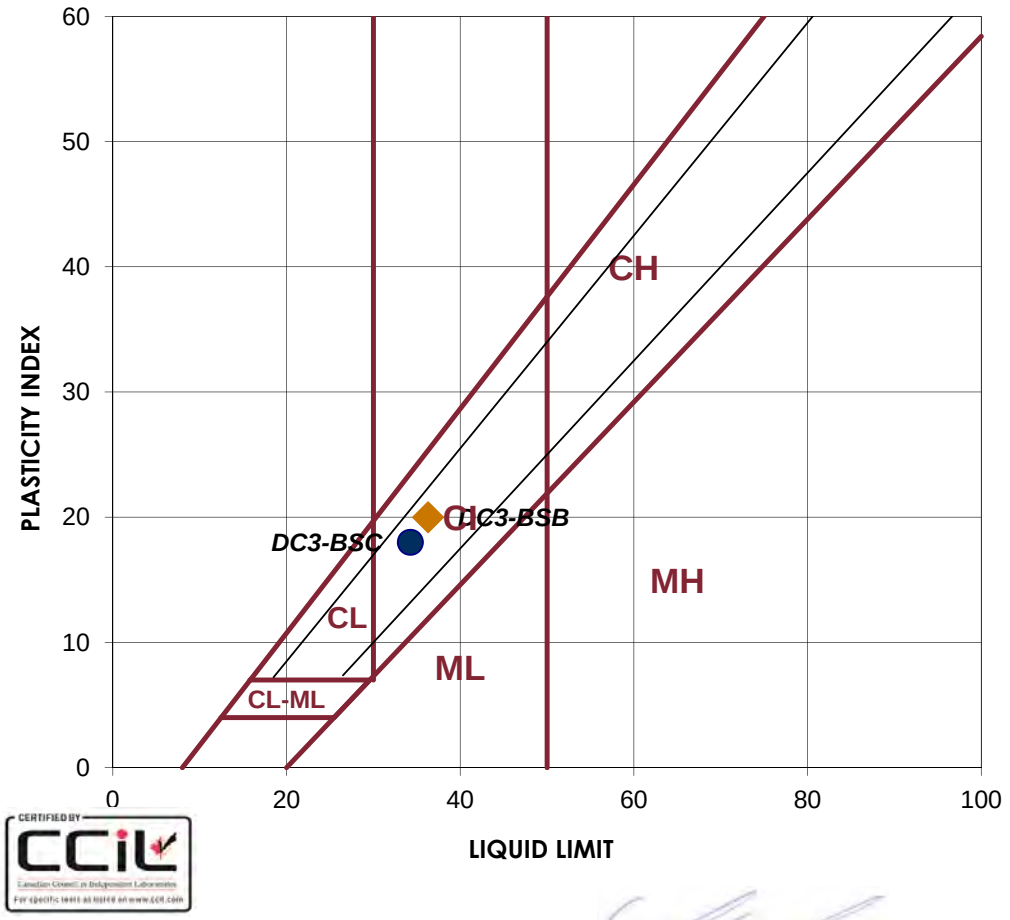
| Sample: DC3-BSC | | | Sample: DC3-BSB | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 20 | Number of Blows | 21 | 23 |
| | | Container Number | | |
| 31.30 | 31.03 | Wt. Sample (wet+tare)(g) | 26.55 | 28.96 |
| 23.60 | 23.32 | Wt. Sample (dry+tare)(g) | 19.74 | 21.62 |
| 1.66 | 1.33 | Wt. Tare (g) | 1.31 | 1.66 |
| 21.9 | 22.0 | Wt. Dry Soil (g) | 18.4 | 20.0 |
| 7.7 | 7.7 | Wt. Water (g) | 6.8 | 7.3 |
| 35.1% | 35.1% | Water Content (%) | 37.0% | 36.8% |
| 34.4% | 34.1% | Corrected Water Content (%) | 36.2% | 36.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.93 | 14.45 | Wt. Sample (wet+tare)(g) | 12.14 | 13.8 |
| 12.16 | 12.68 | Wt. Sample (dry+tare)(g) | 10.67 | 12.11 |
| 1.21 | 1.61 | Wt. Tare (g) | 1.58 | 1.57 |
| 11.0 | 11.1 | Wt. Dry Soil (g) | 9.1 | 10.5 |
| 1.8 | 1.8 | Wt. Water (g) | 1.5 | 1.7 |
| 16.2% | 16.0% | Water Content (%) | 16.2% | 16.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 34 | | LL | 36 |
| PL | 16 | | PL | 16 |
| PI | 18 | | PI | 20 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 12, 2016 |
| Date Tested: | April 24, 2016 |
| Tested By: | C.Tollifson |


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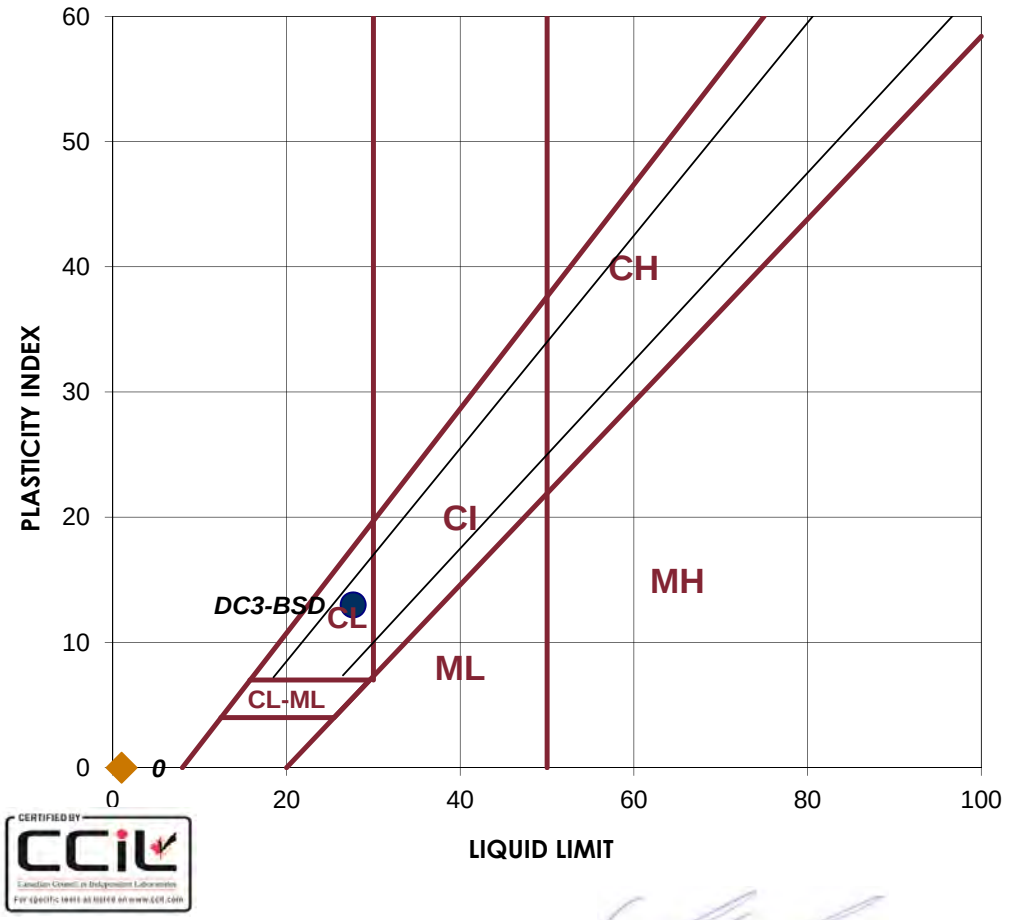
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC3-BSD | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 28 | Number of Blows | | |
| | | Container Number | | |
| 38.07 | 37.89 | Wt. Sample (wet+tare)(g) | | |
| 30.27 | 30.11 | Wt. Sample (dry+tare)(g) | | |
| 1.63 | 1.54 | Wt. Tare (g) | | |
| 28.6 | 28.6 | Wt. Dry Soil (g) | | |
| 7.8 | 7.8 | Wt. Water (g) | | |
| 27.2% | 27.2% | Water Content (%) | | |
| 27.7% | 27.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 15.25 | 14.21 | Wt. Sample (wet+tare)(g) | | |
| 13.46 | 12.53 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.37 | Wt. Tare (g) | | |
| 12.0 | 11.2 | Wt. Dry Soil (g) | | |
| 1.8 | 1.7 | Wt. Water (g) | | |
| 15.0% | 15.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 28 | | LL | |
| PL | 15 | | PL | |
| PI | 13 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 15, 2016 |
| Date Tested: | May 19, 2016 |
| Tested By: | C. Small |


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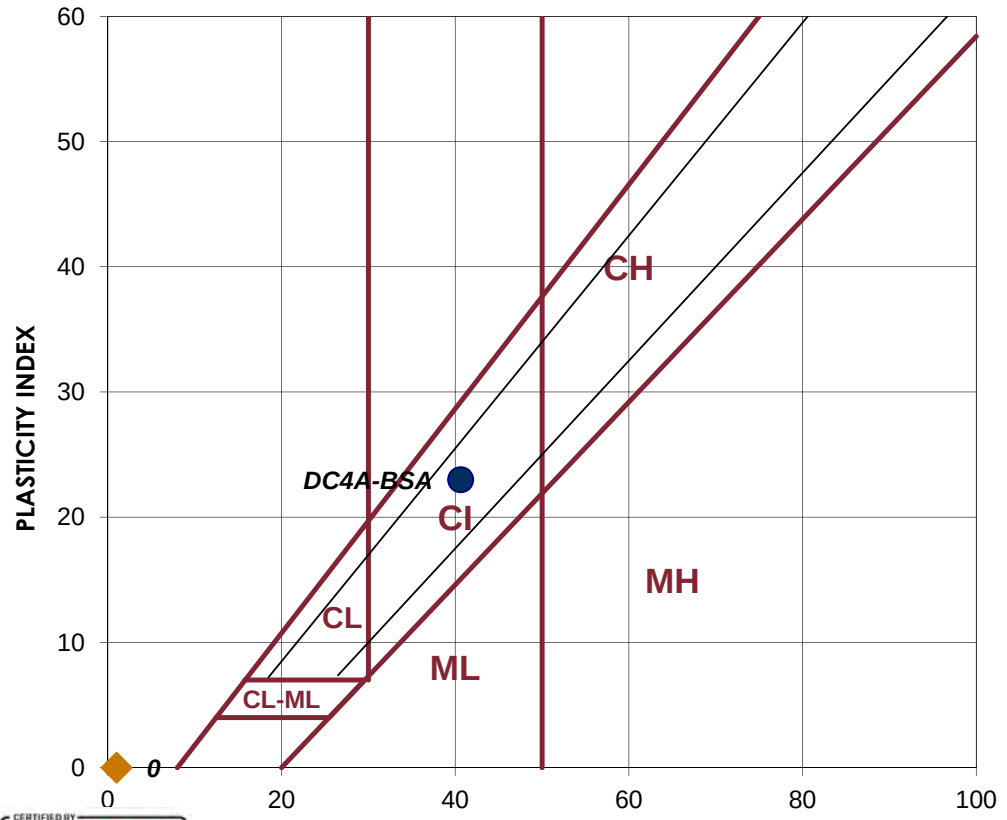
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC4A-BSA | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | | |
| | | Container Number | | |
| 23.09 | 23.44 | Wt. Sample (wet+tare)(g) | | |
| 16.76 | 16.98 | Wt. Sample (dry+tare)(g) | | |
| 1.44 | 1.29 | Wt. Tare (g) | | |
| 15.3 | 15.7 | Wt. Dry Soil (g) | | |
| 6.3 | 6.5 | Wt. Water (g) | | |
| 41.3% | 41.2% | Water Content (%) | | |
| 40.7% | 40.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.13 | 9.51 | Wt. Sample (wet+tare)(g) | | |
| 7.98 | 8.35 | Wt. Sample (dry+tare)(g) | | |
| 1.46 | 1.67 | Wt. Tare (g) | | |
| 6.5 | 6.7 | Wt. Dry Soil (g) | | |
| 1.2 | 1.2 | Wt. Water (g) | | |
| 17.6% | 17.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 41 | | LL | |
| PL | 18 | | PL | |
| PI | 23 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 15, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | C. Oost |


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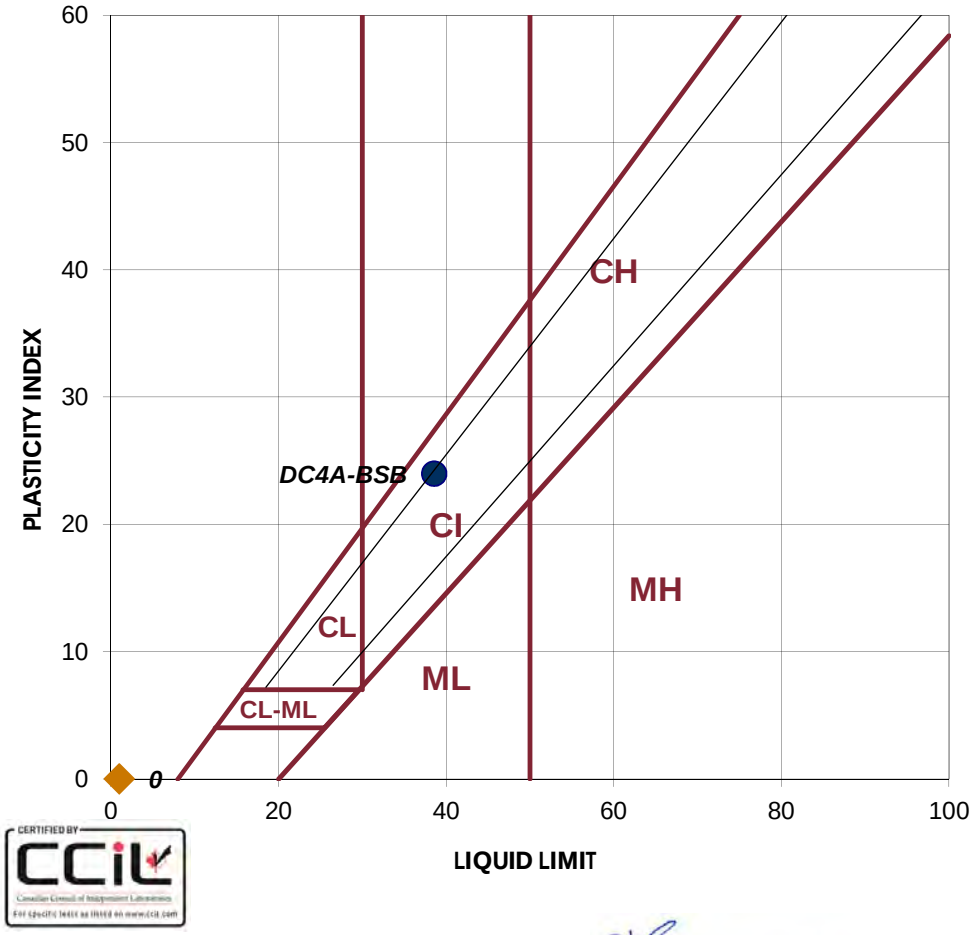
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC4A-BSB | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 22 | Number of Blows | | |
| | | Container Number | | |
| 13.52 | 13.98 | Wt. Sample (wet+tare)(g) | | |
| 10.08 | 10.39 | Wt. Sample (dry+tare)(g) | | |
| 1.29 | 1.16 | Wt. Tare (g) | | |
| 8.8 | 9.2 | Wt. Dry Soil (g) | | |
| 3.4 | 3.6 | Wt. Water (g) | | |
| 39.1% | 38.9% | Water Content (%) | | |
| 38.7% | 38.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 7.97 | 9.11 | Wt. Sample (wet+tare)(g) | | |
| 7.11 | 8.09 | Wt. Sample (dry+tare)(g) | | |
| 1.44 | 1.53 | Wt. Tare (g) | | |
| 5.7 | 6.6 | Wt. Dry Soil (g) | | |
| 0.9 | 1.0 | Wt. Water (g) | | |
| 15.2% | 15.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | |
| PL | 15 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***NON-PLASTIC*** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 14, 2016 |
| Date Tested: | April 24, 2016 |
| Tested By: | C.Tollifson |


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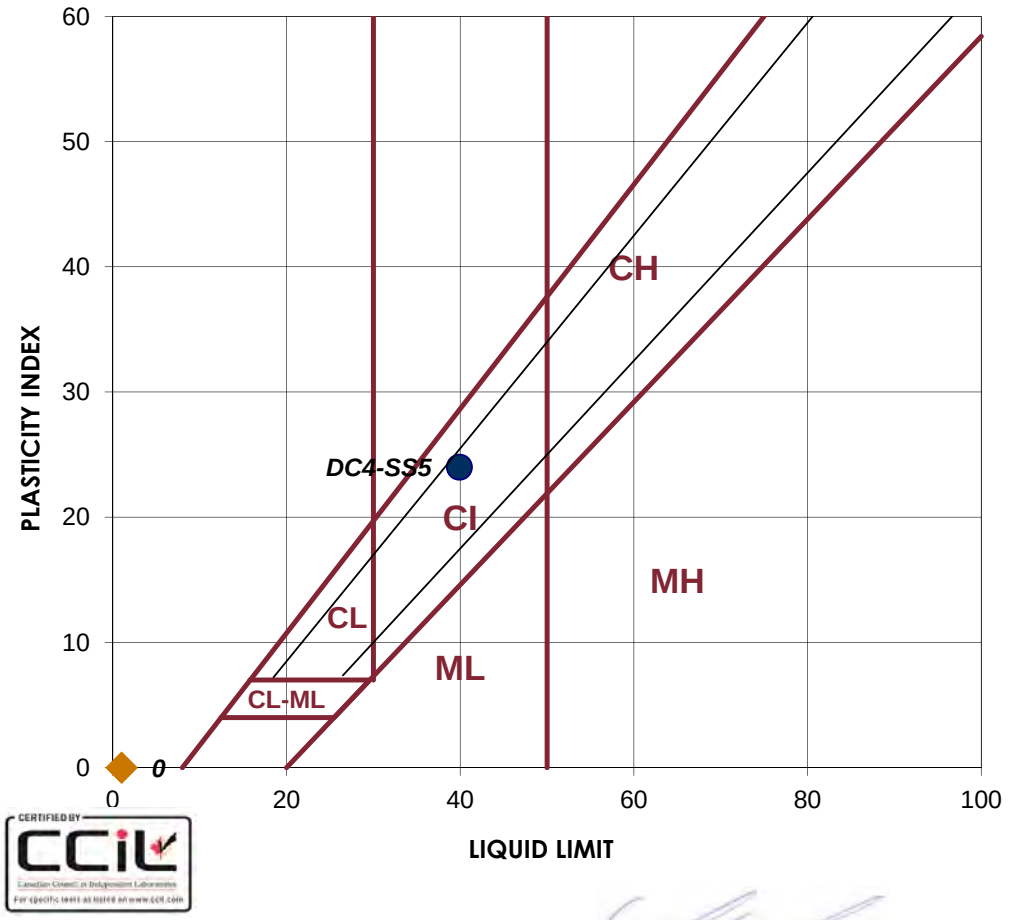
| Sample: DC4-SS5 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | | |
| | | Container Number | | |
| 25.55 | 26.72 | Wt. Sample (wet+tare)(g) | | |
| 18.61 | 19.50 | Wt. Sample (dry+tare)(g) | | |
| 1.23 | 1.39 | Wt. Tare (g) | | |
| 17.4 | 18.1 | Wt. Dry Soil (g) | | |
| 6.9 | 7.2 | Wt. Water (g) | | |
| 39.9% | 39.9% | Water Content (%) | | |
| 39.9% | 39.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.11 | 8.97 | Wt. Sample (wet+tare)(g) | | |
| 11.45 | 7.95 | Wt. Sample (dry+tare)(g) | | |
| 1.56 | 1.61 | Wt. Tare (g) | | |
| 9.9 | 6.3 | Wt. Dry Soil (g) | | |
| 1.7 | 1.0 | Wt. Water (g) | | |
| 16.8% | 16.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 40 | | LL | |
| PL | 16 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 14, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | C. Oost |


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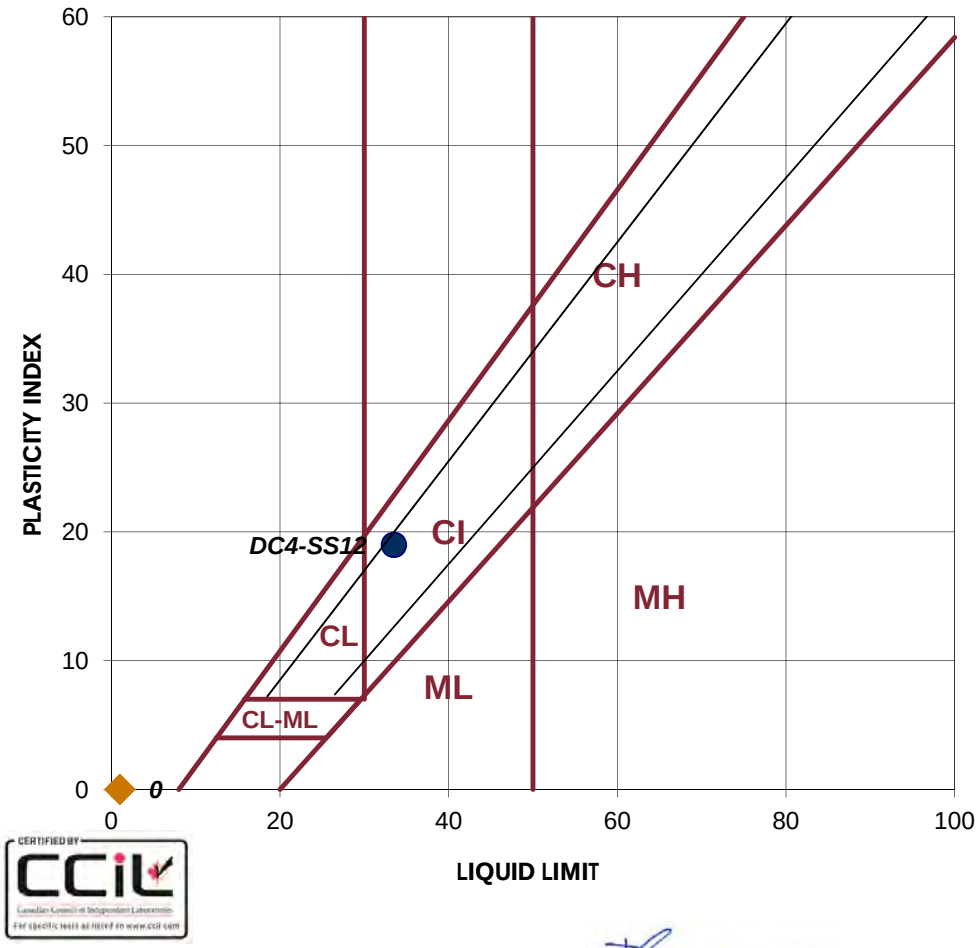
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC4-SS12 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 27 | Number of Blows | | |
| | | Container Number | | |
| 13.54 | 13.56 | Wt. Sample (wet+tare)(g) | | |
| 10.48 | 10.50 | Wt. Sample (dry+tare)(g) | | |
| 1.28 | 1.30 | Wt. Tare (g) | | |
| 9.2 | 9.2 | Wt. Dry Soil (g) | | |
| 3.1 | 3.1 | Wt. Water (g) | | |
| 33.3% | 33.3% | Water Content (%) | | |
| 33.4% | 33.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.47 | 7.4 | Wt. Sample (wet+tare)(g) | | |
| 7.61 | 6.68 | Wt. Sample (dry+tare)(g) | | |
| 1.45 | 1.49 | Wt. Tare (g) | | |
| 6.2 | 5.2 | Wt. Dry Soil (g) | | |
| 0.9 | 0.7 | Wt. Water (g) | | |
| 14.0% | 13.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | |
| PL | 14 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***NON-PLASTIC*** | |






Reviewed By:

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 14, 2016 |
| Date Tested: | May 20, 2016 |
| Tested By: | C. Small |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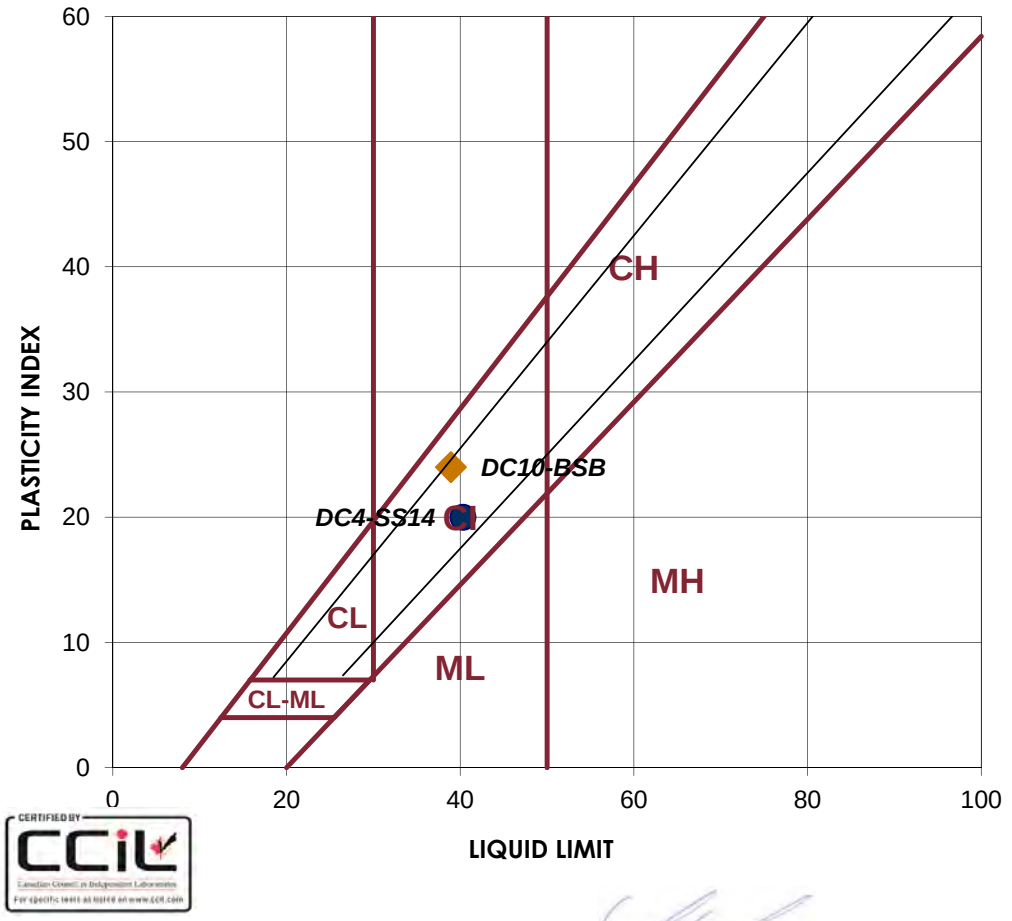
| Sample: DC4-SS14 | | | Sample: DC10-BSB | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 23 | Number of Blows | 22 | 23 |
| | | Container Number | | |
| 18.52 | 23.79 | Wt. Sample (wet+tare)(g) | 14.89 | 18.98 |
| 13.49 | 17.33 | Wt. Sample (dry+tare)(g) | 11.04 | 13.98 |
| 1.14 | 1.46 | Wt. Tare (g) | 1.28 | 1.29 |
| 12.4 | 15.9 | Wt. Dry Soil (g) | 9.8 | 12.7 |
| 5.0 | 6.5 | Wt. Water (g) | 3.9 | 5.0 |
| 40.7% | 40.7% | Water Content (%) | 39.4% | 39.4% |
| 40.3% | 40.3% | Corrected Water Content (%) | 38.8% | 39.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.08 | 12.65 | Wt. Sample (wet+tare)(g) | 8.59 | 8.76 |
| 10.29 | 10.8 | Wt. Sample (dry+tare)(g) | 7.65 | 7.81 |
| 1.54 | 1.67 | Wt. Tare (g) | 1.51 | 1.48 |
| 8.8 | 9.1 | Wt. Dry Soil (g) | 6.1 | 6.3 |
| 1.8 | 1.9 | Wt. Water (g) | 0.9 | 0.9 |
| 20.5% | 20.3% | Water Content (%) | 15.3% | 15.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 40 | | LL | 39 |
| PL | 20 | | PL | 15 |
| PI | 20 | | PI | 24 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |

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Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 13, 2016 |
| Date Tested: | April 25, 2016 |
| Tested By: | C. Tollifson |


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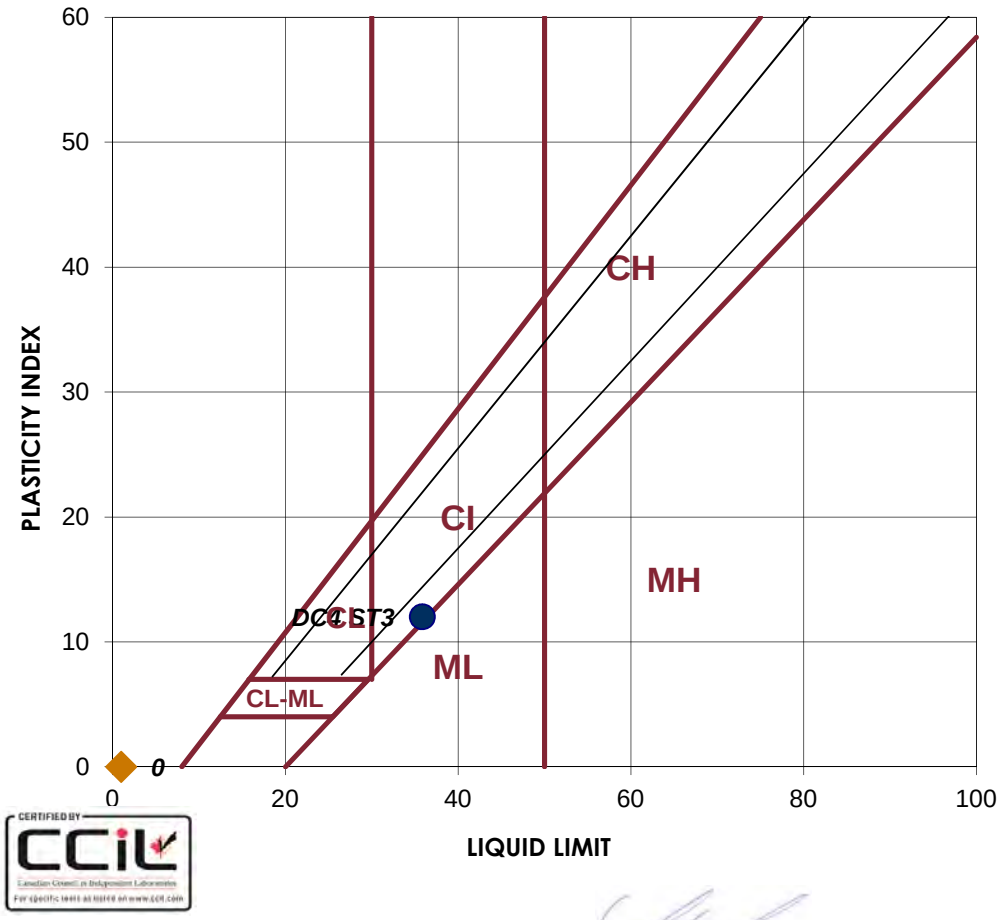
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC4 ST3 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | | |
| | | Container Number | | |
| 27.24 | 28.21 | Wt. Sample (wet+tare)(g) | | |
| 20.43 | 21.15 | Wt. Sample (dry+tare)(g) | | |
| 1.49 | 1.51 | Wt. Tare (g) | | |
| 18.9 | 19.6 | Wt. Dry Soil (g) | | |
| 6.8 | 7.1 | Wt. Water (g) | | |
| 36.0% | 35.9% | Water Content (%) | | |
| 36.0% | 35.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.63 | 12.36 | Wt. Sample (wet+tare)(g) | | |
| 9.47 | 10.41 | Wt. Sample (dry+tare)(g) | | |
| 1.45 | 1.43 | Wt. Tare (g) | | |
| 8.0 | 9.0 | Wt. Dry Soil (g) | | |
| 2.2 | 2.0 | Wt. Water (g) | | |
| 26.9% | 21.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | |
| PL | 24 | | PL | |
| PI | 12 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 26, 2016 |
| Date Tested: | July 11, 2016 |
| Tested By: | B. Pelkey |


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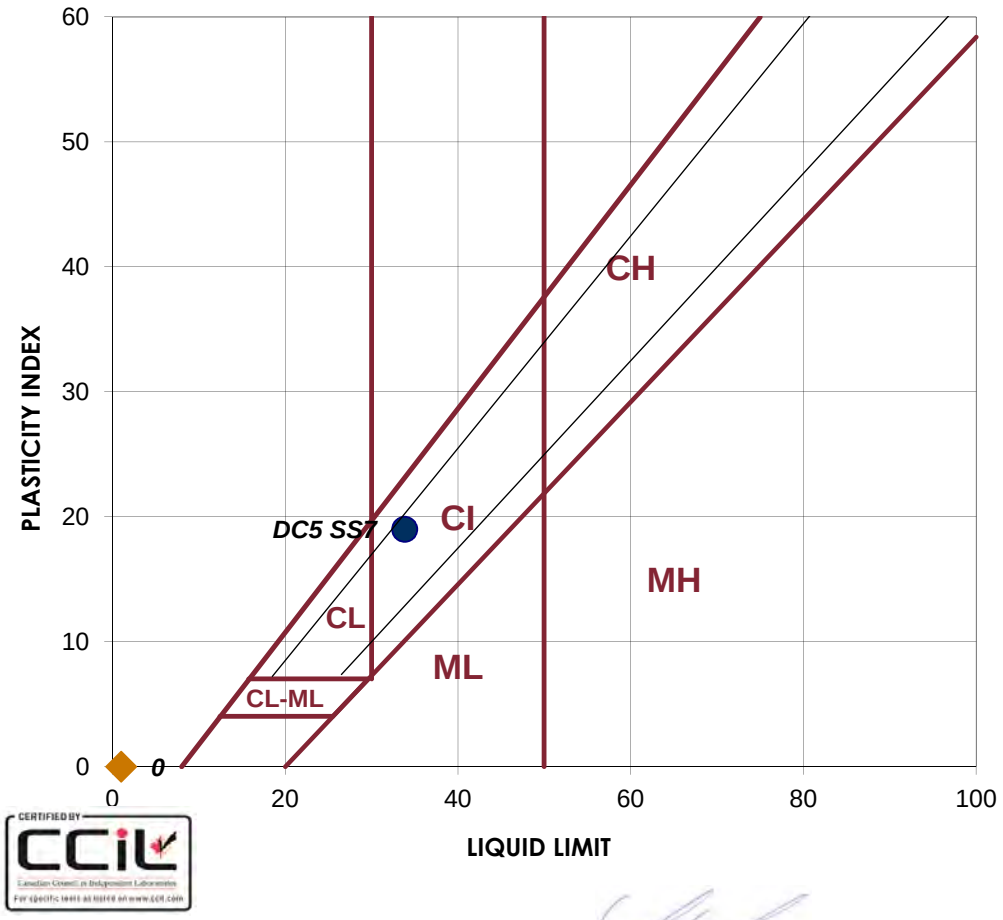
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC5 SS7 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 30 | 28 | Number of Blows | | |
| | | Container Number | | |
| 28.34 | 30.39 | Wt. Sample (wet+tare)(g) | | |
| 21.63 | 23.22 | Wt. Sample (dry+tare)(g) | | |
| 1.48 | 1.59 | Wt. Tare (g) | | |
| 20.2 | 21.6 | Wt. Dry Soil (g) | | |
| 6.7 | 7.2 | Wt. Water (g) | | |
| 33.3% | 33.1% | Water Content (%) | | |
| 34.0% | 33.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.51 | 26.55 | Wt. Sample (wet+tare)(g) | | |
| 23.11 | 24.91 | Wt. Sample (dry+tare)(g) | | |
| 13.76 | 13.81 | Wt. Tare (g) | | |
| 9.4 | 11.1 | Wt. Dry Soil (g) | | |
| 1.4 | 1.6 | Wt. Water (g) | | |
| 15.0% | 14.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 34 | | LL | |
| PL | 15 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 26, 2016 |
| Date Tested: | July 15, 2016 |
| Tested By: | C. Oost |

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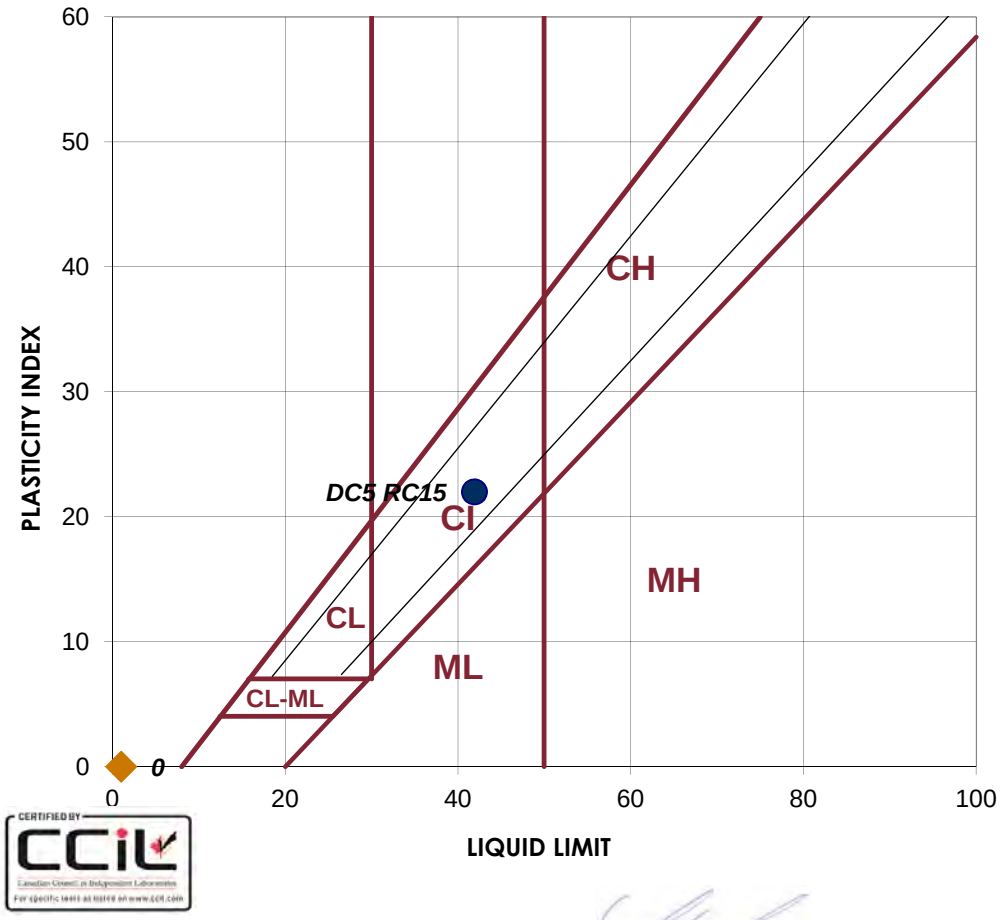
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC5 RC15 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 22 | Number of Blows | | |
| | | Container Number | | |
| 16.97 | 15.35 | Wt. Sample (wet+tare)(g) | | |
| 12.26 | 11.14 | Wt. Sample (dry+tare)(g) | | |
| 1.20 | 1.30 | Wt. Tare (g) | | |
| 11.1 | 9.8 | Wt. Dry Soil (g) | | |
| 4.7 | 4.2 | Wt. Water (g) | | |
| 42.6% | 42.8% | Water Content (%) | | |
| 41.7% | 42.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.32 | 22.65 | Wt. Sample (wet+tare)(g) | | |
| 21.23 | 21.56 | Wt. Sample (dry+tare)(g) | | |
| 15.81 | 15.93 | Wt. Tare (g) | | |
| 5.4 | 5.6 | Wt. Dry Soil (g) | | |
| 1.1 | 1.1 | Wt. Water (g) | | |
| 20.1% | 19.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 42 | | LL | |
| PL | 20 | | PL | |
| PI | 22 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 22, 2016 |
| Date Tested: | May 2, 2016 |
| Tested By: | B. Pelkey |


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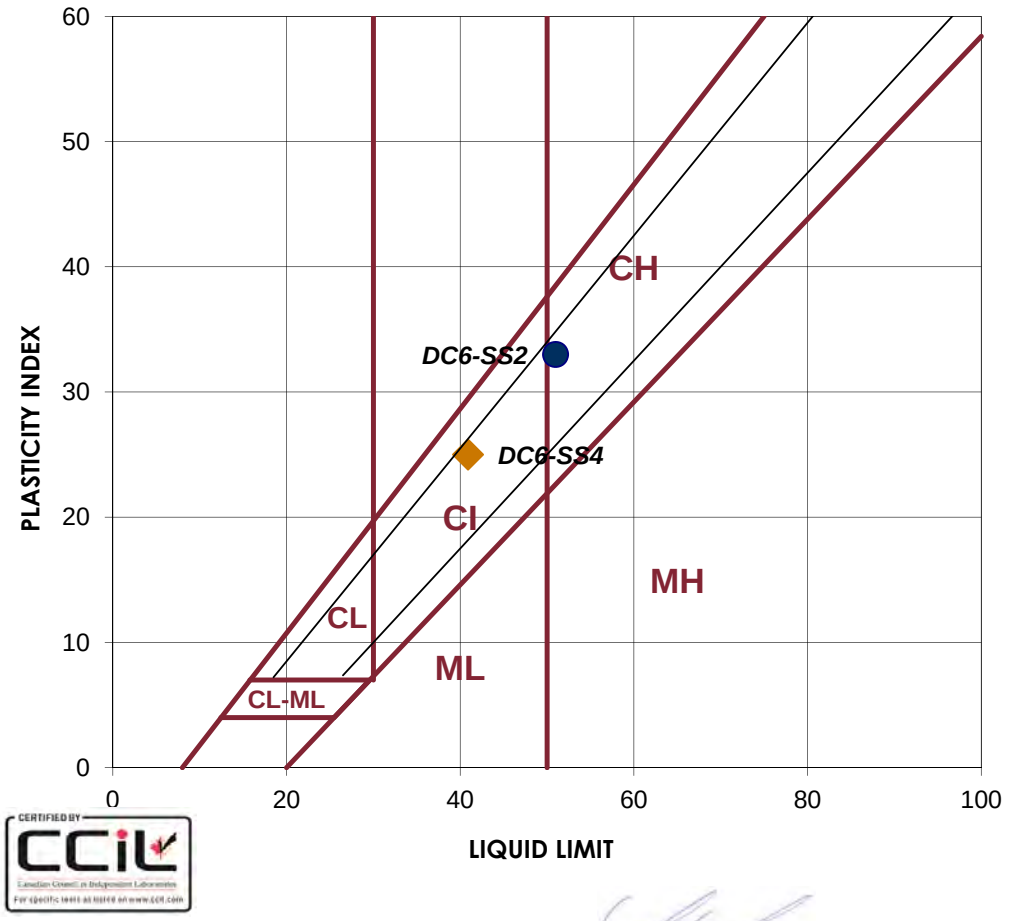
| Sample: DC6-SS2 | | | Sample: DC6-SS4 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | 25 | 25 |
| | | Container Number | | |
| 29.48 | 31.60 | Wt. Sample (wet+tare)(g) | 32.51 | 35.88 |
| 20.17 | 21.58 | Wt. Sample (dry+tare)(g) | 23.44 | 25.94 |
| 1.60 | 1.54 | Wt. Tare (g) | 1.28 | 1.61 |
| 18.6 | 20.0 | Wt. Dry Soil (g) | 22.2 | 24.3 |
| 9.3 | 10.0 | Wt. Water (g) | 9.1 | 9.9 |
| 50.1% | 50.0% | Water Content (%) | 40.9% | 40.9% |
| 51.0% | 50.9% | Corrected Water Content (%) | 40.9% | 40.9% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.71 | 12.63 | Wt. Sample (wet+tare)(g) | 12.89 | 15.17 |
| 11.85 | 10.91 | Wt. Sample (dry+tare)(g) | 11.33 | 13.29 |
| 1.65 | 1.5 | Wt. Tare (g) | 1.49 | 1.58 |
| 10.2 | 9.4 | Wt. Dry Soil (g) | 9.8 | 11.7 |
| 1.9 | 1.7 | Wt. Water (g) | 1.6 | 1.9 |
| 18.2% | 18.3% | Water Content (%) | 15.9% | 16.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 51 | | LL | 41 |
| PL | 18 | | PL | 16 |
| PI | 33 | | PI | 25 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH-CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 22, 2016 |
| Date Tested: | May 2, 2016 |
| Tested By: | B. Pelkey |


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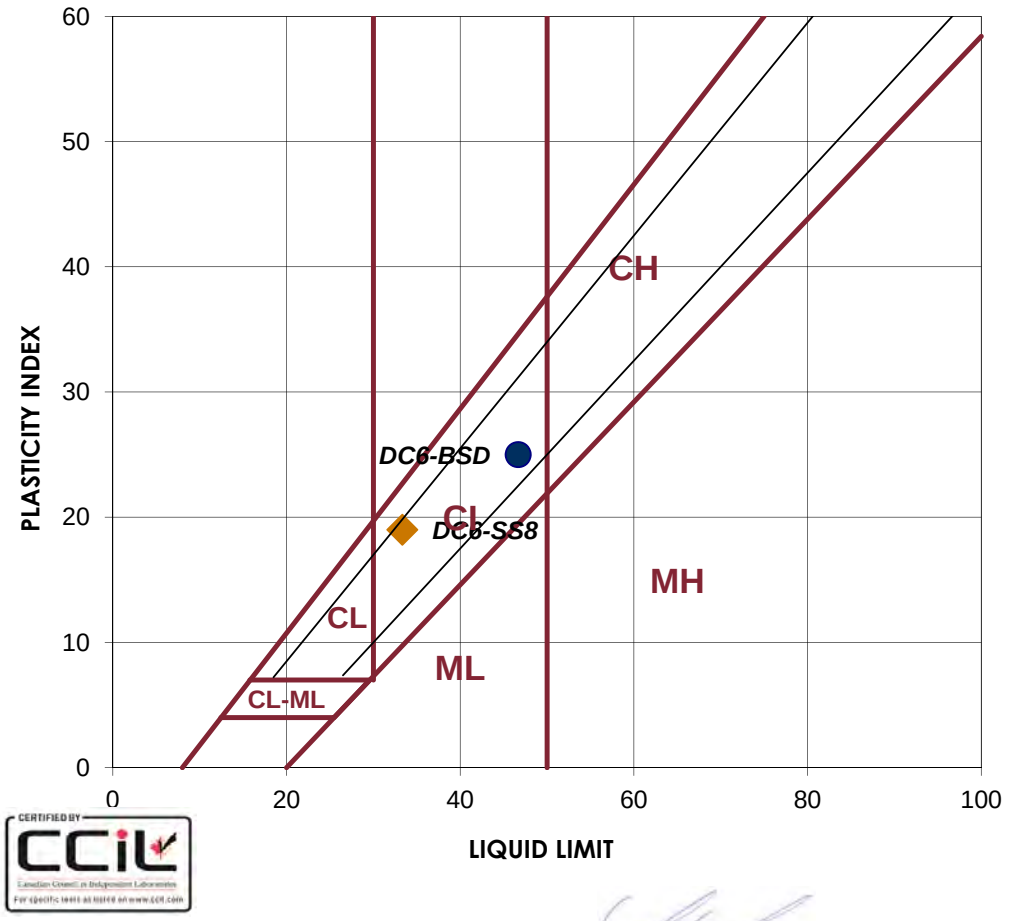
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC6-BSD | | | DC6-SS8 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 27 | Number of Blows | 26 | 24 |
| | | Container Number | | |
| 31.17 | 31.52 | Wt. Sample (wet+tare)(g) | 35.55 | 25.15 |
| 21.69 | 22.05 | Wt. Sample (dry+tare)(g) | 27.06 | 19.28 |
| 1.13 | 1.53 | Wt. Tare (g) | 1.72 | 1.57 |
| 20.6 | 20.5 | Wt. Dry Soil (g) | 25.3 | 17.7 |
| 9.5 | 9.5 | Wt. Water (g) | 8.5 | 5.9 |
| 46.1% | 46.2% | Water Content (%) | 33.5% | 33.1% |
| 46.7% | 46.6% | Corrected Water Content (%) | 33.7% | 33.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.39 | 11.35 | Wt. Sample (wet+tare)(g) | 15.2 | 12.29 |
| 11.28 | 9.52 | Wt. Sample (dry+tare)(g) | 13.49 | 10.93 |
| 1.56 | 1.17 | Wt. Tare (g) | 1.23 | 1.25 |
| 9.7 | 8.4 | Wt. Dry Soil (g) | 12.3 | 9.7 |
| 2.1 | 1.8 | Wt. Water (g) | 1.7 | 1.4 |
| 21.7% | 21.9% | Water Content (%) | 13.9% | 14.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 47 | | LL | 33 |
| PL | 22 | | PL | 14 |
| PI | 25 | | PI | 19 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 22, 2016 |
| Date Tested: | May 5, 2016 |
| Tested By: | B.Pelkey |


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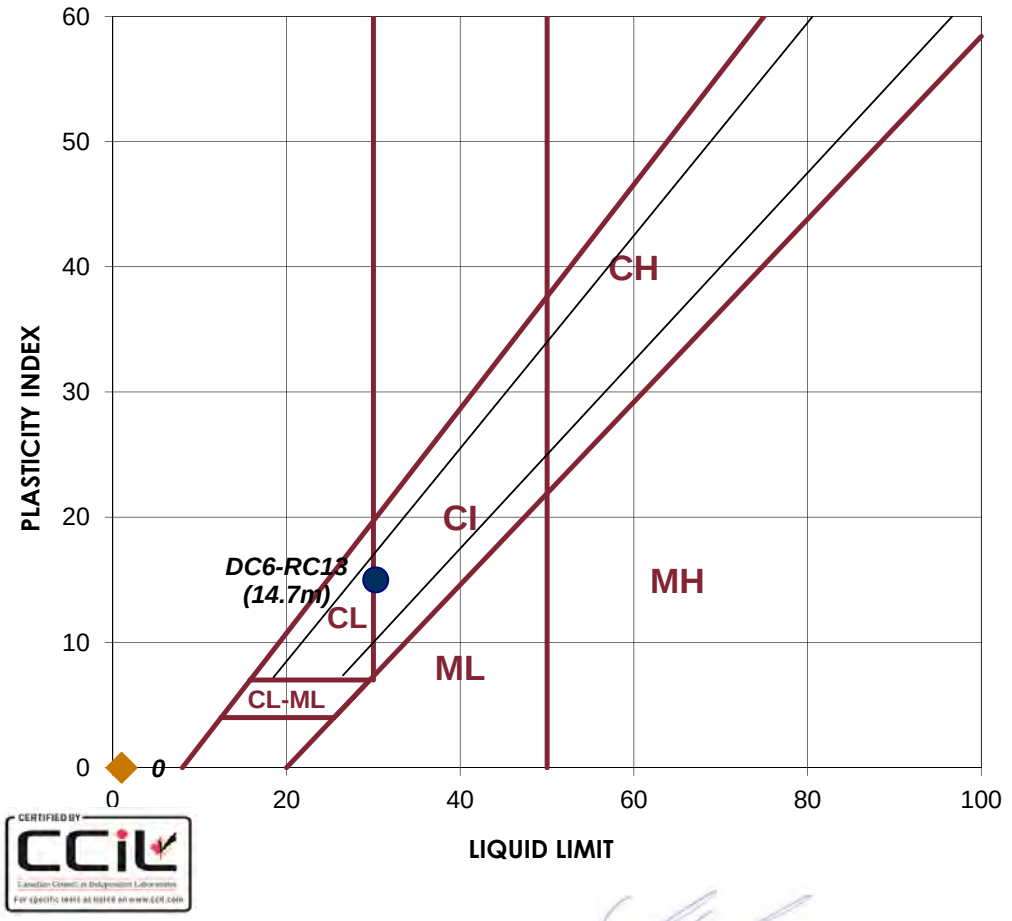
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC6-RC13 (14.7m) | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 22 | Number of Blows | | |
| | | Container Number | | |
| 39.00 | 38.90 | Wt. Sample (wet+tare)(g) | | |
| 30.08 | 30.07 | Wt. Sample (dry+tare)(g) | | |
| 1.30 | 1.25 | Wt. Tare (g) | | |
| 28.8 | 28.8 | Wt. Dry Soil (g) | | |
| 8.9 | 8.8 | Wt. Water (g) | | |
| 31.0% | 30.6% | Water Content (%) | | |
| 30.3% | 30.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.1 | 12.54 | Wt. Sample (wet+tare)(g) | | |
| 9.81 | 11.04 | Wt. Sample (dry+tare)(g) | | |
| 1.46 | 1.26 | Wt. Tare (g) | | |
| 8.4 | 9.8 | Wt. Dry Soil (g) | | |
| 1.3 | 1.5 | Wt. Water (g) | | |
| 15.4% | 15.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | |
| PL | 15 | | PL | |
| PI | 15 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 18, 2016 |
| Date Tested: | May 3, 2016 |
| Tested By: | C.Tollifson |


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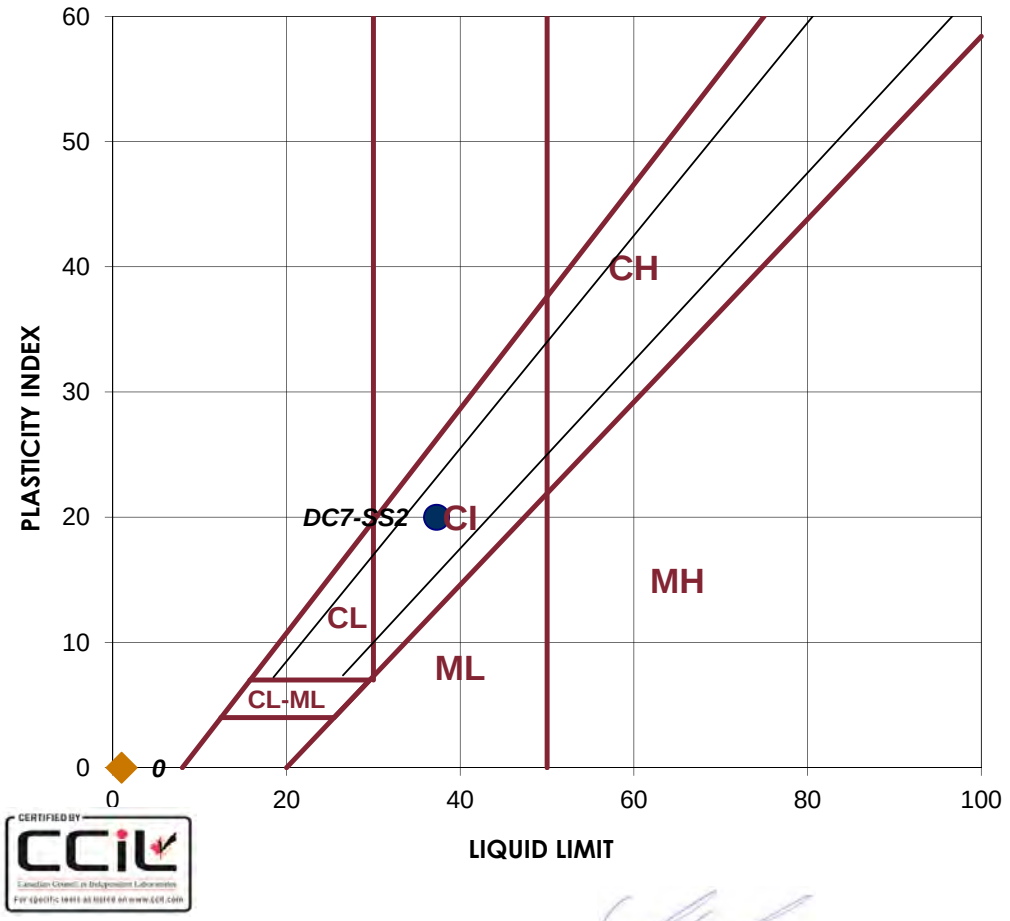
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC7-SS2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 20 | 22 | Number of Blows | | |
| | | Container Number | | |
| 28.23 | 28.54 | Wt. Sample (wet+tare)(g) | | |
| 20.86 | 21.13 | Wt. Sample (dry+tare)(g) | | |
| 1.56 | 1.60 | Wt. Tare (g) | | |
| 19.3 | 19.5 | Wt. Dry Soil (g) | | |
| 7.4 | 7.4 | Wt. Water (g) | | |
| 38.2% | 37.9% | Water Content (%) | | |
| 37.2% | 37.4% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.72 | 15.27 | Wt. Sample (wet+tare)(g) | | |
| 10.27 | 13.26 | Wt. Sample (dry+tare)(g) | | |
| 1.47 | 1.27 | Wt. Tare (g) | | |
| 8.8 | 12.0 | Wt. Dry Soil (g) | | |
| 1.5 | 2.0 | Wt. Water (g) | | |
| 16.5% | 16.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | |
| PL | 17 | | PL | |
| PI | 20 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 14, 2016 |
| Date Tested: | May 2, 2016 |
| Tested By: | B. Pelkey |


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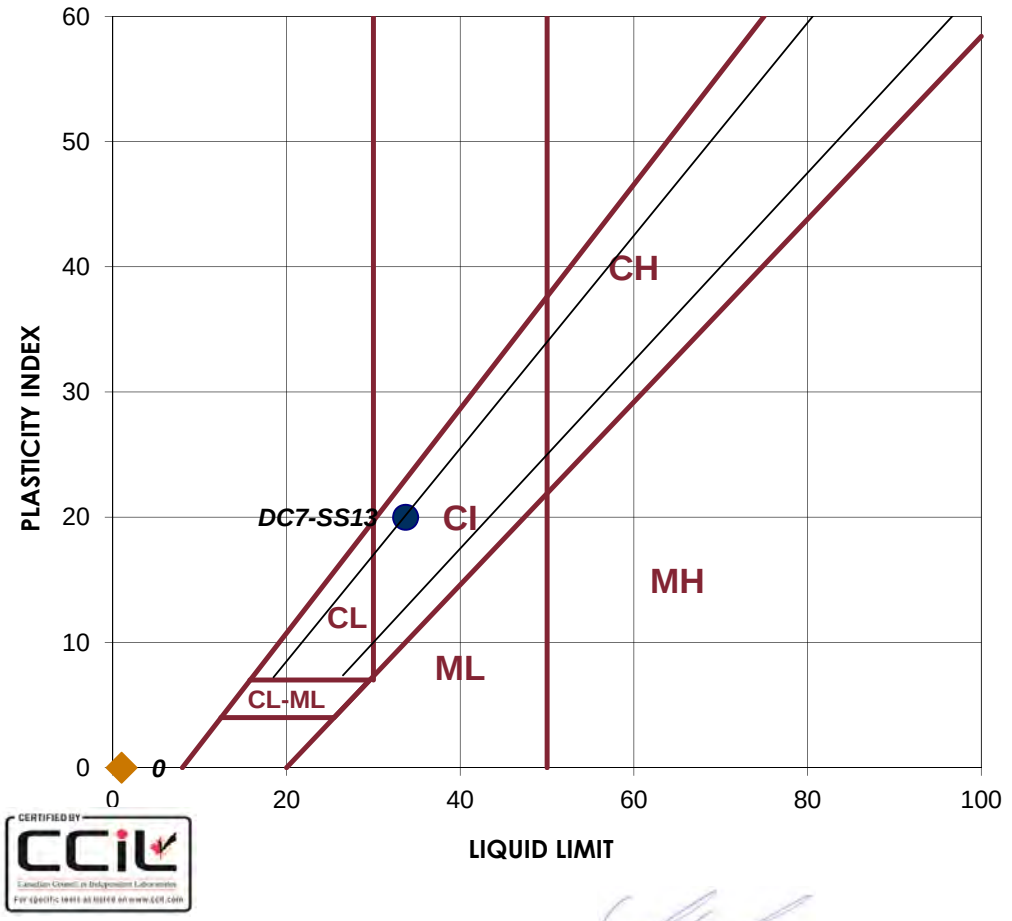
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC7-SS13 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 28 | Number of Blows | | |
| | | Container Number | | |
| 32.01 | 37.16 | Wt. Sample (wet+tare)(g) | | |
| 24.39 | 28.26 | Wt. Sample (dry+tare)(g) | | |
| 1.54 | 1.52 | Wt. Tare (g) | | |
| 22.9 | 26.7 | Wt. Dry Soil (g) | | |
| 7.6 | 8.9 | Wt. Water (g) | | |
| 33.3% | 33.3% | Water Content (%) | | |
| 33.7% | 33.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 15.49 | 14.33 | Wt. Sample (wet+tare)(g) | | |
| 13.75 | 12.68 | Wt. Sample (dry+tare)(g) | | |
| 1.62 | 1.17 | Wt. Tare (g) | | |
| 12.1 | 11.5 | Wt. Dry Soil (g) | | |
| 1.7 | 1.7 | Wt. Water (g) | | |
| 14.3% | 14.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 34 | | LL | |
| PL | 14 | | PL | |
| PI | 20 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 18, 2016 |
| Date Tested: | July 15, 2016 |
| Tested By: | C. Oost |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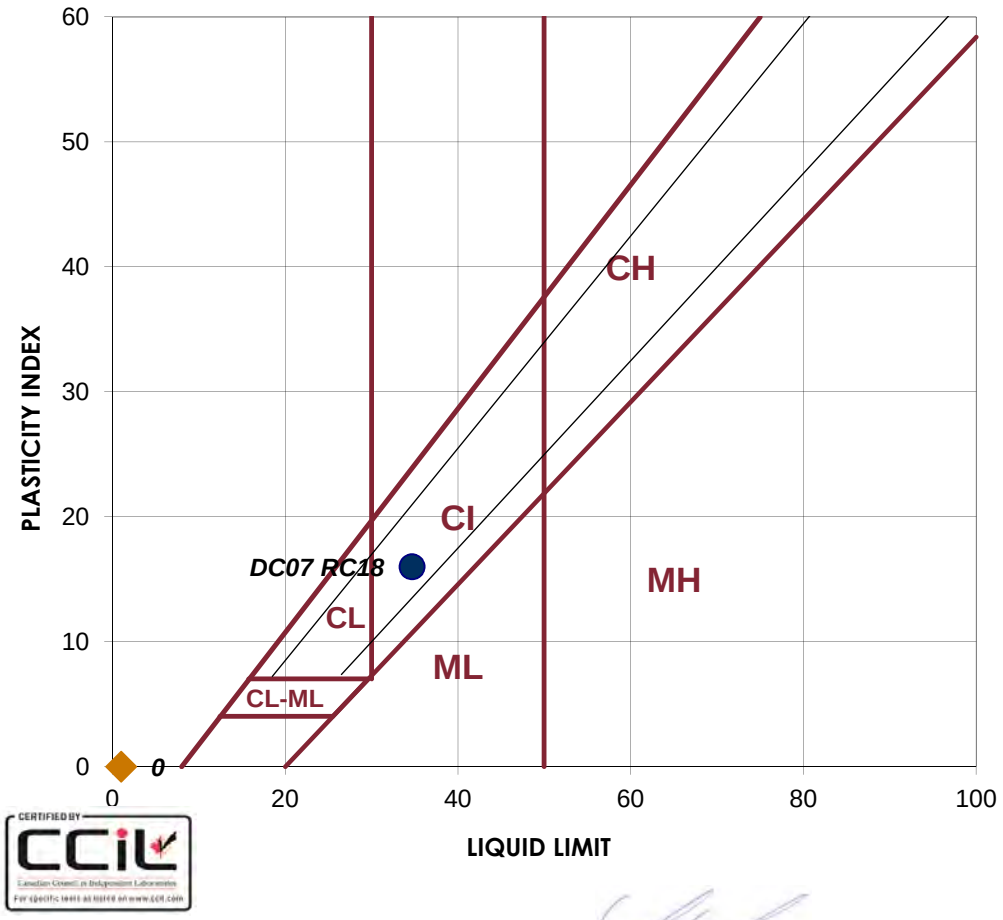
| Sample: DC07 RC18 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 21 | Number of Blows | | |
| | | Container Number | | |
| 17.08 | 16.29 | Wt. Sample (wet+tare)(g) | | |
| 13.02 | 12.36 | Wt. Sample (dry+tare)(g) | | |
| 1.49 | 1.26 | Wt. Tare (g) | | |
| 11.5 | 11.1 | Wt. Dry Soil (g) | | |
| 4.1 | 3.9 | Wt. Water (g) | | |
| 35.2% | 35.4% | Water Content (%) | | |
| 34.7% | 34.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 20.23 | 20.29 | Wt. Sample (wet+tare)(g) | | |
| 19.21 | 19.24 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.9 | Wt. Tare (g) | | |
| 5.4 | 5.3 | Wt. Dry Soil (g) | | |
| 1.0 | 1.1 | Wt. Water (g) | | |
| 18.8% | 19.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 19 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 18, 2016 |
| Date Tested: | July 14, 2016 |
| Tested By: | C. Oost and B. Pelkey |

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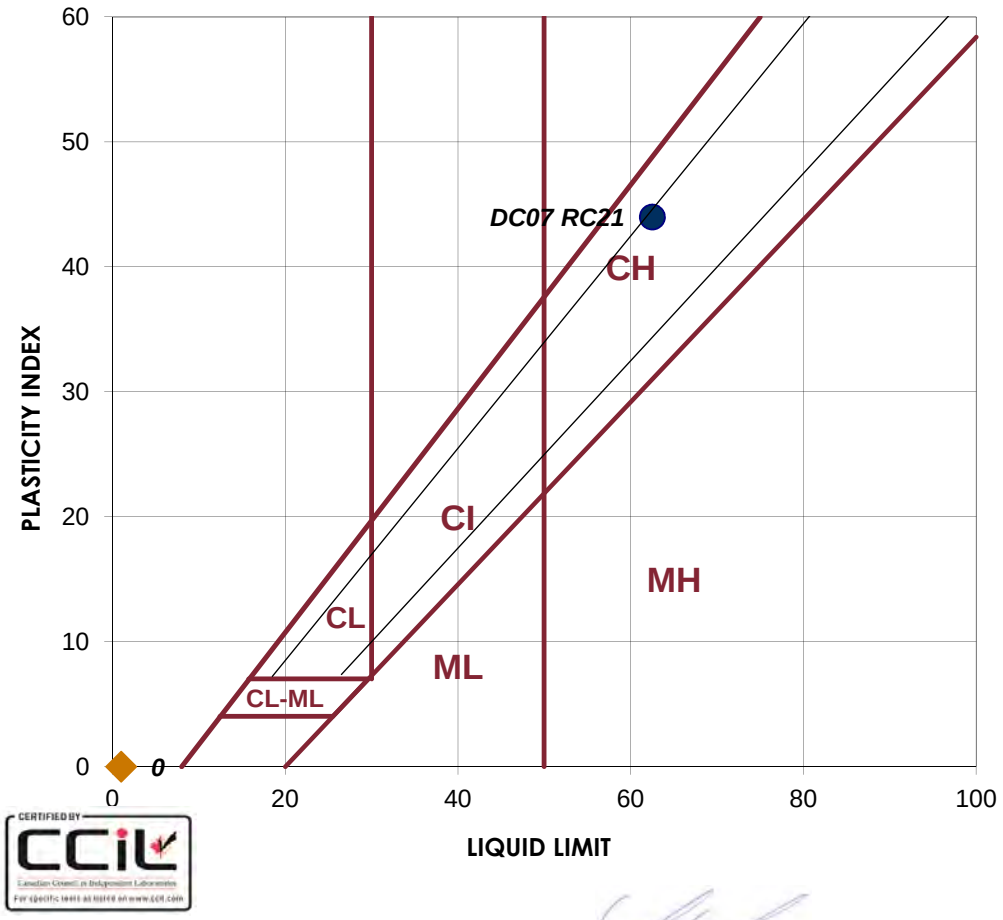
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC07 RC21 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 14.00 | 15.20 | Wt. Sample (wet+tare)(g) | | |
| 9.17 | 10.00 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.73 | Wt. Tare (g) | | |
| 7.7 | 8.3 | Wt. Dry Soil (g) | | |
| 4.8 | 5.2 | Wt. Water (g) | | |
| 63.1% | 62.9% | Water Content (%) | | |
| 62.4% | 62.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.5 | 22.13 | Wt. Sample (wet+tare)(g) | | |
| 21.5 | 21.12 | Wt. Sample (dry+tare)(g) | | |
| 15.86 | 15.65 | Wt. Tare (g) | | |
| 5.6 | 5.5 | Wt. Dry Soil (g) | | |
| 1.0 | 1.0 | Wt. Water (g) | | |
| 17.7% | 18.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 62 | | LL | |
| PL | 18 | | PL | |
| PI | 44 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 18, 2016 |
| Date Tested: | July 14, 2016 |
| Tested By: | B. Pelkey |


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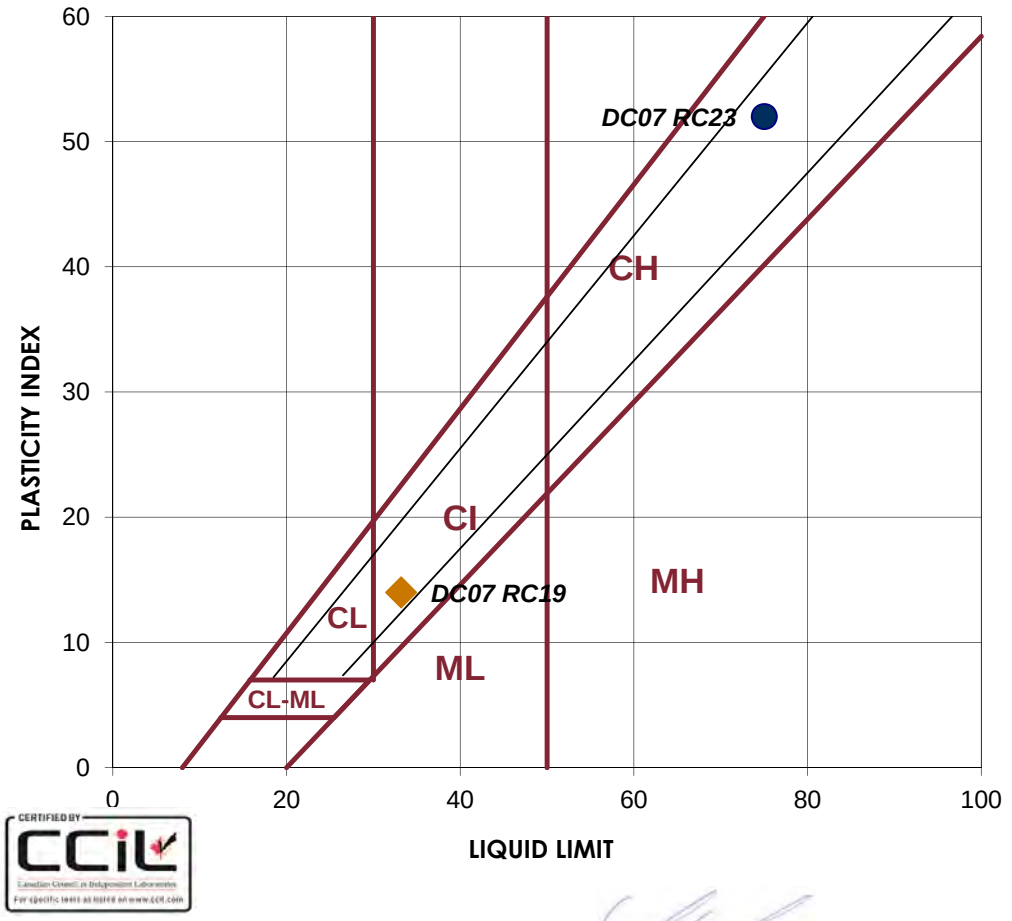
| Sample: DC07 RC23 | | | Sample: DC07 RC19 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 21 | Number of Blows | 22 | 22 |
| | | Container Number | | |
| 28.05 | 22.62 | Wt. Sample (wet+tare)(g) | 22.80 | 29.66 |
| 16.45 | 13.40 | Wt. Sample (dry+tare)(g) | 17.46 | 22.58 |
| 1.33 | 1.28 | Wt. Tare (g) | 1.59 | 1.61 |
| 15.1 | 12.1 | Wt. Dry Soil (g) | 15.9 | 21.0 |
| 11.6 | 9.2 | Wt. Water (g) | 5.3 | 7.1 |
| 76.7% | 76.1% | Water Content (%) | 33.6% | 33.8% |
| 75.5% | 74.5% | Corrected Water Content (%) | 33.1% | 33.2% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.67 | 27.92 | Wt. Sample (wet+tare)(g) | 29.33 | 24.98 |
| 25.89 | 25.28 | Wt. Sample (dry+tare)(g) | 27.17 | 23.21 |
| 13.82 | 13.78 | Wt. Tare (g) | 15.94 | 13.9 |
| 12.1 | 11.5 | Wt. Dry Soil (g) | 11.2 | 9.3 |
| 2.8 | 2.6 | Wt. Water (g) | 2.2 | 1.8 |
| 23.0% | 23.0% | Water Content (%) | 19.2% | 19.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 75 | | LL | 33 |
| PL | 23 | | PL | 19 |
| PI | 52 | | PI | 14 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CI | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 18, 2016 |
| Date Tested: | July 14, 2016 |
| Tested By: | B. Pelkey |


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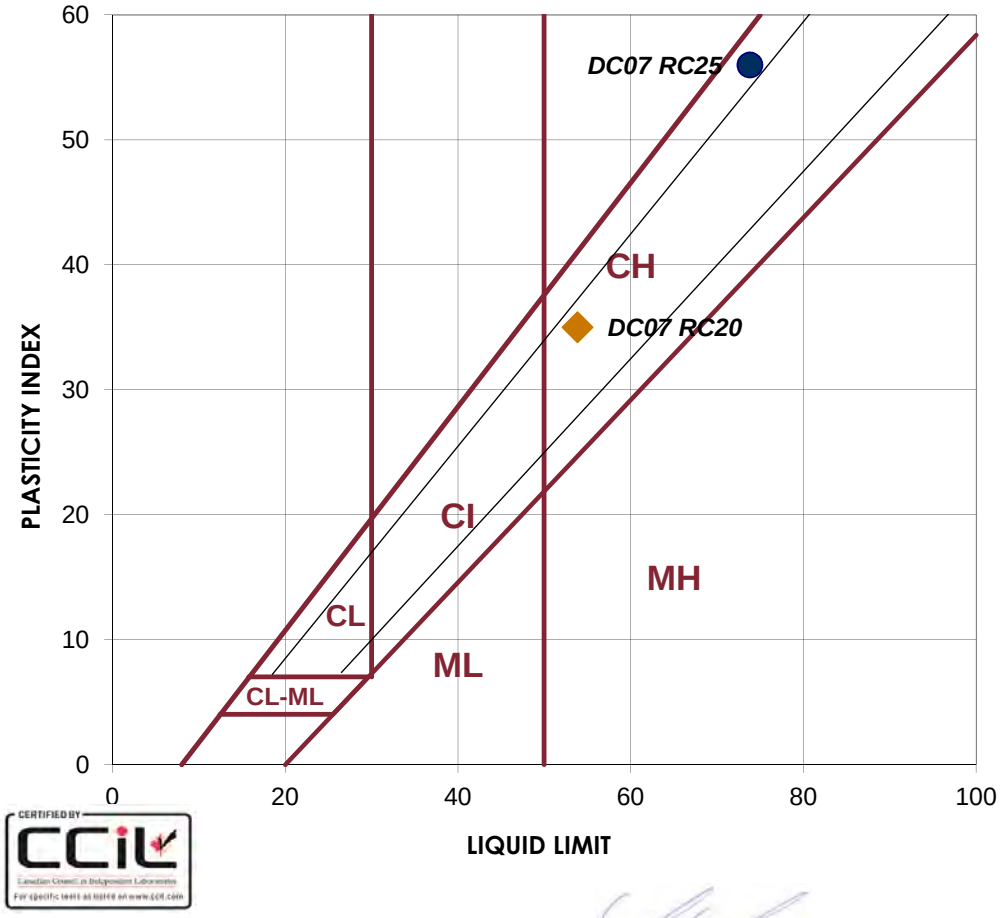
| Sample: DC07 RC25 | | | Sample: DC07 RC20 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 25 | Number of Blows | 20 | 21 |
| | | Container Number | | |
| 27.57 | 21.86 | Wt. Sample (wet+tare)(g) | 25.87 | 24.50 |
| 16.58 | 13.26 | Wt. Sample (dry+tare)(g) | 17.27 | 16.32 |
| 1.65 | 1.53 | Wt. Tare (g) | 1.64 | 1.51 |
| 14.9 | 11.7 | Wt. Dry Soil (g) | 15.6 | 14.8 |
| 11.0 | 8.6 | Wt. Water (g) | 8.6 | 8.2 |
| 73.6% | 73.3% | Water Content (%) | 55.0% | 55.2% |
| 74.3% | 73.3% | Corrected Water Content (%) | 53.6% | 54.1% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 19.85 | 20.31 | Wt. Sample (wet+tare)(g) | 28.01 | 25.35 |
| 18.9 | 19.31 | Wt. Sample (dry+tare)(g) | 26.02 | 23.85 |
| 13.76 | 13.87 | Wt. Tare (g) | 15.78 | 15.82 |
| 5.1 | 5.4 | Wt. Dry Soil (g) | 10.2 | 8.0 |
| 1.0 | 1.0 | Wt. Water (g) | 2.0 | 1.5 |
| 18.5% | 18.4% | Water Content (%) | 19.4% | 18.7% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 74 | | LL | 54 |
| PL | 18 | | PL | 19 |
| PI | 56 | | PI | 35 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CH | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 21 2016 |
| Date Tested: | July 14, 2016 |
| Tested By: | B. Pelkey |


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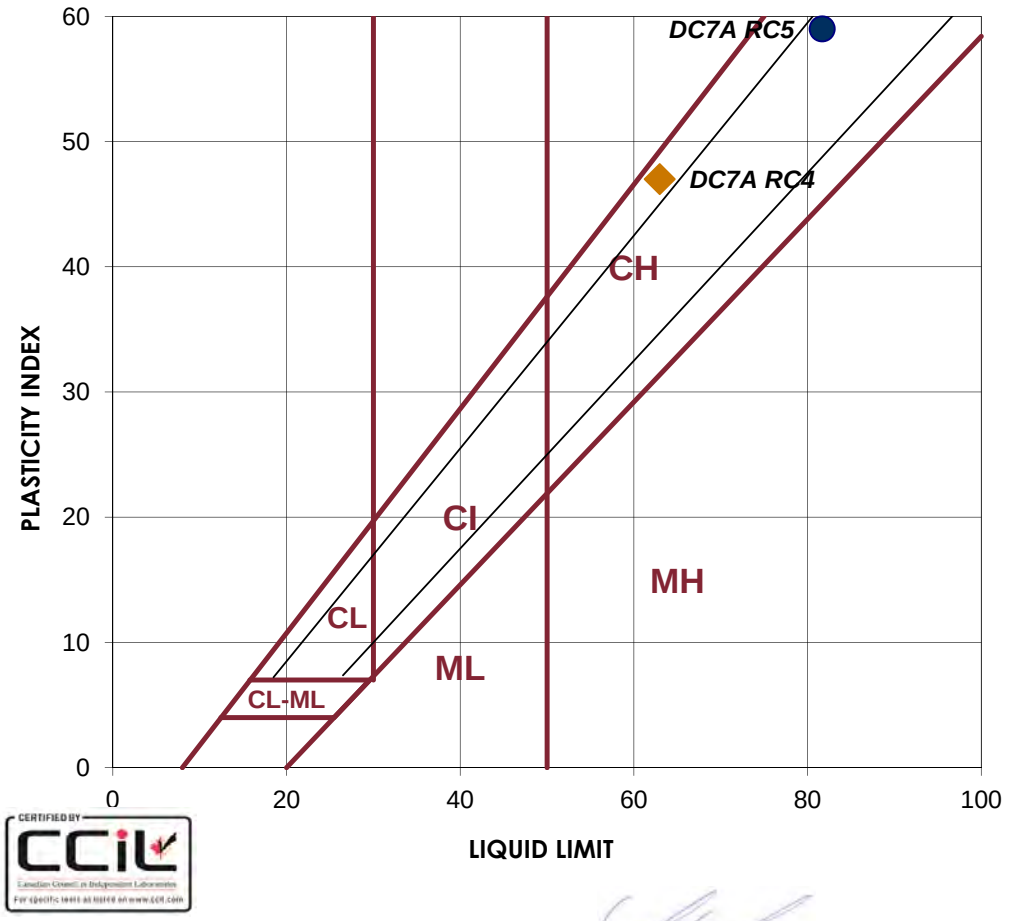
| Sample: DC7A RC5 | | | Sample: DC7A RC4 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 25 | Number of Blows | 21 | 20 |
| | | Container Number | | |
| 20.42 | 21.89 | Wt. Sample (wet+tare)(g) | 22.95 | 27.37 |
| 11.93 | 12.73 | Wt. Sample (dry+tare)(g) | 14.58 | 17.24 |
| 1.57 | 1.59 | Wt. Tare (g) | 1.63 | 1.50 |
| 10.4 | 11.1 | Wt. Dry Soil (g) | 13.0 | 15.7 |
| 8.5 | 9.2 | Wt. Water (g) | 8.4 | 10.1 |
| 81.9% | 82.2% | Water Content (%) | 64.6% | 64.4% |
| 81.1% | 82.2% | Corrected Water Content (%) | 63.3% | 62.6% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.68 | 25.11 | Wt. Sample (wet+tare)(g) | 21.94 | 20.15 |
| 22.62 | 22.99 | Wt. Sample (dry+tare)(g) | 20.87 | 19.31 |
| 13.77 | 13.79 | Wt. Tare (g) | 14.14 | 13.92 |
| 8.9 | 9.2 | Wt. Dry Soil (g) | 6.7 | 5.4 |
| 2.1 | 2.1 | Wt. Water (g) | 1.1 | 0.8 |
| 23.3% | 23.0% | Water Content (%) | 15.9% | 15.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 82 | | LL | 63 |
| PL | 23 | | PL | 16 |
| PI | 59 | | PI | 47 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CH | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | May 19, 2016 |
| Date Tested: | July 4, 2016 |
| Tested By: | B. Pelkey |


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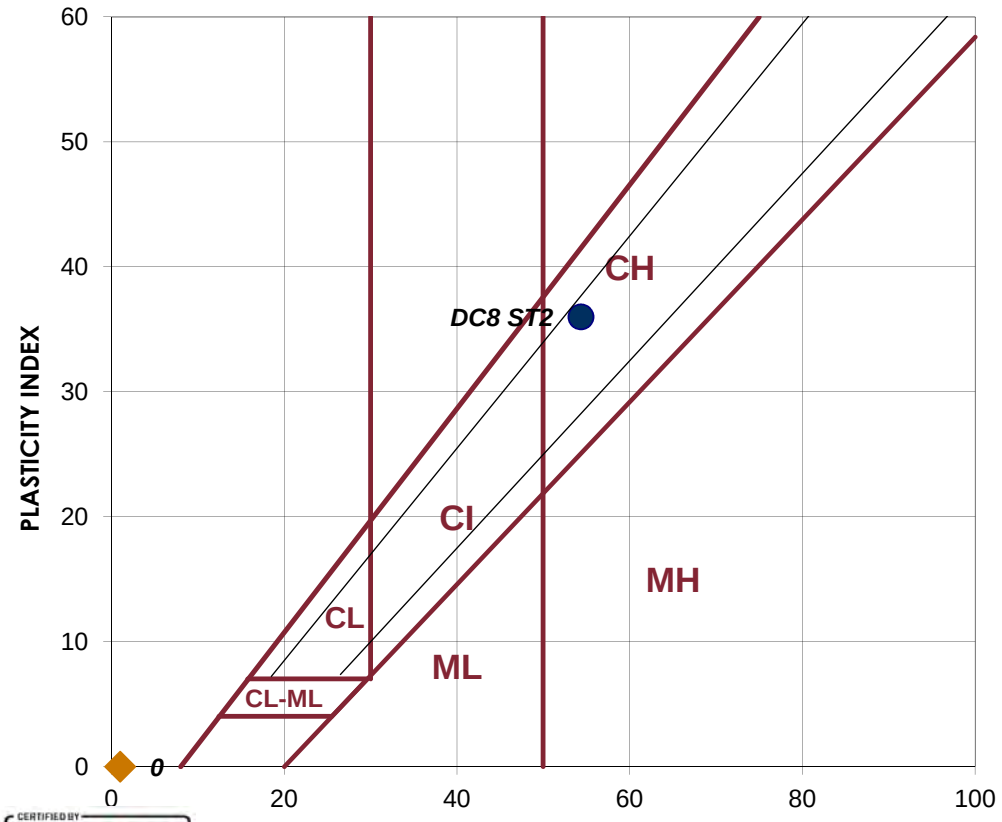
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC8 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 23.40 | 27.42 | Wt. Sample (wet+tare)(g) | | |
| 15.75 | 18.40 | Wt. Sample (dry+tare)(g) | | |
| 1.47 | 1.44 | Wt. Tare (g) | | |
| 14.3 | 17.0 | Wt. Dry Soil (g) | | |
| 7.7 | 9.0 | Wt. Water (g) | | |
| 53.6% | 53.2% | Water Content (%) | | |
| 54.5% | 54.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.28 | 26.76 | Wt. Sample (wet+tare)(g) | | |
| 21.06 | 24.75 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.78 | Wt. Tare (g) | | |
| 7.3 | 11.0 | Wt. Dry Soil (g) | | |
| 1.2 | 2.0 | Wt. Water (g) | | |
| 16.7% | 18.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 54 | | LL | |
| PL | 18 | | PL | |
| PI | 36 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | May 19, 2016 |
| Date Tested: | July 4, 2016 |
| Tested By: | B. Pelkey |


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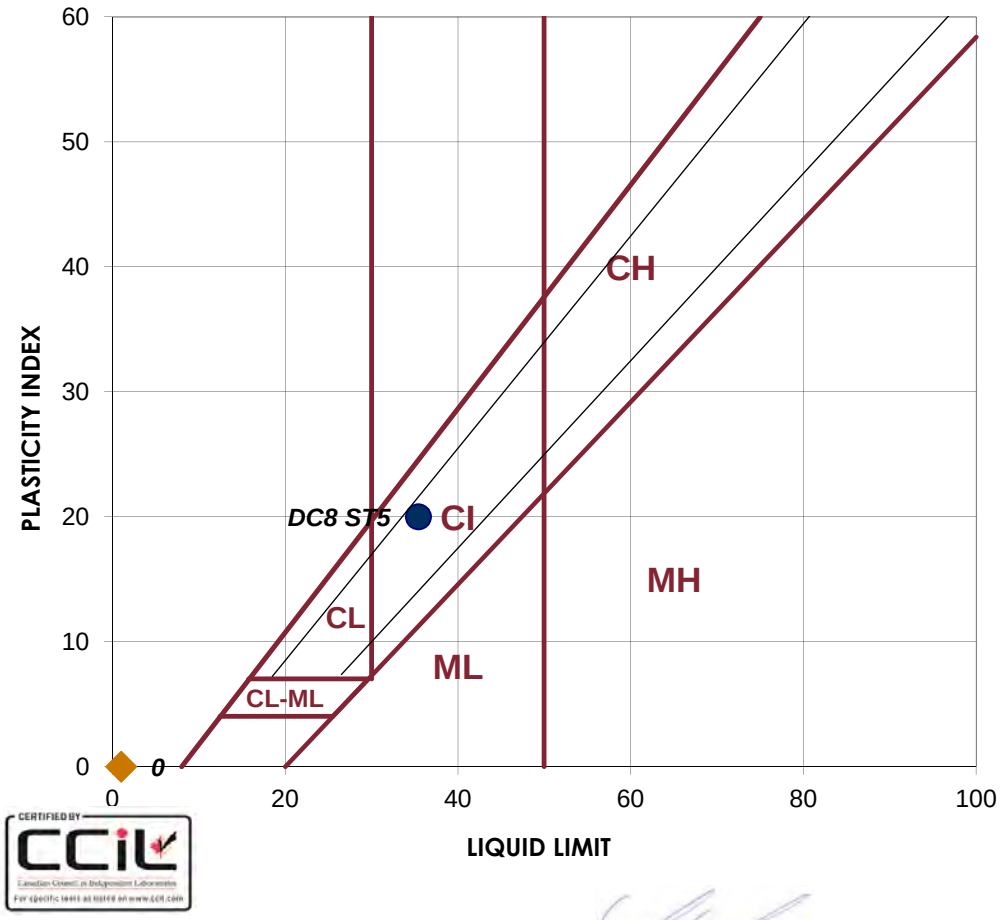
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC8 ST5 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 26 | Number of Blows | | |
| | | Container Number | | |
| 25.97 | 34.42 | Wt. Sample (wet+tare)(g) | | |
| 19.51 | 25.79 | Wt. Sample (dry+tare)(g) | | |
| 1.23 | 1.26 | Wt. Tare (g) | | |
| 18.3 | 24.5 | Wt. Dry Soil (g) | | |
| 6.5 | 8.6 | Wt. Water (g) | | |
| 35.3% | 35.2% | Water Content (%) | | |
| 35.5% | 35.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.14 | 24.55 | Wt. Sample (wet+tare)(g) | | |
| 23.74 | 23.17 | Wt. Sample (dry+tare)(g) | | |
| 14.15 | 13.79 | Wt. Tare (g) | | |
| 9.6 | 9.4 | Wt. Dry Soil (g) | | |
| 1.4 | 1.4 | Wt. Water (g) | | |
| 14.6% | 14.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 15 | | PL | |
| PI | 20 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 19, 2016 |
| Date Tested: | July 6, 2016 |
| Tested By: | B. Pelkey |


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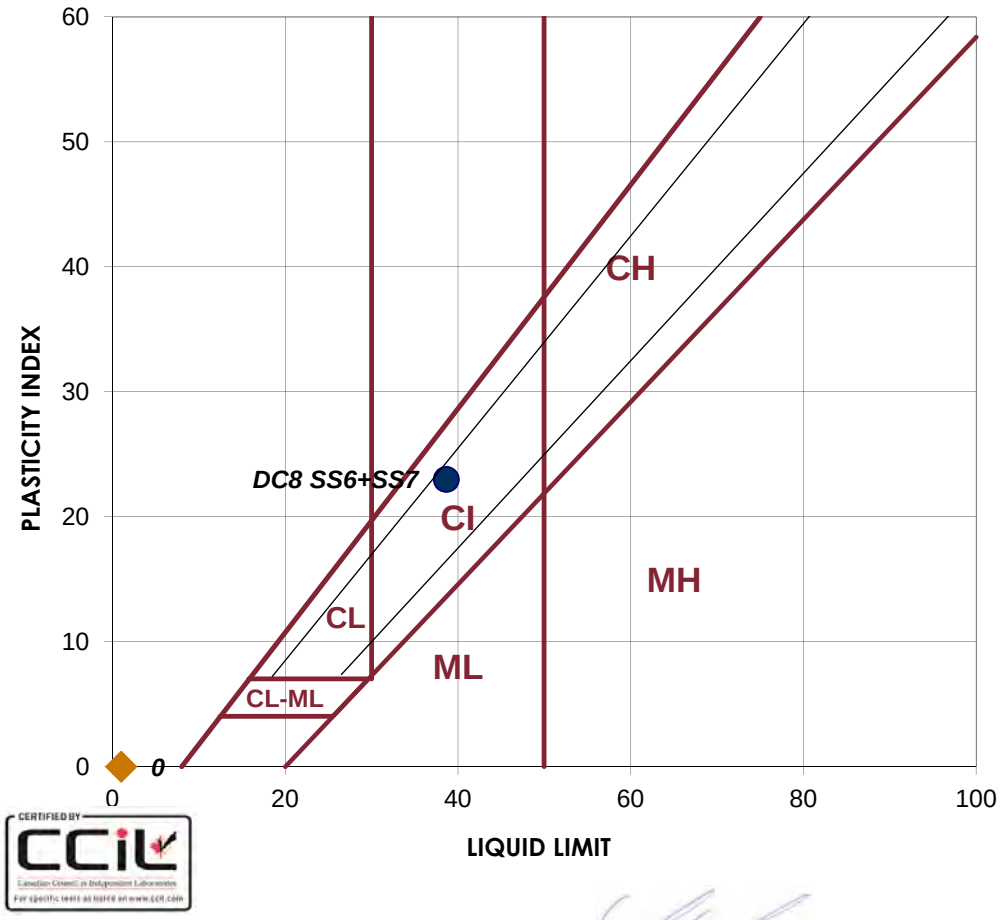
| Sample: DC8 SS6+SS7 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 25 | Number of Blows | | |
| | | Container Number | | |
| 23.18 | 30.31 | Wt. Sample (wet+tare)(g) | | |
| 17.14 | 22.35 | Wt. Sample (dry+tare)(g) | | |
| 1.50 | 1.56 | Wt. Tare (g) | | |
| 15.6 | 20.8 | Wt. Dry Soil (g) | | |
| 6.0 | 8.0 | Wt. Water (g) | | |
| 38.6% | 38.3% | Water Content (%) | | |
| 39.0% | 38.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.2 | 24.97 | Wt. Sample (wet+tare)(g) | | |
| 23.67 | 23.44 | Wt. Sample (dry+tare)(g) | | |
| 13.89 | 13.91 | Wt. Tare (g) | | |
| 9.8 | 9.5 | Wt. Dry Soil (g) | | |
| 1.5 | 1.5 | Wt. Water (g) | | |
| 15.6% | 16.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | |
| PL | 16 | | PL | |
| PI | 23 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 19, 2016 |
| Date Tested: | June 2, 2016 |
| Tested By: | C. Oost |


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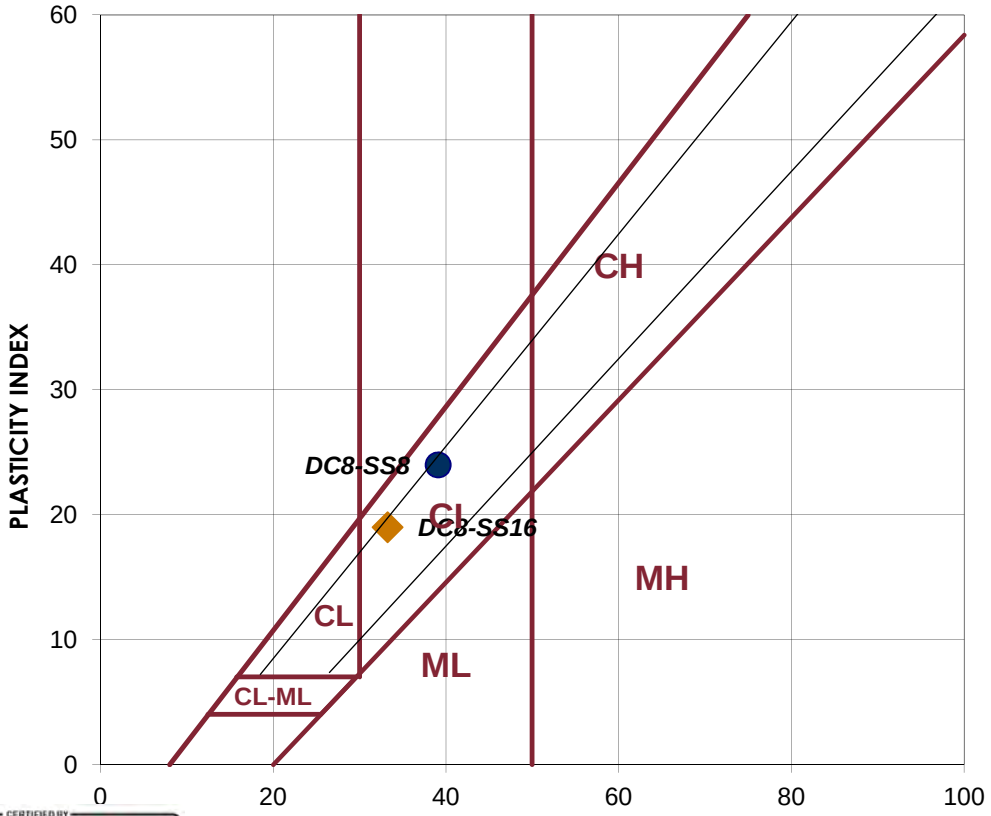
| Sample: DC8-SS8 | | | Sample: DC8-SS16 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 28 | Number of Blows | 22 | 23 |
| | | Container Number | | |
| 14.05 | 13.97 | Wt. Sample (wet+tare)(g) | 13.03 | 12.83 |
| 10.47 | 10.44 | Wt. Sample (dry+tare)(g) | 10.05 | 9.91 |
| 1.22 | 1.28 | Wt. Tare (g) | 1.21 | 1.23 |
| 9.3 | 9.2 | Wt. Dry Soil (g) | 8.8 | 8.7 |
| 3.6 | 3.5 | Wt. Water (g) | 3.0 | 2.9 |
| 38.7% | 38.5% | Water Content (%) | 33.7% | 33.6% |
| 39.1% | 39.1% | Corrected Water Content (%) | 33.2% | 33.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 7.94 | 9.01 | Wt. Sample (wet+tare)(g) | 8.48 | 8.24 |
| 7.07 | 8.05 | Wt. Sample (dry+tare)(g) | 7.64 | 7.42 |
| 1.38 | 1.7 | Wt. Tare (g) | 1.5 | 1.38 |
| 5.7 | 6.4 | Wt. Dry Soil (g) | 6.1 | 6.0 |
| 0.9 | 1.0 | Wt. Water (g) | 0.8 | 0.8 |
| 15.3% | 15.1% | Water Content (%) | 13.7% | 13.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | 33 |
| PL | 15 | | PL | 14 |
| PI | 24 | | PI | 19 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 27, 2016 |
| Date Tested: | July 11, 2016 |
| Tested By: | B. Pelkey |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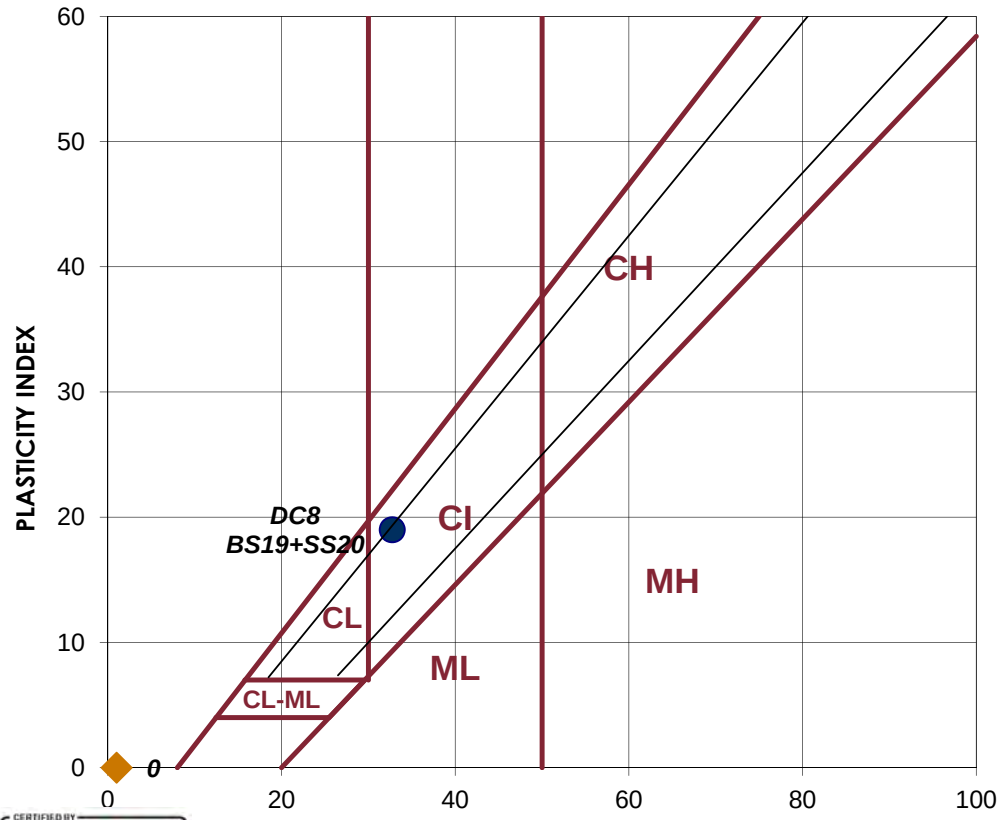
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC8 BS19+SS20 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 28 | Number of Blows | | |
| | | Container Number | | |
| 27.17 | 30.97 | Wt. Sample (wet+tare)(g) | | |
| 20.89 | 23.81 | Wt. Sample (dry+tare)(g) | | |
| 1.56 | 1.60 | Wt. Tare (g) | | |
| 19.3 | 22.2 | Wt. Dry Soil (g) | | |
| 6.3 | 7.2 | Wt. Water (g) | | |
| 32.5% | 32.2% | Water Content (%) | | |
| 32.8% | 32.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.11 | 24.73 | Wt. Sample (wet+tare)(g) | | |
| 25.43 | 23.38 | Wt. Sample (dry+tare)(g) | | |
| 13.78 | 13.86 | Wt. Tare (g) | | |
| 11.7 | 9.5 | Wt. Dry Soil (g) | | |
| 1.7 | 1.4 | Wt. Water (g) | | |
| 14.4% | 14.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | |
| PL | 14 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 19, 2016 |
| Date Tested: | June 2, 2016 |
| Tested By: | C. Oost |


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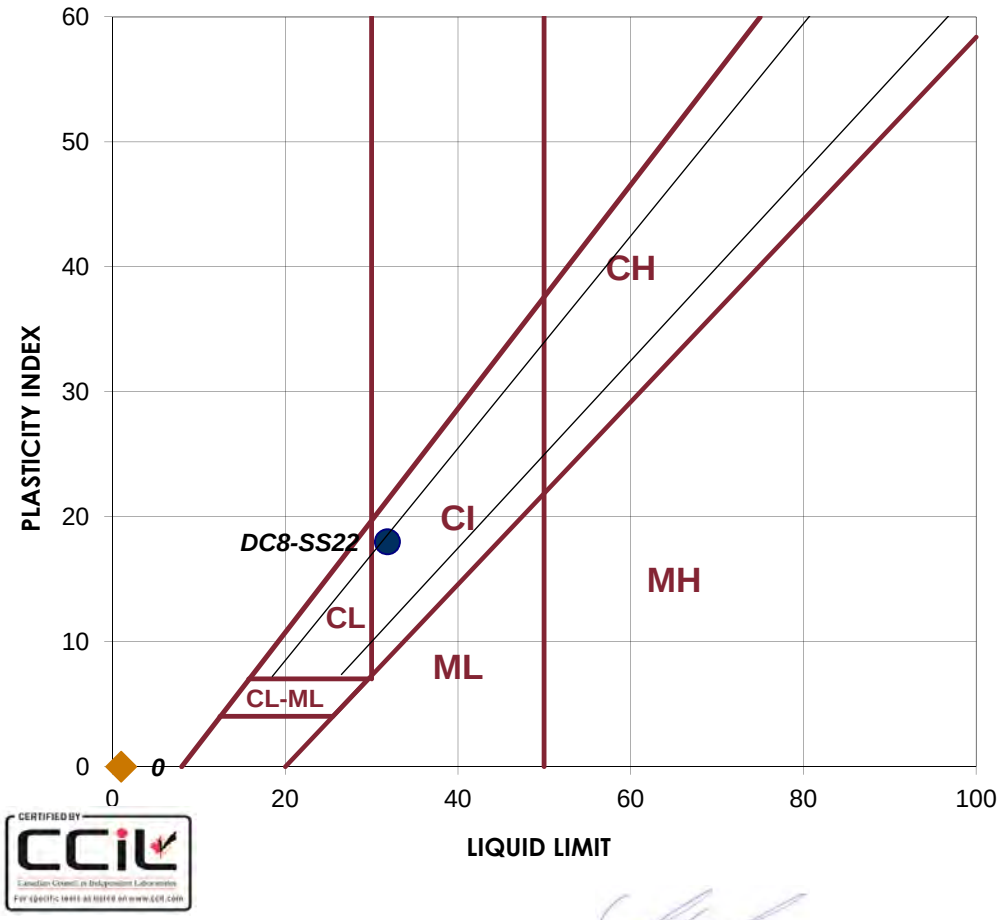
| Sample: DC8-SS22 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 26 | Number of Blows | | |
| | | Container Number | | |
| 14.10 | 14.46 | Wt. Sample (wet+tare)(g) | | |
| 11.01 | 11.37 | Wt. Sample (dry+tare)(g) | | |
| 1.25 | 1.62 | Wt. Tare (g) | | |
| 9.8 | 9.8 | Wt. Dry Soil (g) | | |
| 3.1 | 3.1 | Wt. Water (g) | | |
| 31.7% | 31.7% | Water Content (%) | | |
| 31.8% | 31.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 7.42 | 8.94 | Wt. Sample (wet+tare)(g) | | |
| 6.67 | 8.03 | Wt. Sample (dry+tare)(g) | | |
| 1.41 | 1.59 | Wt. Tare (g) | | |
| 5.3 | 6.4 | Wt. Dry Soil (g) | | |
| 0.8 | 0.9 | Wt. Water (g) | | |
| 14.3% | 14.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | |
| PL | 14 | | PL | |
| PI | 18 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | NON-PLASTIC | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 19, 2016 |
| Date Tested: | June 7, 2016 |
| Tested By: | B. Pelkey |

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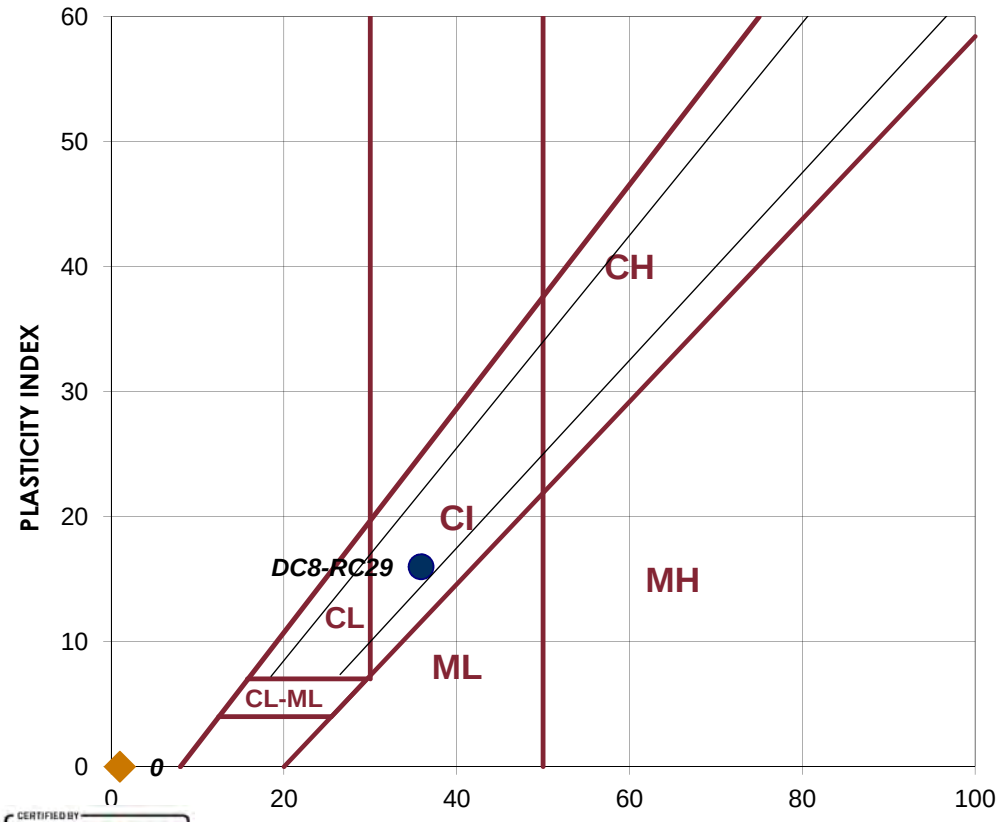
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC8-RC29 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 29 | Number of Blows | | |
| | | Container Number | | |
| 20.02 | 25.94 | Wt. Sample (wet+tare)(g) | | |
| 15.22 | 19.48 | Wt. Sample (dry+tare)(g) | | |
| 1.60 | 1.20 | Wt. Tare (g) | | |
| 13.6 | 18.3 | Wt. Dry Soil (g) | | |
| 4.8 | 6.5 | Wt. Water (g) | | |
| 35.2% | 35.3% | Water Content (%) | | |
| 35.7% | 36.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.88 | 16 | Wt. Sample (wet+tare)(g) | | |
| 11.05 | 13.57 | Wt. Sample (dry+tare)(g) | | |
| 1.45 | 1.6 | Wt. Tare (g) | | |
| 9.6 | 12.0 | Wt. Dry Soil (g) | | |
| 1.8 | 2.4 | Wt. Water (g) | | |
| 19.1% | 20.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | |
| PL | 20 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 16, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | C. Oost and C. Tollifson |


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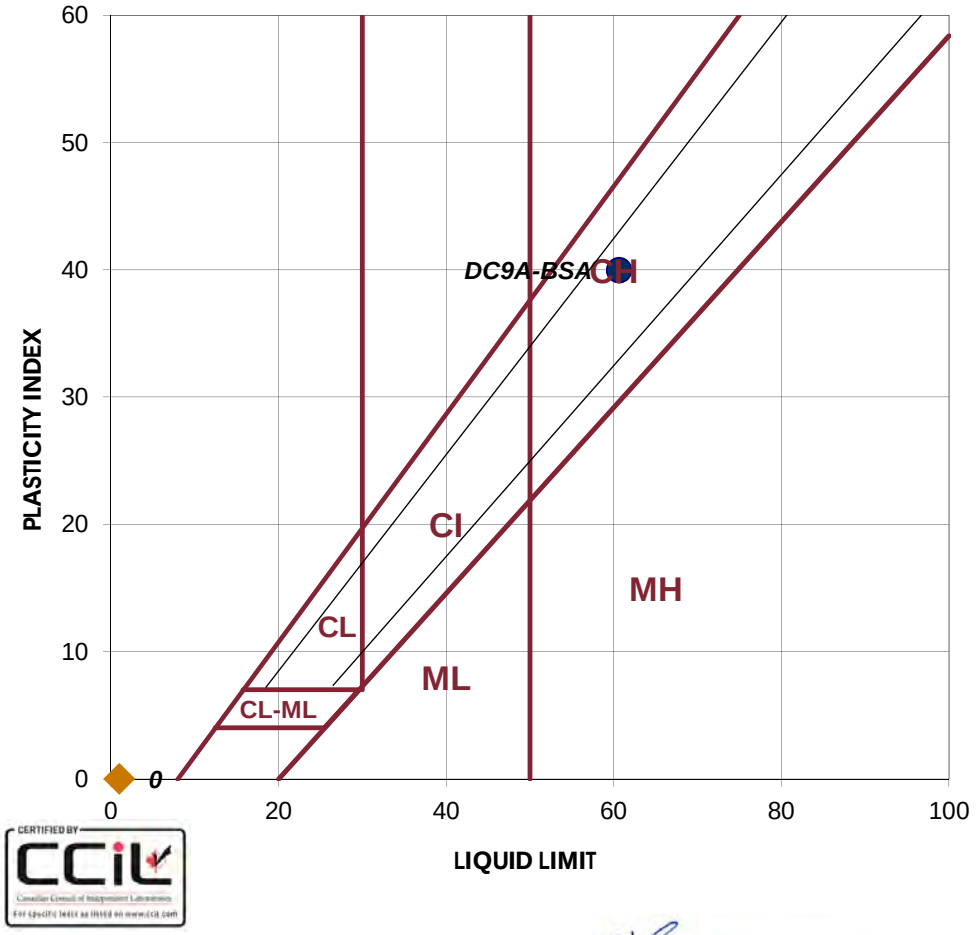
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC9A-BSA | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 22 | Number of Blows | | |
| | | Container Number | | |
| 12.88 | 16.11 | Wt. Sample (wet+tare)(g) | | |
| 8.52 | 10.54 | Wt. Sample (dry+tare)(g) | | |
| 1.37 | 1.52 | Wt. Tare (g) | | |
| 7.2 | 9.0 | Wt. Dry Soil (g) | | |
| 4.4 | 5.6 | Wt. Water (g) | | |
| 61.0% | 61.8% | Water Content (%) | | |
| 60.4% | 60.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 14.1 | 12.46 | Wt. Sample (wet+tare)(g) | | |
| 11.86 | 10.53 | Wt. Sample (dry+tare)(g) | | |
| 1.21 | 1.29 | Wt. Tare (g) | | |
| 10.7 | 9.2 | Wt. Dry Soil (g) | | |
| 2.2 | 1.9 | Wt. Water (g) | | |
| 21.0% | 20.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 61 | | LL | |
| PL | 21 | | PL | |
| PI | 40 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |




Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. STANTEC is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of STANTEC.

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Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 16, 2016 |
| Date Tested: | May 19, 2016 |
| Tested By: | C. Small |

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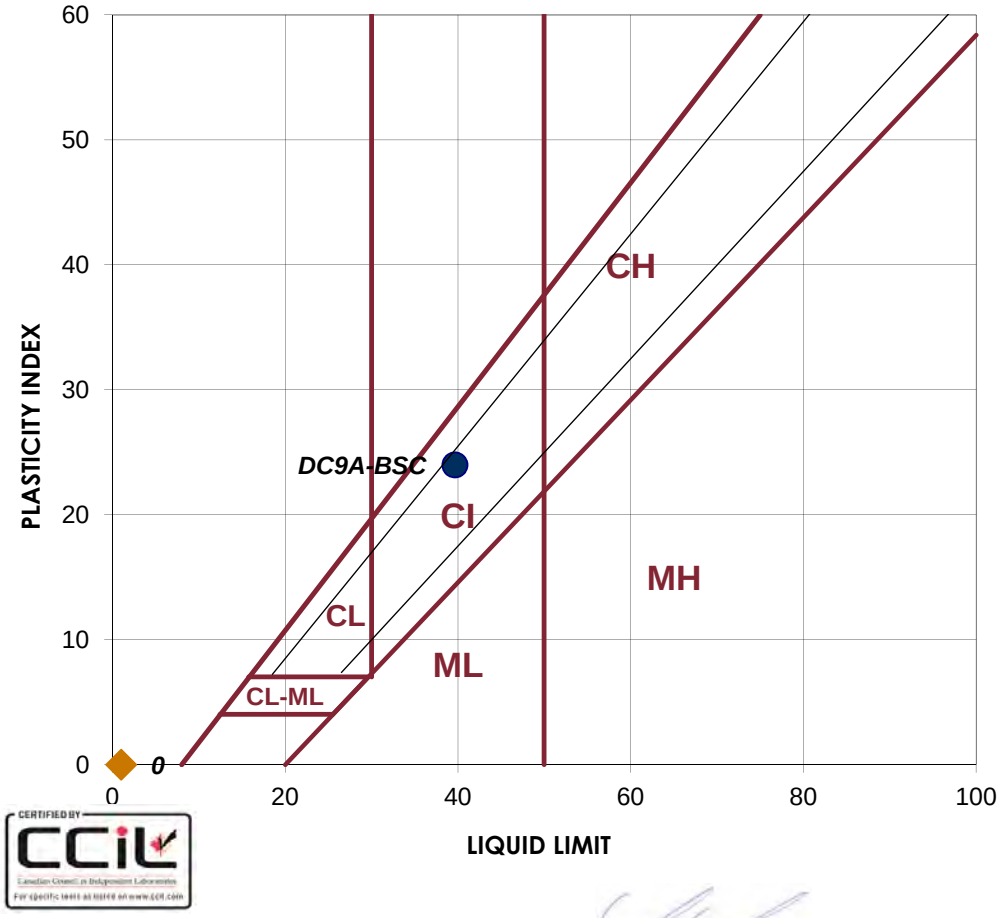
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC9A-BSC | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 26 | Number of Blows | | |
| | | Container Number | | |
| 21.85 | 25.04 | Wt. Sample (wet+tare)(g) | | |
| 15.99 | 18.28 | Wt. Sample (dry+tare)(g) | | |
| 1.19 | 1.15 | Wt. Tare (g) | | |
| 14.8 | 17.1 | Wt. Dry Soil (g) | | |
| 5.9 | 6.8 | Wt. Water (g) | | |
| 39.6% | 39.5% | Water Content (%) | | |
| 39.6% | 39.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.07 | 10.35 | Wt. Sample (wet+tare)(g) | | |
| 10.6 | 9.14 | Wt. Sample (dry+tare)(g) | | |
| 1.56 | 1.54 | Wt. Tare (g) | | |
| 9.0 | 7.6 | Wt. Dry Soil (g) | | |
| 1.5 | 1.2 | Wt. Water (g) | | |
| 16.3% | 15.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 40 | | LL | |
| PL | 16 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 10, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | C. Oost and C. Tollifson |


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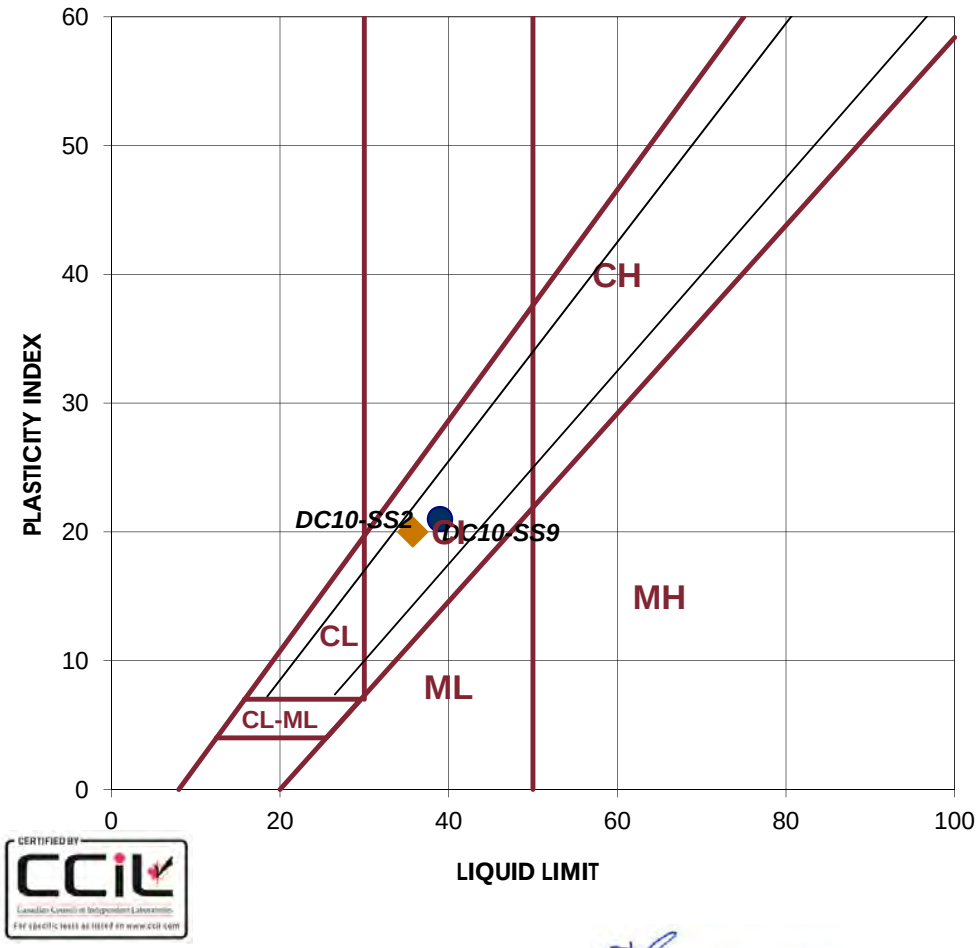
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC10-SS2 | | | DC10-SS9 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 23 | Number of Blows | 22 | 22 |
| | | Container Number | | |
| 14.84 | 16.54 | Wt. Sample (wet+tare)(g) | 17.29 | 15.67 |
| 11.03 | 12.32 | Wt. Sample (dry+tare)(g) | 13.02 | 11.89 |
| 1.39 | 1.61 | Wt. Tare (g) | 1.28 | 1.45 |
| 9.6 | 10.7 | Wt. Dry Soil (g) | 11.7 | 10.4 |
| 3.8 | 4.2 | Wt. Water (g) | 4.3 | 3.8 |
| 39.5% | 39.4% | Water Content (%) | 36.4% | 36.2% |
| 38.9% | 39.0% | Corrected Water Content (%) | 35.8% | 35.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 16.62 | 13.4 | Wt. Sample (wet+tare)(g) | 17.23 | 17.83 |
| 14.32 | 11.61 | Wt. Sample (dry+tare)(g) | 15.06 | 15.65 |
| 1.33 | 1.46 | Wt. Tare (g) | 1.46 | 1.51 |
| 13.0 | 10.2 | Wt. Dry Soil (g) | 13.6 | 14.1 |
| 2.3 | 1.8 | Wt. Water (g) | 2.2 | 2.2 |
| 17.7% | 17.6% | Water Content (%) | 16.0% | 15.4% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | 36 |
| PL | 18 | | PL | 16 |
| PI | 21 | | PI | 20 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI ● | | | CI ◆ | |

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Reviewed By:

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 27, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |


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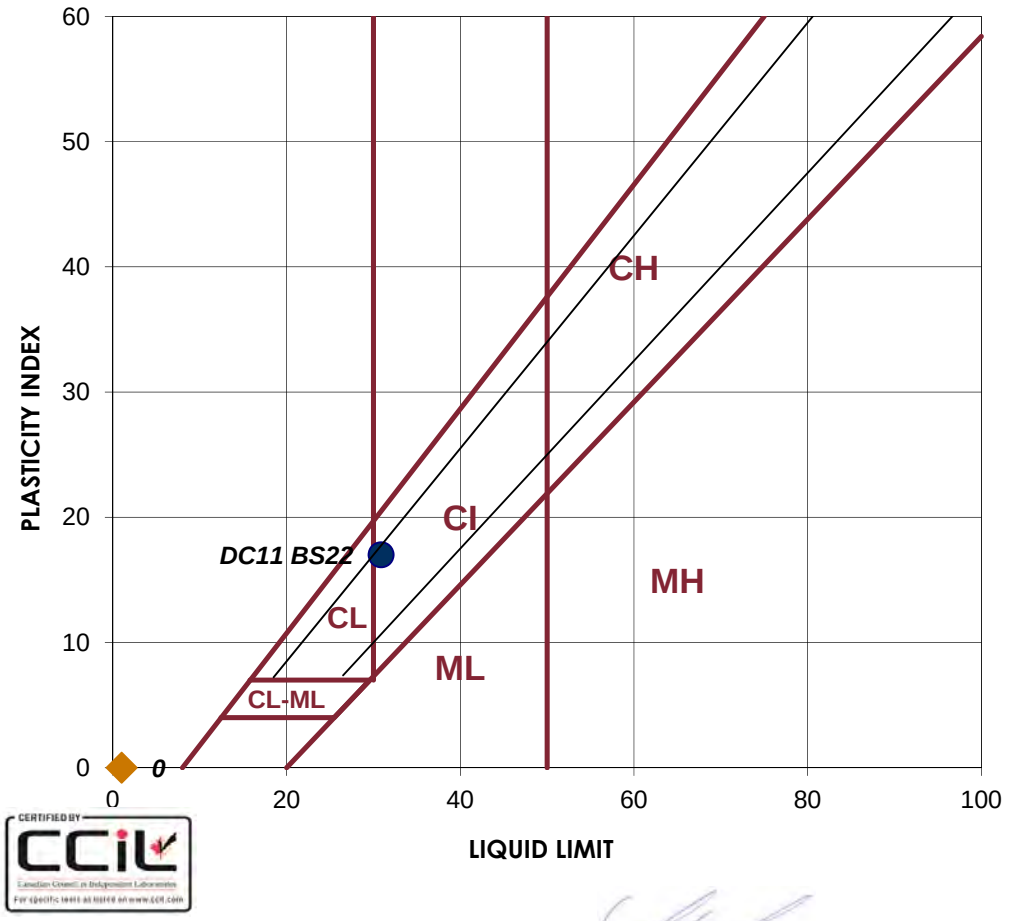
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC11 BS22 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | | |
| | | Container Number | | |
| 28.67 | 25.57 | Wt. Sample (wet+tare)(g) | | |
| 22.19 | 19.76 | Wt. Sample (dry+tare)(g) | | |
| 1.54 | 1.23 | Wt. Tare (g) | | |
| 20.7 | 18.5 | Wt. Dry Soil (g) | | |
| 6.5 | 5.8 | Wt. Water (g) | | |
| 31.4% | 31.4% | Water Content (%) | | |
| 30.9% | 30.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.78 | 26.24 | Wt. Sample (wet+tare)(g) | | |
| 25.16 | 24.77 | Wt. Sample (dry+tare)(g) | | |
| 13.82 | 14.14 | Wt. Tare (g) | | |
| 11.3 | 10.6 | Wt. Dry Soil (g) | | |
| 1.6 | 1.5 | Wt. Water (g) | | |
| 14.3% | 13.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 14 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CI-CL** | | | **NON-PLASTIC** | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 30, 2016 |
| Date Tested: | June 2, 2016 |
| Tested By: | C. Oost |


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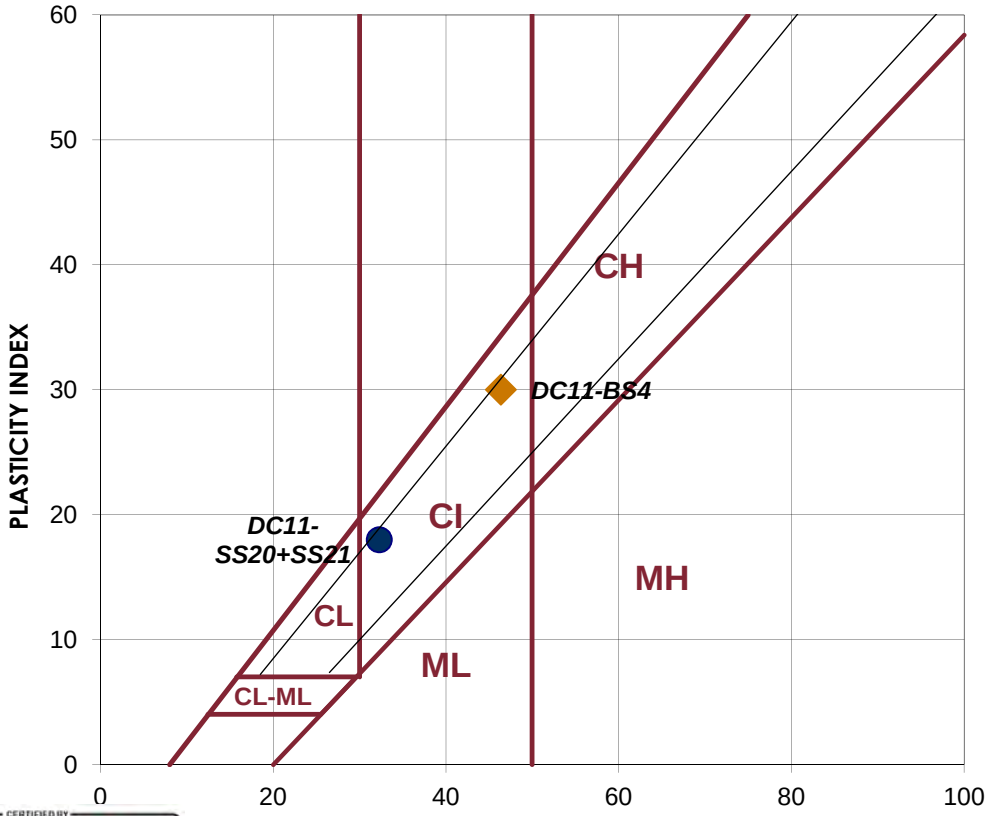
| Sample: DC11-SS20+SS21 | | | Sample: DC11-BS4 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 26 | Number of Blows | 27 | 28 |
| | | Container Number | | |
| 13.09 | 12.37 | Wt. Sample (wet+tare)(g) | 12.97 | 12.05 |
| 10.20 | 9.68 | Wt. Sample (dry+tare)(g) | 9.27 | 8.70 |
| 1.22 | 1.29 | Wt. Tare (g) | 1.22 | 1.36 |
| 9.0 | 8.4 | Wt. Dry Soil (g) | 8.1 | 7.3 |
| 2.9 | 2.7 | Wt. Water (g) | 3.7 | 3.4 |
| 32.2% | 32.1% | Water Content (%) | 46.0% | 45.6% |
| 32.3% | 32.2% | Corrected Water Content (%) | 46.4% | 46.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.55 | 9.23 | Wt. Sample (wet+tare)(g) | 8.51 | 9.65 |
| 7.66 | 8.25 | Wt. Sample (dry+tare)(g) | 7.51 | 8.52 |
| 1.24 | 1.24 | Wt. Tare (g) | 1.46 | 1.51 |
| 6.4 | 7.0 | Wt. Dry Soil (g) | 6.1 | 7.0 |
| 0.9 | 1.0 | Wt. Water (g) | 1.0 | 1.1 |
| 13.9% | 14.0% | Water Content (%) | 16.5% | 16.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | 46 |
| PL | 14 | | PL | 16 |
| PI | 18 | | PI | 30 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 27, 2016 |
| Date Tested: | July 8, 2016 |
| Tested By: | B. Pelkey |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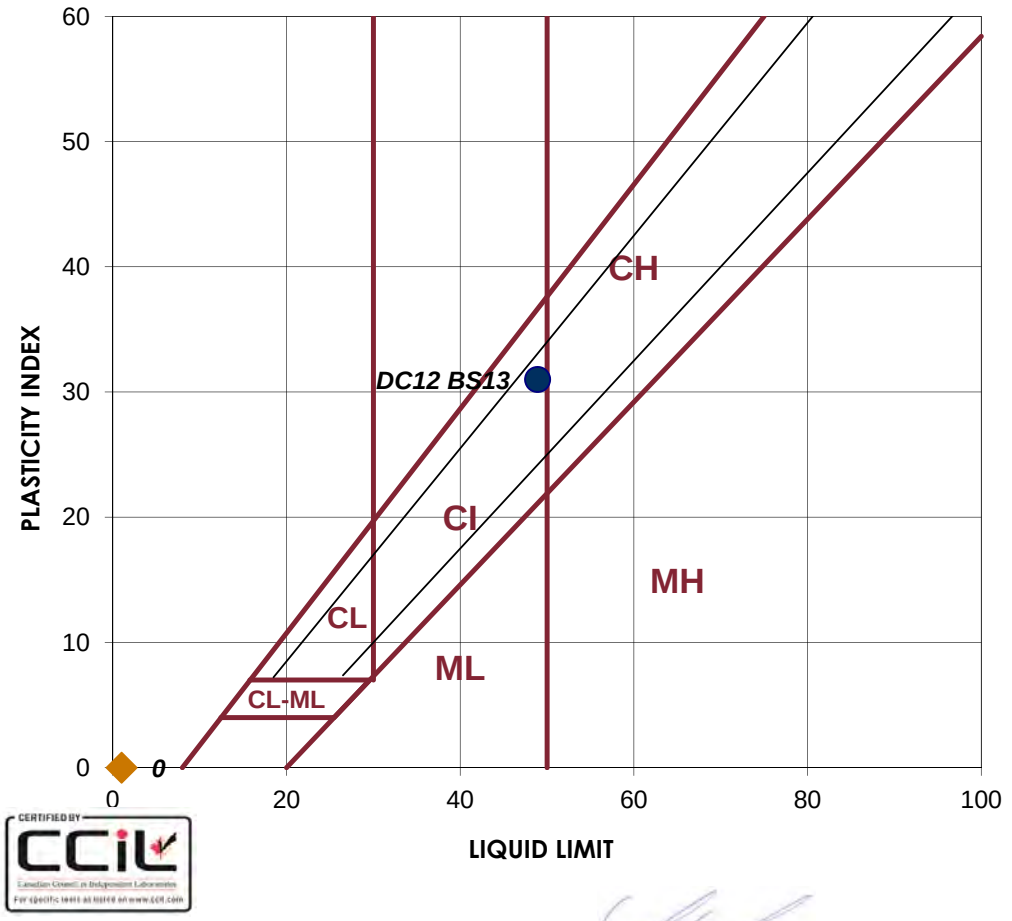
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC12 BS13 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 23.98 | 25.79 | Wt. Sample (wet+tare)(g) | | |
| 16.62 | 17.81 | Wt. Sample (dry+tare)(g) | | |
| 1.23 | 1.27 | Wt. Tare (g) | | |
| 15.4 | 16.5 | Wt. Dry Soil (g) | | |
| 7.4 | 8.0 | Wt. Water (g) | | |
| 47.8% | 48.2% | Water Content (%) | | |
| 48.7% | 49.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.74 | 27.61 | Wt. Sample (wet+tare)(g) | | |
| 23.96 | 25.5 | Wt. Sample (dry+tare)(g) | | |
| 14.14 | 13.78 | Wt. Tare (g) | | |
| 9.8 | 11.7 | Wt. Dry Soil (g) | | |
| 1.8 | 2.1 | Wt. Water (g) | | |
| 18.1% | 18.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 49 | | LL | |
| PL | 18 | | PL | |
| PI | 31 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CH*** | | | ***NON-PLASTIC*** | |

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Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 27, 2015 |
| Date Tested: | July 15, 2016 |
| Tested By: | C. Oost |


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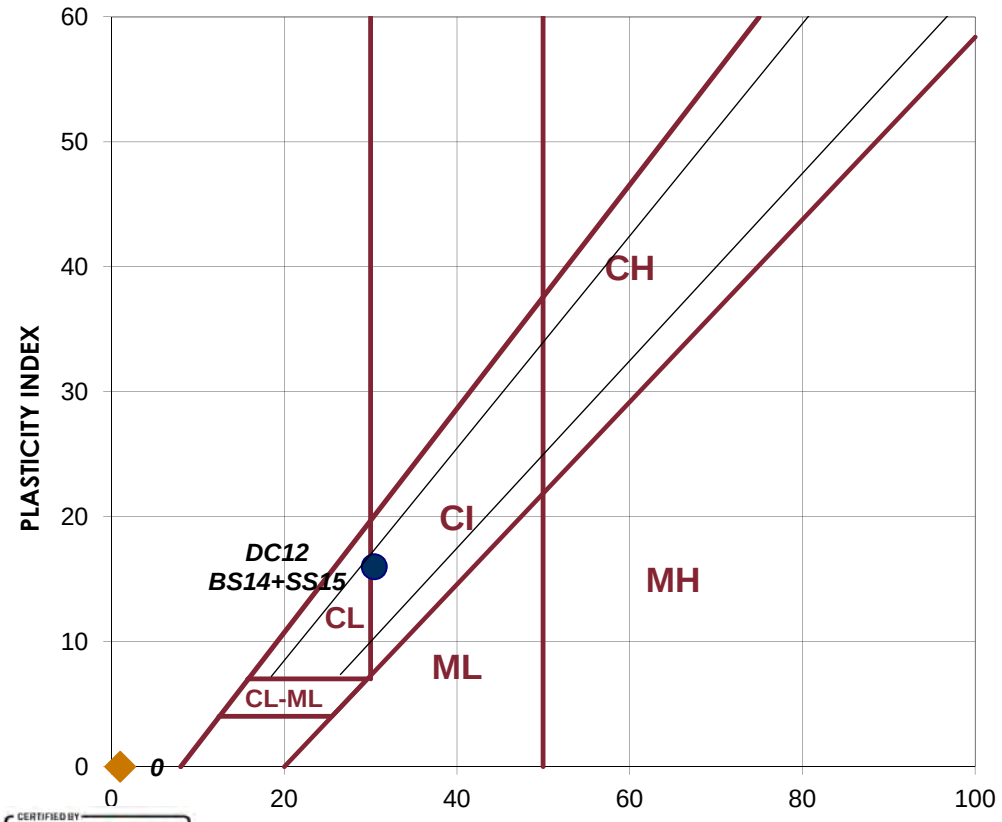
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC12 BS14+SS15 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | | |
| | | Container Number | | |
| 17.24 | 16.54 | Wt. Sample (wet+tare)(g) | | |
| 13.46 | 13.01 | Wt. Sample (dry+tare)(g) | | |
| 1.25 | 1.55 | Wt. Tare (g) | | |
| 12.2 | 11.5 | Wt. Dry Soil (g) | | |
| 3.8 | 3.5 | Wt. Water (g) | | |
| 31.0% | 30.8% | Water Content (%) | | |
| 30.5% | 30.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22 | 22.36 | Wt. Sample (wet+tare)(g) | | |
| 21.23 | 21.57 | Wt. Sample (dry+tare)(g) | | |
| 15.65 | 15.77 | Wt. Tare (g) | | |
| 5.6 | 5.8 | Wt. Dry Soil (g) | | |
| 0.8 | 0.8 | Wt. Water (g) | | |
| 13.8% | 13.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | |
| PL | 14 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CL*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 27, 2016 |
| Date Tested: | July 6, 2016 |
| Tested By: | B. Pelkey |

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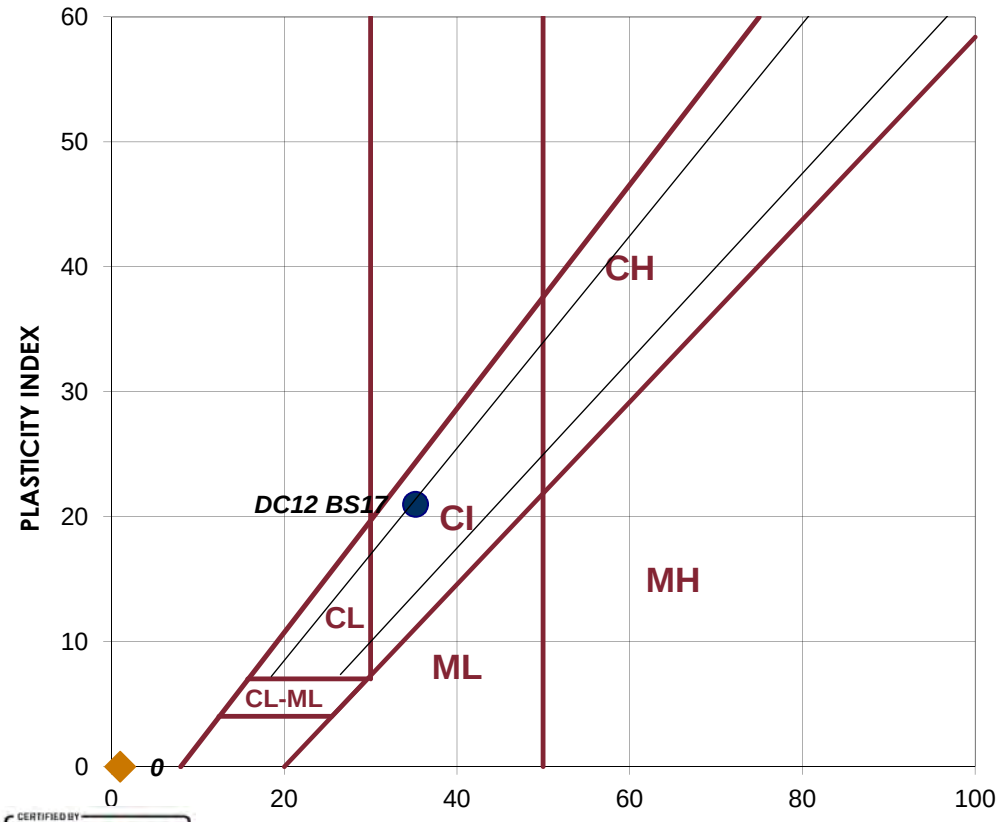
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC12 BS17 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 20.50 | 21.04 | Wt. Sample (wet+tare)(g) | | |
| 15.61 | 15.95 | Wt. Sample (dry+tare)(g) | | |
| 1.45 | 1.23 | Wt. Tare (g) | | |
| 14.2 | 14.7 | Wt. Dry Soil (g) | | |
| 4.9 | 5.1 | Wt. Water (g) | | |
| 34.5% | 34.6% | Water Content (%) | | |
| 35.2% | 35.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.51 | 32.79 | Wt. Sample (wet+tare)(g) | | |
| 26.06 | 30.68 | Wt. Sample (dry+tare)(g) | | |
| 15.96 | 15.9 | Wt. Tare (g) | | |
| 10.1 | 14.8 | Wt. Dry Soil (g) | | |
| 1.5 | 2.1 | Wt. Water (g) | | |
| 14.4% | 14.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 14 | | PL | |
| PI | 21 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 27, 2016 |
| Date Tested: | July 6, 2016 |
| Tested By: | B. Pelkey |


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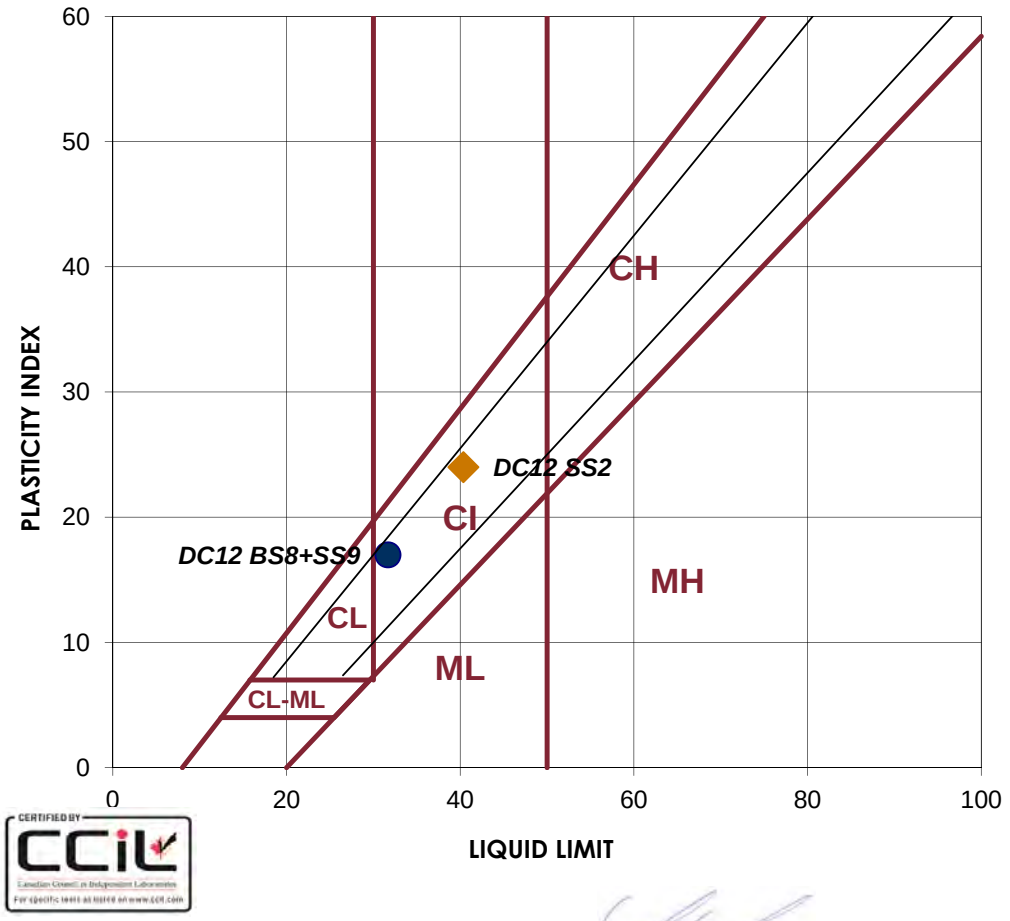
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC12 BS8+SS9 | | | DC12 SS2 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 23 | Number of Blows | 25 | 27 |
| | | Container Number | | |
| 30.13 | 29.20 | Wt. Sample (wet+tare)(g) | 26.09 | 29.37 |
| 23.18 | 22.49 | Wt. Sample (dry+tare)(g) | 18.97 | 21.44 |
| 1.50 | 1.58 | Wt. Tare (g) | 1.29 | 1.65 |
| 21.7 | 20.9 | Wt. Dry Soil (g) | 17.7 | 19.8 |
| 7.0 | 6.7 | Wt. Water (g) | 7.1 | 7.9 |
| 32.1% | 32.1% | Water Content (%) | 40.3% | 40.1% |
| 31.6% | 31.8% | Corrected Water Content (%) | 40.3% | 40.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.74 | 27.27 | Wt. Sample (wet+tare)(g) | 25.87 | 27.94 |
| 22.45 | 25.47 | Wt. Sample (dry+tare)(g) | 24.48 | 26.23 |
| 14.15 | 13.79 | Wt. Tare (g) | 15.81 | 15.98 |
| 8.3 | 11.7 | Wt. Dry Soil (g) | 8.7 | 10.3 |
| 1.3 | 1.8 | Wt. Water (g) | 1.4 | 1.7 |
| 15.5% | 15.4% | Water Content (%) | 16.0% | 16.7% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | 40 |
| PL | 15 | | PL | 16 |
| PI | 17 | | PI | 24 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 30, 2016 |
| Date Tested: | June 2, 2016 |
| Tested By: | C. Oost |


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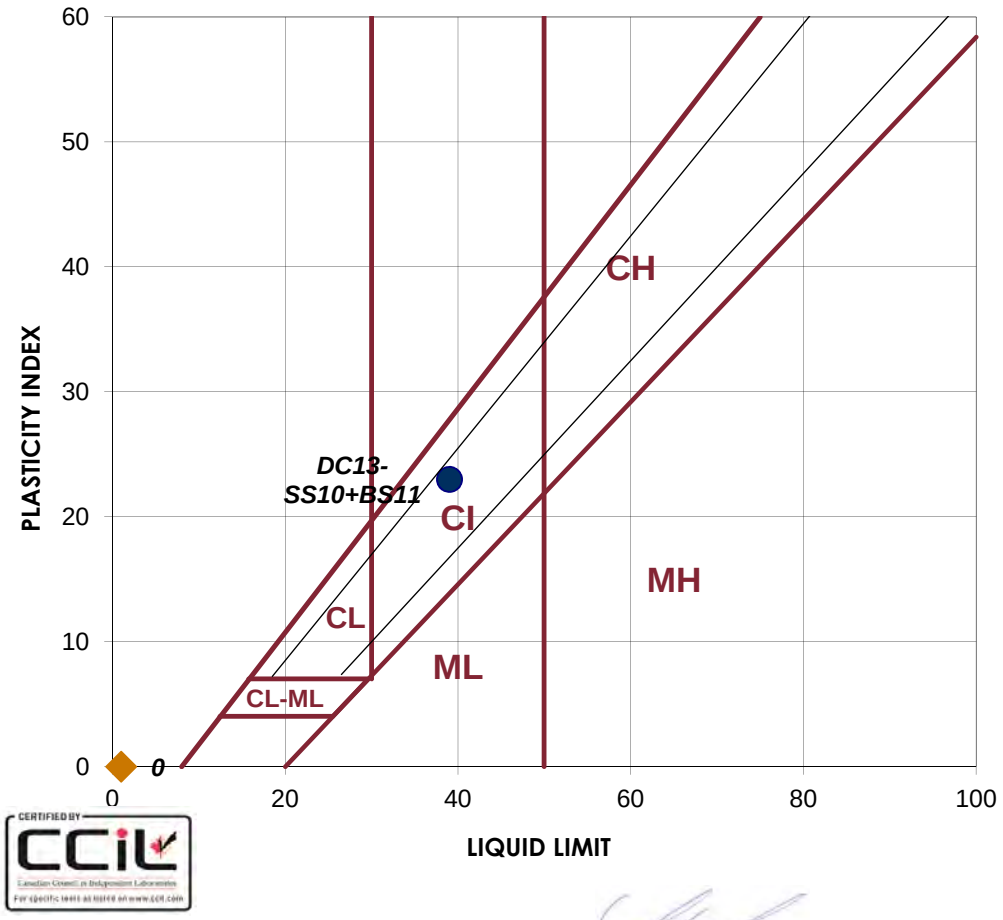
| Sample: DC13-SS10+BS11 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 27 | Number of Blows | | |
| | | Container Number | | |
| 13.45 | 13.83 | Wt. Sample (wet+tare)(g) | | |
| 9.99 | 10.39 | Wt. Sample (dry+tare)(g) | | |
| 1.07 | 1.49 | Wt. Tare (g) | | |
| 8.9 | 8.9 | Wt. Dry Soil (g) | | |
| 3.5 | 3.4 | Wt. Water (g) | | |
| 38.8% | 38.7% | Water Content (%) | | |
| 39.0% | 39.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.41 | 9.03 | Wt. Sample (wet+tare)(g) | | |
| 8.33 | 8.03 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.59 | Wt. Tare (g) | | |
| 6.8 | 6.4 | Wt. Dry Soil (g) | | |
| 1.1 | 1.0 | Wt. Water (g) | | |
| 15.8% | 15.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | |
| PL | 16 | | PL | |
| PI | 23 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 17, 2016 |
| Date Tested: | June 29, 2016 |
| Tested By: | B. Pelkey |


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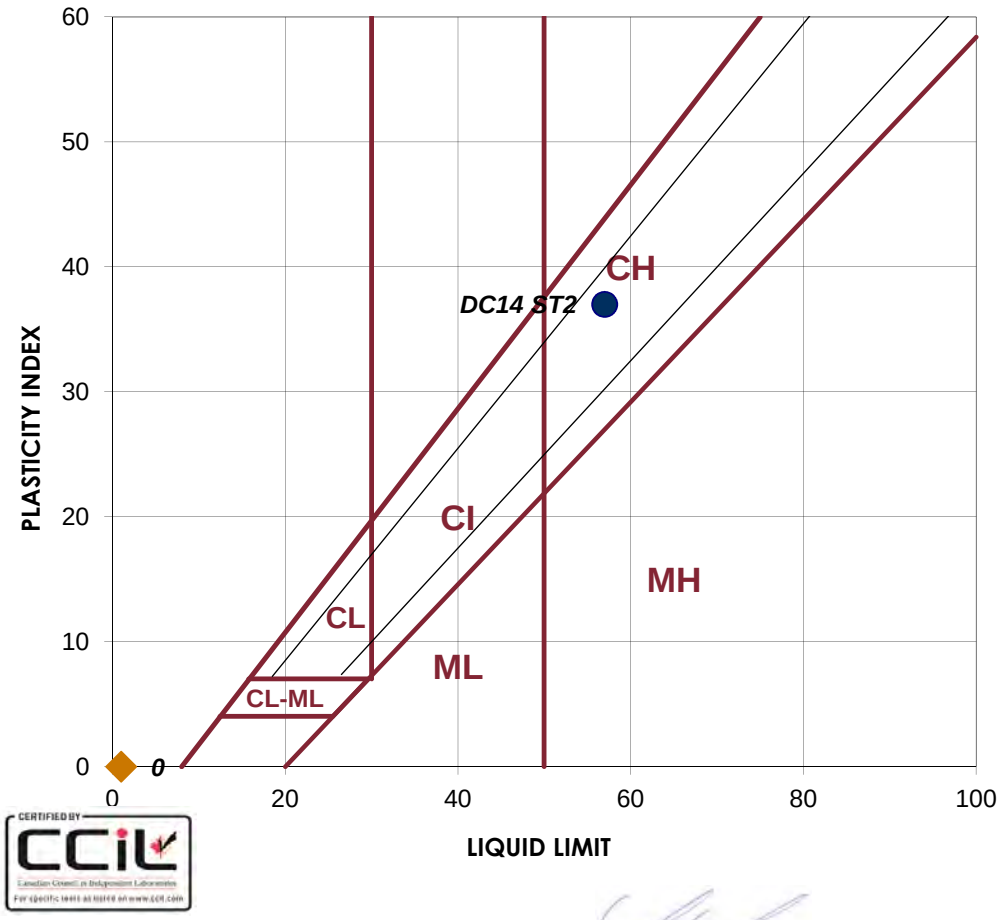
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC14 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 27.94 | 27.31 | Wt. Sample (wet+tare)(g) | | |
| 18.48 | 18.03 | Wt. Sample (dry+tare)(g) | | |
| 1.57 | 1.46 | Wt. Tare (g) | | |
| 16.9 | 16.6 | Wt. Dry Soil (g) | | |
| 9.5 | 9.3 | Wt. Water (g) | | |
| 55.9% | 56.0% | Water Content (%) | | |
| 57.0% | 57.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.37 | 23.53 | Wt. Sample (wet+tare)(g) | | |
| 22.62 | 21.95 | Wt. Sample (dry+tare)(g) | | |
| 13.78 | 13.87 | Wt. Tare (g) | | |
| 8.8 | 8.1 | Wt. Dry Soil (g) | | |
| 1.8 | 1.6 | Wt. Water (g) | | |
| 19.8% | 19.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 57 | | LL | |
| PL | 20 | | PL | |
| PI | 37 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 17, 2016 |
| Date Tested: | July 6, 2016 |
| Tested By: | B. Pelkey |


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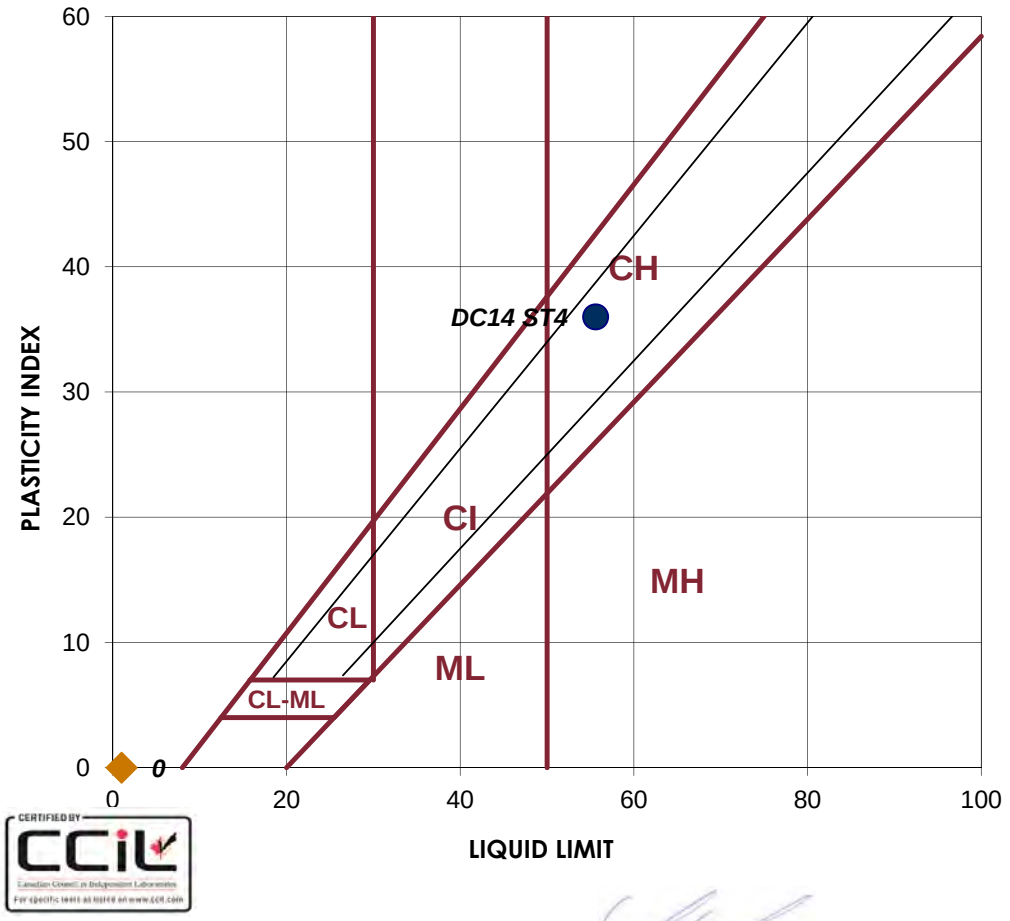
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC14 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 25 | Number of Blows | | |
| | | Container Number | | |
| 23.38 | 22.97 | Wt. Sample (wet+tare)(g) | | |
| 15.51 | 15.22 | Wt. Sample (dry+tare)(g) | | |
| 1.31 | 1.19 | Wt. Tare (g) | | |
| 14.2 | 14.0 | Wt. Dry Soil (g) | | |
| 7.9 | 7.8 | Wt. Water (g) | | |
| 55.4% | 55.2% | Water Content (%) | | |
| 55.9% | 55.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.14 | 24.19 | Wt. Sample (wet+tare)(g) | | |
| 21.58 | 22.46 | Wt. Sample (dry+tare)(g) | | |
| 13.76 | 13.78 | Wt. Tare (g) | | |
| 7.8 | 8.7 | Wt. Dry Soil (g) | | |
| 1.6 | 1.7 | Wt. Water (g) | | |
| 19.9% | 19.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 56 | | LL | |
| PL | 20 | | PL | |
| PI | 36 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 11, 2016 |
| Date Tested: | May 26, 2016 |
| Tested By: | C. Small |


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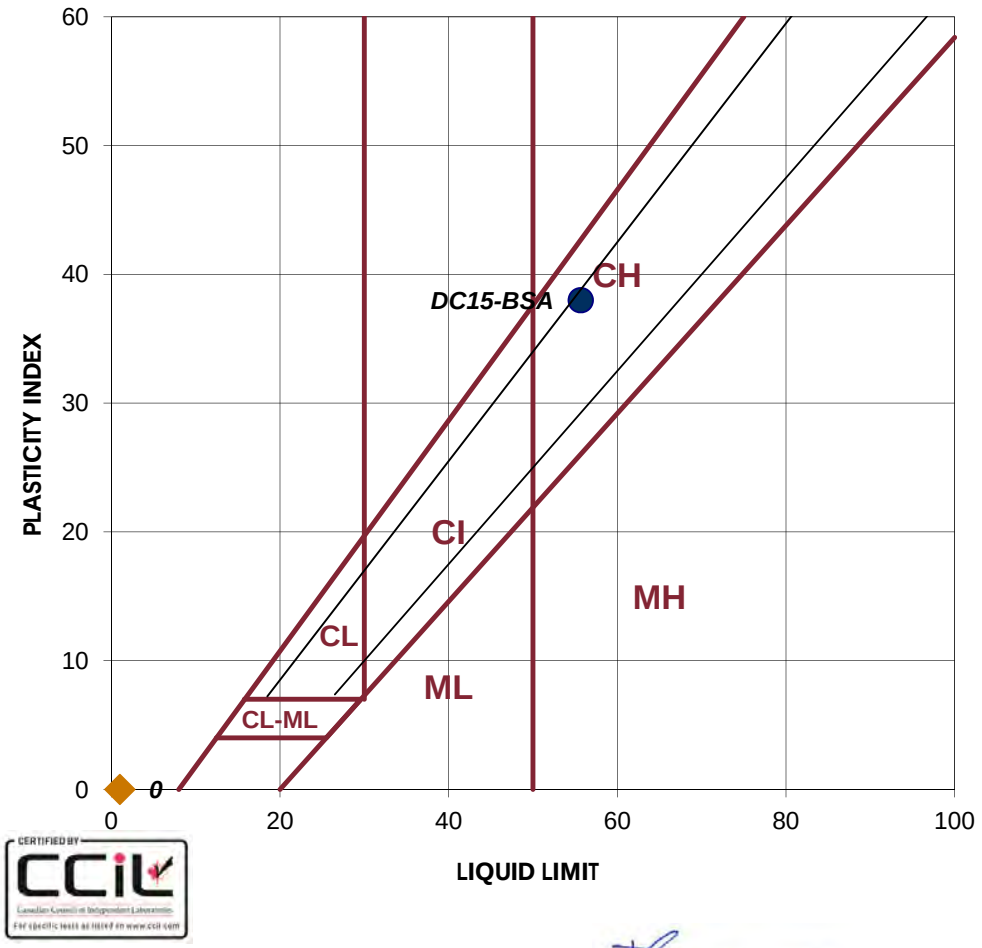
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC15-BSA | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 28 | Number of Blows | | |
| | | Container Number | | |
| 18.78 | 20.05 | Wt. Sample (wet+tare)(g) | | |
| 12.51 | 13.49 | Wt. Sample (dry+tare)(g) | | |
| 1.19 | 1.54 | Wt. Tare (g) | | |
| 11.3 | 12.0 | Wt. Dry Soil (g) | | |
| 6.3 | 6.6 | Wt. Water (g) | | |
| 55.4% | 54.9% | Water Content (%) | | |
| 55.7% | 55.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.81 | 11.36 | Wt. Sample (wet+tare)(g) | | |
| 11.05 | 9.8 | Wt. Sample (dry+tare)(g) | | |
| 1.24 | 1.15 | Wt. Tare (g) | | |
| 9.8 | 8.7 | Wt. Dry Soil (g) | | |
| 1.8 | 1.6 | Wt. Water (g) | | |
| 17.9% | 18.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 56 | | LL | |
| PL | 18 | | PL | |
| PI | 38 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |

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Reviewed By:

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 11, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | C. Oost |


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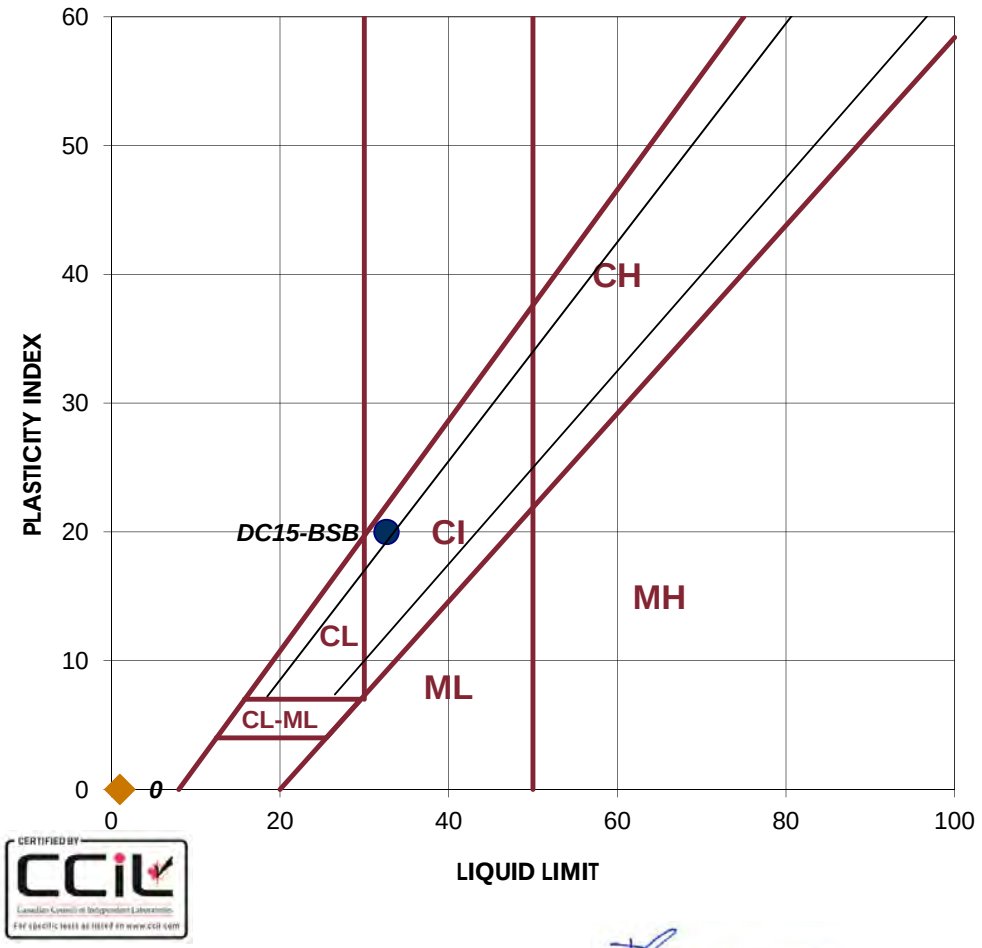
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC15-BSB | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 14.40 | 14.14 | Wt. Sample (wet+tare)(g) | | |
| 11.13 | 10.93 | Wt. Sample (dry+tare)(g) | | |
| 1.19 | 1.15 | Wt. Tare (g) | | |
| 9.9 | 9.8 | Wt. Dry Soil (g) | | |
| 3.3 | 3.2 | Wt. Water (g) | | |
| 32.9% | 32.8% | Water Content (%) | | |
| 32.6% | 32.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.46 | 8.02 | Wt. Sample (wet+tare)(g) | | |
| 7.65 | 7.26 | Wt. Sample (dry+tare)(g) | | |
| 1.47 | 1.46 | Wt. Tare (g) | | |
| 6.2 | 5.8 | Wt. Dry Soil (g) | | |
| 0.8 | 0.8 | Wt. Water (g) | | |
| 13.1% | 13.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | |
| PL | 13 | | PL | |
| PI | 20 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***NON-PLASTIC*** | |



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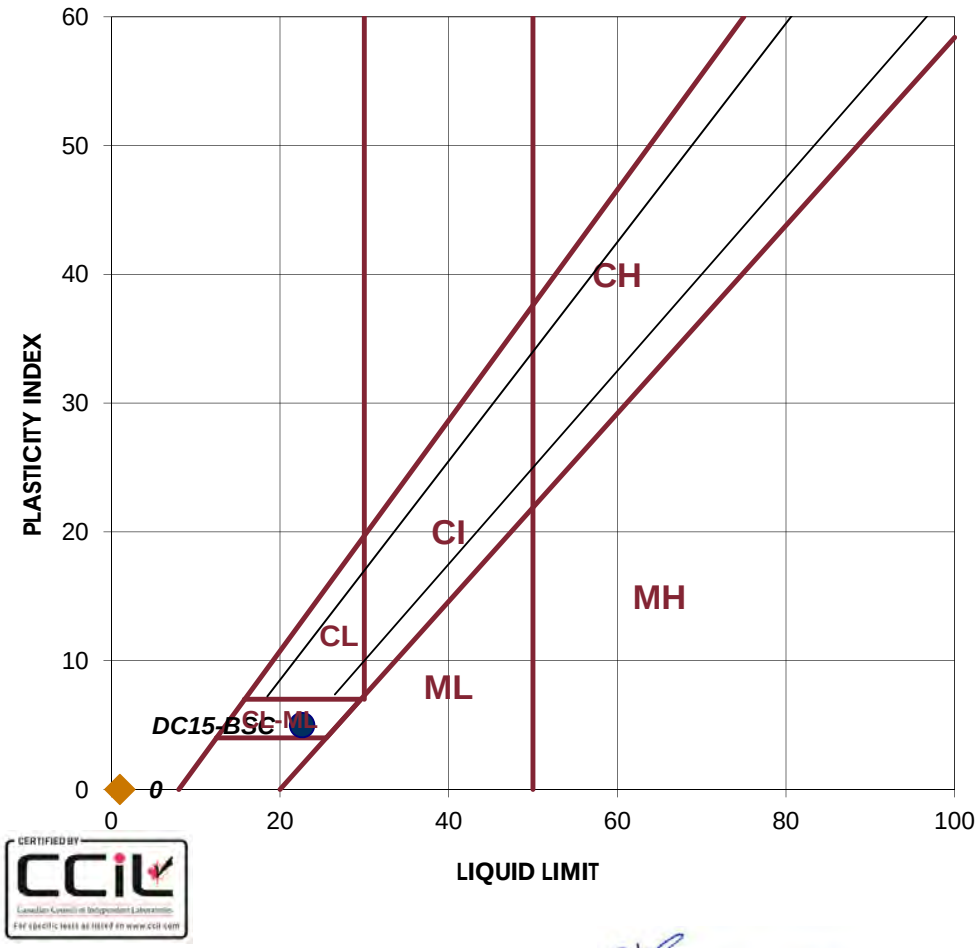
## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 11, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | B. Pelkey and C. Oost |

| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC15-BSC | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 27 | Number of Blows | | |
| | | Container Number | | |
| 22.09 | 29.05 | Wt. Sample (wet+tare)(g) | | |
| 18.29 | 24.00 | Wt. Sample (dry+tare)(g) | | |
| 1.25 | 1.35 | Wt. Tare (g) | | |
| 17.0 | 22.7 | Wt. Dry Soil (g) | | |
| 3.8 | 5.1 | Wt. Water (g) | | |
| 22.3% | 22.3% | Water Content (%) | | |
| 22.7% | 22.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.75 | 9.37 | Wt. Sample (wet+tare)(g) | | |
| 7.61 | 8.17 | Wt. Sample (dry+tare)(g) | | |
| 1.19 | 1.49 | Wt. Tare (g) | | |
| 6.4 | 6.7 | Wt. Dry Soil (g) | | |
| 1.1 | 1.2 | Wt. Water (g) | | |
| 17.8% | 18.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | |
| PL | 18 | | PL | |
| PI | 5 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-ML*** | | | ***NON-PLASTIC*** | |

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Reviewed By:

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 11, 2016 |
| Date Tested: | June 1, 2016 |
| Tested By: | C. Tollifson |


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**LABORATORY**
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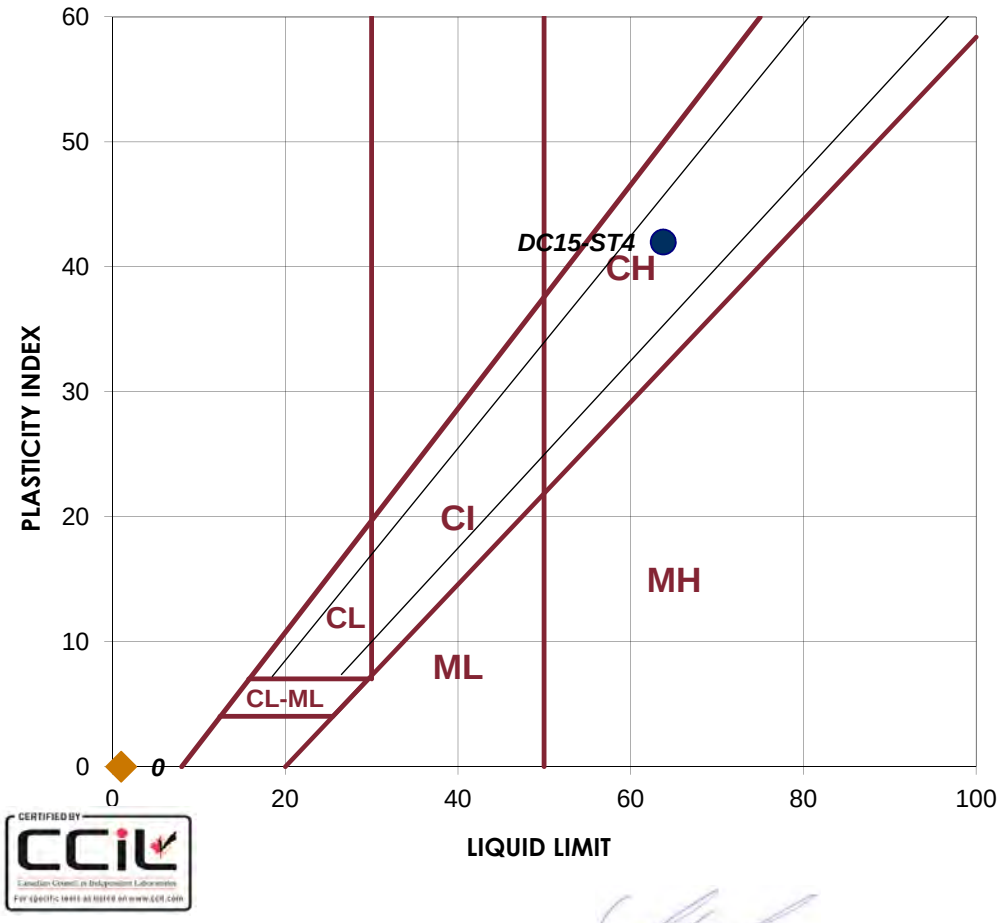
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC15-ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 22 | Number of Blows | | |
| | | Container Number | | |
| 21.78 | 23.73 | Wt. Sample (wet+tare)(g) | | |
| 13.87 | 14.91 | Wt. Sample (dry+tare)(g) | | |
| 1.59 | 1.22 | Wt. Tare (g) | | |
| 12.3 | 13.7 | Wt. Dry Soil (g) | | |
| 7.9 | 8.8 | Wt. Water (g) | | |
| 64.4% | 64.4% | Water Content (%) | | |
| 64.1% | 63.4% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.22 | 10.98 | Wt. Sample (wet+tare)(g) | | |
| 9.52 | 9.27 | Wt. Sample (dry+tare)(g) | | |
| 1.72 | 1.39 | Wt. Tare (g) | | |
| 7.8 | 7.9 | Wt. Dry Soil (g) | | |
| 1.7 | 1.7 | Wt. Water (g) | | |
| 21.8% | 21.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 64 | | LL | |
| PL | 22 | | PL | |
| PI | 42 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 16, 2016 |
| Date Tested: | May 26, 2016 |
| Tested By: | C. Small |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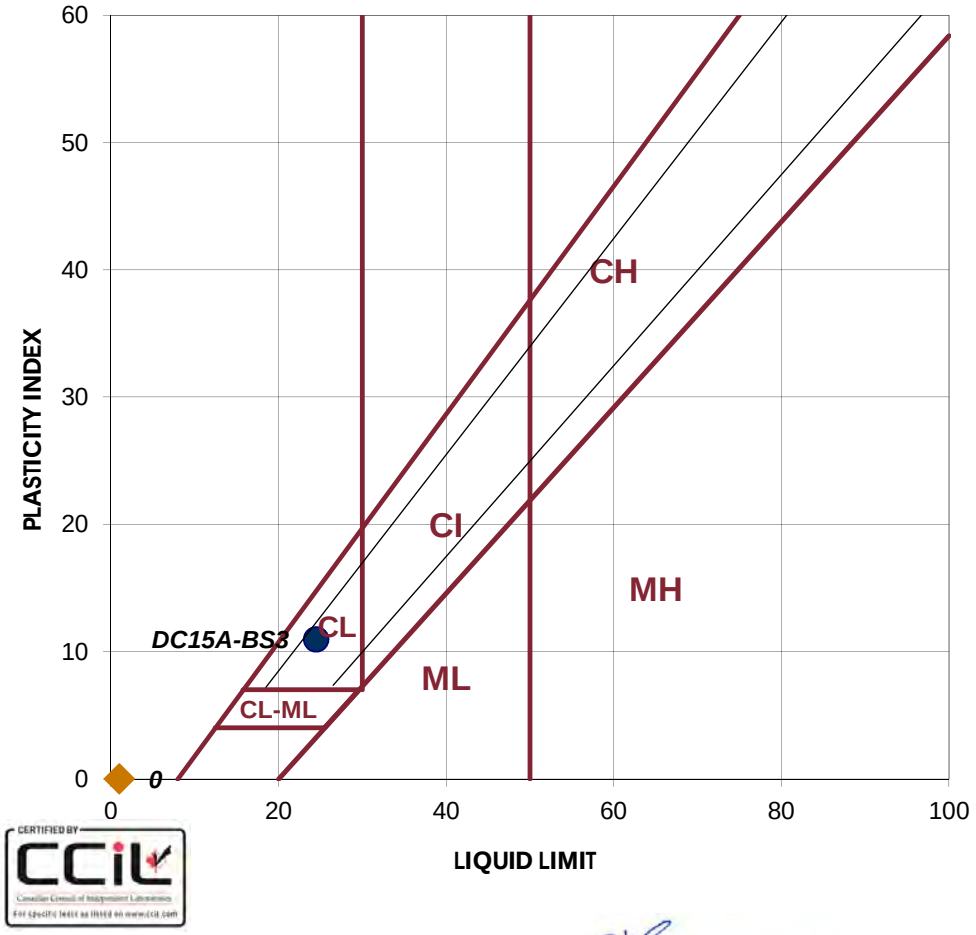
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC15A-BS3 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 30 | Number of Blows | | |
| | | Container Number | | |
| 22.56 | 31.90 | Wt. Sample (wet+tare)(g) | | |
| 18.48 | 25.96 | Wt. Sample (dry+tare)(g) | | |
| 1.46 | 1.28 | Wt. Tare (g) | | |
| 17.0 | 24.7 | Wt. Dry Soil (g) | | |
| 4.1 | 5.9 | Wt. Water (g) | | |
| 24.0% | 24.1% | Water Content (%) | | |
| 24.3% | 24.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 15.94 | 16.43 | Wt. Sample (wet+tare)(g) | | |
| 14.28 | 14.71 | Wt. Sample (dry+tare)(g) | | |
| 1.46 | 1.53 | Wt. Tare (g) | | |
| 12.8 | 13.2 | Wt. Dry Soil (g) | | |
| 1.7 | 1.7 | Wt. Water (g) | | |
| 12.9% | 13.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 24 | | LL | |
| PL | 13 | | PL | |
| PI | 11 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 16, 2016 |
| Date Tested: | May 31, 2016 |
| Tested By: | C. Tollifson |


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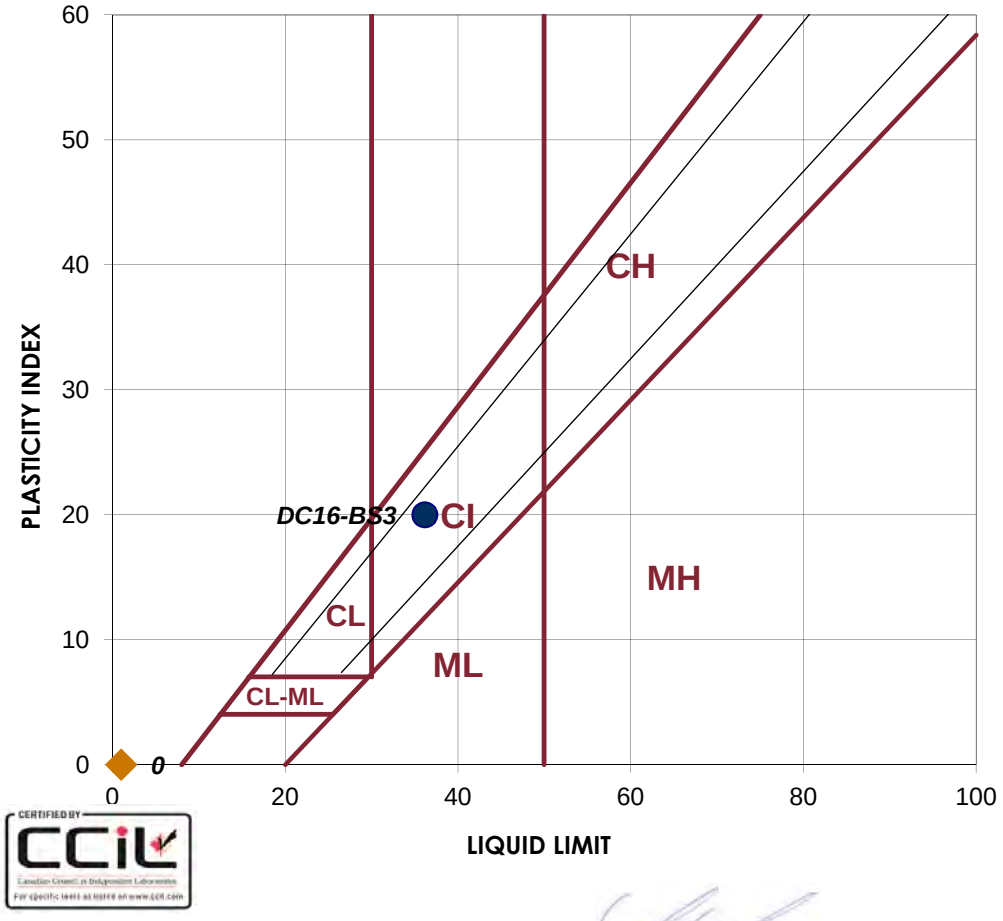
| Sample: DC16-BS3 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 27 | Number of Blows | | |
| | | Container Number | | |
| 30.82 | 27.63 | Wt. Sample (wet+tare)(g) | | |
| 23.04 | 20.62 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.06 | Wt. Tare (g) | | |
| 21.5 | 19.6 | Wt. Dry Soil (g) | | |
| 7.8 | 7.0 | Wt. Water (g) | | |
| 36.1% | 35.8% | Water Content (%) | | |
| 36.1% | 36.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.03 | 13.75 | Wt. Sample (wet+tare)(g) | | |
| 9.67 | 12.04 | Wt. Sample (dry+tare)(g) | | |
| 1.23 | 1.51 | Wt. Tare (g) | | |
| 8.4 | 10.5 | Wt. Dry Soil (g) | | |
| 1.4 | 1.7 | Wt. Water (g) | | |
| 16.1% | 16.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | |
| PL | 16 | | PL | |
| PI | 20 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 16, 2016 |
| Date Tested: | May 30, 2016 |
| Tested By: | C. Oost |


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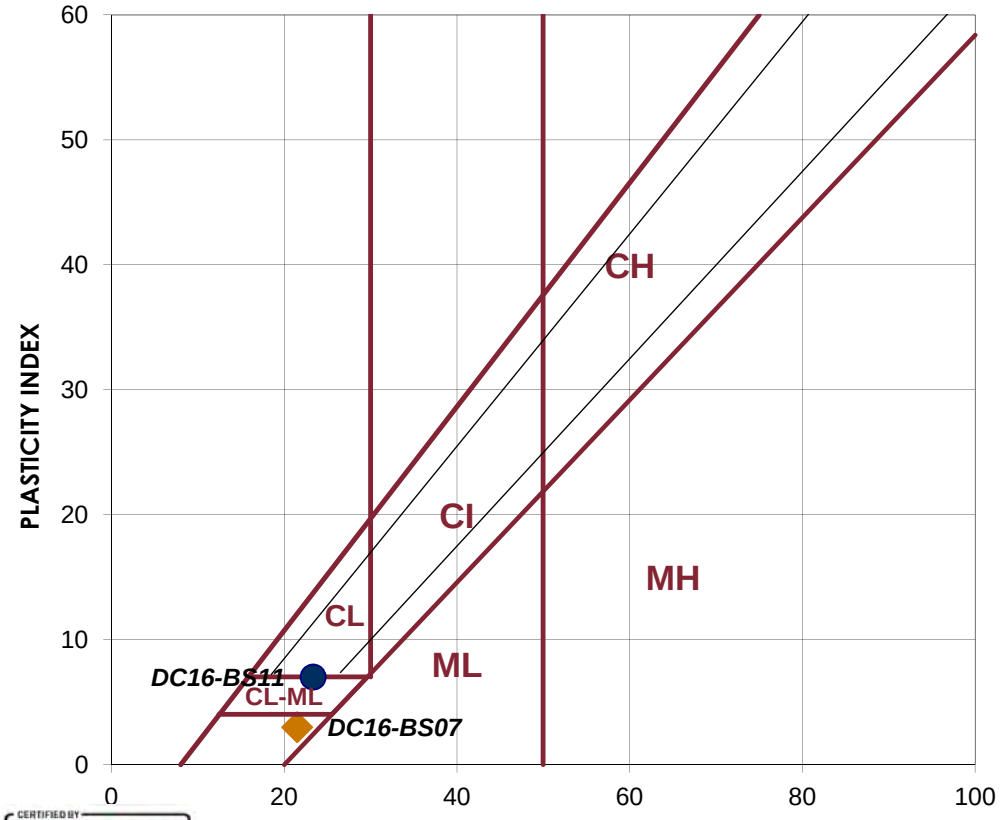
Tel: (403) 253-7876


| Sample: DC16-BS11 | | | Sample: DC16-BS07 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 28 | Number of Blows | 21 | 21 |
| | | Container Number | | |
| 17.51 | 16.57 | Wt. Sample (wet+tare)(g) | 20.89 | 17.08 |
| 14.45 | 13.72 | Wt. Sample (dry+tare)(g) | 17.34 | 14.26 |
| 1.21 | 1.35 | Wt. Tare (g) | 1.24 | 1.34 |
| 13.2 | 12.4 | Wt. Dry Soil (g) | 16.1 | 12.9 |
| 3.1 | 2.9 | Wt. Water (g) | 3.6 | 2.8 |
| 23.1% | 23.0% | Water Content (%) | 22.0% | 21.8% |
| 23.3% | 23.4% | Corrected Water Content (%) | 21.6% | 21.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.51 | 8.45 | Wt. Sample (wet+tare)(g) | 8.53 | 8.96 |
| 7.57 | 7.5 | Wt. Sample (dry+tare)(g) | 7.47 | 7.83 |
| 1.63 | 1.41 | Wt. Tare (g) | 1.46 | 1.39 |
| 5.9 | 6.1 | Wt. Dry Soil (g) | 6.0 | 6.4 |
| 0.9 | 0.9 | Wt. Water (g) | 1.1 | 1.1 |
| 15.8% | 15.6% | Water Content (%) | 17.6% | 17.5% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | 21 |
| PL | 16 | | PL | 18 |
| PI | 7 | | PI | 3 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL-ML | | | ML | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 17, 2016 |
| Date Tested: | May 31, 2016 |
| Tested By: | C. Tollifson |


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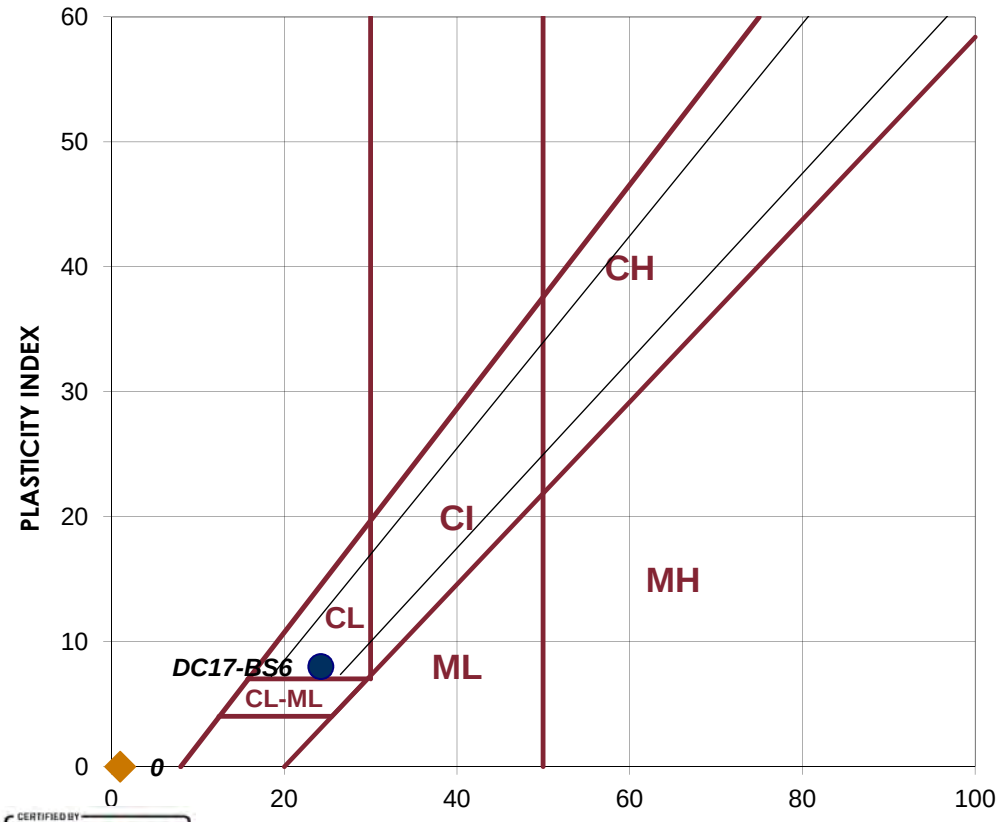
| Sample: DC17-BS6 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 28 | Number of Blows | | |
| | | Container Number | | |
| 34.24 | 34.34 | Wt. Sample (wet+tare)(g) | | |
| 27.83 | 28.02 | Wt. Sample (dry+tare)(g) | | |
| 1.30 | 1.49 | Wt. Tare (g) | | |
| 26.5 | 26.5 | Wt. Dry Soil (g) | | |
| 6.4 | 6.3 | Wt. Water (g) | | |
| 24.2% | 23.8% | Water Content (%) | | |
| 24.3% | 24.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.04 | 11.48 | Wt. Sample (wet+tare)(g) | | |
| 11.45 | 10.11 | Wt. Sample (dry+tare)(g) | | |
| 1.45 | 1.44 | Wt. Tare (g) | | |
| 10.0 | 8.7 | Wt. Dry Soil (g) | | |
| 1.6 | 1.4 | Wt. Water (g) | | |
| 15.9% | 15.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 24 | | LL | |
| PL | 16 | | PL | |
| PI | 8 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CL** | | | **NON-PLASTIC** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 17, 2016 |
| Date Tested: | May 30, 2016 |
| Tested By: | C. Oost |


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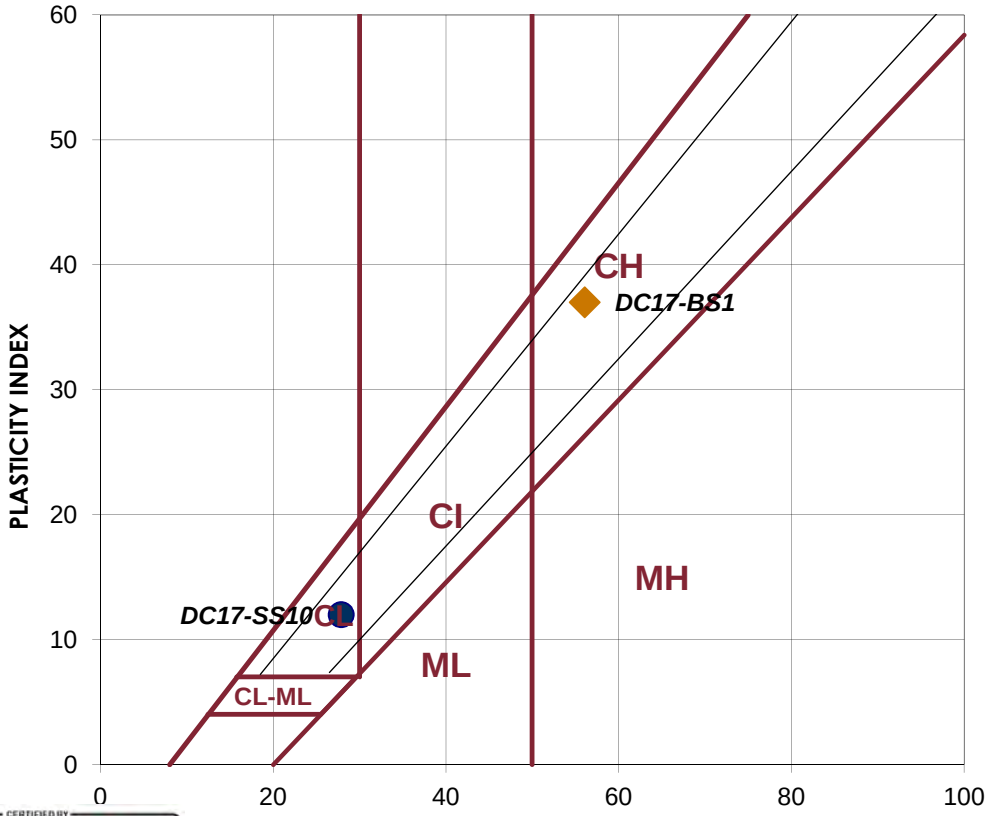
| Sample: DC17-SS10 | | | Sample: DC17-BS1 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 28 | Number of Blows | 23 | 23 |
| | | Container Number | | |
| 15.55 | 15.31 | Wt. Sample (wet+tare)(g) | 12.72 | 12.91 |
| 12.48 | 12.27 | Wt. Sample (dry+tare)(g) | 8.61 | 8.68 |
| 1.29 | 1.22 | Wt. Tare (g) | 1.29 | 1.27 |
| 11.2 | 11.1 | Wt. Dry Soil (g) | 7.3 | 7.4 |
| 3.1 | 3.0 | Wt. Water (g) | 4.1 | 4.2 |
| 27.4% | 27.5% | Water Content (%) | 56.1% | 57.1% |
| 27.8% | 27.9% | Corrected Water Content (%) | 55.6% | 56.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.87 | 9.48 | Wt. Sample (wet+tare)(g) | 8.07 | 7.98 |
| 7.82 | 8.35 | Wt. Sample (dry+tare)(g) | 7.02 | 6.98 |
| 1.49 | 1.38 | Wt. Tare (g) | 1.49 | 1.53 |
| 6.3 | 7.0 | Wt. Dry Soil (g) | 5.5 | 5.5 |
| 1.1 | 1.1 | Wt. Water (g) | 1.1 | 1.0 |
| 16.6% | 16.2% | Water Content (%) | 19.0% | 18.3% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 28 | | LL | 56 |
| PL | 16 | | PL | 19 |
| PI | 12 | | PI | 37 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CH | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 17, 2016 |
| Date Tested: | November 14, 2016 |
| Tested By: | B.Pelkey |

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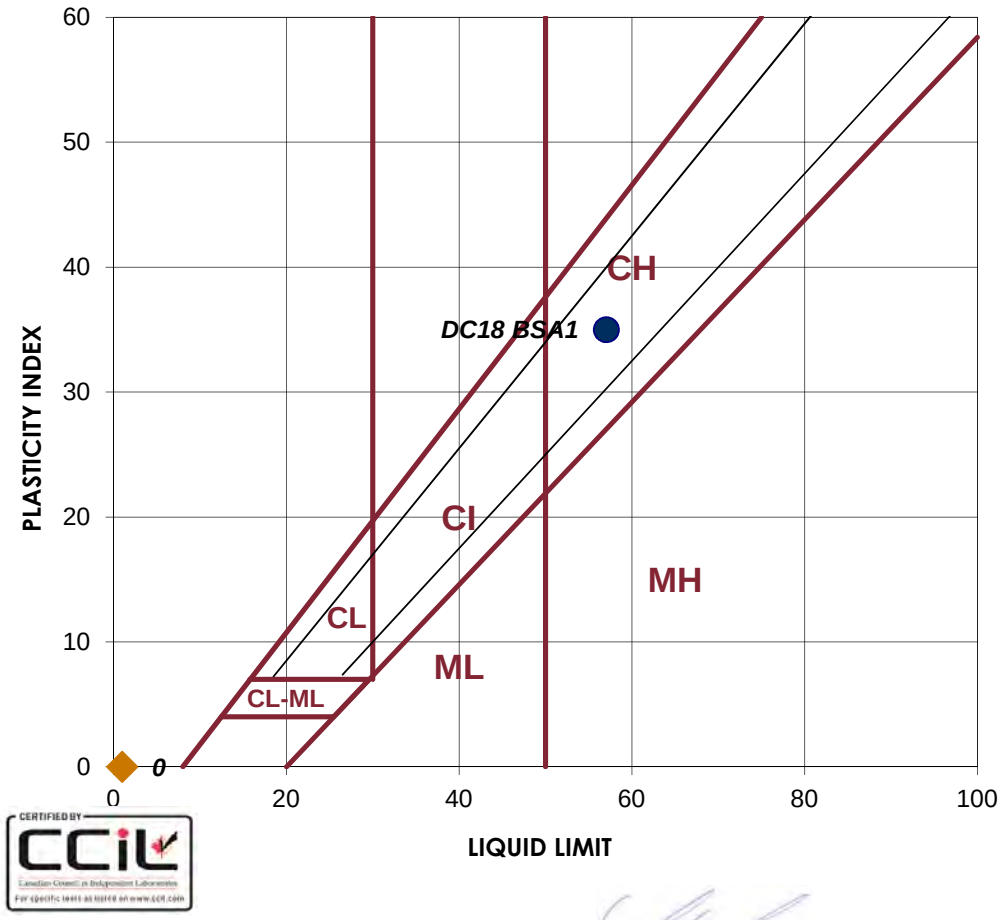
| Sample: DC18 BSA1 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 23 | Number of Blows | | |
| | | Container Number | | |
| 21.16 | 25.66 | Wt. Sample (wet+tare)(g) | | |
| 13.86 | 16.73 | Wt. Sample (dry+tare)(g) | | |
| 1.20 | 1.23 | Wt. Tare (g) | | |
| 12.7 | 15.5 | Wt. Dry Soil (g) | | |
| 7.3 | 8.9 | Wt. Water (g) | | |
| 57.7% | 57.6% | Water Content (%) | | |
| 57.1% | 57.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.47 | 27.12 | Wt. Sample (wet+tare)(g) | | |
| 25.01 | 24.79 | Wt. Sample (dry+tare)(g) | | |
| 13.84 | 13.9 | Wt. Tare (g) | | |
| 11.2 | 10.9 | Wt. Dry Soil (g) | | |
| 2.5 | 2.3 | Wt. Water (g) | | |
| 22.0% | 21.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 57 | | LL | |
| PL | 22 | | PL | |
| PI | 35 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 17, 2016 |
| Date Tested: | May 31, 2016 |
| Tested By: | C. Tollifson |


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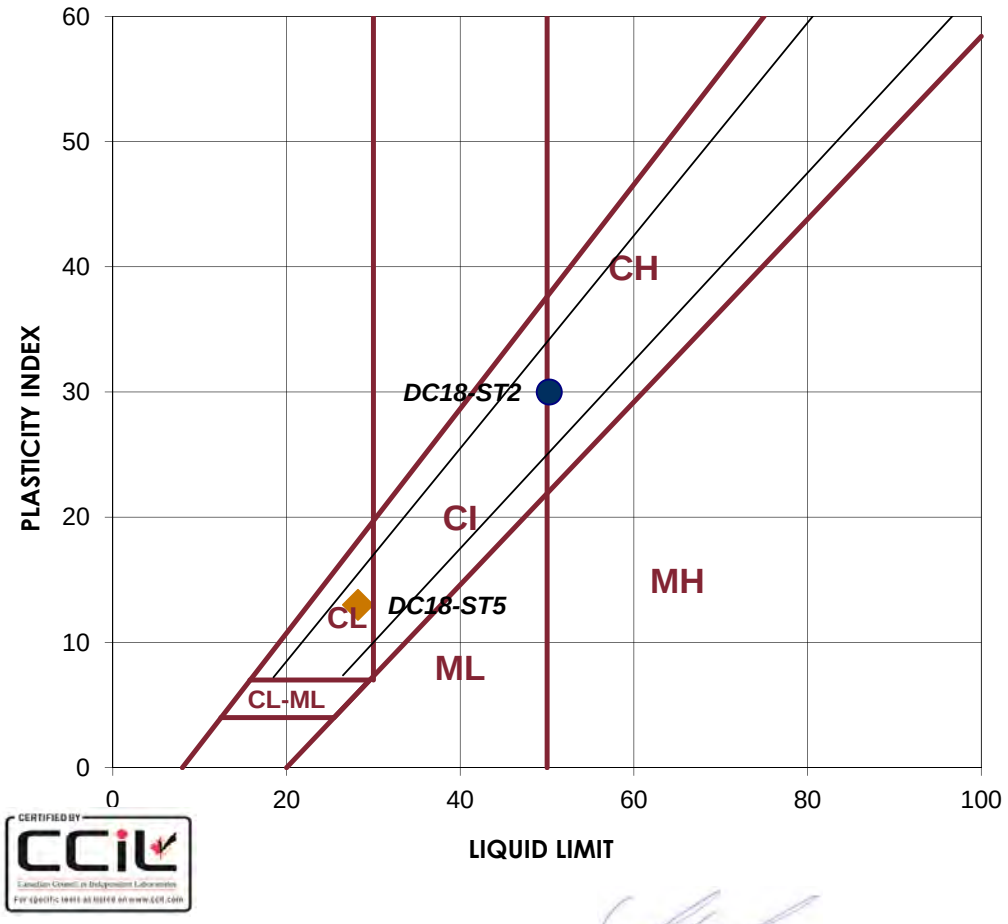
| Sample: DC18-ST2 | | | Sample: DC18-ST5 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 20 | 20 | Number of Blows | 20 | 20 |
| | | Container Number | | |
| 29.73 | 26.33 | Wt. Sample (wet+tare)(g) | 29.94 | 22.81 |
| 20.14 | 17.77 | Wt. Sample (dry+tare)(g) | 23.56 | 17.98 |
| 1.54 | 1.21 | Wt. Tare (g) | 1.51 | 1.35 |
| 18.6 | 16.6 | Wt. Dry Soil (g) | 22.1 | 16.6 |
| 9.6 | 8.6 | Wt. Water (g) | 6.4 | 4.8 |
| 51.6% | 51.7% | Water Content (%) | 28.9% | 29.0% |
| 50.2% | 50.3% | Corrected Water Content (%) | 28.2% | 28.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.56 | 15.77 | Wt. Sample (wet+tare)(g) | 13.08 | 15.2 |
| 10.71 | 13.45 | Wt. Sample (dry+tare)(g) | 11.57 | 13.39 |
| 1.38 | 1.55 | Wt. Tare (g) | 1.49 | 1.23 |
| 9.3 | 11.9 | Wt. Dry Soil (g) | 10.1 | 12.2 |
| 1.9 | 2.3 | Wt. Water (g) | 1.5 | 1.8 |
| 19.8% | 19.5% | Water Content (%) | 15.0% | 14.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 50 | | LL | 28 |
| PL | 20 | | PL | 15 |
| PI | 30 | | PI | 13 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH-CI | | | CL-CI | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 17, 2016 |
| Date Tested: | May 30, 2016 |
| Tested By: | C. Oost |


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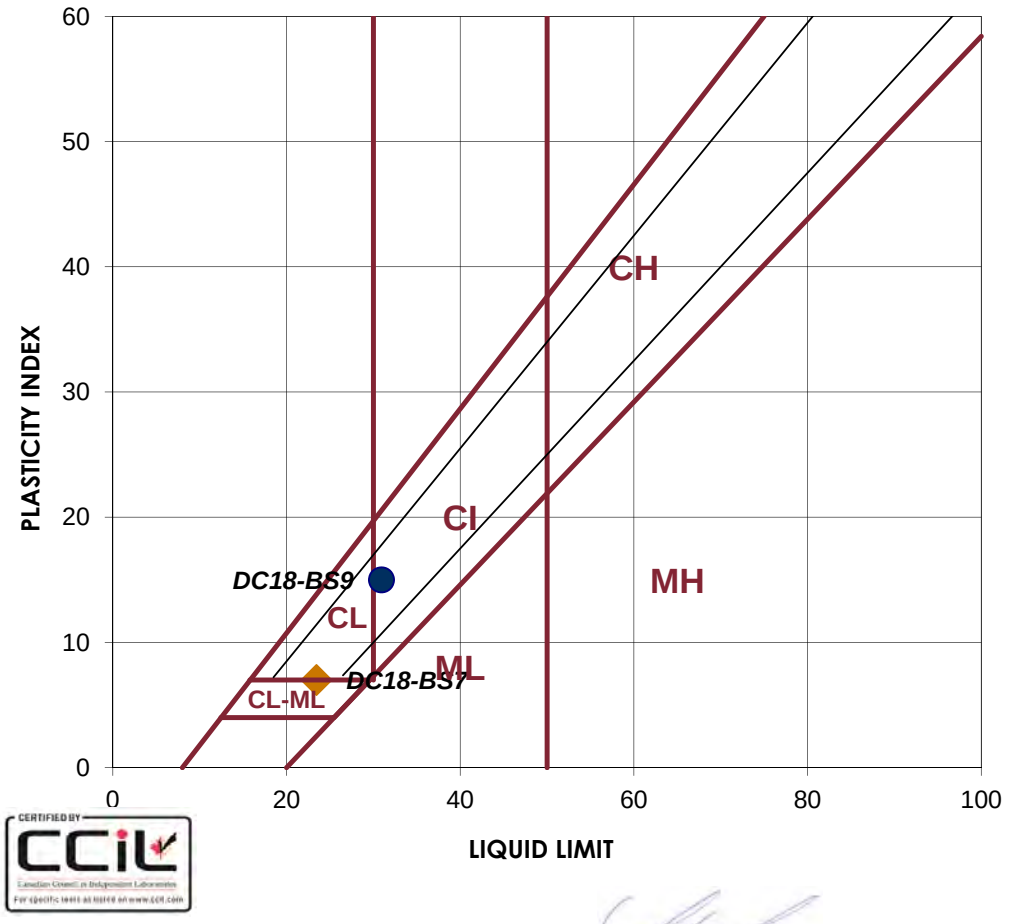
| Sample: DC18-BS9 | | | Sample: DC18-BS7 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | 27 | 25 |
| | | Container Number | | |
| 14.48 | 15.33 | Wt. Sample (wet+tare)(g) | 15.89 | 15.82 |
| 11.34 | 12.00 | Wt. Sample (dry+tare)(g) | 13.14 | 13.05 |
| 1.19 | 1.23 | Wt. Tare (g) | 1.32 | 1.21 |
| 10.2 | 10.8 | Wt. Dry Soil (g) | 11.8 | 11.8 |
| 3.1 | 3.3 | Wt. Water (g) | 2.8 | 2.8 |
| 30.9% | 30.9% | Water Content (%) | 23.3% | 23.4% |
| 30.9% | 30.9% | Corrected Water Content (%) | 23.5% | 23.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.37 | 8.18 | Wt. Sample (wet+tare)(g) | 8.98 | 8.55 |
| 8.26 | 7.27 | Wt. Sample (dry+tare)(g) | 7.96 | 7.56 |
| 1.52 | 1.52 | Wt. Tare (g) | 1.53 | 1.45 |
| 6.7 | 5.8 | Wt. Dry Soil (g) | 6.4 | 6.1 |
| 1.1 | 0.9 | Wt. Water (g) | 1.0 | 1.0 |
| 16.5% | 15.8% | Water Content (%) | 15.9% | 16.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | 23 |
| PL | 16 | | PL | 16 |
| PI | 15 | | PI | 7 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | CL-ML | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 9, 2016 |
| Date Tested: | May 27, 2016 |
| Tested By: | C. Small |

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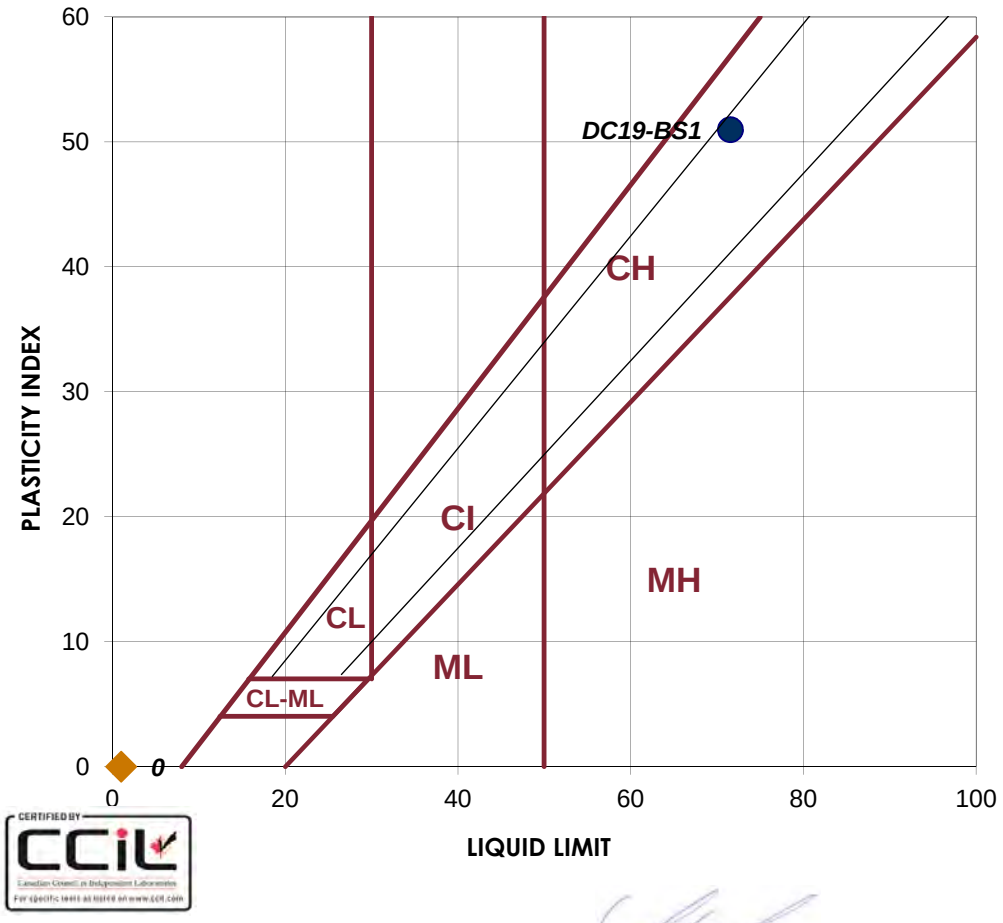
Tel: (403) 253-7876

| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC19-BS1 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 25 | Number of Blows | | |
| | | Container Number | | |
| 17.28 | 18.14 | Wt. Sample (wet+tare)(g) | | |
| 10.62 | 11.23 | Wt. Sample (dry+tare)(g) | | |
| 1.37 | 1.60 | Wt. Tare (g) | | |
| 9.3 | 9.6 | Wt. Dry Soil (g) | | |
| 6.7 | 6.9 | Wt. Water (g) | | |
| 72.0% | 71.8% | Water Content (%) | | |
| 71.3% | 71.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 10.6 | 10.19 | Wt. Sample (wet+tare)(g) | | |
| 8.99 | 8.72 | Wt. Sample (dry+tare)(g) | | |
| 1.22 | 1.54 | Wt. Tare (g) | | |
| 7.8 | 7.2 | Wt. Dry Soil (g) | | |
| 1.6 | 1.5 | Wt. Water (g) | | |
| 20.7% | 20.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 72 | | LL | |
| PL | 21 | | PL | |
| PI | 51 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 9, 2016 |
| Date Tested: | October 12, 2016 |
| Tested By: | C.Small |

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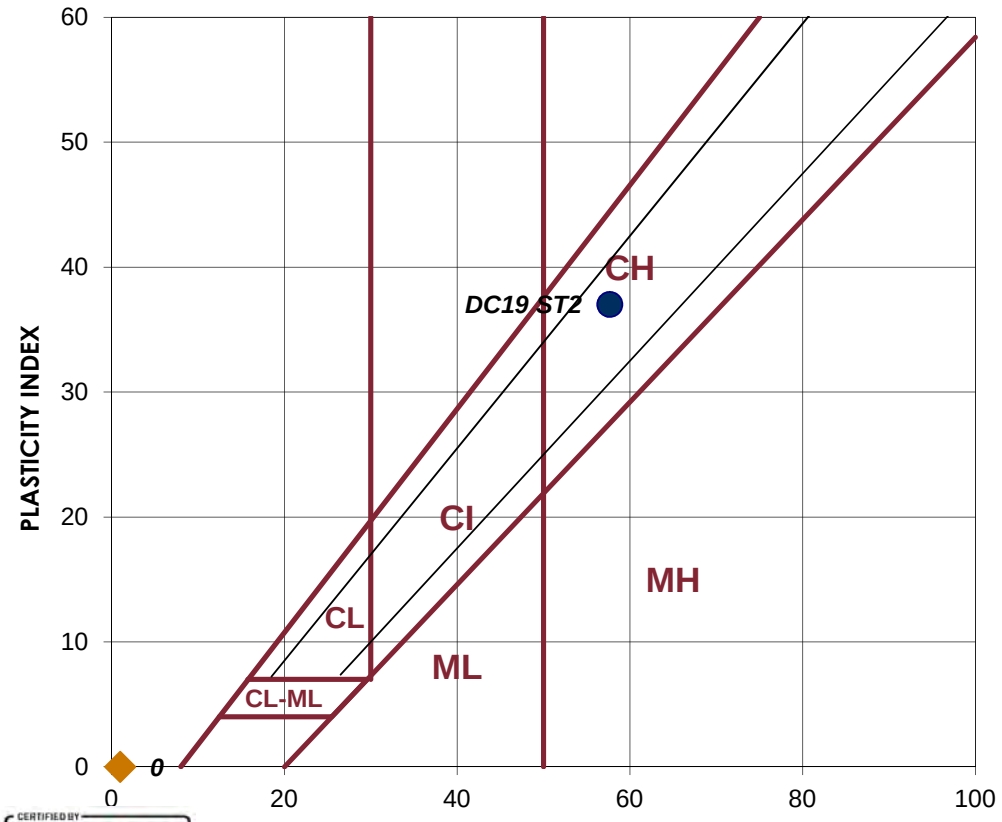
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC19 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 22 | Number of Blows | | |
| | | Container Number | | |
| 26.52 | 23.74 | Wt. Sample (wet+tare)(g) | | |
| 17.29 | 15.55 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.52 | Wt. Tare (g) | | |
| 15.8 | 14.0 | Wt. Dry Soil (g) | | |
| 9.2 | 8.2 | Wt. Water (g) | | |
| 58.5% | 58.4% | Water Content (%) | | |
| 57.9% | 57.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 20.97 | 22.87 | Wt. Sample (wet+tare)(g) | | |
| 19.68 | 21.3 | Wt. Sample (dry+tare)(g) | | |
| 13.78 | 13.87 | Wt. Tare (g) | | |
| 5.9 | 7.4 | Wt. Dry Soil (g) | | |
| 1.3 | 1.6 | Wt. Water (g) | | |
| 21.9% | 21.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 58 | | LL | |
| PL | 21 | | PL | |
| PI | 37 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 9, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | C. Oost |


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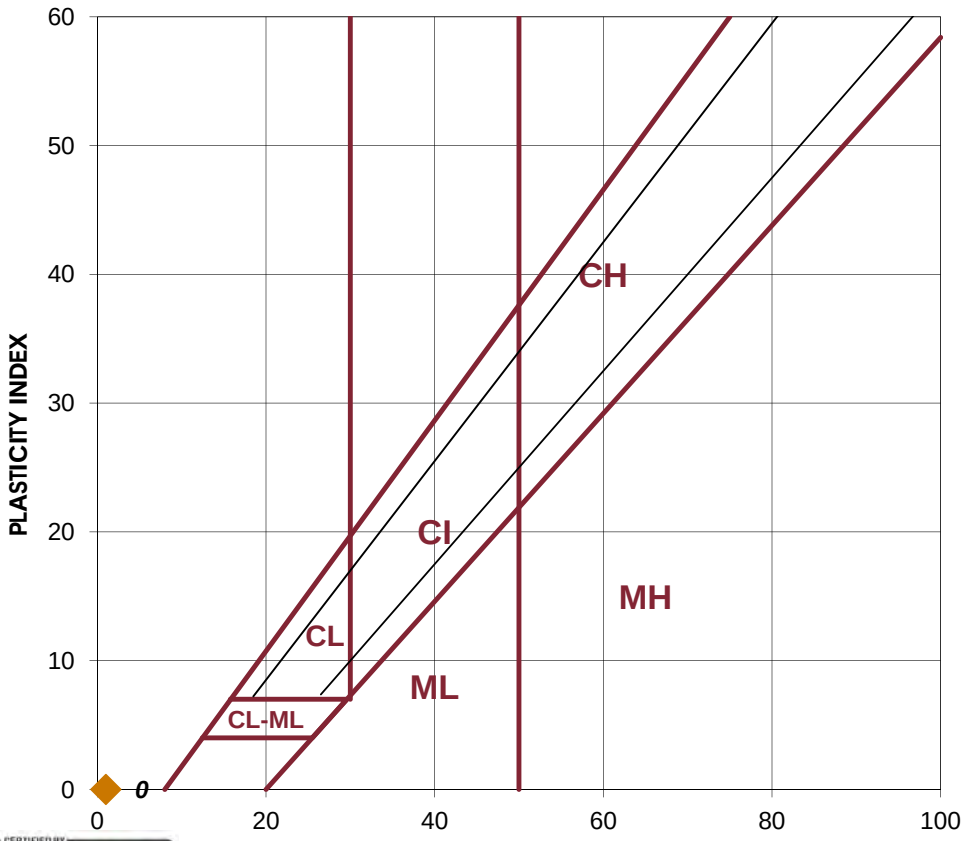
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC19-BS4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 27 | Number of Blows | | |
| | | Container Number | | |
| 20.78 | 18.80 | Wt. Sample (wet+tare)(g) | | |
| 12.44 | 11.15 | Wt. Sample (dry+tare)(g) | | |
| 1.63 | 1.21 | Wt. Tare (g) | | |
| 10.8 | 9.9 | Wt. Dry Soil (g) | | |
| 8.3 | 7.7 | Wt. Water (g) | | |
| 77.2% | 77.0% | Water Content (%) | | |
| 78.5% | 77.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.86 | 9.7 | Wt. Sample (wet+tare)(g) | | |
| 10.43 | 8.59 | Wt. Sample (dry+tare)(g) | | |
| 1.56 | 1.53 | Wt. Tare (g) | | |
| 8.9 | 7.1 | Wt. Dry Soil (g) | | |
| 1.4 | 1.1 | Wt. Water (g) | | |
| 16.1% | 15.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 78 | | LL | |
| PL | 16 | | PL | |
| PI | 62 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 9, 2016 |
| Date Tested: | October 24, 2016 |
| Tested By: | B. Pelkey |


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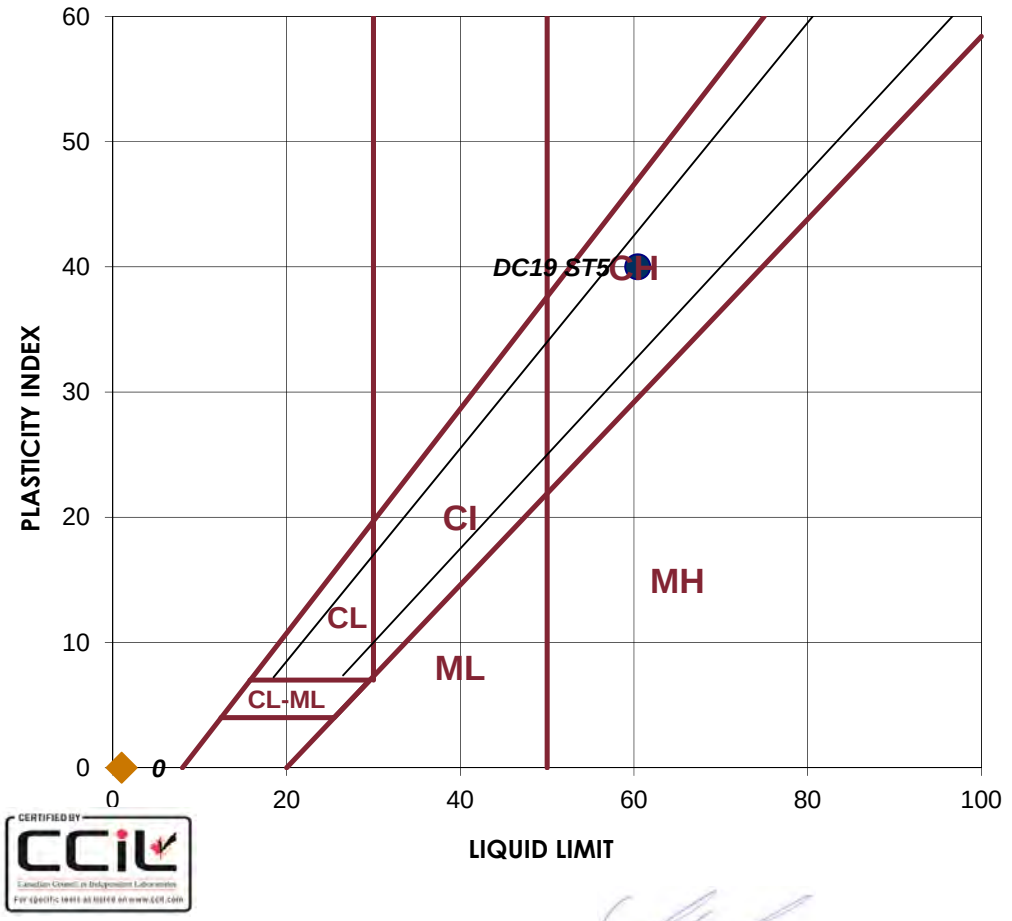
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC19 ST5 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 25 | Number of Blows | | |
| | | Container Number | | |
| 21.64 | 16.77 | Wt. Sample (wet+tare)(g) | | |
| 14.06 | 10.90 | Wt. Sample (dry+tare)(g) | | |
| 1.52 | 1.14 | Wt. Tare (g) | | |
| 12.5 | 9.8 | Wt. Dry Soil (g) | | |
| 7.6 | 5.9 | Wt. Water (g) | | |
| 60.4% | 60.1% | Water Content (%) | | |
| 60.7% | 60.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.27 | 22.75 | Wt. Sample (wet+tare)(g) | | |
| 20.83 | 21.26 | Wt. Sample (dry+tare)(g) | | |
| 13.73 | 13.82 | Wt. Tare (g) | | |
| 7.1 | 7.4 | Wt. Dry Soil (g) | | |
| 1.4 | 1.5 | Wt. Water (g) | | |
| 20.3% | 20.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 60 | | LL | |
| PL | 20 | | PL | |
| PI | 40 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 11, 2016 |
| Date Tested: | May 26, 2016 |
| Tested By: | B. Pelkey |


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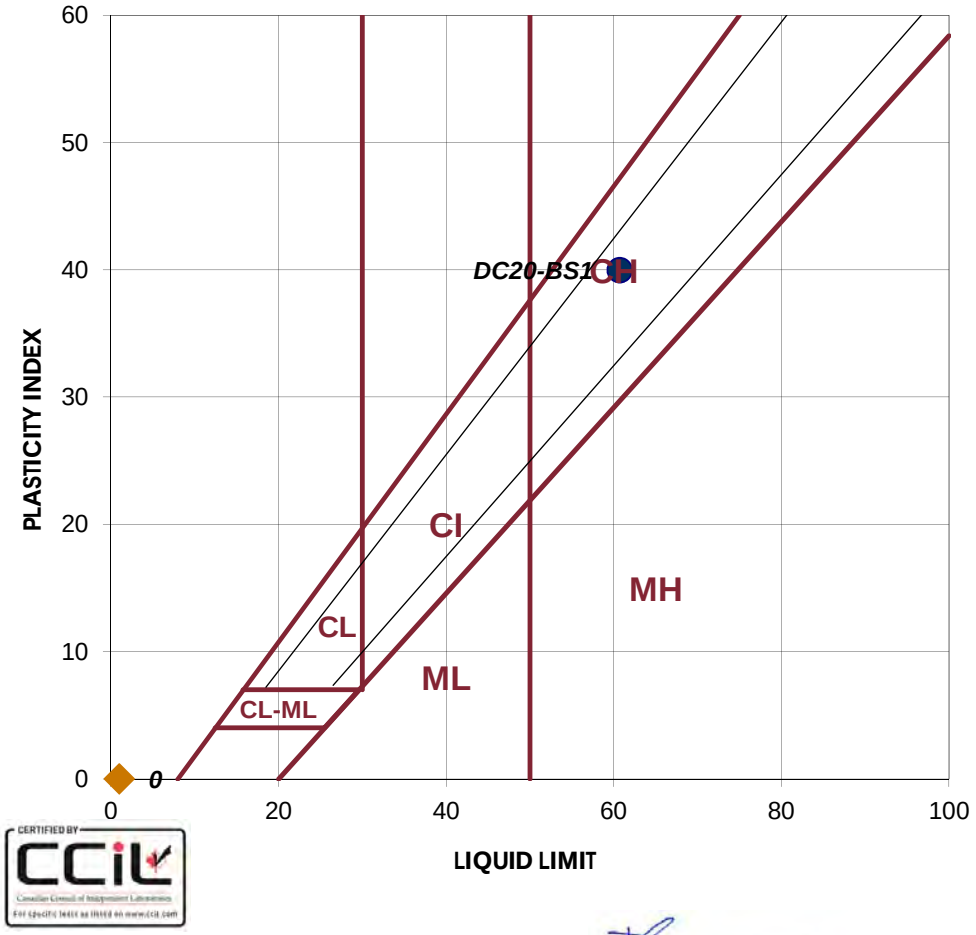
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC20-BS1 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 26 | Number of Blows | | |
| | | Container Number | | |
| 24.18 | 26.73 | Wt. Sample (wet+tare)(g) | | |
| 15.63 | 17.22 | Wt. Sample (dry+tare)(g) | | |
| 1.57 | 1.51 | Wt. Tare (g) | | |
| 14.1 | 15.7 | Wt. Dry Soil (g) | | |
| 8.6 | 9.5 | Wt. Water (g) | | |
| 60.8% | 60.5% | Water Content (%) | | |
| 60.5% | 60.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 15.58 | 14 | Wt. Sample (wet+tare)(g) | | |
| 13.15 | 11.8 | Wt. Sample (dry+tare)(g) | | |
| 1.52 | 1.2 | Wt. Tare (g) | | |
| 11.6 | 10.6 | Wt. Dry Soil (g) | | |
| 2.4 | 2.2 | Wt. Water (g) | | |
| 20.9% | 20.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 61 | | LL | |
| PL | 21 | | PL | |
| PI | 40 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |

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Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 10, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | C. Oost and C. Tollifson |


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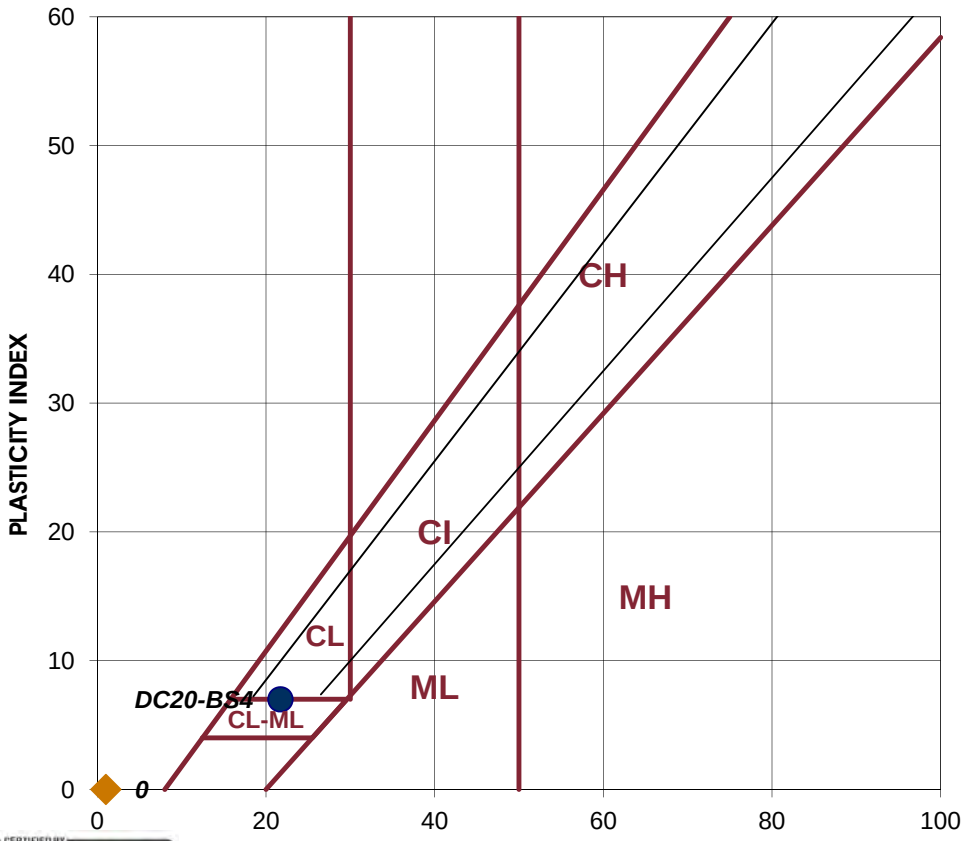
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC20-BS4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 22 | Number of Blows | | |
| | | Container Number | | |
| 16.92 | 17.69 | Wt. Sample (wet+tare)(g) | | |
| 14.17 | 14.77 | Wt. Sample (dry+tare)(g) | | |
| 1.54 | 1.54 | Wt. Tare (g) | | |
| 12.6 | 13.2 | Wt. Dry Soil (g) | | |
| 2.8 | 2.9 | Wt. Water (g) | | |
| 21.8% | 22.1% | Water Content (%) | | |
| 21.7% | 21.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.45 | 12.01 | Wt. Sample (wet+tare)(g) | | |
| 11.89 | 10.66 | Wt. Sample (dry+tare)(g) | | |
| 1.44 | 1.48 | Wt. Tare (g) | | |
| 10.5 | 9.2 | Wt. Dry Soil (g) | | |
| 1.6 | 1.4 | Wt. Water (g) | | |
| 14.9% | 14.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 22 | | LL | |
| PL | 15 | | PL | |
| PI | 7 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-ML*** | | | ***NON-PLASTIC*** | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 11, 2016 |
| Date Tested: | October 27, 2016 |
| Tested By: | C. Woods |


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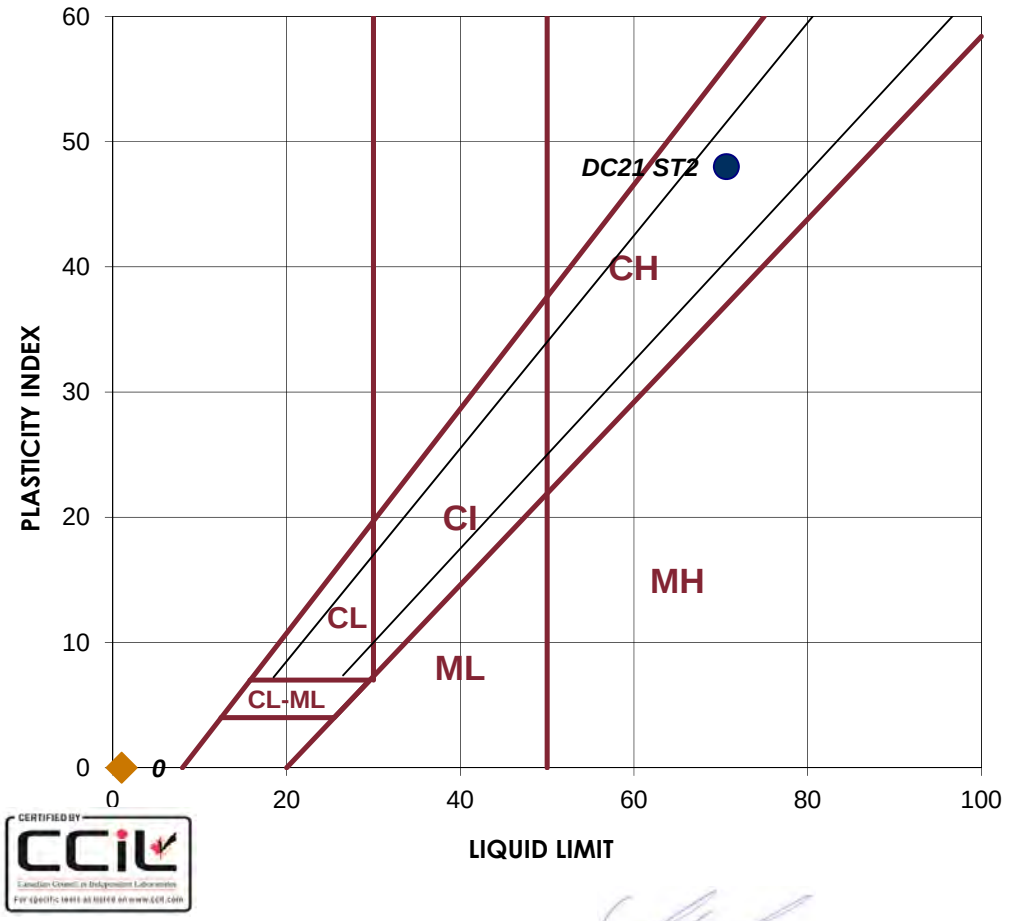
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC21 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 25.36 | 22.55 | Wt. Sample (wet+tare)(g) | | |
| 15.47 | 13.84 | Wt. Sample (dry+tare)(g) | | |
| 1.59 | 1.59 | Wt. Tare (g) | | |
| 13.9 | 12.3 | Wt. Dry Soil (g) | | |
| 9.9 | 8.7 | Wt. Water (g) | | |
| 71.3% | 71.1% | Water Content (%) | | |
| 70.5% | 70.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 20.57 | 24.69 | Wt. Sample (wet+tare)(g) | | |
| 19.3 | 22.6 | Wt. Sample (dry+tare)(g) | | |
| 13.78 | 13.76 | Wt. Tare (g) | | |
| 5.5 | 8.8 | Wt. Dry Soil (g) | | |
| 1.3 | 2.1 | Wt. Water (g) | | |
| 23.0% | 23.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 71 | | LL | |
| PL | 23 | | PL | |
| PI | 48 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 11, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | B. Pelkey |


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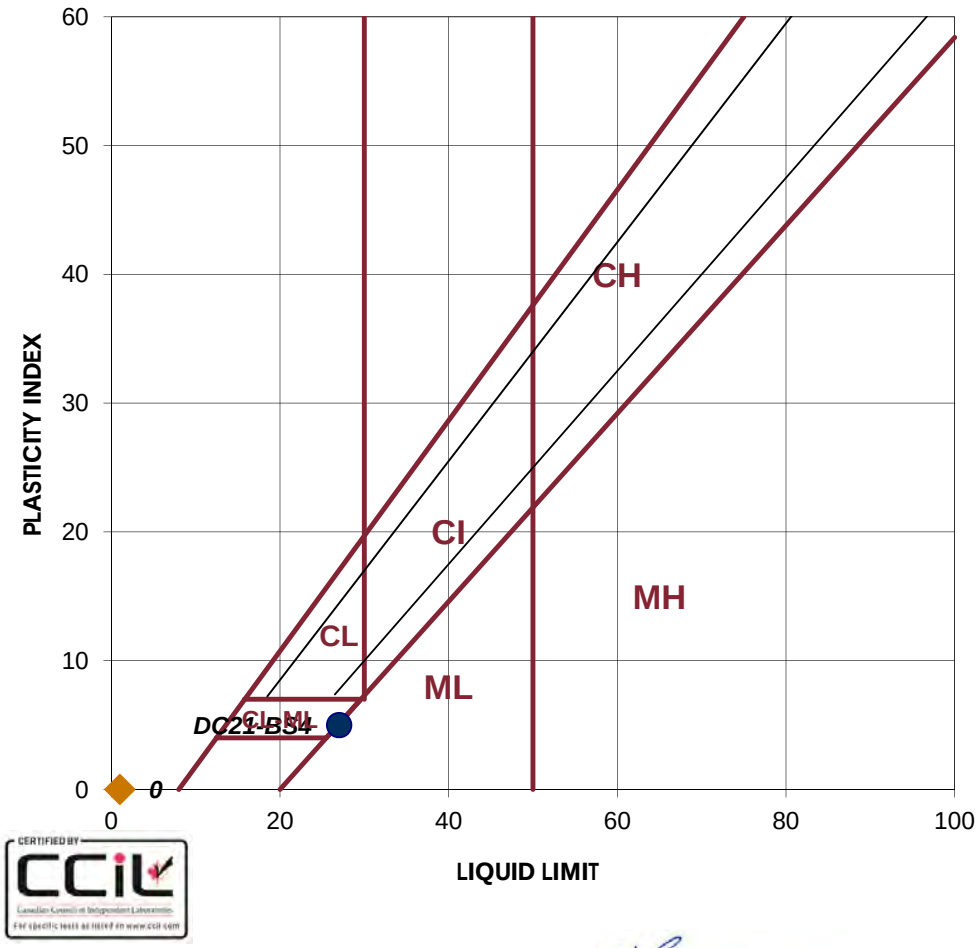
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC21-BS4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 26 | Number of Blows | | |
| | | Container Number | | |
| 19.76 | 24.87 | Wt. Sample (wet+tare)(g) | | |
| 15.81 | 19.86 | Wt. Sample (dry+tare)(g) | | |
| 1.23 | 1.24 | Wt. Tare (g) | | |
| 14.6 | 18.6 | Wt. Dry Soil (g) | | |
| 4.0 | 5.0 | Wt. Water (g) | | |
| 27.1% | 26.9% | Water Content (%) | | |
| 27.0% | 27.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.9 | 7.77 | Wt. Sample (wet+tare)(g) | | |
| 7.58 | 6.65 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.61 | Wt. Tare (g) | | |
| 6.1 | 5.0 | Wt. Dry Soil (g) | | |
| 1.3 | 1.1 | Wt. Water (g) | | |
| 21.7% | 22.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 27 | | LL | |
| PL | 22 | | PL | |
| PI | 5 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ML | | | NON-PLASTIC | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 11, 2016 |
| Date Tested: | October 18, 2016 |
| Tested By: | B.Pelkey |

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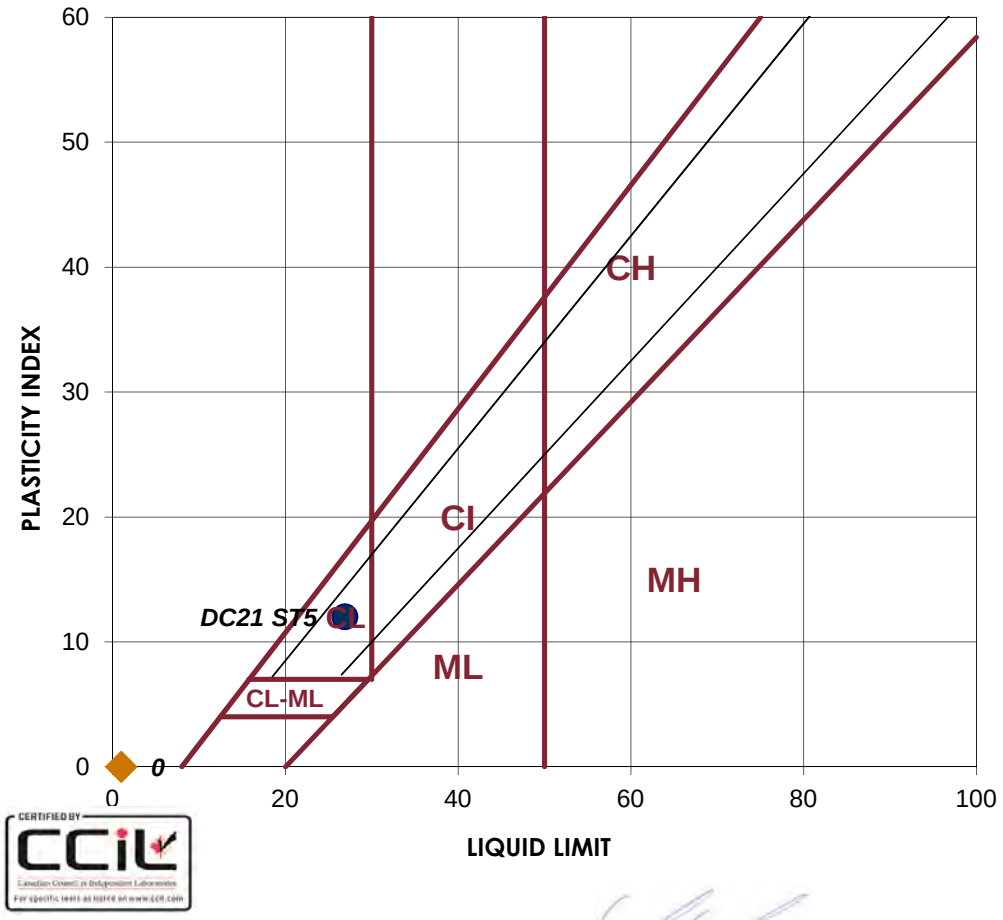
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC21 ST5 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 23 | Number of Blows | | |
| | | Container Number | | |
| 36.84 | 31.07 | Wt. Sample (wet+tare)(g) | | |
| 29.29 | 24.79 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.46 | Wt. Tare (g) | | |
| 27.8 | 23.3 | Wt. Dry Soil (g) | | |
| 7.6 | 6.3 | Wt. Water (g) | | |
| 27.2% | 26.9% | Water Content (%) | | |
| 27.2% | 26.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.84 | 25.1 | Wt. Sample (wet+tare)(g) | | |
| 25.12 | 23.65 | Wt. Sample (dry+tare)(g) | | |
| 13.85 | 13.93 | Wt. Tare (g) | | |
| 11.3 | 9.7 | Wt. Dry Soil (g) | | |
| 1.7 | 1.5 | Wt. Water (g) | | |
| 15.3% | 14.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 27 | | LL | |
| PL | 15 | | PL | |
| PI | 12 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 10, 2016 |
| Date Tested: | May 27, 2016 |
| Tested By: | C. Small |


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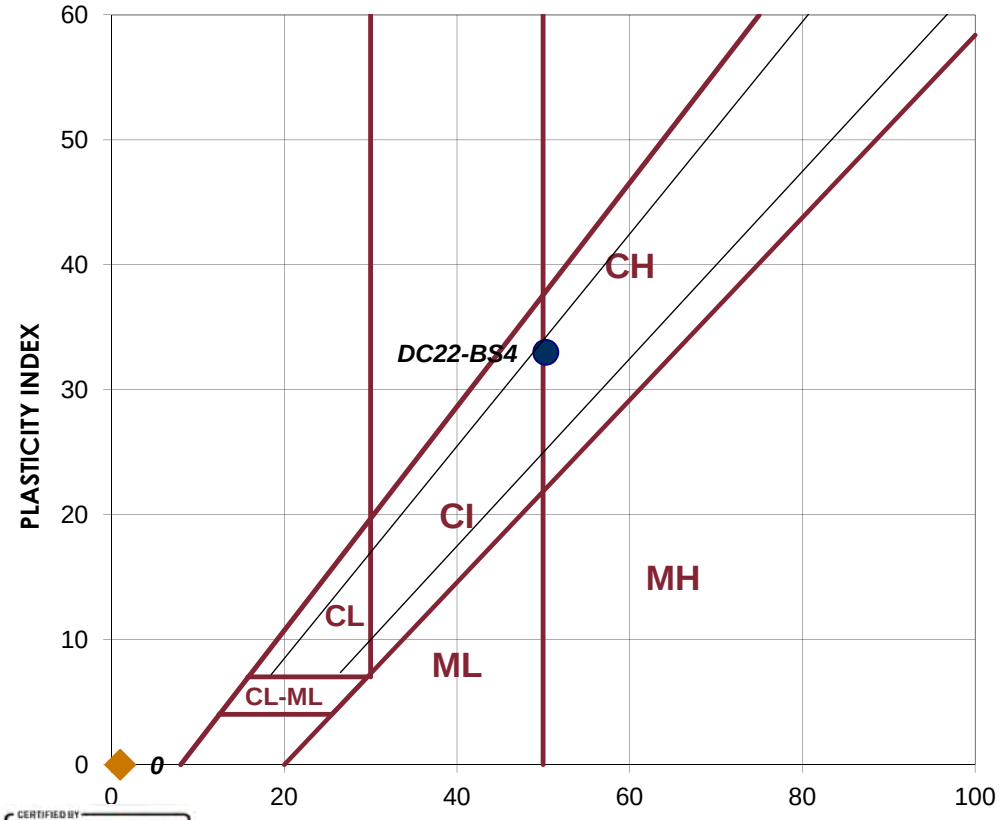
| Sample: DC22-BS4 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 18.92 | 20.19 | Wt. Sample (wet+tare)(g) | | |
| 13.10 | 13.90 | Wt. Sample (dry+tare)(g) | | |
| 1.61 | 1.48 | Wt. Tare (g) | | |
| 11.5 | 12.4 | Wt. Dry Soil (g) | | |
| 5.8 | 6.3 | Wt. Water (g) | | |
| 50.7% | 50.6% | Water Content (%) | | |
| 50.1% | 50.4% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.69 | 11.93 | Wt. Sample (wet+tare)(g) | | |
| 8.51 | 10.43 | Wt. Sample (dry+tare)(g) | | |
| 1.33 | 1.52 | Wt. Tare (g) | | |
| 7.2 | 8.9 | Wt. Dry Soil (g) | | |
| 1.2 | 1.5 | Wt. Water (g) | | |
| 16.4% | 16.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 50 | | LL | |
| PL | 17 | | PL | |
| PI | 33 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH-CI*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 10, 2016 |
| Date Tested: | May 31, 2016 |
| Tested By: | C. Tollifson |

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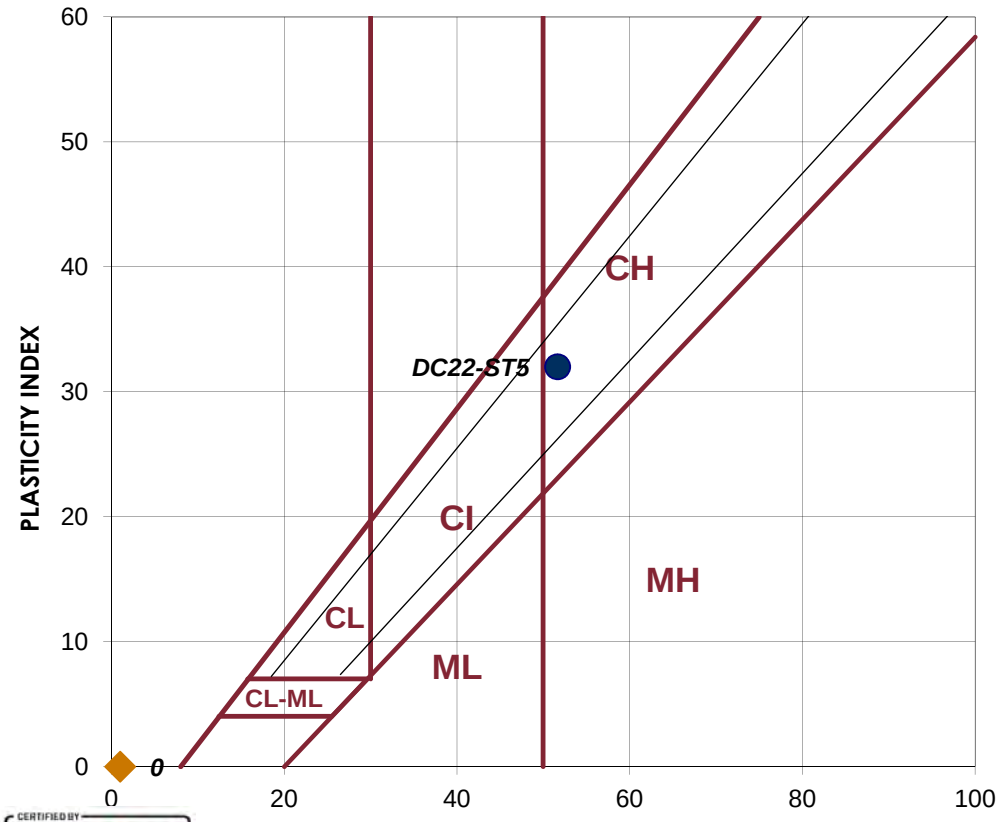
Tel: (403) 253-7876

| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC22-ST5 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 23 | Number of Blows | | |
| | | Container Number | | |
| 25.73 | 21.18 | Wt. Sample (wet+tare)(g) | | |
| 17.31 | 14.33 | Wt. Sample (dry+tare)(g) | | |
| 1.31 | 1.22 | Wt. Tare (g) | | |
| 16.0 | 13.1 | Wt. Dry Soil (g) | | |
| 8.4 | 6.9 | Wt. Water (g) | | |
| 52.6% | 52.3% | Water Content (%) | | |
| 51.5% | 51.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12 | 10.26 | Wt. Sample (wet+tare)(g) | | |
| 10.23 | 8.8 | Wt. Sample (dry+tare)(g) | | |
| 1.59 | 1.38 | Wt. Tare (g) | | |
| 8.6 | 7.4 | Wt. Dry Soil (g) | | |
| 1.8 | 1.5 | Wt. Water (g) | | |
| 20.5% | 19.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 52 | | LL | |
| PL | 20 | | PL | |
| PI | 32 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH-CI*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 10, 2016 |
| Date Tested: | May 26, 2016 |
| Tested By: | C. Small |


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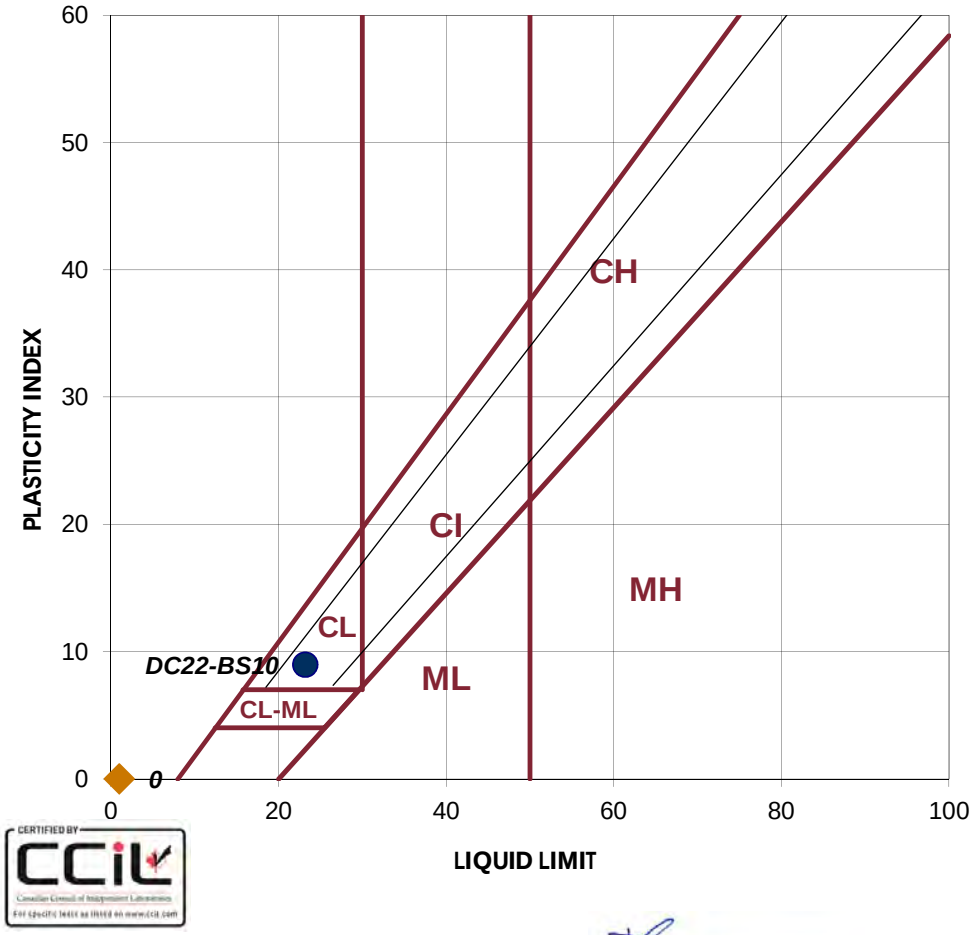
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC22-BS10 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 28 | Number of Blows | | |
| | | Container Number | | |
| 24.49 | 26.89 | Wt. Sample (wet+tare)(g) | | |
| 20.21 | 22.13 | Wt. Sample (dry+tare)(g) | | |
| 1.48 | 1.28 | Wt. Tare (g) | | |
| 18.7 | 20.9 | Wt. Dry Soil (g) | | |
| 4.3 | 4.8 | Wt. Water (g) | | |
| 22.9% | 22.8% | Water Content (%) | | |
| 23.2% | 23.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.28 | 9.92 | Wt. Sample (wet+tare)(g) | | |
| 7.42 | 8.93 | Wt. Sample (dry+tare)(g) | | |
| 1.25 | 1.58 | Wt. Tare (g) | | |
| 6.2 | 7.4 | Wt. Dry Soil (g) | | |
| 0.9 | 1.0 | Wt. Water (g) | | |
| 13.9% | 13.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | |
| PL | 14 | | PL | |
| PI | 9 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 11, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | B. Pelkey and C.Oost |


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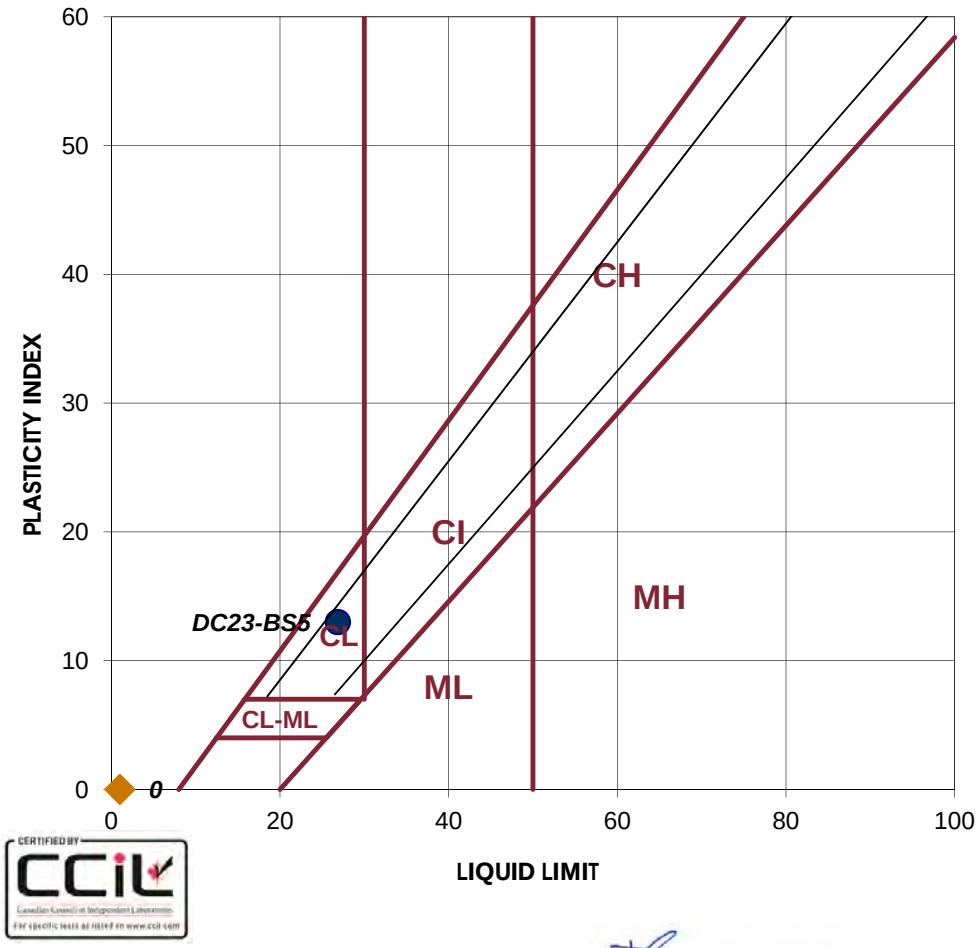
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC23-BS5 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | | |
| | | Container Number | | |
| 21.38 | 18.27 | Wt. Sample (wet+tare)(g) | | |
| 17.08 | 14.61 | Wt. Sample (dry+tare)(g) | | |
| 1.33 | 1.17 | Wt. Tare (g) | | |
| 15.8 | 13.4 | Wt. Dry Soil (g) | | |
| 4.3 | 3.7 | Wt. Water (g) | | |
| 27.3% | 27.2% | Water Content (%) | | |
| 26.9% | 26.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.67 | 9.53 | Wt. Sample (wet+tare)(g) | | |
| 8.65 | 8.54 | Wt. Sample (dry+tare)(g) | | |
| 1.58 | 1.6 | Wt. Tare (g) | | |
| 7.1 | 6.9 | Wt. Dry Soil (g) | | |
| 1.0 | 1.0 | Wt. Water (g) | | |
| 14.4% | 14.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 27 | | LL | |
| PL | 14 | | PL | |
| PI | 13 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL*** | | | ***NON-PLASTIC*** | |

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Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | May 9, 2016 |
| Date Tested: | May 31, 2016 |
| Tested By: | C. Tollifson |


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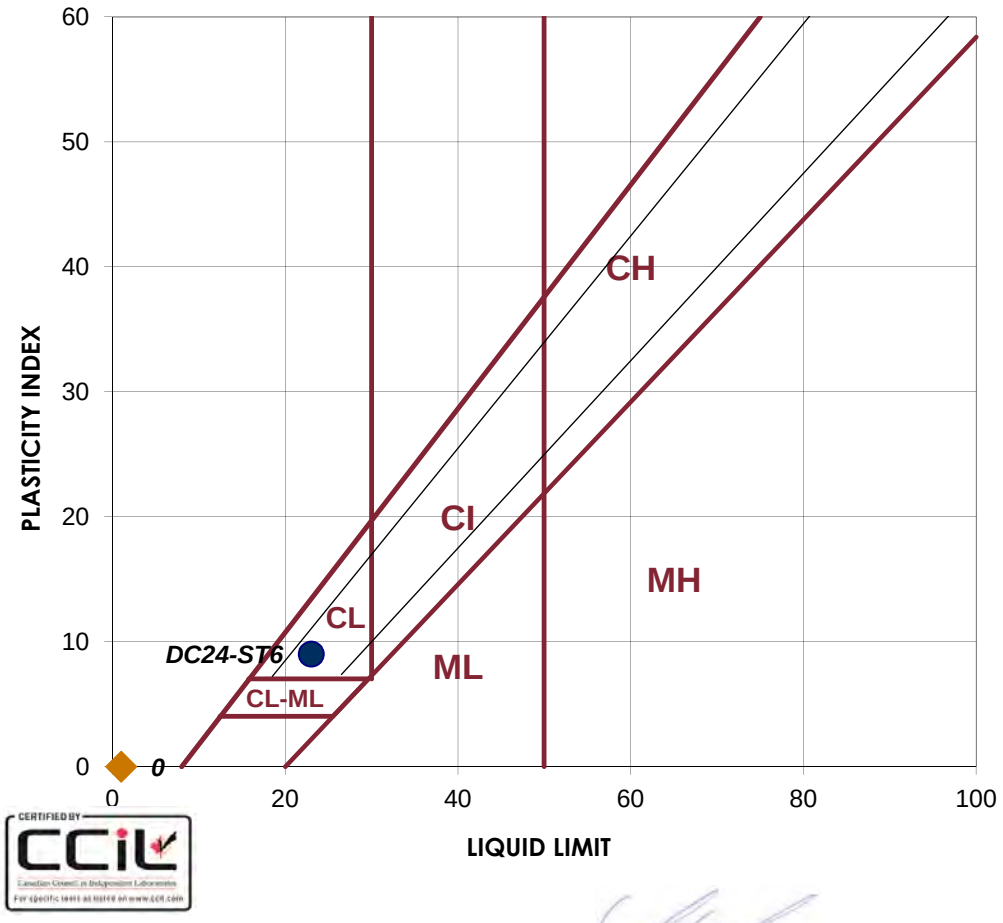
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC24-ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 27 | Number of Blows | | |
| | | Container Number | | |
| 33.65 | 35.22 | Wt. Sample (wet+tare)(g) | | |
| 27.61 | 28.97 | Wt. Sample (dry+tare)(g) | | |
| 1.40 | 1.53 | Wt. Tare (g) | | |
| 26.2 | 27.4 | Wt. Dry Soil (g) | | |
| 6.0 | 6.3 | Wt. Water (g) | | |
| 23.0% | 22.8% | Water Content (%) | | |
| 23.0% | 23.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.68 | 12.61 | Wt. Sample (wet+tare)(g) | | |
| 7.77 | 11.14 | Wt. Sample (dry+tare)(g) | | |
| 1.22 | 1.29 | Wt. Tare (g) | | |
| 6.6 | 9.9 | Wt. Dry Soil (g) | | |
| 0.9 | 1.5 | Wt. Water (g) | | |
| 13.9% | 14.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | |
| PL | 14 | | PL | |
| PI | 9 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | July 7, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |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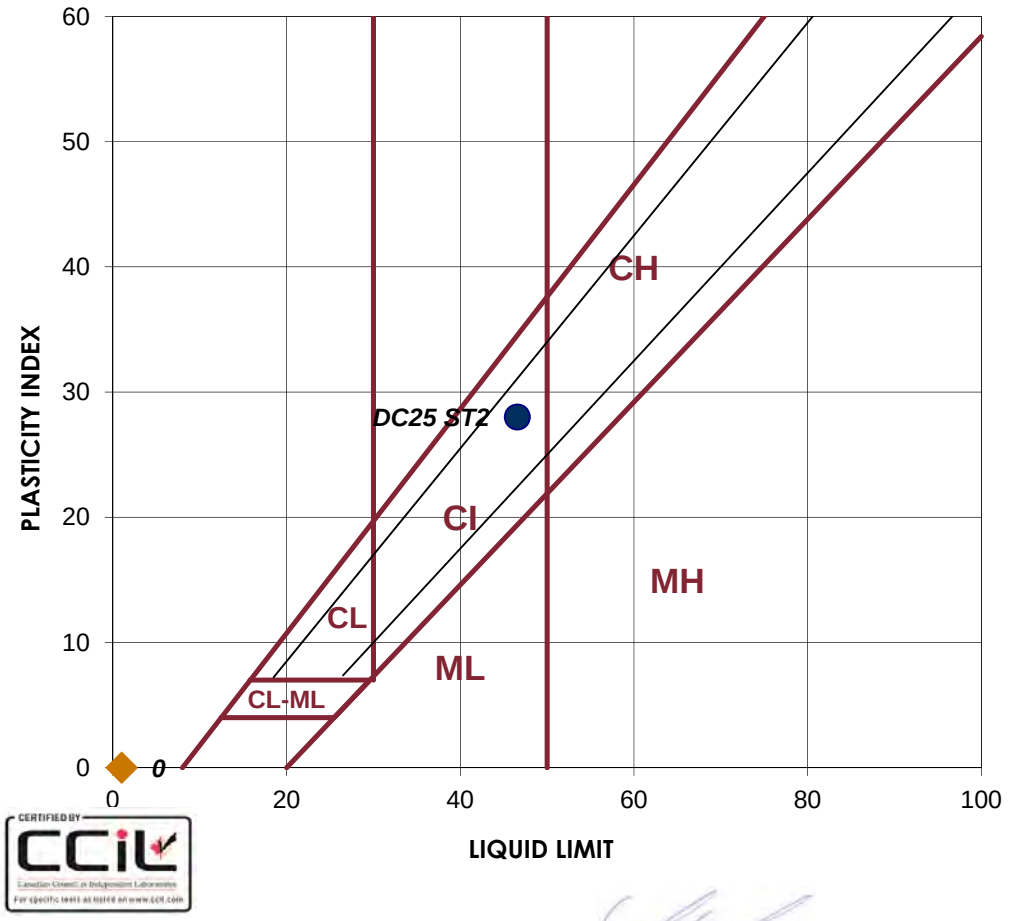
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC25 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 24 | Number of Blows | | |
| | | Container Number | | |
| 24.26 | 25.23 | Wt. Sample (wet+tare)(g) | | |
| 16.87 | 17.63 | Wt. Sample (dry+tare)(g) | | |
| 1.24 | 1.49 | Wt. Tare (g) | | |
| 15.6 | 16.1 | Wt. Dry Soil (g) | | |
| 7.4 | 7.6 | Wt. Water (g) | | |
| 47.3% | 47.1% | Water Content (%) | | |
| 46.3% | 46.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.03 | 26.1 | Wt. Sample (wet+tare)(g) | | |
| 24.89 | 24.1 | Wt. Sample (dry+tare)(g) | | |
| 13.87 | 13.76 | Wt. Tare (g) | | |
| 11.0 | 10.3 | Wt. Dry Soil (g) | | |
| 2.1 | 2.0 | Wt. Water (g) | | |
| 19.4% | 19.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 47 | | LL | |
| PL | 19 | | PL | |
| PI | 28 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 7, 2016 |
| Date Tested: | October 18, 2016 |
| Tested By: | B.Pelkey |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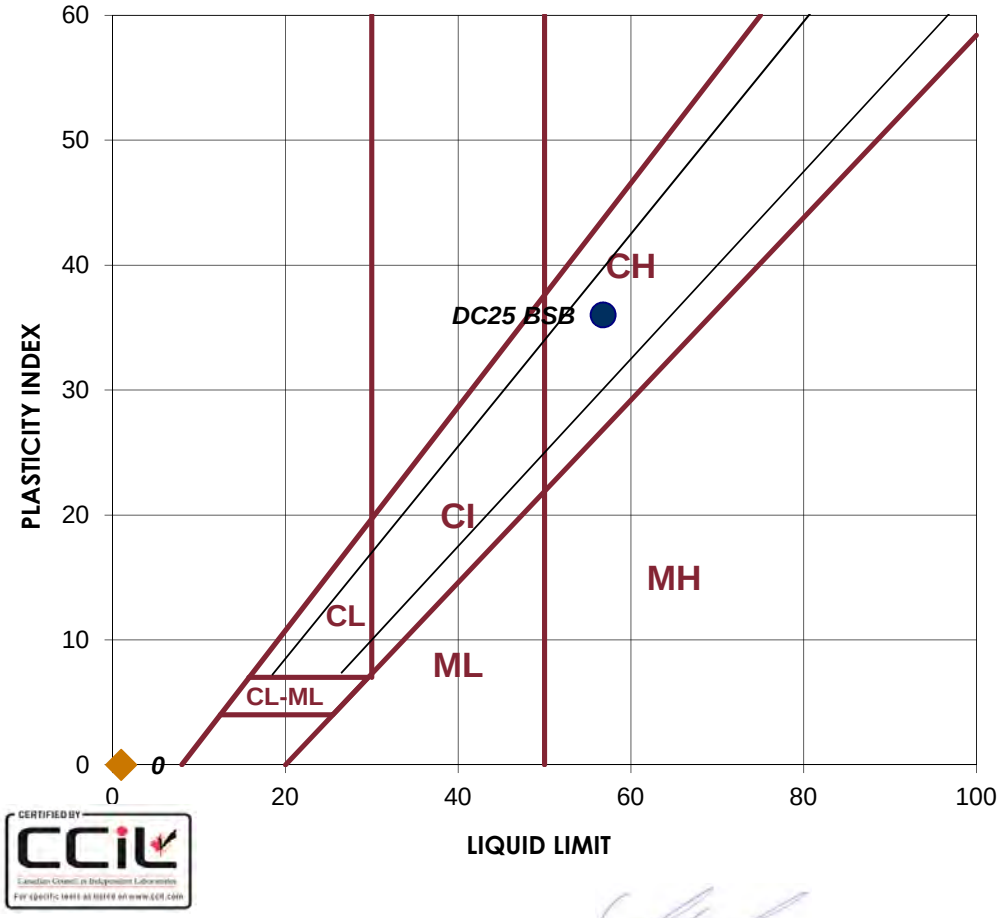
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC25 BSB | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 25 | Number of Blows | | |
| | | Container Number | | |
| 22.31 | 24.03 | Wt. Sample (wet+tare)(g) | | |
| 14.75 | 15.88 | Wt. Sample (dry+tare)(g) | | |
| 1.42 | 1.49 | Wt. Tare (g) | | |
| 13.3 | 14.4 | Wt. Dry Soil (g) | | |
| 7.6 | 8.2 | Wt. Water (g) | | |
| 56.7% | 56.6% | Water Content (%) | | |
| 57.0% | 56.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.1 | 27.44 | Wt. Sample (wet+tare)(g) | | |
| 20.69 | 25.08 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.87 | Wt. Tare (g) | | |
| 6.9 | 11.2 | Wt. Dry Soil (g) | | |
| 1.4 | 2.4 | Wt. Water (g) | | |
| 20.4% | 21.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 57 | | LL | |
| PL | 21 | | PL | |
| PI | 36 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 7, 2016 |
| Date Tested: | July 20, 2016 |
| Tested By: | C. Oost |


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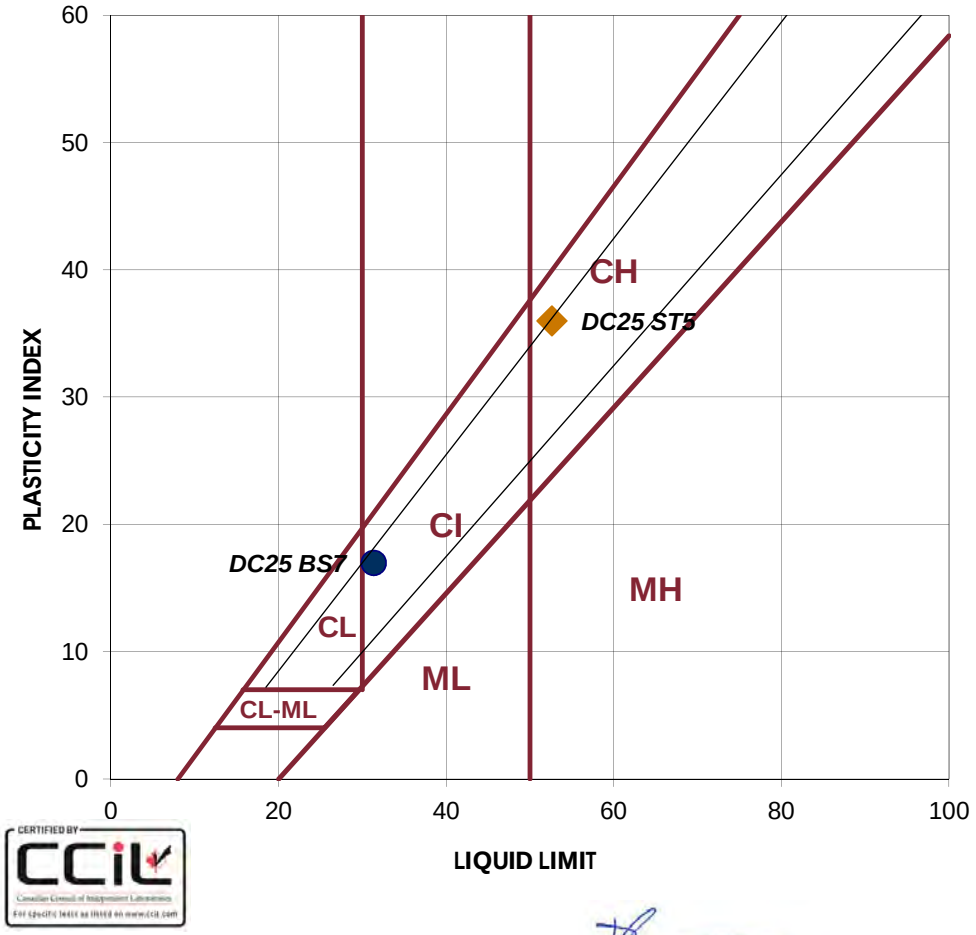
| Sample: DC25 BS7 | | | Sample: DC25 ST5 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | 28 | 28 |
| | | Container Number | | |
| 17.64 | 17.85 | Wt. Sample (wet+tare)(g) | 16.76 | 15.75 |
| 13.80 | 13.85 | Wt. Sample (dry+tare)(g) | 11.46 | 10.83 |
| 1.63 | 1.18 | Wt. Tare (g) | 1.29 | 1.31 |
| 12.2 | 12.7 | Wt. Dry Soil (g) | 10.2 | 9.5 |
| 3.8 | 4.0 | Wt. Water (g) | 5.3 | 4.9 |
| 31.6% | 31.6% | Water Content (%) | 52.1% | 51.7% |
| 31.2% | 31.4% | Corrected Water Content (%) | 52.8% | 52.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.97 | 23.13 | Wt. Sample (wet+tare)(g) | 20.43 | 21.19 |
| 22.1 | 22.21 | Wt. Sample (dry+tare)(g) | 19.54 | 20.13 |
| 15.81 | 15.65 | Wt. Tare (g) | 14.14 | 13.77 |
| 6.3 | 6.6 | Wt. Dry Soil (g) | 5.4 | 6.4 |
| 0.9 | 0.9 | Wt. Water (g) | 0.9 | 1.1 |
| 13.8% | 14.0% | Water Content (%) | 16.5% | 16.7% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | 53 |
| PL | 14 | | PL | 17 |
| PI | 17 | | PI | 36 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CL*** | | | ***CH*** | |



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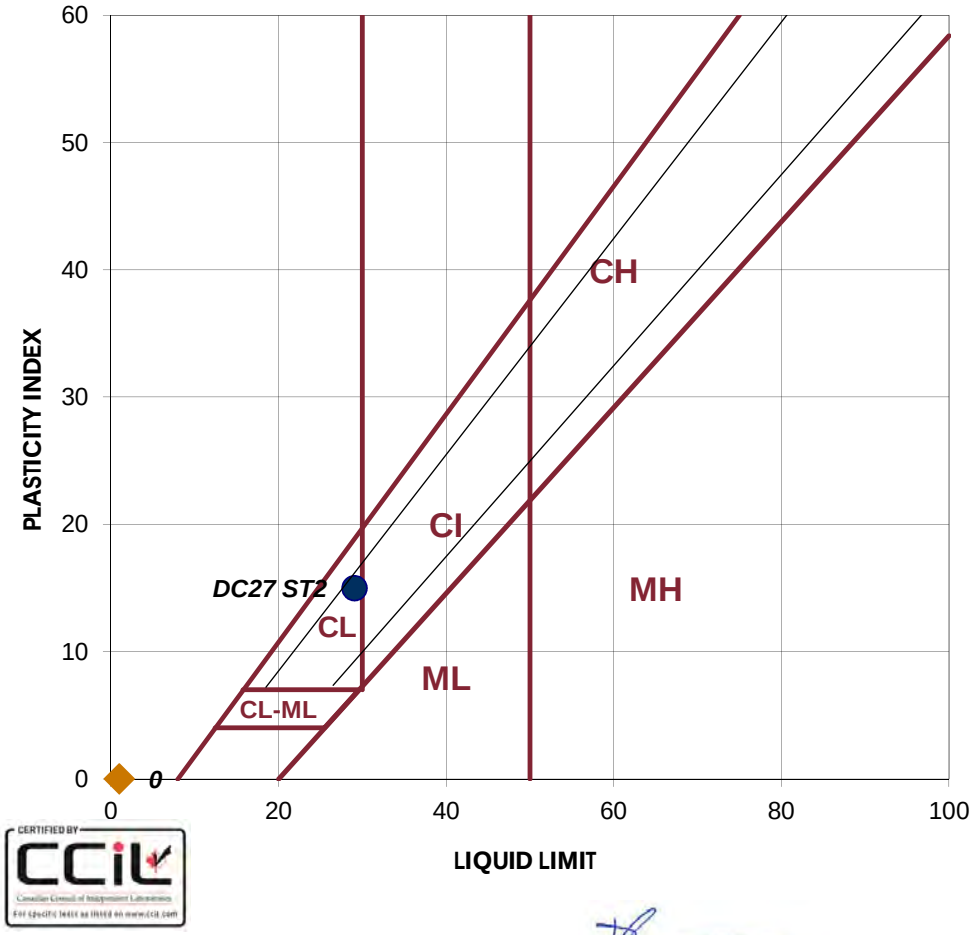
## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 8, 2016 |
| Date Tested: | July 20, 2016 |
| Tested By: | C. Oost |

| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC27 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 23 | Number of Blows | | |
| | | Container Number | | |
| 17.93 | 18.17 | Wt. Sample (wet+tare)(g) | | |
| 14.16 | 14.34 | Wt. Sample (dry+tare)(g) | | |
| 1.26 | 1.24 | Wt. Tare (g) | | |
| 12.9 | 13.1 | Wt. Dry Soil (g) | | |
| 3.8 | 3.8 | Wt. Water (g) | | |
| 29.2% | 29.2% | Water Content (%) | | |
| 29.1% | 28.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.23 | 24.84 | Wt. Sample (wet+tare)(g) | | |
| 23.22 | 23.77 | Wt. Sample (dry+tare)(g) | | |
| 15.81 | 15.85 | Wt. Tare (g) | | |
| 7.4 | 7.9 | Wt. Dry Soil (g) | | |
| 1.0 | 1.1 | Wt. Water (g) | | |
| 13.6% | 13.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 29 | | LL | |
| PL | 14 | | PL | |
| PI | 15 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-CI*** | | | ***NON-PLASTIC*** | |






Reviewed By:

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 8, 2016 |
| Date Tested: | July 25, 2016 |
| Tested By: | B. Pelkey |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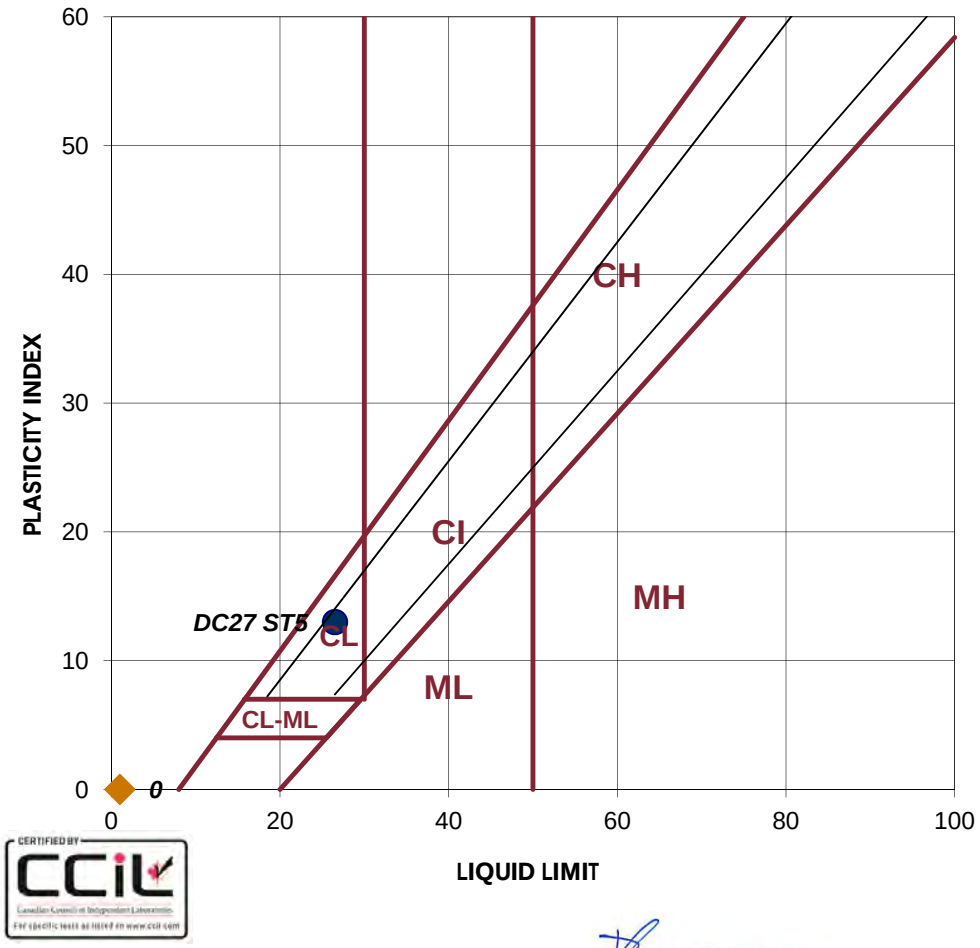
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC27 ST5 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 28.69 | 28.18 | Wt. Sample (wet+tare)(g) | | |
| 22.90 | 22.53 | Wt. Sample (dry+tare)(g) | | |
| 1.24 | 1.35 | Wt. Tare (g) | | |
| 21.7 | 21.2 | Wt. Dry Soil (g) | | |
| 5.8 | 5.7 | Wt. Water (g) | | |
| 26.7% | 26.7% | Water Content (%) | | |
| 26.5% | 26.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.15 | 23.09 | Wt. Sample (wet+tare)(g) | | |
| 24.58 | 21.94 | Wt. Sample (dry+tare)(g) | | |
| 13.87 | 13.83 | Wt. Tare (g) | | |
| 10.7 | 8.1 | Wt. Dry Soil (g) | | |
| 1.6 | 1.2 | Wt. Water (g) | | |
| 14.7% | 14.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 27 | | LL | |
| PL | 14 | | PL | |
| PI | 13 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL*** | | | ***NON-PLASTIC*** | |






Reviewed By:

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 8, 2016 |
| Date Tested: | July 20, 2016 |
| Tested By: | C. Oost |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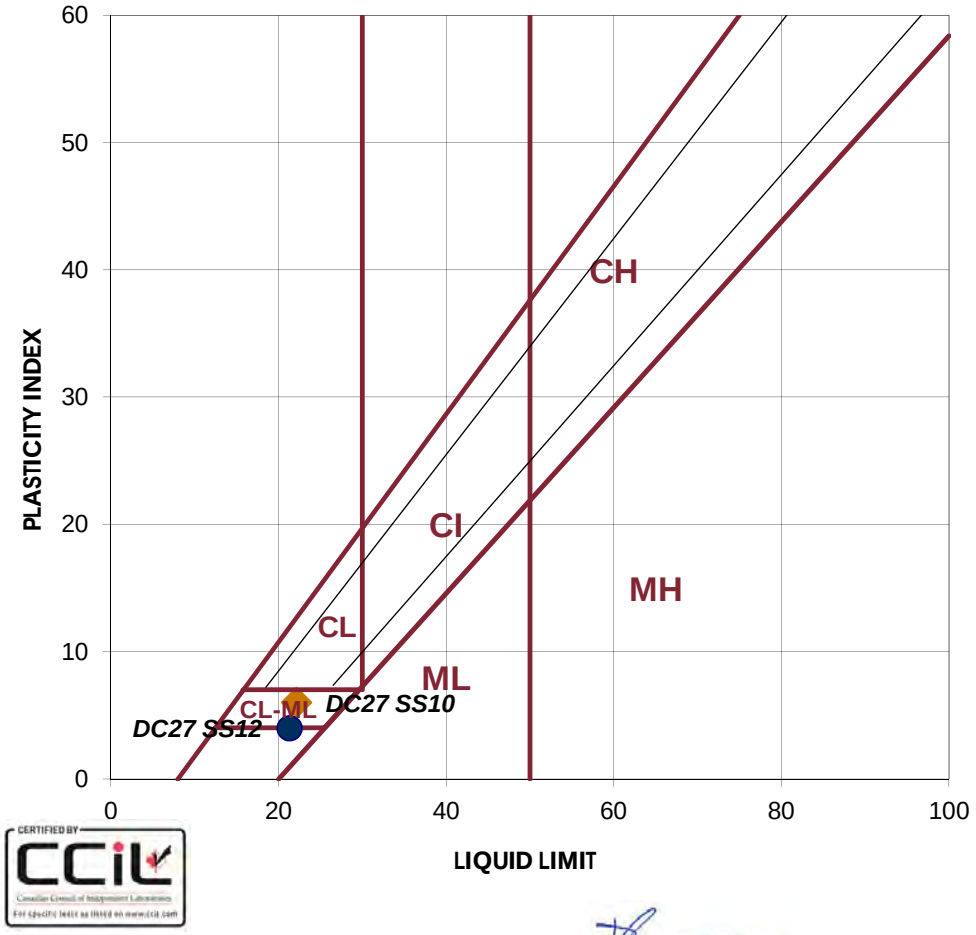
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC27 SS12 | | | DC27 SS10 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 22 | Number of Blows | 22 | 22 |
| | | Container Number | | |
| 15.75 | 19.01 | Wt. Sample (wet+tare)(g) | 15.03 | 19.32 |
| 13.17 | 15.92 | Wt. Sample (dry+tare)(g) | 12.49 | 16.05 |
| 1.25 | 1.53 | Wt. Tare (g) | 1.17 | 1.51 |
| 11.9 | 14.4 | Wt. Dry Soil (g) | 11.3 | 14.5 |
| 2.6 | 3.1 | Wt. Water (g) | 2.5 | 3.3 |
| 21.6% | 21.5% | Water Content (%) | 22.4% | 22.5% |
| 21.4% | 21.1% | Corrected Water Content (%) | 22.1% | 22.1% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.13 | 23.79 | Wt. Sample (wet+tare)(g) | 24.88 | 23.37 |
| 22.66 | 22.37 | Wt. Sample (dry+tare)(g) | 23.61 | 22.27 |
| 13.83 | 13.78 | Wt. Tare (g) | 15.8 | 15.65 |
| 8.8 | 8.6 | Wt. Dry Soil (g) | 7.8 | 6.6 |
| 1.5 | 1.4 | Wt. Water (g) | 1.3 | 1.1 |
| 16.6% | 16.5% | Water Content (%) | 16.3% | 16.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 21 | | LL | 22 |
| PL | 17 | | PL | 16 |
| PI | 4 | | PI | 6 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-ML*** | | | ***CL-ML*** | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 8, 2016 |
| Date Tested: | August 31, 2016 |
| Tested By: | B. Pelkey |


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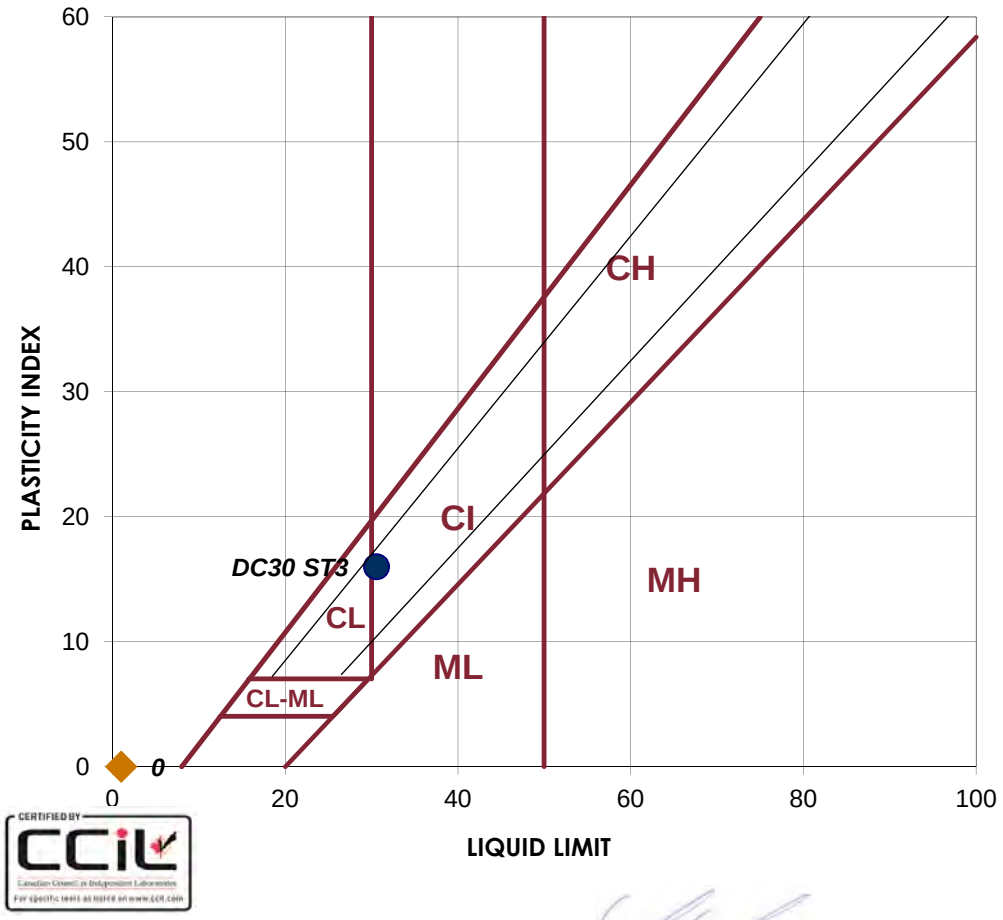
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC30 ST3 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 23 | Number of Blows | | |
| | | Container Number | | |
| 24.17 | 30.40 | Wt. Sample (wet+tare)(g) | | |
| 18.76 | 23.57 | Wt. Sample (dry+tare)(g) | | |
| 1.27 | 1.52 | Wt. Tare (g) | | |
| 17.5 | 22.1 | Wt. Dry Soil (g) | | |
| 5.4 | 6.8 | Wt. Water (g) | | |
| 30.9% | 31.0% | Water Content (%) | | |
| 30.5% | 30.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.71 | 26.36 | Wt. Sample (wet+tare)(g) | | |
| 25.88 | 24.7 | Wt. Sample (dry+tare)(g) | | |
| 14.14 | 13.87 | Wt. Tare (g) | | |
| 11.7 | 10.8 | Wt. Dry Soil (g) | | |
| 1.8 | 1.7 | Wt. Water (g) | | |
| 15.6% | 15.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 15 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 8, 2016 |
| Date Tested: | August 19, 2016 |
| Tested By: | C. Oost |


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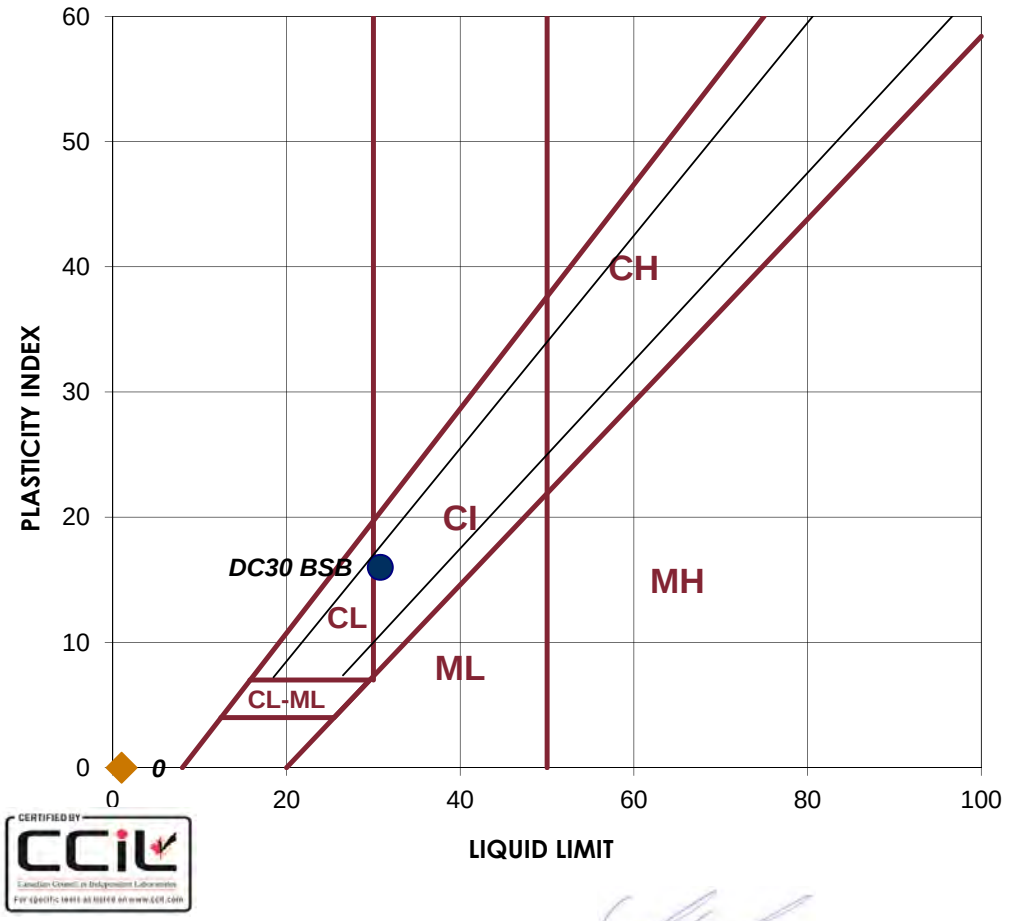
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC30 BSB | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 21.61 | 21.90 | Wt. Sample (wet+tare)(g) | | |
| 16.86 | 17.05 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.45 | Wt. Tare (g) | | |
| 15.4 | 15.6 | Wt. Dry Soil (g) | | |
| 4.8 | 4.9 | Wt. Water (g) | | |
| 30.9% | 31.1% | Water Content (%) | | |
| 30.6% | 30.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.15 | 23.54 | Wt. Sample (wet+tare)(g) | | |
| 21.33 | 22.54 | Wt. Sample (dry+tare)(g) | | |
| 15.81 | 15.65 | Wt. Tare (g) | | |
| 5.5 | 6.9 | Wt. Dry Soil (g) | | |
| 0.8 | 1.0 | Wt. Water (g) | | |
| 14.9% | 14.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 15 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | NON-PLASTIC | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 8, 2016 |
| Date Tested: | August 19, 2016 |
| Tested By: | C. Oost |


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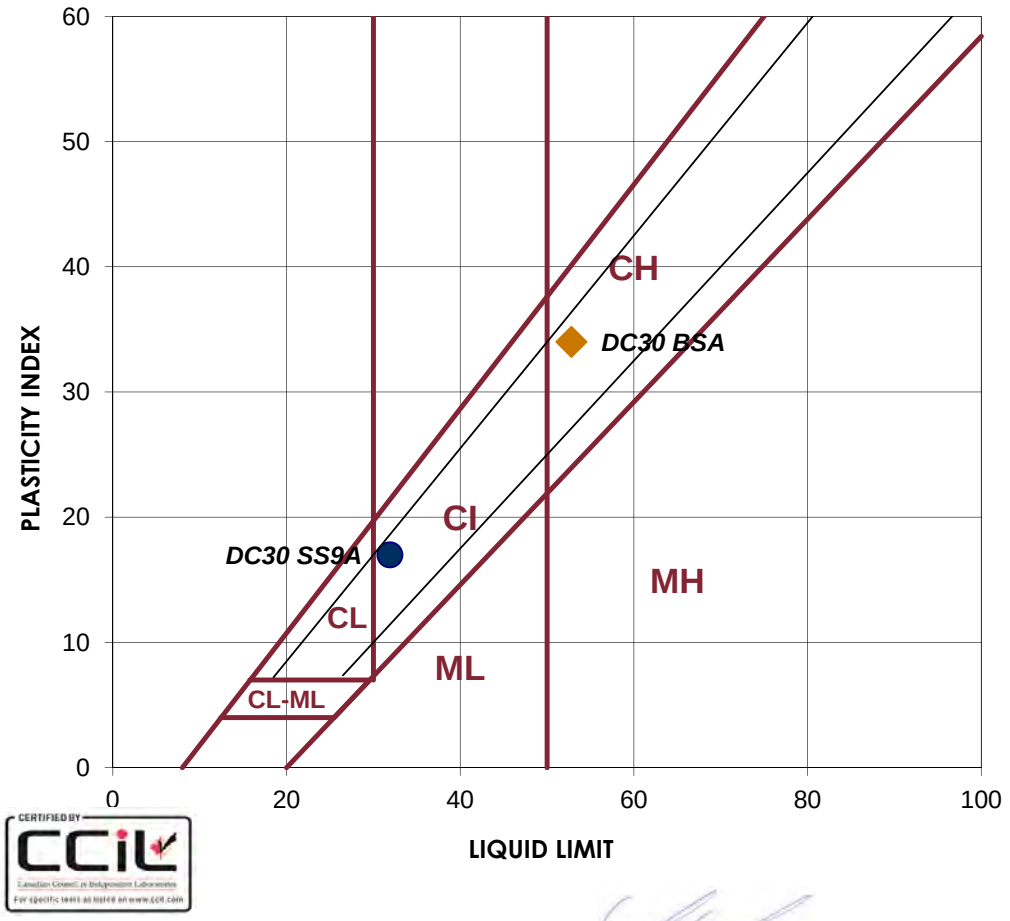
| Sample: DC30 SS9A | | | Sample: DC30 BSA | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 26 | Number of Blows | 24 | 25 |
| | | Container Number | | |
| 18.99 | 24.47 | Wt. Sample (wet+tare)(g) | 14.66 | 19.12 |
| 14.73 | 18.90 | Wt. Sample (dry+tare)(g) | 10.04 | 12.96 |
| 1.34 | 1.39 | Wt. Tare (g) | 1.32 | 1.31 |
| 13.4 | 17.5 | Wt. Dry Soil (g) | 8.7 | 11.7 |
| 4.3 | 5.6 | Wt. Water (g) | 4.6 | 6.2 |
| 31.8% | 31.8% | Water Content (%) | 53.0% | 52.9% |
| 31.8% | 32.0% | Corrected Water Content (%) | 52.7% | 52.9% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 20.07 | 20.78 | Wt. Sample (wet+tare)(g) | 20.99 | 21.07 |
| 19.22 | 19.87 | Wt. Sample (dry+tare)(g) | 19.88 | 19.91 |
| 13.77 | 13.79 | Wt. Tare (g) | 13.87 | 13.77 |
| 5.5 | 6.1 | Wt. Dry Soil (g) | 6.0 | 6.1 |
| 0.9 | 0.9 | Wt. Water (g) | 1.1 | 1.2 |
| 15.6% | 15.0% | Water Content (%) | 18.5% | 18.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | 53 |
| PL | 15 | | PL | 19 |
| PI | 17 | | PI | 34 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | CH | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 7, 2016 |
| Date Tested: | August 23, 2016 |
| Tested By: | C. Oost |


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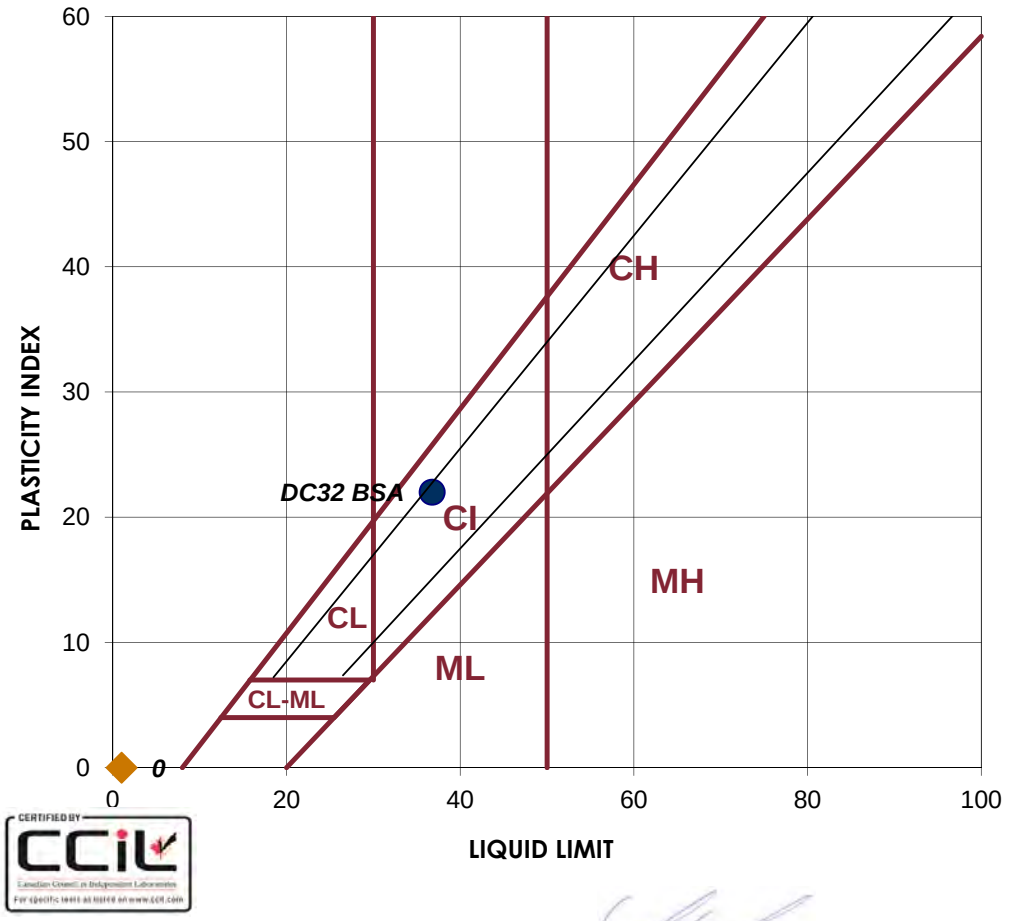
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC32 BSA | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 23 | Number of Blows | | |
| | | Container Number | | |
| 23.76 | 20.73 | Wt. Sample (wet+tare)(g) | | |
| 17.76 | 15.48 | Wt. Sample (dry+tare)(g) | | |
| 1.54 | 1.32 | Wt. Tare (g) | | |
| 16.2 | 14.2 | Wt. Dry Soil (g) | | |
| 6.0 | 5.3 | Wt. Water (g) | | |
| 37.0% | 37.1% | Water Content (%) | | |
| 36.8% | 36.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.79 | 23.83 | Wt. Sample (wet+tare)(g) | | |
| 22.78 | 22.81 | Wt. Sample (dry+tare)(g) | | |
| 15.8 | 15.83 | Wt. Tare (g) | | |
| 7.0 | 7.0 | Wt. Dry Soil (g) | | |
| 1.0 | 1.0 | Wt. Water (g) | | |
| 14.5% | 14.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | |
| PL | 15 | | PL | |
| PI | 22 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 7, 2016 |
| Date Tested: | August 23, 2016 |
| Tested By: | C. Oost |


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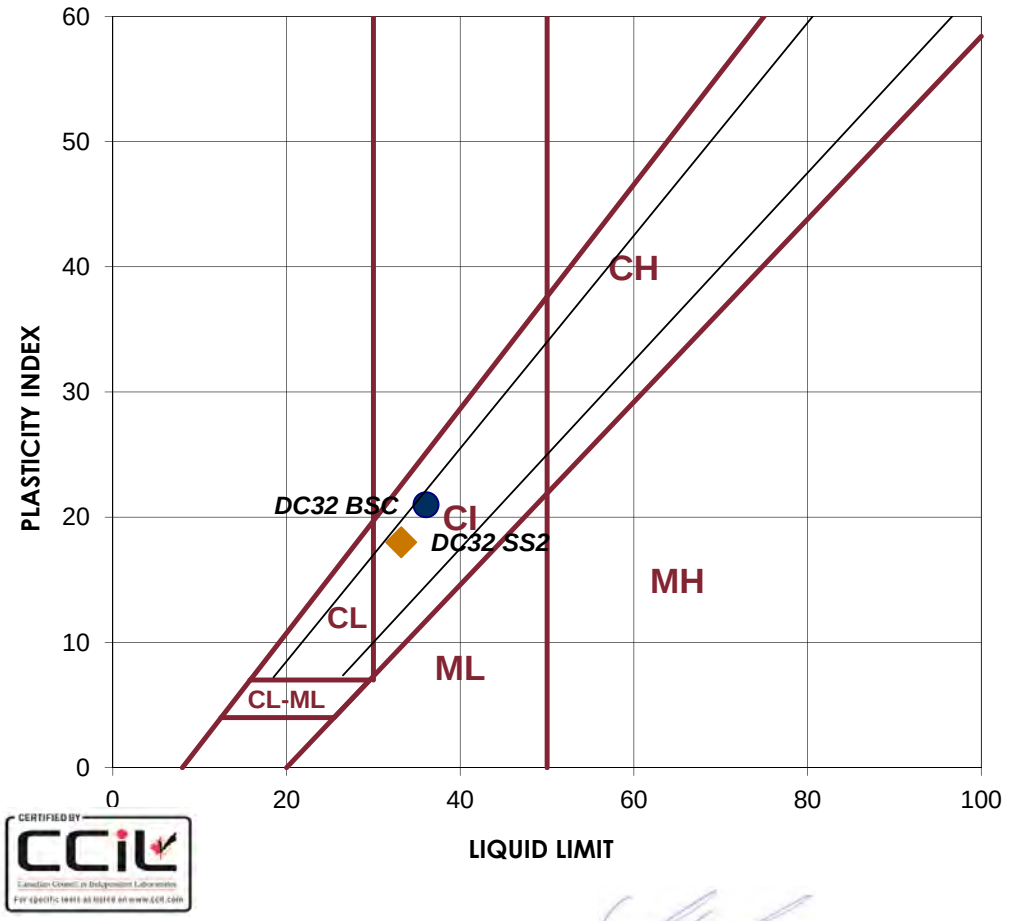
| Sample: DC32 BSC | | | Sample: DC32 SS2 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 27 | Number of Blows | 25 | 27 |
| | | Container Number | | |
| 19.48 | 23.09 | Wt. Sample (wet+tare)(g) | 22.23 | 20.28 |
| 14.66 | 17.34 | Wt. Sample (dry+tare)(g) | 17.02 | 15.56 |
| 1.17 | 1.31 | Wt. Tare (g) | 1.30 | 1.23 |
| 13.5 | 16.0 | Wt. Dry Soil (g) | 15.7 | 14.3 |
| 4.8 | 5.8 | Wt. Water (g) | 5.2 | 4.7 |
| 35.7% | 35.9% | Water Content (%) | 33.1% | 32.9% |
| 35.9% | 36.2% | Corrected Water Content (%) | 33.1% | 33.2% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.38 | 21.33 | Wt. Sample (wet+tare)(g) | 22.95 | 24.06 |
| 22.14 | 20.39 | Wt. Sample (dry+tare)(g) | 21.98 | 22.98 |
| 13.82 | 13.78 | Wt. Tare (g) | 15.65 | 15.78 |
| 8.3 | 6.6 | Wt. Dry Soil (g) | 6.3 | 7.2 |
| 1.2 | 0.9 | Wt. Water (g) | 1.0 | 1.1 |
| 14.9% | 14.2% | Water Content (%) | 15.3% | 15.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | 33 |
| PL | 15 | | PL | 15 |
| PI | 21 | | PI | 18 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Date Received: June 7, 2016
Date Tested: August 23, 2016
Tested By: C. Oost

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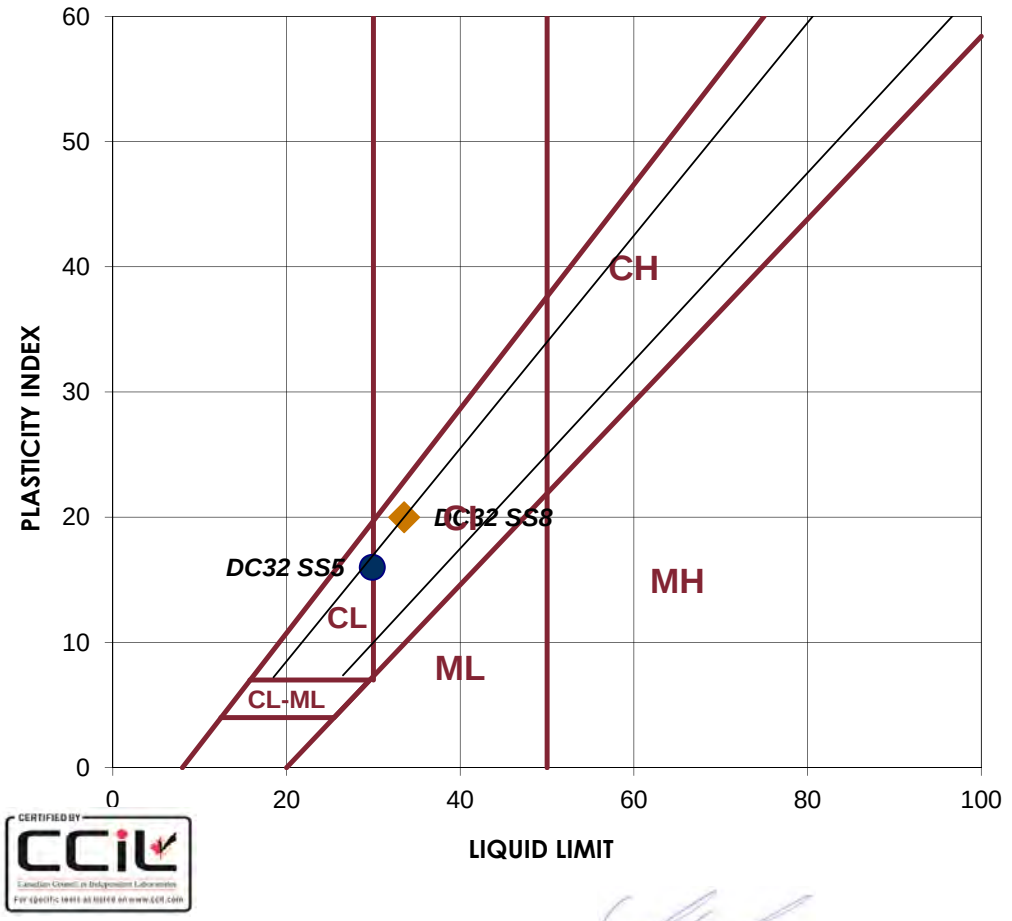
Tel: (403) 253-7876

| Sample: DC32 SS5 | | | Sample: DC32 SS8 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 24 | Number of Blows | 22 | 22 |
| | | Container Number | | |
| 21.82 | 23.98 | Wt. Sample (wet+tare)(g) | 20.94 | 22.17 |
| 17.14 | 18.80 | Wt. Sample (dry+tare)(g) | 15.95 | 16.95 |
| 1.50 | 1.59 | Wt. Tare (g) | 1.33 | 1.59 |
| 15.6 | 17.2 | Wt. Dry Soil (g) | 14.6 | 15.4 |
| 4.7 | 5.2 | Wt. Water (g) | 5.0 | 5.2 |
| 29.9% | 30.1% | Water Content (%) | 34.1% | 34.0% |
| 29.8% | 30.0% | Corrected Water Content (%) | 33.6% | 33.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 21.72 | 20.47 | Wt. Sample (wet+tare)(g) | 21.41 | 20.81 |
| 20.72 | 19.65 | Wt. Sample (dry+tare)(g) | 20.49 | 19.94 |
| 13.92 | 13.77 | Wt. Tare (g) | 13.89 | 13.81 |
| 6.8 | 5.9 | Wt. Dry Soil (g) | 6.6 | 6.1 |
| 1.0 | 0.8 | Wt. Water (g) | 0.9 | 0.9 |
| 14.7% | 13.9% | Water Content (%) | 13.9% | 14.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | 34 |
| PL | 14 | | PL | 14 |
| PI | 16 | | PI | 20 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL-CI | | | CI | |

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Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 7, 2016 |
| Date Tested: | August 28, 2016 |
| Tested By: | B. Pelkey |


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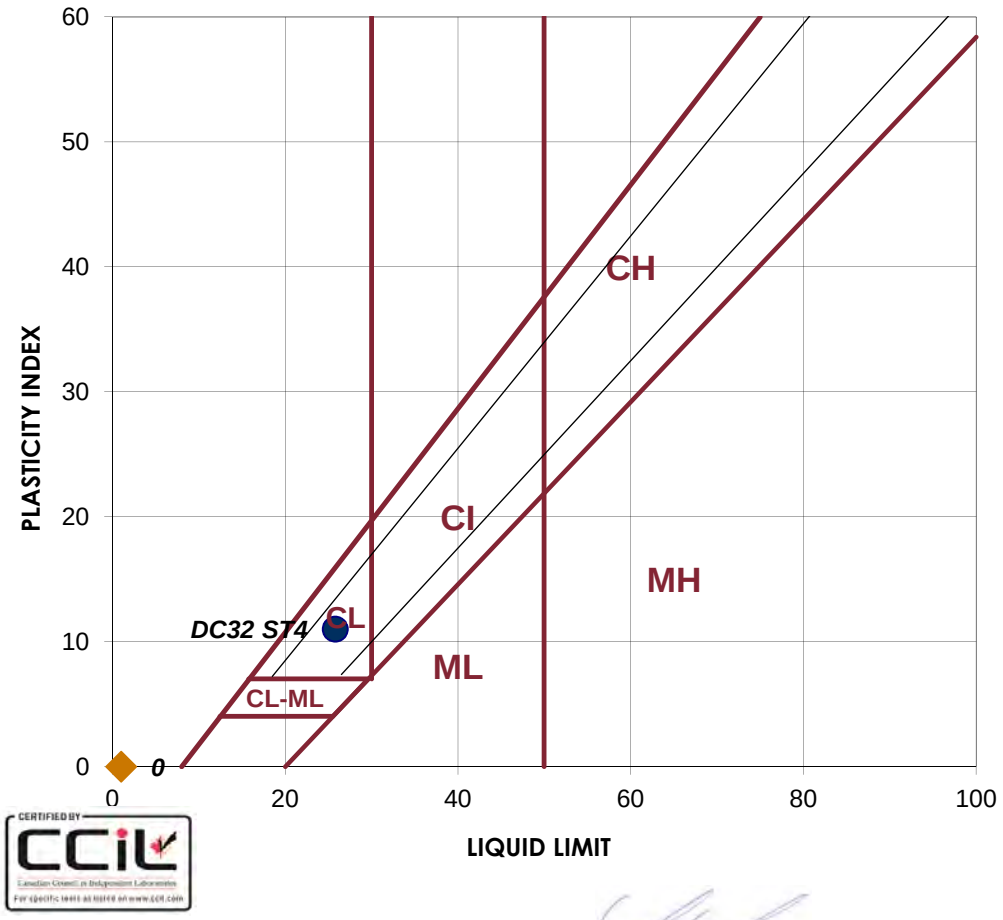
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC32 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 26 | Number of Blows | | |
| | | Container Number | | |
| 27.04 | 27.49 | Wt. Sample (wet+tare)(g) | | |
| 21.83 | 22.12 | Wt. Sample (dry+tare)(g) | | |
| 1.31 | 1.25 | Wt. Tare (g) | | |
| 20.5 | 20.9 | Wt. Dry Soil (g) | | |
| 5.2 | 5.4 | Wt. Water (g) | | |
| 25.4% | 25.7% | Water Content (%) | | |
| 25.7% | 25.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.74 | 30.93 | Wt. Sample (wet+tare)(g) | | |
| 25.12 | 28.71 | Wt. Sample (dry+tare)(g) | | |
| 14.15 | 13.81 | Wt. Tare (g) | | |
| 11.0 | 14.9 | Wt. Dry Soil (g) | | |
| 1.6 | 2.2 | Wt. Water (g) | | |
| 14.8% | 14.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 26 | | LL | |
| PL | 15 | | PL | |
| PI | 11 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 9, 2016 |
| Date Tested: | July 11, 2016 |
| Tested By: | B. Pelkey |


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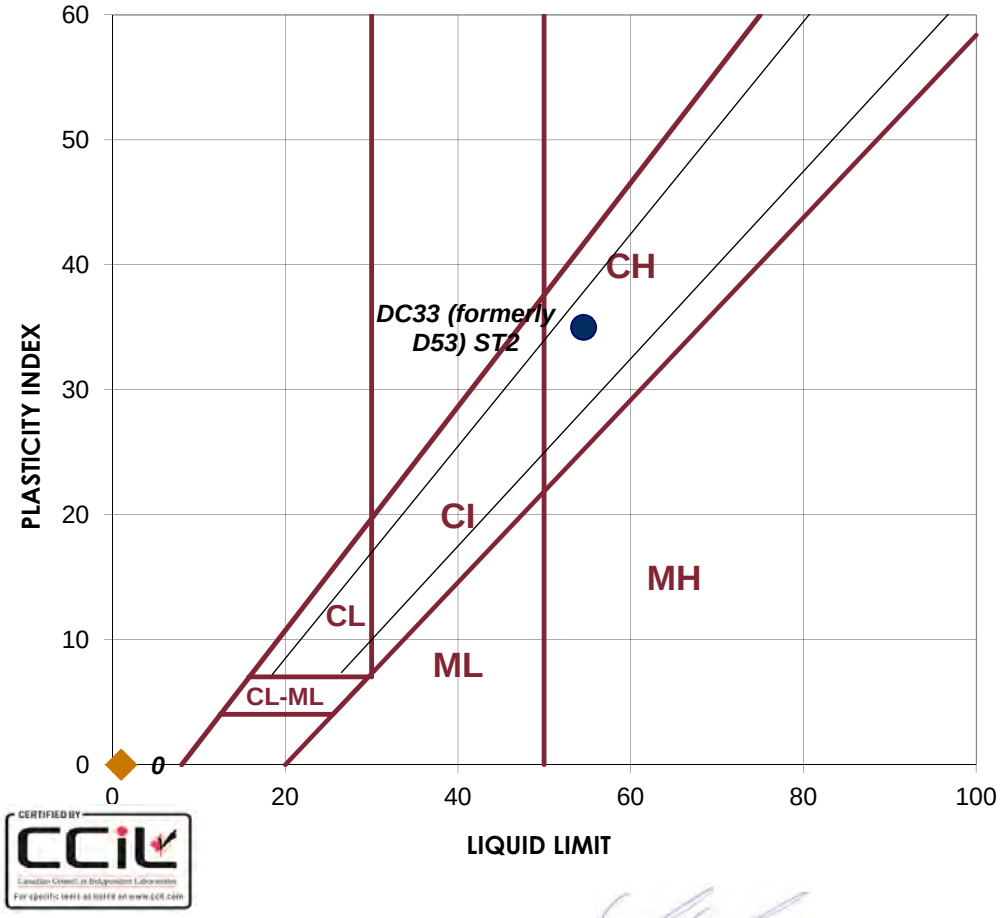
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC33 (formerly D53) ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 28 | Number of Blows | | |
| | | Container Number | | |
| 22.65 | 28.63 | Wt. Sample (wet+tare)(g) | | |
| 15.21 | 19.01 | Wt. Sample (dry+tare)(g) | | |
| 1.46 | 1.18 | Wt. Tare (g) | | |
| 13.8 | 17.8 | Wt. Dry Soil (g) | | |
| 7.4 | 9.6 | Wt. Water (g) | | |
| 54.1% | 54.0% | Water Content (%) | | |
| 54.4% | 54.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.88 | 24.77 | Wt. Sample (wet+tare)(g) | | |
| 21.41 | 22.91 | Wt. Sample (dry+tare)(g) | | |
| 14.13 | 13.79 | Wt. Tare (g) | | |
| 7.3 | 9.1 | Wt. Dry Soil (g) | | |
| 1.5 | 1.9 | Wt. Water (g) | | |
| 20.2% | 20.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 55 | | LL | |
| PL | 20 | | PL | |
| PI | 35 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 9, 2016 |
| Date Tested: | July 6, 2016 |
| Tested By: | B. Pelkey |


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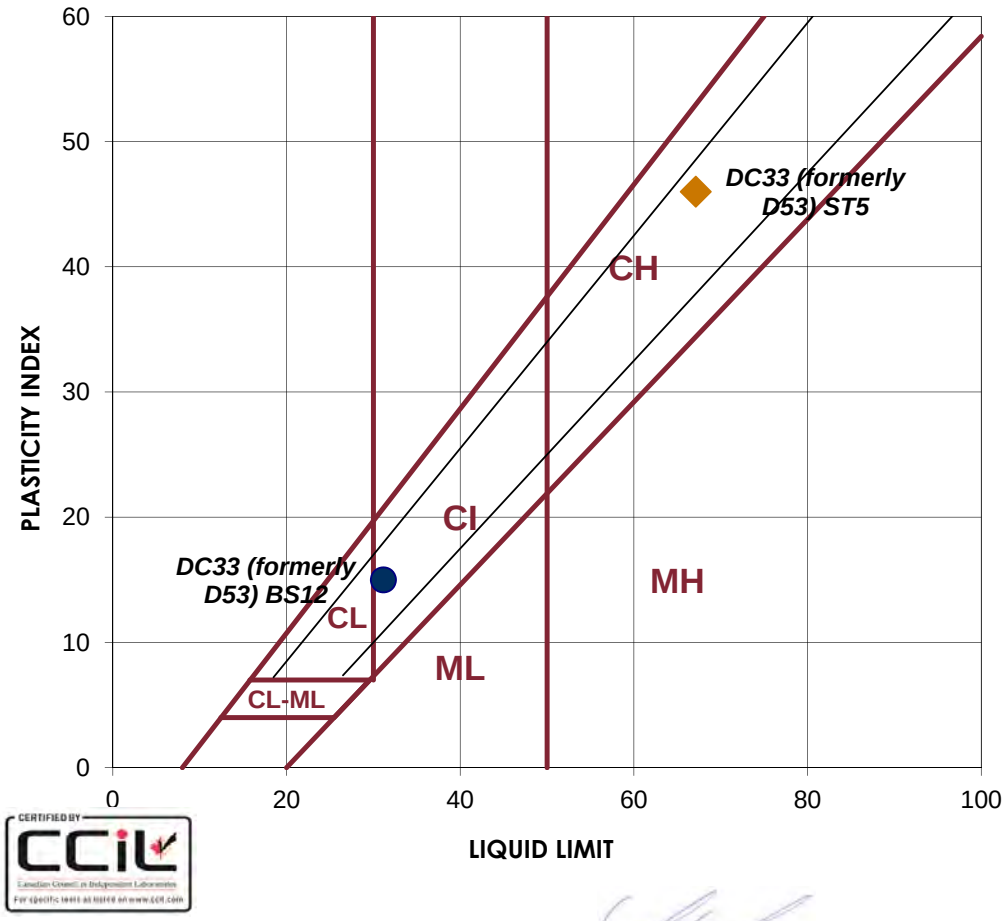
| Sample: DC33 (formerly D53) BS12 | | | Sample: DC33 (formerly D53) ST5 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 29 | Number of Blows | 25 | 23 |
| | | Container Number | | |
| 33.39 | 22.72 | Wt. Sample (wet+tare)(g) | 31.40 | 25.42 |
| 25.89 | 17.70 | Wt. Sample (dry+tare)(g) | 19.40 | 15.70 |
| 1.48 | 1.29 | Wt. Tare (g) | 1.65 | 1.26 |
| 24.4 | 16.4 | Wt. Dry Soil (g) | 17.8 | 14.4 |
| 7.5 | 5.0 | Wt. Water (g) | 12.0 | 9.7 |
| 30.7% | 30.6% | Water Content (%) | 67.6% | 67.3% |
| 31.1% | 31.1% | Corrected Water Content (%) | 67.6% | 66.6% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.75 | 30.78 | Wt. Sample (wet+tare)(g) | 27.03 | 27.23 |
| 23.56 | 28.75 | Wt. Sample (dry+tare)(g) | 25.01 | 25.22 |
| 15.83 | 15.81 | Wt. Tare (g) | 15.65 | 15.78 |
| 7.7 | 12.9 | Wt. Dry Soil (g) | 9.4 | 9.4 |
| 1.2 | 2.0 | Wt. Water (g) | 2.0 | 2.0 |
| 15.4% | 15.7% | Water Content (%) | 21.6% | 21.3% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | 67 |
| PL | 16 | | PL | 21 |
| PI | 15 | | PI | 46 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | CH | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 9, 2016 |
| Date Tested: | July 4, 2016 |
| Tested By: | B. Pelkey |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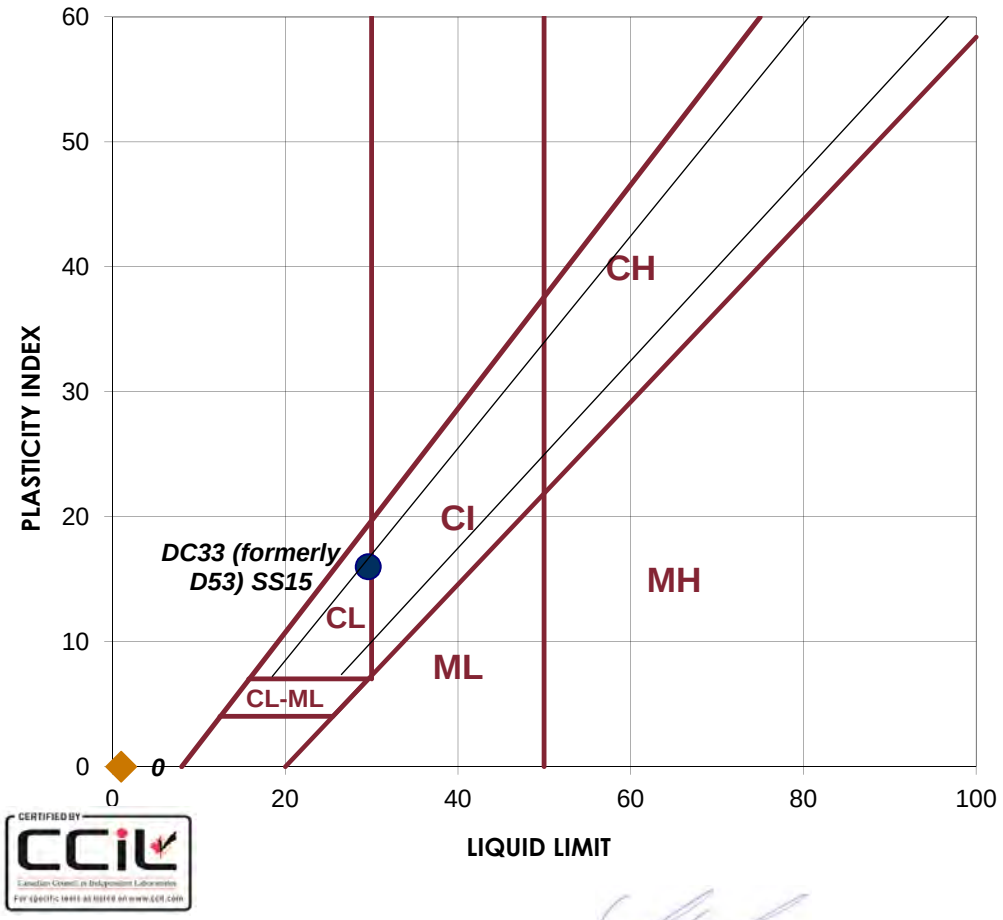
| Sample: | | | Sample: | |
|---|---|---|---|---|
| DC33 (formerly D53) SS15 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 28 | Number of Blows | | |
| | | Container Number | | |
| 36.06 | 25.51 | Wt. Sample (wet+tare)(g) | | |
| 28.24 | 20.10 | Wt. Sample (dry+tare)(g) | | |
| 1.46 | 1.51 | Wt. Tare (g) | | |
| 26.8 | 18.6 | Wt. Dry Soil (g) | | |
| 7.8 | 5.4 | Wt. Water (g) | | |
| 29.2% | 29.1% | Water Content (%) | | |
| 29.7% | 29.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.64 | 28.31 | Wt. Sample (wet+tare)(g) | | |
| 23.32 | 26.52 | Wt. Sample (dry+tare)(g) | | |
| 13.76 | 13.85 | Wt. Tare (g) | | |
| 9.6 | 12.7 | Wt. Dry Soil (g) | | |
| 1.3 | 1.8 | Wt. Water (g) | | |
| 13.8% | 14.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | |
| PL | 14 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-CI*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 10, 2016 |
| Date Tested: | July 21, 2016 |
| Tested By: | B. Pelkey |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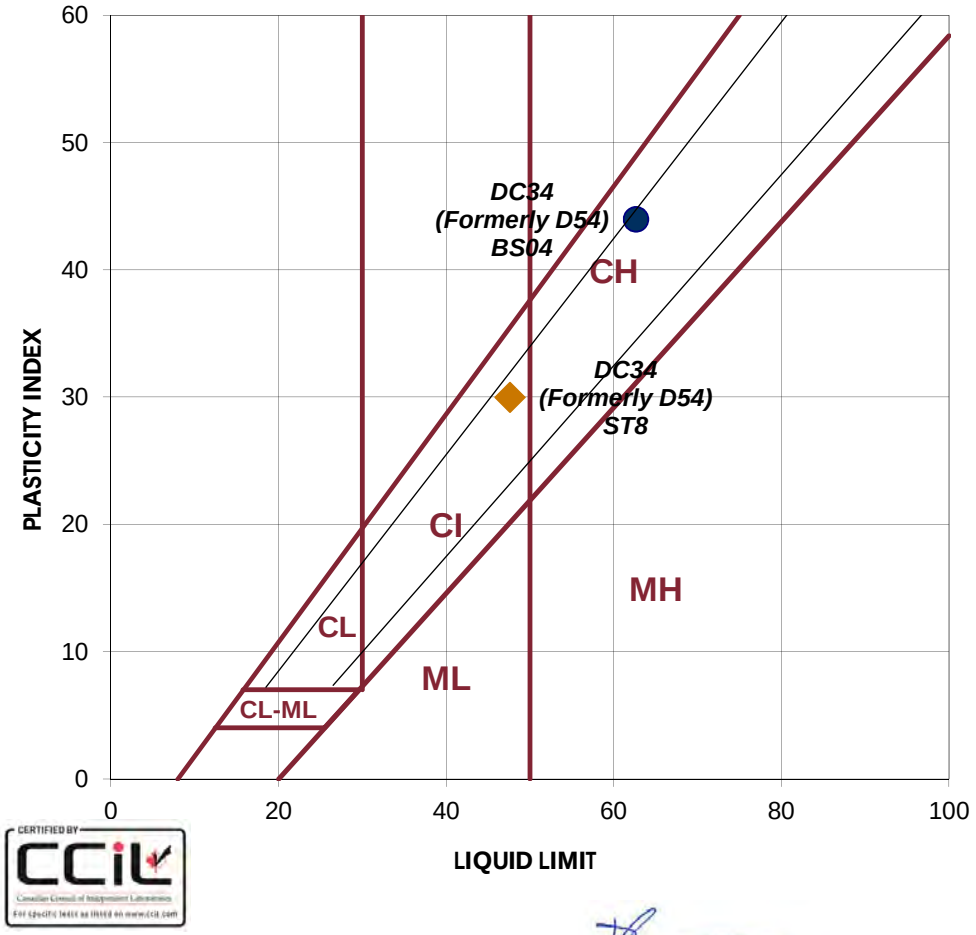
| Sample: DC34 (Formerly D54) BS04 | | | Sample: DC34 (Formerly D54) ST8 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 28 | Number of Blows | 23 | 22 |
| | | Container Number | | |
| 26.54 | 21.37 | Wt. Sample (wet+tare)(g) | 22.04 | 22.57 |
| 16.84 | 13.81 | Wt. Sample (dry+tare)(g) | 15.27 | 15.72 |
| 1.18 | 1.64 | Wt. Tare (g) | 1.21 | 1.53 |
| 15.7 | 12.2 | Wt. Dry Soil (g) | 14.1 | 14.2 |
| 9.7 | 7.6 | Wt. Water (g) | 6.8 | 6.9 |
| 61.9% | 62.1% | Water Content (%) | 48.2% | 48.3% |
| 62.2% | 63.0% | Corrected Water Content (%) | 47.7% | 47.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.13 | 24.08 | Wt. Sample (wet+tare)(g) | 25.33 | 24.83 |
| 21.69 | 22.43 | Wt. Sample (dry+tare)(g) | 23.58 | 23.12 |
| 13.87 | 13.92 | Wt. Tare (g) | 13.79 | 13.81 |
| 7.8 | 8.5 | Wt. Dry Soil (g) | 9.8 | 9.3 |
| 1.4 | 1.7 | Wt. Water (g) | 1.8 | 1.7 |
| 18.4% | 19.4% | Water Content (%) | 17.9% | 18.4% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 63 | | LL | 48 |
| PL | 19 | | PL | 18 |
| PI | 44 | | PI | 30 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** ● | | | ***CI*** ◆ | |



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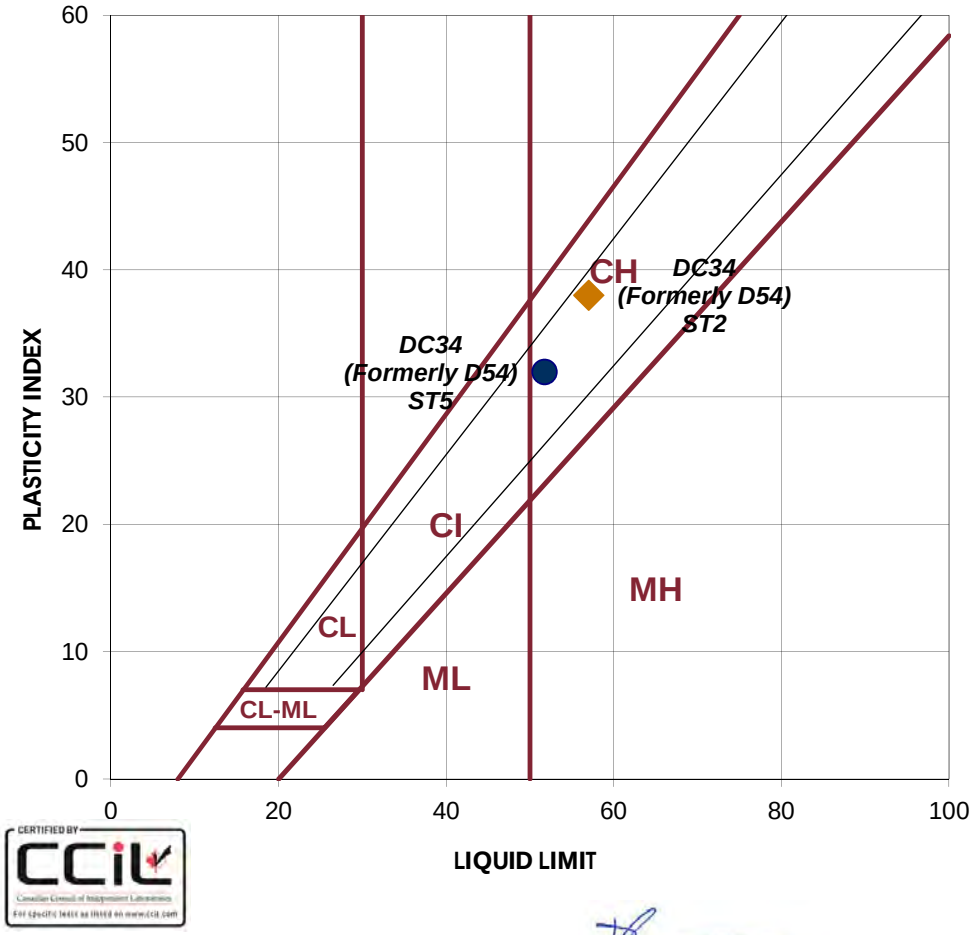
## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Date Received: June 10, 2016
Date Tested: July 23, 2016
Tested By: C. Oost

| Sample: DC34 (Formerly D54) ST5 | | | Sample: DC34 (Formerly D54) ST2 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 23 | Number of Blows | 24 | 23 |
| | | Container Number | | |
| 18.05 | 20.66 | Wt. Sample (wet+tare)(g) | 17.21 | 19.42 |
| 12.29 | 14.03 | Wt. Sample (dry+tare)(g) | 11.39 | 12.82 |
| 1.26 | 1.27 | Wt. Tare (g) | 1.25 | 1.33 |
| 11.0 | 12.8 | Wt. Dry Soil (g) | 10.1 | 11.5 |
| 5.8 | 6.6 | Wt. Water (g) | 5.8 | 6.6 |
| 52.2% | 52.0% | Water Content (%) | 57.4% | 57.4% |
| 52.0% | 51.4% | Corrected Water Content (%) | 57.1% | 56.9% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.56 | 22.77 | Wt. Sample (wet+tare)(g) | 22.51 | 22.3 |
| 21.45 | 21.6 | Wt. Sample (dry+tare)(g) | 21.43 | 21.28 |
| 15.87 | 15.64 | Wt. Tare (g) | 15.81 | 15.94 |
| 5.6 | 6.0 | Wt. Dry Soil (g) | 5.6 | 5.3 |
| 1.1 | 1.2 | Wt. Water (g) | 1.1 | 1.0 |
| 19.9% | 19.6% | Water Content (%) | 19.2% | 19.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 52 | | LL | 57 |
| PL | 20 | | PL | 19 |
| PI | 32 | | PI | 38 |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH-CI** | | | **CH** | |






Reviewed By:

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | June 10, 2016 |
| Date Tested: | July 19, 2016 |
| Tested By: | A. Simaluk |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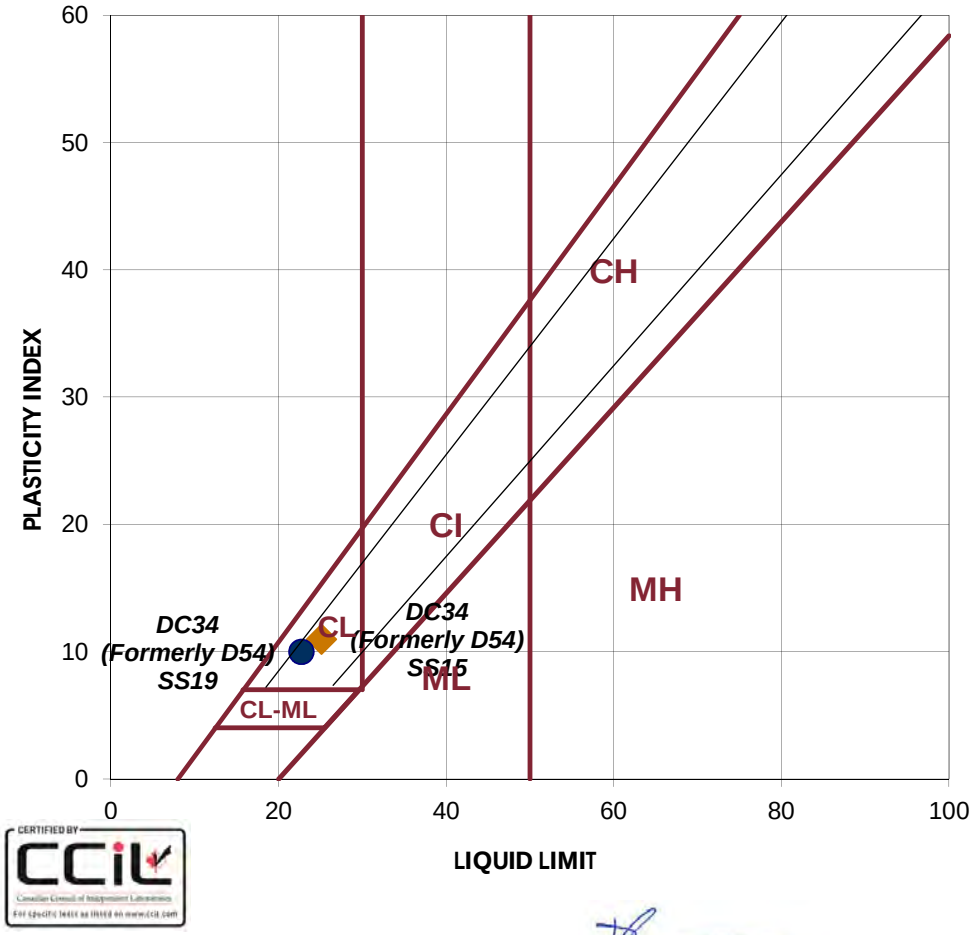
| Sample: DC34 (Formerly D54) SS19 | | | Sample: DC34 (Formerly D54) SS15 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 28 | Number of Blows | 27 | 28 |
| | | Container Number | | |
| 24.66 | 26.56 | Wt. Sample (wet+tare)(g) | 15.27 | 16.85 |
| 20.37 | 21.98 | Wt. Sample (dry+tare)(g) | 12.54 | 13.80 |
| 1.22 | 1.51 | Wt. Tare (g) | 1.52 | 1.53 |
| 19.2 | 20.5 | Wt. Dry Soil (g) | 11.0 | 12.3 |
| 4.3 | 4.6 | Wt. Water (g) | 2.7 | 3.1 |
| 22.4% | 22.4% | Water Content (%) | 24.8% | 24.9% |
| 22.7% | 22.7% | Corrected Water Content (%) | 25.0% | 25.2% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 20.97 | 22.08 | Wt. Sample (wet+tare)(g) | 23.48 | 25.14 |
| 20.15 | 21.12 | Wt. Sample (dry+tare)(g) | 22.54 | 24.03 |
| 13.82 | 13.78 | Wt. Tare (g) | 15.64 | 15.81 |
| 6.3 | 7.3 | Wt. Dry Soil (g) | 6.9 | 8.2 |
| 0.8 | 1.0 | Wt. Water (g) | 0.9 | 1.1 |
| 13.0% | 13.1% | Water Content (%) | 13.6% | 13.5% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | 25 |
| PL | 13 | | PL | 14 |
| PI | 10 | | PI | 11 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CL | |



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Stantec

# Carbonate Content of Soils

ASTM D4373

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Tested By: B. Pelkey
Date Tested: July 7, 2016

| Sample ID | Carbonate Content (%) |
|---|---|
| DC12 BS7 | 0.1% |
| | |
| | |
| | |
| | |
| | |
| | |



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# Carbonate Content of Soils

ASTM D4373

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Tested By: B.Pelkey
Date Tested: 6-Jun-16

| Sample ID | Carbonate Conent (%) |
|---|---|
| DC16-BS7 | 29.9% |
| | |
| | |
| | |
| | |
| | |
| | |



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# Carbonate Content of Soils

ASTM D4373

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Tested By: B.Pelkey
Date Tested: 3-Jun-16

| Sample ID | Carbonate Conent (%) |
|---|---|
| DC16-BS11 | 10.2% |
| | |
| | |
| | |
| | |
| | |
| | |



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# Crumb Test

ASTM D6572

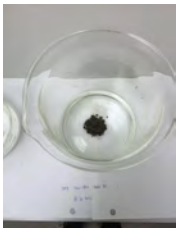
Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Sample ID: DC8 SS6 & BS7
Tested By: C. Oost
Date Tested: 29-Jun-16

Specimen Information

☐ Remolded crumb cube ■ Natural irregular shaped crumb

Moisture Content: 10.6 % ■ In-situ moisture content

Initial Water Temperature: 22.9 °C

| Sample | Dispersive Classification | Photo at 6 hours |
|---|---|---|
| 1 | Grade 1 - Non-dispersive |  |
| 2 | Grade 1 - Non-dispersive |  |
| 3 | Grade 1 - Non-dispersive |  |



Reviewed by: _____

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# Crumb Test

ASTM D6572

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Sample ID: DC34 BS4
Tested By: C. Oost
Date Tested: 22-Jul-16

Specimen Information

☐ Remolded crumb cube ■ Natural irregular shaped crumb

Moisture Content: 33.9 % ■ In-situ moisture content

Initial Water Temperature: 23.4 ºC

| Sample | Dispersive Classification | Photo at 6 hours |
|---|---|---|
| A | 1 - Non-dispersive | Photo not taken, but sample unchanged |
| B | 1 - Non-dispersive | Photo not taken, but sample unchanged |
| C | 1 - Non-dispersive | Photo not taken, but sample unchanged |



Reviewed by: _____

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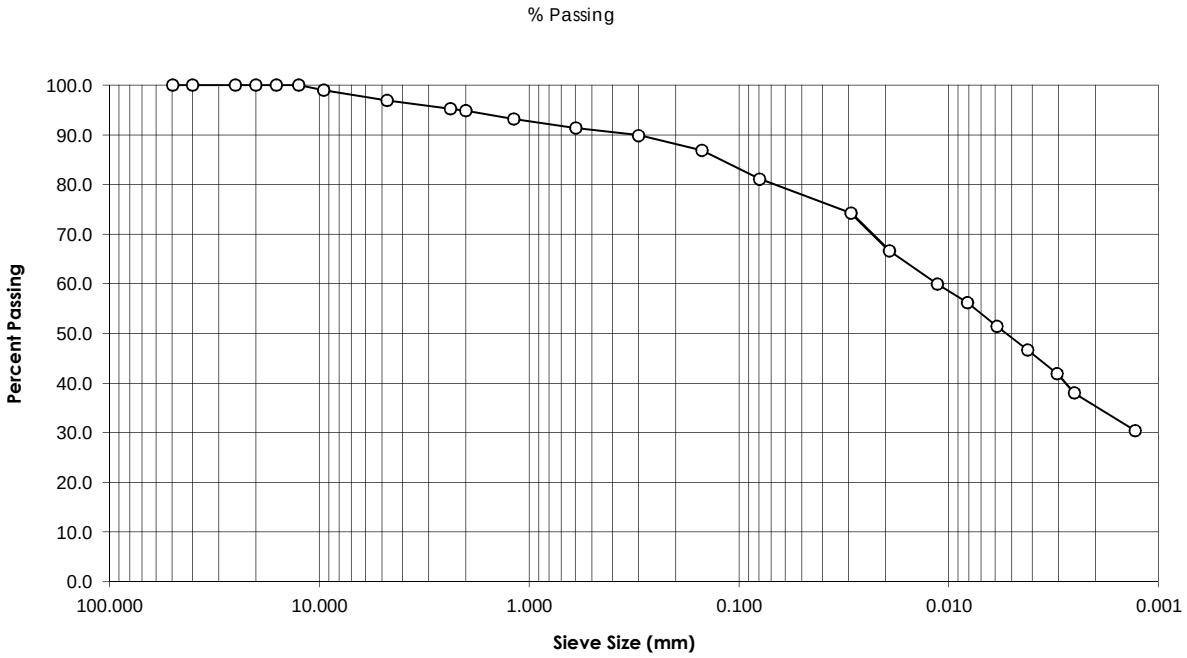
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSA
SOURCE: DC1
TESTED BY: C.Oost

DATE TESTED: April 15, 2016
DATE RECEIVED: April 9, 2016
SAMPLE DESCRIPTION: Fines, Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 51.4 |
| 40.0 | 100.0 | 0.0042 | 46.6 |
| 25.0 | 100.0 | 0.0030 | 41.9 |
| 20.0 | 100.0 | 0.0025 | 38.1 |
| 16.0 | 100.0 | 0.0013 | 30.5 |
| 12.5 | 100.0 | | |
| 9.5 | 99.0 | | |
| 4.75 | 96.9 | | |
| 2.36 | 95.2 | | |
| 2.00 | 94.9 | | |
| 1.18 | 93.1 | | |
| 0.600 | 91.4 | | |
| 0.300 | 89.9 | | |
| 0.150 | 86.9 | | |
| 0.080 | 81.1 | | |
| 0.0292 | 74.2 | | |
| 0.0192 | 66.6 | | |
| 0.0113 | 60.0 | | |
| 0.0081 | 56.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.1% | $D_{10}$: | - |
| Sand: | 15.7% | $D_{30}$: | - |
| Silt: | 45.7% | $D_{60}$: | 0.0114 |
| Clay: | 35.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size Analysis only.

Reviewed by:

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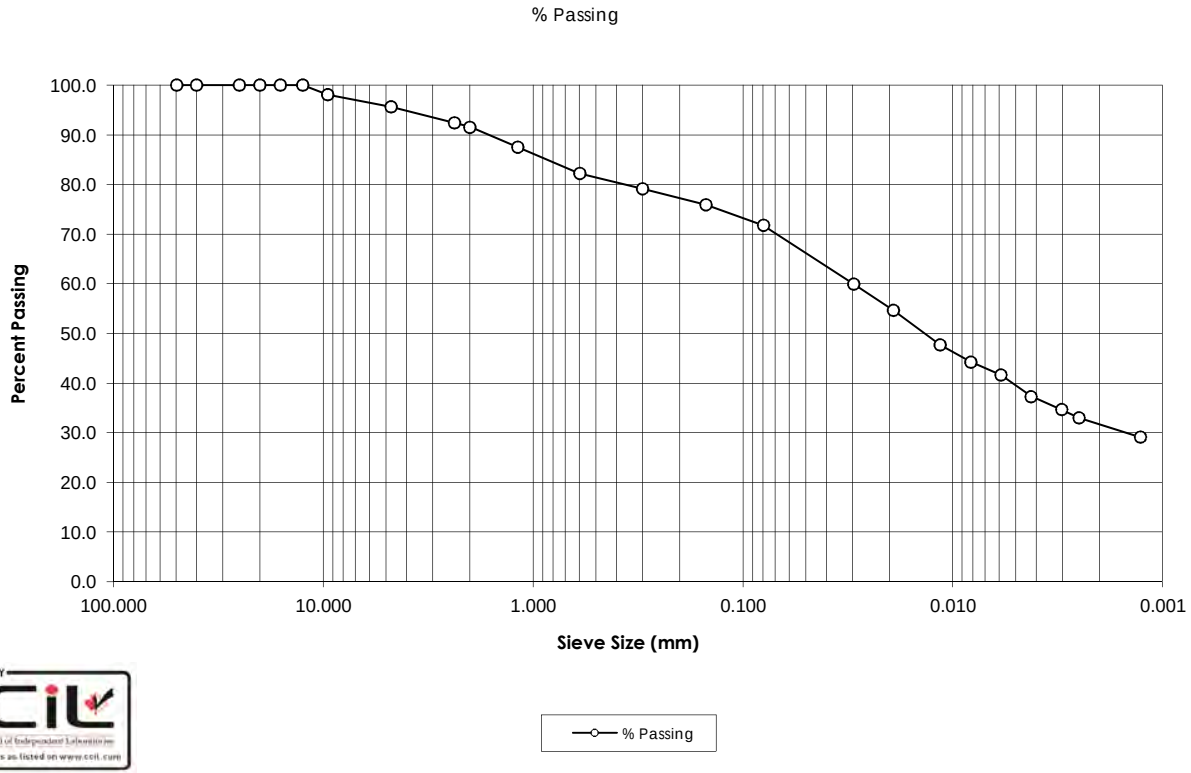
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.220

SAMPLE No.: BSB
SOURCE: DC1
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 9, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 41.7 |
| 40.0 | 100.0 | 0.0042 | 37.3 |
| 25.0 | 100.0 | 0.0030 | 34.7 |
| 20.0 | 100.0 | 0.0025 | 33.0 |
| 16.0 | 100.0 | 0.0013 | 29.2 |
| 12.5 | 100.0 | | |
| 9.5 | 98.1 | | |
| 4.75 | 95.6 | | |
| 2.36 | 92.4 | | |
| 2.00 | 91.6 | | |
| 1.18 | 87.6 | | |
| 0.600 | 82.3 | | |
| 0.300 | 79.1 | | |
| 0.150 | 76.0 | | |
| 0.080 | 71.8 | | |
| 0.0296 | 59.9 | | |
| 0.0192 | 54.7 | | |
| 0.0115 | 47.7 | | |
| 0.0082 | 44.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.4% | $D_{10}$: | - |
| Sand: | 23.8% | $D_{30}$: | 0.0016 |
| Silt: | 40.0% | $D_{60}$: | 0.0301 |
| Clay: | 31.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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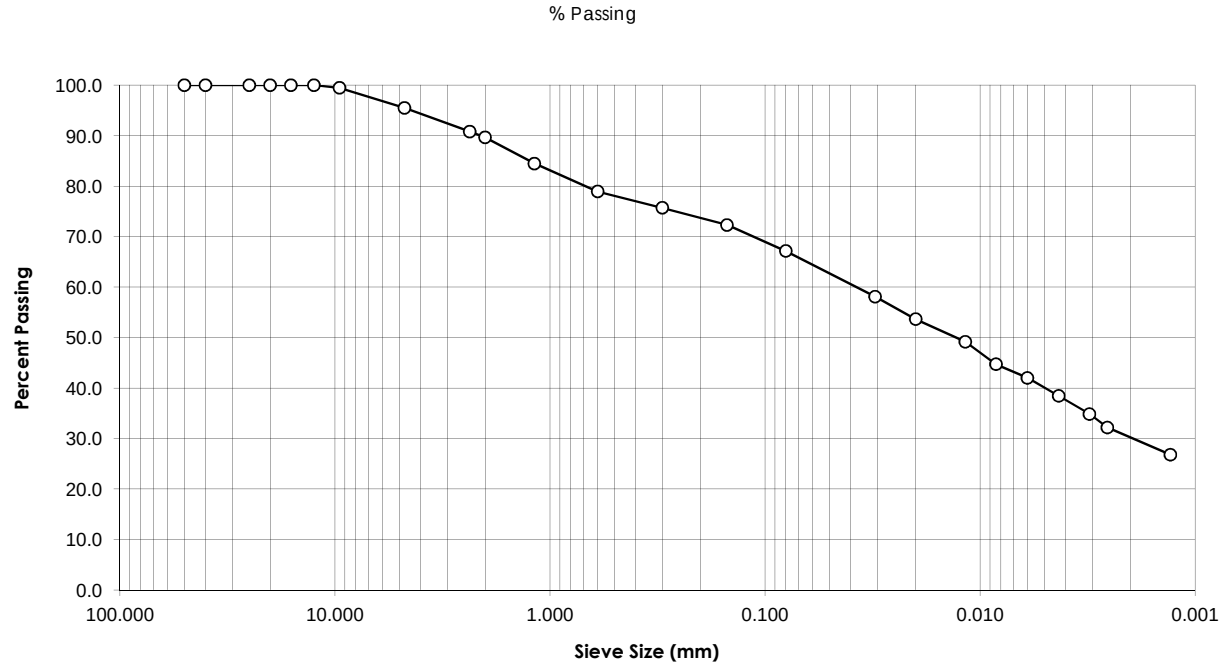
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSC
SOURCE: DC1
TESTED BY: C.Oost

DATE TESTED: April 15, 2016
DATE RECEIVED: April 9, 2016
SAMPLE DESCRIPTION: Sandy Fines, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 42.0 |
| 40.0 | 100.0 | 0.0043 | 38.4 |
| 25.0 | 100.0 | 0.0031 | 34.9 |
| 20.0 | 100.0 | 0.0026 | 32.2 |
| 16.0 | 100.0 | 0.0013 | 26.8 |
| 12.5 | 100.0 | | |
| 9.5 | 99.5 | | |
| 4.75 | 95.5 | | |
| 2.36 | 90.8 | | |
| 2.00 | 89.7 | | |
| 1.18 | 84.5 | | |
| 0.600 | 78.9 | | |
| 0.300 | 75.7 | | |
| 0.150 | 72.3 | | |
| 0.080 | 67.1 | | |
| 0.0307 | 58.1 | | |
| 0.0199 | 53.6 | | |
| 0.0117 | 49.2 | | |
| 0.0084 | 44.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.5% | $D_{10}$: | - |
| Sand: | 28.4% | $D_{30}$: | 0.0021 |
| Silt: | 36.9% | $D_{60}$: | 0.0417 |
| Clay: | 30.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size Analysis only.

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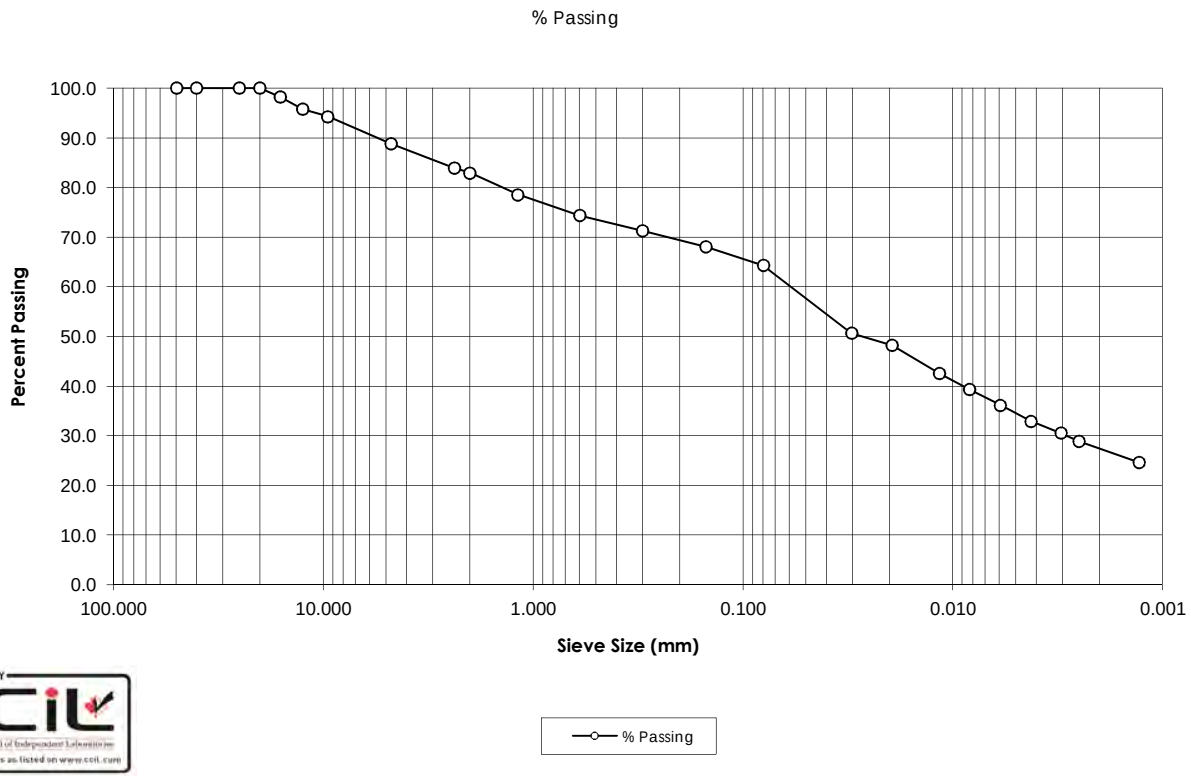
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.220

SAMPLE No.: BSD
SOURCE: DC1
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 9, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 36.2 |
| 40.0 | 100.0 | 0.0043 | 32.9 |
| 25.0 | 100.0 | 0.0031 | 30.5 |
| 20.0 | 100.0 | 0.0025 | 28.9 |
| 16.0 | 98.2 | 0.0013 | 24.6 |
| 12.5 | 95.8 | | |
| 9.5 | 94.3 | | |
| 4.75 | 88.9 | | |
| 2.36 | 83.9 | | |
| 2.00 | 82.9 | | |
| 1.18 | 78.6 | | |
| 0.600 | 74.3 | | |
| 0.300 | 71.3 | | |
| 0.150 | 68.0 | | |
| 0.080 | 64.3 | | |
| 0.0304 | 50.6 | | |
| 0.0195 | 48.2 | | |
| 0.0116 | 42.6 | | |
| 0.0083 | 39.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 11.1% | $D_{10}$: | - |
| Sand: | 24.6% | $D_{30}$: | 0.0029 |
| Silt: | 36.8% | $D_{60}$: | 0.0657 |
| Clay: | 27.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.



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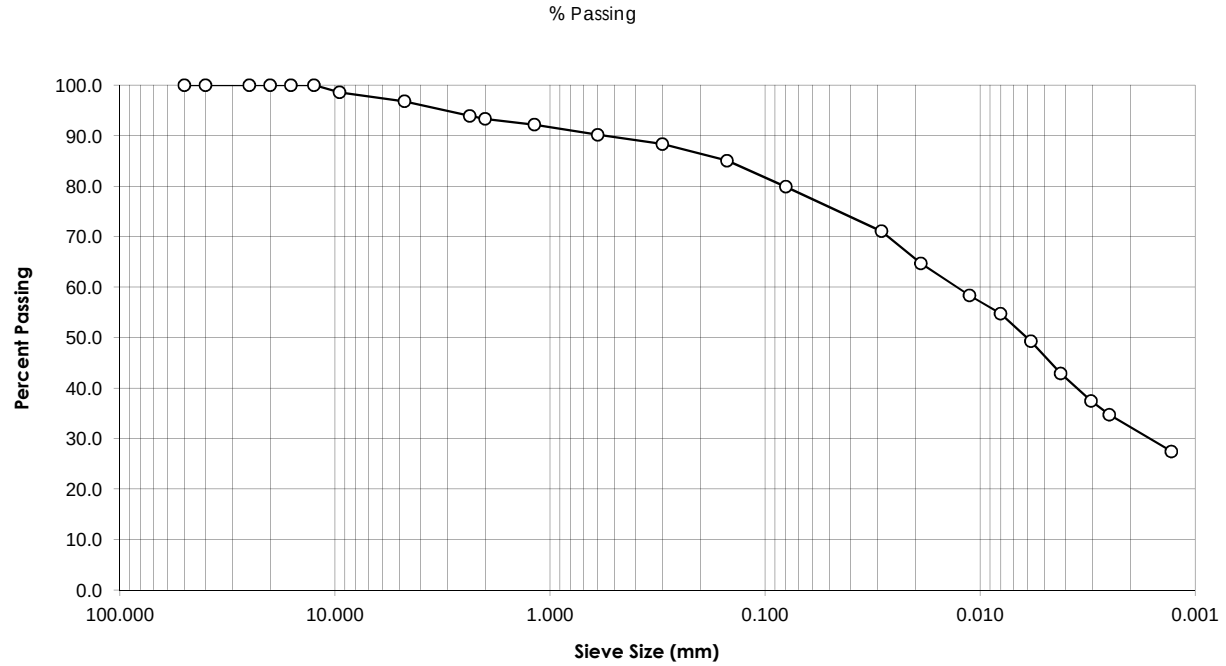
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST3
SOURCE: DC1
TESTED BY: C. Tollifson

DATE TESTED: April 25, 2016
DATE RECEIVED: April 9, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 49.3 |
| 40.0 | 100.0 | 0.0042 | 42.9 |
| 25.0 | 100.0 | 0.0030 | 37.4 |
| 20.0 | 100.0 | 0.0025 | 34.7 |
| 16.0 | 100.0 | 0.0013 | 27.4 |
| 12.5 | 100.0 | | |
| 9.5 | 98.6 | | |
| 4.75 | 96.8 | | |
| 2.36 | 93.9 | | |
| 2.00 | 93.3 | | |
| 1.18 | 92.2 | | |
| 0.600 | 90.2 | | |
| 0.300 | 88.3 | | |
| 0.150 | 85.0 | | |
| 0.080 | 79.9 | | |
| 0.0287 | 71.1 | | |
| 0.0189 | 64.7 | | |
| 0.0112 | 58.3 | | |
| 0.0080 | 54.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.2% | $D_{10}$: | - |
| Sand: | 16.9% | $D_{30}$: | 0.0017 |
| Silt: | 47.6% | $D_{60}$: | 0.0132 |
| Clay: | 32.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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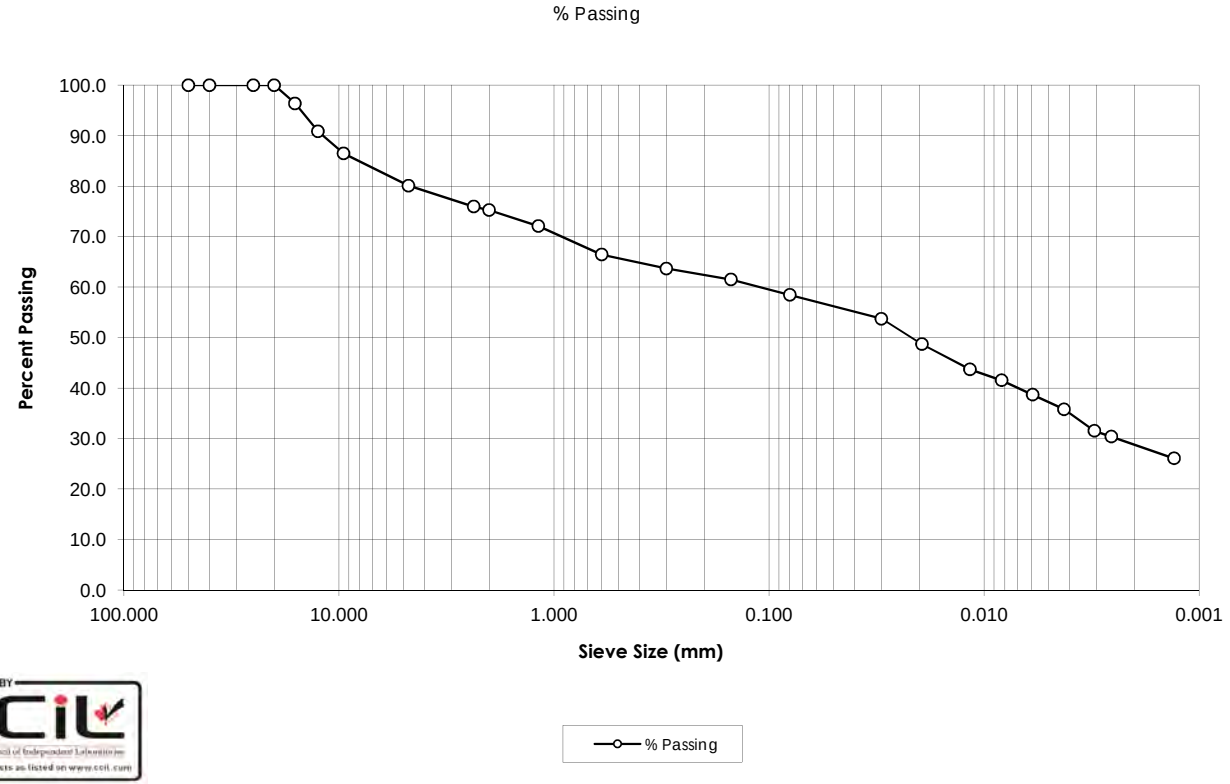
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS7
SOURCE: DC2
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 7, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 38.7 |
| 40.0 | 100.0 | 0.0042 | 35.8 |
| 25.0 | 100.0 | 0.0031 | 31.5 |
| 20.0 | 100.0 | 0.0026 | 30.4 |
| 16.0 | 96.4 | 0.0013 | 26.1 |
| 12.5 | 90.8 | | |
| 9.5 | 86.5 | | |
| 4.75 | 80.1 | | |
| 2.36 | 76.0 | | |
| 2.00 | 75.3 | | |
| 1.18 | 72.1 | | |
| 0.600 | 66.4 | | |
| 0.300 | 63.7 | | |
| 0.150 | 61.5 | | |
| 0.080 | 58.5 | | |
| 0.0300 | 53.7 | | |
| 0.0194 | 48.7 | | |
| 0.0116 | 43.7 | | |
| 0.0083 | 41.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 19.9% | $D_{10}$: | - |
| Sand: | 21.6% | $D_{30}$: | 0.0025 |
| Silt: | 29.7% | $D_{60}$: | 0.1155 |
| Clay: | 28.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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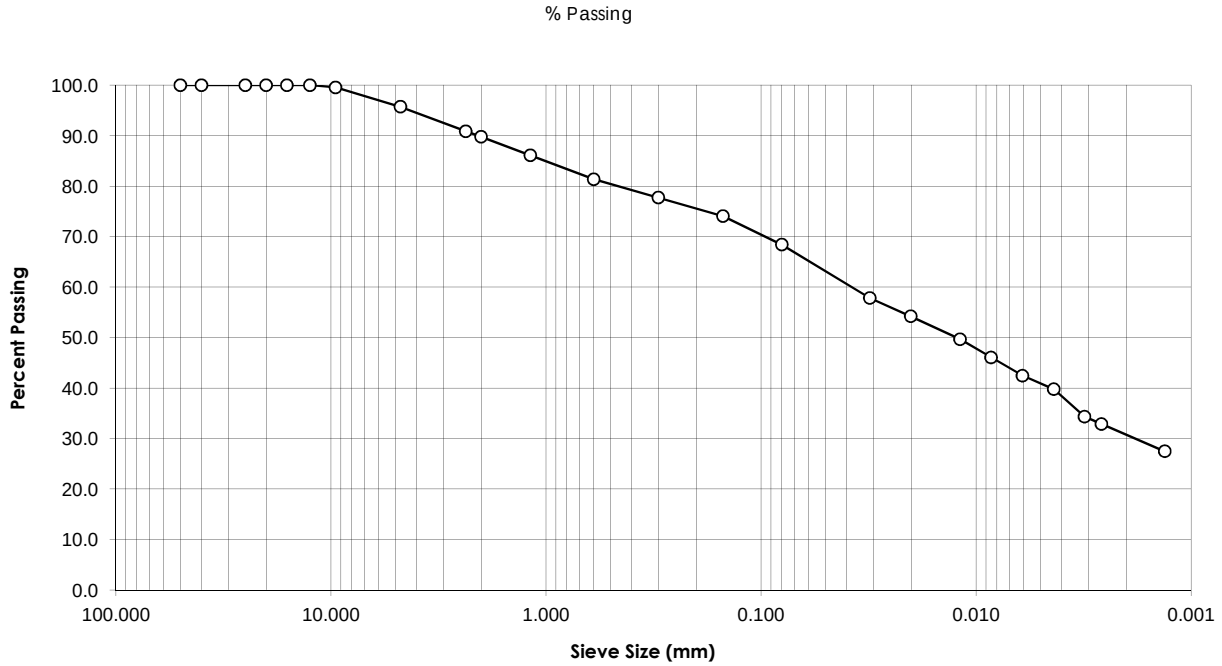
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS10
SOURCE: DC2
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 7, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 42.5 |
| 40.0 | 100.0 | 0.0043 | 39.7 |
| 25.0 | 100.0 | 0.0031 | 34.3 |
| 20.0 | 100.0 | 0.0026 | 32.9 |
| 16.0 | 100.0 | 0.0013 | 27.5 |
| 12.5 | 100.0 | | |
| 9.5 | 99.6 | | |
| 4.75 | 95.7 | | |
| 2.36 | 90.9 | | |
| 2.00 | 89.8 | | |
| 1.18 | 86.1 | | |
| 0.600 | 81.4 | | |
| 0.300 | 77.7 | | |
| 0.150 | 74.1 | | |
| 0.080 | 68.4 | | |
| 0.0312 | 57.8 | | |
| 0.0201 | 54.2 | | |
| 0.0119 | 49.7 | | |
| 0.0085 | 46.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.3% | $D_{10}$: | - |
| Sand: | 27.3% | $D_{30}$: | 0.0020 |
| Silt: | 37.6% | $D_{60}$: | 0.0419 |
| Clay: | 30.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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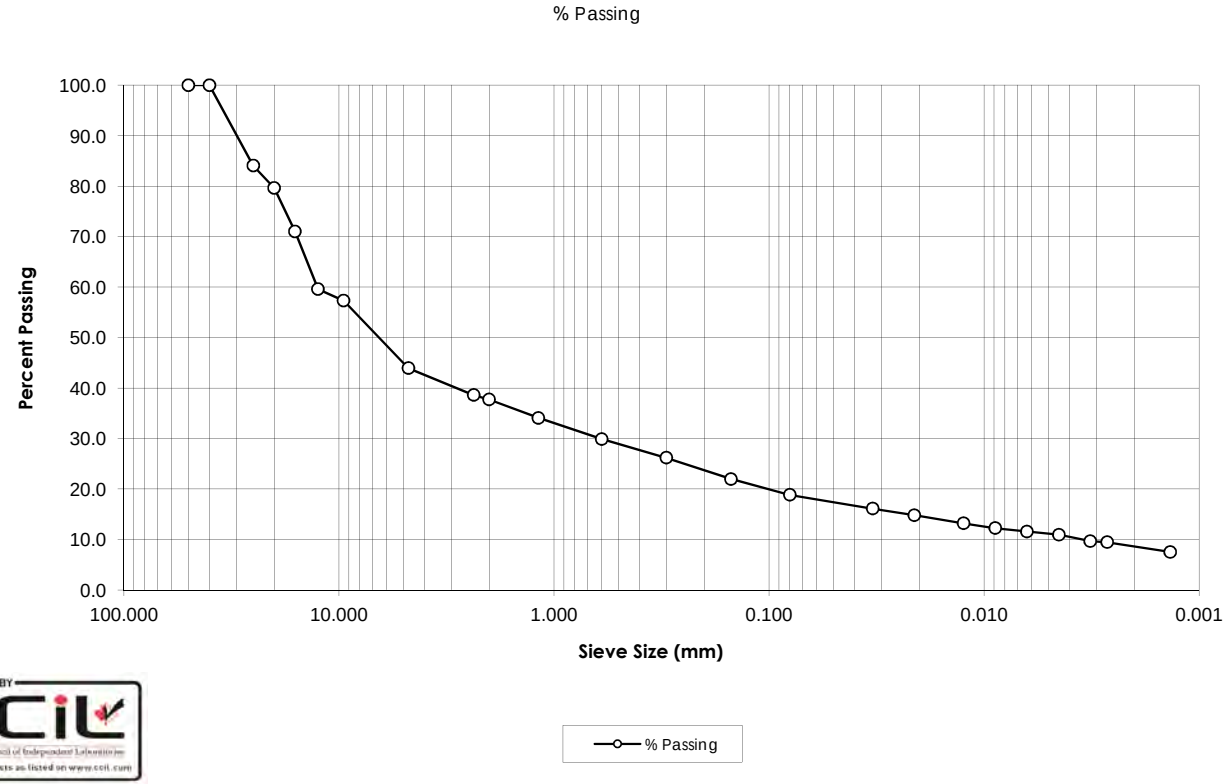
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS13
SOURCE: DC2
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 7, 2016
SAMPLE DESCRIPTION: Sandy Gravel Some Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0063** | **11.6** |
| **40.0** | **100.0** | **0.0045** | **11.0** |
| **25.0** | **84.1** | **0.0032** | **9.7** |
| **20.0** | **79.6** | **0.0027** | **9.5** |
| **16.0** | **71.0** | **0.0014** | **7.5** |
| **12.5** | **59.6** | | |
| **9.5** | **57.3** | | |
| **4.75** | **43.9** | | |
| **2.36** | **38.6** | | |
| **2.00** | **37.7** | | |
| **1.18** | **34.1** | | |
| **0.600** | **29.9** | | |
| **0.300** | **26.2** | | |
| **0.150** | **22.0** | | |
| **0.080** | **18.8** | | |
| **0.0329** | **16.1** | | |
| **0.0211** | **14.8** | | |
| **0.0124** | **13.2** | | |
| **0.0089** | **12.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 56.1% | $D_{10}$: | 0.0035 |
| Sand: | 25.1% | $D_{30}$: | 0.6130 |
| Silt: | 10.2% | $D_{60}$: | 12.6377 |
| Clay: | 8.6% | $C_u$: | 3562.81 |
| | | $C_c$: | 8.38 |

**Comments:** Sample description derived from Grain Size test results

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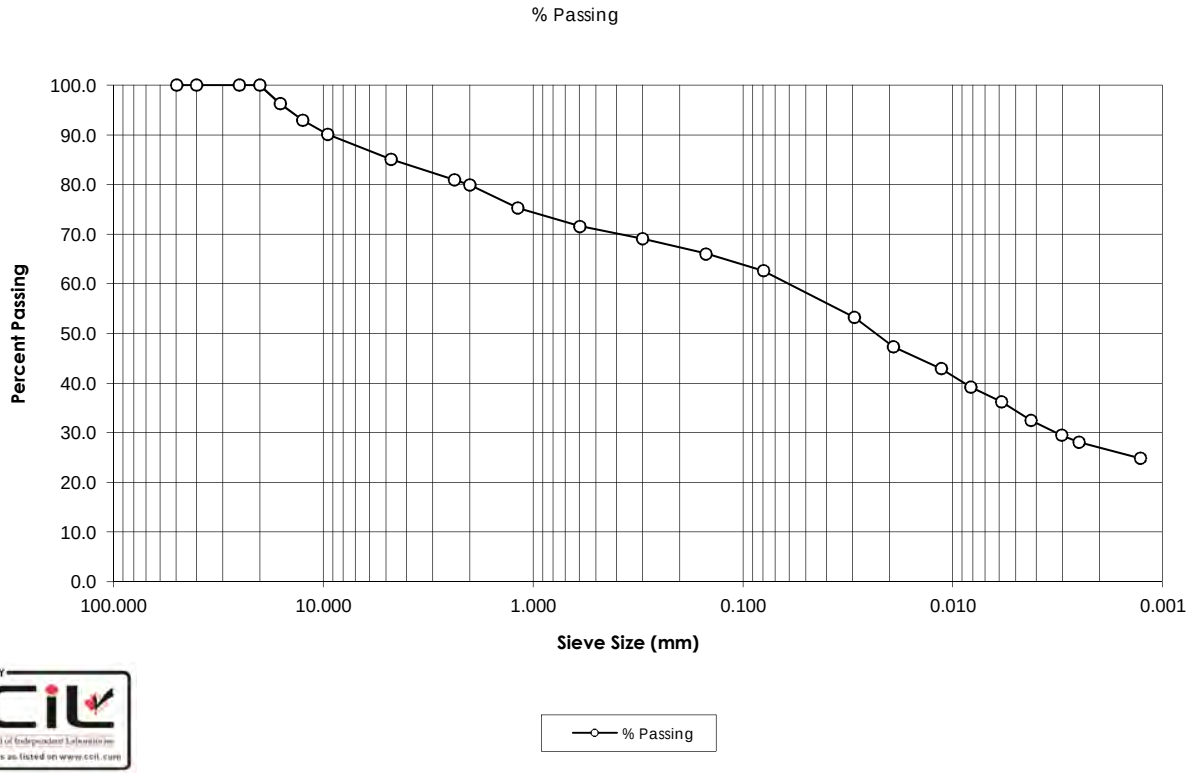
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.220

SAMPLE No.: SS1
SOURCE: DC2A
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 12, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 36.2 |
| 40.0 | 100.0 | 0.0042 | 32.5 |
| 25.0 | 100.0 | 0.0030 | 29.6 |
| 20.0 | 100.0 | 0.0025 | 28.1 |
| 16.0 | 96.3 | 0.0013 | 24.8 |
| 12.5 | 92.9 | | |
| 9.5 | 90.1 | | |
| 4.75 | 85.0 | | |
| 2.36 | 81.0 | | |
| 2.00 | 80.0 | | |
| 1.18 | 75.3 | | |
| 0.600 | 71.6 | | |
| 0.300 | 69.1 | | |
| 0.150 | 66.1 | | |
| 0.080 | 62.6 | | |
| 0.0294 | 53.2 | | |
| 0.0192 | 47.3 | | |
| 0.0114 | 42.9 | | |
| 0.0082 | 39.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 15.0% | $D_{10}$: | - |
| Sand: | 22.4% | $D_{30}$: | 0.0032 |
| Silt: | 35.6% | $D_{60}$: | 0.0666 |
| Clay: | 27.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.



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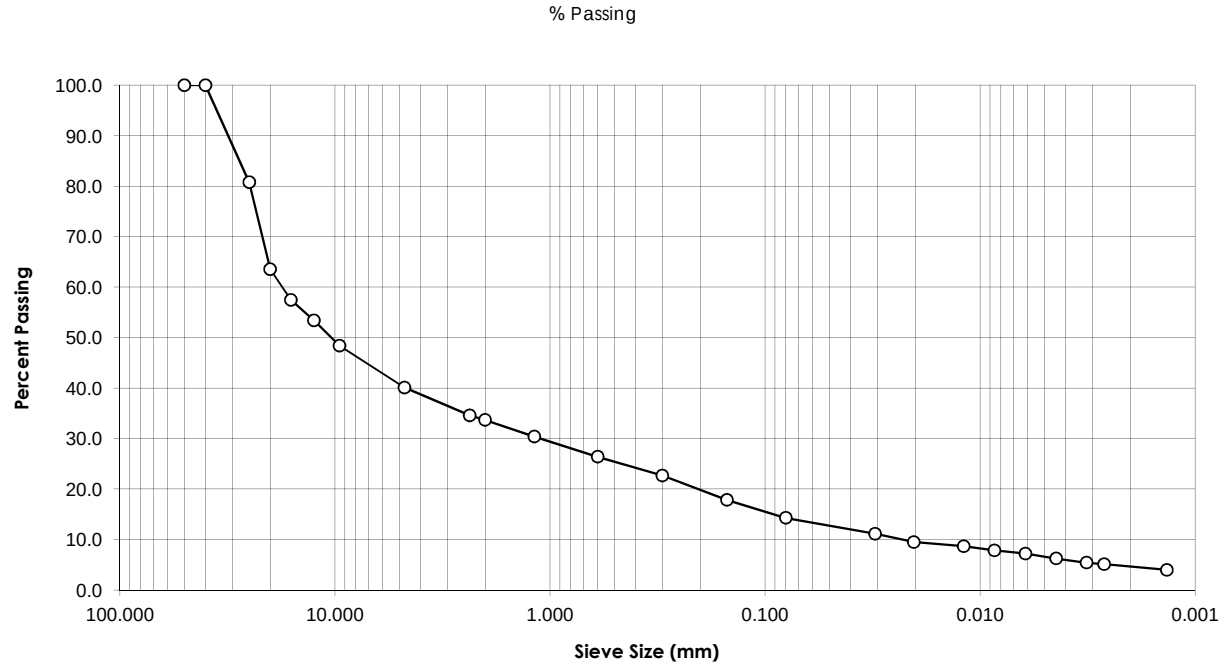
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS3
SOURCE: DC2A
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 12, 2016
SAMPLE DESCRIPTION: Sandy Gravel Some Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 7.2 |
| 40.0 | 100.0 | 0.0044 | 6.2 |
| 25.0 | 80.8 | 0.0032 | 5.4 |
| 20.0 | 63.5 | 0.0026 | 5.1 |
| 16.0 | 57.4 | 0.0013 | 4.0 |
| 12.5 | 53.4 | | |
| 9.5 | 48.4 | | |
| 4.75 | 40.1 | | |
| 2.36 | 34.6 | | |
| 2.00 | 33.7 | | |
| 1.18 | 30.4 | | |
| 0.600 | 26.4 | | |
| 0.300 | 22.7 | | |
| 0.150 | 17.8 | | |
| 0.080 | 14.3 | | |
| 0.0307 | 11.1 | | |
| 0.0203 | 9.5 | | |
| 0.0119 | 8.7 | | |
| 0.0086 | 7.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 59.9% | $D_{10}$: | 0.0237 |
| Sand: | 25.8% | $D_{30}$: | 1.1271 |
| Silt: | 9.6% | $D_{60}$: | 17.7236 |
| Clay: | 4.7% | $C_u$: | 748.88 |
| | | $C_c$: | 3.03 |

**Comments:** Sample description derived from Grain Size test results

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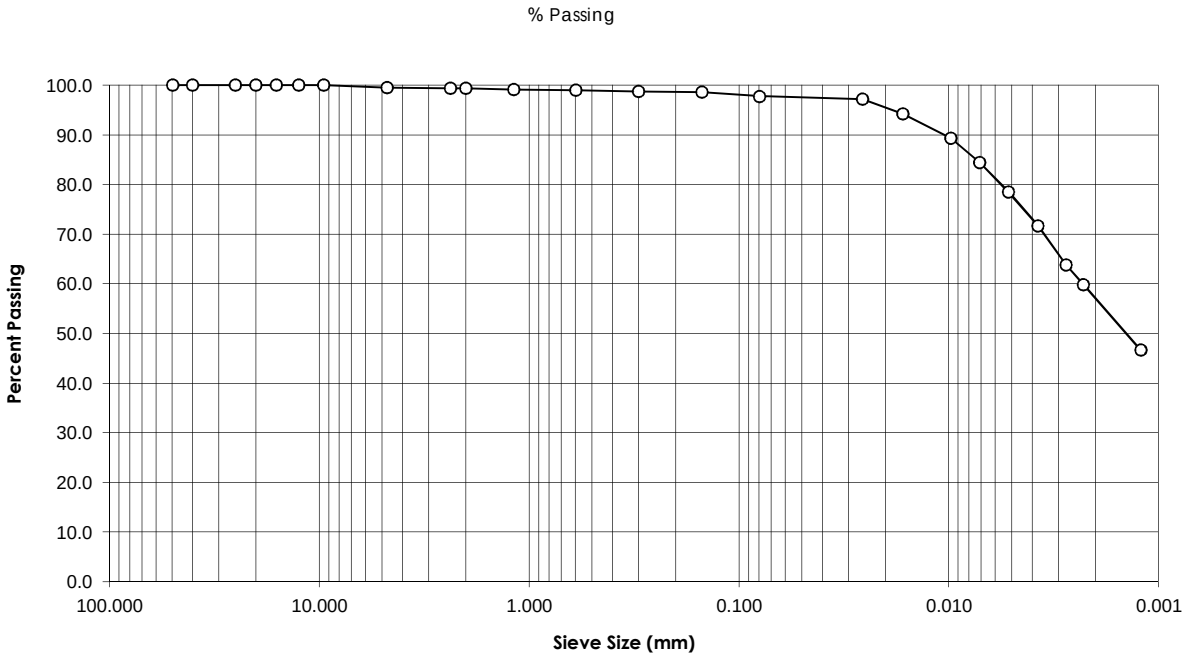
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.220

SAMPLE No.: BSA
SOURCE: DC2
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 7, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand and Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 78.5 |
| 40.0 | 100.0 | 0.0038 | 71.6 |
| 25.0 | 100.0 | 0.0028 | 63.8 |
| 20.0 | 100.0 | 0.0023 | 59.9 |
| 16.0 | 100.0 | 0.0012 | 46.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.5 | | |
| 2.36 | 99.4 | | |
| 2.00 | 99.4 | | |
| 1.18 | 99.2 | | |
| 0.600 | 99.0 | | |
| 0.300 | 98.8 | | |
| 0.150 | 98.6 | | |
| 0.080 | 97.8 | | |
| 0.0257 | 97.2 | | |
| 0.0166 | 94.2 | | |
| 0.0098 | 89.3 | | |
| 0.0071 | 84.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.5% | $D_{10}$: | - |
| Sand: | 1.7% | $D_{30}$: | - |
| Silt: | 40.7% | $D_{60}$: | 0.0023 |
| Clay: | 57.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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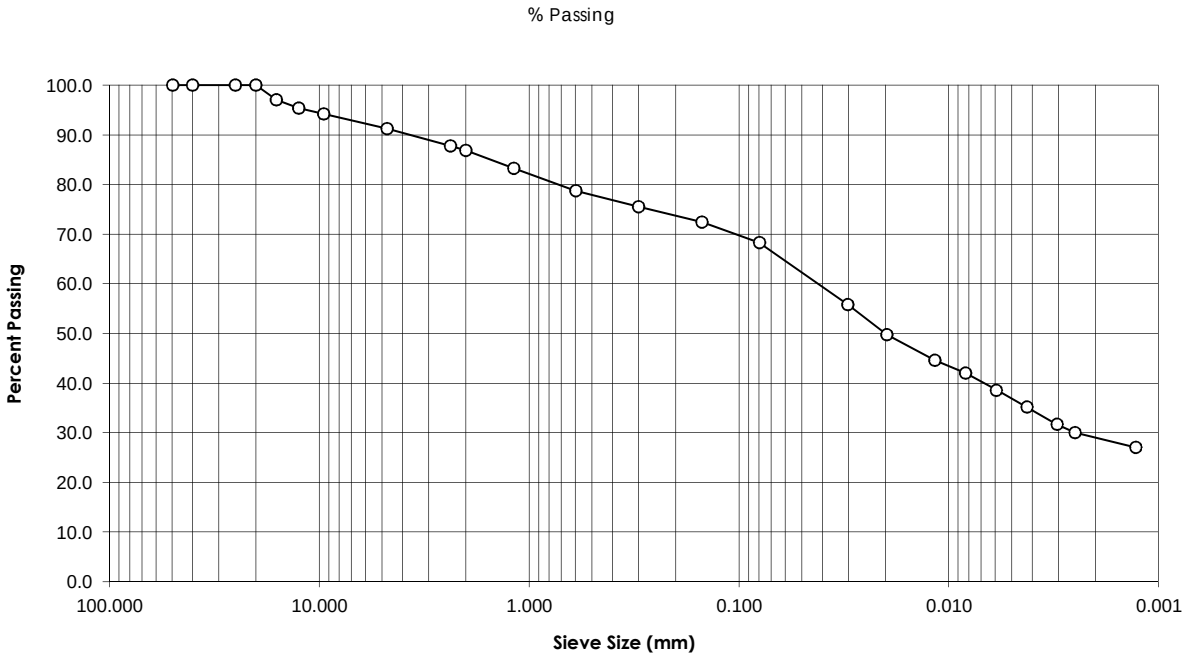
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.220

SAMPLE No.: BSB
SOURCE: DC2
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 7, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 38.6 |
| 40.0 | 100.0 | 0.0043 | 35.2 |
| 25.0 | 100.0 | 0.0031 | 31.8 |
| 20.0 | 100.0 | 0.0025 | 30.0 |
| 16.0 | 97.1 | 0.0013 | 27.1 |
| 12.5 | 95.3 | | |
| 9.5 | 94.2 | | |
| 4.75 | 91.2 | | |
| 2.36 | 87.8 | | |
| 2.00 | 86.9 | | |
| 1.18 | 83.2 | | |
| 0.600 | 78.7 | | |
| 0.300 | 75.6 | | |
| 0.150 | 72.5 | | |
| 0.080 | 68.3 | | |
| 0.0302 | 55.8 | | |
| 0.0197 | 49.8 | | |
| 0.0116 | 44.6 | | |
| 0.0083 | 42.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.8% | $D_{10}$: | - |
| Sand: | 22.9% | $D_{30}$: | 0.0025 |
| Silt: | 39.3% | $D_{60}$: | 0.0481 |
| Clay: | 29.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

Reviewed by:

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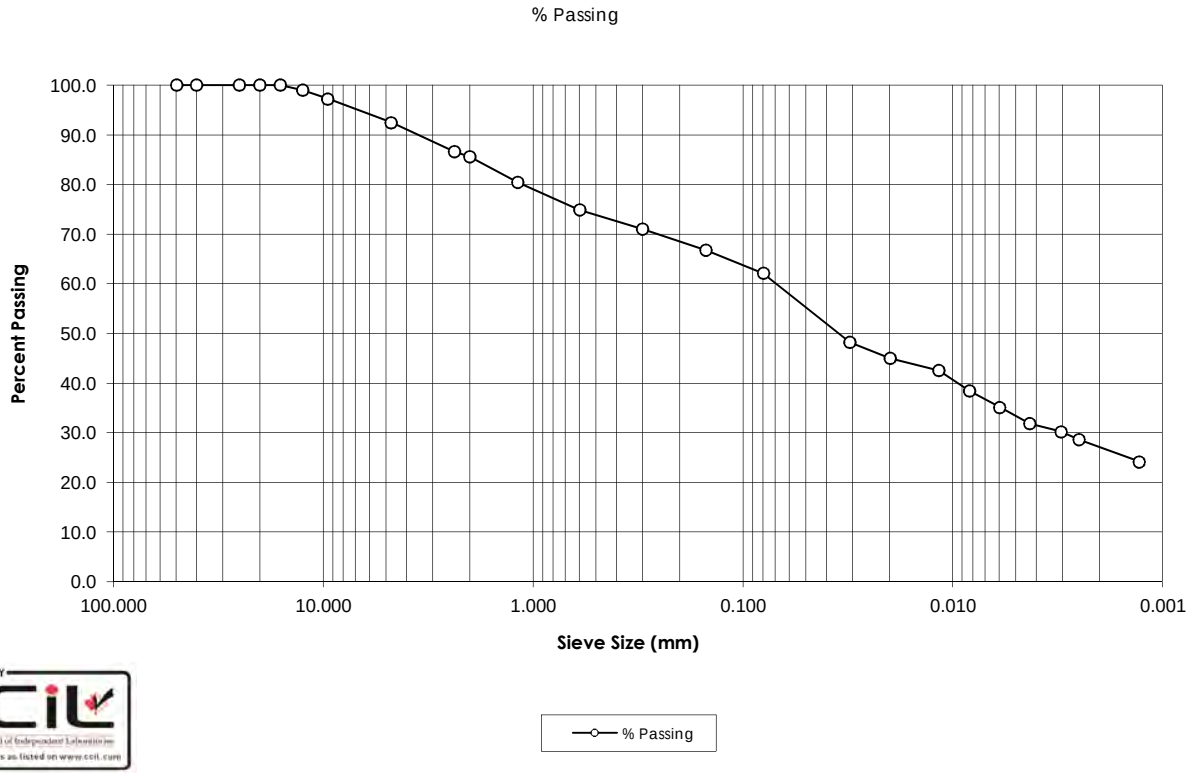
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.220

SAMPLE No.: BSB
SOURCE: DC3
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 11, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 35.1 |
| 40.0 | 100.0 | 0.0043 | 31.9 |
| 25.0 | 100.0 | 0.0031 | 30.2 |
| 20.0 | 100.0 | 0.0025 | 28.6 |
| 16.0 | 100.0 | 0.0013 | 24.2 |
| 12.5 | 98.9 | | |
| 9.5 | 97.3 | | |
| 4.75 | 92.5 | | |
| 2.36 | 86.6 | | |
| 2.00 | 85.6 | | |
| 1.18 | 80.5 | | |
| 0.600 | 74.8 | | |
| 0.300 | 71.0 | | |
| 0.150 | 66.8 | | |
| 0.080 | 62.1 | | |
| 0.0308 | 48.2 | | |
| 0.0198 | 44.9 | | |
| 0.0116 | 42.5 | | |
| 0.0083 | 38.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.5% | $D_{10}$: | - |
| Sand: | 30.4% | $D_{30}$: | 0.0030 |
| Silt: | 35.0% | $D_{60}$: | 0.0732 |
| Clay: | 27.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.220

**OFFICE**
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**LABORATORY**
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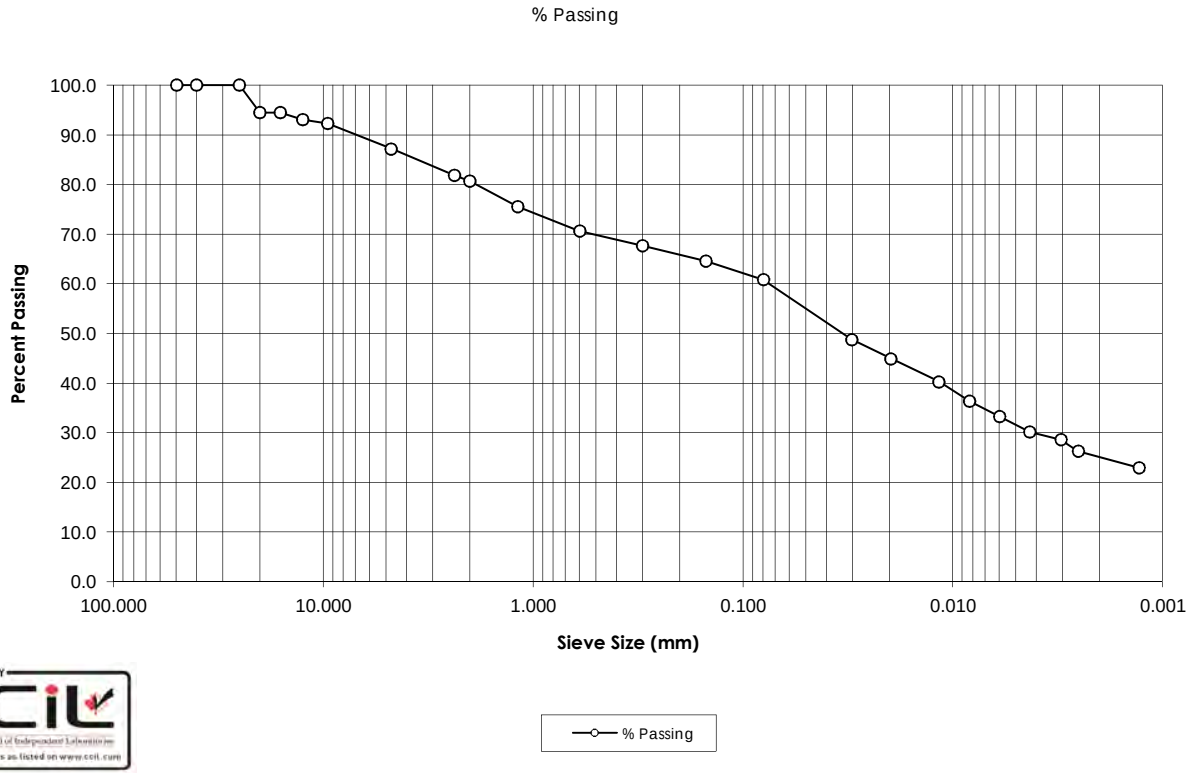
Tel: (403) 253-7876

SAMPLE No.: BSC
SOURCE: DC3
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 11, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 33.3 |
| 40.0 | 100.0 | 0.0043 | 30.2 |
| 25.0 | 100.0 | 0.0031 | 28.7 |
| 20.0 | 94.5 | 0.0025 | 26.3 |
| 16.0 | 94.5 | 0.0013 | 22.9 |
| 12.5 | 93.0 | | |
| 9.5 | 92.3 | | |
| 4.75 | 87.2 | | |
| 2.36 | 81.9 | | |
| 2.00 | 80.7 | | |
| 1.18 | 75.5 | | |
| 0.600 | 70.7 | | |
| 0.300 | 67.7 | | |
| 0.150 | 64.6 | | |
| 0.080 | 60.8 | | |
| 0.0304 | 48.8 | | |
| 0.0197 | 44.9 | | |
| 0.0116 | 40.3 | | |
| 0.0083 | 36.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.8% | $D_{10}$: | - |
| Sand: | 26.4% | $D_{30}$: | 0.0041 |
| Silt: | 35.7% | $D_{60}$: | 0.0769 |
| Clay: | 25.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.



Reviewed by:

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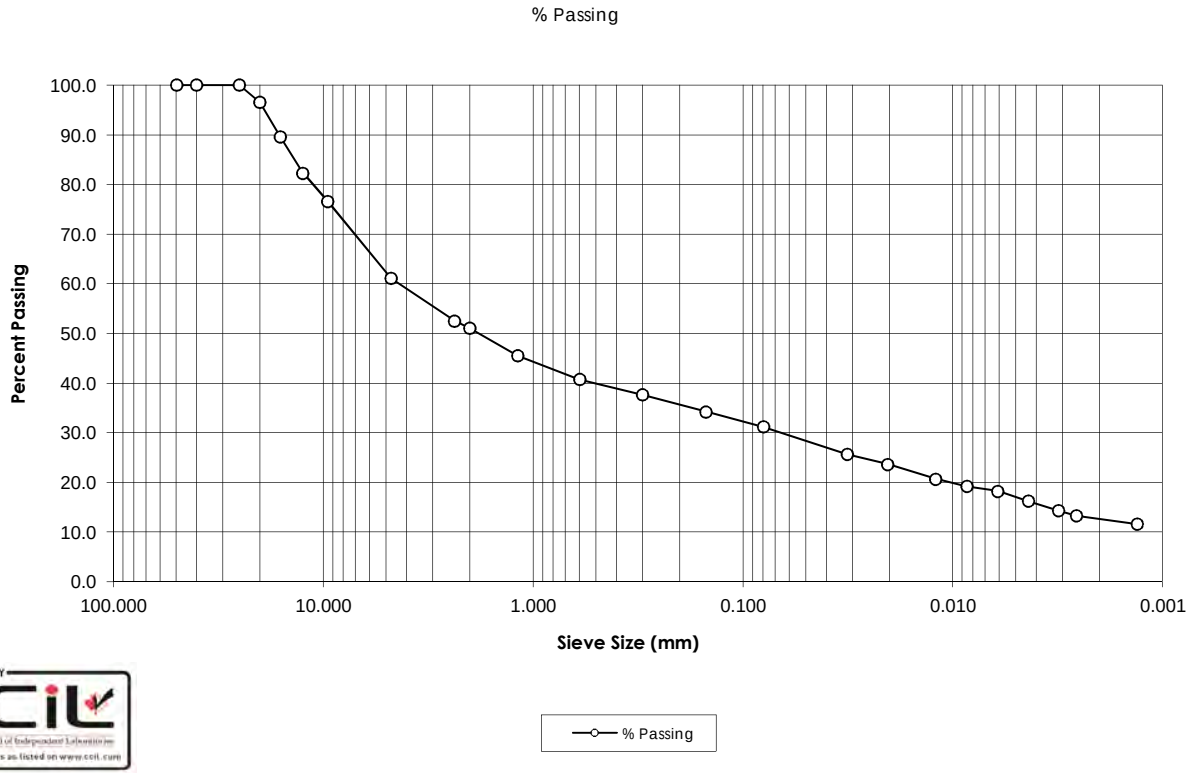
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 11077396.302.702.220

SAMPLE No.: BSD
SOURCE: DC3
TESTED BY: C.Tollifson

DATE TESTED: April 22, 2016
DATE RECEIVED: April 11, 2016
SAMPLE DESCRIPTION: Gravelly Sandy Clay (CL)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 18.2 |
| 40.0 | 100.0 | 0.0044 | 16.3 |
| 25.0 | 100.0 | 0.0031 | 14.3 |
| 20.0 | 96.5 | 0.0026 | 13.3 |
| 16.0 | 89.6 | 0.0013 | 11.6 |
| 12.5 | 82.3 | | |
| 9.5 | 76.5 | | |
| 4.75 | 61.1 | | |
| 2.36 | 52.5 | | |
| 2.00 | 51.1 | | |
| 1.18 | 45.5 | | |
| 0.600 | 40.7 | | |
| 0.300 | 37.6 | | |
| 0.150 | 34.2 | | |
| 0.080 | 31.2 | | |
| 0.0318 | 25.6 | | |
| 0.0204 | 23.7 | | |
| 0.0120 | 20.7 | | |
| 0.0086 | 19.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 38.9% | $D_{10}$: | - |
| Sand: | 29.9% | $D_{30}$: | 0.0701 |
| Silt: | 18.6% | $D_{60}$: | 4.4563 |
| Clay: | 12.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.



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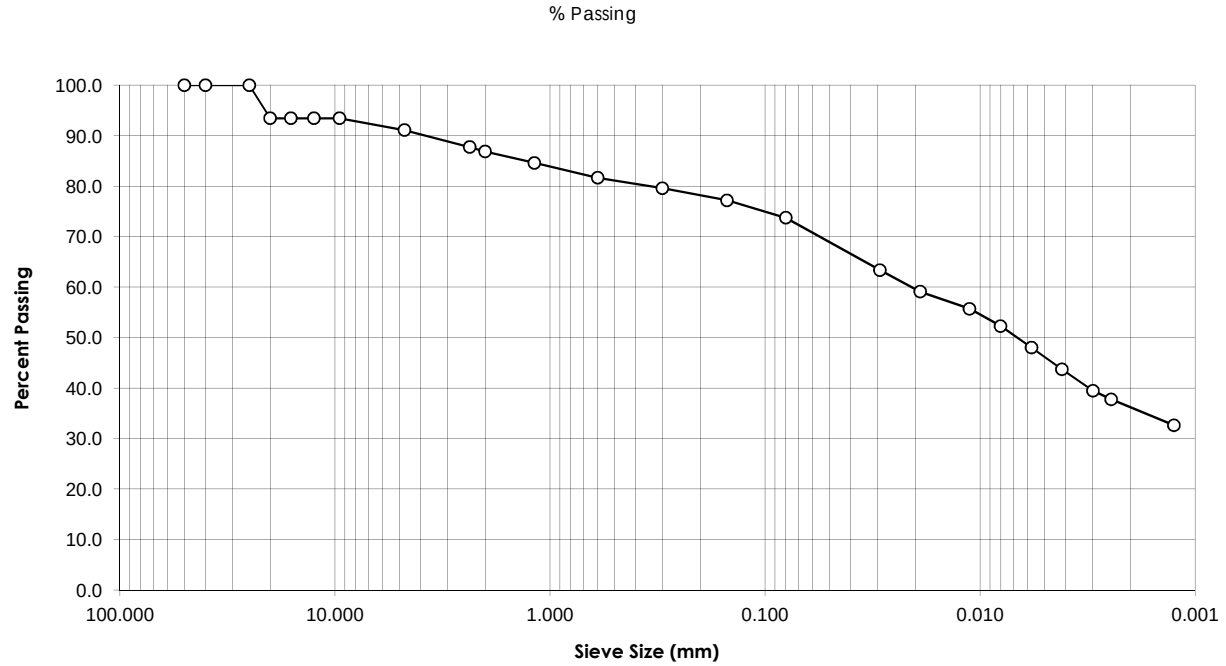
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST3
SOURCE: DC4
TESTED BY: C. Tollifson

DATE TESTED: April 25, 2016
DATE RECEIVED: April 14, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 48.0 |
| 40.0 | 100.0 | 0.0042 | 43.7 |
| 25.0 | 100.0 | 0.0030 | 39.5 |
| 20.0 | 93.4 | 0.0025 | 37.8 |
| 16.0 | 93.4 | 0.0013 | 32.6 |
| 12.5 | 93.4 | | |
| 9.5 | 93.4 | | |
| 4.75 | 91.1 | | |
| 2.36 | 87.7 | | |
| 2.00 | 86.8 | | |
| 1.18 | 84.6 | | |
| 0.600 | 81.7 | | |
| 0.300 | 79.6 | | |
| 0.150 | 77.2 | | |
| 0.080 | 73.7 | | |
| 0.0292 | 63.4 | | |
| 0.0190 | 59.1 | | |
| 0.0112 | 55.7 | | |
| 0.0080 | 52.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.9% | $D_{10}$: | - |
| Sand: | 17.4% | $D_{30}$: | - |
| Silt: | 37.5% | $D_{60}$: | 0.0212 |
| Clay: | 36.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220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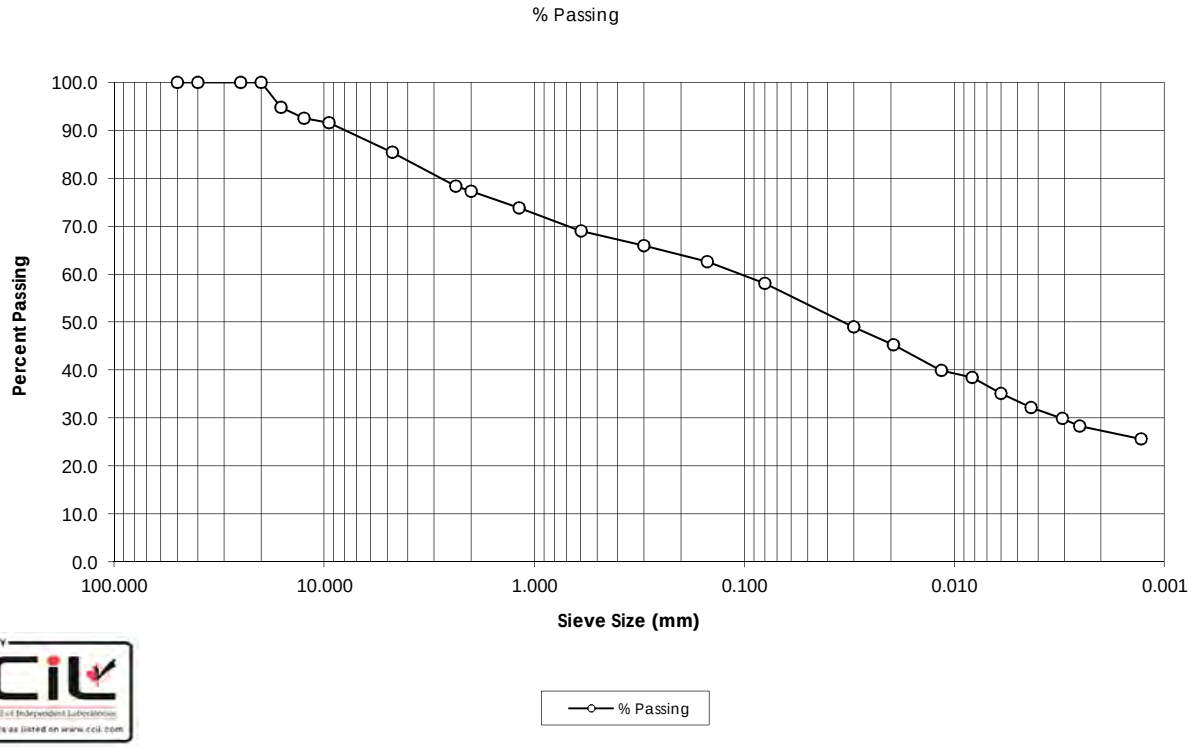
SAMPLE No.: SS12
SOURCE: DC4
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: April 14, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Some Gravel




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0060** | **35.1** |
| **40.0** | **100.0** | **0.0043** | **32.1** |
| **25.0** | **100.0** | **0.0031** | **29.9** |
| **20.0** | **100.0** | **0.0025** | **28.4** |
| **16.0** | **94.9** | **0.0013** | **25.6** |
| **12.5** | **92.5** | | |
| **9.5** | **91.6** | | |
| **4.75** | **85.4** | | |
| **2.36** | **78.4** | | |
| **2.00** | **77.3** | | |
| **1.18** | **73.8** | | |
| **0.600** | **69.1** | | |
| **0.300** | **66.0** | | |
| **0.150** | **62.6** | | |
| **0.080** | **58.1** | | |
| **0.0302** | **49.0** | | |
| **0.0195** | **45.3** | | |
| **0.0116** | **40.0** | | |
| **0.0082** | **38.5** | | |

| | | | |
|---|---|---|---|
| Gravel: | 14.6% | $D_{10}$: | - |
| Sand: | 27.3% | $D_{30}$: | 0.0031 |
| Silt: | 30.7% | $D_{60}$: | 0.1096 |
| Clay: | 27.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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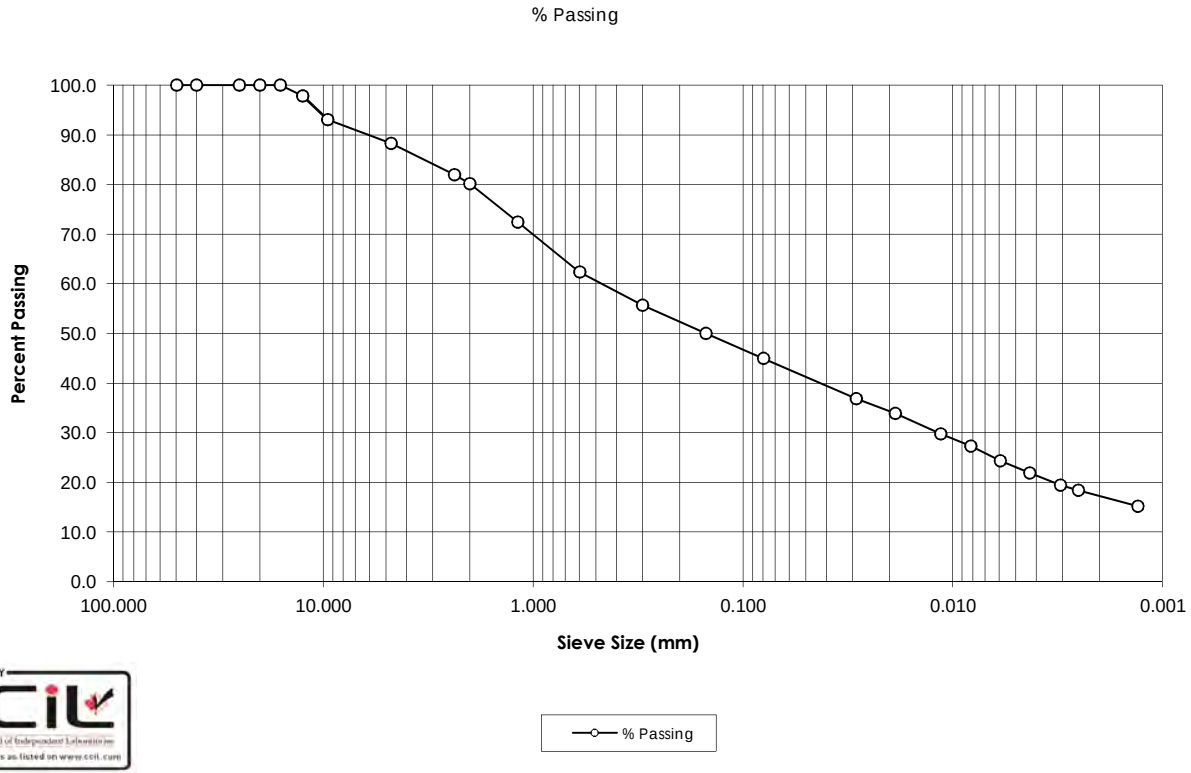
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS14
SOURCE: DC4
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: April 14, 2016
SAMPLE DESCRIPTION: Clay (CI) and Sand Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 24.4 |
| 40.0 | 100.0 | 0.0043 | 21.9 |
| 25.0 | 100.0 | 0.0031 | 19.5 |
| 20.0 | 100.0 | 0.0025 | 18.5 |
| 16.0 | 100.0 | 0.0013 | 15.2 |
| 12.5 | 97.8 | | |
| 9.5 | 93.0 | | |
| 4.75 | 88.3 | | |
| 2.36 | 82.0 | | |
| 2.00 | 80.1 | | |
| 1.18 | 72.4 | | |
| 0.600 | 62.4 | | |
| 0.300 | 55.7 | | |
| 0.150 | 50.0 | | |
| 0.080 | 45.0 | | |
| 0.0288 | 36.9 | | |
| 0.0187 | 33.9 | | |
| 0.0114 | 29.8 | | |
| 0.0082 | 27.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 11.7% | $D_{10}$: | - |
| Sand: | 43.4% | $D_{30}$: | 0.0118 |
| Silt: | 27.6% | $D_{60}$: | 0.4976 |
| Clay: | 17.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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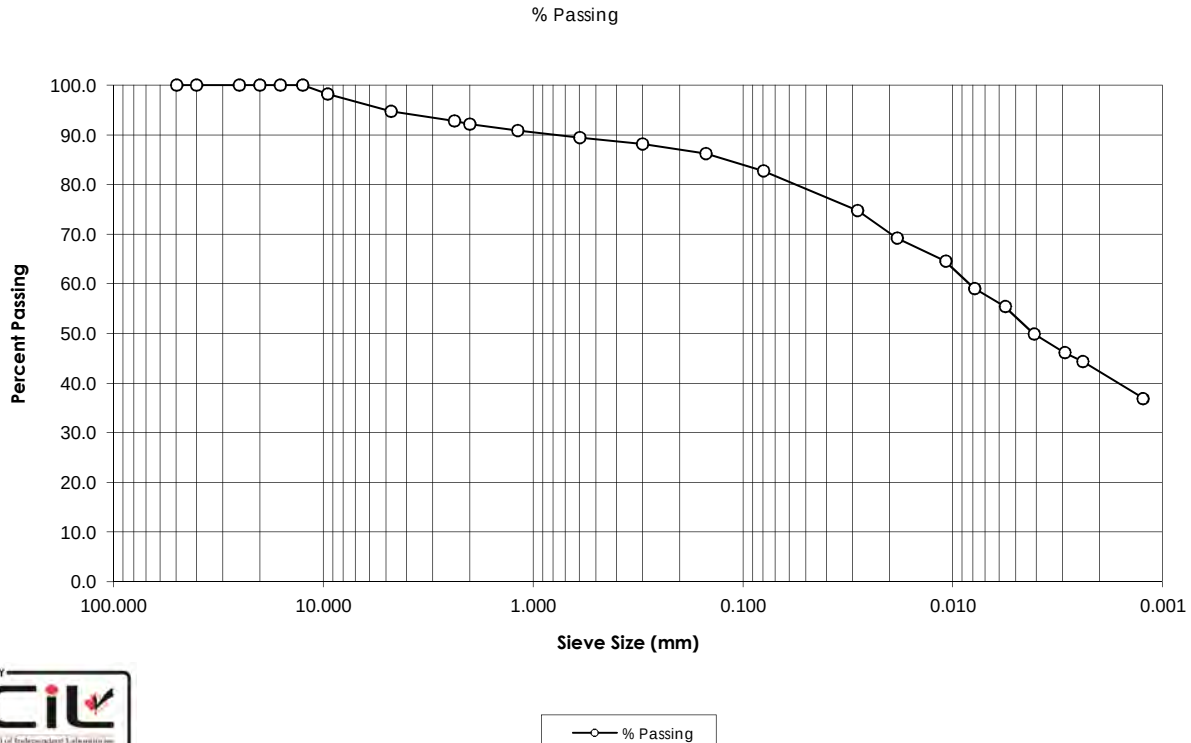
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSA
SOURCE: DC4A
TESTED BY: M. Pilkington

DATE TESTED: May 17, 2016
DATE RECEIVED: April 15, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0056 | 55.4 |
| 40.0 | 100.0 | 0.0041 | 49.9 |
| 25.0 | 100.0 | 0.0029 | 46.2 |
| 20.0 | 100.0 | 0.0024 | 44.3 |
| 16.0 | 100.0 | 0.0012 | 36.9 |
| 12.5 | 100.0 | | |
| 9.5 | 98.3 | | |
| 4.75 | 94.7 | | |
| 2.36 | 92.7 | | |
| 2.00 | 92.2 | | |
| 1.18 | 90.9 | | |
| 0.600 | 89.4 | | |
| 0.300 | 88.1 | | |
| 0.150 | 86.2 | | |
| 0.080 | 82.7 | | |
| 0.0284 | 74.8 | | |
| 0.0184 | 69.2 | | |
| 0.0108 | 64.6 | | |
| 0.0078 | 59.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.3% | $D_{10}$: | - |
| Sand: | 12.0% | $D_{30}$: | - |
| Silt: | 40.4% | $D_{60}$: | 0.0083 |
| Clay: | 42.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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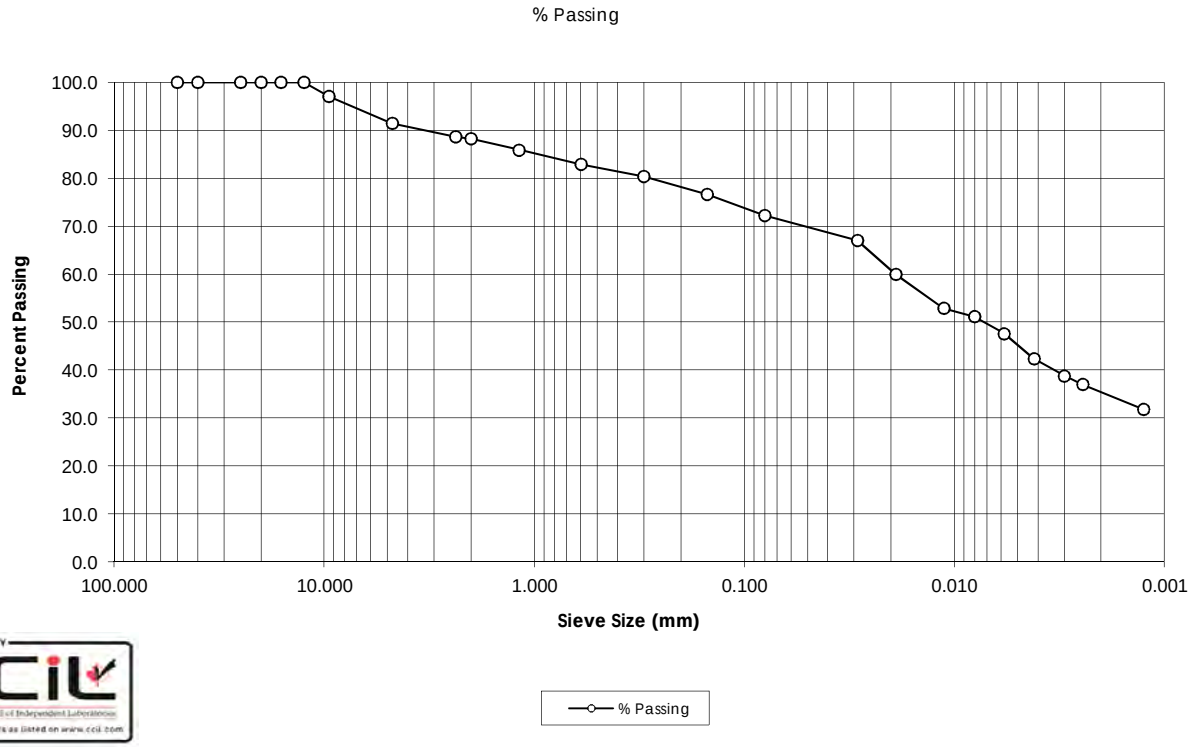
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSB
SOURCE: DC4A
TESTED BY: M. Pilkington

DATE TESTED: May 17, 2016
DATE RECEIVED: April 15, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0058** | **47.6** |
| **40.0** | **100.0** | **0.0042** | **42.3** |
| **25.0** | **100.0** | **0.0030** | **38.8** |
| **20.0** | **100.0** | **0.0025** | **37.0** |
| **16.0** | **100.0** | **0.0013** | **31.7** |
| **12.5** | **100.0** | | |
| **9.5** | **97.0** | | |
| **4.75** | **91.4** | | |
| **2.36** | **88.7** | | |
| **2.00** | **88.2** | | |
| **1.18** | **85.9** | | |
| **0.600** | **82.9** | | |
| **0.300** | **80.4** | | |
| **0.150** | **76.7** | | |
| **0.080** | **72.2** | | |
| **0.0288** | **67.0** | | |
| **0.0189** | **60.0** | | |
| **0.0112** | **52.9** | | |
| **0.0080** | **51.1** | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.6% | $D_{10}$: | - |
| Sand: | 19.2% | $D_{30}$: | - |
| Silt: | 36.8% | $D_{60}$: | 0.0190 |
| Clay: | 35.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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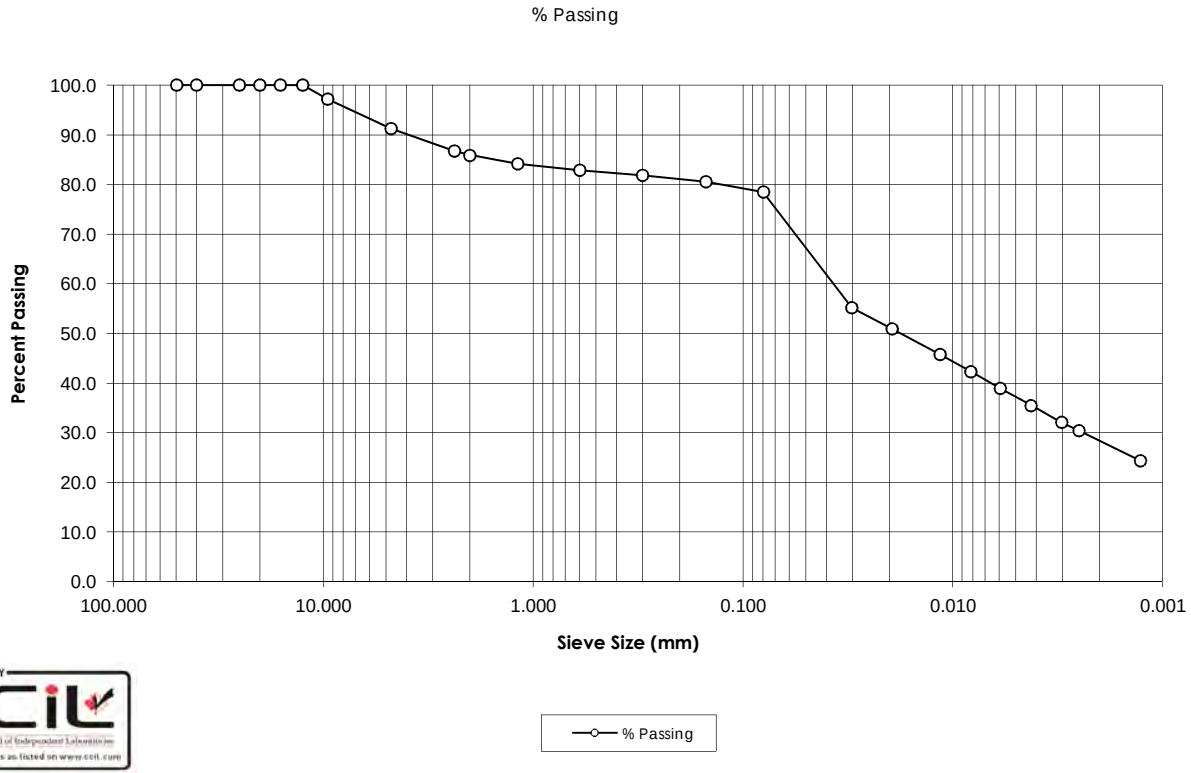
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS7
SOURCE: DC5
TESTED BY: C. Oost

DATE TESTED: July 4, 2016
DATE RECEIVED: May 26, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 38.9 |
| 40.0 | 100.0 | 0.0042 | 35.5 |
| 25.0 | 100.0 | 0.0030 | 32.1 |
| 20.0 | 100.0 | 0.0025 | 30.4 |
| 16.0 | 100.0 | 0.0013 | 24.4 |
| 12.5 | 100.0 | | |
| 9.5 | 97.2 | | |
| 4.75 | 91.2 | | |
| 2.36 | 86.8 | | |
| 2.00 | 85.9 | | |
| 1.18 | 84.2 | | |
| 0.600 | 82.9 | | |
| 0.300 | 81.9 | | |
| 0.150 | 80.6 | | |
| 0.080 | 78.5 | | |
| 0.0303 | 55.2 | | |
| 0.0194 | 50.9 | | |
| 0.0115 | 45.8 | | |
| 0.0082 | 42.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.8% | $D_{10}$: | - |
| Sand: | 12.7% | $D_{30}$: | 0.0024 |
| Silt: | 50.1% | $D_{60}$: | 0.0421 |
| Clay: | 28.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size and Atterberg Limit test results.

Reviewed by:

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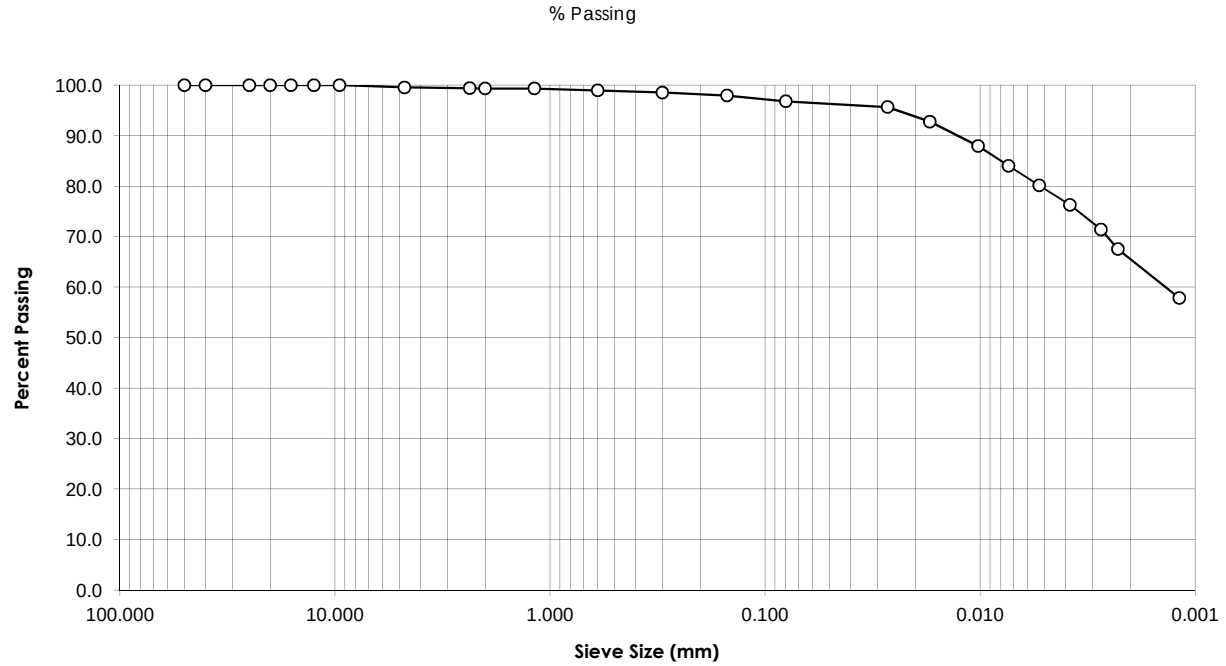
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS2
SOURCE: DC6
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 23, 2016
SAMPLE DESCRIPTION: Clay (CH-CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 80.2 |
| 40.0 | 100.0 | 0.0038 | 76.3 |
| 25.0 | 100.0 | 0.0027 | 71.4 |
| 20.0 | 100.0 | 0.0023 | 67.5 |
| 16.0 | 100.0 | 0.0012 | 57.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.6 | | |
| 2.36 | 99.4 | | |
| 2.00 | 99.3 | | |
| 1.18 | 99.3 | | |
| 0.600 | 98.9 | | |
| 0.300 | 98.6 | | |
| 0.150 | 98.0 | | |
| 0.080 | 96.8 | | |
| 0.0269 | 95.7 | | |
| 0.0171 | 92.8 | | |
| 0.0102 | 87.9 | | |
| 0.0074 | 84.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 2.8% | $D_{30}$: | - |
| Silt: | 31.2% | $D_{60}$: | 0.0014 |
| Clay: | 65.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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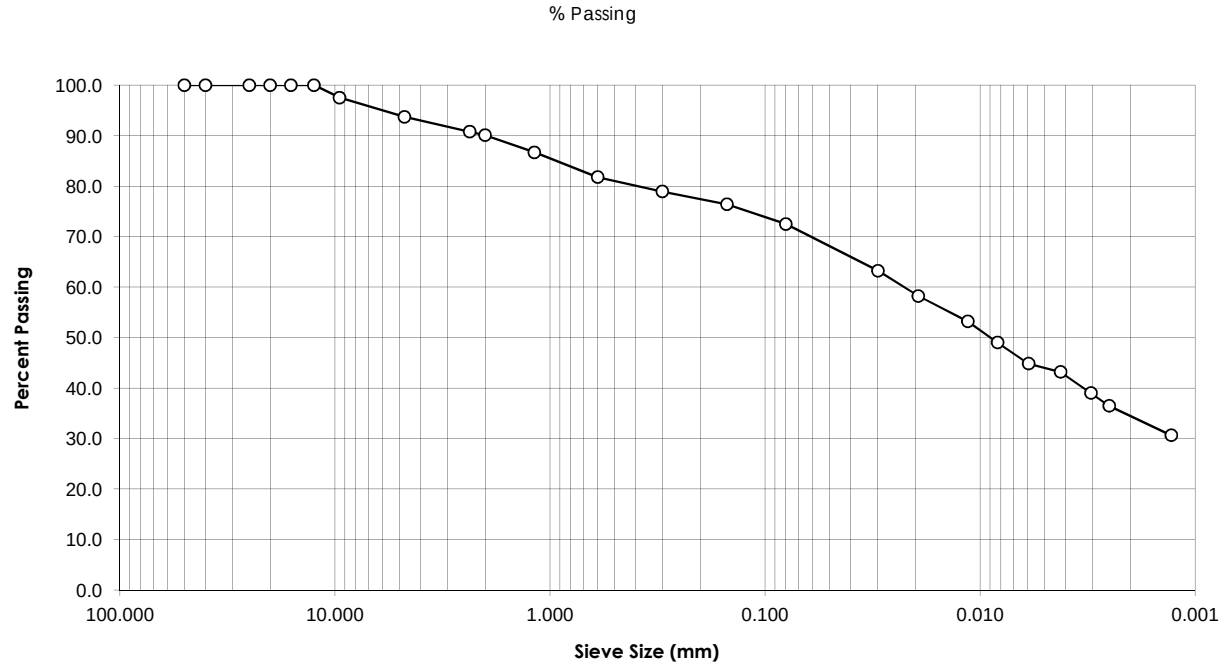
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS4
SOURCE: DC6
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 23, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 44.8 |
| 40.0 | 100.0 | 0.0042 | 43.2 |
| 25.0 | 100.0 | 0.0030 | 39.0 |
| 20.0 | 100.0 | 0.0025 | 36.5 |
| 16.0 | 100.0 | 0.0013 | 30.6 |
| 12.5 | 100.0 | | |
| 9.5 | 97.5 | | |
| 4.75 | 93.7 | | |
| 2.36 | 90.8 | | |
| 2.00 | 90.1 | | |
| 1.18 | 86.7 | | |
| 0.600 | 81.8 | | |
| 0.300 | 78.9 | | |
| 0.150 | 76.4 | | |
| 0.080 | 72.5 | | |
| 0.0298 | 63.3 | | |
| 0.0193 | 58.2 | | |
| 0.0114 | 53.2 | | |
| 0.0083 | 49.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.3% | $D_{10}$: | - |
| Sand: | 21.2% | $D_{30}$: | - |
| Silt: | 38.0% | $D_{60}$: | 0.0231 |
| Clay: | 34.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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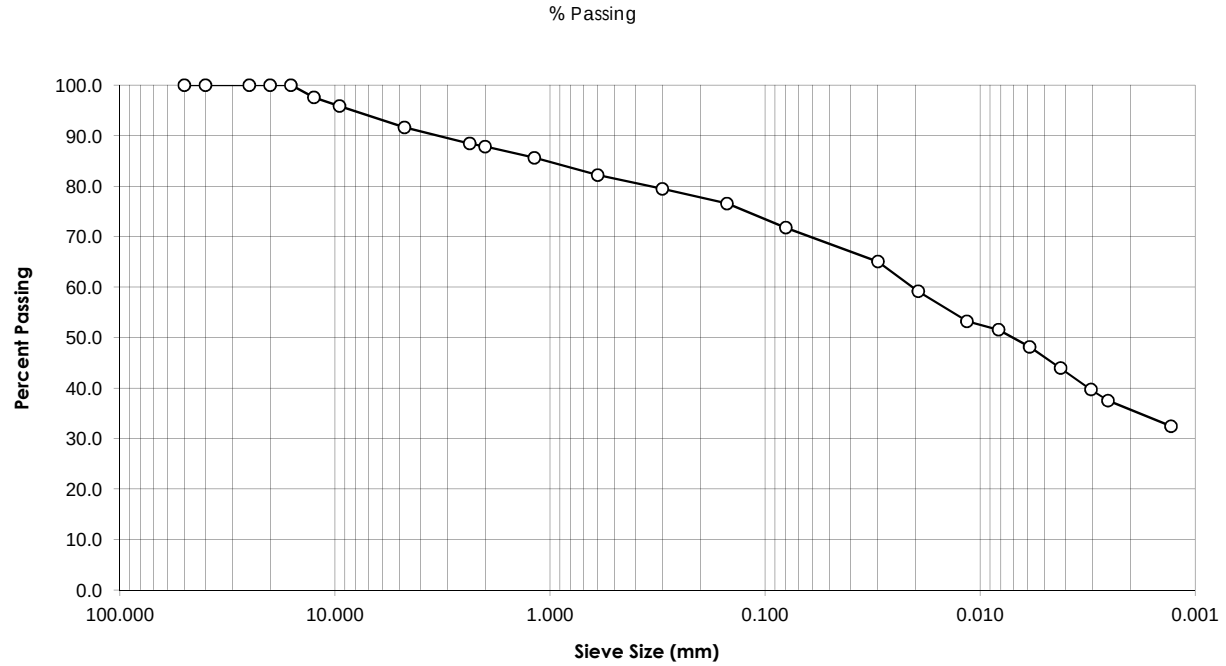
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSC
SOURCE: DC6
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 20, 2016
SAMPLE DESCRIPTION: Fines Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 48.2 |
| 40.0 | 100.0 | 0.0042 | 43.9 |
| 25.0 | 100.0 | 0.0030 | 39.7 |
| 20.0 | 100.0 | 0.0025 | 37.5 |
| 16.0 | 100.0 | 0.0013 | 32.4 |
| 12.5 | 97.6 | | |
| 9.5 | 95.9 | | |
| 4.75 | 91.6 | | |
| 2.36 | 88.4 | | |
| 2.00 | 87.8 | | |
| 1.18 | 85.6 | | |
| 0.600 | 82.2 | | |
| 0.300 | 79.5 | | |
| 0.150 | 76.6 | | |
| 0.080 | 71.8 | | |
| 0.0298 | 65.1 | | |
| 0.0193 | 59.1 | | |
| 0.0115 | 53.2 | | |
| 0.0082 | 51.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.4% | $D_{10}$: | - |
| Sand: | 19.8% | $D_{30}$: | - |
| Silt: | 36.1% | $D_{60}$: | 0.0209 |
| Clay: | 35.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description derived from Grain Size test results

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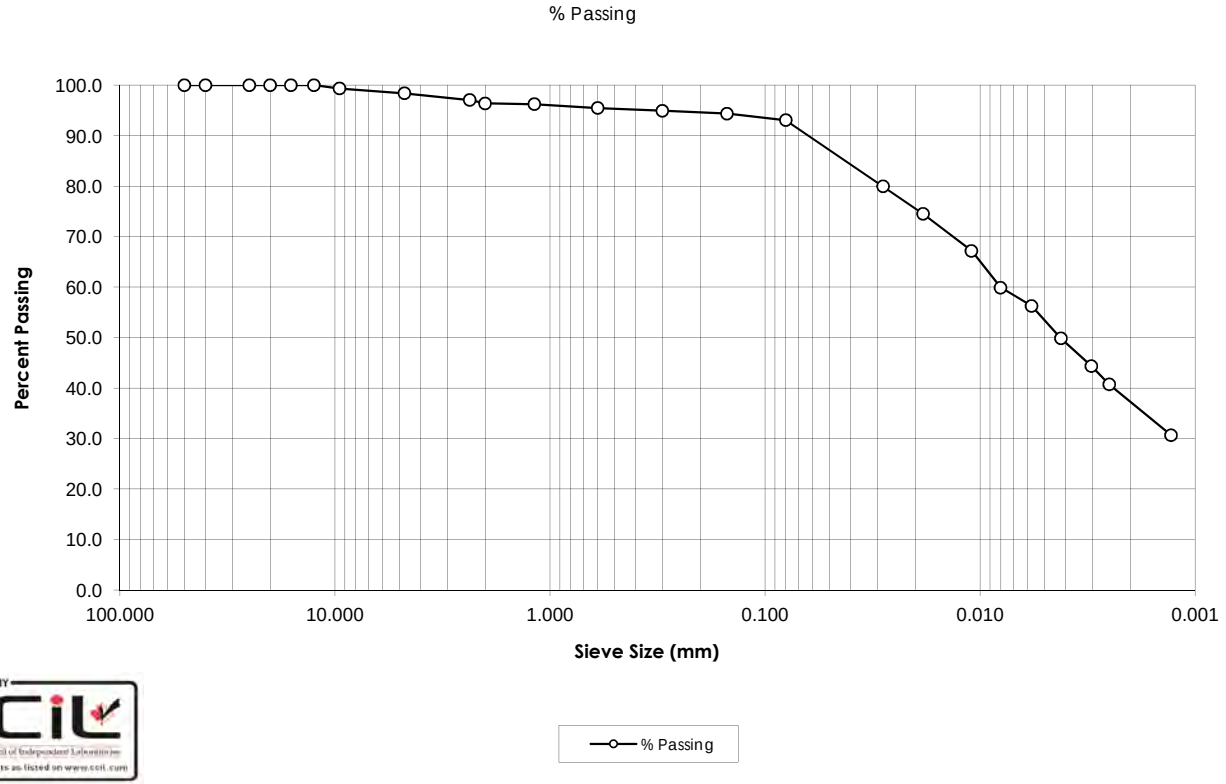
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSD
SOURCE: DC6
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 23, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 56.2 |
| 40.0 | 100.0 | 0.0042 | 49.8 |
| 25.0 | 100.0 | 0.0030 | 44.4 |
| 20.0 | 100.0 | 0.0025 | 40.7 |
| 16.0 | 100.0 | 0.0013 | 30.7 |
| 12.5 | 100.0 | | |
| 9.5 | 99.3 | | |
| 4.75 | 98.4 | | |
| 2.36 | 97.1 | | |
| 2.00 | 96.4 | | |
| 1.18 | 96.2 | | |
| 0.600 | 95.5 | | |
| 0.300 | 94.9 | | |
| 0.150 | 94.4 | | |
| 0.080 | 93.1 | | |
| 0.0282 | 80.0 | | |
| 0.0184 | 74.5 | | |
| 0.0109 | 67.2 | | |
| 0.0080 | 59.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.6% | $D_{10}$: | - |
| Sand: | 5.3% | $D_{30}$: | - |
| Silt: | 55.8% | $D_{60}$: | 0.0081 |
| Clay: | 37.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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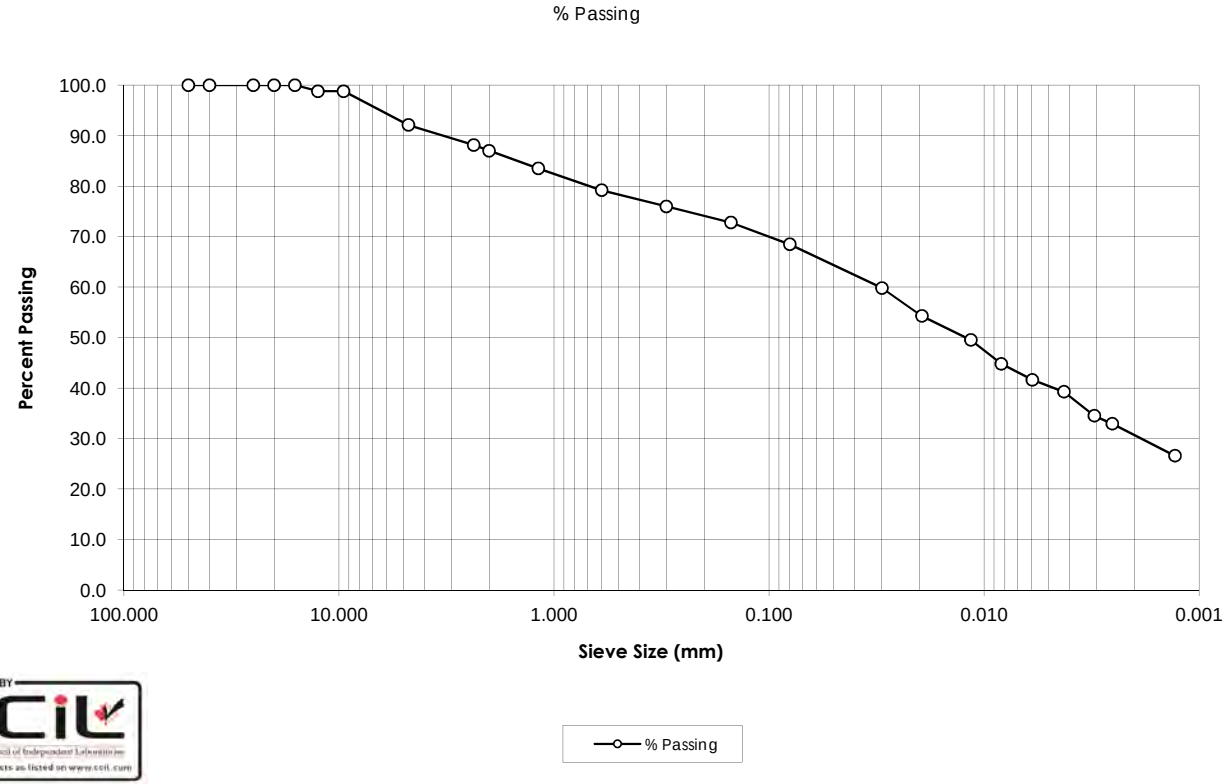
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS8
SOURCE: DC6
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 23, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 41.6 |
| 40.0 | 100.0 | 0.0042 | 39.2 |
| 25.0 | 100.0 | 0.0031 | 34.5 |
| 20.0 | 100.0 | 0.0025 | 32.9 |
| 16.0 | 100.0 | 0.0013 | 26.6 |
| 12.5 | 98.8 | | |
| 9.5 | 98.8 | | |
| 4.75 | 92.1 | | |
| 2.36 | 88.2 | | |
| 2.00 | 87.0 | | |
| 1.18 | 83.5 | | |
| 0.600 | 79.2 | | |
| 0.300 | 76.0 | | |
| 0.150 | 72.8 | | |
| 0.080 | 68.5 | | |
| 0.0298 | 59.8 | | |
| 0.0194 | 54.3 | | |
| 0.0115 | 49.5 | | |
| 0.0083 | 44.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.9% | $D_{10}$: | - |
| Sand: | 23.6% | $D_{30}$: | 0.0020 |
| Silt: | 37.8% | $D_{60}$: | 0.0309 |
| Clay: | 30.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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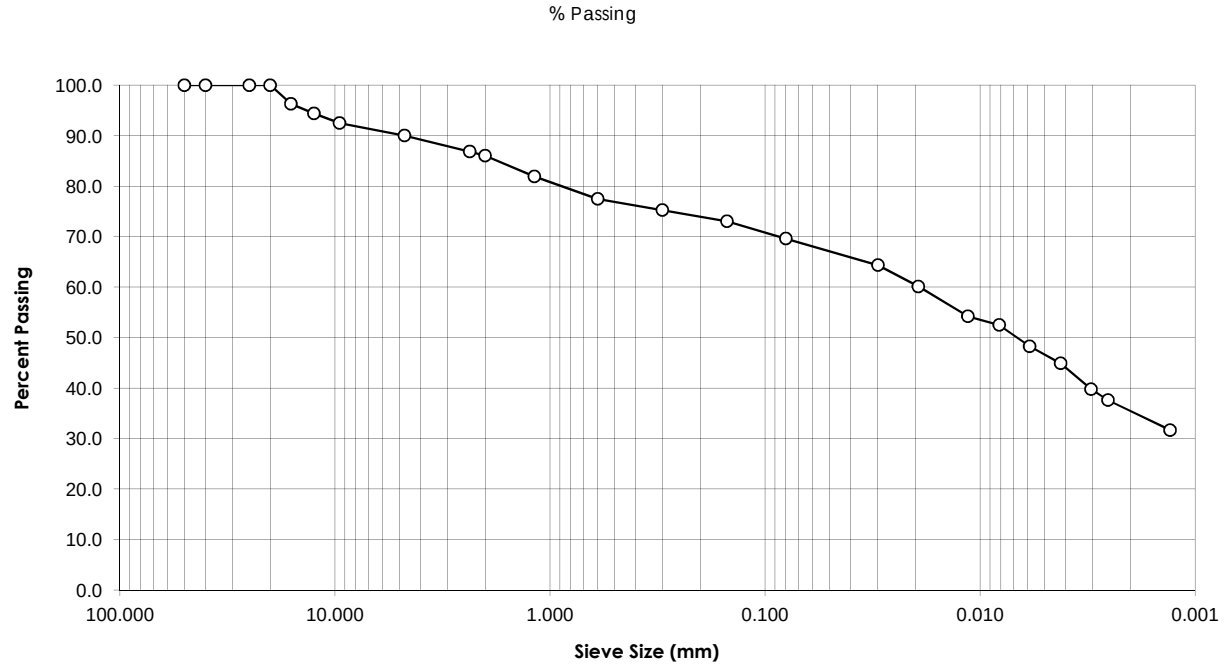
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS2
SOURCE: DC7
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 48.3 |
| 40.0 | 100.0 | 0.0042 | 44.9 |
| 25.0 | 100.0 | 0.0030 | 39.8 |
| 20.0 | 100.0 | 0.0025 | 37.6 |
| 16.0 | 96.3 | 0.0013 | 31.7 |
| 12.5 | 94.4 | | |
| 9.5 | 92.5 | | |
| 4.75 | 90.0 | | |
| 2.36 | 86.9 | | |
| 2.00 | 86.0 | | |
| 1.18 | 81.9 | | |
| 0.600 | 77.5 | | |
| 0.300 | 75.3 | | |
| 0.150 | 73.0 | | |
| 0.080 | 69.6 | | |
| 0.0298 | 64.4 | | |
| 0.0193 | 60.1 | | |
| 0.0114 | 54.2 | | |
| 0.0081 | 52.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 10.0% | $D_{10}$: | - |
| Sand: | 20.4% | $D_{30}$: | - |
| Silt: | 34.1% | $D_{60}$: | 0.0192 |
| Clay: | 35.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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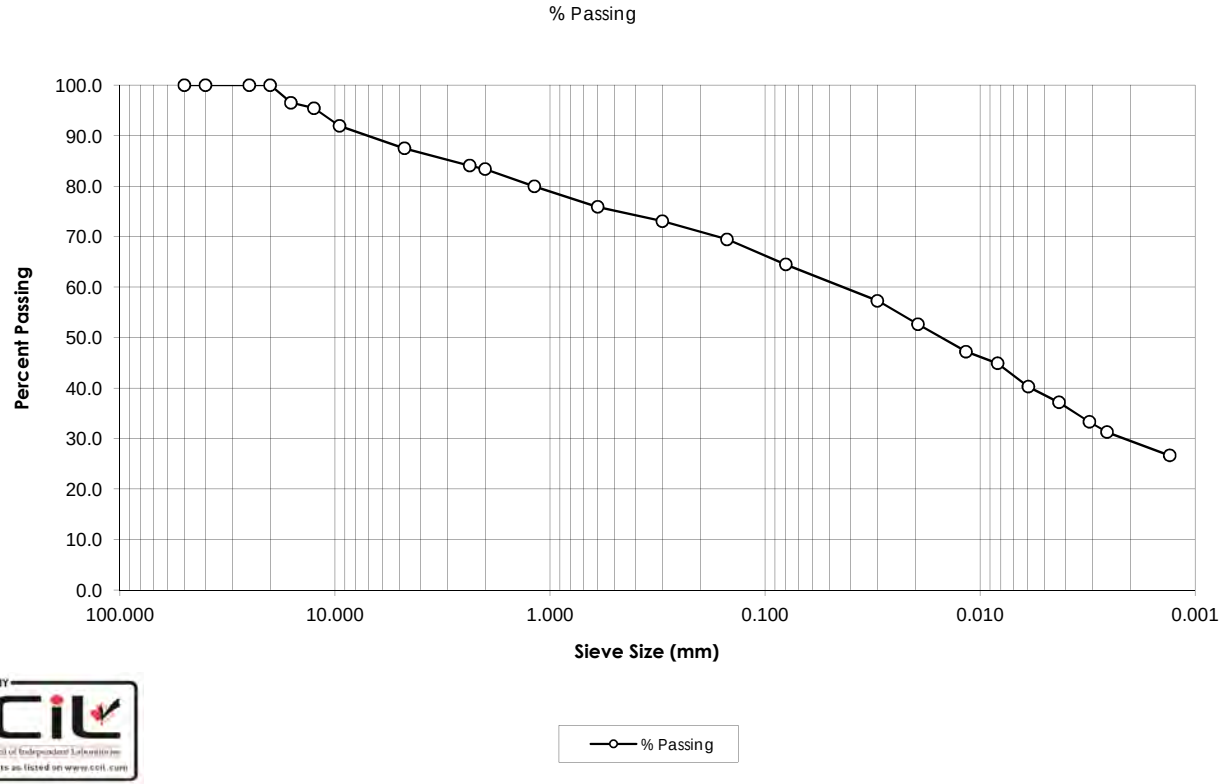
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS13
SOURCE: DC7
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 40.3 |
| 40.0 | 100.0 | 0.0043 | 37.2 |
| 25.0 | 100.0 | 0.0031 | 33.3 |
| 20.0 | 100.0 | 0.0026 | 31.3 |
| 16.0 | 96.5 | 0.0013 | 26.6 |
| 12.5 | 95.4 | | |
| 9.5 | 91.9 | | |
| 4.75 | 87.5 | | |
| 2.36 | 84.0 | | |
| 2.00 | 83.4 | | |
| 1.18 | 79.9 | | |
| 0.600 | 75.9 | | |
| 0.300 | 73.1 | | |
| 0.150 | 69.5 | | |
| 0.080 | 64.5 | | |
| 0.0300 | 57.3 | | |
| 0.0194 | 52.6 | | |
| 0.0116 | 47.2 | | |
| 0.0083 | 44.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.5% | $D_{10}$: | - |
| Sand: | 23.0% | $D_{30}$: | 0.0022 |
| Silt: | 34.9% | $D_{60}$: | 0.0496 |
| Clay: | 29.6% | $C_u$: | - |
| | | $C_c$: | - |

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**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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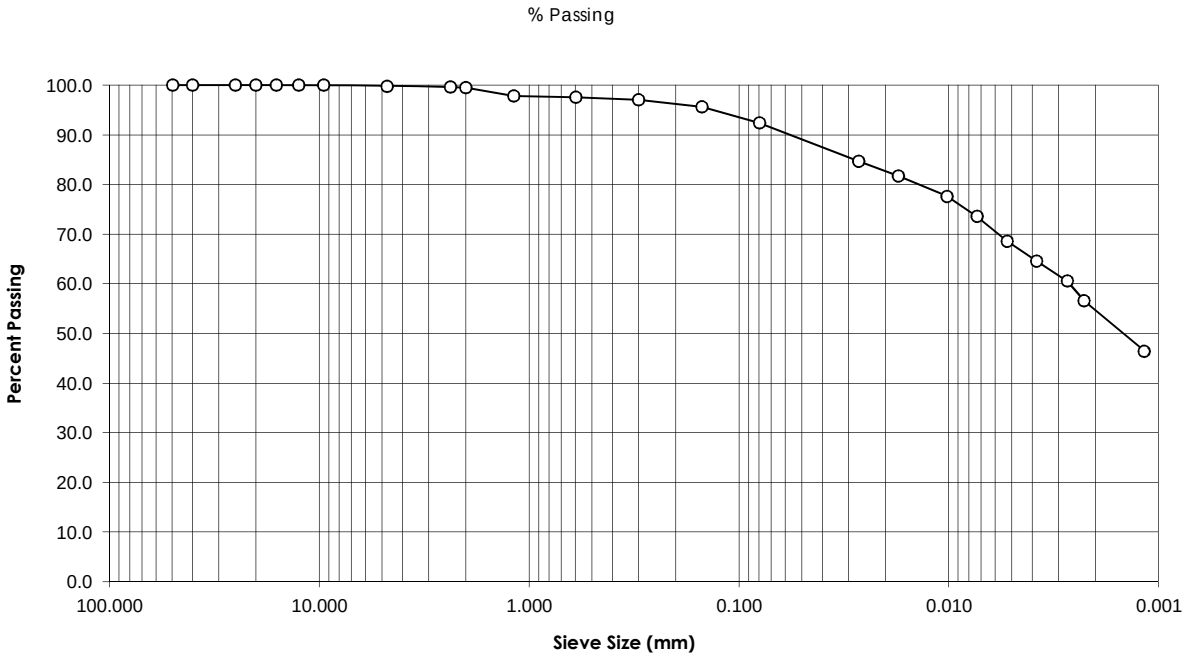
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST2
SOURCE: DC8
TESTED BY: B. Pelkey

DATE TESTED: June 27, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 68.6 |
| 40.0 | 100.0 | 0.0038 | 64.6 |
| 25.0 | 100.0 | 0.0027 | 60.6 |
| 20.0 | 100.0 | 0.0023 | 56.5 |
| 16.0 | 100.0 | 0.0012 | 46.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.8 | | |
| 2.36 | 99.6 | | |
| 2.00 | 99.5 | | |
| 1.18 | 97.9 | | |
| 0.600 | 97.6 | | |
| 0.300 | 97.1 | | |
| 0.150 | 95.6 | | |
| 0.080 | 92.5 | | |
| 0.0269 | 84.7 | | |
| 0.0174 | 81.7 | | |
| 0.0102 | 77.7 | | |
| 0.0073 | 73.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 7.4% | $D_{30}$: | - |
| Silt: | 37.8% | $D_{60}$: | 0.0027 |
| Clay: | 54.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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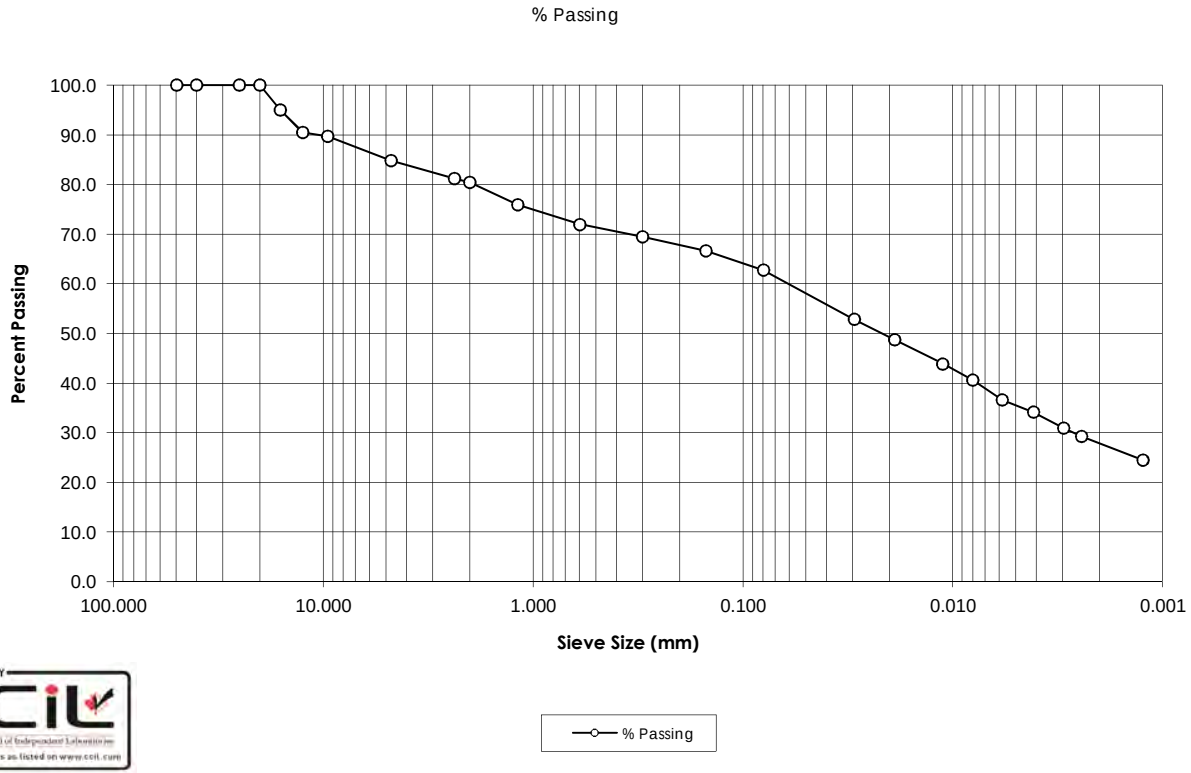
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST5
SOURCE: DC8
TESTED BY: B. Pelkey

DATE TESTED: June 27, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 36.6 |
| 40.0 | 100.0 | 0.0041 | 34.2 |
| 25.0 | 100.0 | 0.0030 | 30.9 |
| 20.0 | 100.0 | 0.0024 | 29.3 |
| 16.0 | 95.0 | 0.0012 | 24.5 |
| 12.5 | 90.4 | | |
| 9.5 | 89.8 | | |
| 4.75 | 84.8 | | |
| 2.36 | 81.2 | | |
| 2.00 | 80.5 | | |
| 1.18 | 75.9 | | |
| 0.600 | 72.0 | | |
| 0.300 | 69.5 | | |
| 0.150 | 66.6 | | |
| 0.080 | 62.8 | | |
| 0.0295 | 52.8 | | |
| 0.0189 | 48.8 | | |
| 0.0112 | 43.9 | | |
| 0.0080 | 40.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 15.2% | $D_{10}$: | - |
| Sand: | 22.0% | $D_{30}$: | 0.0027 |
| Silt: | 34.9% | $D_{60}$: | 0.0666 |
| Clay: | 27.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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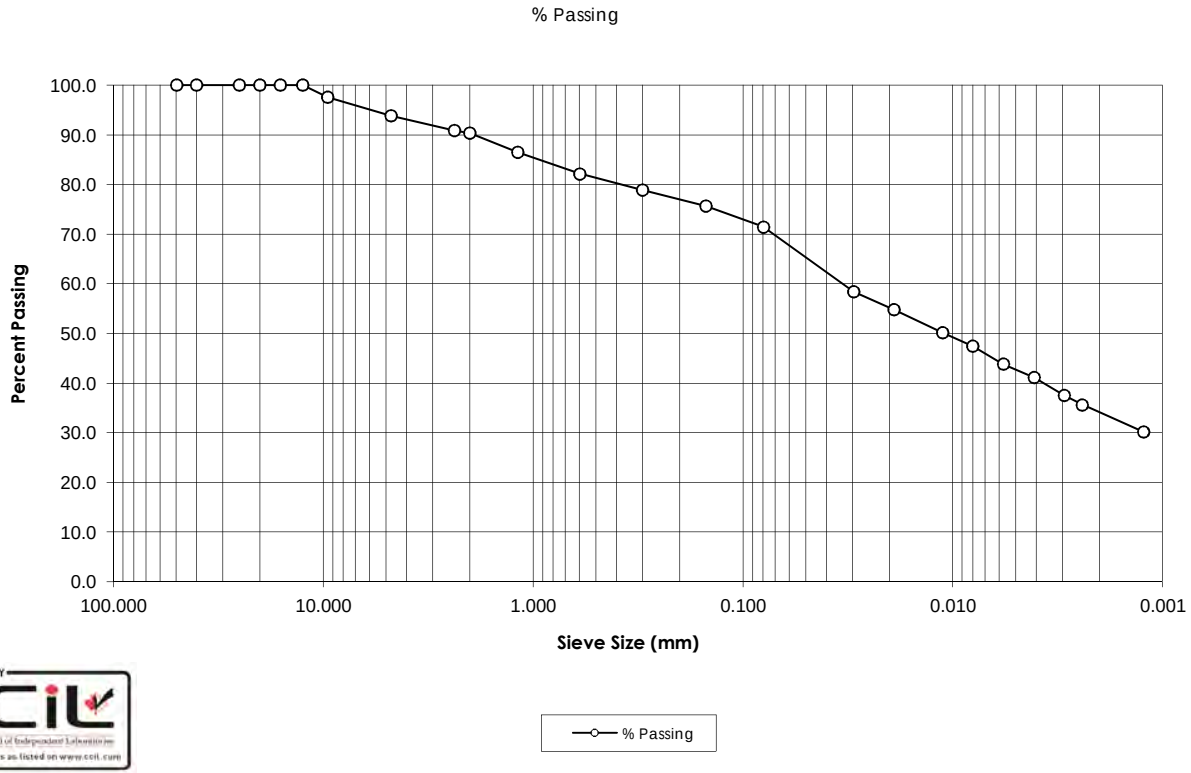
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS6+BS7
SOURCE: DC8
TESTED BY: B. Pelkey

DATE TESTED: June 29, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 43.8 |
| 40.0 | 100.0 | 0.0041 | 41.1 |
| 25.0 | 100.0 | 0.0029 | 37.5 |
| 20.0 | 100.0 | 0.0024 | 35.6 |
| 16.0 | 100.0 | 0.0012 | 30.2 |
| 12.5 | 100.0 | | |
| 9.5 | 97.6 | | |
| 4.75 | 93.9 | | |
| 2.36 | 90.8 | | |
| 2.00 | 90.3 | | |
| 1.18 | 86.5 | | |
| 0.600 | 82.2 | | |
| 0.300 | 78.9 | | |
| 0.150 | 75.7 | | |
| 0.080 | 71.5 | | |
| 0.0296 | 58.4 | | |
| 0.0190 | 54.7 | | |
| 0.0112 | 50.2 | | |
| 0.0080 | 47.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.1% | $D_{10}$: | - |
| Sand: | 22.4% | $D_{30}$: | - |
| Silt: | 37.4% | $D_{60}$: | 0.0364 |
| Clay: | 34.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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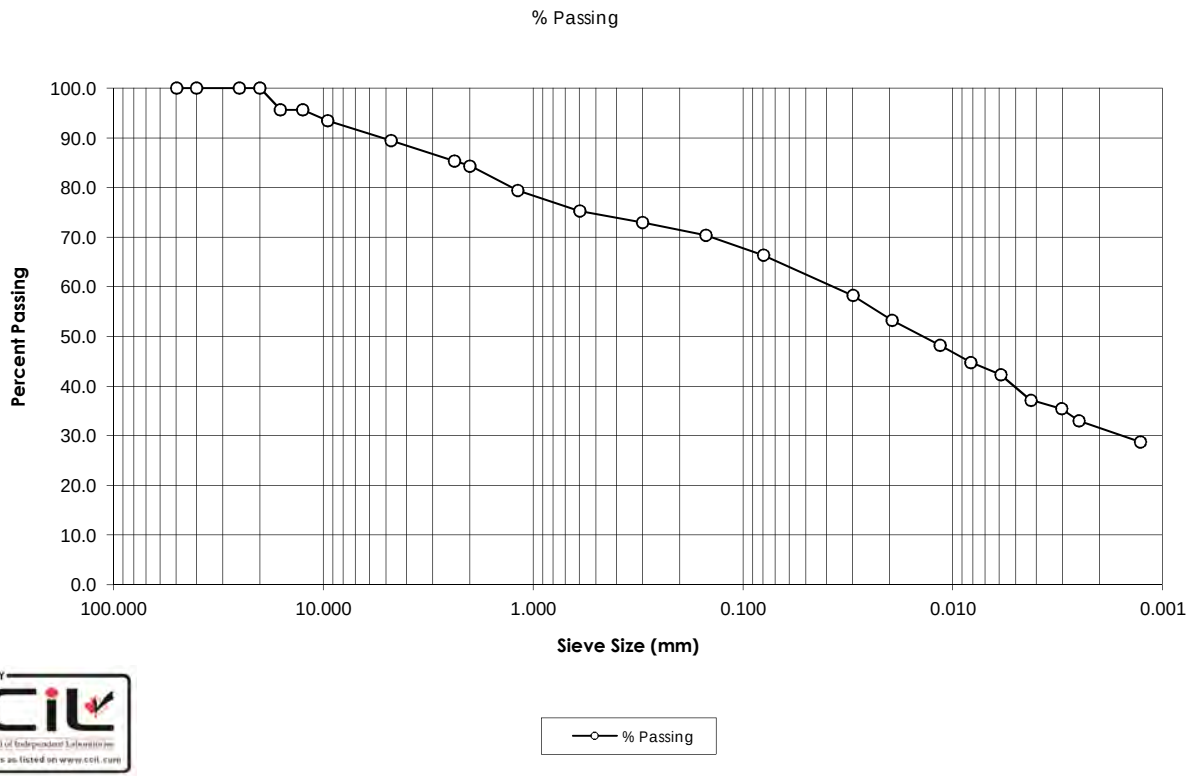
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS8
SOURCE: DC8
TESTED BY: M. Pilkington

DATE TESTED: June 1, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI-CL) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 42.3 |
| 40.0 | 100.0 | 0.0043 | 37.2 |
| 25.0 | 100.0 | 0.0030 | 35.5 |
| 20.0 | 100.0 | 0.0025 | 33.0 |
| 16.0 | 95.6 | 0.0013 | 28.7 |
| 12.5 | 95.6 | | |
| 9.5 | 93.4 | | |
| 4.75 | 89.4 | | |
| 2.36 | 85.3 | | |
| 2.00 | 84.4 | | |
| 1.18 | 79.4 | | |
| 0.600 | 75.3 | | |
| 0.300 | 72.9 | | |
| 0.150 | 70.4 | | |
| 0.080 | 66.4 | | |
| 0.0299 | 58.3 | | |
| 0.0194 | 53.2 | | |
| 0.0115 | 48.2 | | |
| 0.0082 | 44.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 10.6% | $D_{10}$: | - |
| Sand: | 23.0% | $D_{30}$: | 0.0017 |
| Silt: | 34.9% | $D_{60}$: | 0.0408 |
| Clay: | 31.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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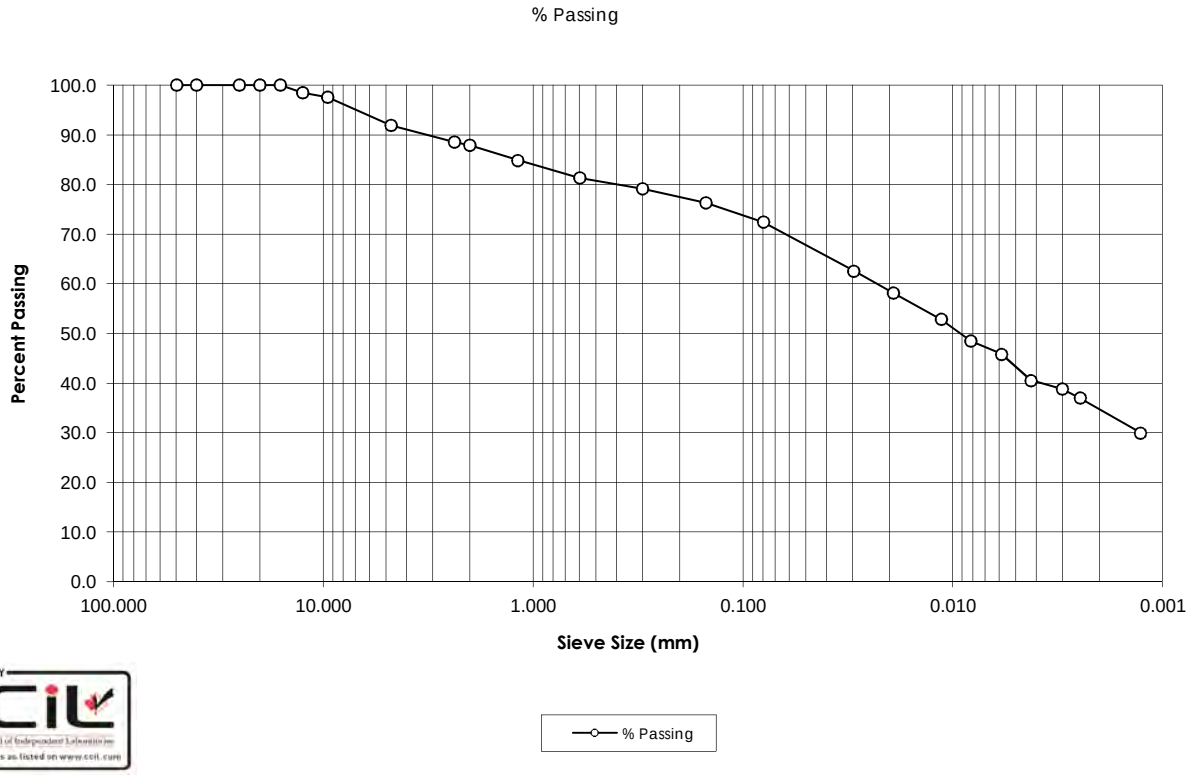
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS16
SOURCE: DC8
TESTED BY: M. Pilkington

DATE TESTED: June 1, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 45.8 |
| 40.0 | 100.0 | 0.0042 | 40.5 |
| 25.0 | 100.0 | 0.0030 | 38.8 |
| 20.0 | 100.0 | 0.0025 | 37.0 |
| 16.0 | 100.0 | 0.0013 | 30.0 |
| 12.5 | 98.5 | | |
| 9.5 | 97.6 | | |
| 4.75 | 92.0 | | |
| 2.36 | 88.5 | | |
| 2.00 | 87.9 | | |
| 1.18 | 84.9 | | |
| 0.600 | 81.3 | | |
| 0.300 | 79.2 | | |
| 0.150 | 76.3 | | |
| 0.080 | 72.4 | | |
| 0.0296 | 62.6 | | |
| 0.0192 | 58.2 | | |
| 0.0114 | 52.9 | | |
| 0.0082 | 48.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.0% | $D_{10}$: | - |
| Sand: | 19.5% | $D_{30}$: | 0.0013 |
| Silt: | 37.6% | $D_{60}$: | 0.0236 |
| Clay: | 34.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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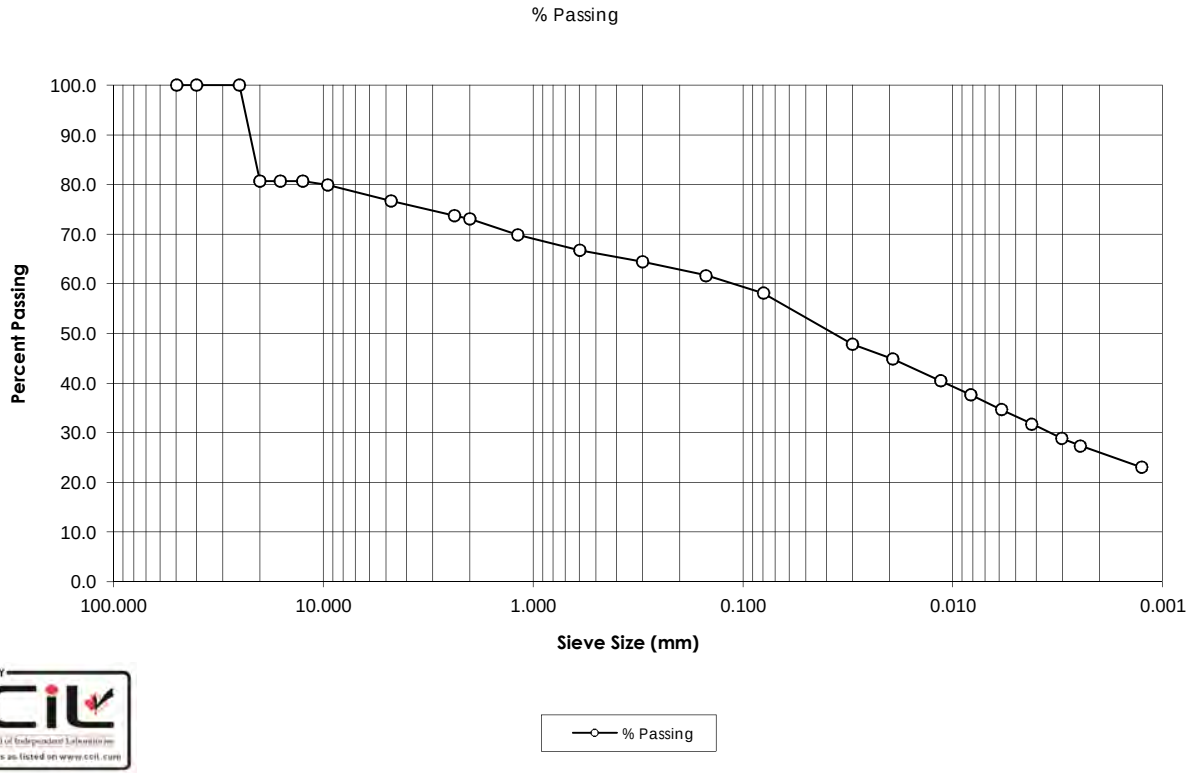
## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS19+SS20
SOURCE: DC8
TESTED BY: C. Oost

DATE TESTED: July 4, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Gravelly Clay (Cl), Some Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 34.7 |
| 40.0 | 100.0 | 0.0042 | 31.8 |
| 25.0 | 100.0 | 0.0030 | 28.9 |
| 20.0 | 80.7 | 0.0025 | 27.4 |
| 16.0 | 80.7 | 0.0013 | 23.0 |
| 12.5 | 80.7 | | |
| 9.5 | 79.9 | | |
| 4.75 | 76.7 | | |
| 2.36 | 73.7 | | |
| 2.00 | 73.1 | | |
| 1.18 | 69.9 | | |
| 0.600 | 66.8 | | |
| 0.300 | 64.5 | | |
| 0.150 | 61.7 | | |
| 0.080 | 58.1 | | |
| 0.0300 | 47.8 | | |
| 0.0192 | 44.9 | | |
| 0.0114 | 40.5 | | |
| 0.0082 | 37.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 23.3% | $D_{10}$: | - |
| Sand: | 18.6% | $D_{30}$: | 0.0035 |
| Silt: | 32.1% | $D_{60}$: | 0.1176 |
| Clay: | 26.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size and Atterberg Limit test results.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

**OFFICE**
325 - 25th Street SE
Suite 200
Calgary, Alberta
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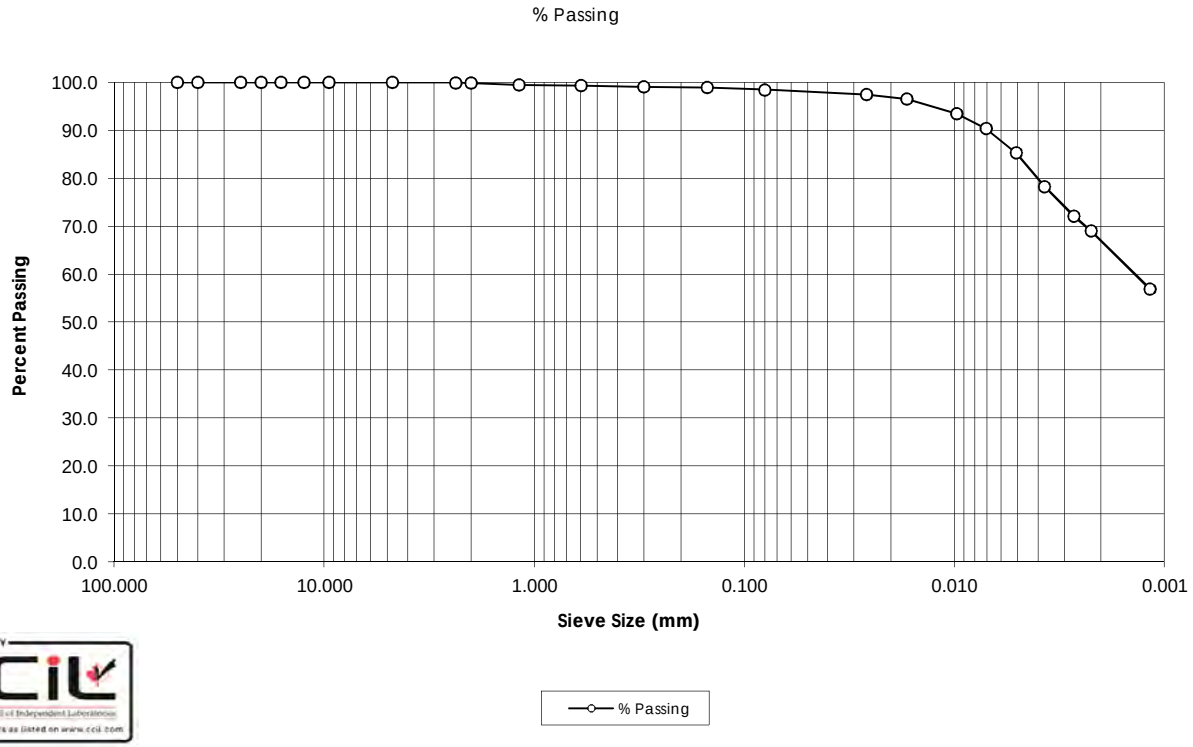
Tel: (403) 716-8000

**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

SAMPLE No.: BSA
SOURCE: DC9A
TESTED BY: M. Pilkington

DATE TESTED: May 17, 2016
DATE RECEIVED: April 16, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0051** | **85.3** |
| **40.0** | **100.0** | **0.0037** | **78.2** |
| **25.0** | **100.0** | **0.0027** | **72.1** |
| **20.0** | **100.0** | **0.0022** | **69.1** |
| **16.0** | **100.0** | **0.0012** | **56.9** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.9** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.5** | | |
| **0.600** | **99.3** | | |
| **0.300** | **99.1** | | |
| **0.150** | **98.9** | | |
| **0.080** | **98.5** | | |
| **0.0262** | **97.5** | | |
| **0.0168** | **96.5** | | |
| **0.0098** | **93.4** | | |
| **0.0071** | **90.4** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.5% | $D_{30}$: | - |
| Silt: | 31.5% | $D_{60}$: | 0.0015 |
| Clay: | 67.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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**LABORATORY**
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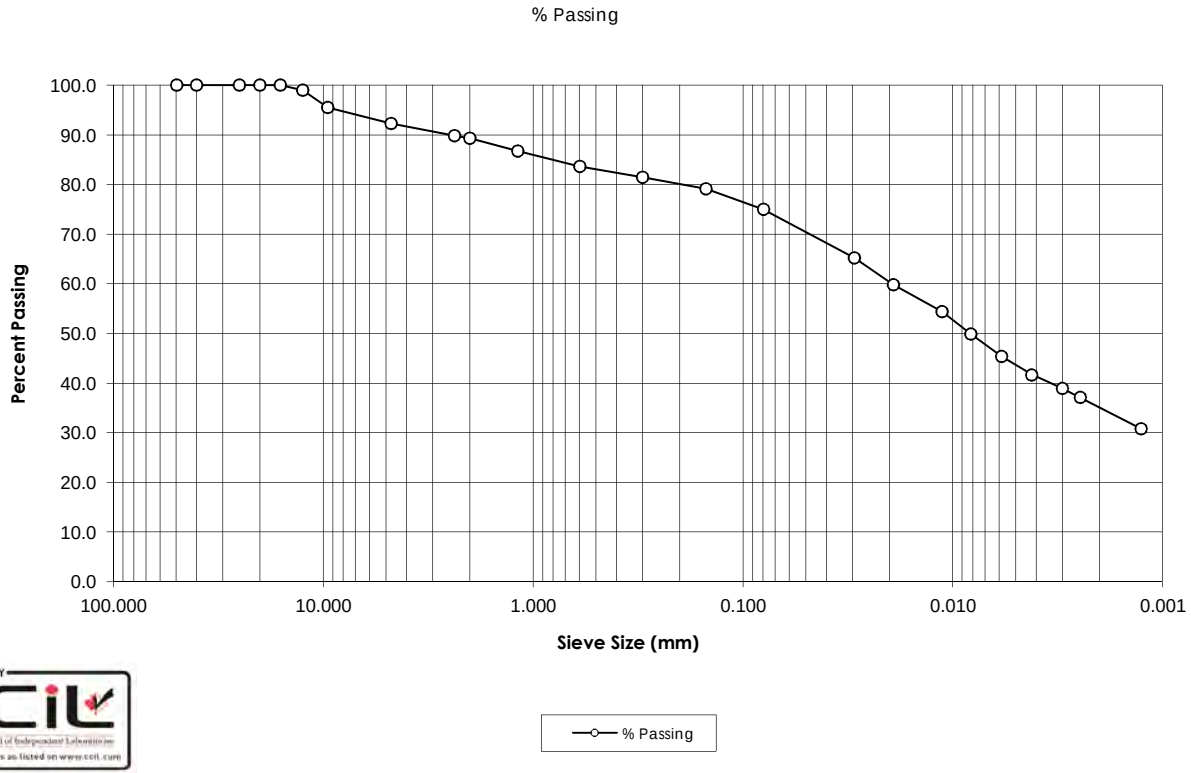
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

SAMPLE No.: BSC
SOURCE: DC9A
TESTED BY: M. Pilkington

DATE TESTED: May 17, 2016
DATE RECEIVED: April 16, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 45.3 |
| 40.0 | 100.0 | 0.0042 | 41.7 |
| 25.0 | 100.0 | 0.0030 | 39.0 |
| 20.0 | 100.0 | 0.0025 | 37.2 |
| 16.0 | 100.0 | 0.0013 | 30.8 |
| 12.5 | 99.0 | | |
| 9.5 | 95.5 | | |
| 4.75 | 92.3 | | |
| 2.36 | 89.9 | | |
| 2.00 | 89.4 | | |
| 1.18 | 86.8 | | |
| 0.600 | 83.7 | | |
| 0.300 | 81.5 | | |
| 0.150 | 79.1 | | |
| 0.080 | 75.1 | | |
| 0.0294 | 65.3 | | |
| 0.0191 | 59.8 | | |
| 0.0112 | 54.4 | | |
| 0.0082 | 49.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.7% | $D_{10}$: | - |
| Sand: | 17.3% | $D_{30}$: | - |
| Silt: | 39.9% | $D_{60}$: | 0.0194 |
| Clay: | 35.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

**Grain Size Analysis**
Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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**LABORATORY**
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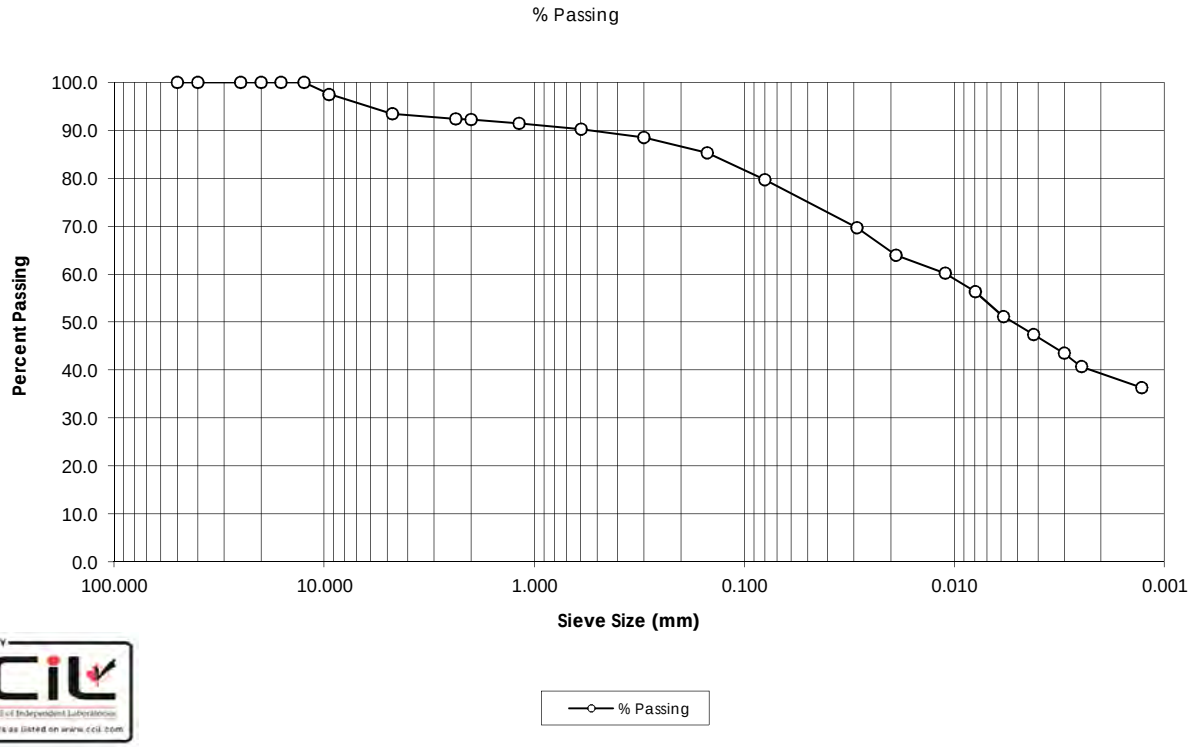
SAMPLE No.: SS2
SOURCE: DC10
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: April 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0059** | **51.2** |
| **40.0** | **100.0** | **0.0042** | **47.4** |
| **25.0** | **100.0** | **0.0030** | **43.6** |
| **20.0** | **100.0** | **0.0025** | **40.7** |
| **16.0** | **100.0** | **0.0013** | **36.3** |
| **12.5** | **100.0** | | |
| **9.5** | **97.5** | | |
| **4.75** | **93.4** | | |
| **2.36** | **92.4** | | |
| **2.00** | **92.2** | | |
| **1.18** | **91.5** | | |
| **0.600** | **90.3** | | |
| **0.300** | **88.6** | | |
| **0.150** | **85.3** | | |
| **0.080** | **79.7** | | |
| **0.0291** | **69.7** | | |
| **0.0189** | **64.0** | | |
| **0.0111** | **60.2** | | |
| **0.0080** | **56.4** | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.6% | $D_{10}$: | - |
| Sand: | 13.7% | $D_{30}$: | - |
| Silt: | 40.4% | $D_{60}$: | 0.0109 |
| Clay: | 39.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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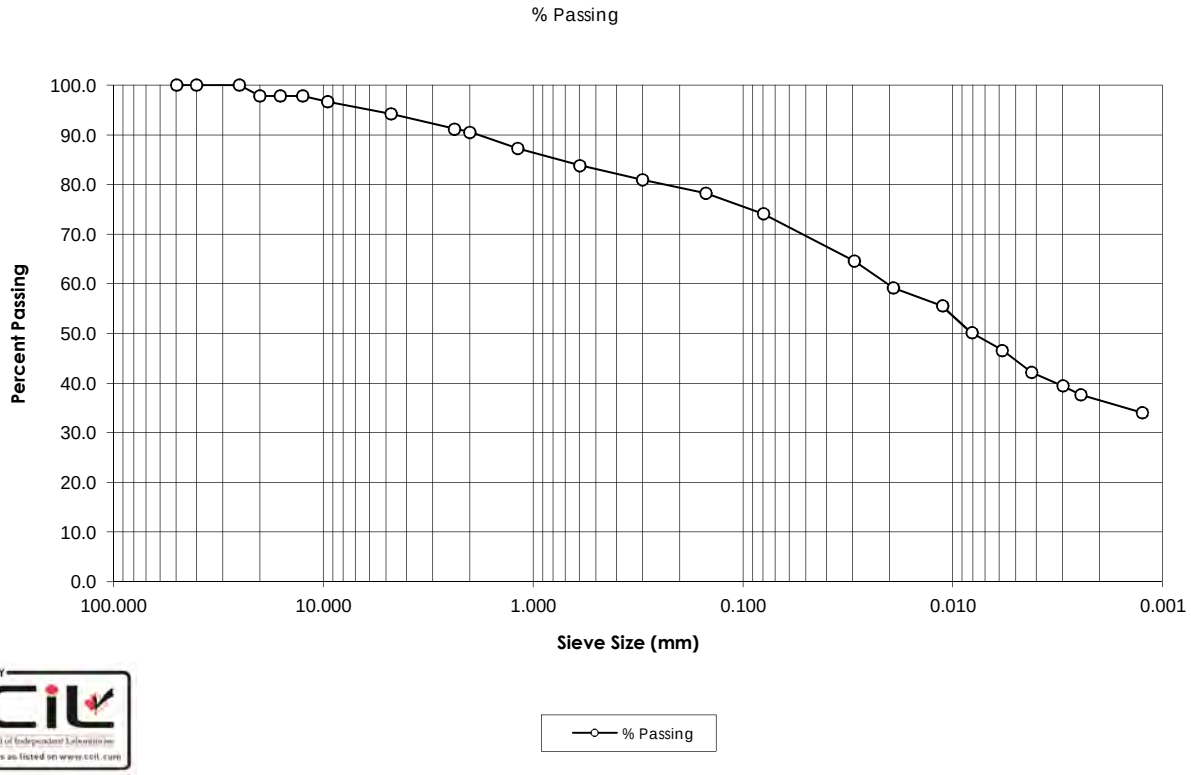
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSB
SOURCE: DC10
TESTED BY: M. Pilkington

DATE TESTED: May 17, 2016
DATE RECEIVED: April 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 46.6 |
| 40.0 | 100.0 | 0.0042 | 42.1 |
| 25.0 | 100.0 | 0.0030 | 39.4 |
| 20.0 | 97.8 | 0.0025 | 37.6 |
| 16.0 | 97.8 | 0.0012 | 34.1 |
| 12.5 | 97.8 | | |
| 9.5 | 96.7 | | |
| 4.75 | 94.2 | | |
| 2.36 | 91.2 | | |
| 2.00 | 90.5 | | |
| 1.18 | 87.3 | | |
| 0.600 | 83.8 | | |
| 0.300 | 80.9 | | |
| 0.150 | 78.2 | | |
| 0.080 | 74.1 | | |
| 0.0294 | 64.5 | | |
| 0.0191 | 59.2 | | |
| 0.0112 | 55.6 | | |
| 0.0081 | 50.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.8% | $D_{10}$: | - |
| Sand: | 20.2% | $D_{30}$: | - |
| Silt: | 37.5% | $D_{60}$: | 0.0208 |
| Clay: | 36.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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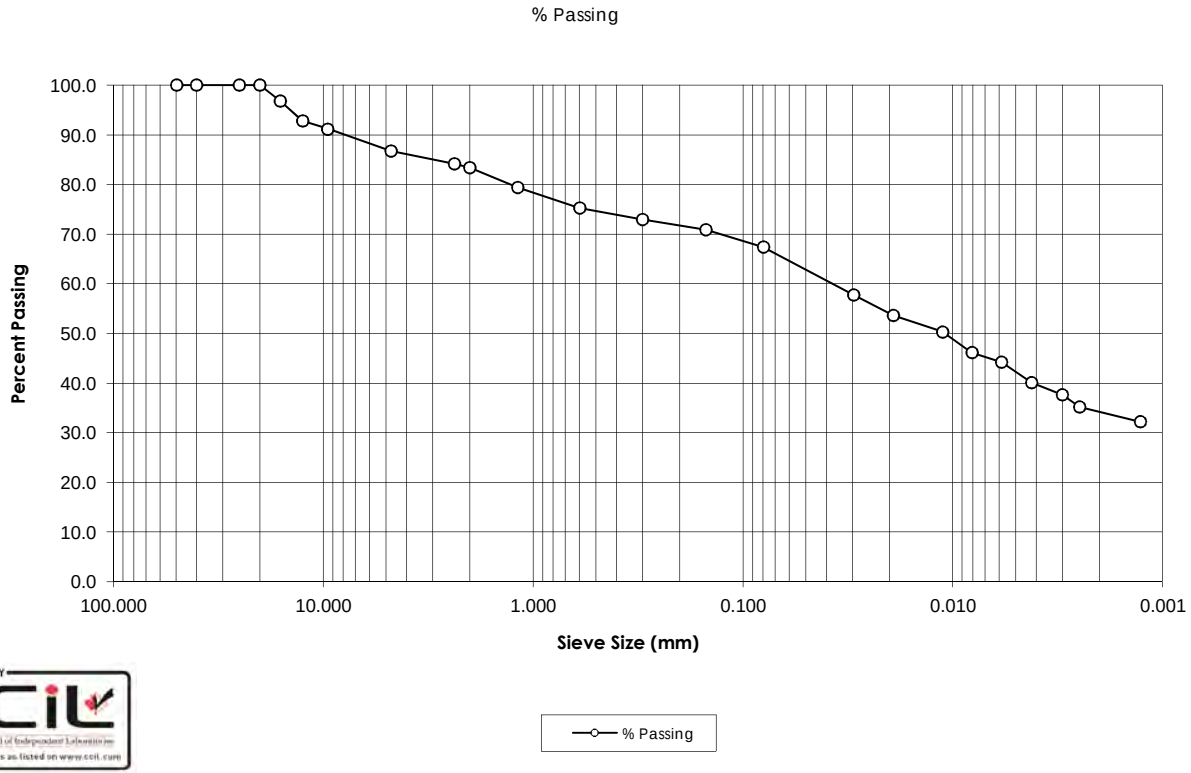
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS9
SOURCE: DC10
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: April 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 44.2 |
| 40.0 | 100.0 | 0.0042 | 40.1 |
| 25.0 | 100.0 | 0.0030 | 37.6 |
| 20.0 | 100.0 | 0.0025 | 35.1 |
| 16.0 | 96.8 | 0.0013 | 32.2 |
| 12.5 | 92.8 | | |
| 9.5 | 91.2 | | |
| 4.75 | 86.7 | | |
| 2.36 | 84.1 | | |
| 2.00 | 83.4 | | |
| 1.18 | 79.4 | | |
| 0.600 | 75.3 | | |
| 0.300 | 73.0 | | |
| 0.150 | 70.8 | | |
| 0.080 | 67.5 | | |
| 0.0296 | 57.8 | | |
| 0.0191 | 53.6 | | |
| 0.0112 | 50.3 | | |
| 0.0081 | 46.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 13.3% | $D_{10}$: | - |
| Sand: | 19.3% | $D_{30}$: | - |
| Silt: | 33.3% | $D_{60}$: | 0.0420 |
| Clay: | 34.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

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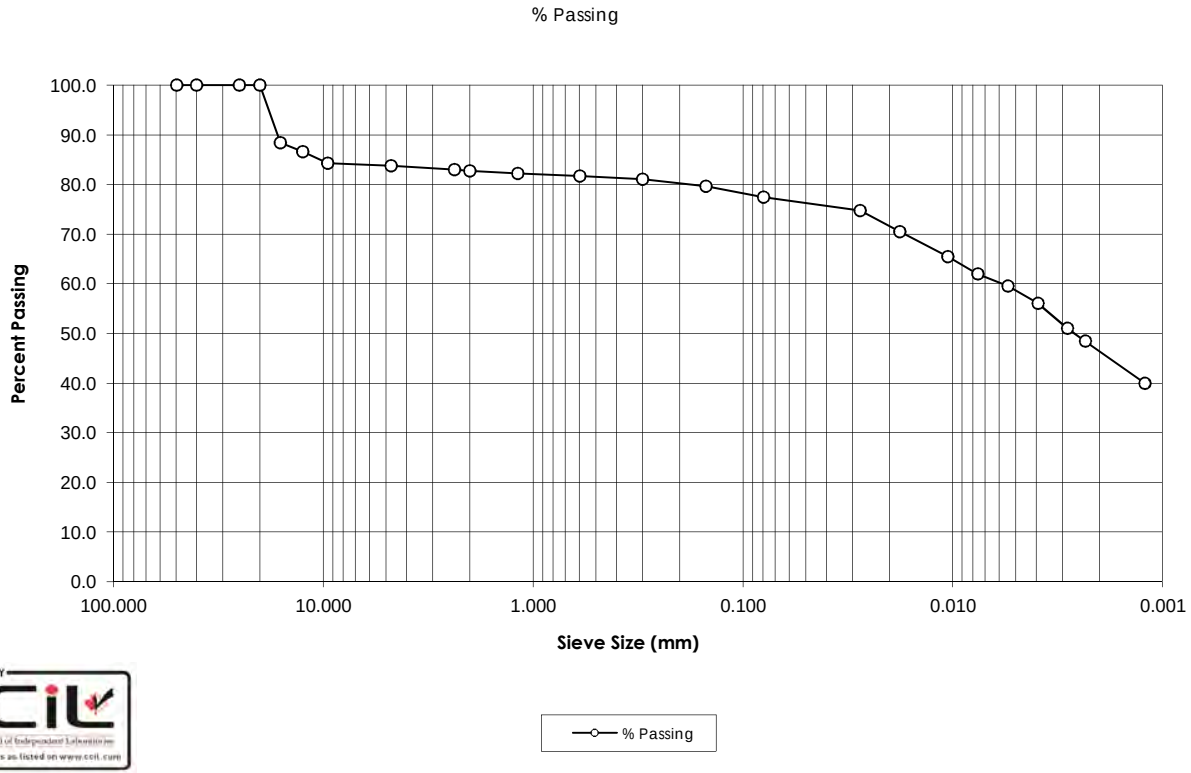
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS4
SOURCE: DC11
TESTED BY: M. Pilkington

DATE TESTED: June 1, 2016
DATE RECEIVED: May 18, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Gravel Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 59.5 |
| 40.0 | 100.0 | 0.0039 | 56.1 |
| 25.0 | 100.0 | 0.0028 | 51.0 |
| 20.0 | 100.0 | 0.0023 | 48.4 |
| 16.0 | 88.4 | 0.0012 | 39.9 |
| 12.5 | 86.6 | | |
| 9.5 | 84.3 | | |
| 4.75 | 83.7 | | |
| 2.36 | 83.0 | | |
| 2.00 | 82.8 | | |
| 1.18 | 82.3 | | |
| 0.600 | 81.8 | | |
| 0.300 | 81.1 | | |
| 0.150 | 79.7 | | |
| 0.080 | 77.5 | | |
| 0.0275 | 74.8 | | |
| 0.0178 | 70.5 | | |
| 0.0105 | 65.4 | | |
| 0.0076 | 62.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 16.3% | $D_{10}$: | - |
| Sand: | 6.3% | $D_{30}$: | - |
| Silt: | 31.0% | $D_{60}$: | 0.0059 |
| Clay: | 46.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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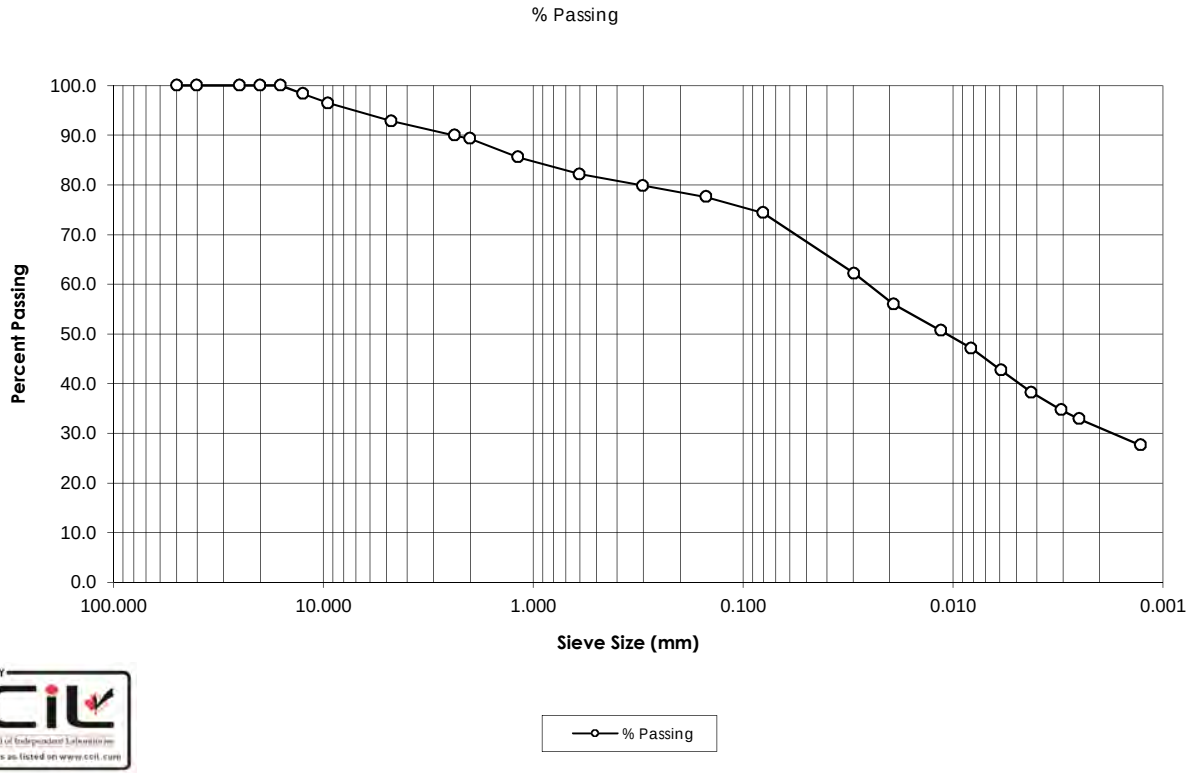
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS22
SOURCE: DC11
TESTED BY: B. Pelkey

DATE TESTED: November 2, 2016
DATE RECEIVED: May 27, 2016
SAMPLE DESCRIPTION: Clay (CI-CL), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 42.6 |
| 40.0 | 100.0 | 0.0042 | 38.2 |
| 25.0 | 100.0 | 0.0030 | 34.7 |
| 20.0 | 100.0 | 0.0025 | 32.9 |
| 16.0 | 100.0 | 0.0013 | 27.5 |
| 12.5 | 98.3 | | |
| 9.5 | 96.4 | | |
| 4.75 | 92.8 | | |
| 2.36 | 90.0 | | |
| 2.00 | 89.3 | | |
| 1.18 | 85.6 | | |
| 0.600 | 82.1 | | |
| 0.300 | 79.9 | | |
| 0.150 | 77.6 | | |
| 0.080 | 74.4 | | |
| 0.0296 | 62.2 | | |
| 0.0192 | 56.0 | | |
| 0.0114 | 50.6 | | |
| 0.0082 | 47.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.2% | $D_{10}$: | - |
| Sand: | 18.5% | $D_{30}$: | 0.0019 |
| Silt: | 43.3% | $D_{60}$: | 0.0260 |
| Clay: | 31.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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**LABORATORY**
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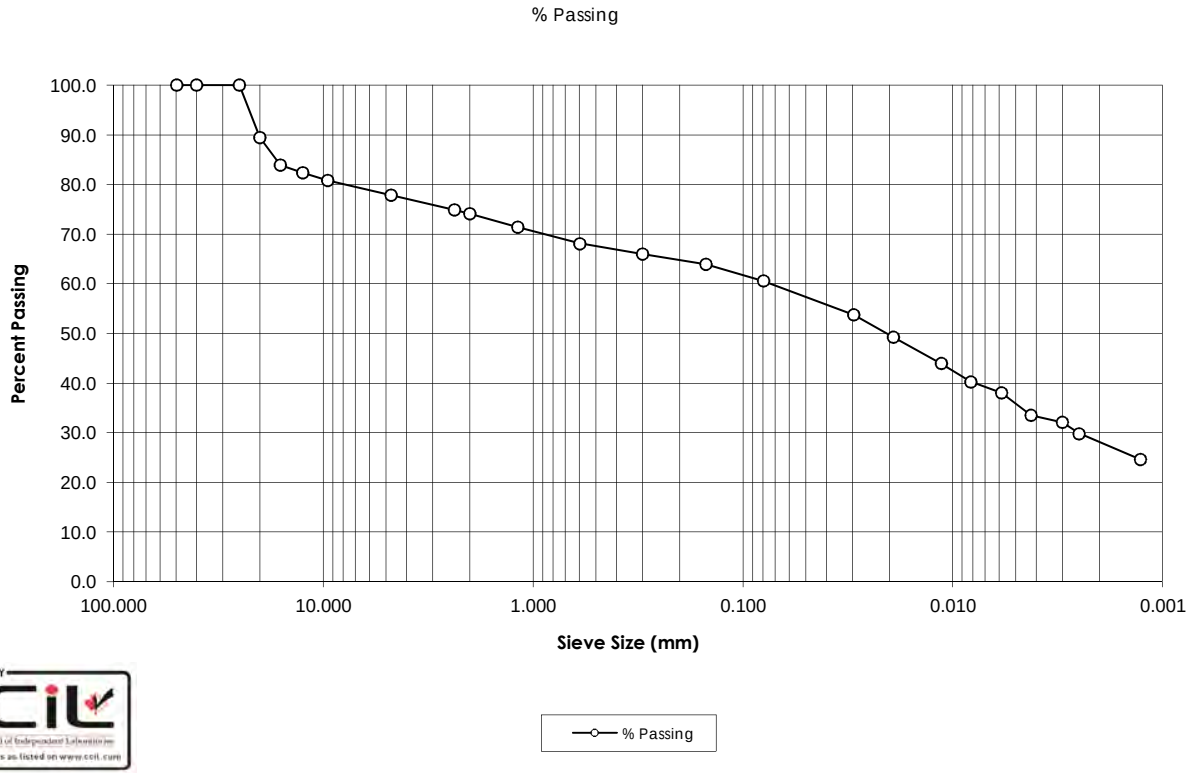
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

SAMPLE No.: SS20+SS21
SOURCE: DC11
TESTED BY: M. Pilkington

DATE TESTED: June 1, 2016
DATE RECEIVED: May 18, 2016
SAMPLE DESCRIPTION: Gravelly Clay (CI) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 38.0 |
| 40.0 | 100.0 | 0.0042 | 33.6 |
| 25.0 | 100.0 | 0.0030 | 32.1 |
| 20.0 | 89.4 | 0.0025 | 29.8 |
| 16.0 | 83.9 | 0.0013 | 24.6 |
| 12.5 | 82.3 | | |
| 9.5 | 80.8 | | |
| 4.75 | 77.8 | | |
| 2.36 | 74.9 | | |
| 2.00 | 74.1 | | |
| 1.18 | 71.4 | | |
| 0.600 | 68.1 | | |
| 0.300 | 66.0 | | |
| 0.150 | 63.9 | | |
| 0.080 | 60.6 | | |
| 0.0296 | 53.7 | | |
| 0.0192 | 49.2 | | |
| 0.0114 | 44.0 | | |
| 0.0082 | 40.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 22.2% | $D_{10}$: | - |
| Sand: | 17.3% | $D_{30}$: | 0.0025 |
| Silt: | 32.5% | $D_{60}$: | 0.0760 |
| Clay: | 28.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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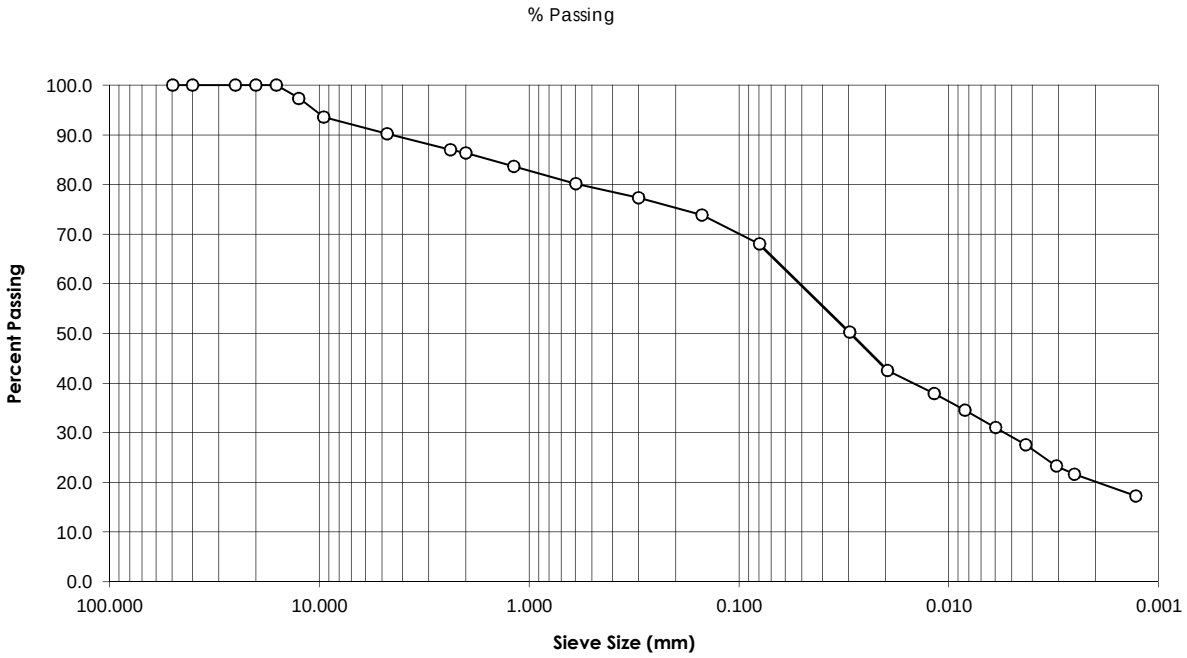
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS5
SOURCE: DC12
TESTED BY: B. Pelkey

DATE TESTED: June 30, 2016
DATE RECEIVED: May 27, 2016
SAMPLE DESCRIPTION: Sandy, Clayey Silt Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0060** | **31.1** |
| **40.0** | **100.0** | **0.0043** | **27.6** |
| **25.0** | **100.0** | **0.0031** | **23.3** |
| **20.0** | **100.0** | **0.0025** | **21.6** |
| **16.0** | **100.0** | **0.0013** | **17.3** |
| **12.5** | **97.4** | | |
| **9.5** | **93.5** | | |
| **4.75** | **90.2** | | |
| **2.36** | **87.0** | | |
| **2.00** | **86.3** | | |
| **1.18** | **83.7** | | |
| **0.600** | **80.2** | | |
| **0.300** | **77.4** | | |
| **0.150** | **73.8** | | |
| **0.080** | **68.1** | | |
| **0.0297** | **50.3** | | |
| **0.0196** | **42.6** | | |
| **0.0117** | **37.9** | | |
| **0.0084** | **34.5** | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.8% | $D_{10}$: | - |
| Sand: | 22.1% | $D_{30}$: | 0.0055 |
| Silt: | 48.0% | $D_{60}$: | 0.0590 |
| Clay: | 20.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size test results only



Reviewed by:

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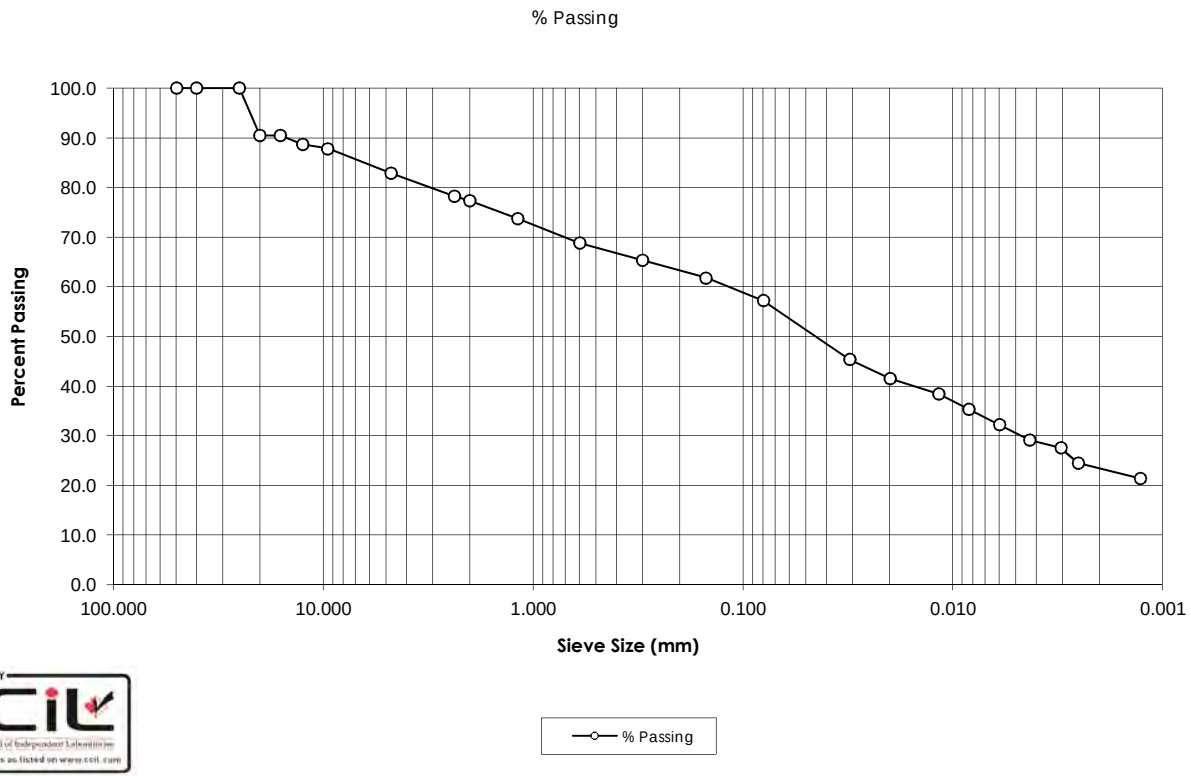
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS8+SS9
SOURCE: DC12
TESTED BY: C. Oost

DATE TESTED: July 4, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI-CL) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0060** | **32.2** |
| **40.0** | **100.0** | **0.0043** | **29.1** |
| **25.0** | **100.0** | **0.0031** | **27.6** |
| **20.0** | **90.5** | **0.0025** | **24.5** |
| **16.0** | **90.5** | **0.0013** | **21.4** |
| **12.5** | **88.7** | | |
| **9.5** | **87.8** | | |
| **4.75** | **82.8** | | |
| **2.36** | **78.3** | | |
| **2.00** | **77.4** | | |
| **1.18** | **73.8** | | |
| **0.600** | **68.8** | | |
| **0.300** | **65.4** | | |
| **0.150** | **61.8** | | |
| **0.080** | **57.2** | | |
| **0.0310** | **45.4** | | |
| **0.0199** | **41.5** | | |
| **0.0116** | **38.4** | | |
| **0.0084** | **35.3** | | |

| | | | |
|---|---|---|---|
| Gravel: | 17.2% | $D_{10}$: | - |
| Sand: | 25.6% | $D_{30}$: | 0.0048 |
| Silt: | 33.8% | $D_{60}$: | 0.1232 |
| Clay: | 23.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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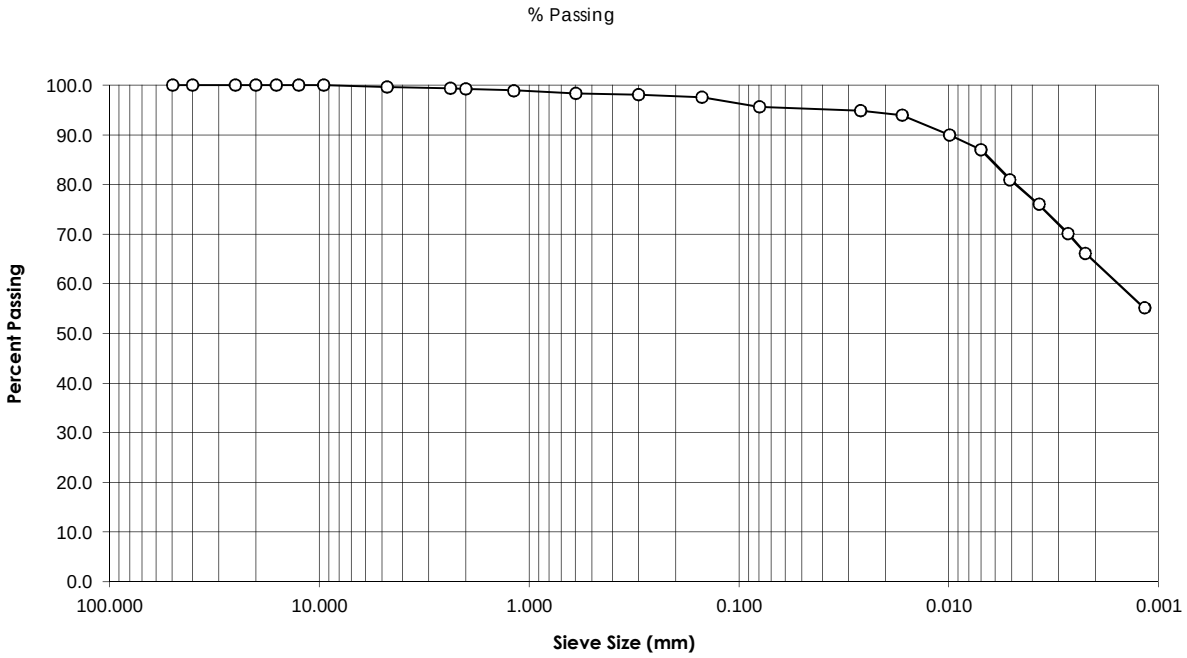
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS13
SOURCE: DC12
TESTED BY: C. Oost

DATE TESTED: July 4, 2016
DATE RECEIVED: May 27, 2016
SAMPLE DESCRIPTION: Clay (CI-CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 81.0 |
| 40.0 | 100.0 | 0.0037 | 76.1 |
| 25.0 | 100.0 | 0.0027 | 70.1 |
| 20.0 | 100.0 | 0.0022 | 66.1 |
| 16.0 | 100.0 | 0.0012 | 55.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.6 | | |
| 2.36 | 99.4 | | |
| 2.00 | 99.3 | | |
| 1.18 | 98.9 | | |
| 0.600 | 98.4 | | |
| 0.300 | 98.1 | | |
| 0.150 | 97.6 | | |
| 0.080 | 95.7 | | |
| 0.0262 | 94.9 | | |
| 0.0167 | 93.9 | | |
| 0.0099 | 90.0 | | |
| 0.0070 | 87.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 3.9% | $D_{30}$: | - |
| Silt: | 31.4% | $D_{60}$: | 0.0017 |
| Clay: | 64.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from the Grain Size and Atterberg Limits test results.

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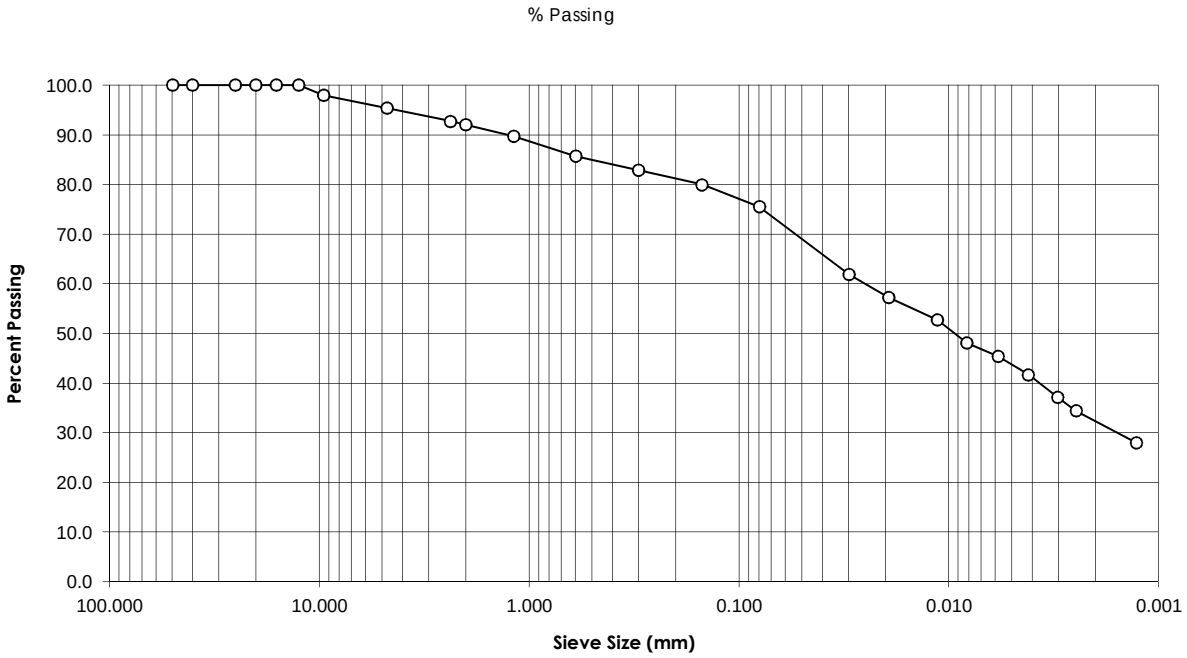
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS14+SS15
SOURCE: DC12
TESTED BY: C. Oost

DATE TESTED: July 4, 2016
DATE RECEIVED: May 27, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 45.4 |
| 40.0 | 100.0 | 0.0042 | 41.7 |
| 25.0 | 100.0 | 0.0030 | 37.1 |
| 20.0 | 100.0 | 0.0025 | 34.4 |
| 16.0 | 100.0 | 0.0013 | 28.0 |
| 12.5 | 100.0 | | |
| 9.5 | 98.0 | | |
| 4.75 | 95.4 | | |
| 2.36 | 92.7 | | |
| 2.00 | 92.1 | | |
| 1.18 | 89.7 | | |
| 0.600 | 85.7 | | |
| 0.300 | 82.9 | | |
| 0.150 | 80.0 | | |
| 0.080 | 75.6 | | |
| 0.0298 | 61.8 | | |
| 0.0192 | 57.3 | | |
| 0.0113 | 52.7 | | |
| 0.0082 | 48.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.6% | $D_{10}$: | - |
| Sand: | 19.9% | $D_{30}$: | 0.0017 |
| Silt: | 43.2% | $D_{60}$: | 0.0257 |
| Clay: | 32.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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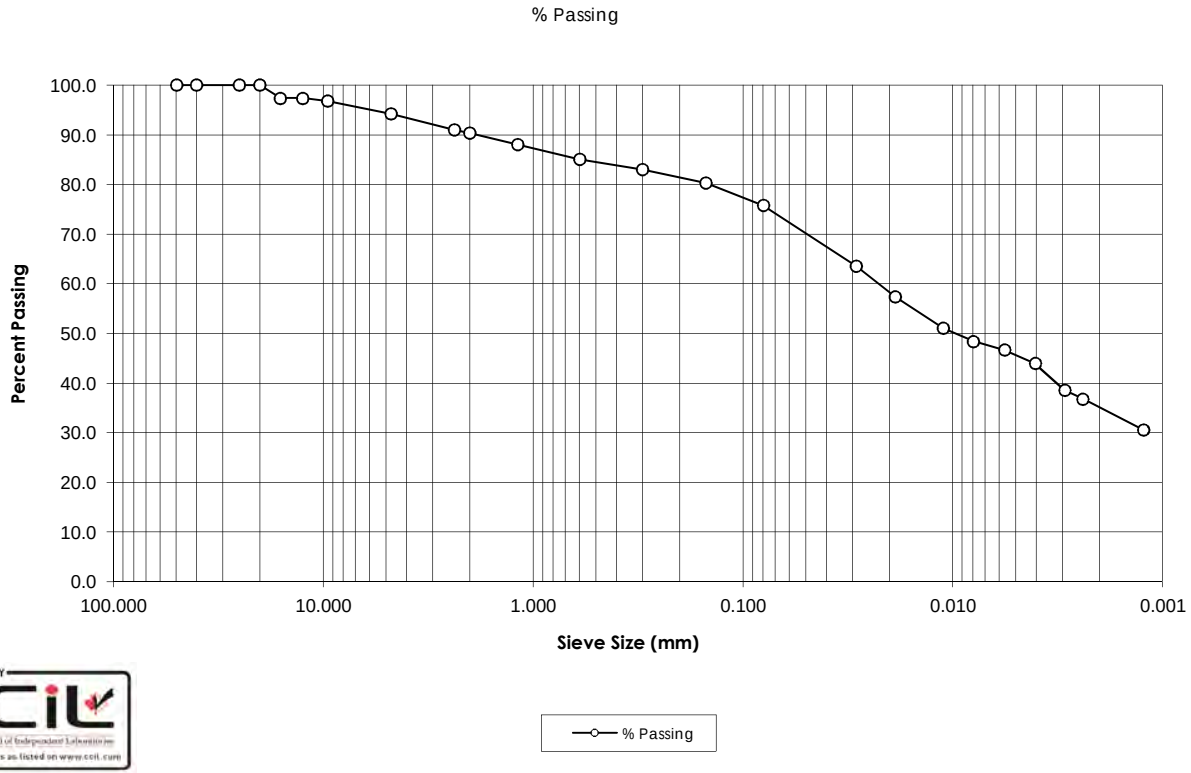
SAMPLE No.: BS17
SOURCE: DC12
TESTED BY: B. Pelkey

DATE TESTED: June 29, 2016
DATE RECEIVED: May 27, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 46.6 |
| 40.0 | 100.0 | 0.0040 | 43.9 |
| 25.0 | 100.0 | 0.0029 | 38.6 |
| 20.0 | 100.0 | 0.0024 | 36.8 |
| 16.0 | 97.4 | 0.0012 | 30.5 |
| 12.5 | 97.4 | | |
| 9.5 | 96.8 | | |
| 4.75 | 94.3 | | |
| 2.36 | 91.0 | | |
| 2.00 | 90.3 | | |
| 1.18 | 88.0 | | |
| 0.600 | 85.1 | | |
| 0.300 | 83.0 | | |
| 0.150 | 80.3 | | |
| 0.080 | 75.8 | | |
| 0.0287 | 63.6 | | |
| 0.0187 | 57.3 | | |
| 0.0111 | 51.1 | | |
| 0.0080 | 48.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.7% | $D_{10}$: | - |
| Sand: | 18.5% | $D_{30}$: | - |
| Silt: | 40.7% | $D_{60}$: | 0.0231 |
| Clay: | 35.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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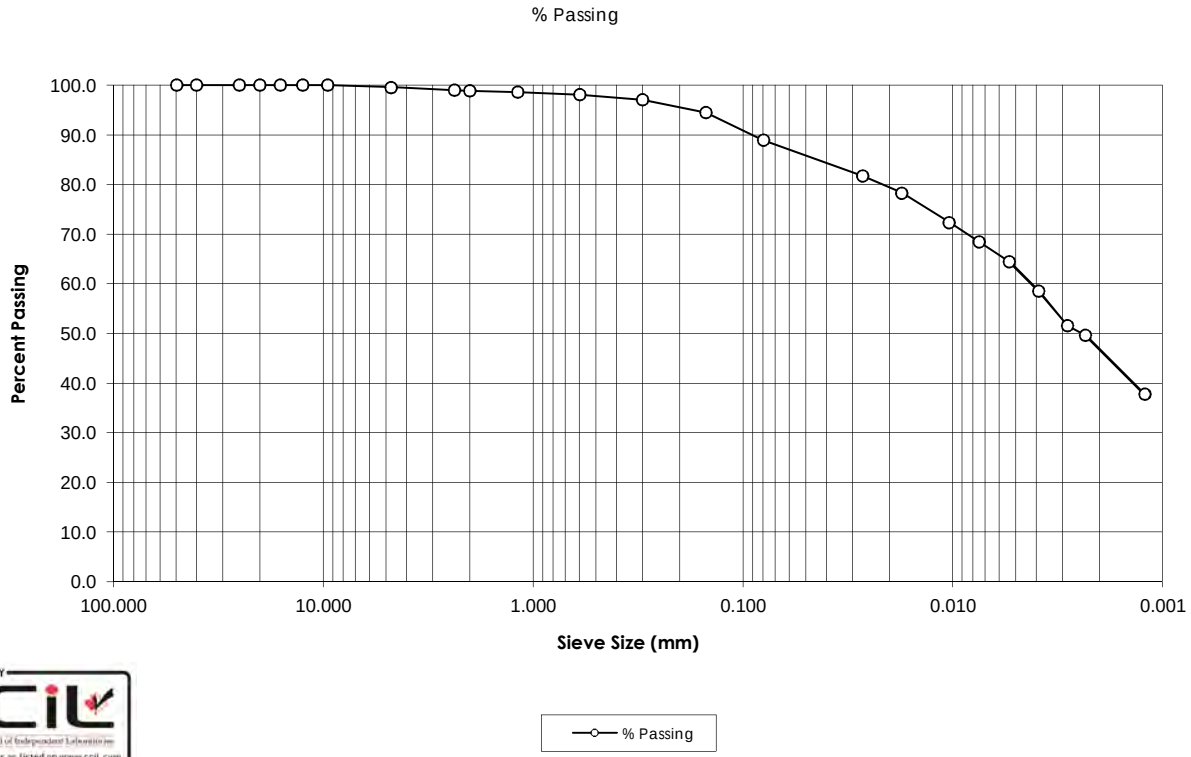
SAMPLE No.: SS2
SOURCE: DC12
TESTED BY: B. Pelkey

DATE TESTED: June 29, 2016
DATE RECEIVED: May 27, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 64.5 |
| 40.0 | 100.0 | 0.0039 | 58.5 |
| 25.0 | 100.0 | 0.0028 | 51.6 |
| 20.0 | 100.0 | 0.0023 | 49.6 |
| 16.0 | 100.0 | 0.0012 | 37.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.6 | | |
| 2.36 | 99.0 | | |
| 2.00 | 98.9 | | |
| 1.18 | 98.6 | | |
| 0.600 | 98.1 | | |
| 0.300 | 97.1 | | |
| 0.150 | 94.5 | | |
| 0.080 | 88.9 | | |
| 0.0269 | 81.7 | | |
| 0.0175 | 78.3 | | |
| 0.0104 | 72.4 | | |
| 0.0075 | 68.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 10.7% | $D_{30}$: | - |
| Silt: | 42.1% | $D_{60}$: | 0.0043 |
| Clay: | 46.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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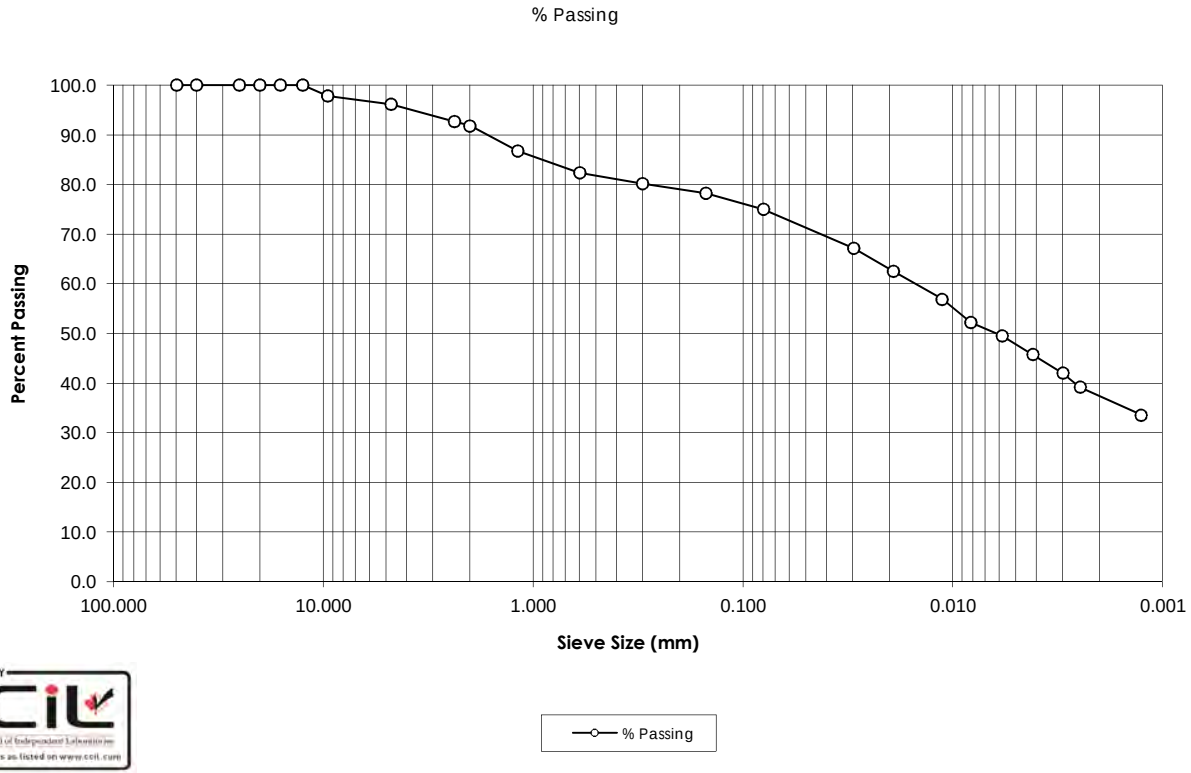
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS10+BS11
SOURCE: DC13
TESTED BY: M. Pilkington

DATE TESTED: June 1, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 49.5 |
| 40.0 | 100.0 | 0.0042 | 45.7 |
| 25.0 | 100.0 | 0.0030 | 42.0 |
| 20.0 | 100.0 | 0.0025 | 39.2 |
| 16.0 | 100.0 | 0.0013 | 33.6 |
| 12.5 | 100.0 | | |
| 9.5 | 97.8 | | |
| 4.75 | 96.2 | | |
| 2.36 | 92.7 | | |
| 2.00 | 91.8 | | |
| 1.18 | 86.8 | | |
| 0.600 | 82.4 | | |
| 0.300 | 80.2 | | |
| 0.150 | 78.3 | | |
| 0.080 | 75.1 | | |
| 0.0296 | 67.2 | | |
| 0.0191 | 62.5 | | |
| 0.0112 | 56.9 | | |
| 0.0082 | 52.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.8% | $D_{10}$: | - |
| Sand: | 21.1% | $D_{30}$: | - |
| Silt: | 37.6% | $D_{60}$: | 0.0157 |
| Clay: | 37.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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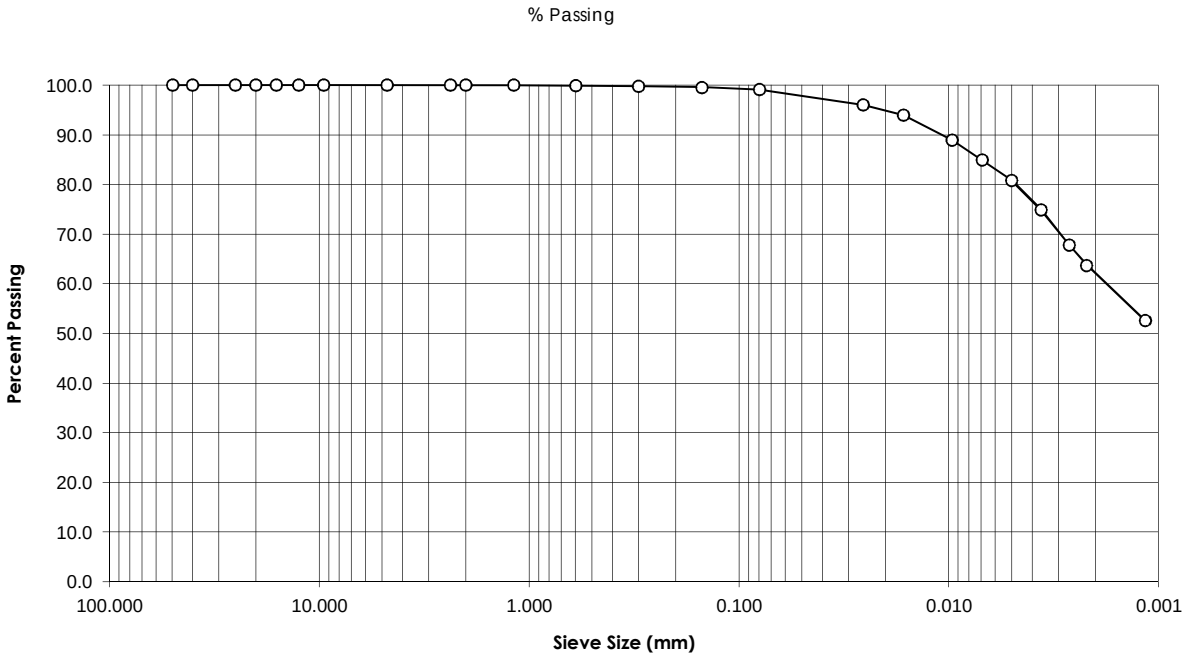
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST2
SOURCE: DC14
TESTED BY: B. Pelkey

DATE TESTED: June 27, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0050 | 80.9 |
| 40.0 | 100.0 | 0.0036 | 74.8 |
| 25.0 | 100.0 | 0.0027 | 67.8 |
| 20.0 | 100.0 | 0.0022 | 63.7 |
| 16.0 | 100.0 | 0.0012 | 52.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.8 | | |
| 0.150 | 99.6 | | |
| 0.080 | 99.1 | | |
| 0.0256 | 96.0 | | |
| 0.0164 | 94.0 | | |
| 0.0096 | 89.0 | | |
| 0.0069 | 84.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.9% | $D_{30}$: | - |
| Silt: | 37.1% | $D_{60}$: | 0.0019 |
| Clay: | 62.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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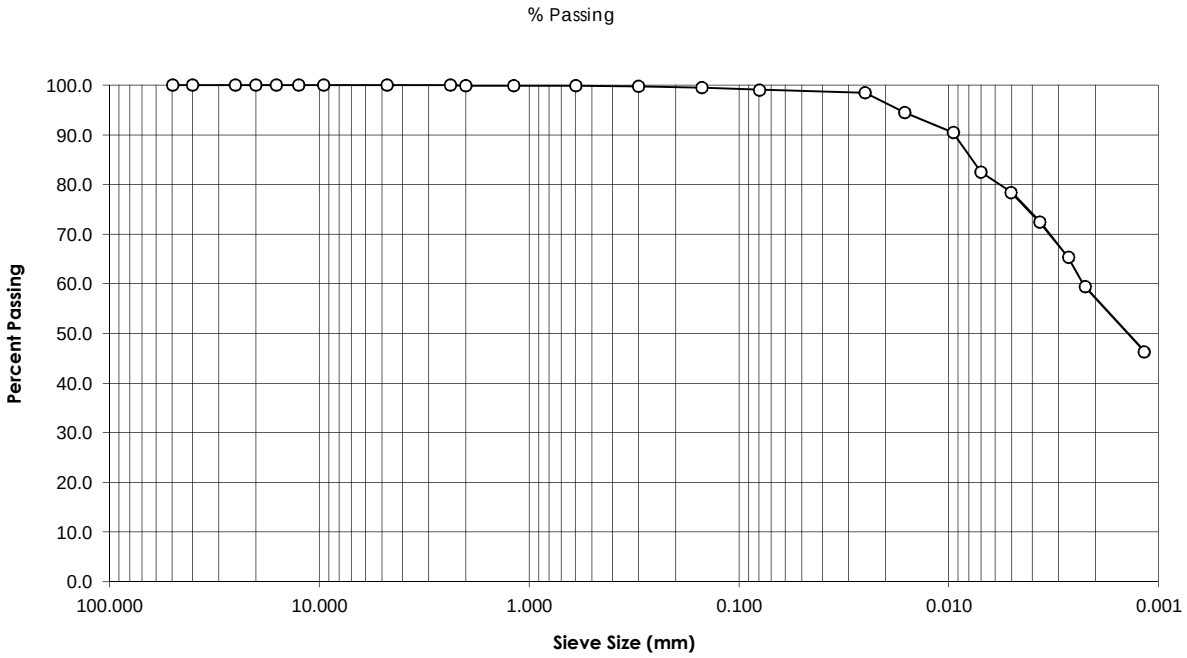
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST4
SOURCE: DC14
TESTED BY: B. Pelkey

DATE TESTED: June 27, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 78.4 |
| 40.0 | 100.0 | 0.0037 | 72.4 |
| 25.0 | 100.0 | 0.0027 | 65.4 |
| 20.0 | 100.0 | 0.0022 | 59.4 |
| 16.0 | 100.0 | 0.0012 | 46.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.8 | | |
| 0.150 | 99.5 | | |
| 0.080 | 99.1 | | |
| 0.0251 | 98.5 | | |
| 0.0162 | 94.5 | | |
| 0.0095 | 90.5 | | |
| 0.0070 | 82.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.9% | $D_{30}$: | - |
| Silt: | 42.0% | $D_{60}$: | 0.0023 |
| Clay: | 57.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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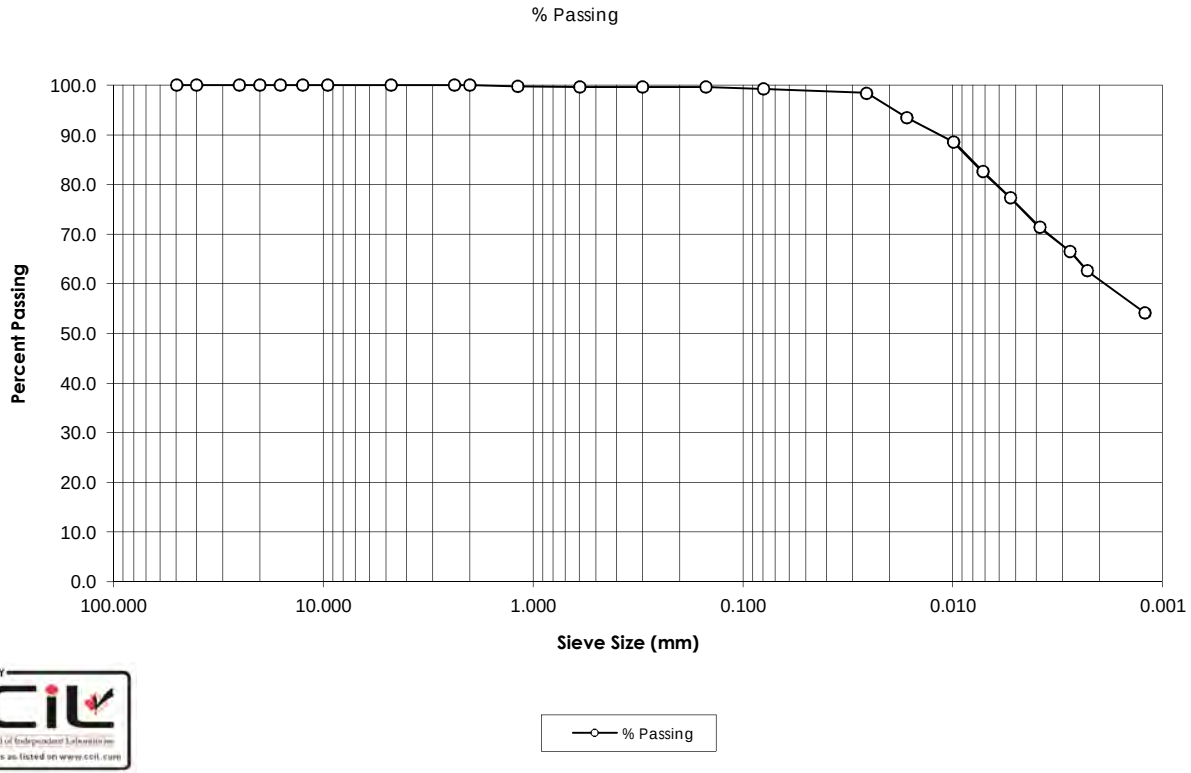
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSA
SOURCE: DC15
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: May 11, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 77.4 |
| 40.0 | 100.0 | 0.0038 | 71.5 |
| 25.0 | 100.0 | 0.0028 | 66.5 |
| 20.0 | 100.0 | 0.0023 | 62.6 |
| 16.0 | 100.0 | 0.0012 | 54.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 99.8 | | |
| 0.600 | 99.6 | | |
| 0.300 | 99.6 | | |
| 0.150 | 99.6 | | |
| 0.080 | 99.2 | | |
| 0.0257 | 98.4 | | |
| 0.0166 | 93.5 | | |
| 0.0099 | 88.6 | | |
| 0.0072 | 82.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.8% | $D_{30}$: | - |
| Silt: | 38.4% | $D_{60}$: | 0.0020 |
| Clay: | 60.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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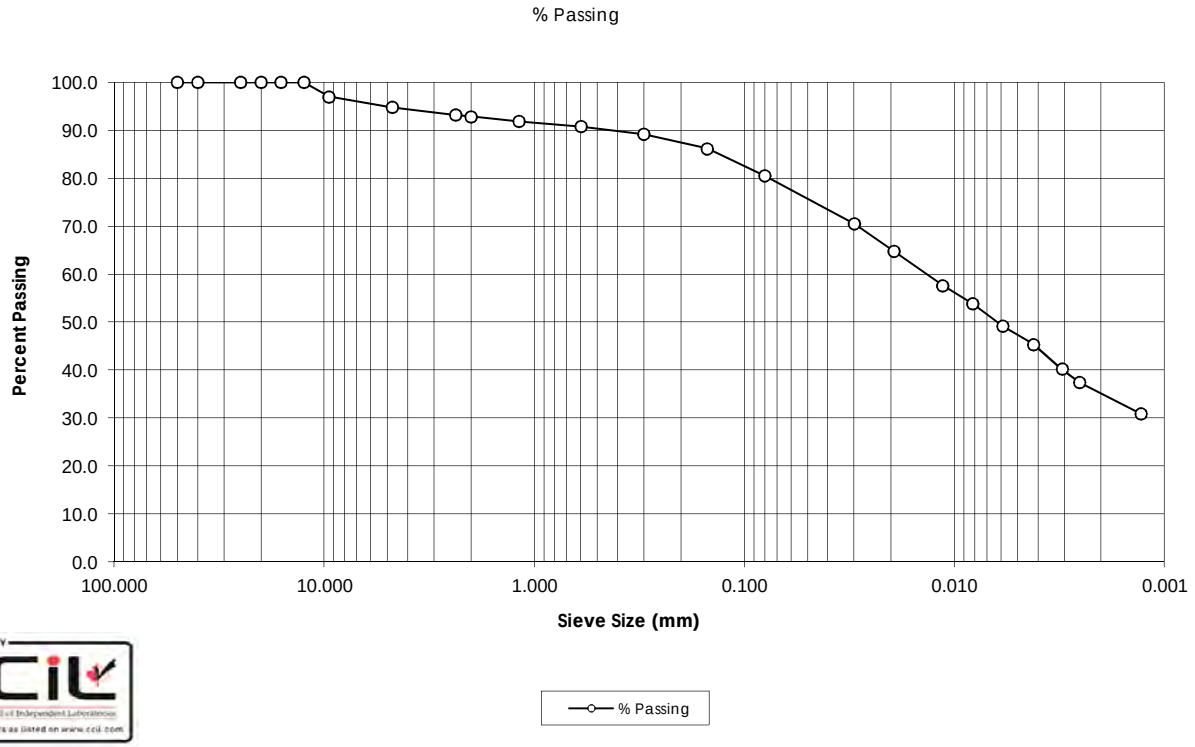
SAMPLE No.: BSB
SOURCE: DC15
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: May 11, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0059** | **49.1** |
| **40.0** | **100.0** | **0.0042** | **45.3** |
| **25.0** | **100.0** | **0.0031** | **40.2** |
| **20.0** | **100.0** | **0.0025** | **37.4** |
| **16.0** | **100.0** | **0.0013** | **30.8** |
| **12.5** | **100.0** | | |
| **9.5** | **97.0** | | |
| **4.75** | **94.7** | | |
| **2.36** | **93.3** | | |
| **2.00** | **92.9** | | |
| **1.18** | **91.9** | | |
| **0.600** | **90.8** | | |
| **0.300** | **89.2** | | |
| **0.150** | **86.2** | | |
| **0.080** | **80.5** | | |
| **0.0298** | **70.5** | | |
| **0.0193** | **64.8** | | |
| **0.0114** | **57.6** | | |
| **0.0082** | **53.8** | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.3% | $D_{10}$: | - |
| Sand: | 14.3% | $D_{30}$: | - |
| Silt: | 45.4% | $D_{60}$: | 0.0141 |
| Clay: | 35.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220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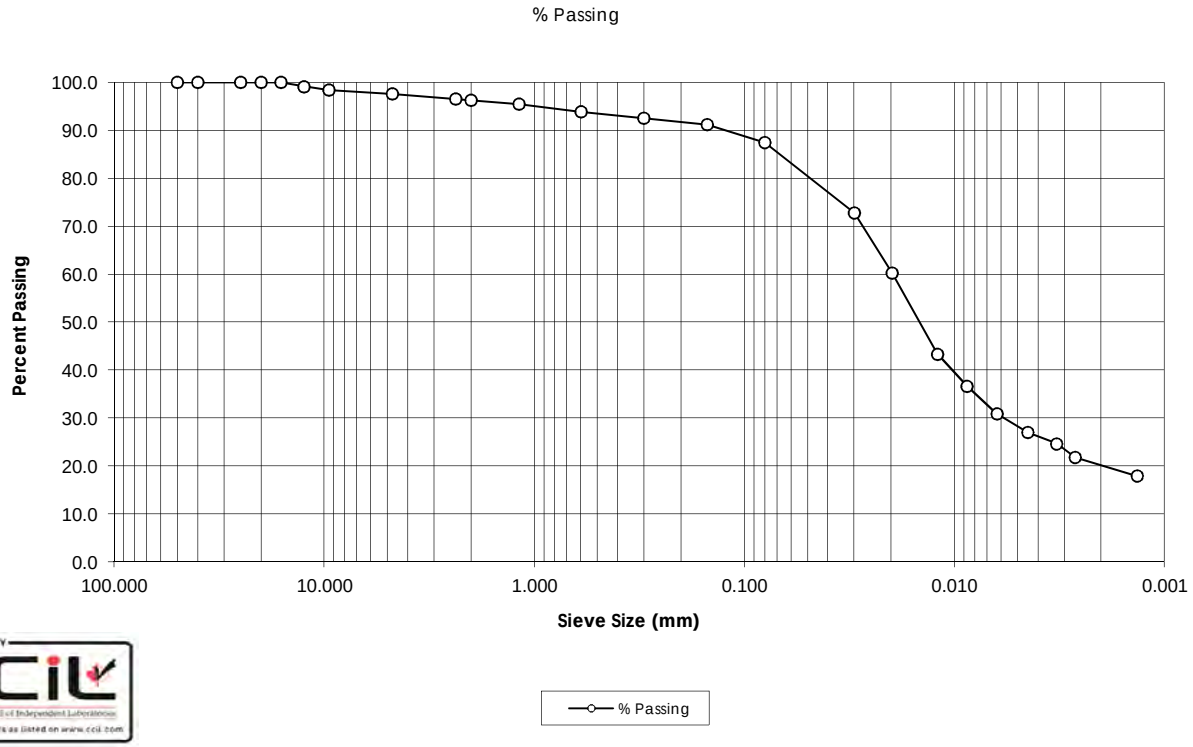
SAMPLE No.: BSC
SOURCE: DC15
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: May 11, 2016
SAMPLE DESCRIPTION: Silty Clay (CL-ML) Some Sand Trace Gravel




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0063** | **30.8** |
| **40.0** | **100.0** | **0.0045** | **27.0** |
| **25.0** | **100.0** | **0.0033** | **24.6** |
| **20.0** | **100.0** | **0.0027** | **21.8** |
| **16.0** | **100.0** | **0.0014** | **17.9** |
| **12.5** | **99.1** | | |
| **9.5** | **98.5** | | |
| **4.75** | **97.6** | | |
| **2.36** | **96.5** | | |
| **2.00** | **96.2** | | |
| **1.18** | **95.5** | | |
| **0.600** | **93.9** | | |
| **0.300** | **92.5** | | |
| **0.150** | **91.2** | | |
| **0.080** | **87.5** | | |
| **0.0298** | **72.8** | | |
| **0.0197** | **60.3** | | |
| **0.0120** | **43.3** | | |
| **0.0087** | **36.6** | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.4% | $D_{10}$: | - |
| Sand: | 10.2% | $D_{30}$: | 0.0059 |
| Silt: | 67.4% | $D_{60}$: | 0.0196 |
| Clay: | 20.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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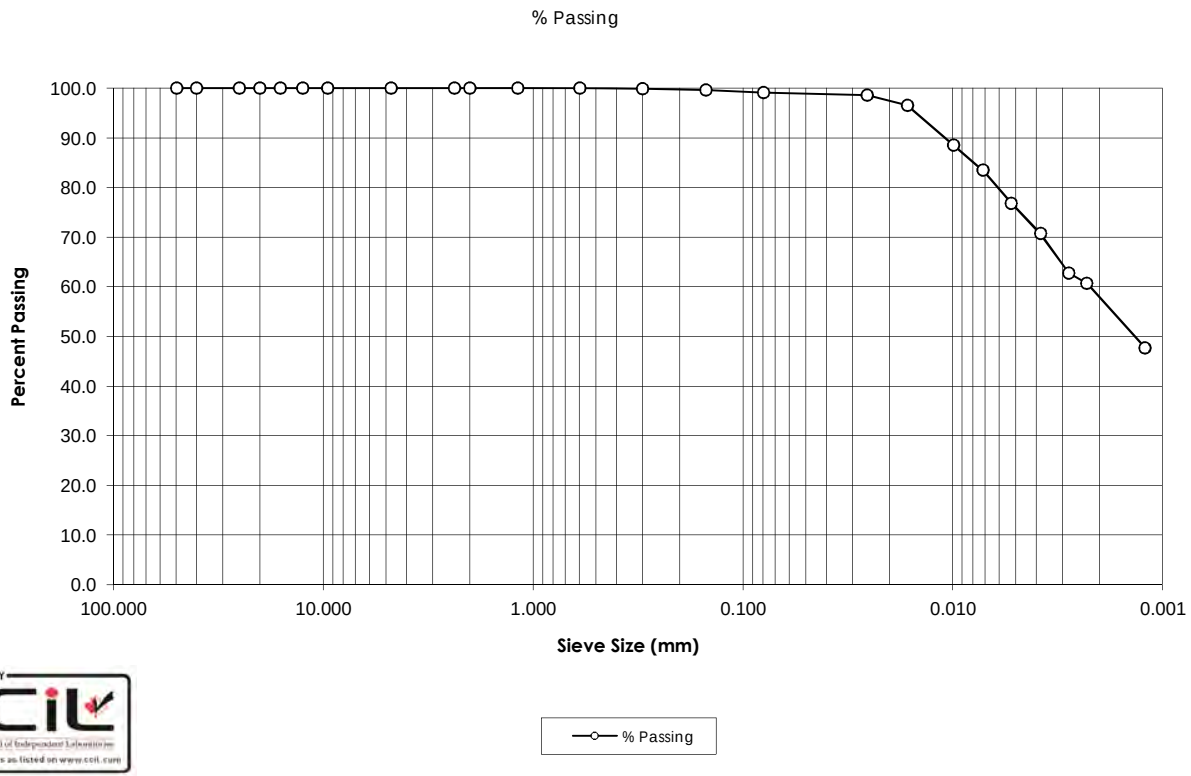
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST4
SOURCE: DC15
TESTED BY: M. Pilkington

DATE TESTED: May 30, 2016
DATE RECEIVED: May 16, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 76.9 |
| 40.0 | 100.0 | 0.0038 | 70.8 |
| 25.0 | 100.0 | 0.0028 | 62.8 |
| 20.0 | 100.0 | 0.0023 | 60.8 |
| 16.0 | 100.0 | 0.0012 | 47.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.7 | | |
| 0.080 | 99.1 | | |
| 0.0255 | 98.6 | | |
| 0.0164 | 96.6 | | |
| 0.0099 | 88.5 | | |
| 0.0072 | 83.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.9% | $D_{30}$: | - |
| Silt: | 41.2% | $D_{60}$: | 0.0022 |
| Clay: | 57.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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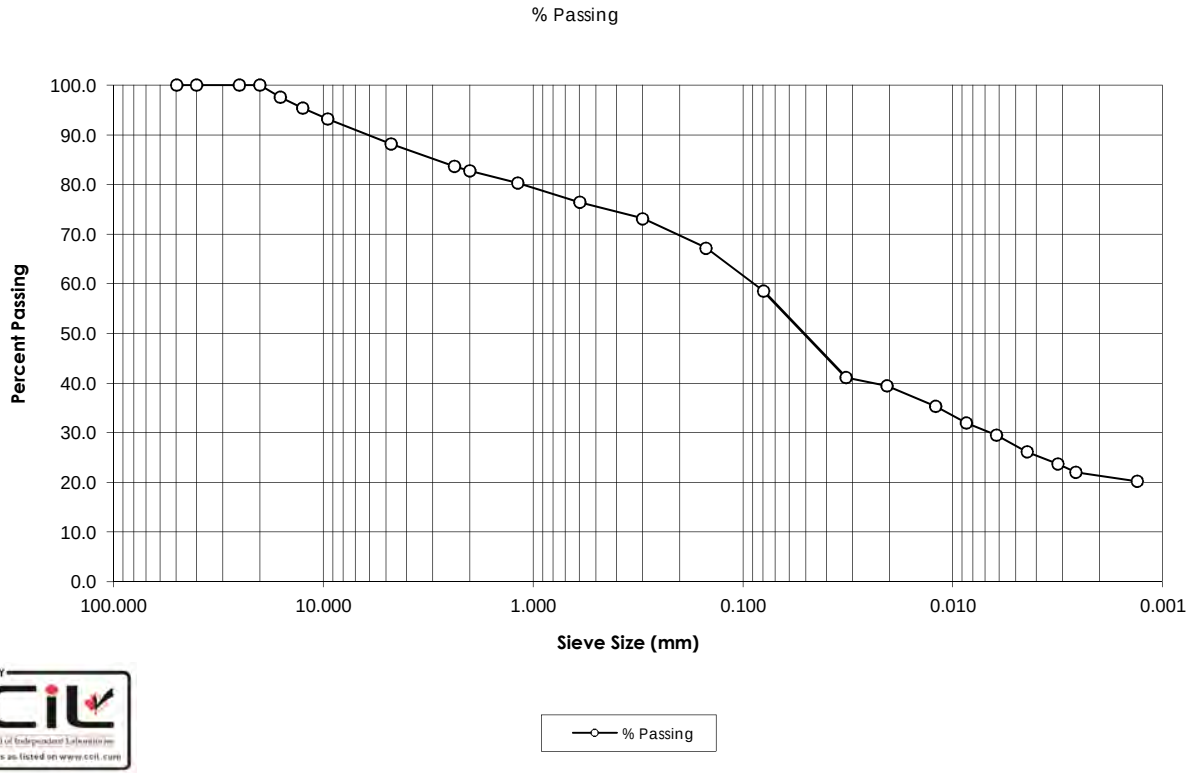
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS3
SOURCE: DC15A
TESTED BY: C. Oost

DATE TESTED: May 19, 2016
DATE RECEIVED: May 11, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0062** | **29.5** |
| **40.0** | **100.0** | **0.0044** | **26.2** |
| **25.0** | **100.0** | **0.0032** | **23.7** |
| **20.0** | **100.0** | **0.0026** | **22.1** |
| **16.0** | **97.5** | **0.0013** | **20.2** |
| **12.5** | **95.4** | | |
| **9.5** | **93.1** | | |
| **4.75** | **88.1** | | |
| **2.36** | **83.7** | | |
| **2.00** | **82.8** | | |
| **1.18** | **80.3** | | |
| **0.600** | **76.4** | | |
| **0.300** | **73.2** | | |
| **0.150** | **67.2** | | |
| **0.080** | **58.6** | | |
| **0.0322** | **41.1** | | |
| **0.0206** | **39.5** | | |
| **0.0120** | **35.3** | | |
| **0.0086** | **32.0** | | |

| | | | |
|---|---|---|---|
| Gravel: | 11.9% | $D_{10}$: | - |
| Sand: | 29.5% | $D_{30}$: | 0.0067 |
| Silt: | 37.2% | $D_{60}$: | 0.0922 |
| Clay: | 21.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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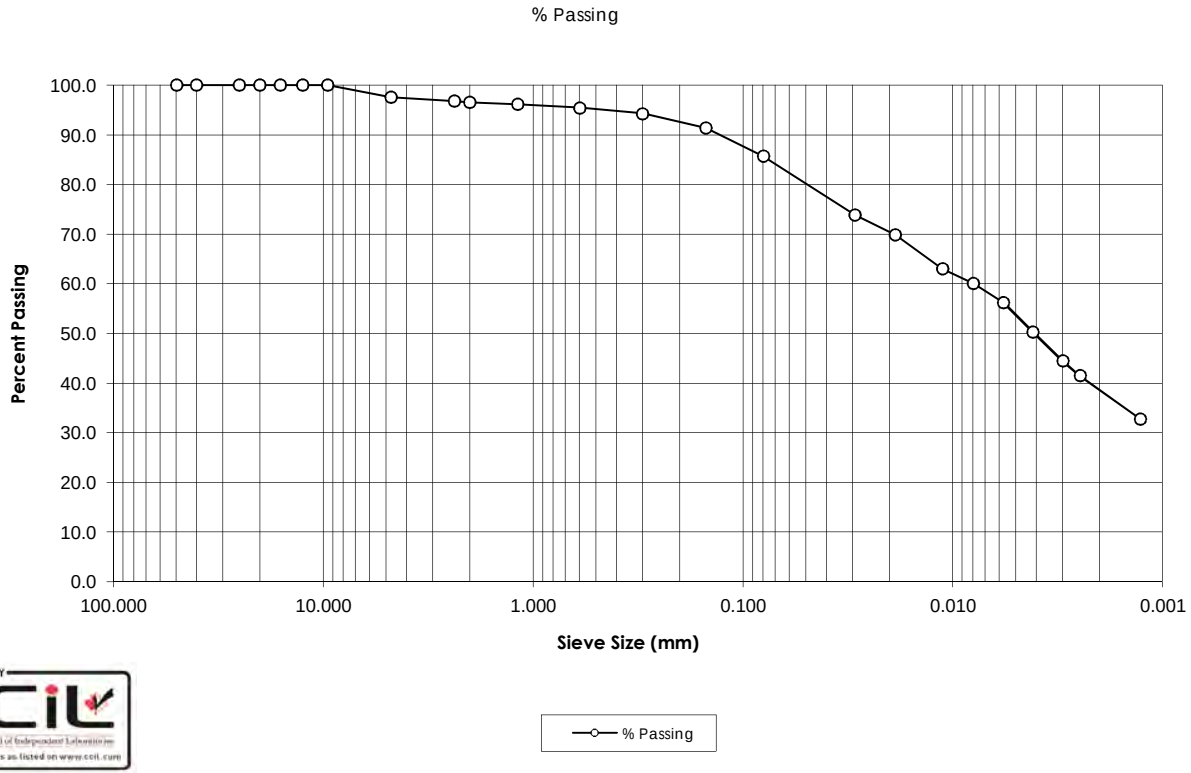
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS3
SOURCE: DC16
TESTED BY: M. Pilkington

DATE TESTED: May 27, 2016
DATE RECEIVED: May 16, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 56.2 |
| 40.0 | 100.0 | 0.0041 | 50.3 |
| 25.0 | 100.0 | 0.0030 | 44.4 |
| 20.0 | 100.0 | 0.0025 | 41.5 |
| 16.0 | 100.0 | 0.0013 | 32.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 97.6 | | |
| 2.36 | 96.8 | | |
| 2.00 | 96.6 | | |
| 1.18 | 96.1 | | |
| 0.600 | 95.5 | | |
| 0.300 | 94.3 | | |
| 0.150 | 91.4 | | |
| 0.080 | 85.7 | | |
| 0.0291 | 73.8 | | |
| 0.0187 | 69.9 | | |
| 0.0112 | 63.1 | | |
| 0.0080 | 60.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.4% | $D_{10}$: | - |
| Sand: | 11.9% | $D_{30}$: | - |
| Silt: | 47.0% | $D_{60}$: | 0.0079 |
| Clay: | 38.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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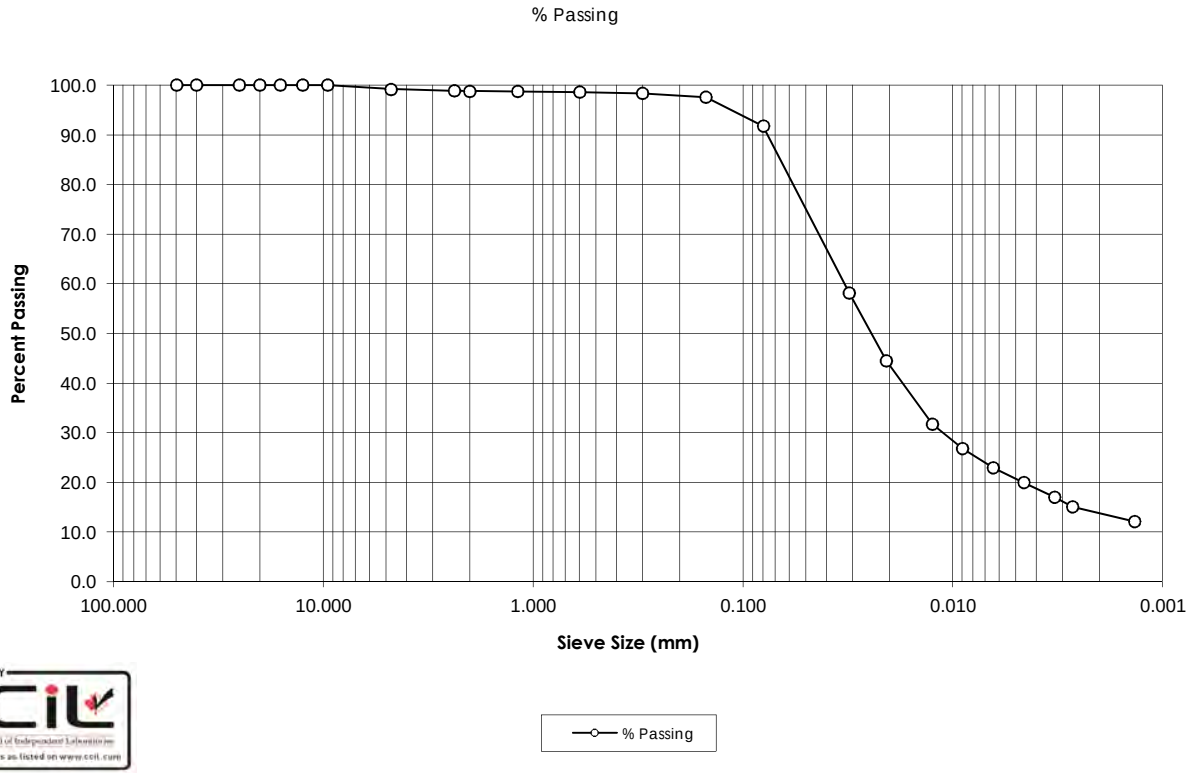
SAMPLE No.: BS07
SOURCE: DC16
TESTED BY: M. Pilkington

DATE TESTED: May 27, 2016
DATE RECEIVED: May 16, 2016
SAMPLE DESCRIPTION: Silt (ML) Trace Sand




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0064 | 22.9 |
| 40.0 | 100.0 | 0.0046 | 20.0 |
| 25.0 | 100.0 | 0.0033 | 17.0 |
| 20.0 | 100.0 | 0.0027 | 15.1 |
| 16.0 | 100.0 | 0.0014 | 12.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.2 | | |
| 2.36 | 98.9 | | |
| 2.00 | 98.8 | | |
| 1.18 | 98.7 | | |
| 0.600 | 98.6 | | |
| 0.300 | 98.3 | | |
| 0.150 | 97.6 | | |
| 0.080 | 91.8 | | |
| 0.0311 | 58.2 | | |
| 0.0207 | 44.5 | | |
| 0.0125 | 31.7 | | |
| 0.0089 | 26.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.8% | $D_{10}$: | - |
| Sand: | 7.3% | $D_{30}$: | 0.0113 |
| Silt: | 78.0% | $D_{60}$: | 0.0344 |
| Clay: | 13.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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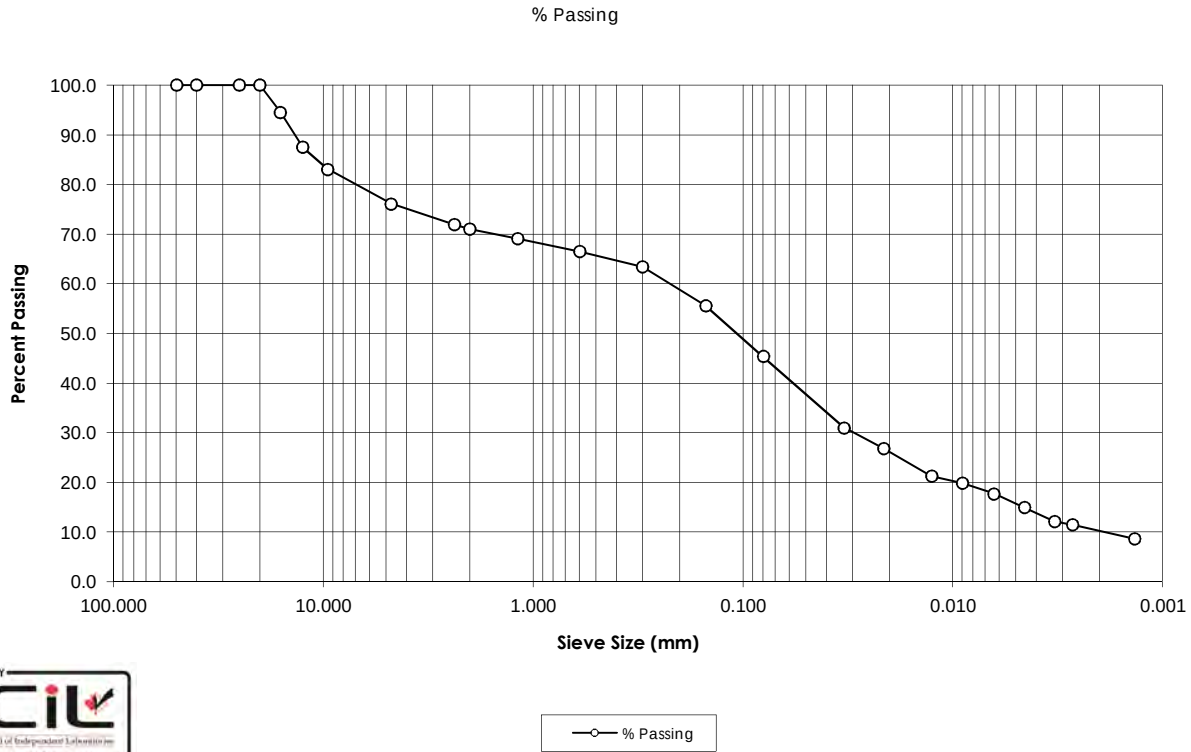
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS11
SOURCE: DC16
TESTED BY: M. Pilkington

DATE TESTED: May 27, 2016
DATE RECEIVED: May 16, 2016
SAMPLE DESCRIPTION: Sandy Gravelly Silty Clay (CL-ML)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0064 | 17.7 |
| 40.0 | 100.0 | 0.0046 | 14.9 |
| 25.0 | 100.0 | 0.0033 | 12.2 |
| 20.0 | 100.0 | 0.0027 | 11.5 |
| 16.0 | 94.5 | 0.0014 | 8.7 |
| 12.5 | 87.5 | | |
| 9.5 | 83.1 | | |
| 4.75 | 76.1 | | |
| 2.36 | 71.9 | | |
| 2.00 | 71.0 | | |
| 1.18 | 69.1 | | |
| 0.600 | 66.5 | | |
| 0.300 | 63.5 | | |
| 0.150 | 55.6 | | |
| 0.080 | 45.4 | | |
| 0.0329 | 31.0 | | |
| 0.0213 | 26.8 | | |
| 0.0126 | 21.2 | | |
| 0.0089 | 19.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 23.9% | $D_{10}$: | 0.0020 |
| Sand: | 30.8% | $D_{30}$: | 0.0303 |
| Silt: | 35.1% | $D_{60}$: | 0.2369 |
| Clay: | 10.3% | $C_u$: | 116.25 |
| | | $C_c$: | 1.90 |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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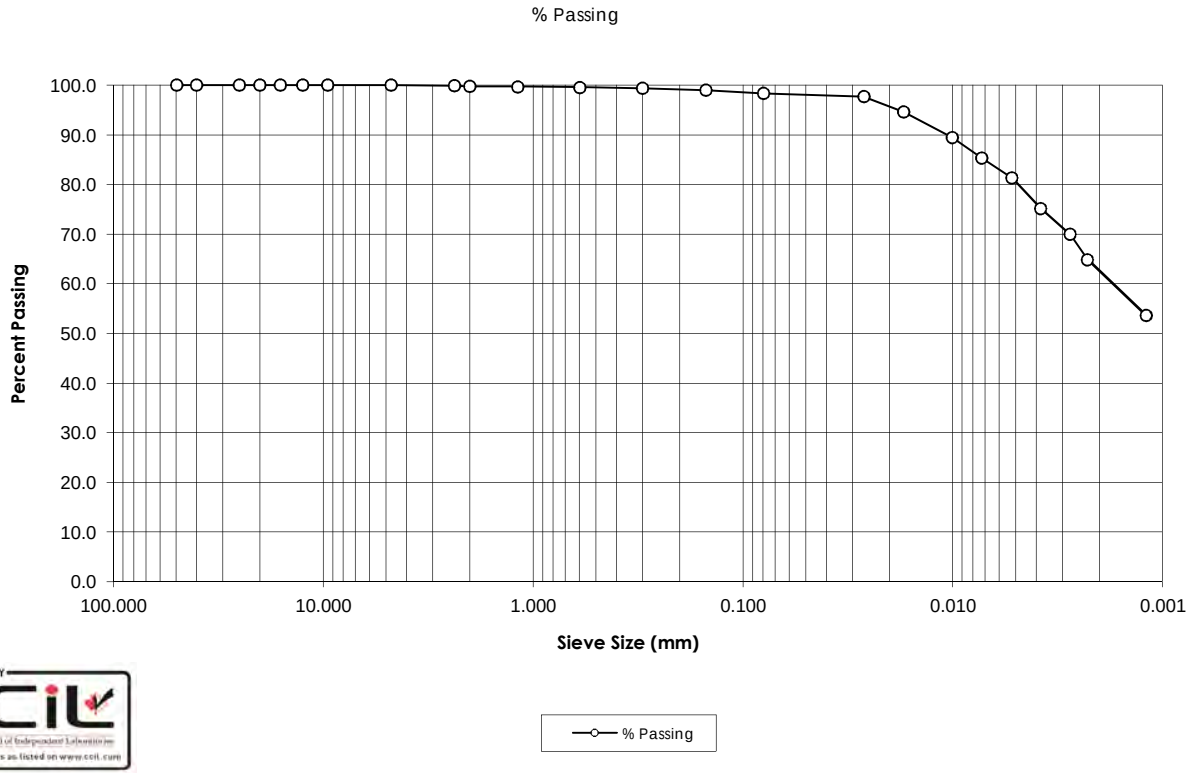
SAMPLE No.: BS1
SOURCE: DC17
TESTED BY: M. Pilkington

DATE TESTED: May 27, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 81.3 |
| 40.0 | 100.0 | 0.0038 | 75.1 |
| 25.0 | 100.0 | 0.0028 | 70.0 |
| 20.0 | 100.0 | 0.0023 | 64.9 |
| 16.0 | 100.0 | 0.0012 | 53.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.8 | | |
| 1.18 | 99.7 | | |
| 0.600 | 99.6 | | |
| 0.300 | 99.4 | | |
| 0.150 | 99.0 | | |
| 0.080 | 98.3 | | |
| 0.0265 | 97.7 | | |
| 0.0171 | 94.6 | | |
| 0.0101 | 89.5 | | |
| 0.0073 | 85.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.7% | $D_{30}$: | - |
| Silt: | 35.7% | $D_{60}$: | 0.0018 |
| Clay: | 62.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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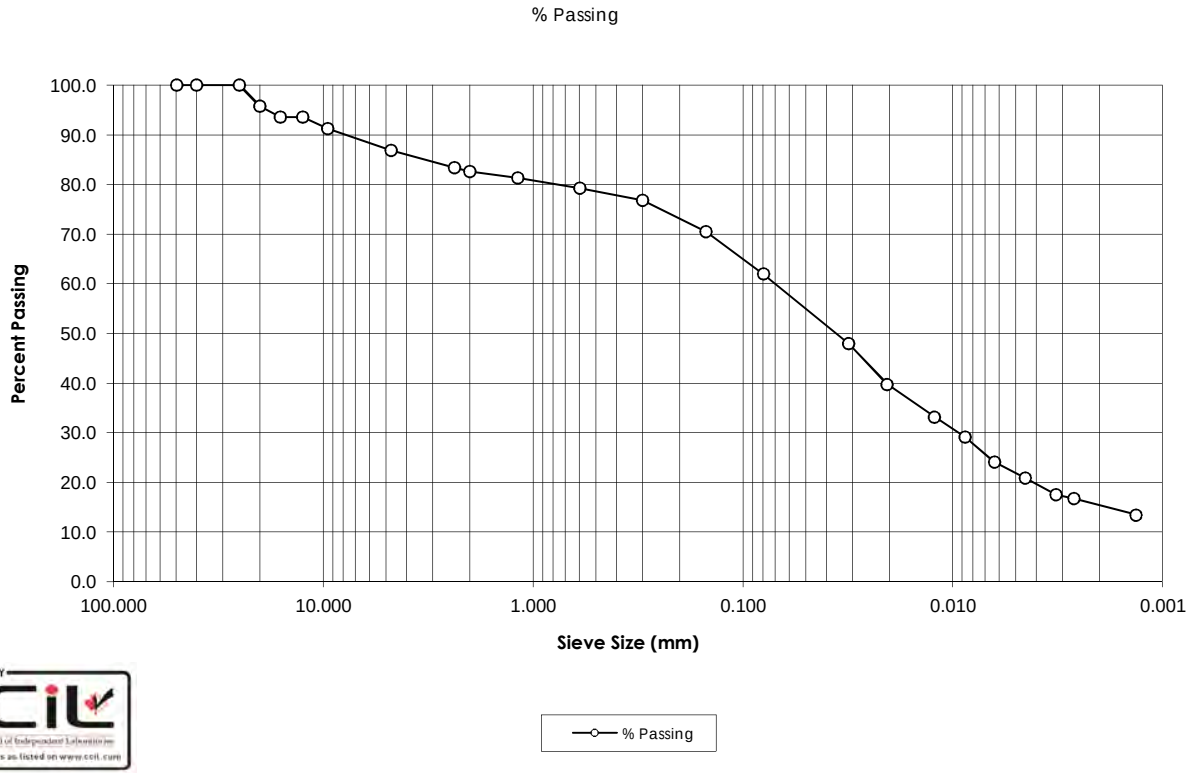
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS6
SOURCE: DC17
TESTED BY: M. Pilkington

DATE TESTED: May 27, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 24.2 |
| 40.0 | 100.0 | 0.0045 | 20.9 |
| 25.0 | 100.0 | 0.0032 | 17.6 |
| 20.0 | 95.7 | 0.0027 | 16.8 |
| 16.0 | 93.5 | 0.0013 | 13.5 |
| 12.5 | 93.5 | | |
| 9.5 | 91.3 | | |
| 4.75 | 86.8 | | |
| 2.36 | 83.4 | | |
| 2.00 | 82.6 | | |
| 1.18 | 81.3 | | |
| 0.600 | 79.2 | | |
| 0.300 | 76.8 | | |
| 0.150 | 70.5 | | |
| 0.080 | 62.0 | | |
| 0.0314 | 48.0 | | |
| 0.0206 | 39.8 | | |
| 0.0122 | 33.2 | | |
| 0.0087 | 29.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 13.2% | $D_{10}$: | - |
| Sand: | 24.8% | $D_{30}$: | 0.0096 |
| Silt: | 46.6% | $D_{60}$: | 0.0738 |
| Clay: | 15.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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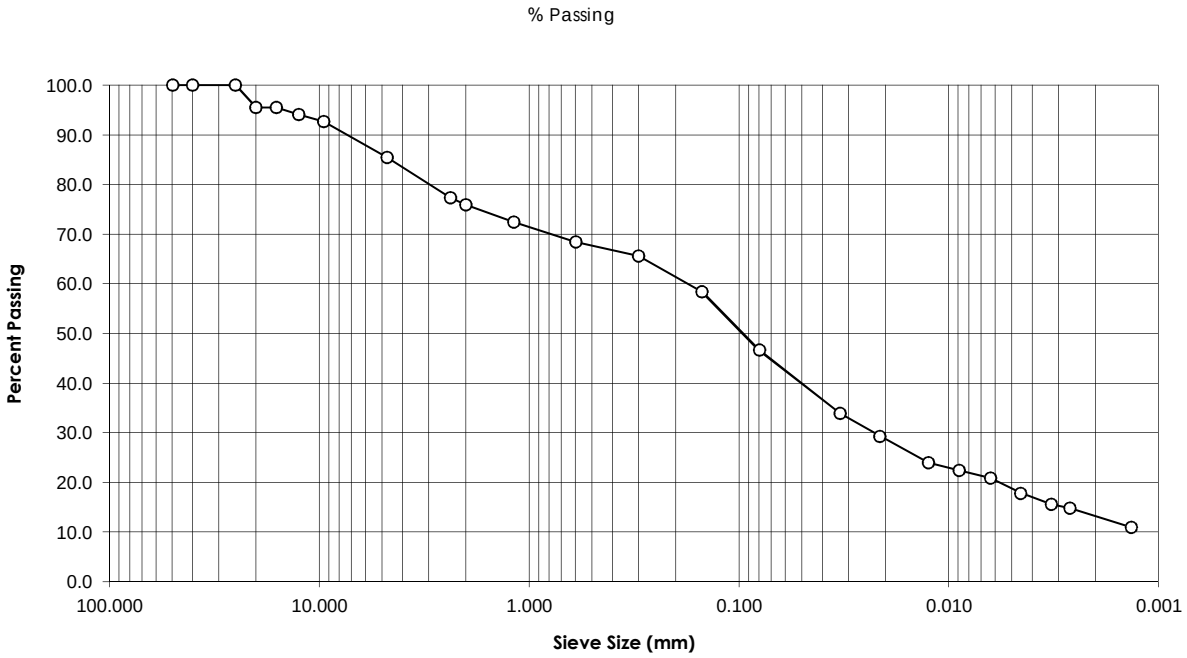
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS10
SOURCE: DC17
TESTED BY: M. Pilkington

DATE TESTED: May 27, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Clay (CL) and Sand Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 20.9 |
| 40.0 | 100.0 | 0.0045 | 17.9 |
| 25.0 | 100.0 | 0.0032 | 15.6 |
| 20.0 | 95.5 | 0.0027 | 14.8 |
| 16.0 | 95.5 | 0.0013 | 11.0 |
| 12.5 | 94.1 | | |
| 9.5 | 92.7 | | |
| 4.75 | 85.5 | | |
| 2.36 | 77.4 | | |
| 2.00 | 75.9 | | |
| 1.18 | 72.5 | | |
| 0.600 | 68.5 | | |
| 0.300 | 65.7 | | |
| 0.150 | 58.4 | | |
| 0.080 | 46.6 | | |
| 0.0329 | 33.9 | | |
| 0.0213 | 29.3 | | |
| 0.0125 | 24.0 | | |
| 0.0089 | 22.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 14.5% | $D_{10}$: | - |
| Sand: | 38.9% | $D_{30}$: | 0.0231 |
| Silt: | 33.4% | $D_{60}$: | 0.1852 |
| Clay: | 13.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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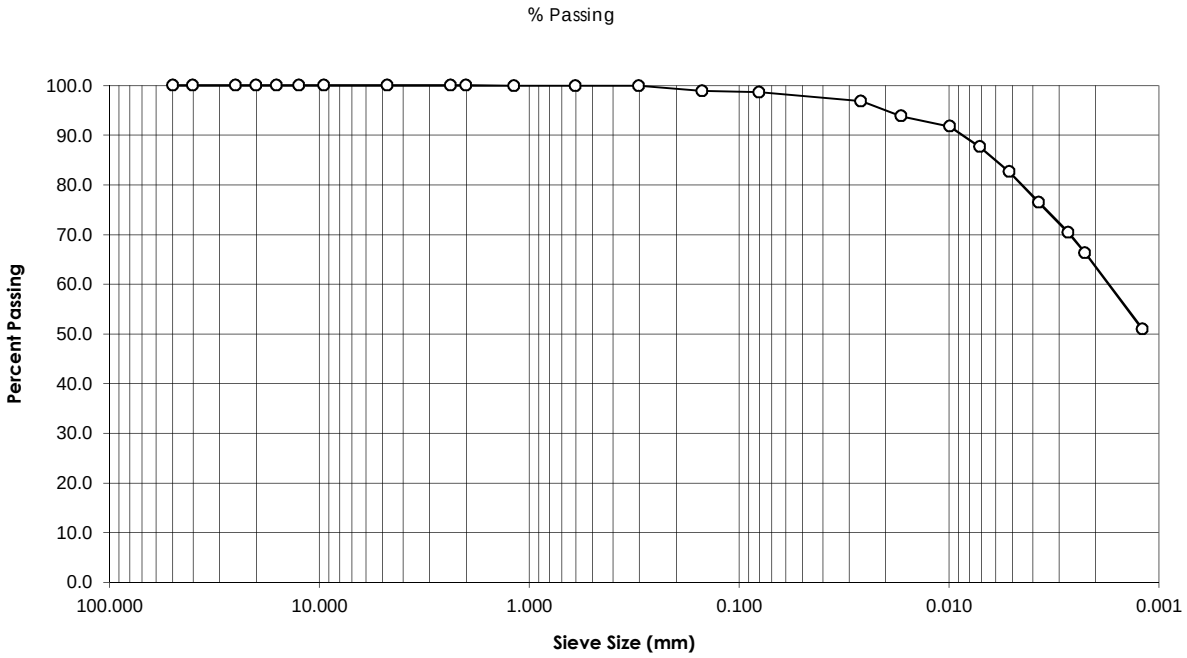
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSA1
SOURCE: DC18
TESTED BY: B.Pelkey

DATE TESTED: November 2, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 82.6 |
| 40.0 | 100.0 | 0.0037 | 76.5 |
| 25.0 | 100.0 | 0.0027 | 70.3 |
| 20.0 | 100.0 | 0.0023 | 66.3 |
| 16.0 | 100.0 | 0.0012 | 51.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.9 | | |
| 0.150 | 98.9 | | |
| 0.080 | 98.6 | | |
| 0.0262 | 96.8 | | |
| 0.0169 | 93.8 | | |
| 0.0099 | 91.7 | | |
| 0.0071 | 87.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.4% | $D_{30}$: | - |
| Silt: | 35.2% | $D_{60}$: | 0.0019 |
| Clay: | 63.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:**

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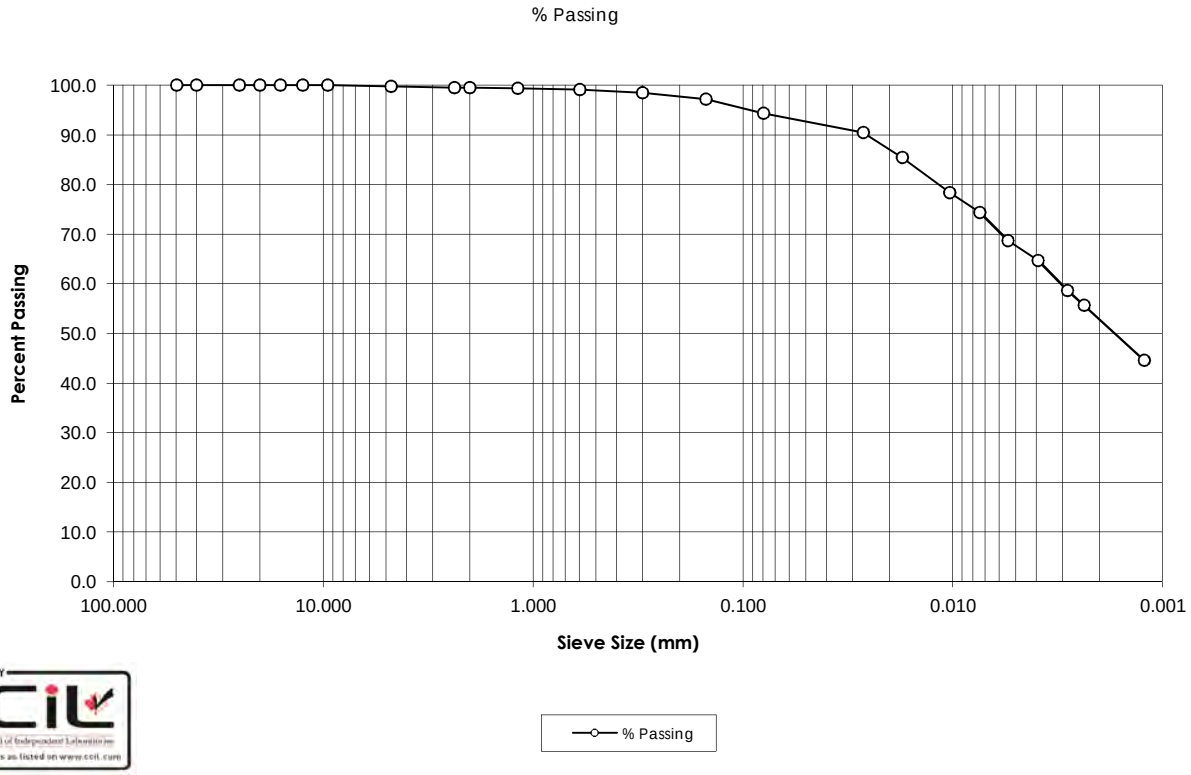
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST2
SOURCE: DC18
TESTED BY: M. Pilkington

DATE TESTED: May 30, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Clay (CH-CL) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 68.7 |
| 40.0 | 100.0 | 0.0039 | 64.7 |
| 25.0 | 100.0 | 0.0028 | 58.7 |
| 20.0 | 100.0 | 0.0024 | 55.7 |
| 16.0 | 100.0 | 0.0012 | 44.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.8 | | |
| 2.36 | 99.6 | | |
| 2.00 | 99.6 | | |
| 1.18 | 99.4 | | |
| 0.600 | 99.1 | | |
| 0.300 | 98.5 | | |
| 0.150 | 97.1 | | |
| 0.080 | 94.3 | | |
| 0.0267 | 90.5 | | |
| 0.0174 | 85.4 | | |
| 0.0103 | 78.4 | | |
| 0.0074 | 74.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 5.4% | $D_{30}$: | - |
| Silt: | 41.4% | $D_{60}$: | 0.0031 |
| Clay: | 52.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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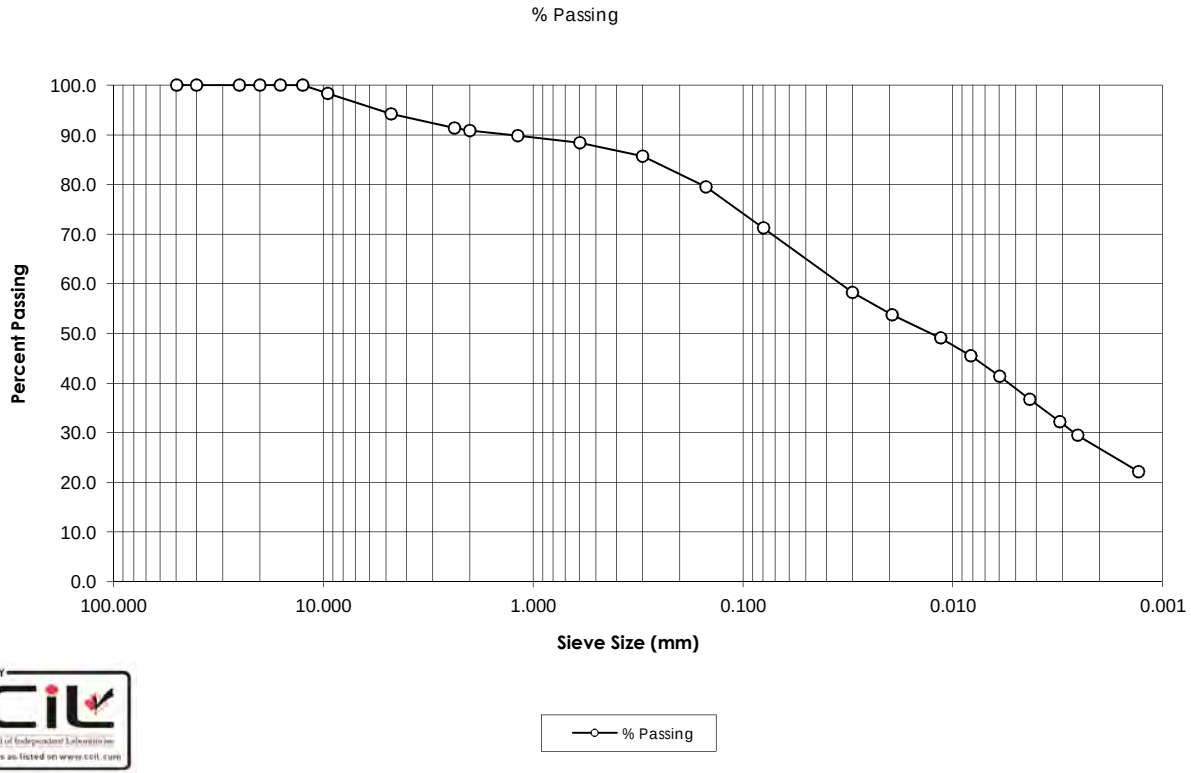
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST5
SOURCE: DC18
TESTED BY: M. Pilkington

DATE TESTED: May 30, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL-CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 41.3 |
| 40.0 | 100.0 | 0.0043 | 36.8 |
| 25.0 | 100.0 | 0.0031 | 32.2 |
| 20.0 | 100.0 | 0.0025 | 29.5 |
| 16.0 | 100.0 | 0.0013 | 22.2 |
| 12.5 | 100.0 | | |
| 9.5 | 98.3 | | |
| 4.75 | 94.2 | | |
| 2.36 | 91.4 | | |
| 2.00 | 90.9 | | |
| 1.18 | 89.8 | | |
| 0.600 | 88.4 | | |
| 0.300 | 85.7 | | |
| 0.150 | 79.5 | | |
| 0.080 | 71.3 | | |
| 0.0300 | 58.3 | | |
| 0.0194 | 53.7 | | |
| 0.0114 | 49.2 | | |
| 0.0082 | 45.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.8% | $D_{10}$: | - |
| Sand: | 22.9% | $D_{30}$: | 0.0026 |
| Silt: | 44.4% | $D_{60}$: | 0.0373 |
| Clay: | 26.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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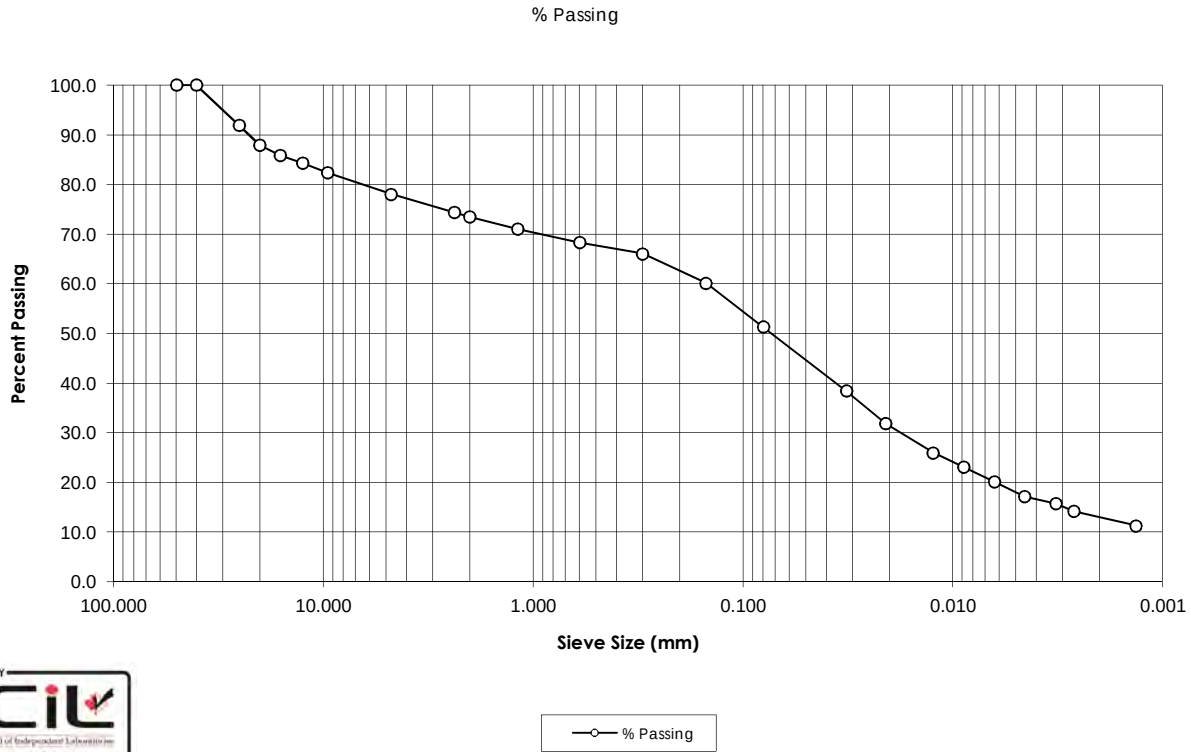
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS7
SOURCE: DC18
TESTED BY: M. Pilkington

DATE TESTED: May 27, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Sandy Gravelly Silty Clay (CL-ML)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 20.1 |
| 40.0 | 100.0 | 0.0045 | 17.2 |
| 25.0 | 92.0 | 0.0032 | 15.7 |
| 20.0 | 87.9 | 0.0027 | 14.2 |
| 16.0 | 85.9 | 0.0013 | 11.3 |
| 12.5 | 84.3 | | |
| 9.5 | 82.4 | | |
| 4.75 | 78.1 | | |
| 2.36 | 74.3 | | |
| 2.00 | 73.5 | | |
| 1.18 | 71.0 | | |
| 0.600 | 68.3 | | |
| 0.300 | 66.1 | | |
| 0.150 | 60.1 | | |
| 0.080 | 51.3 | | |
| 0.0321 | 38.5 | | |
| 0.0208 | 31.8 | | |
| 0.0124 | 26.0 | | |
| 0.0088 | 23.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 21.9% | $D_{10}$: | - |
| Sand: | 26.7% | $D_{30}$: | 0.0183 |
| Silt: | 38.3% | $D_{60}$: | 0.1490 |
| Clay: | 13.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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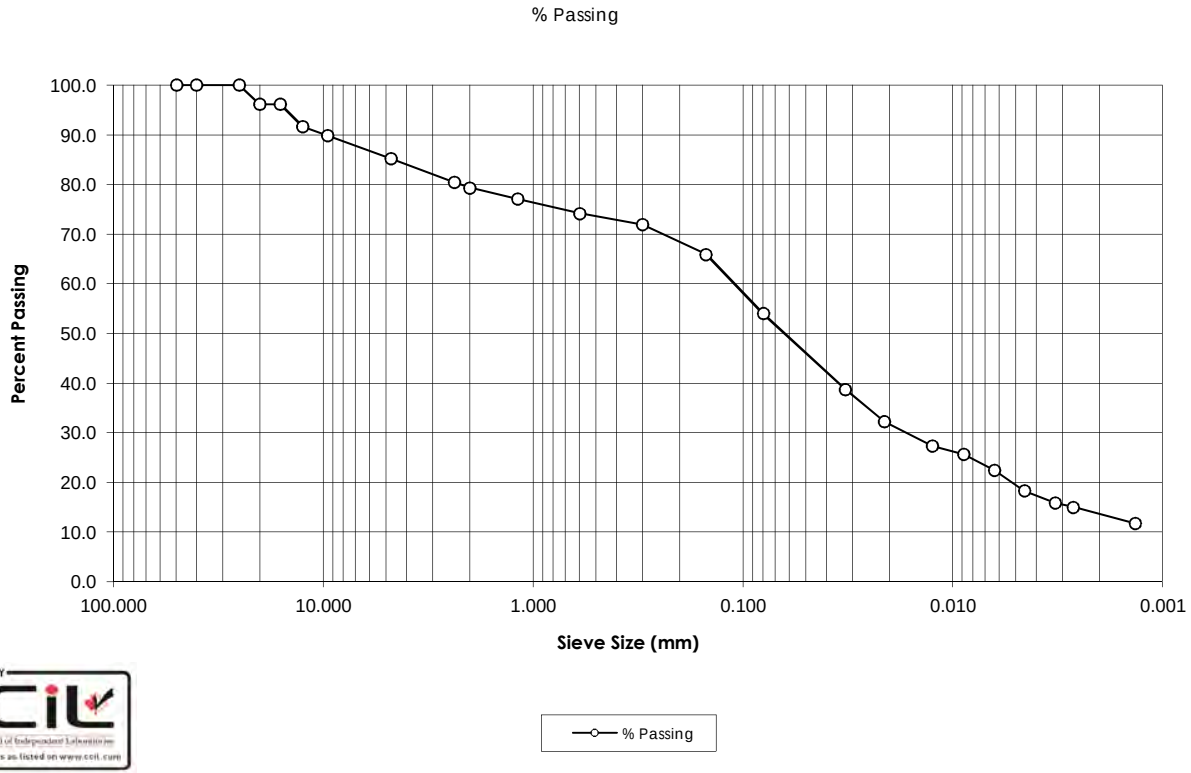
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS9
SOURCE: DC18
TESTED BY: M. Pilkington

DATE TESTED: May 27, 2016
DATE RECEIVED: May 17, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI-CL) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 22.4 |
| 40.0 | 100.0 | 0.0046 | 18.3 |
| 25.0 | 100.0 | 0.0032 | 15.9 |
| 20.0 | 96.2 | 0.0027 | 15.0 |
| 16.0 | 96.2 | 0.0013 | 11.8 |
| 12.5 | 91.6 | | |
| 9.5 | 89.8 | | |
| 4.75 | 85.2 | | |
| 2.36 | 80.5 | | |
| 2.00 | 79.3 | | |
| 1.18 | 77.1 | | |
| 0.600 | 74.2 | | |
| 0.300 | 71.9 | | |
| 0.150 | 65.9 | | |
| 0.080 | 54.0 | | |
| 0.0325 | 38.7 | | |
| 0.0212 | 32.2 | | |
| 0.0125 | 27.3 | | |
| 0.0088 | 25.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 14.8% | $D_{10}$: | - |
| Sand: | 31.2% | $D_{30}$: | 0.0174 |
| Silt: | 40.4% | $D_{60}$: | 0.1169 |
| Clay: | 13.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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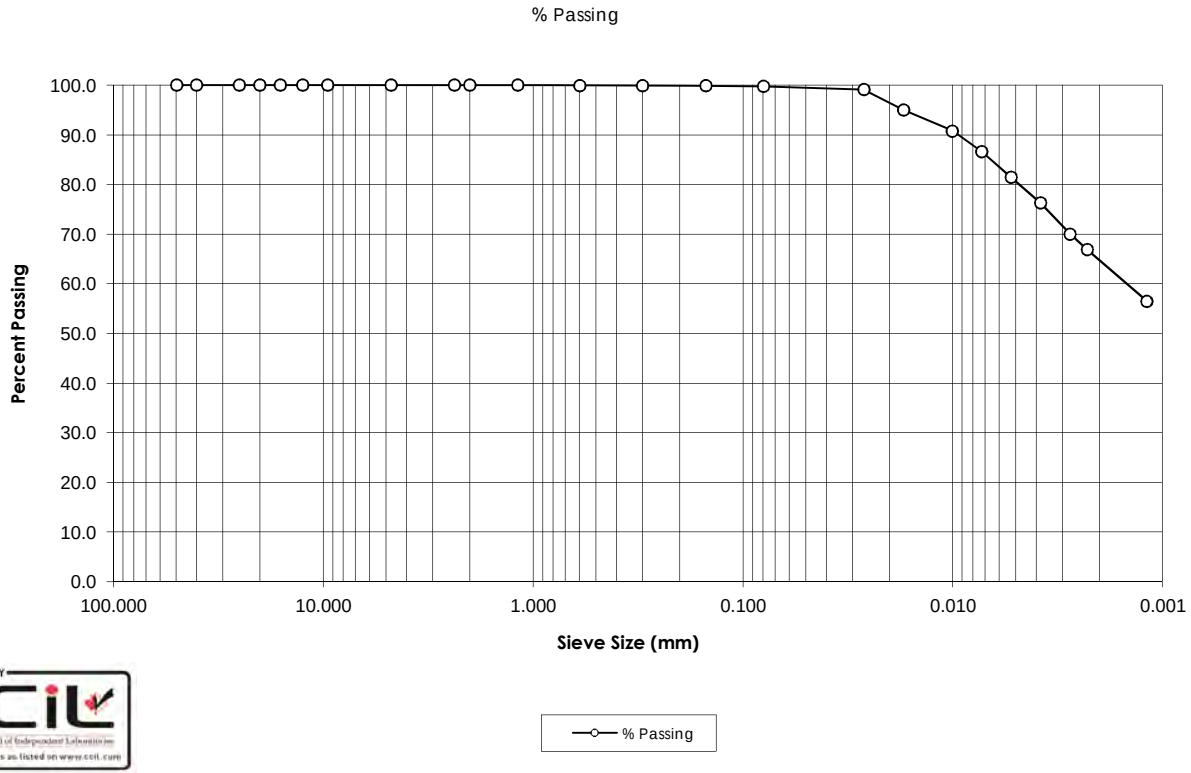
SAMPLE No.: BS1
SOURCE: DC19
TESTED BY: M. Pilkington

DATE TESTED: May 27, 2016
DATE RECEIVED: May 9, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 81.5 |
| 40.0 | 100.0 | 0.0038 | 76.3 |
| 25.0 | 100.0 | 0.0028 | 70.0 |
| 20.0 | 100.0 | 0.0023 | 66.9 |
| 16.0 | 100.0 | 0.0012 | 56.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.7 | | |
| 0.0265 | 99.1 | | |
| 0.0171 | 95.0 | | |
| 0.0101 | 90.8 | | |
| 0.0073 | 86.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.3% | $D_{30}$: | - |
| Silt: | 34.9% | $D_{60}$: | 0.0016 |
| Clay: | 64.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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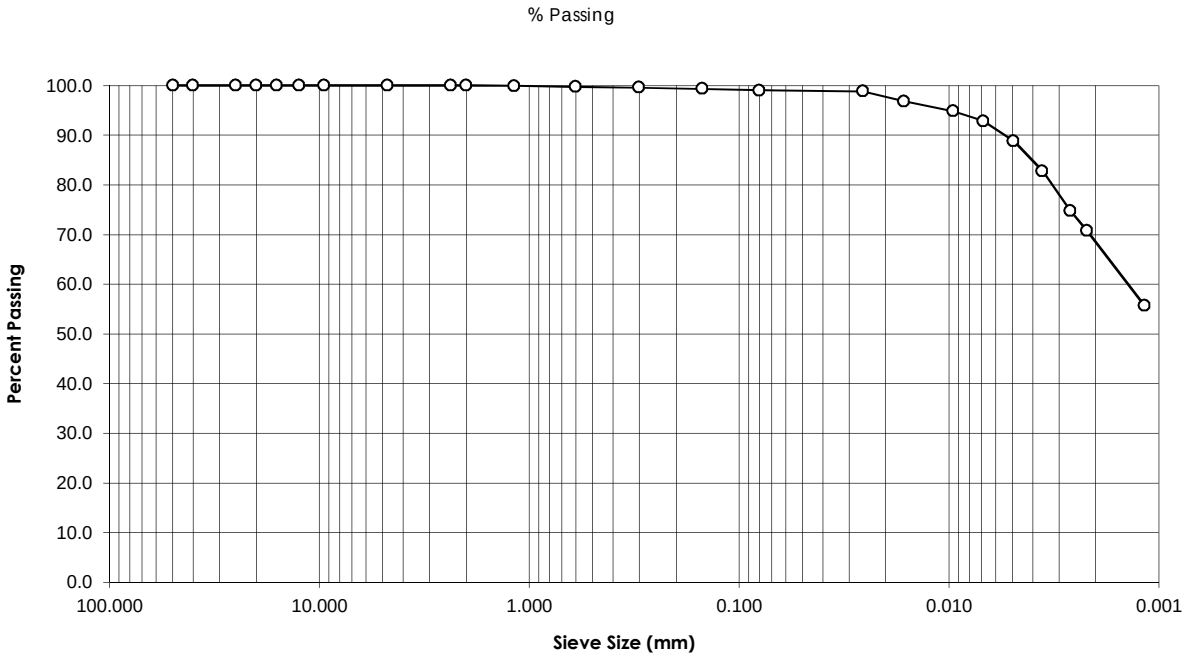
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST2
SOURCE: DC19
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: May 9, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0049 | 88.8 |
| 40.0 | 100.0 | 0.0036 | 82.8 |
| 25.0 | 100.0 | 0.0027 | 74.8 |
| 20.0 | 100.0 | 0.0022 | 70.8 |
| 16.0 | 100.0 | 0.0012 | 55.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.6 | | |
| 0.150 | 99.4 | | |
| 0.080 | 99.0 | | |
| 0.0256 | 98.9 | | |
| 0.0164 | 96.9 | | |
| 0.0096 | 94.8 | | |
| 0.0069 | 92.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.0% | $D_{30}$: | - |
| Silt: | 30.5% | $D_{60}$: | 0.0015 |
| Clay: | 68.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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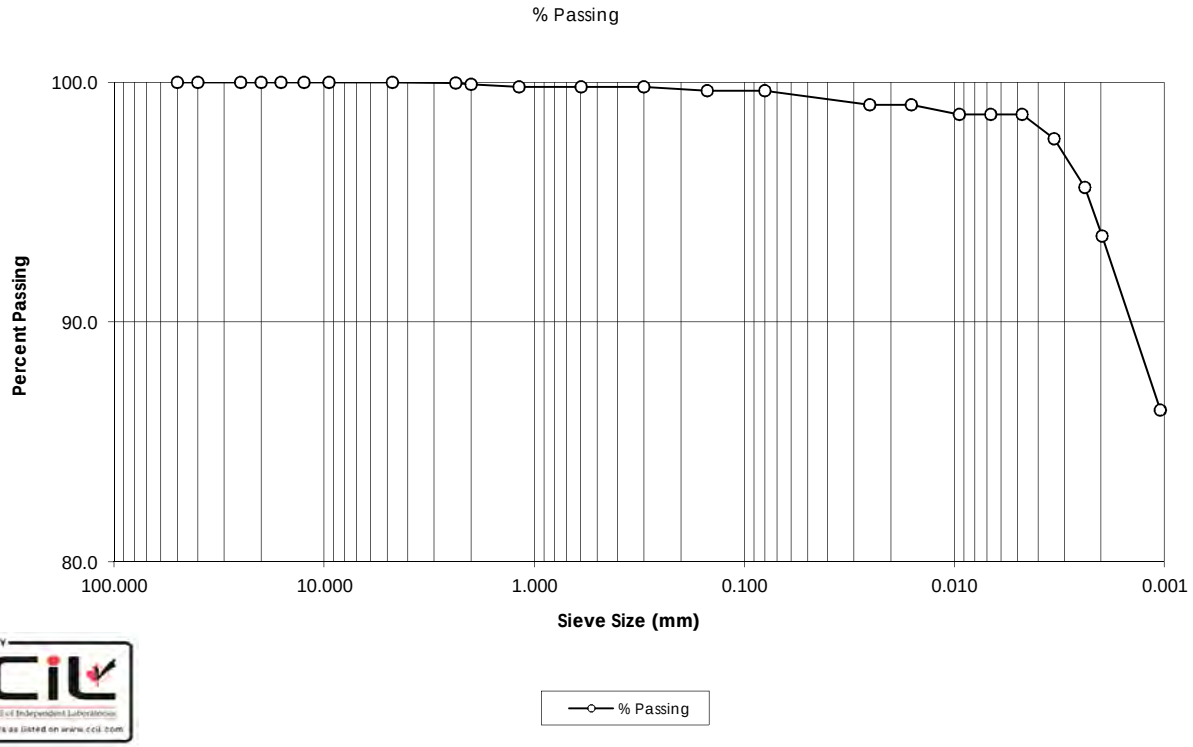
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS4
SOURCE: DC19
TESTED BY: C. Oost

DATE TESTED: May 19, 2016
DATE RECEIVED: May 9, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0047** | **98.7** |
| **40.0** | **100.0** | **0.0034** | **97.6** |
| **25.0** | **100.0** | **0.0024** | **95.6** |
| **20.0** | **100.0** | **0.0020** | **93.6** |
| **16.0** | **100.0** | **0.0010** | **86.3** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.8** | | |
| **0.600** | **99.8** | | |
| **0.300** | **99.8** | | |
| **0.150** | **99.7** | | |
| **0.080** | **99.7** | | |
| **0.0253** | **99.1** | | |
| **0.0160** | **99.1** | | |
| **0.0095** | **98.7** | | |
| **0.0067** | **98.7** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.3% | $D_{30}$: | - |
| Silt: | 5.9% | $D_{60}$: | - |
| Clay: | 93.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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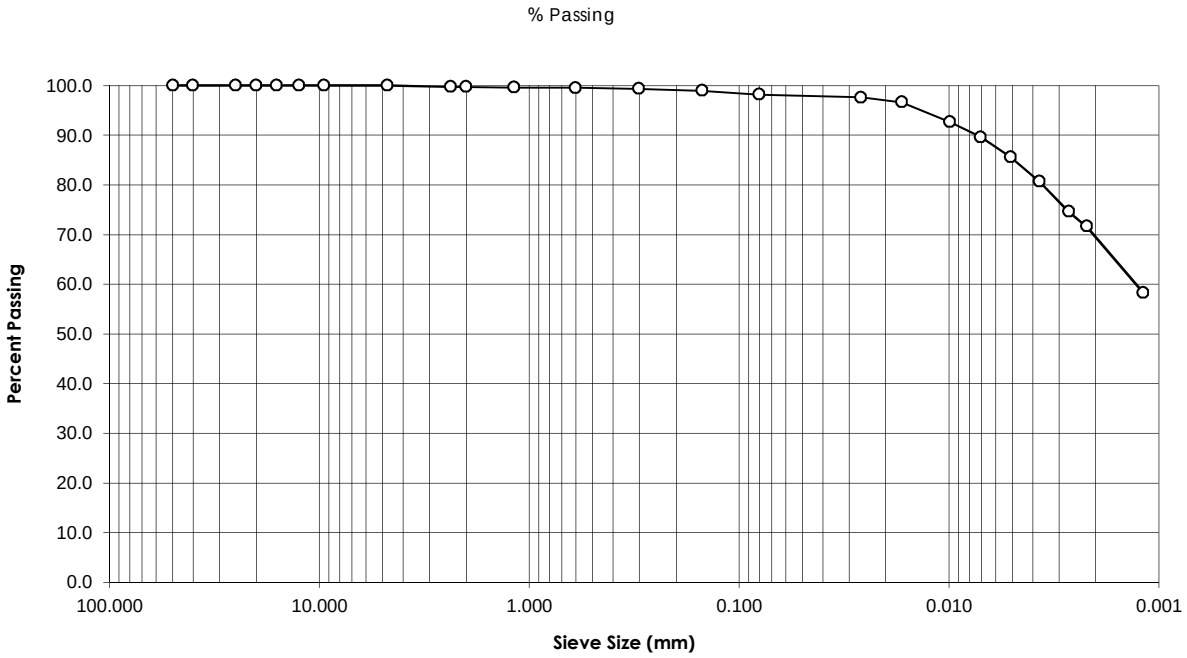
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST5
SOURCE: DC19
TESTED BY: B. Pelkey

DATE TESTED: October 19, 2016
DATE RECEIVED: May 9, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 85.6 |
| 40.0 | 100.0 | 0.0037 | 80.6 |
| 25.0 | 100.0 | 0.0027 | 74.6 |
| 20.0 | 100.0 | 0.0022 | 71.6 |
| 16.0 | 100.0 | 0.0012 | 58.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.8 | | |
| 2.00 | 99.7 | | |
| 1.18 | 99.6 | | |
| 0.600 | 99.5 | | |
| 0.300 | 99.4 | | |
| 0.150 | 98.9 | | |
| 0.080 | 98.2 | | |
| 0.0262 | 97.6 | | |
| 0.0168 | 96.6 | | |
| 0.0099 | 92.6 | | |
| 0.0071 | 89.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.8% | $D_{30}$: | - |
| Silt: | 28.7% | $D_{60}$: | 0.0013 |
| Clay: | 69.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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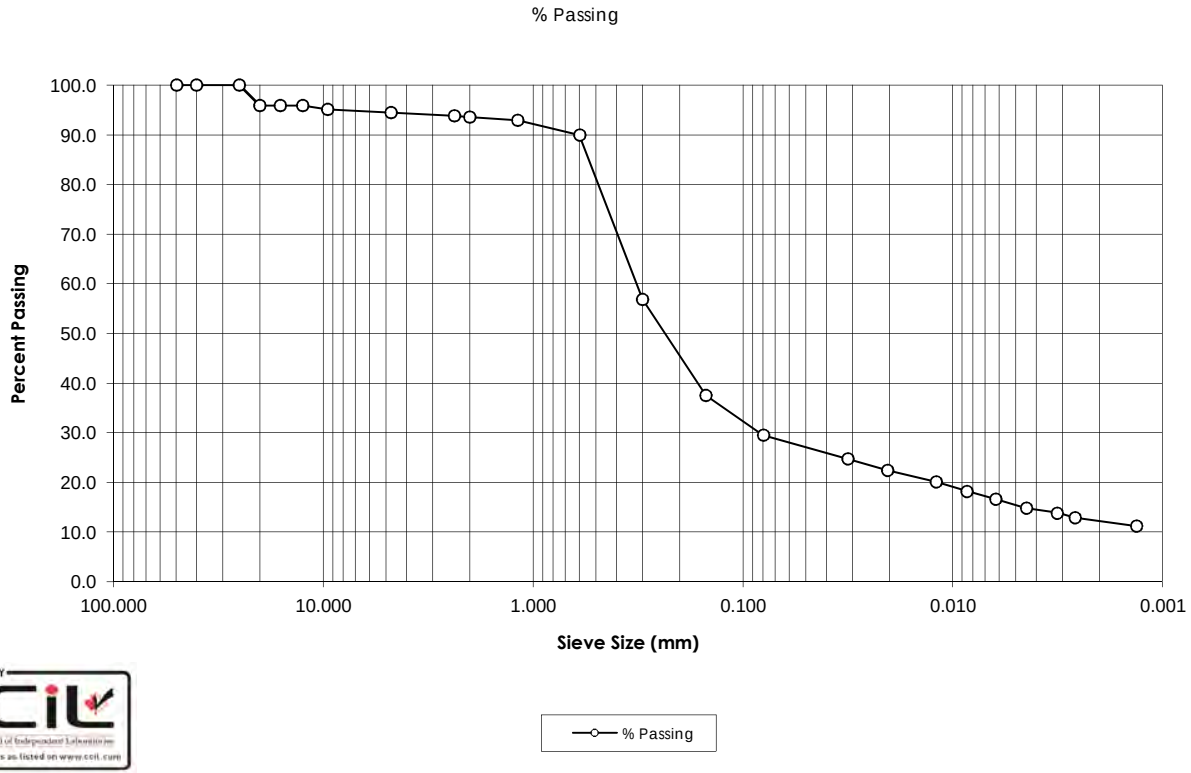
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS7
SOURCE: DC19
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: May 9, 2016
SAMPLE DESCRIPTION: Sand Some Clay Some Silt Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 16.7 |
| 40.0 | 100.0 | 0.0045 | 14.8 |
| 25.0 | 100.0 | 0.0032 | 13.9 |
| 20.0 | 95.9 | 0.0026 | 12.9 |
| 16.0 | 95.9 | 0.0013 | 11.2 |
| 12.5 | 95.9 | | |
| 9.5 | 95.1 | | |
| 4.75 | 94.4 | | |
| 2.36 | 93.8 | | |
| 2.00 | 93.6 | | |
| 1.18 | 92.9 | | |
| 0.600 | 90.0 | | |
| 0.300 | 56.9 | | |
| 0.150 | 37.6 | | |
| 0.080 | 29.5 | | |
| 0.0317 | 24.8 | | |
| 0.0204 | 22.5 | | |
| 0.0120 | 20.1 | | |
| 0.0086 | 18.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.6% | $D_{10}$: | - |
| Sand: | 64.9% | $D_{30}$: | 0.0846 |
| Silt: | 17.3% | $D_{60}$: | 0.3352 |
| Clay: | 12.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size test results only



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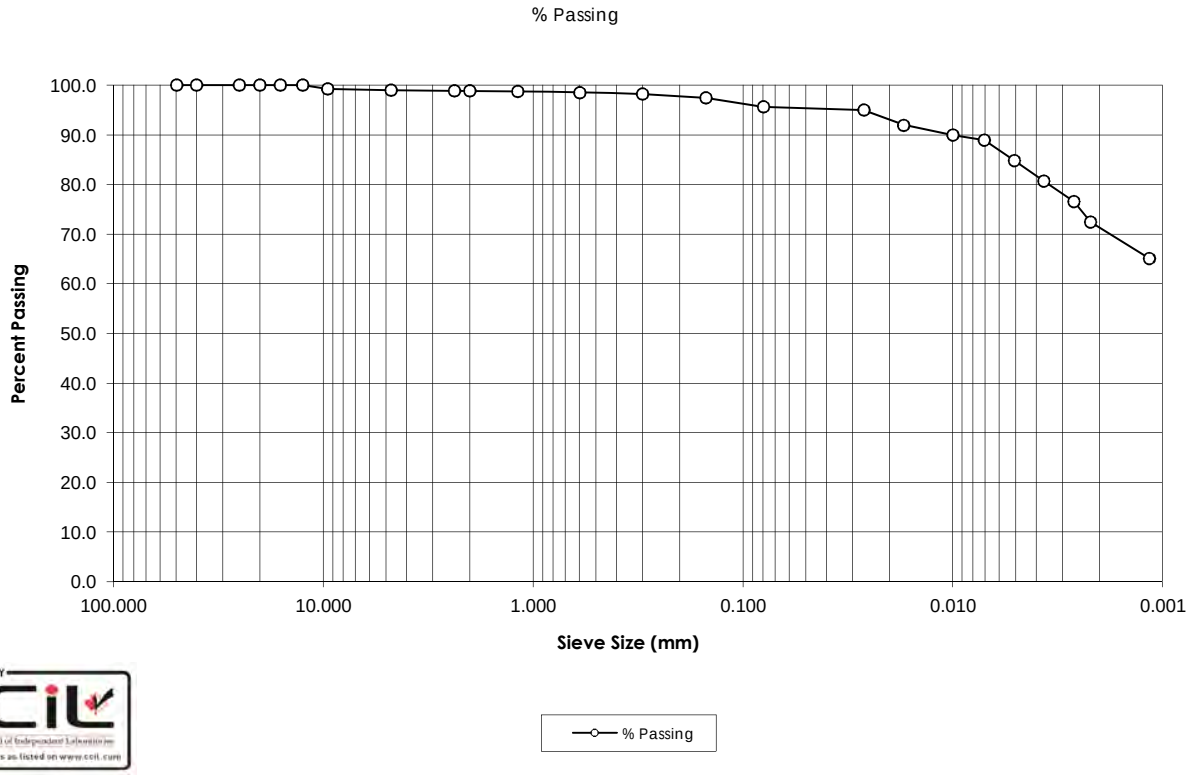
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS1
SOURCE: DC20
TESTED BY: C. Oost

DATE TESTED: May 19, 2016
DATE RECEIVED: May 10, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 84.8 |
| 40.0 | 100.0 | 0.0037 | 80.7 |
| 25.0 | 100.0 | 0.0027 | 76.6 |
| 20.0 | 100.0 | 0.0022 | 72.5 |
| 16.0 | 100.0 | 0.0012 | 65.1 |
| 12.5 | 100.0 | | |
| 9.5 | 99.3 | | |
| 4.75 | 99.0 | | |
| 2.36 | 98.8 | | |
| 2.00 | 98.8 | | |
| 1.18 | 98.7 | | |
| 0.600 | 98.5 | | |
| 0.300 | 98.2 | | |
| 0.150 | 97.4 | | |
| 0.080 | 95.7 | | |
| 0.0265 | 95.1 | | |
| 0.0171 | 92.0 | | |
| 0.0100 | 89.9 | | |
| 0.0071 | 88.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.0% | $D_{10}$: | - |
| Sand: | 3.3% | $D_{30}$: | - |
| Silt: | 24.3% | $D_{60}$: | - |
| Clay: | 71.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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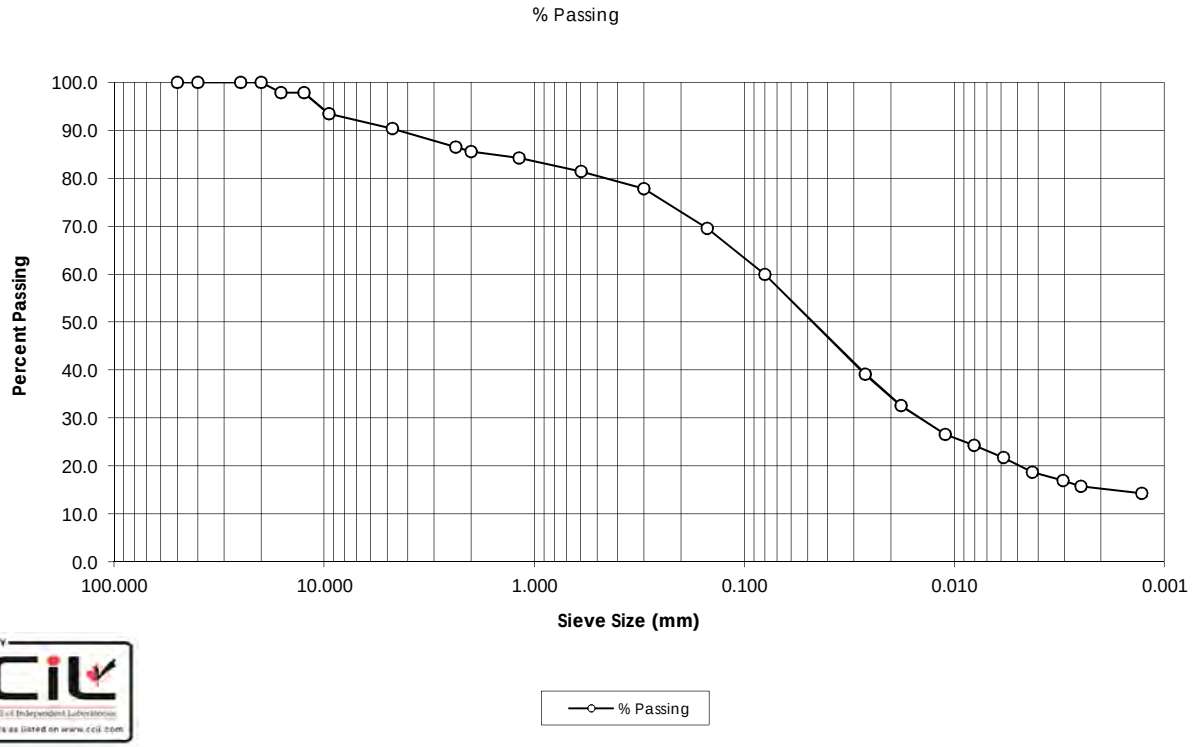
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS4
SOURCE: DC20
TESTED BY: C. Oost

DATE TESTED: May 19, 2016
DATE RECEIVED: May 10, 2016
SAMPLE DESCRIPTION: Silty Clay (CL-ML) and Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0059** | **21.7** |
| **40.0** | **100.0** | **0.0042** | **18.7** |
| **25.0** | **100.0** | **0.0030** | **17.0** |
| **20.0** | **100.0** | **0.0025** | **15.7** |
| **16.0** | **97.9** | **0.0013** | **14.3** |
| **12.5** | **97.9** | | |
| **9.5** | **93.4** | | |
| **4.75** | **90.4** | | |
| **2.36** | **86.5** | | |
| **2.00** | **85.6** | | |
| **1.18** | **84.2** | | |
| **0.600** | **81.5** | | |
| **0.300** | **77.8** | | |
| **0.150** | **69.5** | | |
| **0.080** | **59.9** | | |
| **0.0265** | **39.1** | | |
| **0.0179** | **32.6** | | |
| **0.0110** | **26.6** | | |
| **0.0081** | **24.3** | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.6% | $D_{10}$: | - |
| Sand: | 30.5% | $D_{30}$: | 0.0151 |
| Silt: | 44.7% | $D_{60}$: | 0.0804 |
| Clay: | 15.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220


**OFFICE**
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Tel: (403) 716-8000

**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
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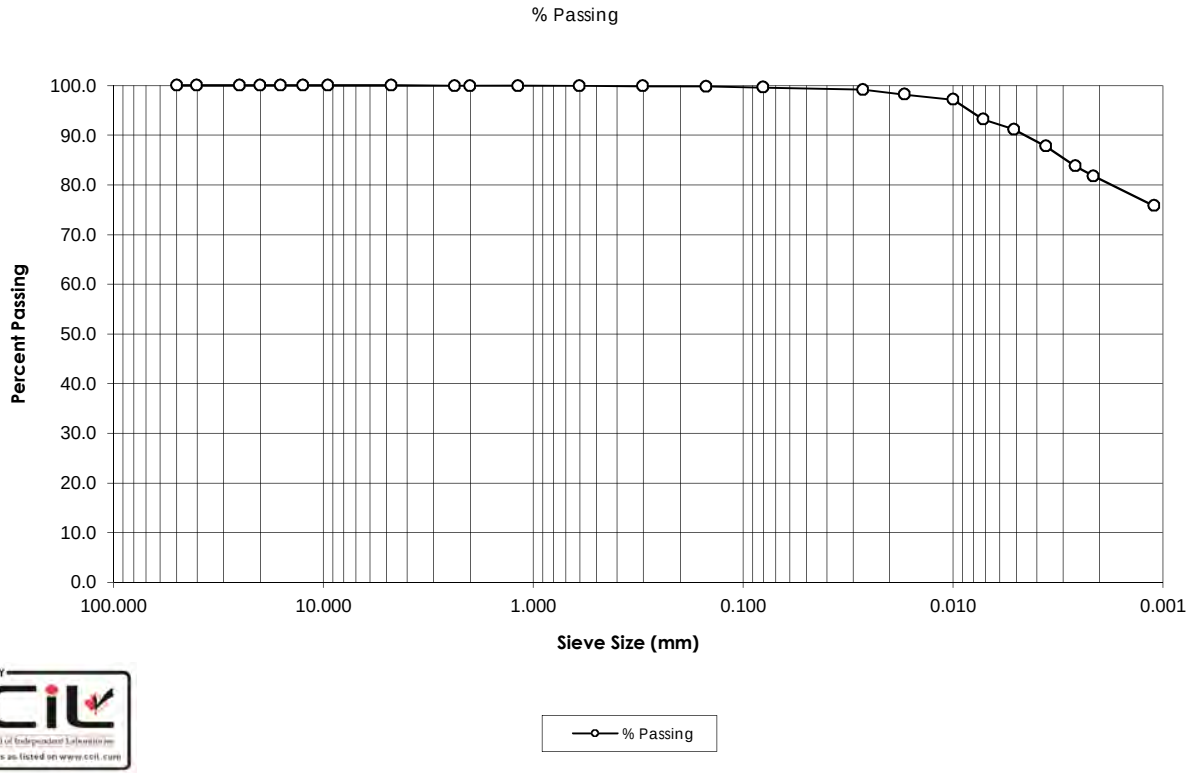
Tel: (403) 253-7876


SAMPLE No.: ST2
SOURCE: DC21
TESTED BY: B. Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: May 11, 2016
SAMPLE DESCRIPTION: Clay (CH)

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 91.2 |
| 40.0 | 100.0 | 0.0036 | 87.8 |
| 25.0 | 100.0 | 0.0026 | 83.8 |
| 20.0 | 100.0 | 0.0021 | 81.8 |
| 16.0 | 100.0 | 0.0011 | 75.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.8 | | |
| 0.080 | 99.6 | | |
| 0.0269 | 99.2 | | |
| 0.0170 | 98.2 | | |
| 0.0099 | 97.2 | | |
| 0.0072 | 93.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.4% | $D_{30}$: | - |
| Silt: | 18.4% | $D_{60}$: | - |
| Clay: | 81.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample descriptong (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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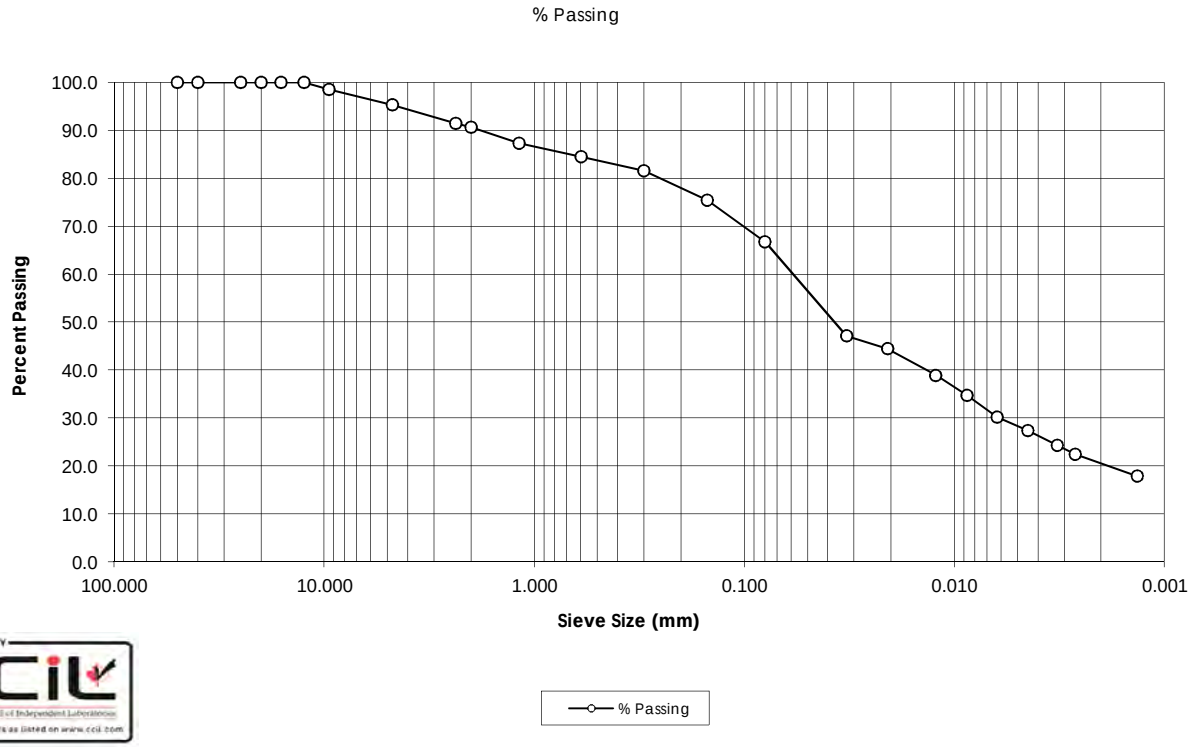
SAMPLE No.: BS4
SOURCE: DC21
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: May 10, 2016
SAMPLE DESCRIPTION: Sandy Silt (ML) Trace Gravel




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0063** | **30.2** |
| **40.0** | **100.0** | **0.0045** | **27.4** |
| **25.0** | **100.0** | **0.0032** | **24.3** |
| **20.0** | **100.0** | **0.0027** | **22.5** |
| **16.0** | **100.0** | **0.0014** | **17.9** |
| **12.5** | **100.0** | | |
| **9.5** | **98.6** | | |
| **4.75** | **95.3** | | |
| **2.36** | **91.5** | | |
| **2.00** | **90.6** | | |
| **1.18** | **87.3** | | |
| **0.600** | **84.5** | | |
| **0.300** | **81.6** | | |
| **0.150** | **75.5** | | |
| **0.080** | **66.8** | | |
| **0.0326** | **47.2** | | |
| **0.0208** | **44.4** | | |
| **0.0123** | **38.9** | | |
| **0.0087** | **34.7** | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.7% | $D_{10}$: | - |
| Sand: | 28.5% | $D_{30}$: | 0.0062 |
| Silt: | 46.2% | $D_{60}$: | 0.0654 |
| Clay: | 20.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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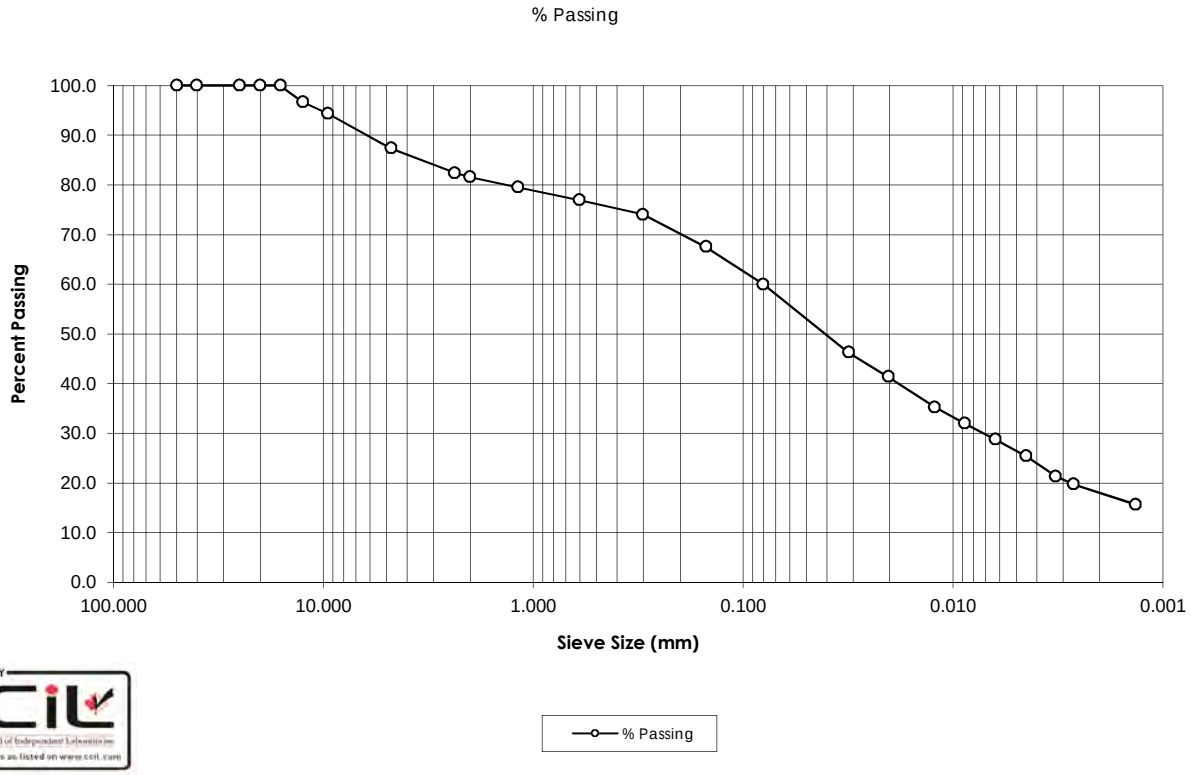
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 1107733936.302.702.220

SAMPLE No.: ST5
SOURCE: DC21
TESTED BY: B. Pelkey

DATE TESTED: October 11, 2016
DATE RECEIVED: May 11, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 28.7 |
| 40.0 | 100.0 | 0.0045 | 25.4 |
| 25.0 | 100.0 | 0.0032 | 21.3 |
| 20.0 | 100.0 | 0.0027 | 19.7 |
| 16.0 | 100.0 | 0.0013 | 15.6 |
| 12.5 | 96.6 | | |
| 9.5 | 94.3 | | |
| 4.75 | 87.4 | | |
| 2.36 | 82.4 | | |
| 2.00 | 81.5 | | |
| 1.18 | 79.5 | | |
| 0.600 | 76.9 | | |
| 0.300 | 74.0 | | |
| 0.150 | 67.6 | | |
| 0.080 | 60.0 | | |
| 0.0314 | 46.2 | | |
| 0.0203 | 41.3 | | |
| 0.0122 | 35.3 | | |
| 0.0088 | 32.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.6% | $D_{10}$: | - |
| Sand: | 27.4% | $D_{30}$: | 0.0073 |
| Silt: | 42.0% | $D_{60}$: | 0.0803 |
| Clay: | 18.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both Grain Size and Atterberg Limit test results.

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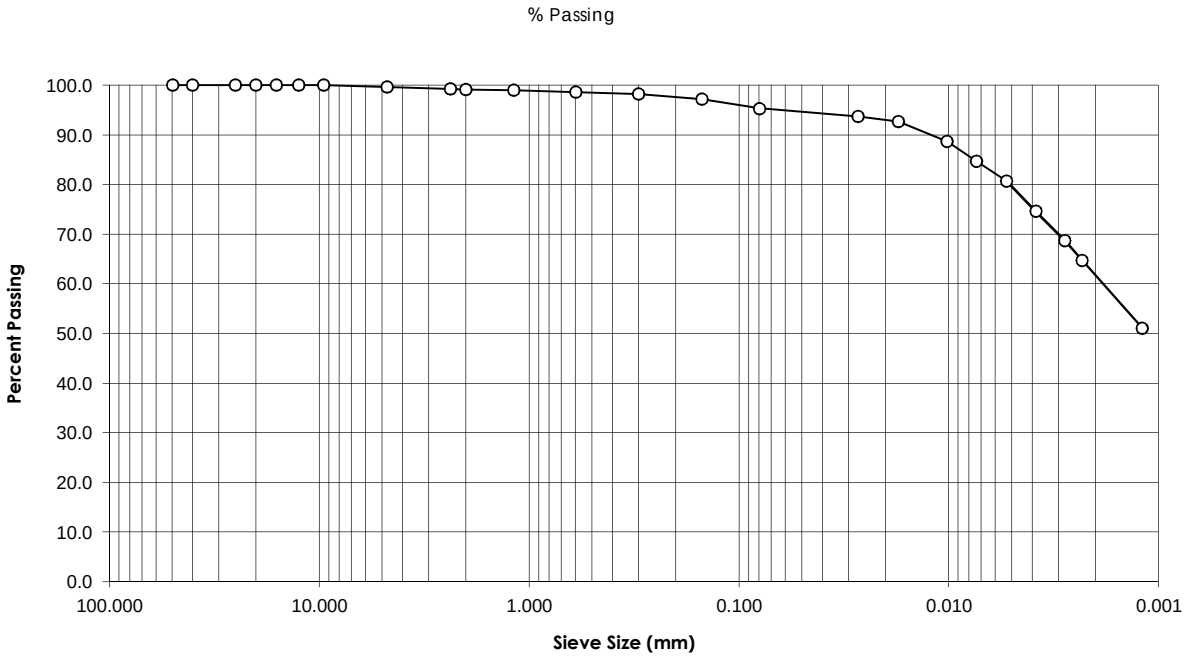
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS4
SOURCE: DC22
TESTED BY: J. Upham

DATE TESTED: May 20, 2016
DATE RECEIVED: May 10, 2016
SAMPLE DESCRIPTION: Clay (CH-CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 80.7 |
| 40.0 | 100.0 | 0.0038 | 74.7 |
| 25.0 | 100.0 | 0.0028 | 68.7 |
| 20.0 | 100.0 | 0.0023 | 64.7 |
| 16.0 | 100.0 | 0.0012 | 51.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.6 | | |
| 2.36 | 99.2 | | |
| 2.00 | 99.1 | | |
| 1.18 | 99.0 | | |
| 0.600 | 98.6 | | |
| 0.300 | 98.2 | | |
| 0.150 | 97.1 | | |
| 0.080 | 95.3 | | |
| 0.0270 | 93.7 | | |
| 0.0173 | 92.7 | | |
| 0.0102 | 88.7 | | |
| 0.0074 | 84.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 4.3% | $D_{30}$: | - |
| Silt: | 33.6% | $D_{60}$: | 0.0020 |
| Clay: | 61.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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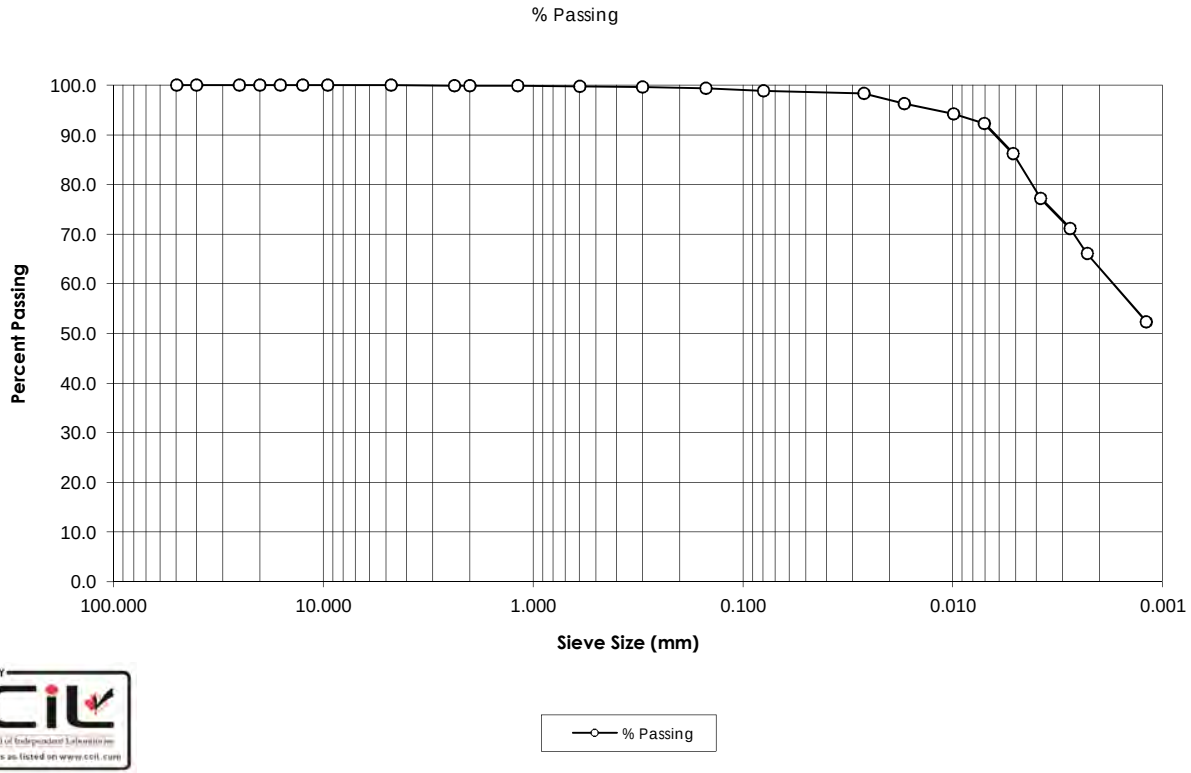
SAMPLE No.: ST5
SOURCE: DC22
TESTED BY: M. Pilkington

DATE TESTED: May 24, 2016
DATE RECEIVED: May 10, 2016
SAMPLE DESCRIPTION: Clay (CH-CL) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 86.2 |
| 40.0 | 100.0 | 0.0038 | 77.2 |
| 25.0 | 100.0 | 0.0028 | 71.1 |
| 20.0 | 100.0 | 0.0023 | 66.1 |
| 16.0 | 100.0 | 0.0012 | 52.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.7 | | |
| 0.150 | 99.4 | | |
| 0.080 | 98.8 | | |
| 0.0265 | 98.3 | | |
| 0.0170 | 96.3 | | |
| 0.0099 | 94.3 | | |
| 0.0071 | 92.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.2% | $D_{30}$: | - |
| Silt: | 35.6% | $D_{60}$: | 0.0018 |
| Clay: | 63.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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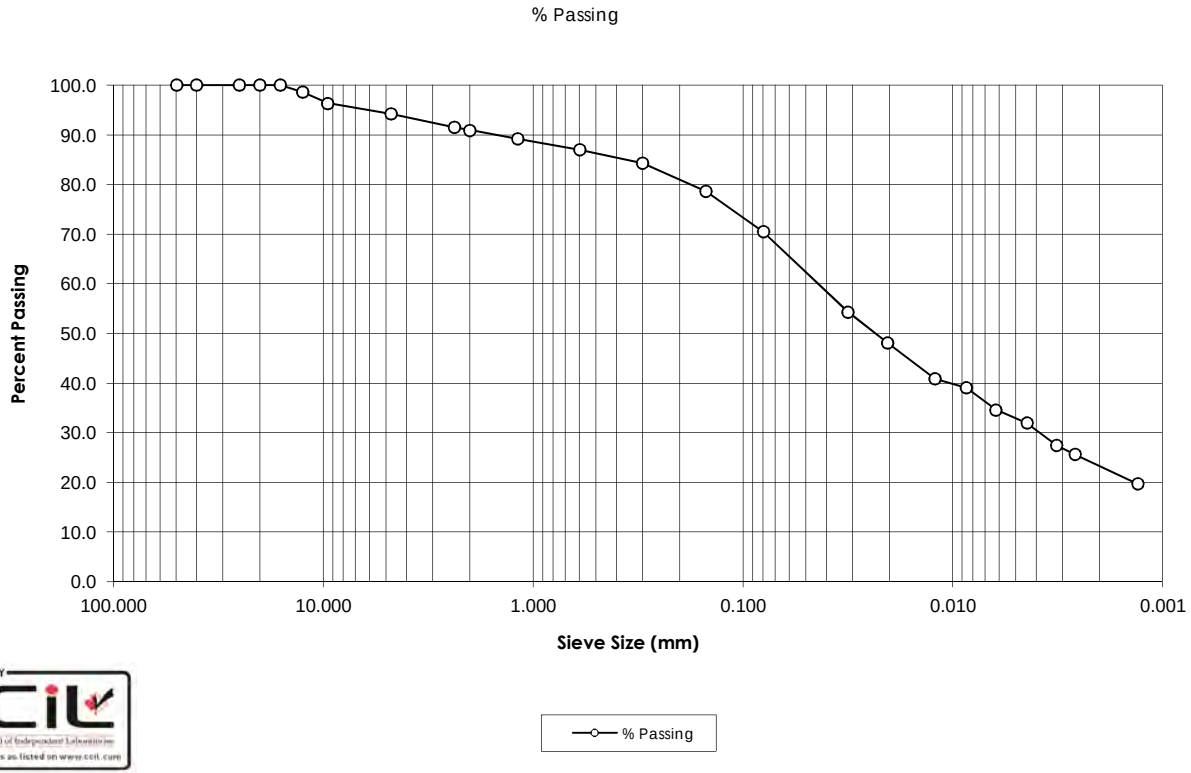
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS10
SOURCE: DC22
TESTED BY: J. Upham

DATE TESTED: May 20, 2016
DATE RECEIVED: May 10, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 34.6 |
| 40.0 | 100.0 | 0.0044 | 31.9 |
| 25.0 | 100.0 | 0.0032 | 27.4 |
| 20.0 | 100.0 | 0.0026 | 25.6 |
| 16.0 | 100.0 | 0.0013 | 19.7 |
| 12.5 | 98.6 | | |
| 9.5 | 96.3 | | |
| 4.75 | 94.3 | | |
| 2.36 | 91.5 | | |
| 2.00 | 90.9 | | |
| 1.18 | 89.2 | | |
| 0.600 | 87.0 | | |
| 0.300 | 84.4 | | |
| 0.150 | 78.6 | | |
| 0.080 | 70.5 | | |
| 0.0315 | 54.3 | | |
| 0.0204 | 48.1 | | |
| 0.0121 | 40.9 | | |
| 0.0086 | 39.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.7% | $D_{10}$: | - |
| Sand: | 23.8% | $D_{30}$: | 0.0039 |
| Silt: | 47.1% | $D_{60}$: | 0.0500 |
| Clay: | 23.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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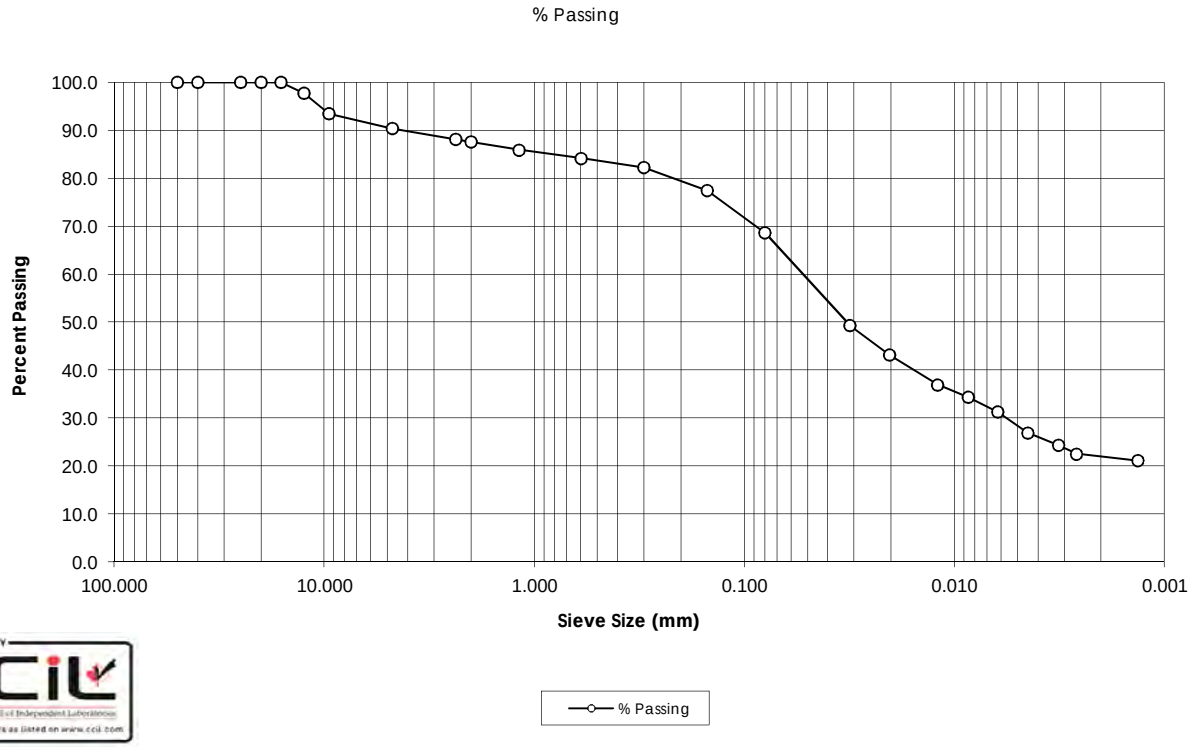
SAMPLE No.: BS5
SOURCE: DC23
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: May 10, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Trace Gravel




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0062** | **31.3** |
| **40.0** | **100.0** | **0.0045** | **26.9** |
| **25.0** | **100.0** | **0.0032** | **24.3** |
| **20.0** | **100.0** | **0.0026** | **22.5** |
| **16.0** | **100.0** | **0.0013** | **21.1** |
| **12.5** | **97.7** | | |
| **9.5** | **93.4** | | |
| **4.75** | **90.3** | | |
| **2.36** | **88.2** | | |
| **2.00** | **87.6** | | |
| **1.18** | **85.9** | | |
| **0.600** | **84.2** | | |
| **0.300** | **82.2** | | |
| **0.150** | **77.5** | | |
| **0.080** | **68.6** | | |
| **0.0314** | **49.2** | | |
| **0.0203** | **43.1** | | |
| **0.0120** | **36.9** | | |
| **0.0086** | **34.3** | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.7% | $D_{10}$: | - |
| Sand: | 21.8% | $D_{30}$: | 0.0057 |
| Silt: | 46.6% | $D_{60}$: | 0.0604 |
| Clay: | 21.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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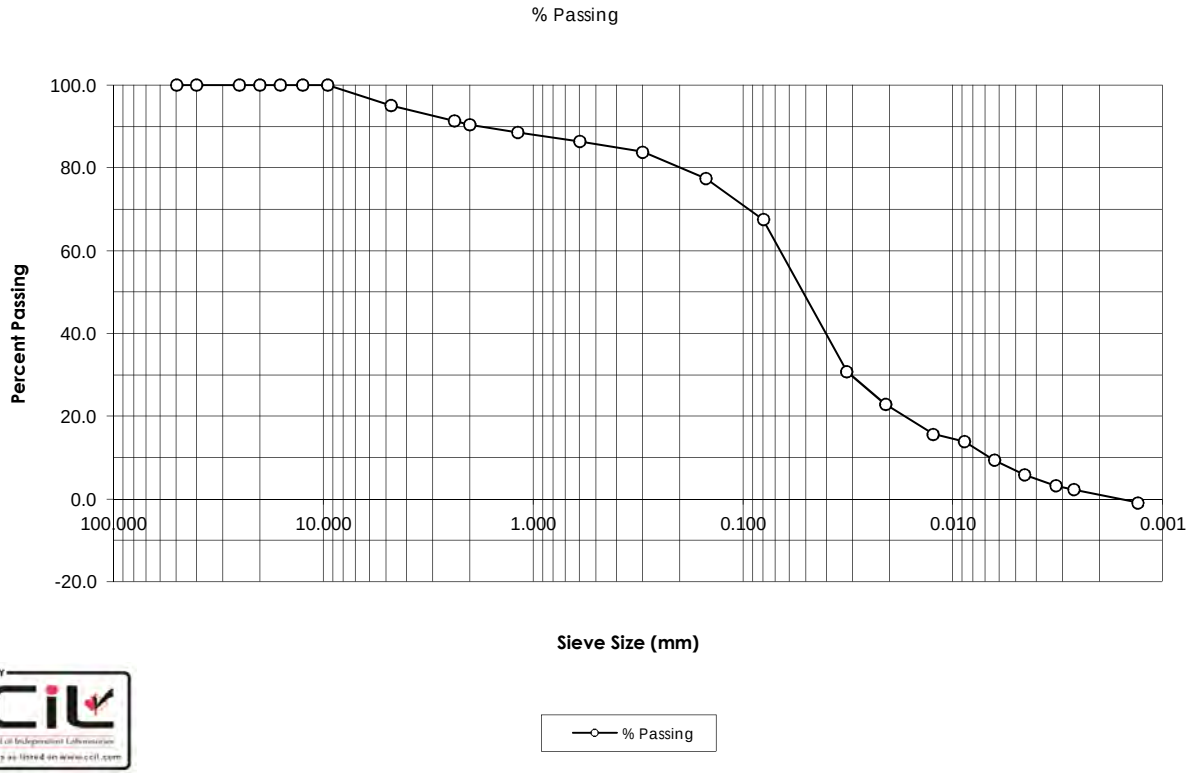
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST6
SOURCE: DC24
TESTED BY: M. Pilkington

DATE TESTED: May 24, 2016
DATE RECEIVED: May 9, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 9.4 |
| 40.0 | 100.0 | 0.0045 | 5.9 |
| 25.0 | 100.0 | 0.0032 | 3.2 |
| 20.0 | 100.0 | 0.0027 | 2.3 |
| 16.0 | 100.0 | 0.0013 | -0.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 95.1 | | |
| 2.36 | 91.4 | | |
| 2.00 | 90.4 | | |
| 1.18 | 88.6 | | |
| 0.600 | 86.4 | | |
| 0.300 | 83.9 | | |
| 0.150 | 77.4 | | |
| 0.080 | 67.6 | | |
| 0.0321 | 30.8 | | |
| 0.0208 | 22.8 | | |
| 0.0124 | 15.7 | | |
| 0.0088 | 13.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.9% | $D_{10}$: | 0.0067 |
| Sand: | 27.5% | $D_{30}$: | 0.0311 |
| Silt: | 66.5% | $D_{60}$: | 0.0728 |
| Clay: | 1.0% | $C_u$: | 10.86 |
| | | $C_c$: | 1.98 |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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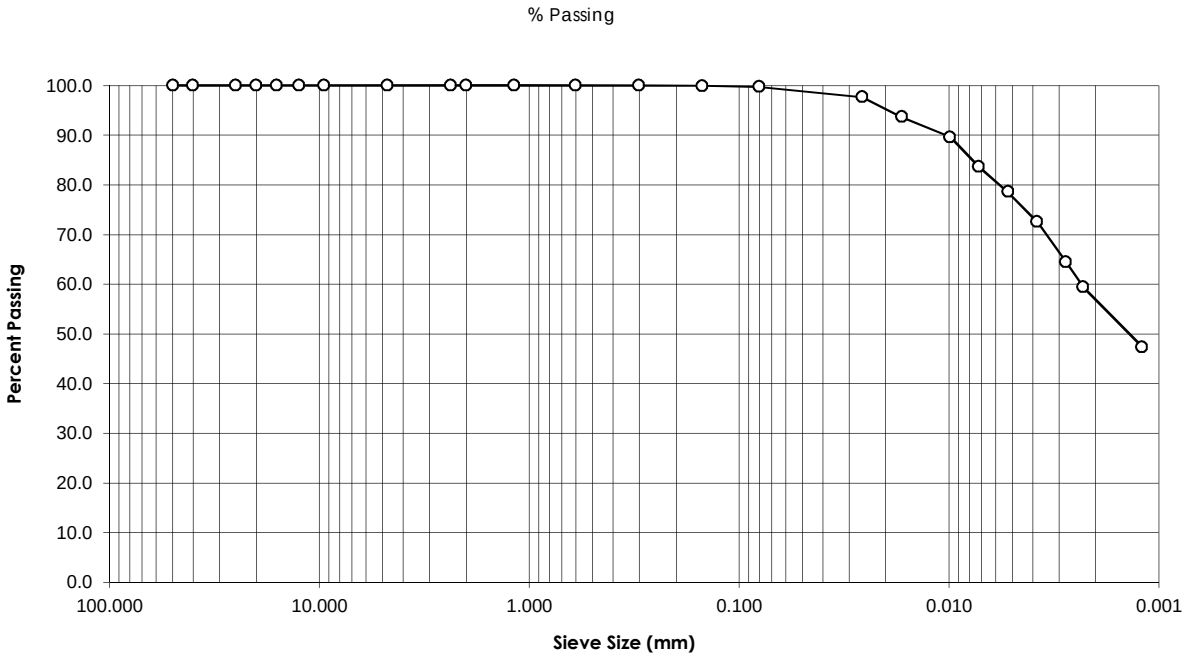
SAMPLE No.: ST2
SOURCE: DC25
TESTED BY: B. Pelkey

DATE TESTED: November 2, 2016
DATE RECEIVED: July 7, 2016
SAMPLE DESCRIPTION: Clay (CI)

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 78.6 |
| 40.0 | 100.0 | 0.0038 | 72.5 |
| 25.0 | 100.0 | 0.0028 | 64.5 |
| 20.0 | 100.0 | 0.0023 | 59.4 |
| 16.0 | 100.0 | 0.0012 | 47.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 100.0 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.8 | | |
| 0.0259 | 97.7 | | |
| 0.0168 | 93.7 | | |
| 0.0099 | 89.6 | | |
| 0.0072 | 83.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.2% | $D_{30}$: | - |
| Silt: | 42.9% | $D_{60}$: | 0.0024 |
| Clay: | 56.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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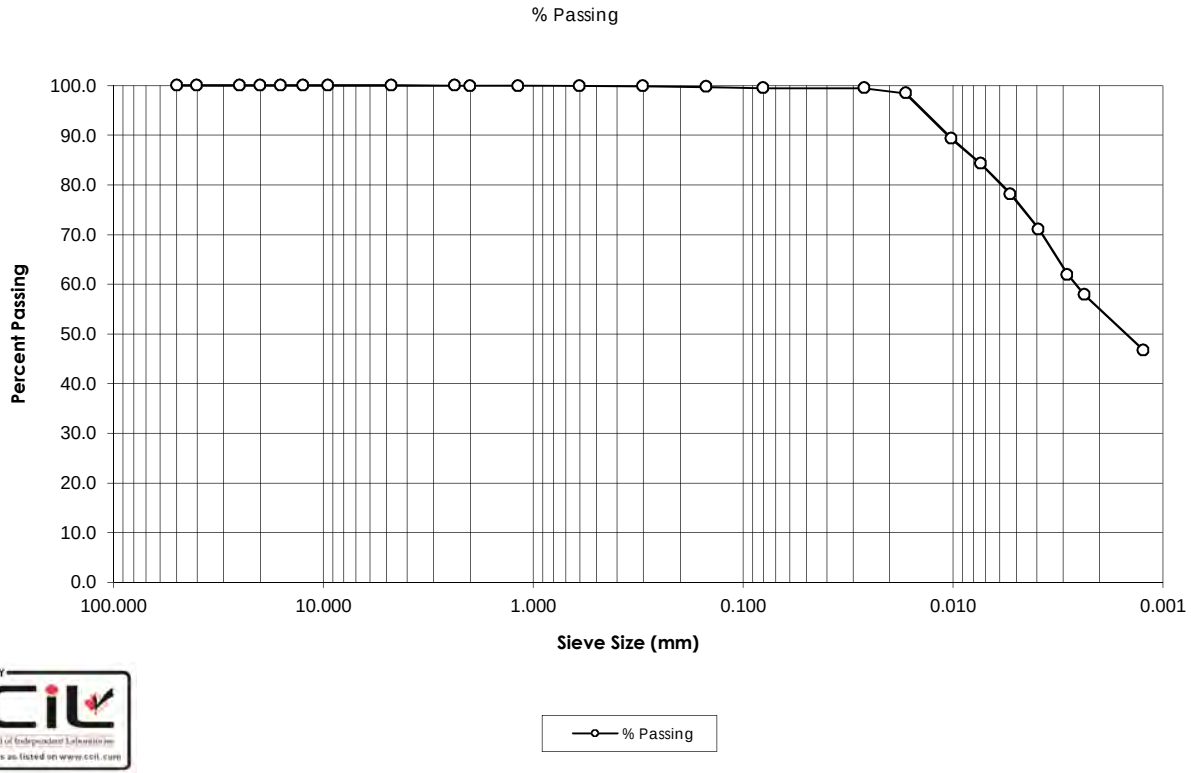
SAMPLE No.: BSB
SOURCE: DC25
TESTED BY: B. Pelkey

DATE TESTED: October 11, 2016
DATE RECEIVED: June 7, 2016
SAMPLE DESCRIPTION: Clay (CH)

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0053** | **78.2** |
| **40.0** | **100.0** | **0.0039** | **71.0** |
| **25.0** | **100.0** | **0.0028** | **61.9** |
| **20.0** | **100.0** | **0.0024** | **57.9** |
| **16.0** | **100.0** | **0.0012** | **46.7** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **100.0** | | |
| **1.18** | **100.0** | | |
| **0.600** | **100.0** | | |
| **0.300** | **99.9** | | |
| **0.150** | **99.7** | | |
| **0.080** | **99.5** | | |
| **0.0265** | **99.5** | | |
| **0.0168** | **98.5** | | |
| **0.0102** | **89.3** | | |
| **0.0074** | **84.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.5% | $D_{30}$: | - |
| Silt: | 44.5% | $D_{60}$: | 0.0026 |
| Clay: | 54.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

**OFFICE**
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**LABORATORY**
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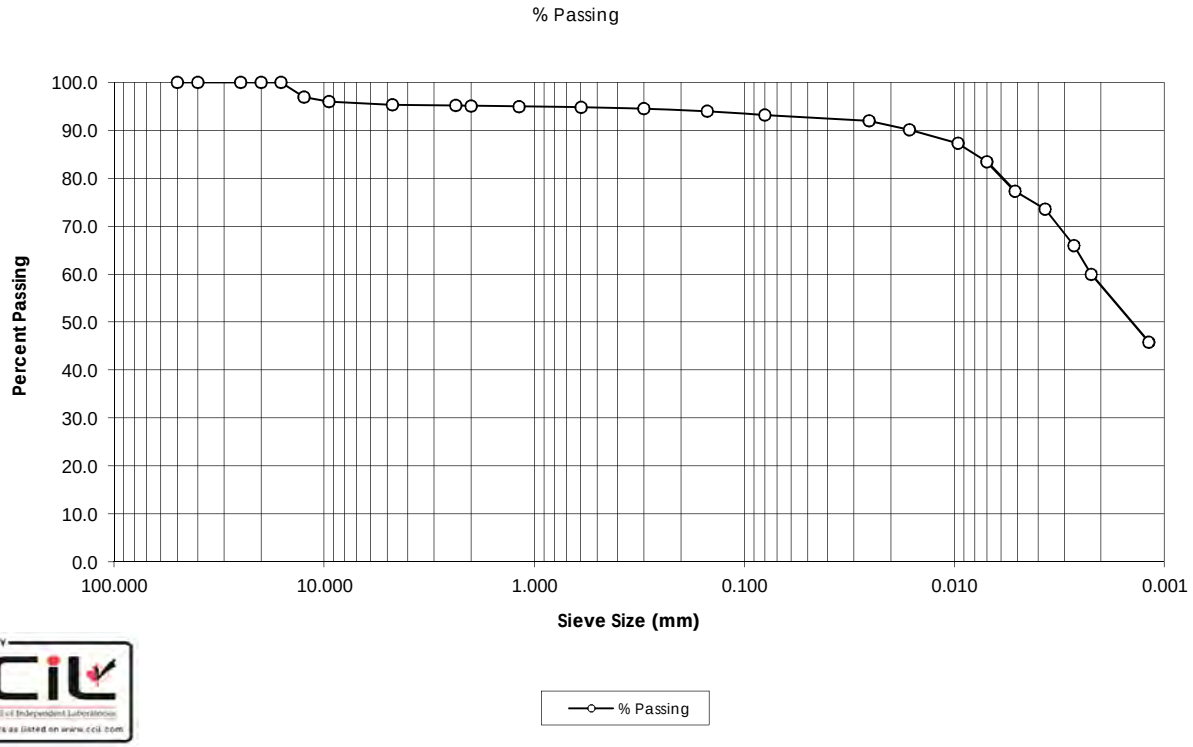
Tel: (403) 253-7876

SAMPLE No.: ST5
SOURCE: DC25
TESTED BY: J. Upham and B. Pelkey

DATE TESTED: July 17, 2016
DATE RECEIVED: June 7, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Gravel Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0051** | **77.3** |
| **40.0** | **100.0** | **0.0037** | **73.5** |
| **25.0** | **100.0** | **0.0027** | **66.0** |
| **20.0** | **100.0** | **0.0022** | **59.9** |
| **16.0** | **100.0** | **0.0012** | **45.8** |
| **12.5** | **97.0** | | |
| **9.5** | **96.0** | | |
| **4.75** | **95.4** | | |
| **2.36** | **95.2** | | |
| **2.00** | **95.1** | | |
| **1.18** | **95.0** | | |
| **0.600** | **94.8** | | |
| **0.300** | **94.5** | | |
| **0.150** | **94.0** | | |
| **0.080** | **93.2** | | |
| **0.0255** | **92.0** | | |
| **0.0164** | **90.1** | | |
| **0.0096** | **87.3** | | |
| **0.0070** | **83.5** | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.6% | $D_{10}$: | - |
| Sand: | 2.2% | $D_{30}$: | - |
| Silt: | 35.7% | $D_{60}$: | 0.0022 |
| Clay: | 57.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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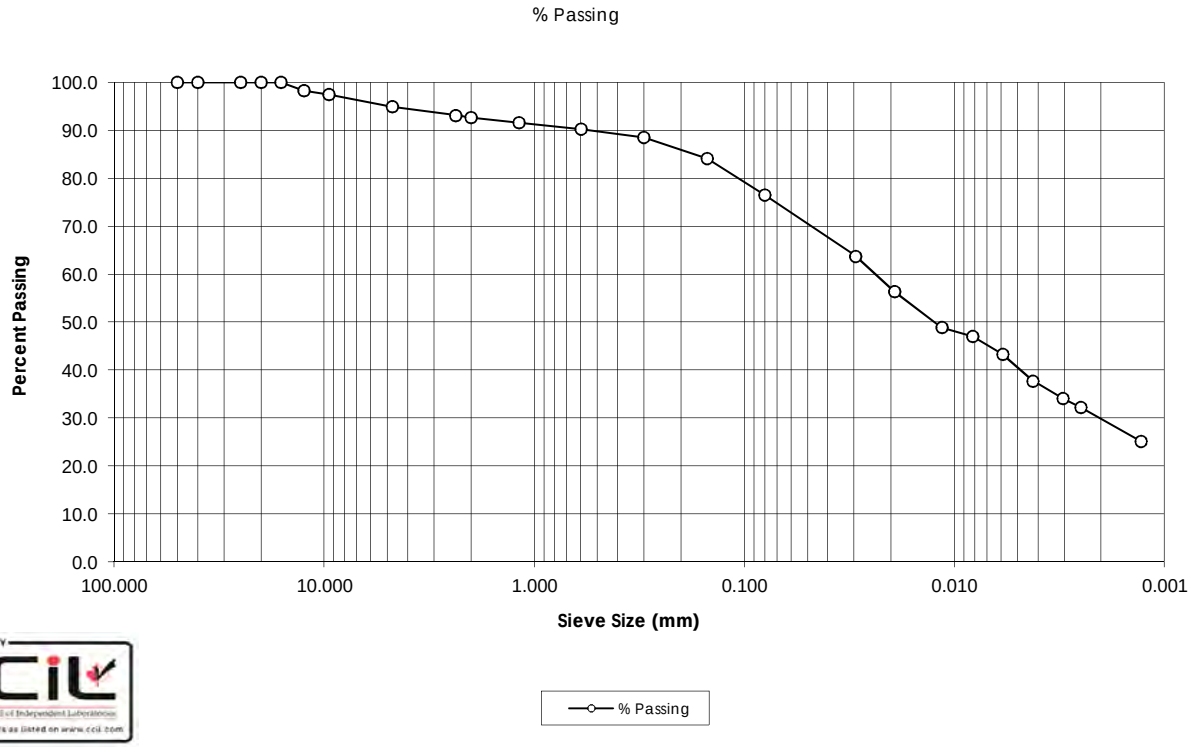
SAMPLE No.: BS07
SOURCE: DC25
TESTED BY: C. Oost

DATE TESTED: July 14, 2016
DATE RECEIVED: June 7, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0059** | **43.3** |
| **40.0** | **100.0** | **0.0042** | **37.7** |
| **25.0** | **100.0** | **0.0030** | **34.0** |
| **20.0** | **100.0** | **0.0025** | **32.2** |
| **16.0** | **100.0** | **0.0013** | **25.1** |
| **12.5** | **98.2** | | |
| **9.5** | **97.4** | | |
| **4.75** | **95.0** | | |
| **2.36** | **93.1** | | |
| **2.00** | **92.7** | | |
| **1.18** | **91.6** | | |
| **0.600** | **90.3** | | |
| **0.300** | **88.5** | | |
| **0.150** | **84.2** | | |
| **0.080** | **76.6** | | |
| **0.0295** | **63.8** | | |
| **0.0192** | **56.3** | | |
| **0.0115** | **48.9** | | |
| **0.0082** | **47.0** | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.0% | $D_{10}$: | - |
| Sand: | 18.4% | $D_{30}$: | 0.0022 |
| Silt: | 46.8% | $D_{60}$: | 0.0245 |
| Clay: | 29.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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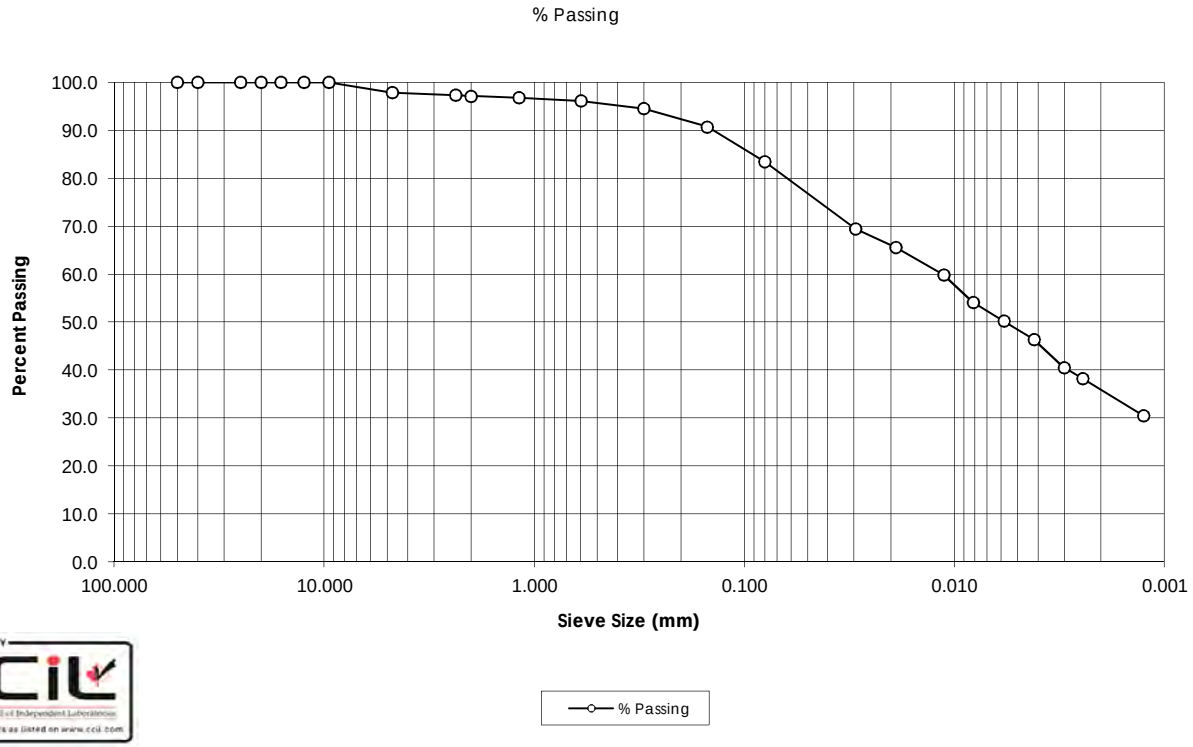
SAMPLE No.: ST2
SOURCE: DC27
TESTED BY: J. Upham and B. Pelkey

DATE TESTED: July 17, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Clay (CL-CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0058** | **50.2** |
| **40.0** | **100.0** | **0.0042** | **46.3** |
| **25.0** | **100.0** | **0.0030** | **40.5** |
| **20.0** | **100.0** | **0.0024** | **38.2** |
| **16.0** | **100.0** | **0.0013** | **30.5** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **97.9** | | |
| **2.36** | **97.3** | | |
| **2.00** | **97.1** | | |
| **1.18** | **96.7** | | |
| **0.600** | **96.1** | | |
| **0.300** | **94.5** | | |
| **0.150** | **90.7** | | |
| **0.080** | **83.5** | | |
| **0.0294** | **69.5** | | |
| **0.0189** | **65.6** | | |
| **0.0112** | **59.8** | | |
| **0.0081** | **54.0** | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.1% | $D_{10}$: | - |
| Sand: | 14.4% | $D_{30}$: | - |
| Silt: | 47.6% | $D_{60}$: | 0.0115 |
| Clay: | 35.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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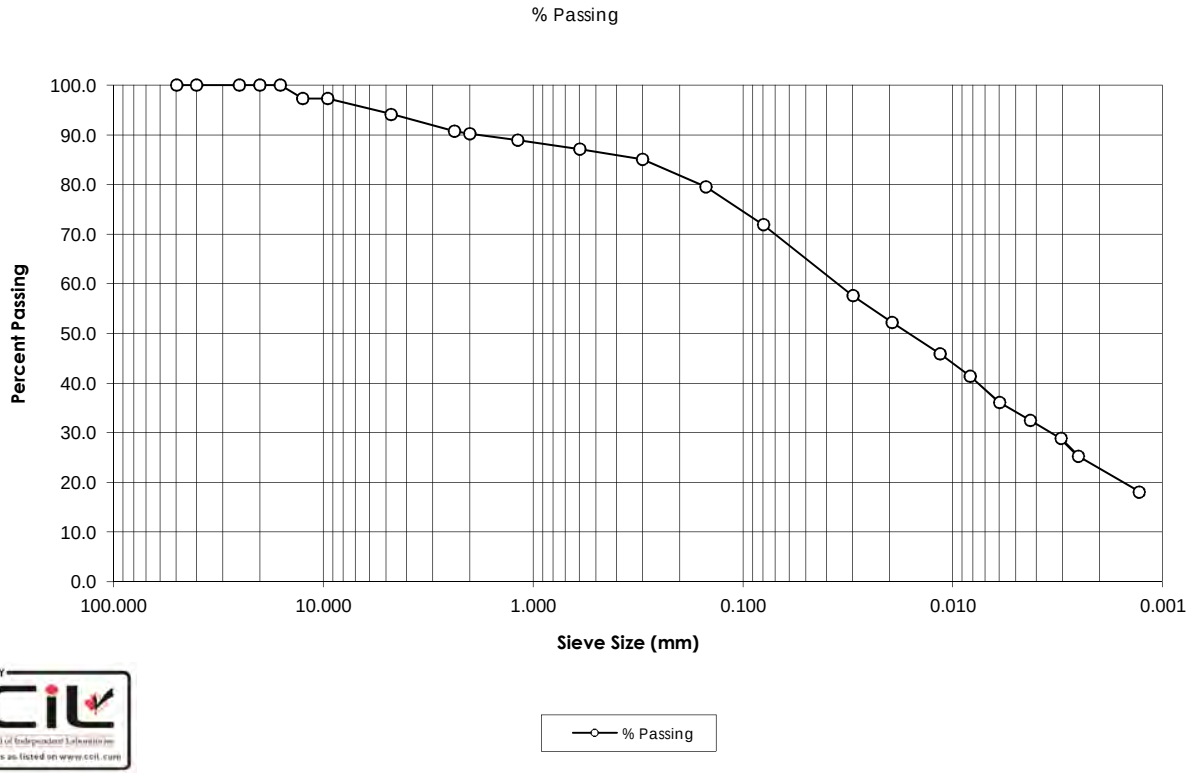
SAMPLE No.: ST5
SOURCE: DC27
TESTED BY: B. Pelkey

DATE TESTED: July 19, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 36.1 |
| 40.0 | 100.0 | 0.0043 | 32.5 |
| 25.0 | 100.0 | 0.0031 | 28.9 |
| 20.0 | 100.0 | 0.0025 | 25.3 |
| 16.0 | 100.0 | 0.0013 | 18.1 |
| 12.5 | 97.3 | | |
| 9.5 | 97.3 | | |
| 4.75 | 94.2 | | |
| 2.36 | 90.7 | | |
| 2.00 | 90.2 | | |
| 1.18 | 88.9 | | |
| 0.600 | 87.1 | | |
| 0.300 | 85.1 | | |
| 0.150 | 79.5 | | |
| 0.080 | 71.9 | | |
| 0.0299 | 57.6 | | |
| 0.0194 | 52.2 | | |
| 0.0115 | 45.9 | | |
| 0.0083 | 41.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.8% | $D_{10}$: | - |
| Sand: | 22.3% | $D_{30}$: | 0.0034 |
| Silt: | 49.1% | $D_{60}$: | 0.0392 |
| Clay: | 22.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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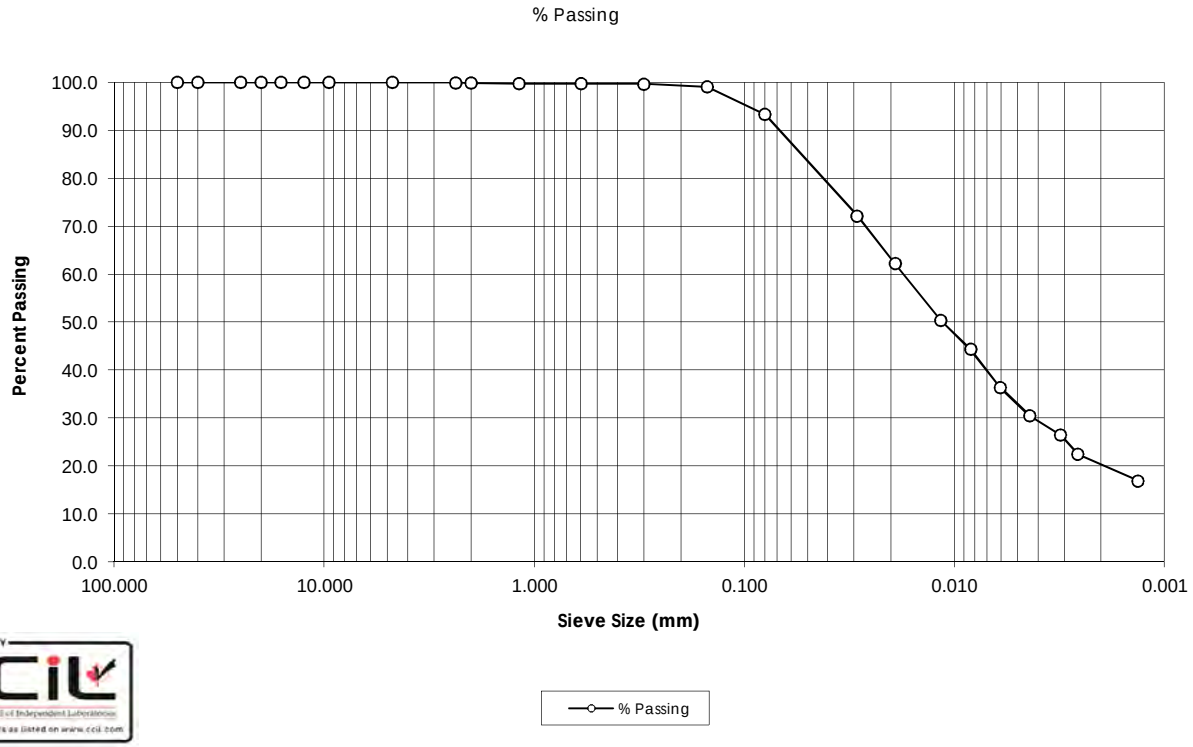
SAMPLE No.: SS10
SOURCE: DC27
TESTED BY: C. Oost

DATE TESTED: July 14, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Silty Clay (CL-ML) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0061** | **36.4** |
| **40.0** | **100.0** | **0.0044** | **30.4** |
| **25.0** | **100.0** | **0.0031** | **26.4** |
| **20.0** | **100.0** | **0.0026** | **22.5** |
| **16.0** | **100.0** | **0.0013** | **16.9** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.9** | | |
| **2.00** | **99.8** | | |
| **1.18** | **99.8** | | |
| **0.600** | **99.8** | | |
| **0.300** | **99.7** | | |
| **0.150** | **99.1** | | |
| **0.080** | **93.3** | | |
| **0.0291** | **72.2** | | |
| **0.0192** | **62.2** | | |
| **0.0116** | **50.3** | | |
| **0.0084** | **44.3** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 6.7% | $D_{30}$: | 0.0042 |
| Silt: | 73.0% | $D_{60}$: | 0.0179 |
| Clay: | 20.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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**LABORATORY**
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Calgary, Alberta
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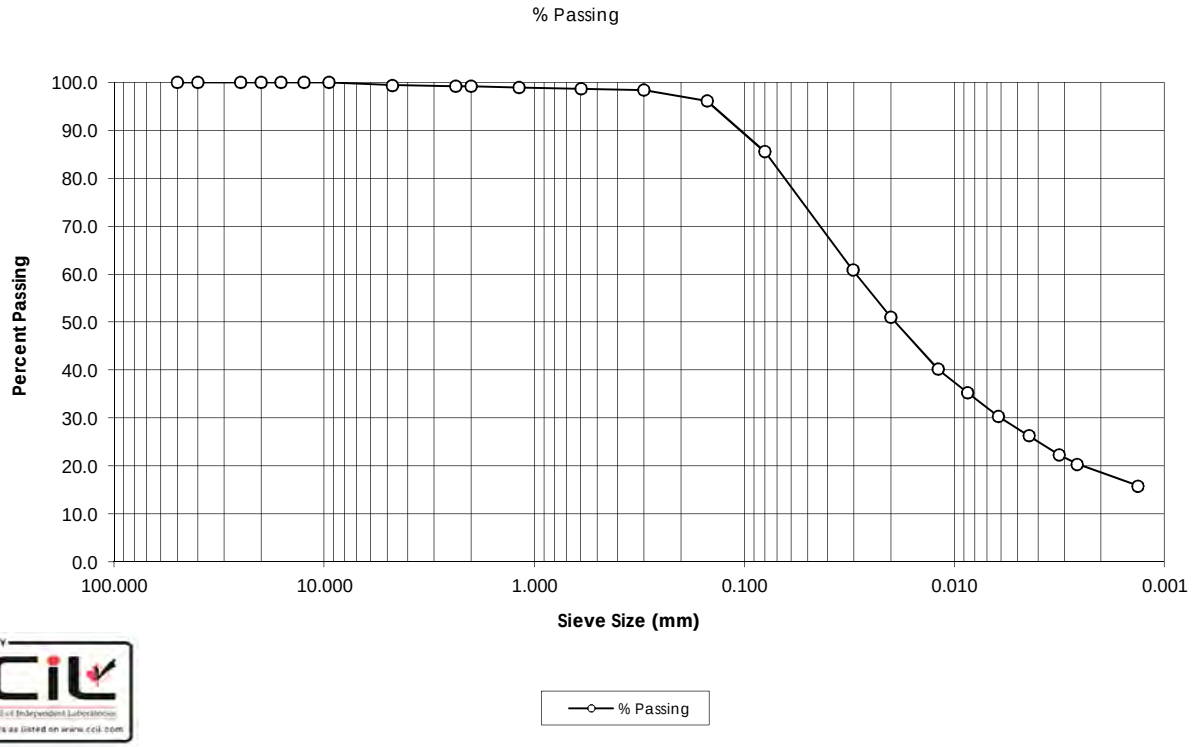
Tel: (403) 253-7876

SAMPLE No.: SS12
SOURCE: DC27
TESTED BY: C. Oost

DATE TESTED: July 14, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Silty Clay (CL-ML) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0062** | **30.3** |
| **40.0** | **100.0** | **0.0044** | **26.3** |
| **25.0** | **100.0** | **0.0032** | **22.4** |
| **20.0** | **100.0** | **0.0026** | **20.4** |
| **16.0** | **100.0** | **0.0013** | **15.8** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.4** | | |
| **2.36** | **99.2** | | |
| **2.00** | **99.2** | | |
| **1.18** | **99.0** | | |
| **0.600** | **98.7** | | |
| **0.300** | **98.5** | | |
| **0.150** | **96.2** | | |
| **0.080** | **85.6** | | |
| **0.0304** | **60.9** | | |
| **0.0201** | **51.0** | | |
| **0.0120** | **40.2** | | |
| **0.0086** | **35.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.6% | $D_{10}$: | - |
| Sand: | 13.8% | $D_{30}$: | 0.0061 |
| Silt: | 67.0% | $D_{60}$: | 0.0295 |
| Clay: | 18.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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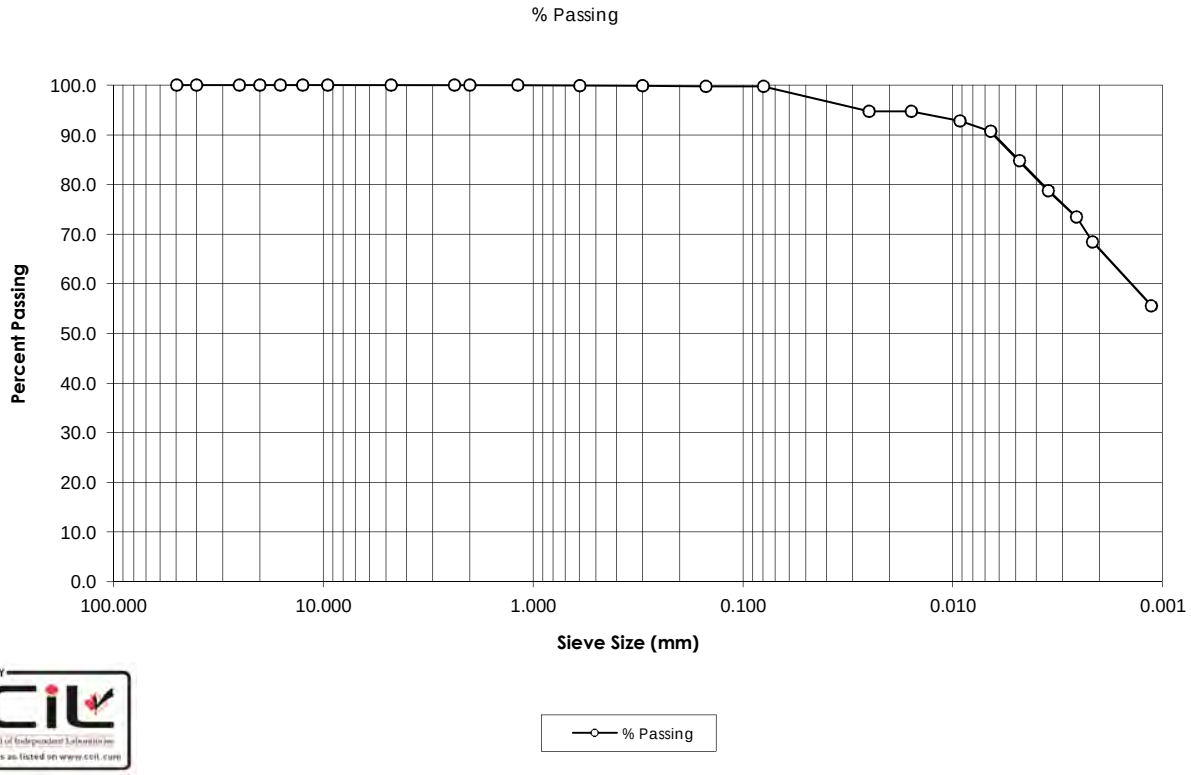
Tel: (403) 253-7876

SAMPLE No.: BSA
SOURCE: DC30
TESTED BY: B. Pelkey

DATE TESTED: August 16, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Clay (CH)

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0048 | 84.8 |
| 40.0 | 100.0 | 0.0035 | 78.8 |
| 25.0 | 100.0 | 0.0026 | 73.4 |
| 20.0 | 100.0 | 0.0022 | 68.5 |
| 16.0 | 100.0 | 0.0011 | 55.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.8 | | |
| 0.080 | 99.8 | | |
| 0.0249 | 94.7 | | |
| 0.0158 | 94.7 | | |
| 0.0092 | 92.8 | | |
| 0.0066 | 90.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.2% | $D_{30}$: | - |
| Silt: | 32.8% | $D_{60}$: | 0.0015 |
| Clay: | 67.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

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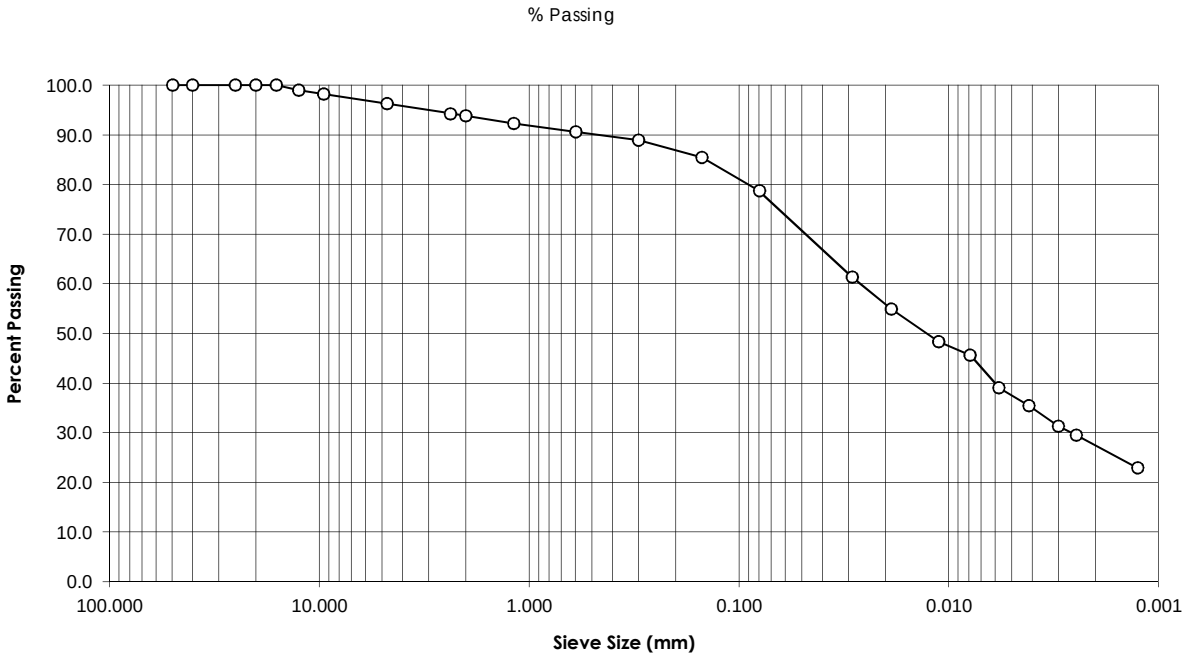
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSB
SOURCE: DC30
TESTED BY: B. Pelkey

DATE TESTED: August 16, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 39.1 |
| 40.0 | 100.0 | 0.0041 | 35.4 |
| 25.0 | 100.0 | 0.0030 | 31.3 |
| 20.0 | 100.0 | 0.0025 | 29.5 |
| 16.0 | 100.0 | 0.0013 | 23.0 |
| 12.5 | 99.0 | | |
| 9.5 | 98.2 | | |
| 4.75 | 96.3 | | |
| 2.36 | 94.3 | | |
| 2.00 | 93.9 | | |
| 1.18 | 92.2 | | |
| 0.600 | 90.6 | | |
| 0.300 | 88.9 | | |
| 0.150 | 85.4 | | |
| 0.080 | 78.8 | | |
| 0.0289 | 61.4 | | |
| 0.0187 | 54.9 | | |
| 0.0112 | 48.4 | | |
| 0.0079 | 45.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.7% | $D_{10}$: | - |
| Sand: | 17.5% | $D_{30}$: | 0.0026 |
| Silt: | 51.3% | $D_{60}$: | 0.0268 |
| Clay: | 27.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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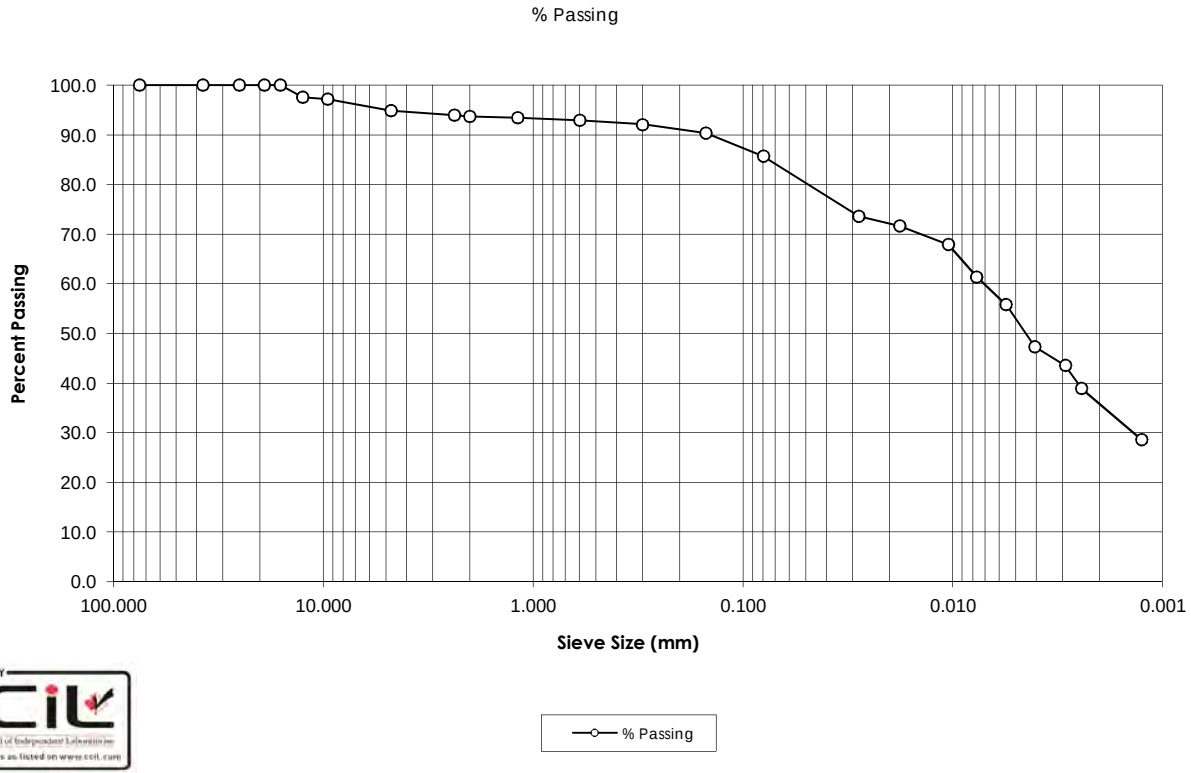
SAMPLE No.: ST3
SOURCE: DC30
TESTED BY: B. Pelkey

DATE TESTED: August 25, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0056 | 55.8 |
| 37.5 | 100.0 | 0.0041 | 47.4 |
| 25.0 | 100.0 | 0.0029 | 43.6 |
| 19.0 | 100.0 | 0.0024 | 38.9 |
| 16.0 | 100.0 | 0.0013 | 28.6 |
| 12.5 | 97.6 | | |
| 9.5 | 97.2 | | |
| 4.75 | 94.9 | | |
| 2.36 | 94.0 | | |
| 2.00 | 93.8 | | |
| 1.18 | 93.4 | | |
| 0.600 | 92.9 | | |
| 0.300 | 92.1 | | |
| 0.150 | 90.4 | | |
| 0.080 | 85.7 | | |
| 0.0280 | 73.6 | | |
| 0.0179 | 71.7 | | |
| 0.0105 | 68.0 | | |
| 0.0077 | 61.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.1% | $D_{10}$: | - |
| Sand: | 9.2% | $D_{30}$: | 0.0014 |
| Silt: | 49.8% | $D_{60}$: | 0.0072 |
| Clay: | 35.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

**OFFICE**
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Calgary, Alberta
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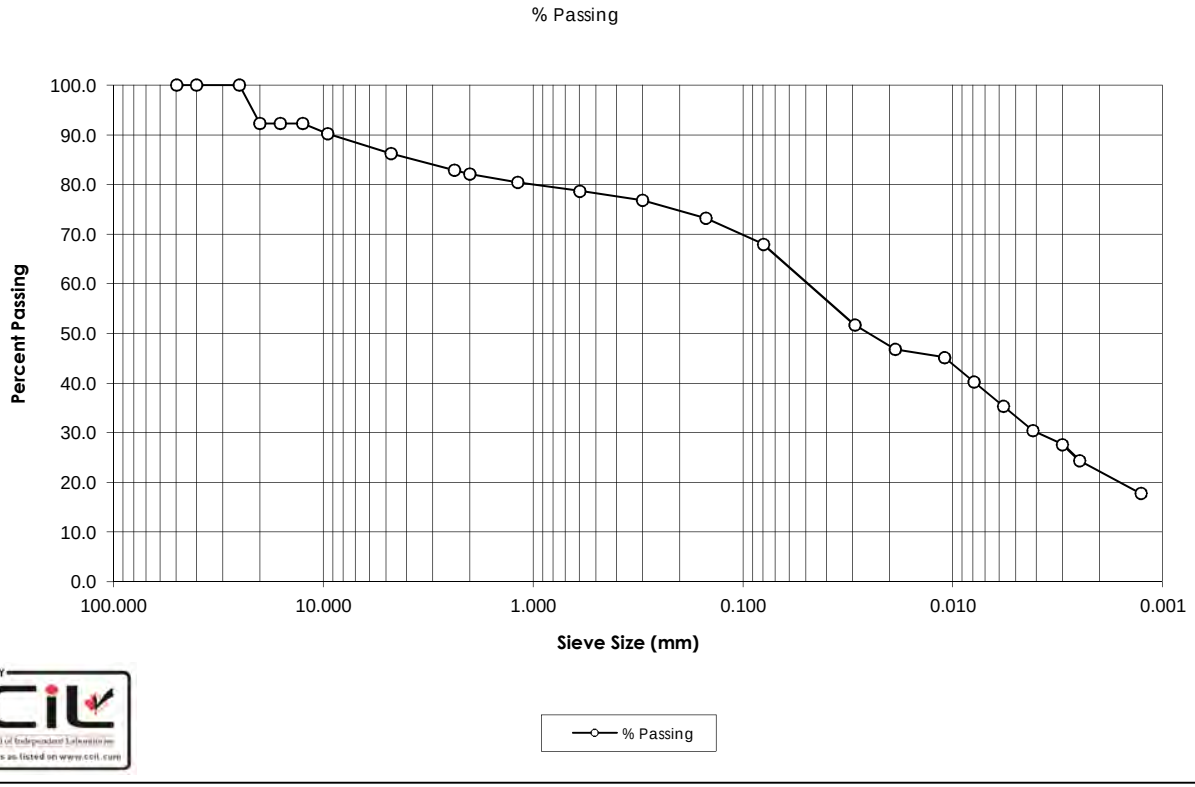
**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

SAMPLE No.: SS9A
SOURCE: DC30
TESTED BY: B. Pelkey

DATE TESTED: August 16, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Some Gravel




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0057** | **35.4** |
| **40.0** | **100.0** | **0.0041** | **30.4** |
| **25.0** | **100.0** | **0.0030** | **27.7** |
| **20.0** | **92.3** | **0.0025** | **24.4** |
| **16.0** | **92.3** | **0.0013** | **17.8** |
| **12.5** | **92.3** | | |
| **9.5** | **90.2** | | |
| **4.75** | **86.2** | | |
| **2.36** | **82.8** | | |
| **2.00** | **82.1** | | |
| **1.18** | **80.4** | | |
| **0.600** | **78.7** | | |
| **0.300** | **76.8** | | |
| **0.150** | **73.2** | | |
| **0.080** | **68.0** | | |
| **0.0291** | **51.7** | | |
| **0.0188** | **46.8** | | |
| **0.0110** | **45.2** | | |
| **0.0079** | **40.3** | | |

| | | | |
|---|---|---|---|
| Gravel: | 13.8% | $D_{10}$: | - |
| Sand: | 18.3% | $D_{30}$: | 0.0040 |
| Silt: | 45.7% | $D_{60}$: | 0.0567 |
| Clay: | 22.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

**OFFICE**
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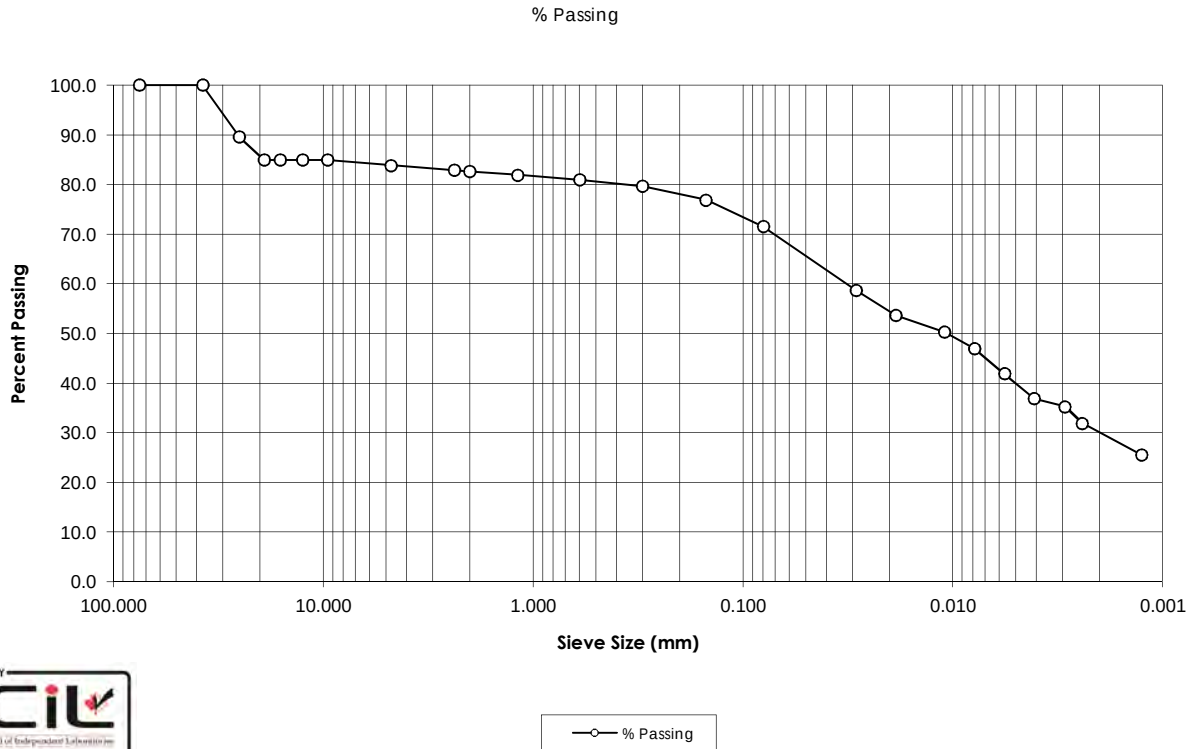
**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

SAMPLE No.: BSA
SOURCE: DC32
TESTED BY: C. Oost

DATE TESTED: August 24, 2016
DATE RECEIVED: June 7, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Gravel Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0057 | 41.9 |
| 37.5 | 100.0 | 0.0041 | 36.9 |
| 25.0 | 89.5 | 0.0029 | 35.3 |
| 19.0 | 84.9 | 0.0024 | 31.9 |
| 16.0 | 84.9 | 0.0013 | 25.6 |
| 12.5 | 84.9 | | |
| 9.5 | 84.9 | | |
| 4.75 | 83.8 | | |
| 2.36 | 82.8 | | |
| 2.00 | 82.7 | | |
| 1.18 | 81.9 | | |
| 0.600 | 80.9 | | |
| 0.300 | 79.7 | | |
| 0.150 | 76.9 | | |
| 0.080 | 71.5 | | |
| 0.0287 | 58.6 | | |
| 0.0186 | 53.6 | | |
| 0.0109 | 50.3 | | |
| 0.0078 | 46.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 16.2% | $D_{10}$: | - |
| Sand: | 12.4% | $D_{30}$: | 0.0021 |
| Silt: | 41.4% | $D_{60}$: | 0.0347 |
| Clay: | 30.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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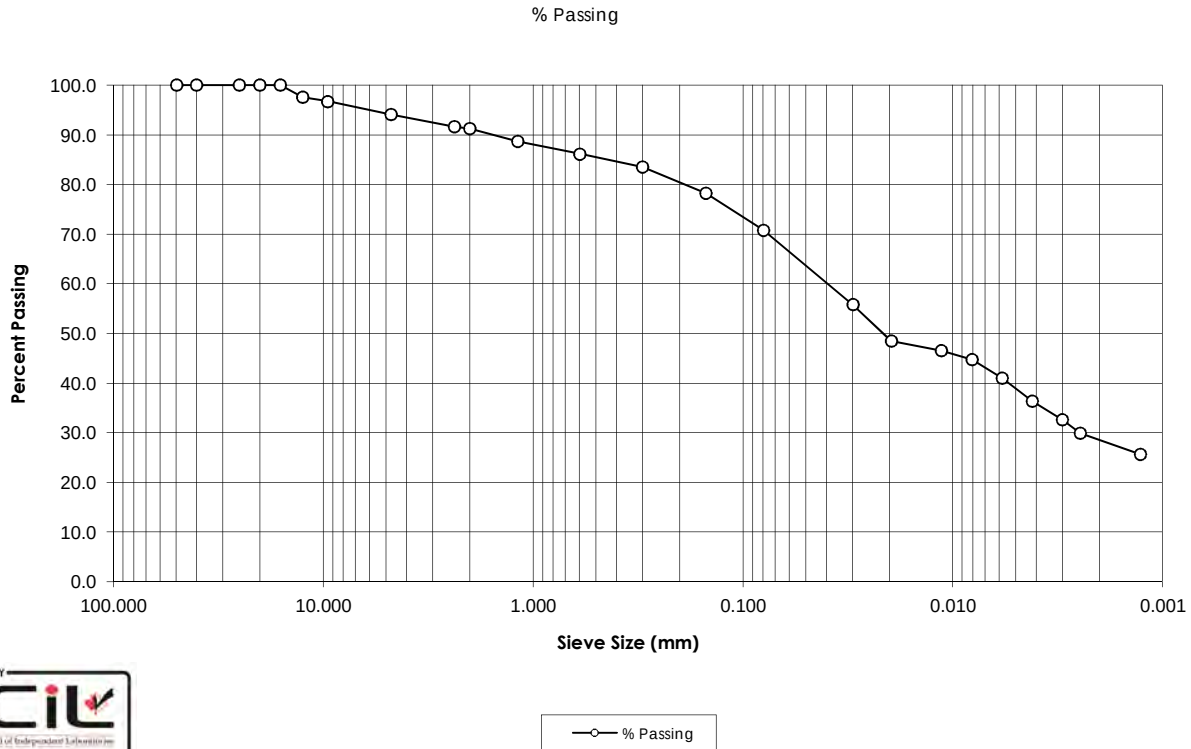
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BSC
SOURCE: DC32
TESTED BY: C. oost

DATE TESTED: August 24, 2016
DATE RECEIVED: June 7, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 41.0 |
| 40.0 | 100.0 | 0.0042 | 36.4 |
| 25.0 | 100.0 | 0.0030 | 32.7 |
| 20.0 | 100.0 | 0.0025 | 29.9 |
| 16.0 | 100.0 | 0.0013 | 25.6 |
| 12.5 | 97.6 | | |
| 9.5 | 96.7 | | |
| 4.75 | 94.1 | | |
| 2.36 | 91.6 | | |
| 2.00 | 91.2 | | |
| 1.18 | 88.7 | | |
| 0.600 | 86.2 | | |
| 0.300 | 83.6 | | |
| 0.150 | 78.2 | | |
| 0.080 | 70.8 | | |
| 0.0299 | 55.9 | | |
| 0.0195 | 48.4 | | |
| 0.0113 | 46.6 | | |
| 0.0081 | 44.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.9% | $D_{10}$: | - |
| Sand: | 23.3% | $D_{30}$: | 0.0025 |
| Silt: | 42.3% | $D_{60}$: | 0.0450 |
| Clay: | 28.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

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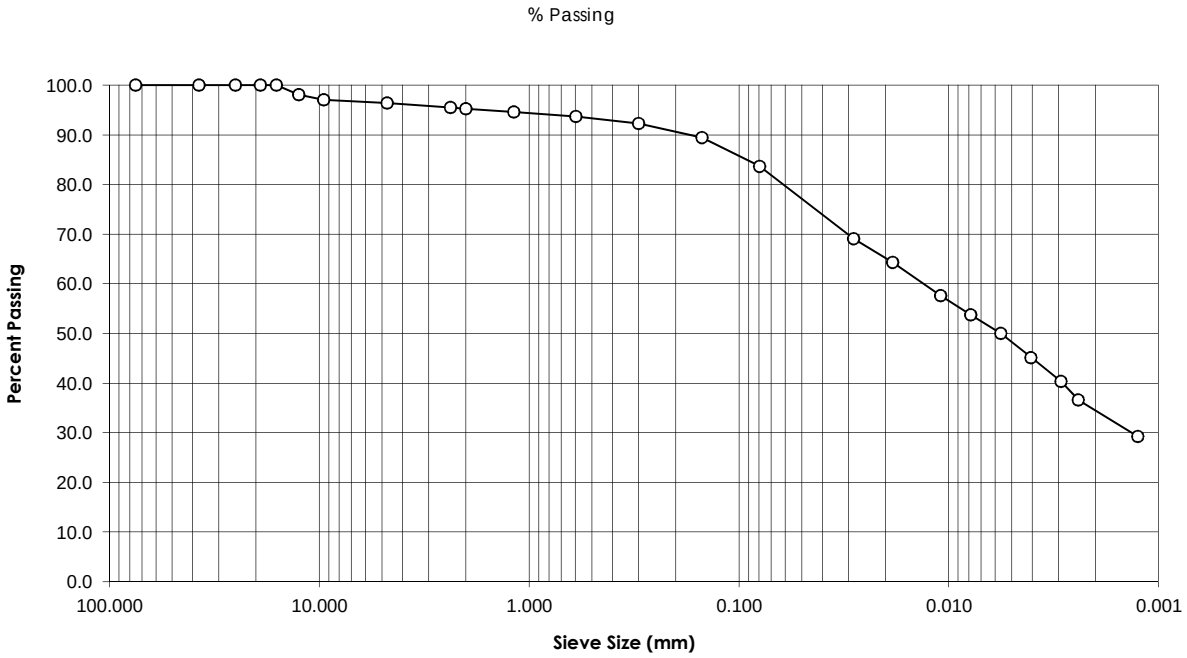
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS2
SOURCE: DC32
TESTED BY: C. Oost

DATE TESTED: August 24, 2016
DATE RECEIVED: June 7, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0056 | 50.0 |
| 37.5 | 100.0 | 0.0041 | 45.2 |
| 25.0 | 100.0 | 0.0029 | 40.4 |
| 19.0 | 100.0 | 0.0024 | 36.6 |
| 16.0 | 100.0 | 0.0013 | 29.3 |
| 12.5 | 98.1 | | |
| 9.5 | 97.1 | | |
| 4.75 | 96.4 | | |
| 2.36 | 95.5 | | |
| 2.00 | 95.2 | | |
| 1.18 | 94.6 | | |
| 0.600 | 93.7 | | |
| 0.300 | 92.3 | | |
| 0.150 | 89.4 | | |
| 0.080 | 83.7 | | |
| 0.0284 | 69.1 | | |
| 0.0185 | 64.3 | | |
| 0.0109 | 57.6 | | |
| 0.0078 | 53.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.6% | $D_{10}$: | - |
| Sand: | 12.7% | $D_{30}$: | 0.0014 |
| Silt: | 49.2% | $D_{60}$: | 0.0137 |
| Clay: | 34.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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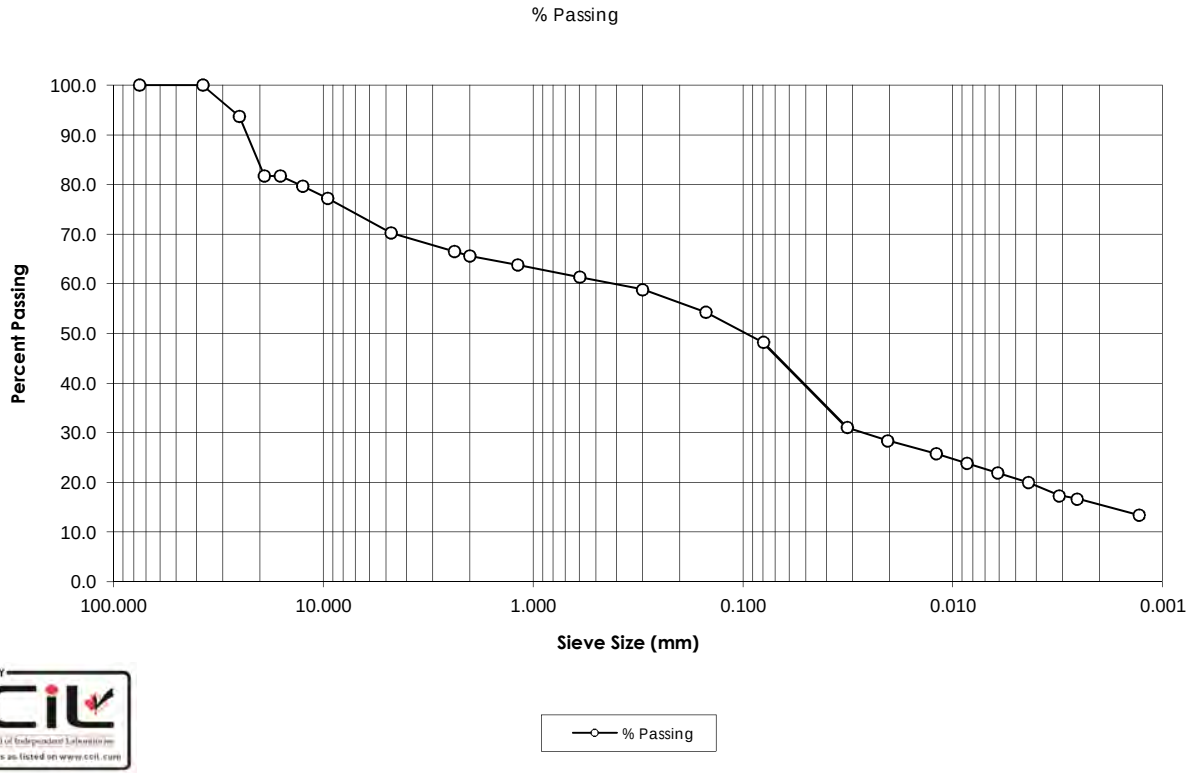
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST4
SOURCE: DC32
TESTED BY: C. Oost

DATE TESTED: August 25, 2016
DATE RECEIVED: June 7, 2016
SAMPLE DESCRIPTION: Gravelly, Sandy Clay (CL)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0061 | 21.9 |
| 37.5 | 100.0 | 0.0044 | 20.0 |
| 25.0 | 93.7 | 0.0031 | 17.4 |
| 19.0 | 81.7 | 0.0026 | 16.7 |
| 16.0 | 81.7 | 0.0013 | 13.4 |
| 12.5 | 79.6 | | |
| 9.5 | 77.2 | | |
| 4.75 | 70.3 | | |
| 2.36 | 66.5 | | |
| 2.00 | 65.7 | | |
| 1.18 | 63.8 | | |
| 0.600 | 61.3 | | |
| 0.300 | 58.9 | | |
| 0.150 | 54.3 | | |
| 0.080 | 48.2 | | |
| 0.0318 | 31.0 | | |
| 0.0205 | 28.4 | | |
| 0.0120 | 25.8 | | |
| 0.0085 | 23.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 29.7% | $D_{10}$: | - |
| Sand: | 22.1% | $D_{30}$: | 0.0274 |
| Silt: | 32.7% | $D_{60}$: | 0.4414 |
| Clay: | 15.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

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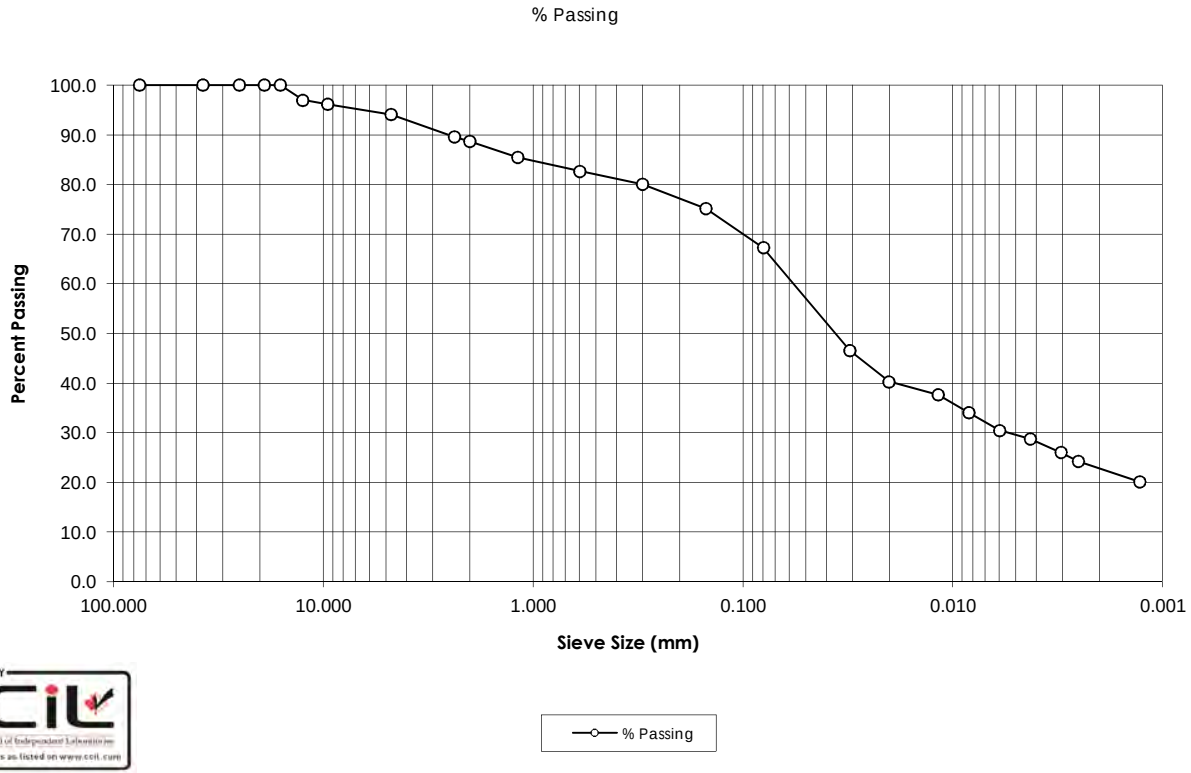
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS5
SOURCE: DC32
TESTED BY: C. Oost

DATE TESTED: August 24, 2016
DATE RECEIVED: June 7, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL-CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0060 | 30.5 |
| 37.5 | 100.0 | 0.0043 | 28.7 |
| 25.0 | 100.0 | 0.0031 | 26.0 |
| 19.0 | 100.0 | 0.0025 | 24.2 |
| 16.0 | 100.0 | 0.0013 | 20.1 |
| 12.5 | 97.0 | | |
| 9.5 | 96.2 | | |
| 4.75 | 94.0 | | |
| 2.36 | 89.5 | | |
| 2.00 | 88.7 | | |
| 1.18 | 85.5 | | |
| 0.600 | 82.7 | | |
| 0.300 | 80.0 | | |
| 0.150 | 75.1 | | |
| 0.080 | 67.3 | | |
| 0.0309 | 46.5 | | |
| 0.0201 | 40.3 | | |
| 0.0117 | 37.6 | | |
| 0.0084 | 34.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.0% | $D_{10}$: | - |
| Sand: | 26.7% | $D_{30}$: | 0.0055 |
| Silt: | 44.5% | $D_{60}$: | 0.0647 |
| Clay: | 22.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

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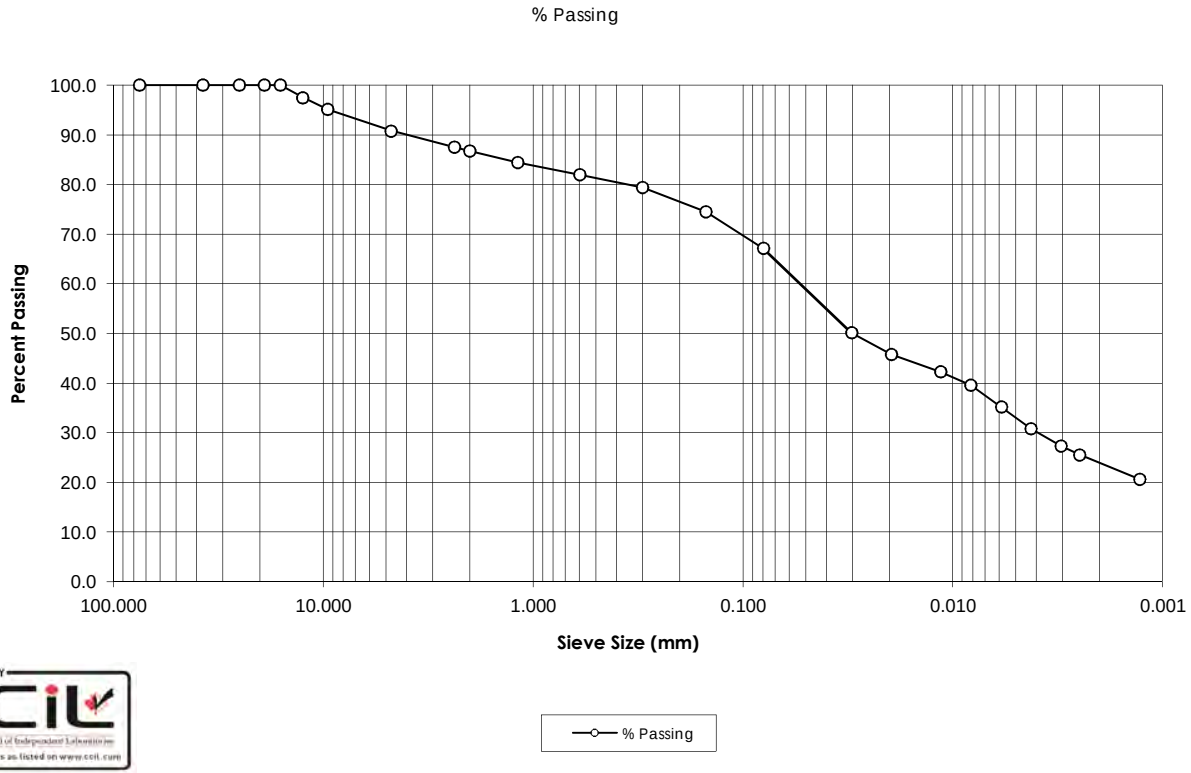
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS8
SOURCE: DC32
TESTED BY: C. Oost

DATE TESTED: August 24, 2016
DATE RECEIVED: June 7, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0059 | 35.2 |
| 37.5 | 100.0 | 0.0042 | 30.8 |
| 25.0 | 100.0 | 0.0030 | 27.3 |
| 19.0 | 100.0 | 0.0025 | 25.6 |
| 16.0 | 100.0 | 0.0013 | 20.7 |
| 12.5 | 97.5 | | |
| 9.5 | 95.1 | | |
| 4.75 | 90.8 | | |
| 2.36 | 87.5 | | |
| 2.00 | 86.7 | | |
| 1.18 | 84.5 | | |
| 0.600 | 81.9 | | |
| 0.300 | 79.4 | | |
| 0.150 | 74.5 | | |
| 0.080 | 67.2 | | |
| 0.0303 | 50.1 | | |
| 0.0195 | 45.7 | | |
| 0.0114 | 42.2 | | |
| 0.0082 | 39.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.2% | $D_{10}$: | - |
| Sand: | 23.6% | $D_{30}$: | 0.0040 |
| Silt: | 43.2% | $D_{60}$: | 0.0609 |
| Clay: | 24.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

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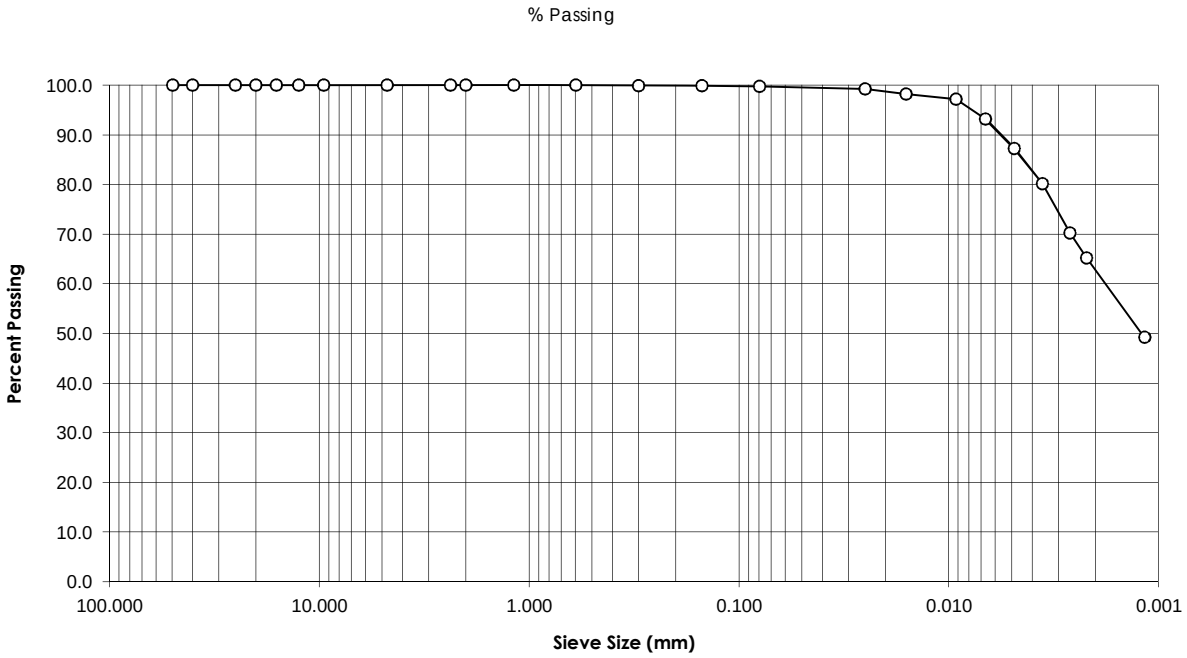
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST2
SOURCE: DC33
TESTED BY: B. Pelkey

DATE TESTED: June 30, 2016
DATE RECEIVED: June 9, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0049 | 87.2 |
| 40.0 | 100.0 | 0.0036 | 80.2 |
| 25.0 | 100.0 | 0.0026 | 70.2 |
| 20.0 | 100.0 | 0.0022 | 65.2 |
| 16.0 | 100.0 | 0.0012 | 49.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 100.0 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.8 | | |
| 0.0251 | 99.2 | | |
| 0.0160 | 98.2 | | |
| 0.0092 | 97.2 | | |
| 0.0067 | 93.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.2% | $D_{30}$: | - |
| Silt: | 37.0% | $D_{60}$: | 0.0019 |
| Clay: | 62.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size and Atterberg Limit test results. Source DC33 formerly reported as D53.

Reviewed by:

Stantec

**Grain Size Analysis**
Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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**LABORATORY**
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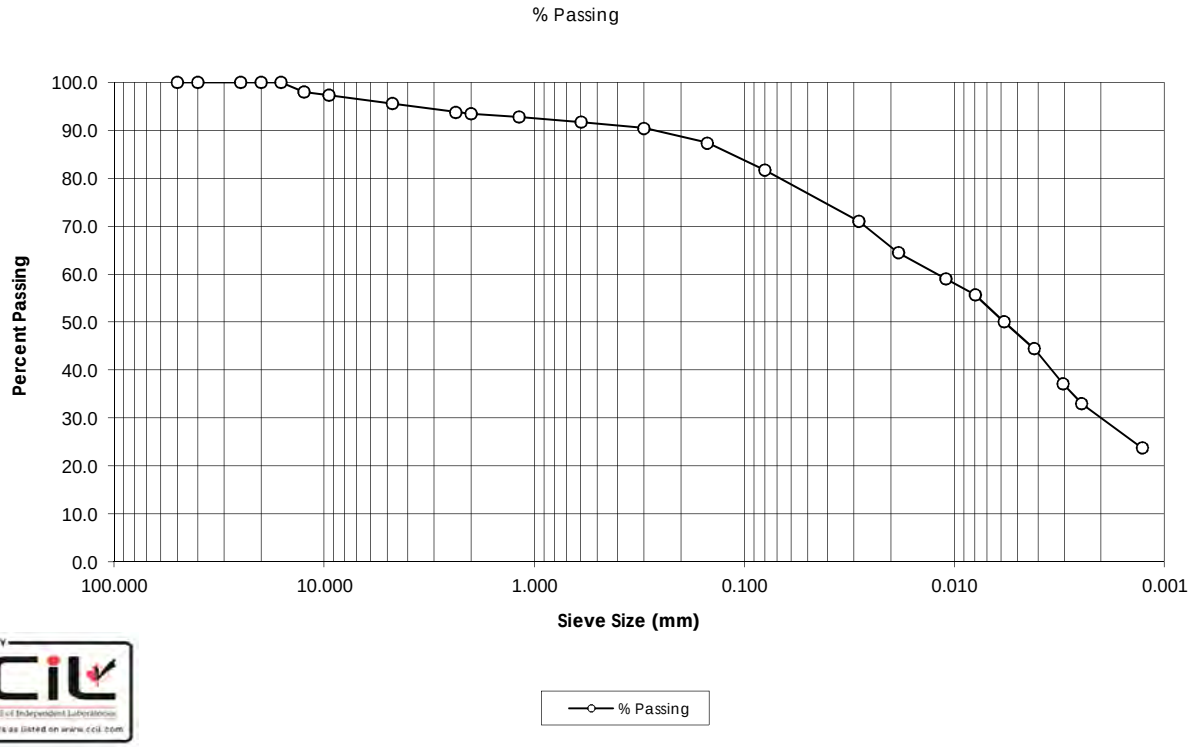
Tel: (403) 253-7876

SAMPLE No.: BS14
SOURCE: DC33
TESTED BY: J. Upham and B. Pelkey

DATE TESTED: July 17, 2016
DATE RECEIVED: June 9, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0058** | **50.1** |
| **40.0** | **100.0** | **0.0042** | **44.5** |
| **25.0** | **100.0** | **0.0030** | **37.1** |
| **20.0** | **100.0** | **0.0025** | **33.0** |
| **16.0** | **100.0** | **0.0013** | **23.7** |
| **12.5** | **98.0** | | |
| **9.5** | **97.3** | | |
| **4.75** | **95.6** | | |
| **2.36** | **93.8** | | |
| **2.00** | **93.4** | | |
| **1.18** | **92.8** | | |
| **0.600** | **91.7** | | |
| **0.300** | **90.5** | | |
| **0.150** | **87.4** | | |
| **0.080** | **81.8** | | |
| **0.0285** | **71.0** | | |
| **0.0185** | **64.5** | | |
| **0.0110** | **59.0** | | |
| **0.0080** | **55.6** | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.4% | $D_{10}$: | - |
| Sand: | 13.9% | $D_{30}$: | 0.0021 |
| Silt: | 51.7% | $D_{60}$: | 0.0124 |
| Clay: | 30.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results. Source DC33 formerly reported as D53.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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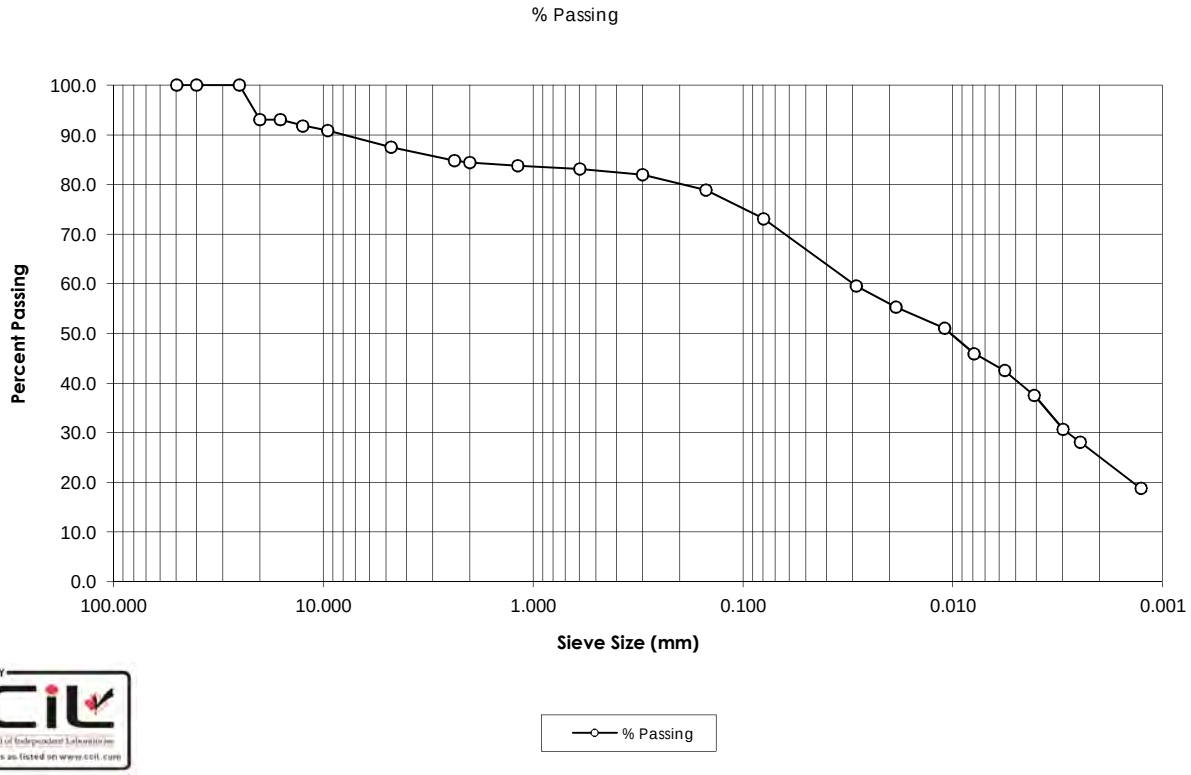
SAMPLE No.: SS15
SOURCE: DC33
TESTED BY: B. Pelkey

DATE TESTED: June 27, 2016
DATE RECEIVED: June 9, 2016
SAMPLE DESCRIPTION: Clay (CL-CI) Some Sand Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 42.6 |
| 40.0 | 100.0 | 0.0041 | 37.5 |
| 25.0 | 100.0 | 0.0030 | 30.7 |
| 20.0 | 93.1 | 0.0025 | 28.2 |
| 16.0 | 93.1 | 0.0013 | 18.8 |
| 12.5 | 91.8 | | |
| 9.5 | 90.9 | | |
| 4.75 | 87.5 | | |
| 2.36 | 84.8 | | |
| 2.00 | 84.4 | | |
| 1.18 | 83.8 | | |
| 0.600 | 83.1 | | |
| 0.300 | 82.0 | | |
| 0.150 | 78.9 | | |
| 0.080 | 73.1 | | |
| 0.0287 | 59.5 | | |
| 0.0186 | 55.3 | | |
| 0.0109 | 51.1 | | |
| 0.0079 | 46.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.5% | $D_{10}$: | - |
| Sand: | 14.4% | $D_{30}$: | 0.0028 |
| Silt: | 47.9% | $D_{60}$: | 0.0307 |
| Clay: | 25.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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Stantec

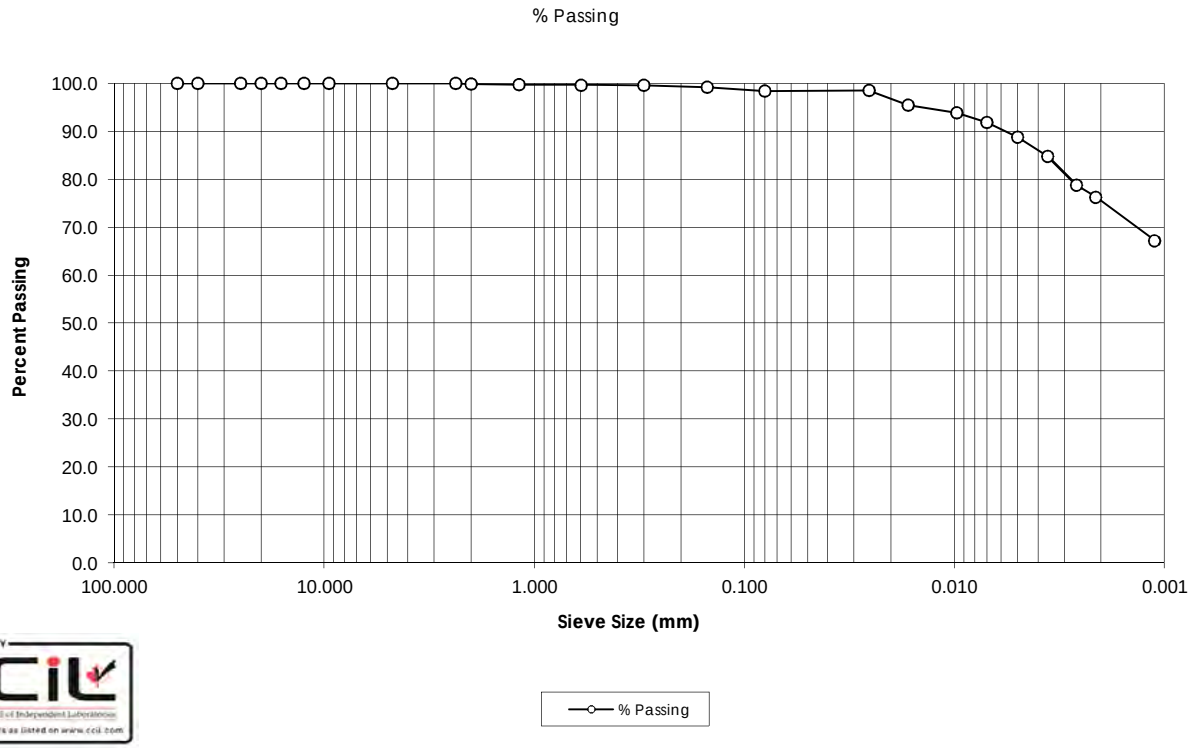
## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST2
SOURCE: DC34
TESTED BY: J. Upham and B. Pelkey

DATE TESTED: July 17, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0050** | **88.8** |
| **40.0** | **100.0** | **0.0036** | **84.8** |
| **25.0** | **100.0** | **0.0026** | **78.7** |
| **20.0** | **100.0** | **0.0021** | **76.3** |
| **16.0** | **100.0** | **0.0011** | **67.2** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **99.8** | | |
| **1.18** | **99.7** | | |
| **0.600** | **99.7** | | |
| **0.300** | **99.6** | | |
| **0.150** | **99.3** | | |
| **0.080** | **98.5** | | |
| **0.0255** | **98.5** | | |
| **0.0166** | **95.5** | | |
| **0.0098** | **93.9** | | |
| **0.0070** | **91.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.5% | $D_{30}$: | - |
| Silt: | 23.0% | $D_{60}$: | - |
| Clay: | 75.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results. Source DC34 formerly reported as D54.



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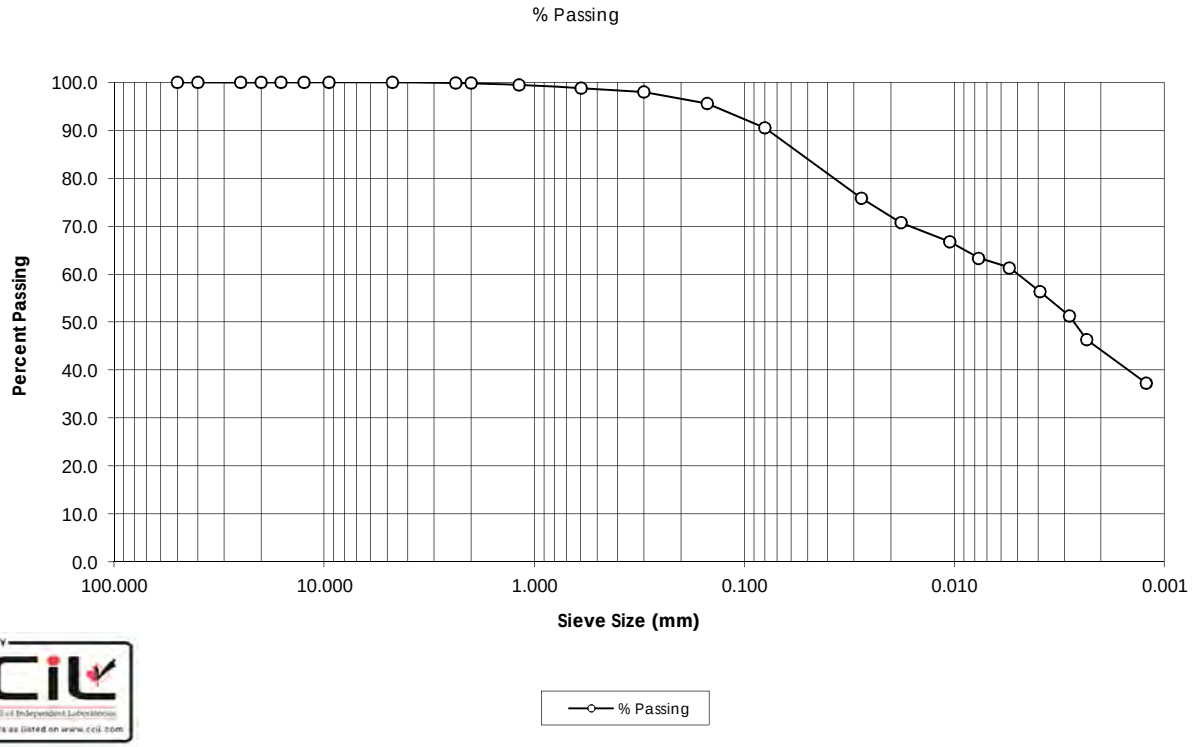
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS04
SOURCE: DC34
TESTED BY: J. Upham and B. Pelkey

DATE TESTED: July 21, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0055** | **61.4** |
| **40.0** | **100.0** | **0.0039** | **56.3** |
| **25.0** | **100.0** | **0.0028** | **51.3** |
| **20.0** | **100.0** | **0.0023** | **46.3** |
| **16.0** | **100.0** | **0.0012** | **37.3** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.9** | | |
| **2.00** | **99.8** | | |
| **1.18** | **99.5** | | |
| **0.600** | **98.8** | | |
| **0.300** | **98.0** | | |
| **0.150** | **95.6** | | |
| **0.080** | **90.6** | | |
| **0.0277** | **75.8** | | |
| **0.0180** | **70.8** | | |
| **0.0105** | **66.8** | | |
| **0.0077** | **63.4** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 9.4% | $D_{30}$: | - |
| Silt: | 46.4% | $D_{60}$: | 0.0051 |
| Clay: | 44.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results. Source DC34 formerly reported as D54.



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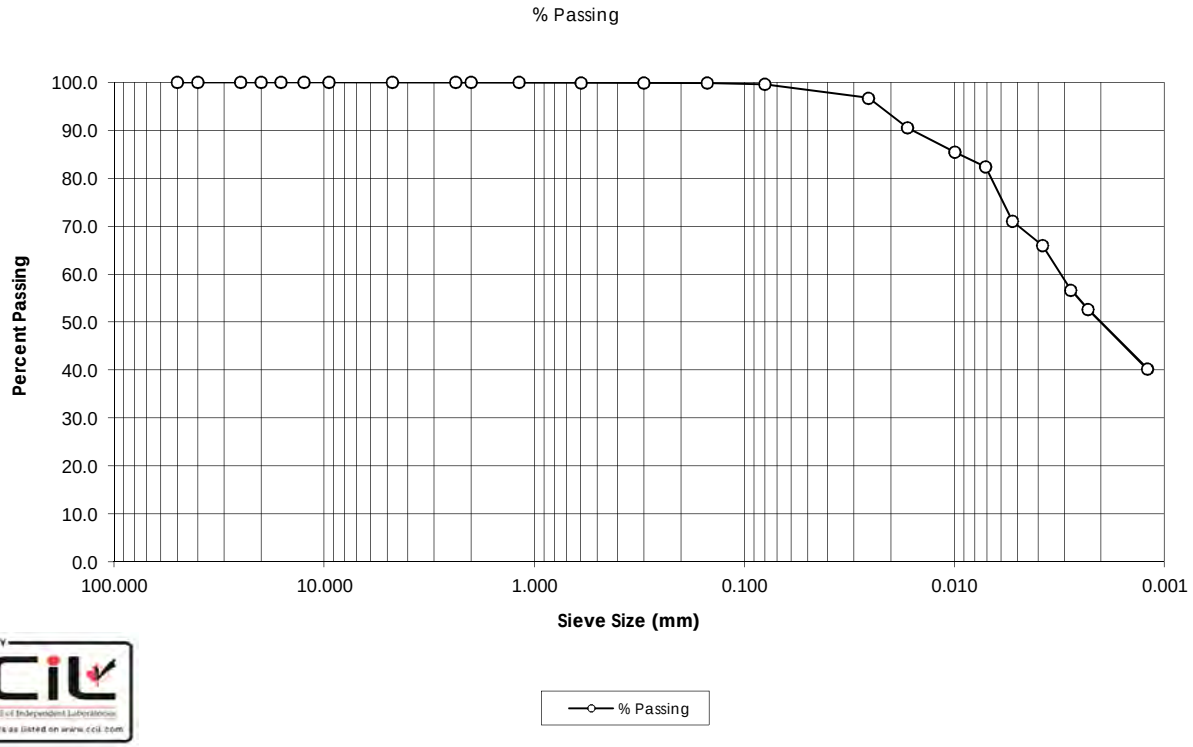
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: ST5
SOURCE: DC34
TESTED BY: C. Oost

DATE TESTED: July 18, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay (CH-CL)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0053** | **71.1** |
| **40.0** | **100.0** | **0.0038** | **65.9** |
| **25.0** | **100.0** | **0.0028** | **56.7** |
| **20.0** | **100.0** | **0.0023** | **52.6** |
| **16.0** | **100.0** | **0.0012** | **40.3** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **100.0** | | |
| **1.18** | **100.0** | | |
| **0.600** | **99.9** | | |
| **0.300** | **99.9** | | |
| **0.150** | **99.8** | | |
| **0.080** | **99.7** | | |
| **0.0256** | **96.7** | | |
| **0.0167** | **90.6** | | |
| **0.0099** | **85.4** | | |
| **0.0071** | **82.4** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.3% | $D_{30}$: | - |
| Silt: | 49.9% | $D_{60}$: | 0.0032 |
| Clay: | 49.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results. Source DC34 formerly reported as D54.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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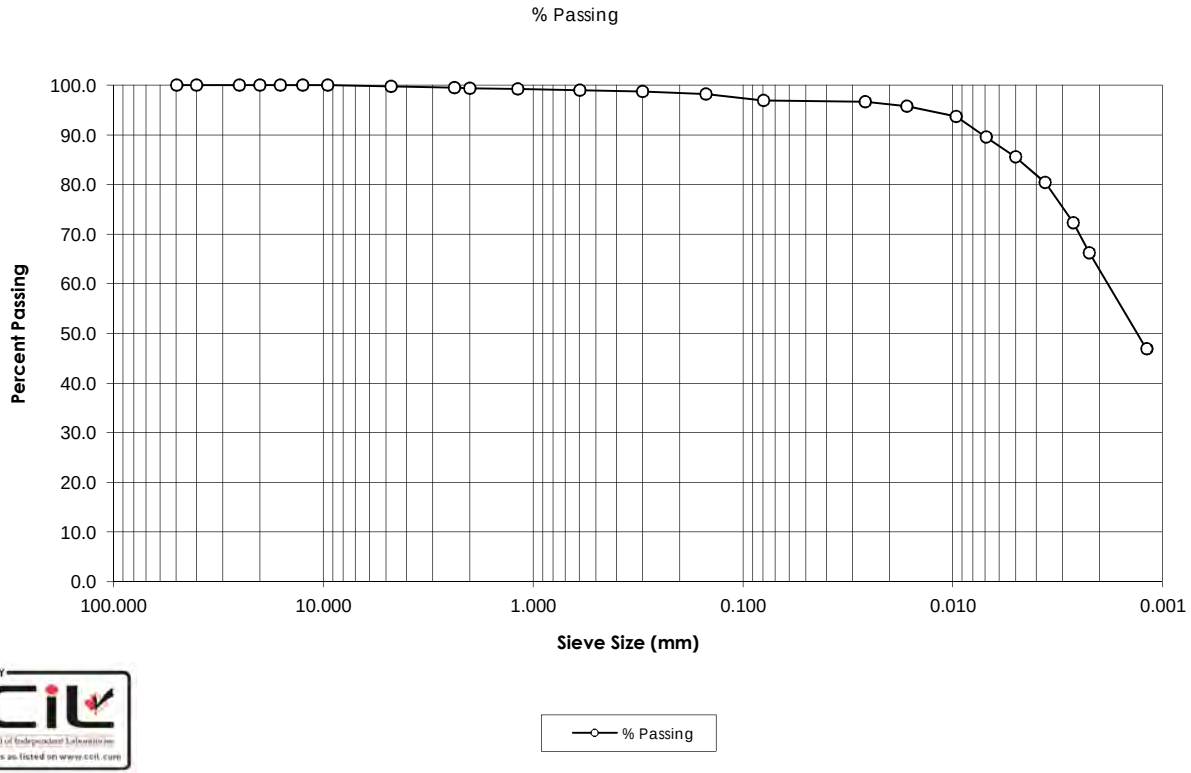
SAMPLE No.: ST8
SOURCE: DC34
TESTED BY: C. Oost

DATE TESTED: July 18, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0050 | 85.6 |
| 40.0 | 100.0 | 0.0036 | 80.5 |
| 25.0 | 100.0 | 0.0027 | 72.3 |
| 20.0 | 100.0 | 0.0022 | 66.2 |
| 16.0 | 100.0 | 0.0012 | 46.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.8 | | |
| 2.36 | 99.5 | | |
| 2.00 | 99.4 | | |
| 1.18 | 99.3 | | |
| 0.600 | 99.0 | | |
| 0.300 | 98.8 | | |
| 0.150 | 98.2 | | |
| 0.080 | 97.0 | | |
| 0.0261 | 96.7 | | |
| 0.0165 | 95.7 | | |
| 0.0096 | 93.7 | | |
| 0.0069 | 89.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 2.8% | $D_{30}$: | - |
| Silt: | 34.1% | $D_{60}$: | 0.0019 |
| Clay: | 62.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results. Source DC34 formerly reported as D54.

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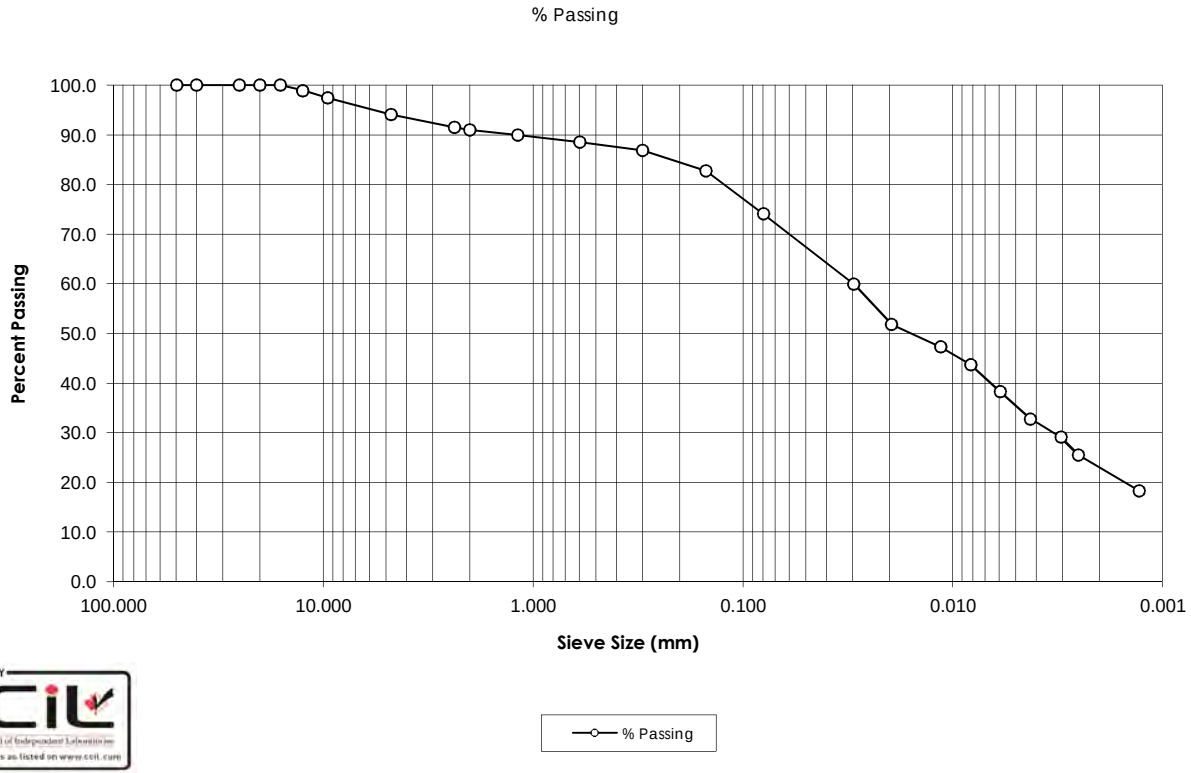
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS15
SOURCE: DC34
TESTED BY: B. Pelkey

DATE TESTED: July 26, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 38.2 |
| 40.0 | 100.0 | 0.0043 | 32.8 |
| 25.0 | 100.0 | 0.0031 | 29.2 |
| 20.0 | 100.0 | 0.0025 | 25.6 |
| 16.0 | 100.0 | 0.0013 | 18.3 |
| 12.5 | 98.9 | | |
| 9.5 | 97.4 | | |
| 4.75 | 94.1 | | |
| 2.36 | 91.5 | | |
| 2.00 | 91.0 | | |
| 1.18 | 90.0 | | |
| 0.600 | 88.5 | | |
| 0.300 | 86.9 | | |
| 0.150 | 82.7 | | |
| 0.080 | 74.1 | | |
| 0.0296 | 60.0 | | |
| 0.0195 | 51.8 | | |
| 0.0114 | 47.3 | | |
| 0.0082 | 43.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.9% | $D_{10}$: | - |
| Sand: | 20.0% | $D_{30}$: | 0.0033 |
| Silt: | 51.1% | $D_{60}$: | 0.0297 |
| Clay: | 23.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results. Source DC34 formerly reported as D54.



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

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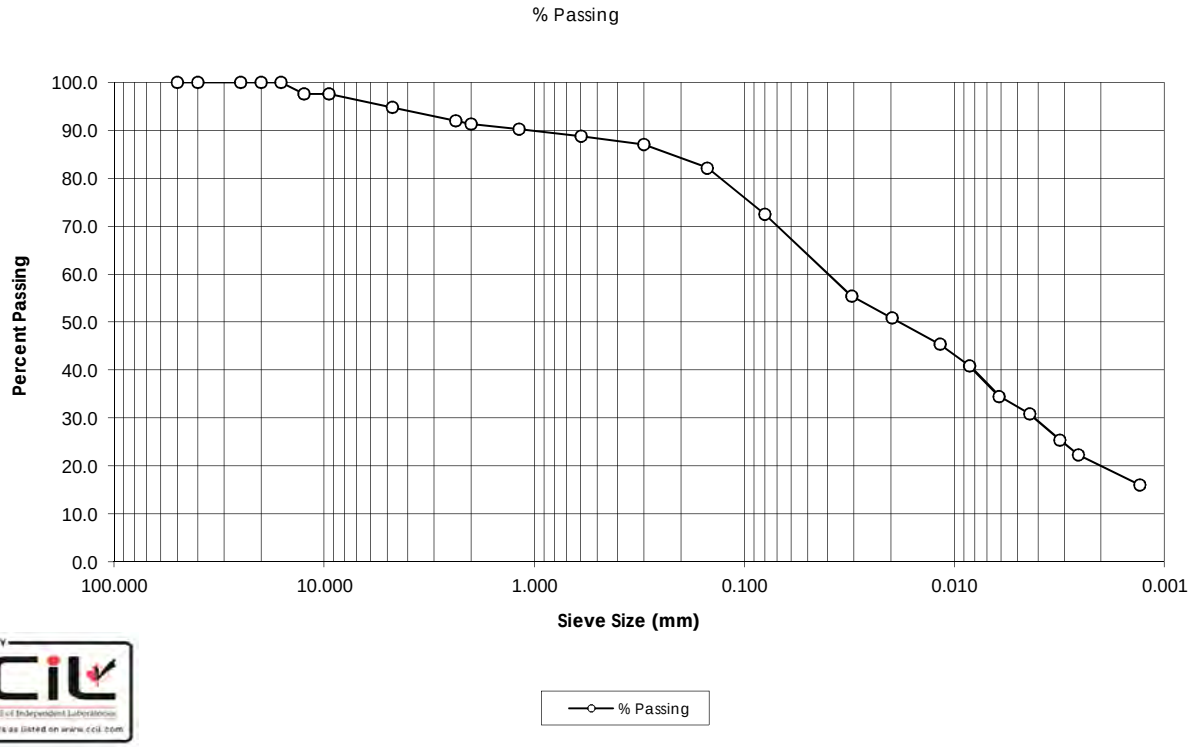
SAMPLE No.: SS19
SOURCE: DC34
TESTED BY: J. Upham and B. Pelkey

DATE TESTED: July 17, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0061** | **34.5** |
| **40.0** | **100.0** | **0.0044** | **30.9** |
| **25.0** | **100.0** | **0.0032** | **25.4** |
| **20.0** | **100.0** | **0.0026** | **22.3** |
| **16.0** | **100.0** | **0.0013** | **16.0** |
| **12.5** | **97.6** | | |
| **9.5** | **97.6** | | |
| **4.75** | **94.8** | | |
| **2.36** | **92.0** | | |
| **2.00** | **91.4** | | |
| **1.18** | **90.3** | | |
| **0.600** | **88.8** | | |
| **0.300** | **87.1** | | |
| **0.150** | **82.2** | | |
| **0.080** | **72.5** | | |
| **0.0308** | **55.4** | | |
| **0.0198** | **50.9** | | |
| **0.0117** | **45.4** | | |
| **0.0085** | **40.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.2% | $D_{10}$: | - |
| Sand: | 22.3% | $D_{30}$: | 0.0042 |
| Silt: | 52.5% | $D_{60}$: | 0.0454 |
| Clay: | 20.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results. Source DC34 formerly reported as D54.



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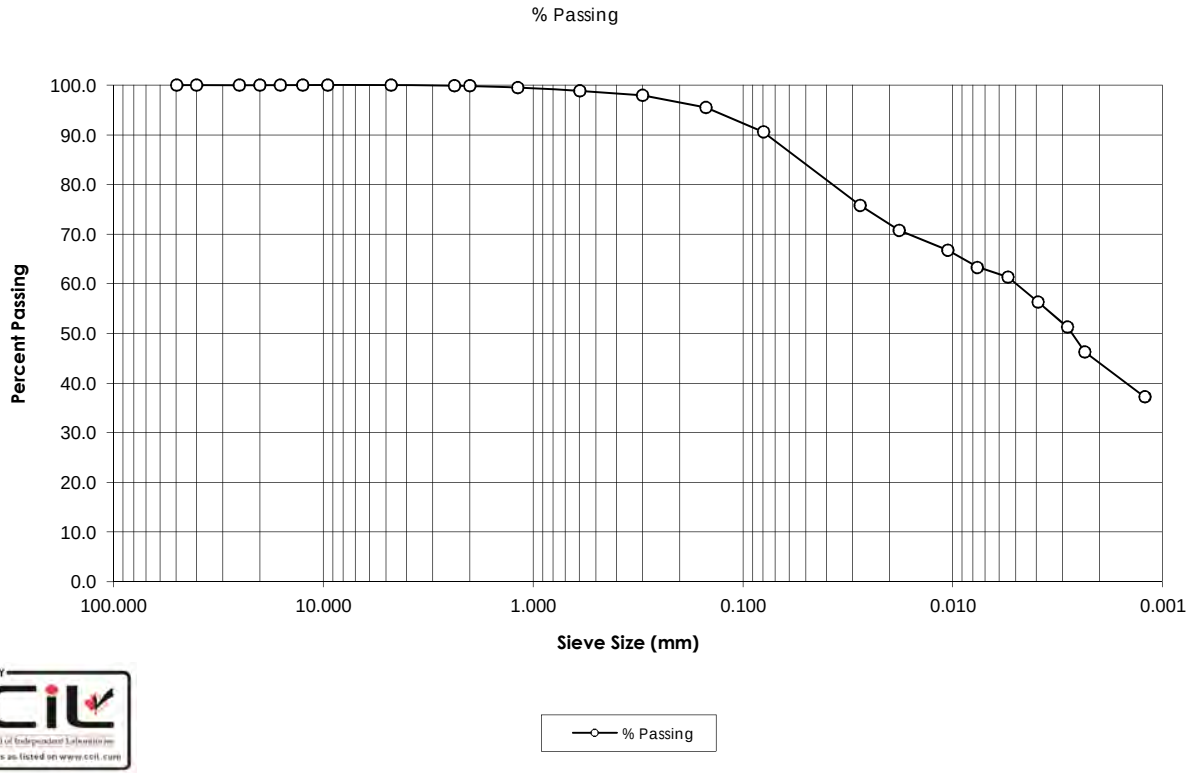
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS04
SOURCE: DC34 (Formerly D54)
TESTED BY: C. Oost

DATE TESTED: August 10, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 61.4 |
| 40.0 | 100.0 | 0.0039 | 56.3 |
| 25.0 | 100.0 | 0.0028 | 51.3 |
| 20.0 | 100.0 | 0.0023 | 46.3 |
| 16.0 | 100.0 | 0.0012 | 37.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.8 | | |
| 1.18 | 99.5 | | |
| 0.600 | 98.8 | | |
| 0.300 | 98.0 | | |
| 0.150 | 95.6 | | |
| 0.080 | 90.6 | | |
| 0.0277 | 75.8 | | |
| 0.0180 | 70.8 | | |
| 0.0105 | 66.8 | | |
| 0.0077 | 63.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 9.4% | $D_{30}$: | - |
| Silt: | 46.4% | $D_{60}$: | 0.0051 |
| Clay: | 44.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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Stantec

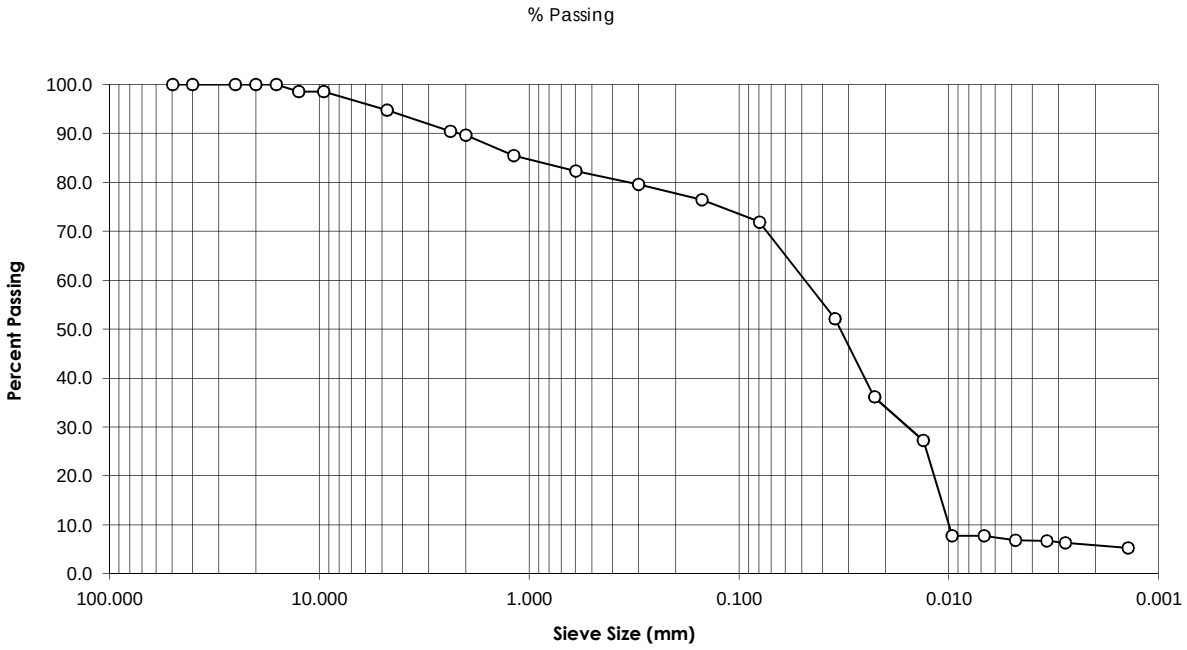
## Grain Size Analysis

Double Hydrometer
Report (Vacuum)
ASTM D4221
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: SS6+BS7
SOURCE: DC8
TESTED BY: C. Oost

DATE TESTED: July 26, 2016
DATE RECEIVED: May 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0068 | 7.8 |
| 40.0 | 100.0 | 0.0048 | 6.9 |
| 25.0 | 100.0 | 0.0034 | 6.7 |
| 20.0 | 100.0 | 0.0028 | 6.4 |
| 16.0 | 100.0 | 0.0014 | 5.3 |
| 12.5 | 98.5 | | |
| 9.5 | 98.5 | | |
| 4.75 | 94.7 | | |
| 2.36 | 90.4 | | |
| 2.00 | 89.6 | | |
| 1.18 | 85.5 | | |
| 0.600 | 82.3 | | |
| 0.300 | 79.6 | | |
| 0.150 | 76.5 | | |
| 0.080 | 71.9 | | |
| 0.0347 | 52.1 | | |
| 0.0226 | 36.1 | | |
| 0.0132 | 27.3 | | |
| 0.0096 | 7.8 | | |

Dispersion = 16.4%

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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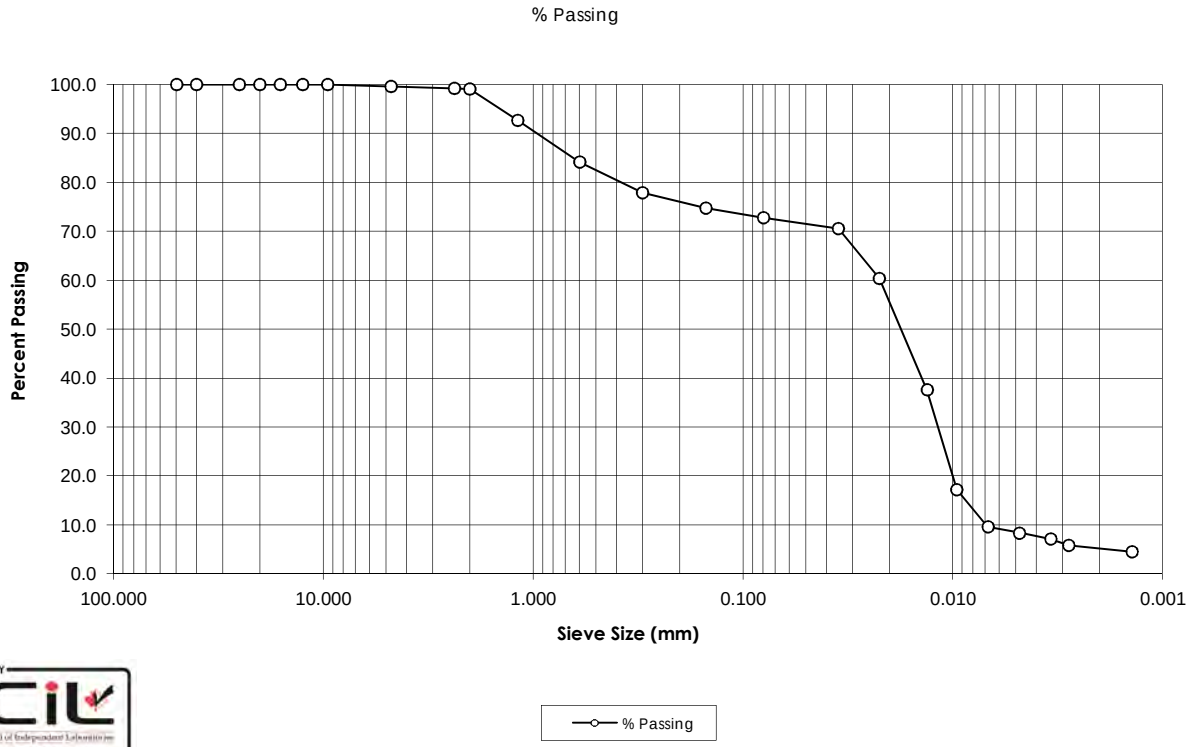
## Grain Size Analysis

Double Hydrometer
Report (Vacuum)
ASTM D4221
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220

SAMPLE No.: BS04
SOURCE: DC34 (Formerly D54)
TESTED BY: C. Oost

DATE TESTED: August 10, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0068 | 9.6 |
| 40.0 | 100.0 | 0.0048 | 8.4 |
| 25.0 | 100.0 | 0.0034 | 7.1 |
| 20.0 | 100.0 | 0.0028 | 5.8 |
| 16.0 | 100.0 | 0.0014 | 4.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.5 | | |
| 2.36 | 99.2 | | |
| 2.00 | 99.0 | | |
| 1.18 | 92.6 | | |
| 0.600 | 84.1 | | |
| 0.300 | 77.9 | | |
| 0.150 | 74.7 | | |
| 0.080 | 72.8 | | |
| 0.0350 | 70.5 | | |
| 0.0223 | 60.4 | | |
| 0.0133 | 37.5 | | |
| 0.0096 | 17.2 | | |

Dispersion = 14.2%

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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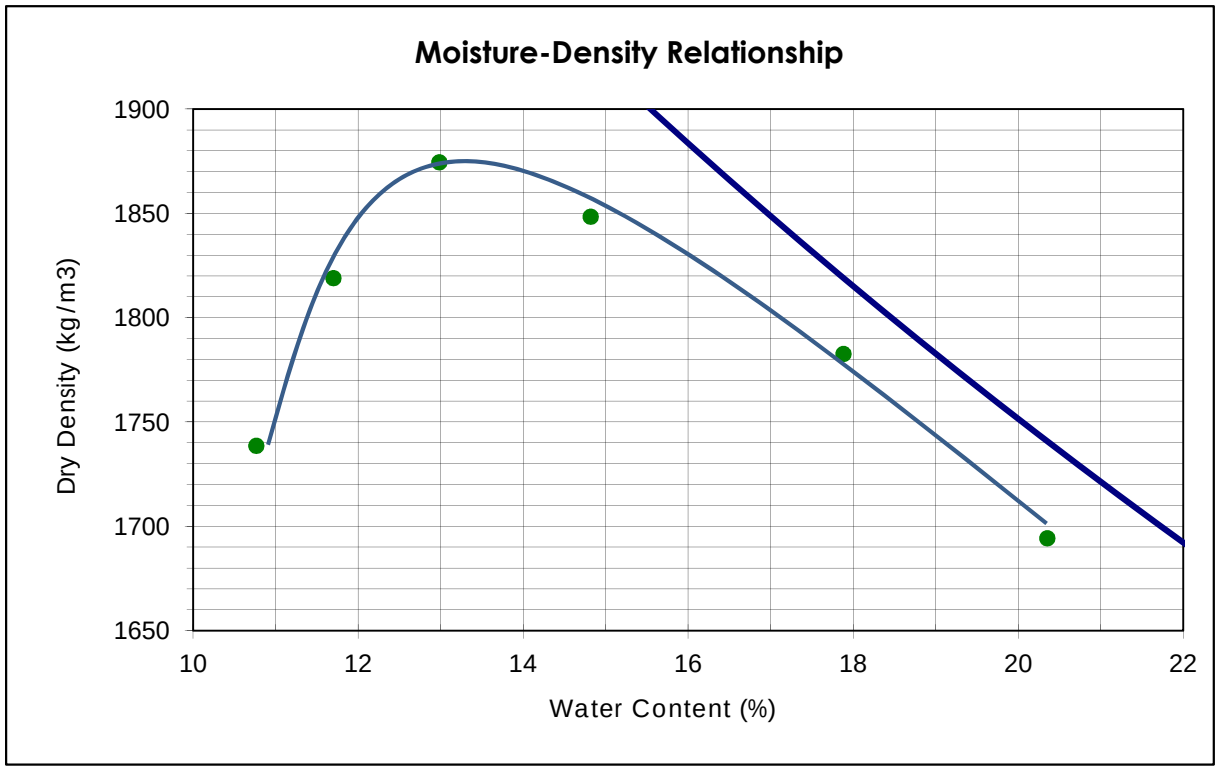
| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | April 7, 2016 |
| Project Name: | SR1 | Date Tested: | April 23, 2016 |
| Project No.: | 110773396.302.702.220 | Tested By: | C.Oost |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1739 | 1819 | 1874 | 1848 | 1783 | 1694 |
| MOISTURE CONTENT (%) | 10.8 | 11.7 | 13.0 | 14.8 | 17.9 | 20.4 |

**Source of Sample:** DC2-BSB
**Visual Soil Description:** Sandy Silty Clay Trace Gravel
**Maximum Dry Density (kg/m3):** 1875
**Optimum M.C. (%):** 13.0%
**Natural M.C.(%):** 12.2%






Reviewed by: _____

Stantec

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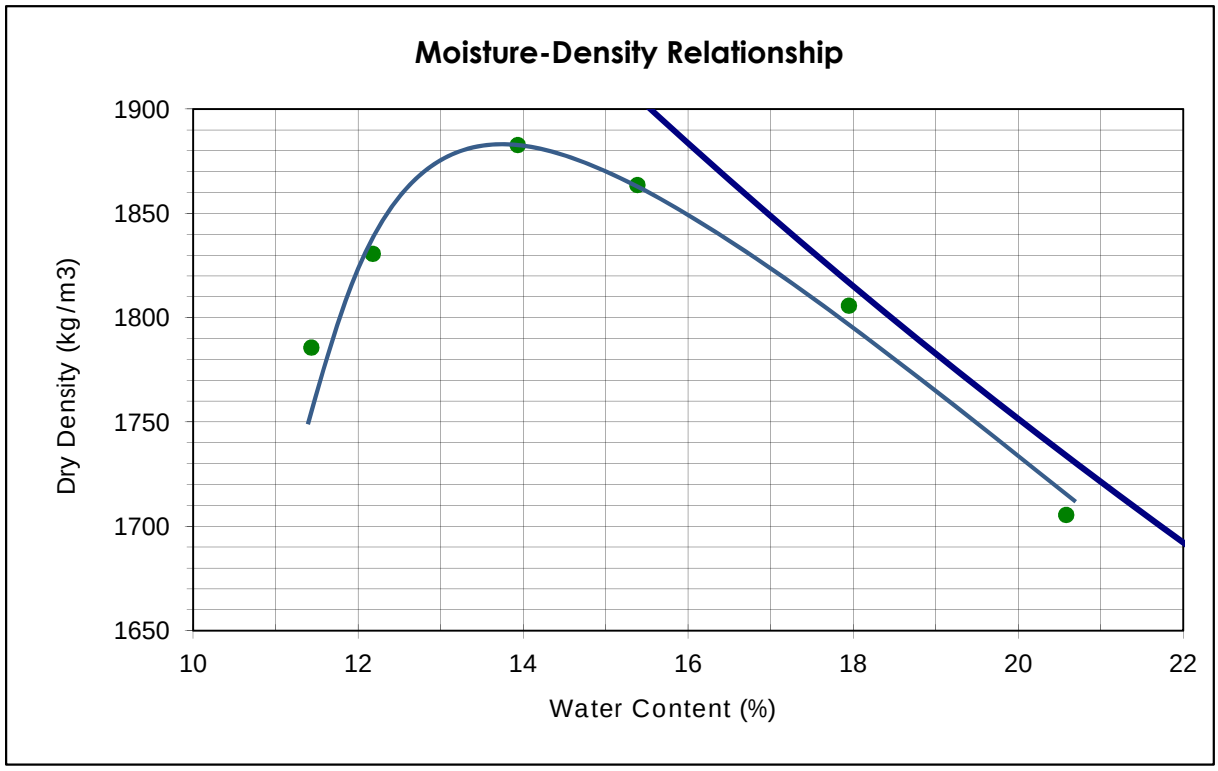
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | April 12, 2016 |
| Project Name: | SR1 | Date Tested: | April 23, 2016 |
| Project No.: | 110773396.302.702.220 | Tested By: | C.Oost |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1786 | 1831 | 1883 | 1864 | 1806 | 1705 |
| MOISTURE CONTENT (%) | 11.4 | 12.2 | 13.9 | 15.4 | 17.9 | 20.6 |

**Source of Sample:** DC3-BSC
**Visual Soil Description:** Sandy Clay and Silt Trace Gravel
**Maximum Dry Density (kg/m3):** 1885
**Optimum M.C. (%):** 14.0%
**Natural M.C.(%):** 12.8%






Reviewed by: _____

Stantec

# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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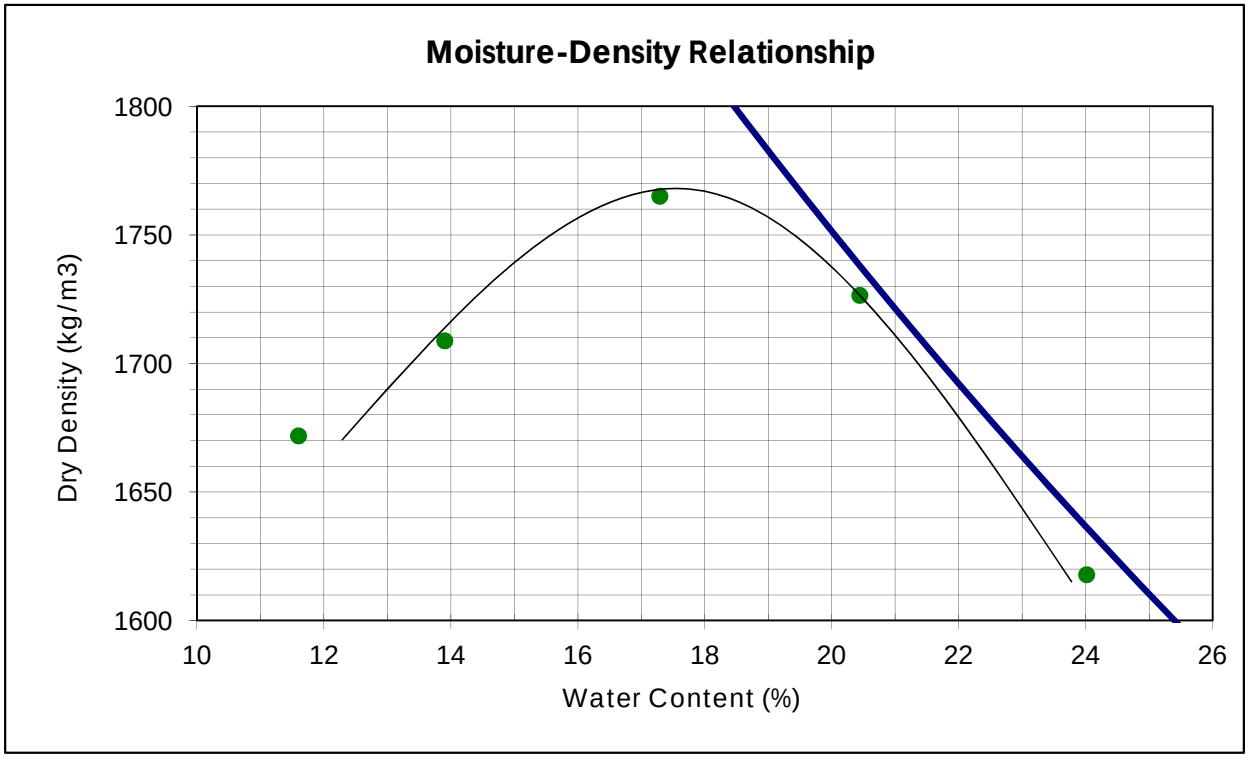
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.220

Date Sampled: April 15, 2016
Date Tested: May 20, 2016
Tested By: C. Small

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1672 | 1709 | 1765 | 1727 | 1618 |
| MOISTURE CONTENT (%) | 11.6 | 13.9 | 17.3 | 20.4 | 24.0 |

**Source of Sample:** DC4A-BSA
**Visual Soil Description:** Clay with Trace Sand and Trace Gravel
**Maximum Dry Density (kg/m3):** 1765
**Optimum M.C. (%):** 17.5%
**Natural M.C.(%):** 8.9%



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# Moisture - Density Relationship Report

☑ ASTM Designation: D698
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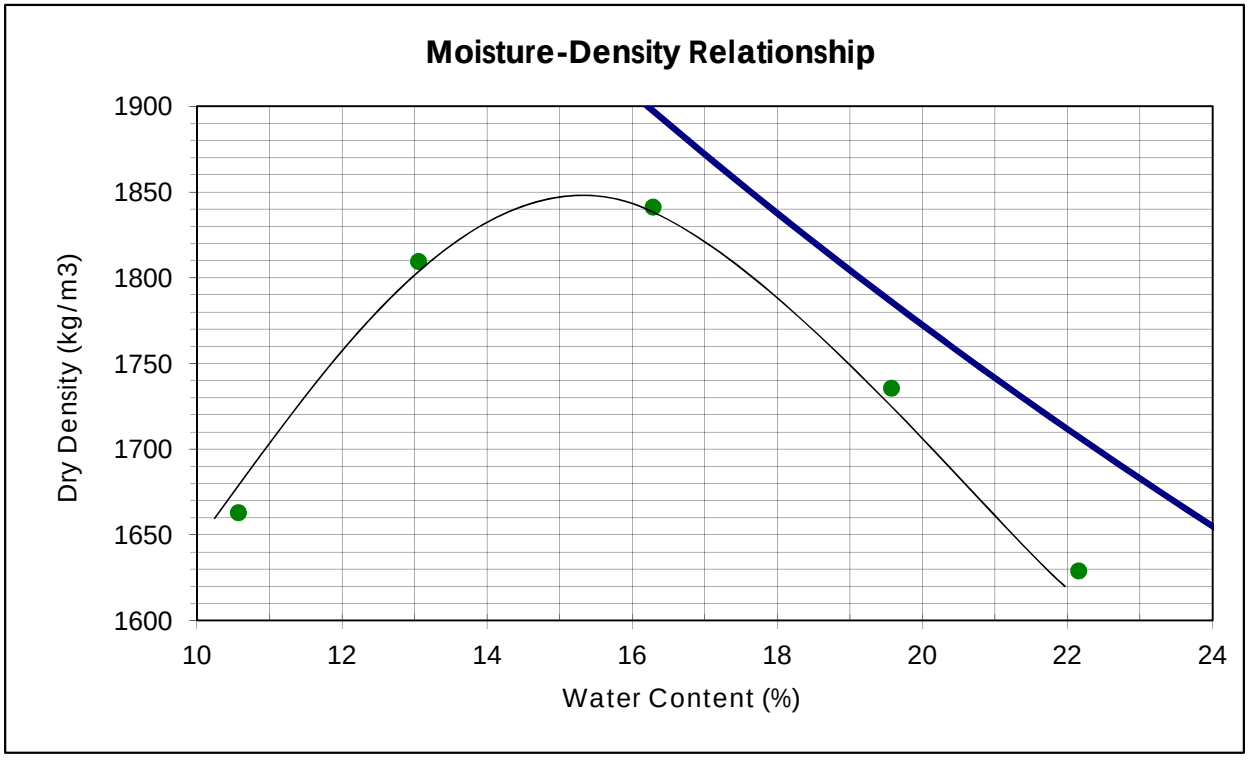
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.220

Date Sampled: April 15, 2016
Date Tested: May 25, 2016
Tested By: C. Small

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1663 | 1809 | 1841 | 1735 | 1629 |
| MOISTURE CONTENT (%) | 10.6 | 13.1 | 16.3 | 19.6 | 22.2 |

**Source of Sample:** DC4A-BSB
**Visual Soil Description:** Clay with Trace Gravel and Trace Sand
**Maximum Dry Density (kg/m3):** 1850
**Optimum M.C. (%):** 15.5%
**Natural M.C.(%):** 3.0%



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# Moisture - Density Relationship Report

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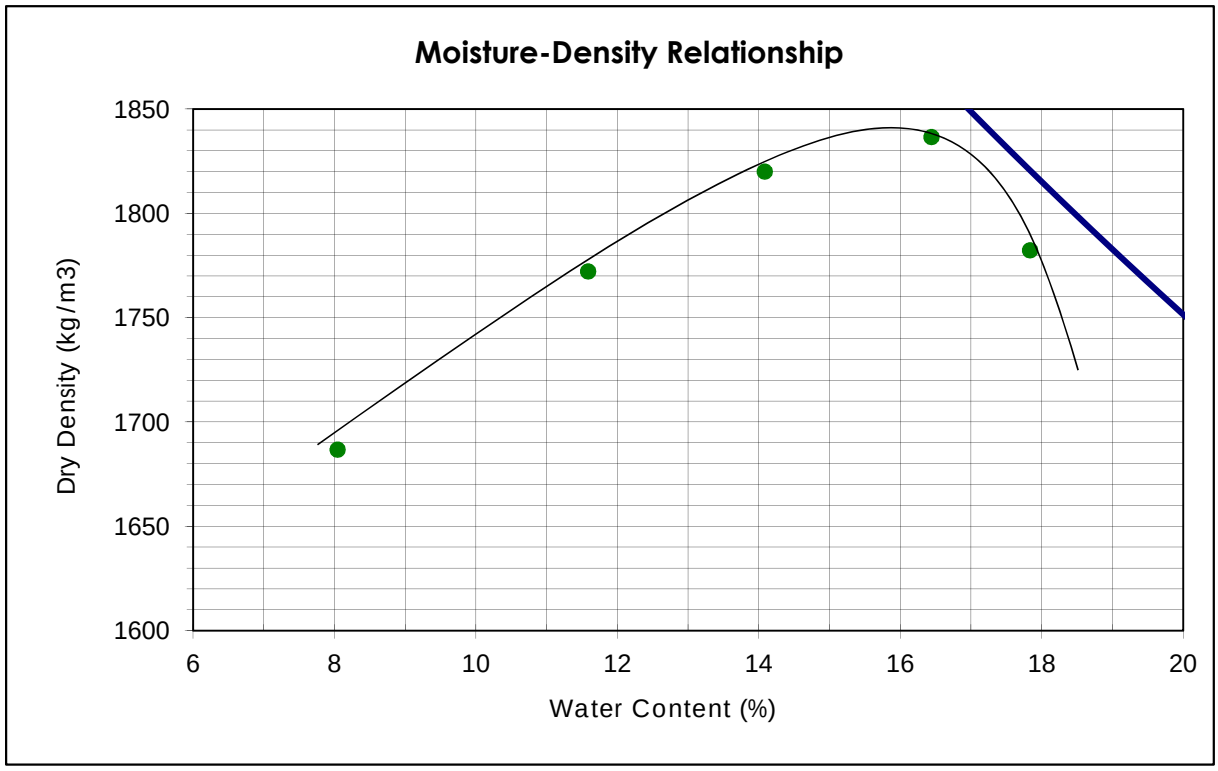
| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | April 21, 2016 |
| Project Name: | SR1 | Date Tested: | May 2, 2016 |
| Project No.: | 110773396.302.702.220 | Tested By: | C.Tollifson |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1687 | 1772 | 1820 | 1837 | 1782 |
| MOISTURE CONTENT (%) | 8.0 | 11.6 | 14.1 | 16.4 | 17.8 |

**Source of Sample:** DC6 BSB (3.0-4.6m)
**Visual Soil Description:** Clay
**Maximum Dry Density (kg/m3):** 1840
**Optimum M.C. (%):** 16.0
**Natural M.C.(%):** 14.2



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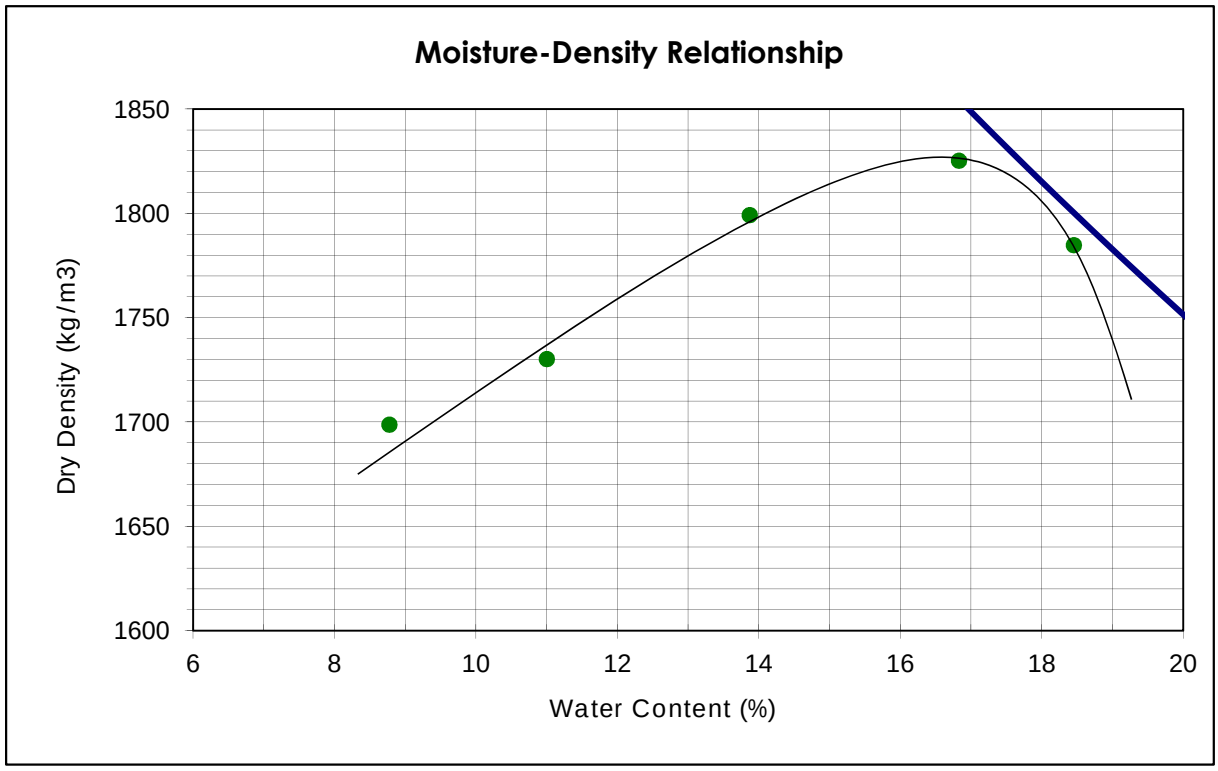
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | April 16, 2016 |
| Project Name: | SR1 | Date Tested: | May 2, 2016 |
| Project No.: | 110773396.302.702.220 | Tested By: | C.Tollifson |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1699 | 1730 | 1799 | 1825 | 1785 |
| MOISTURE CONTENT (%) | 8.8 | 11.0 | 13.9 | 16.8 | 18.5 |

**Source of Sample:** DC7 BSB (5.5-6.0m)
**Visual Soil Description:** Dark Brown Clay Some Sand and Gravel
**Maximum Dry Density (kg/m3):** 1825
**Optimum M.C. (%):** 16.5
**Natural M.C.(%):** 15.1



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# Moisture - Density Relationship Report

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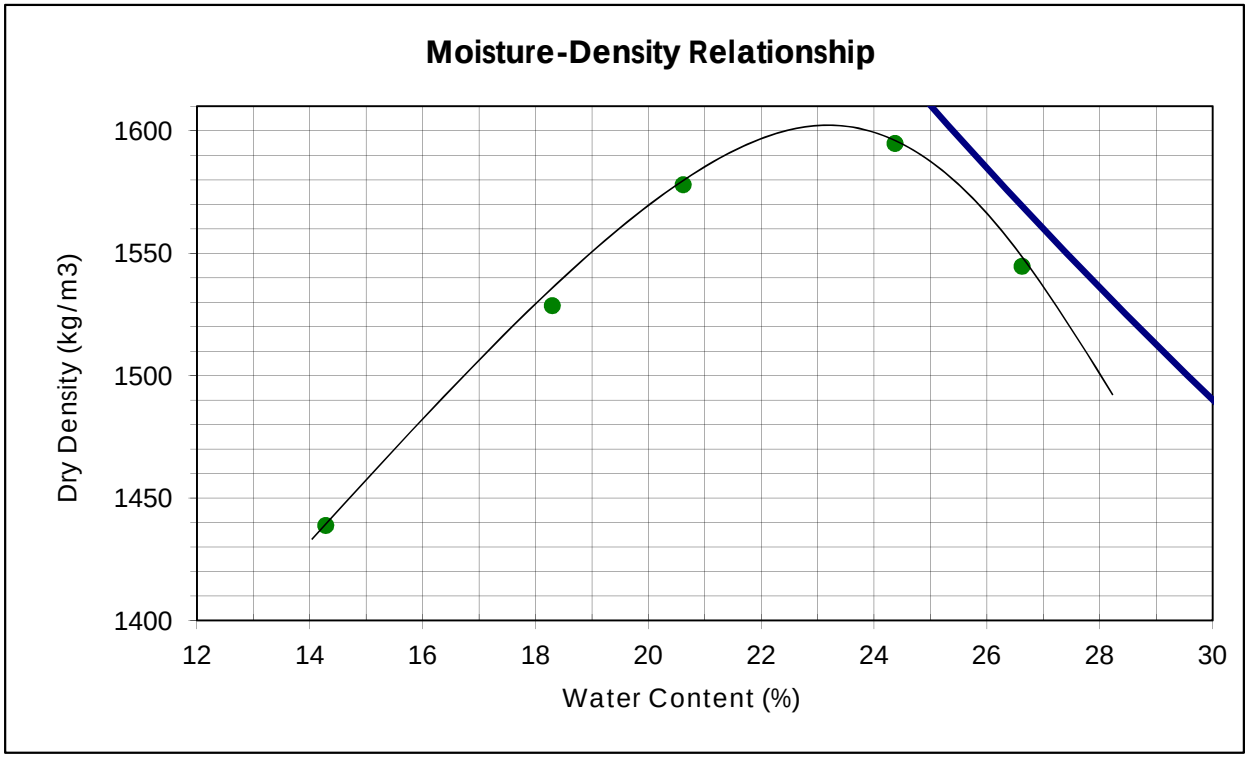
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.220

Date Sampled: April 16, 2016
Date Tested: May 20, 2016
Tested By: C. Small

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1439 | 1529 | 1578 | 1595 | 1545 |
| MOISTURE CONTENT (%) | 14.3 | 18.3 | 20.6 | 24.4 | 26.6 |

**Source of Sample:** DC9A-BSA
**Visual Soil Description:** Brown Clay
**Maximum Dry Density (kg/m3):** 1600
**Optimum M.C. (%):** 23.0%
**Natural M.C.(%):** 29.4%



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## Moisture - Density Relationship Report

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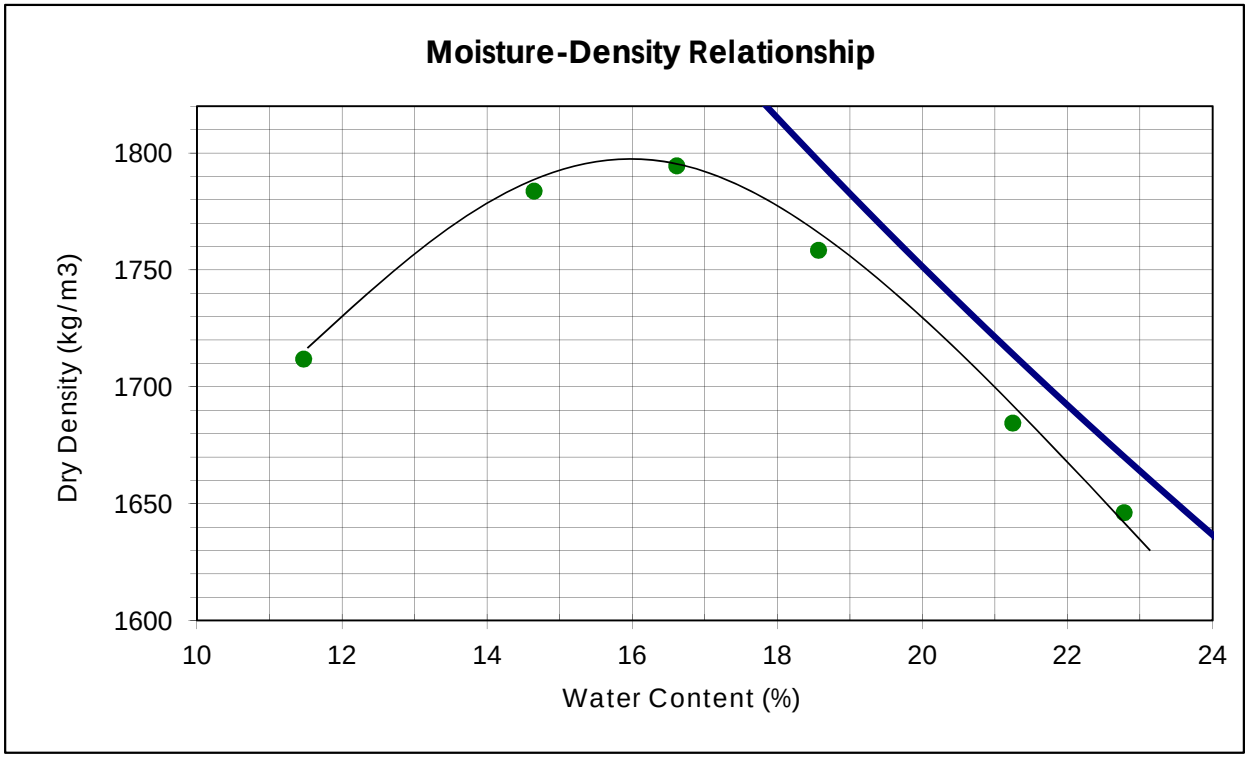
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.220

Date Sampled: April 16, 2016
Date Tested: May 20, 2016
Tested By: C. Small

| TRIAL No. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1712 | 1784 | 1795 | 1685 | 1646 | 1758 |
| MOISTURE CONTENT (%) | 11.5 | 14.6 | 16.6 | 21.2 | 22.8 | 18.6 |

**Source of Sample:** DC9A-BSC
**Visual Soil Description:** Clay with Trace Sand
**Maximum Dry Density (kg/m3):** 1800
**Optimum M.C. (%):** 16.0%
**Natural M.C.(%):** 13.6%



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# Moisture - Density Relationship Report

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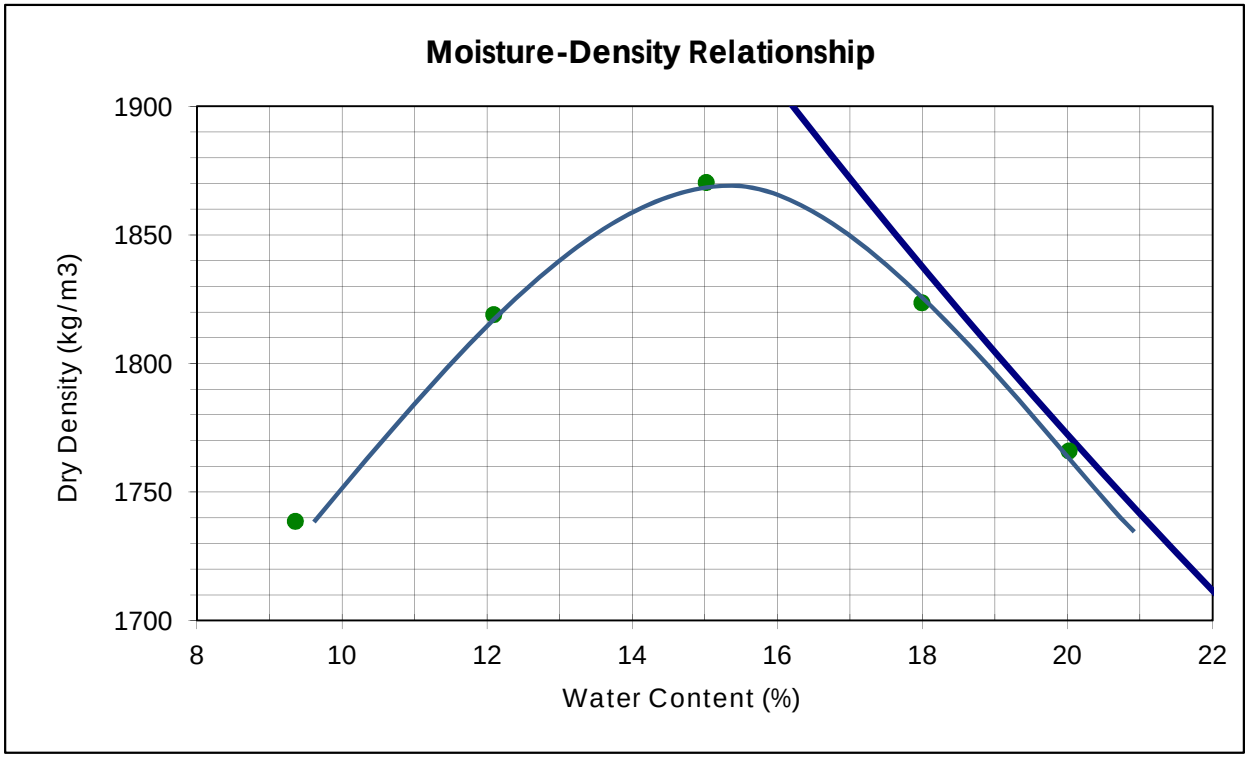
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.220

Date Sampled: April 22, 2016
Date Tested: May 20, 2016
Tested By: C.Small

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1739 | 1819 | 1870 | 1824 | 1766 |
| MOISTURE CONTENT (%) | 9.4 | 12.1 | 15.0 | 18.0 | 20.0 |

**Source of Sample:** DC10-BSB
**Visual Soil Description:** Brown Clay Trace Gravel
**Maximum Dry Density (kg/m3):** 1875
**Optimum M.C. (%):** 15.5%
**Natural M.C.(%):** 13.7%



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# Moisture - Density Relationship Report

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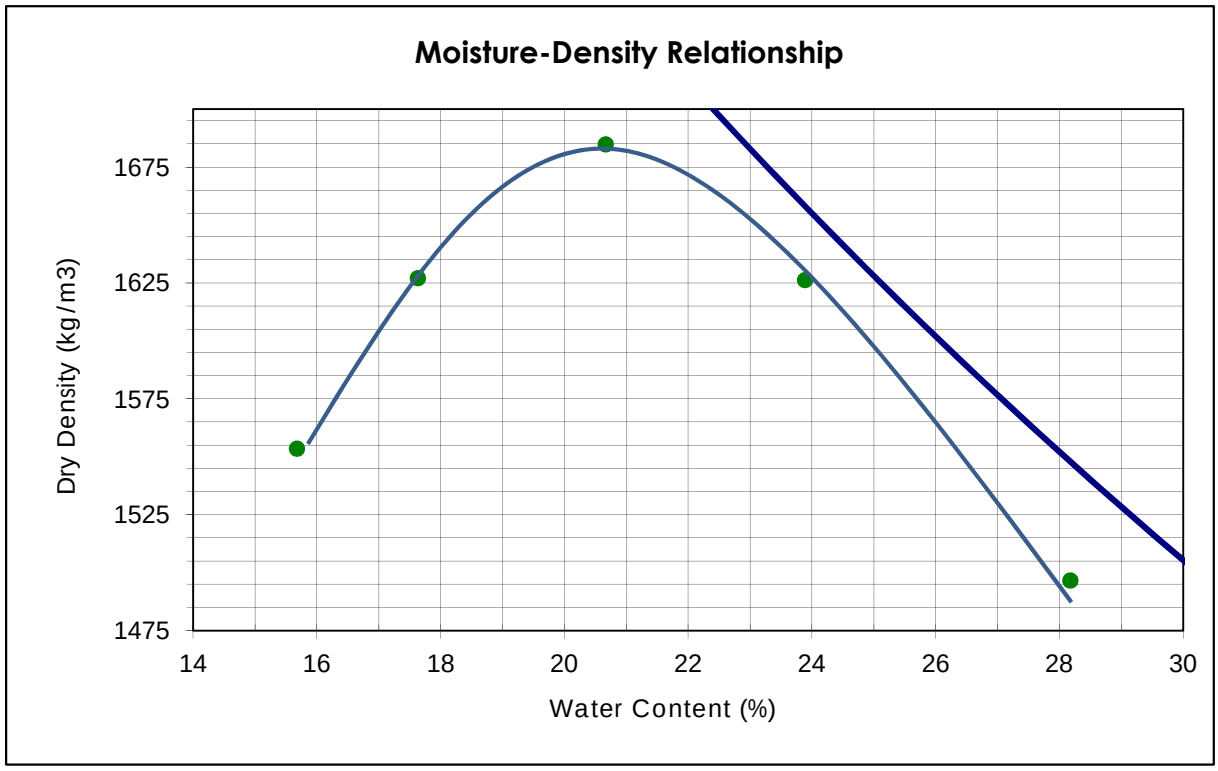
| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | May 17, 2016 |
| Project Name: | SR1 | Date Tested: | May 26 & May 27, 2016 |
| Project No.: | 110773396.302.702.220 | Tested By: | C.Small & M. Pilkington |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1553 | 1627 | 1685 | 1626 | 1497 |
| MOISTURE CONTENT (%) | 15.7 | 17.6 | 20.7 | 23.9 | 28.2 |

**Source of Sample:** DC15-BSA
**Visual Soil Description:** Clay
**Maximum Dry Density (kg/m3):** 1685
**Optimum M.C. (%):** 20.5%
**Natural M.C.(%):** 22.0%



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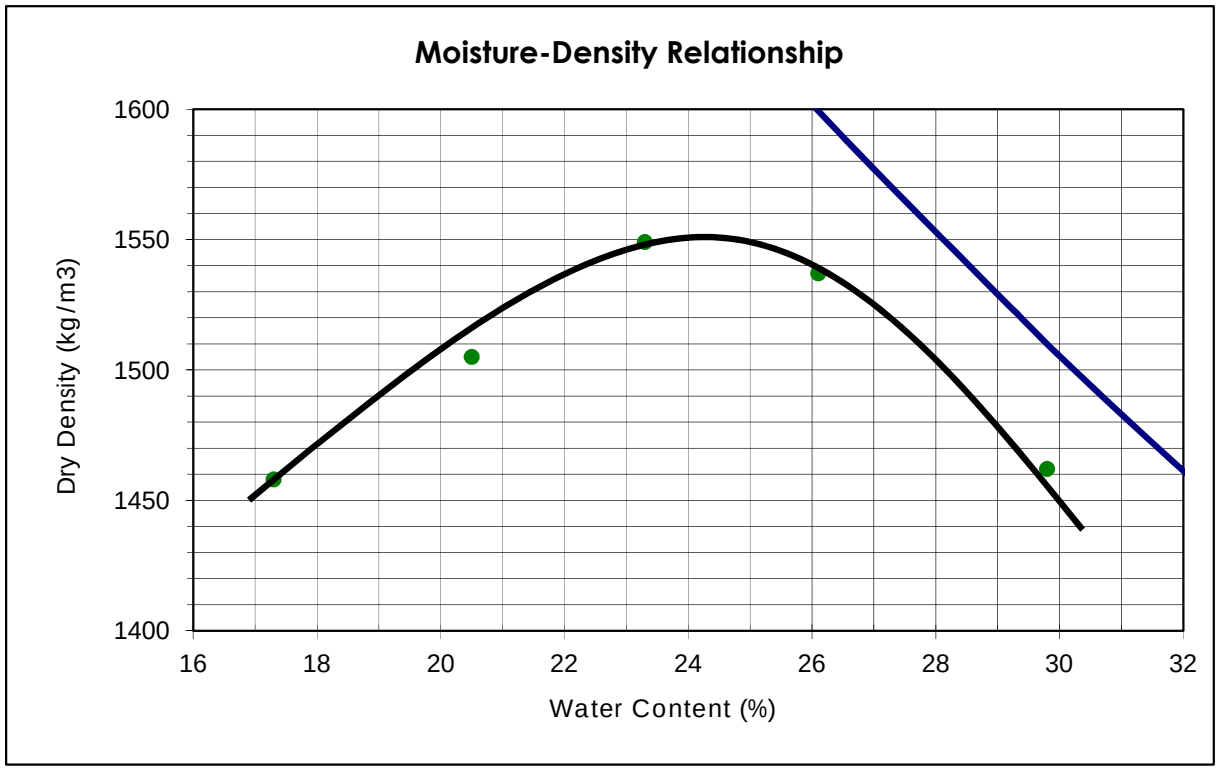
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | May 17, 2016 |
| Project Name: | SR1 | Date Tested: | November 7, 2016 |
| Project No.: | 110773396.302.702.220 | Tested By: | C.Small |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1458 | 1505 | 1549 | 1537 | 1462 |
| MOISTURE CONTENT (%) | 17.3 | 20.5 | 23.3 | 26.1 | 29.8 |

**Source of Sample:** DC18 BSA1 0.5-1.5m
**Visual Soil Description:** Clay (CH), Trace Sand
**Maximum Dry Density (kg/m3):** 1550
**Optimum M.C. (%):** 24.0
**Natural M.C.(%):** 23.6



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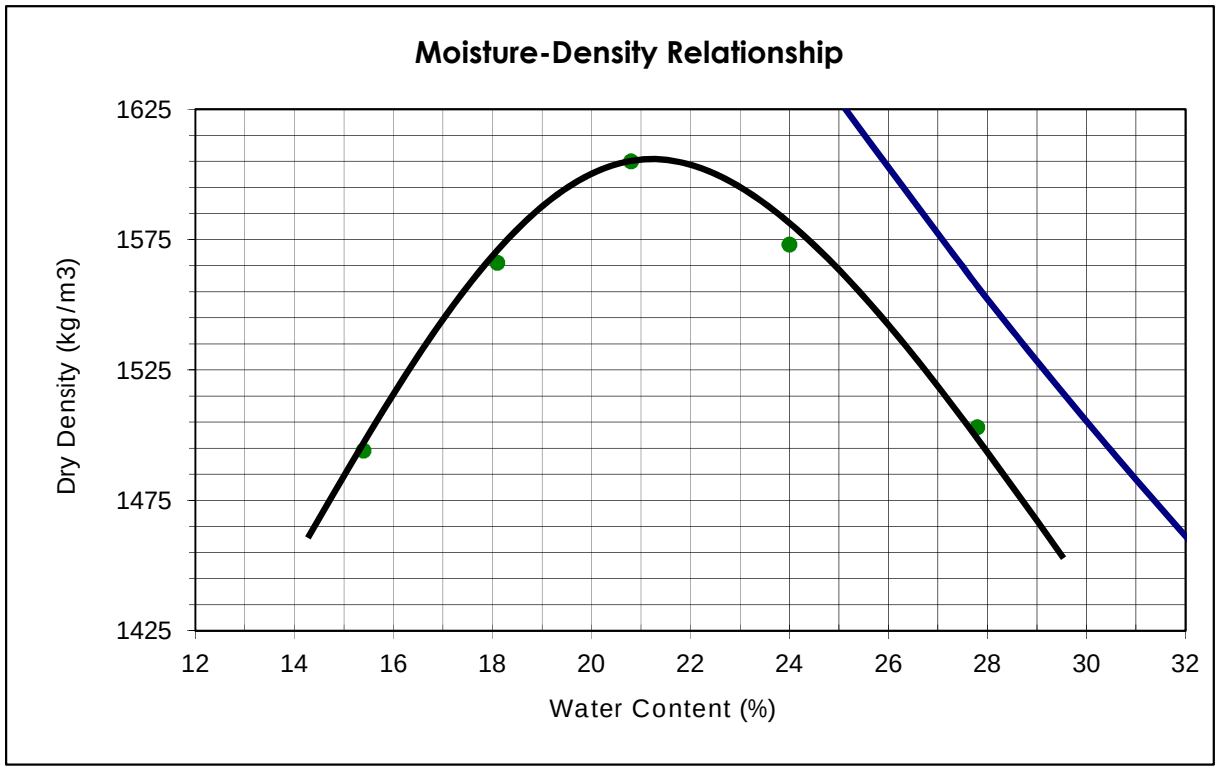
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | June 7, 2016 |
| Project Name: | SR1 | Date Tested: | October 20, 2016 |
| Project No.: | 110773396.302.702.220 | Tested By: | M.Pilkington |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1494 | 1566 | 1605 | 1573 | 1503 |
| MOISTURE CONTENT (%) | 15.4 | 18.1 | 20.8 | 24.0 | 27.8 |

**Source of Sample:** DC25 BSB (2.0-3.0m)
**Visual Soil Description:** Clay (CH)
**Maximum Dry Density (kg/m3):** 1605
**Optimum M.C. (%):** 21.0
**Natural M.C.(%):** 29.2



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## Moisture - Density Relationship Report

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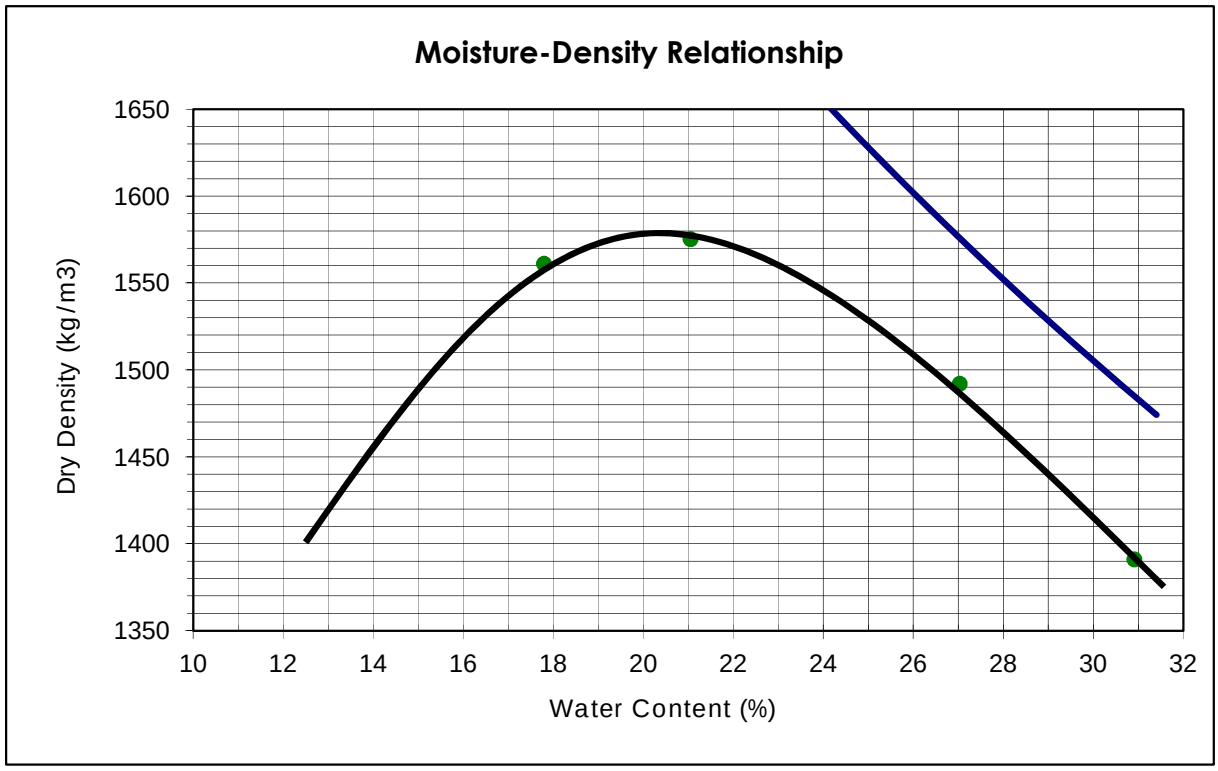
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.220

Date Sampled: June 8, 2016
Date Tested: August 22, 2016
Tested By: M. Boudreau

| TRIAL No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1561 | 1575 | 1492 | 1391 |
| MOISTURE CONTENT (%) | 17.8 | 21.1 | 27.0 | 30.9 |

**Source of Sample:** DC30 BSA
**Visual Soil Description:** Brown Clay (CH)
**Maximum Dry Density (kg/m3):** 1580kg/m3
**Optimum M.C. (%):** 22.5%
**Natural M.C.(%):** 25.8%



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## Moisture - Density Relationship Report

☑ ASTM Designation: D698
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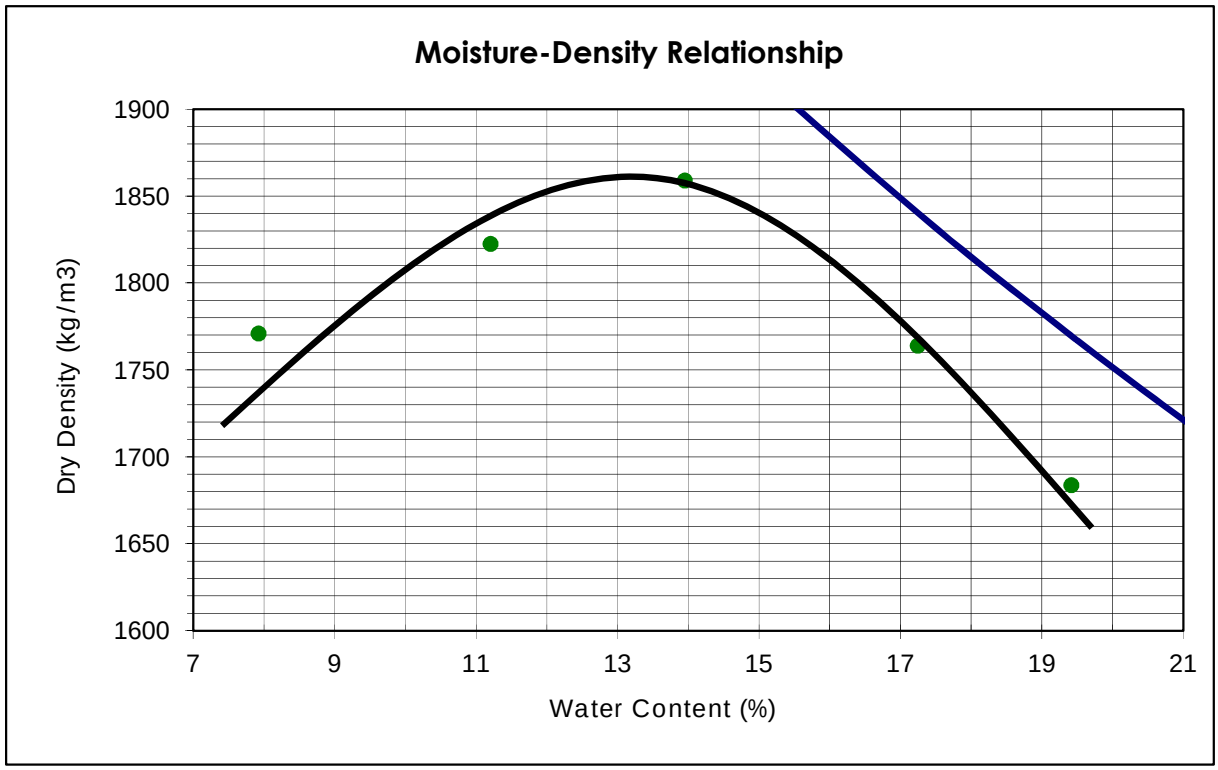
Tel: (403) 253-7876
Fax: (403) 253-0021

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.220

Date Sampled: June 8, 2016
Date Tested: August 23, 2016
Tested By: M. Boudreau

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1771 | 1822 | 1859 | 1764 | 1684 |
| MOISTURE CONTENT (%) | 7.9 | 11.2 | 14.0 | 17.2 | 19.4 |

**Source of Sample:** DC30 BSB
**Visual Soil Description:** Brown Clay (CI-CL) Some Sand, Trace Gravel
**Maximum Dry Density (kg/m3):** 1860kg/m3
**Optimum M.C. (%):** 13.5%
**Natural M.C.(%):** 12.0%



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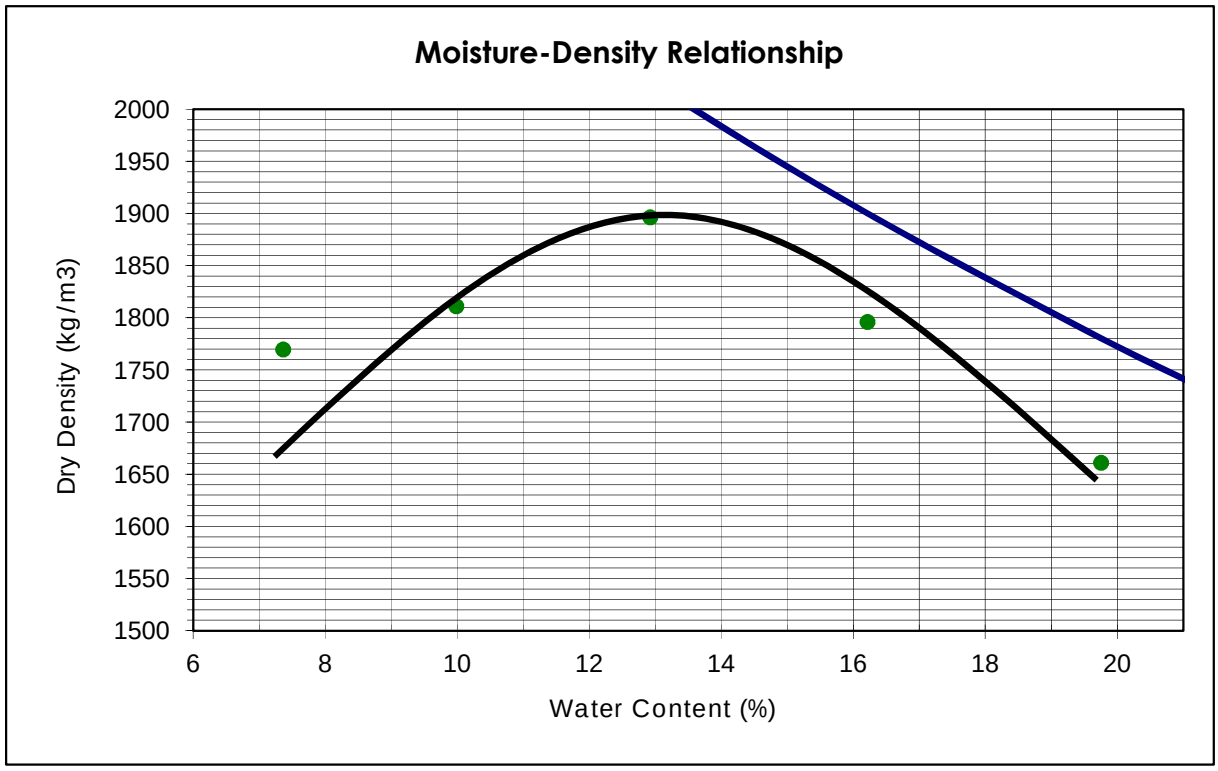
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | June 7, 2016 |
| Project Name: | SR1 | Date Tested: | August 23, 2016 |
| Project No.: | 110773396.302.702.220 | Tested By: | M. Boudreau |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1770 | 1811 | 1896 | 1796 | 1661 |
| MOISTURE CONTENT (%) | 7.4 | 10.0 | 12.9 | 16.2 | 19.8 |

**Source of Sample:** DC32 BSA
**Visual Soil Description:** Brown Clay (Cl) some Sand, Some Gravel
**Maximum Dry Density (kg/m3):** 1900kg/m3
**Optimum M.C. (%):** 13.0%
**Natural M.C.(%):** 13.2%



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## Moisture - Density Relationship Report

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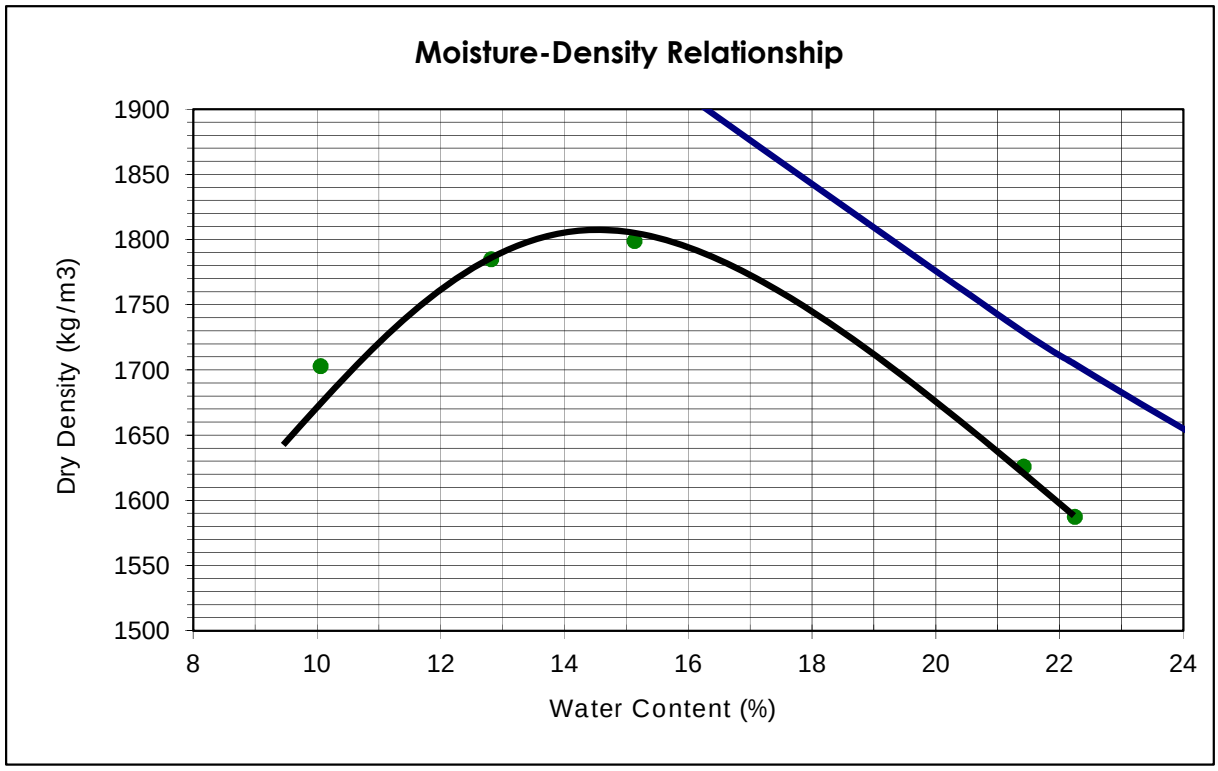
Fax: (403) 253-0021

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.220

Date Sampled: June 7, 2016
Date Tested: August 23, 2016
Tested By: M. Boudreau

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1703 | 1785 | 1799 | 1626 | 1587 |
| MOISTURE CONTENT (%) | 10.1 | 12.8 | 15.1 | 21.4 | 22.2 |

**Source of Sample:** DC32 BSC
**Visual Soil Description:** Brown Sandy Clay (CI) Trace Gravel
**Maximum Dry Density (kg/m3):** 1800kg/m3
**Optimum M.C. (%):** 15.0%
**Natural M.C.(%):** 10.6%



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# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Tel: (403) 253-7876

Tested by: C.Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.220 |
| **PROJECT TITLE:** | SR1 | **DATE:** | April 21, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay Trace Sand and Gravel | **SAMPLE No.:** | DC1-ST3 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 9.62 |
| Diameter (cm) | 7.23 |
| Area (cm ²) | 41.06 |
| Total Mass (g) | 843.9 |
| Volume (cm³) | 394.9 |
| Water Content (%) | 18.3 |
| Degree of Saturation (%) | 100 |
| Wet Density (g/cm³) | 2.137 |
| Dry Density(g/cm³) | 1.807 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

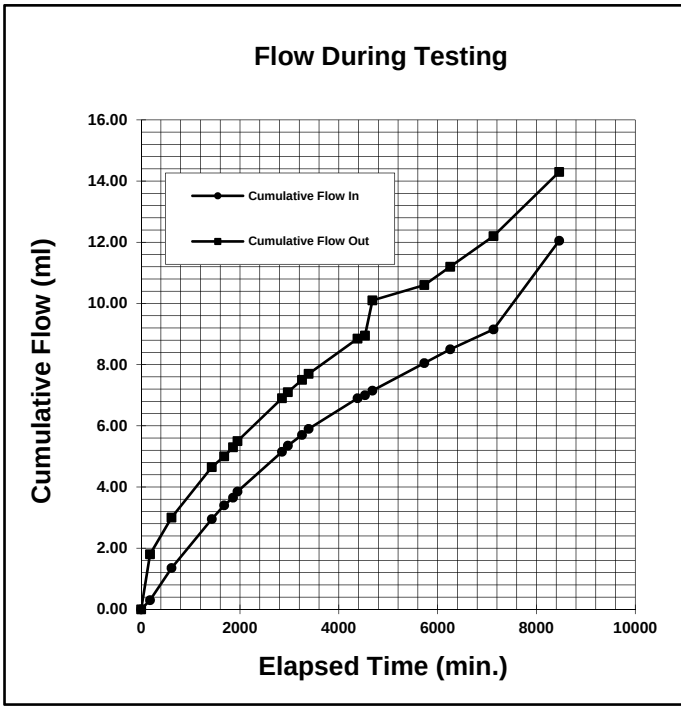
| | |
|---|---|
| Length (cm) | 9.61 |
| Diameter (cm) | 7.23 |
| Area (cm ²) | 41.06 |
| Total Mass (g) | 856.4 |
| Volume (cm³) | 394.5 |
| Water Content (%) | 18.6 |
| Beta Saturation (%) | 99 |
| Wet Density (g/cm³) | 2.171 |
| Dry Density(g/cm³) | 1.831 |

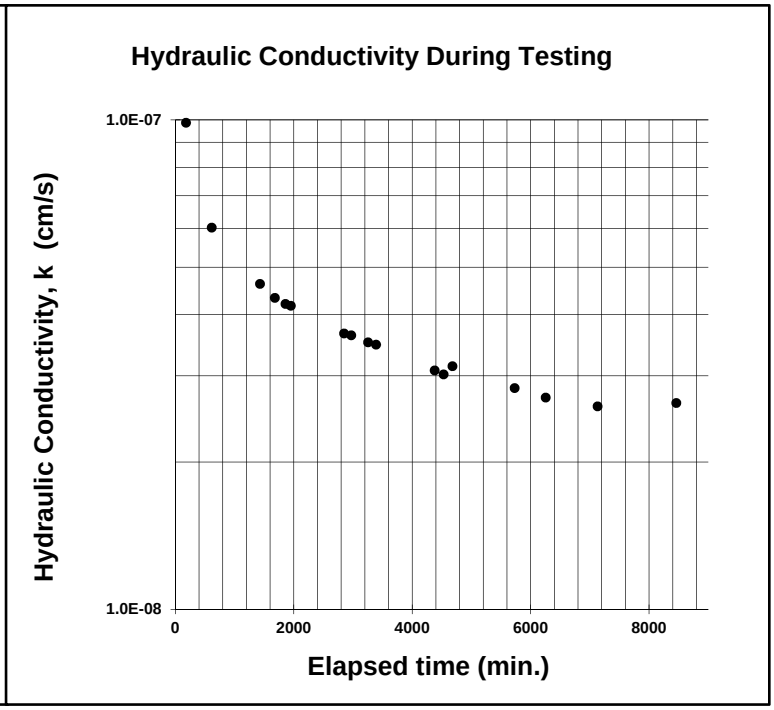
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 500 |
| Top Cap Pressure(kPa) | 480 |
| Bottom Cap Pressure(kPa) | 480 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 500 |
| Top Cap Pressure (kPa) | 480 |
| Bottom Cap Pressure(kPa) | 460 |
| Hydraulic Gradient | 21.2 |




**Hydraulic Conductivity (cm/s) = 2.9E-08**

Reviewed by:

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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**LABORATORY**
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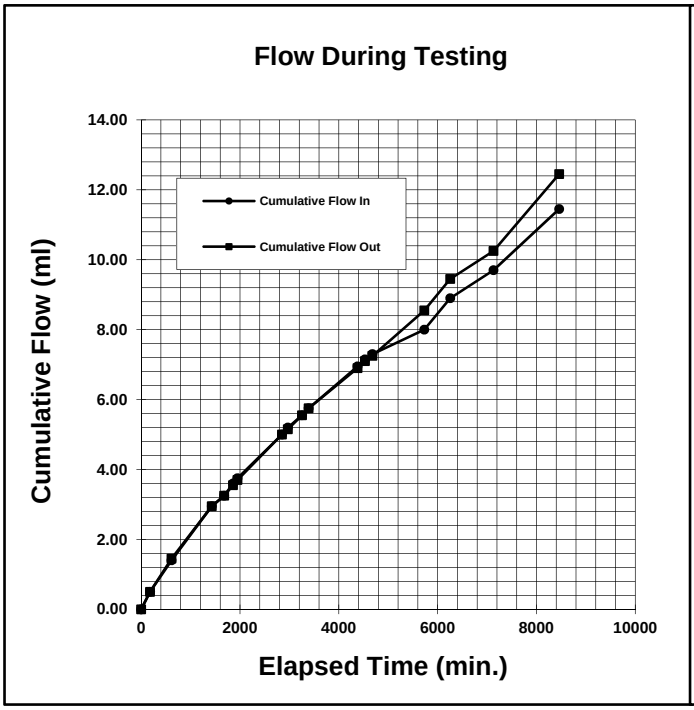
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

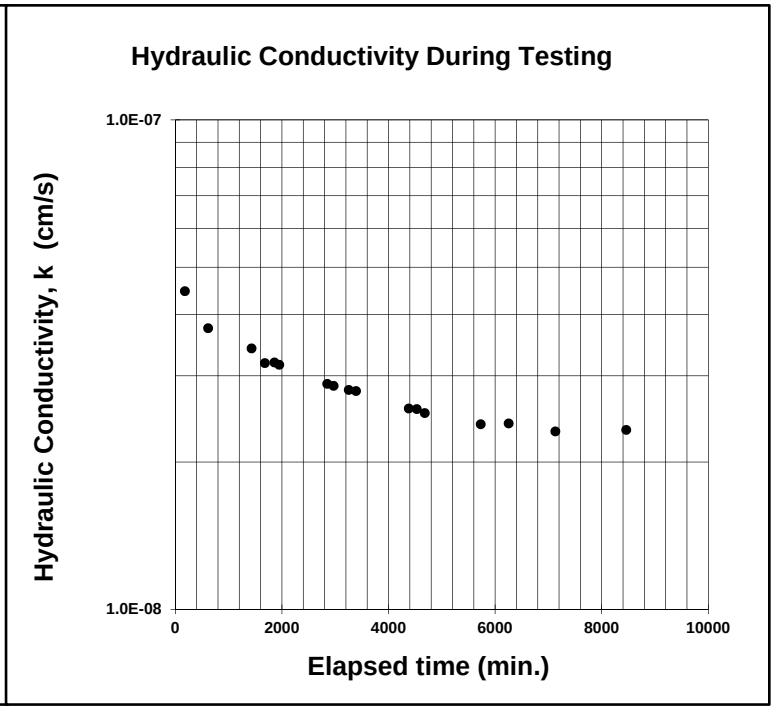
Tested by: C.Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.220 |
| **PROJECT TITLE:** | SR1 | **DATE:** | April 21, 2016 |
| **SAMPLE DESCRIPTION:** | Clay Some Sand and Gravel | **SAMPLE No.:** | DC2-ST4 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 9.27 | Length (cm) | 9.30 |
| Diameter (cm) | 7.14 | Diameter (cm) | 7.16 |
| Area (cm ²) | 40.04 | Area (cm ²) | 40.26 |
| Total Mass (g) | 755.4 | Total Mass (g) | 776.5 |
| Volume (cm³) | 371.2 | Volume (cm³) | 374.5 |
| Water Content (%) | 10.6 | Water Content (%) | 23.1 |
| Degree of Saturation (%) | 62 | Beta Saturation (%) | 99 |
| Wet Density (g/cm³) | 2.035 | Wet Density (g/cm³) | 2.074 |
| Dry Density(g/cm³) | 1.840 | Dry Density(g/cm³) | 1.685 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 360 | Cell Pressure (kPa) | 360 |
| Top Cap Pressure(kPa) | 340 | Top Cap Pressure (kPa) | 340 |
| Bottom Cap Pressure(kPa) | 340 | Bottom Cap Pressure(kPa) | 320 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 22.0 |




**Hydraulic Conductivity (cm/s) = 2.4E-08**

Reviewed by:

# Flexible Wall Hydraulic Conductivity Test
# ASTM D5084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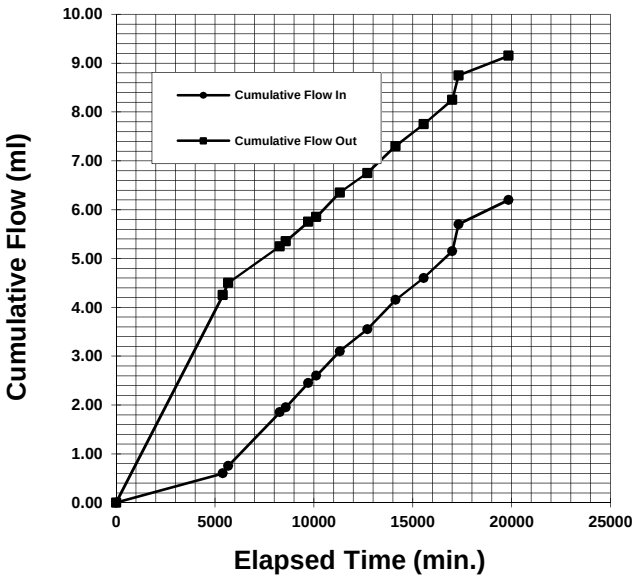
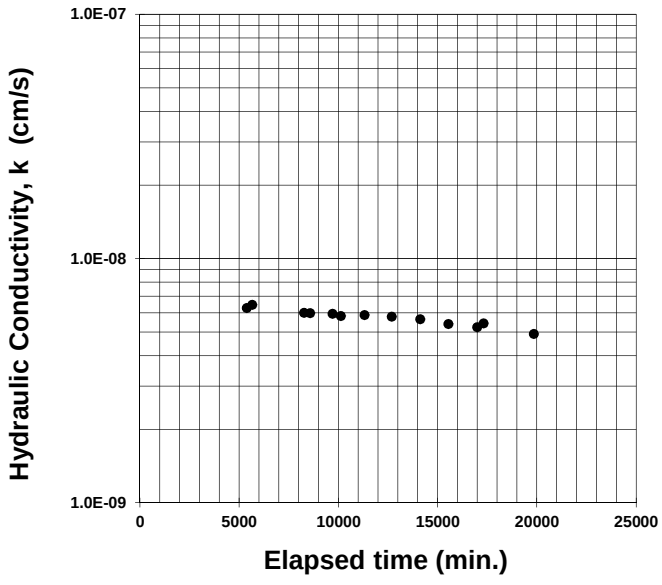
Tested by: C. Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.220 |
| **PROJECT TITLE:** | SR1 | **DATE:** | May 27, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Tr Sand/Gravel | **SAMPLE No.:** | DC4A BSB |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 8.49 | Length (cm) | 8.52 |
| Diameter (cm) | 7.02 | Diameter (cm) | 7.12 |
| Area (cm ²) | 38.70 | Area (cm ²) | 39.82 |
| Total Mass (g) | 728.2 | Total Mass (g) | 738.8 |
| Volume (cm³) | 328.6 | Volume (cm³) | 339.2 |
| Water Content (%) | 15.8 | Water Content (%) | 18.5 |
| Degree of Saturation (%) | 104 | Beta Saturation (%) | 99 |
| Wet Density (g/cm³) | 2.216 | Wet Density (g/cm³) | 2.178 |
| Dry Density(g/cm³) | 1.913 | Dry Density(g/cm³) | 1.838 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 360 | Cell Pressure (kPa) | 360 |
| Top Cap Pressure(kPa) | 340 | Top Cap Pressure (kPa) | 340 |
| Bottom Cap Pressure(kPa) | 340 | Bottom Cap Pressure(kPa) | 320 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 24.0 |




**Hydraulic Conductivity (cm/s) = 5.5E-09**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Tel: (403) 253-7876

Tested by: C.Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.220 |
| **PROJECT TITLE:** | SR1 | **DATE:** | April 21, 2016 |
| **SAMPLE DESCRIPTION:** | Grey Clay Some Gravel | **SAMPLE No.:** | DC4-ST3 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 8.86 |
| Diameter (cm) | 7.18 |
| Area (cm ²) | 40.49 |
| Total Mass (g) | 805.0 |
| Volume (cm³) | 358.7 |
| Water Content (%) | 11.8 |
| Degree of Saturation (%) | 92 |
| Wet Density (g/cm³) | 2.244 |
| Dry Density(g/cm³) | 2.008 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

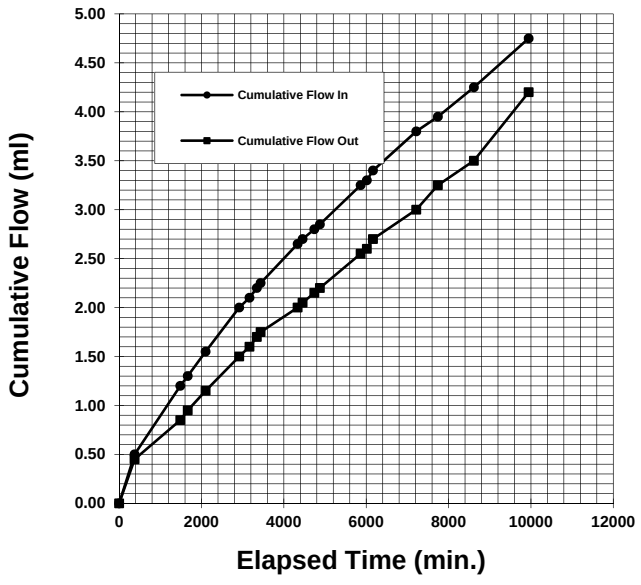
| | |
|---|---|
| Length (cm) | 8.85 |
| Diameter (cm) | 7.15 |
| Area (cm ²) | 40.15 |
| Total Mass (g) | 826.6 |
| Volume (cm³) | 355.3 |
| Water Content (%) | 15.6 |
| Beta Saturation (%) | 99 |
| Wet Density (g/cm³) | 2.326 |
| Dry Density(g/cm³) | 2.012 |

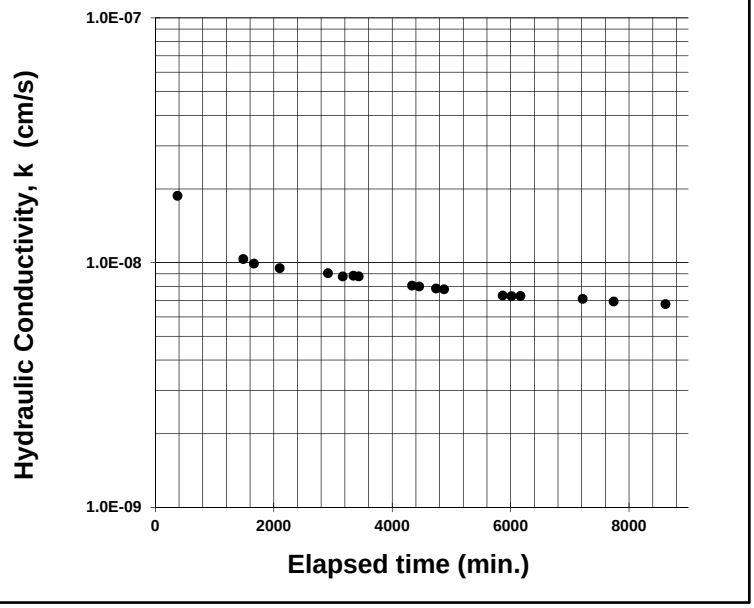
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 360 |
| Top Cap Pressure(kPa) | 340 |
| Bottom Cap Pressure(kPa) | 340 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 360 |
| Top Cap Pressure (kPa) | 340 |
| Bottom Cap Pressure(kPa) | 320 |
| Hydraulic Gradient | 23.0 |




**Hydraulic Conductivity (cm/s) = 7.1E-09**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Tel: (403) 253-7876

Tested by: C.Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.220 |
| **PROJECT TITLE:** | SR1 | **DATE:** | May 9, 2016 |
| **SAMPLE DESCRIPTION:** | Dark Brown Clay Some Gravel | **SAMPLE No.:** | DC6-BSC |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 8.86 |
| Diameter (cm) | 7.27 |
| Area (cm ²) | 41.51 |
| Total Mass (g) | 780.7 |
| Volume (cm³) | 367.8 |
| Water Content (%) | 14.6 |
| Degree of Saturation (%) | 86 |
| Wet Density (g/cm³) | 2.123 |
| Dry Density(g/cm³) | 1.852 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

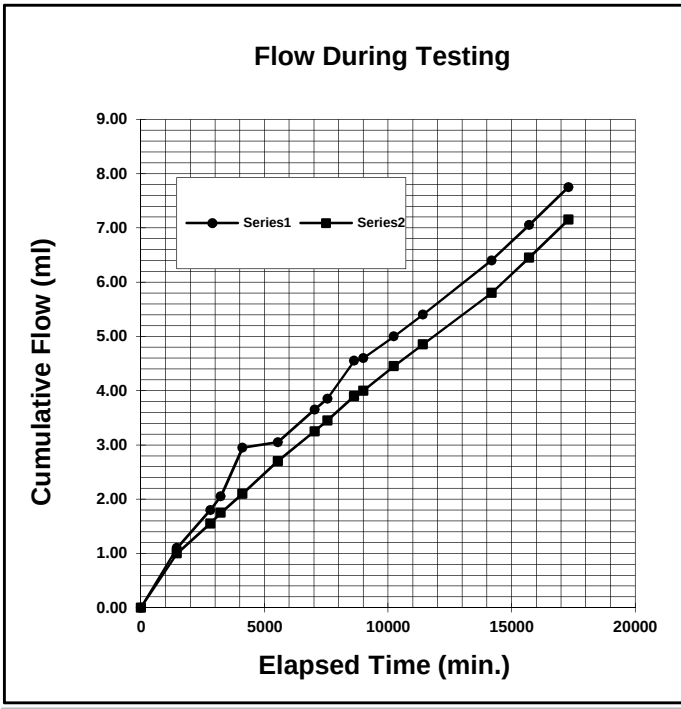
| | |
|---|---|
| Length (cm) | 8.90 |
| Diameter (cm) | 7.3 |
| Area (cm ²) | 41.85 |
| Total Mass (g) | 797.4 |
| Volume (cm³) | 372.5 |
| Water Content (%) | 15.1 |
| Beta Saturation (%) | 99 |
| Wet Density (g/cm³) | 2.141 |
| Dry Density(g/cm³) | 1.860 |

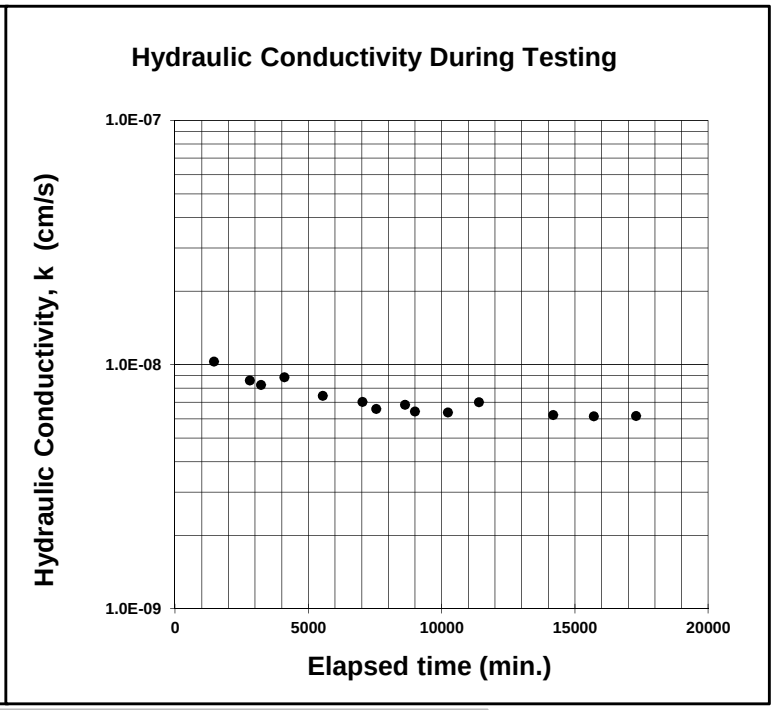
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 360 |
| Top Cap Pressure(kPa) | 340 |
| Bottom Cap Pressure(kPa) | 340 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 380 |
| Top Cap Pressure (kPa) | 360 |
| Bottom Cap Pressure(kPa) | 340 |
| Hydraulic Gradient | 23.0 |




*remolded based on proctor test averages: 1860kg/m3 @ 14.5% moisture

**Hydraulic Conductivity (cm/s) = 6.4E-09**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Tel: (403) 253-7876

Tested by: C.Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.220 |
| **PROJECT TITLE:** | SR1 | **DATE:** | May 9, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Some Sand, Some Gravel | **SAMPLE No.:** | DC7-SS7 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 9.04 |
| Diameter (cm) | 7.25 |
| Area (cm ²) | 41.28 |
| Total Mass (g) | 797.4 |
| Volume (cm³) | 373.2 |
| Water Content (%) | 14.7 |
| Degree of Saturation (%) | 88 |
| Wet Density (g/cm³) | 2.137 |
| Dry Density(g/cm³) | 1.863 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

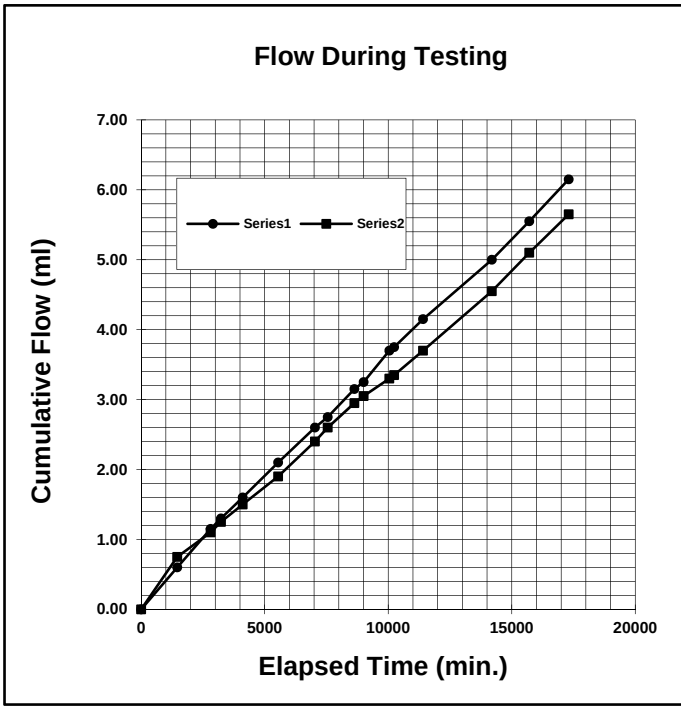
| | |
|---|---|
| Length (cm) | 9.05 |
| Diameter (cm) | 7.37 |
| Area (cm ²) | 42.66 |
| Total Mass (g) | 843.9 |
| Volume (cm³) | 386.1 |
| Water Content (%) | 17.1 |
| Beta Saturation (%) | 99 |
| Wet Density (g/cm³) | 2.186 |
| Dry Density(g/cm³) | 1.866 |

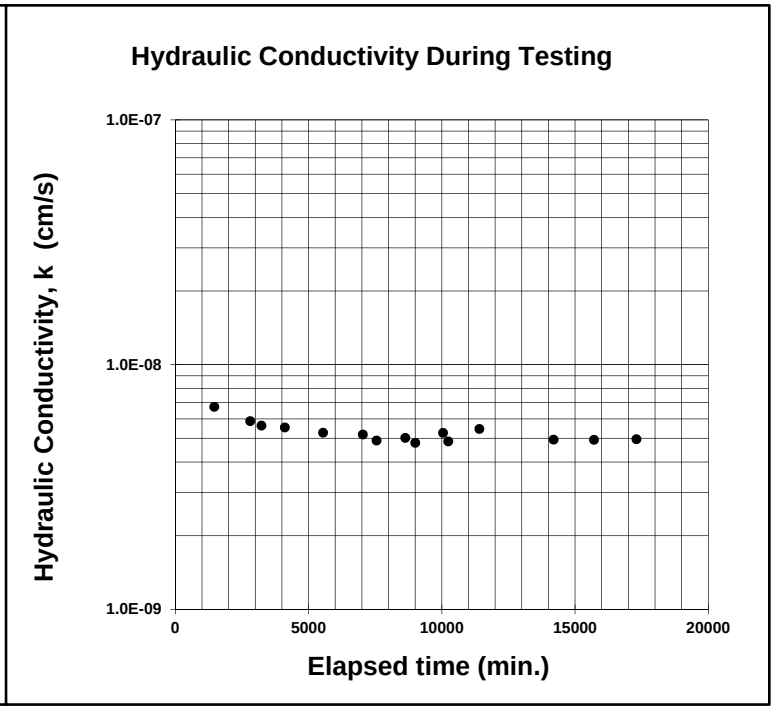
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 360 |
| Top Cap Pressure(kPa) | 340 |
| Bottom Cap Pressure(kPa) | 340 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 380 |
| Top Cap Pressure (kPa) | 360 |
| Bottom Cap Pressure(kPa) | 340 |
| Hydraulic Gradient | 22.6 |




**Hydraulic Conductivity (cm/s) = 5.0E-09**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | June 10, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | DC8 BS9+SS10 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 9.60 |
| Diameter (cm) | 7.30 |
| Area (cm ²) | 41.85 |
| Total Mass (g) | 791.5 |
| Volume (cm³) | 401.8 |
| Water Content (%) | 19.6 |
| Degree of Saturation (%) | 83 |
| Wet Density (g/cm³) | 1.970 |
| Dry Density(g/cm³) | 1.646 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

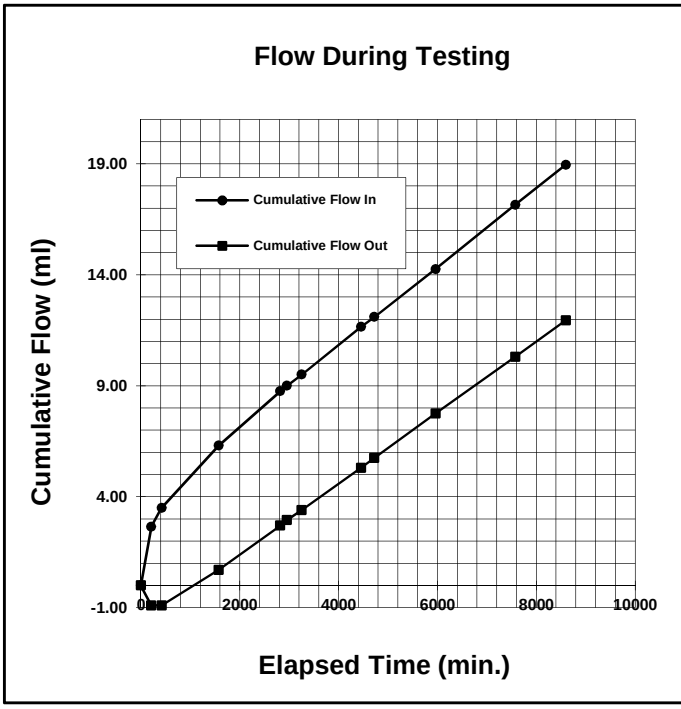
| | |
|---|---|
| Length (cm) | 9.61 |
| Diameter (cm) | 7.32 |
| Area (cm ²) | 42.08 |
| Total Mass (g) | 830.8 |
| Volume (cm³) | 404.4 |
| Water Content (%) | 20.2 |
| Beta Saturation (%) | 100 |
| Wet Density (g/cm³) | 2.054 |
| Dry Density(g/cm³) | 1.709 |

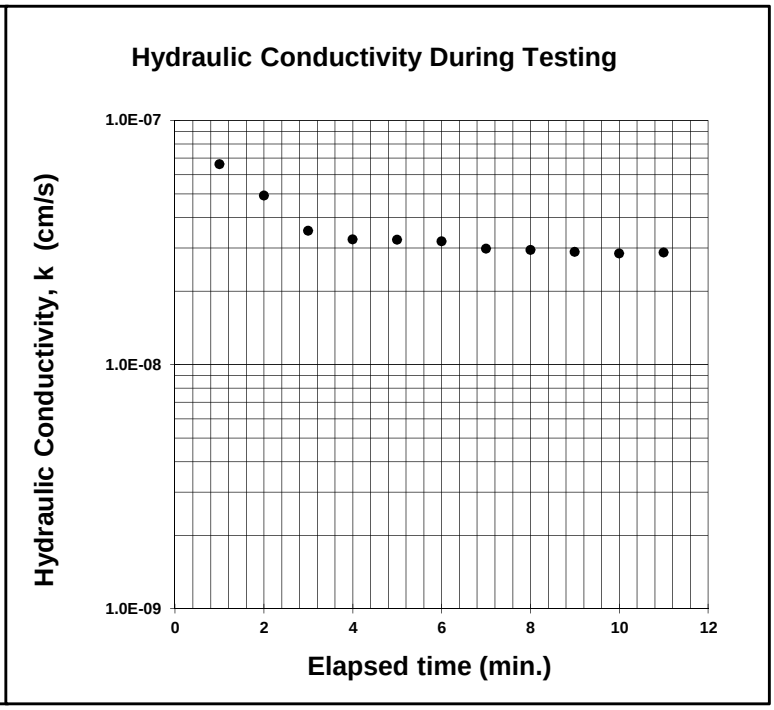
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 400 |
| Top Cap Pressure(kPa) | 380 |
| Bottom Cap Pressure(kPa) | 380 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 360 |
| Top Cap Pressure (kPa) | 340 |
| Bottom Cap Pressure(kPa) | 320 |
| Hydraulic Gradient | 21.2 |




**Hydraulic Conductivity (cm/s) = 3.0E-08**

Reviewed by:

Stantec

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Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | June 10, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | DC14 BS10&SS11 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 10.51 |
| Diameter (cm) | 7.26 |
| Area (cm ²) | 41.40 |
| Total Mass (g) | 889.1 |
| Volume (cm³) | 435.1 |
| Water Content (%) | 14.9 |
| Degree of Saturation (%) | 78 |
| Wet Density (g/cm³) | 2.044 |
| Dry Density(g/cm³) | 1.778 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

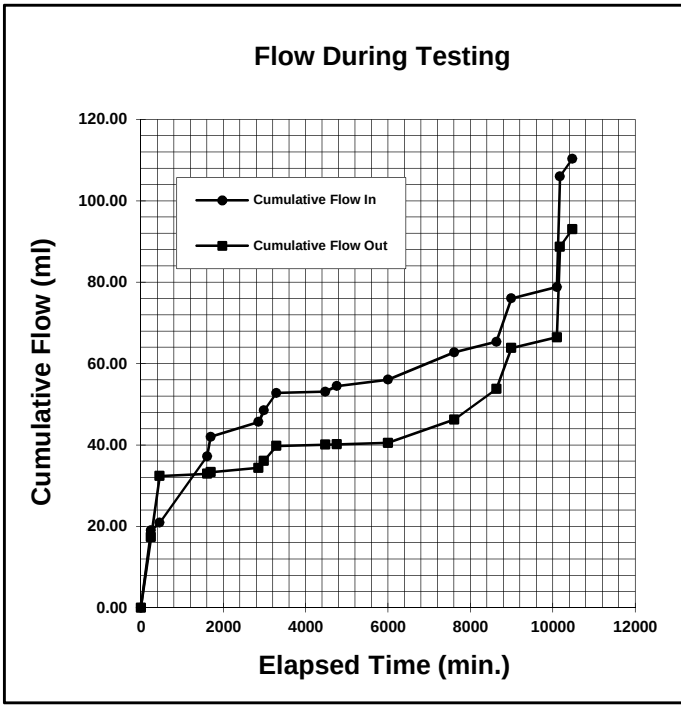
| | |
|---|---|
| Length (cm) | 10.47 |
| Diameter (cm) | 7.26 |
| Area (cm ²) | 41.40 |
| Total Mass (g) | 908.2 |
| Volume (cm³) | 433.4 |
| Water Content (%) | 18.6 |
| Beta Saturation (%) | 98 |
| Wet Density (g/cm³) | 2.095 |
| Dry Density(g/cm³) | 1.767 |

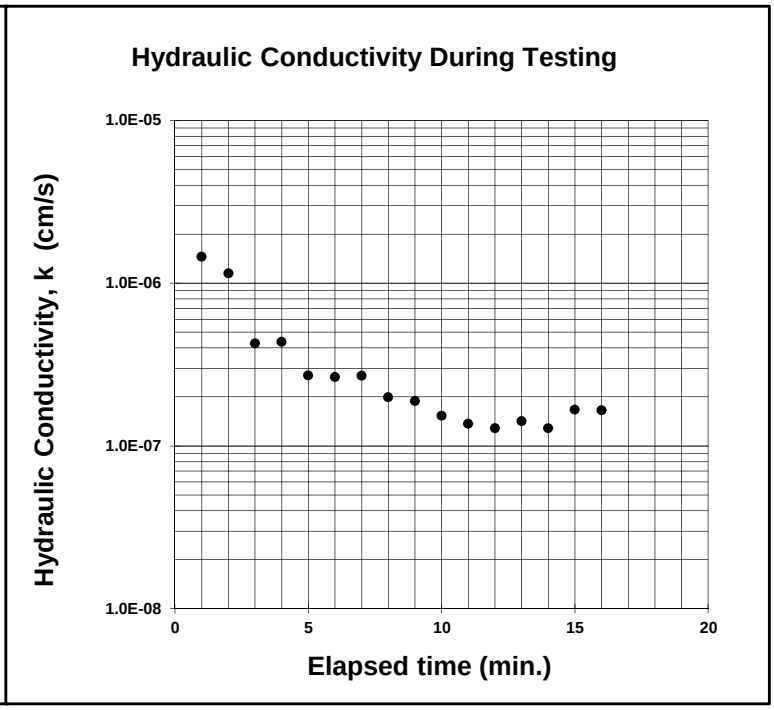
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 400 |
| Top Cap Pressure(kPa) | 380 |
| Bottom Cap Pressure(kPa) | 380 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 360 |
| Top Cap Pressure (kPa) | 340 |
| Bottom Cap Pressure(kPa) | 320 |
| Hydraulic Gradient | 19.4 |




**Hydraulic Conductivity (cm/s) = 1.5E-07**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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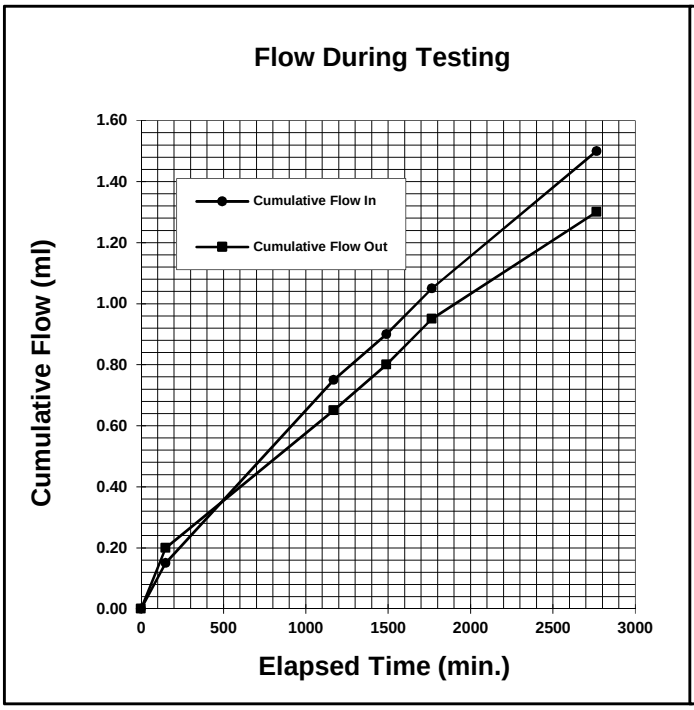
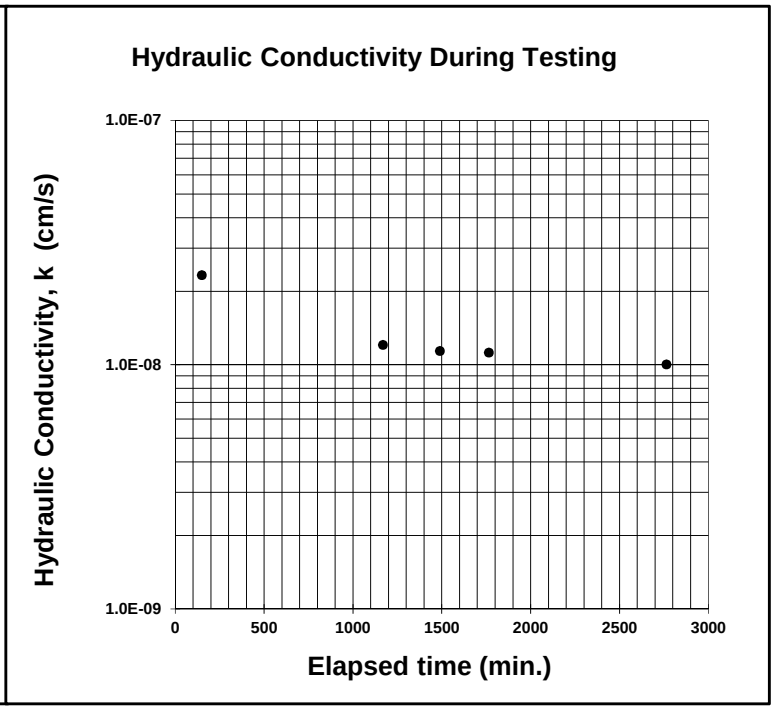
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | November 10, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | DC18 BSA1 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 10.32 | Length (cm) | 10.38 |
| Diameter (cm) | 7.24 | Diameter (cm) | 7.34 |
| Area (cm ²) | 41.17 | Area (cm ²) | 42.31 |
| Total Mass (g) | 847.5 | Total Mass (g) | 868.2 |
| Volume (cm³) | 424.9 | Volume (cm³) | 439.2 |
| Water Content (%) | 26.0 | Water Content (%) | 27.3 |
| Degree of Saturation (%) | 100 | Beta Saturation (%) | 93 |
| Wet Density (g/cm³) | 1.995 | Wet Density (g/cm³) | 1.977 |
| Dry Density(g/cm³) | 1.583 | Dry Density(g/cm³) | 1.553 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 150 | Cell Pressure (kPa) | 170 |
| Top Cap Pressure(kPa) | 130 | Top Cap Pressure (kPa) | 150 |
| Bottom Cap Pressure(kPa) | 130 | Bottom Cap Pressure(kPa) | 130 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 19.8 |




**Hydraulic Conductivity (cm/s) = 1.1E-08**

Reviewed by:

Stantec

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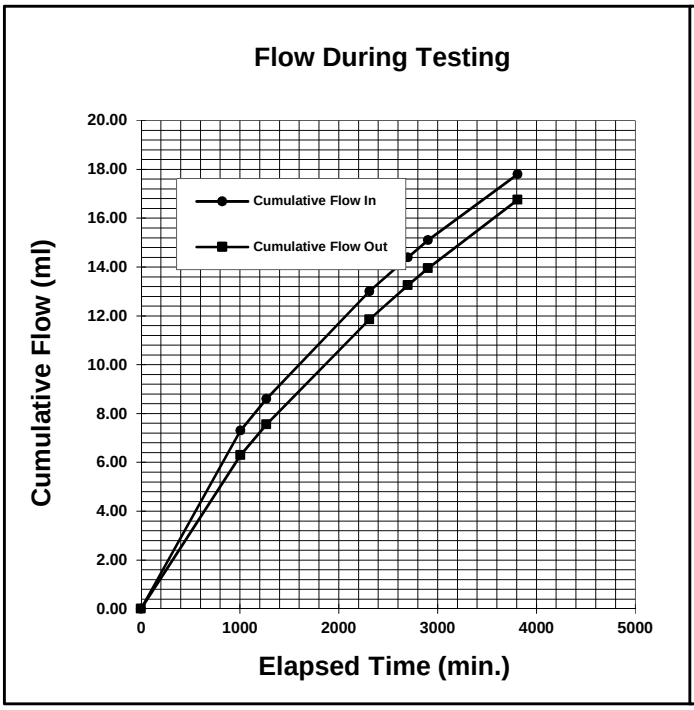
Tel: (403) 253-7876

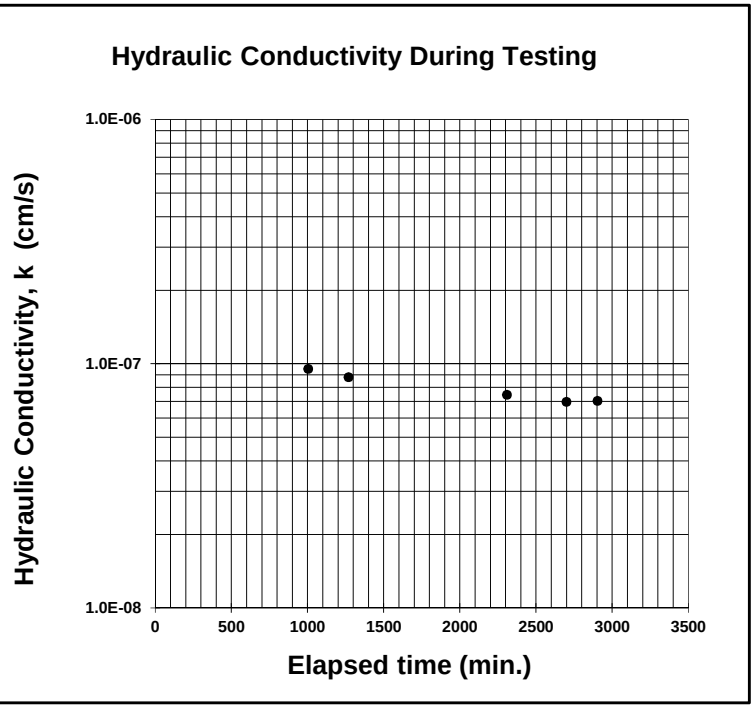
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.220 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 17, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Trace Gravel | **SAMPLE No.:** | DC19 ST5 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 8.75 | Length (cm) | 8.78 |
| Diameter (cm) | 7.28 | Diameter (cm) | 7.28 |
| Area (cm ²) | 41.62 | Area (cm ²) | 41.62 |
| Total Mass (g) | 730.4 | Total Mass (g) | 738.4 |
| Volume (cm³) | 364.2 | Volume (cm³) | 365.5 |
| Water Content (%) | 25.0 | Water Content (%) | 18.5 |
| Degree of Saturation (%) | 99 | Beta Saturation (%) | 96 |
| Wet Density (g/cm³) | 2.005 | Wet Density (g/cm³) | 2.020 |
| Dry Density(g/cm³) | 1.605 | Dry Density(g/cm³) | 1.705 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 150 | Cell Pressure (kPa) | 170 |
| Top Cap Pressure(kPa) | 130 | Top Cap Pressure (kPa) | 150 |
| Bottom Cap Pressure(kPa) | 130 | Bottom Cap Pressure(kPa) | 130 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 23.3 |




**Hydraulic Conductivity (cm/s) = 7.7E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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**LABORATORY**
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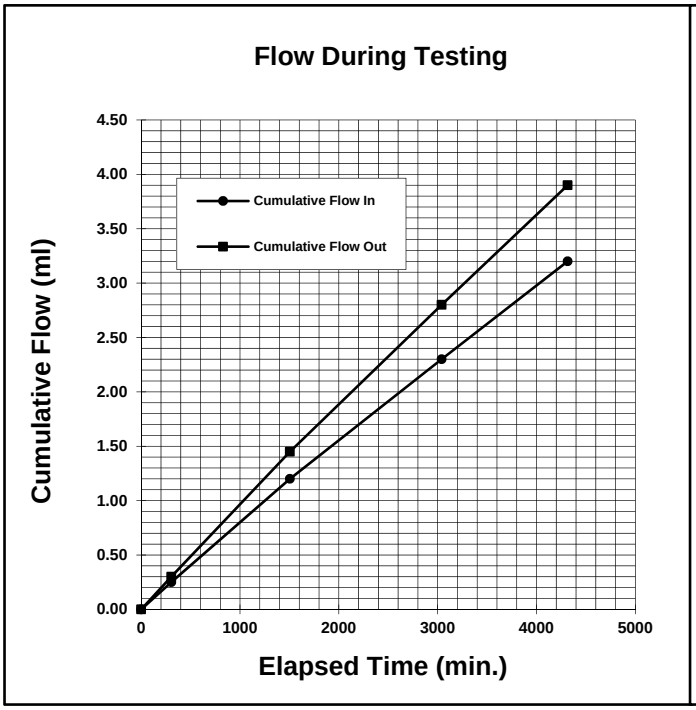
Tel: (403) 253-7876

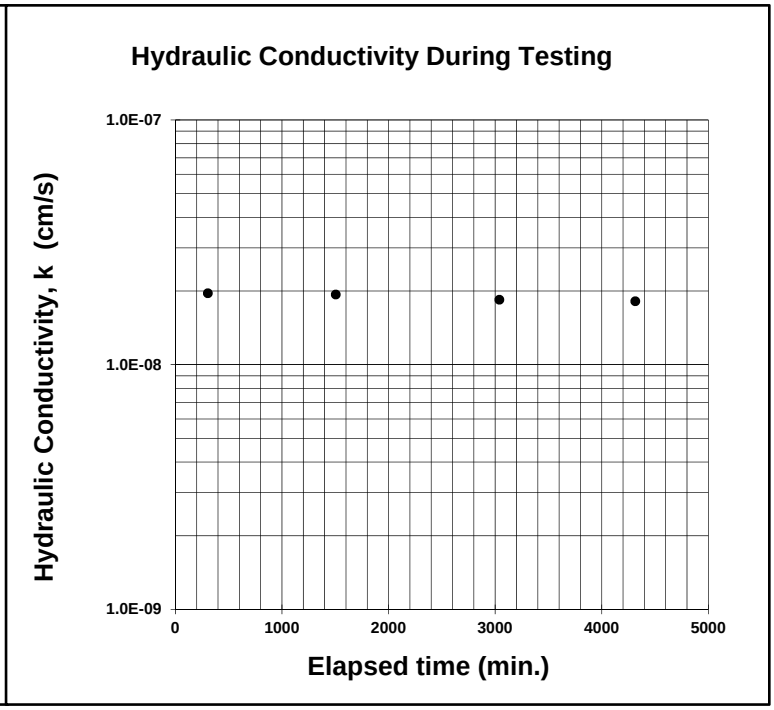
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.220 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 19, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | DC21 ST2 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 10.70 | Length (cm) | 9.92 |
| Diameter (cm) | 7.20 | Diameter (cm) | 6.88 |
| Area (cm ²) | 40.72 | Area (cm ²) | 37.18 |
| Total Mass (g) | 867.8 | Total Mass (g) | 871.5 |
| Volume (cm³) | 435.7 | Volume (cm³) | 368.8 |
| Water Content (%) | 25.5 | Water Content (%) | 24.0 |
| Degree of Saturation (%) | 99 | Beta Saturation (%) | 93 |
| Wet Density (g/cm³) | 1.992 | Wet Density (g/cm³) | 2.363 |
| Dry Density(g/cm³) | 1.587 | Dry Density(g/cm³) | 1.905 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 220 | Cell Pressure (kPa) | 240 |
| Top Cap Pressure(kPa) | 200 | Top Cap Pressure (kPa) | 220 |
| Bottom Cap Pressure(kPa) | 200 | Bottom Cap Pressure(kPa) | 200 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 19.1 |




**Hydraulic Conductivity (cm/s) = 1.9E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Calgary, Alberta
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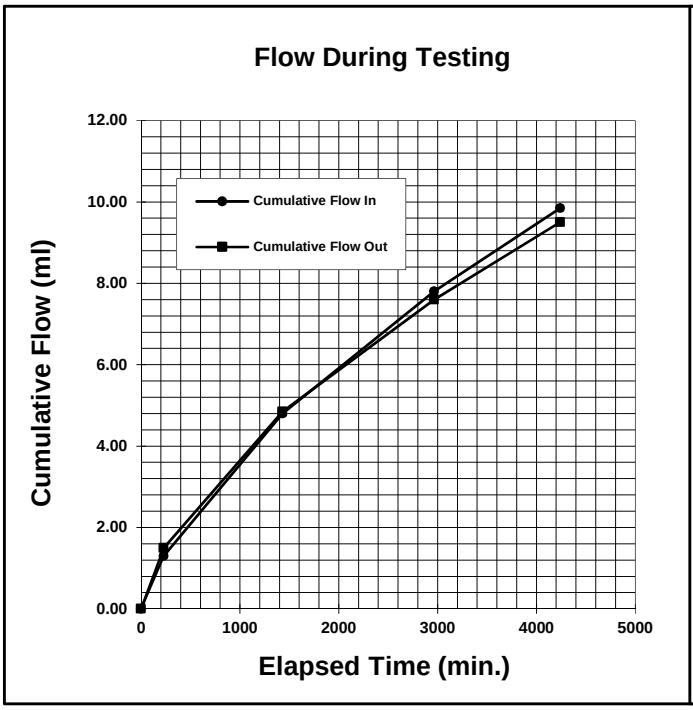
Tel: (403) 253-7876

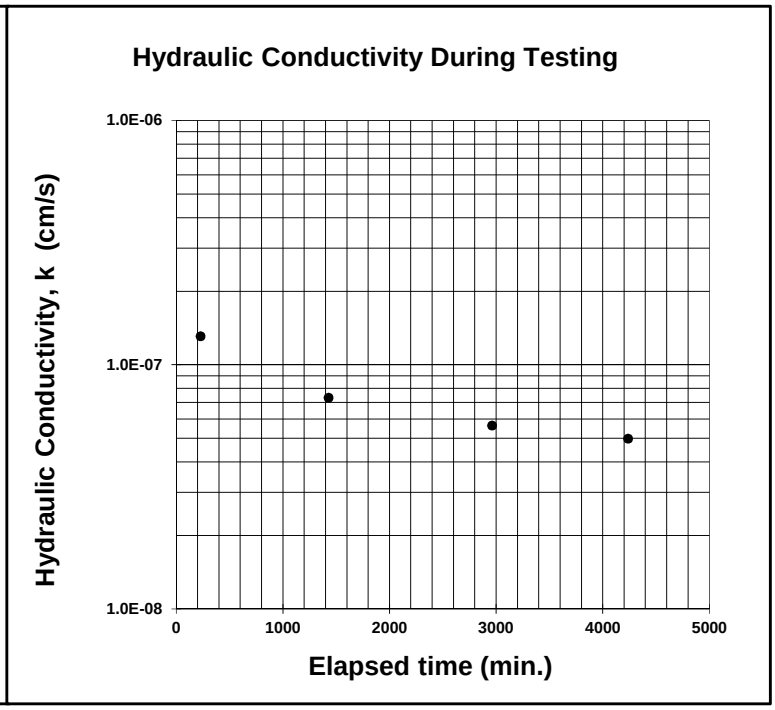
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.220 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 26, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | DC25 ST2 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 10.79 | Length (cm) | 10.90 |
| Diameter (cm) | 7.25 | Diameter (cm) | 7.29 |
| Area (cm ²) | 41.28 | Area (cm ²) | 41.74 |
| Total Mass (g) | 866.2 | Total Mass (g) | 888.6 |
| Volume (cm³) | 445.4 | Volume (cm³) | 455.0 |
| Water Content (%) | 24.7 | Water Content (%) | 23.1 |
| Degree of Saturation (%) | 91 | Beta Saturation (%) | 93 |
| Wet Density (g/cm³) | 1.945 | Wet Density (g/cm³) | 1.953 |
| Dry Density(g/cm³) | 1.559 | Dry Density(g/cm³) | 1.587 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 220 | Cell Pressure (kPa) | 240 |
| Top Cap Pressure(kPa) | 200 | Top Cap Pressure (kPa) | 220 |
| Bottom Cap Pressure(kPa) | 200 | Bottom Cap Pressure(kPa) | 200 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 18.9 |




**Hydraulic Conductivity (cm/s) = 7.7E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | November 1, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | DC30 BSB |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 10.22 |
| Diameter (cm) | 7.24 |
| Area (cm ²) | 41.17 |
| Total Mass (g) | 910.7 |
| Volume (cm³) | 420.7 |
| Water Content (%) | 15.0 |
| Degree of Saturation (%) | 94 |
| Wet Density (g/cm³) | 2.164 |
| Dry Density(g/cm³) | 1.882 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

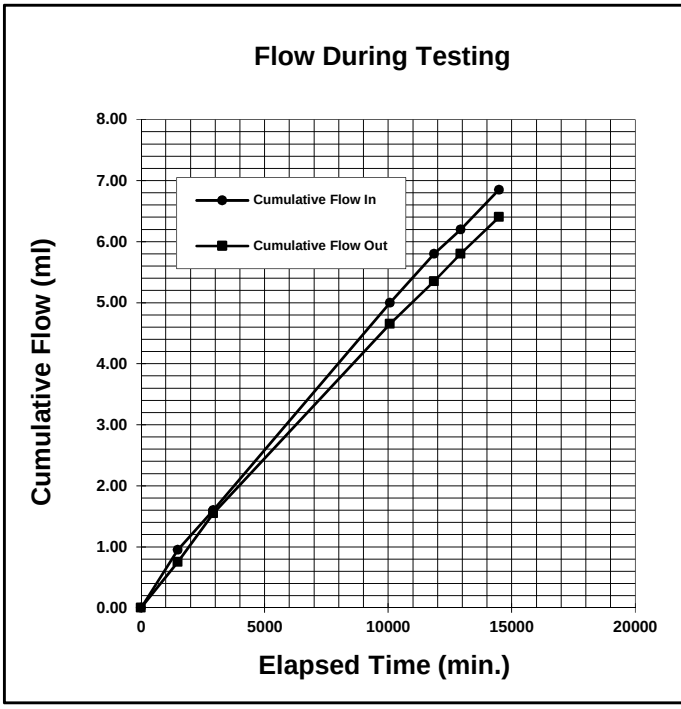
| | |
|---|---|
| Length (cm) | 10.16 |
| Diameter (cm) | 7.3 |
| Area (cm ²) | 41.85 |
| Total Mass (g) | 920.6 |
| Volume (cm³) | 425.2 |
| Water Content (%) | 15.4 |
| Beta Saturation (%) | 93 |
| Wet Density (g/cm³) | 2.165 |
| Dry Density(g/cm³) | 1.877 |

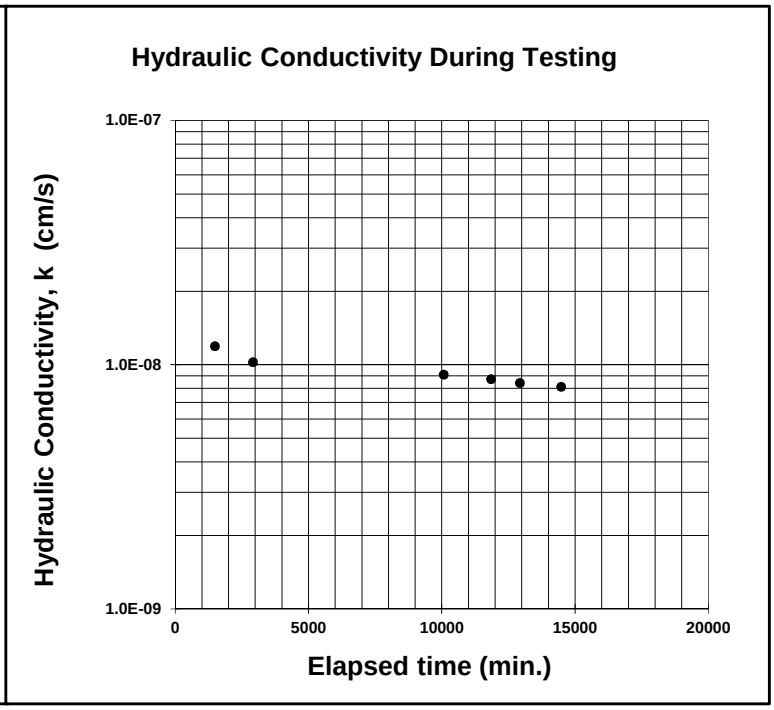
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 360 |
| Top Cap Pressure(kPa) | 340 |
| Bottom Cap Pressure(kPa) | 340 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 380 |
| Top Cap Pressure (kPa) | 360 |
| Bottom Cap Pressure(kPa) | 340 |
| Hydraulic Gradient | 20.0 |




**Hydraulic Conductivity (cm/s) = 8.9E-09**

Reviewed by:

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Stantec

# Pinhole Test

ASTM D4647

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Sample ID: DC8 BS6+SS7
Tested By: C. Oost
Date Tested: June 29, 2016

Specimen Information

■ Remolded ☐ Undisturbed

Moisture Content: 10.3 %  ■ In-situ moisture content

| Sample | Dispersive Classification | Photo Post Test |
|---|---|---|
| 1 | ND3 | No photo taken, but pinhole remained 1mm after testing |
| | | |
| | | |



Reviewed by: _____

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Stantec

# Pinhole Test

ASTM D4647

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Sample ID: DC34 BS4 (formerly D54 BS4)
Tested By: C. Oost
Date Tested: 22-Jul-16

Specimen Information

■ Remolded ☐ Undisturbed

Moisture Content: 32.2 %

■ In-situ moisture content

| Sample | Dispersive Classification | Photo Post Test |
|---|---|---|
| 1 | ND3 | Photo not taken, but sample unchanged, pinhole still 1mm |
| | | |
| | | |



Reviewed by: _____

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# Specific Gravity of Soil

ASTM D854 - Method A
Procedure For Moist Specimens

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.220
Soil Description: Clay Trace Sand
Notes: Max. Particle Size of Test Specimen = 4.75mm
Sample deaired using rapid boiling method

Sample: DC4-ST3
Tested By: C. Tollifson
Date: 4/24/2016

| Soil Type | Minimum Specimen Dry Weight (g) |
|---|---|
| SP, SP-SM | 100 +/- 10 |
| SP-SC, SM, SC | 75 +/- 10 |
| Silt or Clay | 50 +/- 10 |

| Moisture Content (ASTM D2216) | | |
|---|---|---|
| Tare no. | BG | |
| Wet Wt. & Tare | 27.84 | g |
| Dry Wt. & Tare | 27.37 | g |
| Wt. of Water | 0.47 | g |
| Tare Wt. | 1.63 | g |
| Wt. of Dry Soil | 25.74 | g |
| Moisture Content | 1.80 | % |

{A} Calibration of Pycnometers (Revised 03-10-16)

| Pycnometer No. | | H1 | A | Z1 |
|---|---|---|---|---|
| Mean Mass of Pycnometer | | 161.40 | 166.32 | 170.46 |
| Mean Calibrated Volume of Pycnometer (g/mL) | Vp | 499.19 | 499.36 | 499.74 |

{B} Specific Gravity Determination

| | | *Trial # 1* | *Trial #2* | *Trial #3* |
|---|---|---|---|---|
| Mass of Pycnometer (g)* | | 161.41 | 166.32 | 170.44 |
| Mass of Tare (g) | | 321.90 | 403.30 | 403.60 |
| Mass of Tare & Soil (g) | | 372.40 | 453.00 | 453.40 |
| Mass of Oven-Dried Solids | Ms | 50.50 | 49.70 | 49.80 |
| Mass of Deaired Water, Pycnometer & Soil (g) | Mpws,ti | 691.35 | 695.91 | 700.46 |
| Temperature of Deaired Water, Pycnometer & Soil | $T_t$ | 20.60 | 20.90 | 20.70 |
| Density of Water @ $T_t$ (g/mL) | pw,t | 0.99808 | 0.99802 | 0.99806 |
| Mass of Water & Pycnometer at Test | Mpw,t | 2.69 | 2.69 | 2.68 |
| Conversion Factor for ($T_t$) | K | 0.99987 | 0.99981 | 0.99985 |
| Specific Gravity (0.001) | $G_t$ | 2.687 | 2.689 | 2.684 |

**max tolerance of 0.06g from calibration*

Average Specific Gravity 2.687

*(maximum tolerance of 0.02 between trials)*

Reviewed By: _____

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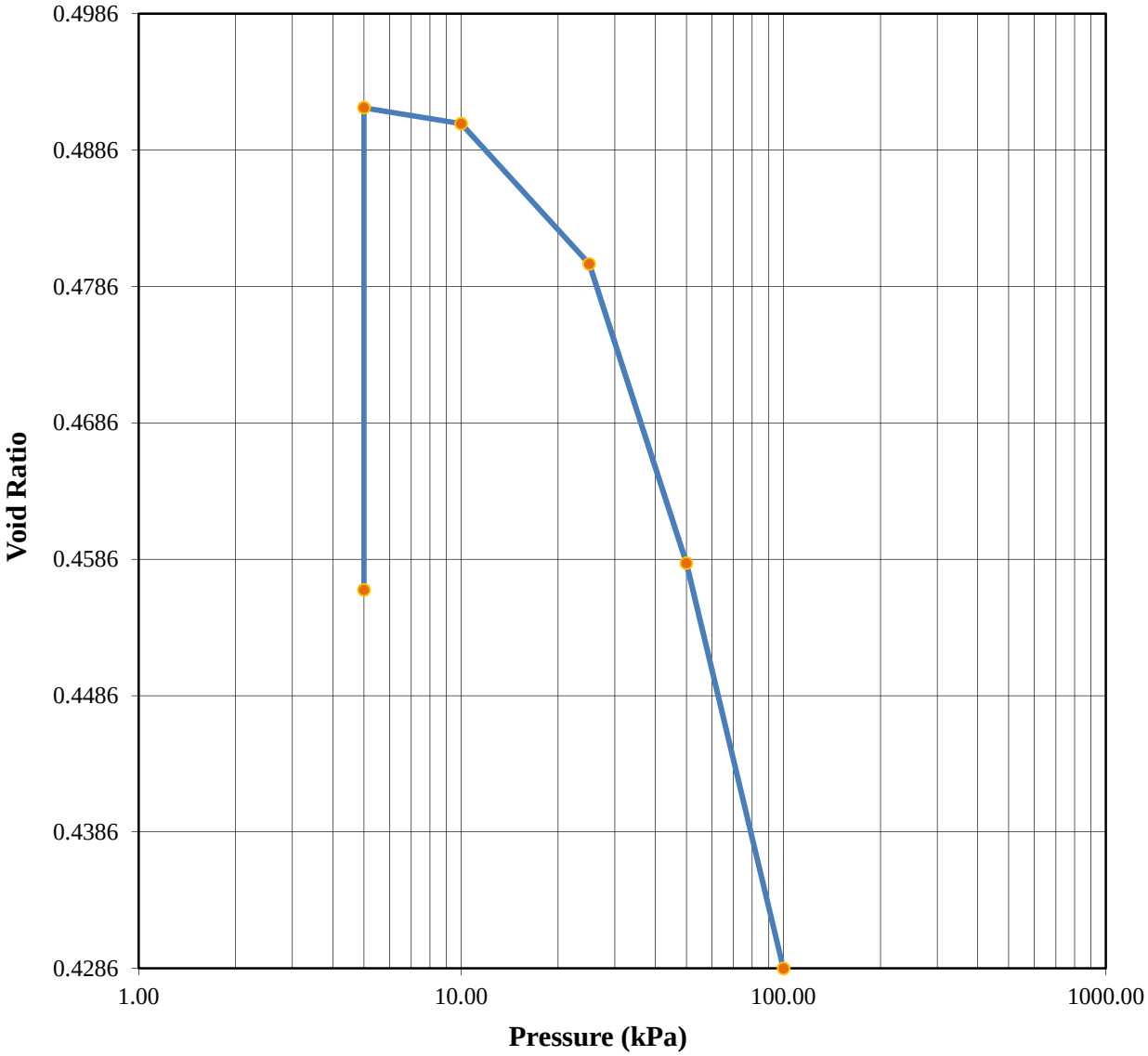
# Swell Test
## ASTM D4546 Method C
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 18.4 | 19.6 | **Liquid Limits:** | - | **Test Date:** | 20-Apr-16 |
| **Dry Density (g/cm3):** | 1.851 | 1.911 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 108.19 | 128.20 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.4552 | 0.4274 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Sandy Clay Trace Gravel | | |
| **Project Number:** | 110773396.302.702.220 | **Depth:** 4.6-4.95m | **Remarks:** |
| **Sample Number:** | DC3-ST5 | **Boring Number:** | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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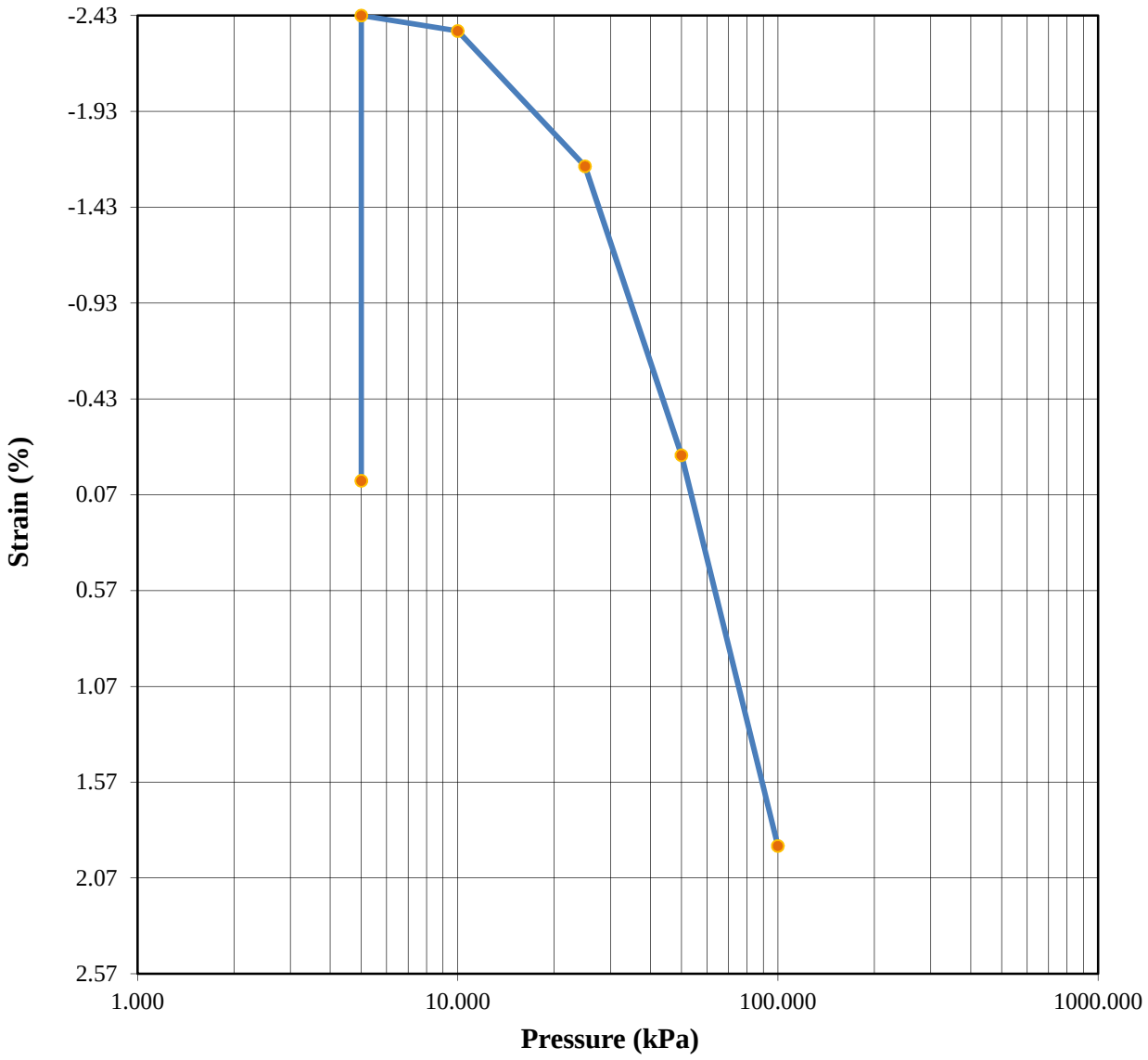
# Swell Test
## ASTM D4546 Method C
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 18.4 | 19.6 | **Liquid Limits:** | - | **Test Date:** | 20-Apr-16 |
| **Dry Density (g/cm3):** | 1.851 | 1.911 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 108.19 | 128.20 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.4552 | 0.4274 | | | | |
| | | | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Sandy Clay Trace Gravel | | |
| **Project Number:** | 110773396.302.702.220 | **Depth:** 4.6-4.95m | **Remarks:** |
| **Sample Number:** | DC3-ST5 | **Boring Number:** | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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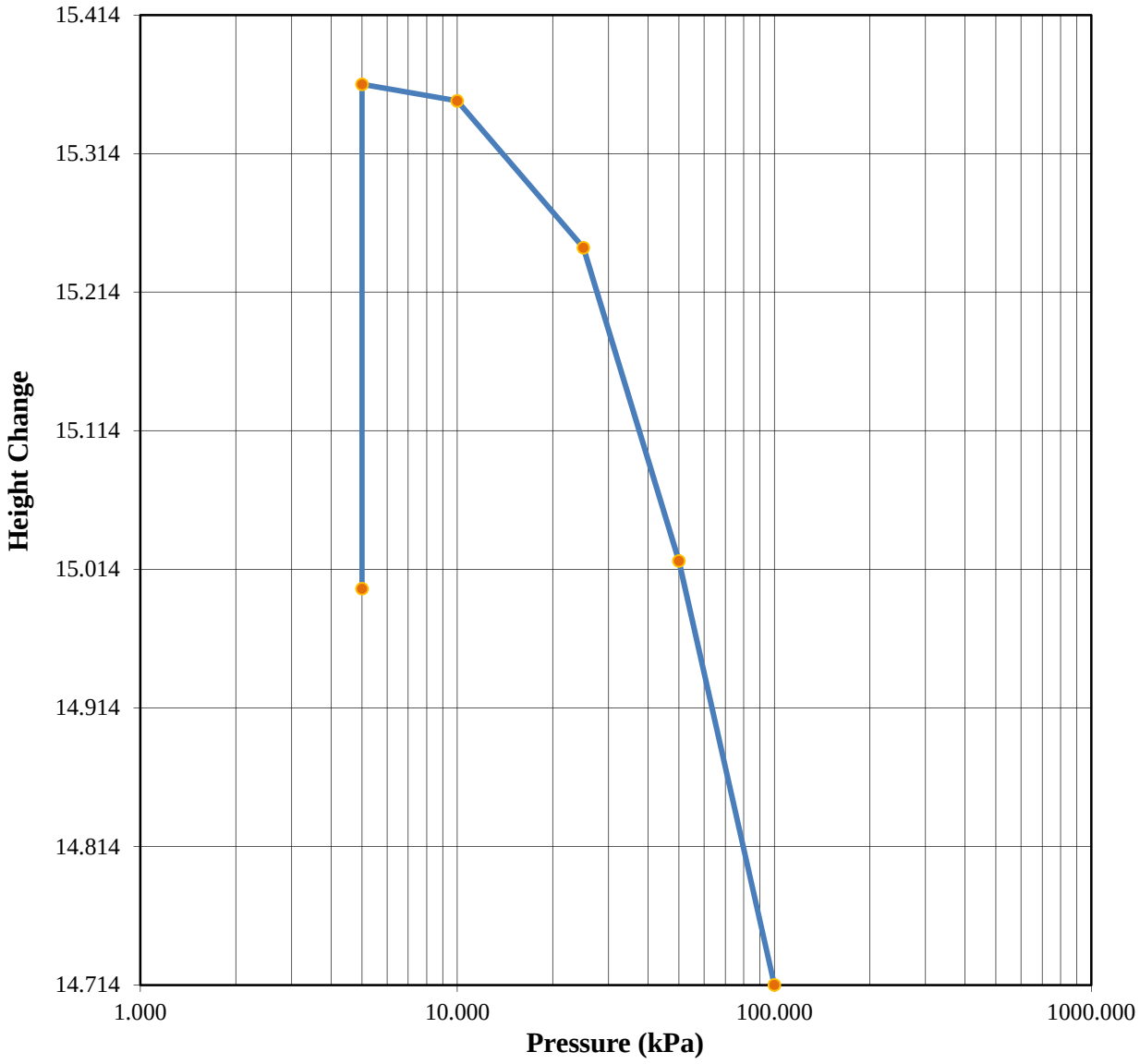
# Swell Test
## ASTM D4546 Method C
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 18.4 | 19.6 | **Liquid Limits:** | - | **Test Date:** | 20-Apr-16 |
| **Dry Density (g/cm3):** | 1.851 | 1.911 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 108.19 | 128.20 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.4552 | 0.4274 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Sandy Clay Trace Gravel | | |
| **Project Number:** | 110773396.302.702.220 | **Depth:** 4.6-4.95m | **Remarks:** |
| **Sample Number:** | DC3-ST5 | **Boring Number:** | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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# Swell Test
## ASTM D4546 Method C
### Summary

**Project:** SR1 **Project Number:** .302.702.220
**Location:**
**Job Number:**

**Sample Number:** DC3-ST5 **Sample Description:**
**Boring Number:** Brown Sandy Clay Trace Gravel
**Depth:** 4.6-4.95m **Remarks:** **Test Number:**
**Sample Type:** Undisturbed **Test Date:** 20-Apr-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 15.0000 | 4.7002 | 0.00 | 0.4563 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 15.0000 | 4.7002 | 0.00 | 0.4563 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 5.000 | -0.3640 | 15.3640 | 5.0642 | -2.43 | 0.4917 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 10.000 | -0.3520 | 15.3520 | 5.0522 | -2.35 | 0.4905 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 25.000 | -0.2460 | 15.2460 | 4.9462 | -1.64 | 0.4802 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | 50.000 | -0.0200 | 15.0200 | 4.7202 | -0.13 | 0.4583 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6 | 100.000 | 0.2860 | 14.7140 | 4.4142 | 1.91 | 0.4286 | 0.000 | 0.000 | 0.000 | 0.000 |

**Tested By:** C.Tollifson **Checked By:** C.Lamoureux

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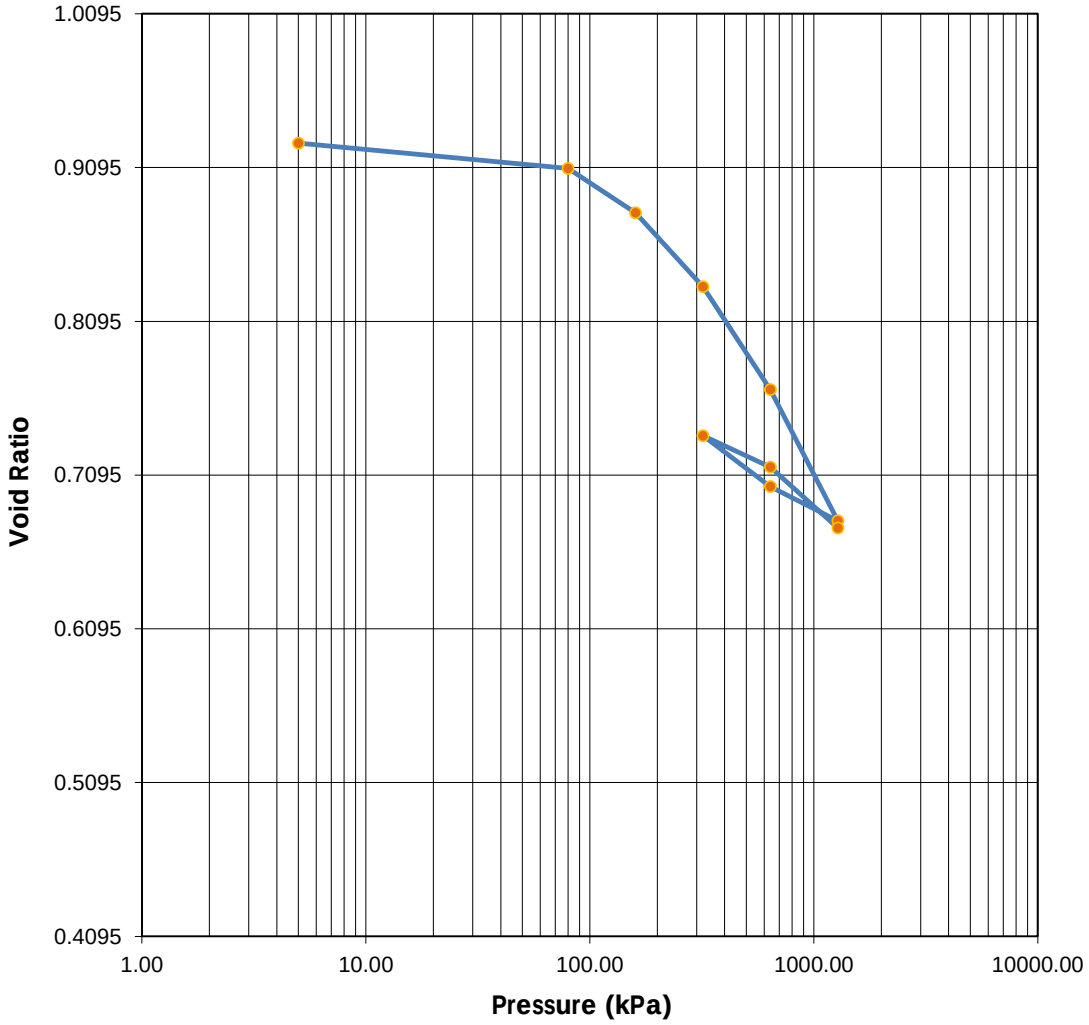
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Moisture (%):** | 33.0 | 29.9 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.400 | 1.562 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 95.79 | 110.79 | | | | |
| **Void Ratio:** | 0.9240 | 0.6739 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.220 **Depth:** 3.0-3.6m

**Sample Number:** DC33 ST5 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads 10kPa, 20kPa, and 40kPa omitted due to swelling; formerly known as D53 ST5

**Tested By:** C. Oost **Reviewed By:** C. Lamoureux

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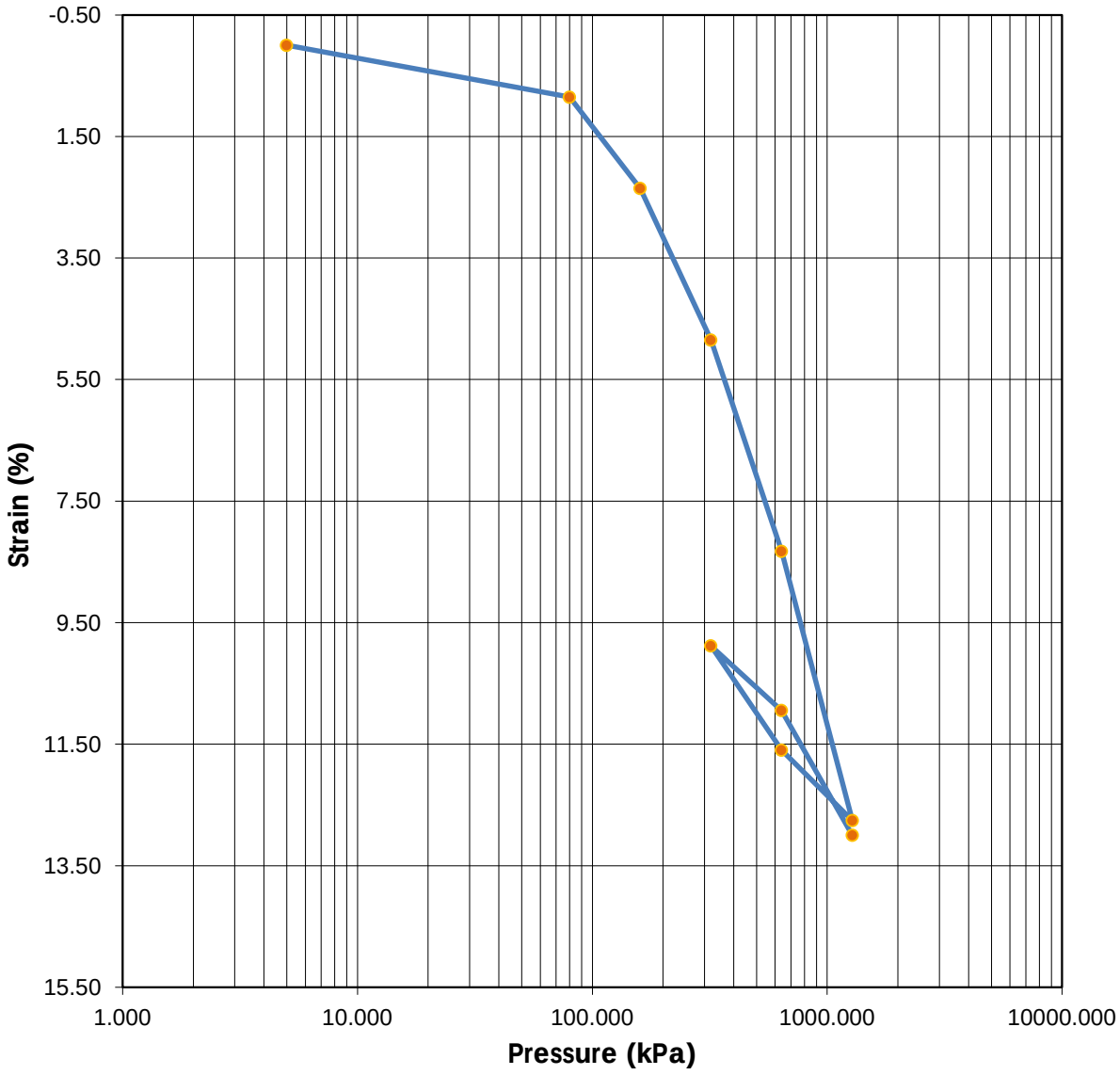
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 33.0 | 29.9 | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Dry Density (g/cm3):** | 1.400 | 1.562 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 95.79 | 110.79 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.9240 | 0.6739 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.220 | **Depth:** 3.0-3.6m | **Remarks:** |
| **Sample Number:** | DC33 ST5 | **Boring Number:** | Loads 10kPa, 20kPa, and 40kPa omitted due to swelling; formerly known as D53 ST5 |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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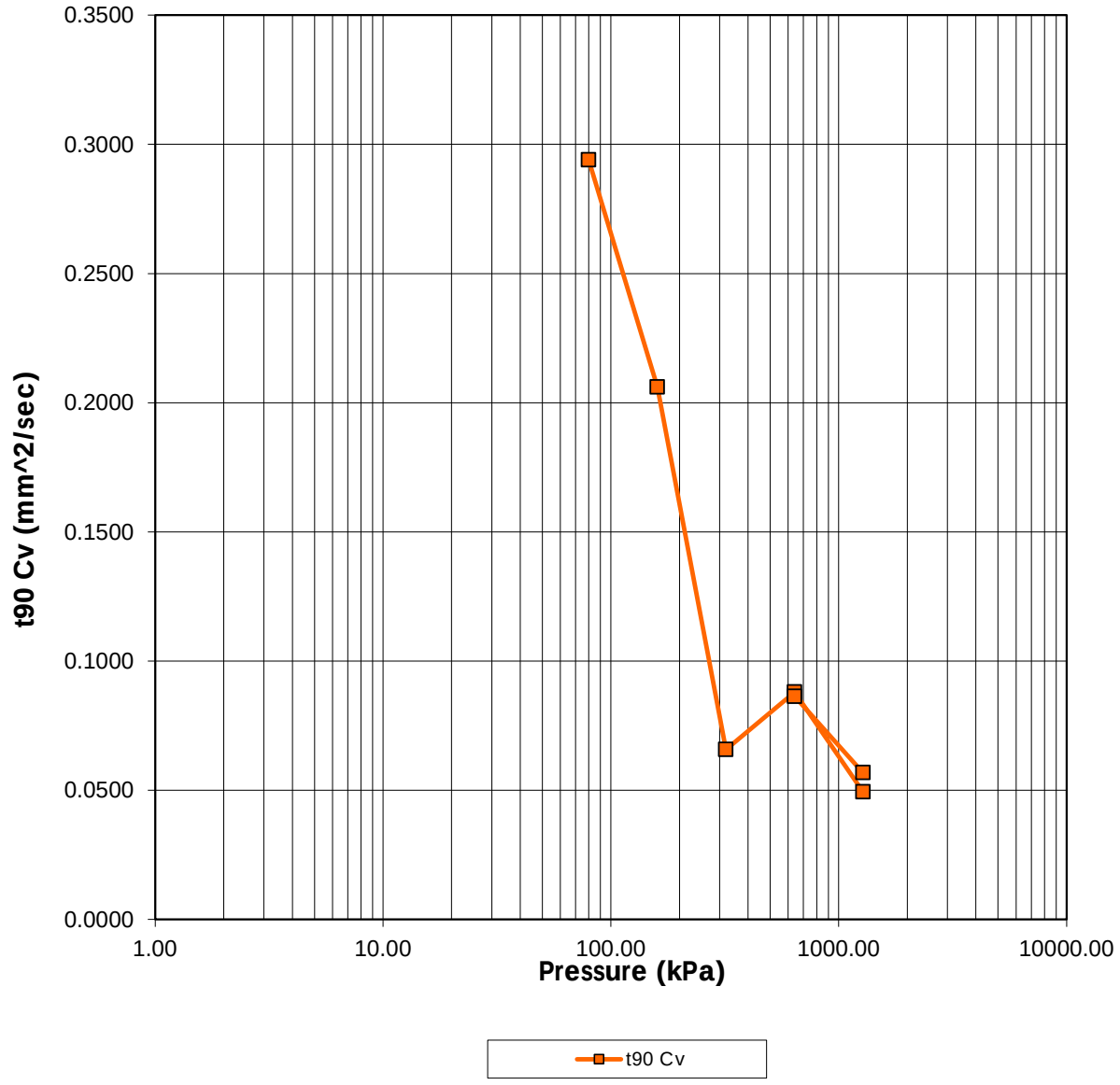
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 33.0 | 29.9 | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Dry Density (g/cm3):** | 1.400 | 1.562 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 95.79 | 110.79 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.9240 | 0.6739 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

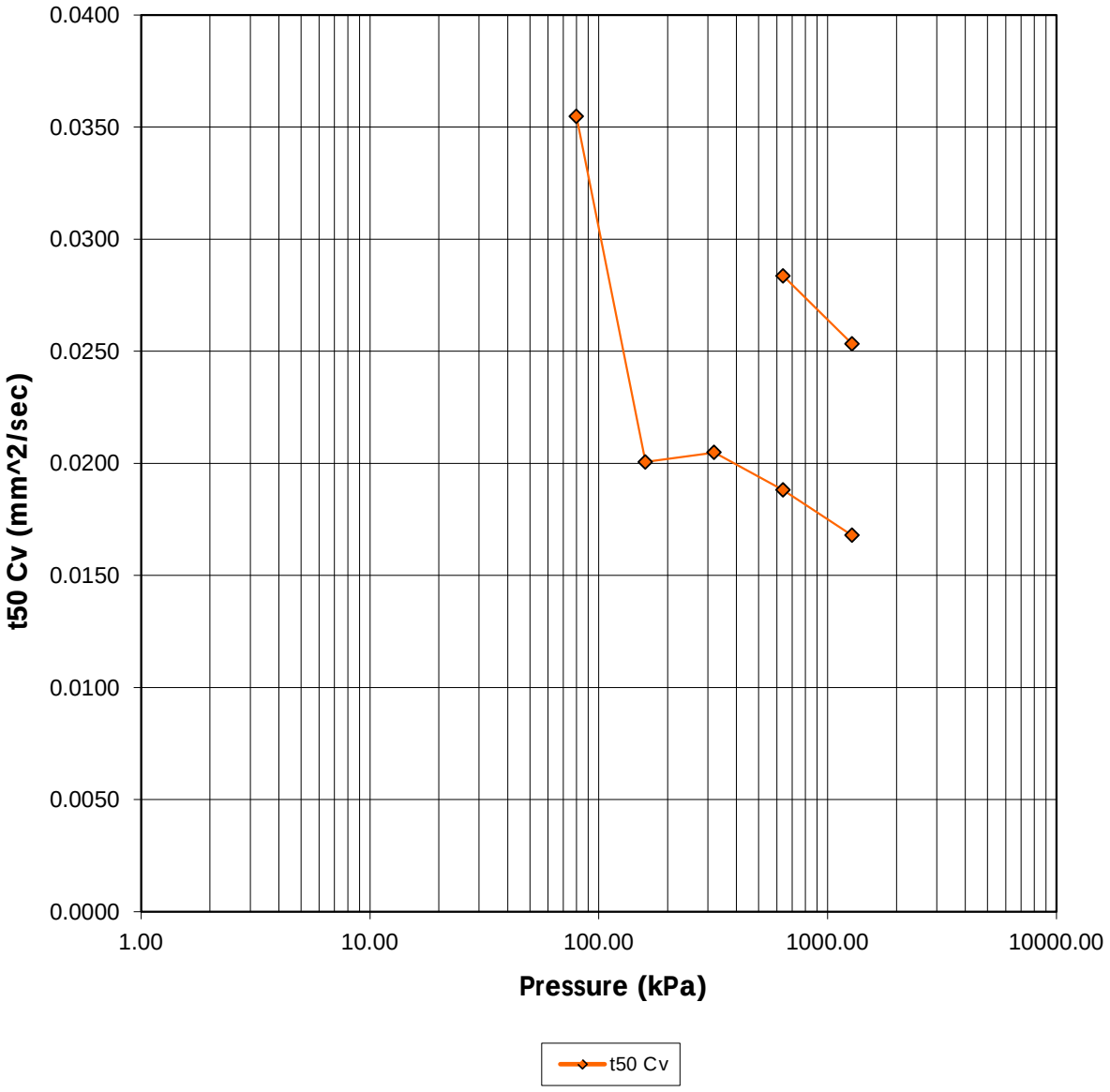
**Project Number:** 110773396.302.702.220 **Depth:** 3.0-3.6m
**Sample Number:** DC33 ST5 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportation
**Location:**

**Remarks:**
Loads 10kPa, 20kPa, and 40kPa omitted due to swelling; formerly known as D53 ST5

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 33.0 | 29.9 | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Dry Density (g/cm3):** | 1.400 | 1.562 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 95.79 | 110.79 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.9240 | 0.6739 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.220 **Depth:** 3.0-3.6m
**Sample Number:** DC33 ST5 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportation
**Location:**

**Remarks:**
Loads 10kPa, 20kPa, and 40kPa omitted due to swelling; formerly known as D53 ST5

Stantec Consulting Ltd.
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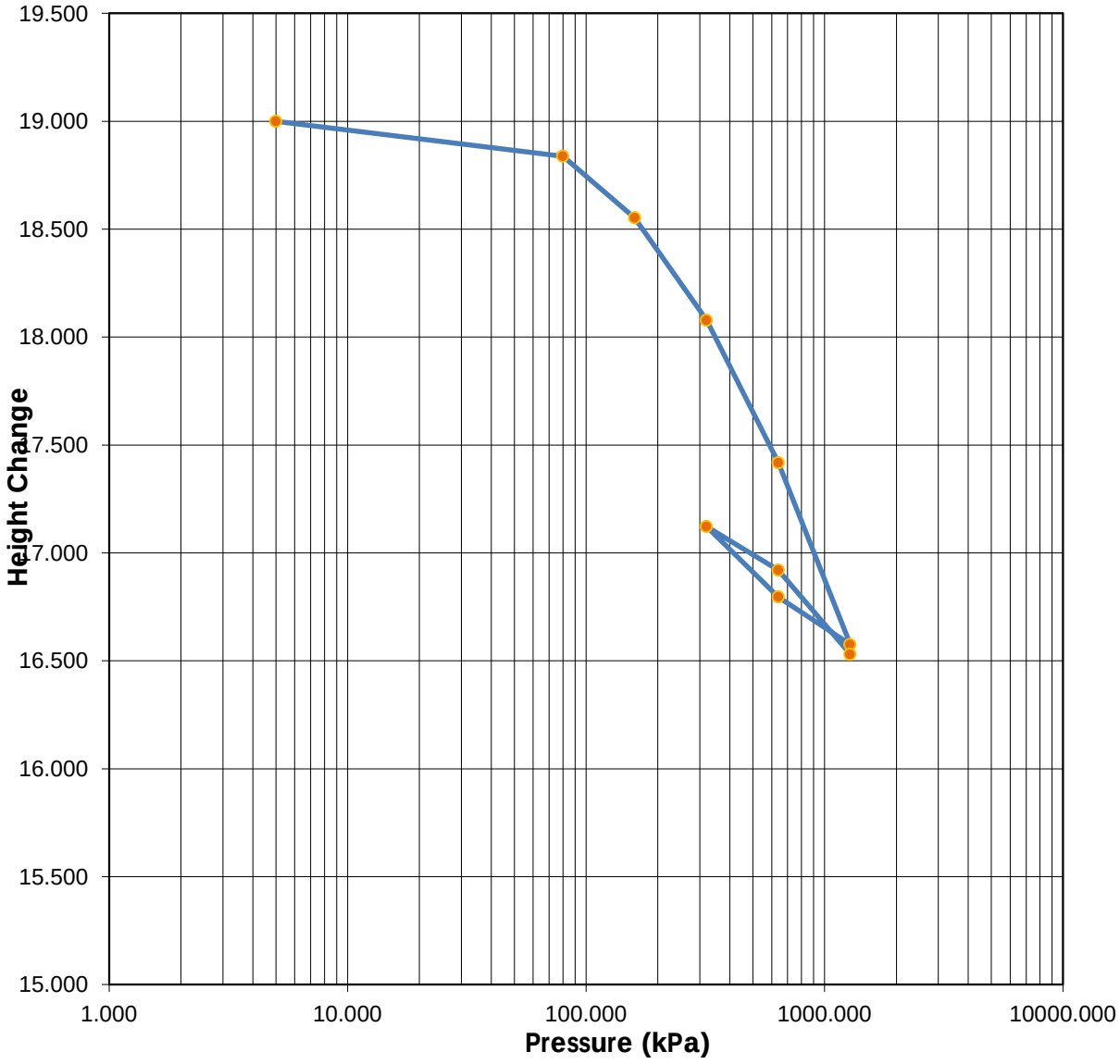
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 33.0 | 29.9 | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Dry Density (g/cm3):** | 1.400 | 1.562 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 95.79 | 110.79 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.9240 | 0.6739 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.220 **Depth:** 3.0-3.6m
**Sample Number:** DC33 ST5 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportation
**Location:**

**Remarks:**
Loads 10kPa, 20kPa, and 40kPa omitted due to swelling; formerly known as D53 ST5

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220

**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Sample Description:** Brown Clay
**Remarks:**

**Test Number:**
**Test Date:** 28-Jun-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 19.0000 | 9.1317 | 0.00 | 0.9254 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 19.0000 | 9.1317 | 0.00 | 0.9254 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 10.000 | -0.0060 | 19.0060 | 9.1377 | -0.03 | 0.9260 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 20.000 | -0.0040 | 19.0040 | 9.1357 | -0.02 | 0.9258 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 40.000 | 0.0220 | 18.9780 | 9.1097 | 0.12 | 0.9231 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | 80.000 | 0.1620 | 18.8380 | 8.9697 | 0.85 | 0.9089 | 4.266 | 8.212 | 0.294 | 0.035 |
| 6 | 160.000 | 0.4480 | 18.5520 | 8.6837 | 2.36 | 0.8800 | 5.902 | 14.083 | 0.206 | 0.020 |
| 7 | 320.000 | 0.9220 | 18.0780 | 8.2097 | 4.85 | 0.8319 | 17.555 | 13.095 | 0.066 | 0.020 |
| 8 | 640.000 | 1.5820 | 17.4180 | 7.5497 | 8.33 | 0.7650 | 12.181 | 13.239 | 0.088 | 0.019 |
| 9 | 1280.000 | 2.4240 | 16.5760 | 6.7077 | 12.76 | 0.6797 | 19.670 | 13.432 | 0.049 | 0.017 |
| 10 | 640.000 | 2.2040 | 16.7960 | 6.9277 | 11.60 | 0.7020 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 320.000 | 1.8780 | 17.1220 | 7.2537 | 9.88 | 0.7351 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 640.000 | 2.0800 | 16.9200 | 7.0517 | 10.95 | 0.7146 | 11.721 | 8.286 | 0.086 | 0.028 |
| 13 | 1280.000 | 2.4700 | 16.5300 | 6.6617 | 13.00 | 0.6751 | 17.004 | 8.855 | 0.057 | 0.025 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.220
**Location:**
**Job Number:** **Test Date:** 28-Jun-16

**Sample Number:** DC33 ST5 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 3.0-3.6m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** 0.0000 **Initial Void Ratio:** 0.9240 **Initial Height (mm):** 19.0000
**Plastic Limit:** 0.0000 **Plasticity Index (%):** 0.0000 **Initial Diameter (mm):** 50.0000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 61.1300

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 32.61 | 56.98 |
| Dry Soil + Container (g) | 24.92 | 44.15 |
| Weight of Container (g) | 1.58 | 1.24 |
| Moisture Content (%) | 32.95 | 29.90 |
| Void Ratio | 0.9240 | 0.6739 |
| Saturation (%) | 95.79 | 110.79 |
| Dry Density (g/cm3) | 1.40 | 1.56 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

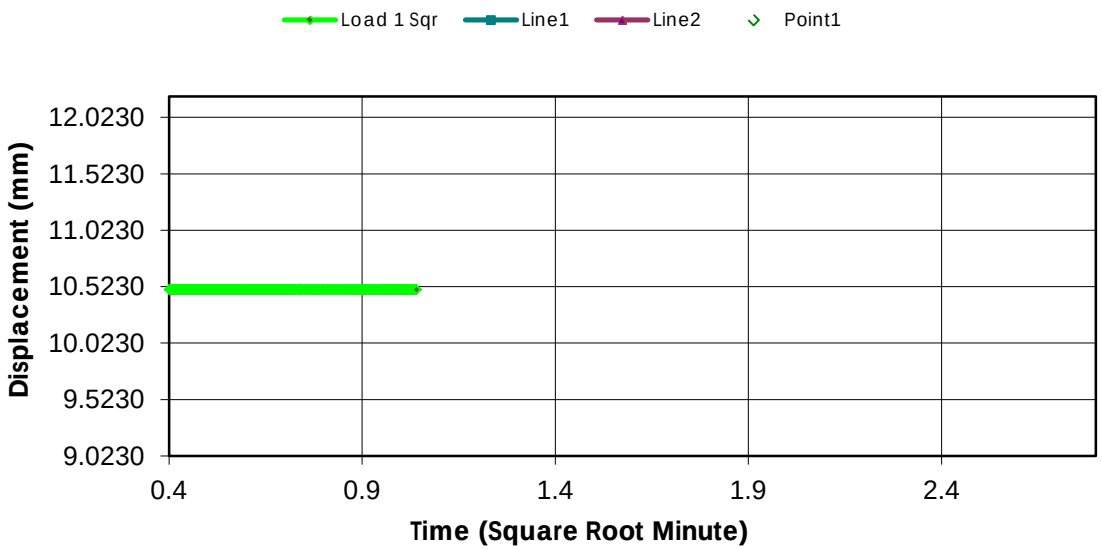
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

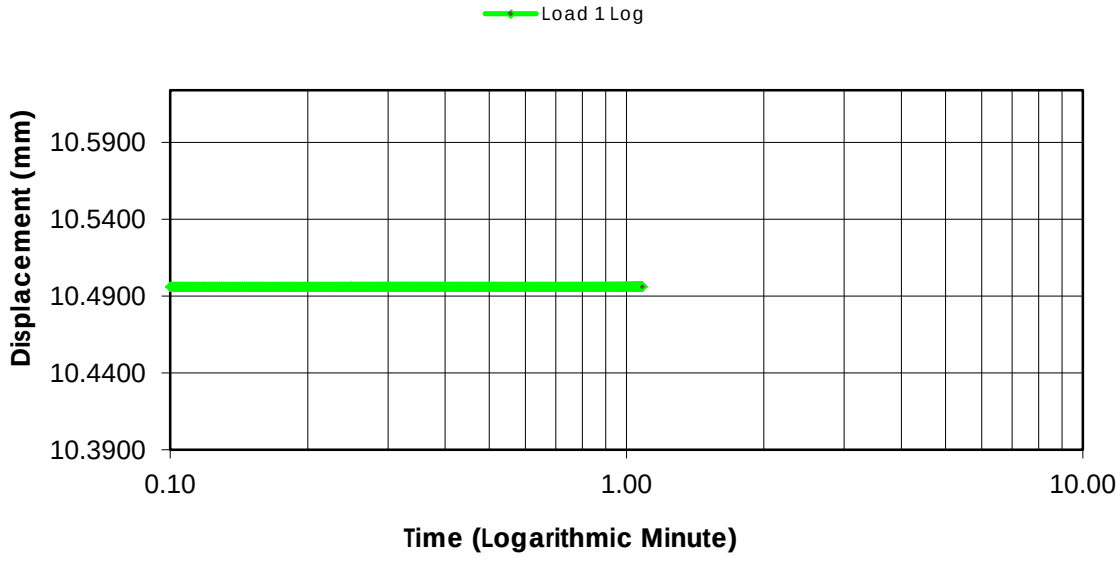
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |
| 1 | 00:00:06 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |
| 2 | 00:00:15 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |
| 3 | 00:00:30 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |
| 4 | 00:01:00 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |
| 5 | 00:01:05 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 2) Load 10.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

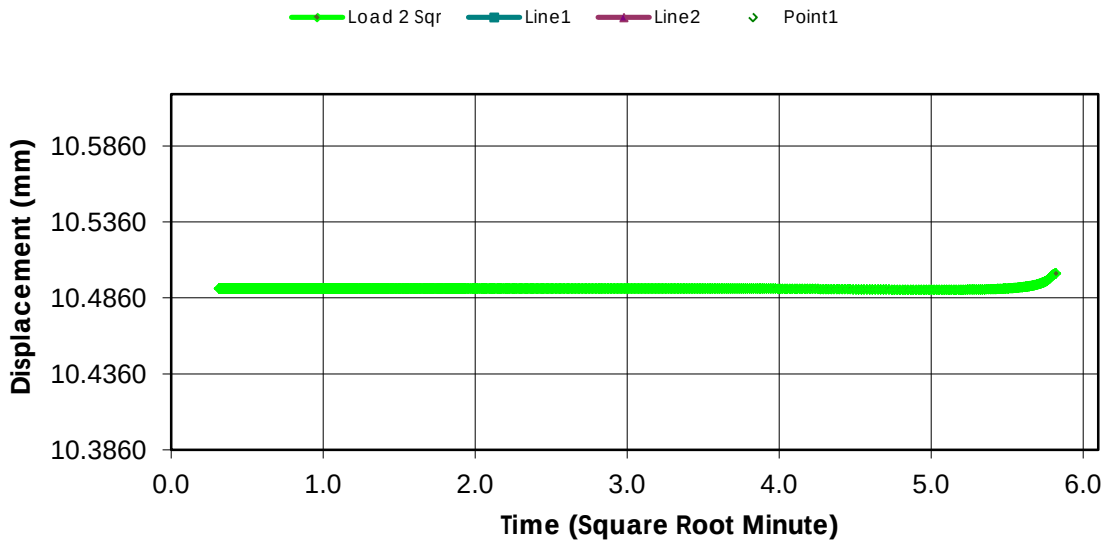
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

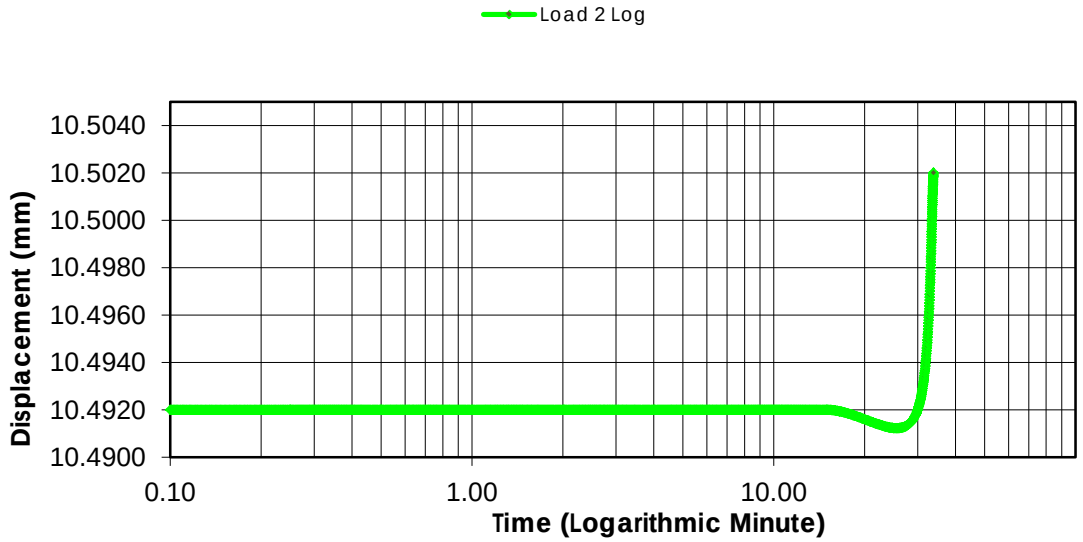
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |
| 1 | 00:00:06 | 10.4920 | 0.0040 | 0.0211 | 0.9236 |
| 2 | 00:00:15 | 10.4920 | 0.0040 | 0.0211 | 0.9236 |
| 3 | 00:00:30 | 10.4920 | 0.0040 | 0.0211 | 0.9236 |
| 4 | 00:01:00 | 10.4920 | 0.0040 | 0.0211 | 0.9236 |
| 5 | 00:02:01 | 10.4920 | 0.0040 | 0.0211 | 0.9236 |
| 6 | 00:04:01 | 10.4920 | 0.0040 | 0.0211 | 0.9236 |
| 7 | 00:08:01 | 10.4920 | 0.0040 | 0.0211 | 0.9236 |
| 8 | 00:15:01 | 10.4920 | 0.0040 | 0.0211 | 0.9236 |
| 9 | 00:30:02 | 10.4920 | 0.0040 | 0.0211 | 0.9236 |
| 10 | 00:33:54 | 10.5020 | -0.0060 | -0.0316 | 0.9246 |

# Consolidation Test Results
## (Sequence 2) Load 10.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 3) Load 20.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

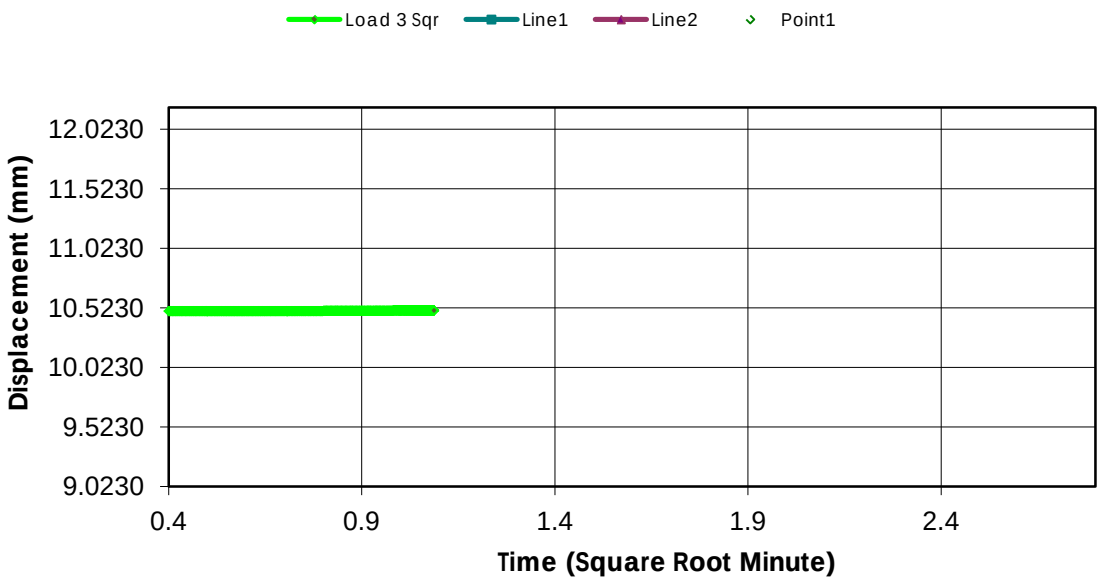
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

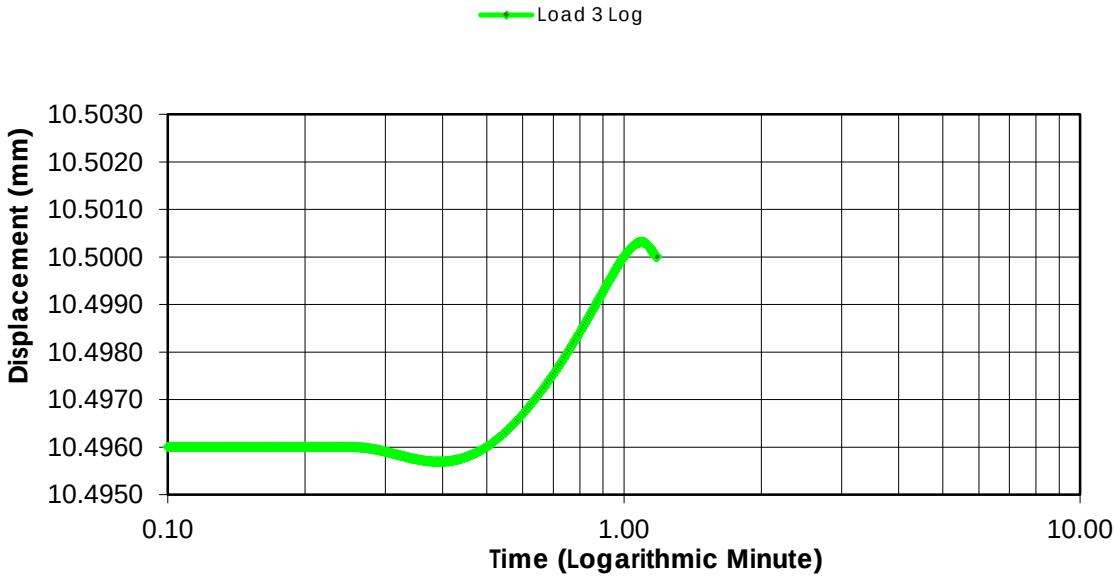
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.5020 | -0.0060 | -0.0316 | 0.9246 |
| 1 | 00:00:06 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |
| 2 | 00:00:15 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |
| 3 | 00:00:30 | 10.4960 | 0.0000 | 0.0000 | 0.9240 |
| 4 | 00:01:00 | 10.5000 | -0.0040 | -0.0211 | 0.9244 |
| 5 | 00:01:11 | 10.5000 | -0.0040 | -0.0211 | 0.9244 |

# Consolidation Test Results
## (Sequence 3) Load 20.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

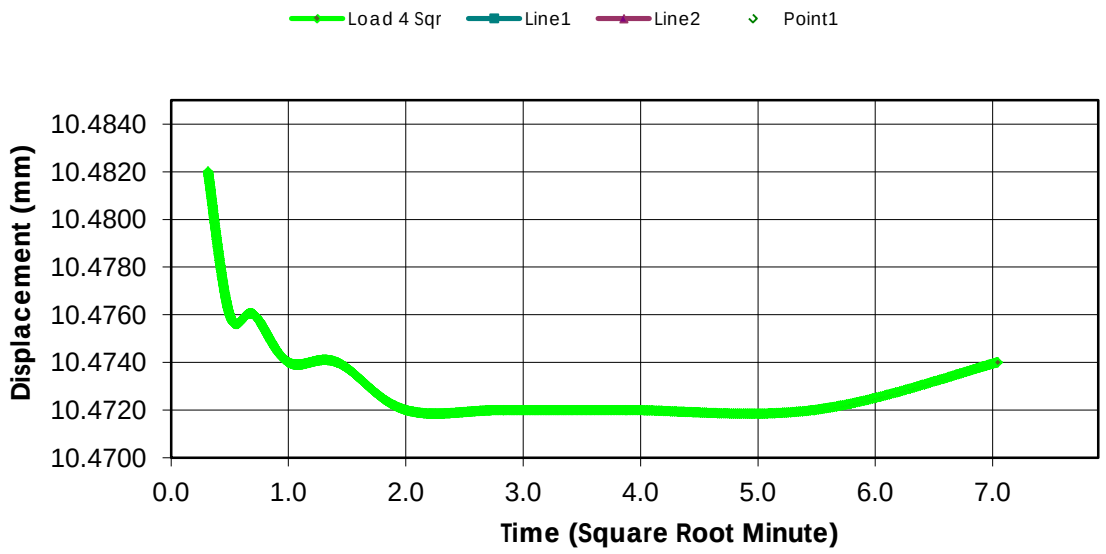
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

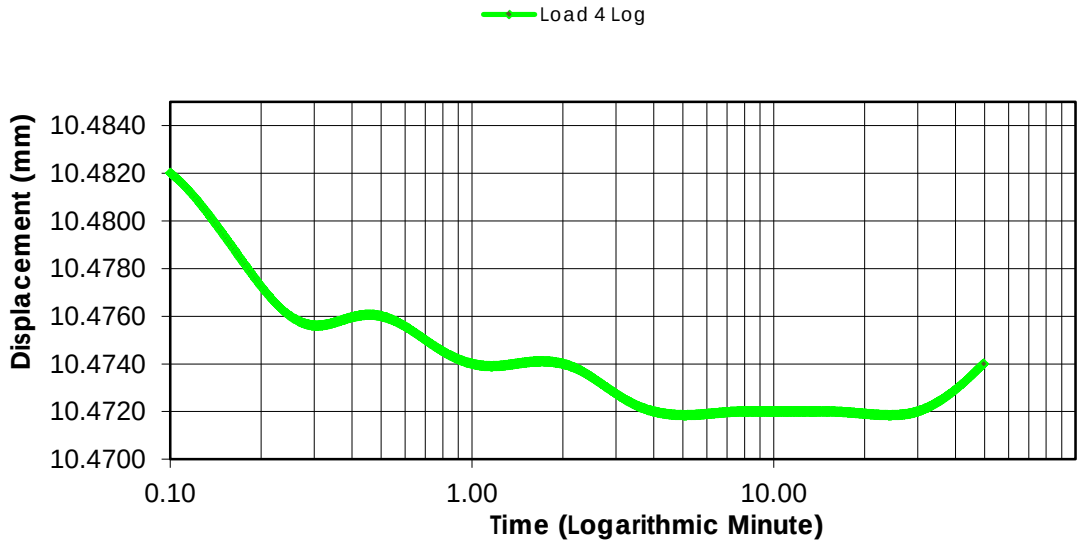
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.5000 | -0.0040 | -0.0211 | 0.9244 |
| 1 | 00:00:06 | 10.4820 | 0.0140 | 0.0737 | 0.9226 |
| 2 | 00:00:15 | 10.4760 | 0.0200 | 0.1053 | 0.9220 |
| 3 | 00:00:30 | 10.4760 | 0.0200 | 0.1053 | 0.9220 |
| 4 | 00:01:00 | 10.4740 | 0.0220 | 0.1158 | 0.9218 |
| 5 | 00:02:00 | 10.4740 | 0.0220 | 0.1158 | 0.9218 |
| 6 | 00:04:00 | 10.4720 | 0.0240 | 0.1263 | 0.9216 |
| 7 | 00:08:01 | 10.4720 | 0.0240 | 0.1263 | 0.9216 |
| 8 | 00:15:01 | 10.4720 | 0.0240 | 0.1263 | 0.9216 |
| 9 | 00:30:02 | 10.4720 | 0.0240 | 0.1263 | 0.9216 |
| 10 | 00:49:38 | 10.4740 | 0.0220 | 0.1158 | 0.9218 |

# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

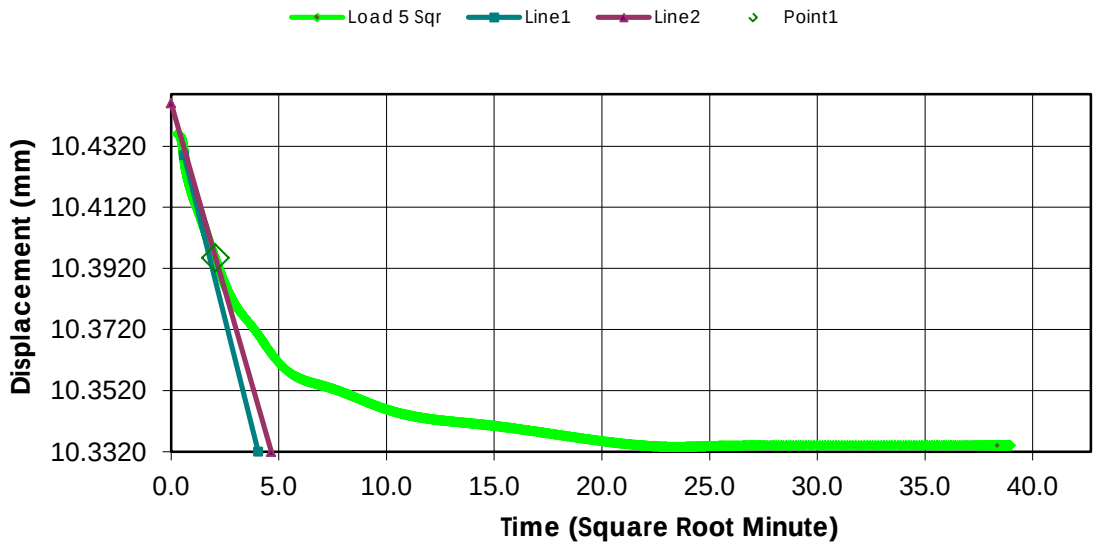
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

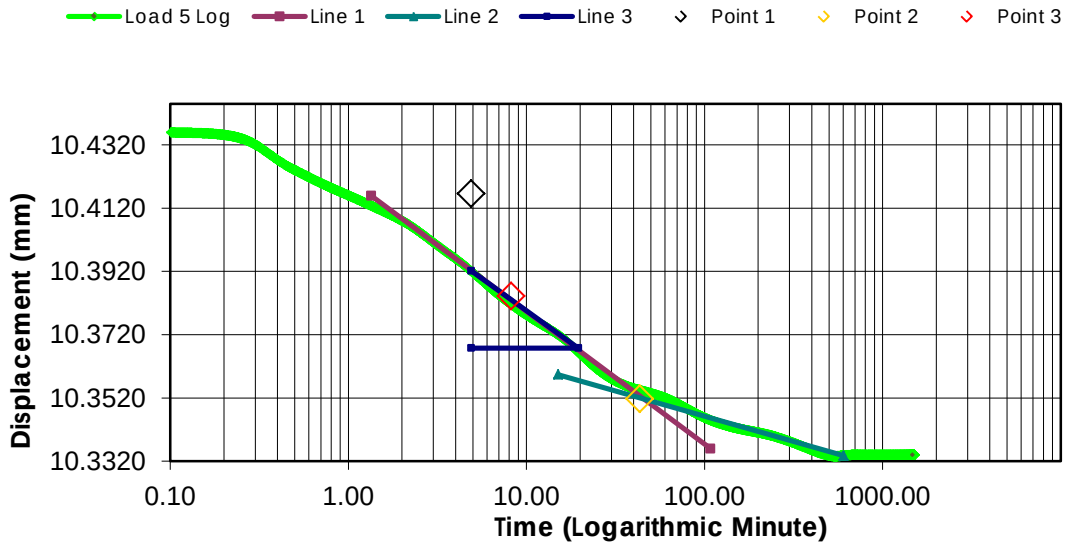
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.4740 | 0.0220 | 0.1158 | 0.9218 |
| 1 | 00:00:05 | 10.4360 | 0.0600 | 0.3158 | 0.9180 |
| 2 | 00:00:15 | 10.4340 | 0.0620 | 0.3263 | 0.9178 |
| 3 | 00:00:30 | 10.4240 | 0.0720 | 0.3789 | 0.9167 |
| 4 | 00:01:00 | 10.4160 | 0.0800 | 0.4211 | 0.9159 |
| 5 | 00:02:00 | 10.4080 | 0.0880 | 0.4632 | 0.9151 |
| 6 | 00:04:00 | 10.3960 | 0.1000 | 0.5263 | 0.9139 |
| 7 | 00:08:00 | 10.3820 | 0.1140 | 0.6000 | 0.9125 |
| 8 | 00:15:01 | 10.3720 | 0.1240 | 0.6526 | 0.9115 |
| 9 | 00:30:02 | 10.3580 | 0.1380 | 0.7263 | 0.9101 |
| 10 | 01:00:04 | 10.3520 | 0.1440 | 0.7579 | 0.9095 |
| 11 | 02:00:08 | 10.3440 | 0.1520 | 0.8000 | 0.9086 |
| 12 | 04:00:17 | 10.3400 | 0.1560 | 0.8211 | 0.9082 |
| 13 | 08:00:34 | 10.3340 | 0.1620 | 0.8526 | 0.9076 |
| 14 | 12:00:52 | 10.3340 | 0.1620 | 0.8526 | 0.9076 |
| 15 | 24:01:44 | 10.3340 | 0.1620 | 0.8526 | 0.9076 |
| 16 | 24:30:41 | 10.3340 | 0.1620 | 0.8526 | 0.9076 |

# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

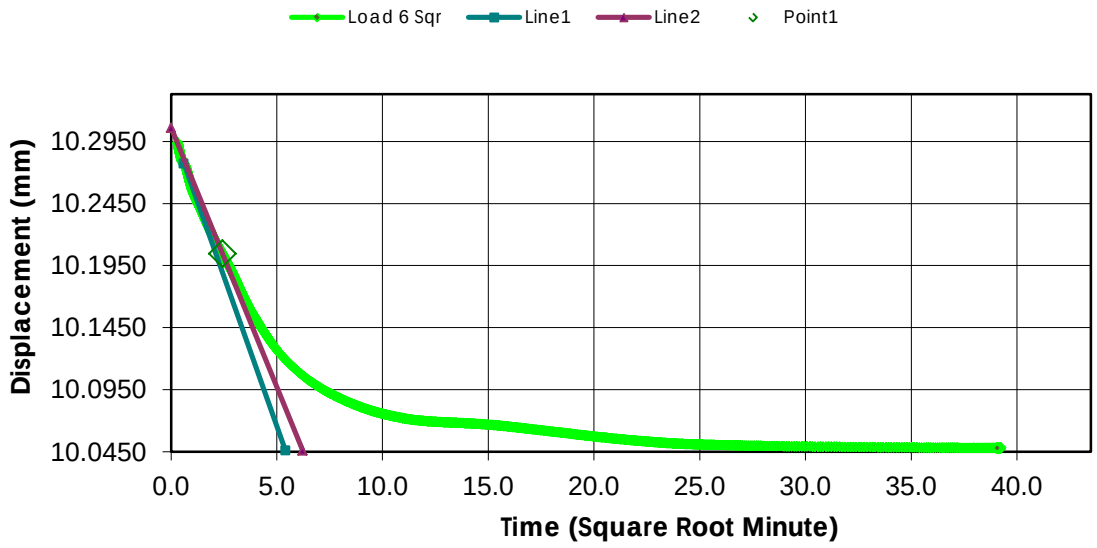
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

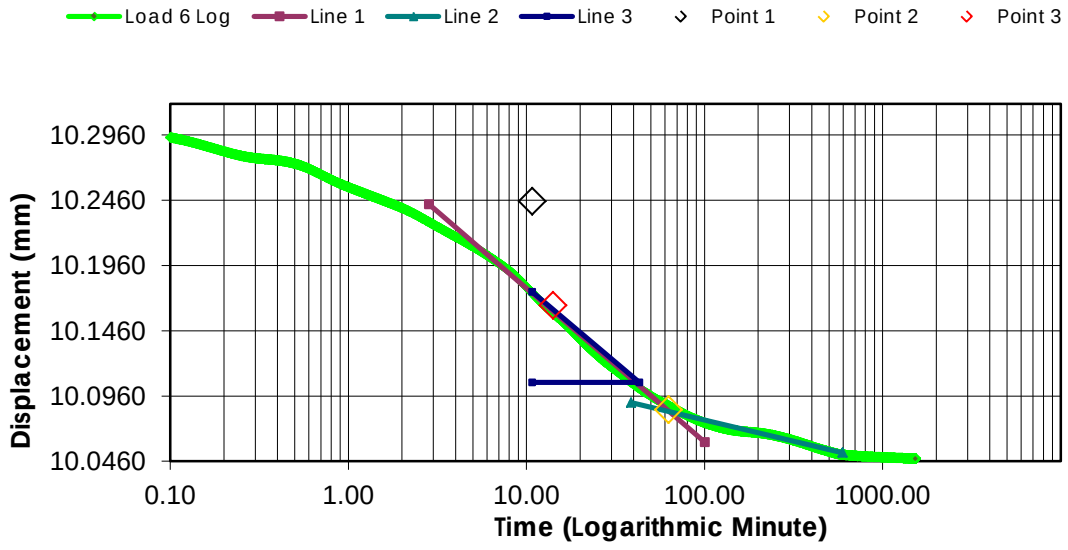
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.3340 | 0.1620 | 0.8526 | 0.9076 |
| 1 | 00:00:06 | 10.2940 | 0.2020 | 1.0632 | 0.9036 |
| 2 | 00:00:15 | 10.2800 | 0.2160 | 1.1368 | 0.9022 |
| 3 | 00:00:30 | 10.2740 | 0.2220 | 1.1684 | 0.9016 |
| 4 | 00:01:00 | 10.2560 | 0.2400 | 1.2632 | 0.8997 |
| 5 | 00:02:00 | 10.2400 | 0.2560 | 1.3474 | 0.8981 |
| 6 | 00:04:00 | 10.2180 | 0.2780 | 1.4632 | 0.8959 |
| 7 | 00:08:00 | 10.1920 | 0.3040 | 1.6000 | 0.8932 |
| 8 | 00:15:01 | 10.1560 | 0.3400 | 1.7895 | 0.8896 |
| 9 | 00:30:02 | 10.1180 | 0.3780 | 1.9895 | 0.8858 |
| 10 | 01:00:04 | 10.0900 | 0.4060 | 2.1368 | 0.8829 |
| 11 | 02:00:08 | 10.0720 | 0.4240 | 2.2316 | 0.8811 |
| 12 | 04:00:17 | 10.0660 | 0.4300 | 2.2632 | 0.8805 |
| 13 | 08:00:35 | 10.0540 | 0.4420 | 2.3263 | 0.8793 |
| 14 | 12:00:52 | 10.0500 | 0.4460 | 2.3474 | 0.8789 |
| 15 | 24:01:44 | 10.0480 | 0.4480 | 2.3579 | 0.8787 |
| 16 | 25:26:34 | 10.0480 | 0.4480 | 2.3579 | 0.8787 |

# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

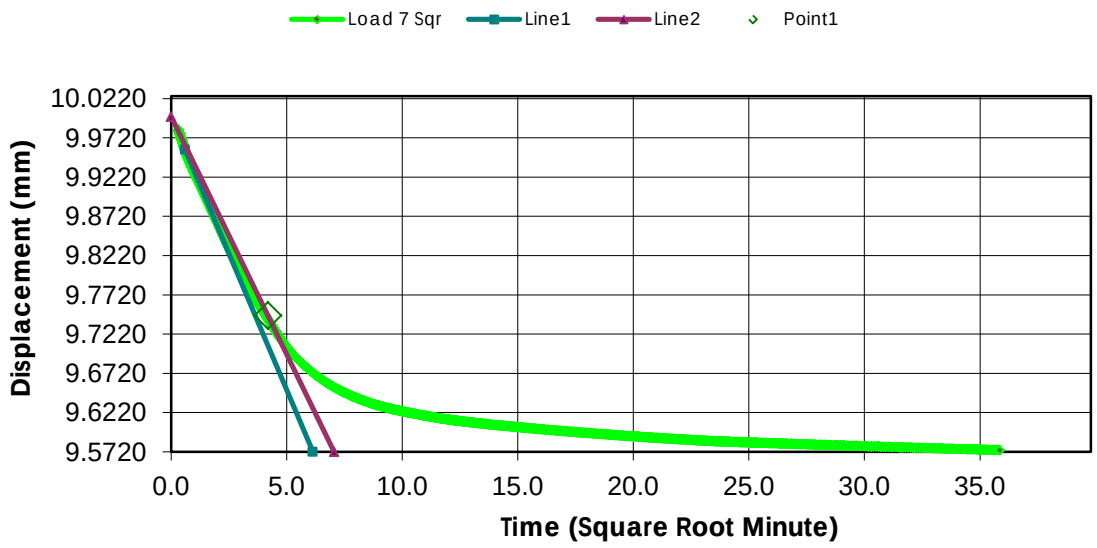
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

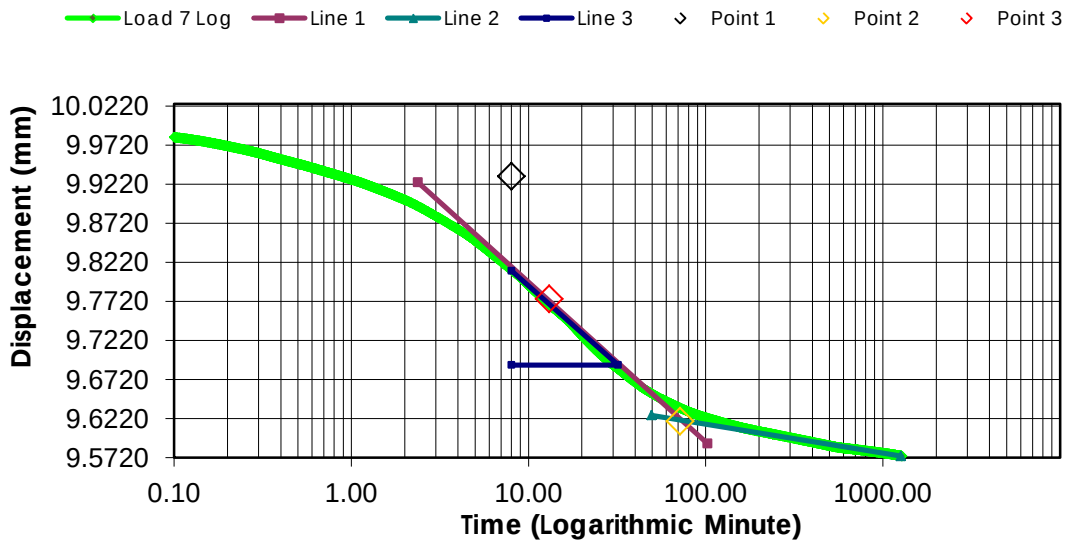
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.0480 | 0.4480 | 2.3579 | 0.8787 |
| 1 | 00:00:06 | 9.9820 | 0.5140 | 2.7053 | 0.8720 |
| 2 | 00:00:15 | 9.9660 | 0.5300 | 2.7895 | 0.8704 |
| 3 | 00:00:30 | 9.9480 | 0.5480 | 2.8842 | 0.8685 |
| 4 | 00:01:00 | 9.9280 | 0.5680 | 2.9895 | 0.8665 |
| 5 | 00:02:00 | 9.9020 | 0.5940 | 3.1263 | 0.8639 |
| 6 | 00:04:01 | 9.8640 | 0.6320 | 3.3263 | 0.8600 |
| 7 | 00:08:01 | 9.8120 | 0.6840 | 3.6000 | 0.8548 |
| 8 | 00:15:01 | 9.7560 | 0.7400 | 3.8947 | 0.8491 |
| 9 | 00:30:02 | 9.6900 | 0.8060 | 4.2421 | 0.8424 |
| 10 | 01:00:05 | 9.6440 | 0.8520 | 4.4842 | 0.8378 |
| 11 | 02:00:09 | 9.6180 | 0.8780 | 4.6211 | 0.8351 |
| 12 | 04:00:18 | 9.6020 | 0.8940 | 4.7053 | 0.8335 |
| 13 | 08:00:35 | 9.5880 | 0.9080 | 4.7789 | 0.8321 |
| 14 | 12:00:52 | 9.5820 | 0.9140 | 4.8105 | 0.8315 |
| 15 | 21:25:29 | 9.5740 | 0.9220 | 4.8526 | 0.8307 |

# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

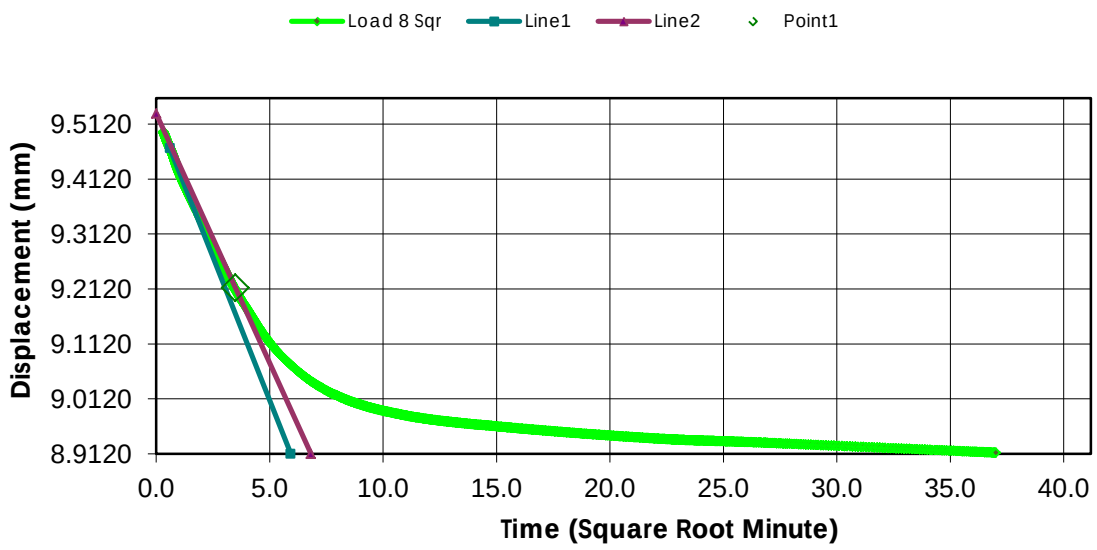
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

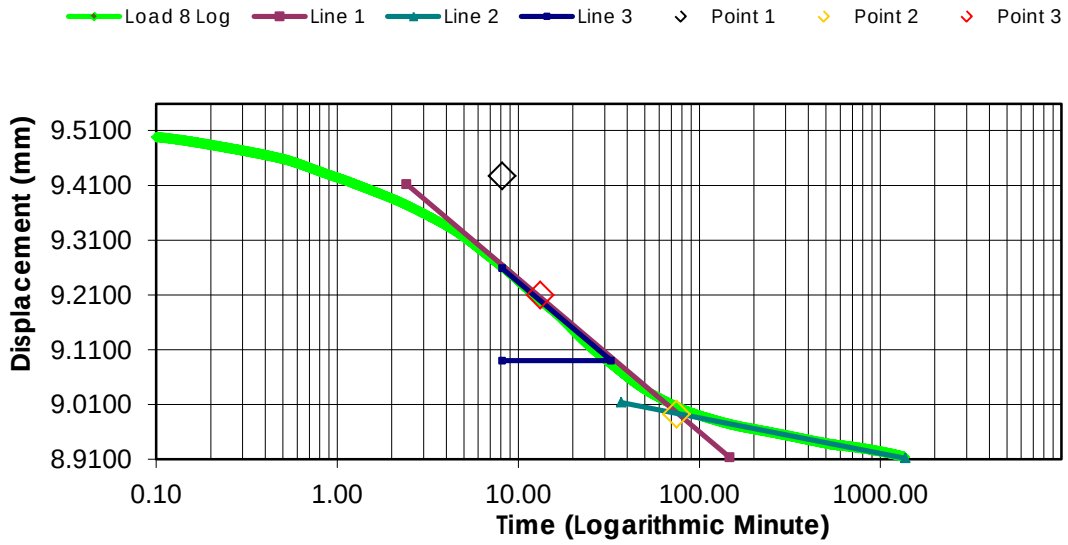
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5740 | 0.9220 | 4.8526 | 0.8307 |
| 1 | 00:00:06 | 9.4980 | 0.9980 | 5.2526 | 0.8230 |
| 2 | 00:00:15 | 9.4780 | 1.0180 | 5.3579 | 0.8209 |
| 3 | 00:00:30 | 9.4580 | 1.0380 | 5.4632 | 0.8189 |
| 4 | 00:01:00 | 9.4240 | 1.0720 | 5.6421 | 0.8155 |
| 5 | 00:02:00 | 9.3860 | 1.1100 | 5.8421 | 0.8116 |
| 6 | 00:04:00 | 9.3360 | 1.1600 | 6.1053 | 0.8066 |
| 7 | 00:08:01 | 9.2620 | 1.2340 | 6.4947 | 0.7991 |
| 8 | 00:15:01 | 9.1840 | 1.3120 | 6.9053 | 0.7912 |
| 9 | 00:30:02 | 9.0920 | 1.4040 | 7.3895 | 0.7819 |
| 10 | 01:00:04 | 9.0220 | 1.4740 | 7.7579 | 0.7748 |
| 11 | 02:00:09 | 8.9820 | 1.5140 | 7.9684 | 0.7707 |
| 12 | 04:00:18 | 8.9600 | 1.5360 | 8.0842 | 0.7685 |
| 13 | 08:00:35 | 8.9400 | 1.5560 | 8.1895 | 0.7665 |
| 14 | 12:00:52 | 8.9320 | 1.5640 | 8.2316 | 0.7657 |
| 15 | 22:50:14 | 8.9140 | 1.5820 | 8.3263 | 0.7638 |

# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

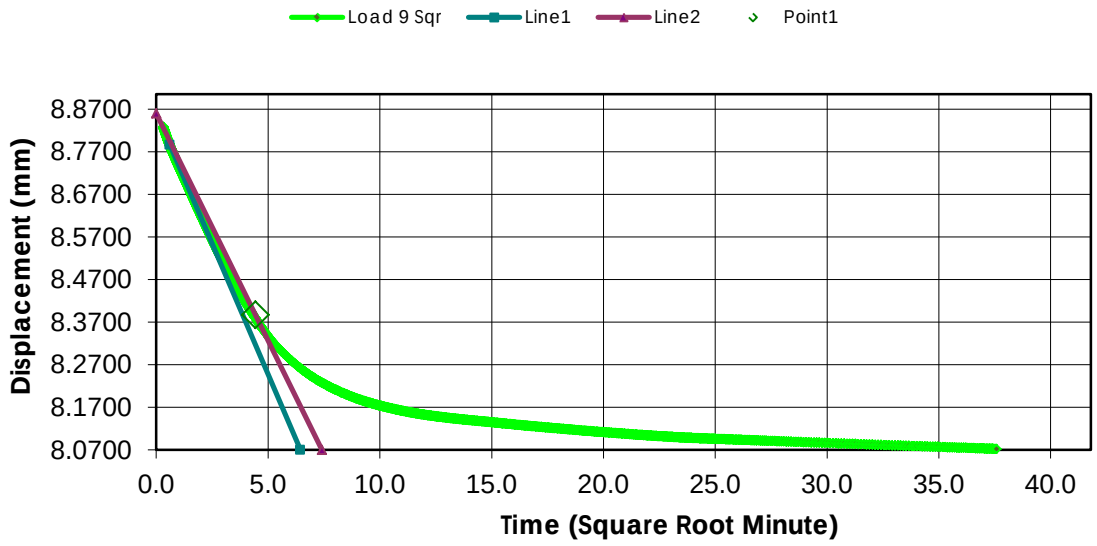
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

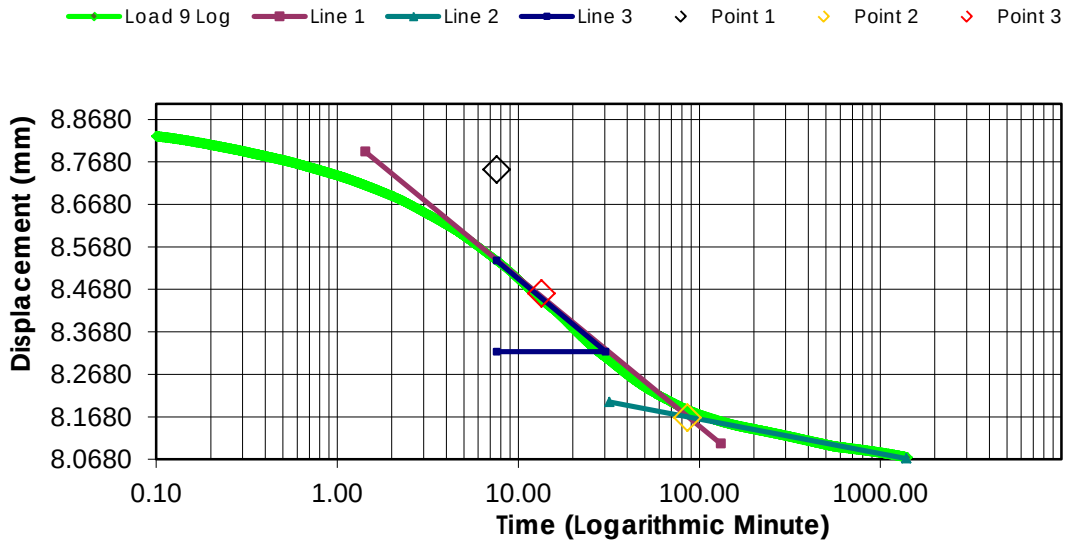
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.9140 | 1.5820 | 8.3263 | 0.7638 |
| 1 | 00:00:06 | 8.8280 | 1.6680 | 8.7789 | 0.7551 |
| 2 | 00:00:15 | 8.8000 | 1.6960 | 8.9263 | 0.7523 |
| 3 | 00:00:30 | 8.7720 | 1.7240 | 9.0737 | 0.7495 |
| 4 | 00:01:00 | 8.7360 | 1.7600 | 9.2632 | 0.7458 |
| 5 | 00:02:00 | 8.6880 | 1.8080 | 9.5158 | 0.7409 |
| 6 | 00:04:00 | 8.6200 | 1.8760 | 9.8737 | 0.7341 |
| 7 | 00:08:01 | 8.5280 | 1.9680 | 10.3579 | 0.7247 |
| 8 | 00:15:01 | 8.4260 | 2.0700 | 10.8947 | 0.7144 |
| 9 | 00:30:02 | 8.3080 | 2.1880 | 11.5158 | 0.7025 |
| 10 | 01:00:04 | 8.2180 | 2.2780 | 11.9895 | 0.6934 |
| 11 | 02:00:09 | 8.1620 | 2.3340 | 12.2842 | 0.6877 |
| 12 | 04:00:17 | 8.1320 | 2.3640 | 12.4421 | 0.6846 |
| 13 | 08:00:35 | 8.1040 | 2.3920 | 12.5895 | 0.6818 |
| 14 | 12:00:52 | 8.0920 | 2.4040 | 12.6526 | 0.6806 |
| 15 | 23:32:33 | 8.0720 | 2.4240 | 12.7579 | 0.6786 |

# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

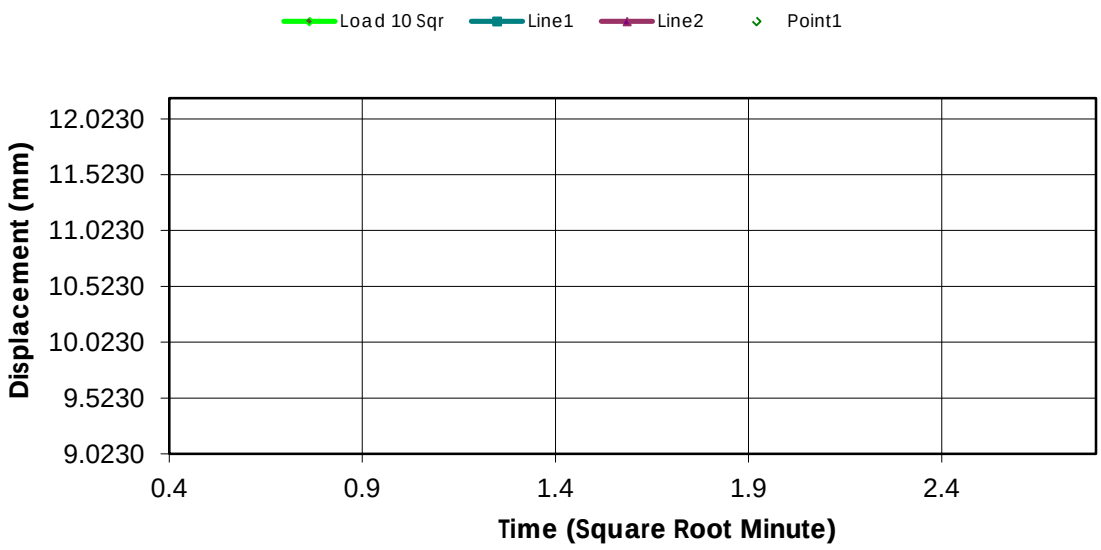
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

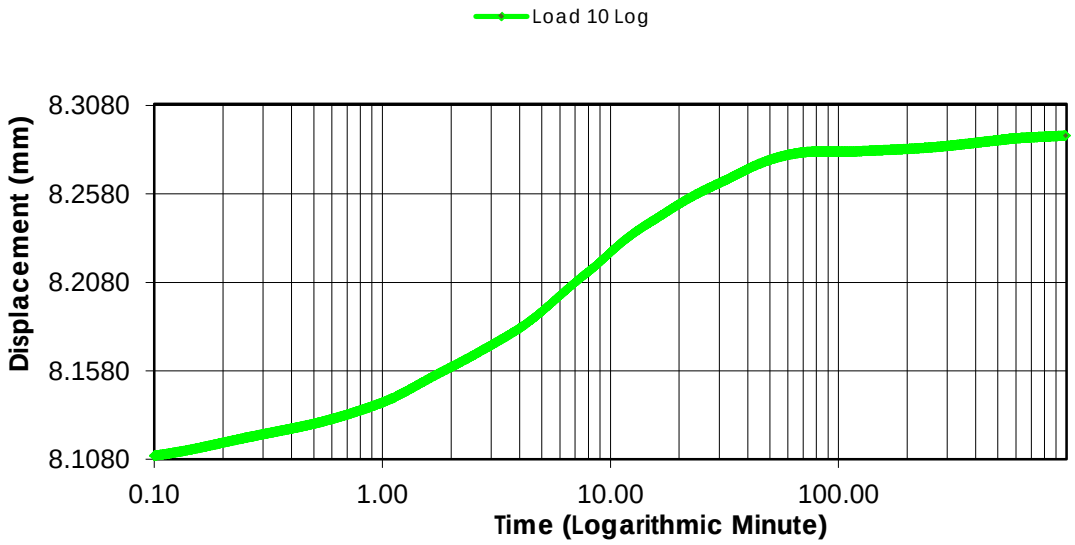
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.0720 | 2.4240 | 12.7579 | 0.6786 |
| 1 | 00:00:06 | 8.1100 | 2.3860 | 12.5579 | 0.6824 |
| 2 | 00:00:15 | 8.1200 | 2.3760 | 12.5053 | 0.6834 |
| 3 | 00:00:30 | 8.1280 | 2.3680 | 12.4632 | 0.6842 |
| 4 | 00:01:00 | 8.1400 | 2.3560 | 12.4000 | 0.6855 |
| 5 | 00:02:00 | 8.1600 | 2.3360 | 12.2947 | 0.6875 |
| 6 | 00:04:00 | 8.1820 | 2.3140 | 12.1789 | 0.6897 |
| 7 | 00:08:01 | 8.2140 | 2.2820 | 12.0105 | 0.6929 |
| 8 | 00:15:01 | 8.2420 | 2.2540 | 11.8632 | 0.6958 |
| 9 | 00:30:02 | 8.2640 | 2.2320 | 11.7474 | 0.6980 |
| 10 | 01:00:05 | 8.2800 | 2.2160 | 11.6632 | 0.6996 |
| 11 | 02:00:09 | 8.2820 | 2.2140 | 11.6526 | 0.6998 |
| 12 | 04:00:18 | 8.2840 | 2.2120 | 11.6421 | 0.7000 |
| 13 | 08:00:35 | 8.2880 | 2.2080 | 11.6211 | 0.7004 |
| 14 | 12:00:53 | 8.2900 | 2.2060 | 11.6105 | 0.7006 |
| 15 | 23:35:25 | 8.2920 | 2.2040 | 11.6000 | 0.7008 |

# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

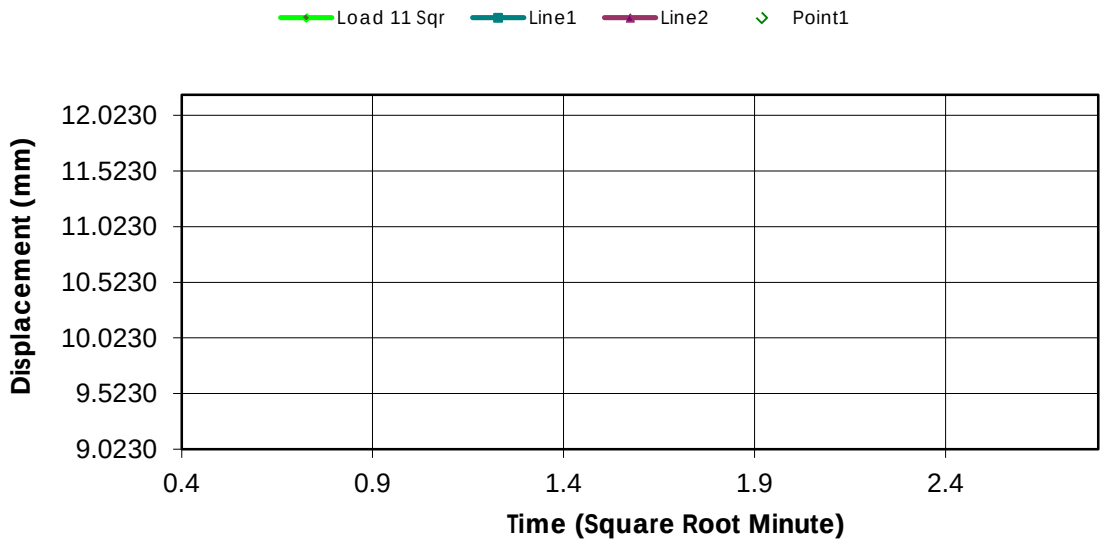
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

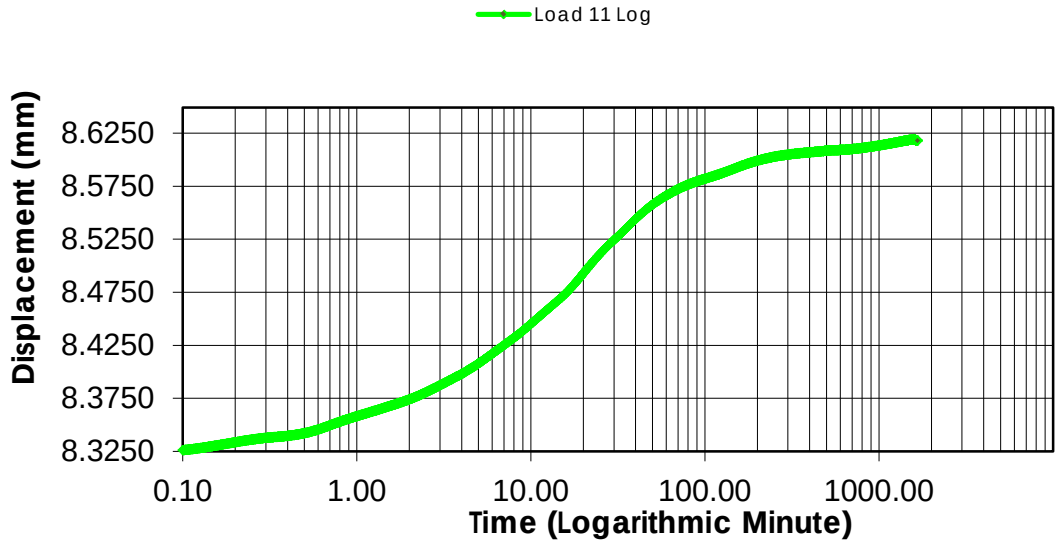
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.2920 | 2.2040 | 11.6000 | 0.7008 |
| 1 | 00:00:06 | 8.3260 | 2.1700 | 11.4211 | 0.7043 |
| 2 | 00:00:15 | 8.3360 | 2.1600 | 11.3684 | 0.7053 |
| 3 | 00:00:30 | 8.3420 | 2.1540 | 11.3368 | 0.7059 |
| 4 | 00:01:00 | 8.3580 | 2.1380 | 11.2526 | 0.7075 |
| 5 | 00:02:01 | 8.3740 | 2.1220 | 11.1684 | 0.7091 |
| 6 | 00:04:01 | 8.3980 | 2.0980 | 11.0421 | 0.7116 |
| 7 | 00:08:01 | 8.4320 | 2.0640 | 10.8632 | 0.7150 |
| 8 | 00:15:01 | 8.4700 | 2.0260 | 10.6632 | 0.7189 |
| 9 | 00:30:03 | 8.5240 | 1.9720 | 10.3790 | 0.7243 |
| 10 | 01:00:05 | 8.5660 | 1.9300 | 10.1579 | 0.7286 |
| 11 | 02:00:09 | 8.5860 | 1.9100 | 10.0526 | 0.7306 |
| 12 | 04:00:18 | 8.6020 | 1.8940 | 9.9684 | 0.7322 |
| 13 | 08:00:35 | 8.6080 | 1.8880 | 9.9368 | 0.7328 |
| 14 | 12:00:53 | 8.6100 | 1.8860 | 9.9263 | 0.7330 |
| 15 | 24:01:45 | 8.6180 | 1.8780 | 9.8842 | 0.7339 |
| 16 | 27:48:24 | 8.6180 | 1.8780 | 9.8842 | 0.7339 |

# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

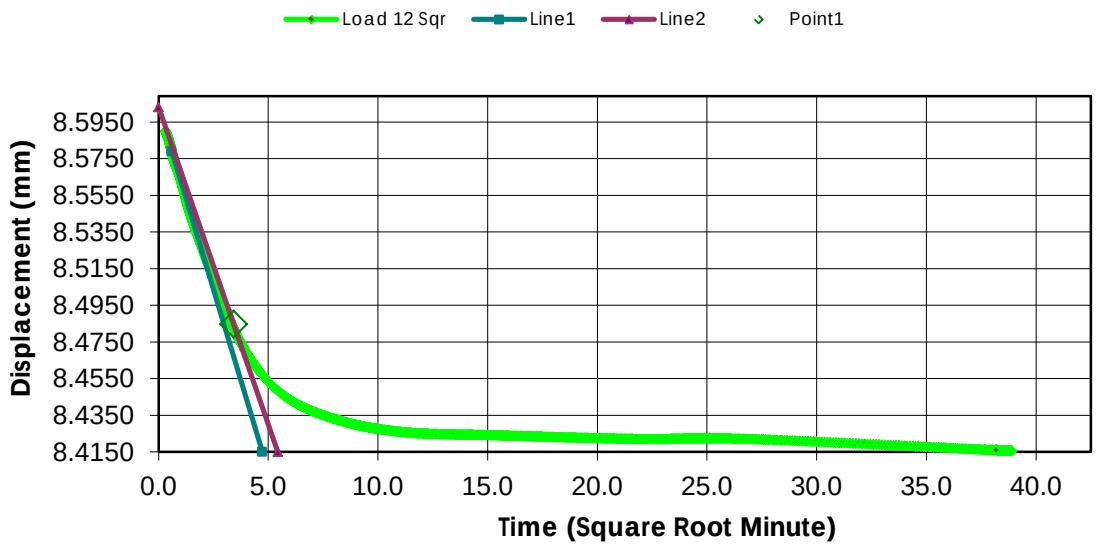
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

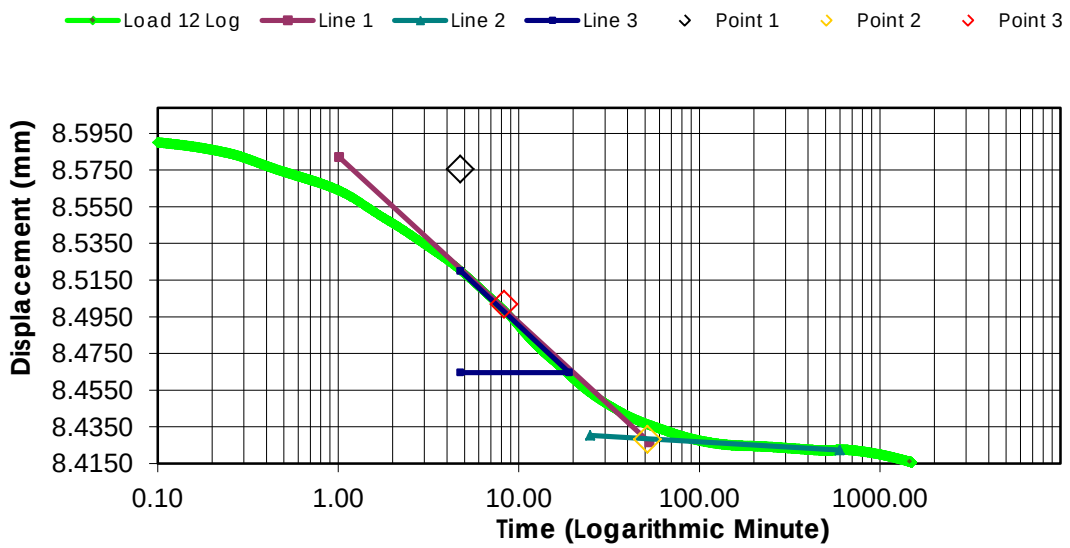
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.6180 | 1.8780 | 9.8842 | 0.7339 |
| 1 | 00:00:06 | 8.5900 | 1.9060 | 10.0316 | 0.7310 |
| 2 | 00:00:15 | 8.5840 | 1.9120 | 10.0632 | 0.7304 |
| 3 | 00:00:30 | 8.5740 | 1.9220 | 10.1158 | 0.7294 |
| 4 | 00:01:00 | 8.5640 | 1.9320 | 10.1684 | 0.7284 |
| 5 | 00:02:00 | 8.5460 | 1.9500 | 10.2632 | 0.7266 |
| 6 | 00:04:00 | 8.5260 | 1.9700 | 10.3684 | 0.7245 |
| 7 | 00:08:01 | 8.5000 | 1.9960 | 10.5053 | 0.7219 |
| 8 | 00:15:01 | 8.4720 | 2.0240 | 10.6526 | 0.7191 |
| 9 | 00:30:02 | 8.4480 | 2.0480 | 10.7789 | 0.7166 |
| 10 | 01:00:04 | 8.4340 | 2.0620 | 10.8526 | 0.7152 |
| 11 | 02:00:09 | 8.4260 | 2.0700 | 10.8947 | 0.7144 |
| 12 | 04:00:18 | 8.4240 | 2.0720 | 10.9053 | 0.7142 |
| 13 | 08:00:35 | 8.4220 | 2.0740 | 10.9158 | 0.7140 |
| 14 | 12:00:52 | 8.4220 | 2.0740 | 10.9158 | 0.7140 |
| 15 | 24:01:45 | 8.4160 | 2.0800 | 10.9474 | 0.7134 |
| 16 | 24:16:48 | 8.4160 | 2.0800 | 10.9474 | 0.7134 |

# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.220
**Test Date:** 28-Jun-16
**Test Number:**

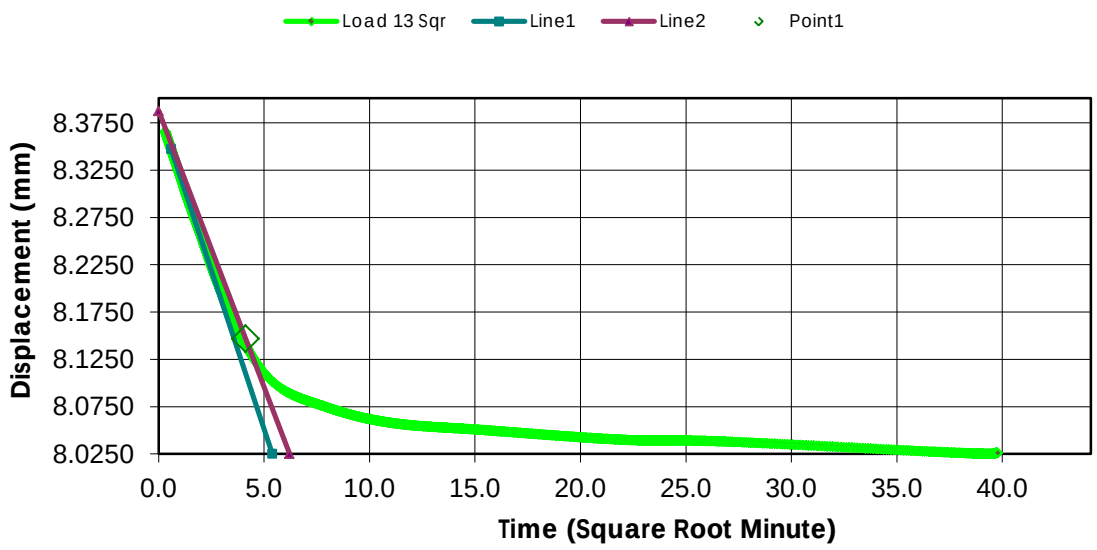
**Sample Number:** DC33 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

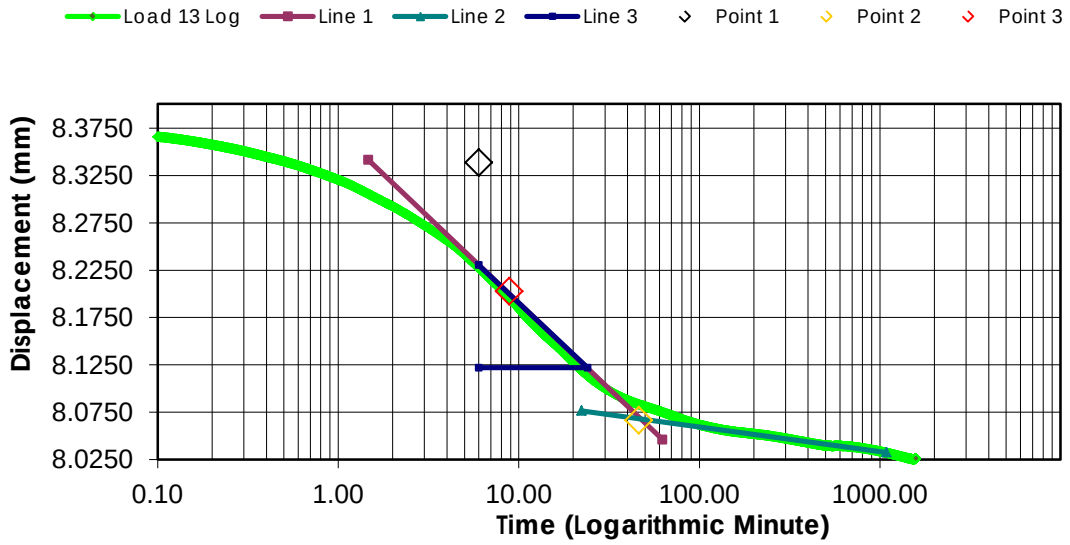
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.4160 | 2.0800 | 10.9474 | 0.7134 |
| 1 | 00:00:06 | 8.3660 | 2.1300 | 11.2105 | 0.7083 |
| 2 | 00:00:15 | 8.3540 | 2.1420 | 11.2737 | 0.7071 |
| 3 | 00:00:30 | 8.3400 | 2.1560 | 11.3474 | 0.7057 |
| 4 | 00:01:01 | 8.3200 | 2.1760 | 11.4526 | 0.7037 |
| 5 | 00:02:01 | 8.2920 | 2.2040 | 11.6000 | 0.7008 |
| 6 | 00:04:01 | 8.2560 | 2.2400 | 11.7895 | 0.6972 |
| 7 | 00:08:01 | 8.2040 | 2.2920 | 12.0632 | 0.6919 |
| 8 | 00:15:01 | 8.1500 | 2.3460 | 12.3474 | 0.6865 |
| 9 | 00:30:03 | 8.1000 | 2.3960 | 12.6105 | 0.6814 |
| 10 | 01:00:05 | 8.0760 | 2.4200 | 12.7368 | 0.6790 |
| 11 | 02:00:09 | 8.0580 | 2.4380 | 12.8316 | 0.6771 |
| 12 | 04:00:18 | 8.0500 | 2.4460 | 12.8737 | 0.6763 |
| 13 | 08:00:35 | 8.0400 | 2.4560 | 12.9263 | 0.6753 |
| 14 | 12:00:53 | 8.0380 | 2.4580 | 12.9368 | 0.6751 |
| 15 | 24:01:45 | 8.0260 | 2.4700 | 13.0000 | 0.6739 |
| 16 | 26:22:54 | 8.0260 | 2.4700 | 13.0000 | 0.6739 |

# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



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Calgary Laboratory
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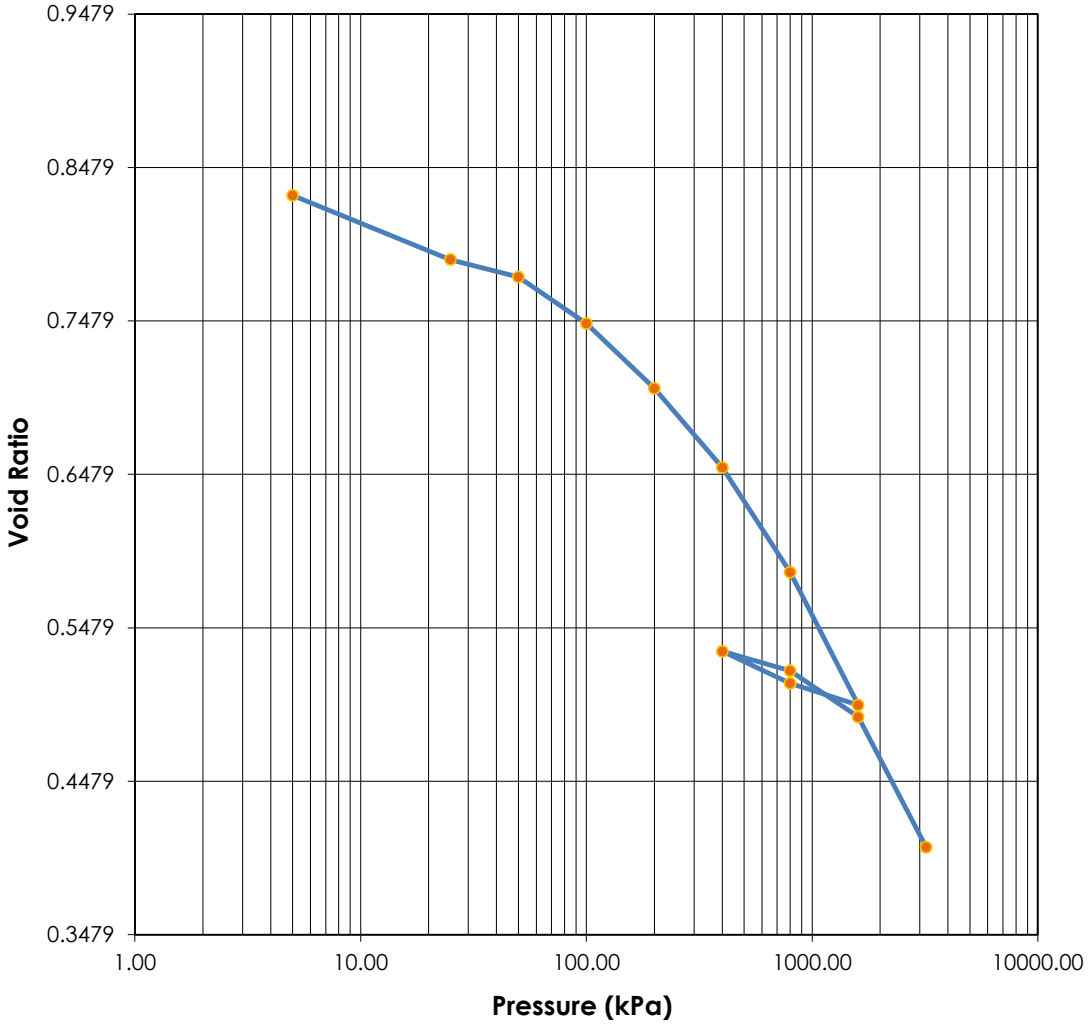
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 30.0 | 22.2 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.473 | 1.887 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 97.31 | 138.91 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8284 | 0.4039 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 3.0-3.6m

**Sample Number:** DC34 ST5 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Load at 12.5kPa omitted due to swelling

**Tested By:** C. Oost **Reviewed By:** C. Lamoureux

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

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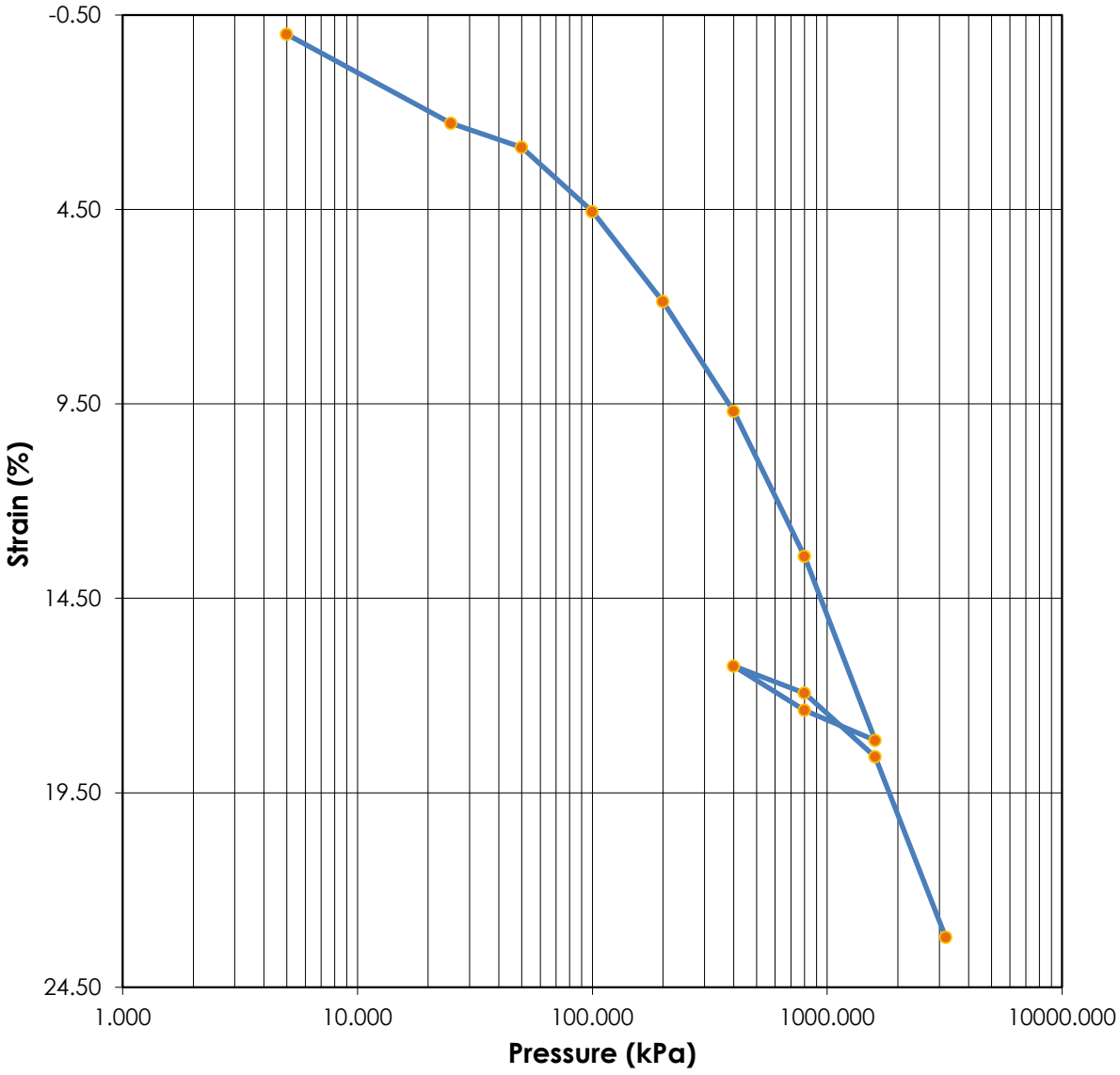
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 30.0 | 22.2 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.473 | 1.887 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 97.31 | 138.91 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8284 | 0.4039 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 3.0-3.6m | **Remarks:** |
| **Sample Number:** | DC34 ST5 | **Boring Number:** | Load at 12.5kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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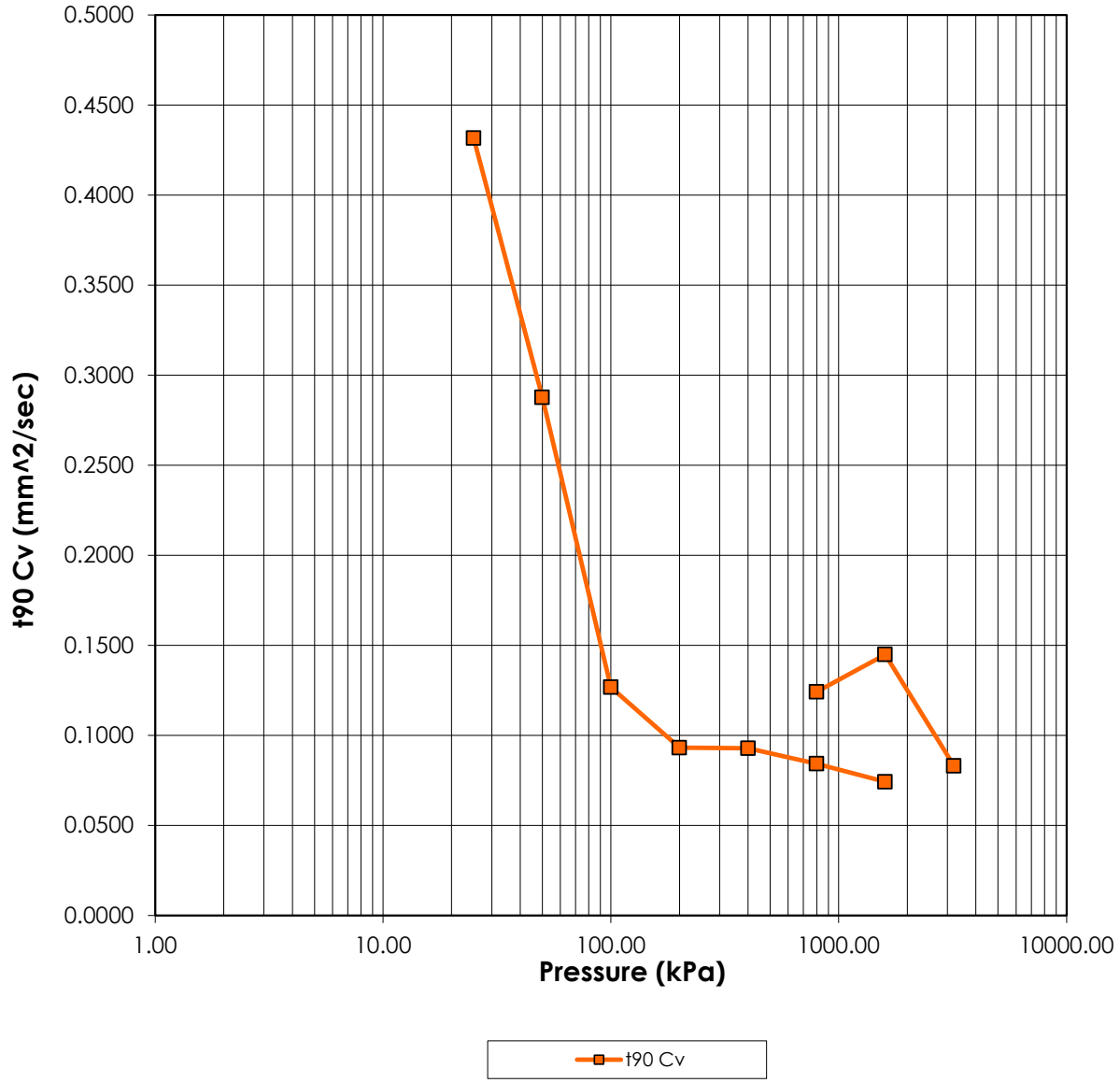
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 30.0 | 22.2 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.473 | 1.887 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 97.31 | 138.91 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8284 | 0.4039 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 3.0-3.6m
**Sample Number:** DC34 ST5 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportation
**Location:**

**Remarks:**
Load at 12.5kPa omitted due to swelling

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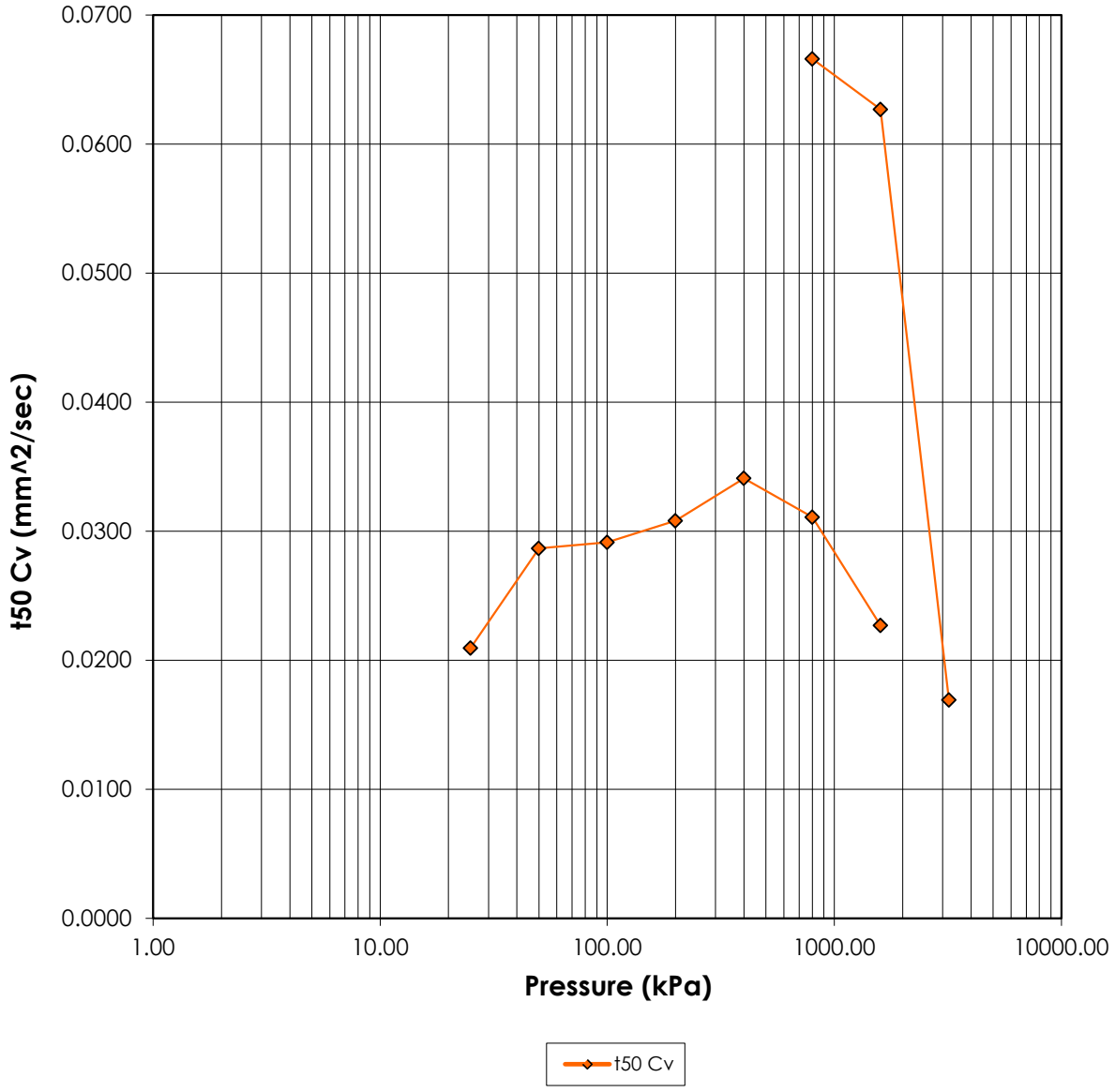
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 30.0 | 22.2 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.473 | 1.887 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 97.31 | 138.91 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8284 | 0.4039 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 3.0-3.6m
**Sample Number:** DC34 ST5 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportation
**Location:**

**Remarks:**
Load at 12.5kPa omitted due to swelling

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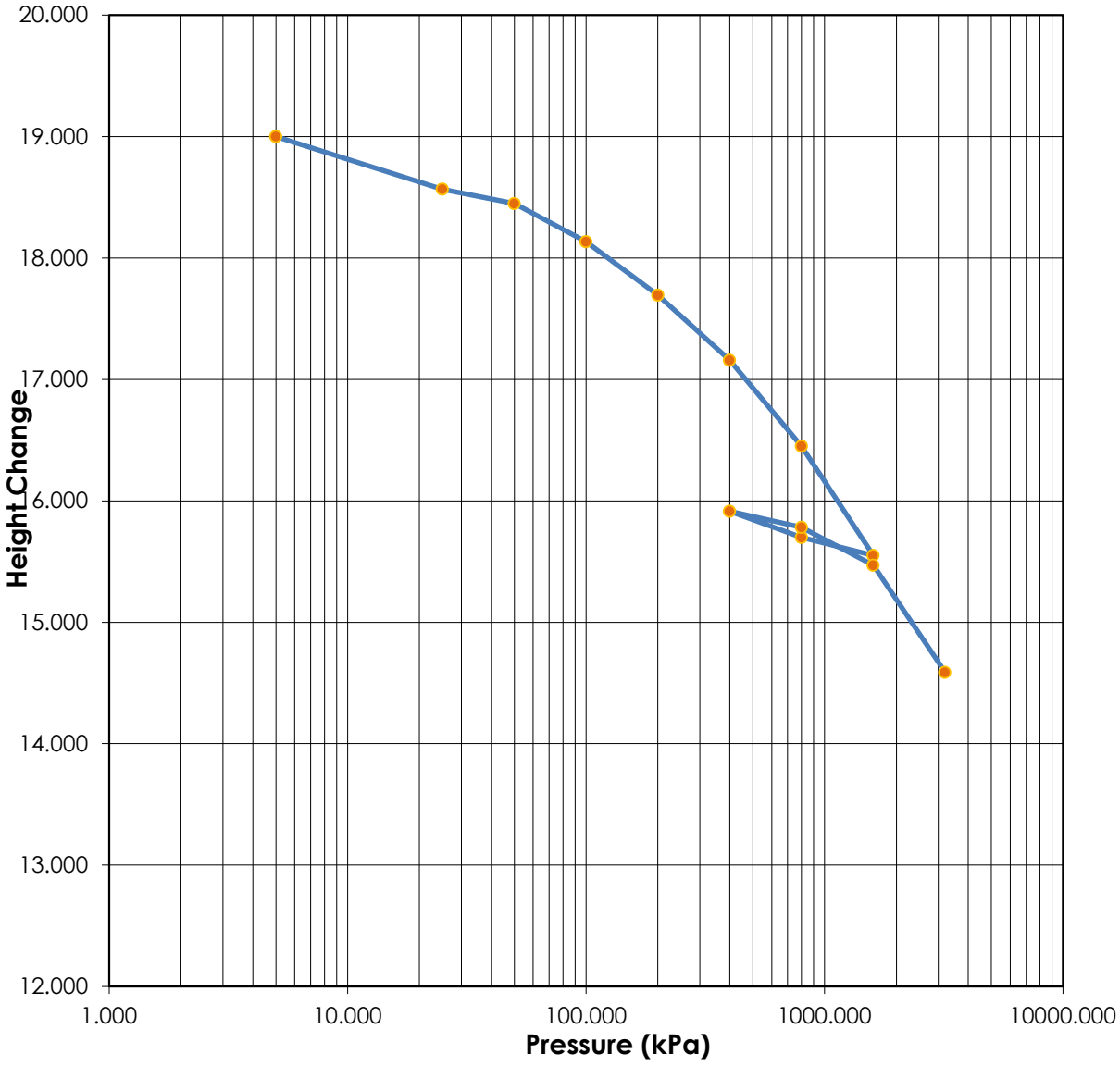
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 30.0 | 22.2 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.473 | 1.887 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 97.31 | 138.91 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8284 | 0.4039 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 3.0-3.6m
**Sample Number:** DC34 ST5 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportation
**Location:**

**Remarks:**
Load at 12.5kPa omitted due to swelling

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Sample Description:** Brown Clay
**Remarks:** Load at 12.5kPa omitted due to swelling

**Test Number:**
**Test Date:** 15-Jul-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 19.0000 | 8.6157 | 0.00 | 0.8297 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 19.0000 | 8.6157 | 0.00 | 0.8297 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 12.500 | 0.2520 | 18.7480 | 8.3637 | 1.33 | 0.8054 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 25.000 | 0.4340 | 18.5660 | 8.1817 | 2.28 | 0.7879 | 2.822 | 13.508 | 0.432 | 0.021 |
| 4 | 50.000 | 0.5520 | 18.4480 | 8.0637 | 2.91 | 0.7765 | 4.181 | 9.745 | 0.288 | 0.029 |
| 5 | 100.000 | 0.8660 | 18.1340 | 7.7497 | 4.56 | 0.7463 | 9.167 | 9.262 | 0.127 | 0.029 |
| 6 | 200.000 | 1.3060 | 17.6940 | 7.3097 | 6.87 | 0.7039 | 11.865 | 8.341 | 0.093 | 0.031 |
| 7 | 400.000 | 1.8420 | 17.1580 | 6.7737 | 9.69 | 0.6523 | 11.202 | 7.086 | 0.093 | 0.034 |
| 8 | 800.000 | 2.5500 | 16.4500 | 6.0657 | 13.42 | 0.5841 | 11.343 | 7.146 | 0.084 | 0.031 |
| 9 | 1600.000 | 3.4500 | 15.5500 | 5.1657 | 18.16 | 0.4975 | 11.512 | 8.743 | 0.074 | 0.023 |
| 10 | 800.000 | 3.3020 | 15.6980 | 5.3137 | 17.38 | 0.5117 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 400.000 | 3.0860 | 15.9140 | 5.5297 | 16.24 | 0.5325 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 800.000 | 3.2180 | 15.7820 | 5.3977 | 16.94 | 0.5198 | 7.087 | 3.070 | 0.124 | 0.067 |
| 13 | 1600.000 | 3.5300 | 15.4700 | 5.0857 | 18.58 | 0.4898 | 5.835 | 3.134 | 0.145 | 0.063 |
| 14 | 3200.000 | 4.4120 | 14.5880 | 4.2037 | 23.22 | 0.4048 | 9.054 | 10.326 | 0.083 | 0.017 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Jul-16

**Sample Number:** DC34 ST5 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 3.0-3.6m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** - **Initial Void Ratio:** 0.8284 **Initial Height (mm):** 19.0000
**Plastic Limit:** - **Plasticity Index (%):** - **Initial Diameter (mm):** 50.0000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 61.5300

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 49.42 | 58.03 |
| Dry Soil + Container (g) | 38.35 | 47.79 |
| Weight of Container (g) | 1.48 | 1.60 |
| Moisture Content (%) | 30.02 | 22.17 |
| Void Ratio | 0.8284 | 0.4039 |
| Saturation (%) | 97.31 | 138.91 |
| Dry Density (g/cm3) | 1.47 | 1.89 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

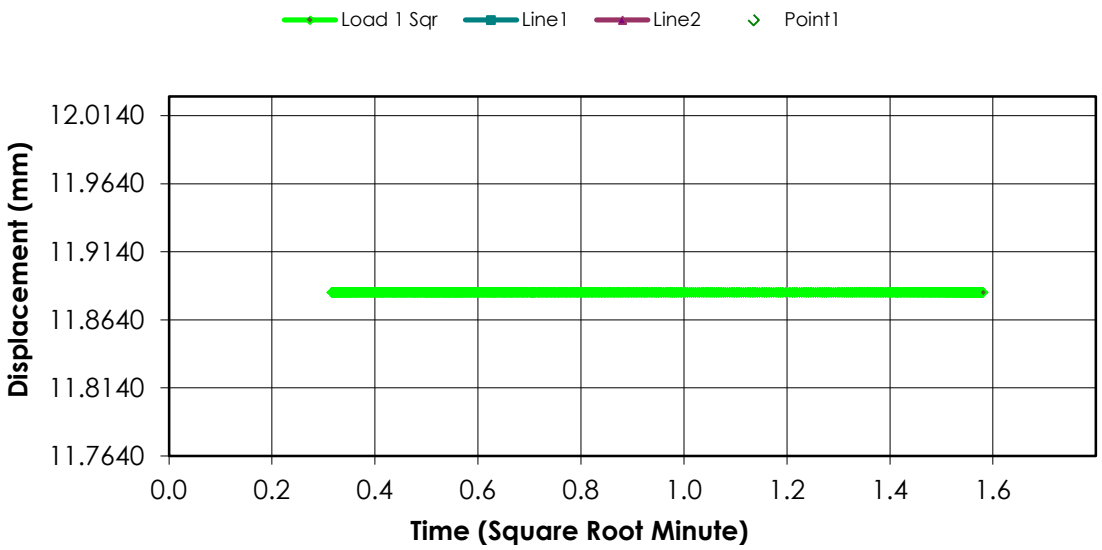
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

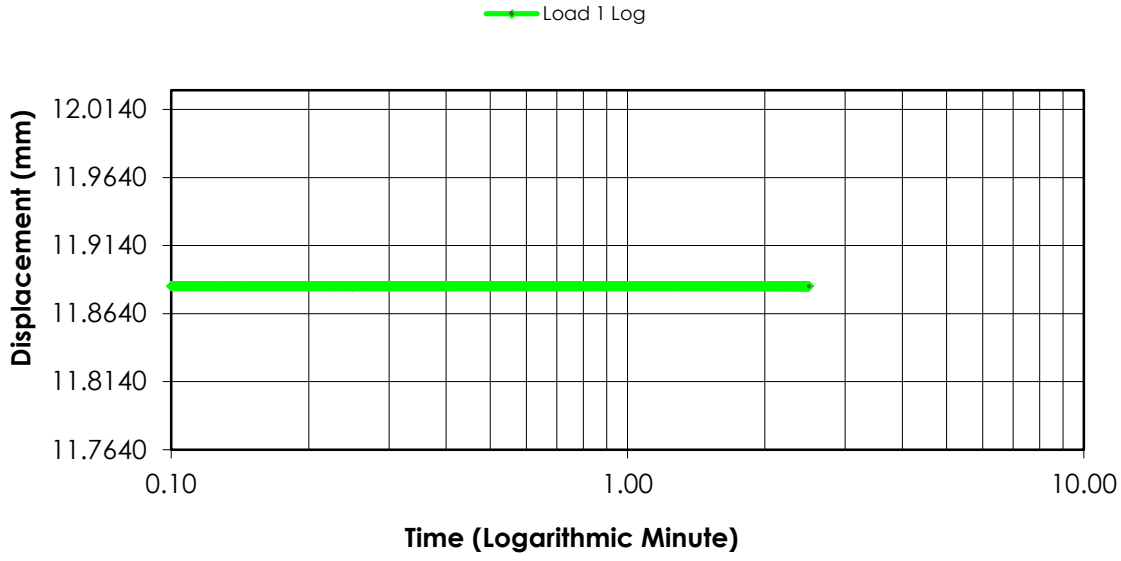
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.8840 | 0.0000 | 0.0000 | 0.8284 |
| 1 | 00:00:06 | 11.8840 | 0.0000 | 0.0000 | 0.8284 |
| 2 | 00:00:15 | 11.8840 | 0.0000 | 0.0000 | 0.8284 |
| 3 | 00:00:30 | 11.8840 | 0.0000 | 0.0000 | 0.8284 |
| 4 | 00:01:00 | 11.8840 | 0.0000 | 0.0000 | 0.8284 |
| 5 | 00:02:00 | 11.8840 | 0.0000 | 0.0000 | 0.8284 |
| 6 | 00:02:30 | 11.8840 | 0.0000 | 0.0000 | 0.8284 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 3) Load 25.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

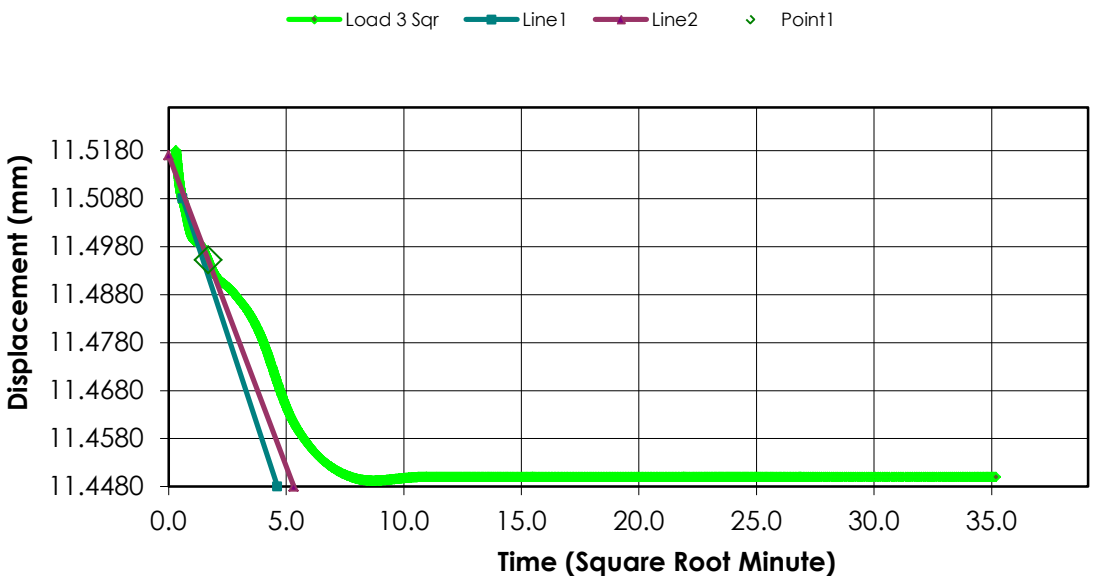
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

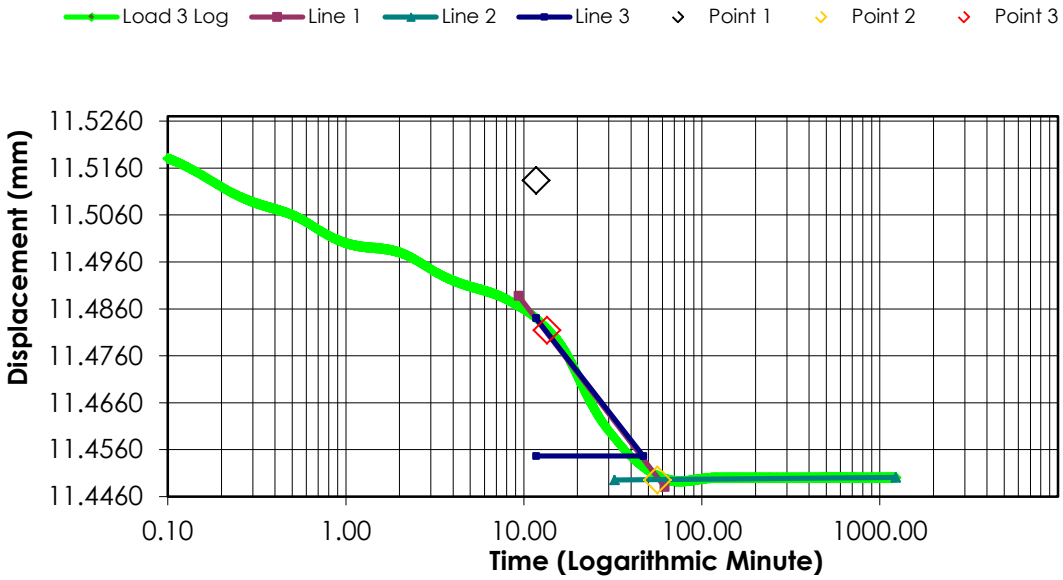
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.6320 | 0.2520 | 1.3263 | 0.8042 |
| 1 | 00:00:06 | 11.5180 | 0.3660 | 1.9263 | 0.7932 |
| 2 | 00:00:15 | 11.5100 | 0.3740 | 1.9684 | 0.7925 |
| 3 | 00:00:30 | 11.5060 | 0.3780 | 1.9895 | 0.7921 |
| 4 | 00:01:00 | 11.5000 | 0.3840 | 2.0211 | 0.7915 |
| 5 | 00:02:00 | 11.4980 | 0.3860 | 2.0316 | 0.7913 |
| 6 | 00:04:00 | 11.4920 | 0.3920 | 2.0632 | 0.7907 |
| 7 | 00:08:00 | 11.4880 | 0.3960 | 2.0842 | 0.7903 |
| 8 | 00:15:01 | 11.4800 | 0.4040 | 2.1263 | 0.7896 |
| 9 | 00:30:02 | 11.4600 | 0.4240 | 2.2316 | 0.7876 |
| 10 | 01:00:05 | 11.4500 | 0.4340 | 2.2842 | 0.7867 |
| 11 | 02:00:10 | 11.4500 | 0.4340 | 2.2842 | 0.7867 |
| 12 | 04:00:21 | 11.4500 | 0.4340 | 2.2842 | 0.7867 |
| 13 | 08:00:42 | 11.4500 | 0.4340 | 2.2842 | 0.7867 |
| 14 | 12:01:03 | 11.4500 | 0.4340 | 2.2842 | 0.7867 |
| 15 | 20:37:58 | 11.4500 | 0.4340 | 2.2842 | 0.7867 |

# Consolidation Test Results
## (Sequence 3) Load 25.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 50.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

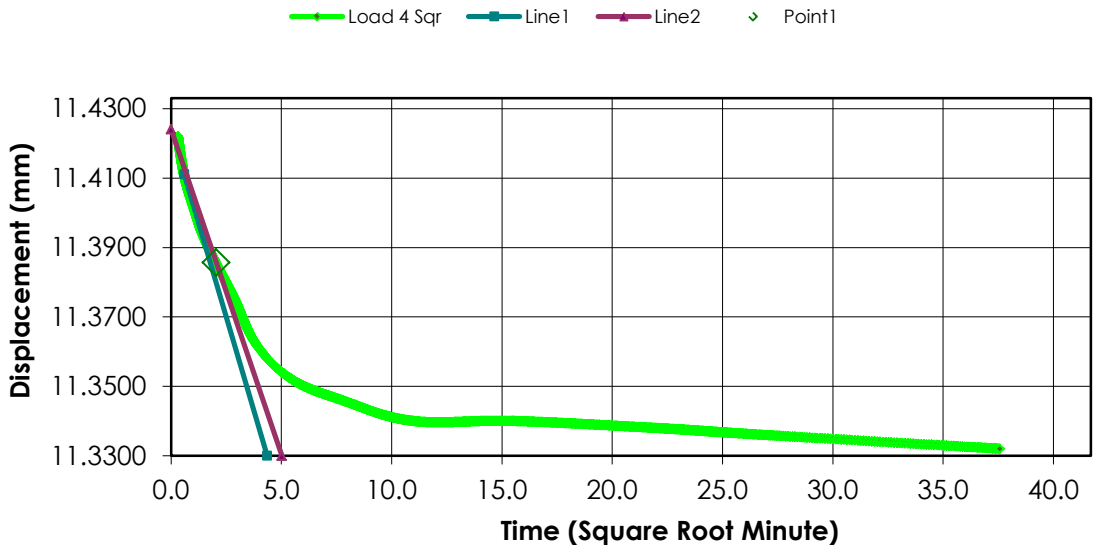
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

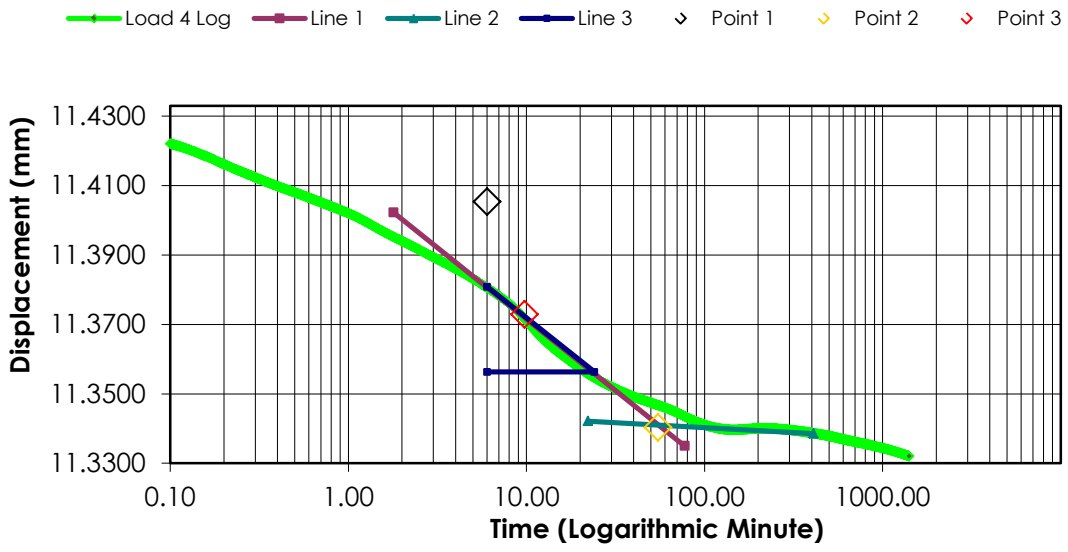
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.4500 | 0.4340 | 2.2842 | 0.7867 |
| 1 | 00:00:06 | 11.4220 | 0.4620 | 2.4316 | 0.7840 |
| 2 | 00:00:15 | 11.4140 | 0.4700 | 2.4737 | 0.7832 |
| 3 | 00:00:30 | 11.4080 | 0.4760 | 2.5053 | 0.7826 |
| 4 | 00:01:00 | 11.4020 | 0.4820 | 2.5368 | 0.7821 |
| 5 | 00:02:00 | 11.3940 | 0.4900 | 2.5789 | 0.7813 |
| 6 | 00:04:00 | 11.3860 | 0.4980 | 2.6211 | 0.7805 |
| 7 | 00:08:00 | 11.3760 | 0.5080 | 2.6737 | 0.7796 |
| 8 | 00:15:01 | 11.3620 | 0.5220 | 2.7474 | 0.7782 |
| 9 | 00:30:02 | 11.3520 | 0.5320 | 2.8000 | 0.7772 |
| 10 | 01:00:04 | 11.3460 | 0.5380 | 2.8316 | 0.7767 |
| 11 | 02:00:09 | 11.3400 | 0.5440 | 2.8632 | 0.7761 |
| 12 | 04:00:19 | 11.3400 | 0.5440 | 2.8632 | 0.7761 |
| 13 | 08:00:37 | 11.3380 | 0.5460 | 2.8737 | 0.7759 |
| 14 | 12:00:57 | 11.3360 | 0.5480 | 2.8842 | 0.7757 |
| 15 | 23:30:57 | 11.3320 | 0.5520 | 2.9053 | 0.7753 |

# Consolidation Test Results
## (Sequence 4) Load 50.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 100.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

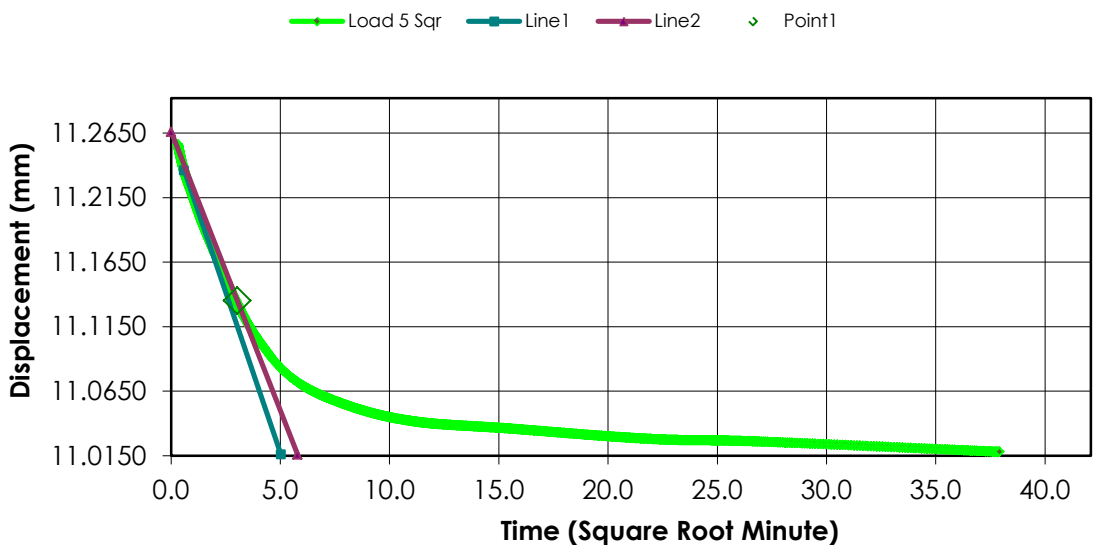
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

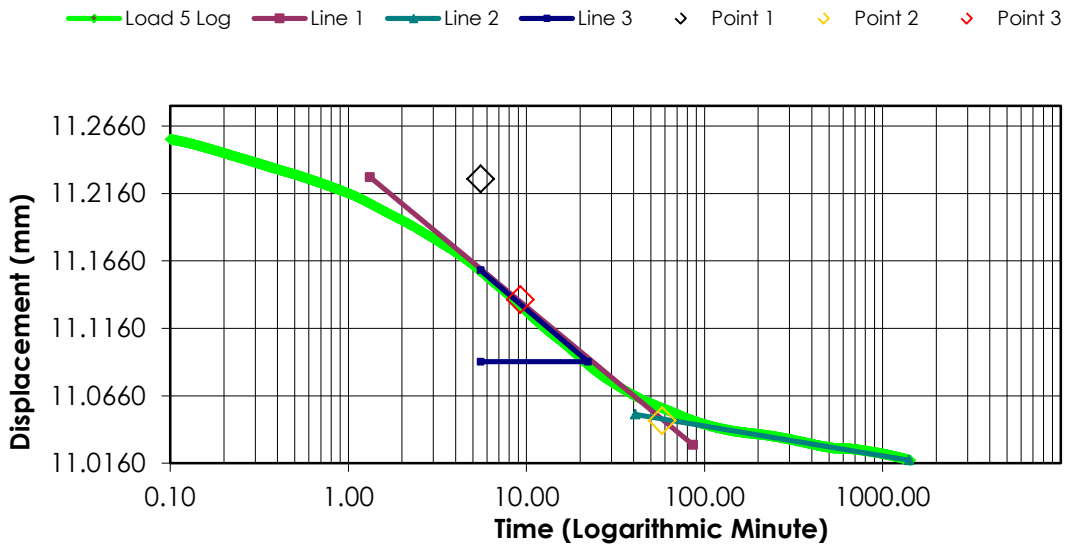
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.3320 | 0.5520 | 2.9053 | 0.7753 |
| 1 | 00:00:06 | 11.2560 | 0.6280 | 3.3053 | 0.7680 |
| 2 | 00:00:15 | 11.2420 | 0.6420 | 3.3789 | 0.7667 |
| 3 | 00:00:30 | 11.2300 | 0.6540 | 3.4421 | 0.7655 |
| 4 | 00:01:00 | 11.2160 | 0.6680 | 3.5158 | 0.7642 |
| 5 | 00:02:00 | 11.1960 | 0.6880 | 3.6211 | 0.7622 |
| 6 | 00:04:01 | 11.1720 | 0.7120 | 3.7474 | 0.7599 |
| 7 | 00:08:01 | 11.1400 | 0.7440 | 3.9158 | 0.7568 |
| 8 | 00:15:01 | 11.1080 | 0.7760 | 4.0842 | 0.7538 |
| 9 | 00:30:02 | 11.0760 | 0.8080 | 4.2526 | 0.7507 |
| 10 | 01:00:04 | 11.0560 | 0.8280 | 4.3579 | 0.7488 |
| 11 | 02:00:08 | 11.0420 | 0.8420 | 4.4316 | 0.7474 |
| 12 | 04:00:17 | 11.0360 | 0.8480 | 4.4632 | 0.7468 |
| 13 | 08:00:33 | 11.0280 | 0.8560 | 4.5053 | 0.7461 |
| 14 | 12:00:50 | 11.0260 | 0.8580 | 4.5158 | 0.7459 |
| 15 | 23:57:19 | 11.0180 | 0.8660 | 4.5579 | 0.7451 |

# Consolidation Test Results
## (Sequence 5) Load 100.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 200.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

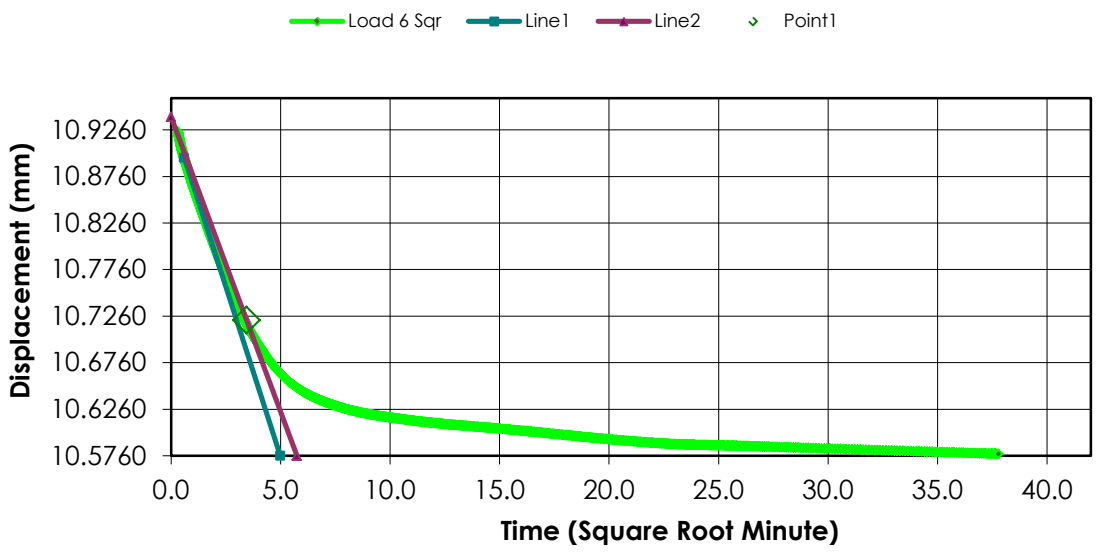
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

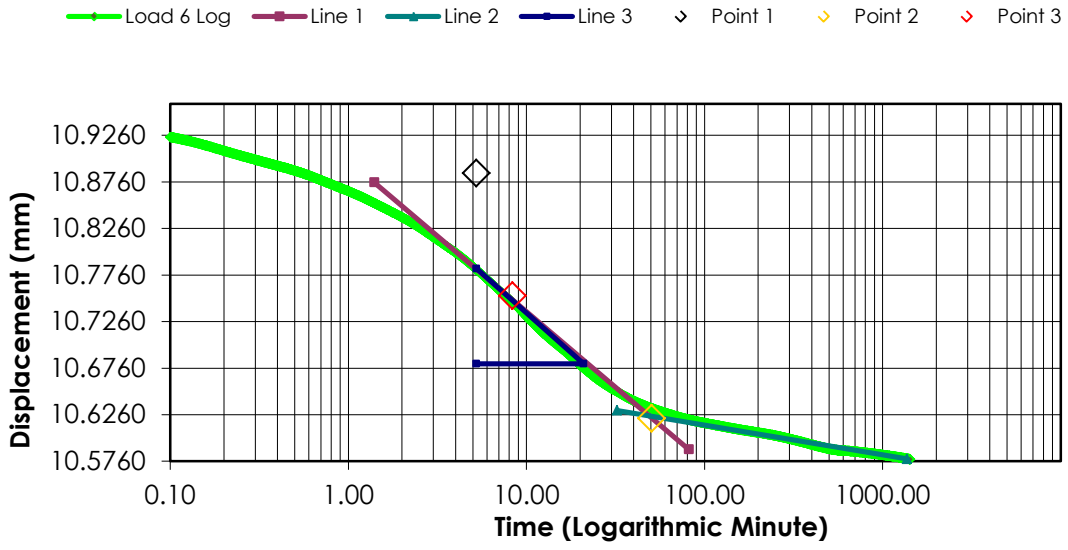
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.0180 | 0.8660 | 4.5579 | 0.7451 |
| 1 | 00:00:06 | 10.9240 | 0.9600 | 5.0526 | 0.7361 |
| 2 | 00:00:15 | 10.9040 | 0.9800 | 5.1579 | 0.7341 |
| 3 | 00:00:30 | 10.8880 | 0.9960 | 5.2421 | 0.7326 |
| 4 | 00:01:00 | 10.8660 | 1.0180 | 5.3579 | 0.7305 |
| 5 | 00:02:00 | 10.8380 | 1.0460 | 5.5053 | 0.7278 |
| 6 | 00:04:00 | 10.8000 | 1.0840 | 5.7053 | 0.7241 |
| 7 | 00:08:00 | 10.7500 | 1.1340 | 5.9684 | 0.7193 |
| 8 | 00:15:01 | 10.7000 | 1.1840 | 6.2316 | 0.7145 |
| 9 | 00:30:02 | 10.6540 | 1.2300 | 6.4737 | 0.7101 |
| 10 | 01:00:04 | 10.6280 | 1.2560 | 6.6105 | 0.7076 |
| 11 | 02:00:09 | 10.6140 | 1.2700 | 6.6842 | 0.7062 |
| 12 | 04:00:18 | 10.6040 | 1.2800 | 6.7368 | 0.7053 |
| 13 | 08:00:37 | 10.5900 | 1.2940 | 6.8105 | 0.7039 |
| 14 | 12:00:57 | 10.5860 | 1.2980 | 6.8316 | 0.7035 |
| 15 | 23:47:54 | 10.5780 | 1.3060 | 6.8737 | 0.7028 |

# Consolidation Test Results
## (Sequence 6) Load 200.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 400.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

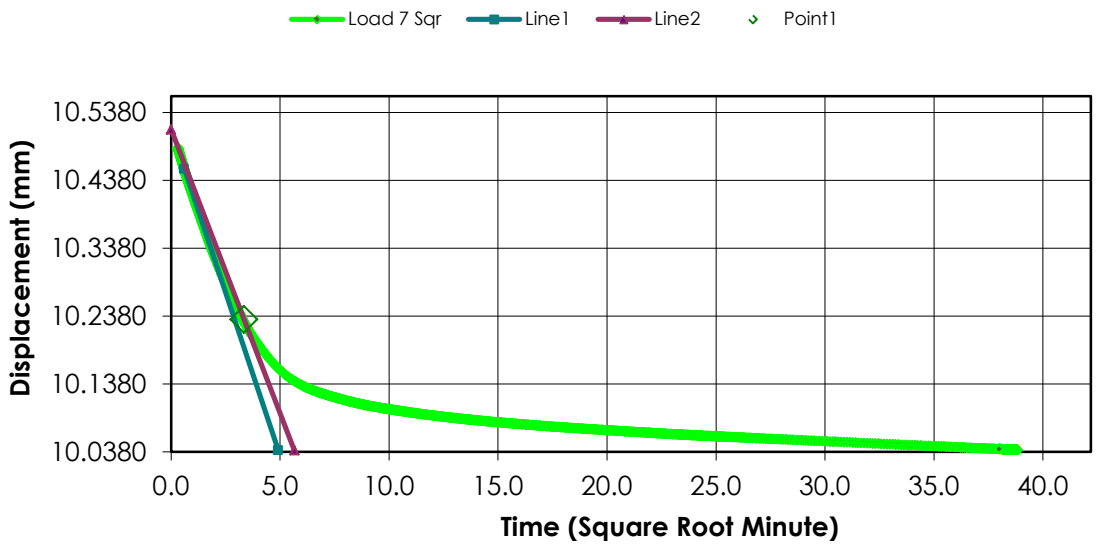
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

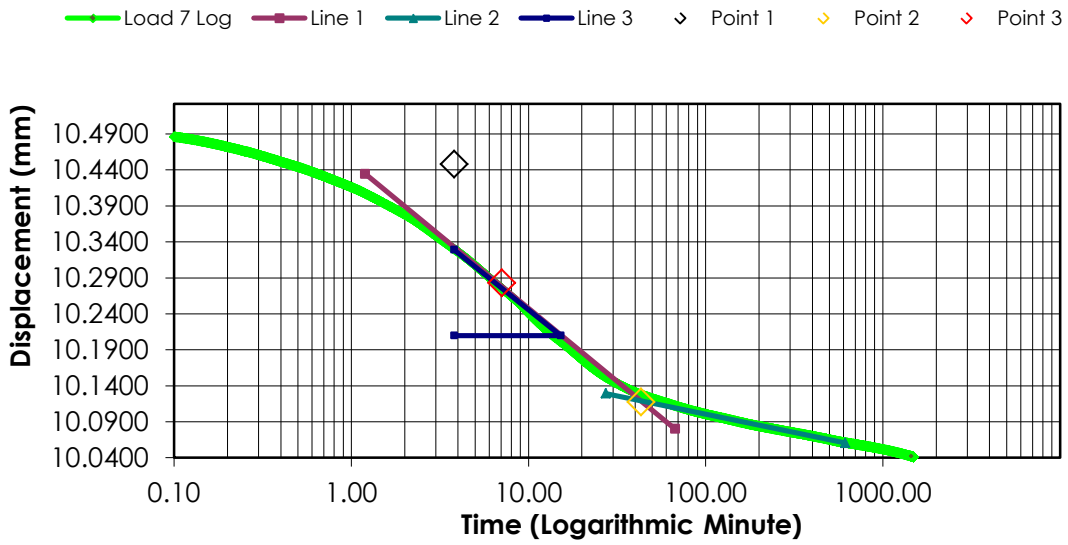
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.5780 | 1.3060 | 6.8737 | 0.7028 |
| 1 | 00:00:06 | 10.4860 | 1.3980 | 7.3579 | 0.6939 |
| 2 | 00:00:15 | 10.4660 | 1.4180 | 7.4632 | 0.6920 |
| 3 | 00:00:30 | 10.4440 | 1.4400 | 7.5789 | 0.6899 |
| 4 | 00:01:00 | 10.4160 | 1.4680 | 7.7263 | 0.6872 |
| 5 | 00:02:00 | 10.3780 | 1.5060 | 7.9263 | 0.6835 |
| 6 | 00:04:00 | 10.3260 | 1.5580 | 8.2000 | 0.6785 |
| 7 | 00:08:00 | 10.2640 | 1.6200 | 8.5263 | 0.6725 |
| 8 | 00:15:01 | 10.2020 | 1.6820 | 8.8526 | 0.6666 |
| 9 | 00:30:02 | 10.1460 | 1.7380 | 9.1474 | 0.6612 |
| 10 | 01:00:04 | 10.1160 | 1.7680 | 9.3053 | 0.6583 |
| 11 | 02:00:09 | 10.0960 | 1.7880 | 9.4105 | 0.6564 |
| 12 | 04:00:16 | 10.0800 | 1.8040 | 9.4947 | 0.6548 |
| 13 | 08:00:23 | 10.0660 | 1.8180 | 9.5684 | 0.6535 |
| 14 | 12:00:32 | 10.0580 | 1.8260 | 9.6105 | 0.6527 |
| 15 | 24:00:57 | 10.0420 | 1.8420 | 9.6947 | 0.6512 |
| 16 | 24:03:27 | 10.0420 | 1.8420 | 9.6947 | 0.6512 |

# Consolidation Test Results
## (Sequence 7) Load 400.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 800.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

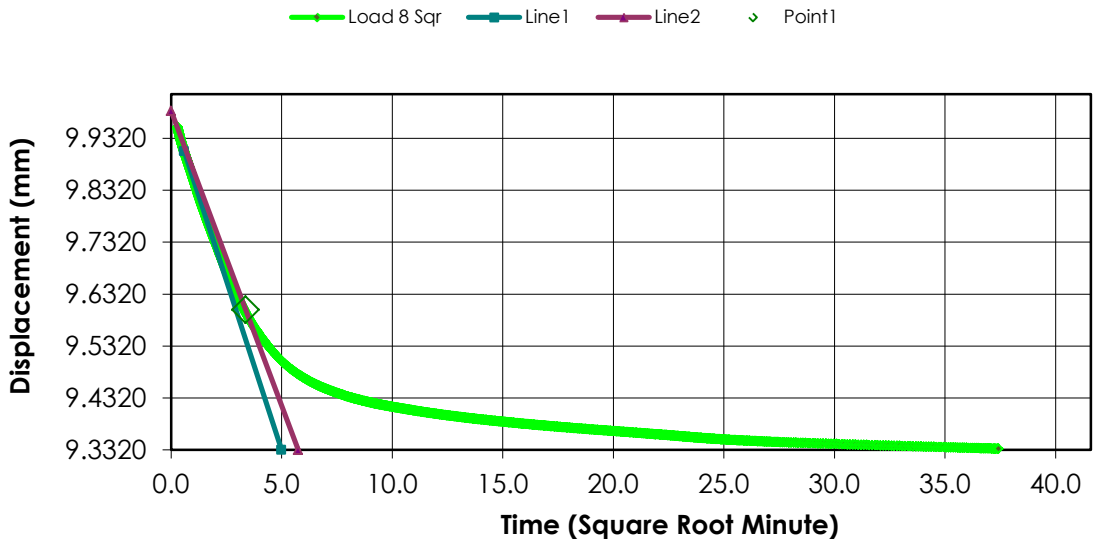
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

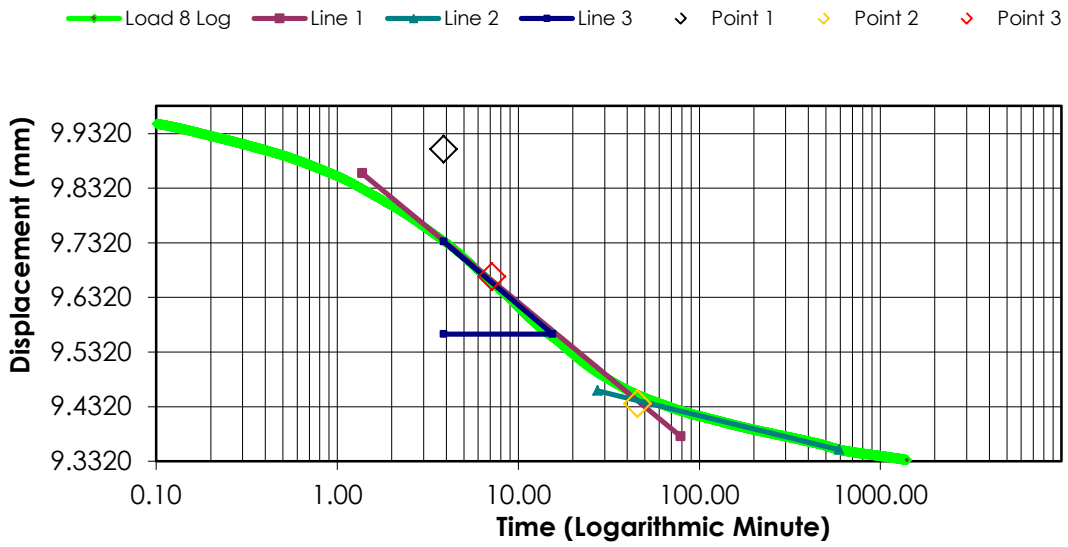
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.0420 | 1.8420 | 9.6947 | 0.6512 |
| 1 | 00:00:05 | 9.9540 | 1.9300 | 10.1579 | 0.6427 |
| 2 | 00:00:14 | 9.9220 | 1.9620 | 10.3263 | 0.6396 |
| 3 | 00:00:30 | 9.8920 | 1.9920 | 10.4842 | 0.6367 |
| 4 | 00:01:00 | 9.8540 | 2.0300 | 10.6842 | 0.6331 |
| 5 | 00:02:00 | 9.8000 | 2.0840 | 10.9684 | 0.6279 |
| 6 | 00:04:00 | 9.7320 | 2.1520 | 11.3263 | 0.6213 |
| 7 | 00:08:00 | 9.6440 | 2.2400 | 11.7895 | 0.6129 |
| 8 | 00:15:00 | 9.5620 | 2.3220 | 12.2211 | 0.6050 |
| 9 | 00:30:00 | 9.4860 | 2.3980 | 12.6211 | 0.5977 |
| 10 | 01:00:02 | 9.4380 | 2.4460 | 12.8737 | 0.5931 |
| 11 | 02:00:04 | 9.4080 | 2.4760 | 13.0316 | 0.5902 |
| 12 | 04:00:08 | 9.3840 | 2.5000 | 13.1579 | 0.5879 |
| 13 | 08:00:16 | 9.3620 | 2.5220 | 13.2737 | 0.5857 |
| 14 | 12:00:24 | 9.3480 | 2.5360 | 13.3474 | 0.5844 |
| 15 | 23:20:56 | 9.3340 | 2.5500 | 13.4211 | 0.5830 |

# Consolidation Test Results
## (Sequence 8) Load 800.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1600.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

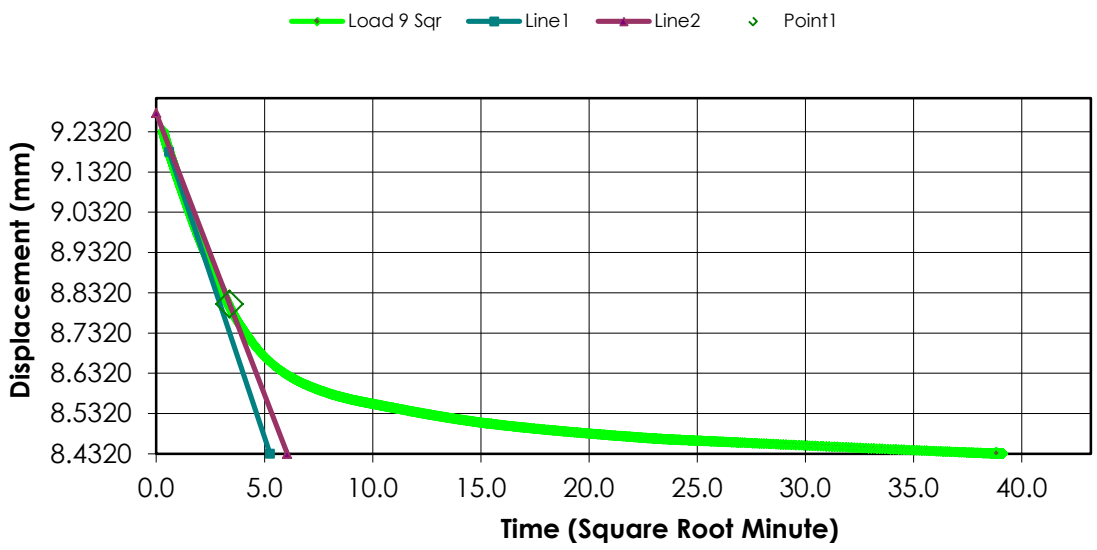
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

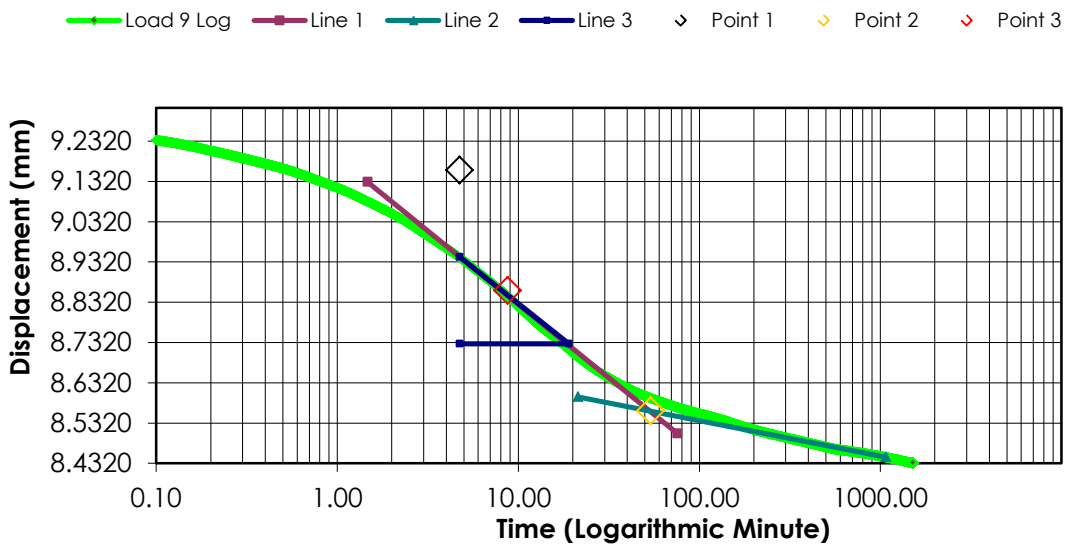
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.3340 | 2.5500 | 13.4211 | 0.5830 |
| 1 | 00:00:06 | 9.2340 | 2.6500 | 13.9474 | 0.5734 |
| 2 | 00:00:15 | 9.1980 | 2.6860 | 14.1368 | 0.5700 |
| 3 | 00:00:30 | 9.1640 | 2.7200 | 14.3158 | 0.5667 |
| 4 | 00:01:00 | 9.1160 | 2.7680 | 14.5684 | 0.5621 |
| 5 | 00:02:00 | 9.0520 | 2.8320 | 14.9053 | 0.5559 |
| 6 | 00:04:00 | 8.9660 | 2.9180 | 15.3579 | 0.5476 |
| 7 | 00:08:01 | 8.8620 | 3.0220 | 15.9053 | 0.5376 |
| 8 | 00:15:01 | 8.7520 | 3.1320 | 16.4842 | 0.5270 |
| 9 | 00:30:01 | 8.6500 | 3.2340 | 17.0211 | 0.5172 |
| 10 | 01:00:02 | 8.5860 | 3.2980 | 17.3579 | 0.5111 |
| 11 | 02:00:04 | 8.5460 | 3.3380 | 17.5684 | 0.5072 |
| 12 | 04:00:09 | 8.5060 | 3.3780 | 17.7789 | 0.5034 |
| 13 | 08:00:17 | 8.4740 | 3.4100 | 17.9474 | 0.5003 |
| 14 | 12:00:25 | 8.4600 | 3.4240 | 18.0211 | 0.4989 |
| 15 | 24:00:50 | 8.4340 | 3.4500 | 18.1579 | 0.4964 |
| 16 | 25:07:26 | 8.4340 | 3.4500 | 18.1579 | 0.4964 |

# Consolidation Test Results
## (Sequence 9) Load 1600.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 800.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

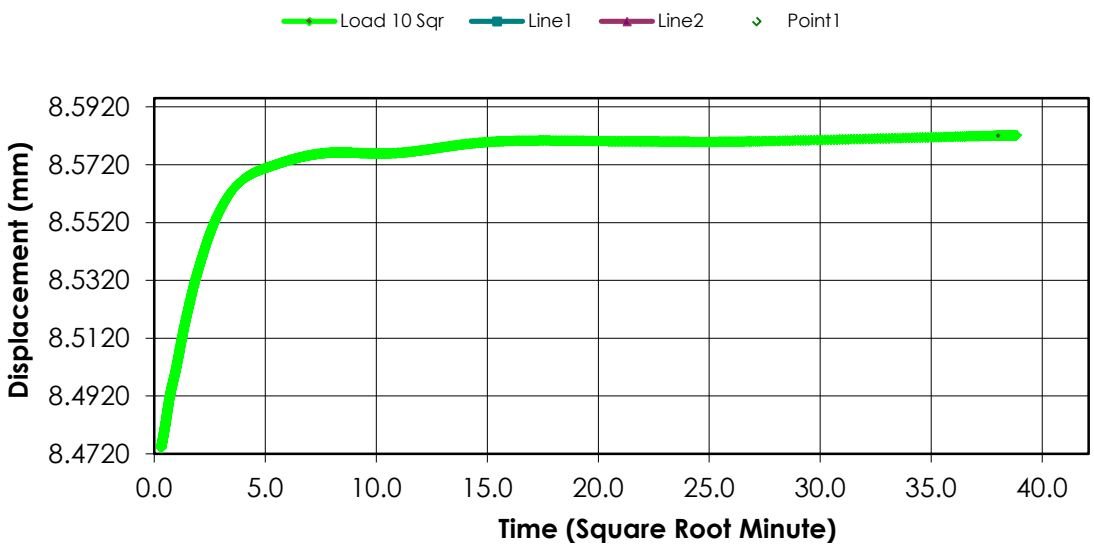
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

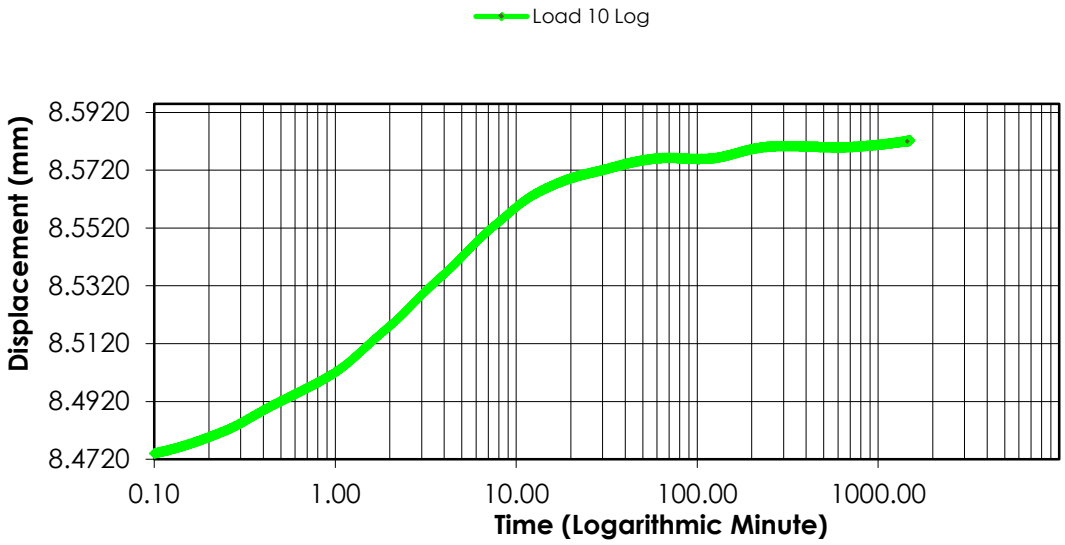
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.4340 | 3.4500 | 18.1579 | 0.4964 |
| 1 | 00:00:06 | 8.4740 | 3.4100 | 17.9474 | 0.5003 |
| 2 | 00:00:15 | 8.4820 | 3.4020 | 17.9053 | 0.5011 |
| 3 | 00:00:30 | 8.4920 | 3.3920 | 17.8526 | 0.5020 |
| 4 | 00:01:00 | 8.5020 | 3.3820 | 17.8000 | 0.5030 |
| 5 | 00:02:00 | 8.5180 | 3.3660 | 17.7158 | 0.5045 |
| 6 | 00:04:00 | 8.5360 | 3.3480 | 17.6211 | 0.5063 |
| 7 | 00:08:00 | 8.5540 | 3.3300 | 17.5263 | 0.5080 |
| 8 | 00:15:01 | 8.5660 | 3.3180 | 17.4632 | 0.5091 |
| 9 | 00:30:01 | 8.5720 | 3.3120 | 17.4316 | 0.5097 |
| 10 | 01:00:02 | 8.5760 | 3.3080 | 17.4105 | 0.5101 |
| 11 | 02:00:04 | 8.5760 | 3.3080 | 17.4105 | 0.5101 |
| 12 | 04:00:08 | 8.5800 | 3.3040 | 17.3895 | 0.5105 |
| 13 | 08:00:17 | 8.5800 | 3.3040 | 17.3895 | 0.5105 |
| 14 | 12:00:25 | 8.5800 | 3.3040 | 17.3895 | 0.5105 |
| 15 | 24:00:50 | 8.5820 | 3.3020 | 17.3789 | 0.5107 |
| 16 | 24:06:14 | 8.5820 | 3.3020 | 17.3789 | 0.5107 |

# Consolidation Test Results
## (Sequence 10) Rebound 800.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 400.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

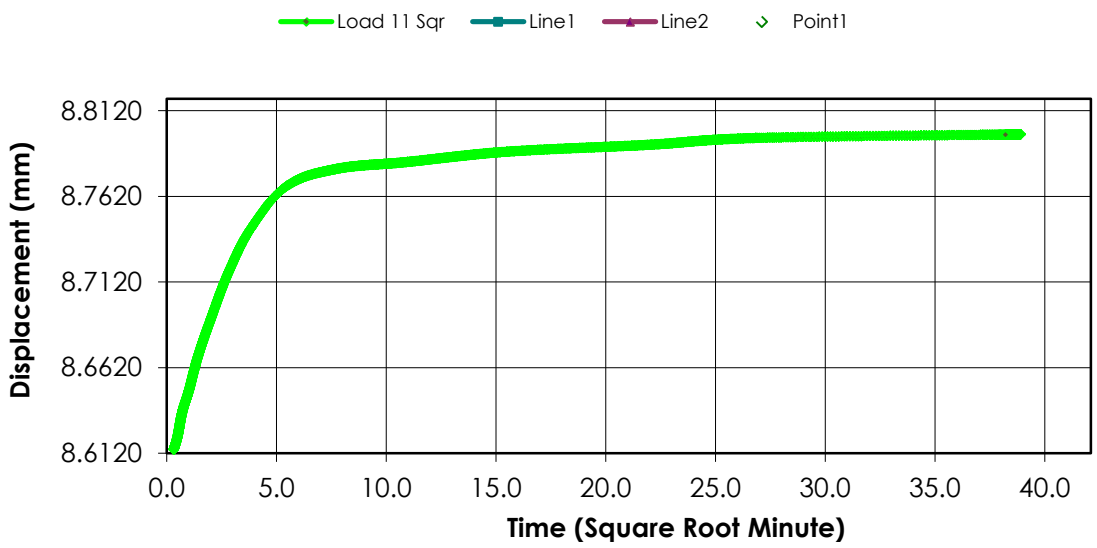
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

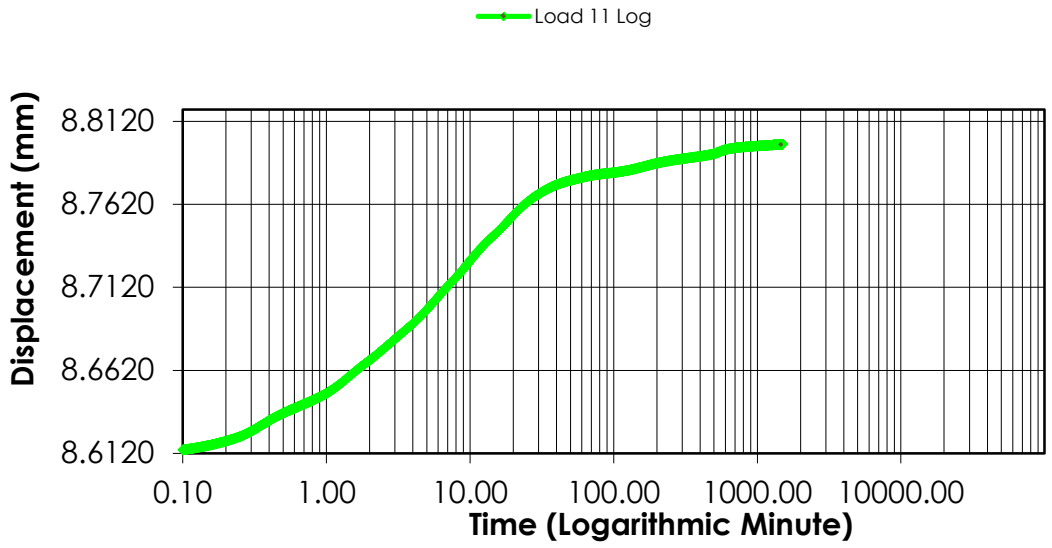
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.5820 | 3.3020 | 17.3789 | 0.5107 |
| 1 | 00:00:06 | 8.6140 | 3.2700 | 17.2105 | 0.5138 |
| 2 | 00:00:15 | 8.6220 | 3.2620 | 17.1684 | 0.5145 |
| 3 | 00:00:30 | 8.6360 | 3.2480 | 17.0947 | 0.5159 |
| 4 | 00:01:00 | 8.6480 | 3.2360 | 17.0316 | 0.5170 |
| 5 | 00:02:00 | 8.6680 | 3.2160 | 16.9263 | 0.5190 |
| 6 | 00:04:00 | 8.6900 | 3.1940 | 16.8105 | 0.5211 |
| 7 | 00:08:01 | 8.7180 | 3.1660 | 16.6632 | 0.5238 |
| 8 | 00:15:01 | 8.7440 | 3.1400 | 16.5263 | 0.5263 |
| 9 | 00:30:01 | 8.7680 | 3.1160 | 16.4000 | 0.5286 |
| 10 | 01:00:02 | 8.7780 | 3.1060 | 16.3474 | 0.5295 |
| 11 | 02:00:04 | 8.7820 | 3.1020 | 16.3263 | 0.5299 |
| 12 | 04:00:09 | 8.7880 | 3.0960 | 16.2947 | 0.5305 |
| 13 | 08:00:17 | 8.7920 | 3.0920 | 16.2737 | 0.5309 |
| 14 | 12:00:26 | 8.7960 | 3.0880 | 16.2526 | 0.5313 |
| 15 | 24:00:50 | 8.7980 | 3.0860 | 16.2421 | 0.5315 |
| 16 | 24:19:58 | 8.7980 | 3.0860 | 16.2421 | 0.5315 |

# Consolidation Test Results
## (Sequence 11) Rebound 400.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 800.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

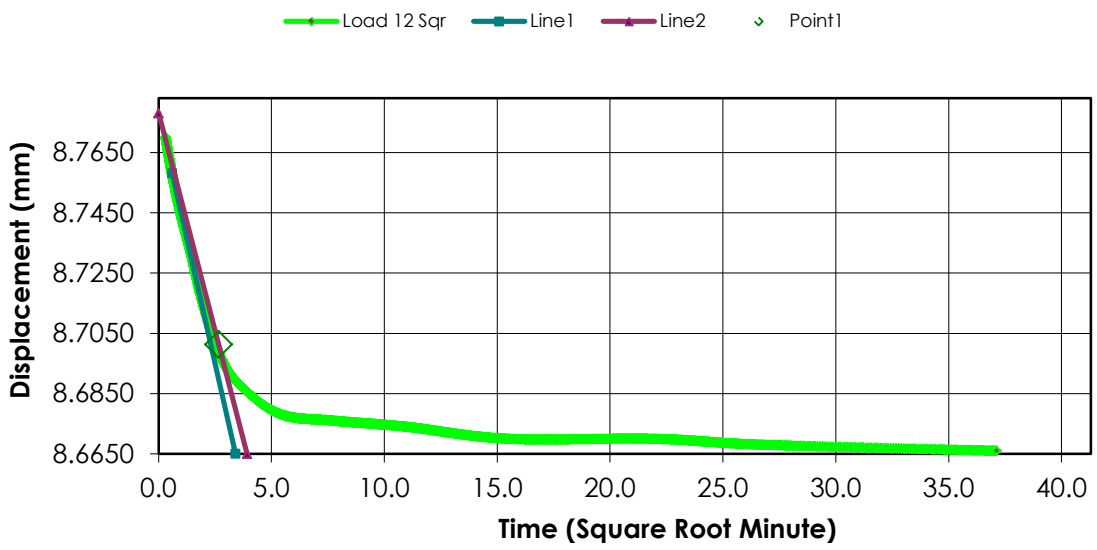
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

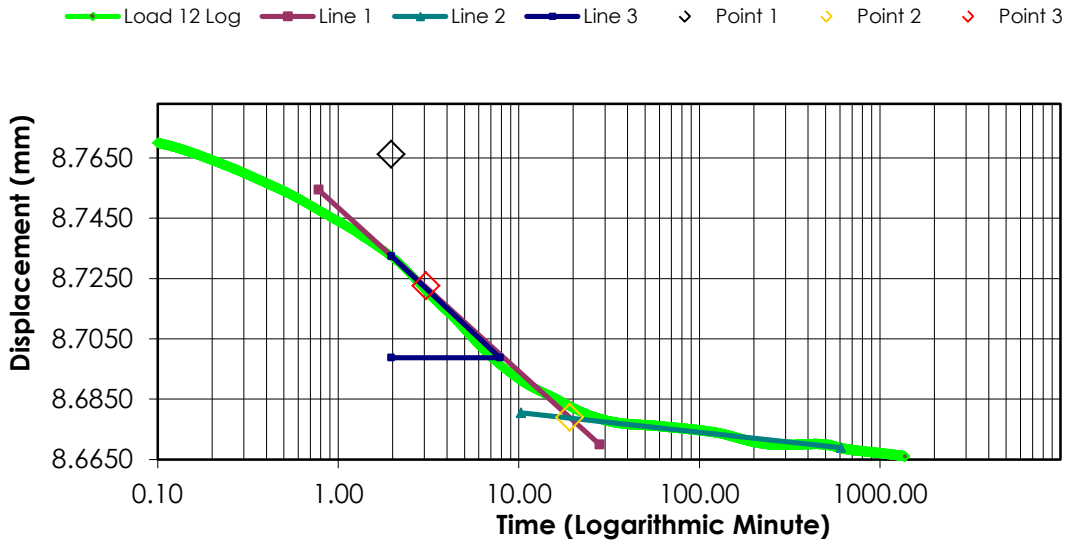
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.7980 | 3.0860 | 16.2421 | 0.5315 |
| 1 | 00:00:06 | 8.7700 | 3.1140 | 16.3895 | 0.5288 |
| 2 | 00:00:15 | 8.7620 | 3.1220 | 16.4316 | 0.5280 |
| 3 | 00:00:30 | 8.7540 | 3.1300 | 16.4737 | 0.5272 |
| 4 | 00:01:00 | 8.7440 | 3.1400 | 16.5263 | 0.5263 |
| 5 | 00:02:00 | 8.7320 | 3.1520 | 16.5895 | 0.5251 |
| 6 | 00:04:00 | 8.7140 | 3.1700 | 16.6842 | 0.5234 |
| 7 | 00:08:00 | 8.6960 | 3.1880 | 16.7789 | 0.5217 |
| 8 | 00:15:00 | 8.6860 | 3.1980 | 16.8316 | 0.5207 |
| 9 | 00:30:01 | 8.6780 | 3.2060 | 16.8737 | 0.5199 |
| 10 | 01:00:02 | 8.6760 | 3.2080 | 16.8842 | 0.5197 |
| 11 | 02:00:04 | 8.6740 | 3.2100 | 16.8947 | 0.5195 |
| 12 | 04:00:08 | 8.6700 | 3.2140 | 16.9158 | 0.5191 |
| 13 | 08:00:17 | 8.6700 | 3.2140 | 16.9158 | 0.5191 |
| 14 | 12:00:25 | 8.6680 | 3.2160 | 16.9263 | 0.5190 |
| 15 | 22:58:34 | 8.6660 | 3.2180 | 16.9368 | 0.5188 |

# Consolidation Test Results
## (Sequence 12) Load 800.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1600.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

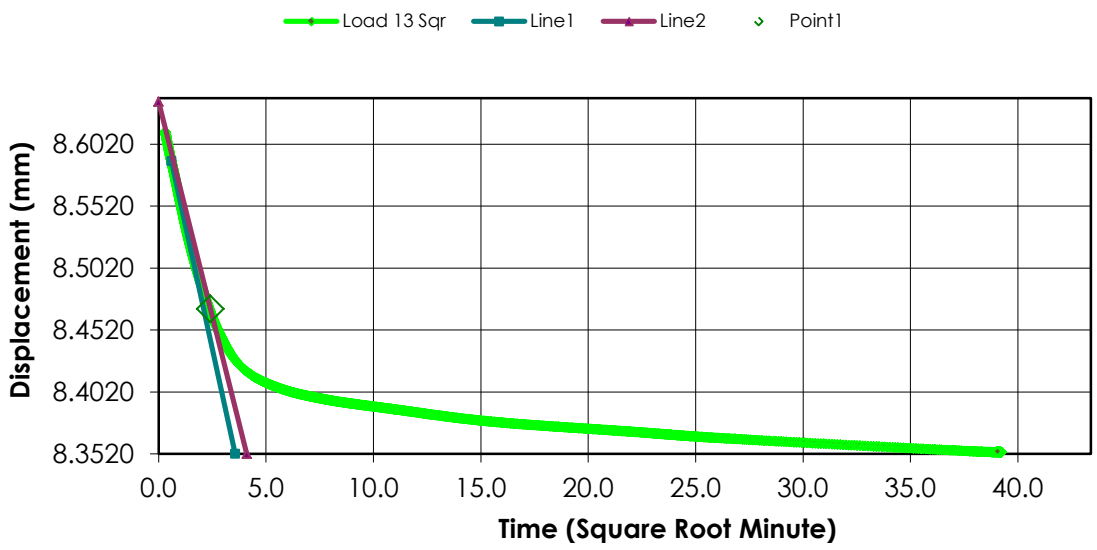
**Sample Number:** DC34 ST5
**Boring Number:**
**Depth:** 3.0-3.6m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

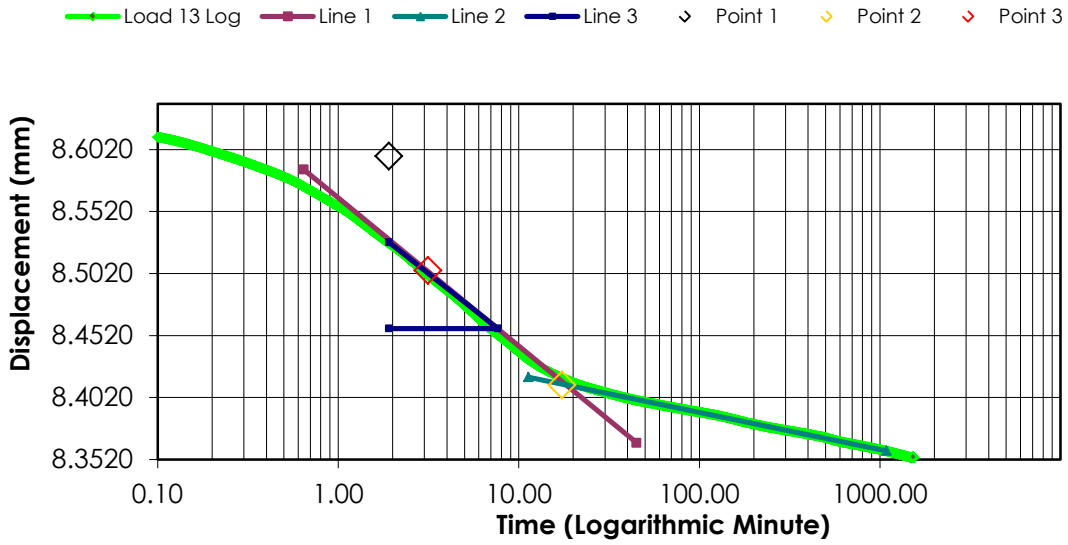
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.6660 | 3.2180 | 16.9368 | 0.5188 |
| 1 | 00:00:06 | 8.6120 | 3.2720 | 17.2211 | 0.5136 |
| 2 | 00:00:15 | 8.5960 | 3.2880 | 17.3053 | 0.5120 |
| 3 | 00:00:30 | 8.5800 | 3.3040 | 17.3895 | 0.5105 |
| 4 | 00:01:00 | 8.5560 | 3.3280 | 17.5158 | 0.5082 |
| 5 | 00:02:00 | 8.5240 | 3.3600 | 17.6842 | 0.5051 |
| 6 | 00:04:00 | 8.4880 | 3.3960 | 17.8737 | 0.5016 |
| 7 | 00:08:00 | 8.4500 | 3.4340 | 18.0737 | 0.4980 |
| 8 | 00:15:01 | 8.4220 | 3.4620 | 18.2211 | 0.4953 |
| 9 | 00:30:01 | 8.4060 | 3.4780 | 18.3053 | 0.4937 |
| 10 | 01:00:02 | 8.3960 | 3.4880 | 18.3579 | 0.4928 |
| 11 | 02:00:04 | 8.3880 | 3.4960 | 18.4000 | 0.4920 |
| 12 | 04:00:08 | 8.3780 | 3.5060 | 18.4526 | 0.4910 |
| 13 | 08:00:17 | 8.3700 | 3.5140 | 18.4947 | 0.4903 |
| 14 | 12:00:25 | 8.3640 | 3.5200 | 18.5263 | 0.4897 |
| 15 | 24:00:44 | 8.3540 | 3.5300 | 18.5789 | 0.4887 |
| 16 | 25:25:22 | 8.3540 | 3.5300 | 18.5789 | 0.4887 |

# Consolidation Test Results
## (Sequence 13) Load 1600.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 14) Load 3200.000 kpa

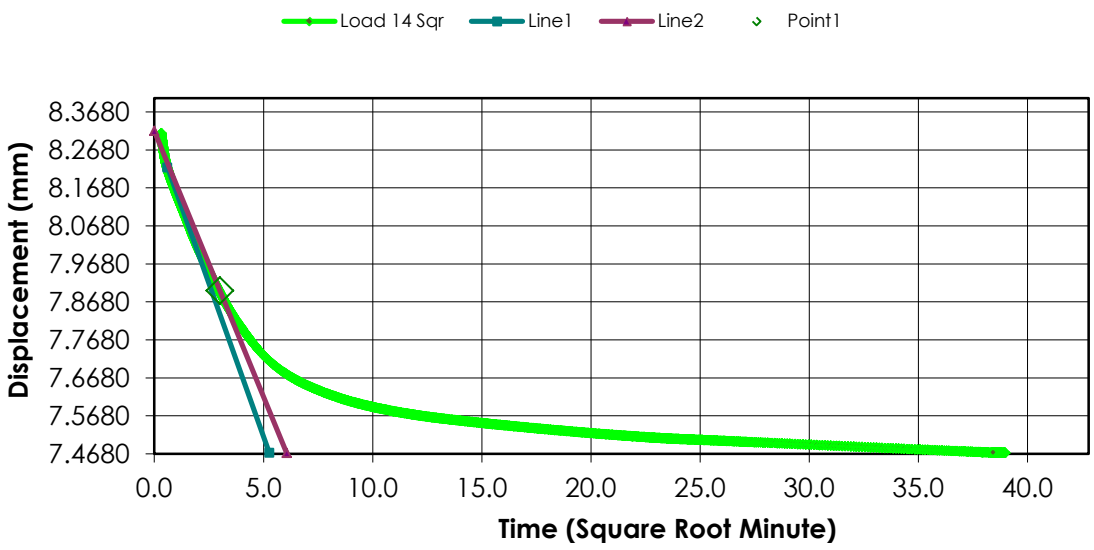
**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Jul-16
**Test Number:**

**Sample Number:** DC34 ST5 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 3.0-3.6m **Remarks:**
**Sample Type:** Undisturbed

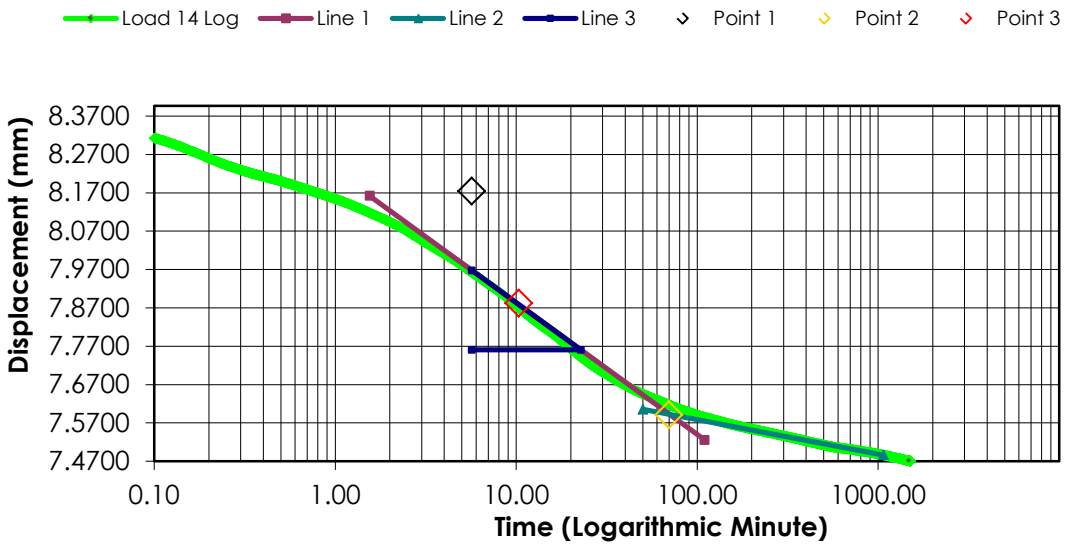
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.3540 | 3.5300 | 18.5789 | 0.4887 |
| 1 | 00:00:06 | 8.3120 | 3.5720 | 18.8000 | 0.4847 |
| 2 | 00:00:15 | 8.2420 | 3.6420 | 19.1684 | 0.4780 |
| 3 | 00:00:30 | 8.2000 | 3.6840 | 19.3895 | 0.4739 |
| 4 | 00:01:00 | 8.1540 | 3.7300 | 19.6316 | 0.4695 |
| 5 | 00:02:00 | 8.0940 | 3.7900 | 19.9474 | 0.4637 |
| 6 | 00:04:00 | 8.0100 | 3.8740 | 20.3895 | 0.4556 |
| 7 | 00:08:00 | 7.9120 | 3.9720 | 20.9053 | 0.4462 |
| 8 | 00:15:00 | 7.8100 | 4.0740 | 21.4421 | 0.4364 |
| 9 | 00:30:01 | 7.7020 | 4.1820 | 22.0105 | 0.4260 |
| 10 | 01:00:02 | 7.6300 | 4.2540 | 22.3895 | 0.4191 |
| 11 | 02:00:04 | 7.5800 | 4.3040 | 22.6526 | 0.4143 |
| 12 | 04:00:08 | 7.5460 | 4.3380 | 22.8316 | 0.4110 |
| 13 | 08:00:17 | 7.5140 | 4.3700 | 23.0000 | 0.4079 |
| 14 | 12:00:25 | 7.5000 | 4.3840 | 23.0737 | 0.4066 |
| 15 | 24:00:51 | 7.4720 | 4.4120 | 23.2211 | 0.4039 |
| 16 | 24:35:45 | 7.4720 | 4.4120 | 23.2211 | 0.4039 |

# Consolidation Test Results
## (Sequence 14) Load 3200.000 kpa

### Consolidation Graph (Squareroot Time)



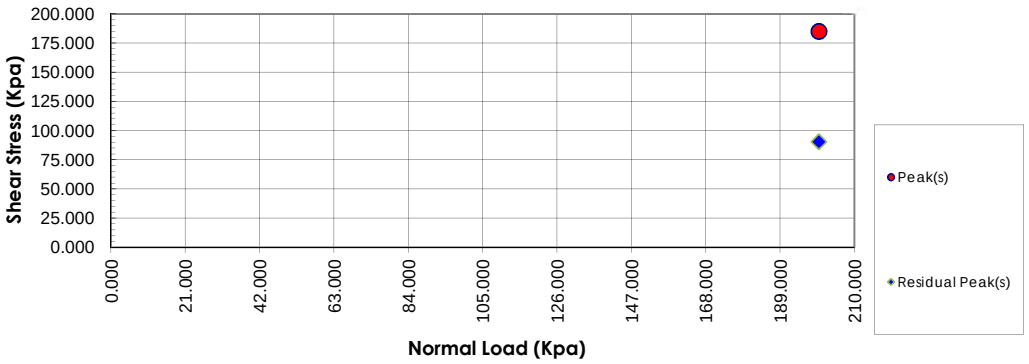

### Consolidation Graph (Logarithmic Time)

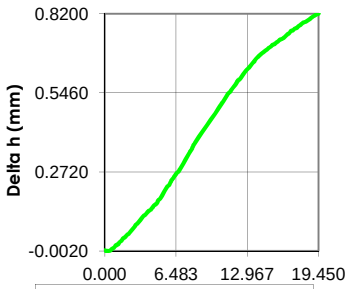


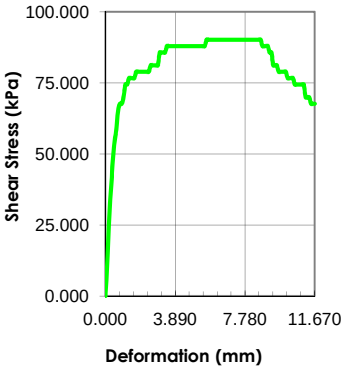
## Stantec Consulting Ltd.

### Direct Shear Test

Stantec




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 11.8 | | | |
| Density (g/cm3) | 1.947 | | | |
| Void Ratio | 0.386 | | | |
| Saturation (%) | 82.13 | | | |
| Diameter (mm) | 60.0 | | | |
| Height (mm) | 25.4 | | | |
| | | | | |

| Final | A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 10.9 | | | |
| Density (g/cm3) | 1.918 | | | |
| Void Ratio | 0.408 | | | |
| Saturation (%) | 84.55 | | | |
| Diameter (mm) | 60.0 | | | |
| Height (mm) | 24.304 | | | |
| Normal Stress (kPa) | 200.0 | | | |
| Peak Stress (kPa) | 184.9 | | | |
| Residual Stress (kPa) | 90.2 | | | |
| Strain (%) | 19.450 | | | |
| Rate (mm/min) | 0.008 | | | |
| | | | | |

| Project Date | |
|---|---|
| Date | 26-Apr-16 |

| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.210 |
| **Boring Number** | - |
| **Sample Number:** | DC3-SS6 |
| **Depth:** | 5.0-5.1 m |
| **Sample Type:** | Undisturbed |
| **Description:** | Dark Brown Sandy Clay Trace Gravel |
| **Test Type:** | Direct Shear |
| **Remarks:** | Remolded sample at in-sinu moisture content. |

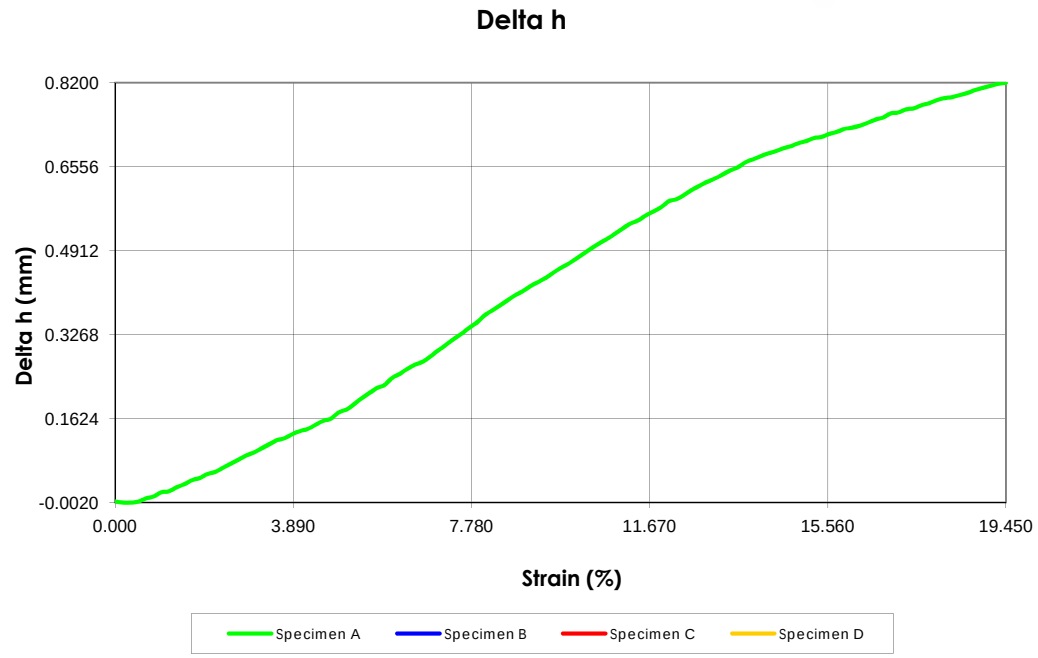
Reviewed By:C.Lamoureux

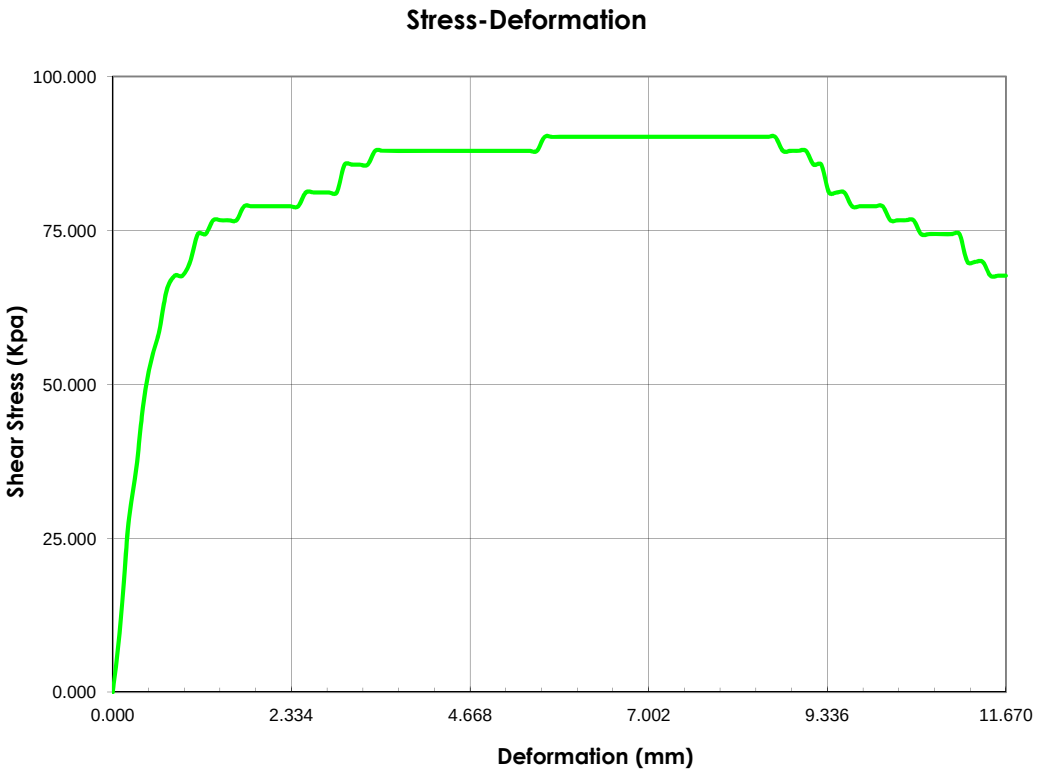
Date: 26-Apr-16

Tested By: C.Tollifson

**Stantec Consulting Ltd.**
**Direct Shear Test**

Stantec

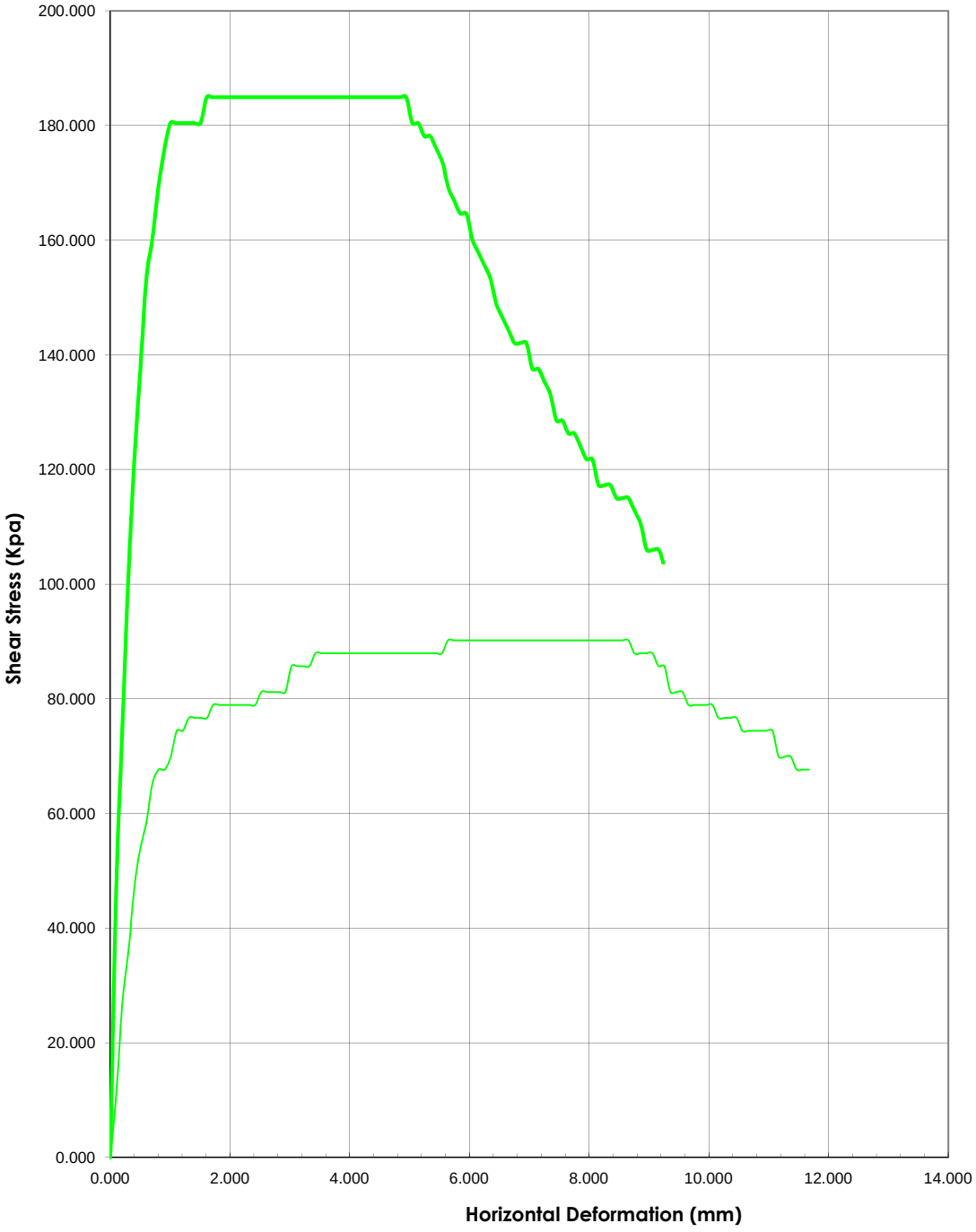


**Stantec Consulting Ltd.**
**Direct Shear Test**

Stantec

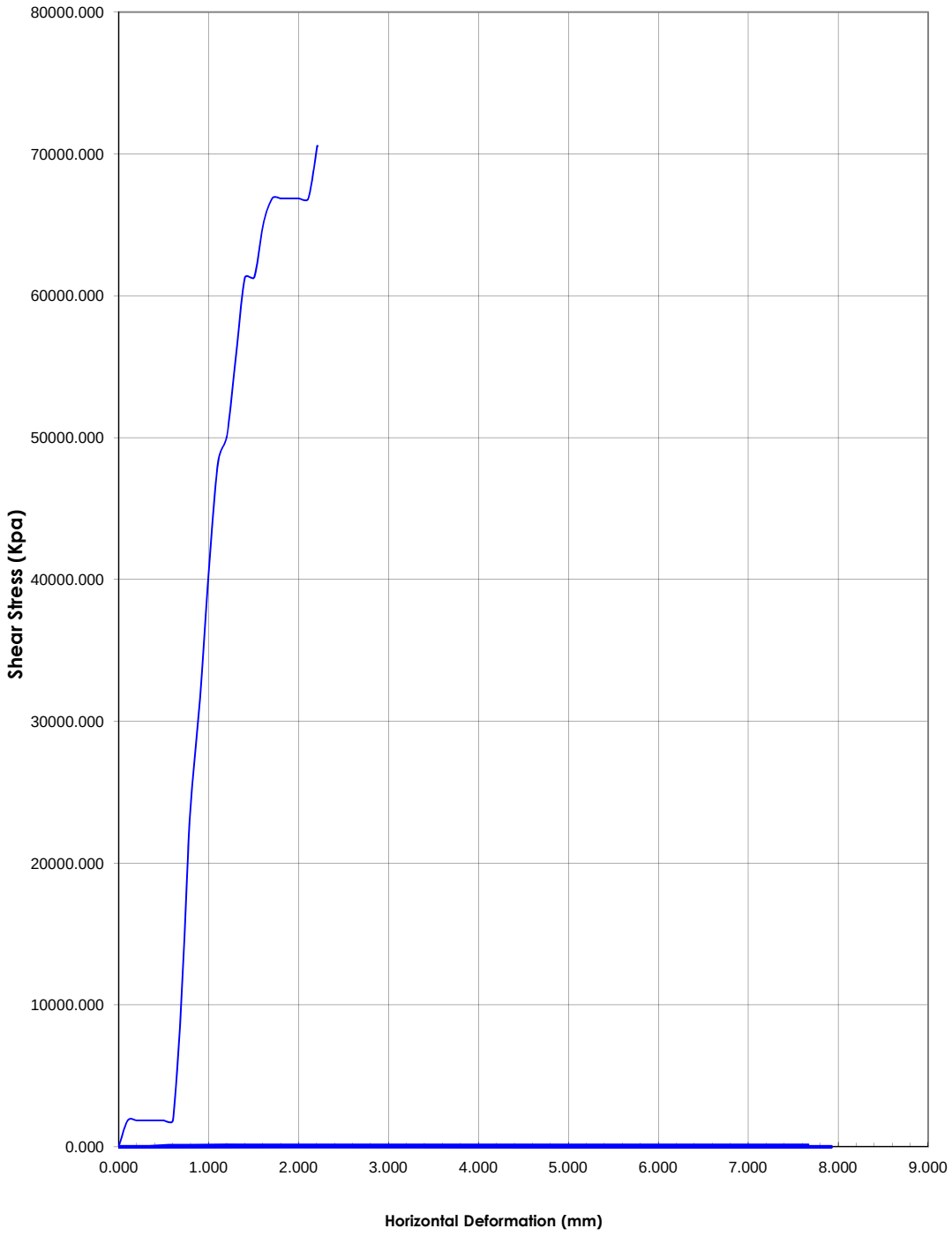
## Specimen A Stress-Deformation



**Stantec Consulting Ltd.**
**Direct Shear Test**

Stantec

## Specimen B Stress-Deformation



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

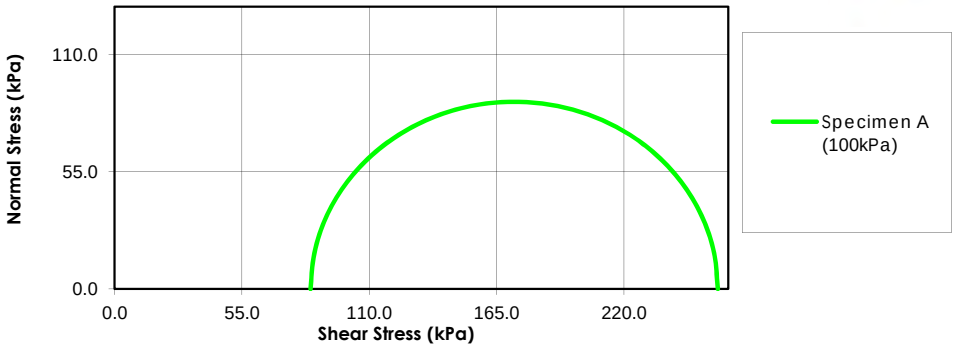
Stantec

Reviewed By C.Lamoureux

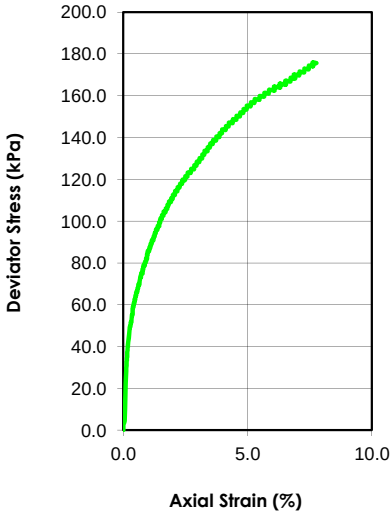
Date: 28-Apr-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.0 | | | |
| Dry Density (g/cm3) | 1.867 | | | |
| Saturation (%) | 84.94 | | | |
| Void Ratio | 0.443 | | | |
| Diameter (mm) | 69.6 | | | |
| Height (mm) | 146.2 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 13.1 | | | |
| Dry Density (g/cm3) | 1.914 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.410 | | | |
| Effective Stress (kPa) | 101.4 | | | |
| Back Press. (kPa) | 338.6 | | | |
| Rate of Strain | 0.016 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 260.50 | | | |
| σ'3 at Failure (kPa) | 84.65 | | | |
| | | | | |
| | | | | |

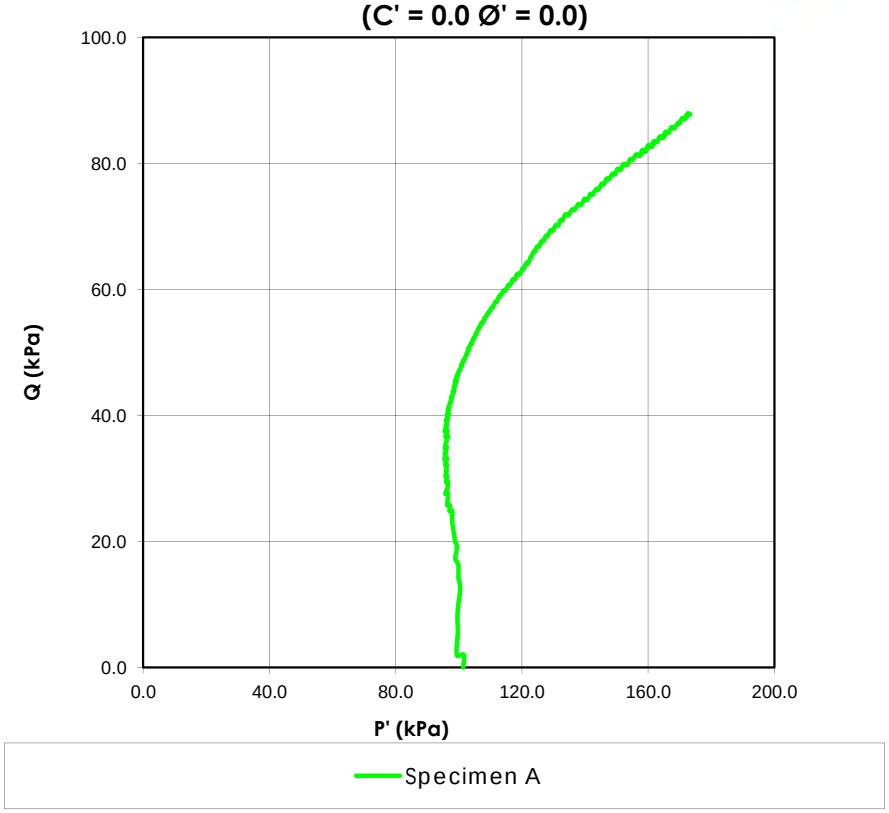
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC1-BSC |
| **Depth:** | 5.0-6.0m |
| **Sample Type:** | Undisturbed |
| **Description:** | Dark Brown Sandy Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

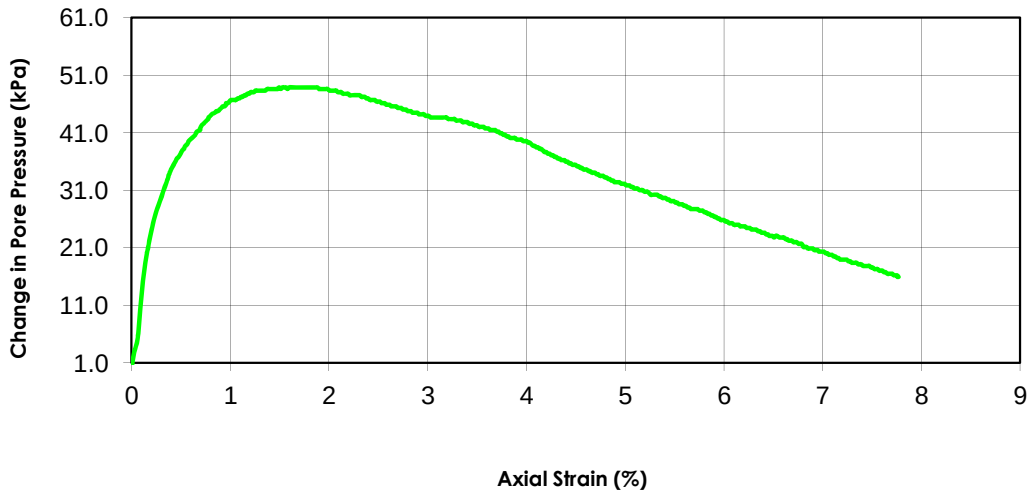
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

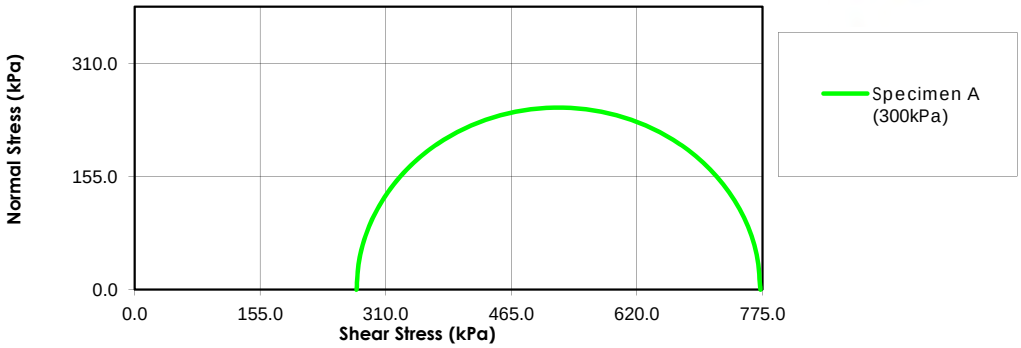
Stantec

Reviewed By C.Lamoureux

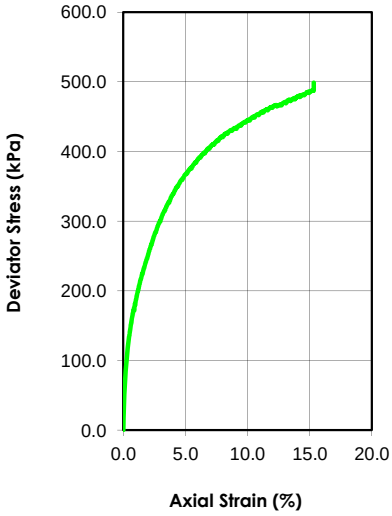
Date: 7-Apr-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 10.6 | | | |
| Dry Density (g/cm3) | 1.903 | | | |
| Saturation (%) | 68.63 | | | |
| Void Ratio | 0.416 | | | |
| Diameter (mm) | 72.4 | | | |
| Height (mm) | 145.5 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 8.7 | | | |
| Dry Density (g/cm3) | 1.976 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.367 | | | |
| Effective Stress (kPa) | 273.4 | | | |
| Back Press. (kPa) | 426.6 | | | |
| Rate of Strain | 0.0152 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

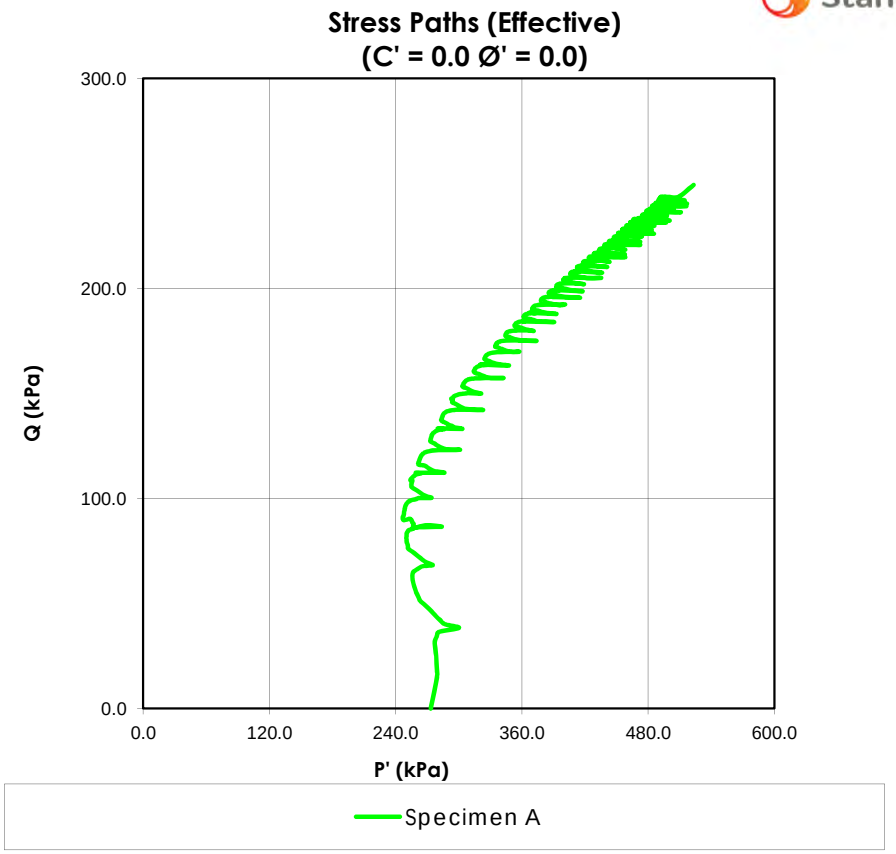
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 772.51 | | | |
| σ'3 at Failure (kPa) | 273.97 | | | |
| | | | | |
| | | | | |

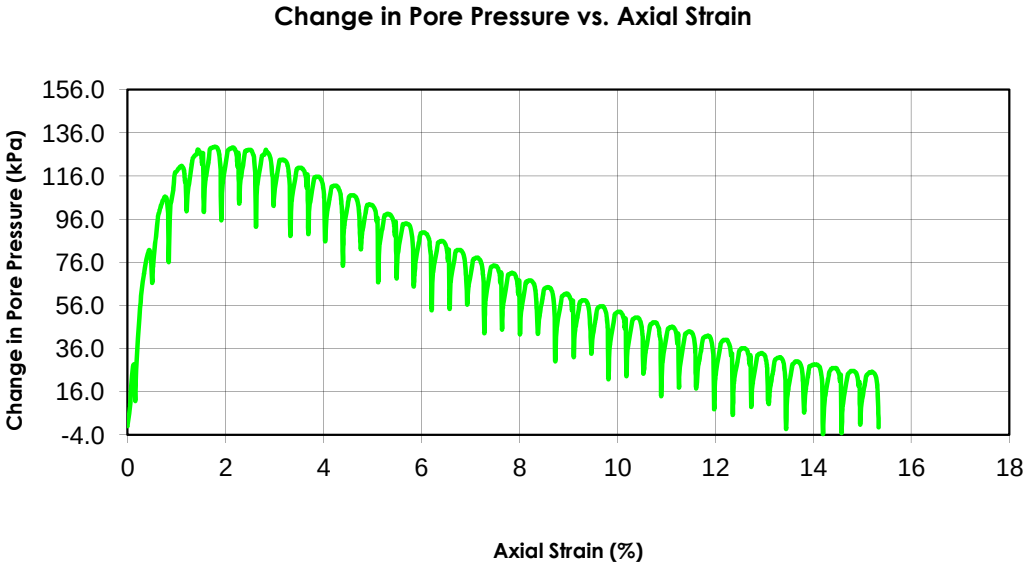
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC2-ST4 |
| **Depth:** | 3.0-3.5m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay Some Sand and Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | Large rock inside specimen observed post-test |

**Stantec Consulting Ltd.**

**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

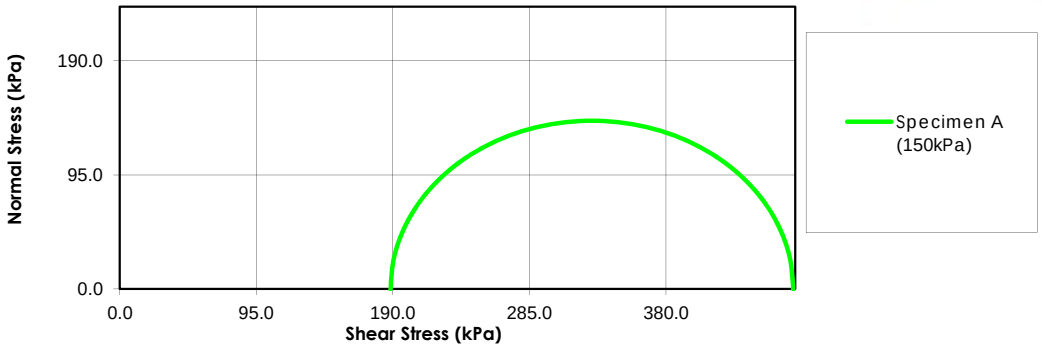
Stantec

Reviewed By C.Lamoureux

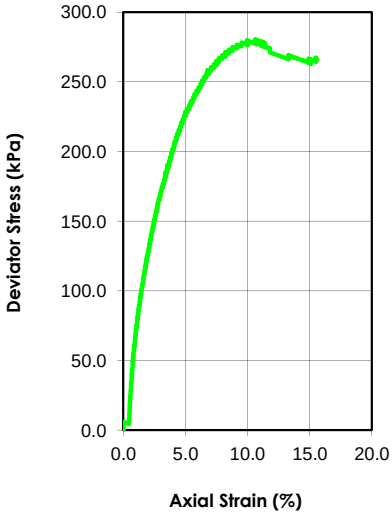
Date: 21-Apr-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 12.3 | | | |
| Dry Density (g/cm3) | 1.854 | | | |
| Saturation (%) | 72.77 | | | |
| Void Ratio | 0.453 | | | |
| Diameter (mm) | 55.0 | | | |
| Height (mm) | 115.6 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 9.6 | | | |
| Dry Density (g/cm3) | 1.83 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.474 | | | |
| Effective Stress (kPa) | 178.5 | | | |
| Back Press. (kPa) | 331.5 | | | |
| Rate of Strain | 0.012 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

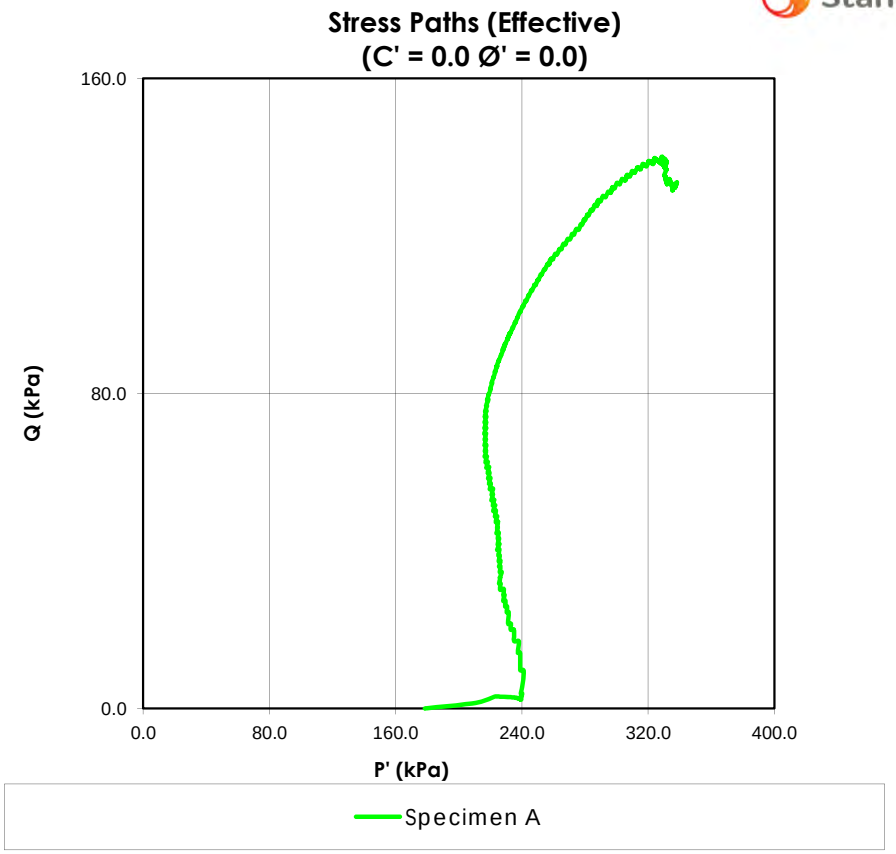
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 468.64 | | | |
| σ'3 at Failure (kPa) | 188.42 | | | |
| | | | | |
| | | | | |

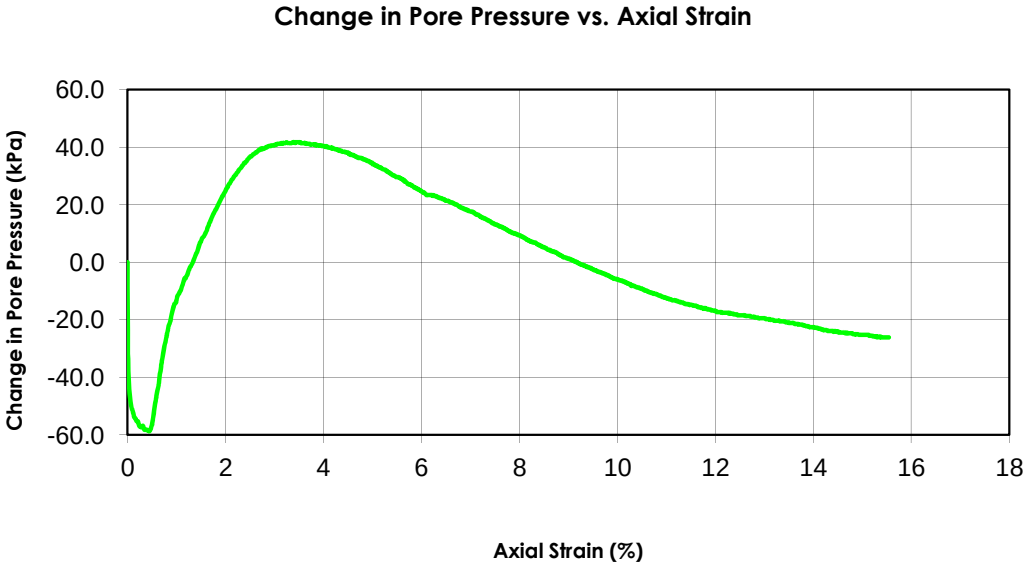
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC4-ST3 |
| **Depth:** | 1.5-2.0m |
| **Sample Type:** | Undisturbed |
| **Description:** | Grey Clay Some Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

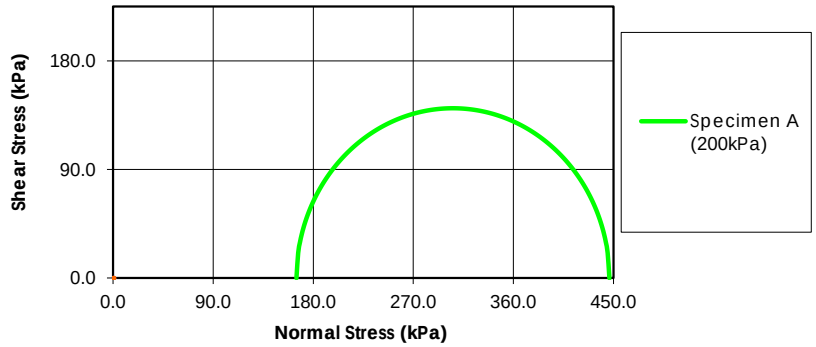
Stantec

Reviewed By C. Lamoureux

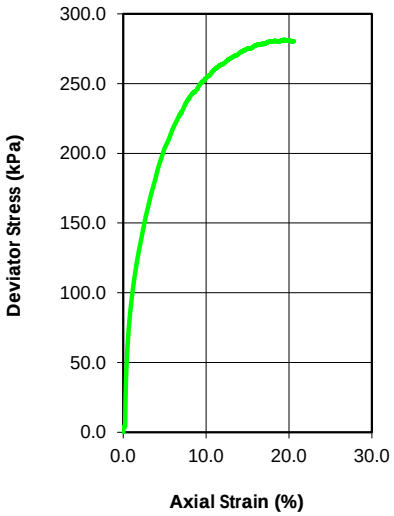
Date: 22-Jun-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 11.4 | | | |
| Dry Density (g/cm3) | 1.889 | | | |
| Saturation (%) | 71.47 | | | |
| Void Ratio | 0.430 | | | |
| Diameter (mm) | 71.20 | | | |
| Height (mm) | 155.00 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 8.5 | | | |
| Dry Density (g/cm3) | 1.894 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.426 | | | |
| Effective Stress (kPa) | 226.6 | | | |
| Back Press. (kPa) | 133.4 | | | |
| Rate of Strain | 0.022 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

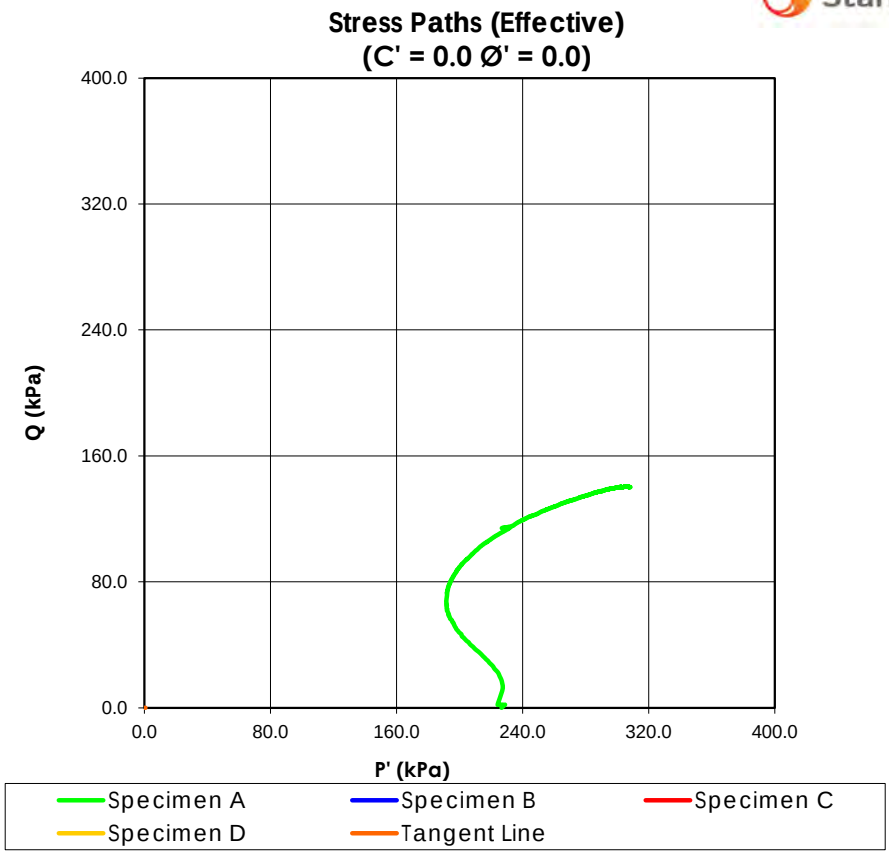
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 446.30 | | | |
| σ'3 at Failure (kPa) | 164.91 | | | |
| | | | | |
| | | | | |

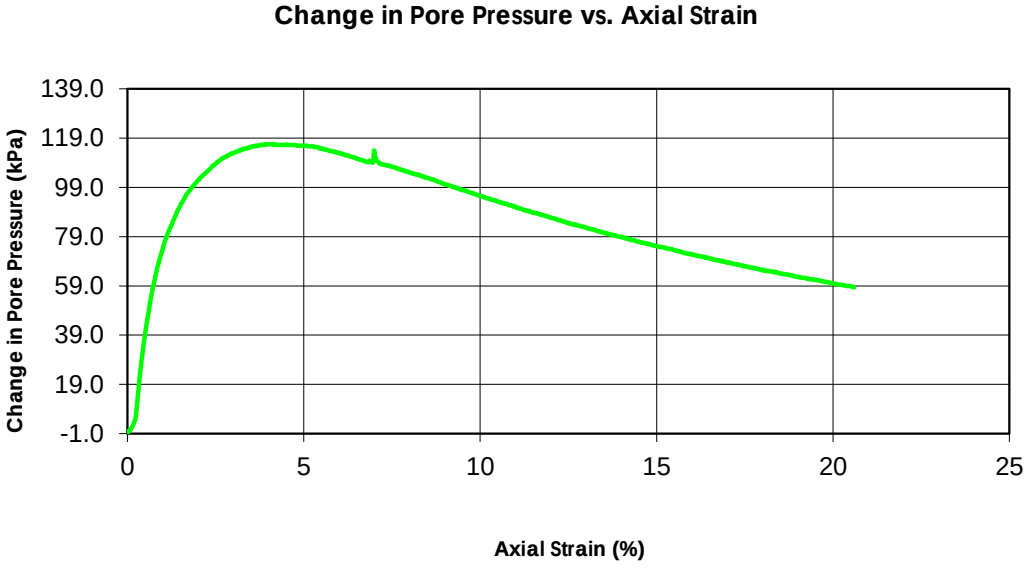
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC8 ST5 |
| **Depth:** | 3.0-3.6m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, Some Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

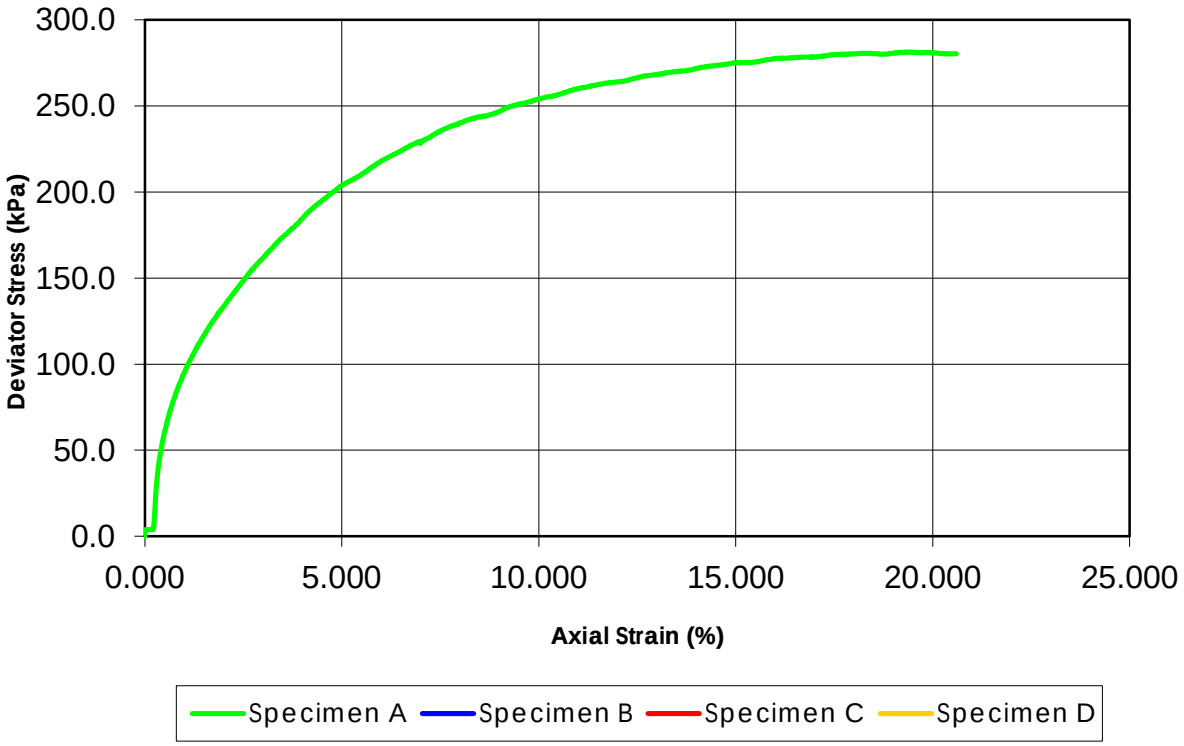
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

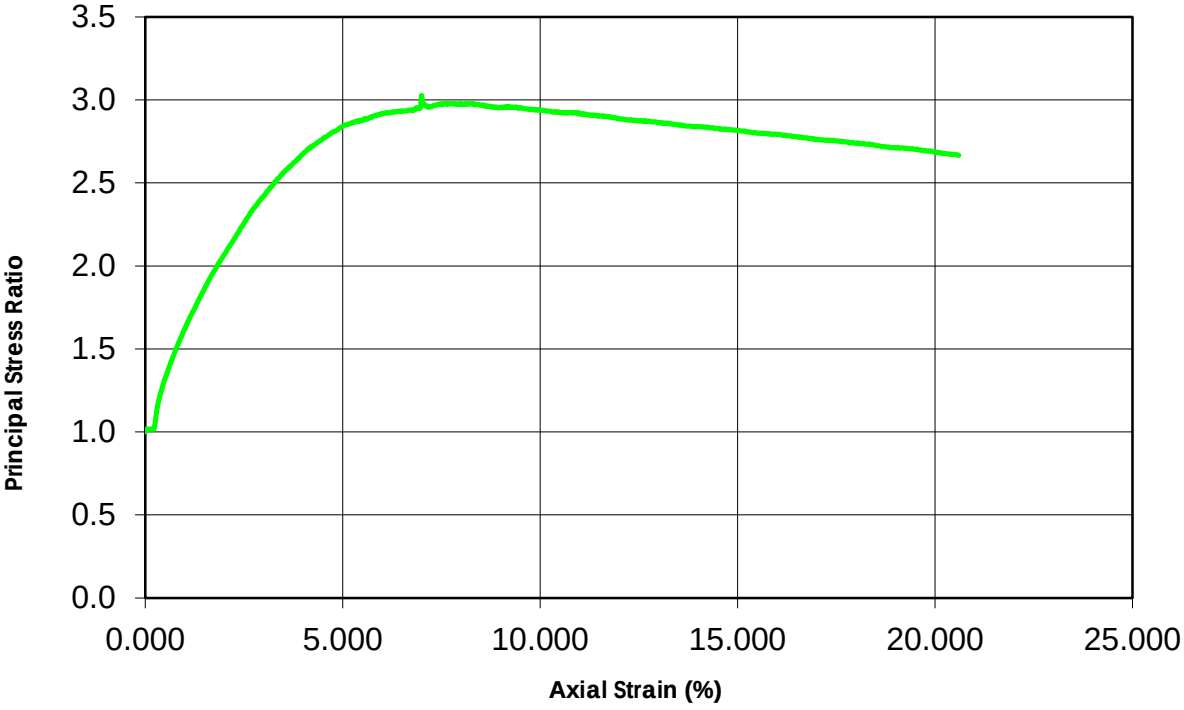


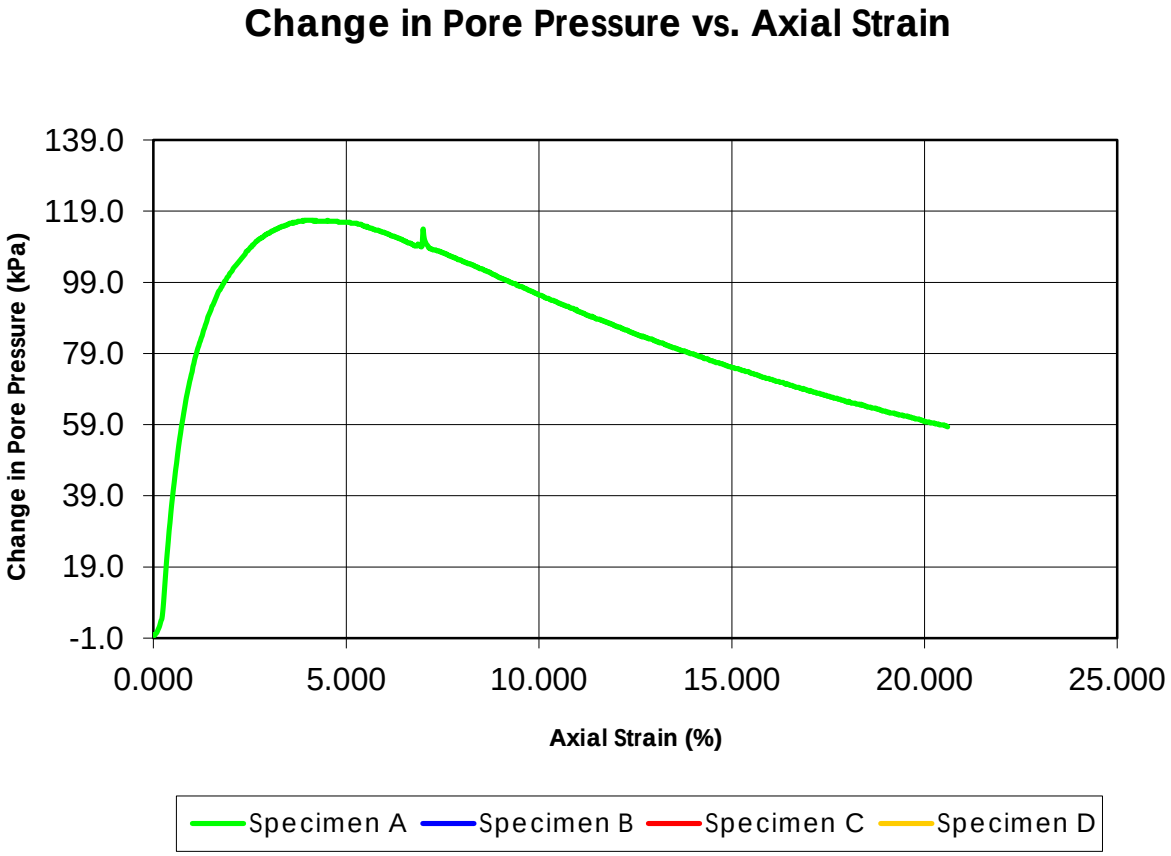



## Deviator Stress vs. Axial Strain



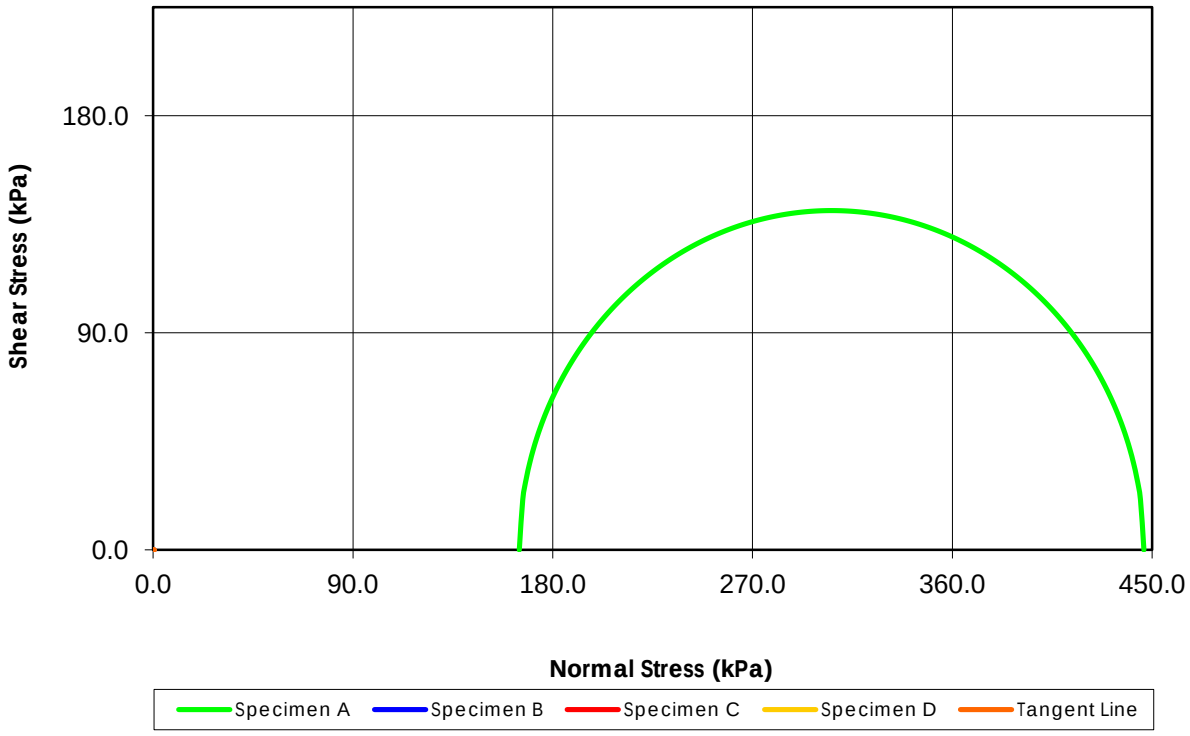

## Principal Stress Ratio vs. Axial Strain



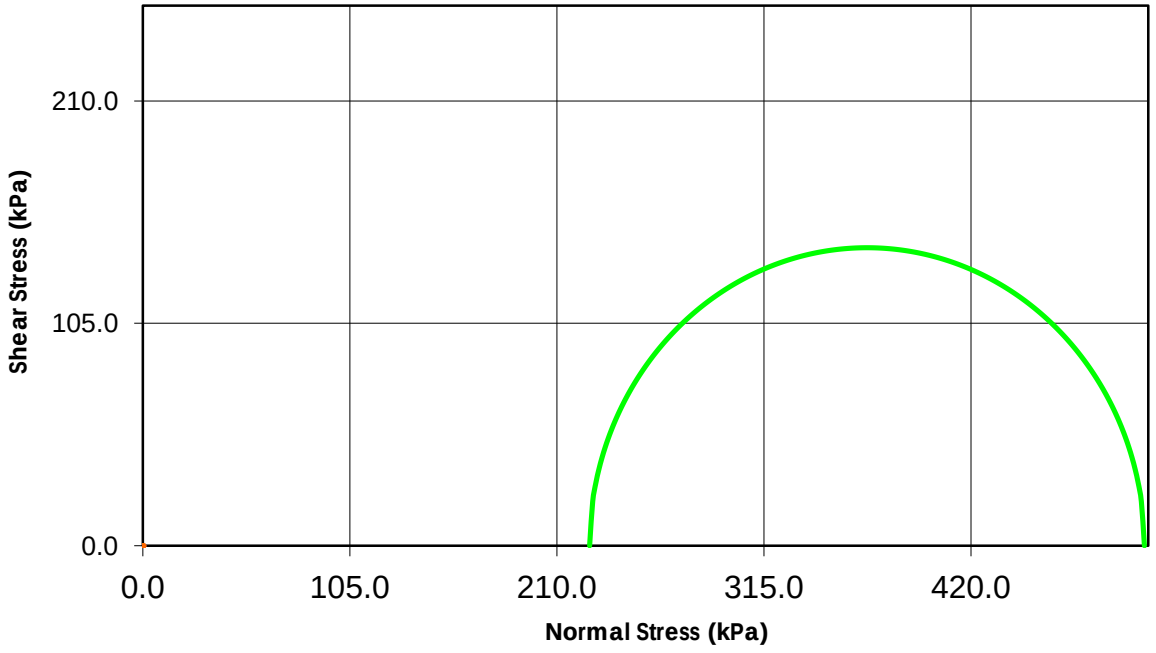

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
139.0
119.0
99.0
79.0
59.0
39.0
19.0
-1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

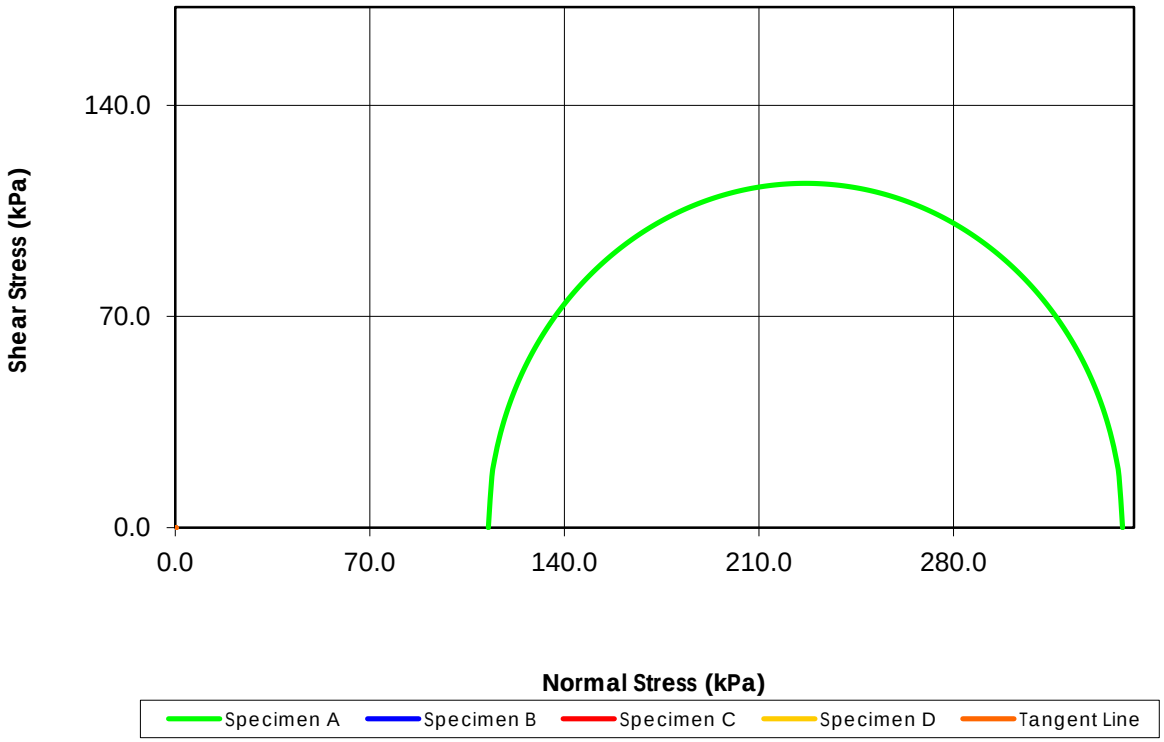



### Total Stress
### (C = 0.0 Ø = 0.0)

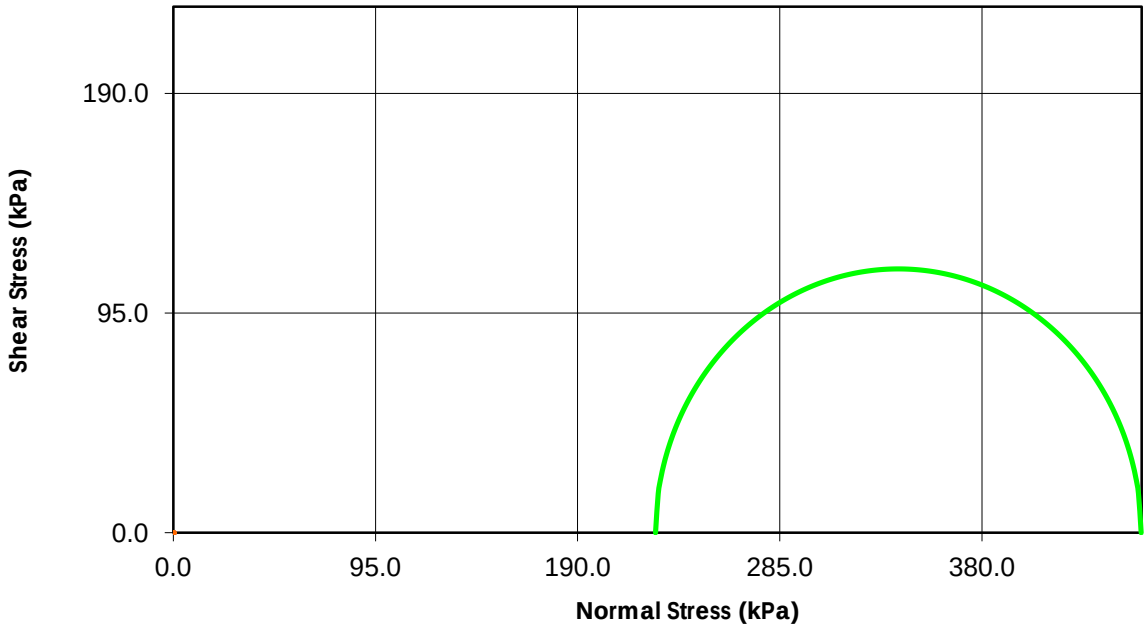


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

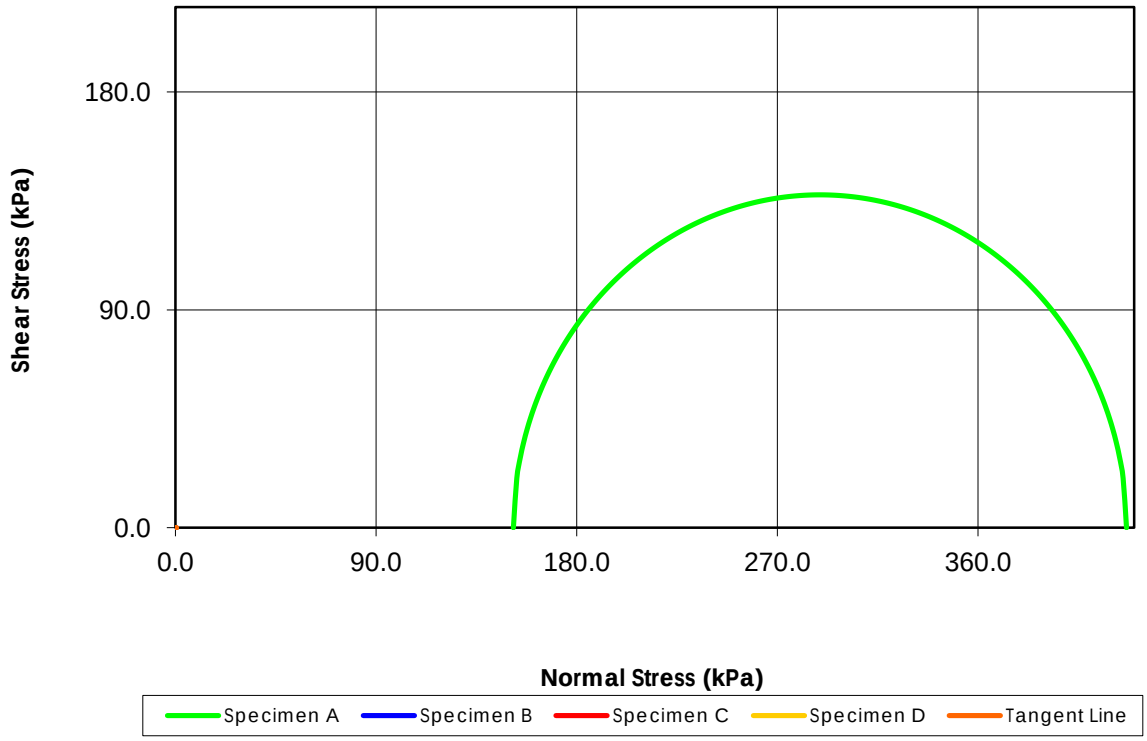



## Total Stress
## (C = 0.0 Ø = 0.0)

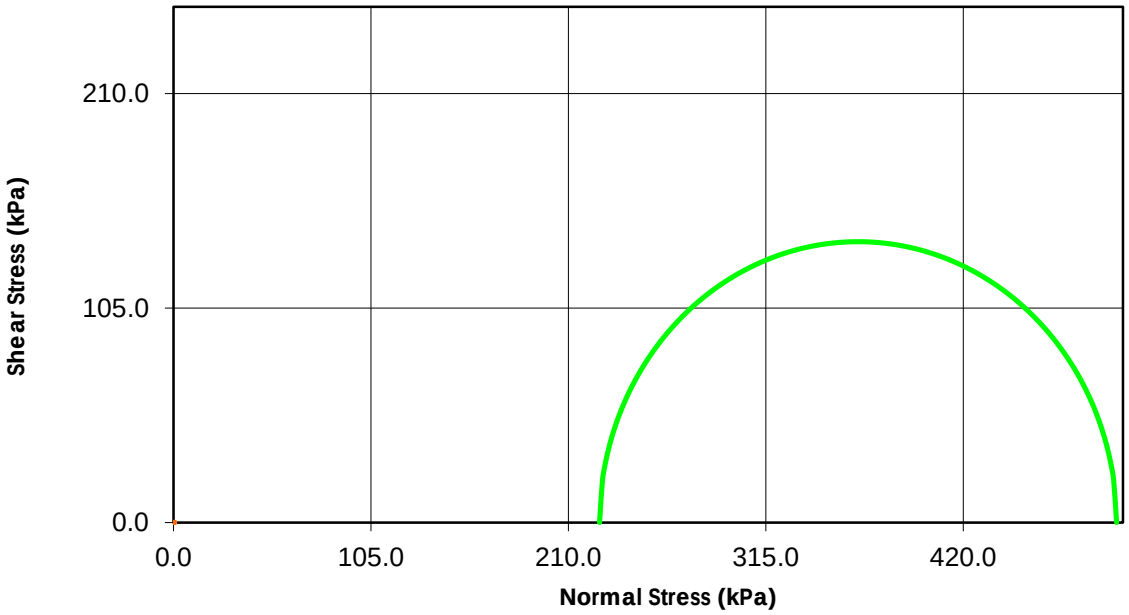


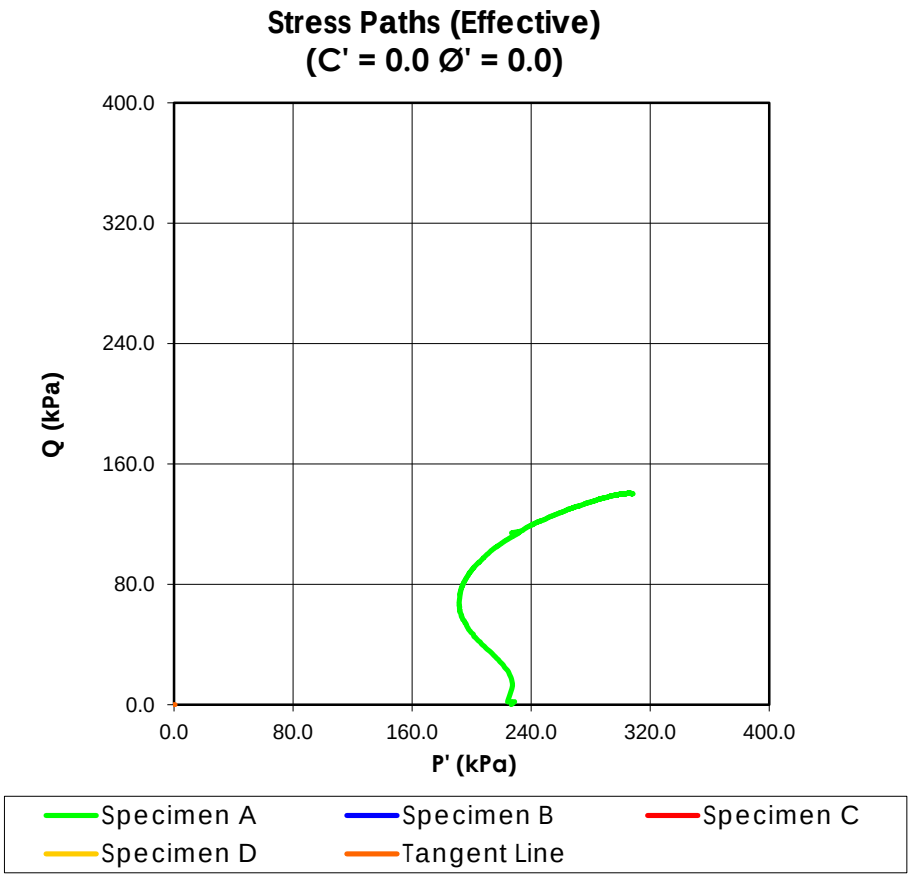
# Mohr Stress Circles at 15% Axial Strain Criterion

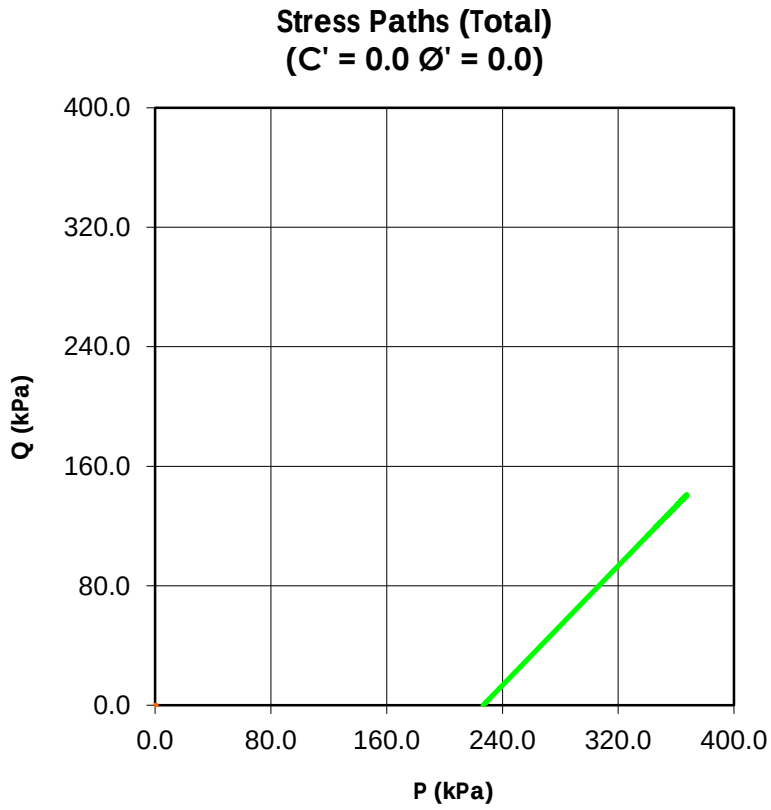
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

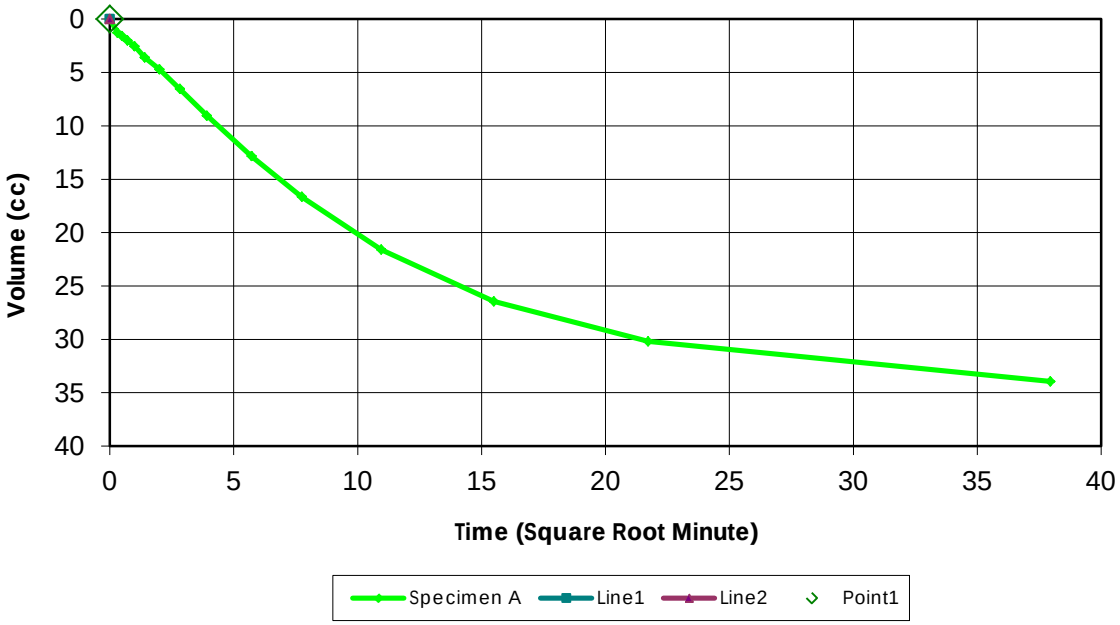



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

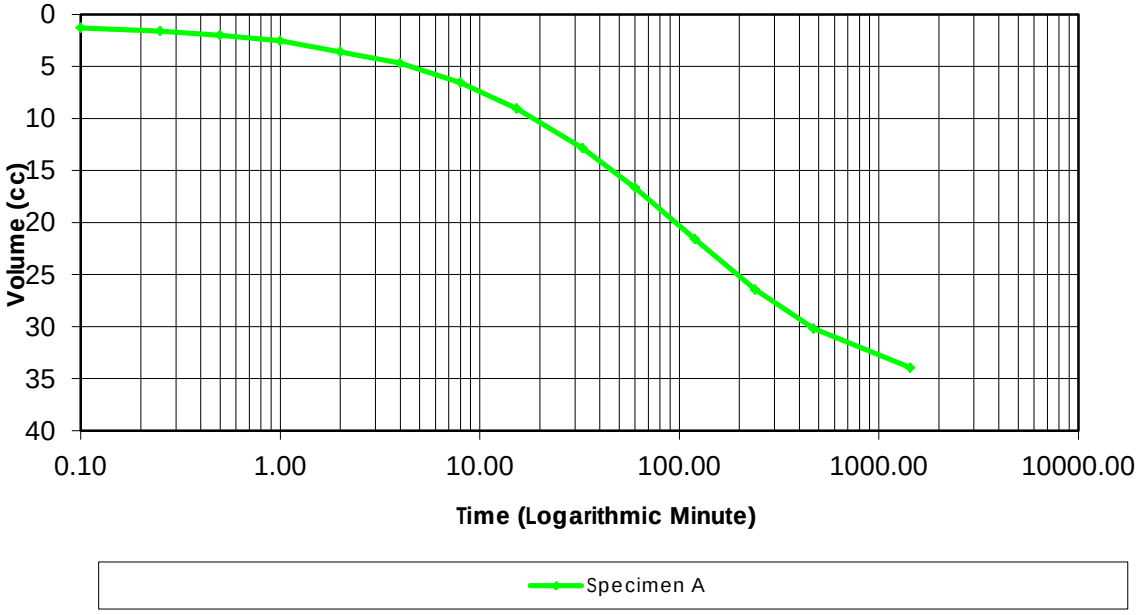

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 100.0 | 60.0 | 20.0 | 0.0 | 0.24 |
| 3 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 4 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 5 | 120.0 | 80.0 | 20.0 | 0.0 | 0.67 |
| 6 | 120.0 | 100.0 | 0.0 | 20.0 | |
| 7 | 120.0 | 100.0 | 0.0 | 0.0 | |
| 8 | 140.0 | 100.0 | 20.0 | 0.0 | 0.78 |
| 9 | 140.0 | 120.0 | 0.0 | 20.0 | |
| 10 | 140.0 | 120.0 | 0.0 | 0.0 | |
| 11 | 160.0 | 120.0 | 20.0 | 0.0 | 0.83 |
| 12 | 160.0 | 140.0 | 0.0 | 20.0 | |
| 13 | 160.0 | 140.0 | 0.0 | 0.0 | |
| 14 | 200.0 | 140.0 | 40.0 | 0.0 | 0.95 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.0-3.6m

| | |
|---|---|
| Cell Pressure (kPa) | 360 |
| Back Pressure (kPa) | 160 |
| Effective Pressure (kPa) | 200 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71.2 |
| Initial Sample Height (mm) | 155 |
| Initial Sample Area (cm2) | 39.81 |
| Initial Volume (cm3) | 617.1 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 42.55 | N/A |
| 00:00:06 | 41.25 | 1.300 |
| 00:00:15 | 40.95 | 1.600 |
| 00:00:30 | 40.55 | 2.000 |
| 00:01:00 | 40.00 | 2.550 |
| 00:02:00 | 38.95 | 3.600 |
| 00:04:00 | 37.85 | 4.700 |
| 00:08:00 | 36.00 | 6.550 |
| 00:15:20 | 33.50 | 9.050 |
| 00:32:45 | 29.70 | 12.850 |
| 01:00:00 | 25.90 | 16.650 |
| 02:00:00 | 20.95 | 21.600 |
| 04:00:00 | 16.10 | 26.450 |
| 07:52:00 | 12.35 | 30.200 |
| 24:00:00 | 8.60 | 33.950 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

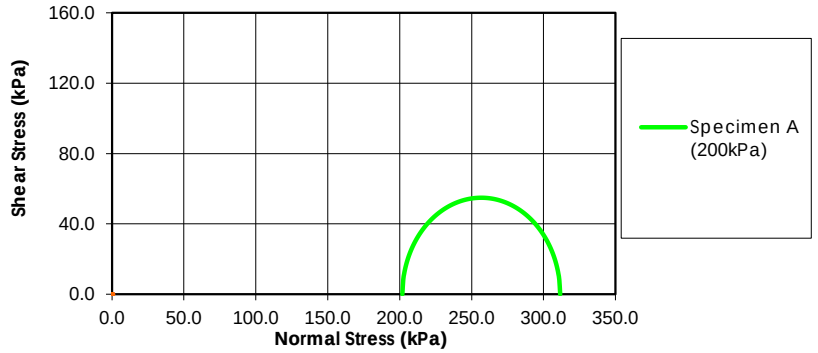
Stantec

Reviewed By: C. Lamoureux

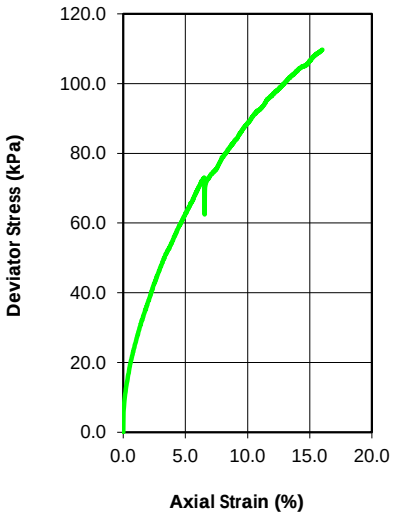
Date: 4-Jun-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.7 | | | |
| Dry Density (g/cm3) | 1.956 | | | |
| Saturation (%) | 104.45 | | | |
| Void Ratio | 0.380 | | | |
| Diameter (mm) | 70.10 | | | |
| Height (mm) | 140.10 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 12.8 | | | |
| Dry Density (g/cm3) | 1.980 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.364 | | | |
| Effective Stress (kPa) | 139.9 | | | |
| Back Press. (kPa) | 240.1 | | | |
| Rate of Strain | 0.017 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

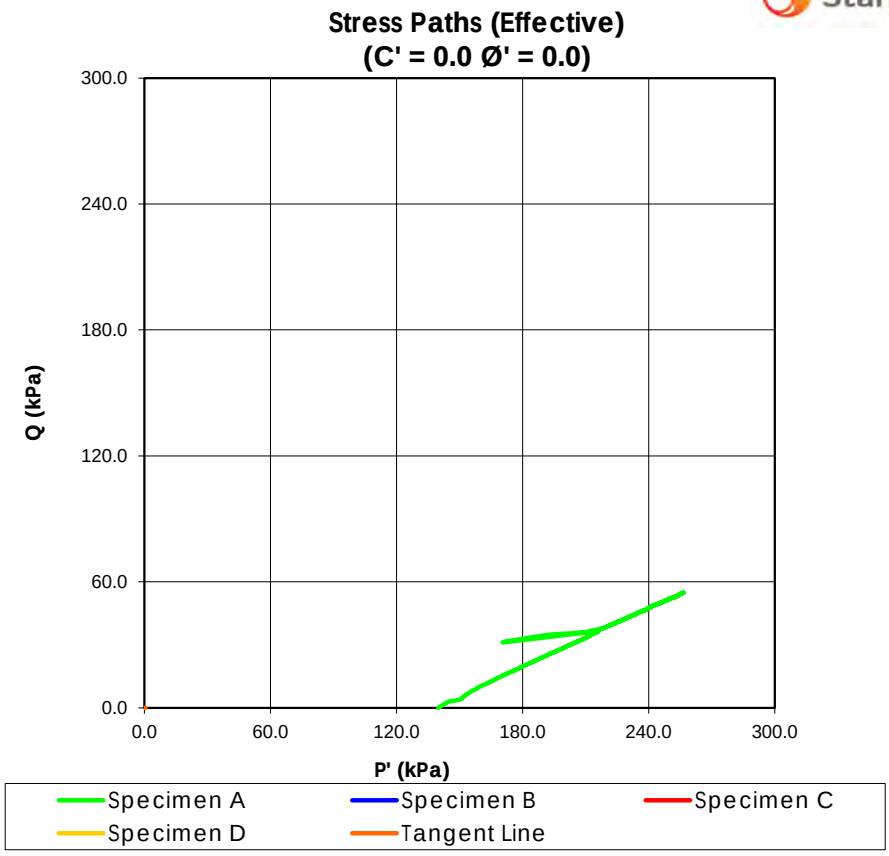
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 311.59 | | | |
| σ'3 at Failure (kPa) | 201.86 | | | |
| | | | | |
| | | | | |

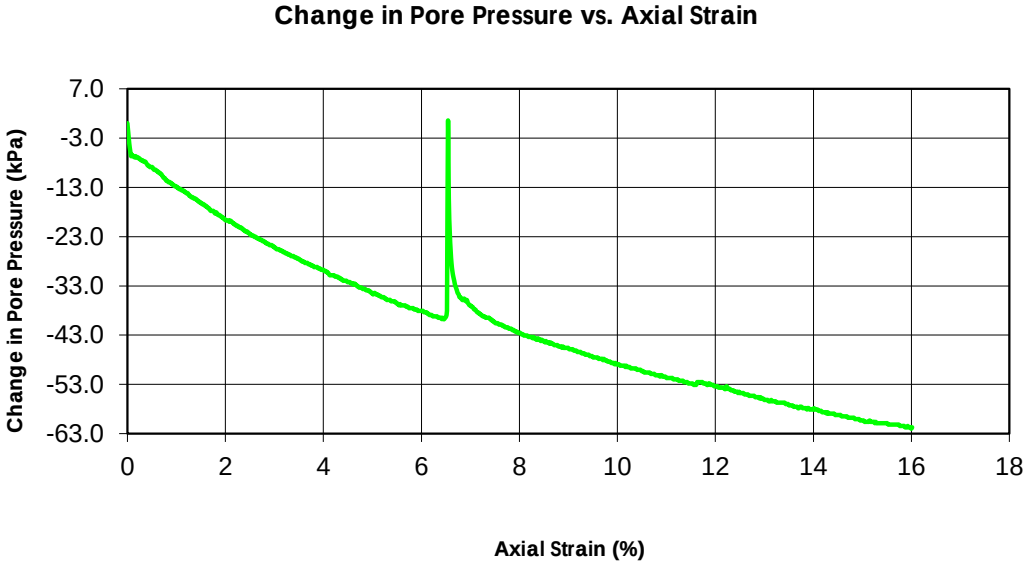
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC11 BS22 |
| **Depth:** | 16.2-16.4m |
| **Sample Type:** | Undisturbed |
| **Description:** | Dark Brown Clay, Trace Sand/Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

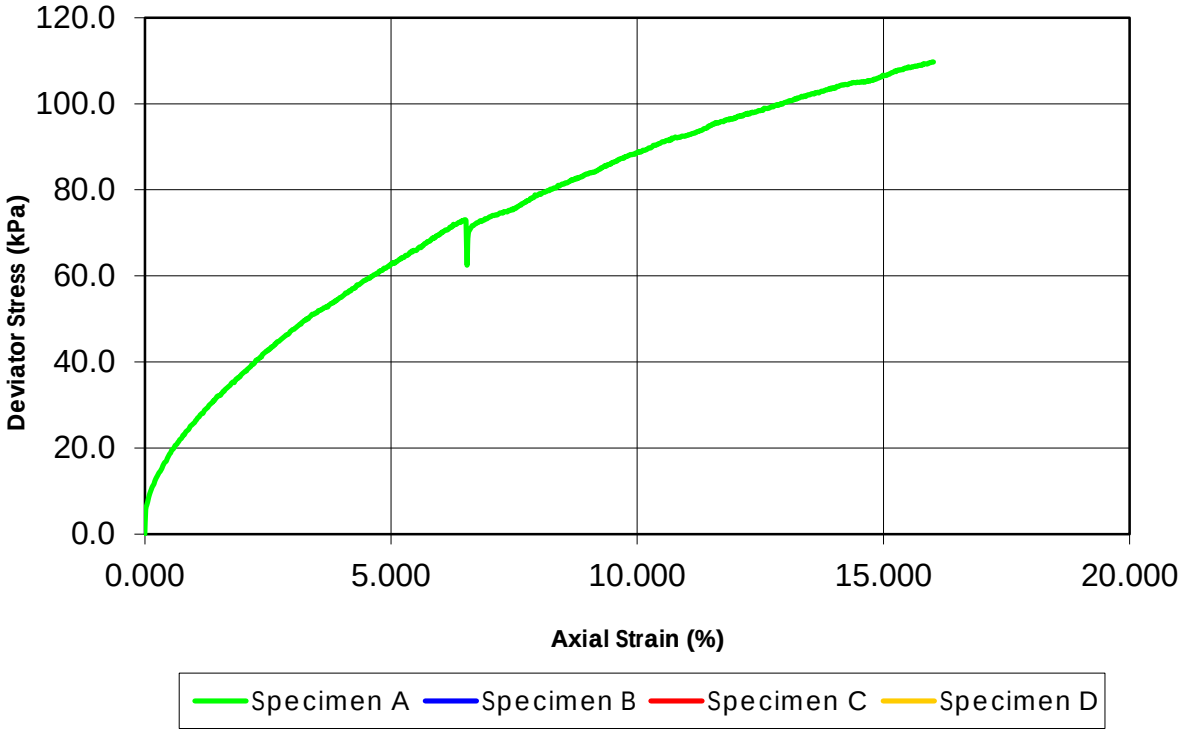
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

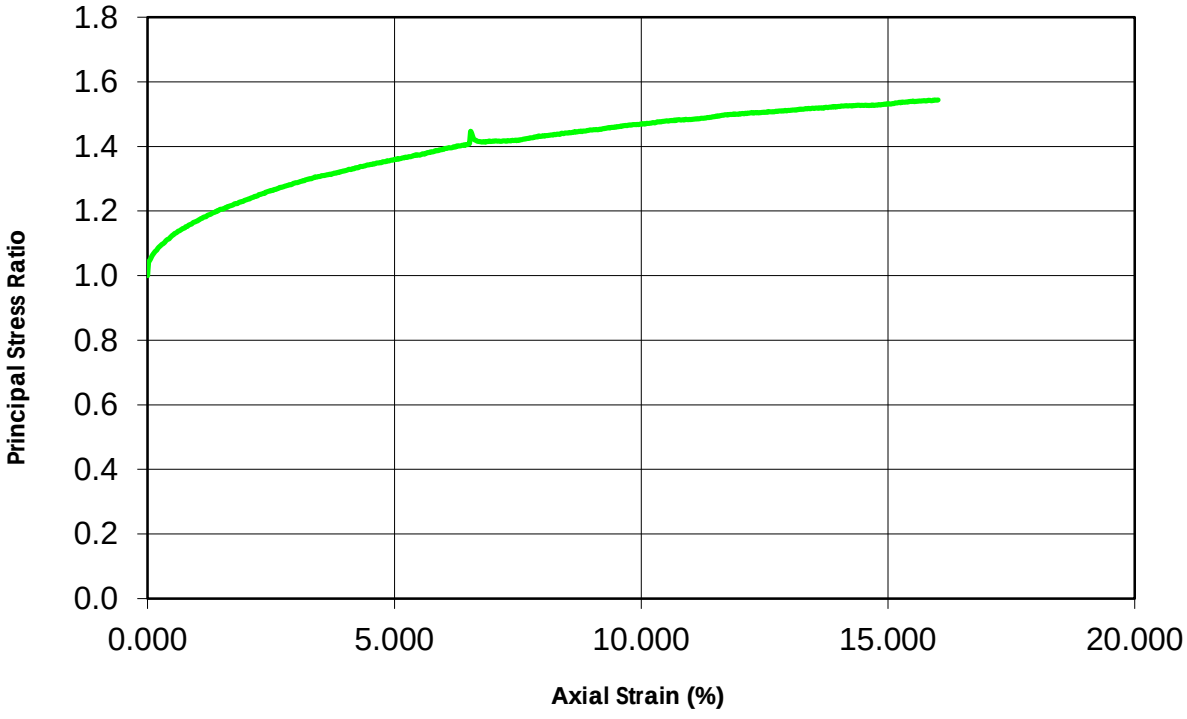


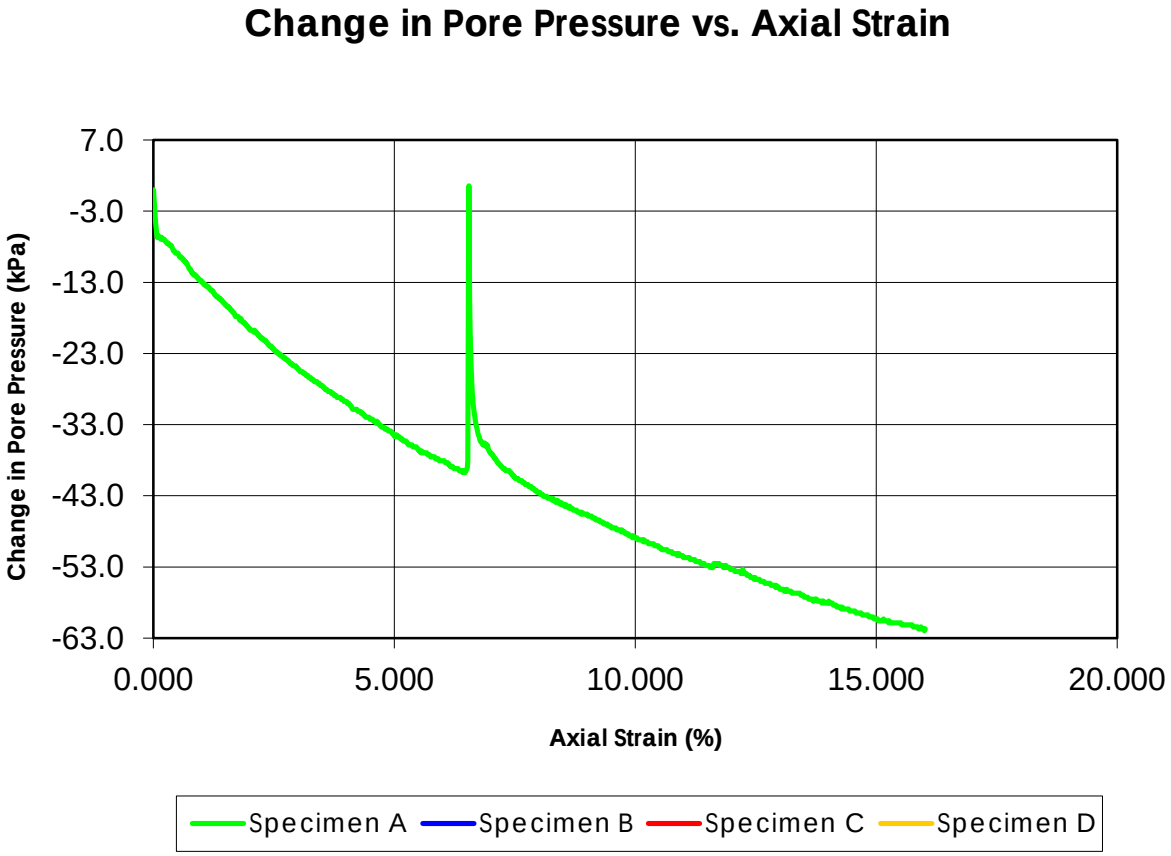



## Deviator Stress vs. Axial Strain



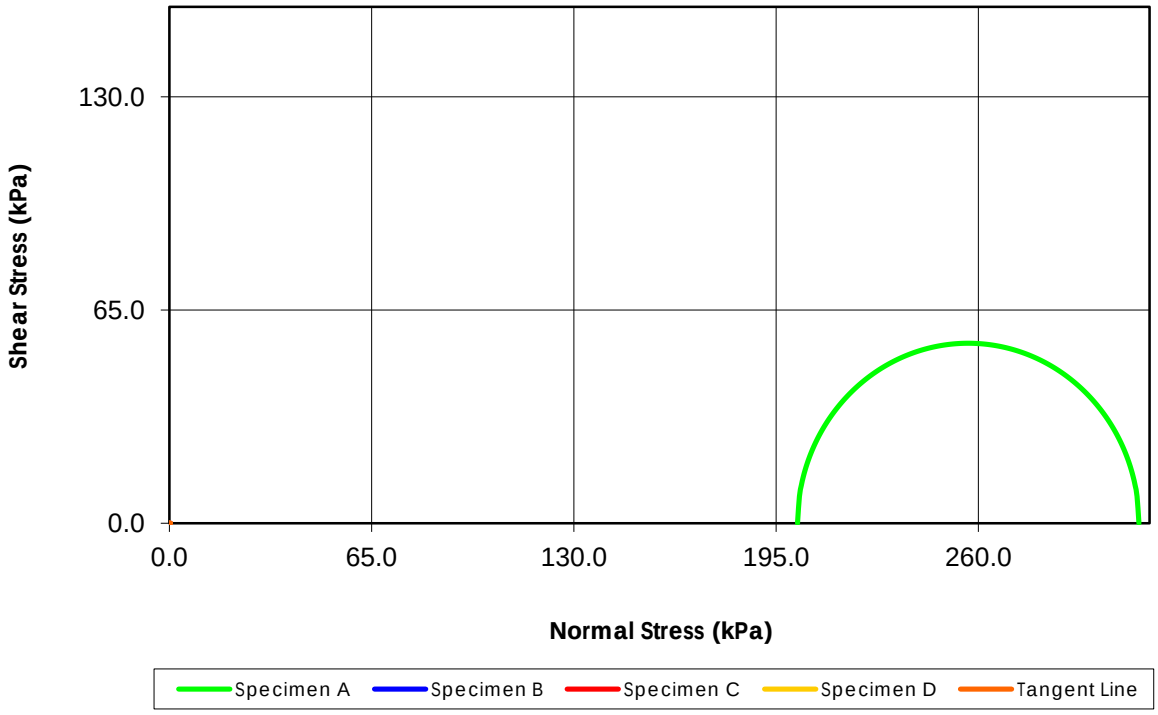

## Principal Stress Ratio vs. Axial Strain



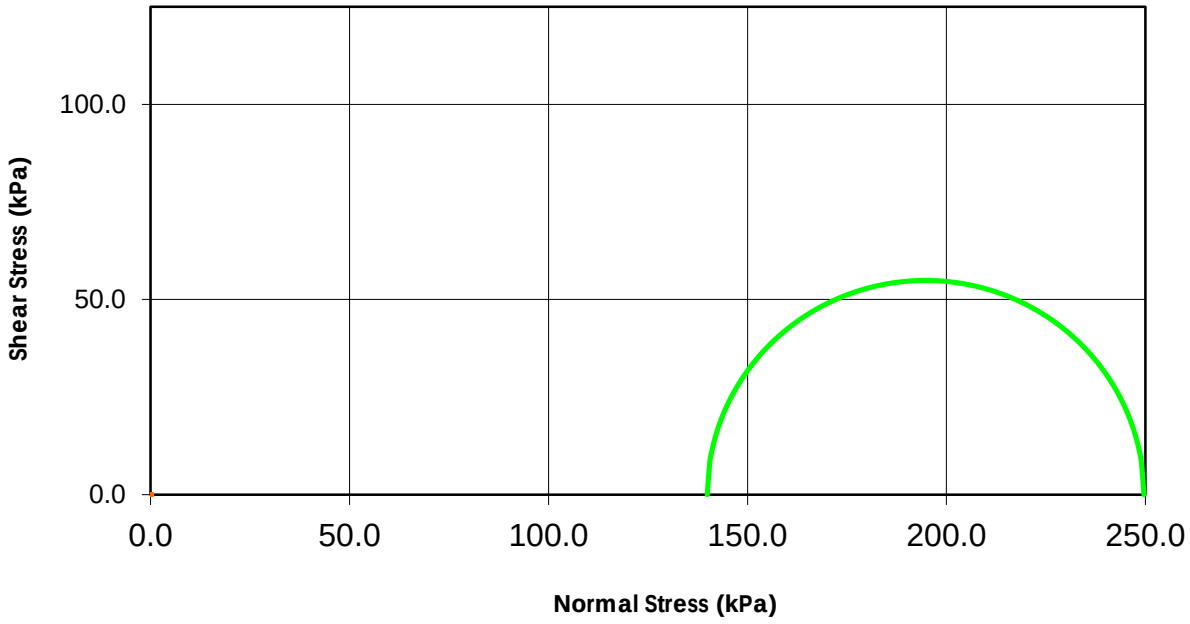

Change in Pore Pressure vs. Axial Strain
7.0
-3.0
-13.0
-23.0
-33.0
-43.0
-53.0
-63.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

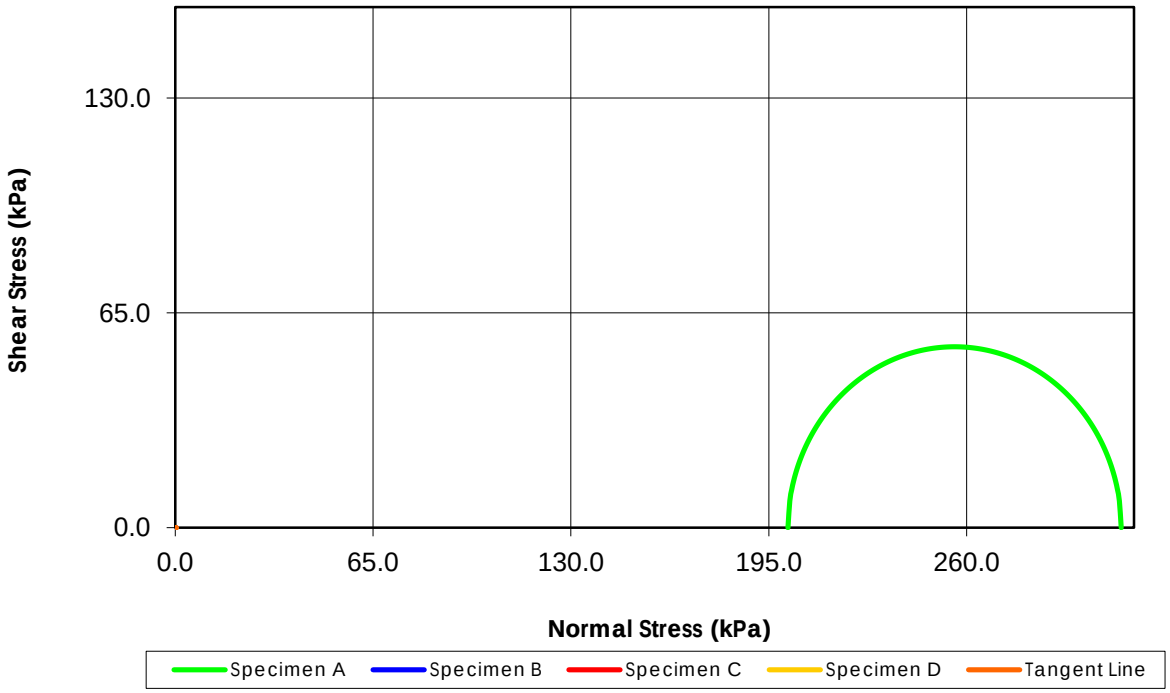



### Total Stress
### (C = 0.0 Ø = 0.0)

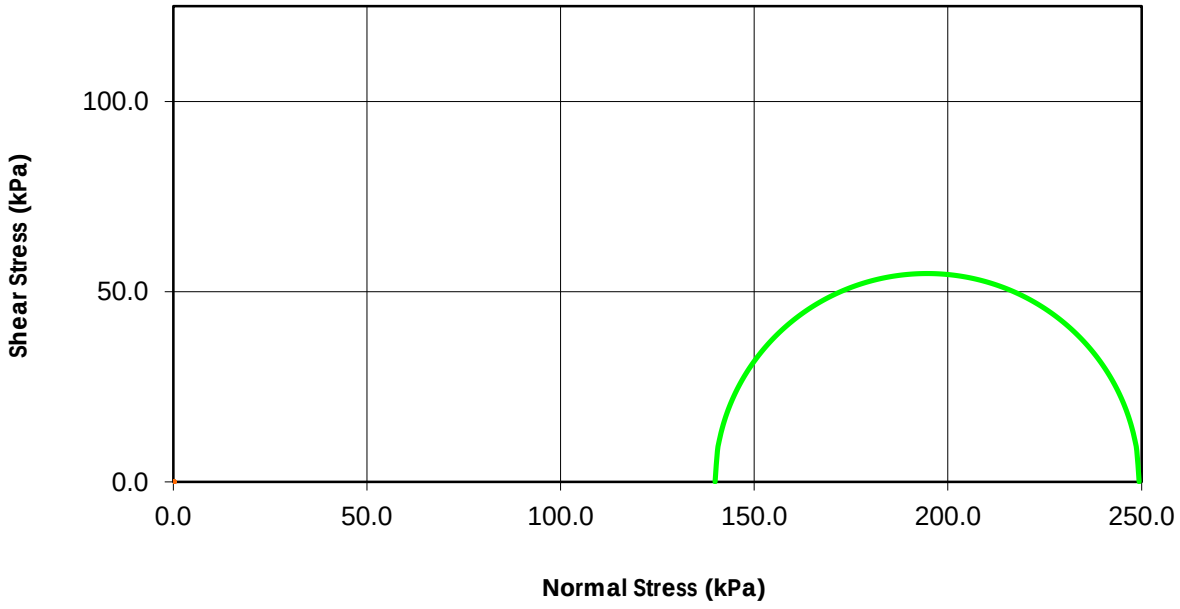


## Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

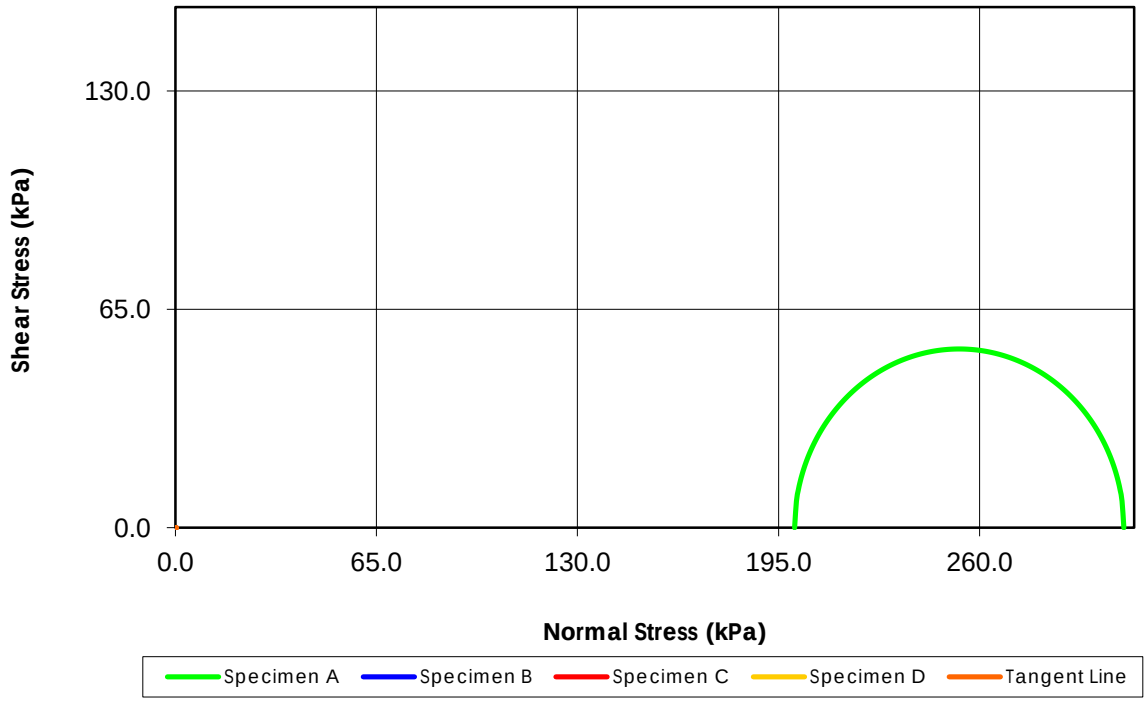



### Total Stress
### (C = 0.0 Ø = 0.0)

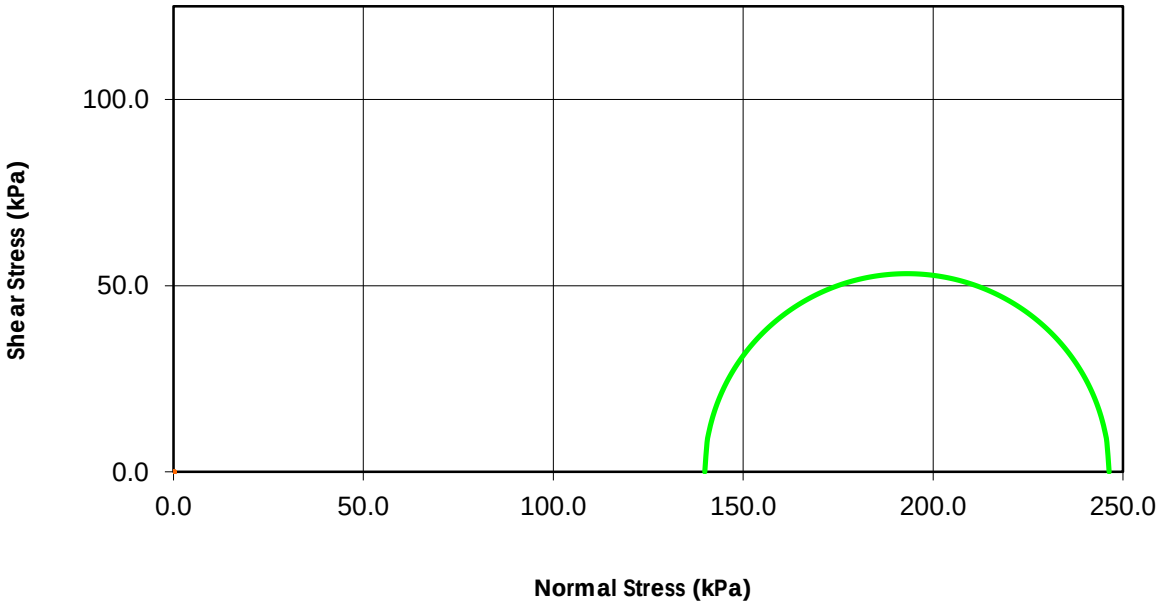


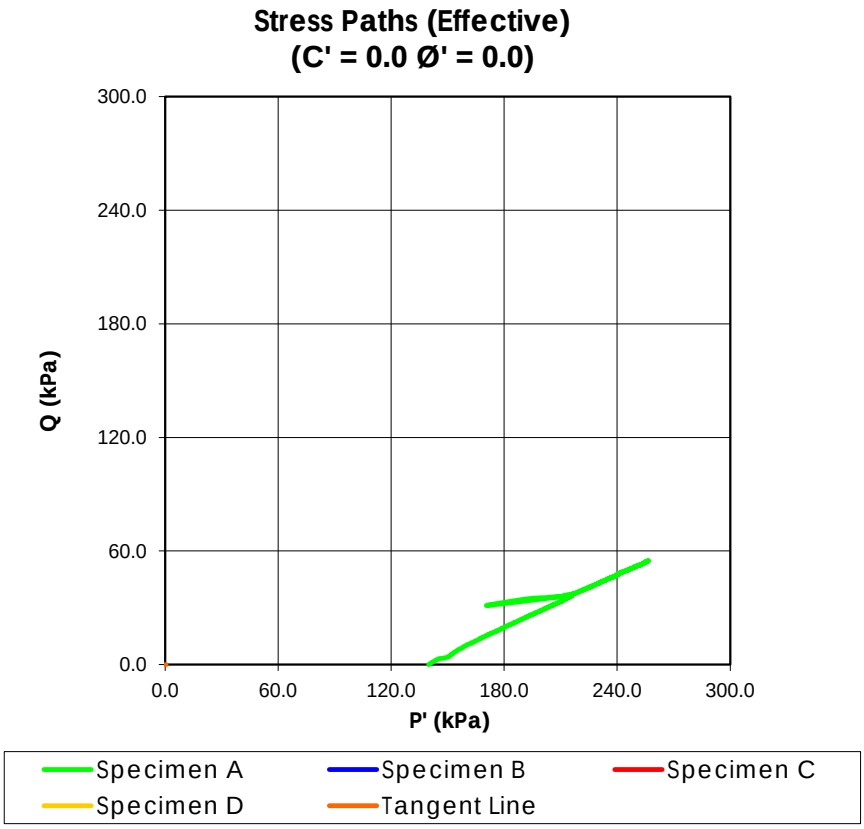
# Mohr Stress Circles at 15% Axial Strain Criterion

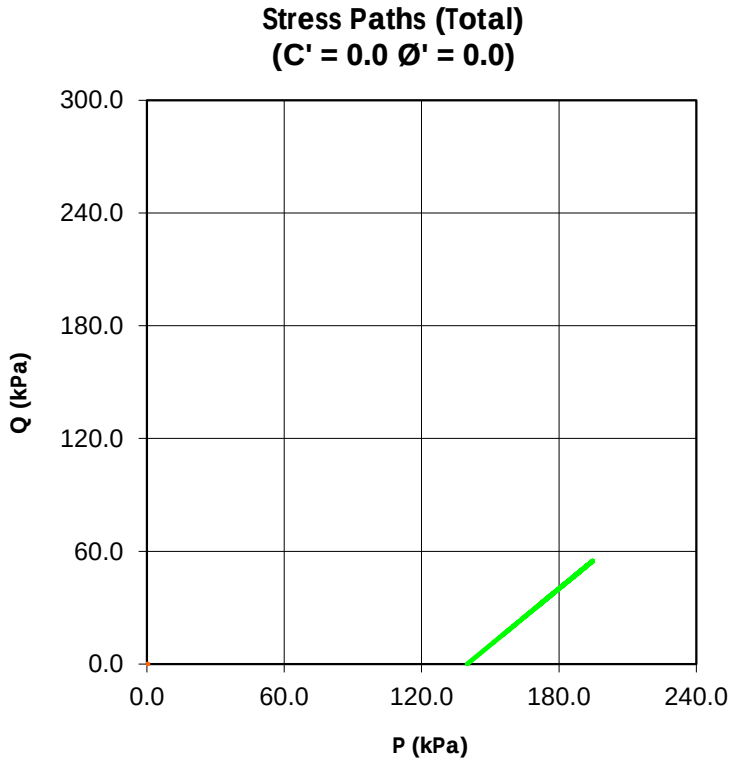
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

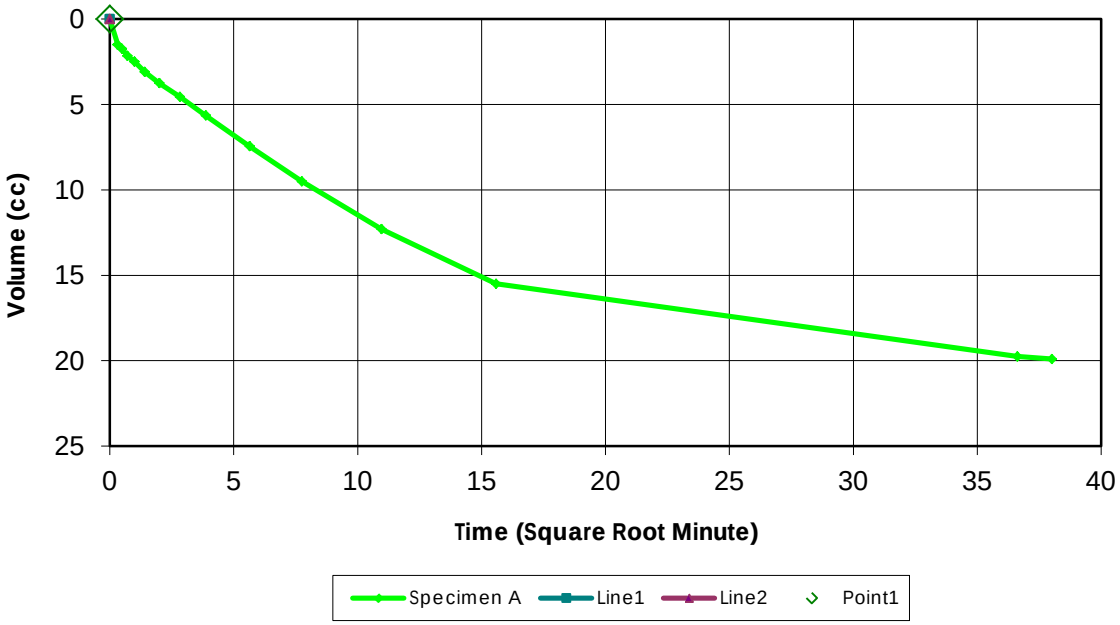



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

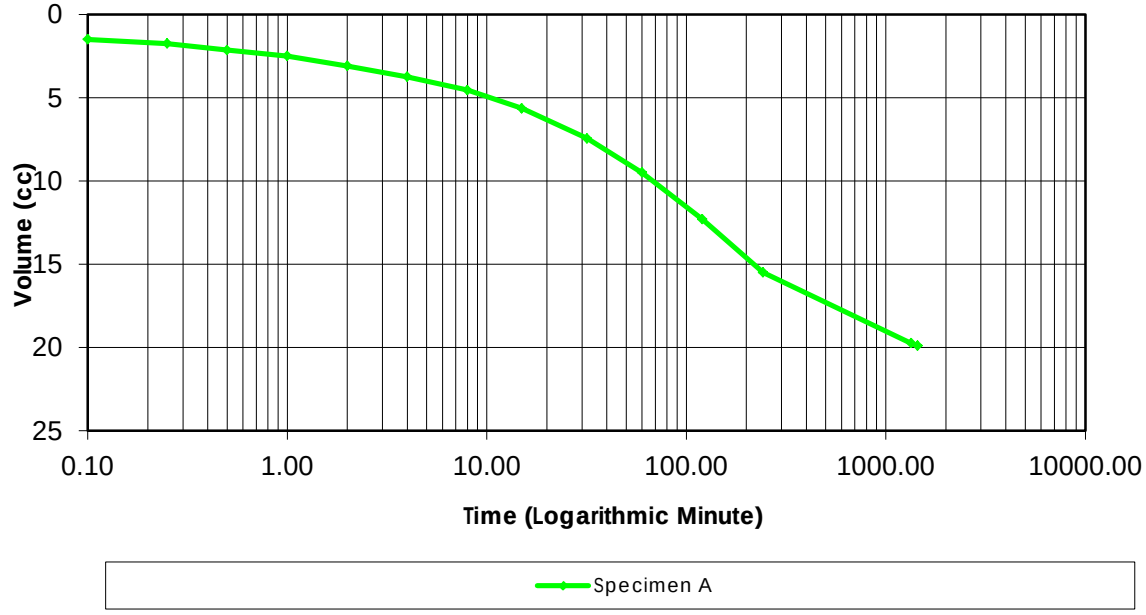

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 40.0 | 20.0 | N/A | N/A | N/A |
| 1 | 40.0 | 20.0 | 0.0 | 0.0 | |
| 2 | 50.0 | 20.0 | 10.0 | 0.0 | 36.00 |
| 3 | 50.0 | 30.0 | 0.0 | 10.0 | |
| 4 | 50.0 | 30.0 | 0.0 | 0.0 | |
| 5 | 60.0 | 30.0 | 10.0 | 0.0 | 5.00 |
| 6 | 60.0 | 40.0 | 0.0 | 10.0 | |
| 7 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 8 | 100.0 | 40.0 | 40.0 | 0.0 | 66.00 |
| 9 | 100.0 | 80.0 | 0.0 | 40.0 | |
| 10 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 11 | 150.0 | 100.0 | 50.0 | 20.0 | 84.00 |
| 12 | 150.0 | 130.0 | 0.0 | 30.0 | |
| 13 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 14 | 200.0 | 130.0 | 50.0 | 0.0 | 96.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 16.2-16.4m

| | |
|---|---|
| Cell Pressure (kPa) | 380 |
| Back Pressure (kPa) | 180 |
| Effective Pressure (kPa) | 200 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 70.1 |
| Initial Sample Height (mm) | 140.1 |
| Initial Sample Area (cm2) | 38.59 |
| Initial Volume (cm3) | 540.7 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 33.80 | N/A |
| 00:00:06 | 32.30 | 1.500 |
| 00:00:15 | 32.05 | 1.750 |
| 00:00:30 | 31.65 | 2.150 |
| 00:01:00 | 31.30 | 2.500 |
| 00:02:00 | 30.70 | 3.100 |
| 00:04:00 | 30.05 | 3.750 |
| 00:08:00 | 29.25 | 4.550 |
| 00:15:00 | 28.15 | 5.650 |
| 00:31:50 | 26.35 | 7.450 |
| 01:00:00 | 24.30 | 9.500 |
| 02:00:15 | 21.50 | 12.300 |
| 04:03:00 | 18.30 | 15.500 |
| 22:21:00 | 14.05 | 19.750 |
| 24:05:00 | 13.90 | 19.900 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

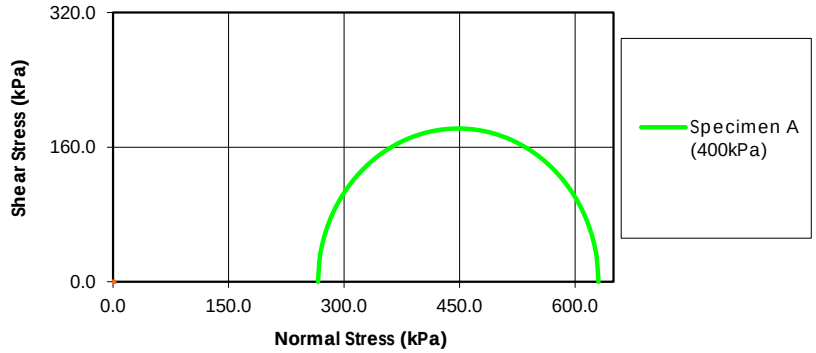
Stantec

Reviewed By C. Lamoureux

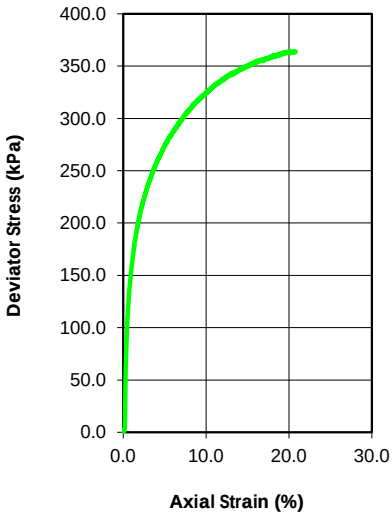
Date: 29-Jun-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.2 | | | |
| Dry Density (g/cm3) | 1.819 | | | |
| Saturation (%) | 79.06 | | | |
| Void Ratio | 0.484 | | | |
| Diameter (mm) | 73.00 | | | |
| Height (mm) | 148.50 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 10.3 | | | |
| Dry Density (g/cm3) | 1.943 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.389 | | | |
| Effective Stress (kPa) | 393.9 | | | |
| Back Press. (kPa) | 146.1 | | | |
| Rate of Strain | 0.021 | | | |

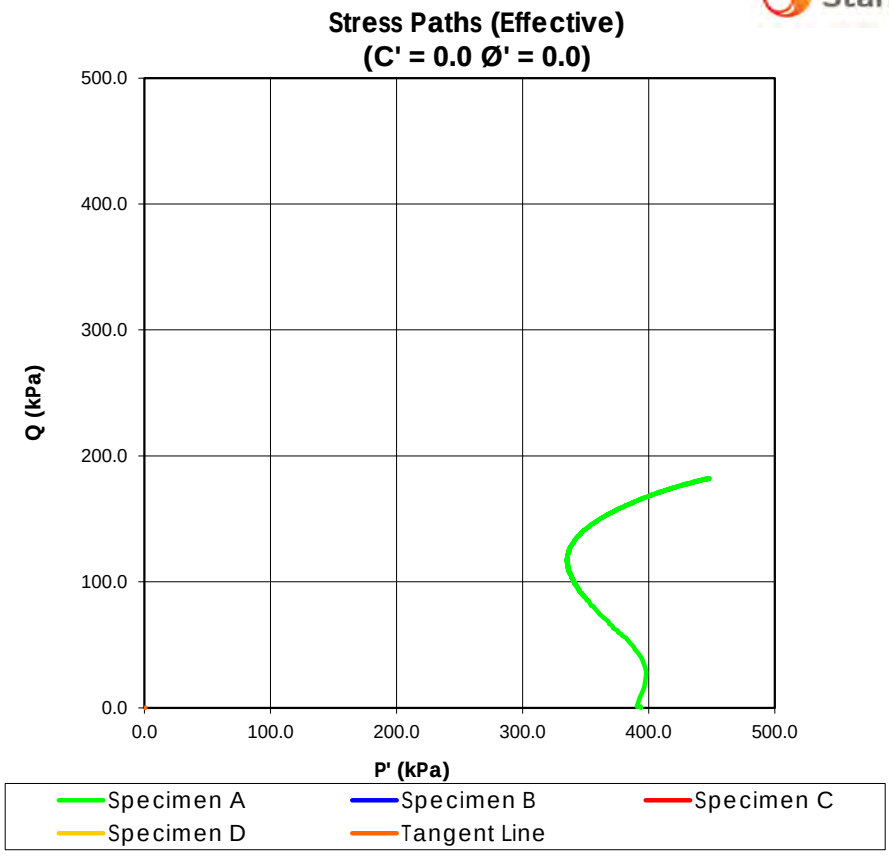
| Maximium Deviator Stress Criterion | | After Shear | A | B | C | D |
|---|---|---|---|---|---|---|
| C (kPa) | 0.0 | σ'1 at Failure (kPa) | 630.49 | | | |
| C' (kPa) | 0.0 | σ'3 at Failure (kPa) | 266.21 | | | |
| Ø (deg) | 0.0 | | | | | |
| Ø' (deg) | 0.0 | | | | | |

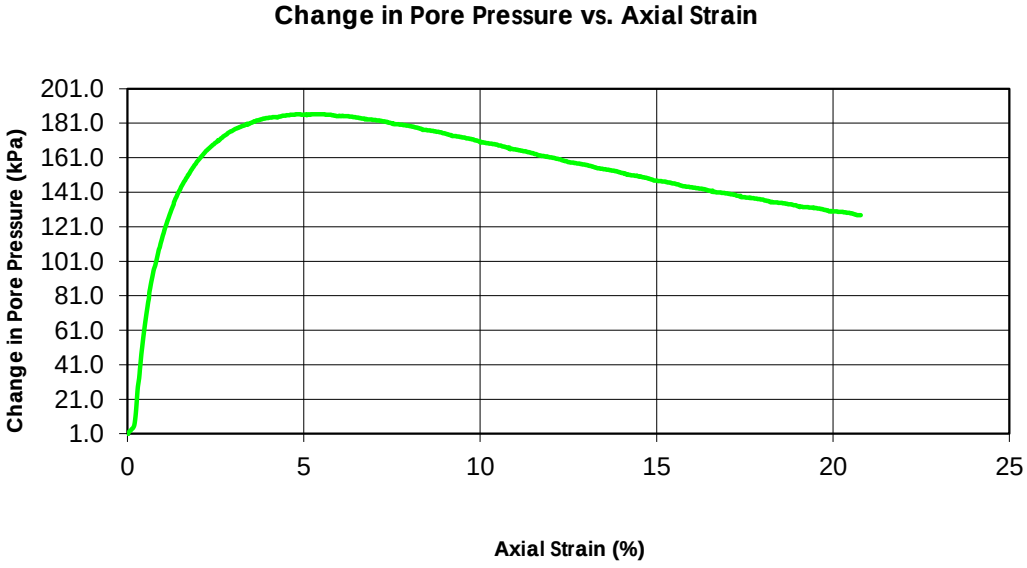
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC12 BS14+SS15 |
| **Depth:** | 13.3-14.15m |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

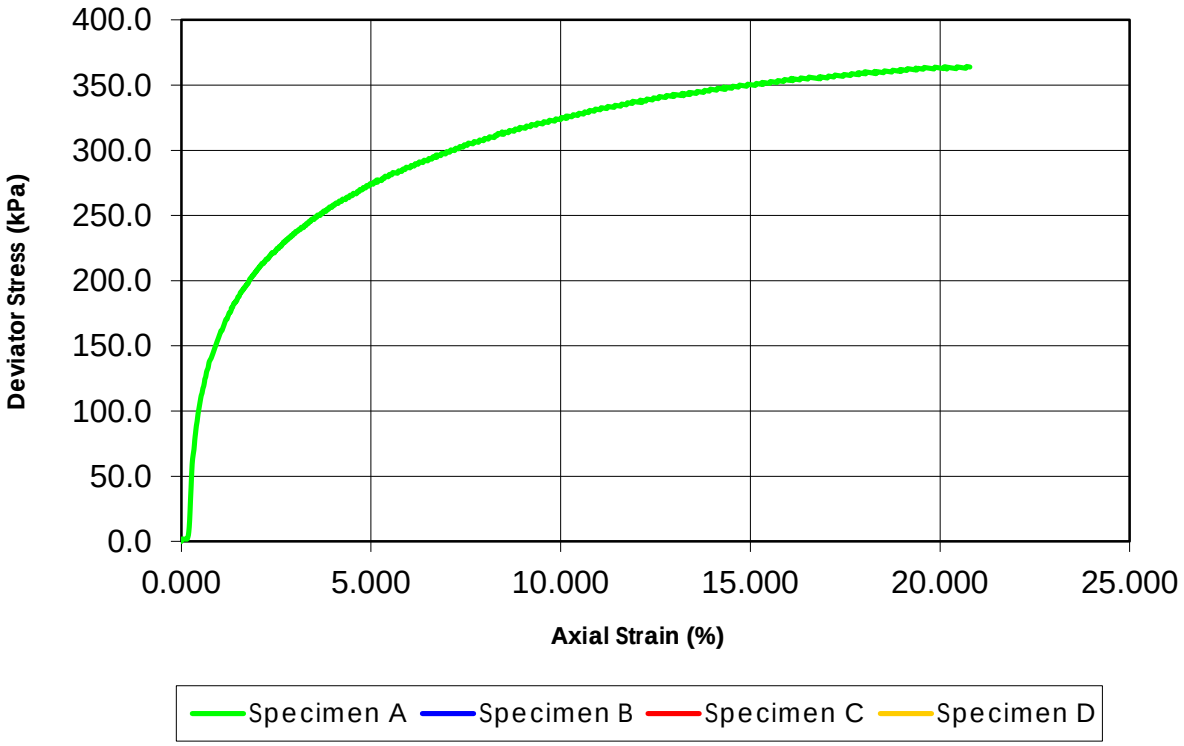
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

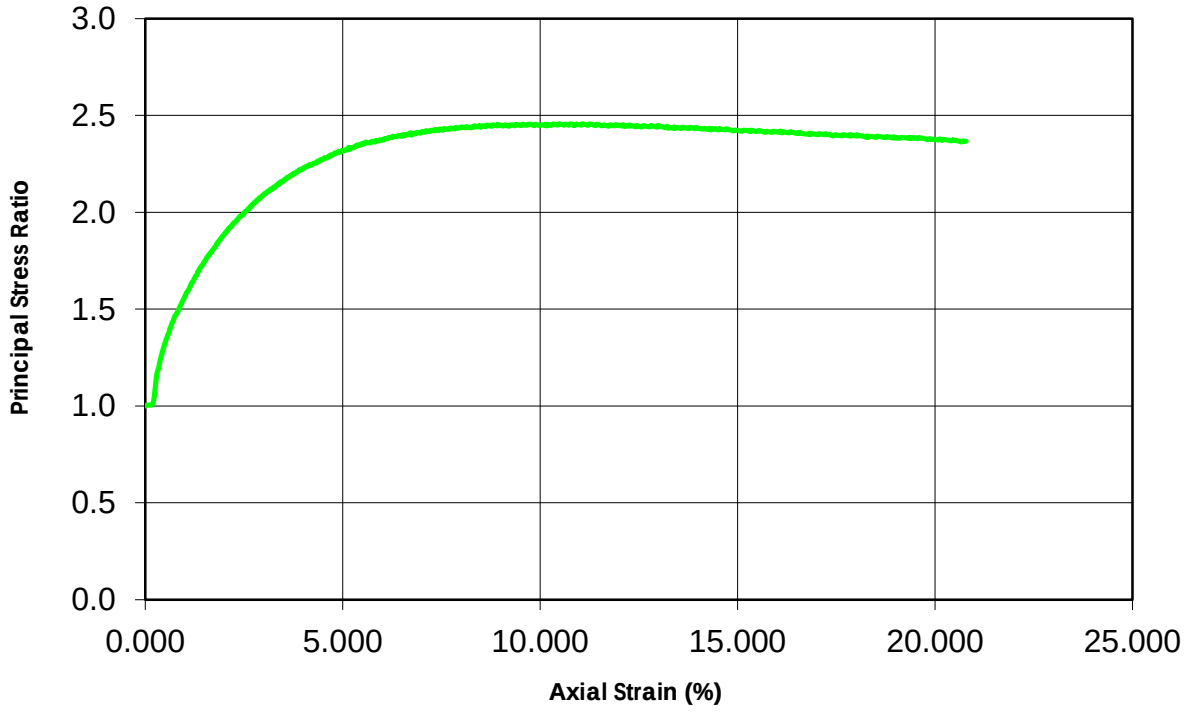


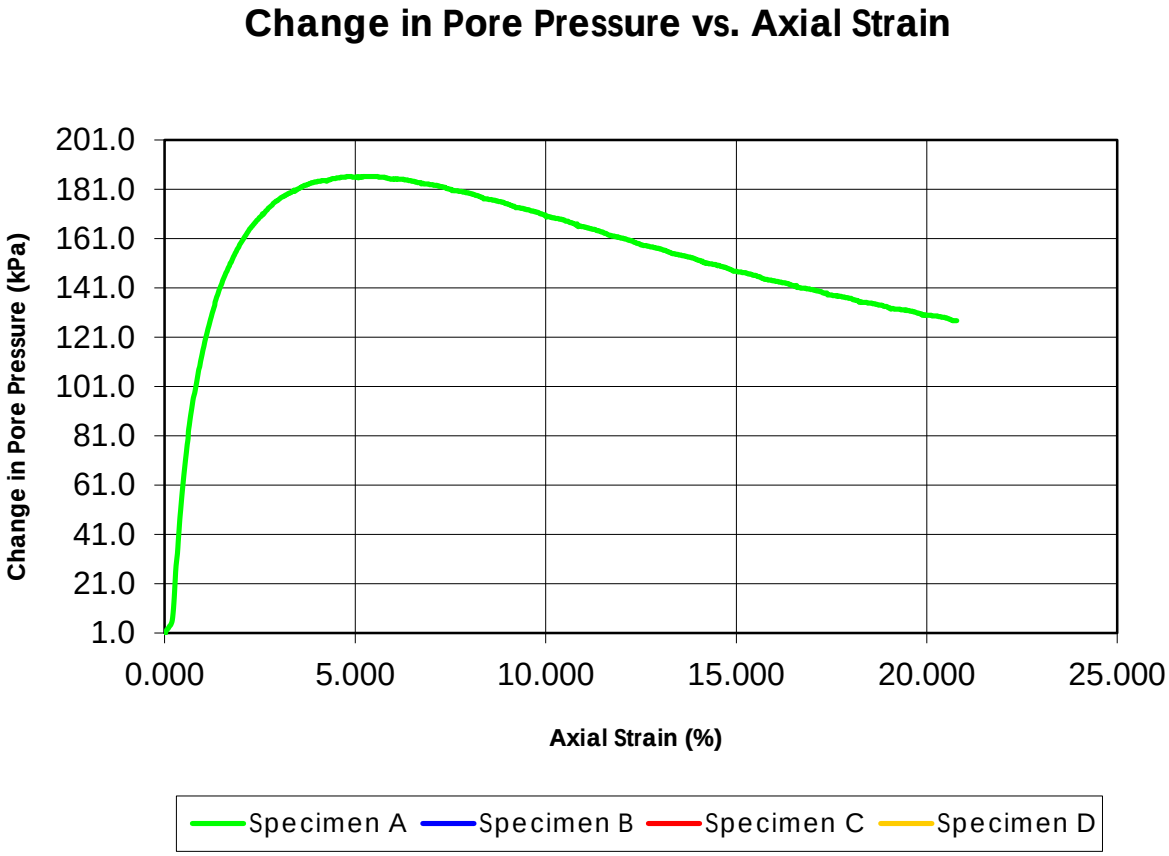



## Deviator Stress vs. Axial Strain



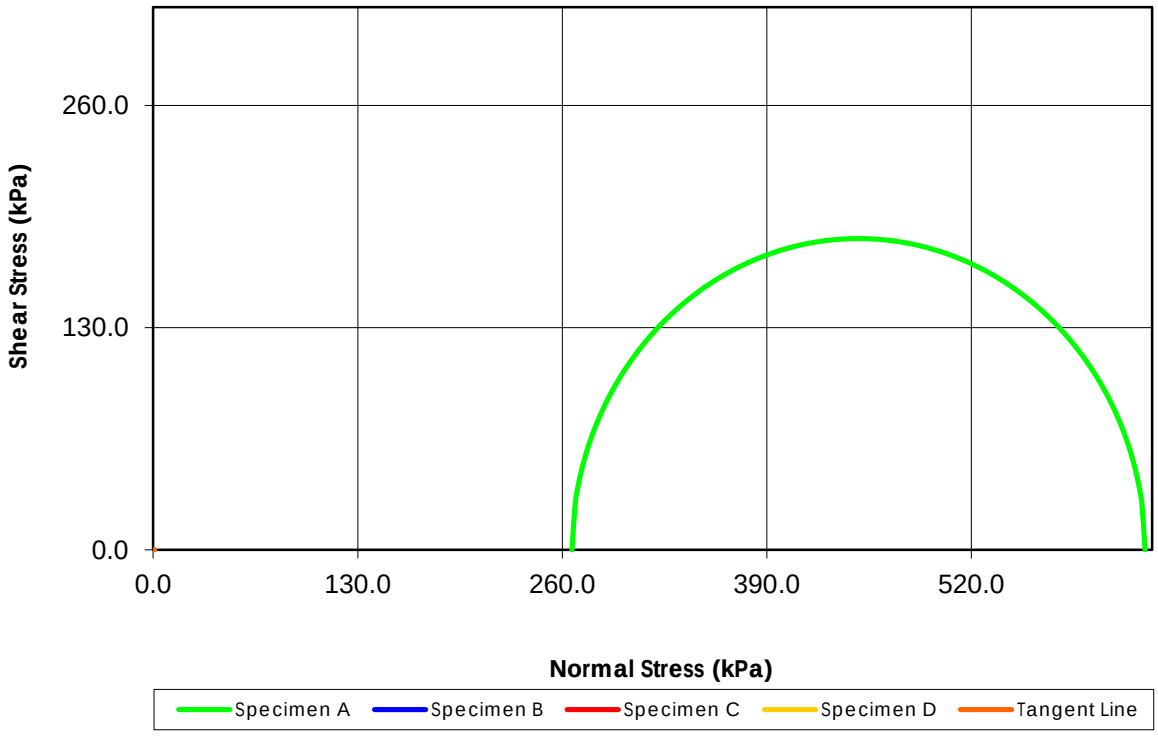

## Principal Stress Ratio vs. Axial Strain



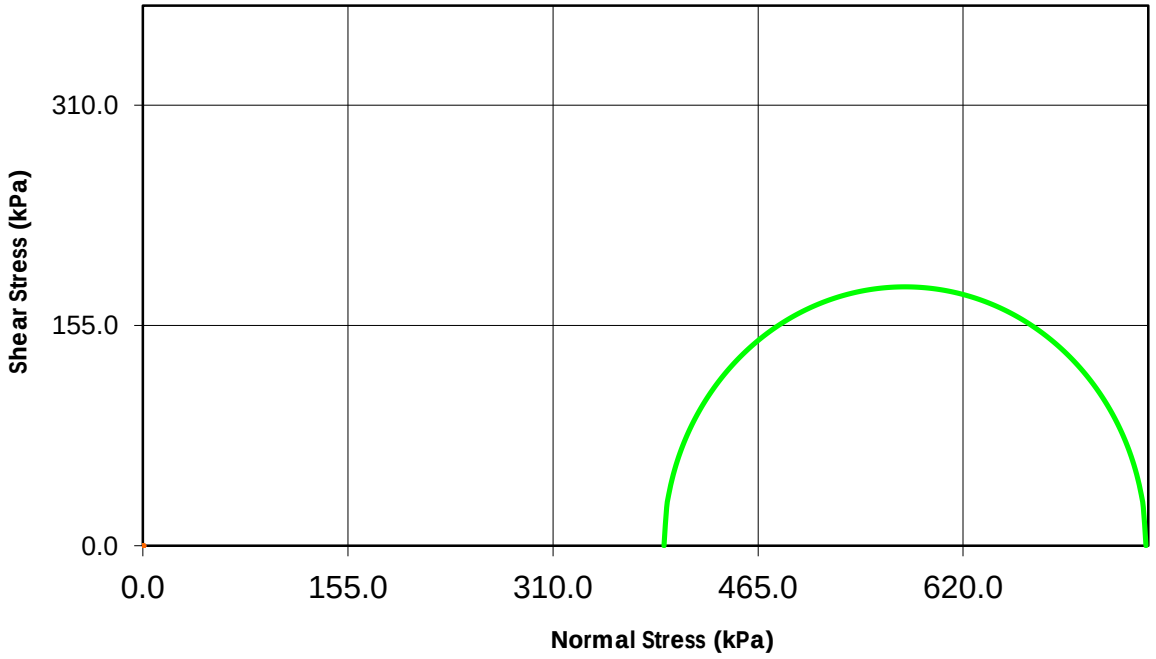

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
201.0
181.0
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

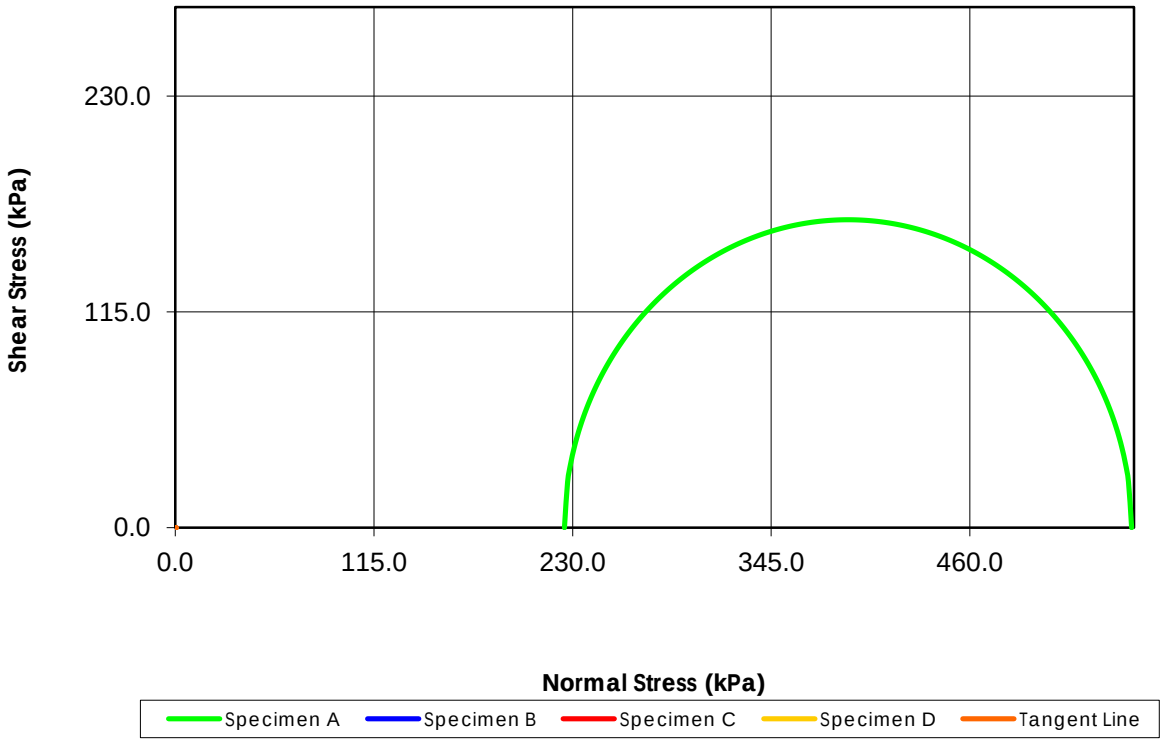



### Total Stress
### (C = 0.0 Ø = 0.0)

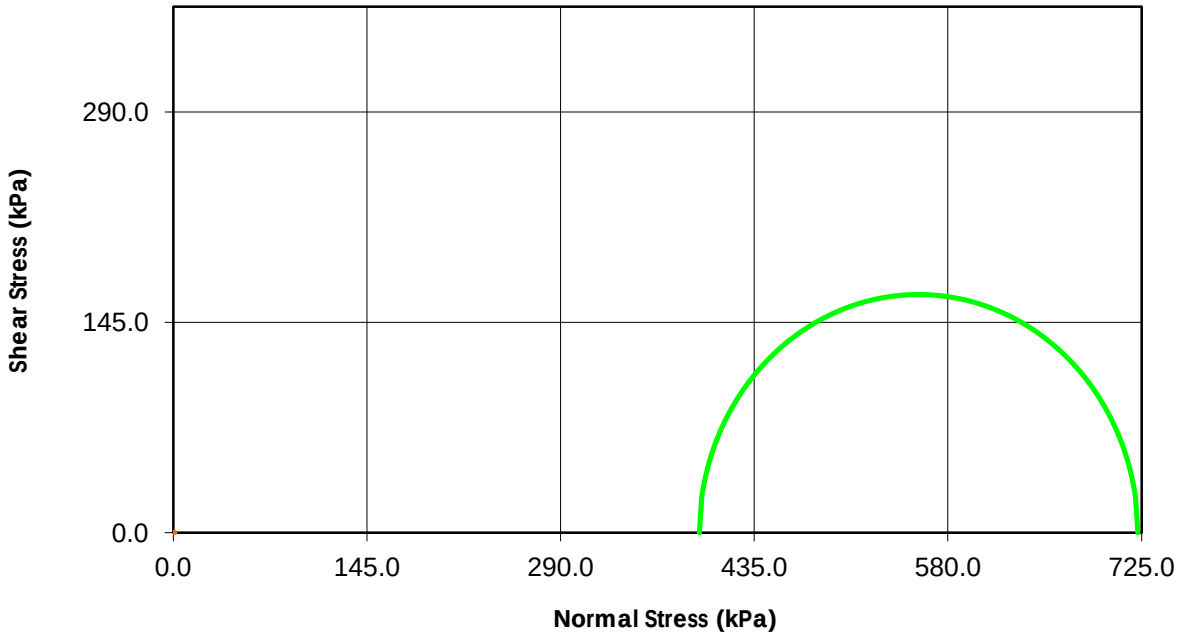


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)



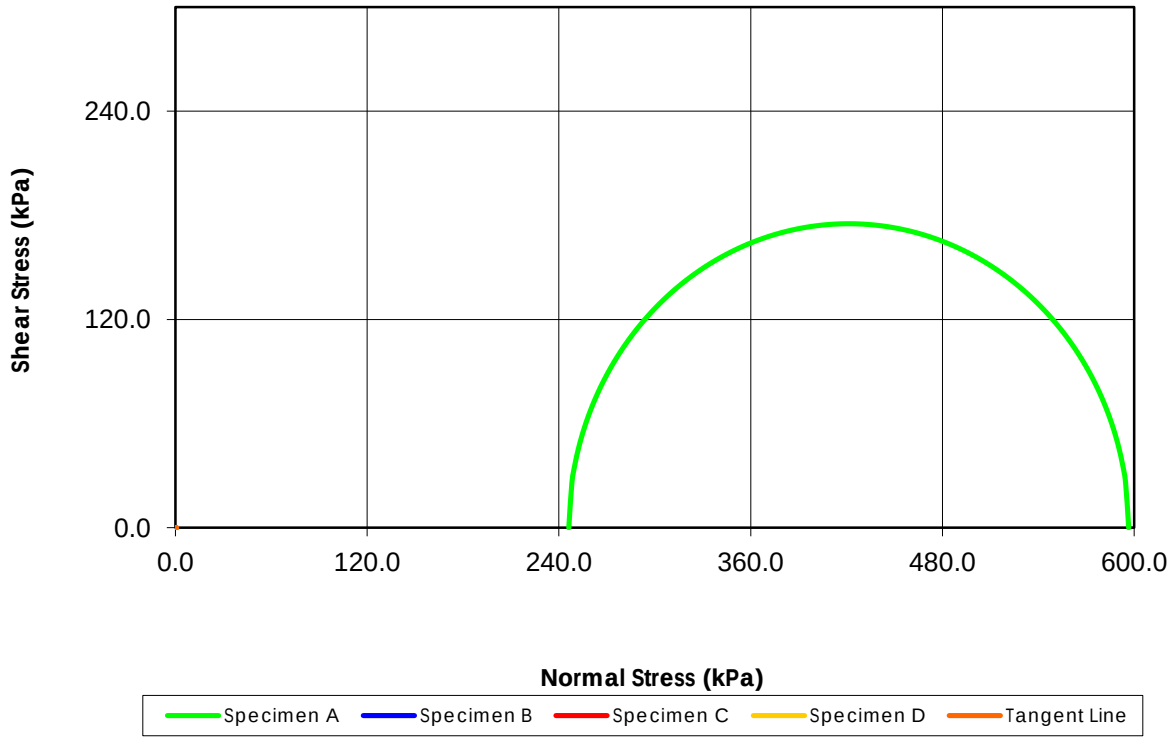

## Total Stress
## (C = 0.0 Ø = 0.0)



# Mohr Stress Circles at 15% Axial Strain Criterion

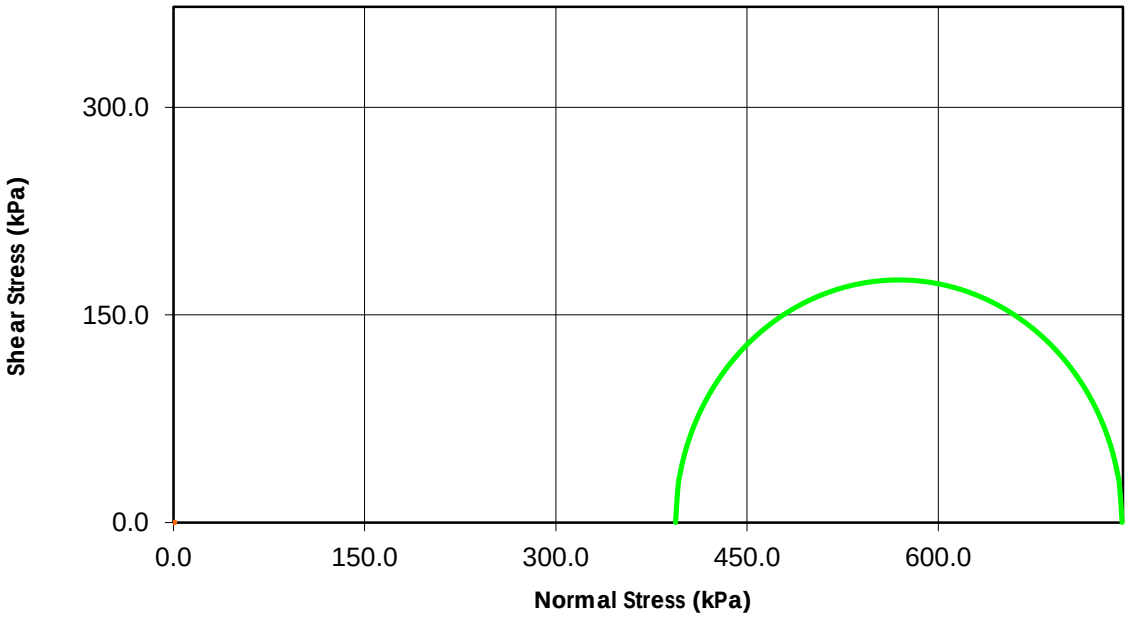
## Effective Stress

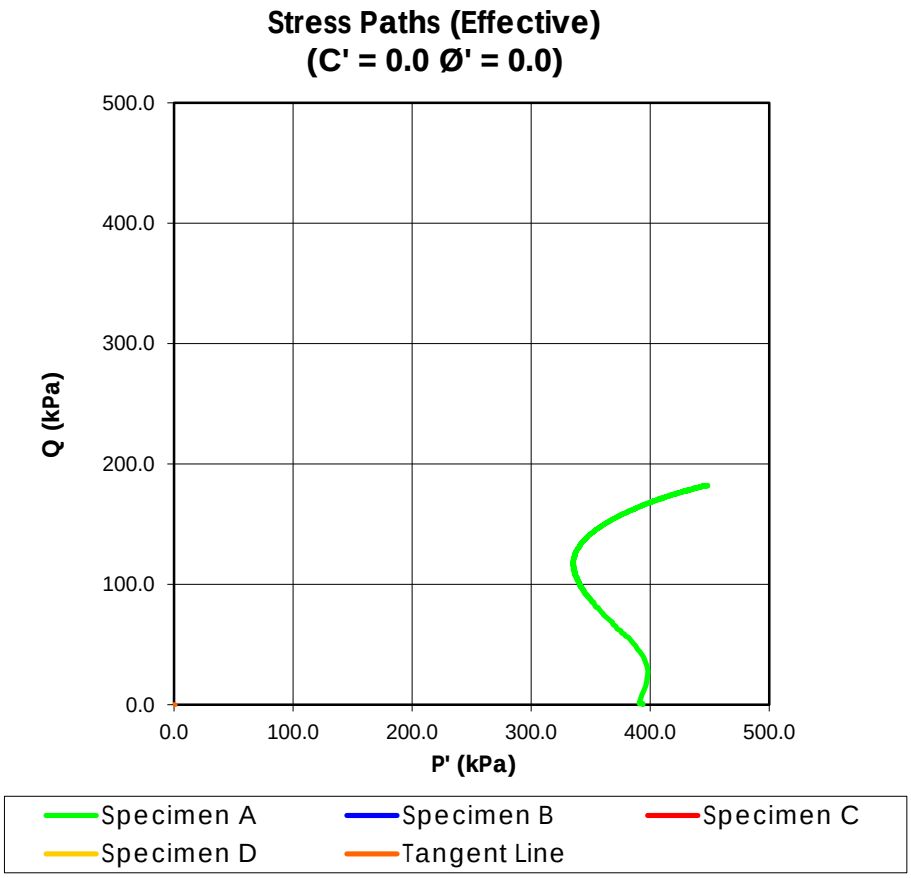
## (C' = 0.0 Ø' = 0.0)

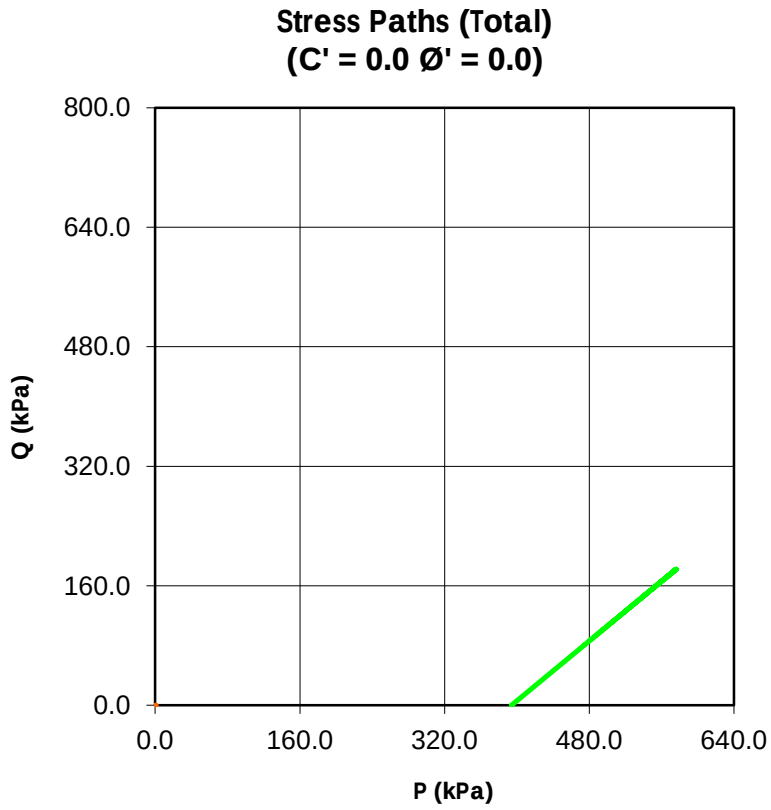



## Total Stress

## (C = 0.0 Ø = 0.0)

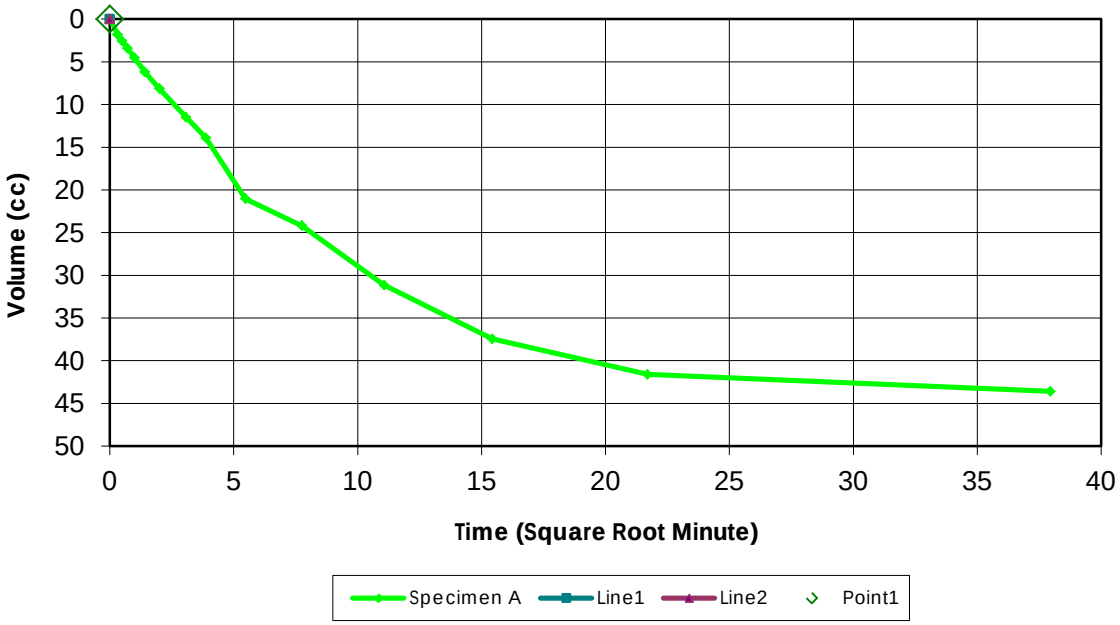



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
500.0
400.0
300.0
200.0
100.0
0.0
Q (kPa)
0.0
100.0
200.0
300.0
400.0
500.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

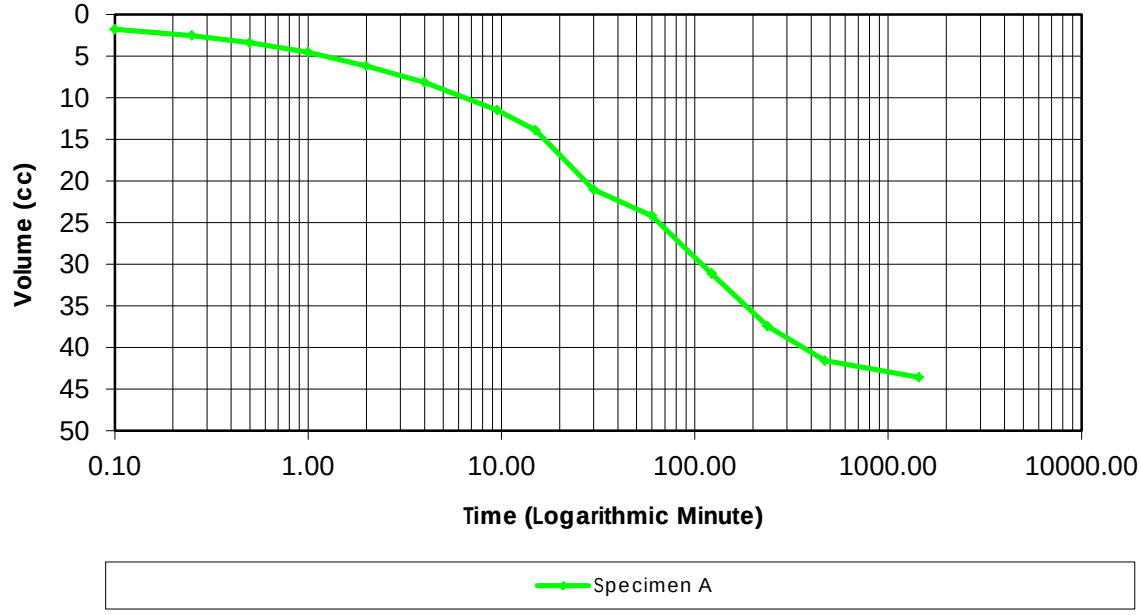

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 100.0 | 60.0 | 20.0 | 0.0 | 74.00 |
| 3 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 4 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 5 | 120.0 | 80.0 | 20.0 | 0.0 | 77.00 |
| 6 | 120.0 | 100.0 | 0.0 | 20.0 | |
| 7 | 120.0 | 100.0 | 0.0 | 0.0 | |
| 8 | 140.0 | 100.0 | 20.0 | 0.0 | 80.00 |
| 9 | 140.0 | 120.0 | 0.0 | 20.0 | |
| 10 | 140.0 | 120.0 | 0.0 | 0.0 | |
| 11 | 160.0 | 120.0 | 20.0 | 0.0 | 84.00 |
| 12 | 160.0 | 140.0 | 0.0 | 20.0 | |
| 13 | 160.0 | 140.0 | 0.0 | 0.0 | |
| 14 | 180.0 | 140.0 | 20.0 | 0.0 | 96.00 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 0

| | |
|---|---|
| Cell Pressure (kPa) | 540 |
| Back Pressure (kPa) | 140 |
| Effective Pressure (kPa) | 400 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 73 |
| Initial Sample Height (mm) | 148.5 |
| Initial Sample Area (cm2) | 41.85 |
| Initial Volume (cm3) | 621.5 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 43.00 | N/A |
| 00:00:06 | 41.20 | 1.800 |
| 00:00:15 | 40.45 | 2.550 |
| 00:00:30 | 39.60 | 3.400 |
| 00:01:00 | 38.45 | 4.550 |
| 00:02:00 | 36.80 | 6.200 |
| 00:04:00 | 34.85 | 8.150 |
| 00:09:30 | 31.50 | 11.500 |
| 00:15:00 | 29.10 | 13.900 |
| 00:30:00 | 21.95 | 21.050 |
| 01:00:00 | 18.80 | 24.200 |
| 02:02:30 | 11.85 | 31.150 |
| 03:58:00 | 5.55 | 37.450 |
| 07:51:00 | 1.40 | 41.600 |
| 24:00:00 | -0.60 | 43.600 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

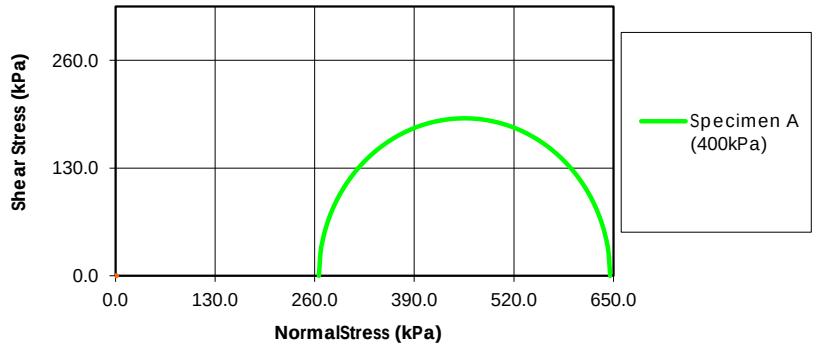
Stantec

Reviewed By: C. Lamoureux

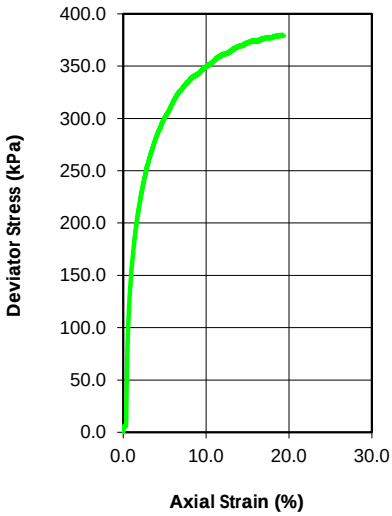
Date: 6-Jun-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 13.7 | | | |
| Dry Density (g/cm3) | 1.887 | | | |
| Saturation (%) | 85.89 | | | |
| Void Ratio | 0.431 | | | |
| Diameter (mm) | 70.80 | | | |
| Height (mm) | 145.20 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 10.2 | | | |
| Dry Density (g/cm3) | 1.867 | | | |
| Saturation (%) | 100.0 | | | |
| Void Ratio | 0.446 | | | |
| Effective Stress (kPa) | 440.7 | | | |
| Back Press. (kPa) | 109.3 | | | |
| Rate of Strain | 0.019 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

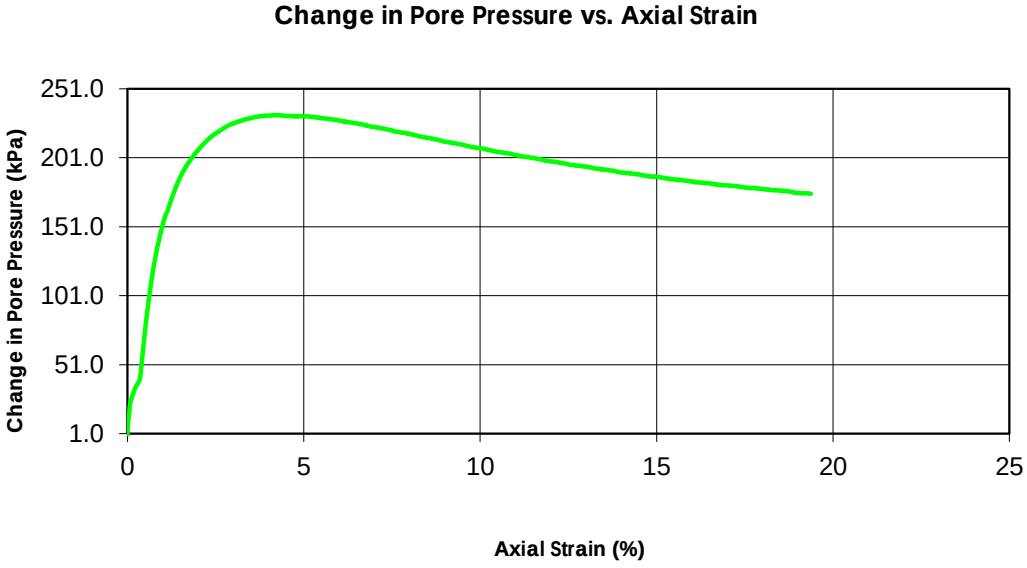
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 645.62 | | | |
| σ'3 at Failure (kPa) | 265.50 | | | |
| | | | | |
| | | | | |

| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC13 SS10/BS11 |
| **Depth:** | 6.1-6.55m |
| **Sample Type:** | Undisturbed |
| **Description:** | Dark Brown Clay, Trace Gravel/Sand |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

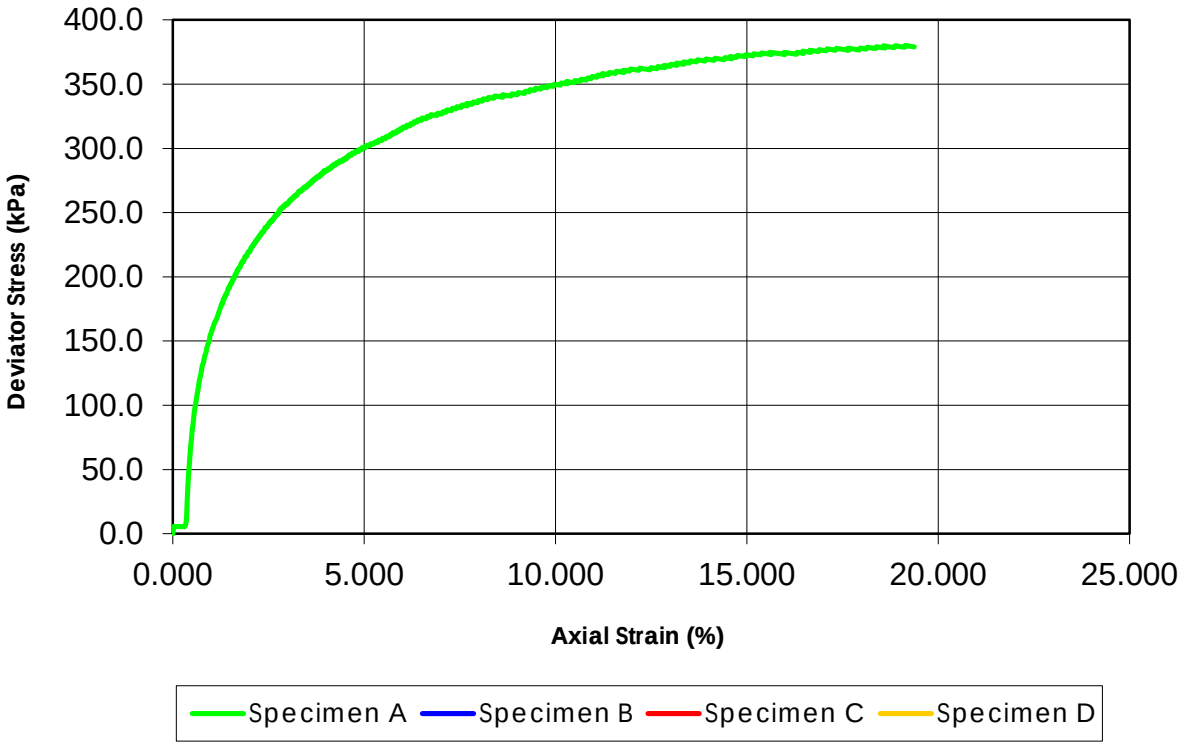
**Stantec Consulting Ltd.**

**Consolidated Undrained Triaxial Test (ASTM D4767)**

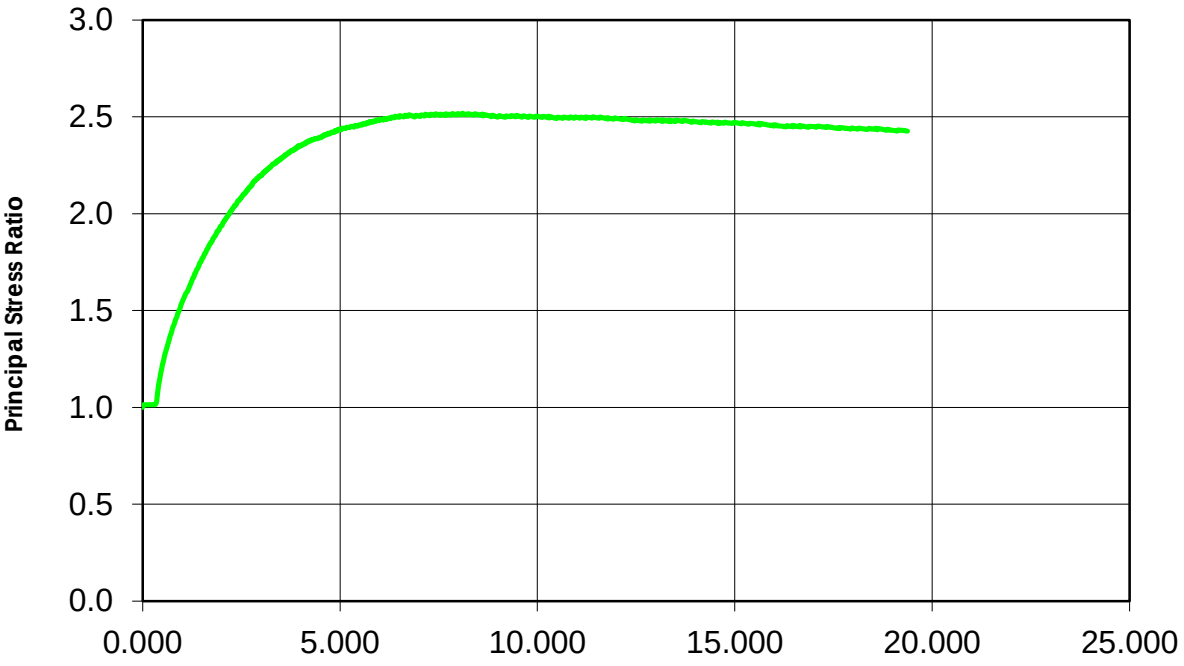
Stantec

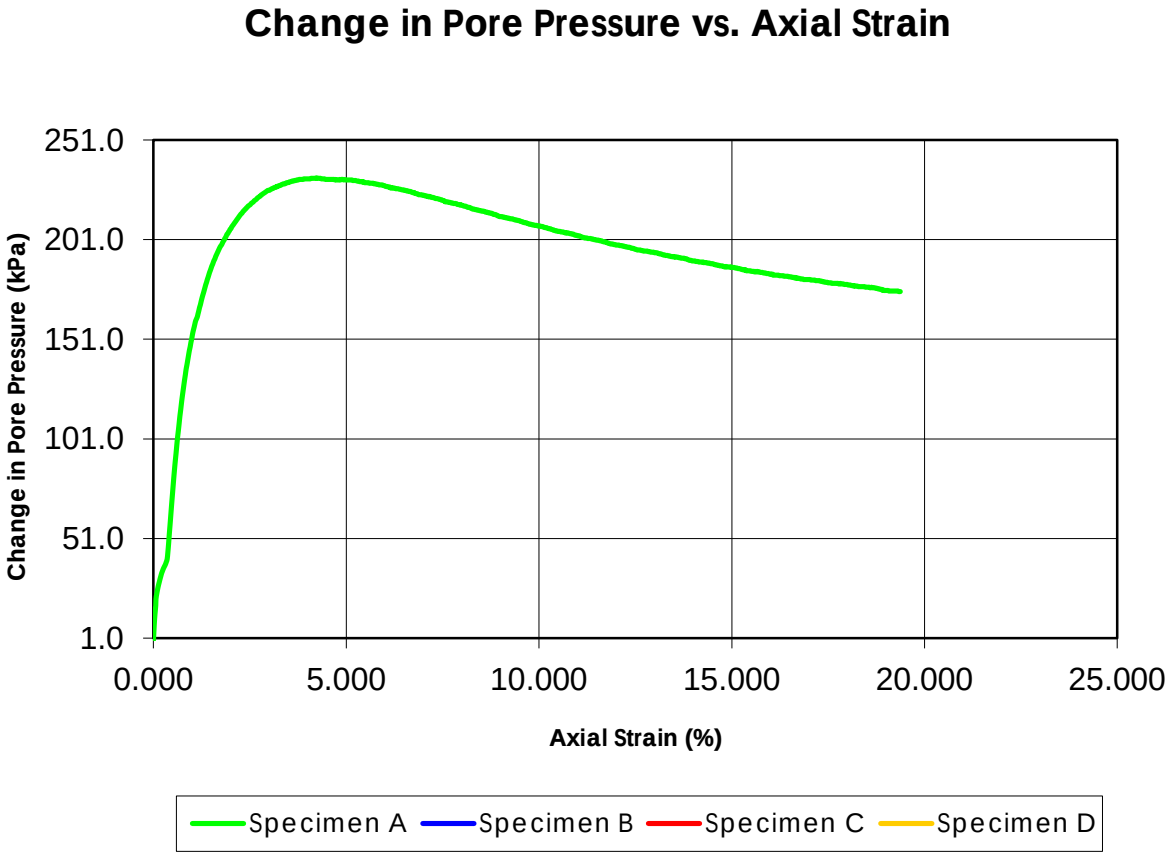



## Deviator Stress vs. Axial Strain



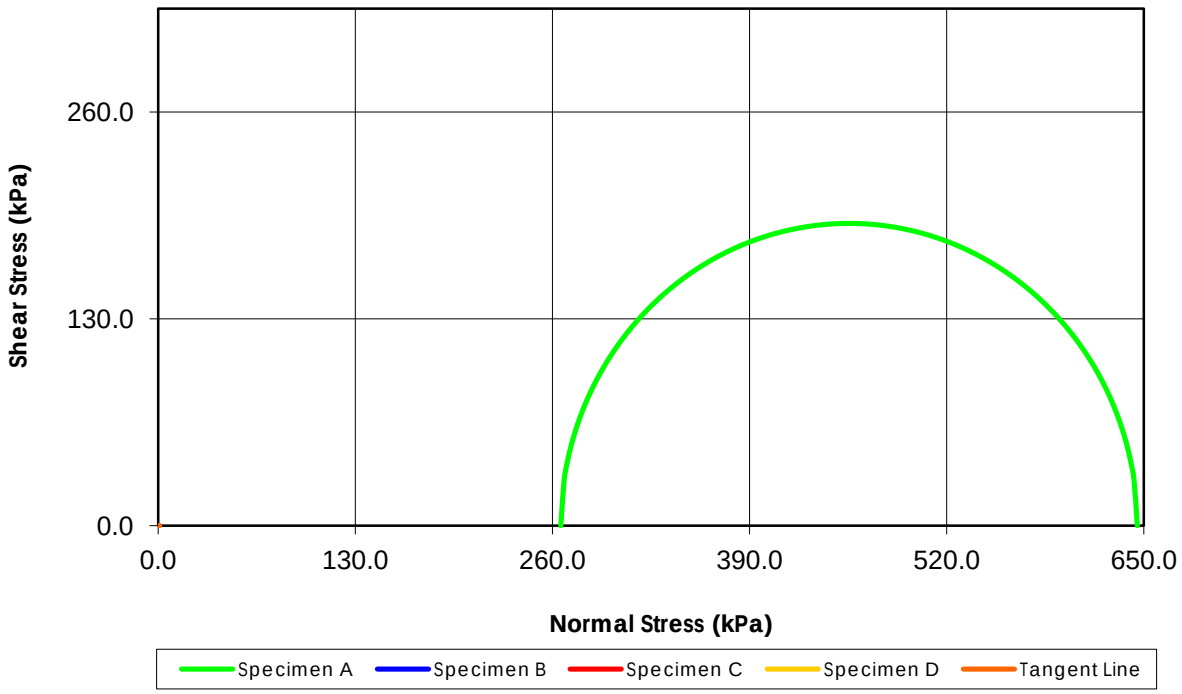

## Principal Stress Ratio vs. Axial Strain



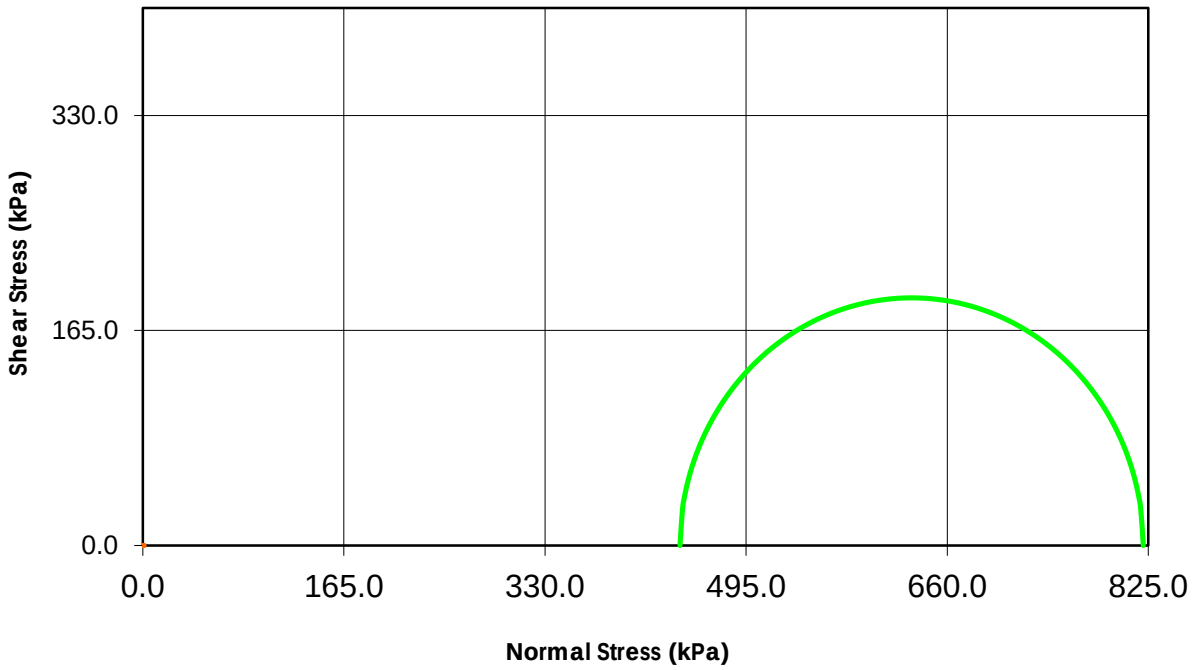

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

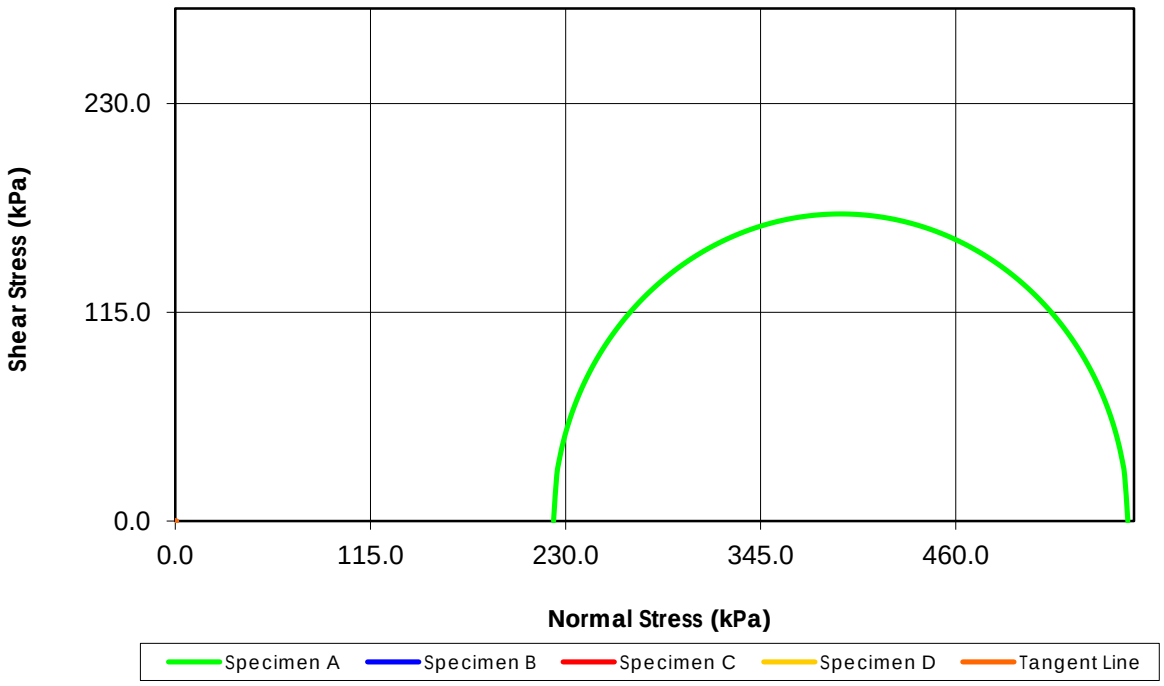



### Total Stress
### (C = 0.0 Ø = 0.0)

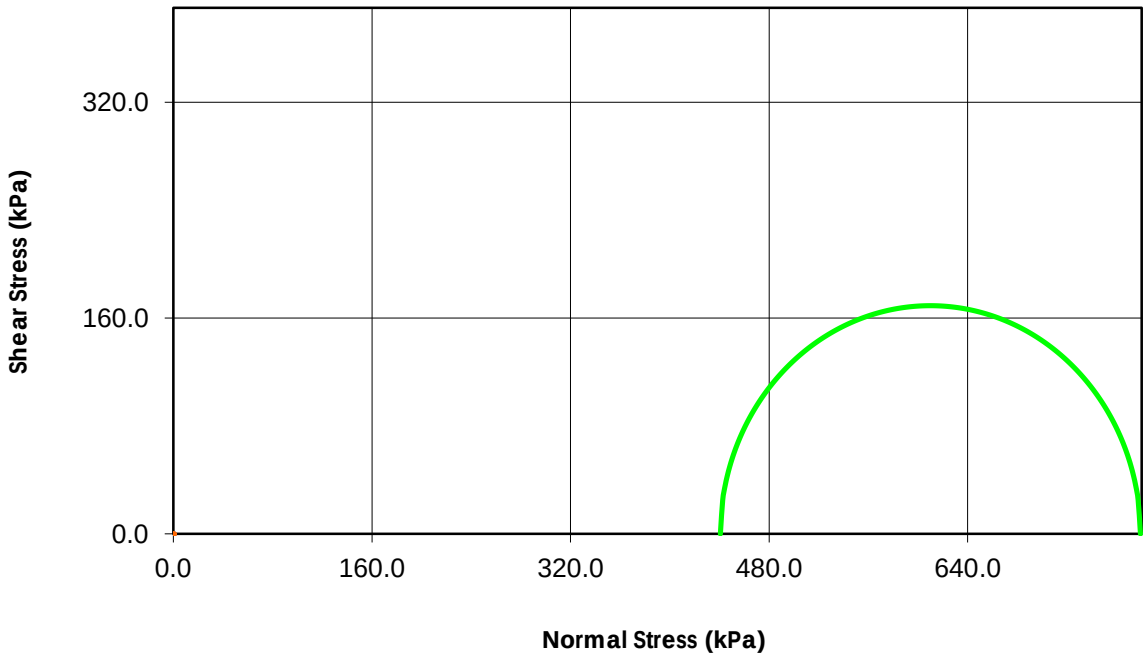


## Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

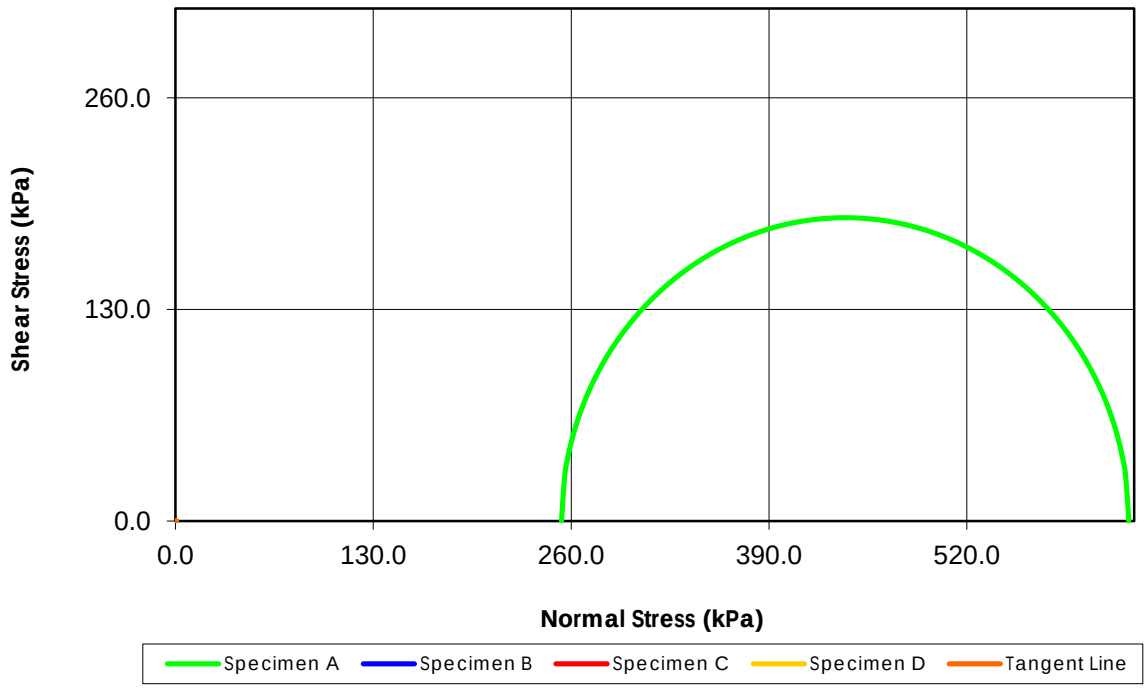



### Total Stress
### (C = 0.0 Ø = 0.0)

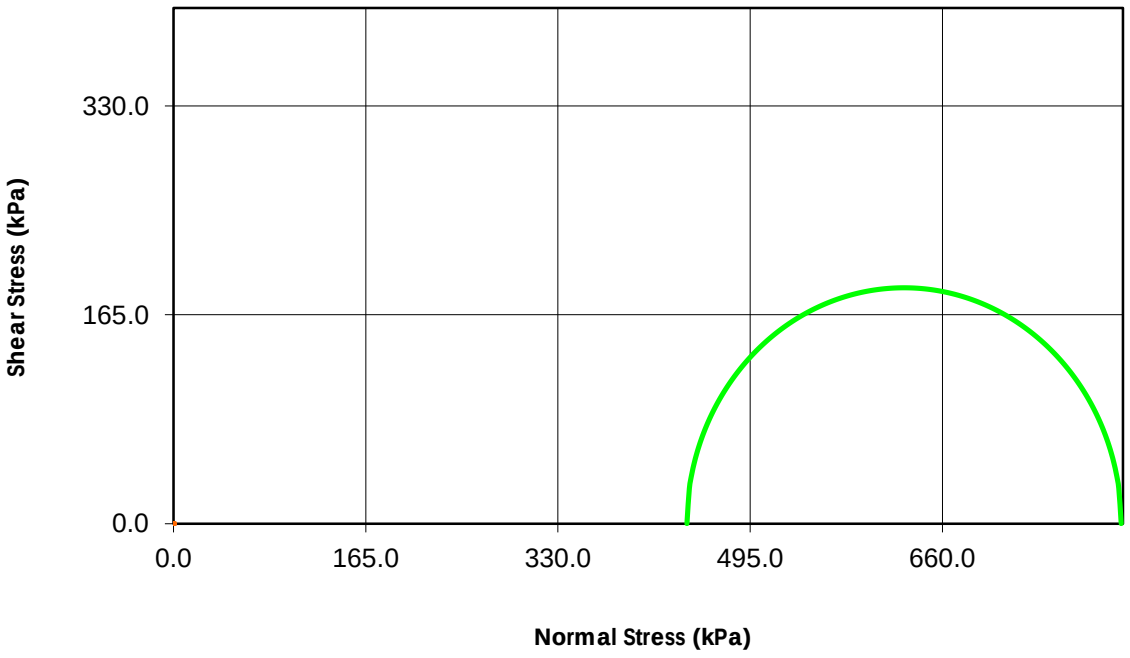


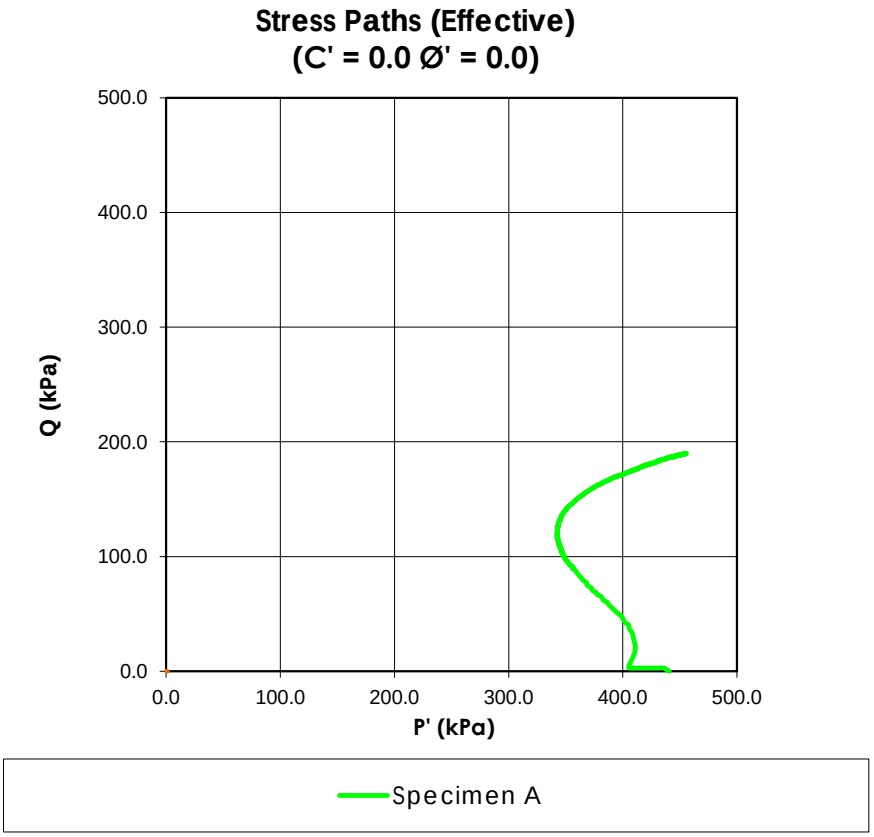
## Mohr Stress Circles at 15% Axial Strain Criterion

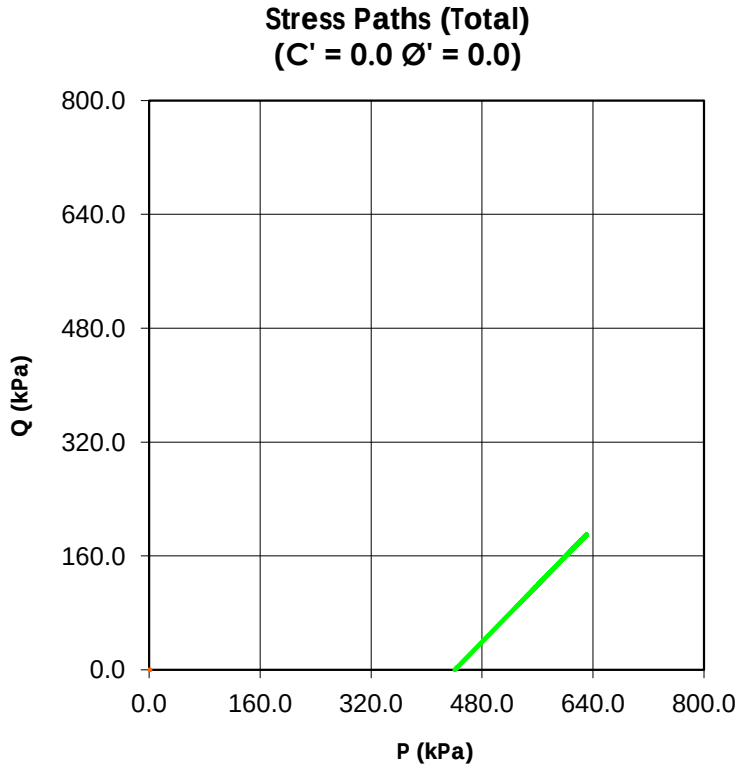
### Effective Stress
### (C' = 0.0 Ø' = 0.0)




### Total Stress
### (C = 0.0 Ø = 0.0)

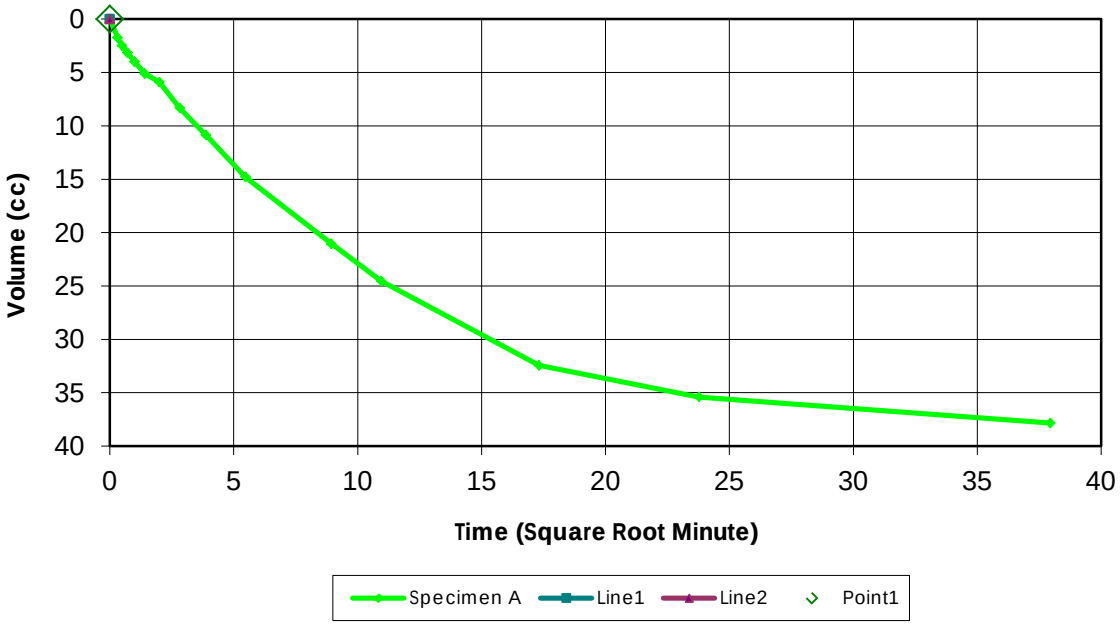



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
500.0
400.0
300.0
200.0
100.0
0.0
Q (kPa)
0.0
100.0
200.0
300.0
400.0
500.0
P' (kPa)
Specimen A

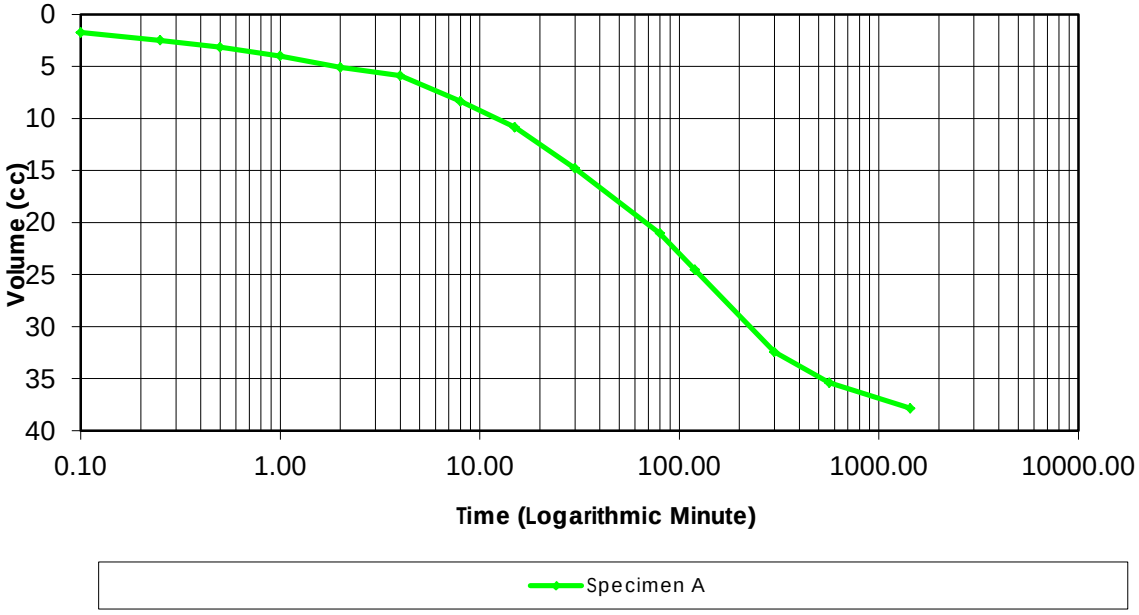

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 40.0 | 20.0 | N/A | N/A | N/A |
| 1 | 40.0 | 20.0 | 0.0 | 0.0 | |
| 2 | 50.0 | 20.0 | 10.0 | 0.0 | 9.00 |
| 3 | 50.0 | 30.0 | 0.0 | 10.0 | |
| 4 | 50.0 | 30.0 | 0.0 | 0.0 | |
| 5 | 60.0 | 30.0 | 10.0 | 0.0 | 33.00 |
| 6 | 60.0 | 40.0 | 0.0 | 10.0 | |
| 7 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 8 | 100.0 | 40.0 | 40.0 | 0.0 | 6525.00 |
| 9 | 100.0 | 80.0 | 0.0 | 40.0 | |
| 10 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 11 | 150.0 | 80.0 | 50.0 | 0.0 | 62.00 |
| 12 | 150.0 | 130.0 | 0.0 | 50.0 | |
| 13 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 14 | 170.0 | 130.0 | 20.0 | 0.0 | 74.00 |
| 15 | 170.0 | 150.0 | 0.0 | 20.0 | |
| 16 | 170.0 | 150.0 | 0.0 | 0.0 | |
| 17 | 190.0 | 150.0 | 20.0 | 0.0 | 95.00 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 6.1-6.55m

| | |
|---|---|
| Cell Pressure (kPa) | 550 |
| Back Pressure (kPa) | 150 |
| Effective Pressure (kPa) | 400 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 70.8 |
| Initial Sample Height (mm) | 145.2 |
| Initial Sample Area (cm2) | 39.37 |
| Initial Volume (cm3) | 571.6 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.35 | N/A |
| 00:00:06 | 42.60 | 1.750 |
| 00:00:15 | 41.85 | 2.500 |
| 00:00:30 | 41.20 | 3.150 |
| 00:01:00 | 40.35 | 4.000 |
| 00:02:00 | 39.25 | 5.100 |
| 00:04:00 | 38.45 | 5.900 |
| 00:08:00 | 36.00 | 8.350 |
| 00:15:00 | 33.50 | 10.850 |
| 00:30:00 | 29.55 | 14.800 |
| 01:20:00 | 23.30 | 21.050 |
| 02:00:00 | 19.80 | 24.550 |
| 05:00:00 | 11.90 | 32.450 |
| 09:25:00 | 8.95 | 35.400 |
| 24:00:00 | 6.50 | 37.850 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

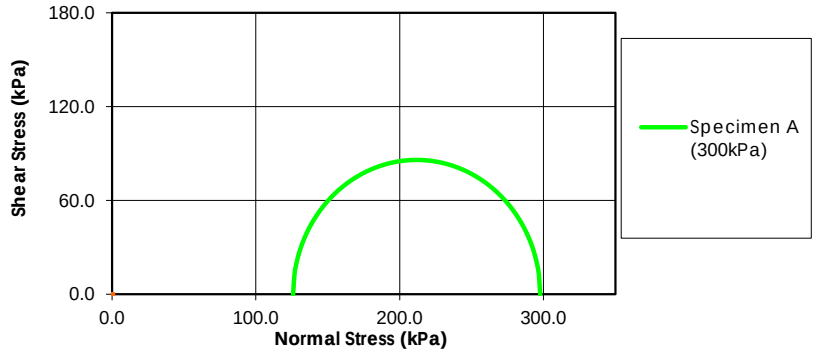
Stantec

Reviewed By C. Lamoureux

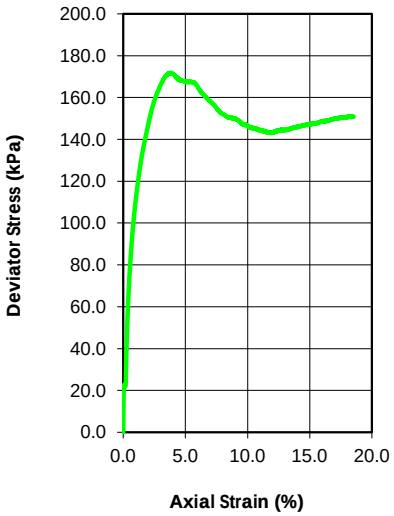
Date: 18-May-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.0 | | | |
| Dry Density (g/cm3) | 1.560 | | | |
| Saturation (%) | 99.80 | | | |
| Void Ratio | 0.727 | | | |
| Diameter (mm) | 72.4 | | | |
| Height (mm) | 154.0 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 23.7 | | | |
| Dry Density (g/cm3) | 1.562 | | | |
| Saturation (%) | 100.0 | | | |
| Void Ratio | 0.728 | | | |
| Effective Stress (kPa) | 297.4 | | | |
| Back Press. (kPa) | 242.6 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

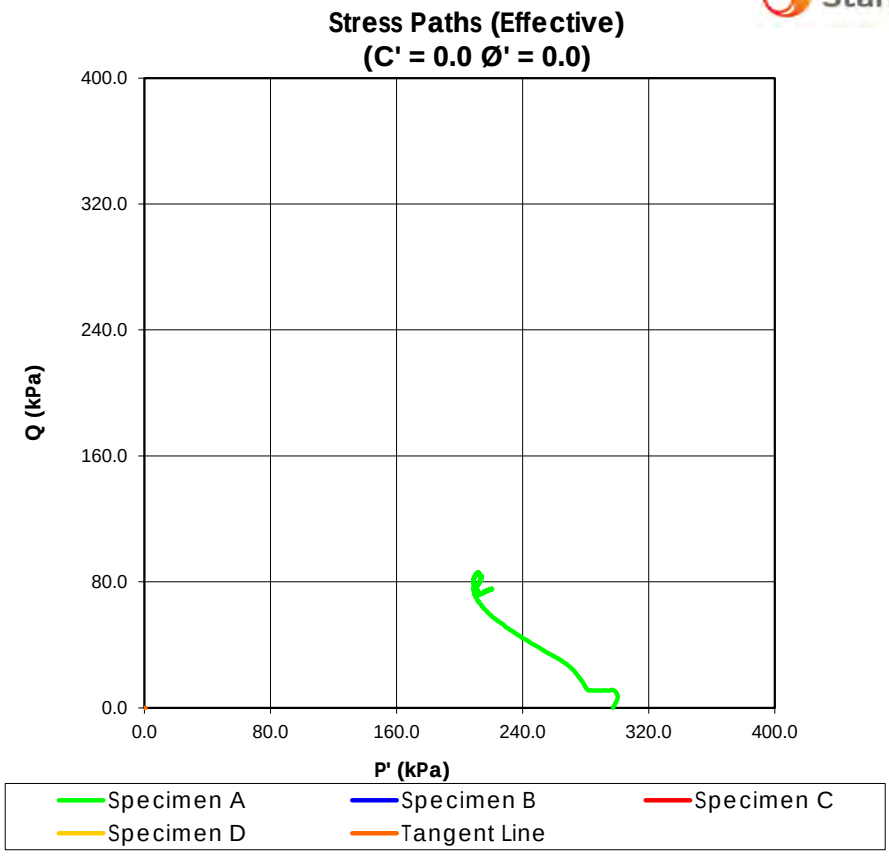
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 297.70 | | | |
| σ'3 at Failure (kPa) | 125.92 | | | |
| | | | | |
| | | | | |

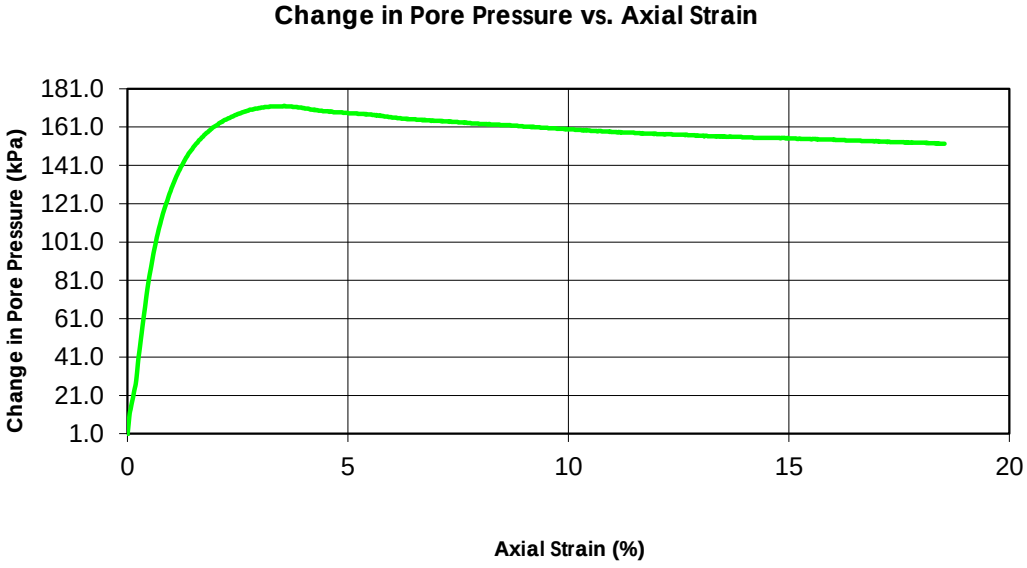
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC15-ST4 Top |
| **Depth:** | 3.0-3.5m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

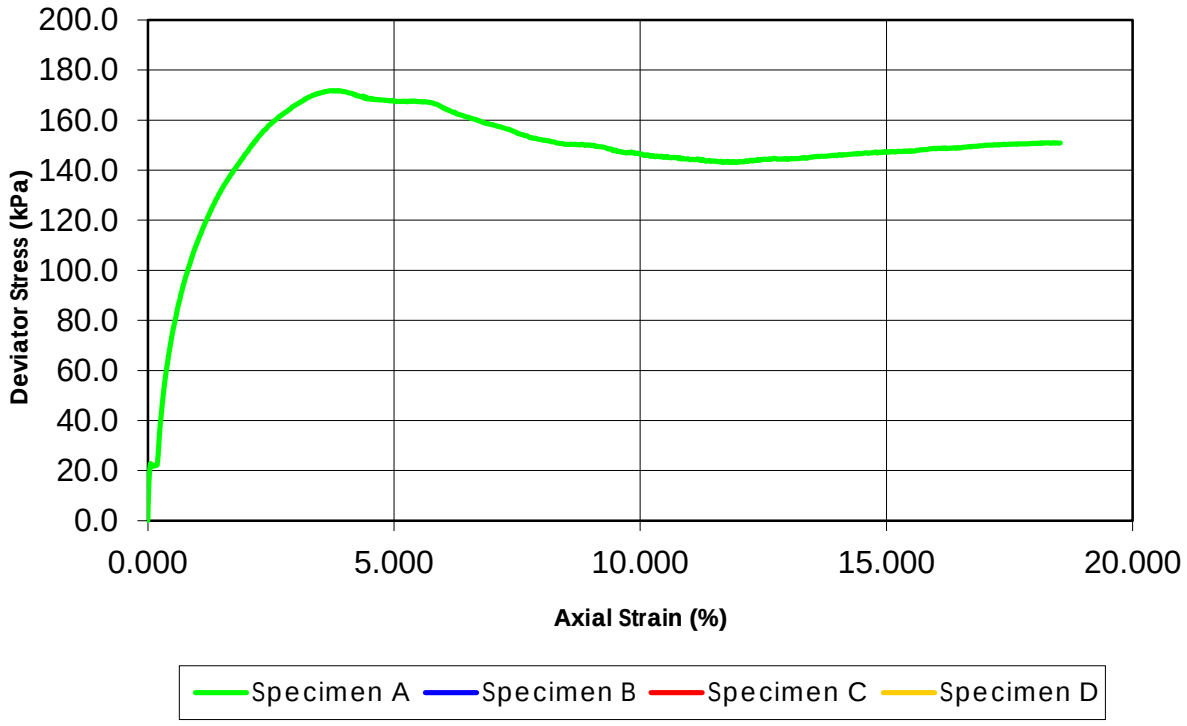
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

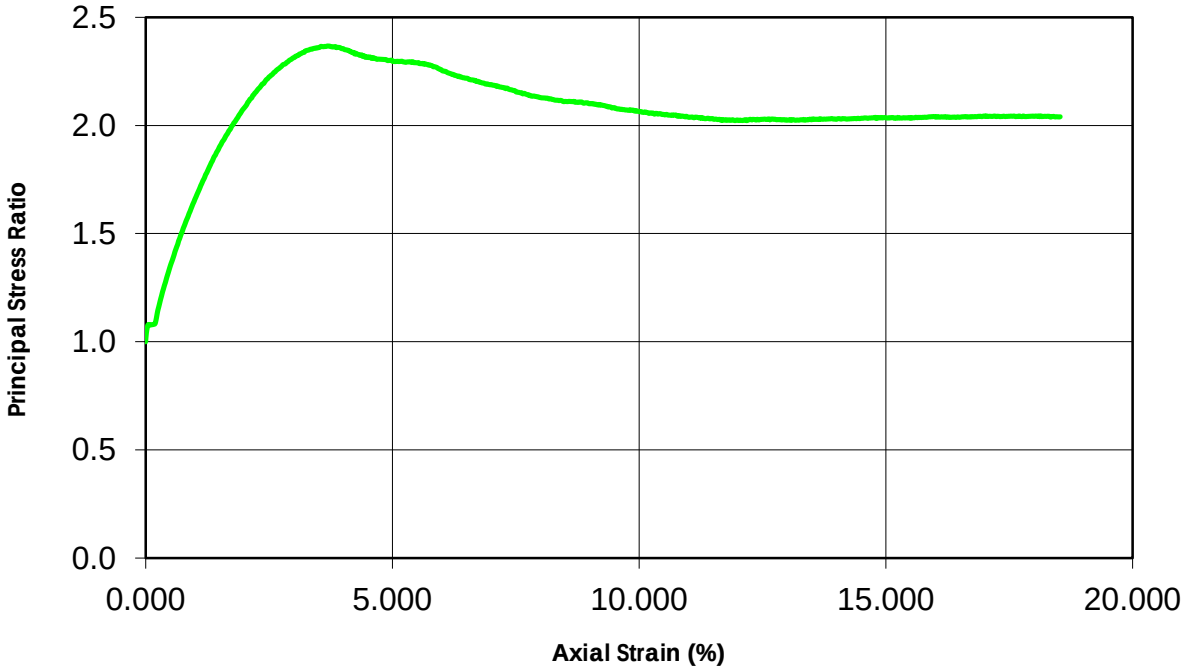


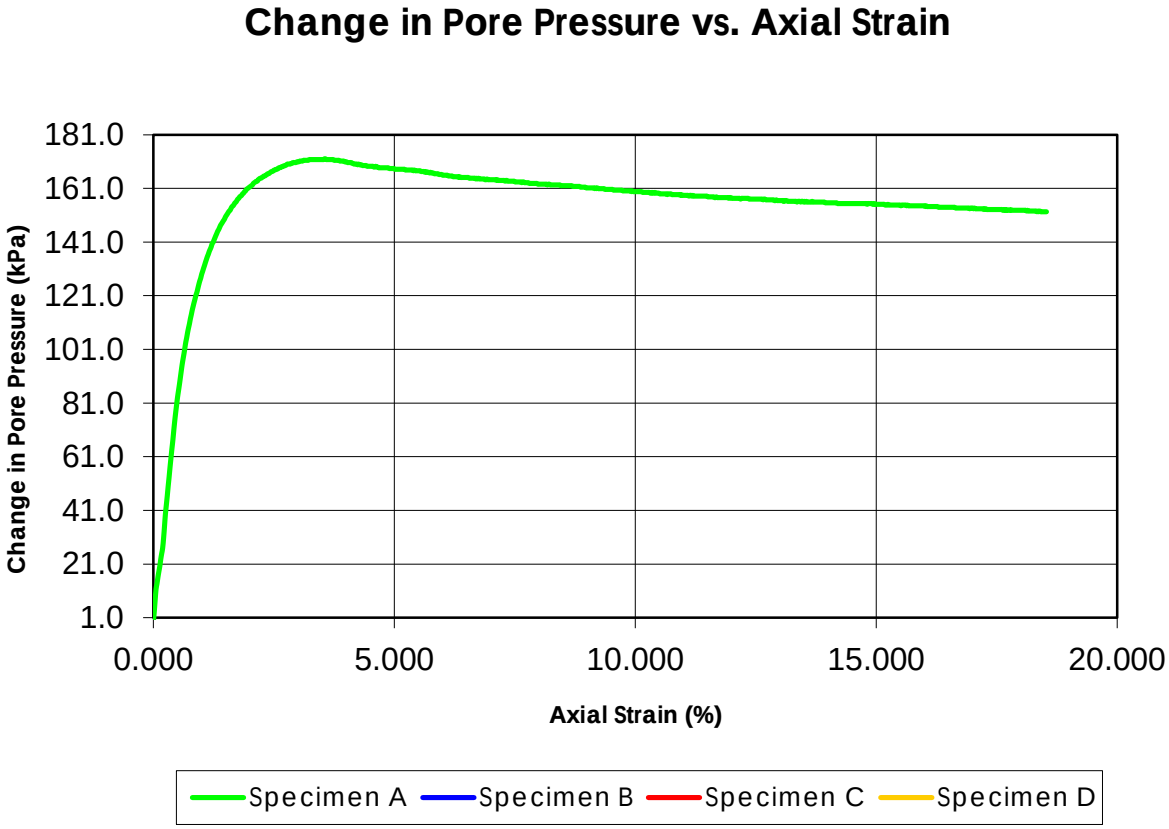



## Deviator Stress vs. Axial Strain



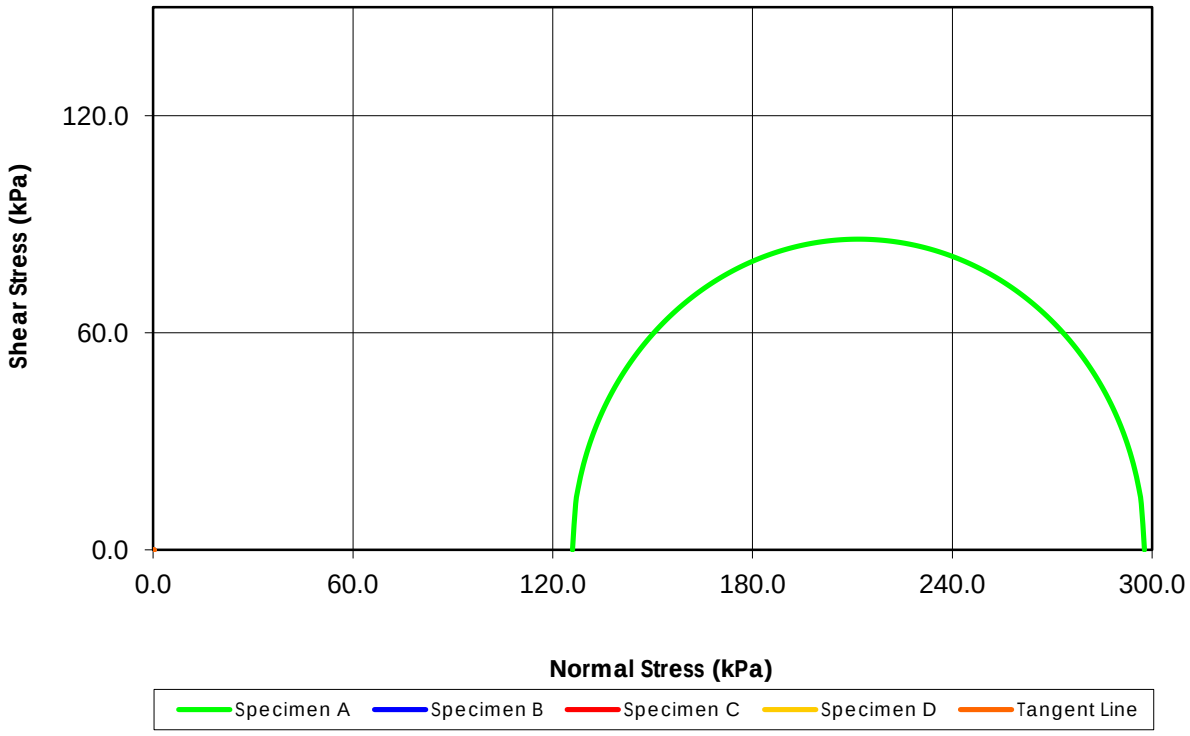

## Principal Stress Ratio vs. Axial Strain



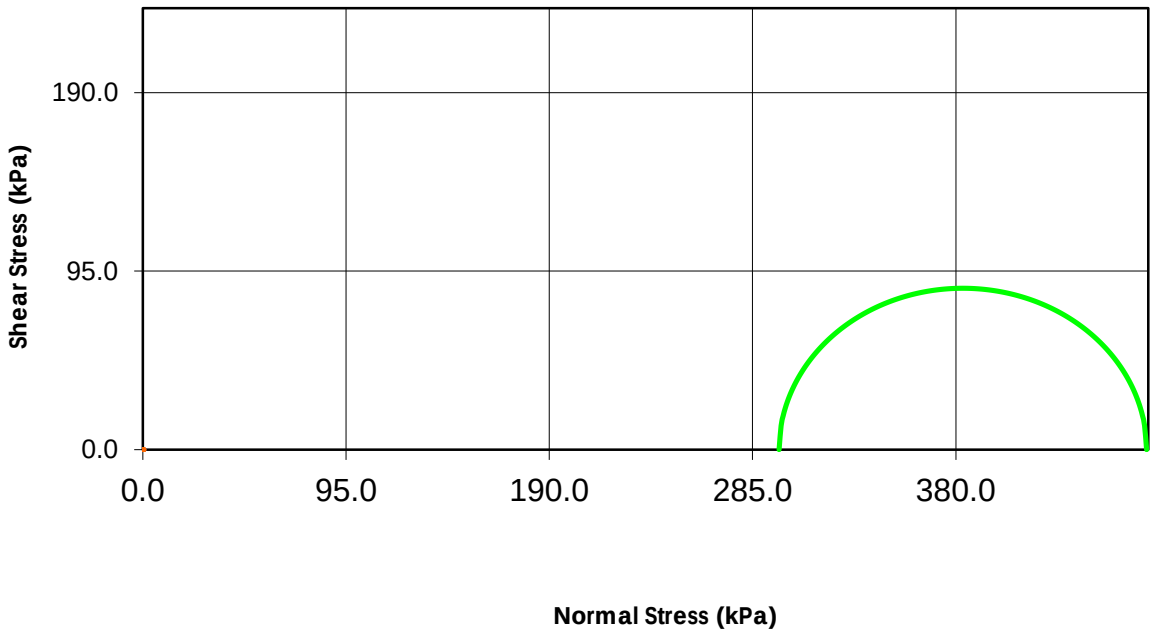

Change in Pore Pressure vs. Axial Strain
181.0
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

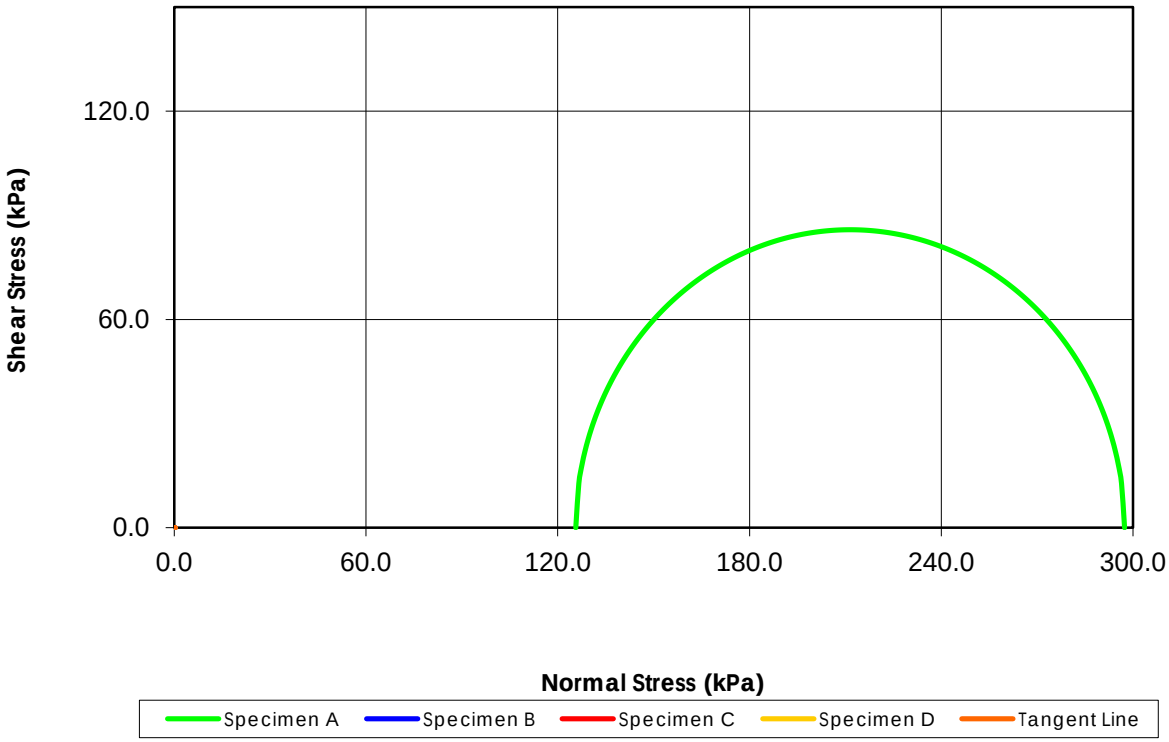



### Total Stress
### (C = 0.0 Ø = 0.0)

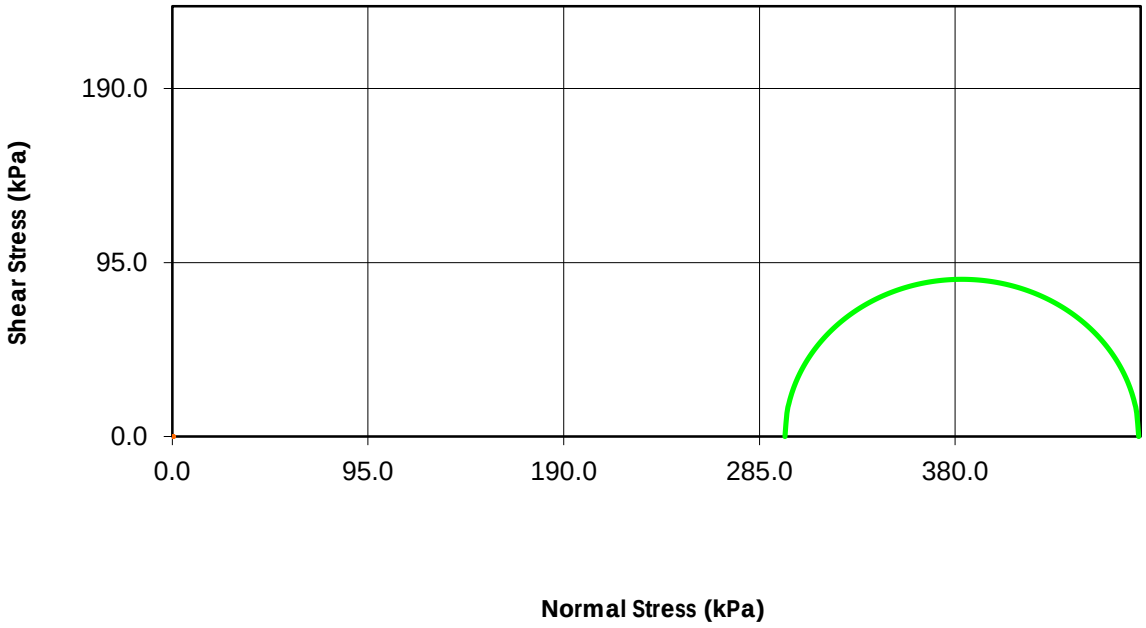


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

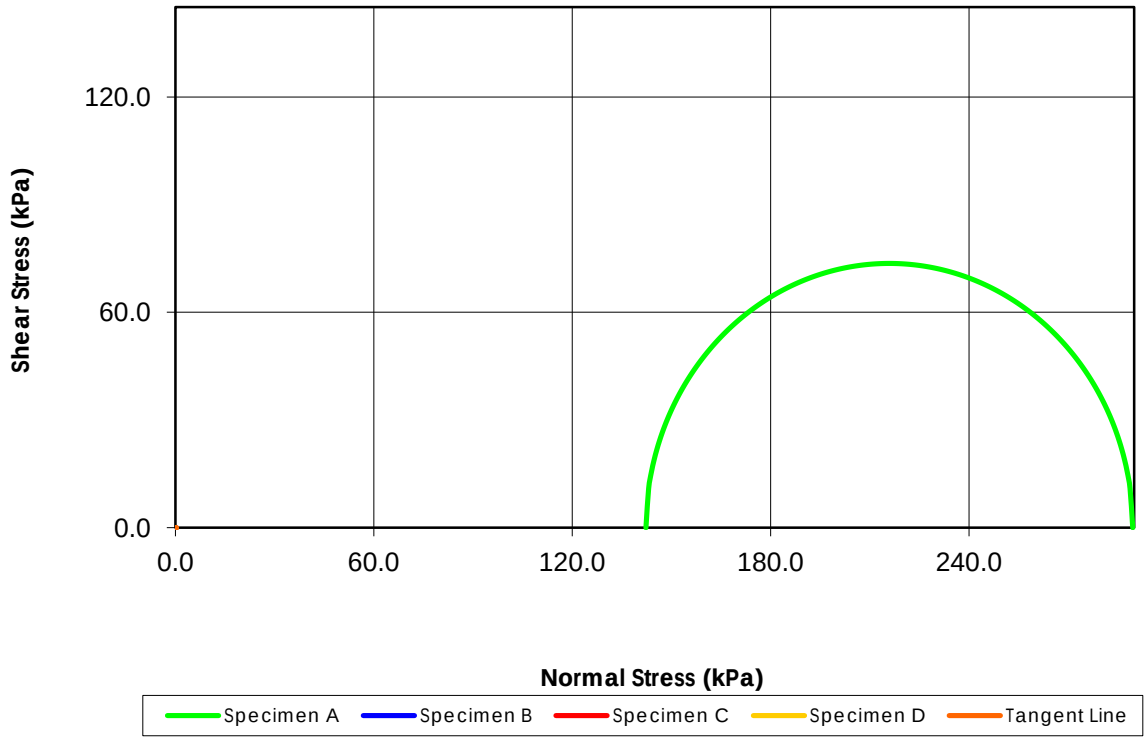



## Total Stress
## (C = 0.0 Ø = 0.0)

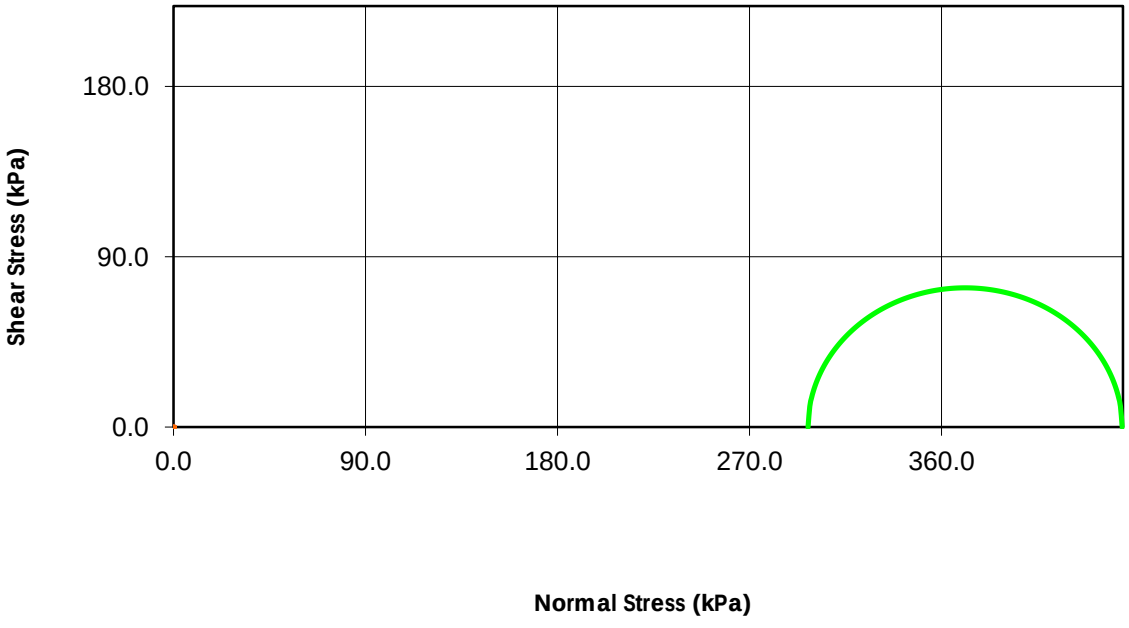


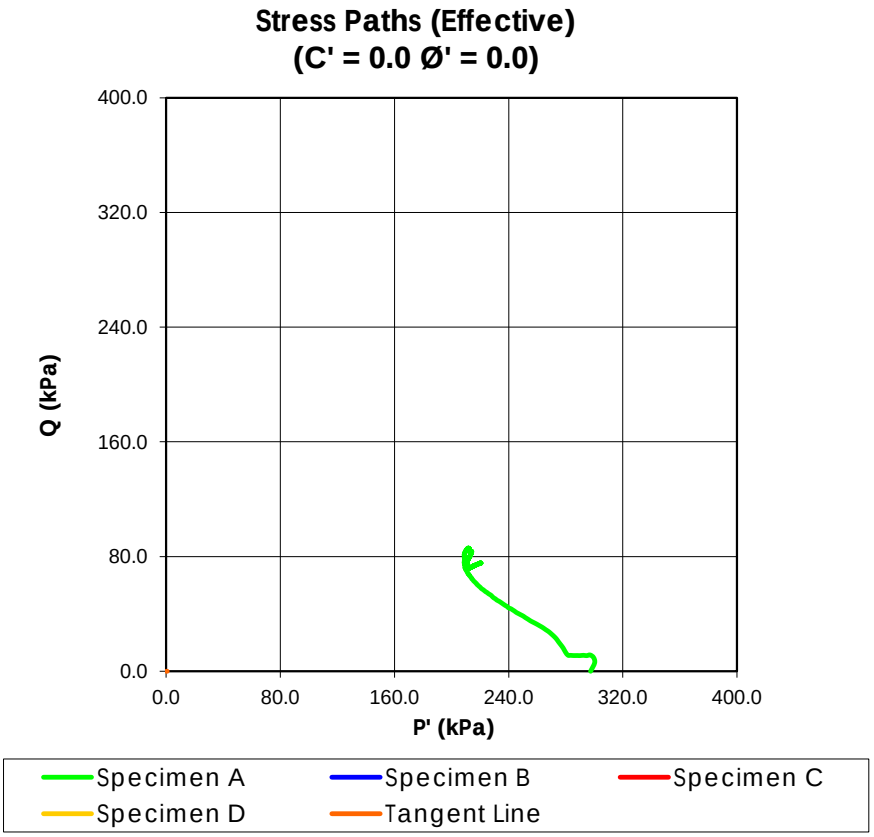
# Mohr Stress Circles at 15% Axial Strain Criterion

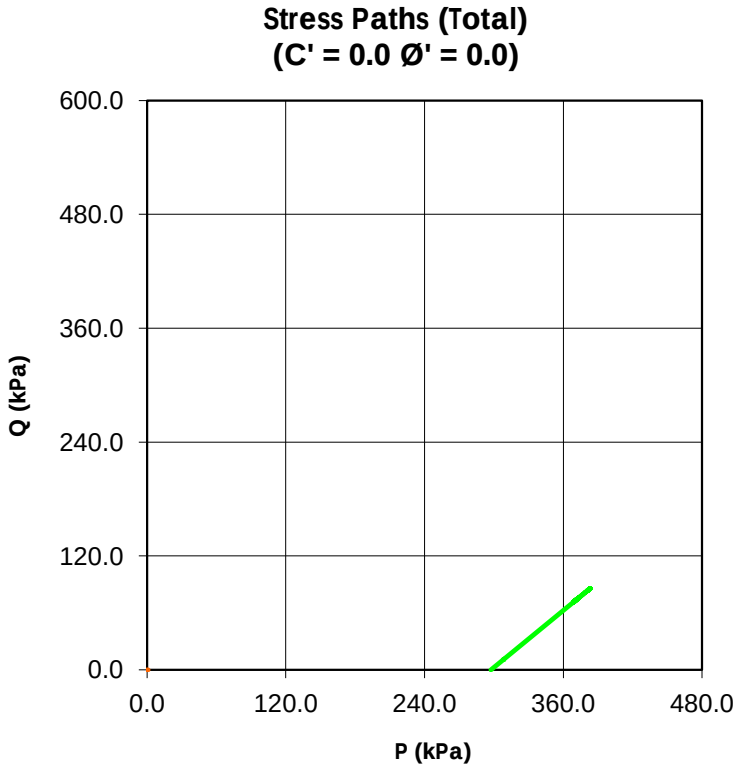
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

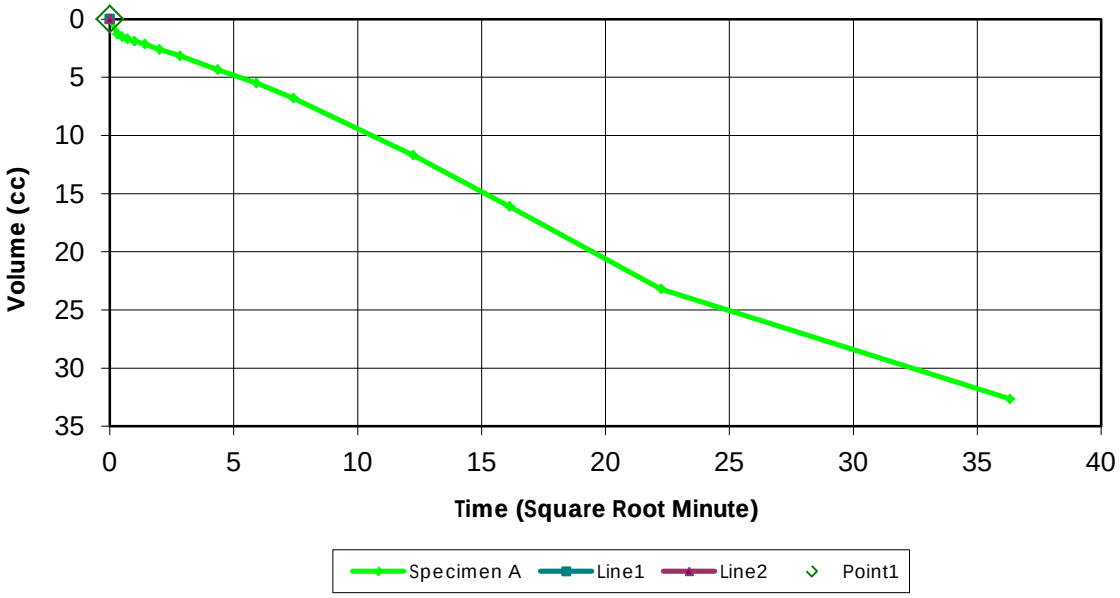



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

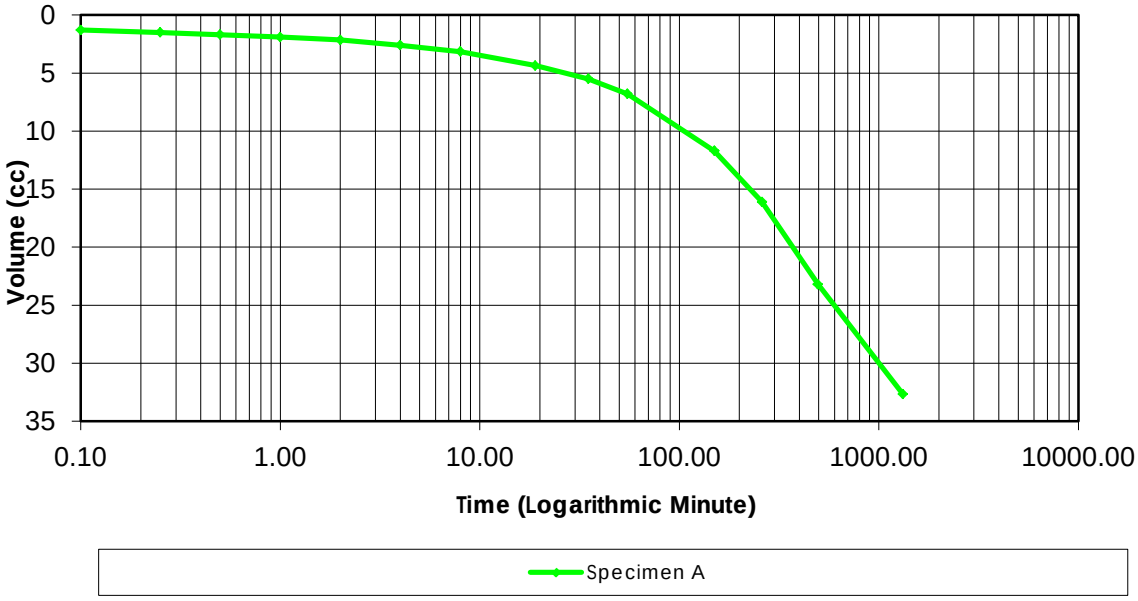

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 120.0 | 40.0 | 60.0 | 0.0 | 44.00 |
| 3 | 120.0 | 100.0 | 0.0 | 60.0 | |
| 4 | 120.0 | 100.0 | 0.0 | 0.0 | |
| 5 | 170.0 | 100.0 | 50.0 | 0.0 | 74.00 |
| 6 | 170.0 | 150.0 | 0.0 | 50.0 | |
| 7 | 170.0 | 150.0 | 0.0 | 0.0 | |
| 8 | 220.0 | 150.0 | 50.0 | 0.0 | 0.73 |
| 9 | 220.0 | 200.0 | 0.0 | 50.0 | |
| 10 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 11 | 260.0 | 200.0 | 40.0 | 0.0 | 0.95 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.0-3.5m

| | |
|---|---|
| Cell Pressure (kPa) | 540 |
| Back Pressure (kPa) | 240 |
| Effective Pressure (kPa) | 300 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 154 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 634 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 37.30 | N/A |
| 00:00:06 | 36.00 | 1.300 |
| 00:00:15 | 35.80 | 1.500 |
| 00:00:30 | 35.60 | 1.700 |
| 00:01:00 | 35.40 | 1.900 |
| 00:02:00 | 35.15 | 2.150 |
| 00:04:00 | 34.70 | 2.600 |
| 00:08:00 | 34.15 | 3.150 |
| 00:19:00 | 32.95 | 4.350 |
| 00:35:00 | 31.80 | 5.500 |
| 00:55:00 | 30.50 | 6.800 |
| 02:30:00 | 25.60 | 11.700 |
| 04:20:00 | 21.20 | 16.100 |
| 08:15:00 | 14.10 | 23.200 |
| 22:00:00 | 4.65 | 32.650 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

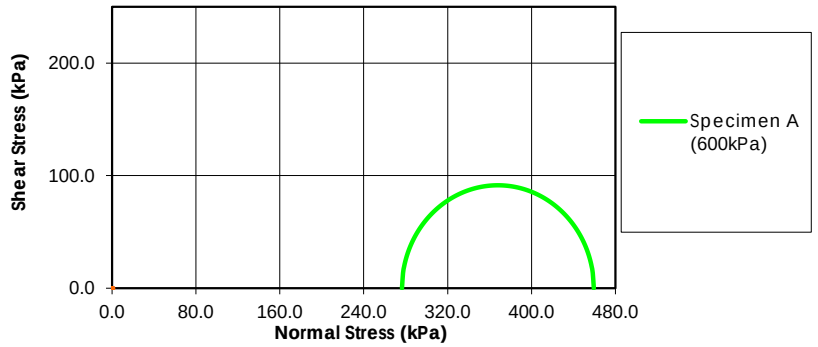
Stantec

Reviewed By C. Lamoureux

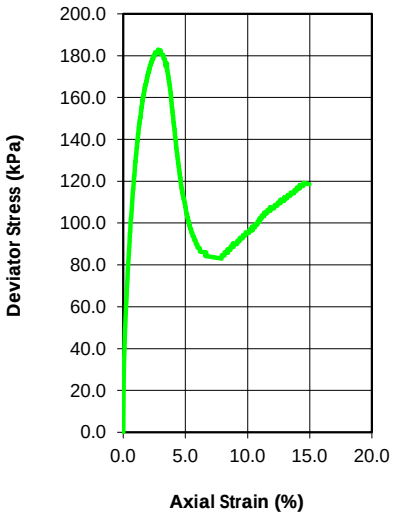
Date: 18-May-16

Tested By: C.Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.0 | | | |
| Dry Density (g/cm3) | 1.536 | | | |
| Saturation (%) | 96.15 | | | |
| Void Ratio | 0.755 | | | |
| Diameter (mm) | 72.4 | | | |
| Height (mm) | 168.2 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 23.3 | | | |
| Dry Density (g/cm3) | 1.535 | | | |
| Saturation (%) | 100.0 | | | |
| Void Ratio | 0.758 | | | |
| Effective Stress (kPa) | 372.0 | | | |
| Back Press. (kPa) | 298.0 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

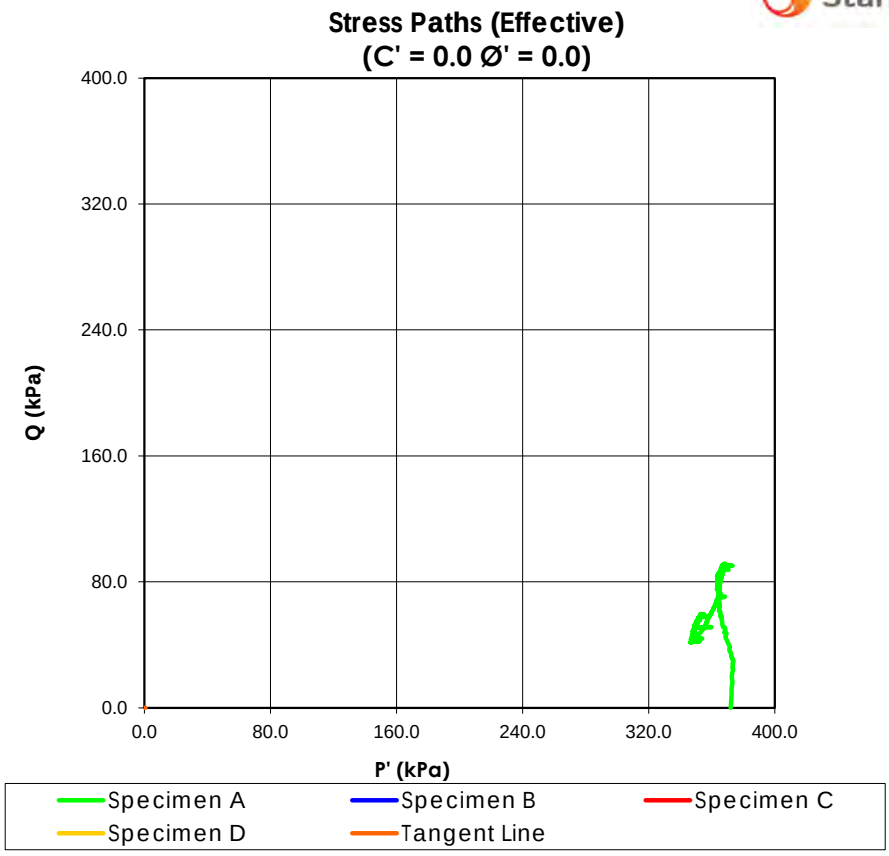
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 459.39 | | | |
| σ'3 at Failure (kPa) | 276.47 | | | |
| | | | | |
| | | | | |

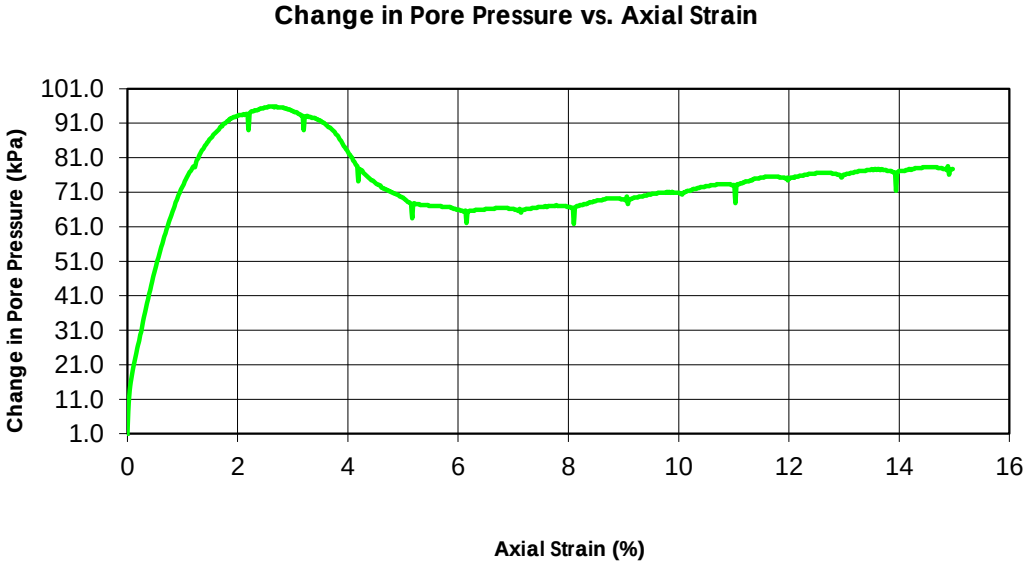
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 10773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC15-ST4 Bottom |
| **Depth:** | 3.0-3.5m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

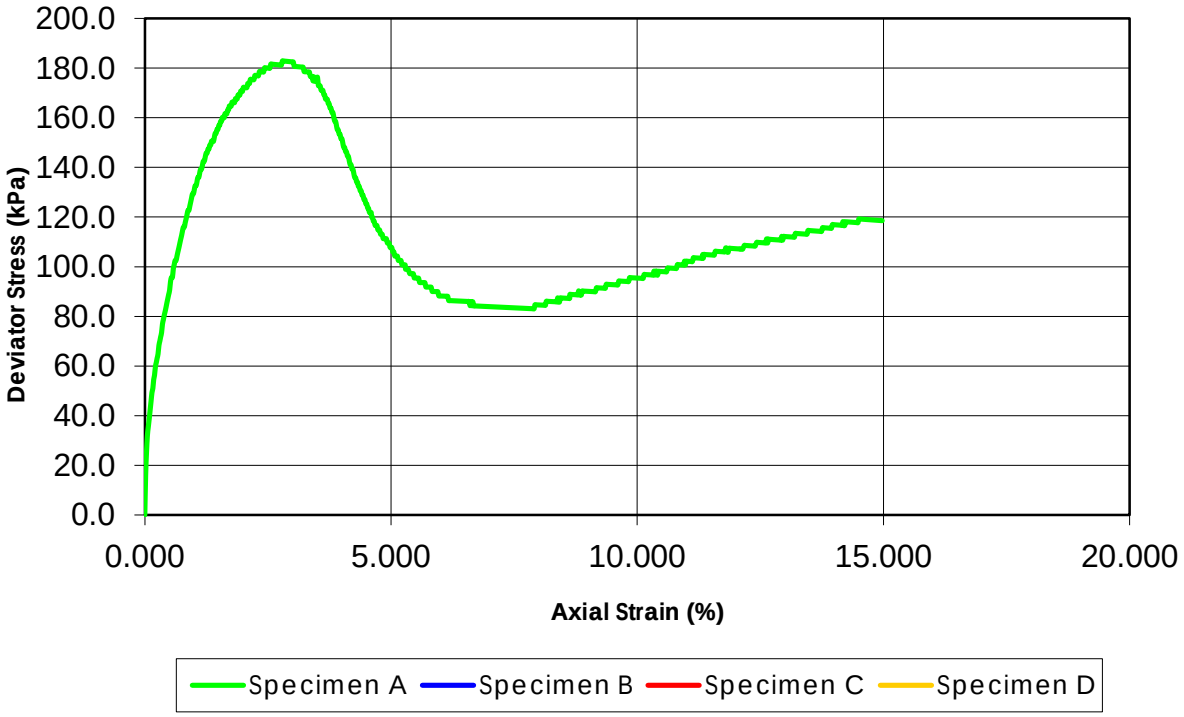
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

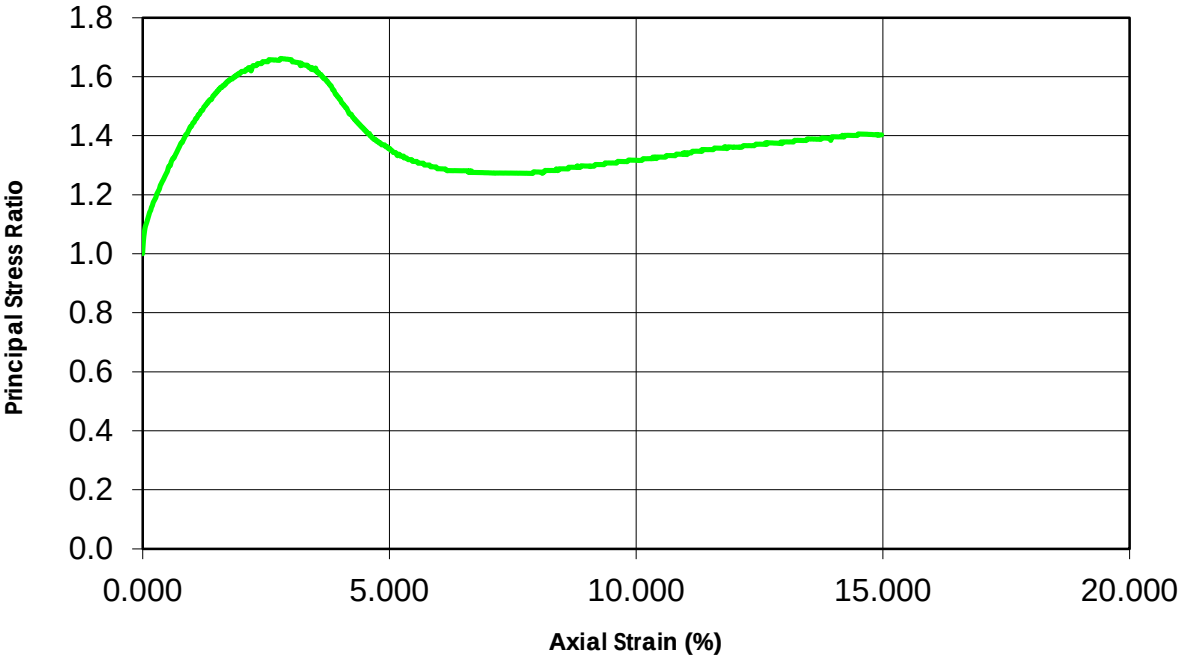


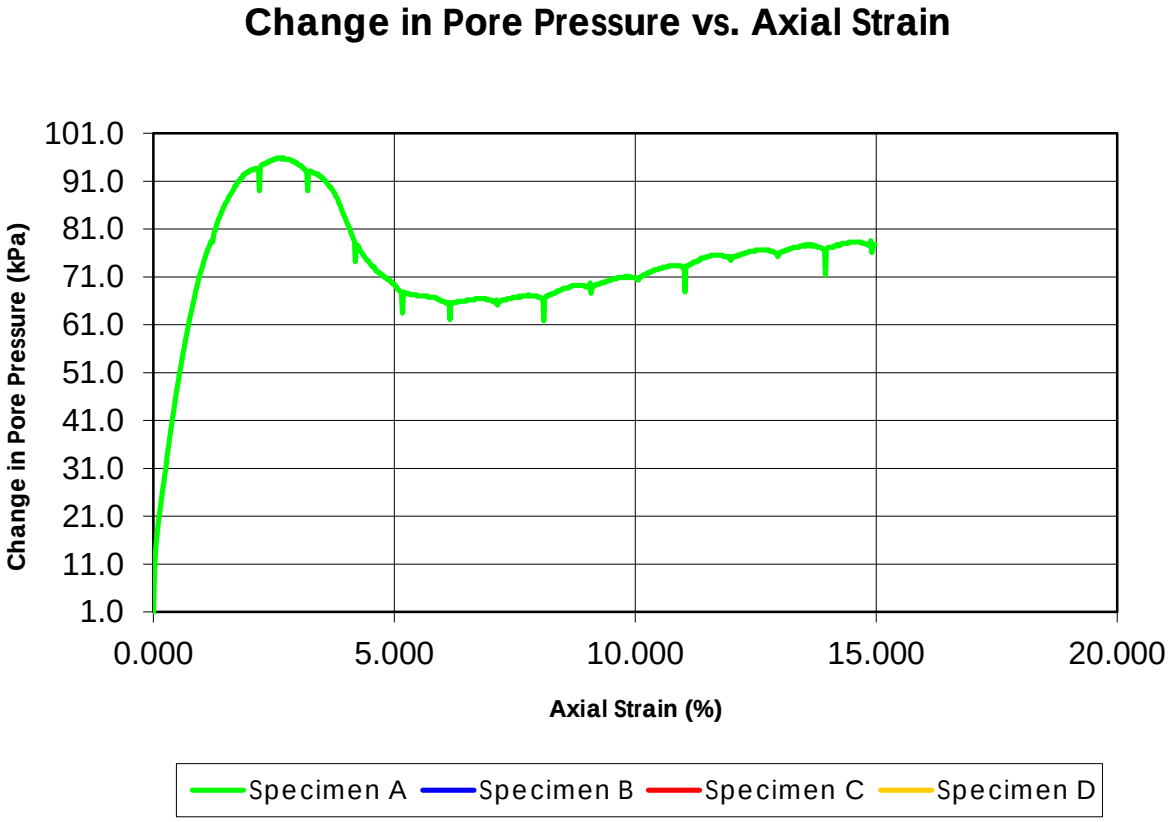



## Deviator Stress vs. Axial Strain



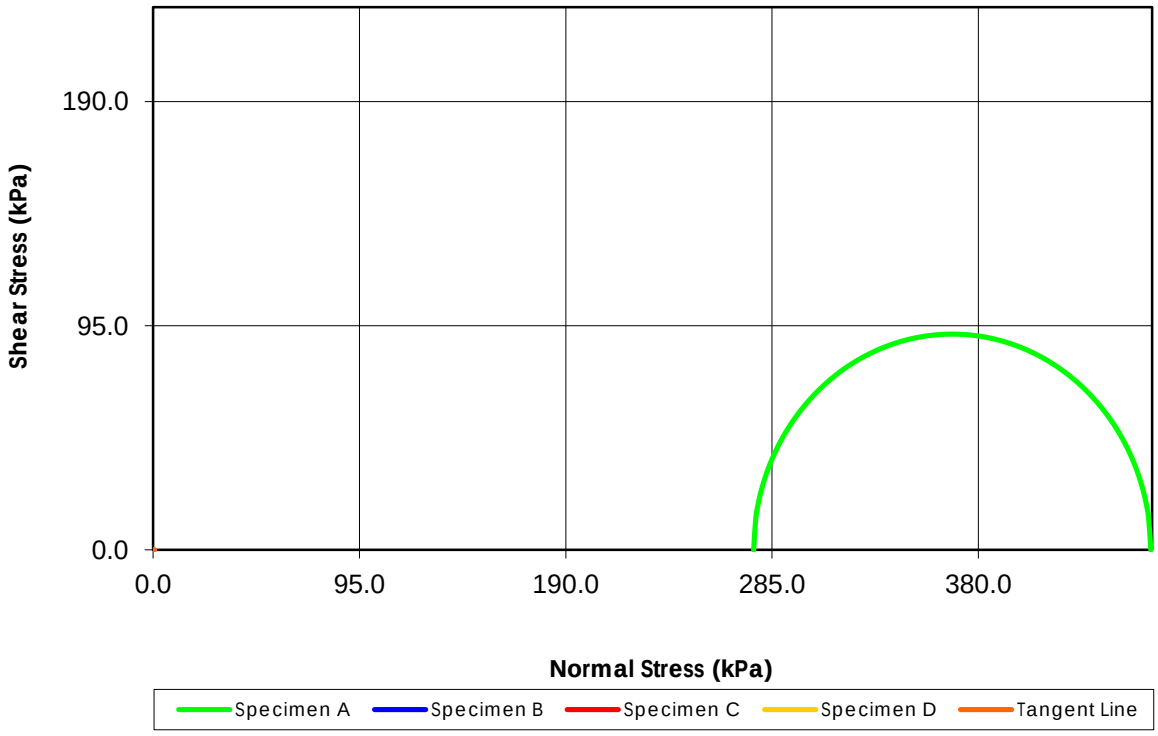

## Principal Stress Ratio vs. Axial Strain



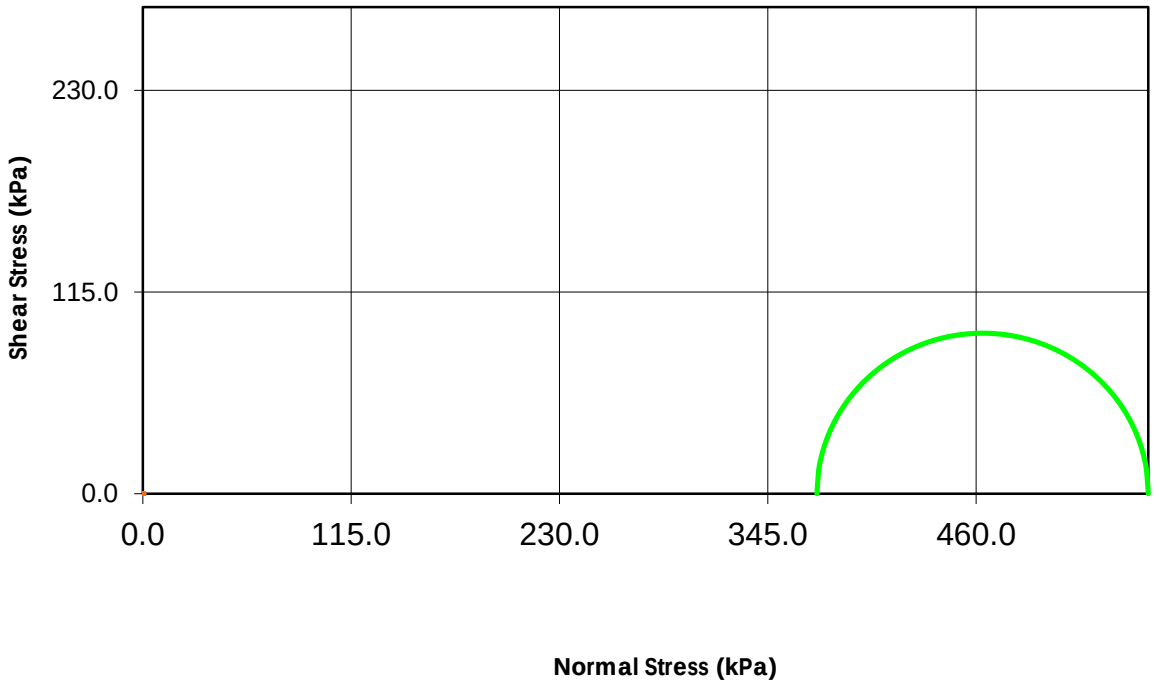

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
101.0
91.0
81.0
71.0
61.0
51.0
41.0
31.0
21.0
11.0
1.0
0.000
5.000
10.000
15.000
20.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

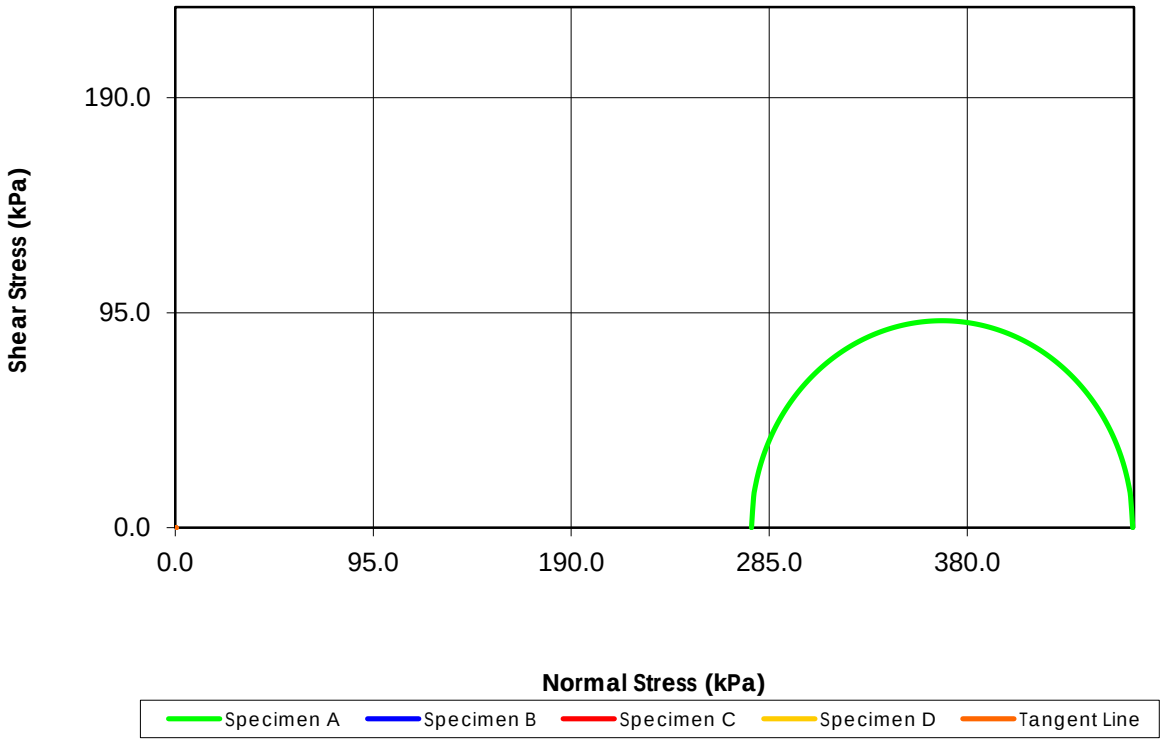



### Total Stress
### (C = 0.0 Ø = 0.0)

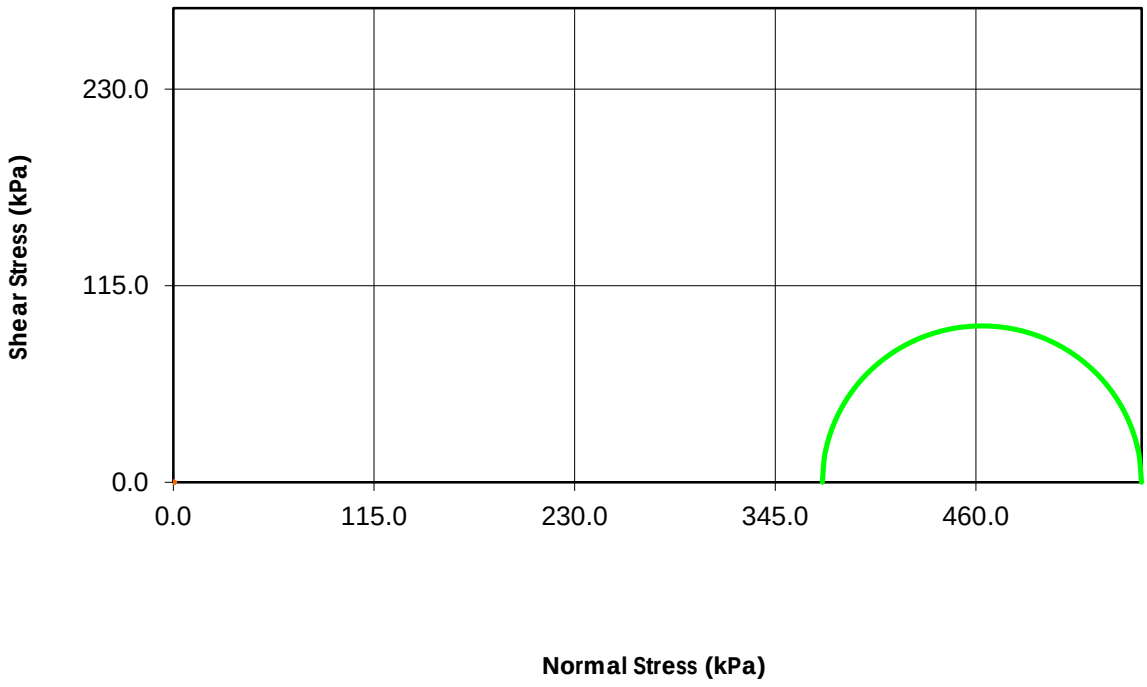


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

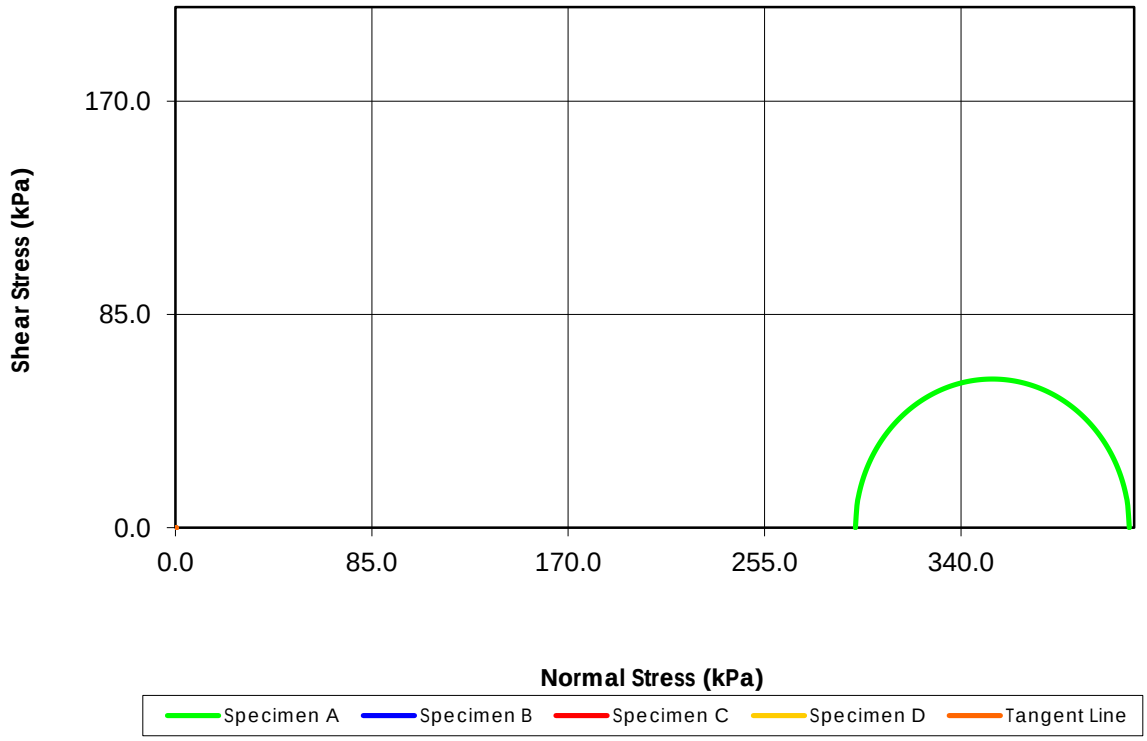



## Total Stress
## (C = 0.0 Ø = 0.0)

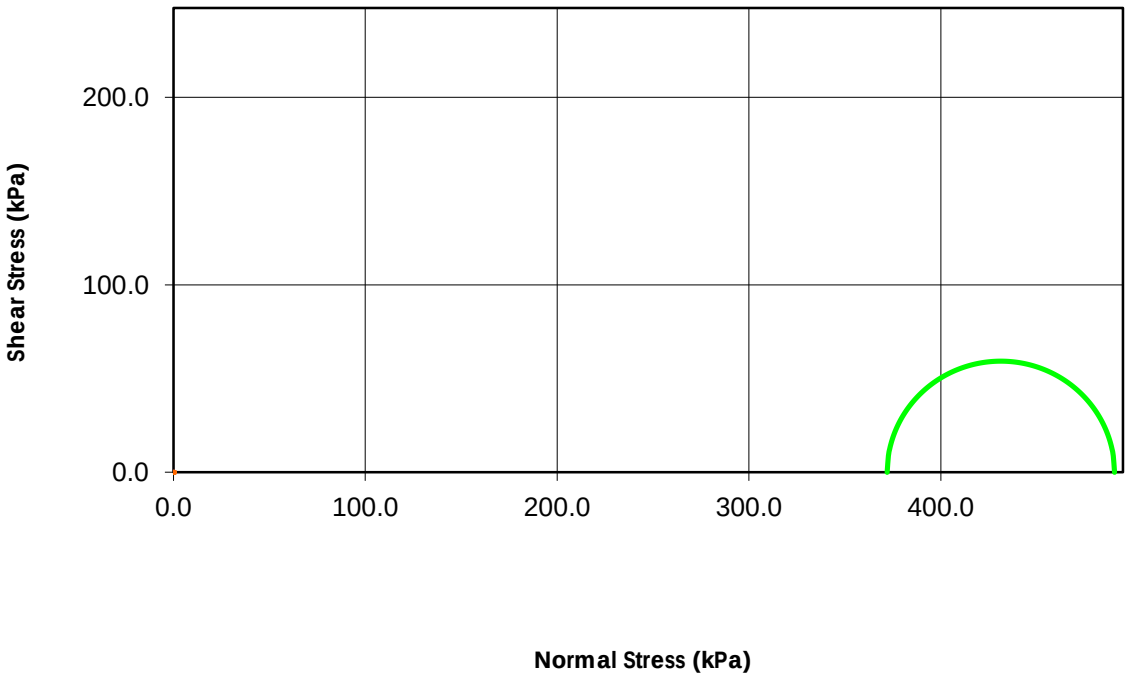


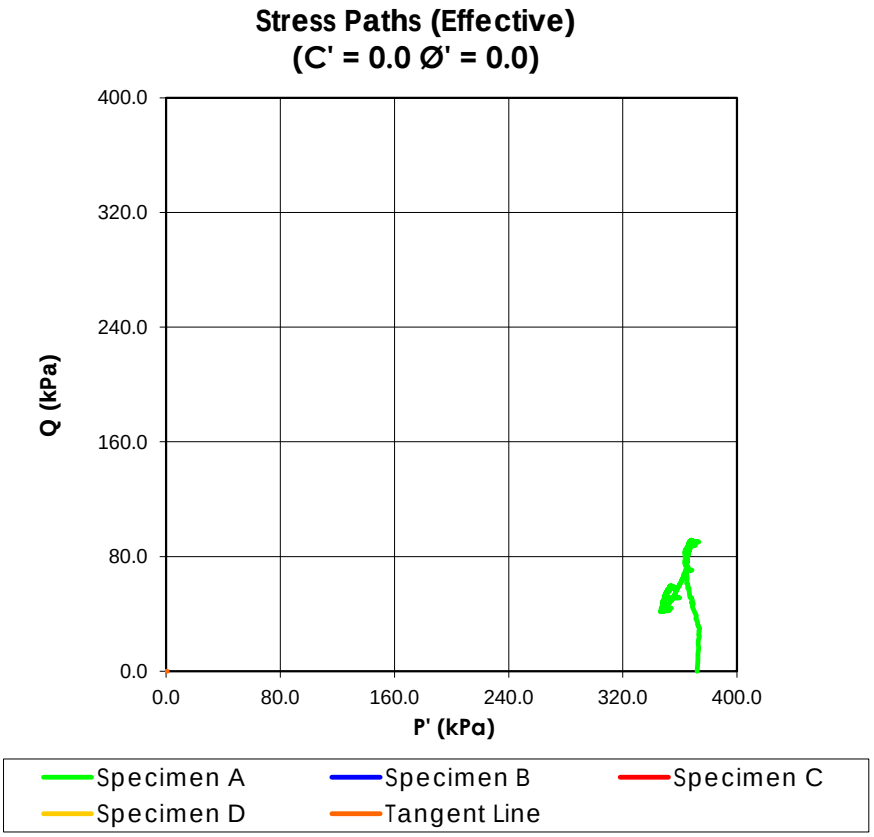
# Mohr Stress Circles at 15% Axial Strain Criterion

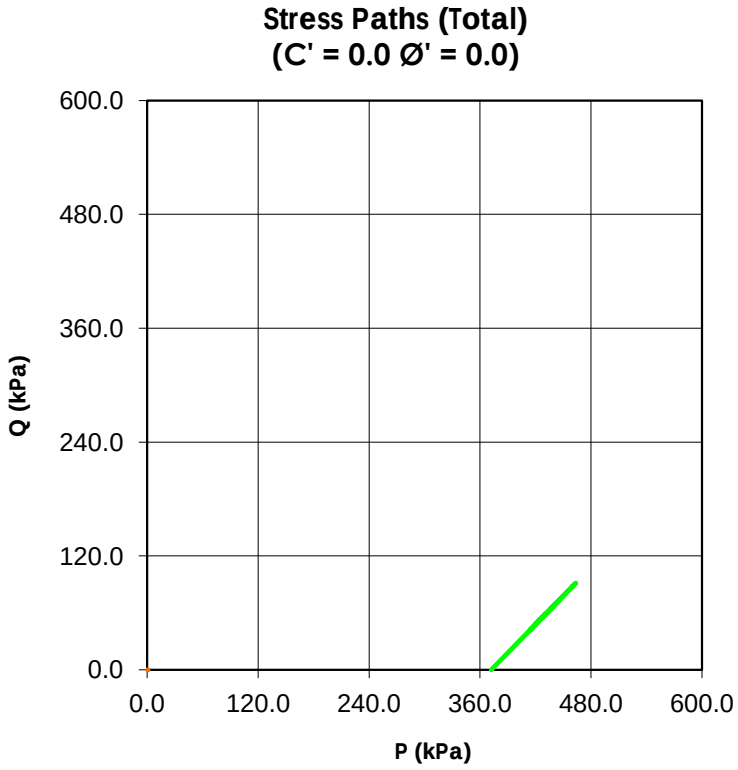
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

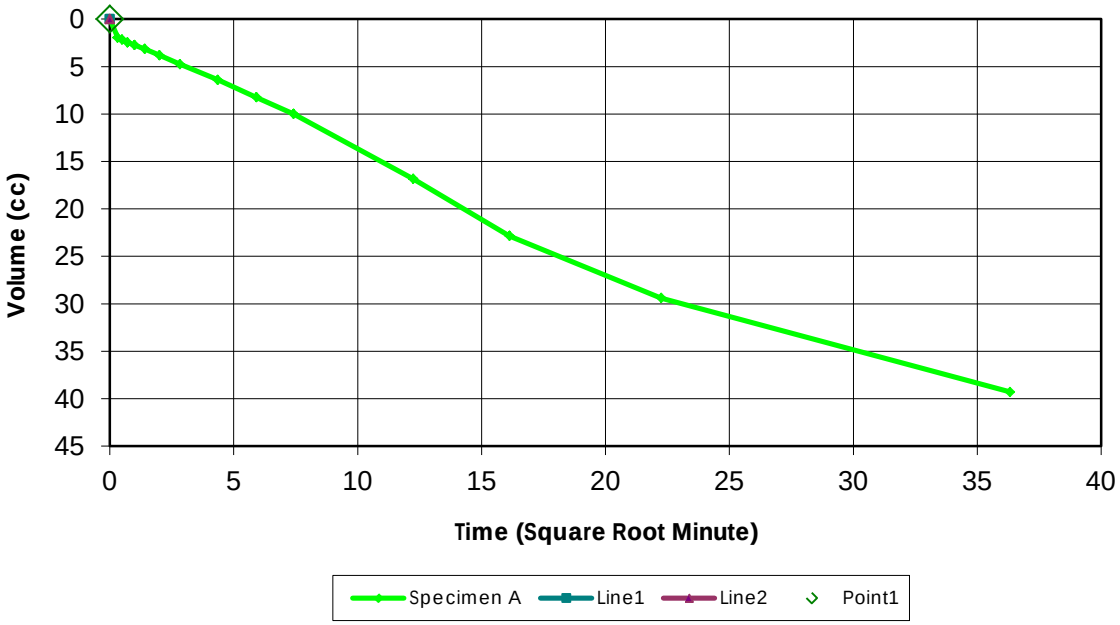



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

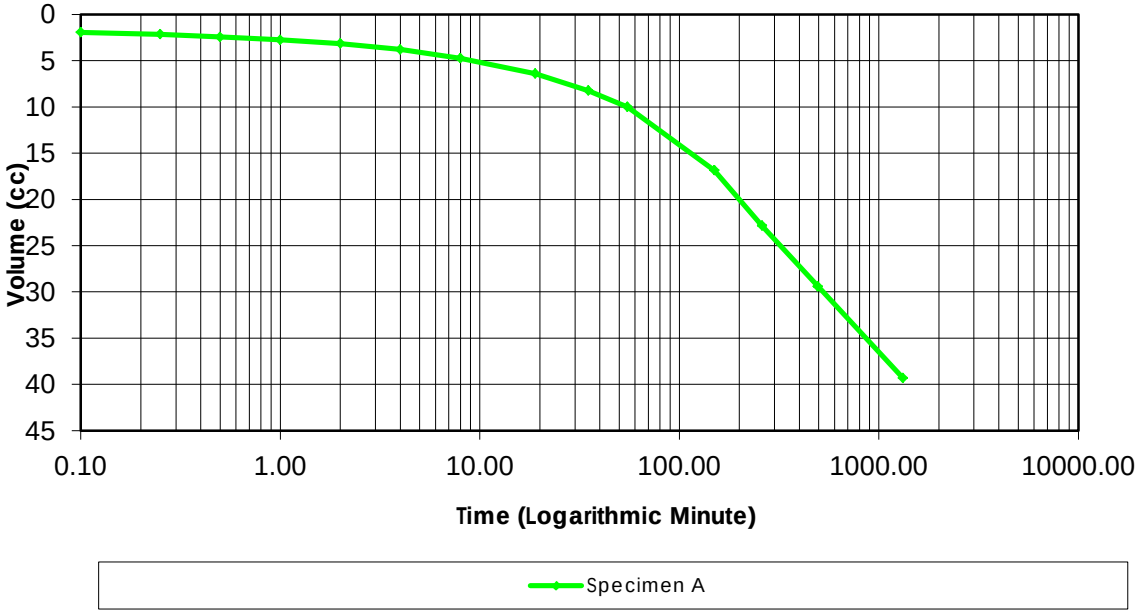

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 10773396.302.70

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.97

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 70.0 | 40.0 | 10.0 | 0.0 | 0.30 |
| 3 | 70.0 | 50.0 | 0.0 | 10.0 | |
| 4 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 5 | 80.0 | 50.0 | 10.0 | 0.0 | 0.46 |
| 6 | 80.0 | 60.0 | 0.0 | 10.0 | |
| 7 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 8 | 90.0 | 60.0 | 10.0 | 0.0 | 0.97 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 10773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.0-3.5m

| | |
|---|---|
| Cell Pressure (kPa) | 670 |
| Back Pressure (kPa) | 70 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 168.2 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 692.5 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 43.45 | N/A |
| 00:00:06 | 41.50 | 1.950 |
| 00:00:15 | 41.30 | 2.150 |
| 00:00:30 | 41.00 | 2.450 |
| 00:01:00 | 40.70 | 2.750 |
| 00:02:00 | 40.30 | 3.150 |
| 00:04:00 | 39.65 | 3.800 |
| 00:08:00 | 38.70 | 4.750 |
| 00:19:00 | 37.05 | 6.400 |
| 00:35:00 | 35.20 | 8.250 |
| 00:55:00 | 33.45 | 10.000 |
| 02:30:00 | 26.60 | 16.850 |
| 04:20:00 | 20.60 | 22.850 |
| 08:15:00 | 14.05 | 29.400 |
| 22:00:00 | 4.15 | 39.300 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

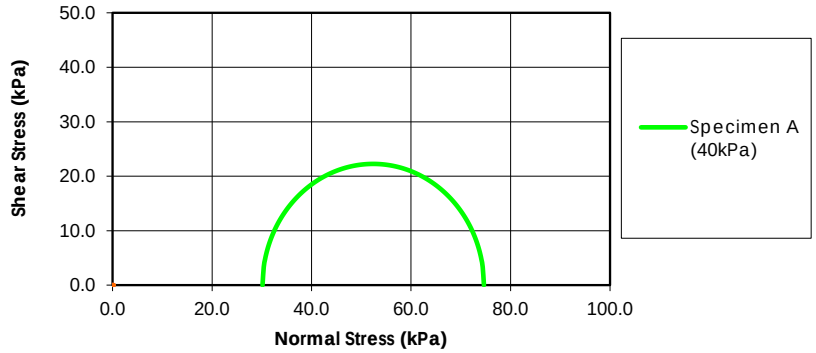
Stantec

Reviewed By C. Lamoureux

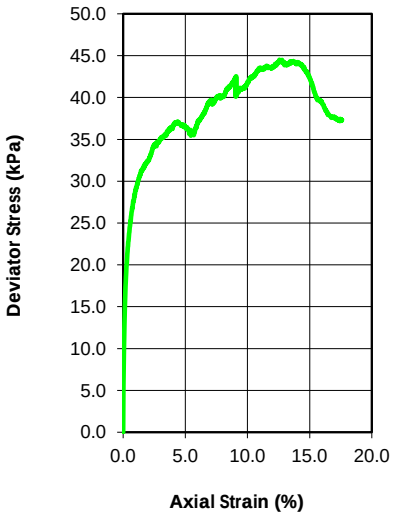
Date: 3-Oct-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.5 | | | |
| Dry Density (g/cm3) | 1.508 | | | |
| Saturation (%) | 93.77 | | | |
| Void Ratio | 0.787 | | | |
| Diameter (mm) | 71.600 | | | |
| Height (mm) | 150.100 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.94 | | | |
| Water Content (%) | 26.9 | | | |
| Dry Density (g/cm3) | 1.455 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.856 | | | |
| Effective Stress (kPa) | 34.9 | | | |
| Back Press. (kPa) | 275.1 | | | |
| Rate of Strain | 0.018 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

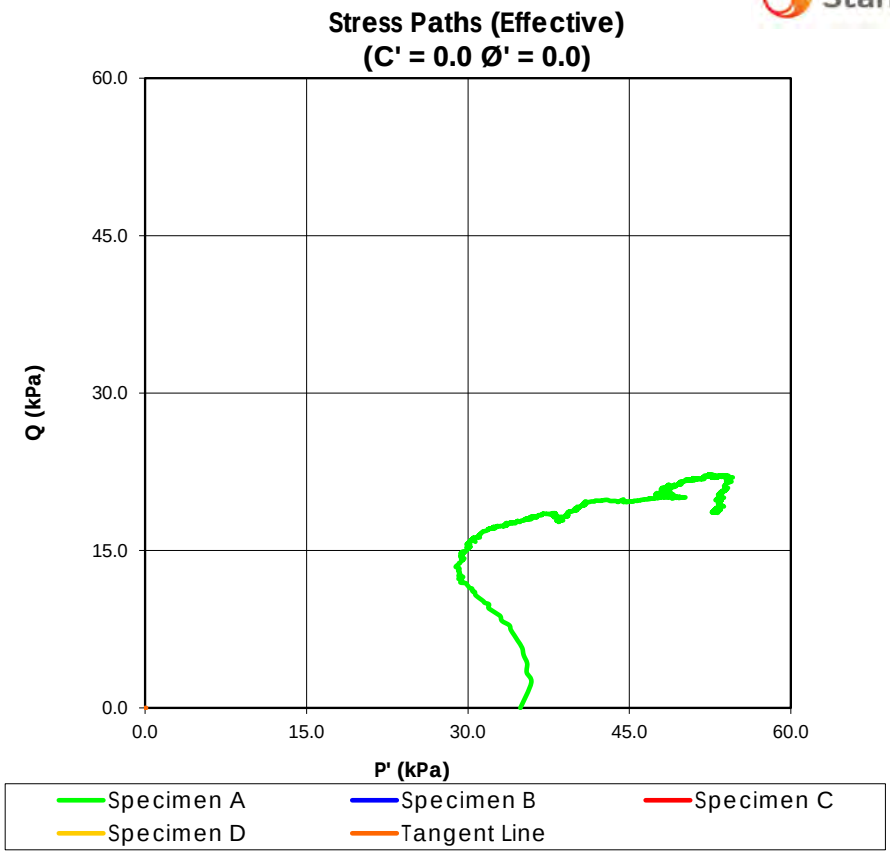
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 74.65 | | | |
| σ'3 at Failure (kPa) | 30.15 | | | |
| | | | | |
| | | | | |

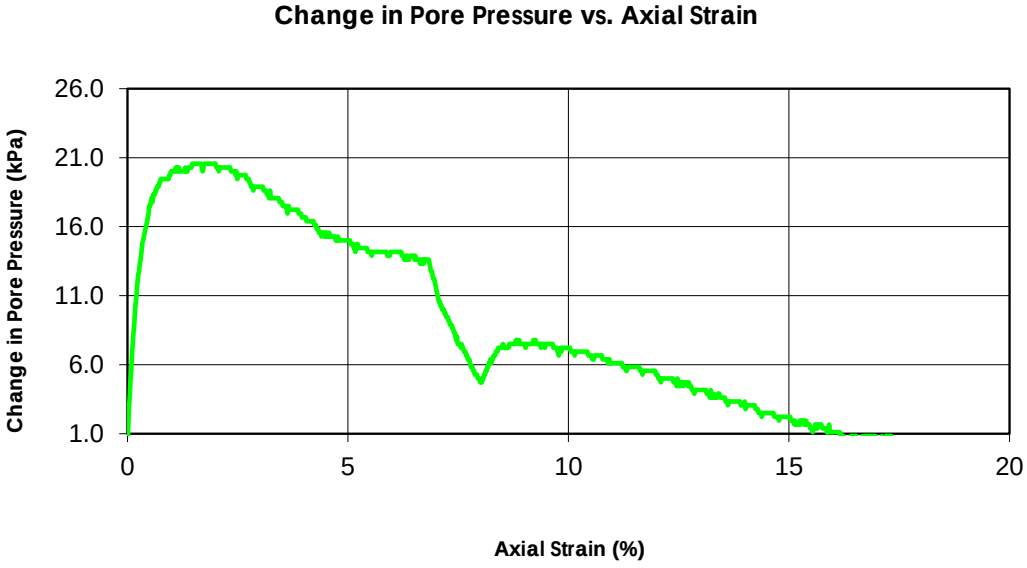
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC19 ST2 |
| **Depth:** | 1.5-2.0m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

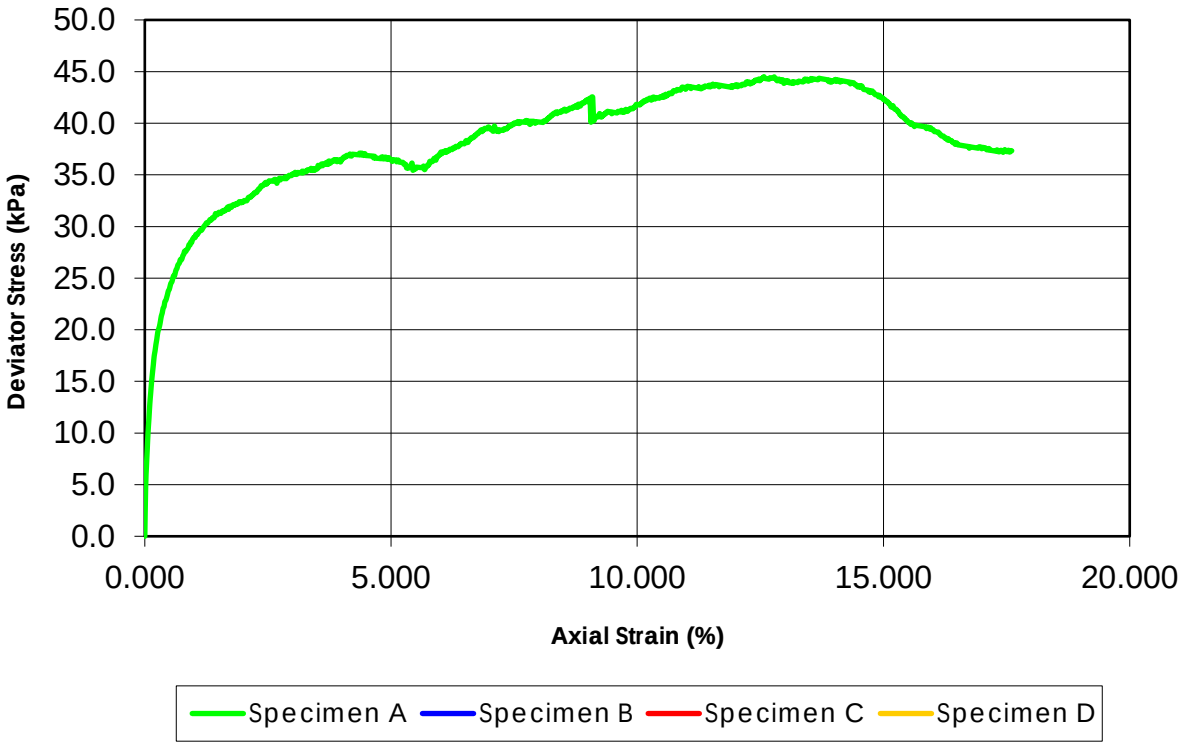
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

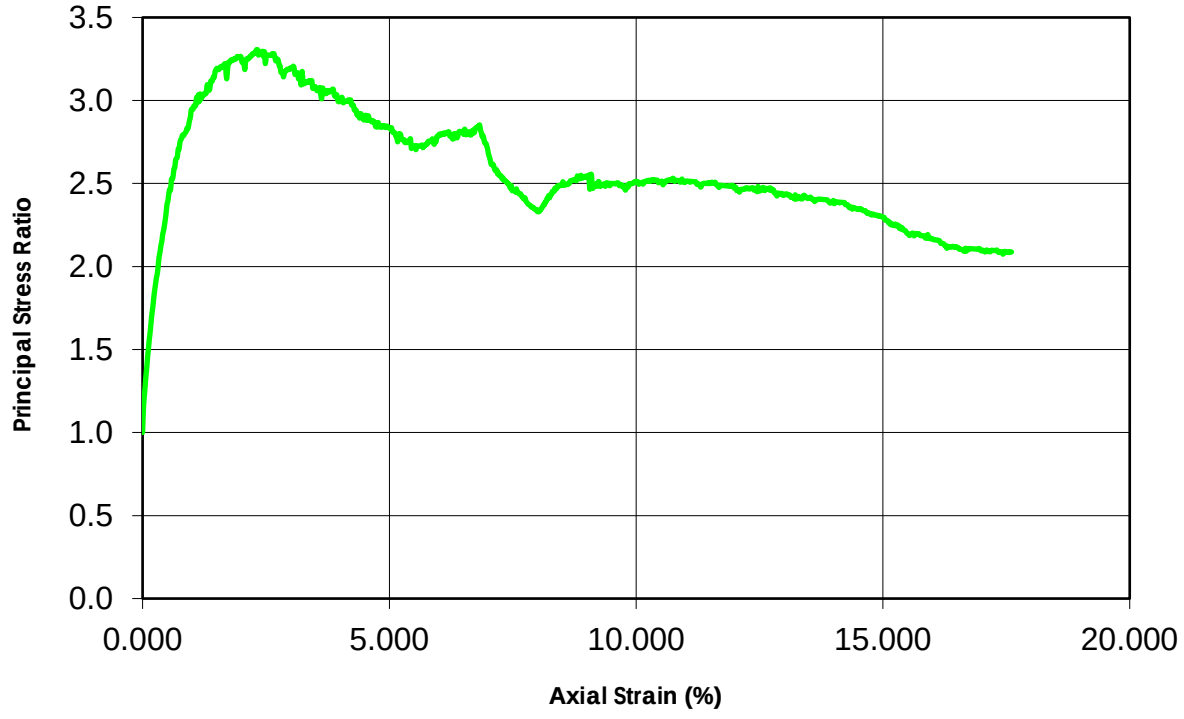


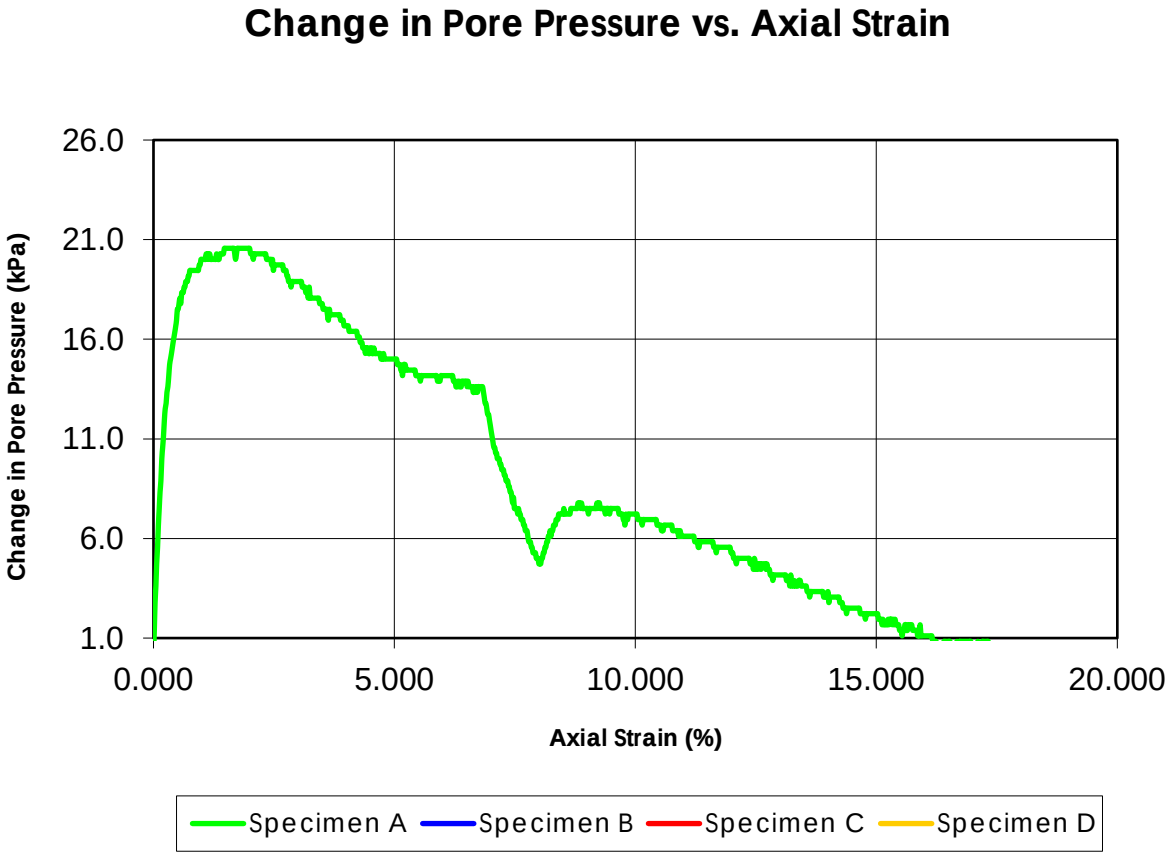



## Deviator Stress vs. Axial Strain



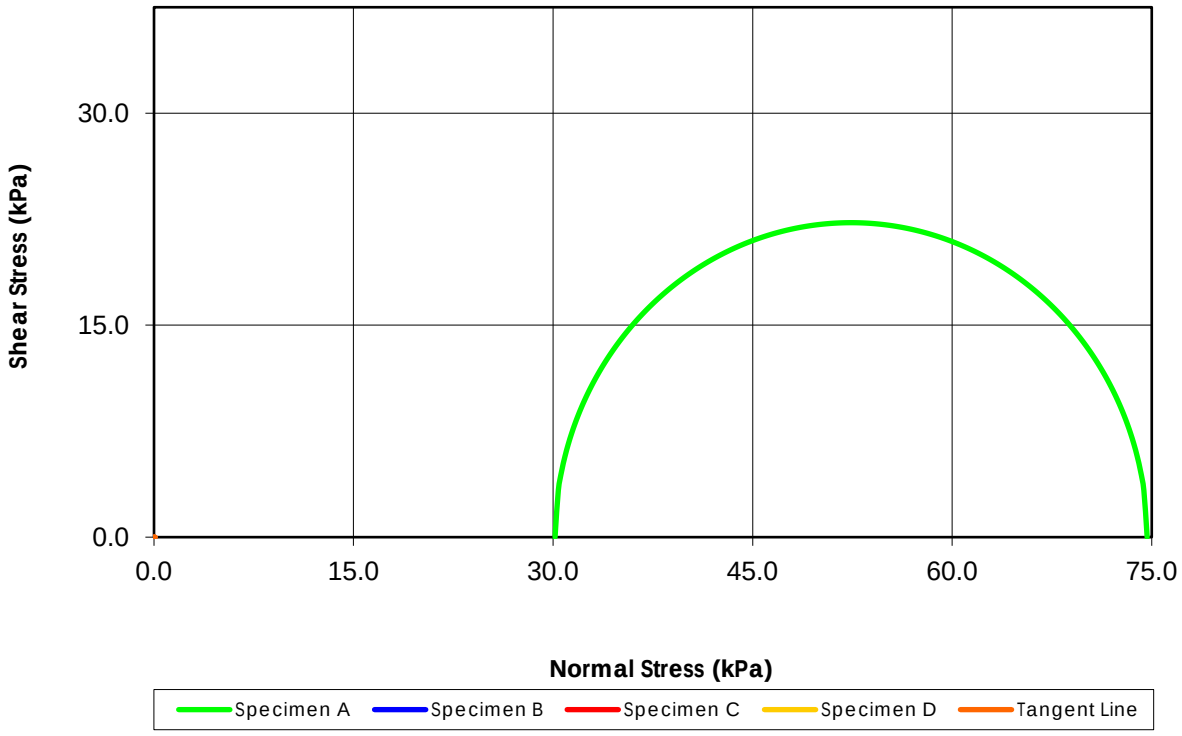

## Principal Stress Ratio vs. Axial Strain



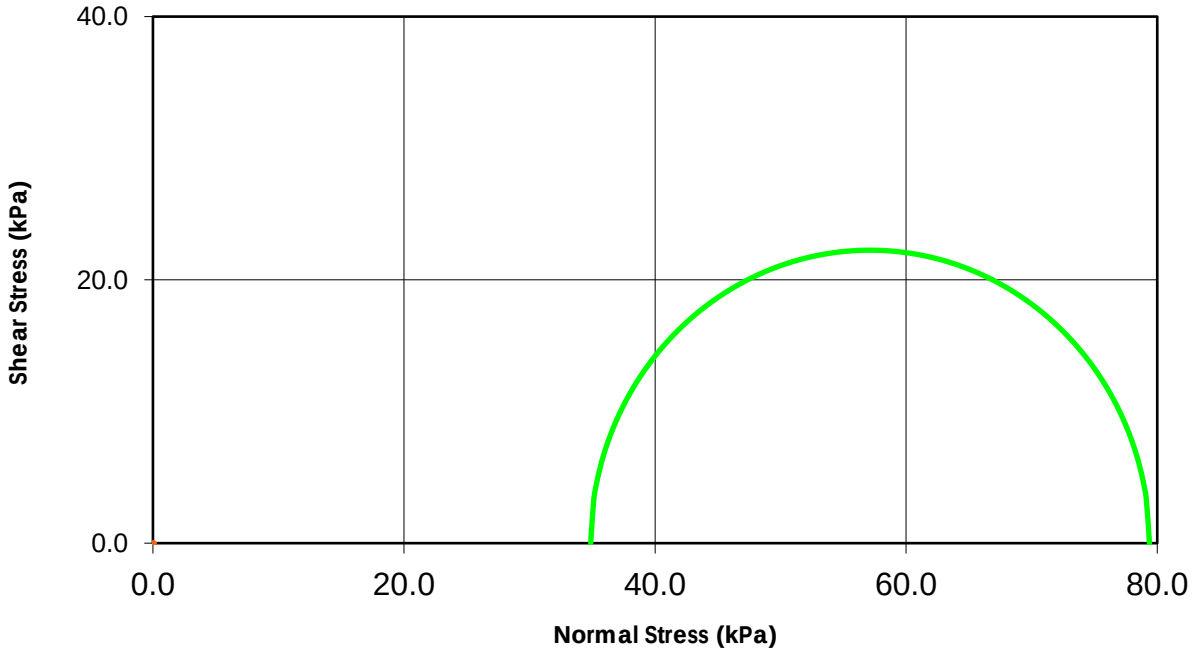

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
26.0
21.0
16.0
11.0
6.0
1.0
0.000
5.000
10.000
15.000
20.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

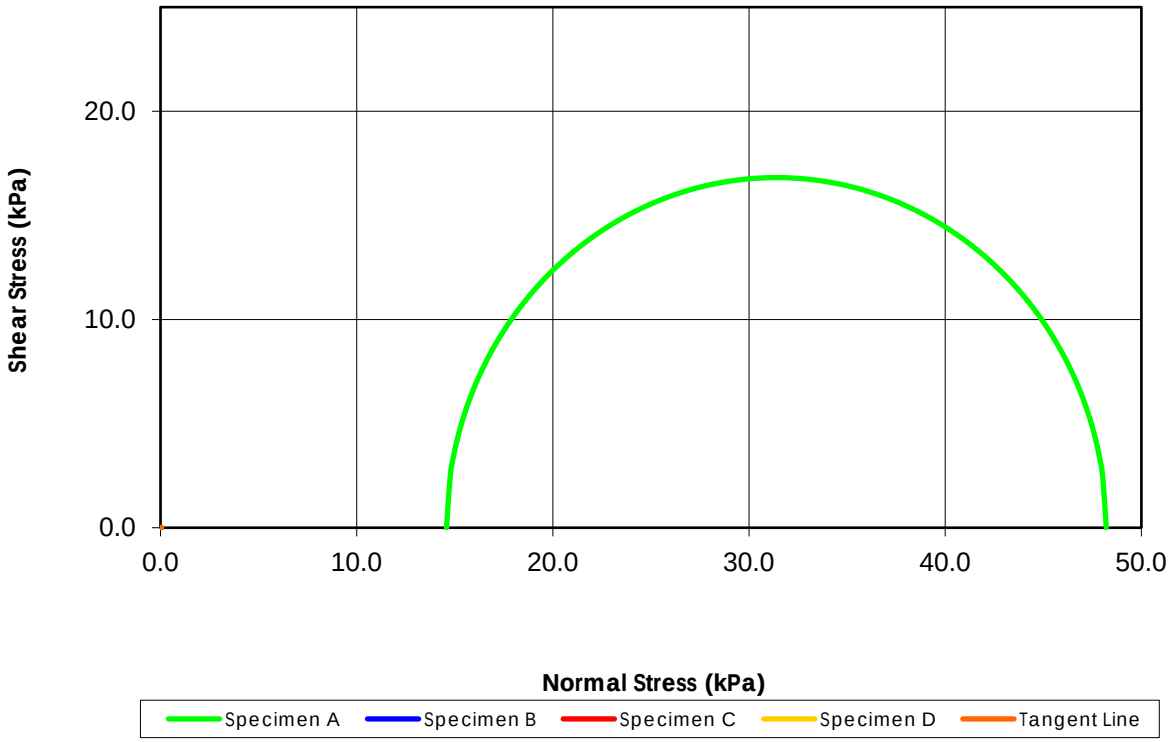



### Total Stress
### (C = 0.0 Ø = 0.0)

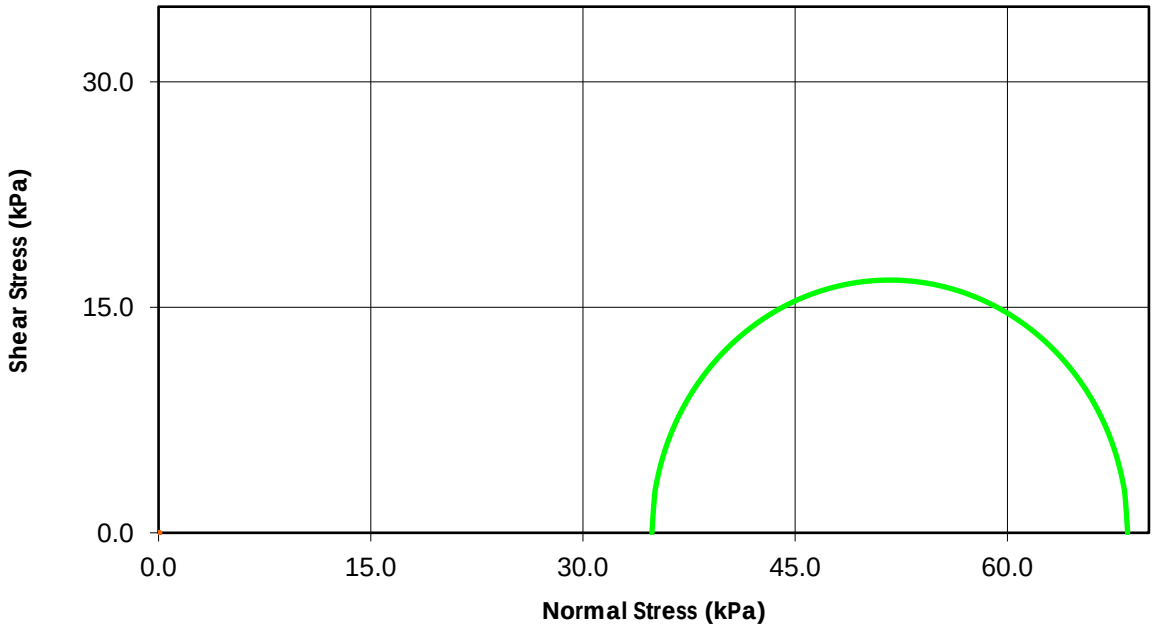


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)



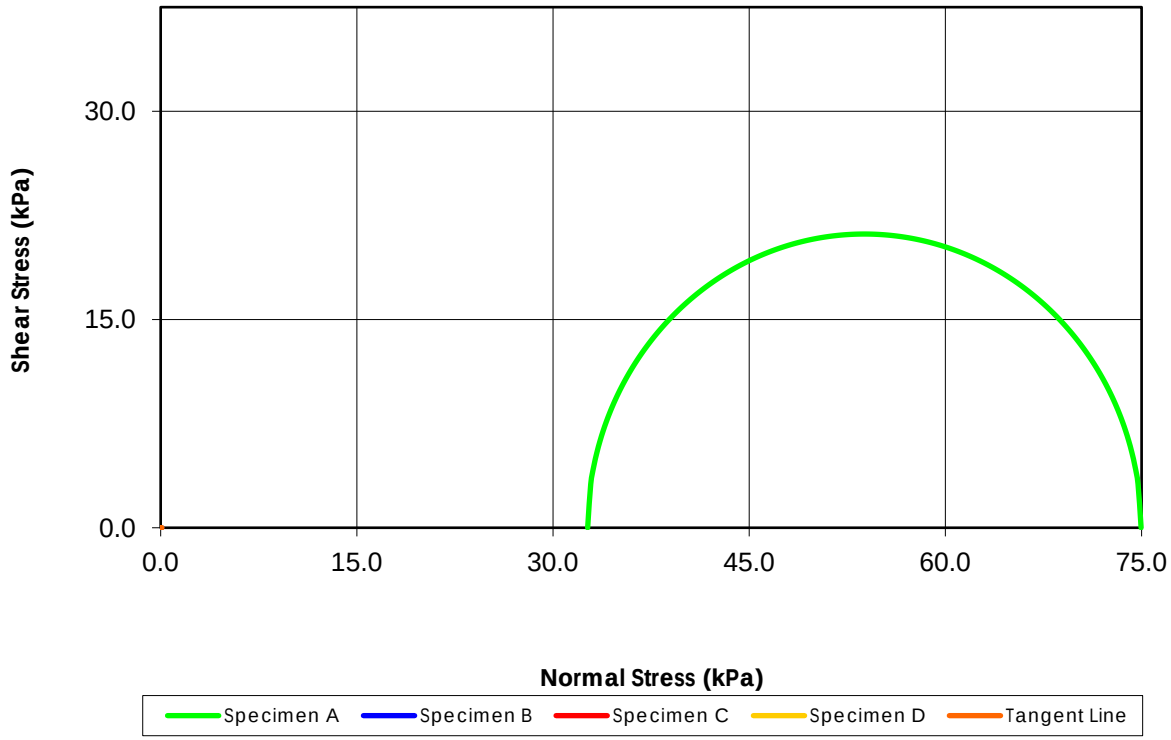

## Total Stress
## (C = 0.0 Ø = 0.0)



# Mohr Stress Circles at 15% Axial Strain Criterion

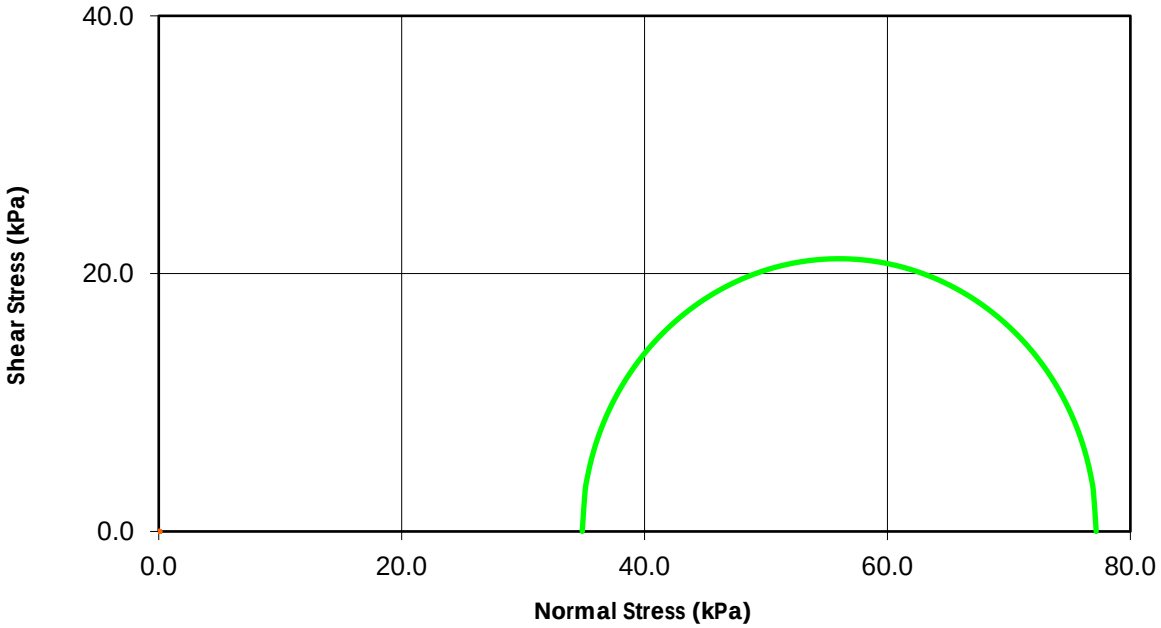
## Effective Stress

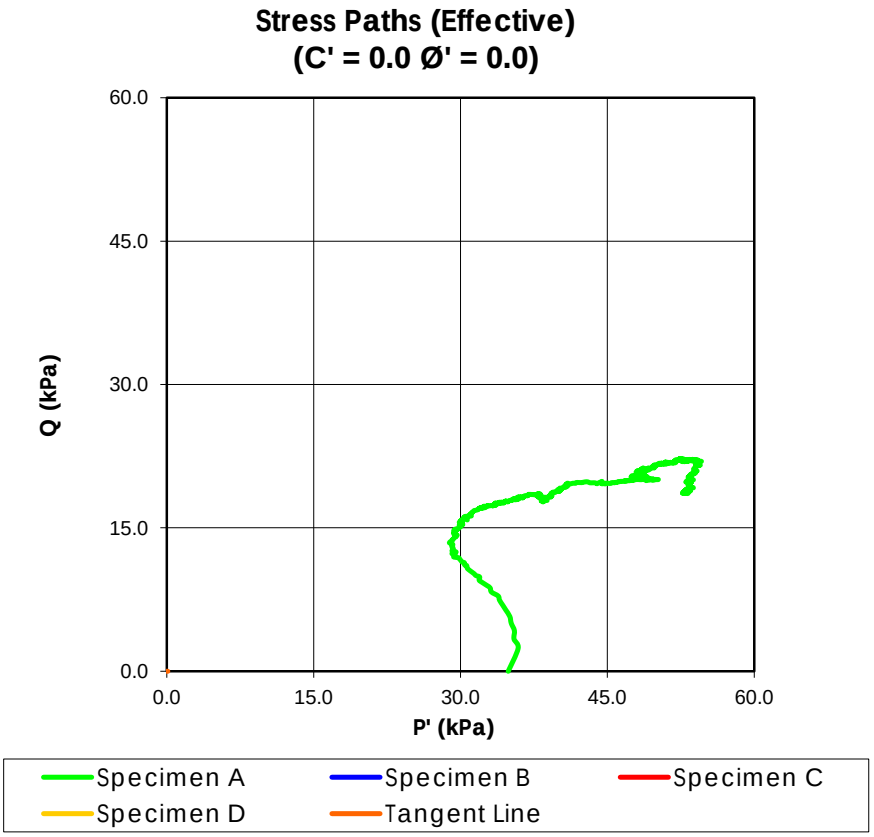
## (C' = 0.0 Ø' = 0.0)

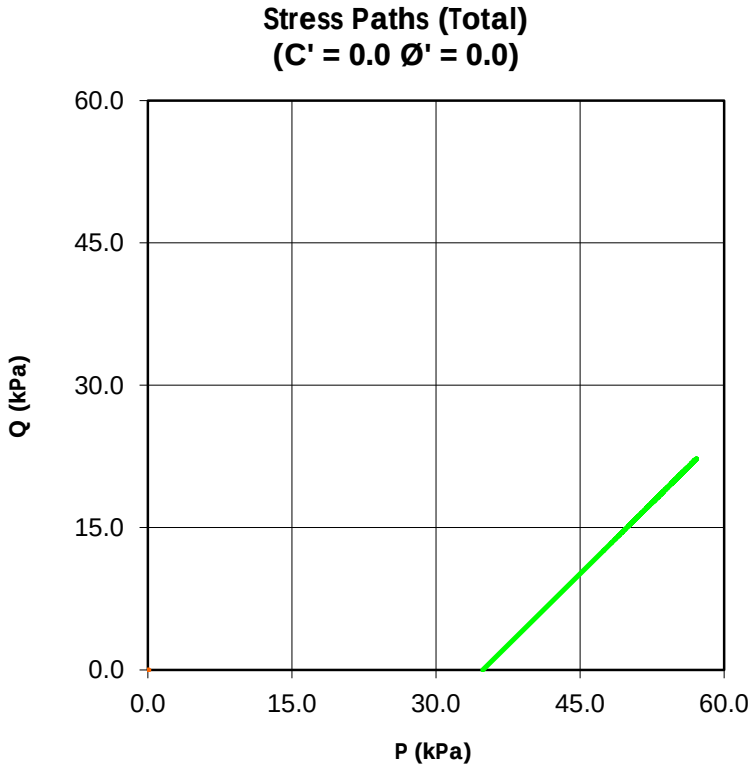



## Total Stress

## (C = 0.0 Ø = 0.0)

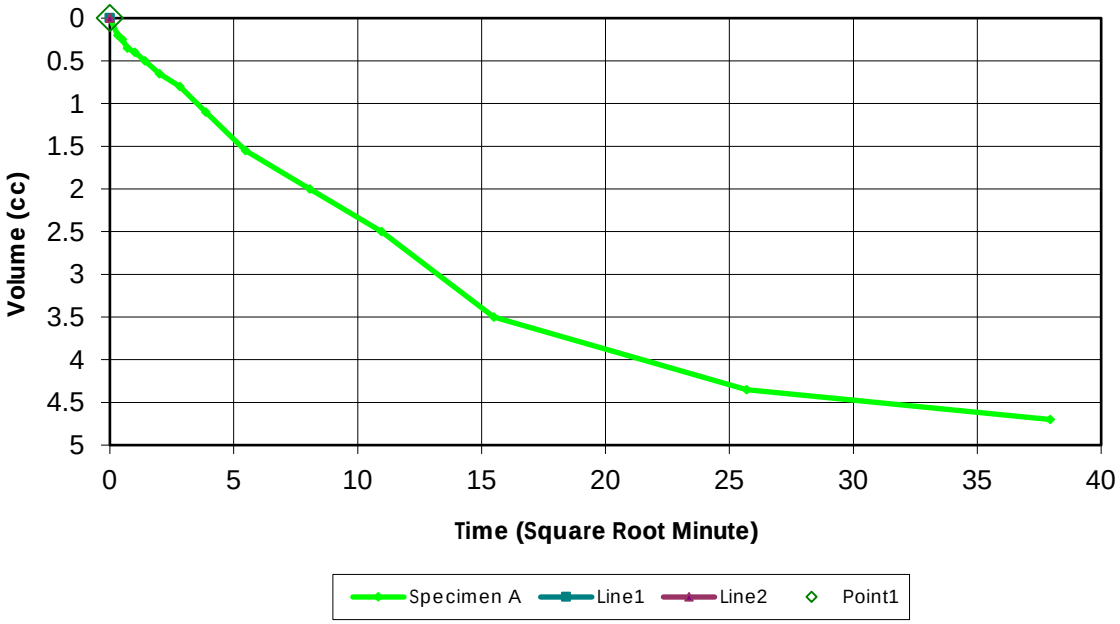



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
60.0
45.0
30.0
15.0
0.0
Q (kPa)
0.0
15.0
30.0
45.0
60.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

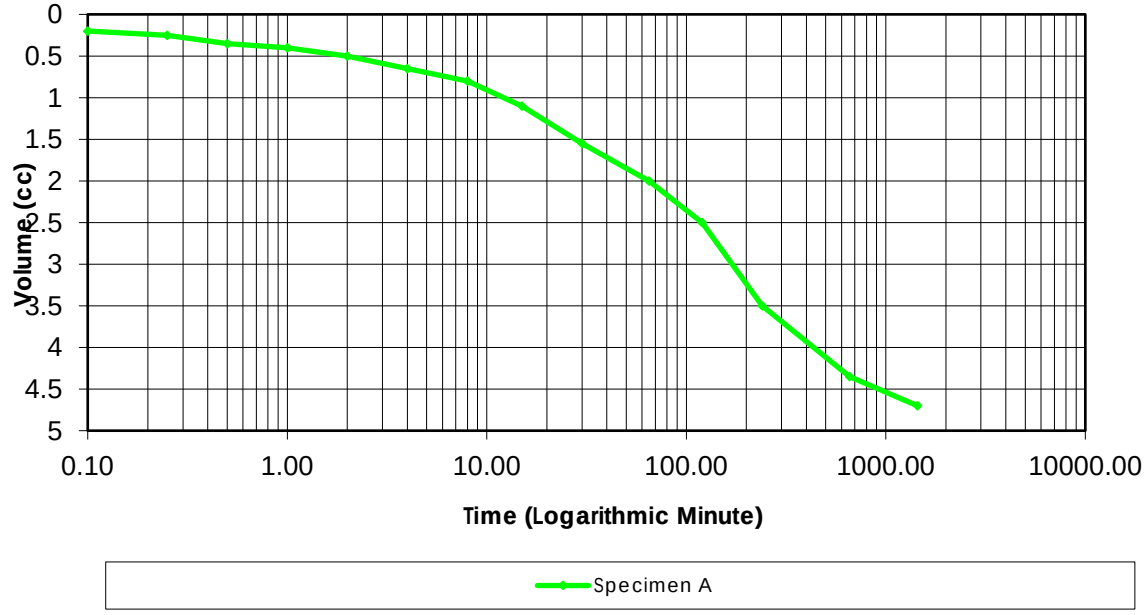

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
60.0
45.0
30.0
15.0
0.0
Q (kPa)
0.0
15.0
30.0
45.0
60.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.94

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 290.0 | 270.0 | N/A | N/A | N/A |
| 1 | 360.0 | 270.0 | 70.0 | 0.0 | 94.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 1.5-2.0m

| | |
|---|---|
| Cell Pressure (kPa) | 310 |
| Back Pressure (kPa) | 270 |
| Effective Pressure (kPa) | 40 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71.6 |
| Initial Sample Height (mm) | 150.1 |
| Initial Sample Area (cm2) | 40.26 |
| Initial Volume (cm3) | 604.4 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 48.15 | N/A |
| 00:00:06 | 47.95 | 0.200 |
| 00:00:15 | 47.90 | 0.250 |
| 00:00:30 | 47.80 | 0.350 |
| 00:01:00 | 47.75 | 0.400 |
| 00:02:00 | 47.65 | 0.500 |
| 00:04:00 | 47.50 | 0.650 |
| 00:08:00 | 47.35 | 0.800 |
| 00:15:00 | 47.05 | 1.100 |
| 00:30:00 | 46.60 | 1.550 |
| 01:05:00 | 46.15 | 2.000 |
| 02:00:00 | 45.65 | 2.500 |
| 04:00:00 | 44.65 | 3.500 |
| 11:00:00 | 43.80 | 4.350 |
| 24:00:00 | 43.45 | 4.700 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

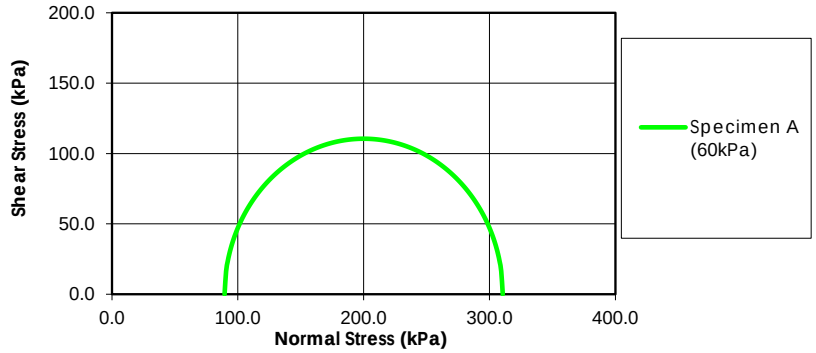
Stantec

Reviewed By C. Lamoureux

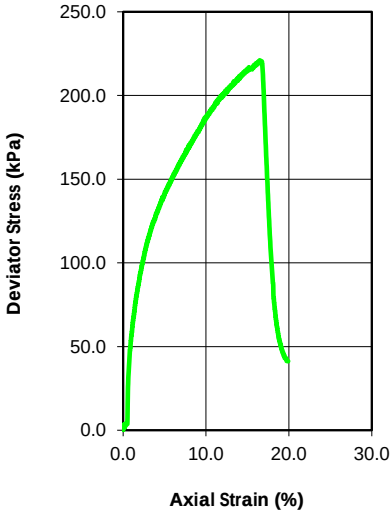
Date: 5-Oct-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 13.9 | | | |
| Dry Density (g/cm3) | 1.994 | | | |
| Saturation (%) | 106.37 | | | |
| Void Ratio | 0.354 | | | |
| Diameter (mm) | 71.0 | | | |
| Height (mm) | 159.3 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 1.00 | | | |
| Water Content (%) | 13.6 | | | |
| Dry Density (g/cm3) | 2.04 | | | |
| Saturation (%) | 100.0 | | | |
| Void Ratio | 0.322 | | | |
| Effective Stress (kPa) | 60.6 | | | |
| Back Press. (kPa) | 269.4 | | | |
| Rate of Strain | 0.022 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

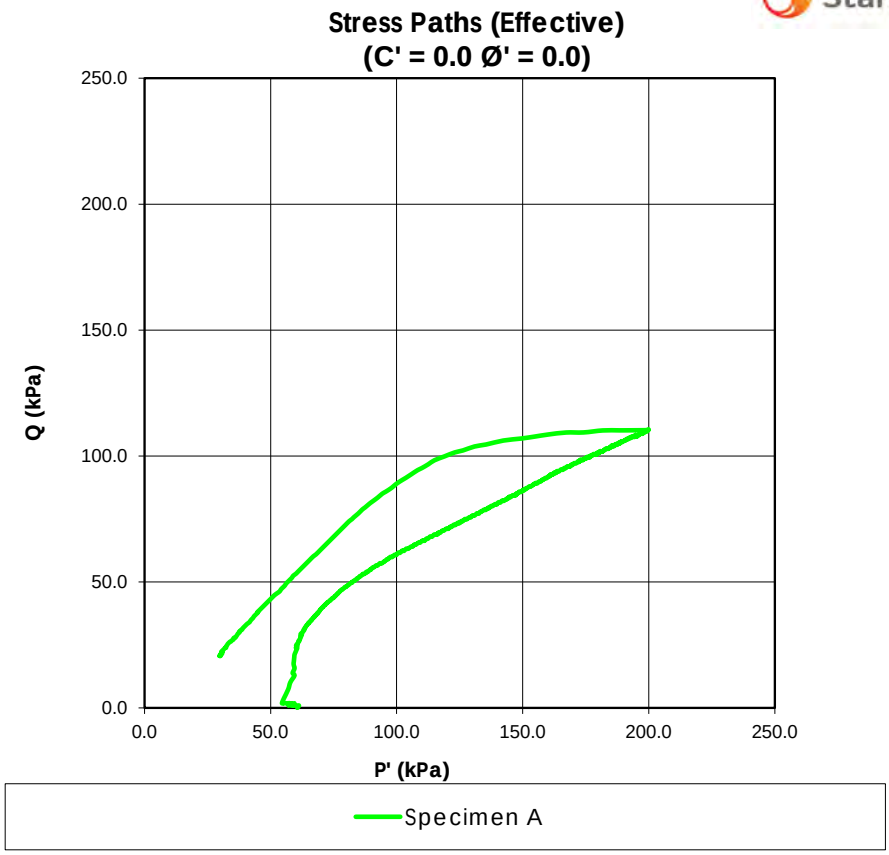
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 310.47 | | | |
| σ'3 at Failure (kPa) | 89.44 | | | |
| | | | | |
| | | | | |

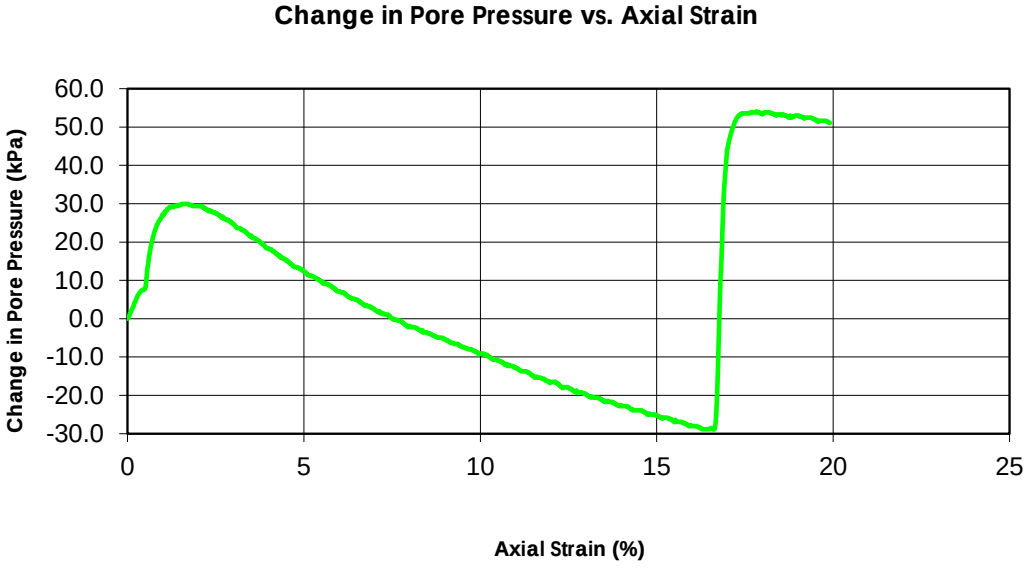
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC21 ST5 |
| **Depth:** | 3.0-3.5m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay with Sand & Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

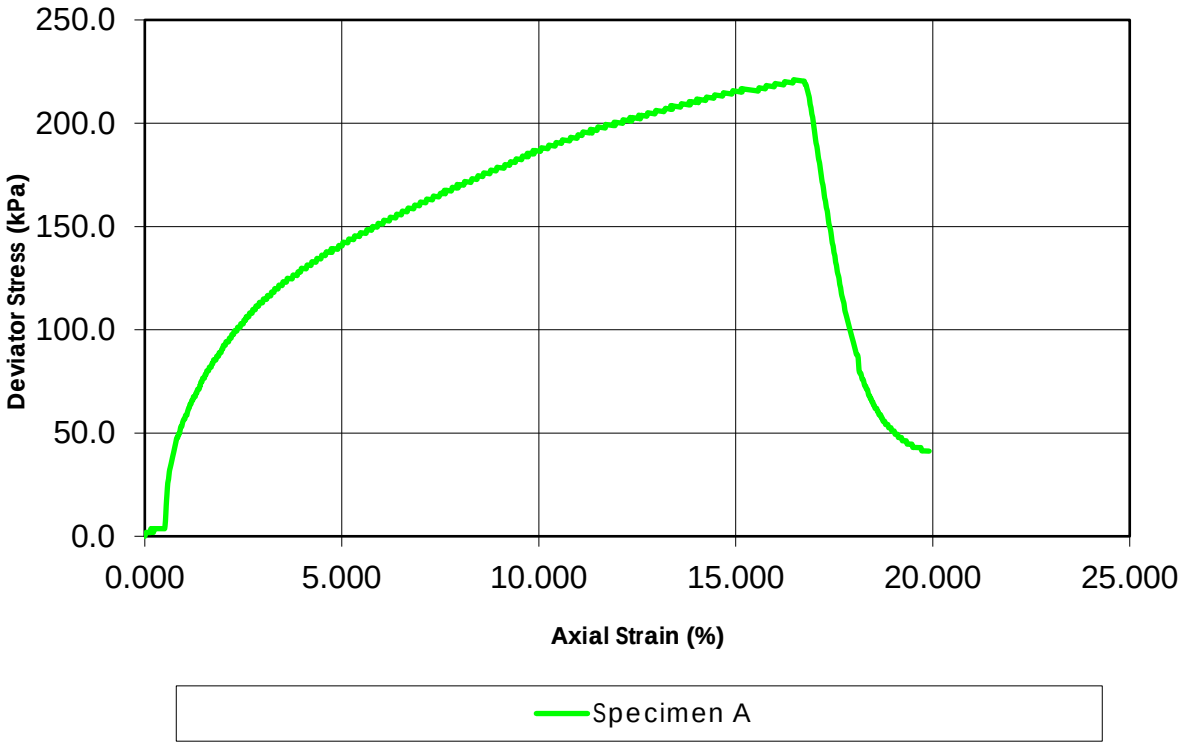
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

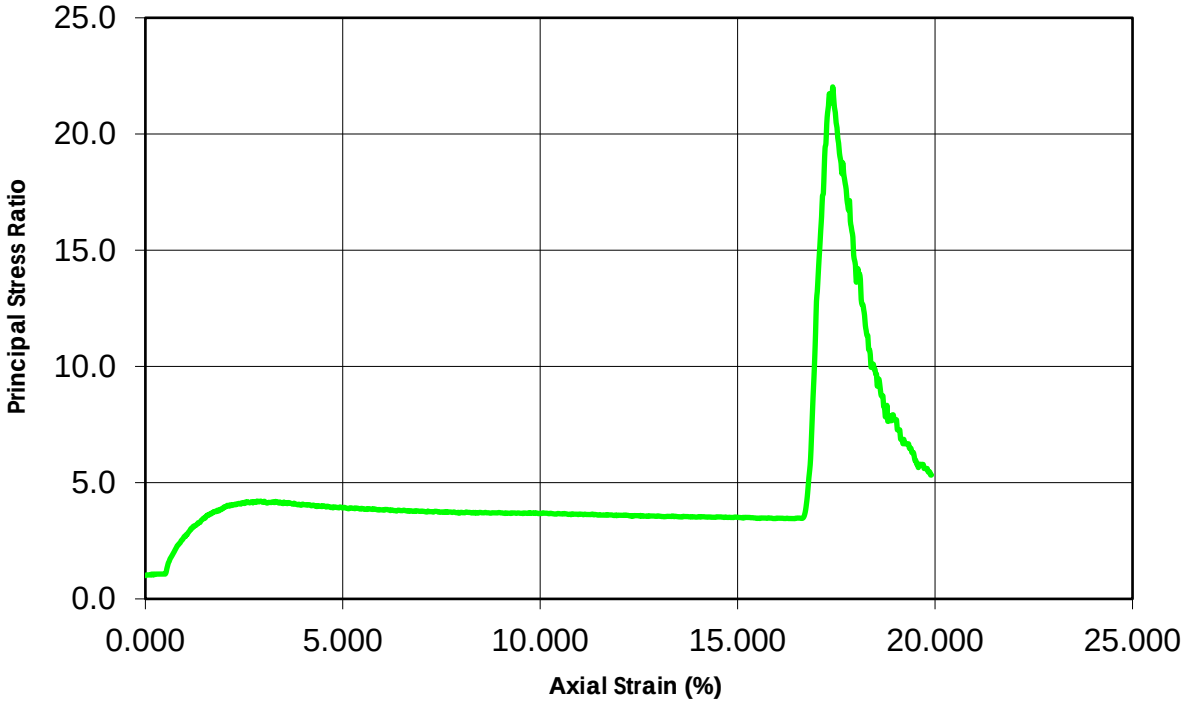


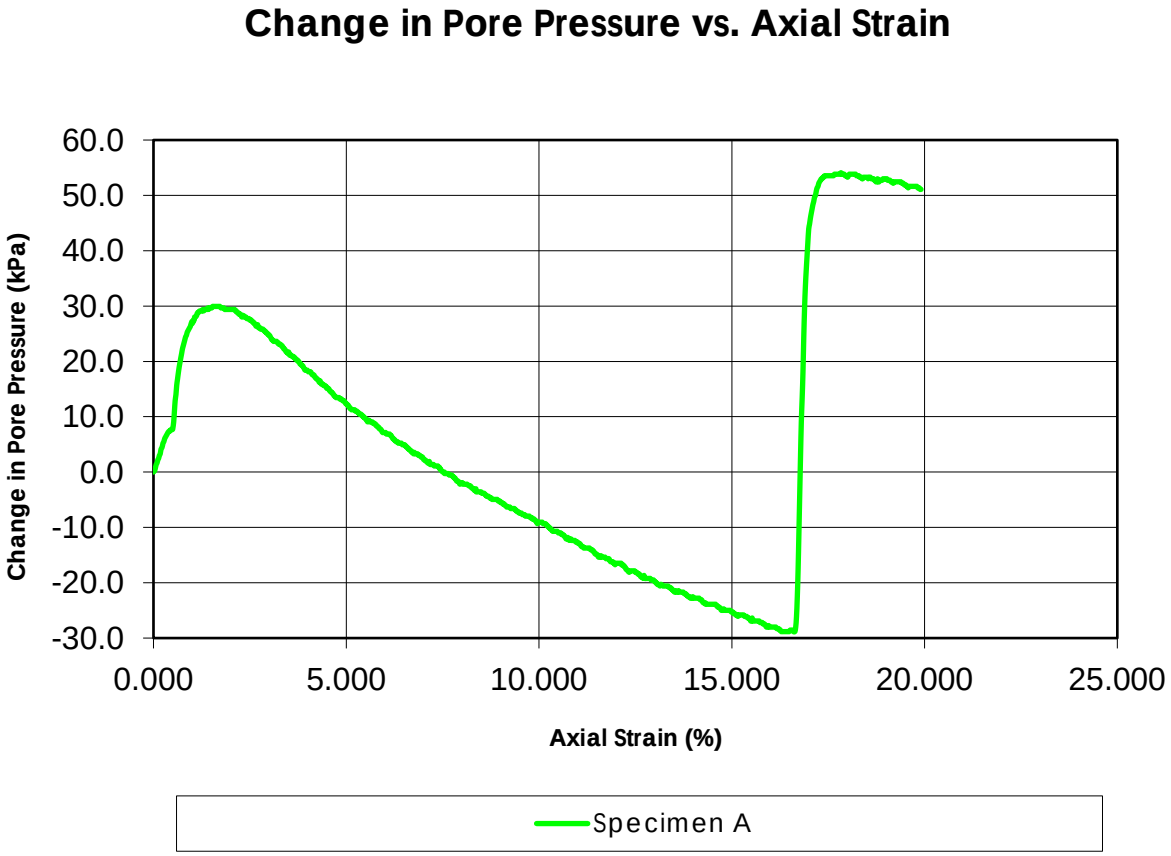



## Deviator Stress vs. Axial Strain



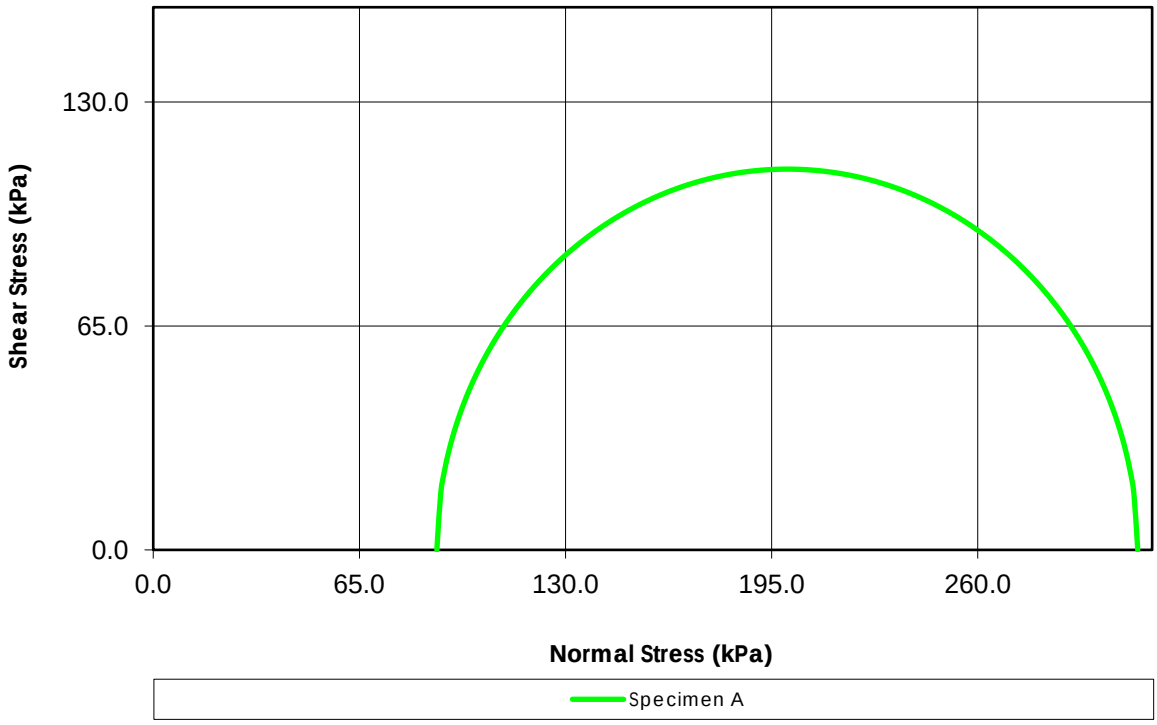

## Principal Stress Ratio vs. Axial Strain



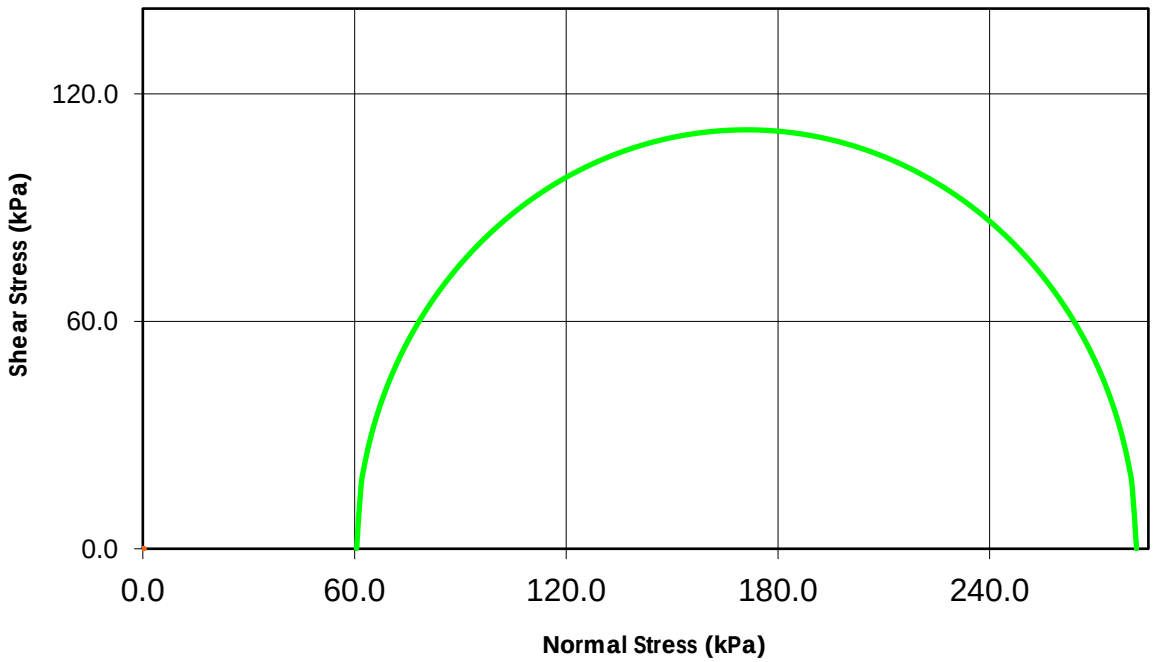

Change in Pore Pressure vs. Axial Strain
60.0
50.0
40.0
30.0
20.0
10.0
0.0
-10.0
-20.0
-30.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

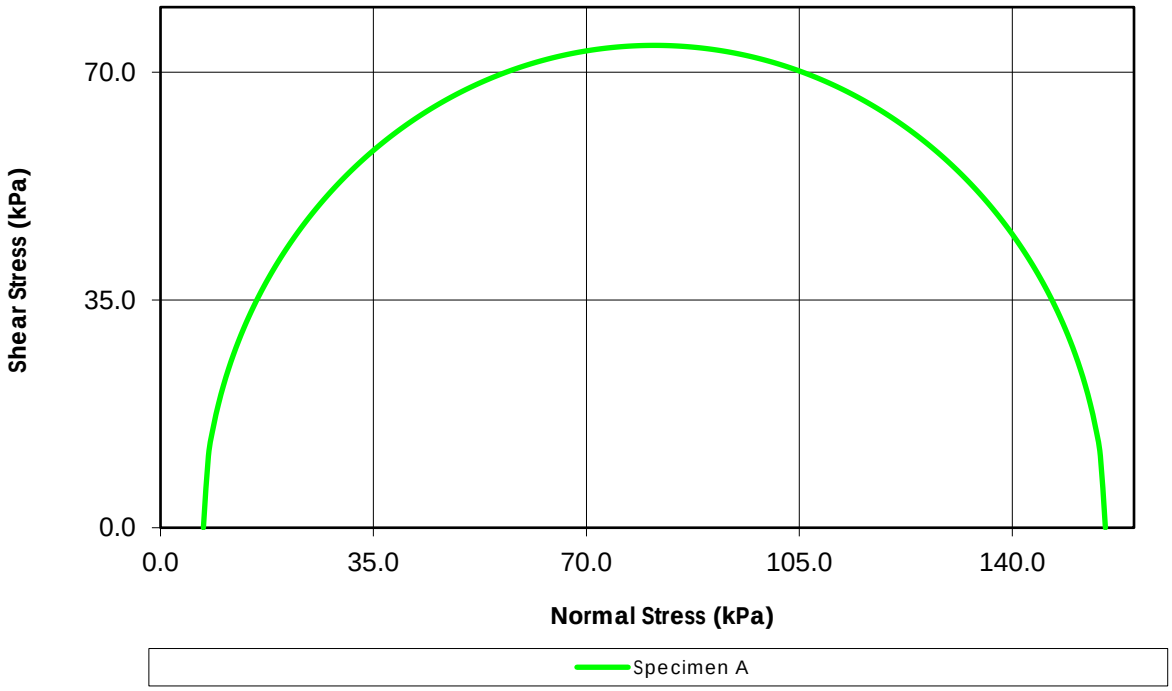



### Total Stress
### (C = 0.0 Ø = 0.0)

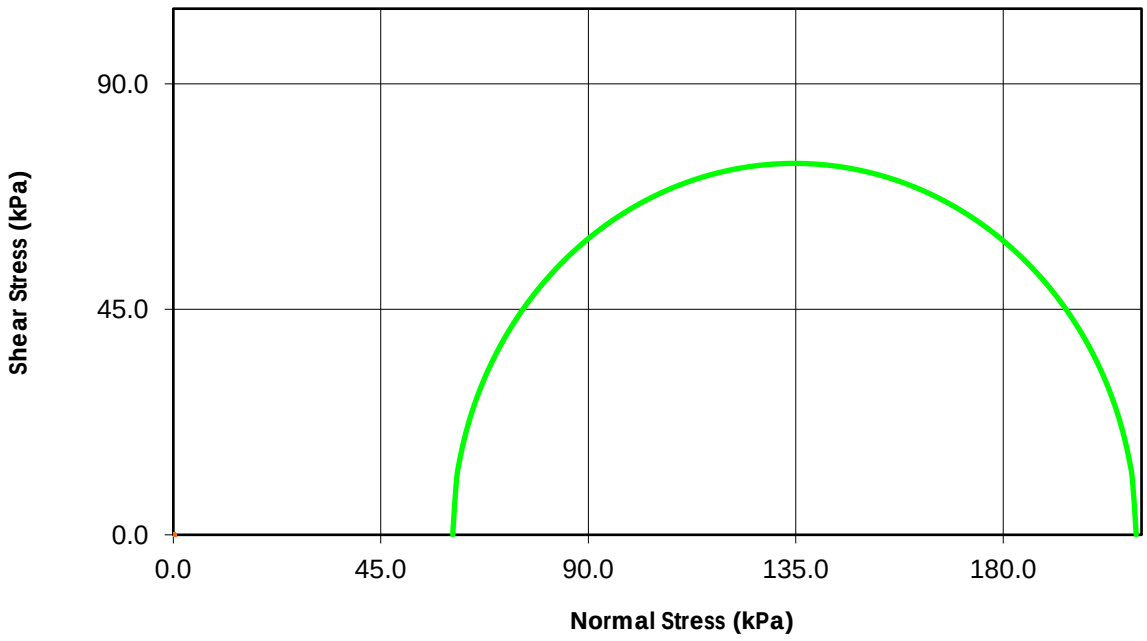


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

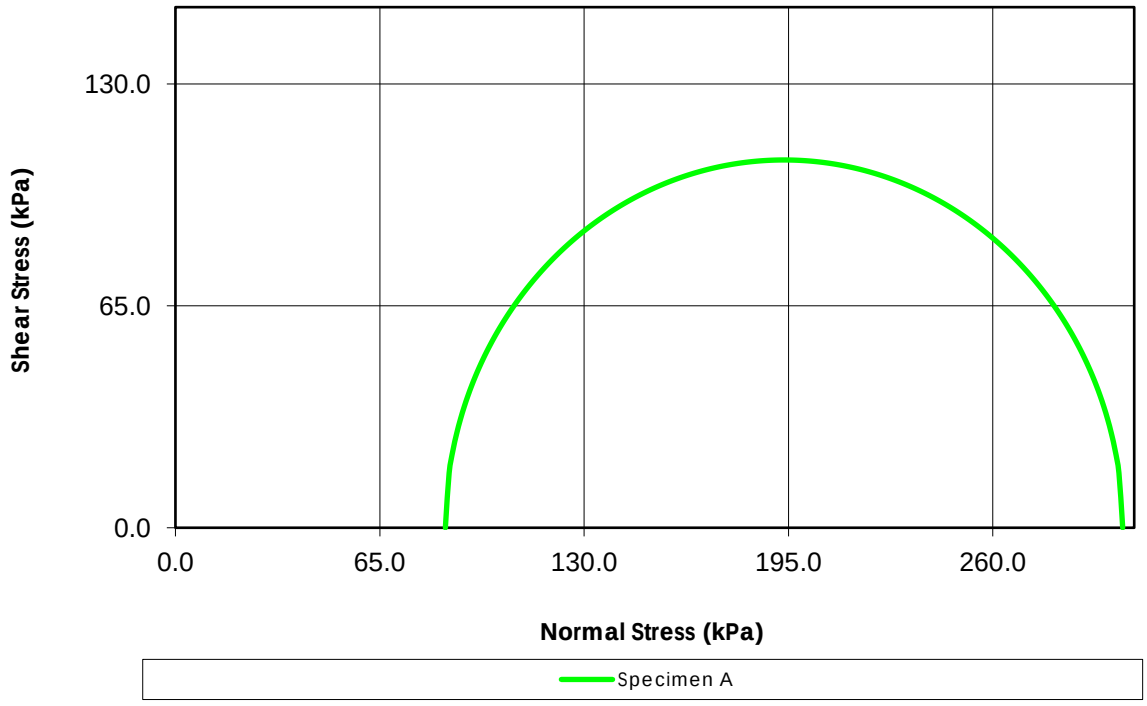



## Total Stress
## (C = 0.0 Ø = 0.0)

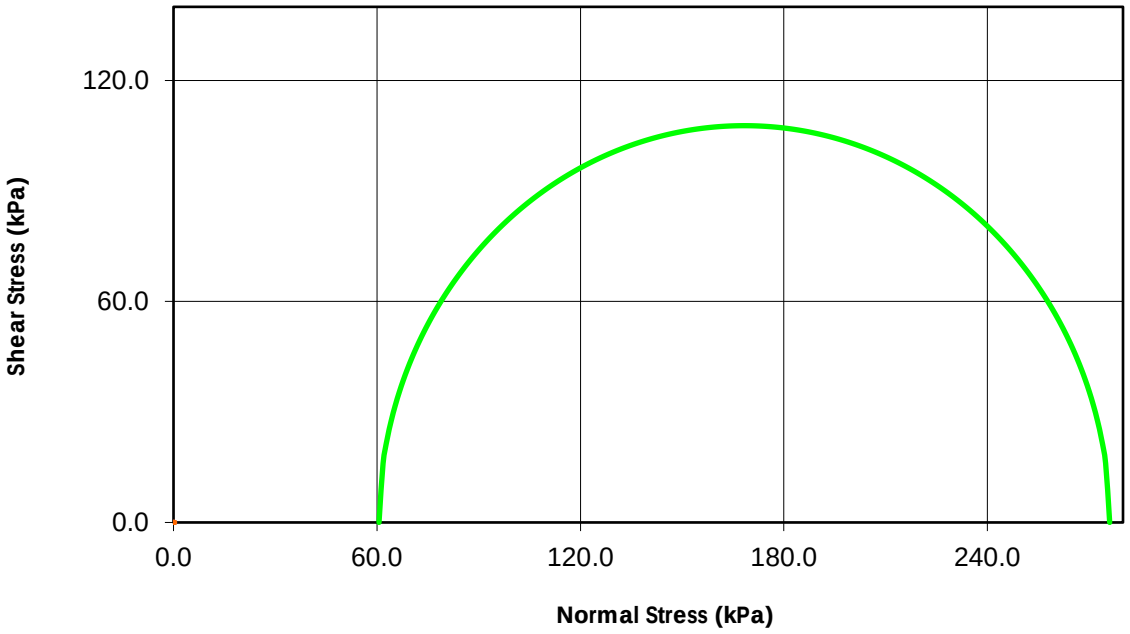


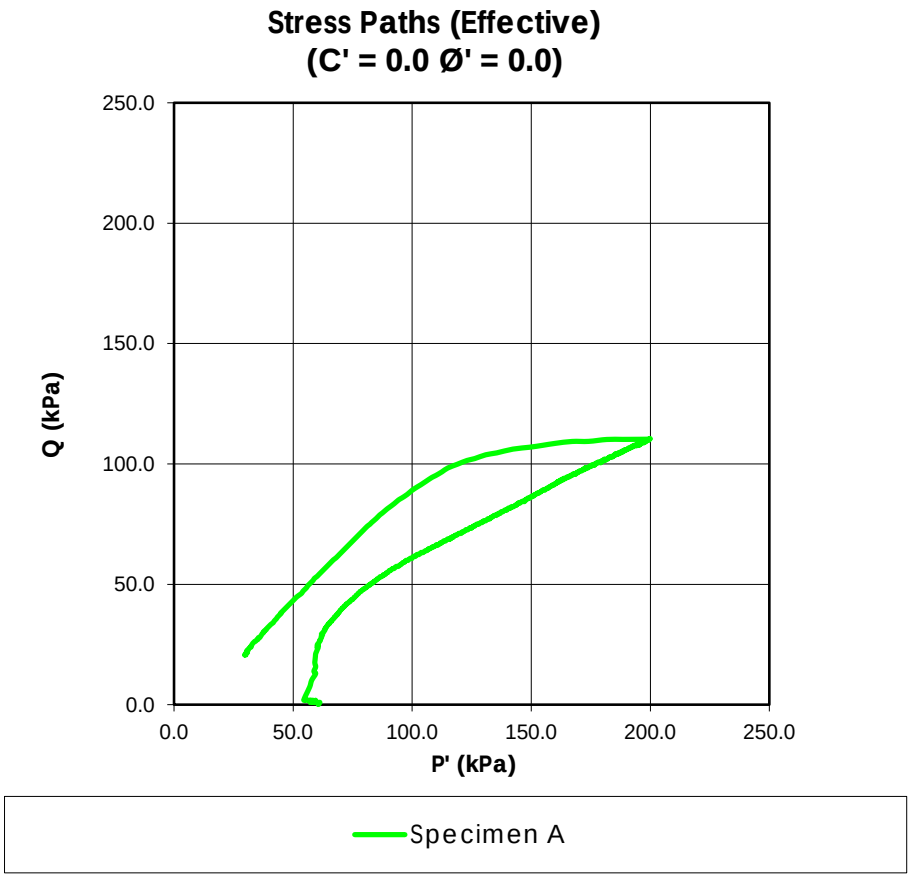
## Mohr Stress Circles at 15% Axial Strain Criterion

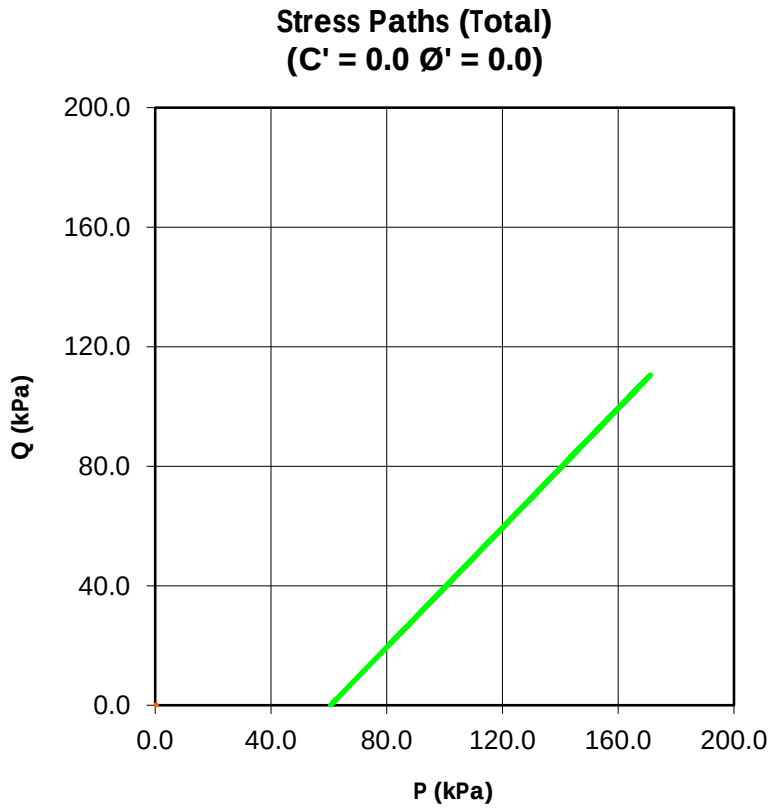
### Effective Stress
### (C' = 0.0 Ø' = 0.0)




### Total Stress
### (C = 0.0 Ø = 0.0)

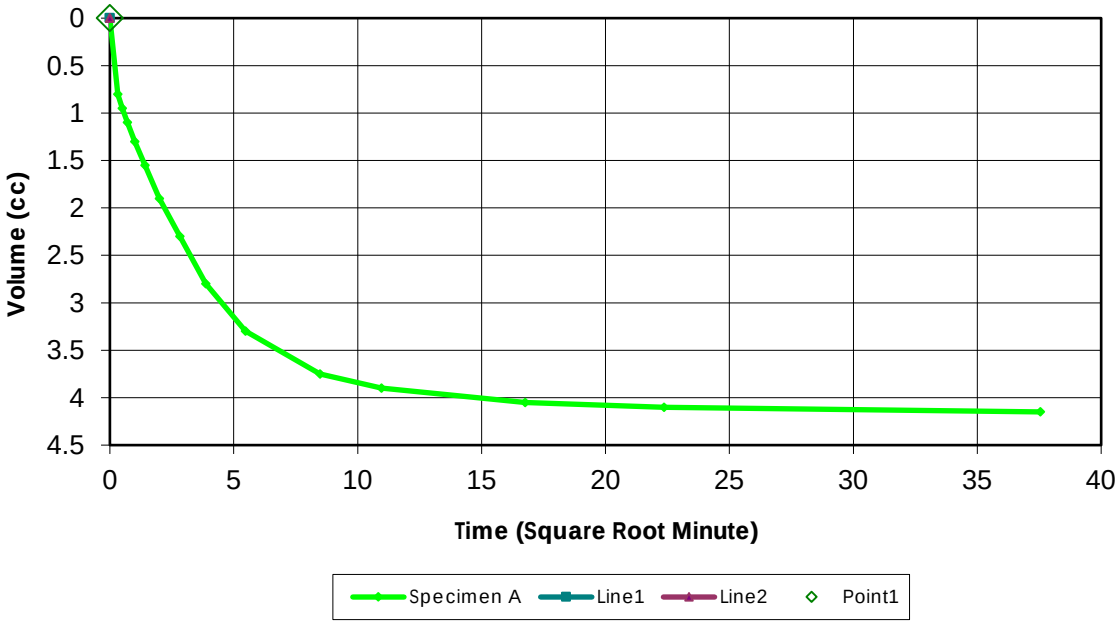



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
250.0
200.0
150.0
100.0
50.0
0.0
Q (kPa)
0.0
50.0
100.0
150.0
200.0
250.0
P' (kPa)
Specimen A

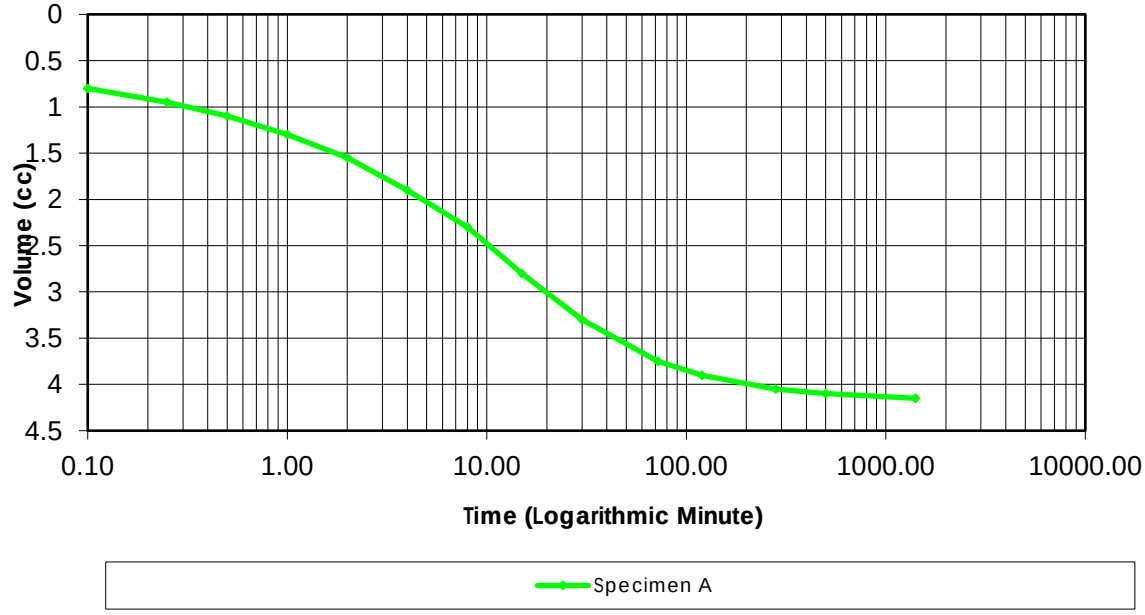

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
200.0
160.0
120.0
80.0
40.0
0.0
Q (kPa)
0.0
40.0
80.0
120.0
160.0
200.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 1.00

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 50.00 |
| 3 | 150.0 | 130.0 | 0.0 | 70.0 | |
| 4 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 5 | 220.0 | 130.0 | 70.0 | 0.0 | 71.00 |
| 6 | 220.0 | 200.0 | 0.0 | 70.0 | |
| 7 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 8 | 290.0 | 200.0 | 70.0 | 0.0 | 83.00 |
| 9 | 290.0 | 270.0 | 0.0 | 70.0 | |
| 10 | 290.0 | 270.0 | 0.0 | 0.0 | |
| 11 | 360.0 | 270.0 | 70.0 | 0.0 | 100.00 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.0-3.5m

| | |
|---|---|
| Cell Pressure (kPa) | 330 |
| Back Pressure (kPa) | 270 |
| Effective Pressure (kPa) | 60 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71 |
| Initial Sample Height (mm) | 159.3 |
| Initial Sample Area (cm2) | 39.59 |
| Initial Volume (cm3) | 630.7 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 42.60 | N/A |
| 00:00:06 | 41.80 | 0.800 |
| 00:00:15 | 41.65 | 0.950 |
| 00:00:30 | 41.50 | 1.100 |
| 00:01:00 | 41.30 | 1.300 |
| 00:02:00 | 41.05 | 1.550 |
| 00:04:00 | 40.70 | 1.900 |
| 00:08:00 | 40.30 | 2.300 |
| 00:15:00 | 39.80 | 2.800 |
| 00:30:00 | 39.30 | 3.300 |
| 01:12:00 | 38.85 | 3.750 |
| 02:00:00 | 38.70 | 3.900 |
| 04:41:00 | 38.55 | 4.050 |
| 08:20:00 | 38.50 | 4.100 |
| 23:30:00 | 38.45 | 4.150 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

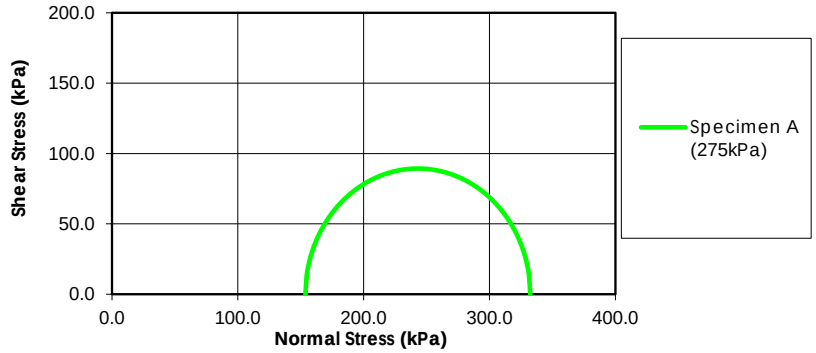
Specimen A (275kPa)

Reviewed By: C. Lamoureux

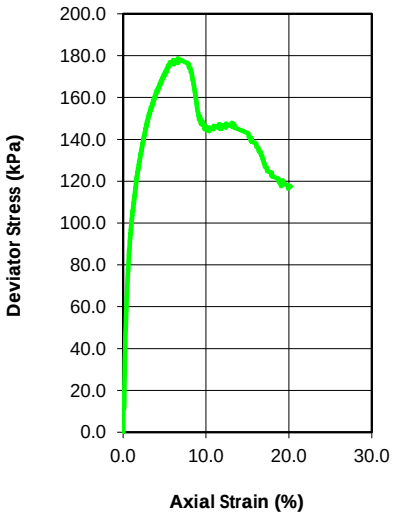
Date: 6-Oct-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 29.2 | | | |
| Dry Density (g/cm3) | 1.447 | | | |
| Saturation (%) | 91.10 | | | |
| Void Ratio | 0.866 | | | |
| Diameter (mm) | 71.0 | | | |
| Height (mm) | 146.0 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.94 | | | |
| Water Content (%) | 24.5 | | | |
| Dry Density (g/cm3) | 1.589 | | | |
| Saturation (%) | 100.0 | | | |
| Void Ratio | 0.699 | | | |
| Effective Stress (kPa) | 288.3 | | | |
| Back Press. (kPa) | 186.7 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

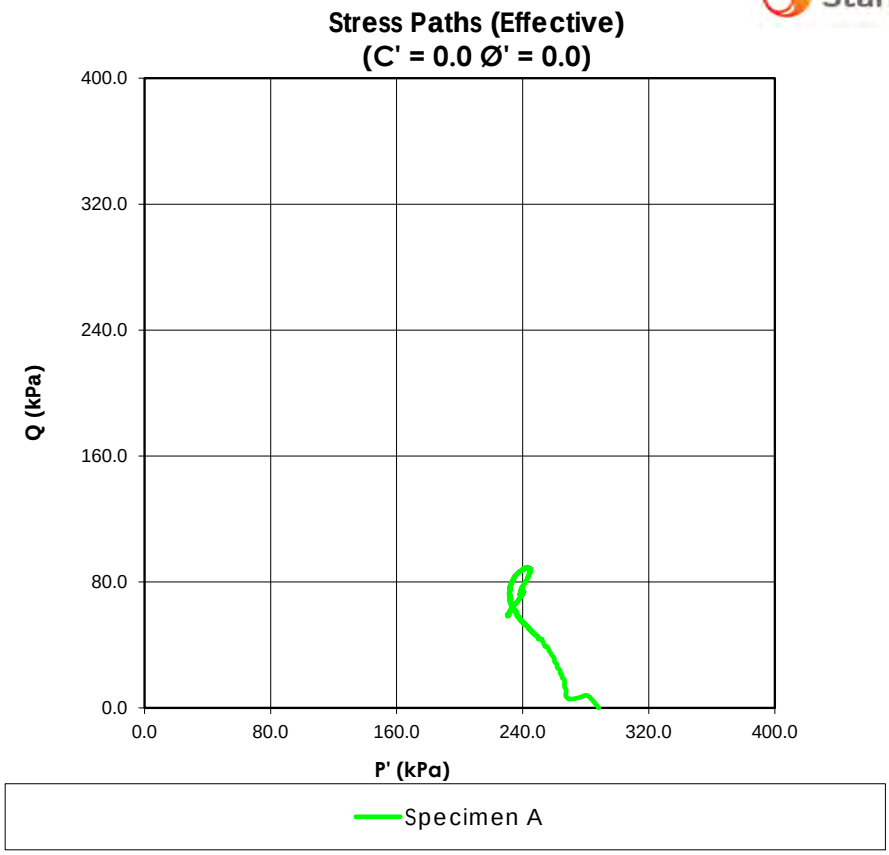
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 332.33 | | | |
| σ'3 at Failure (kPa) | 153.70 | | | |
| | | | | |
| | | | | |

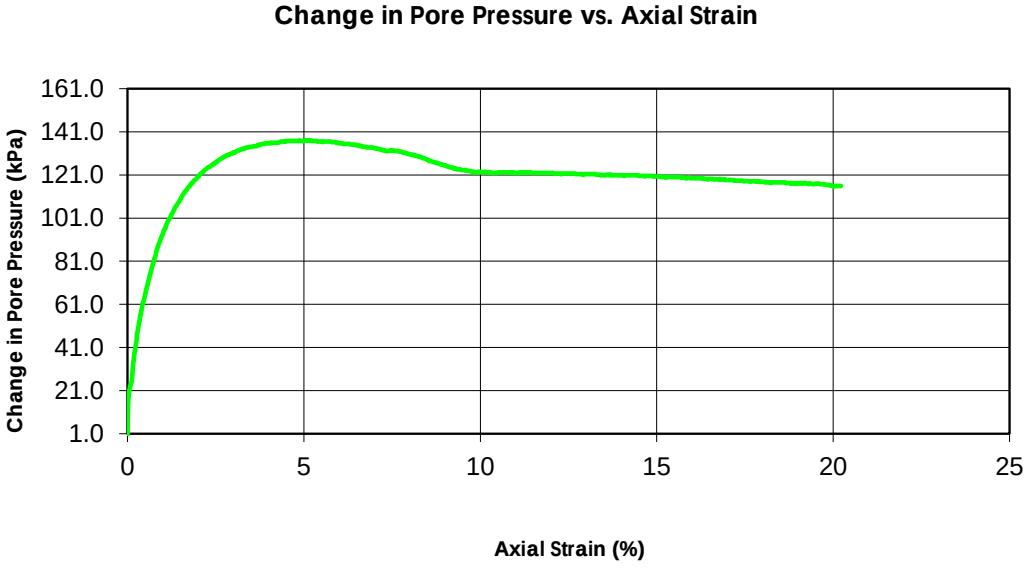
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC25 BSB |
| **Depth:** | 2.3m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

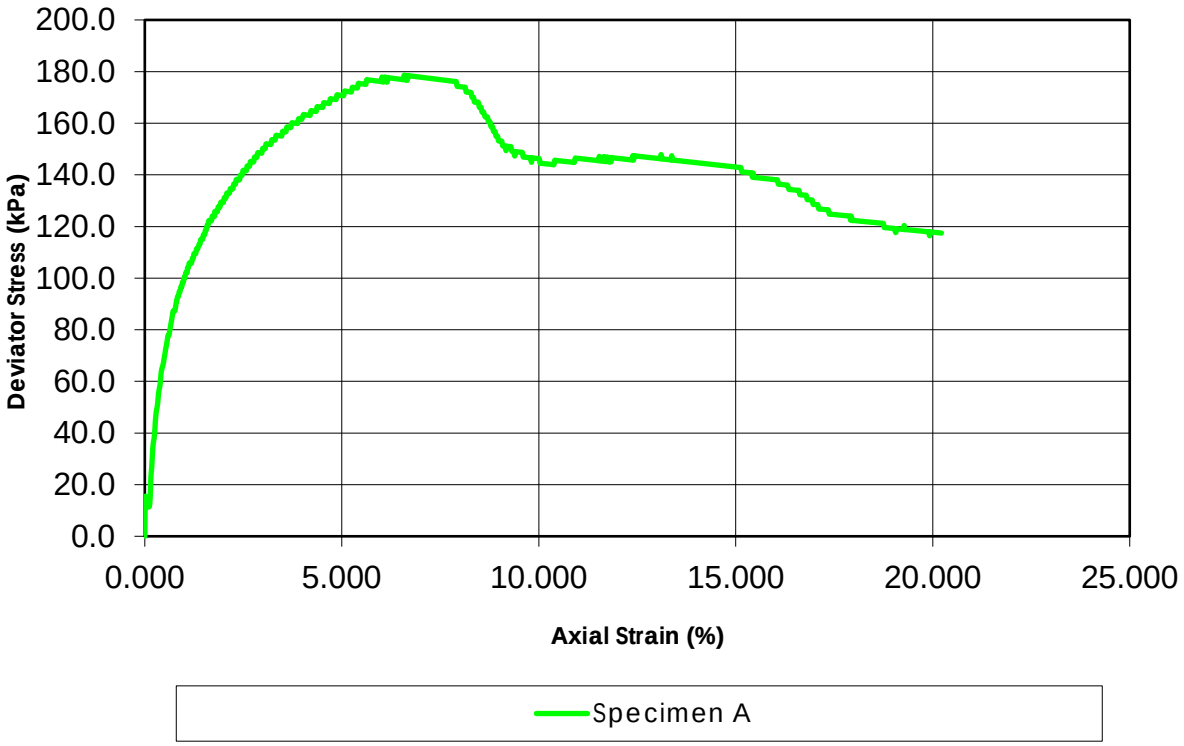
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

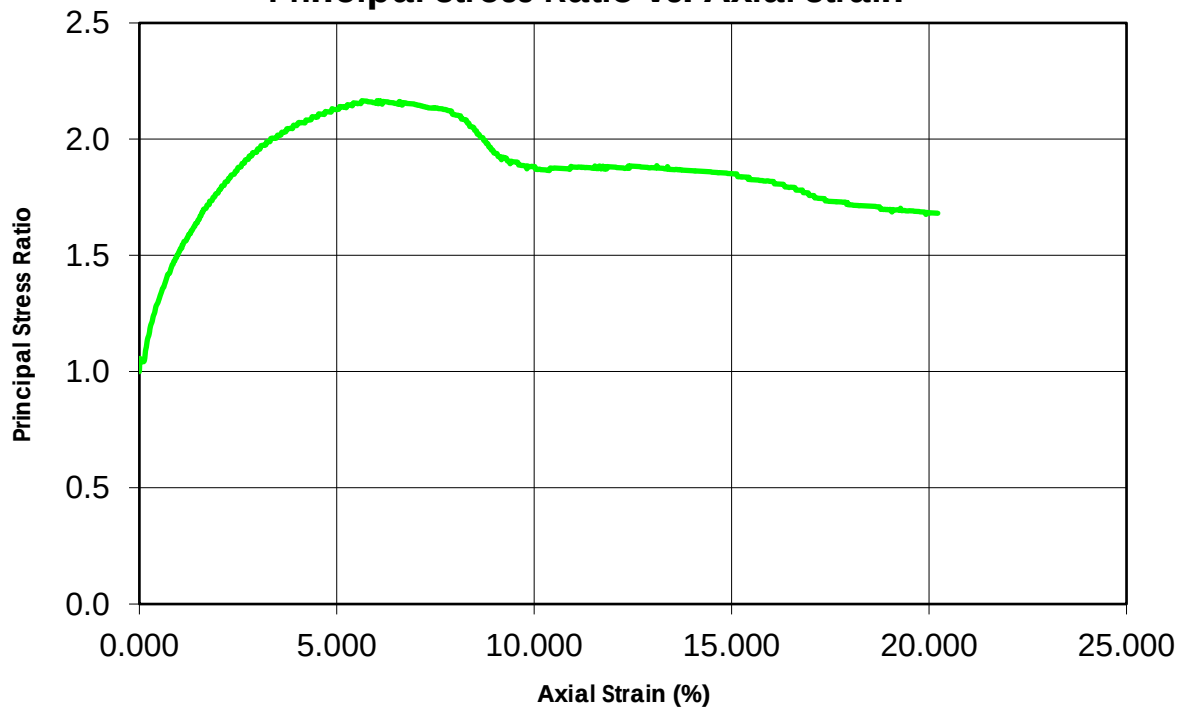


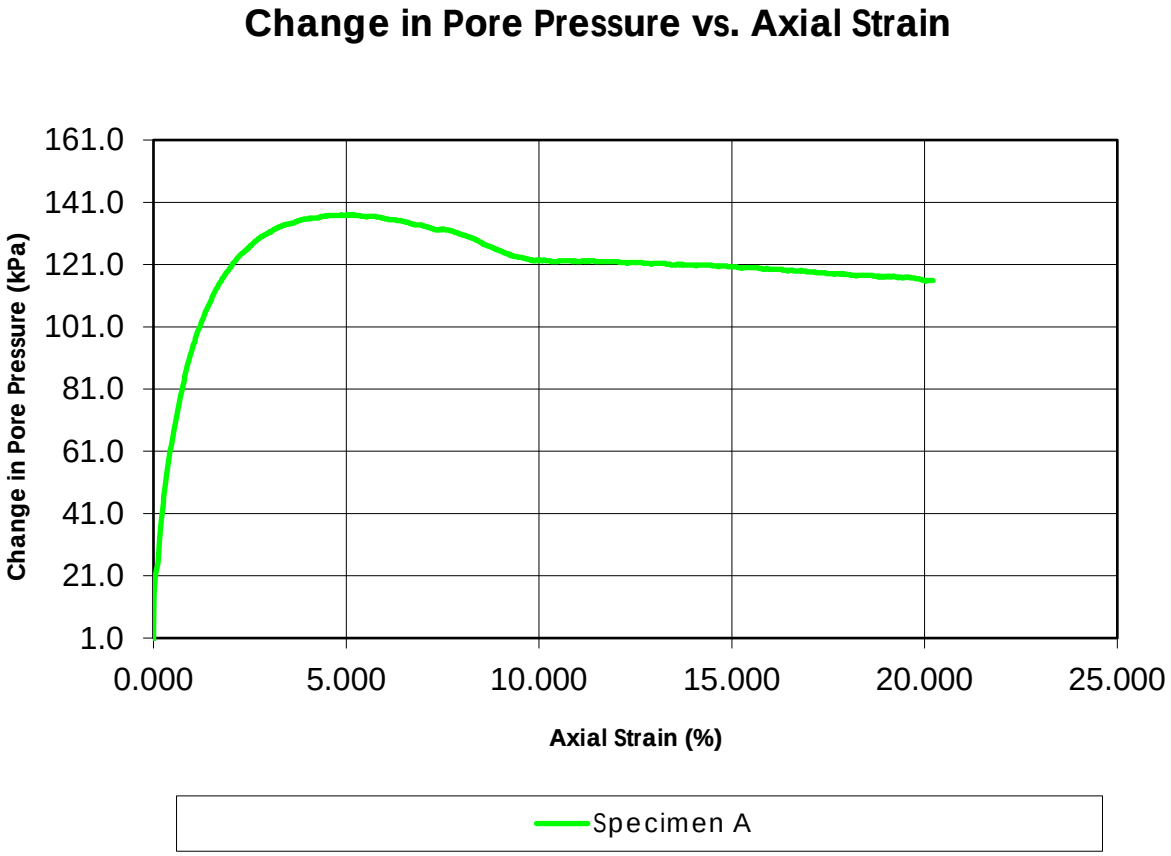



## Deviator Stress vs. Axial Strain



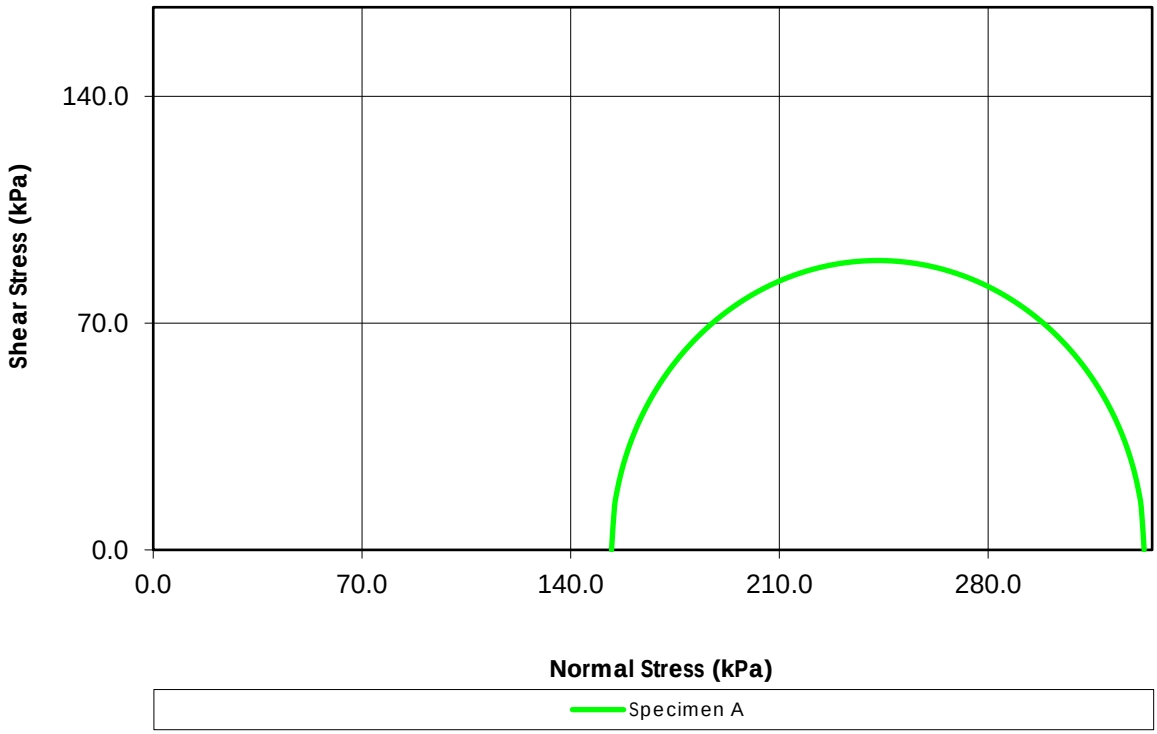

## Principal Stress Ratio vs. Axial Strain



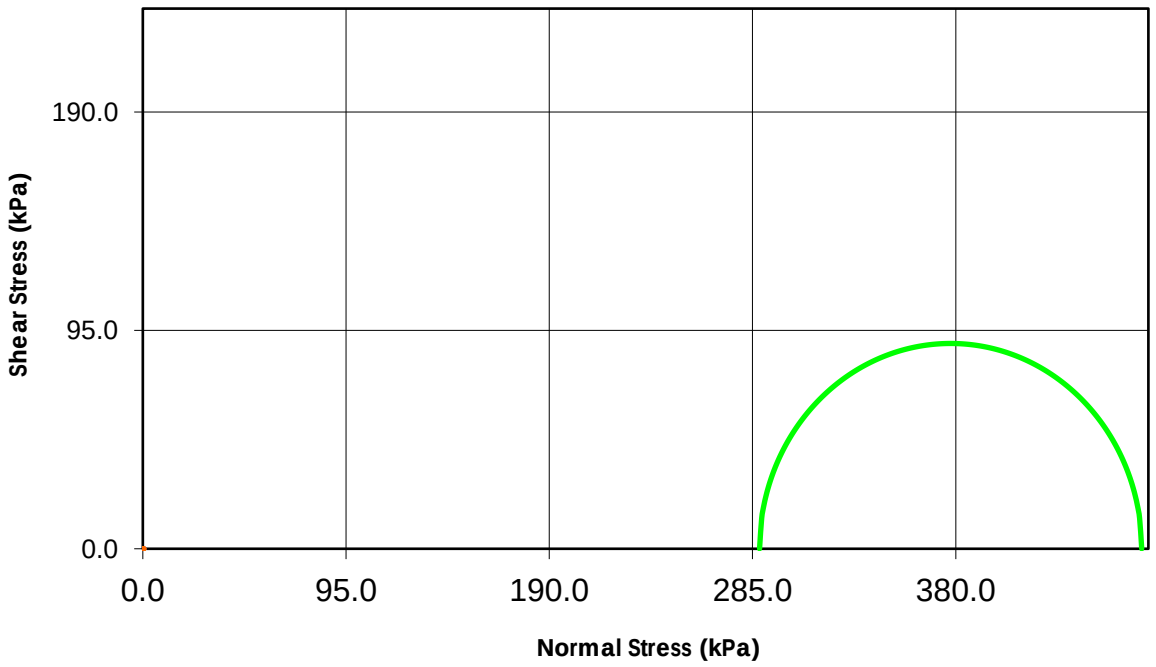

Change in Pore Pressure vs. Axial Strain
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

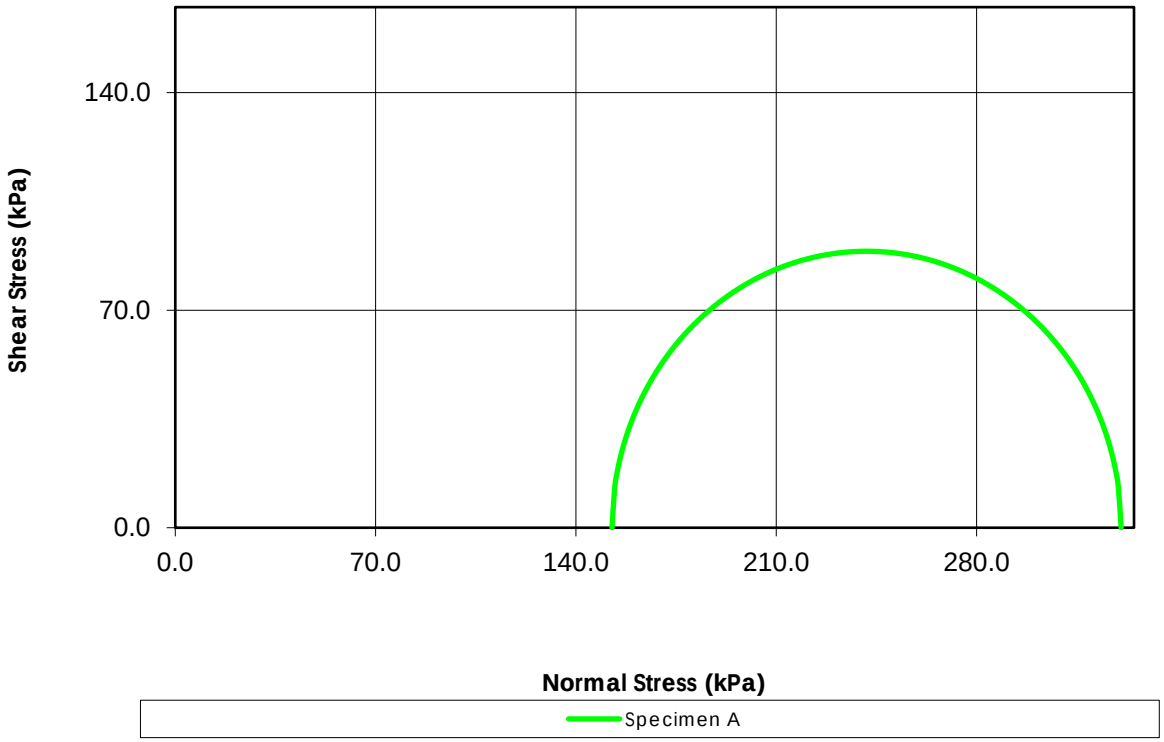



### Total Stress
### (C = 0.0 Ø = 0.0)

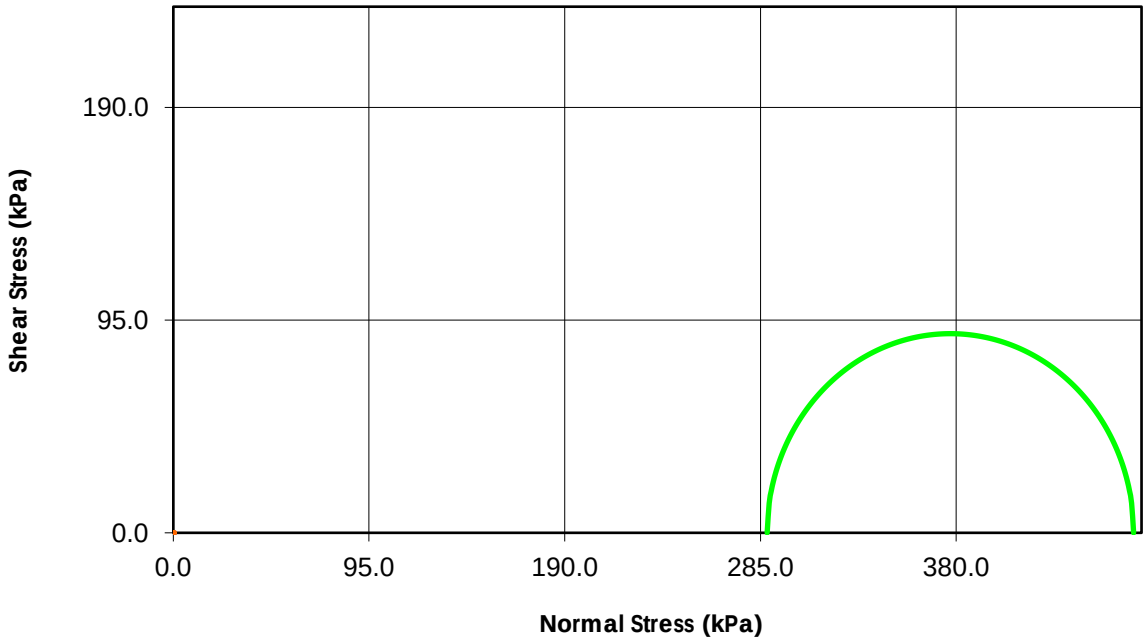


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

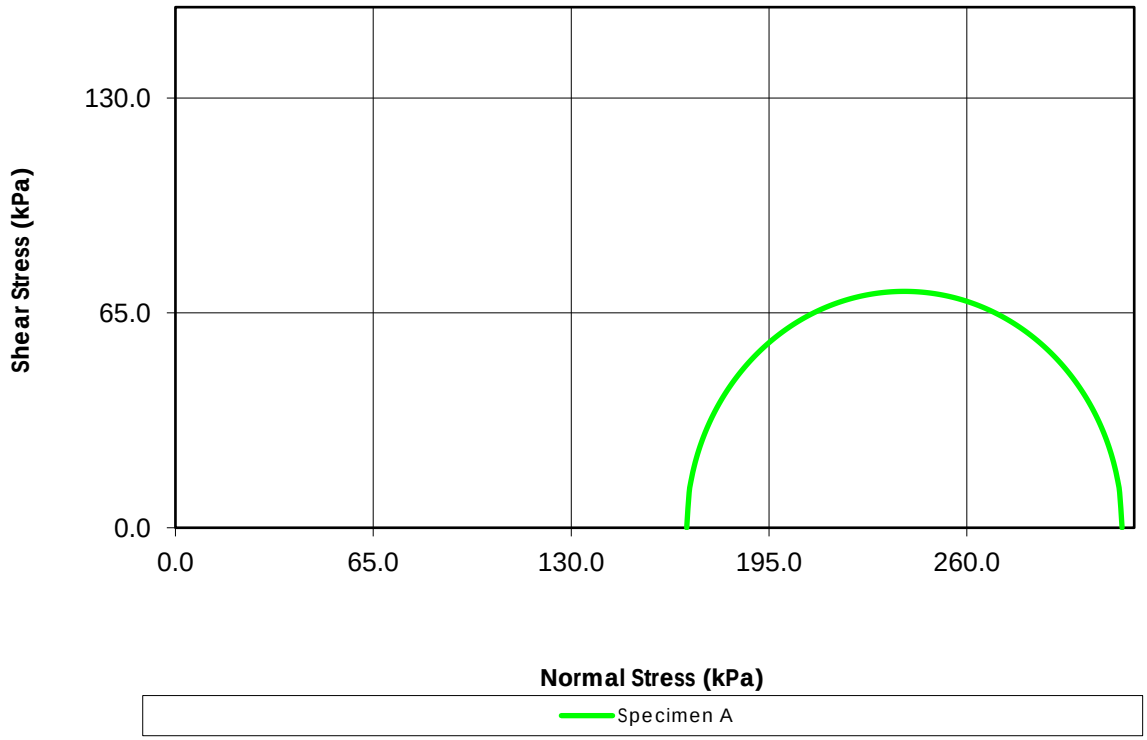



## Total Stress
## (C = 0.0 Ø = 0.0)

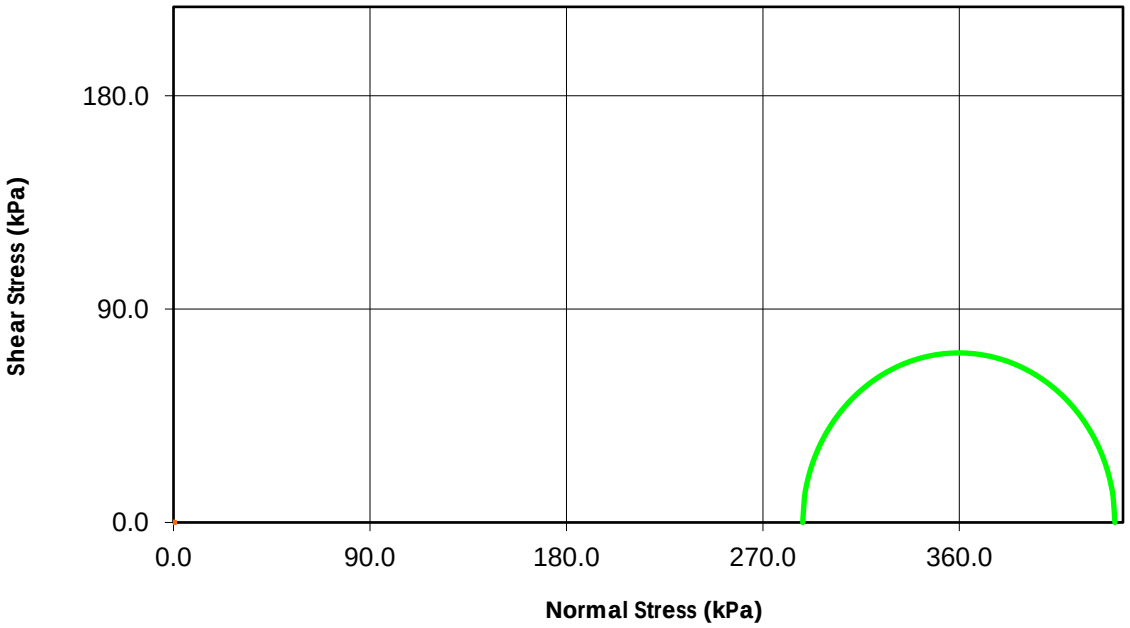


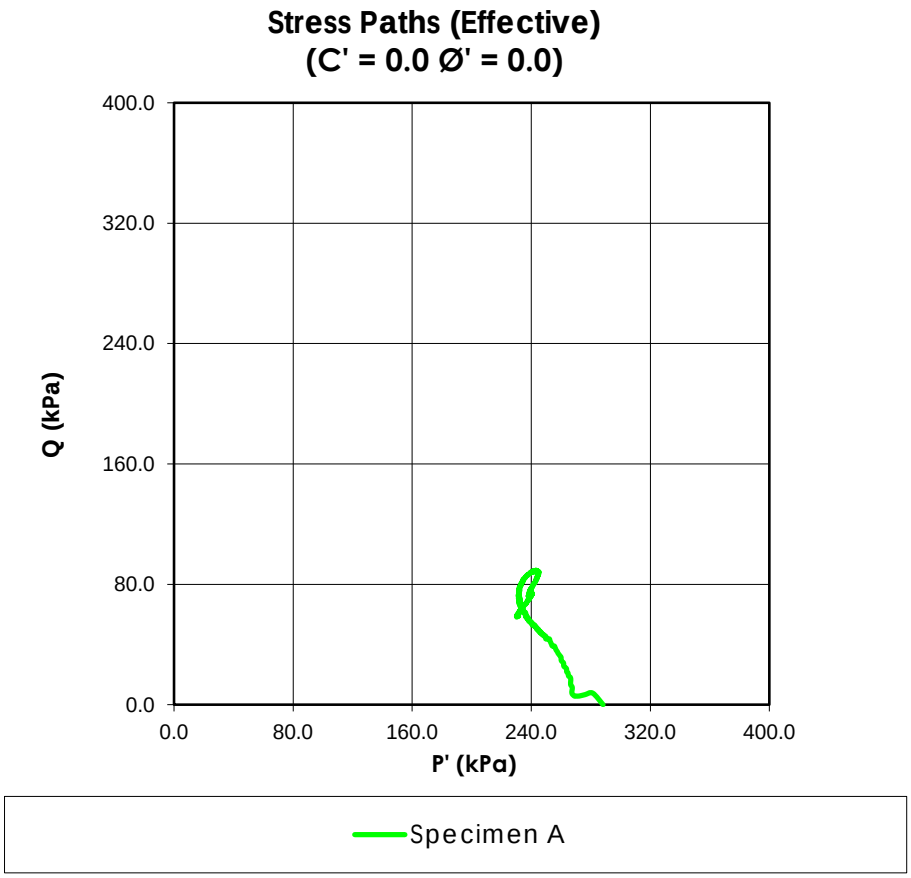
# Mohr Stress Circles at 15% Axial Strain Criterion

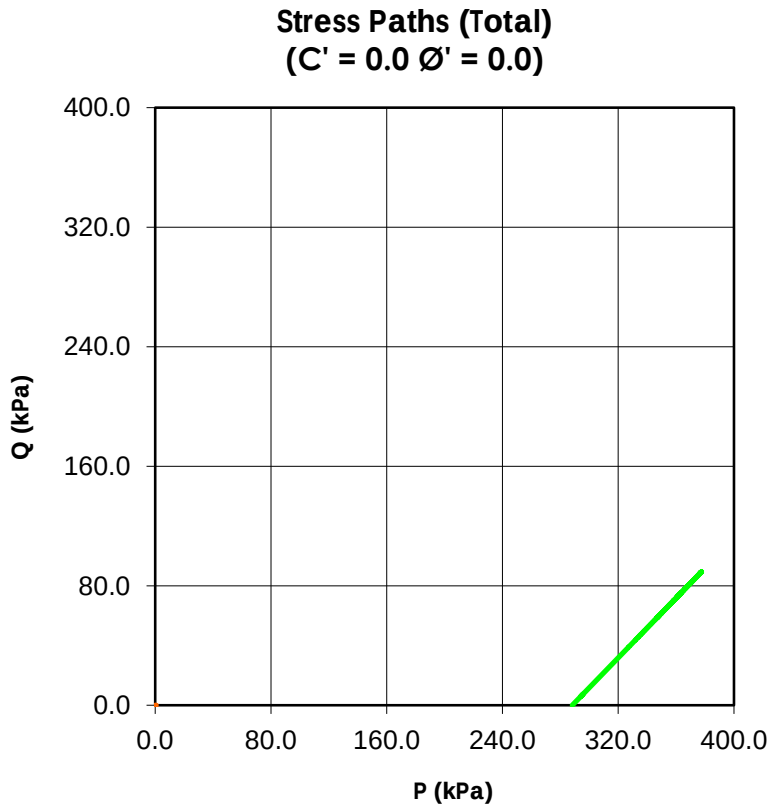
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

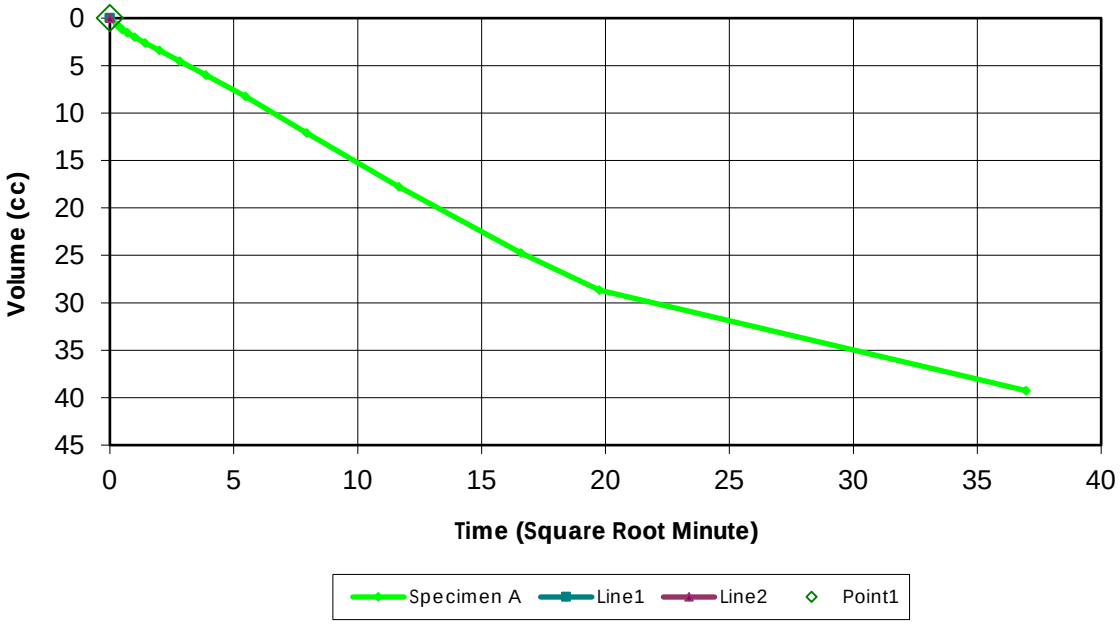



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A

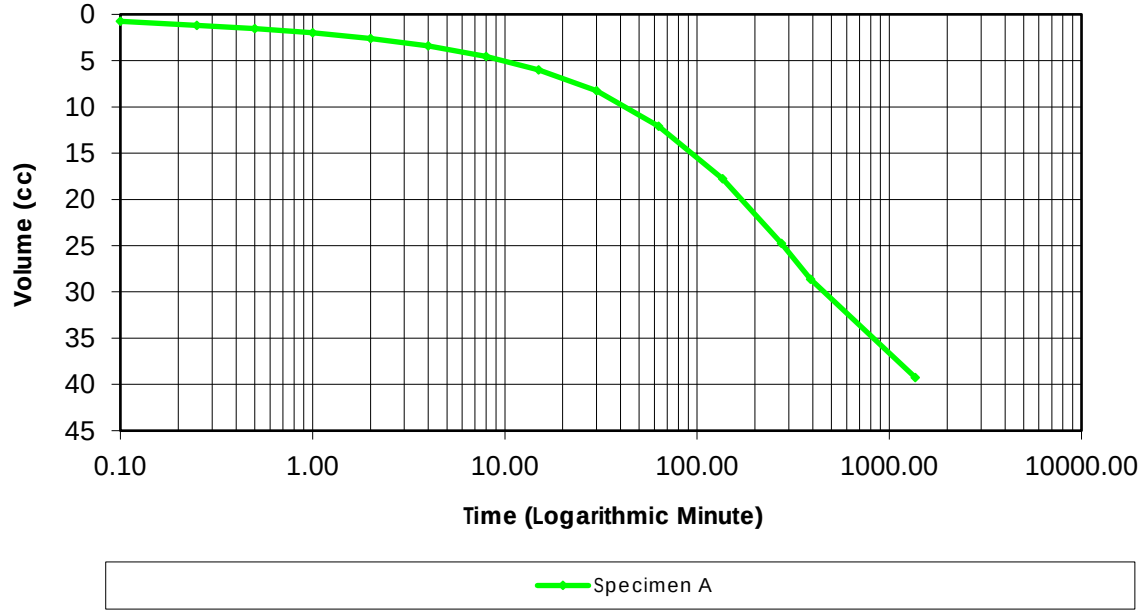

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.94

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 150.0 | 130.0 | N/A | N/A | N/A |
| 1 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 2 | 220.0 | 130.0 | 70.0 | 0.0 | 0.85 |
| 3 | 220.0 | 200.0 | 0.0 | 70.0 | |
| 4 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 5 | 290.0 | 200.0 | 70.0 | 0.0 | 0.94 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0 Depth: 2.3m

| | |
|---|---|
| Cell Pressure (kPa) | 475 |
| Back Pressure (kPa) | 200 |
| Effective Pressure (kPa) | 275 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71 |
| Initial Sample Height (mm) | 146 |
| Initial Sample Area (cm2) | 39.59 |
| Initial Volume (cm3) | 578 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 36.75 | N/A |
| 00:00:06 | 36.00 | 0.750 |
| 00:00:15 | 35.55 | 1.200 |
| 00:00:30 | 35.20 | 1.550 |
| 00:01:00 | 34.75 | 2.000 |
| 00:02:00 | 34.15 | 2.600 |
| 00:04:00 | 33.35 | 3.400 |
| 00:08:00 | 32.20 | 4.550 |
| 00:15:00 | 30.75 | 6.000 |
| 00:30:00 | 28.50 | 8.250 |
| 01:03:00 | 24.65 | 12.100 |
| 02:16:00 | 19.00 | 17.750 |
| 04:35:00 | 12.00 | 24.750 |
| 06:30:00 | 8.10 | 28.650 |
| 22:46:00 | -2.50 | 39.250 |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

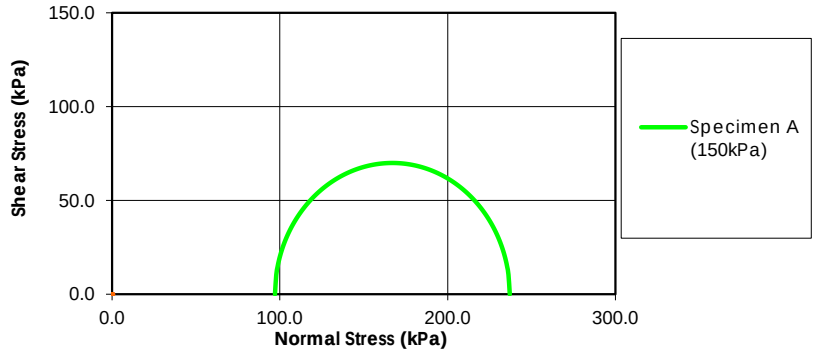
Stantec

Reviewed By C. Lamoureux

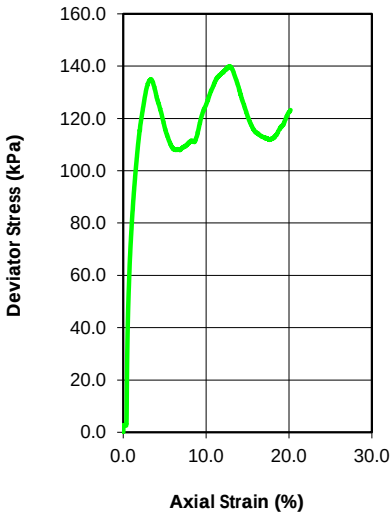
Date: 13-Jul-16

Tested By: c. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 34.1 | | | |
| Dry Density (g/cm3) | 1.489 | | | |
| Saturation (%) | 113.08 | | | |
| Void Ratio | 0.813 | | | |
| Diameter (mm) | 71.90 | | | |
| Height (mm) | 151.00 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 31.6 | | | |
| Dry Density (g/cm3) | 1.594 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.694 | | | |
| Effective Stress (kPa) | 145.5 | | | |
| Back Press. (kPa) | 184.5 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

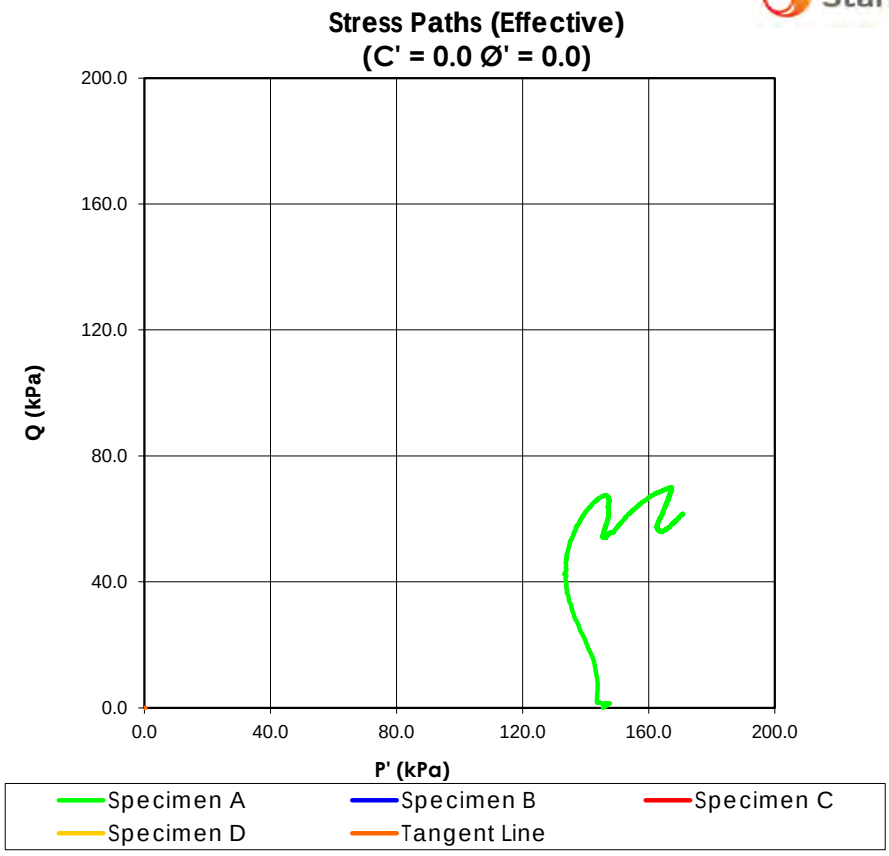
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 237.04 | | | |
| σ'3 at Failure (kPa) | 97.11 | | | |
| | | | | |
| | | | | |

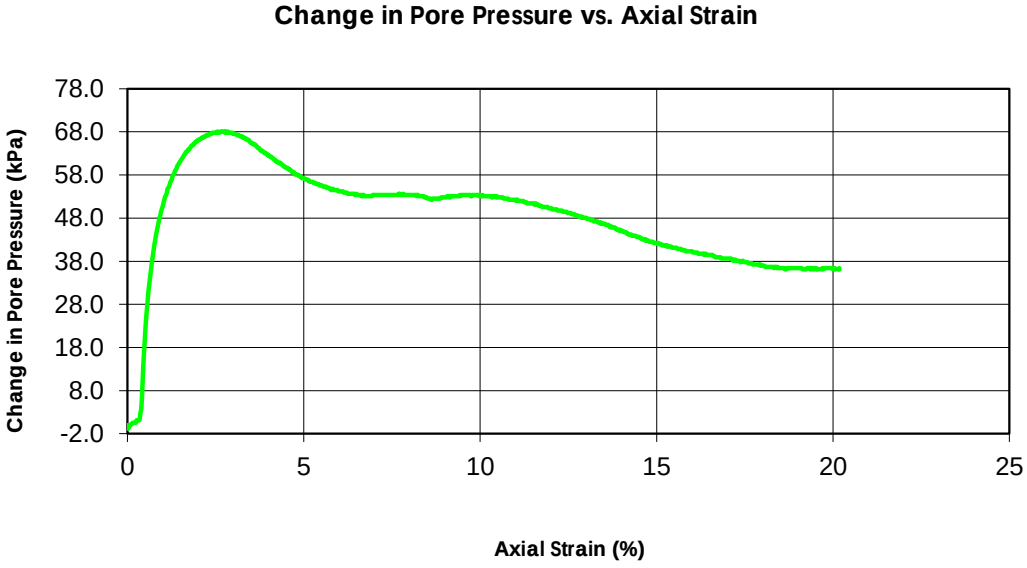
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC25 ST5 |
| **Depth:** | 3.0-3.6m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

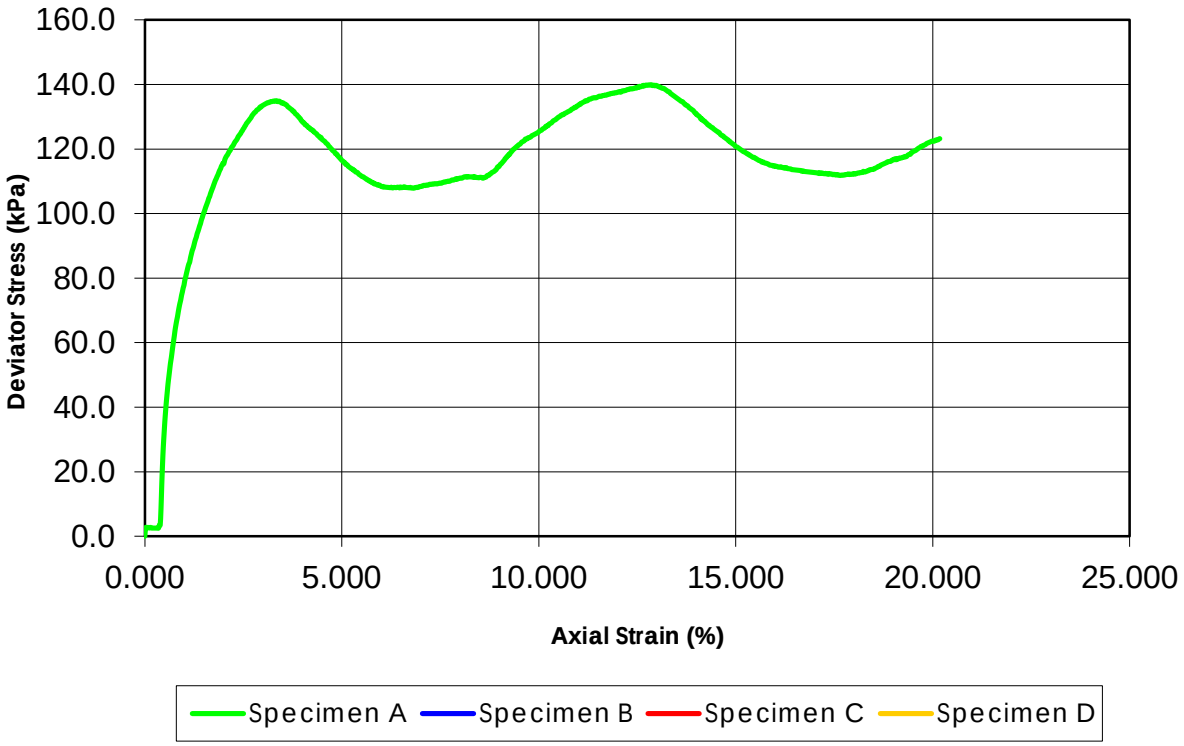
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

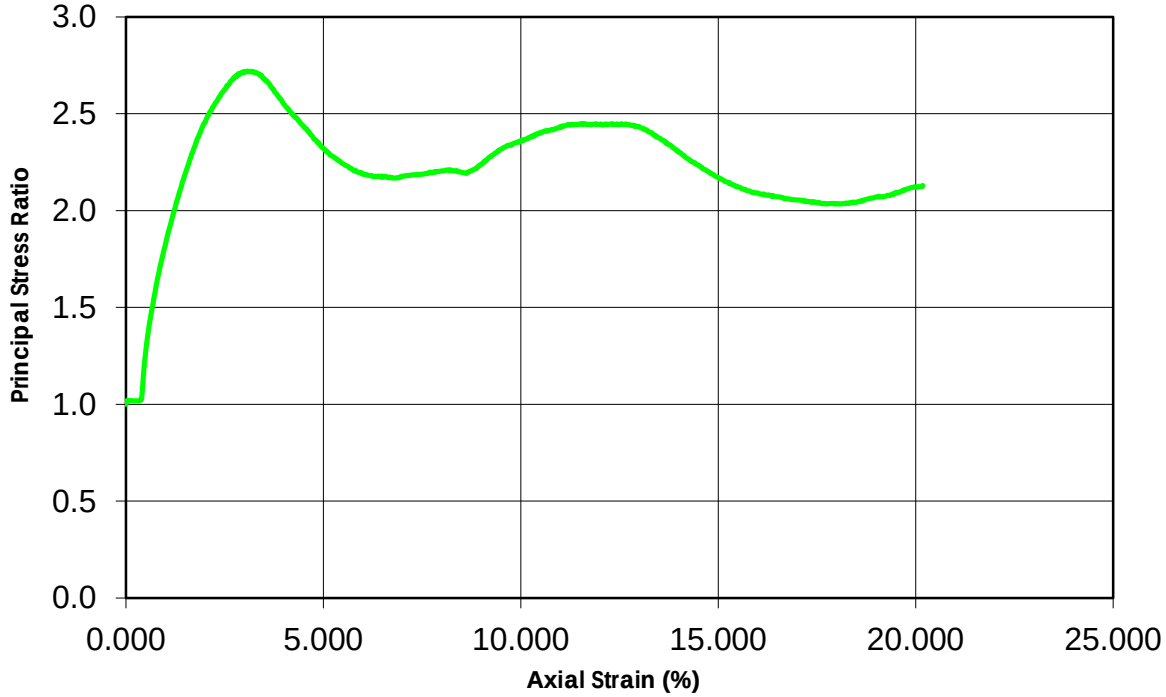


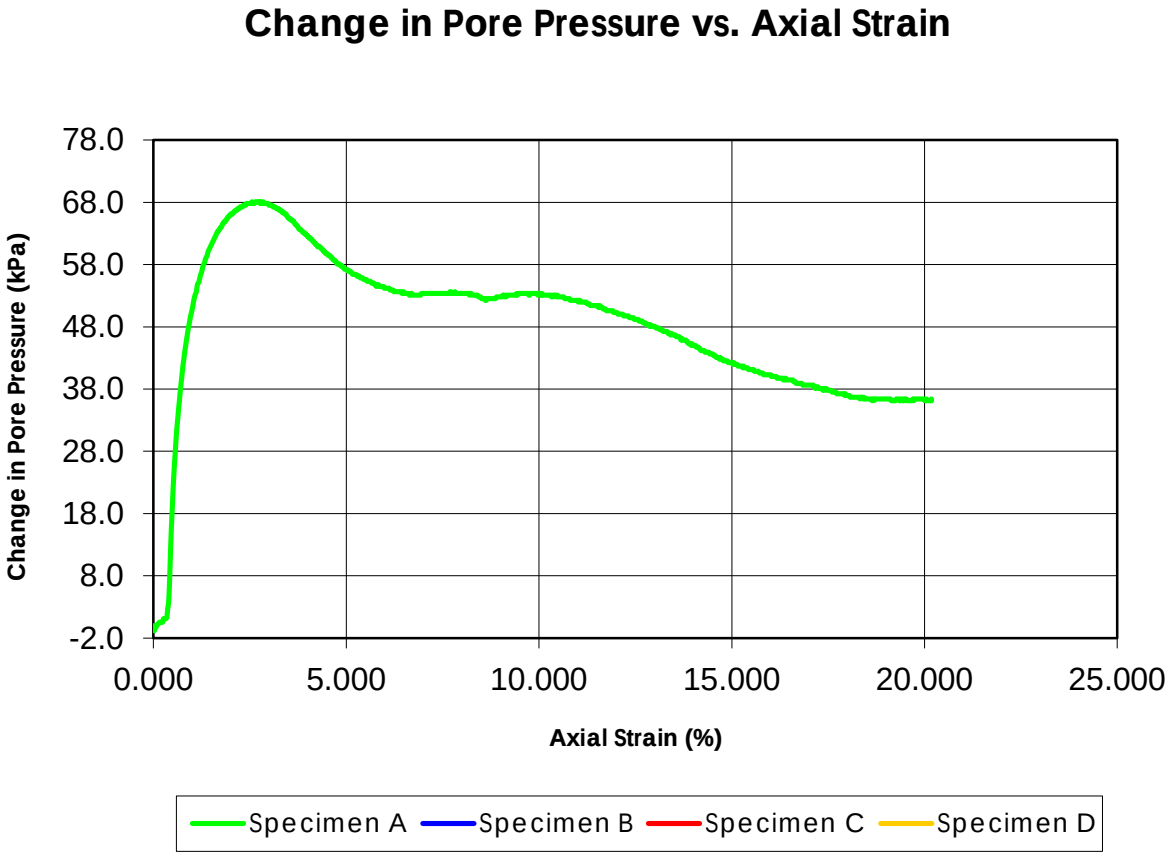



## Deviator Stress vs. Axial Strain



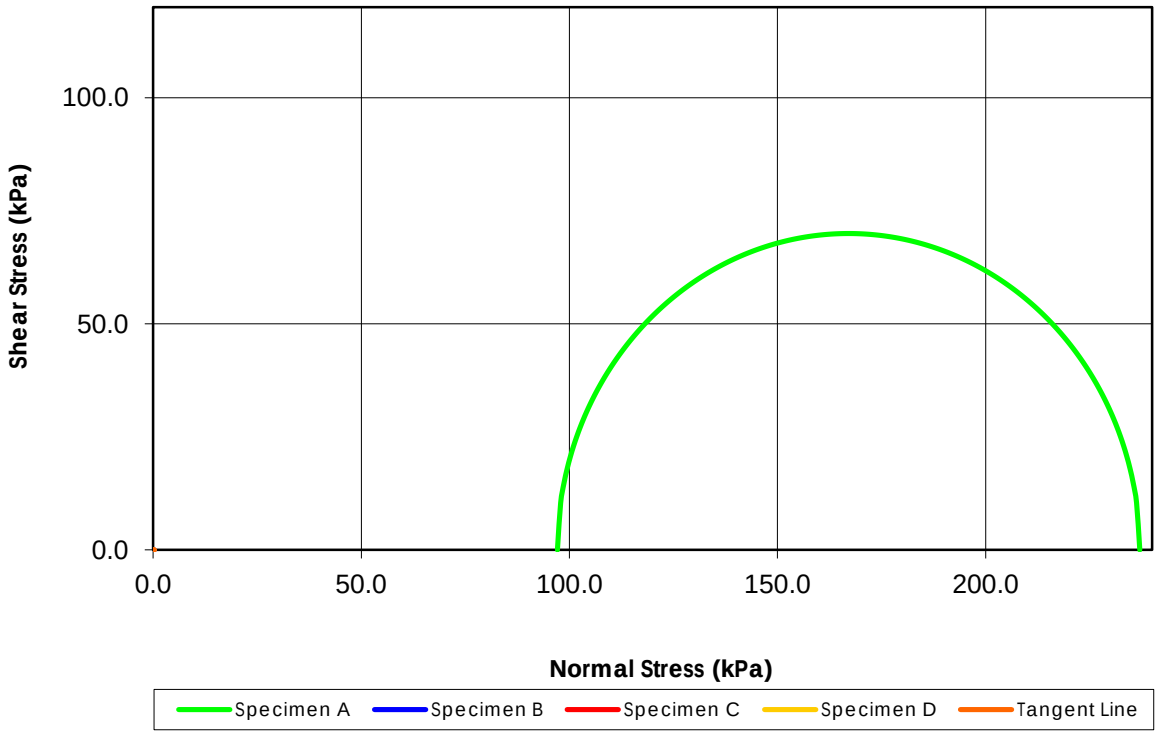

## Principal Stress Ratio vs. Axial Strain



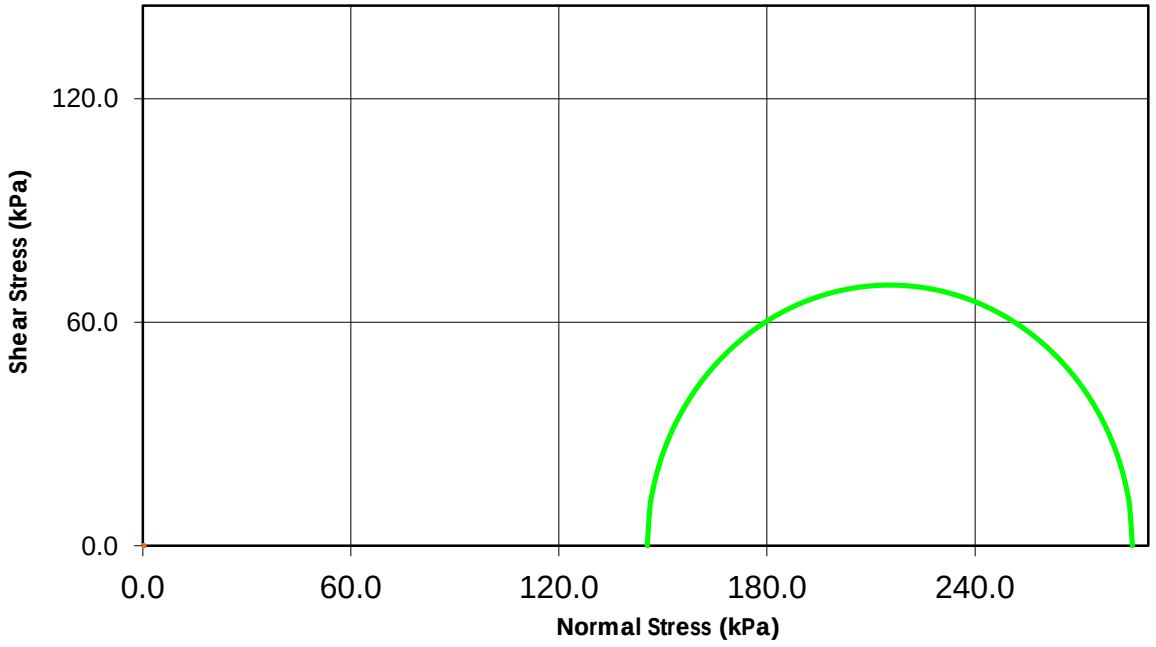

Change in Pore Pressure vs. Axial Strain
78.0
68.0
58.0
48.0
38.0
28.0
18.0
8.0
-2.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

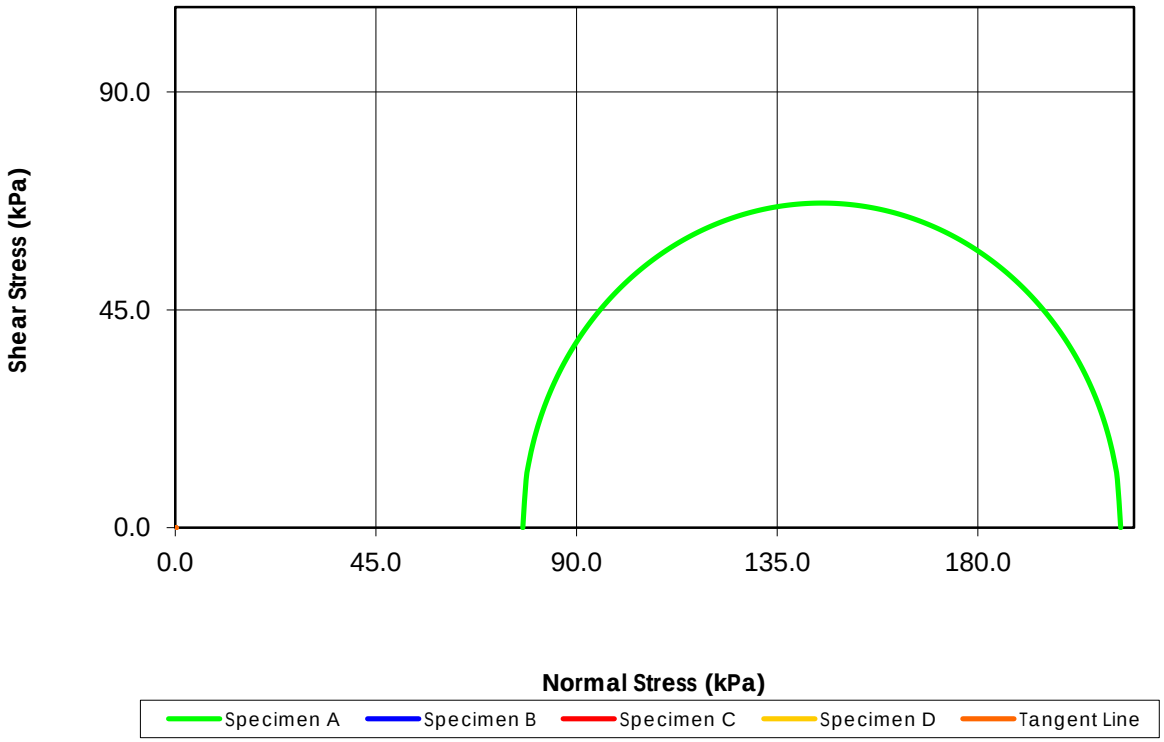



### Total Stress
### (C = 0.0 Ø = 0.0)

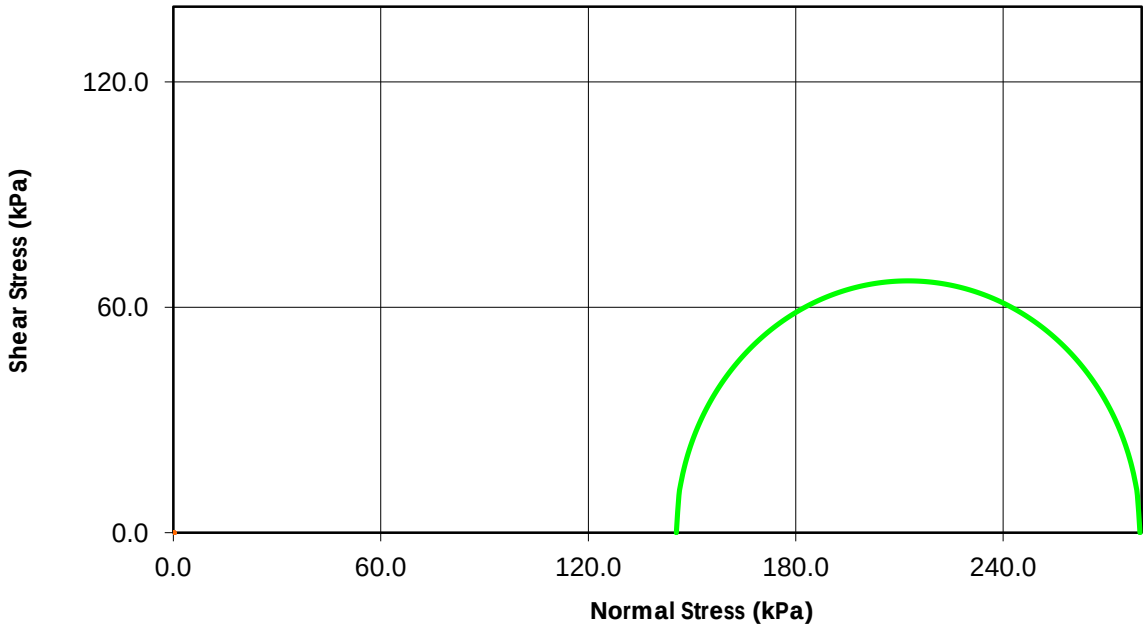


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

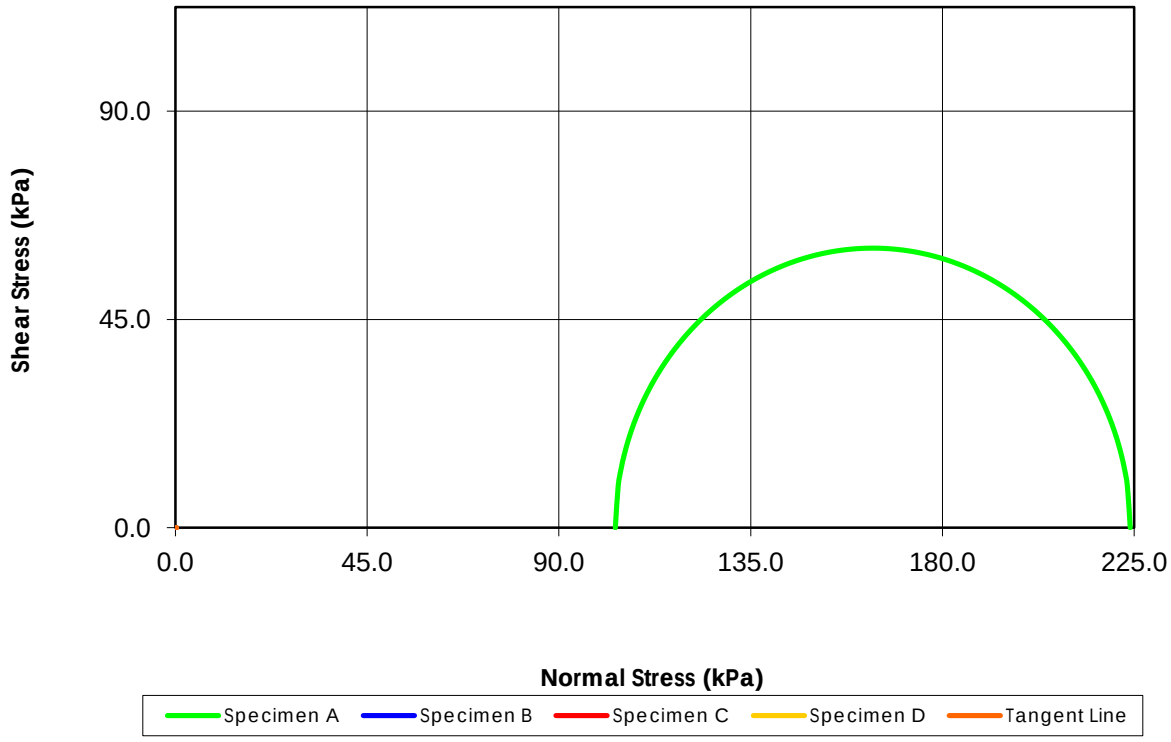



## Total Stress
## (C = 0.0 Ø = 0.0)

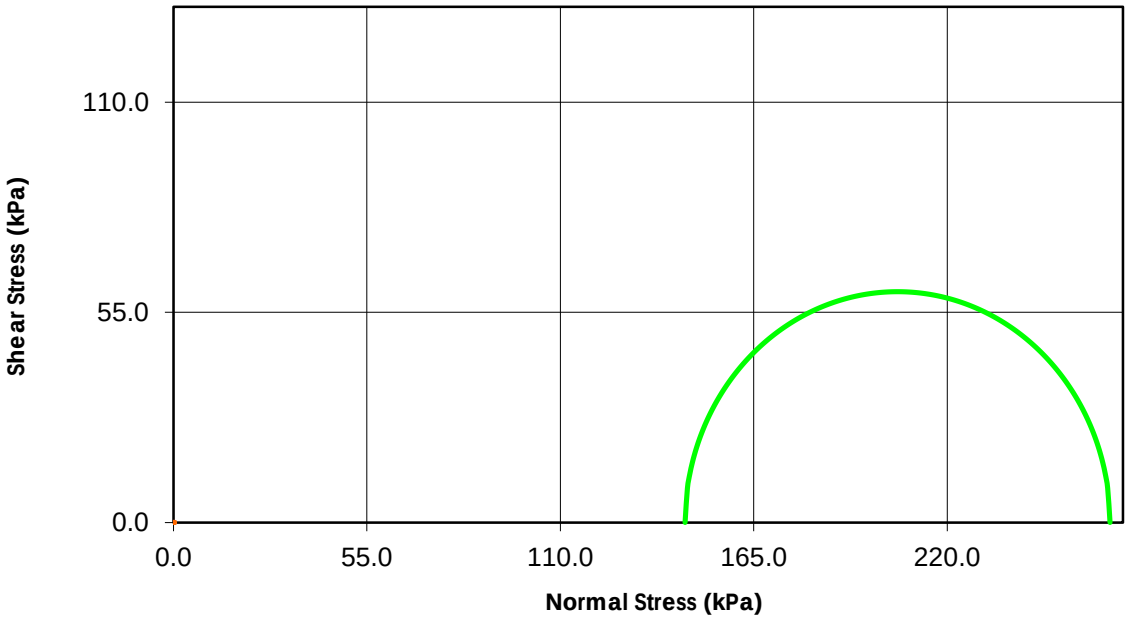


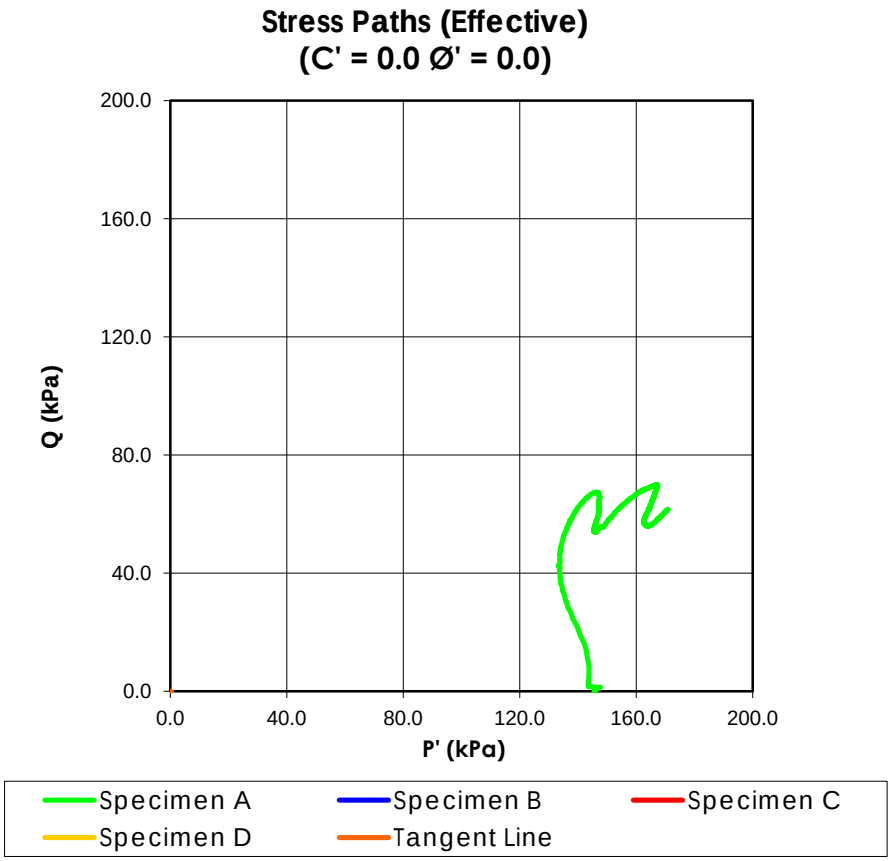
# Mohr Stress Circles at 15% Axial Strain Criterion

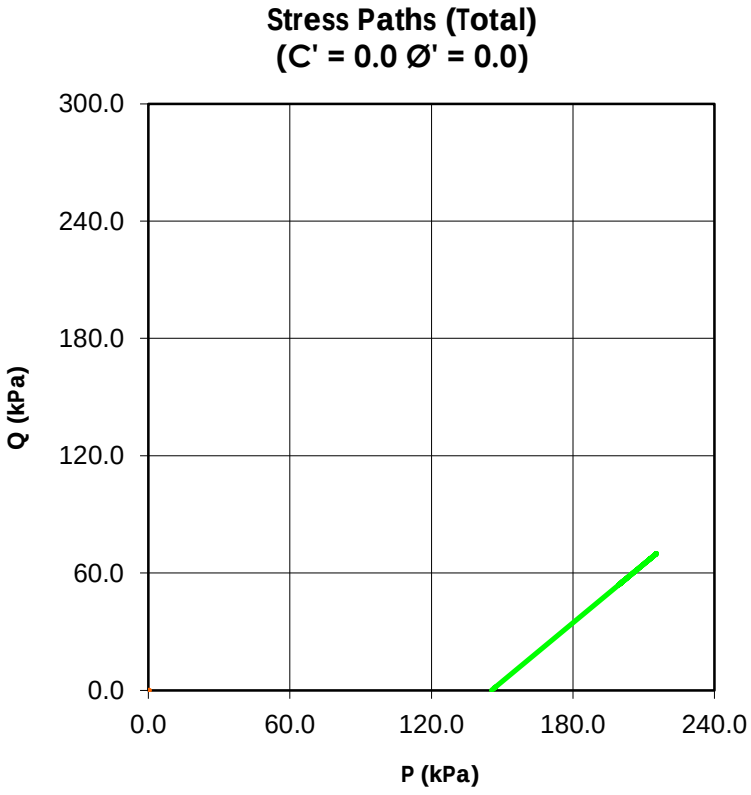
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

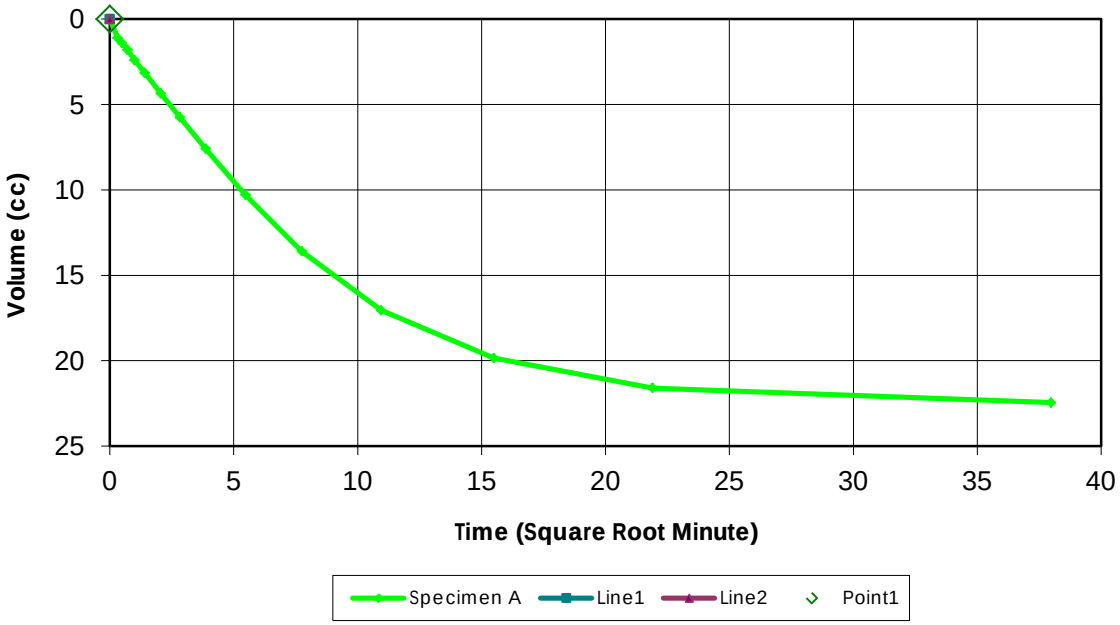



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
200.0
160.0
120.0
80.0
40.0
0.0
Q (kPa)
0.0
40.0
80.0
120.0
160.0
200.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

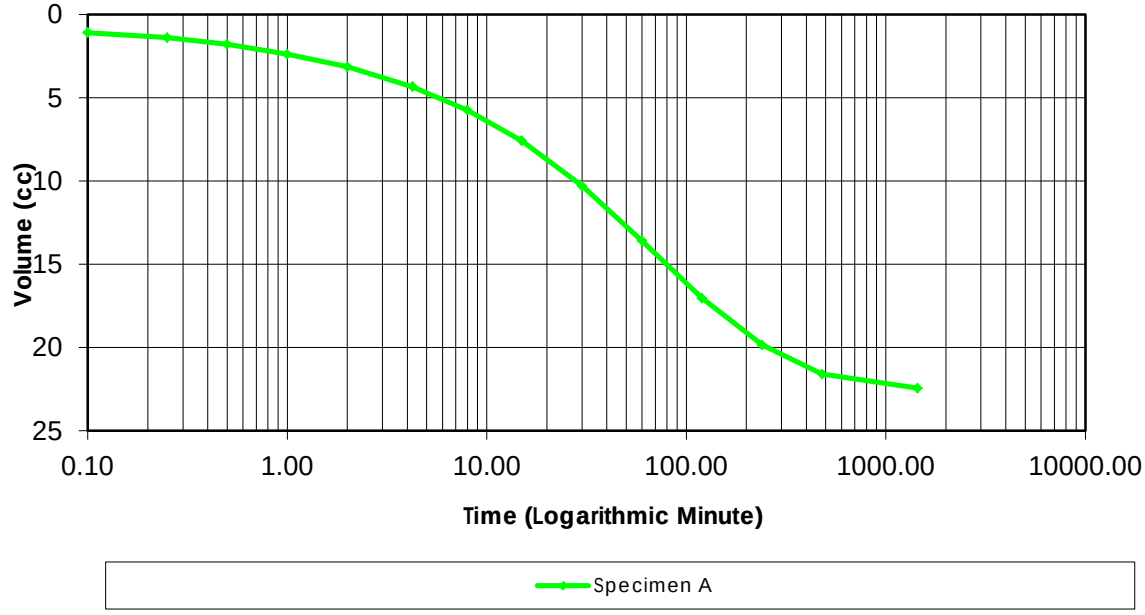

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 130.0 | 40.0 | 70.0 | 0.0 | 0.73 |
| 3 | 130.0 | 110.0 | 0.0 | 70.0 | |
| 4 | 130.0 | 110.0 | 0.0 | 0.0 | |
| 5 | 200.0 | 110.0 | 70.0 | 0.0 | 0.91 |
| 6 | 200.0 | 180.0 | 0.0 | 70.0 | |
| 7 | 200.0 | 180.0 | 0.0 | 0.0 | |
| 8 | 270.0 | 180.0 | 70.0 | 0.0 | 0.95 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.0-3.6m

| | |
|---|---|
| Cell Pressure (kPa) | 330 |
| Back Pressure (kPa) | 180 |
| Effective Pressure (kPa) | 150 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71.9 |
| Initial Sample Height (mm) | 151 |
| Initial Sample Area (cm2) | 40.6 |
| Initial Volume (cm3) | 613.1 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.80 | N/A |
| 00:00:06 | 43.70 | 1.100 |
| 00:00:15 | 43.40 | 1.400 |
| 00:00:30 | 43.00 | 1.800 |
| 00:01:00 | 42.40 | 2.400 |
| 00:02:00 | 41.65 | 3.150 |
| 00:04:15 | 40.45 | 4.350 |
| 00:08:00 | 39.05 | 5.750 |
| 00:15:00 | 37.20 | 7.600 |
| 00:30:00 | 34.50 | 10.300 |
| 01:00:00 | 31.20 | 13.600 |
| 02:00:00 | 27.75 | 17.050 |
| 04:00:00 | 24.95 | 19.850 |
| 08:00:00 | 23.20 | 21.600 |
| 24:02:00 | 22.35 | 22.450 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

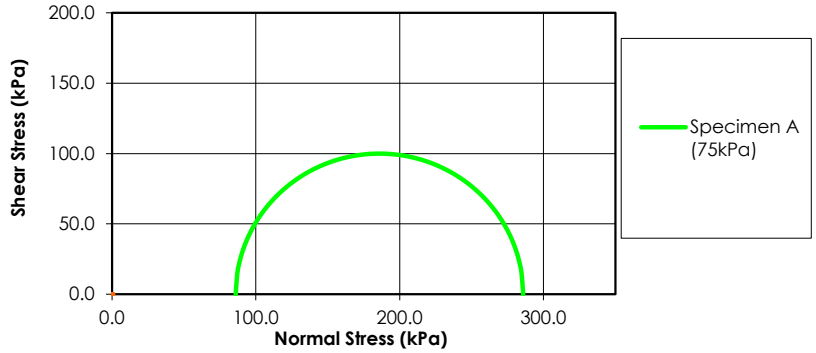
Stantec

Reviewed By: C. Lamoureux'

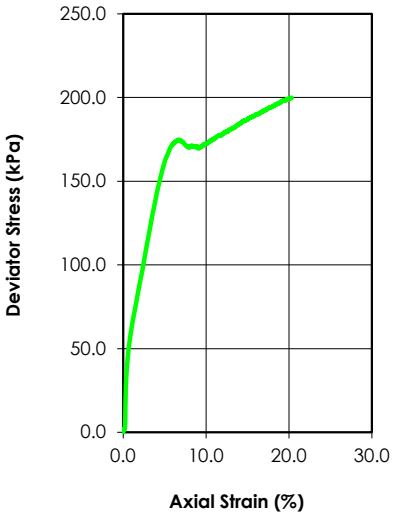
Date: 13-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 21.0 | | | |
| Dry Density (g/cm3) | 1.802 | | | |
| Saturation (%) | 113.99 | | | |
| Void Ratio | 0.498 | | | |
| Diameter (mm) | 72.000 | | | |
| Height (mm) | 163.000 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 20.4 | | | |
| Dry Density (g/cm3) | 1.900 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.421 | | | |
| Effective Stress (kPa) | 70.7 | | | |
| Back Press. (kPa) | 254.3 | | | |
| Rate of Strain | 0.023 | | | |

| Maximum Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 285.86 | | | |
| σ'3 at Failure (kPa) | 86.00 | | | |
| | | | | |
| | | | | |

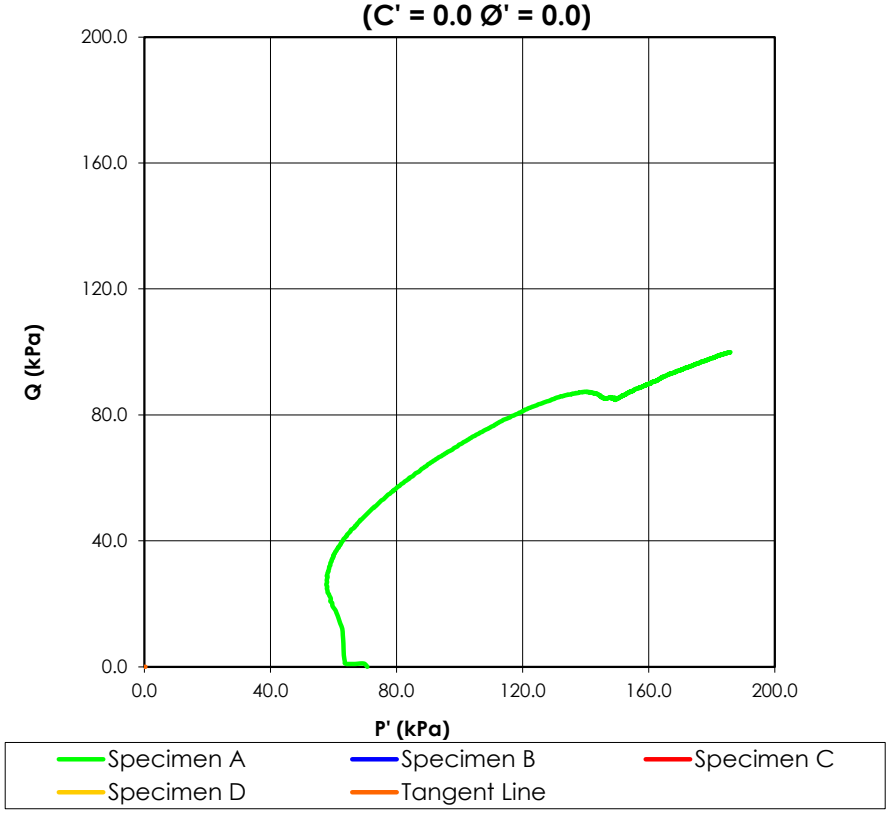
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC27 ST2 |
| **Depth:** | 1.5-2.1m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

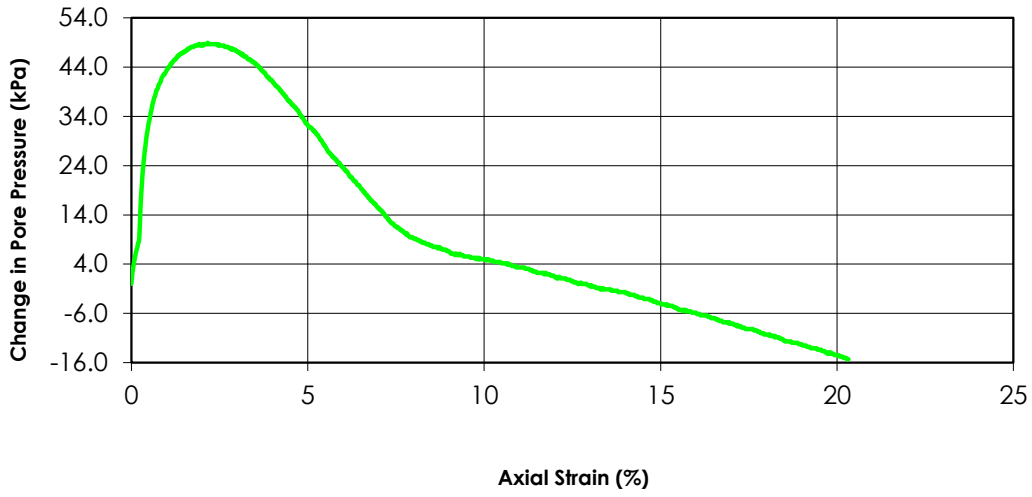
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

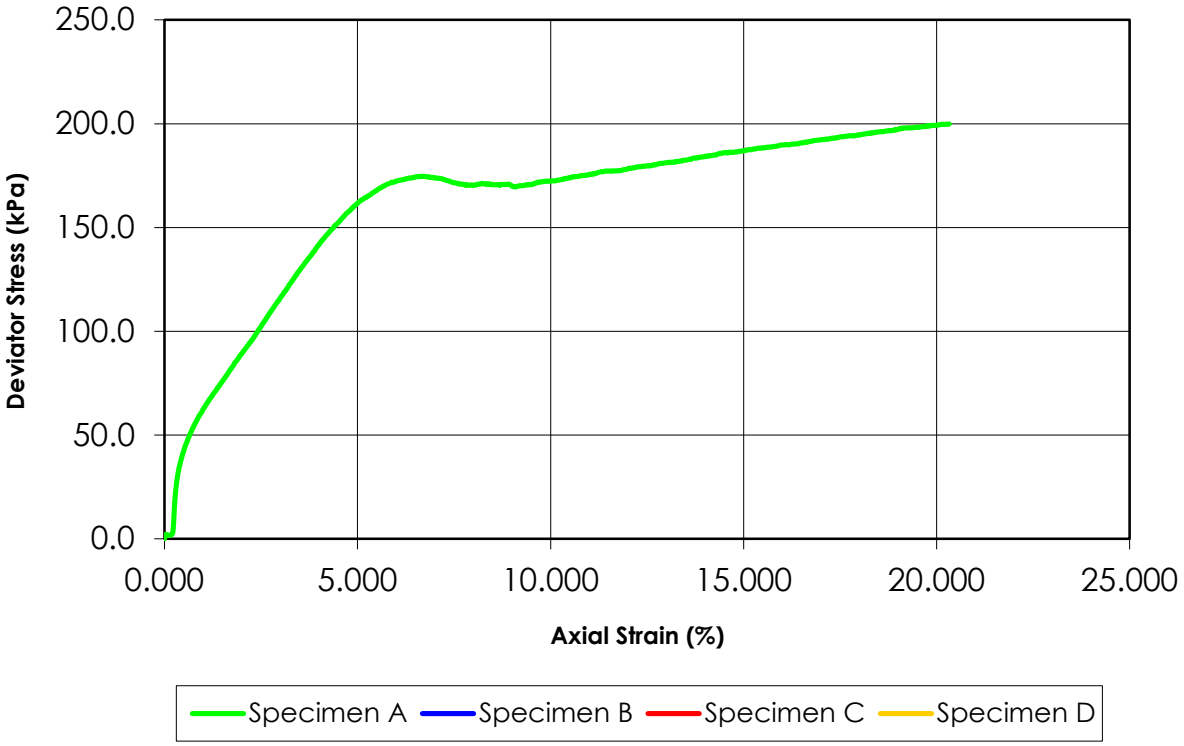
## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)



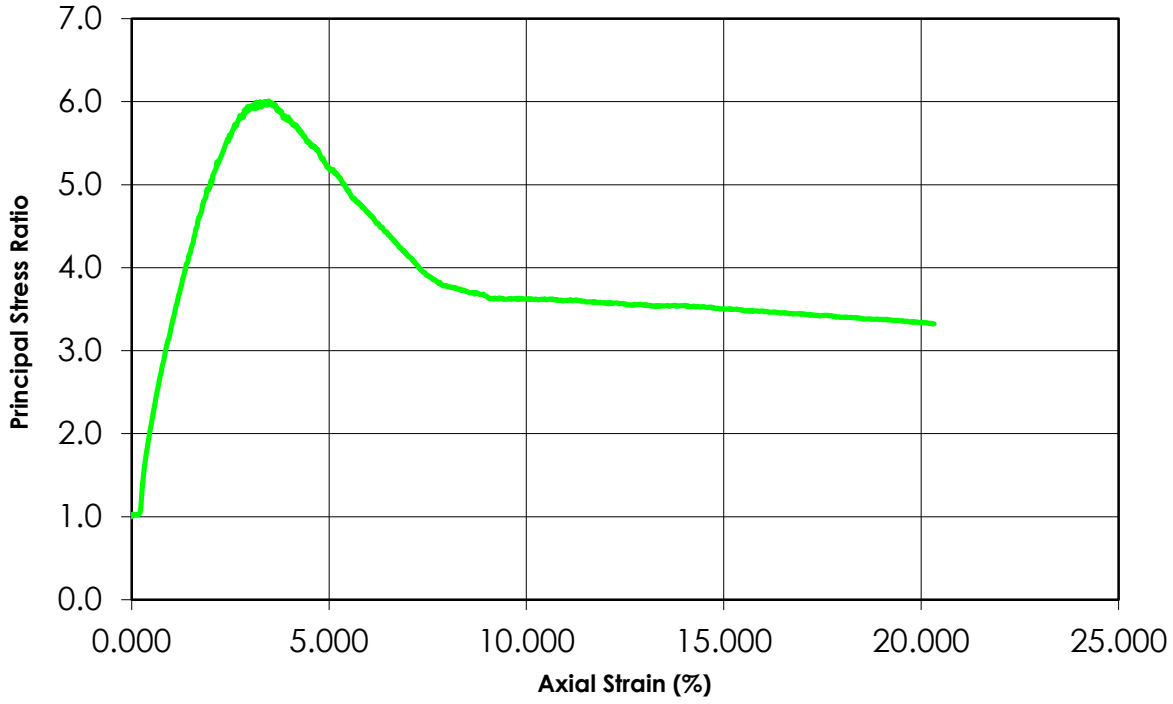

## Change in Pore Pressure vs. Axial Strain

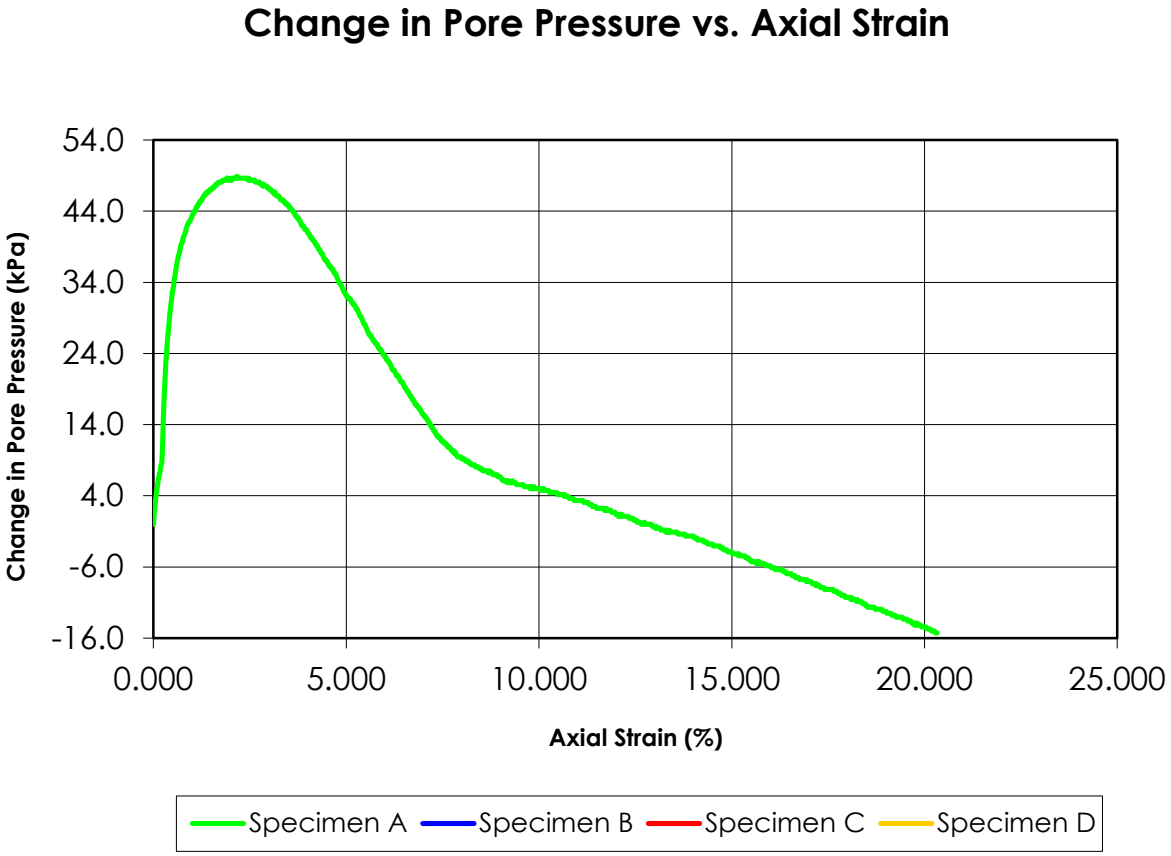


## Deviator Stress vs. Axial Strain



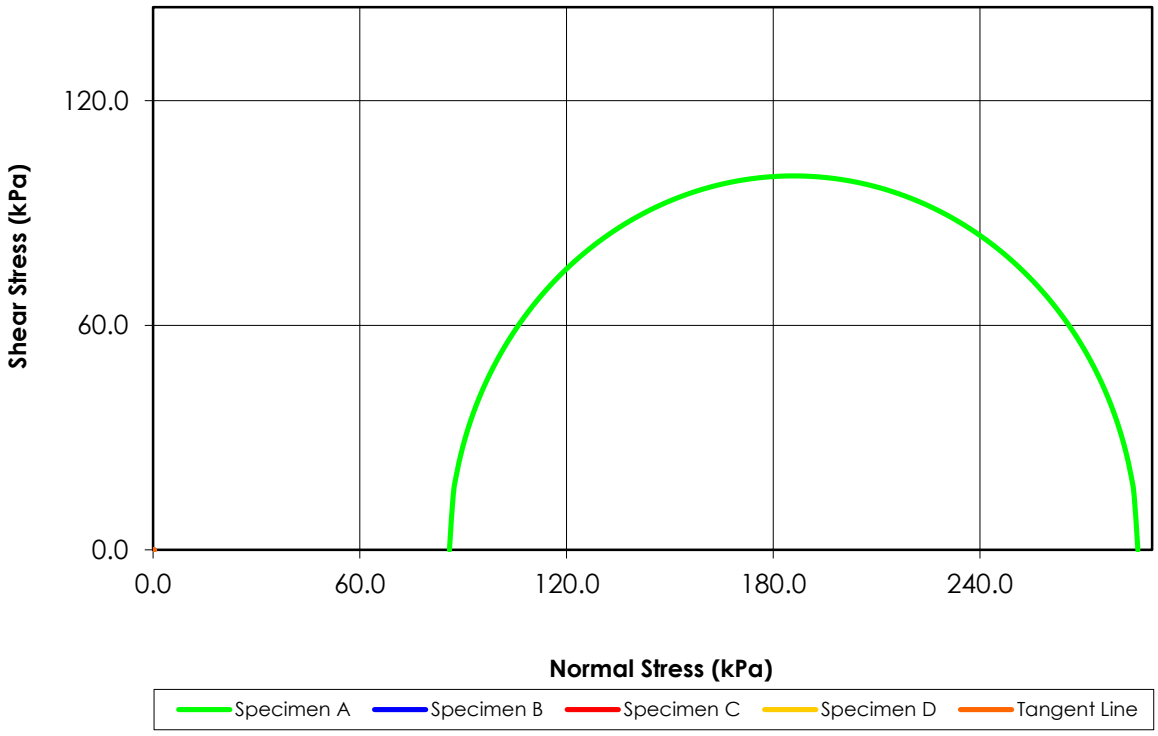

## Principal Stress Ratio vs. Axial Strain



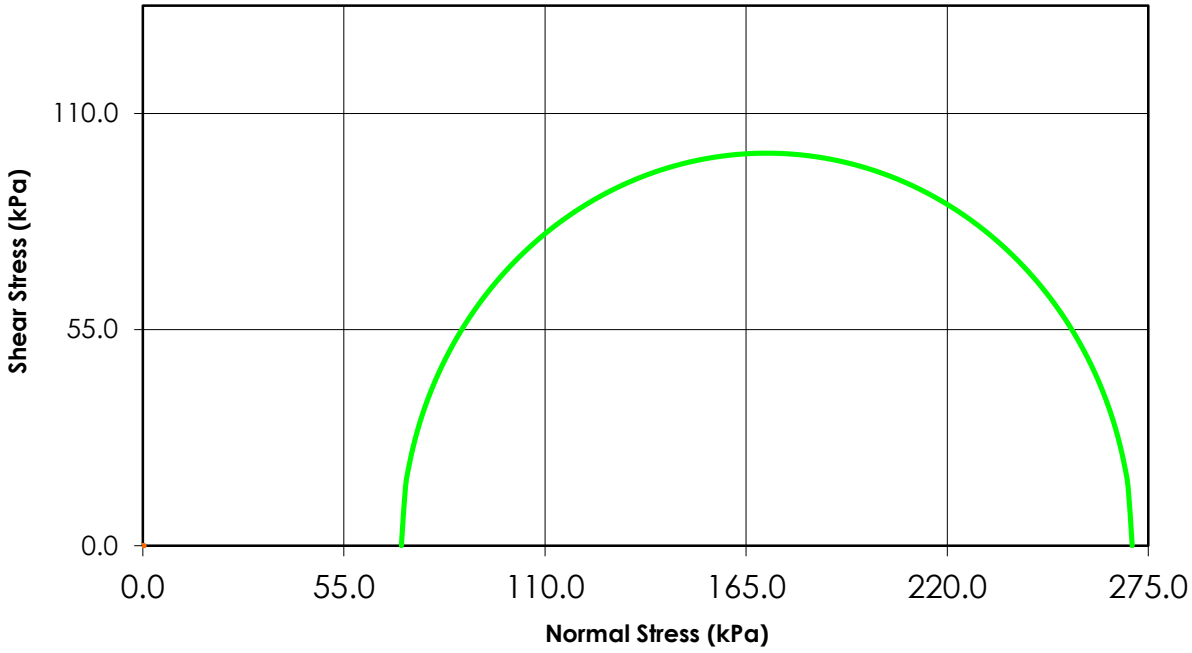

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
54.0
44.0
34.0
24.0
14.0
4.0
-6.0
-16.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

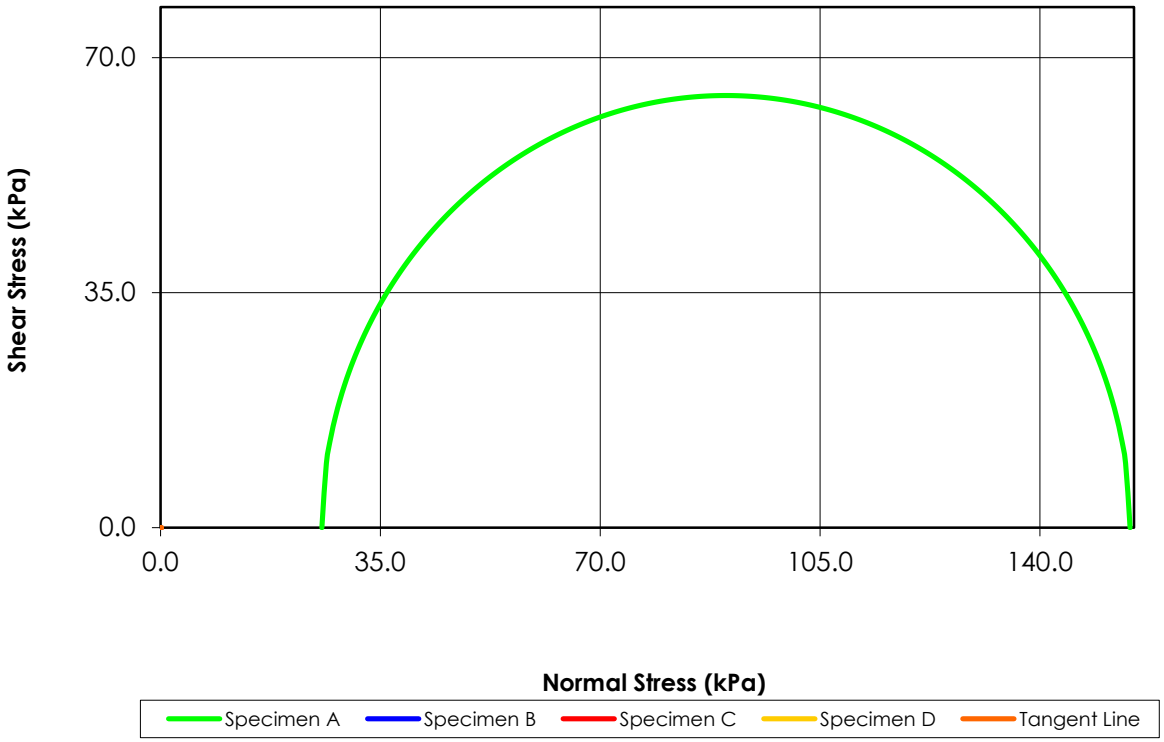



### Total Stress
### (C = 0.0 Ø = 0.0)

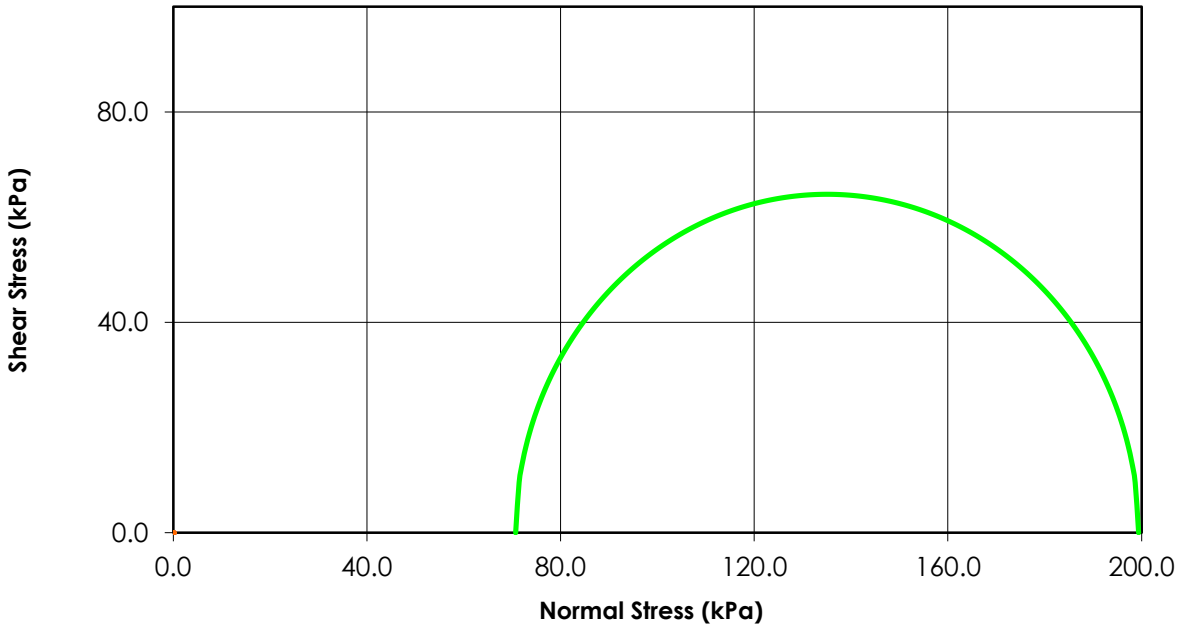


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

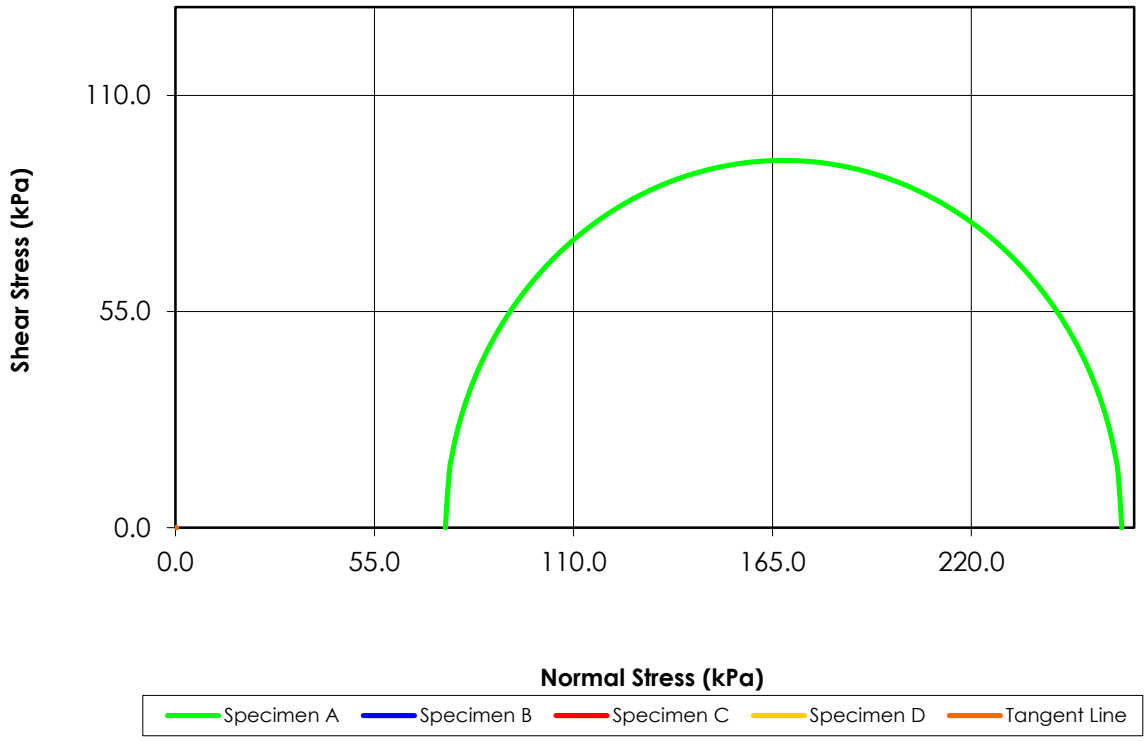



## Total Stress
## (C = 0.0 Ø = 0.0)

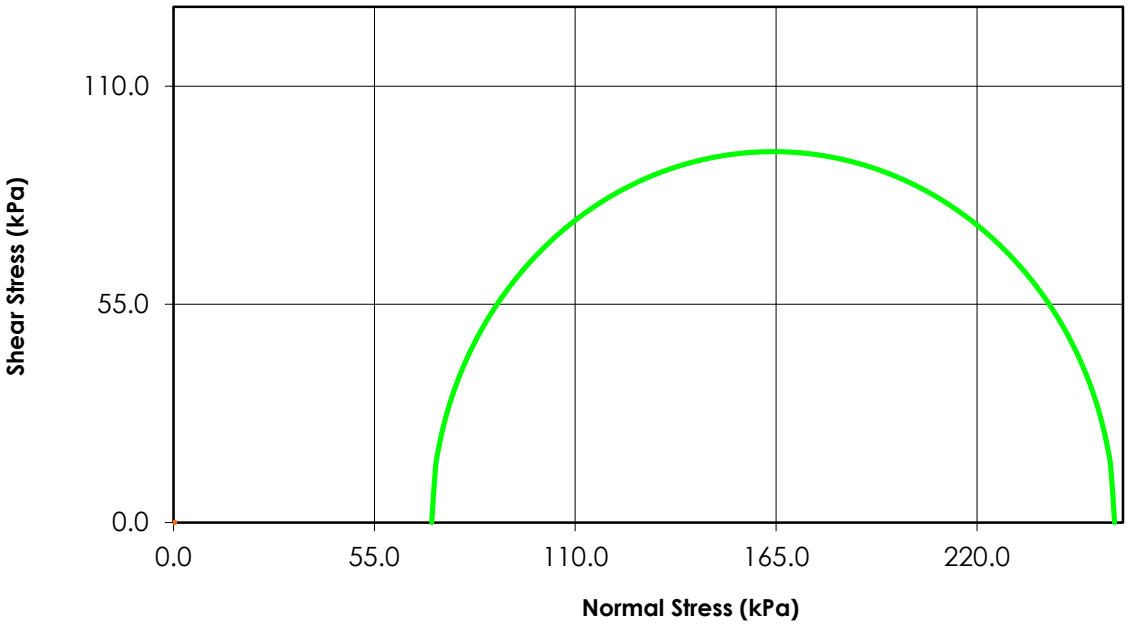


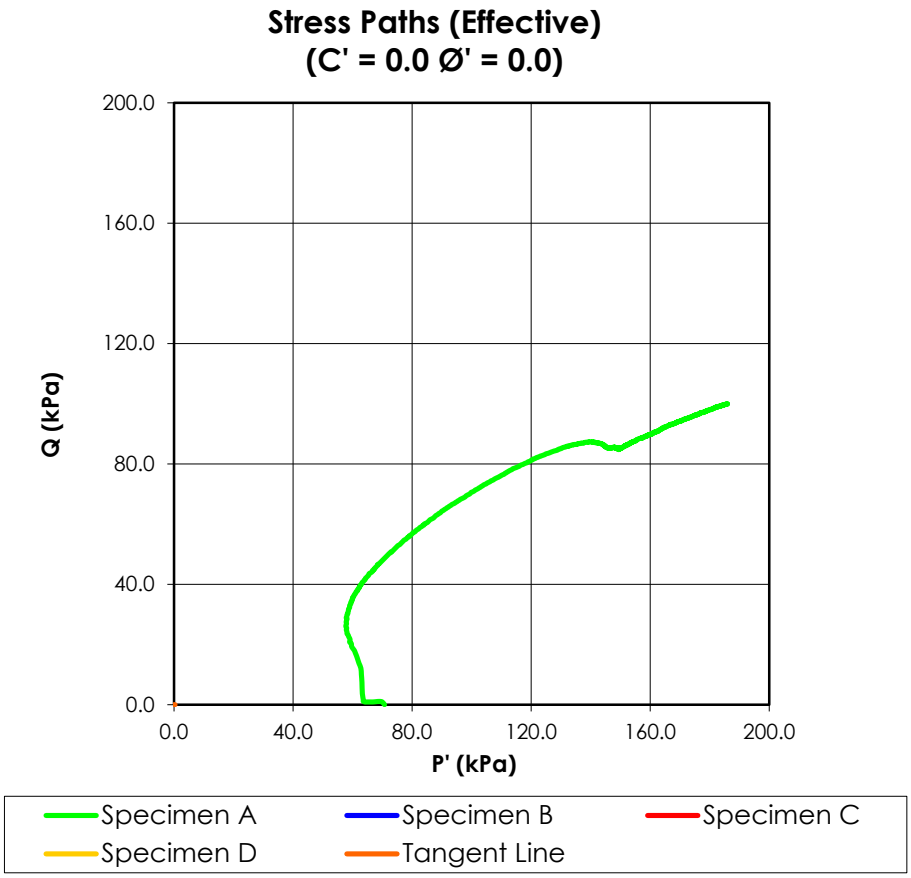
# Mohr Stress Circles at 15% Axial Strain Criterion

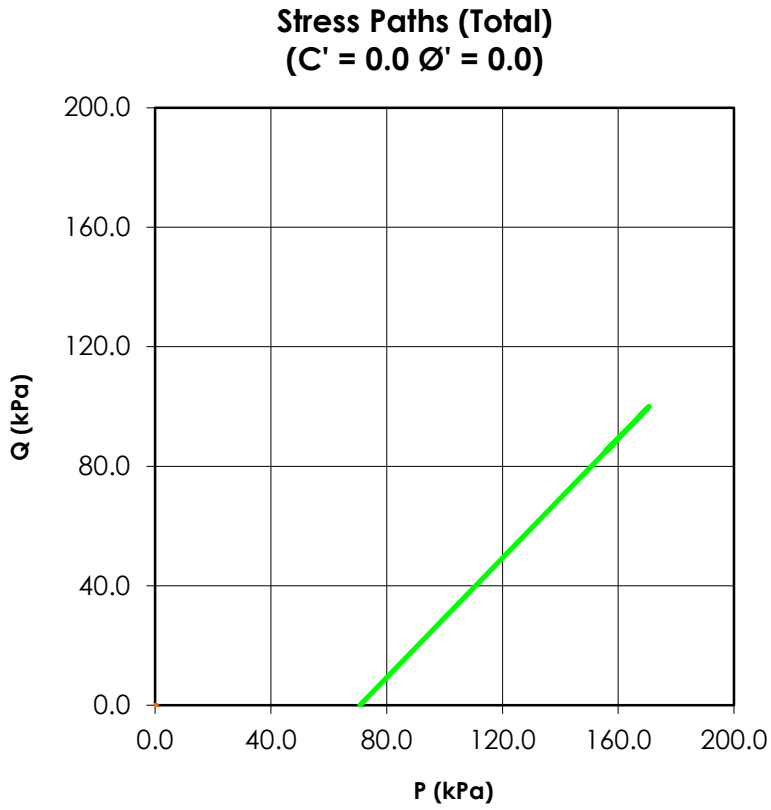
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

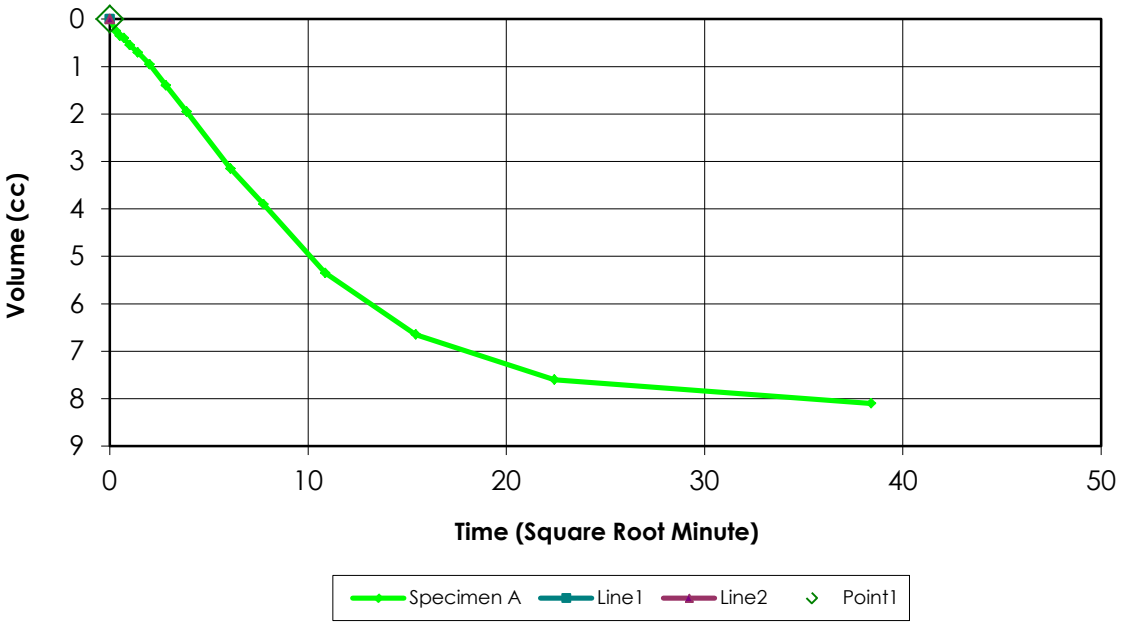



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
200.0
160.0
120.0
80.0
40.0
0.0
Q (kPa)
0.0
40.0
80.0
120.0
160.0
200.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

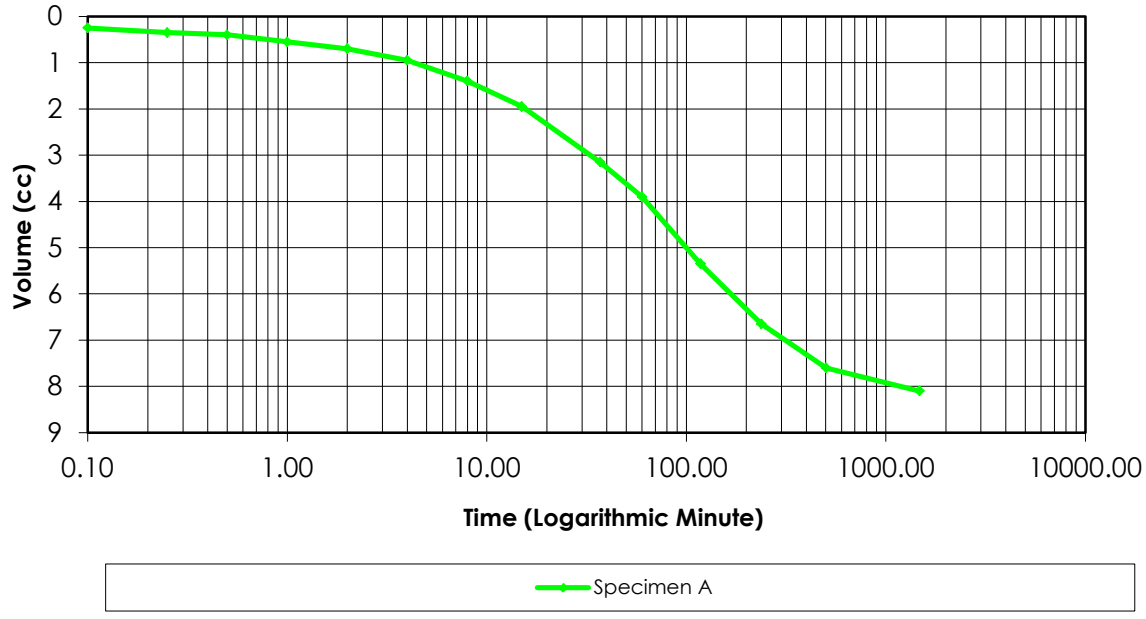

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
200.0
160.0
120.0
80.0
40.0
0.0
Q (kPa)
0.0
40.0
80.0
120.0
160.0
200.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 130.0 | 40.0 | 70.0 | 0.0 | 36.00 |
| 3 | 130.0 | 110.0 | 0.0 | 70.0 | |
| 4 | 130.0 | 110.0 | 0.0 | 0.0 | |
| 5 | 200.0 | 110.0 | 70.0 | 0.0 | 64.00 |
| 6 | 200.0 | 180.0 | 0.0 | 70.0 | |
| 7 | 200.0 | 180.0 | 0.0 | 0.0 | |
| 8 | 270.0 | 180.0 | 70.0 | 0.0 | 81.00 |
| 9 | 270.0 | 250.0 | 0.0 | 70.0 | |
| 10 | 270.0 | 250.0 | 0.0 | 0.0 | |
| 11 | 340.0 | 250.0 | 70.0 | 0.0 | 95.00 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0 Depth: 1.5-2.1m

| | |
|---|---|
| Cell Pressure (kPa) | 325 |
| Back Pressure (kPa) | 250 |
| Effective Pressure (kPa) | 75 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72 |
| Initial Sample Height (mm) | 163 |
| Initial Sample Area (cm2) | 40.72 |
| Initial Volume (cm3) | 663.7 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 45.10 | N/A |
| 00:00:06 | 44.85 | 0.250 |
| 00:00:15 | 44.75 | 0.350 |
| 00:00:30 | 44.70 | 0.400 |
| 00:01:00 | 44.55 | 0.550 |
| 00:02:00 | 44.40 | 0.700 |
| 00:04:00 | 44.15 | 0.950 |
| 00:08:00 | 43.70 | 1.400 |
| 00:15:00 | 43.15 | 1.950 |
| 00:37:00 | 41.95 | 3.150 |
| 01:00:00 | 41.20 | 3.900 |
| 01:58:00 | 39.75 | 5.350 |
| 03:58:00 | 38.45 | 6.650 |
| 08:23:00 | 37.50 | 7.600 |
| 24:34:30 | 37.00 | 8.100 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

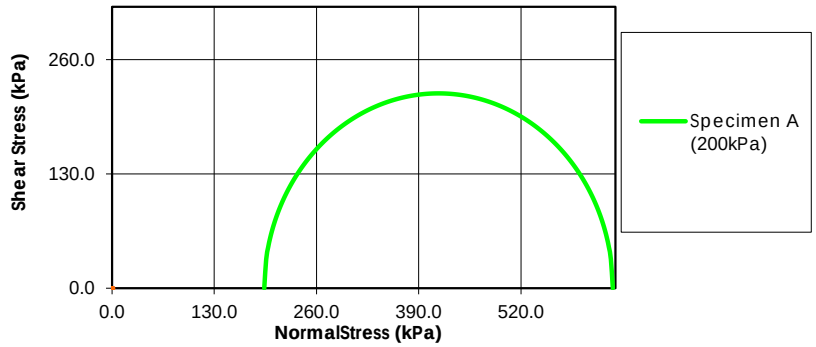
Stantec

Reviewed By C. Lamoureux

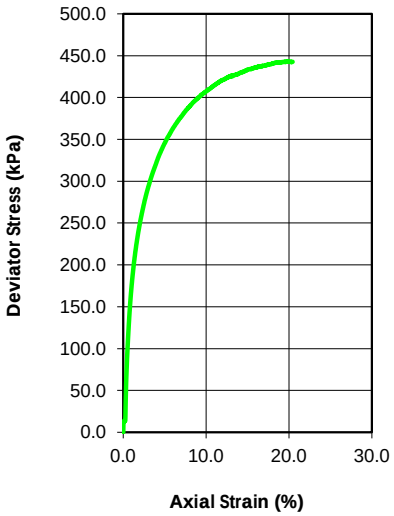
Date: 13-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.4 | | | |
| Dry Density (g/cm3) | 1.869 | | | |
| Saturation (%) | 87.68 | | | |
| Void Ratio | 0.445 | | | |
| Diameter (mm) | 72.500 | | | |
| Height (mm) | 155.500 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 1.00 | | | |
| Water Content (%) | 12.8 | | | |
| Dry Density (g/cm3) | 1.923 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.404 | | | |
| Effective Stress (kPa) | 187.2 | | | |
| Back Press. (kPa) | 122.8 | | | |
| Rate of Strain | 0.022 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

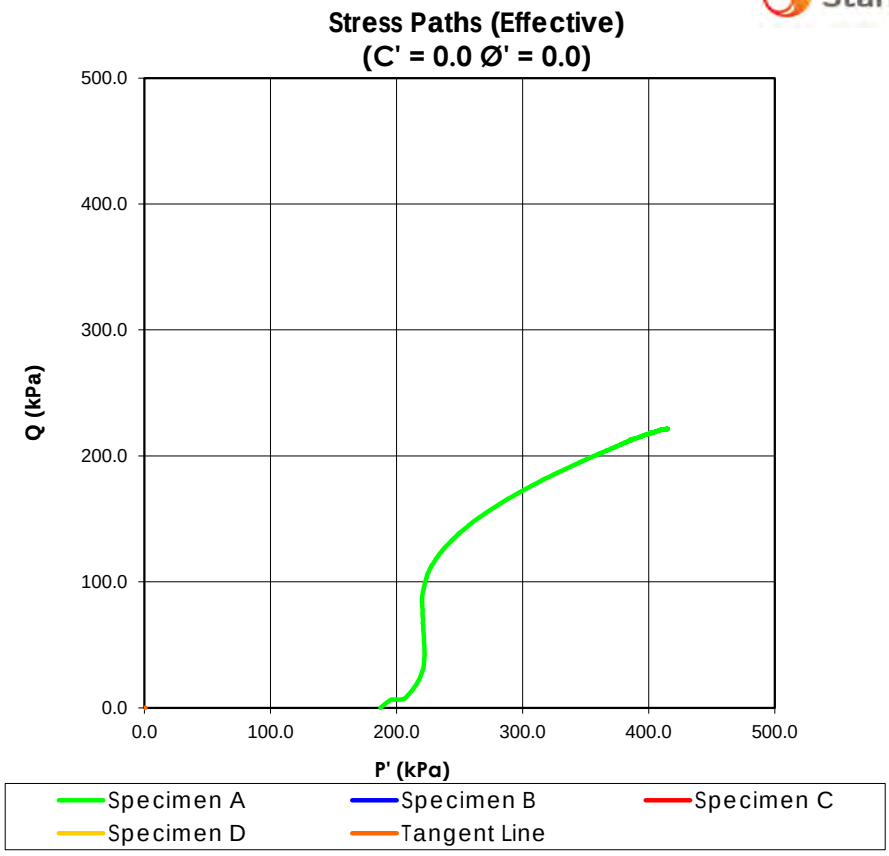
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 636.67 | | | |
| σ'3 at Failure (kPa) | 193.56 | | | |
| | | | | |
| | | | | |

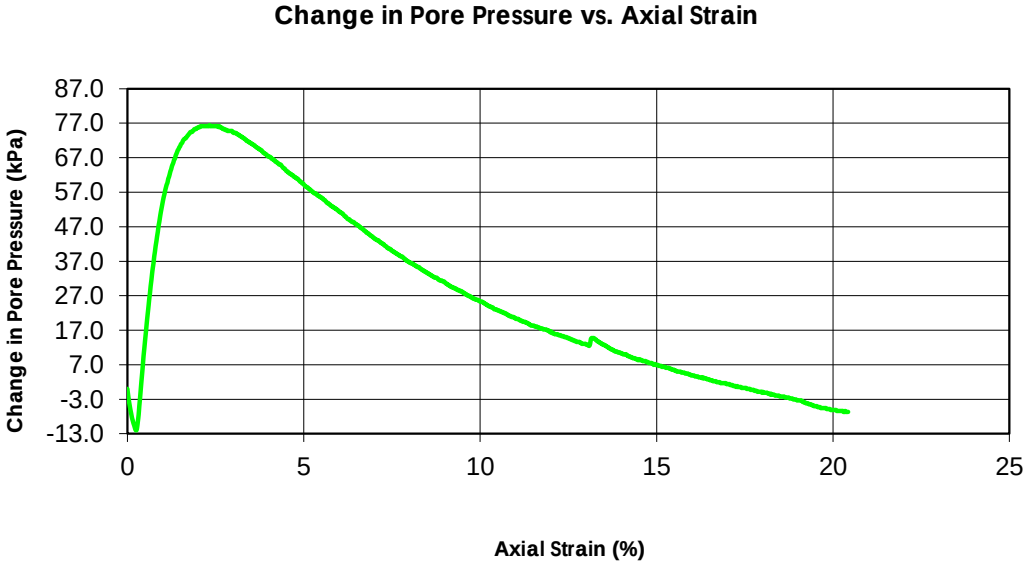
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC27 ST5 |
| **Depth:** | 3.0-3.6m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Silty Clay, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

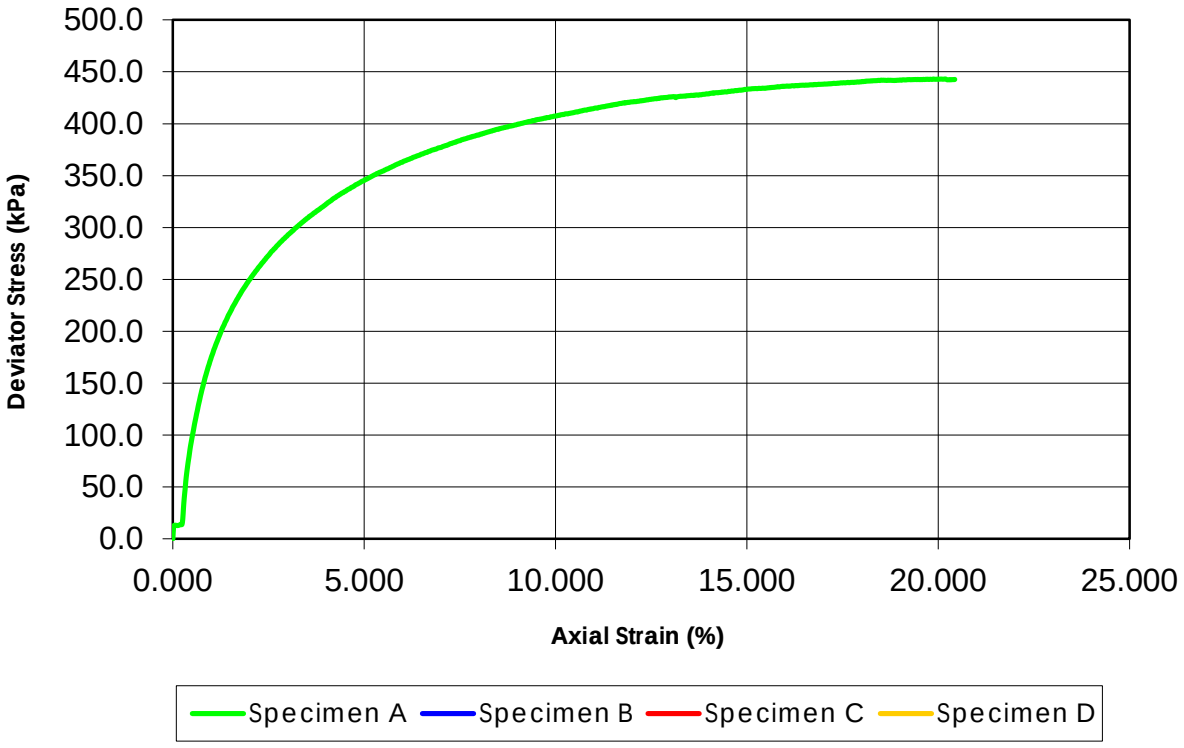
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

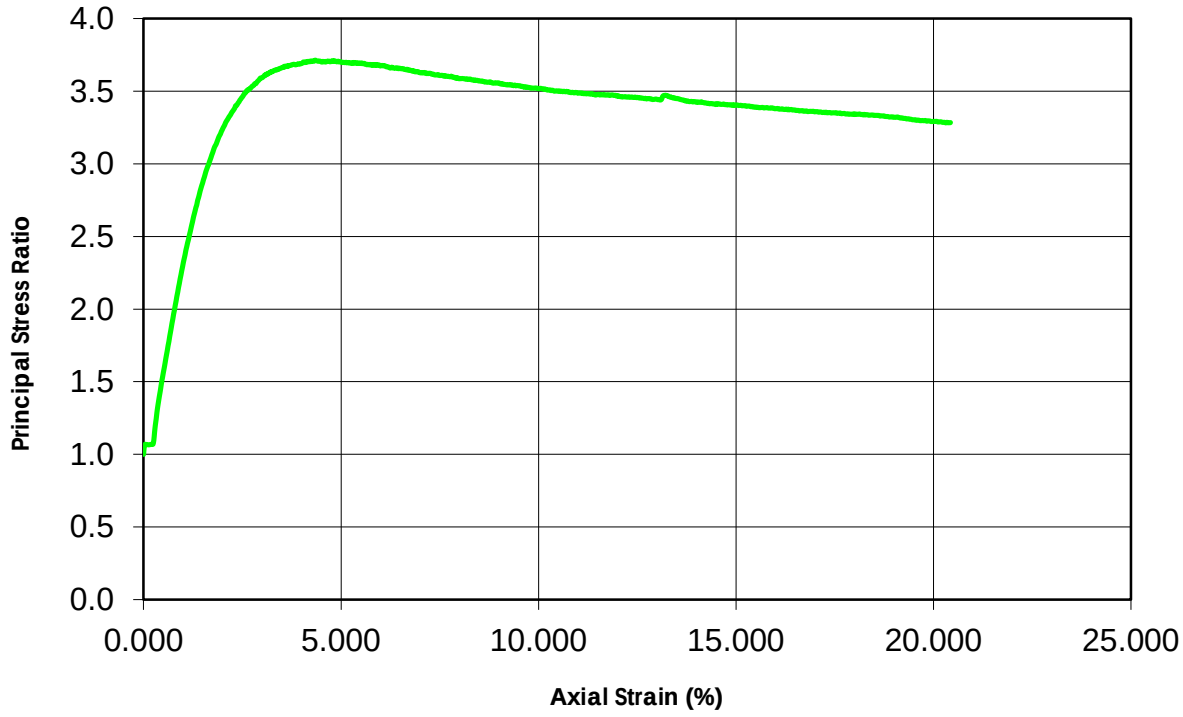


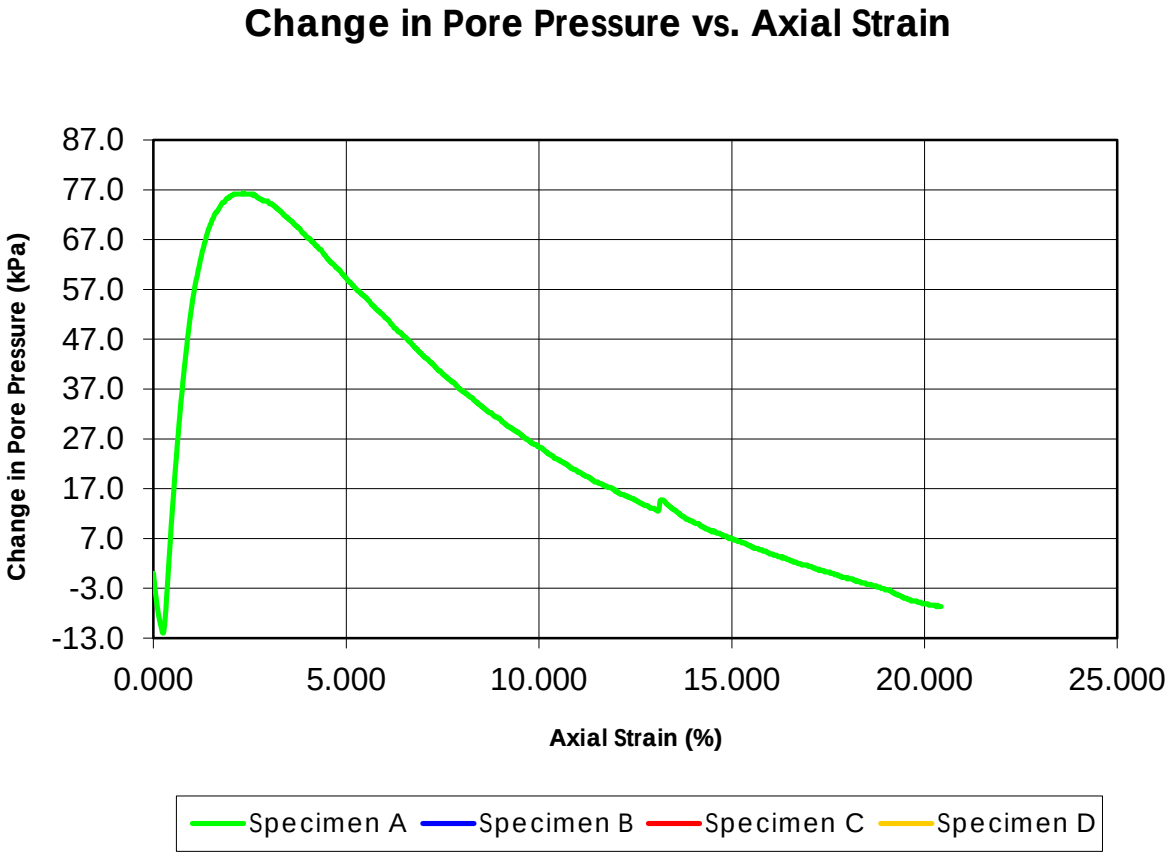



## Deviator Stress vs. Axial Strain



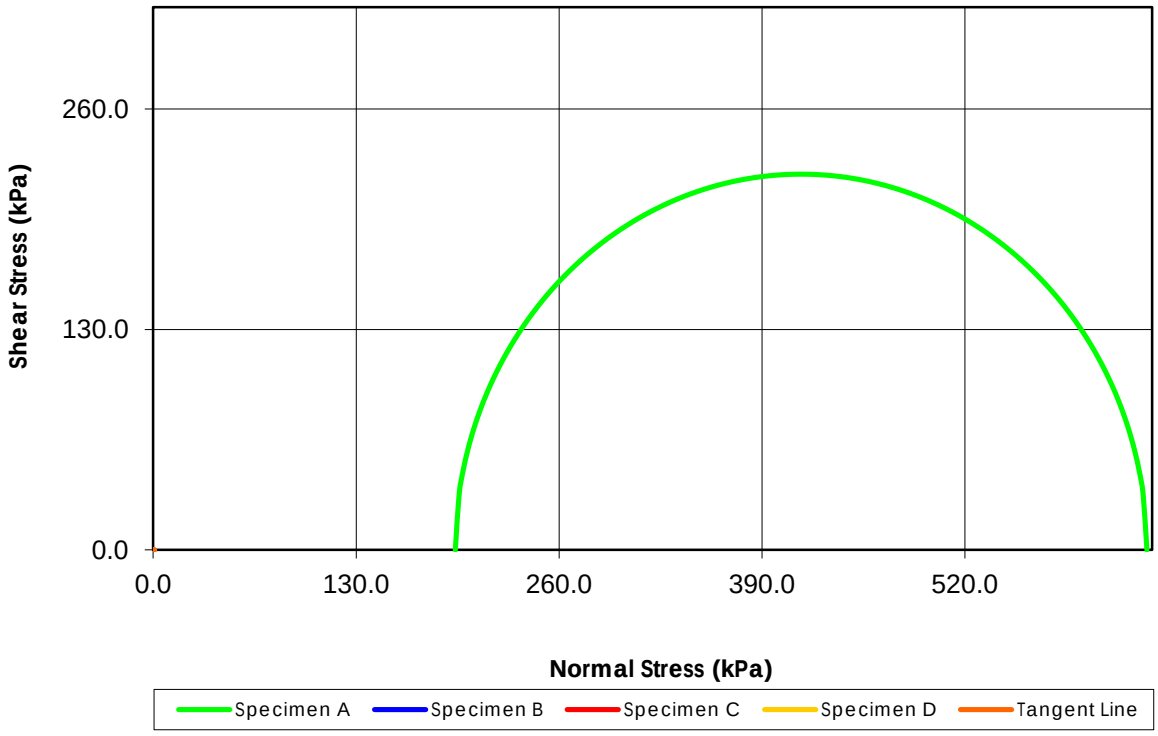

## Principal Stress Ratio vs. Axial Strain



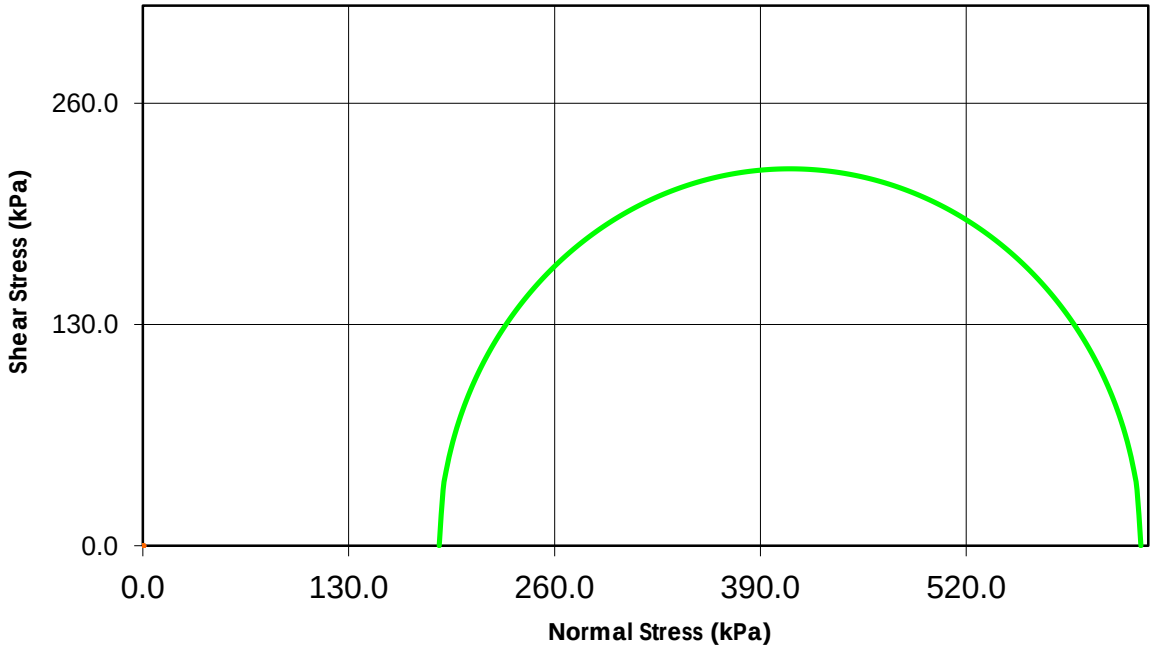

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
87.0
77.0
67.0
57.0
47.0
37.0
27.0
17.0
7.0
-3.0
-13.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

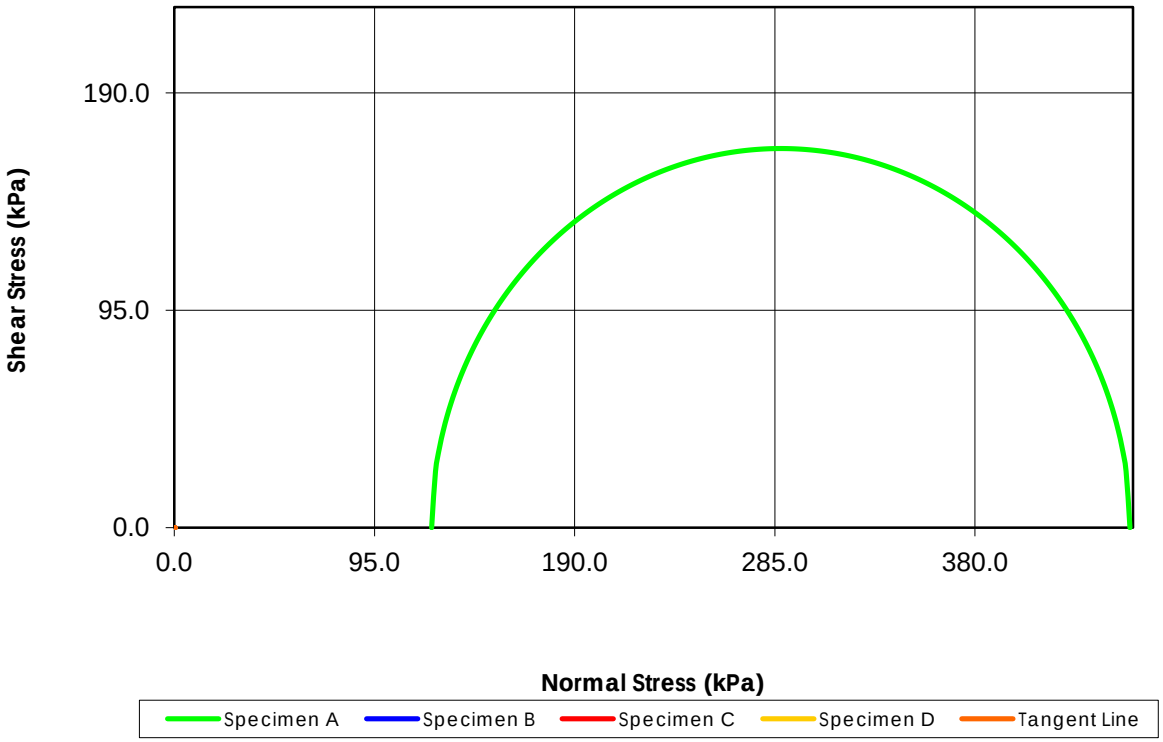



### Total Stress
### (C = 0.0 Ø = 0.0)

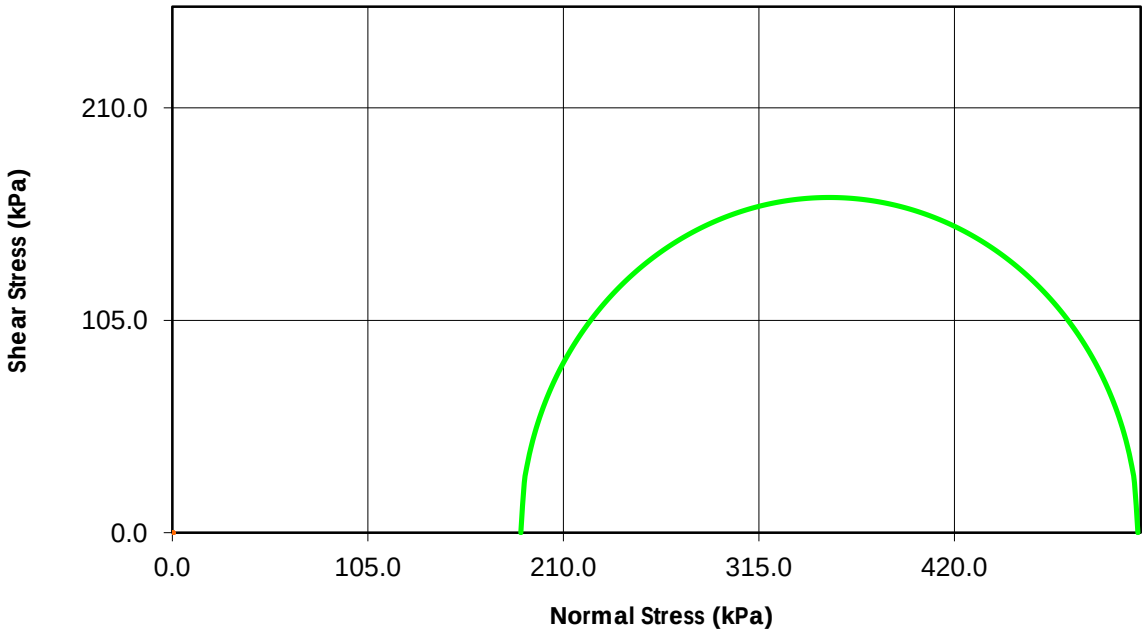


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

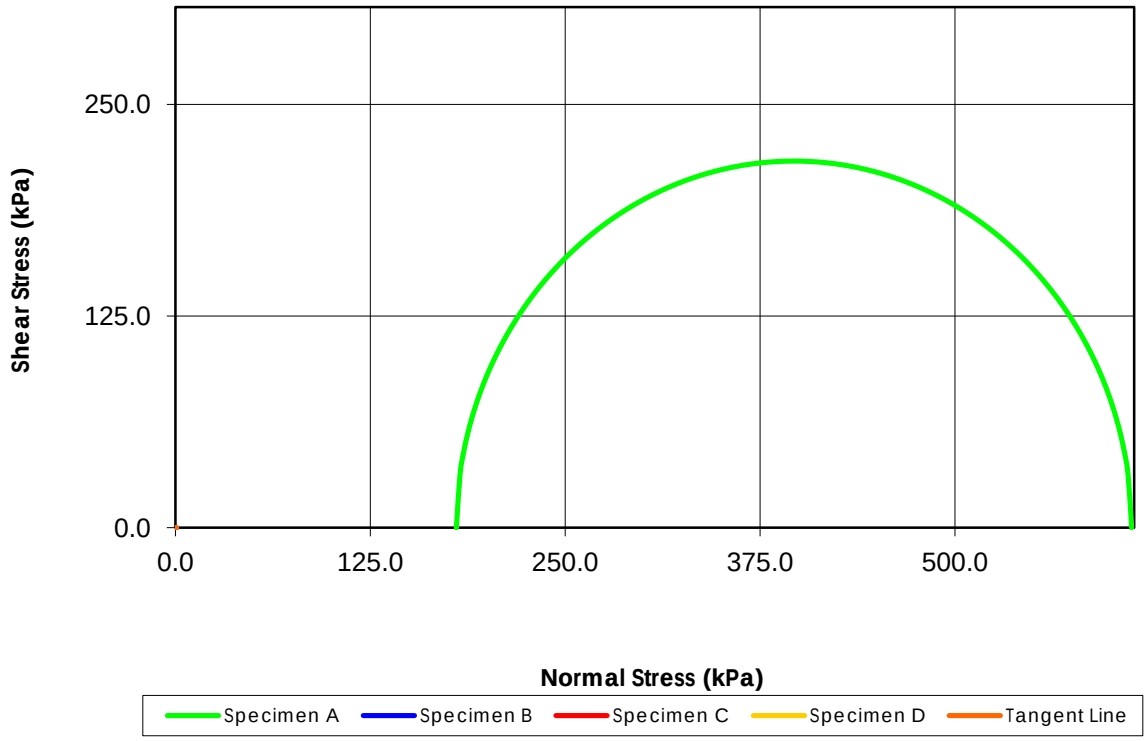



## Total Stress
## (C = 0.0 Ø = 0.0)

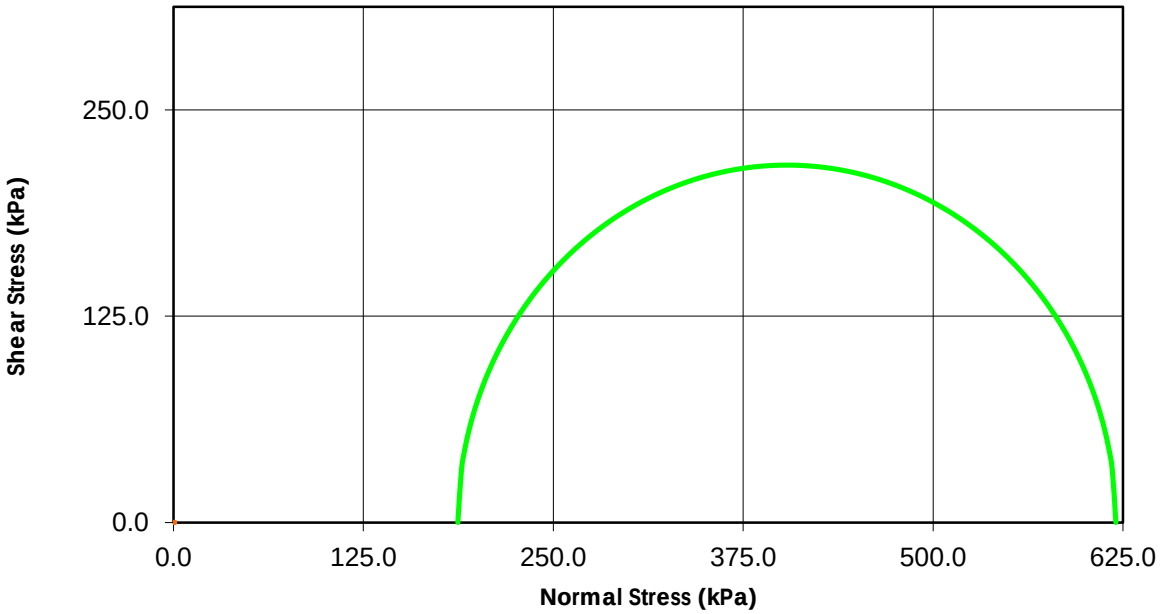


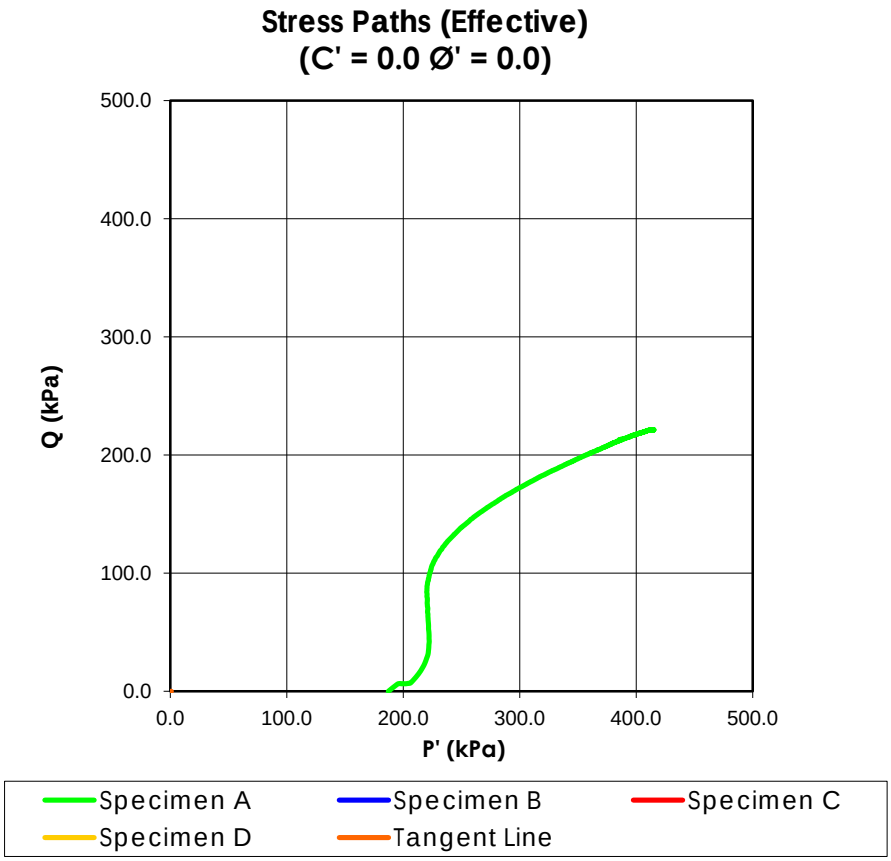
# Mohr Stress Circles at 15% Axial Strain Criterion

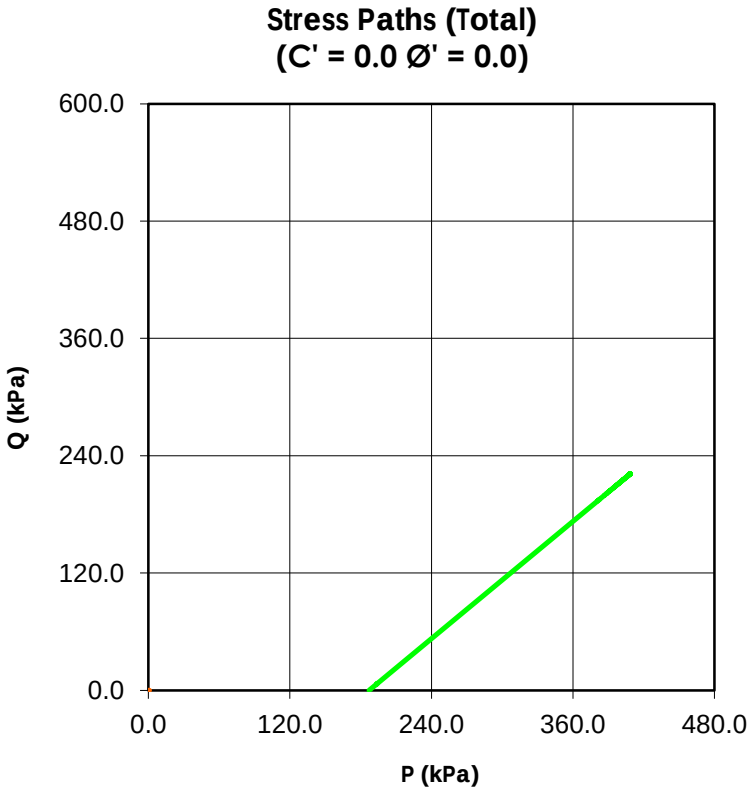
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

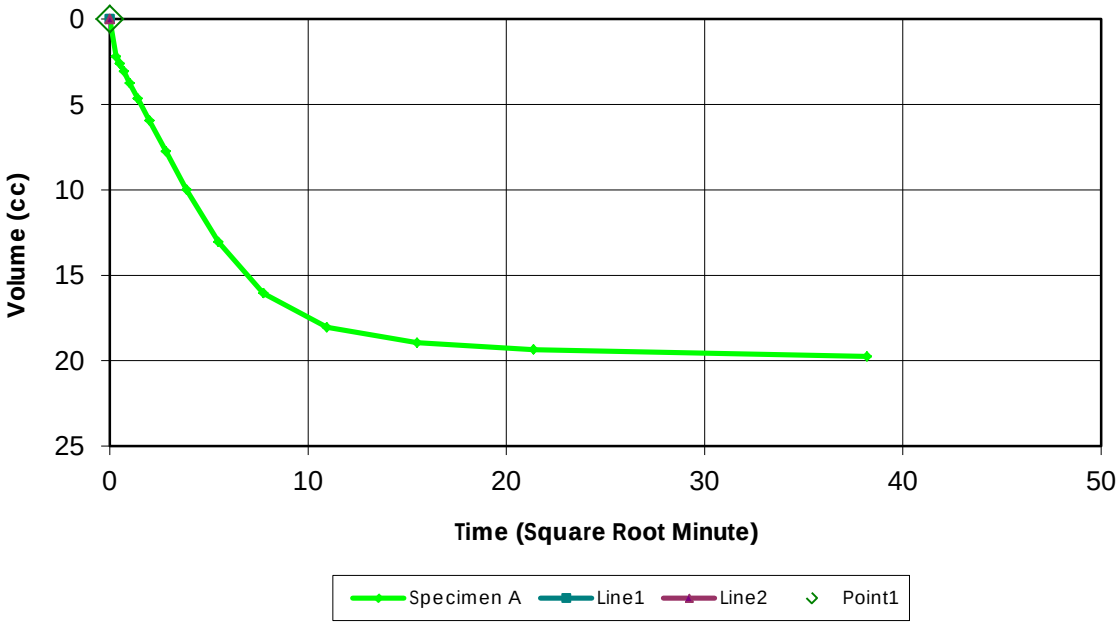



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
500.0
400.0
300.0
200.0
100.0
0.0
Q (kPa)
0.0
100.0
200.0
300.0
400.0
500.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

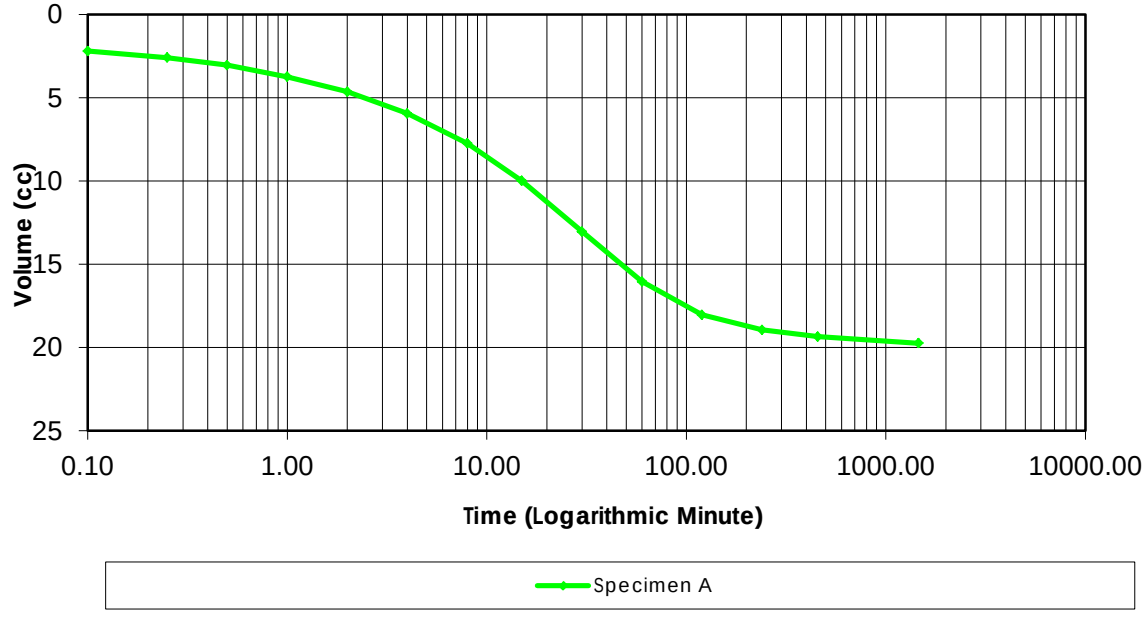

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 1

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 130.0 | 40.0 | 70.0 | 0.0 | 0.63 |
| 3 | 130.0 | 110.0 | 0.0 | 70.0 | |
| 4 | 130.0 | 110.0 | 0.0 | 0.0 | |
| 5 | 200.0 | 110.0 | 70.0 | 0.0 | 1.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.0-3.6m

| | |
|---|---|
| Cell Pressure (kPa) | 310 |
| Back Pressure (kPa) | 110 |
| Effective Pressure (kPa) | 200 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.5 |
| Initial Sample Height (mm) | 155.5 |
| Initial Sample Area (cm2) | 41.28 |
| Initial Volume (cm3) | 641.9 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 46.55 | N/A |
| 00:00:06 | 44.35 | 2.200 |
| 00:00:15 | 43.95 | 2.600 |
| 00:00:30 | 43.50 | 3.050 |
| 00:01:00 | 42.80 | 3.750 |
| 00:02:00 | 41.90 | 4.650 |
| 00:04:00 | 40.60 | 5.950 |
| 00:08:00 | 38.80 | 7.750 |
| 00:15:00 | 36.55 | 10.000 |
| 00:30:00 | 33.50 | 13.050 |
| 01:00:00 | 30.50 | 16.050 |
| 02:00:00 | 28.50 | 18.050 |
| 04:00:00 | 27.60 | 18.950 |
| 07:37:00 | 27.20 | 19.350 |
| 24:19:00 | 26.80 | 19.750 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

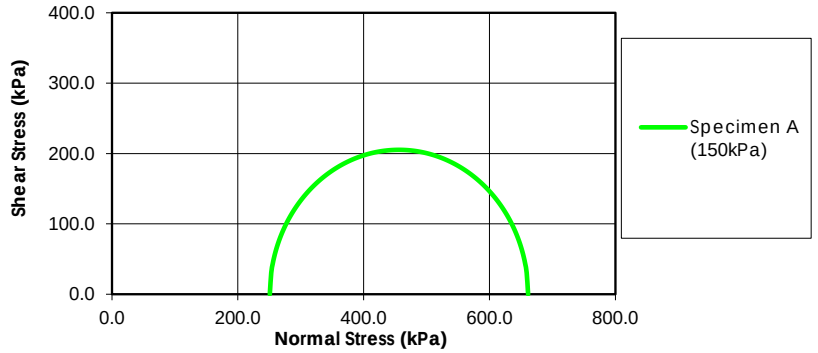
Stantec

Reviewed By C. Lamoureux

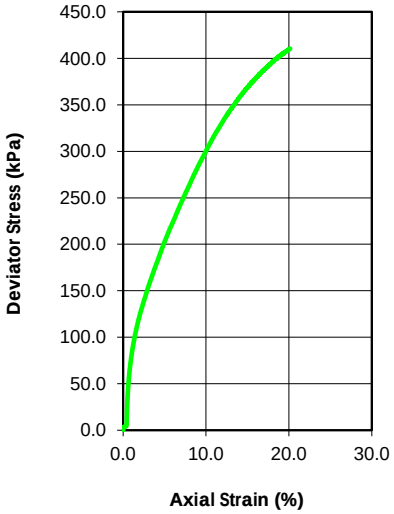
Date: 1-Nov-16

Tested By: C. Woods

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 15.5 | | | |
| Dry Density (g/cm3) | 1.863 | | | |
| Saturation (%) | 93.25 | | | |
| Void Ratio | 0.449 | | | |
| Diameter (mm) | 72.6 | | | |
| Height (mm) | 141.2 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.93 | | | |
| Water Content (%) | 14.2 | | | |
| Dry Density (g/cm3) | 1.921 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.406 | | | |
| Effective Stress (kPa) | 150.4 | | | |
| Back Press. (kPa) | 269.6 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 661.22 | | | |
| σ'3 at Failure (kPa) | 250.75 | | | |
| | | | | |
| | | | | |

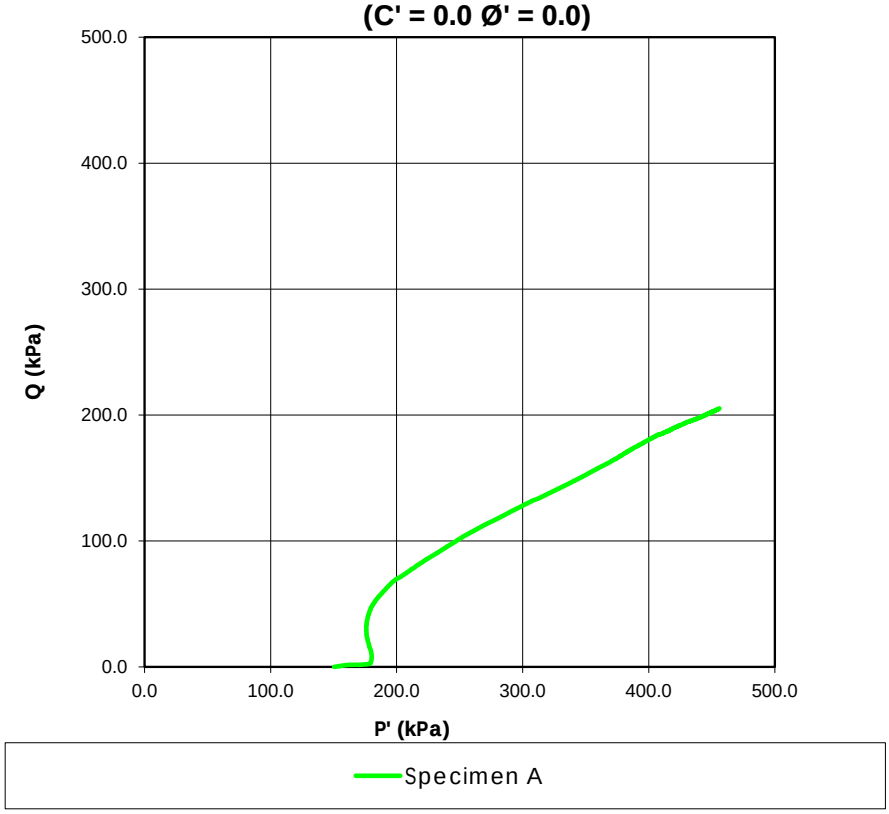
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | DC30 BSB |
| **Depth:** | 3.0-4.6m |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay, Trace Sand |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

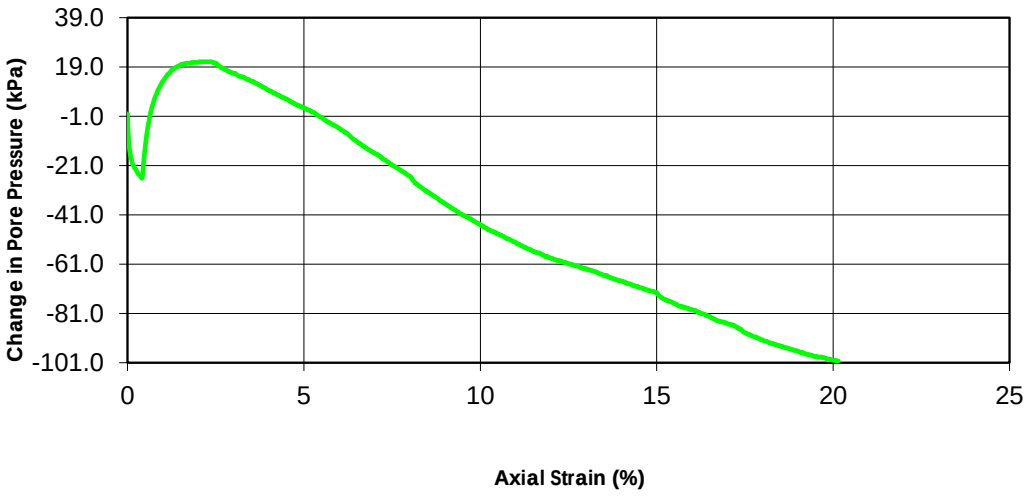
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

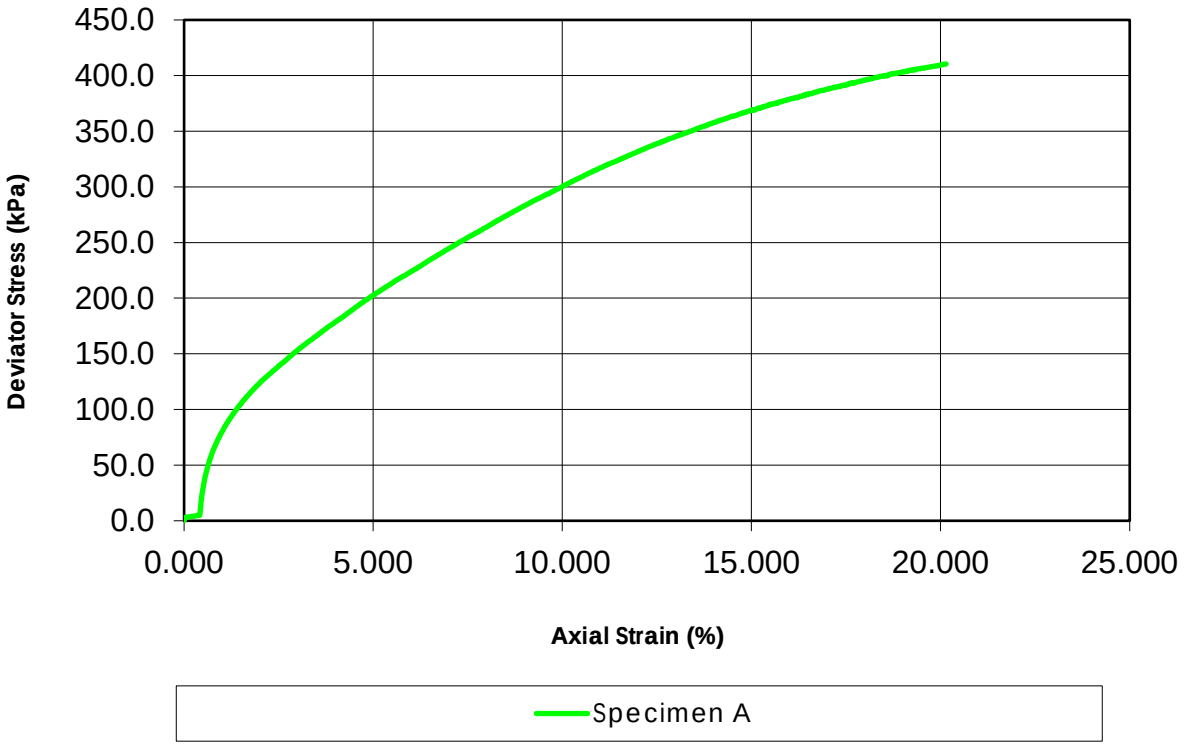
**Stress Paths (Effective)**
**(C' = 0.0 Ø' = 0.0)**



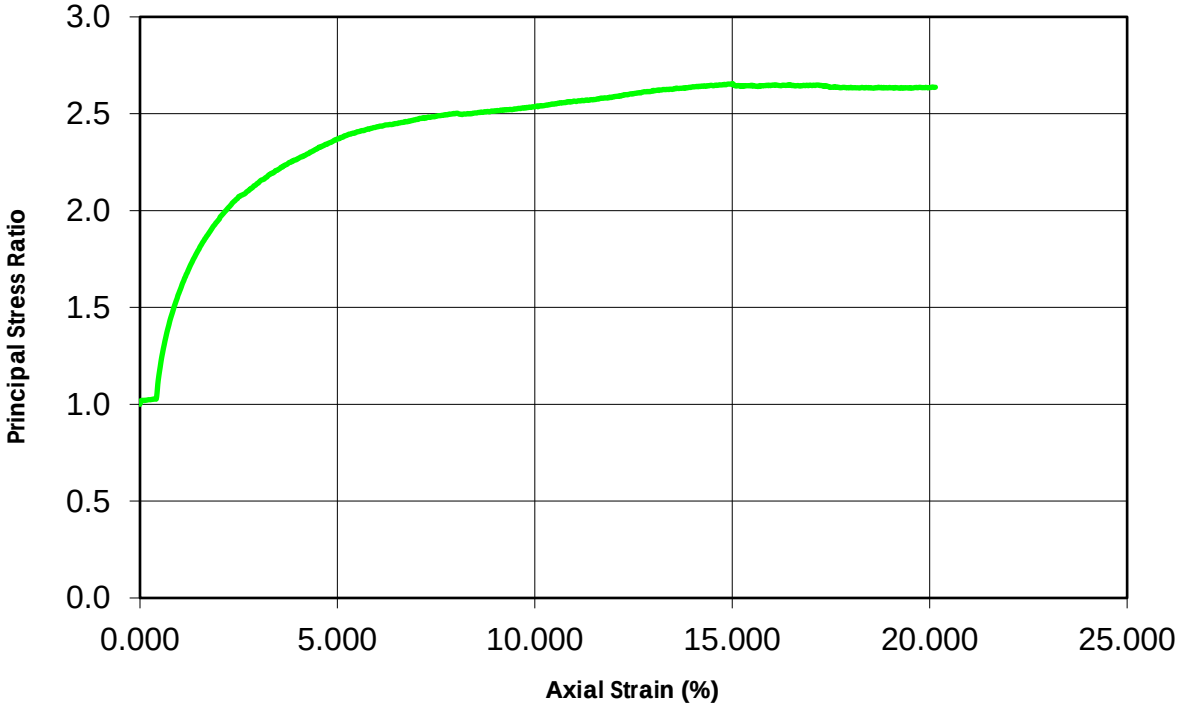

**Change in Pore Pressure vs. Axial Strain**

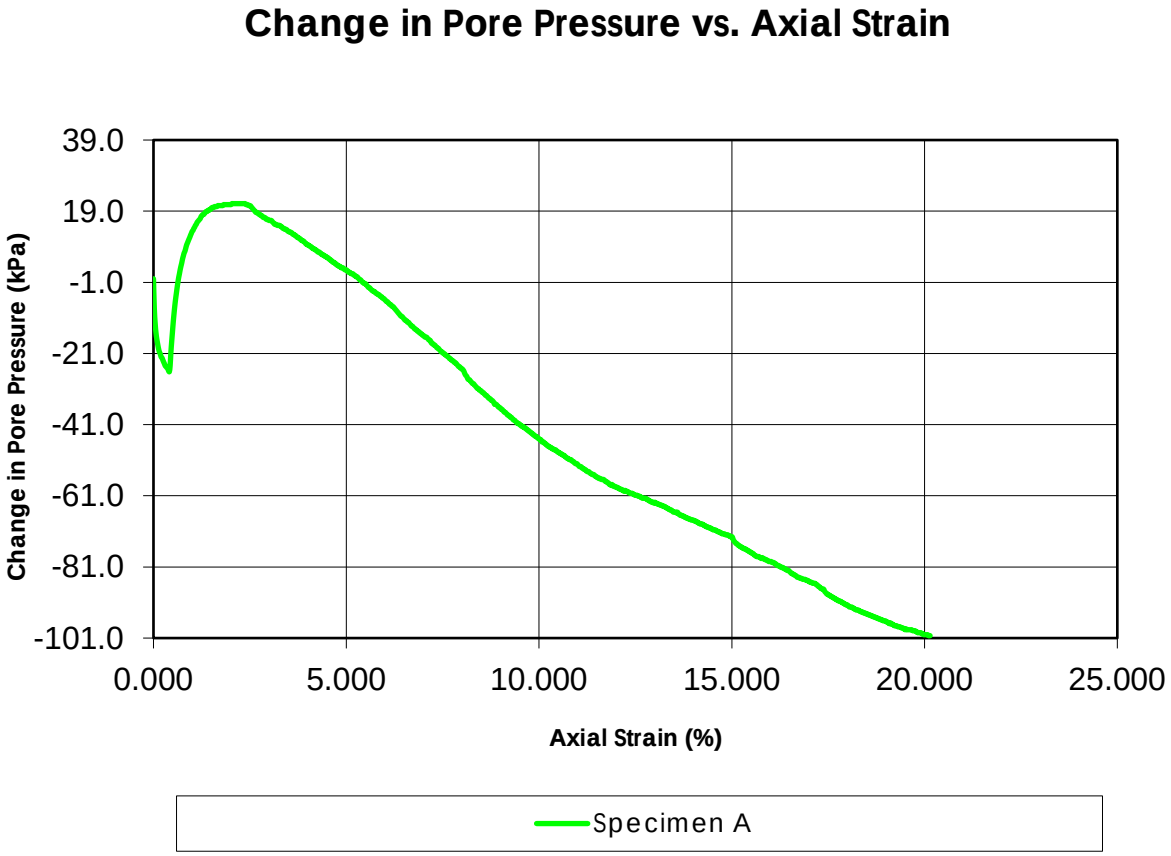


## Deviator Stress vs. Axial Strain



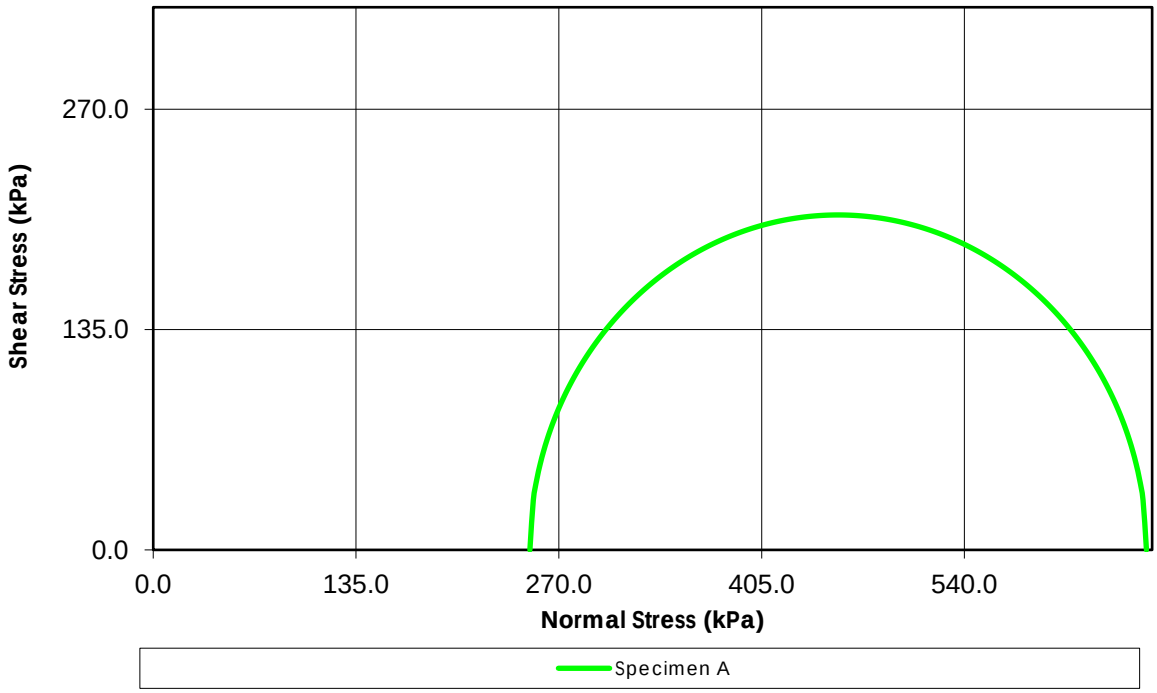

## Principal Stress Ratio vs. Axial Strain



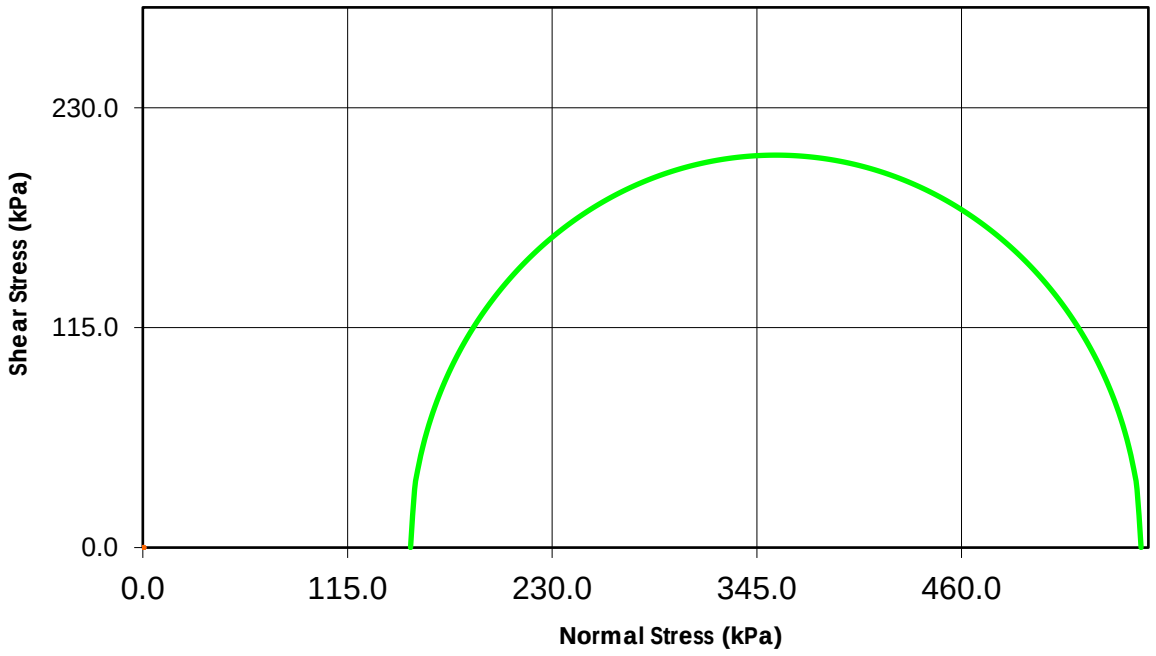

Change in Pore Pressure vs. Axial Strain
39.0
19.0
-1.0
-21.0
-41.0
-61.0
-81.0
-101.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

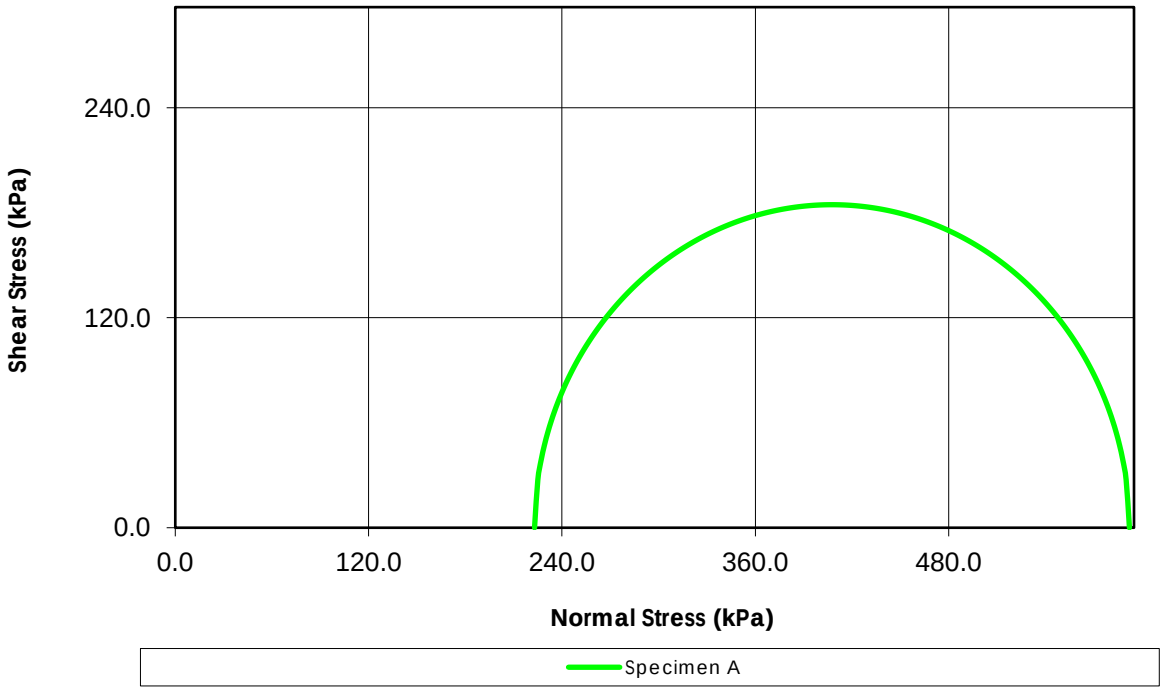



### Total Stress
### (C = 0.0 Ø = 0.0)

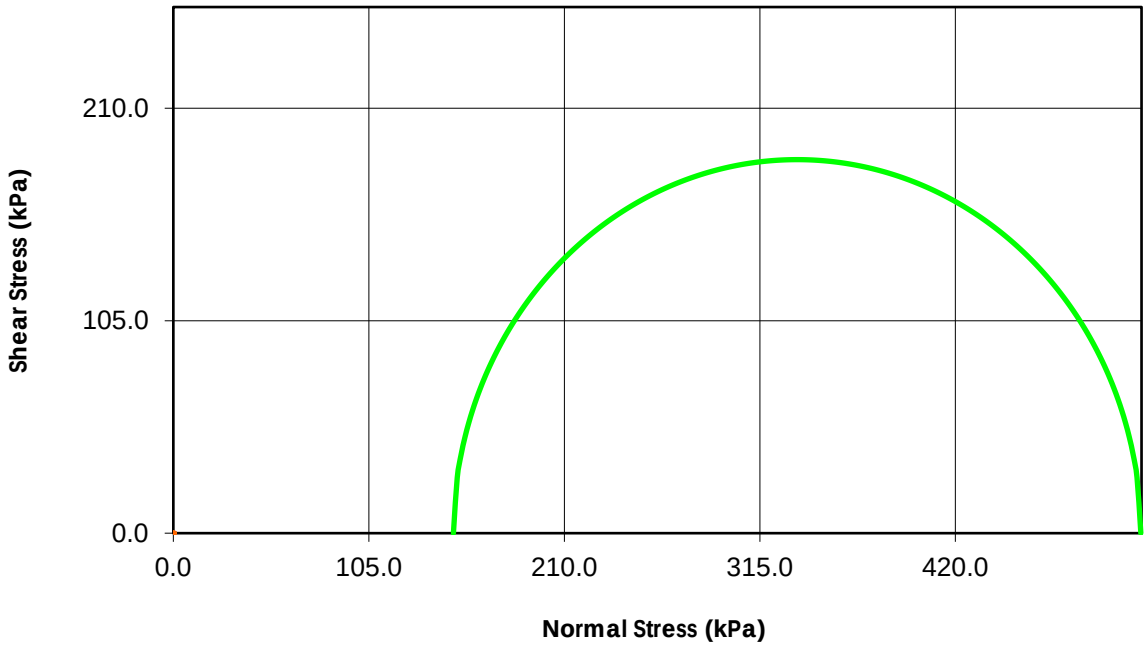


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

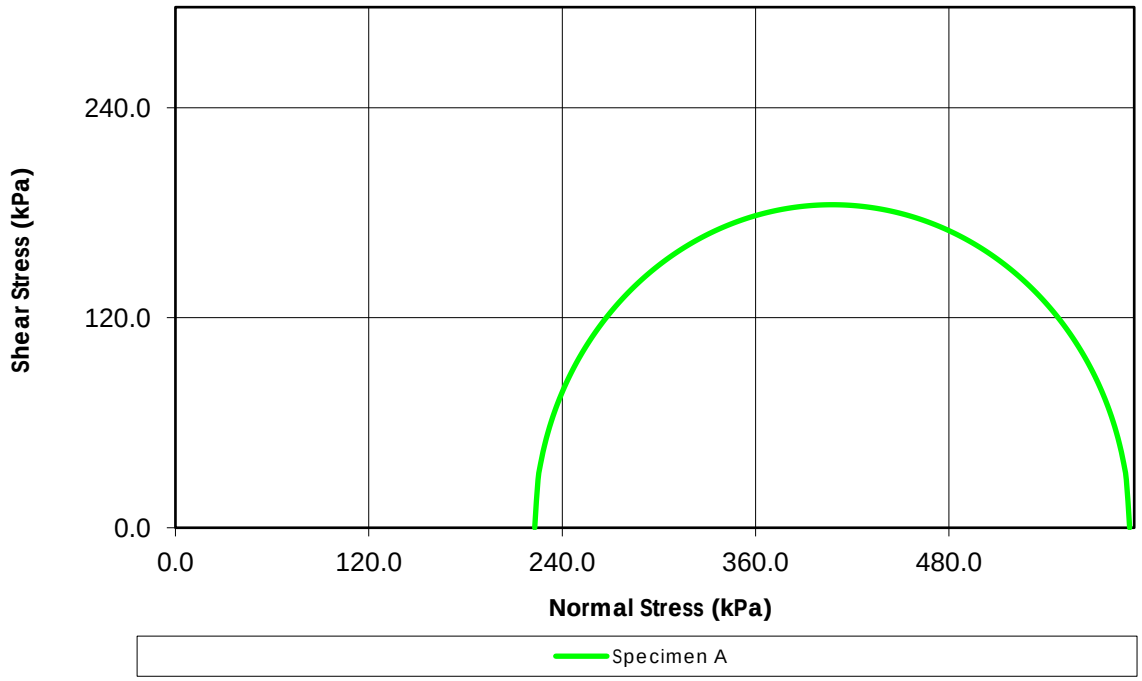



## Total Stress
## (C = 0.0 Ø = 0.0)

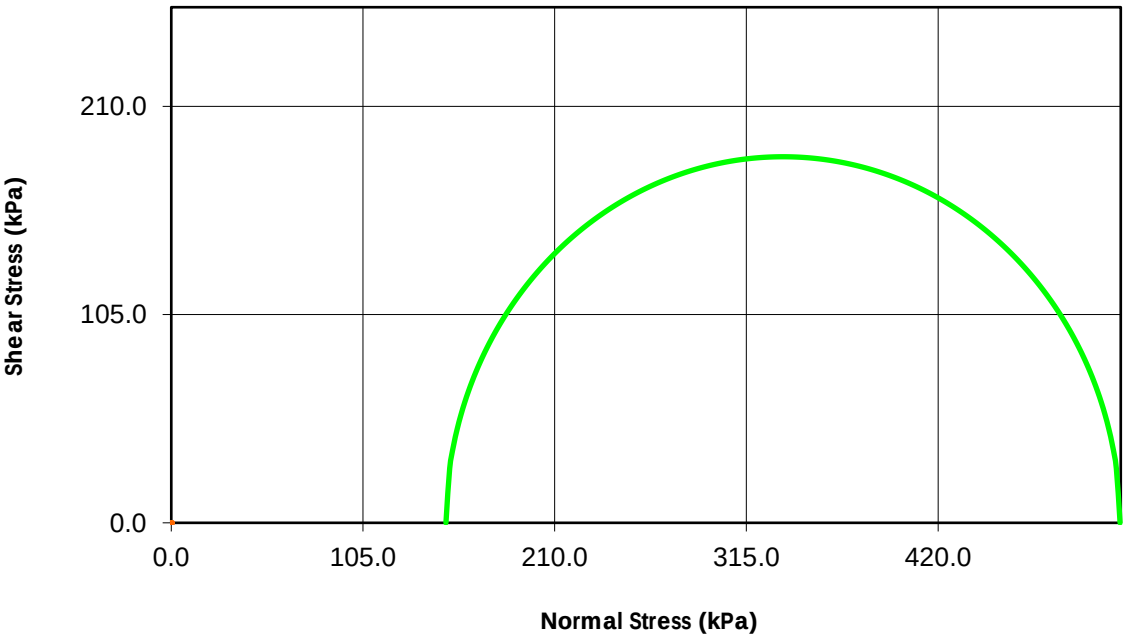


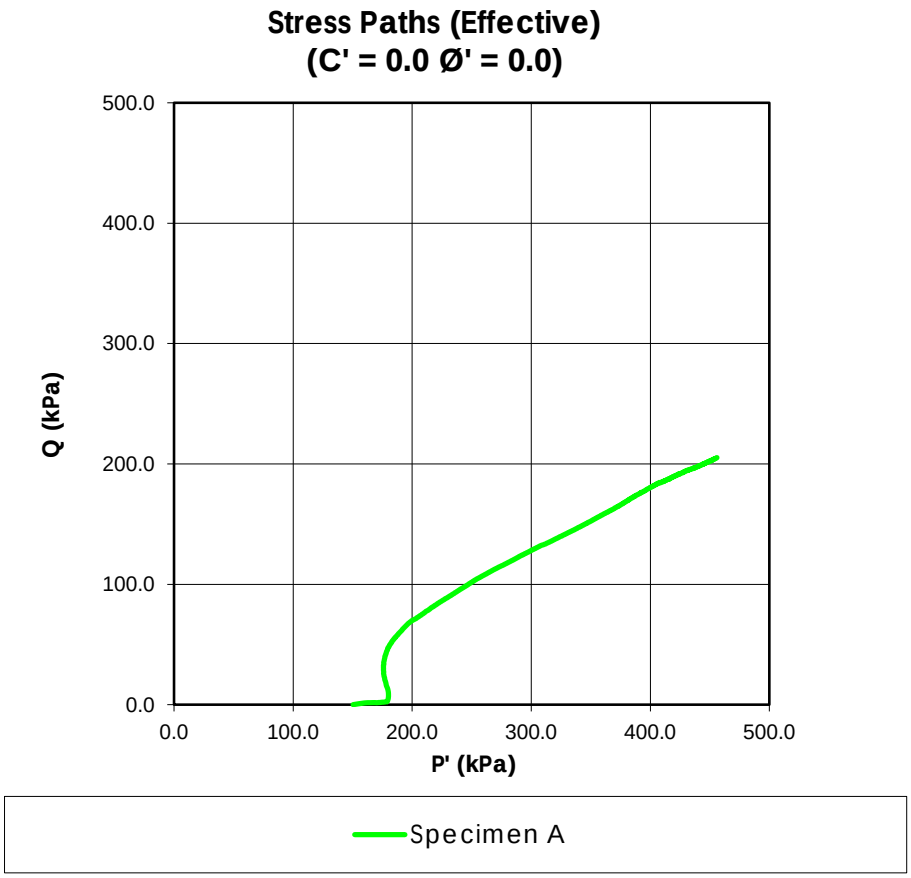
# Mohr Stress Circles at 15% Axial Strain Criterion

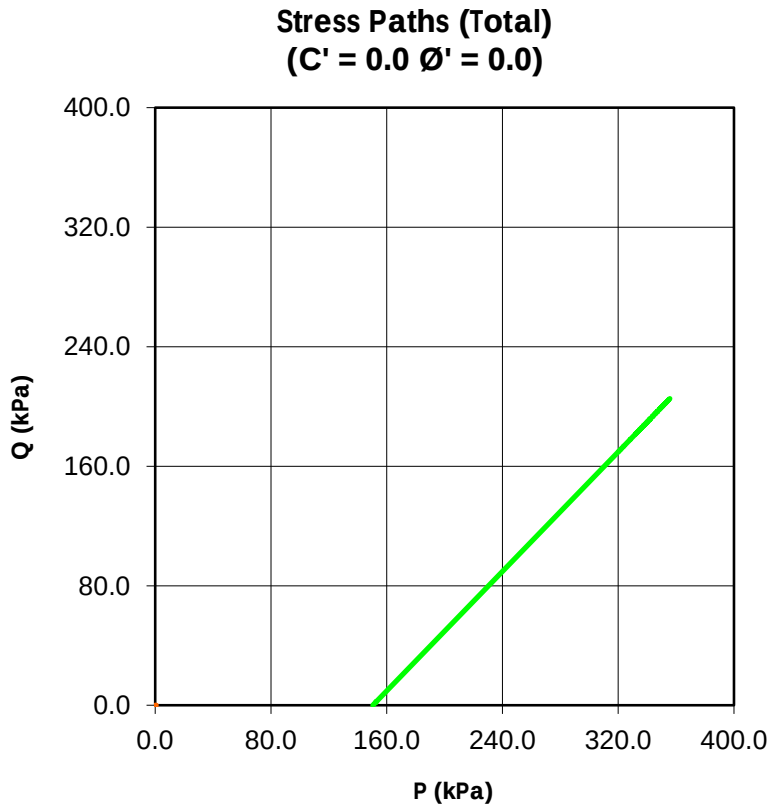
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

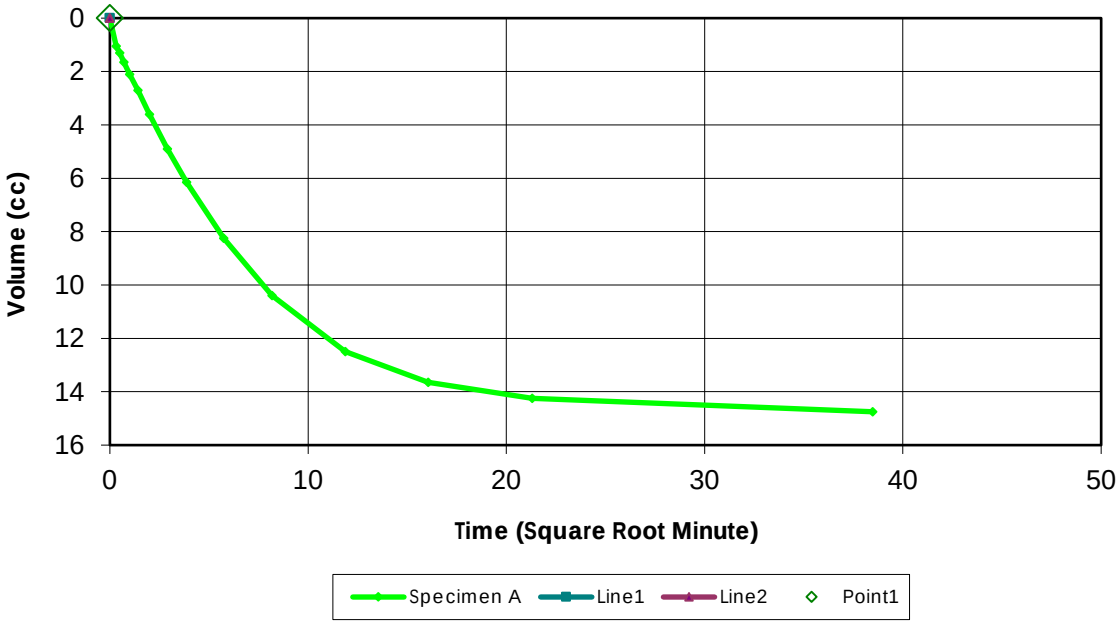



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
500.0
400.0
300.0
200.0
100.0
0.0
Q (kPa)
0.0
100.0
200.0
300.0
400.0
500.0
P' (kPa)
Specimen A

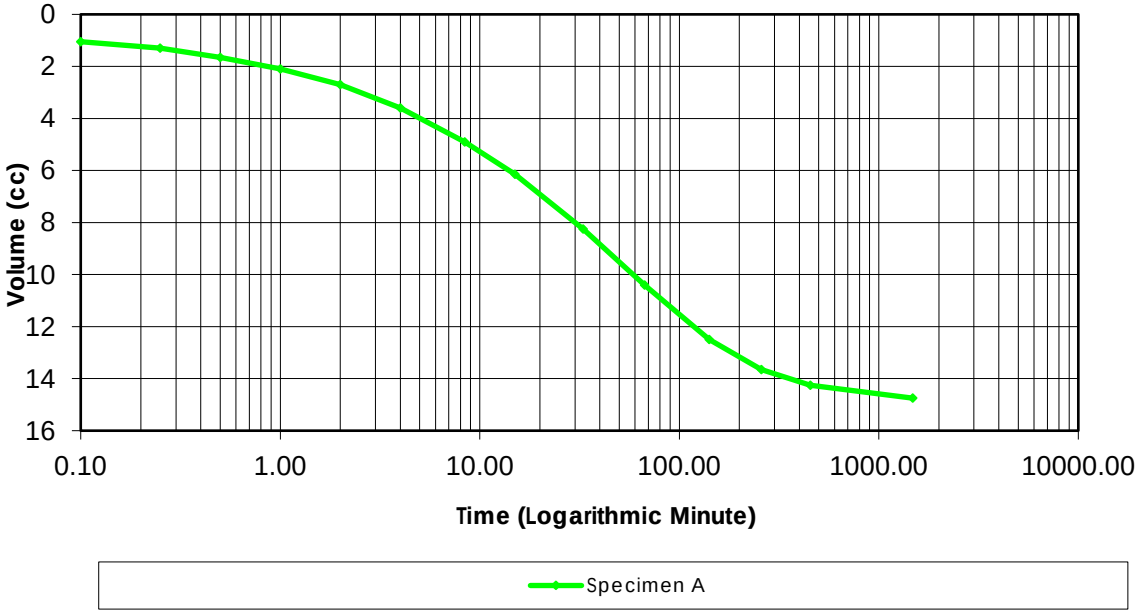

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.93

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 50.00 |
| 3 | 150.0 | 130.0 | 0.0 | 70.0 | |
| 4 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 5 | 220.0 | 130.0 | 70.0 | 0.0 | 71.00 |
| 6 | 220.0 | 200.0 | 0.0 | 70.0 | |
| 7 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 8 | 290.0 | 200.0 | 70.0 | 0.0 | 93.00 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.0-4.6m

| | |
|---|---|
| Cell Pressure (kPa) | 420 |
| Back Pressure (kPa) | 270 |
| Effective Pressure (kPa) | 150 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.6 |
| Initial Sample Height (mm) | 141.2 |
| Initial Sample Area (cm2) | 41.4 |
| Initial Volume (cm3) | 584.5 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 46.60 | N/A |
| 00:00:06 | 45.55 | 1.050 |
| 00:00:15 | 45.30 | 1.300 |
| 00:00:30 | 44.95 | 1.650 |
| 00:01:00 | 44.50 | 2.100 |
| 00:02:00 | 43.90 | 2.700 |
| 00:04:00 | 43.00 | 3.600 |
| 00:08:25 | 41.70 | 4.900 |
| 00:15:00 | 40.45 | 6.150 |
| 00:33:00 | 38.35 | 8.250 |
| 01:07:00 | 36.20 | 10.400 |
| 02:21:00 | 34.10 | 12.500 |
| 04:18:00 | 32.95 | 13.650 |
| 07:34:00 | 32.35 | 14.250 |
| 24:40:00 | 31.85 | 14.750 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

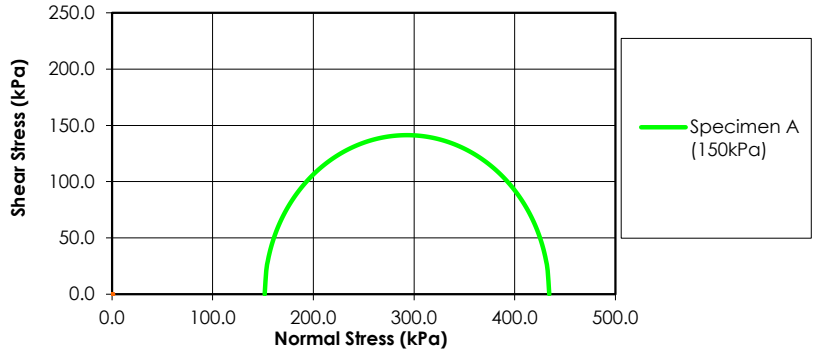
Stantec

Reviewed By C. Lamoureux

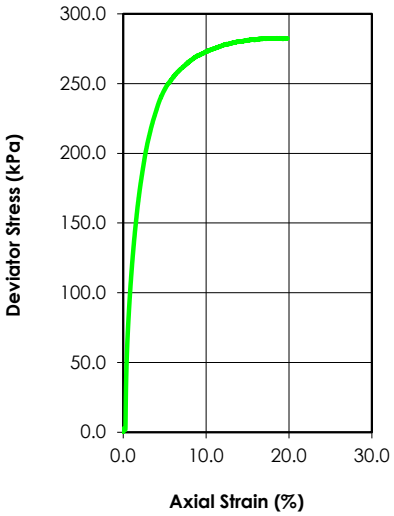
Date: 22-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 16.8 | | | |
| Dry Density (g/cm3) | 1.858 | | | |
| Saturation (%) | 99.94 | | | |
| Void Ratio | 0.453 | | | |
| Diameter (mm) | 72.400 | | | |
| Height (mm) | 152.600 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 14.5 | | | |
| Dry Density (g/cm3) | 1.896 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.424 | | | |
| Effective Stress (kPa) | 137.7 | | | |
| Back Press. (kPa) | 72.3 | | | |
| Rate of Strain | 0.021 | | | |

| Maximum Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 434.26 | | | |
| σ'3 at Failure (kPa) | 151.64 | | | |
| | | | | |
| | | | | |

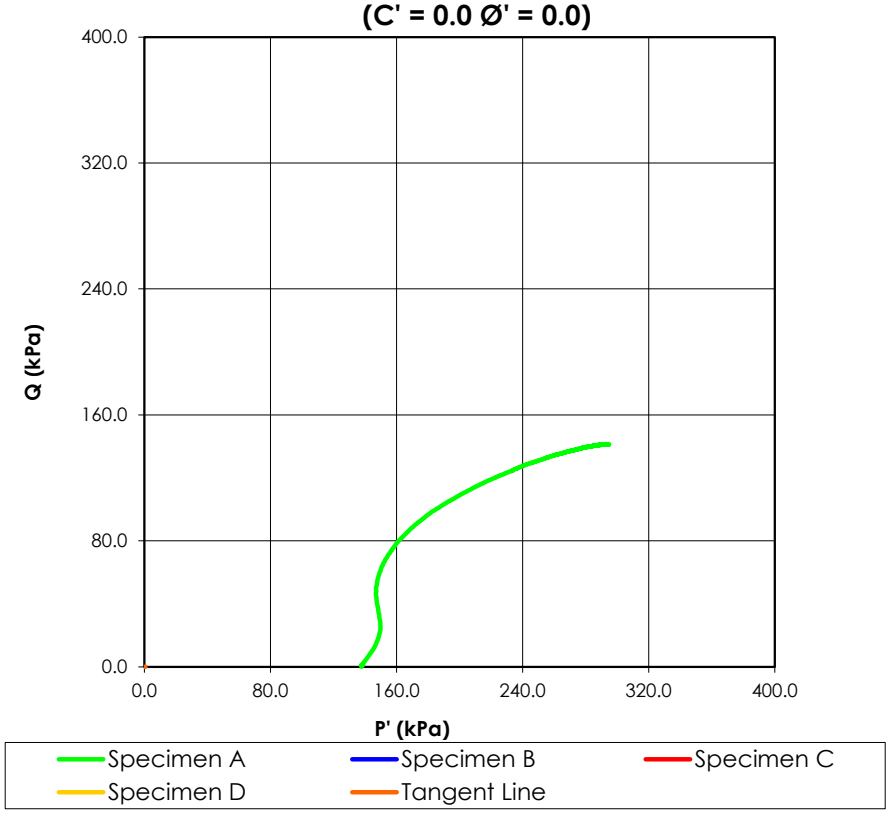
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC30 ST3 |
| **Depth:** | 3.00-3.45m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, trace gravel, trace sand |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

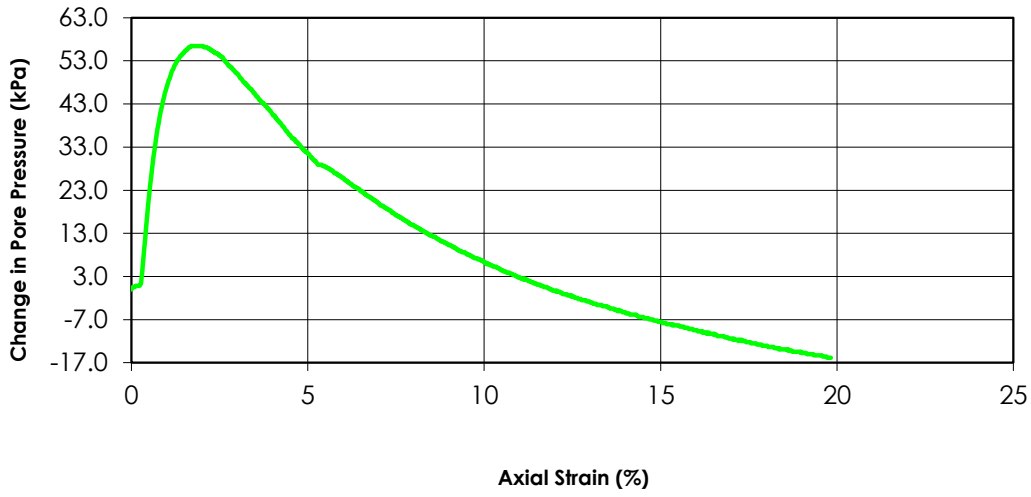
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

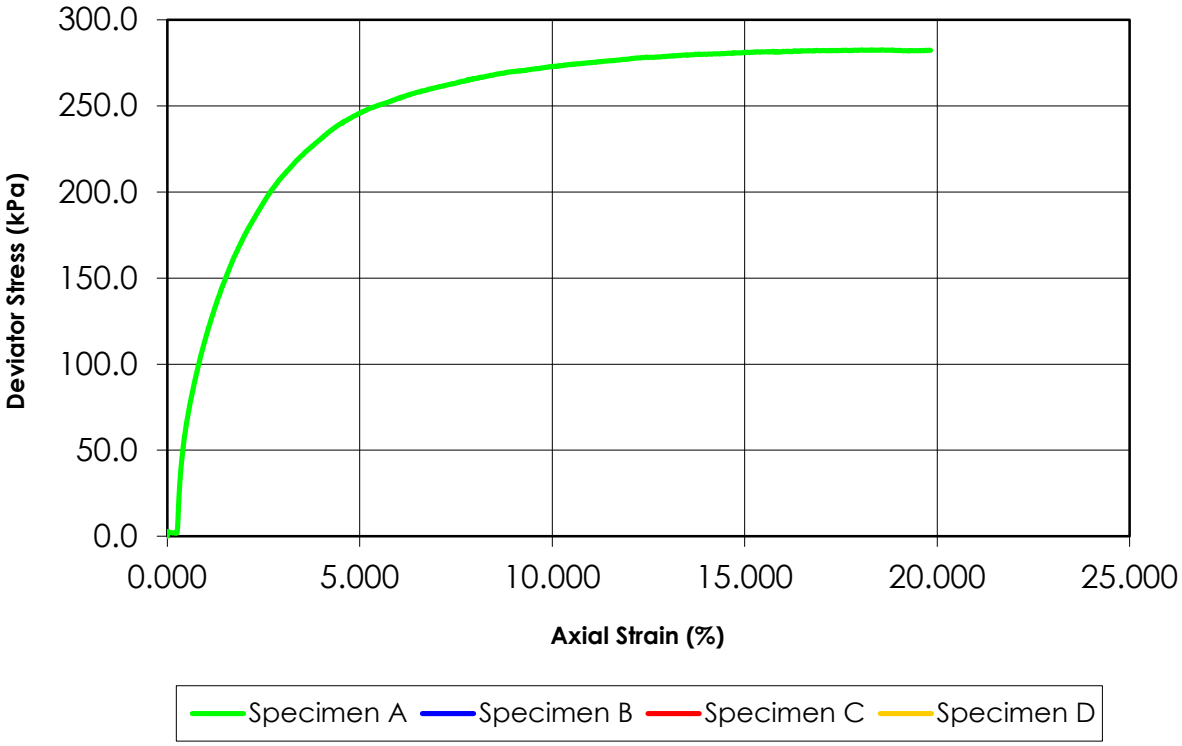
## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)



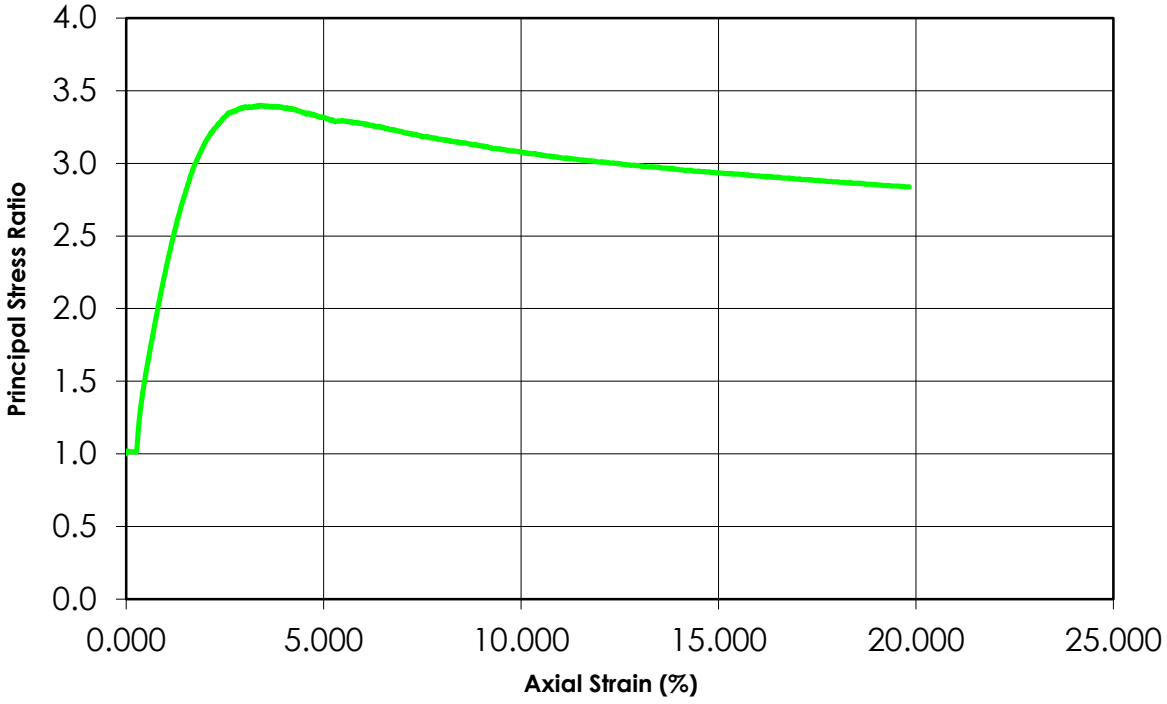

## Change in Pore Pressure vs. Axial Strain



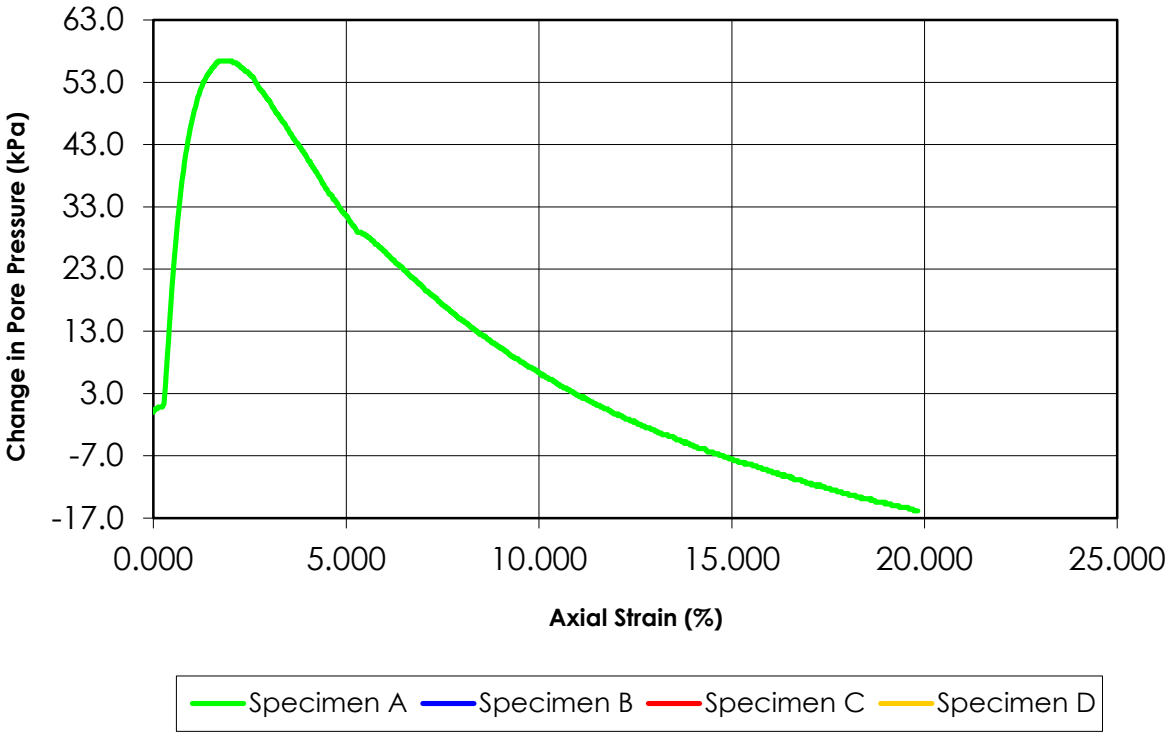
## Deviator Stress vs. Axial Strain




## Principal Stress Ratio vs. Axial Strain

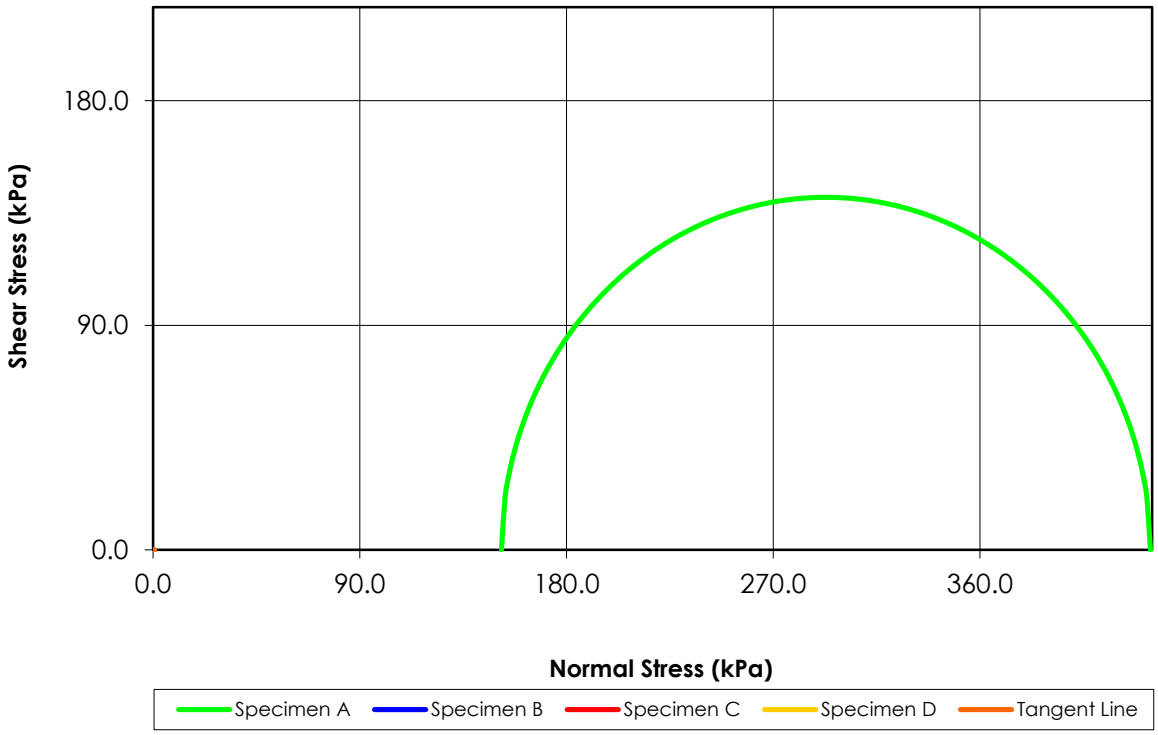


## Change in Pore Pressure vs. Axial Strain

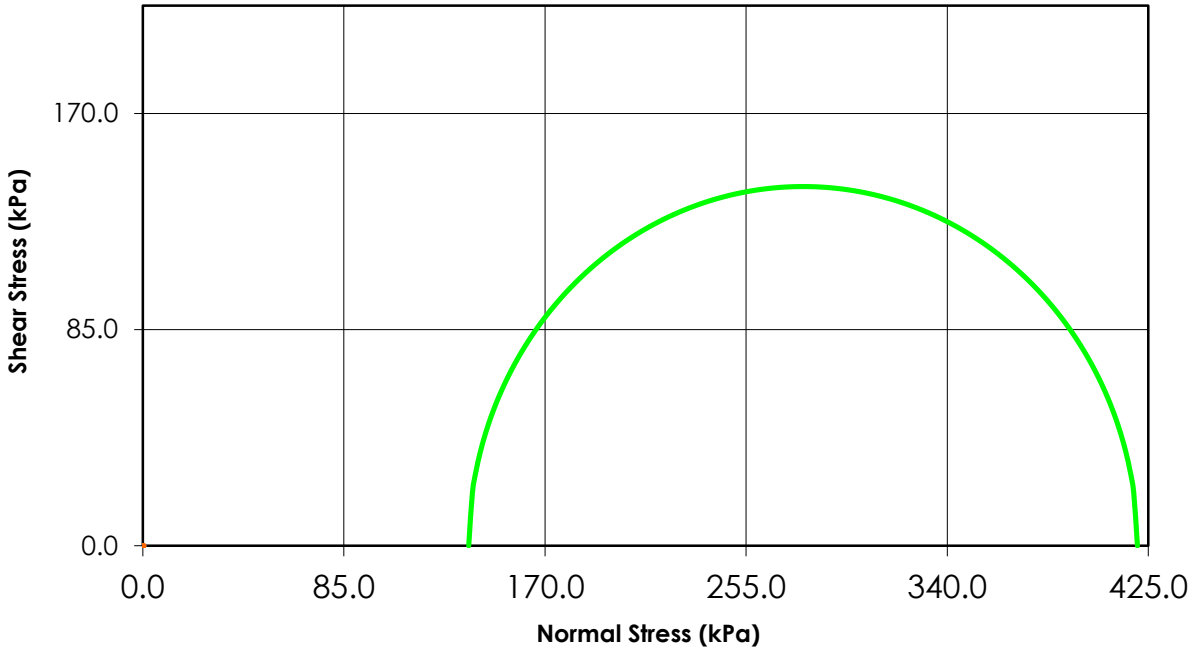


# Mohr Stress Circles at Maximum Deviator Stress Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

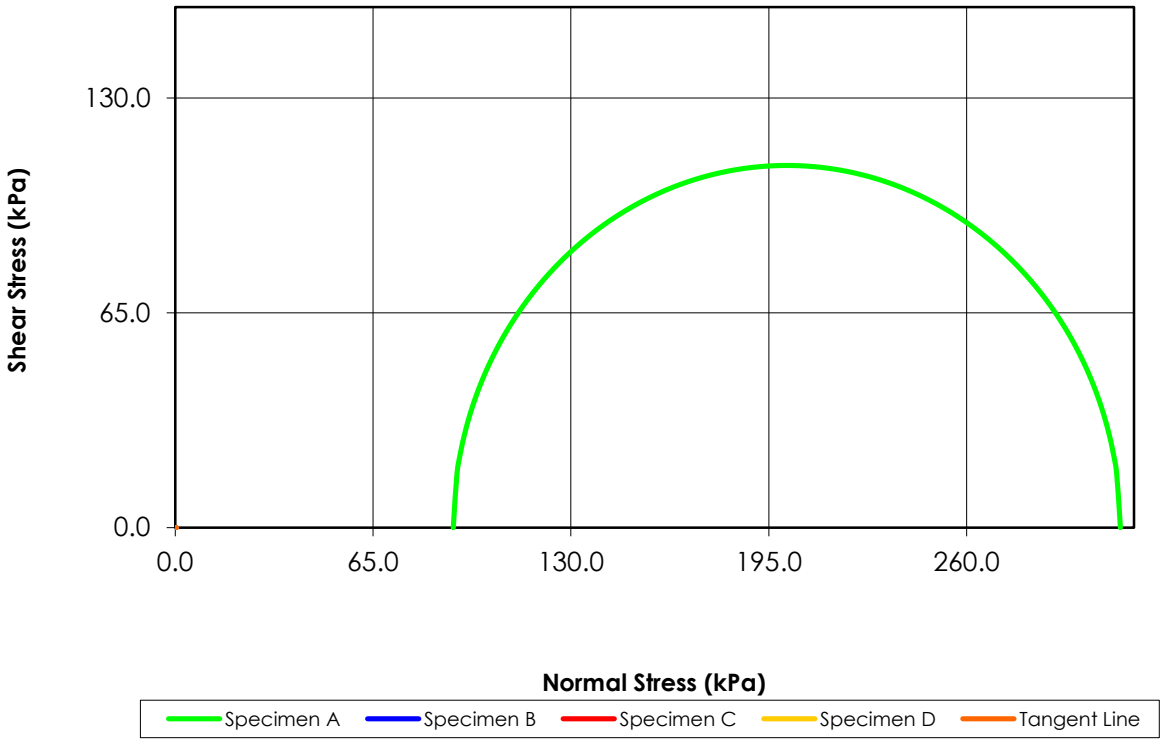



## Total Stress
## (C = 0.0 Ø = 0.0)

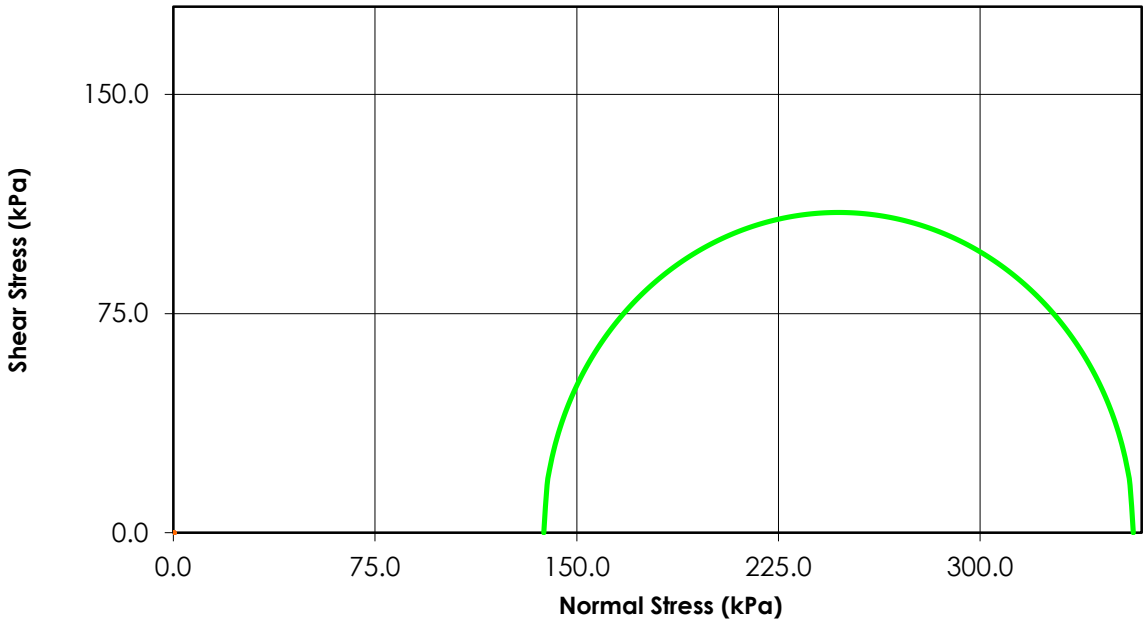


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)



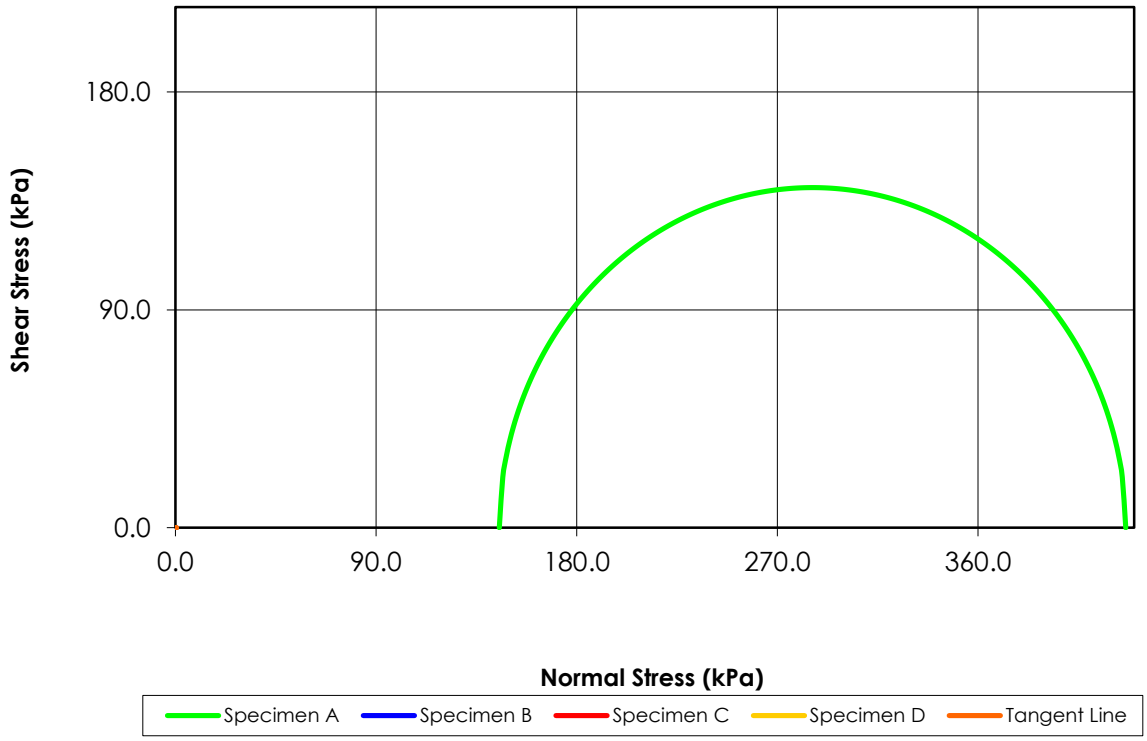

## Total Stress
## (C = 0.0 Ø = 0.0)



# Mohr Stress Circles at 15% Axial Strain Criterion

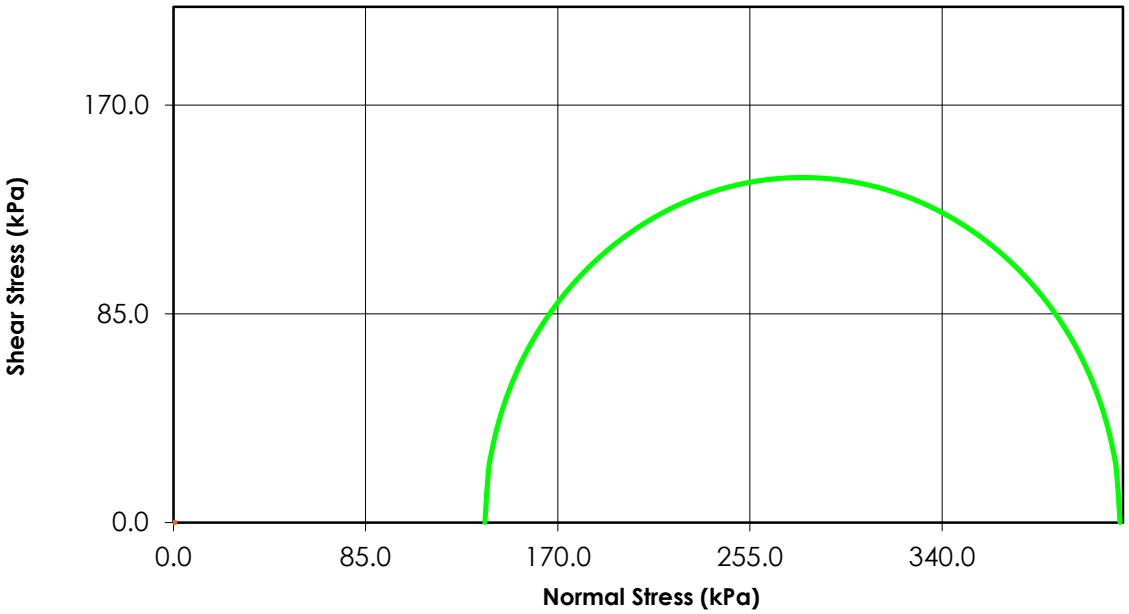
## Effective Stress

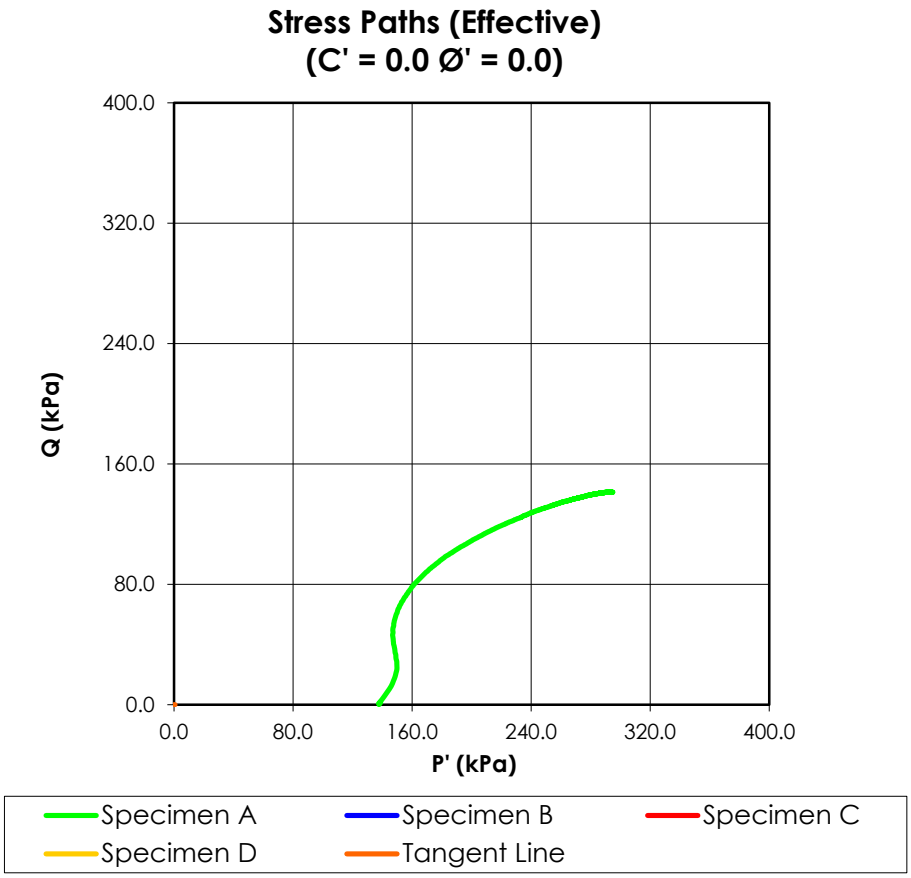
## (C' = 0.0 Ø' = 0.0)

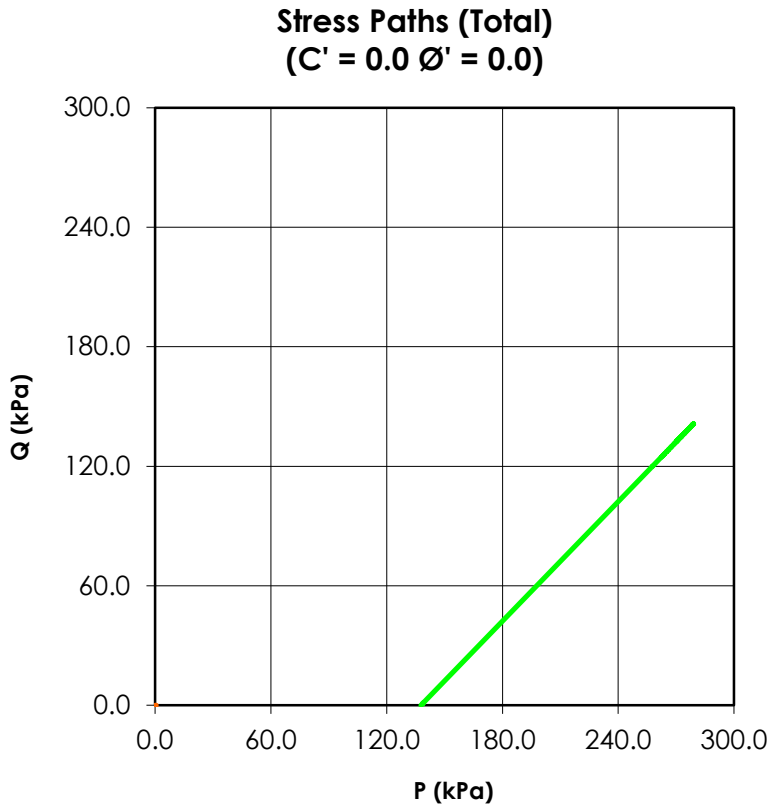



## Total Stress

## (C = 0.0 Ø = 0.0)

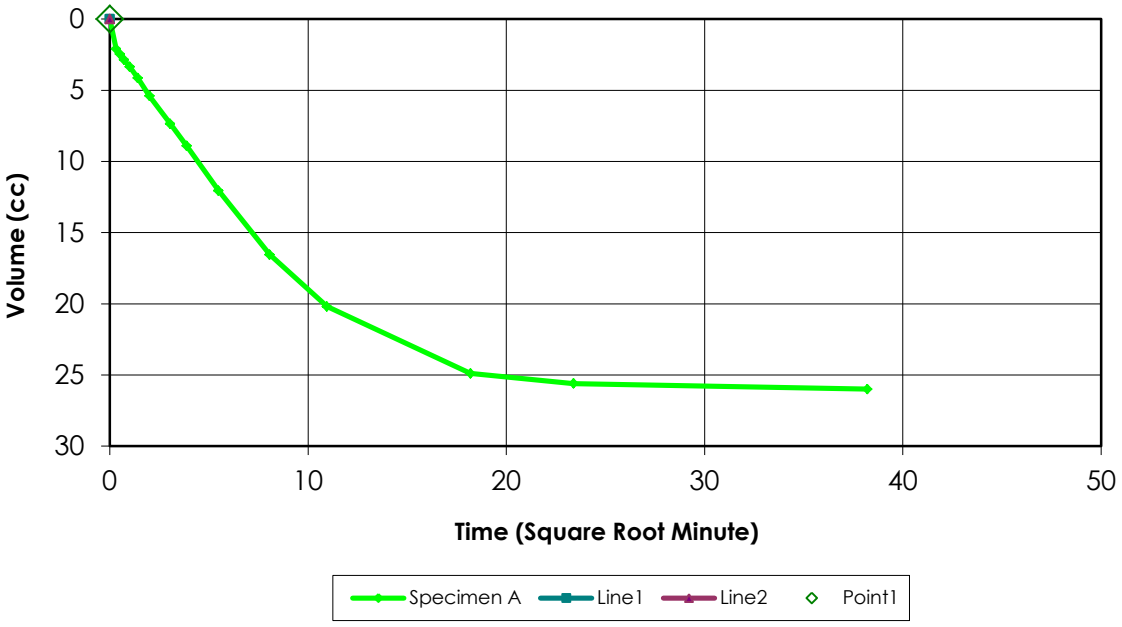



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

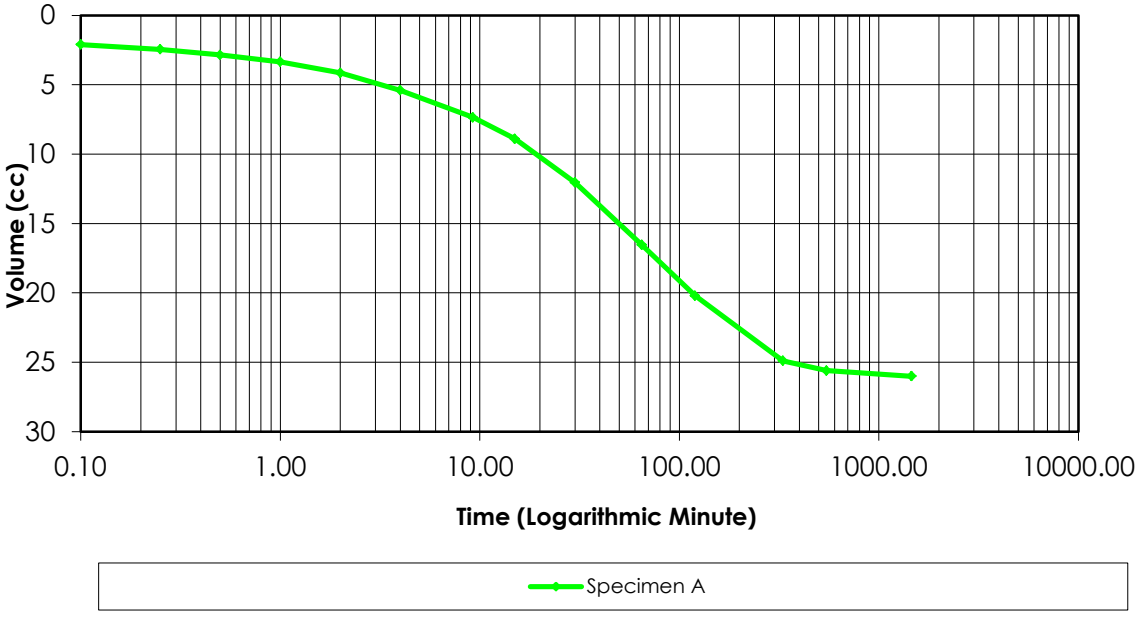

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 95.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.00-3.45m

| | |
|---|---|
| Cell Pressure (kPa) | 210 |
| Back Pressure (kPa) | 60 |
| Effective Pressure (kPa) | 150 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 152.6 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 628.2 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 45.10 | N/A |
| 00:00:06 | 43.00 | 2.100 |
| 00:00:15 | 42.65 | 2.450 |
| 00:00:30 | 42.25 | 2.850 |
| 00:01:00 | 41.75 | 3.350 |
| 00:02:00 | 40.95 | 4.150 |
| 00:04:00 | 39.70 | 5.400 |
| 00:09:15 | 37.75 | 7.350 |
| 00:15:00 | 36.20 | 8.900 |
| 00:30:00 | 33.05 | 12.050 |
| 01:05:00 | 28.55 | 16.550 |
| 02:00:00 | 24.90 | 20.200 |
| 05:31:00 | 20.20 | 24.900 |
| 09:07:00 | 19.50 | 25.600 |
| 24:20:00 | 19.10 | 26.000 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

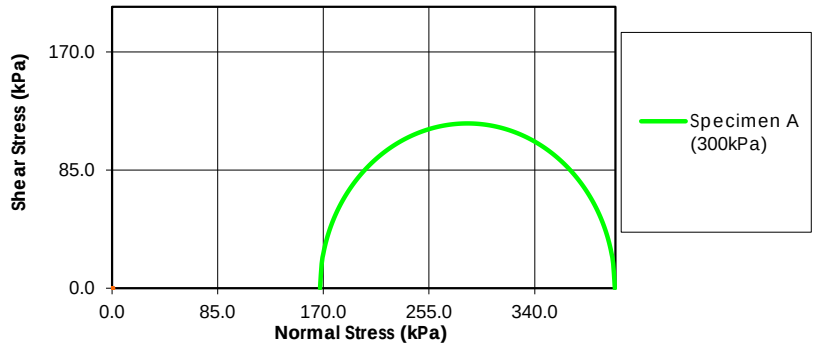
Stantec

Reviewed By C. Lamoureux

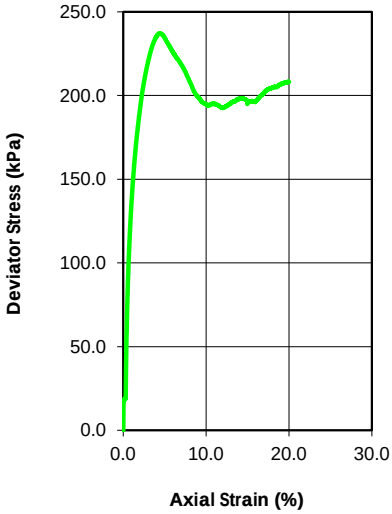
Date: 28-Jun-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 23.4 | | | |
| Dry Density (g/cm3) | 1.649 | | | |
| Saturation (%) | 98.91 | | | |
| Void Ratio | 0.637 | | | |
| Diameter (mm) | 72.400 | | | |
| Height (mm) | 157.100 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | 0 | | | |
| Plastic Limit | 0 | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 19.5 | | | |
| Dry Density (g/cm3) | 1.645 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.642 | | | |
| Effective Stress (kPa) | 291.3 | | | |
| Back Press. (kPa) | 168.7 | | | |
| Rate of Strain | 0.022 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

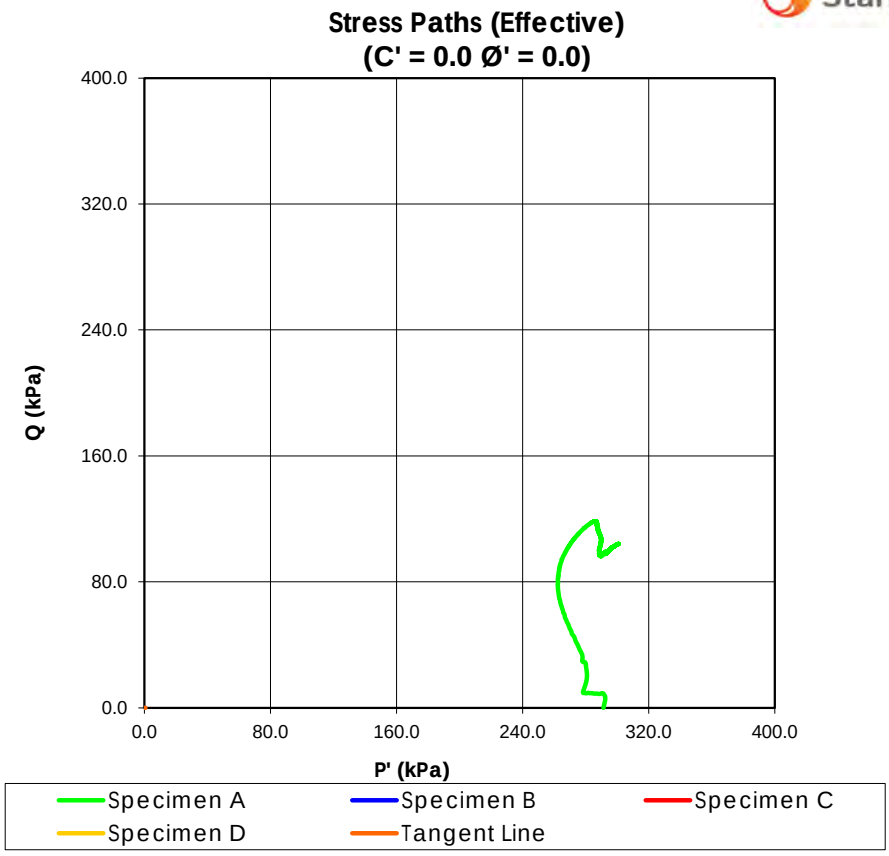
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 404.52 | | | |
| σ'3 at Failure (kPa) | 167.36 | | | |
| | | | | |
| | | | | |

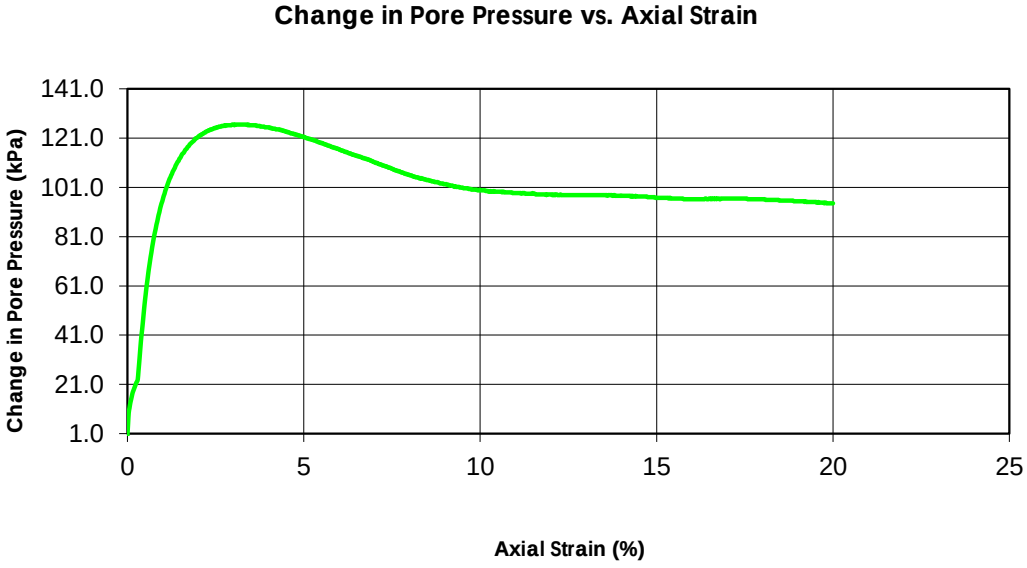
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC33 ST2 |
| **Depth:** | 1.5-2.1m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | Formerly known as D53 ST2 |

**Stantec Consulting Ltd.**

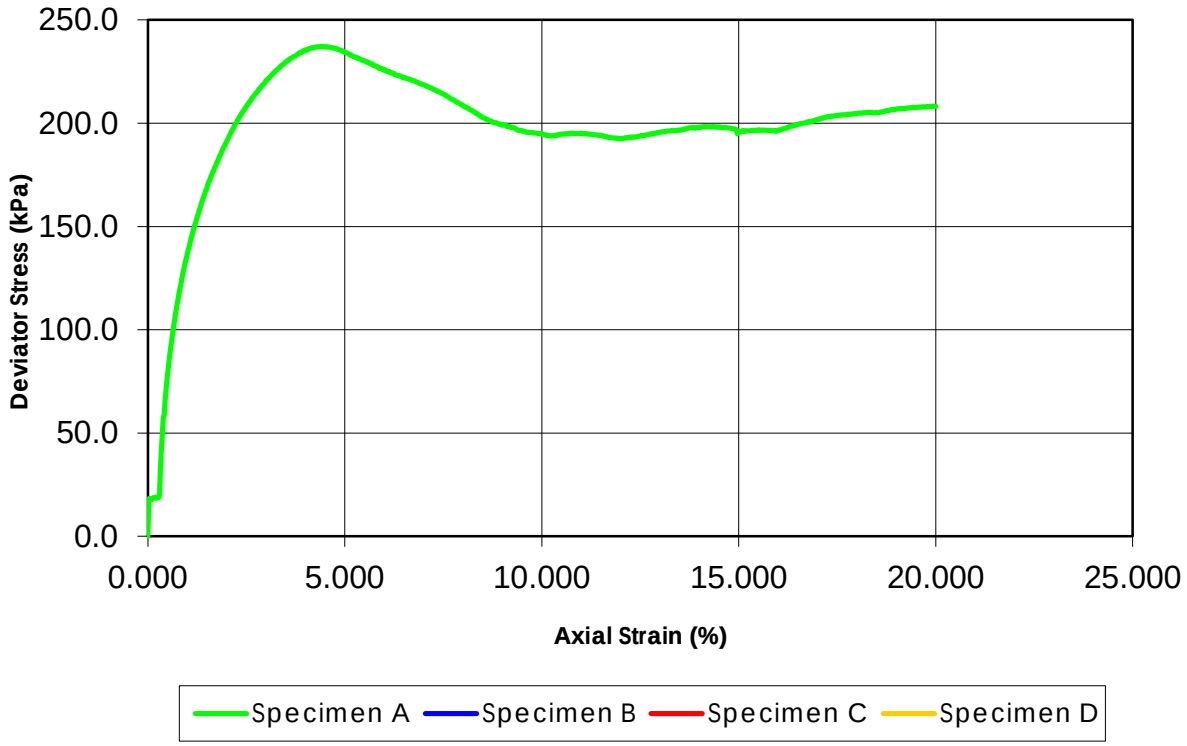
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

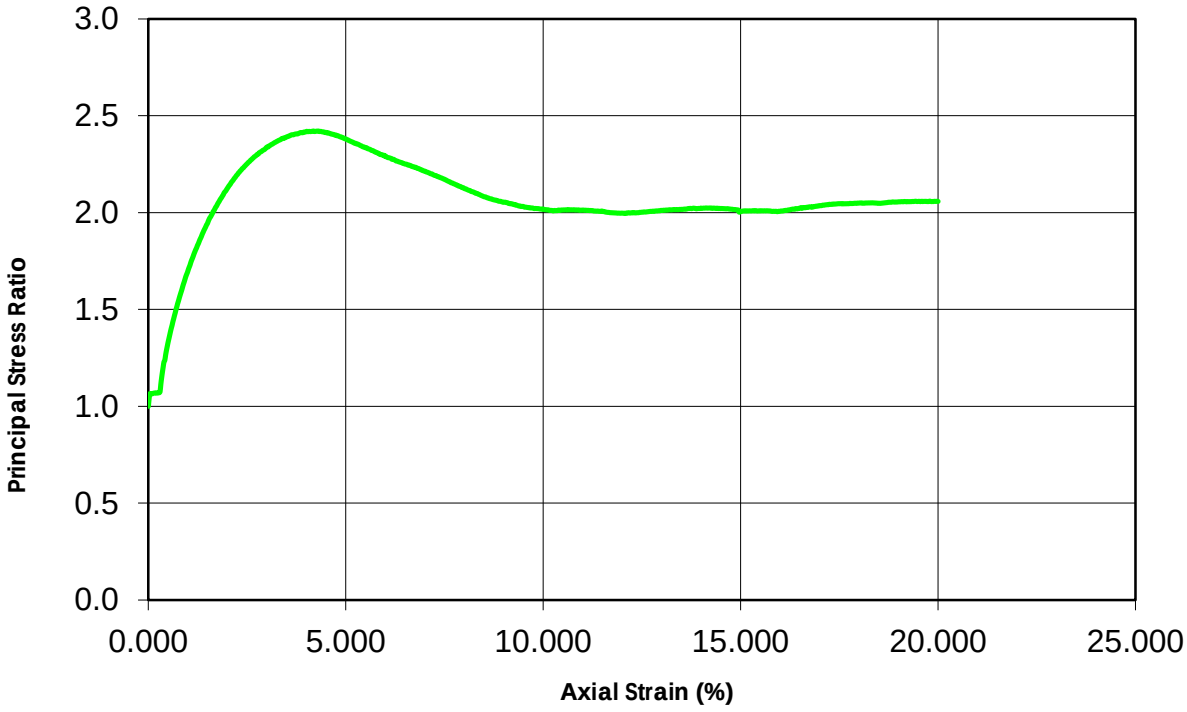


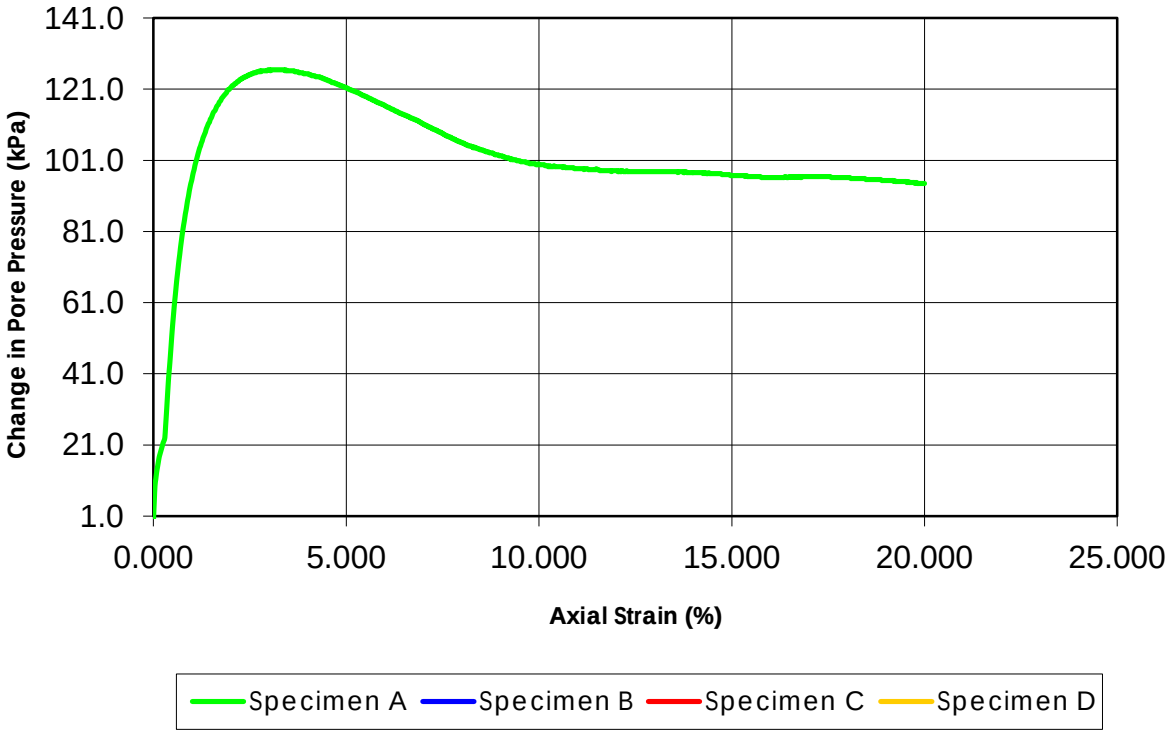
## Deviator Stress vs. Axial Strain




## Principal Stress Ratio vs. Axial Strain

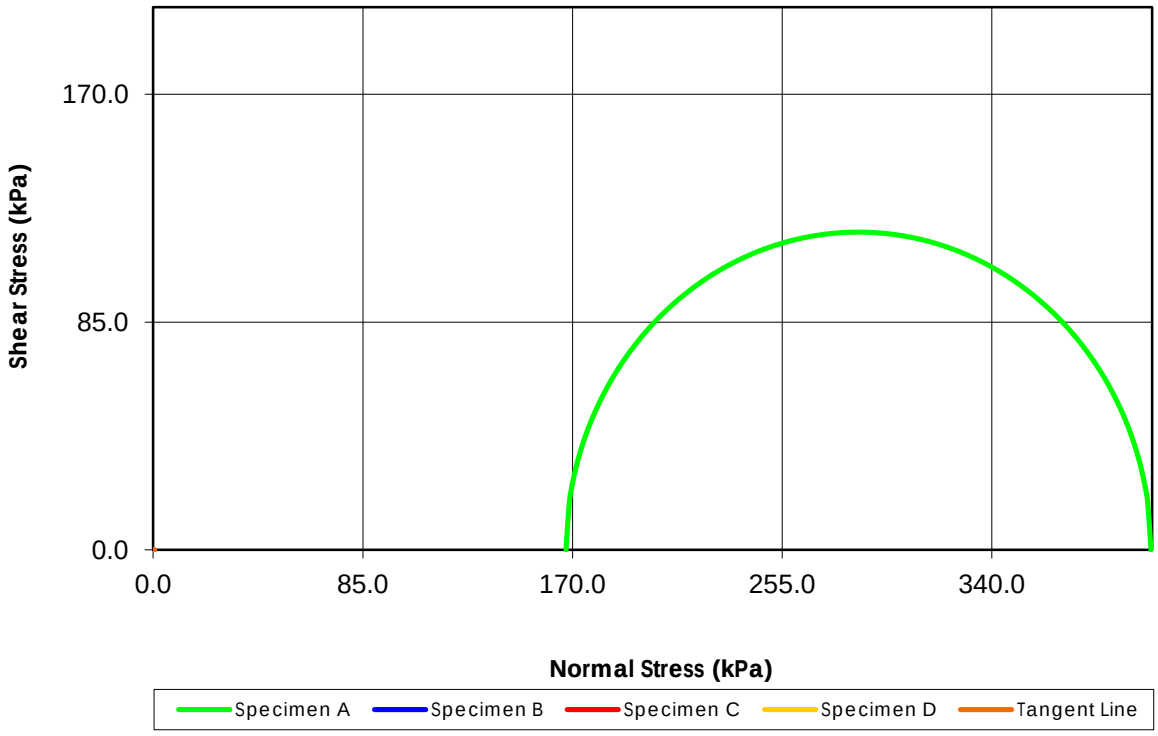


## Change in Pore Pressure vs. Axial Strain

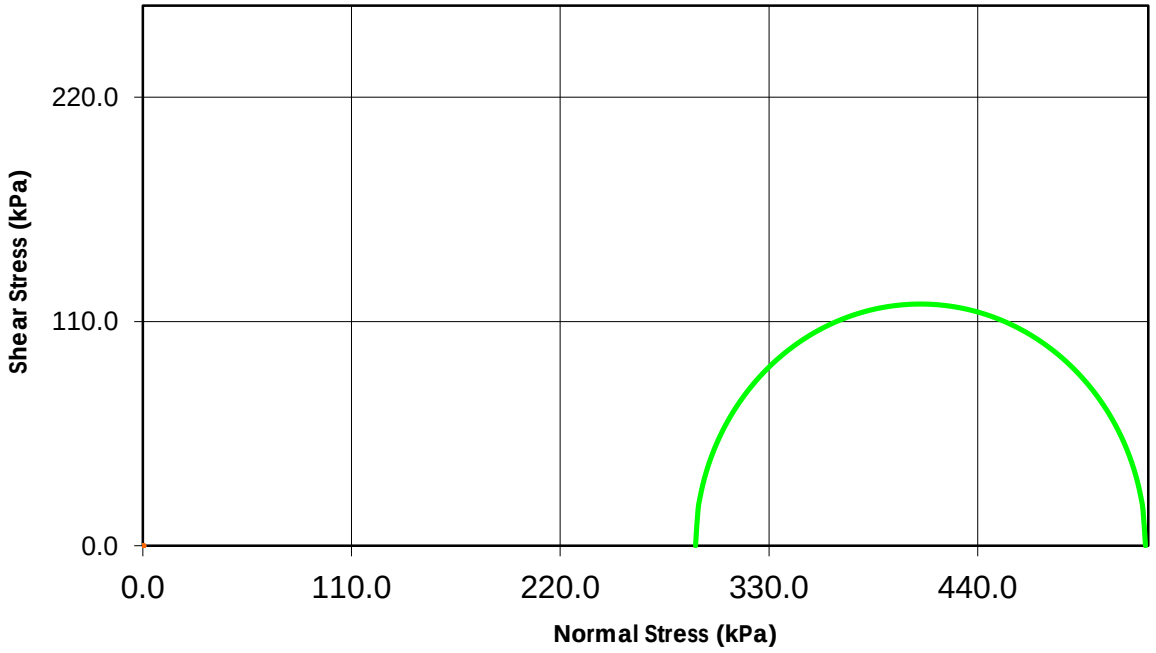


## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

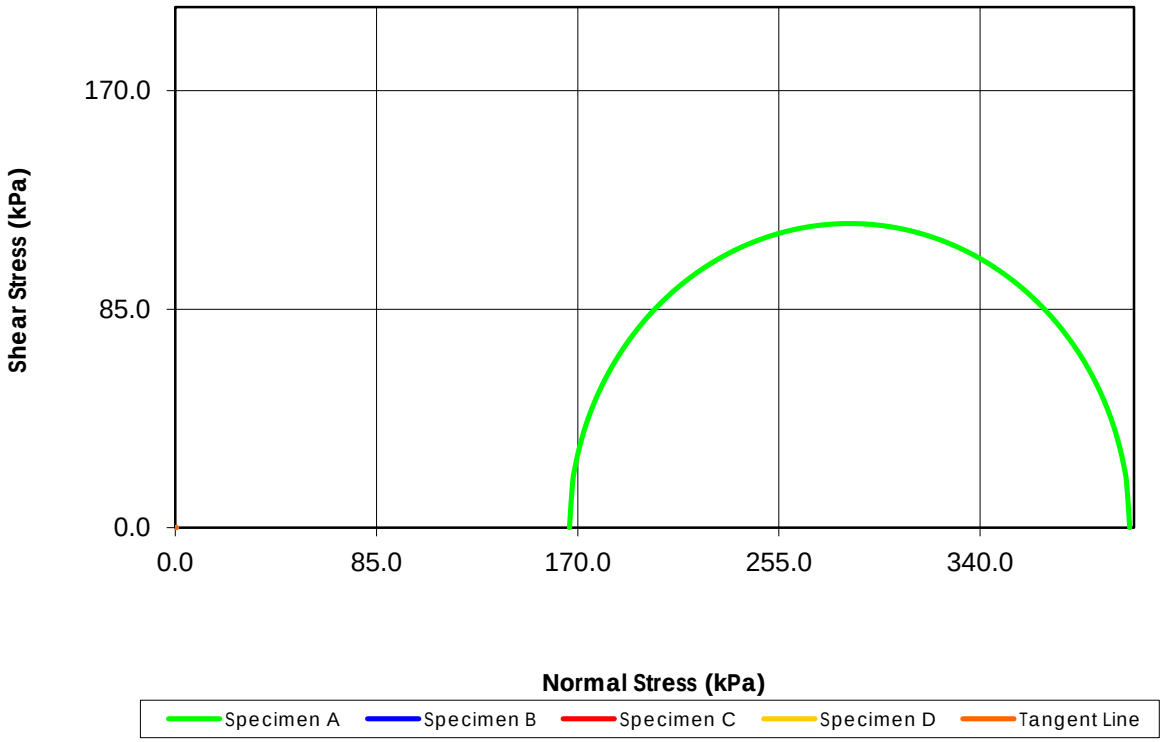



### Total Stress
### (C = 0.0 Ø = 0.0)

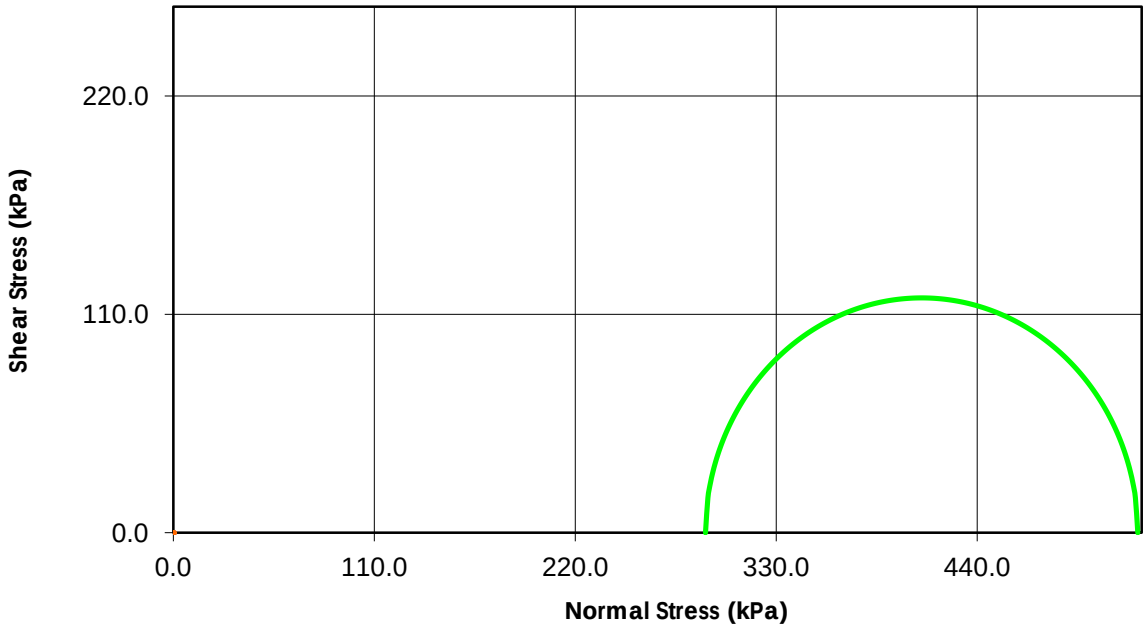


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

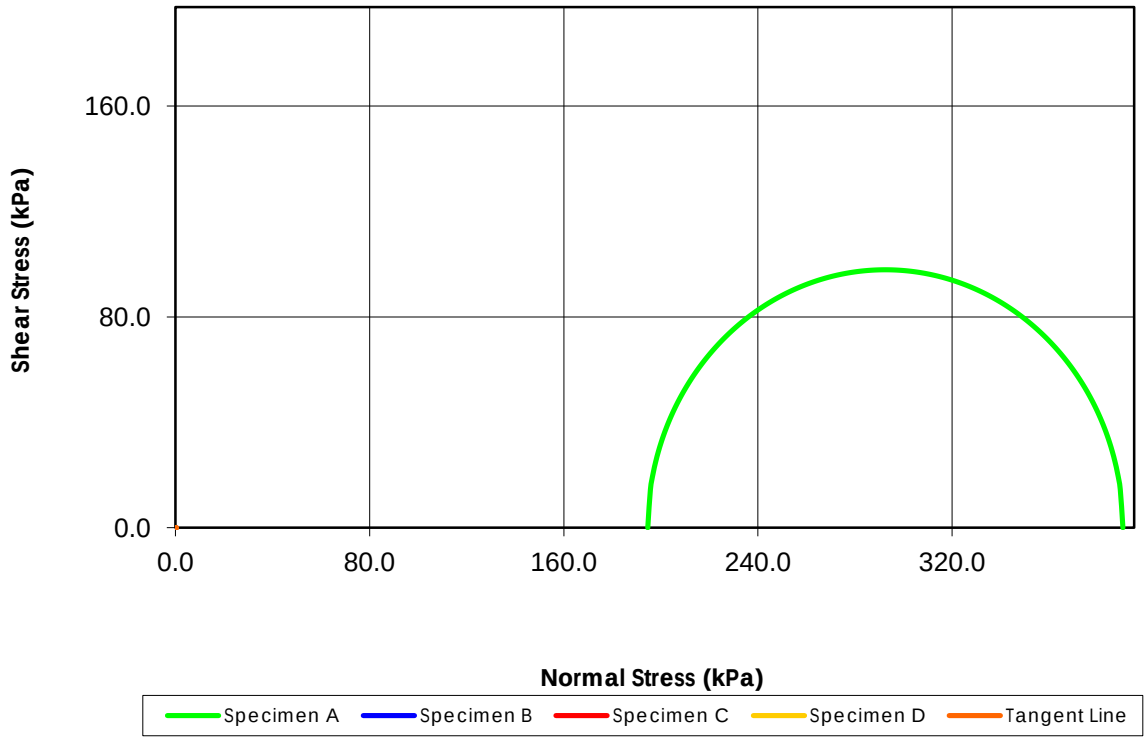



## Total Stress
## (C = 0.0 Ø = 0.0)

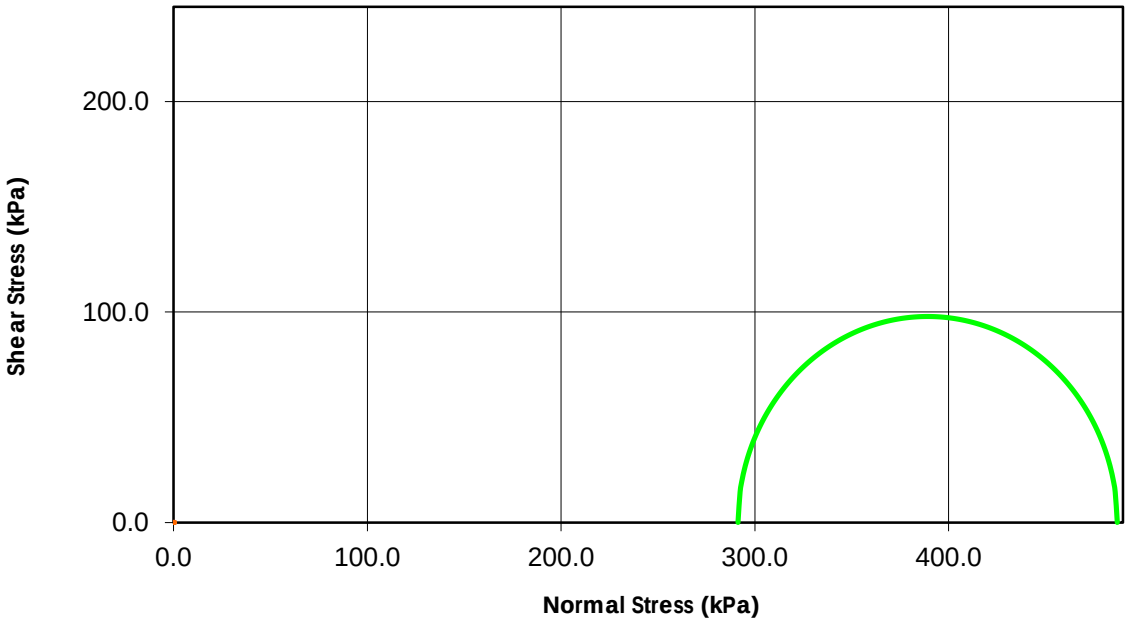


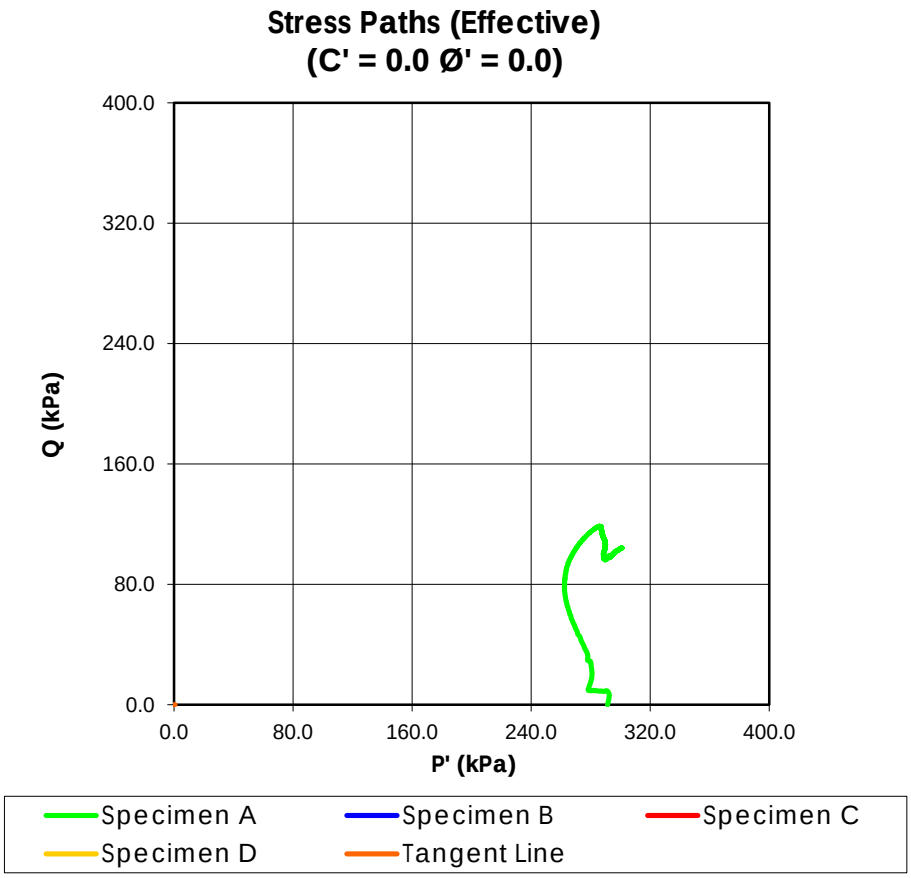
# Mohr Stress Circles at 15% Axial Strain Criterion

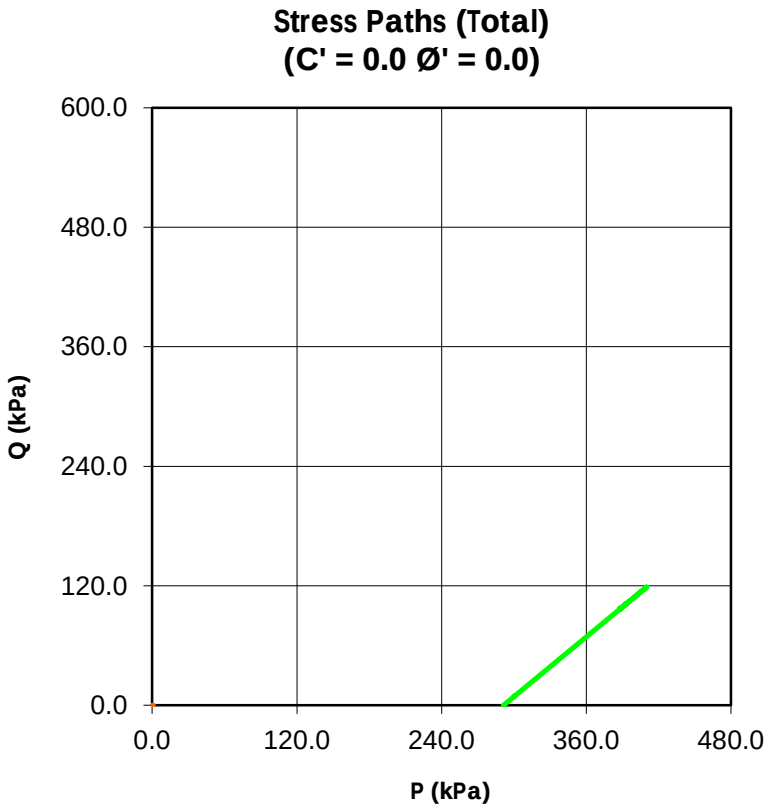
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

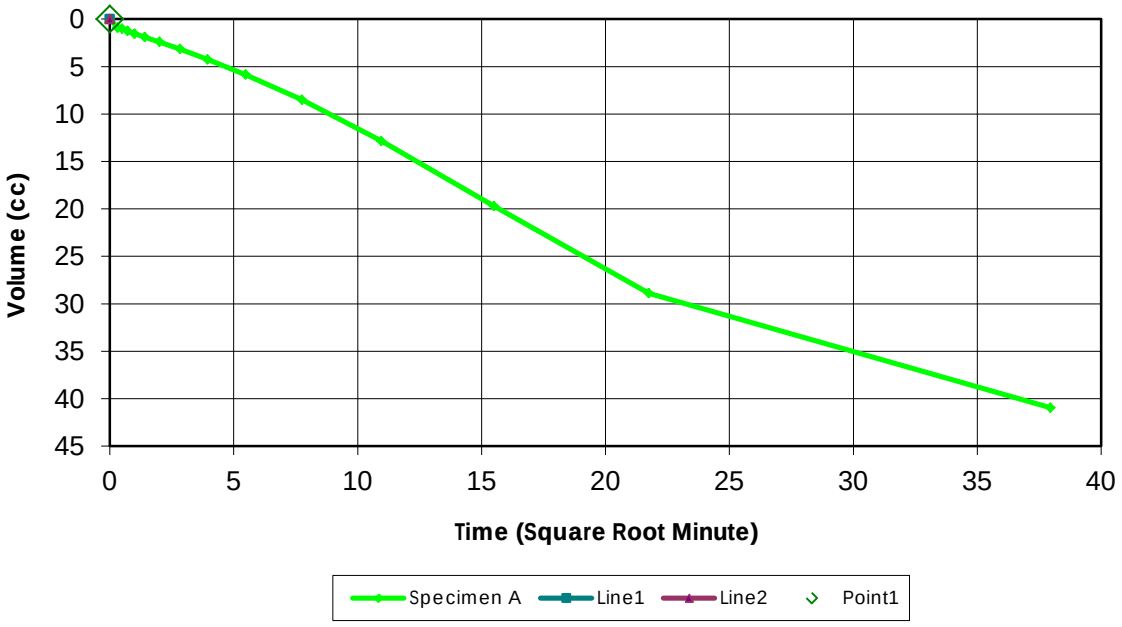



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

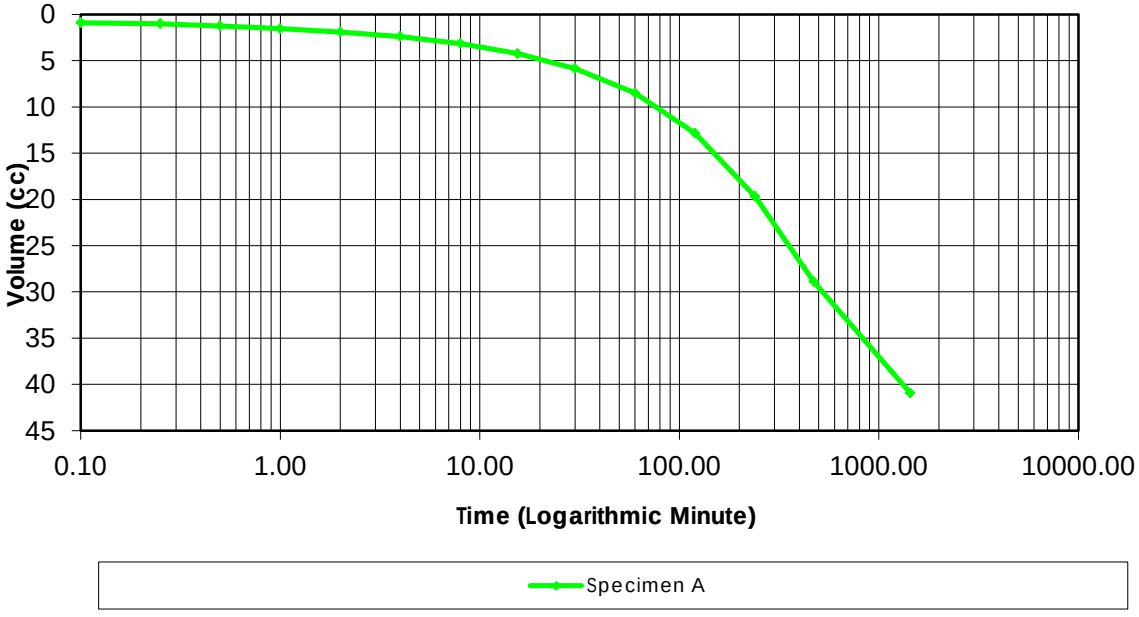

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 100.0 | 60.0 | 20.0 | 0.0 | 0.25 |
| 3 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 4 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 5 | 120.0 | 80.0 | 20.0 | 0.0 | 0.28 |
| 6 | 120.0 | 100.0 | 0.0 | 20.0 | |
| 7 | 120.0 | 100.0 | 0.0 | 0.0 | |
| 8 | 140.0 | 100.0 | 20.0 | 0.0 | 0.40 |
| 9 | 140.0 | 120.0 | 0.0 | 20.0 | |
| 10 | 140.0 | 120.0 | 0.0 | 0.0 | |
| 11 | 160.0 | 120.0 | 20.0 | 0.0 | 0.45 |
| 12 | 160.0 | 140.0 | 0.0 | 20.0 | |
| 13 | 160.0 | 140.0 | 0.0 | 0.0 | |
| 14 | 180.0 | 140.0 | 20.0 | 0.0 | 1.58 |
| 15 | 180.0 | 160.0 | 0.0 | 20.0 | |
| 16 | 180.0 | 160.0 | 0.0 | 0.0 | |
| 17 | 200.0 | 160.0 | 20.0 | 0.0 | 0.96 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 1.5-2.1m

| | |
|---|---|
| Cell Pressure (kPa) | 460 |
| Back Pressure (kPa) | 160 |
| Effective Pressure (kPa) | 300 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 157.1 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 646.8 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.65 | N/A |
| 00:00:06 | 43.75 | 0.900 |
| 00:00:15 | 43.65 | 1.000 |
| 00:00:30 | 43.40 | 1.250 |
| 00:01:00 | 43.10 | 1.550 |
| 00:02:00 | 42.75 | 1.900 |
| 00:04:00 | 42.25 | 2.400 |
| 00:08:00 | 41.50 | 3.150 |
| 00:15:30 | 40.40 | 4.250 |
| 00:30:00 | 38.80 | 5.850 |
| 01:00:00 | 36.15 | 8.500 |
| 02:00:00 | 31.80 | 12.850 |
| 04:00:00 | 24.95 | 19.700 |
| 07:53:00 | 15.75 | 28.900 |
| 24:00:00 | 3.70 | 40.950 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

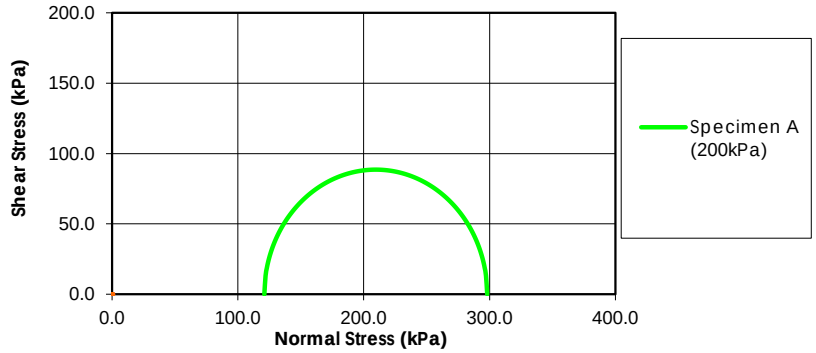
Stantec

Reviewed By: C. Lamoureux

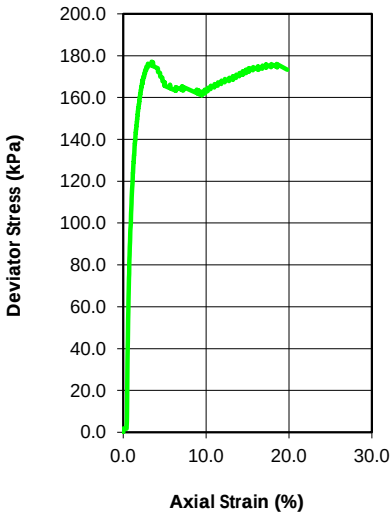
Date: 14-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 16.2 | | | |
| Dry Density (g/cm3) | 1.780 | | | |
| Saturation (%) | 84.42 | | | |
| Void Ratio | 0.517 | | | |
| Diameter (mm) | 72.40 | | | |
| Height (mm) | 154.00 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 13.7 | | | |
| Dry Density (g/cm3) | 1.725 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.565 | | | |
| Effective Stress (kPa) | 199.6 | | | |
| Back Press. (kPa) | 180.4 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

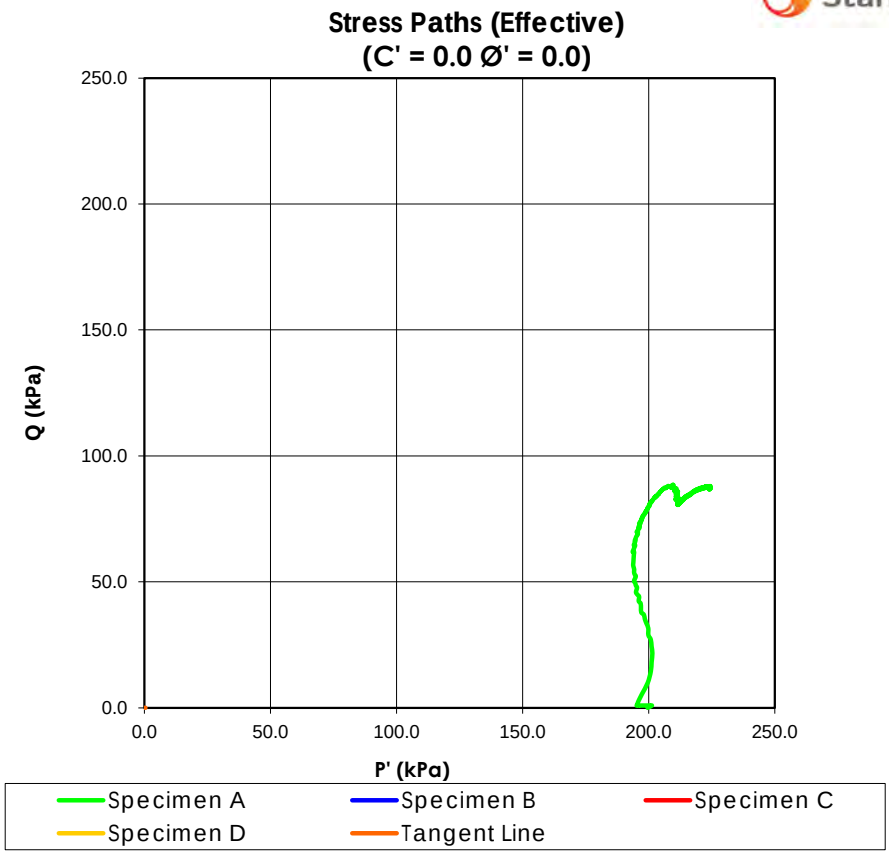
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 298.13 | | | |
| σ'3 at Failure (kPa) | 121.04 | | | |
| | | | | |
| | | | | |

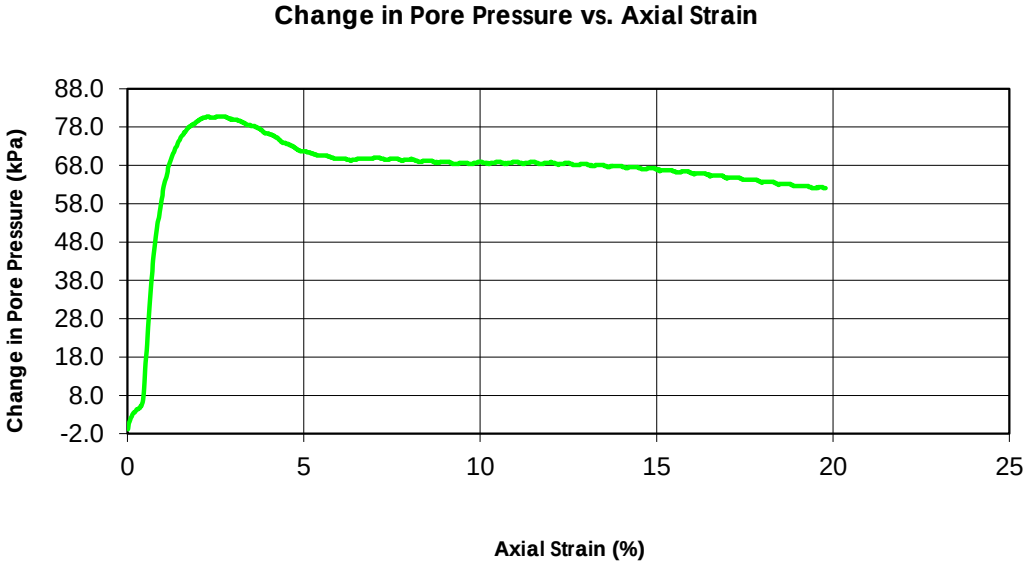
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC33 ST8 |
| **Depth:** | 4.6-5.2m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | Formerly D53 ST8 |

**Stantec Consulting Ltd.**

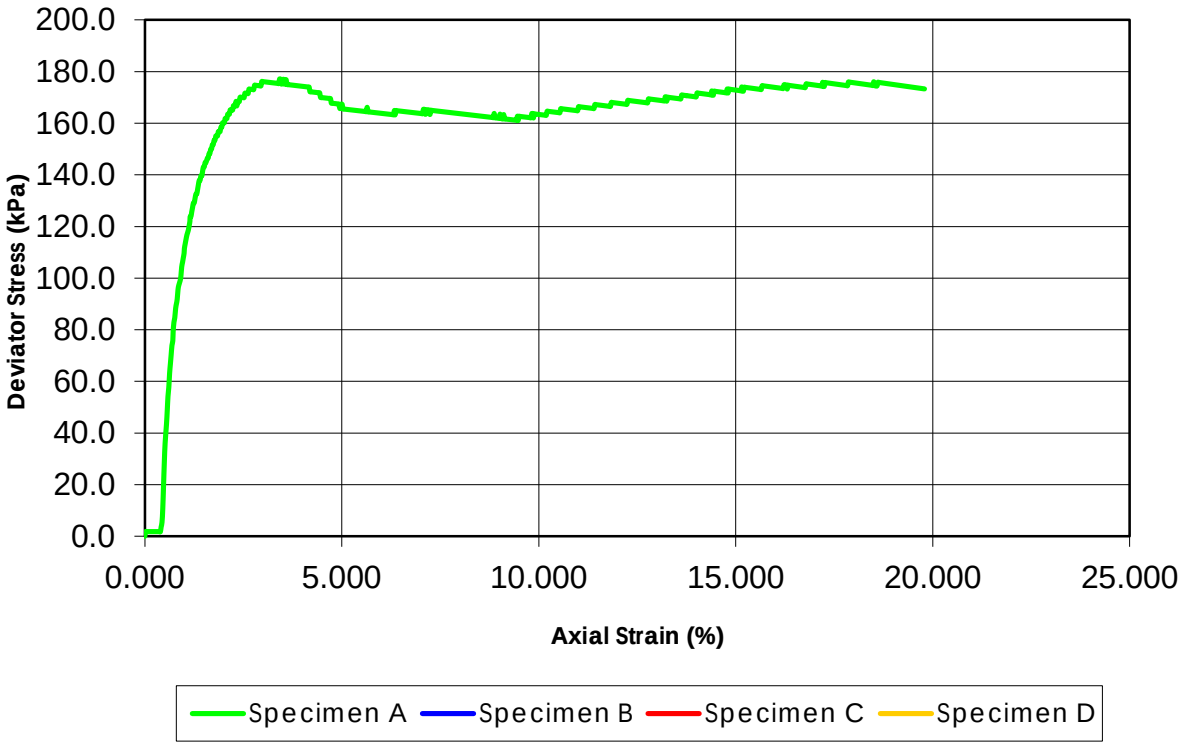
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

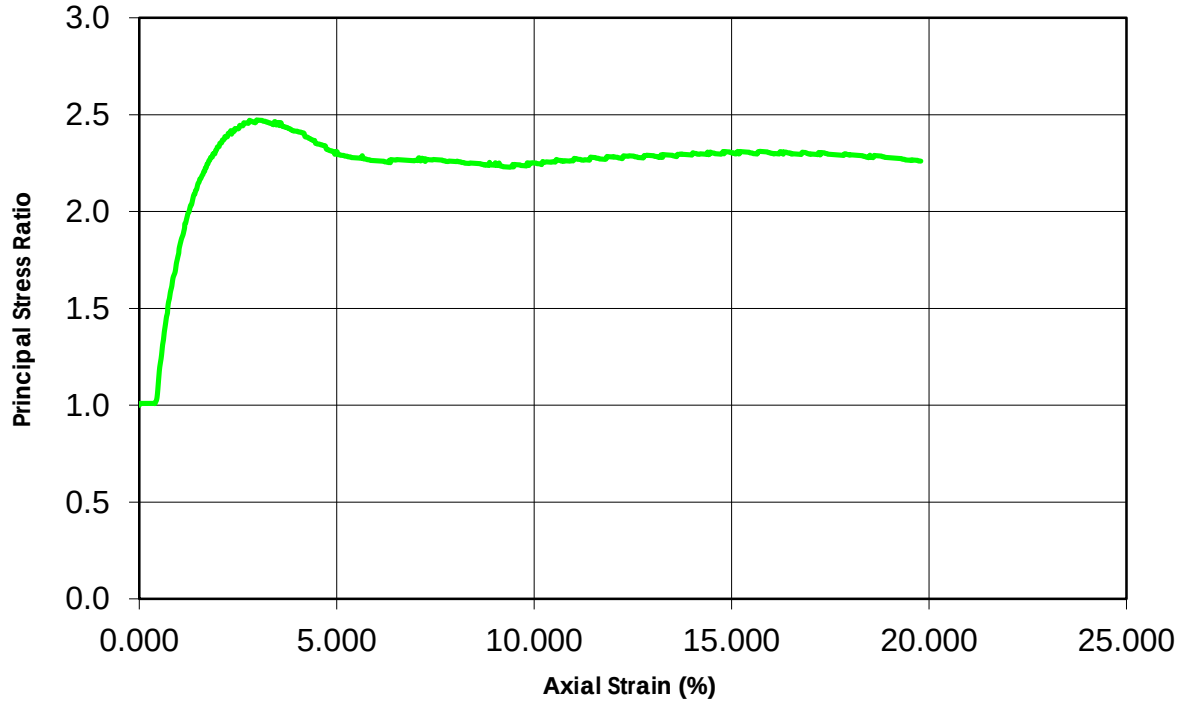


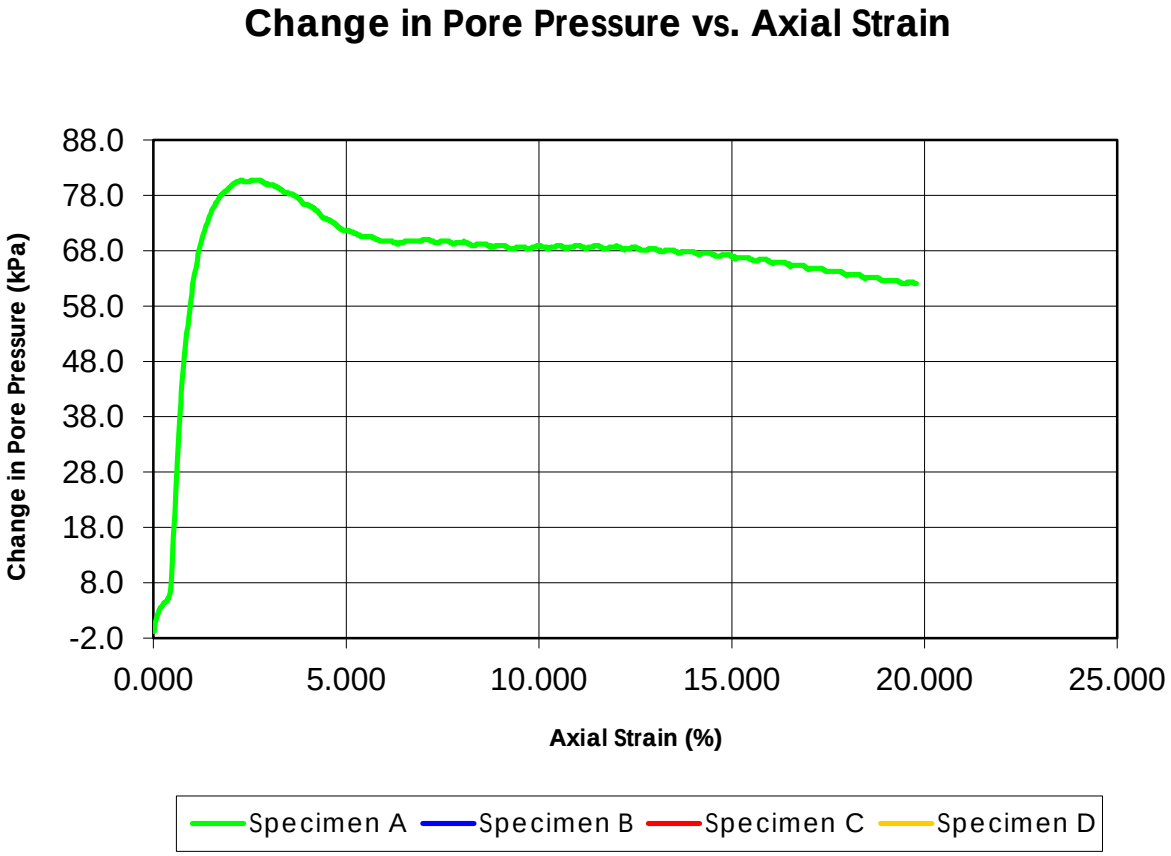



## Deviator Stress vs. Axial Strain



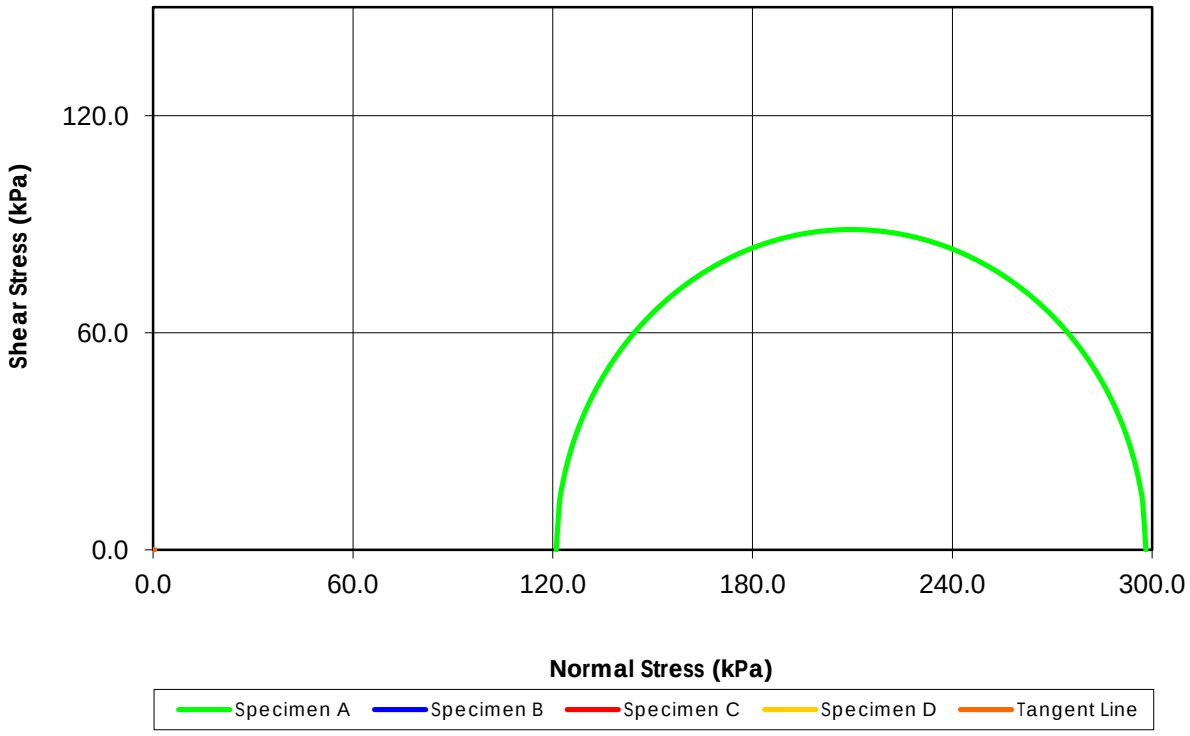

## Principal Stress Ratio vs. Axial Strain



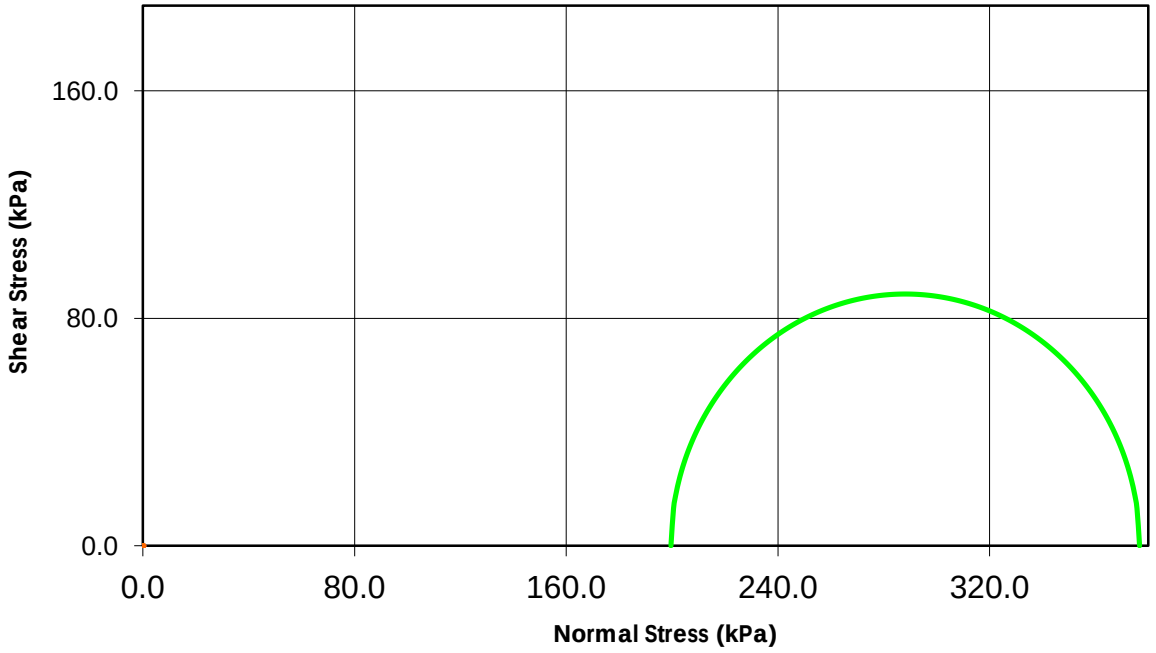

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
88.0
78.0
68.0
58.0
48.0
38.0
28.0
18.0
8.0
-2.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

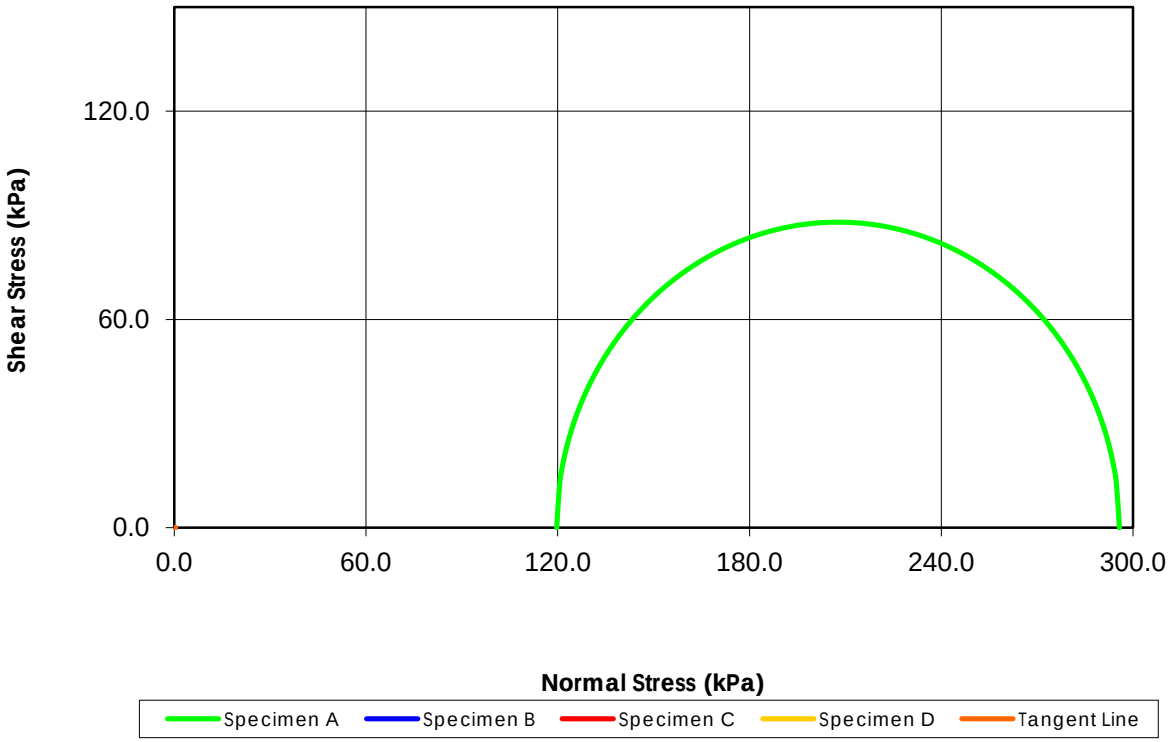



### Total Stress
### (C = 0.0 Ø = 0.0)

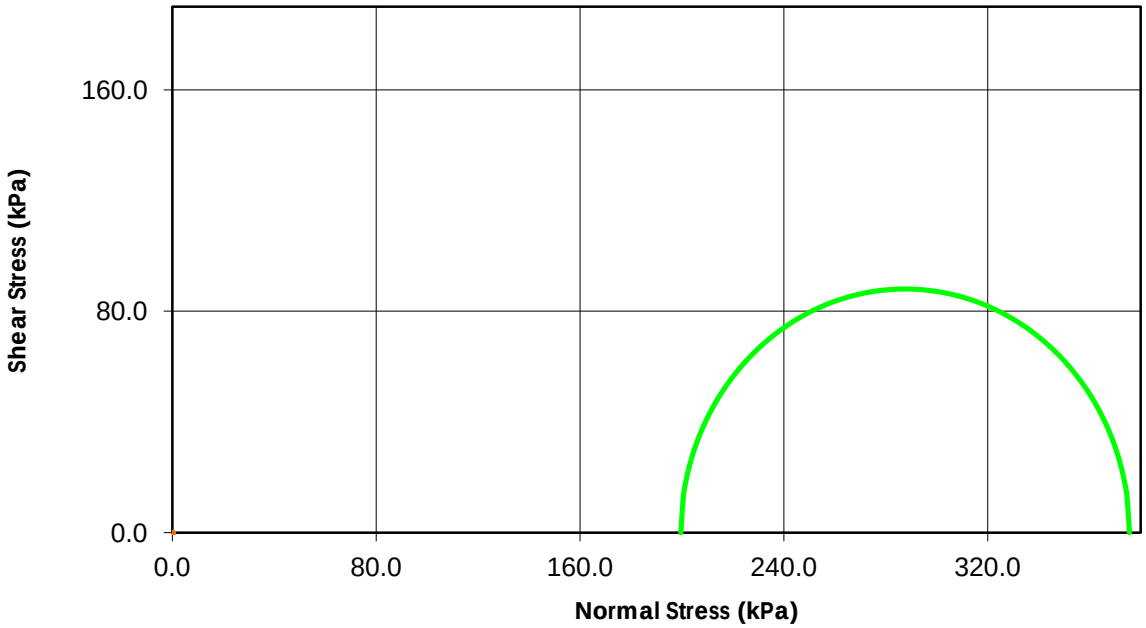


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

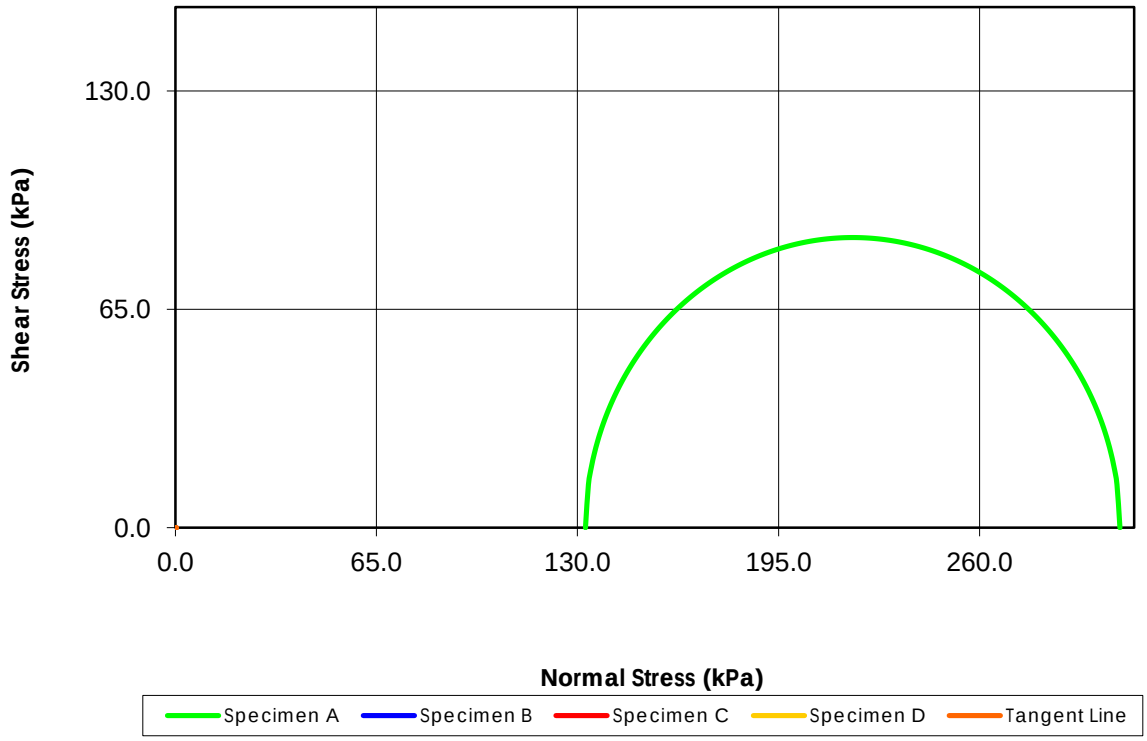



## Total Stress
## (C = 0.0 Ø = 0.0)

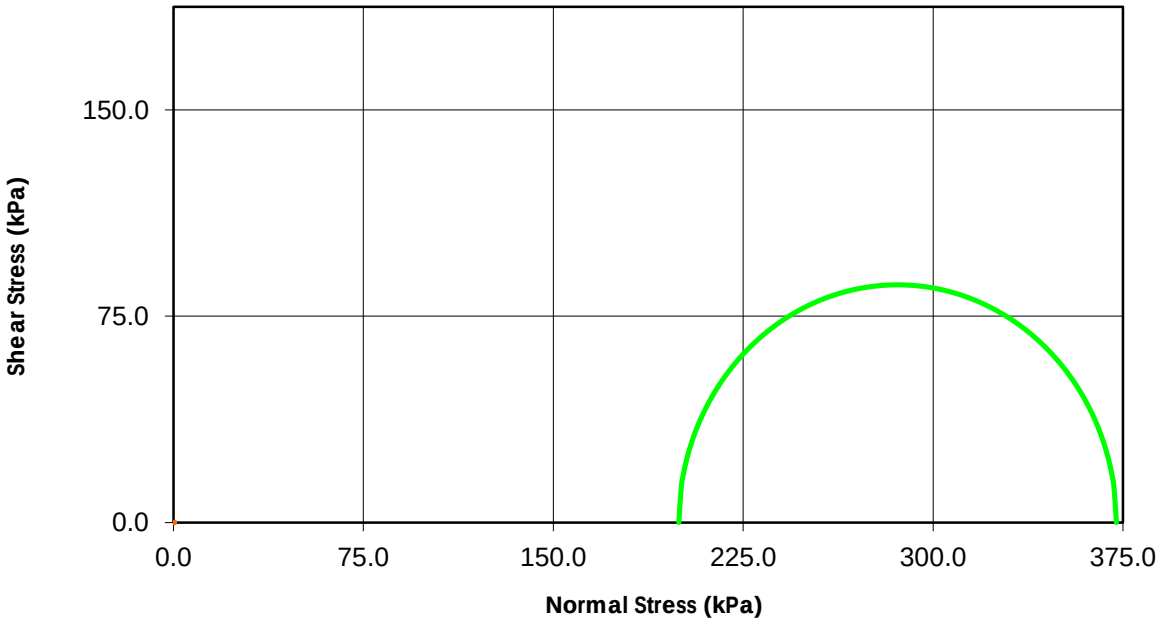


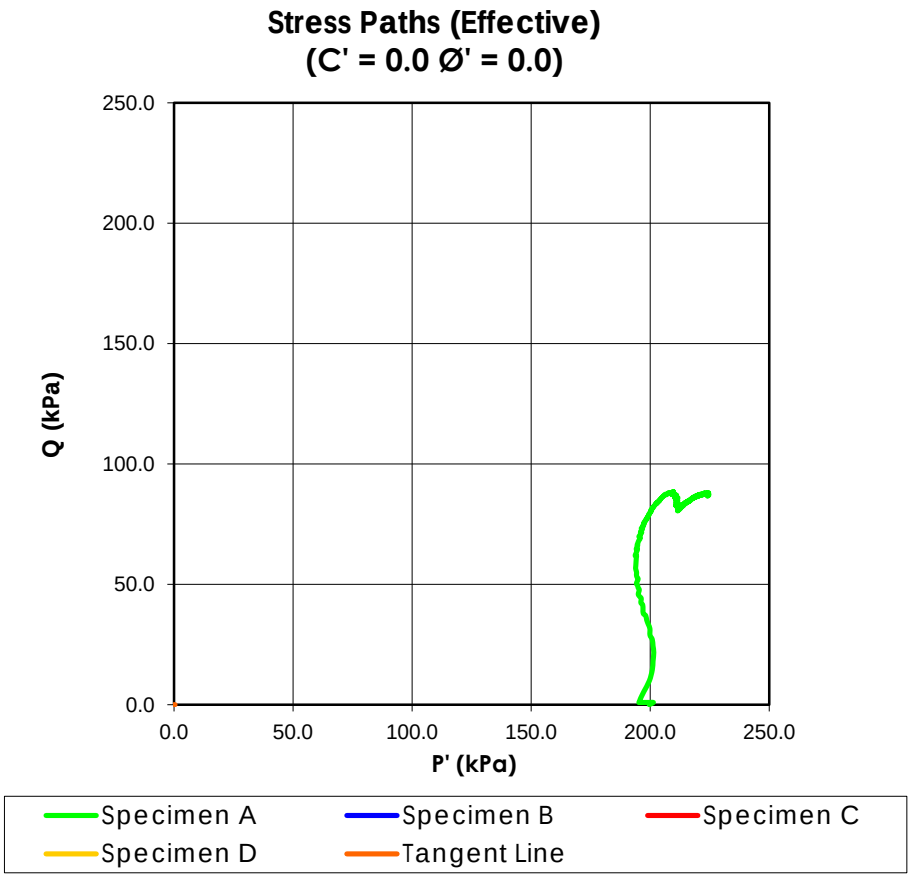
# Mohr Stress Circles at 15% Axial Strain Criterion

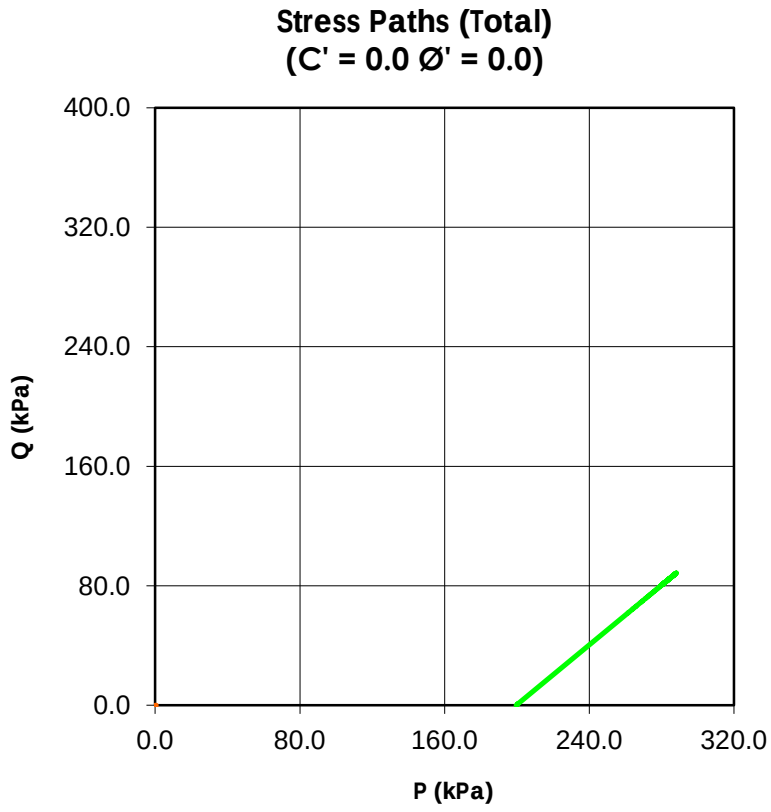
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

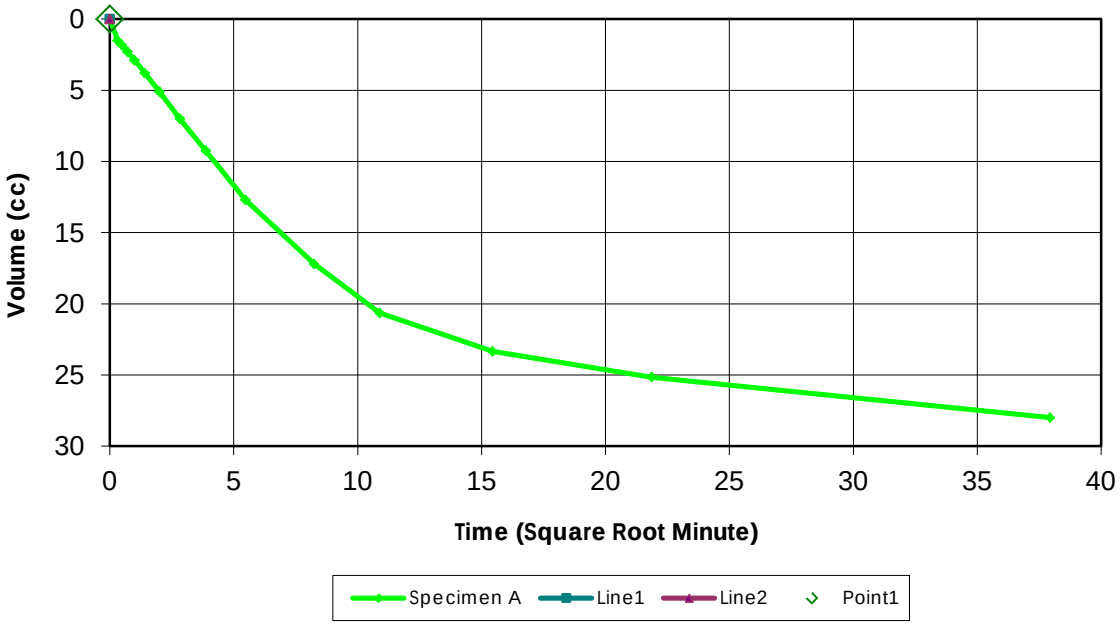



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
250.0
200.0
150.0
100.0
50.0
0.0
Q (kPa)
0.0
50.0
100.0
150.0
200.0
250.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

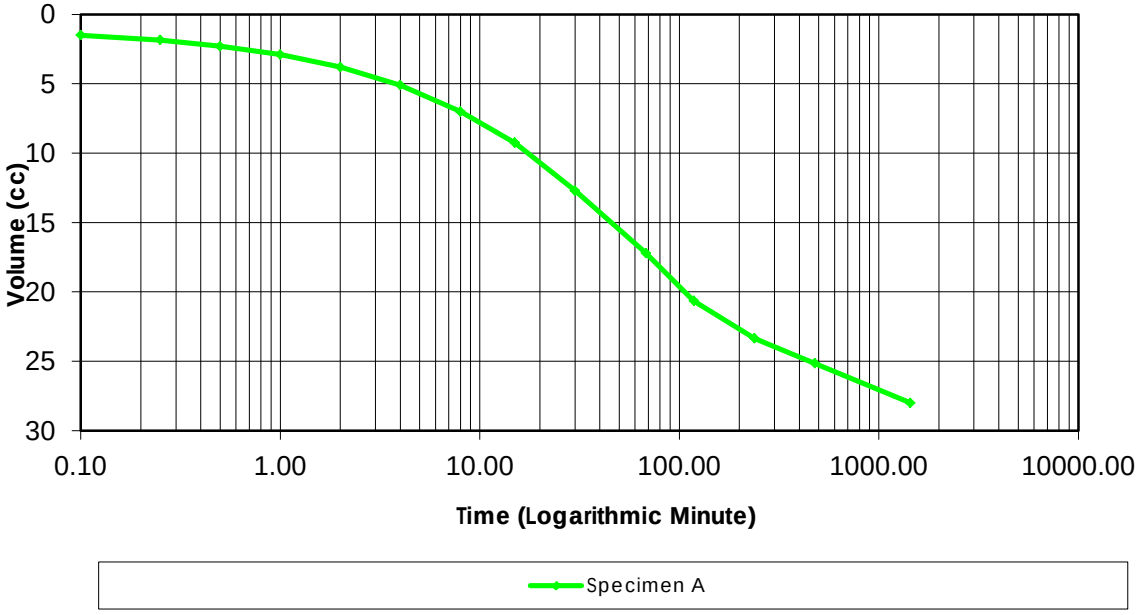

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 130.0 | 40.0 | 70.0 | 0.0 | 0.43 |
| 3 | 130.0 | 110.0 | 0.0 | 70.0 | |
| 4 | 130.0 | 110.0 | 0.0 | 0.0 | |
| 5 | 200.0 | 110.0 | 70.0 | 0.0 | 0.84 |
| 6 | 200.0 | 180.0 | 0.0 | 70.0 | |
| 7 | 200.0 | 180.0 | 0.0 | 0.0 | |
| 8 | 270.0 | 180.0 | 70.0 | 0.0 | 0.96 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 4.6-5.2m

| | |
|---|---|
| Cell Pressure (kPa) | 380 |
| Back Pressure (kPa) | 180 |
| Effective Pressure (kPa) | 200 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 154 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 634 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 45.15 | N/A |
| 00:00:06 | 43.65 | 1.500 |
| 00:00:15 | 43.30 | 1.850 |
| 00:00:30 | 42.85 | 2.300 |
| 00:01:00 | 42.25 | 2.900 |
| 00:02:00 | 41.35 | 3.800 |
| 00:04:00 | 40.05 | 5.100 |
| 00:08:00 | 38.15 | 7.000 |
| 00:15:00 | 35.90 | 9.250 |
| 00:30:00 | 32.45 | 12.700 |
| 01:08:00 | 27.95 | 17.200 |
| 01:58:30 | 24.50 | 20.650 |
| 03:58:30 | 21.80 | 23.350 |
| 07:58:00 | 20.00 | 25.150 |
| 23:59:00 | 17.15 | 28.000 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

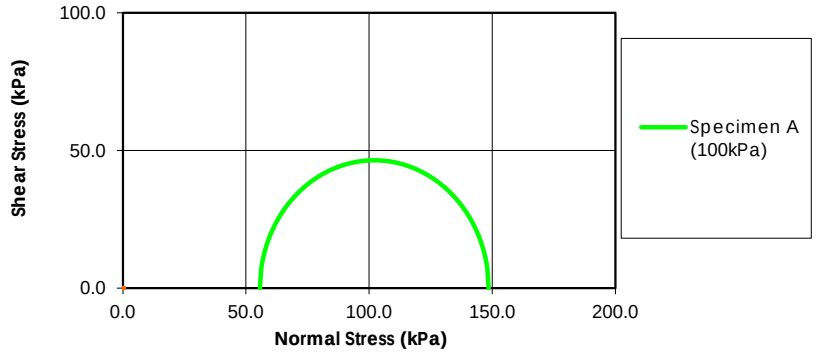
Stantec

Reviewed By C. Lamoureux

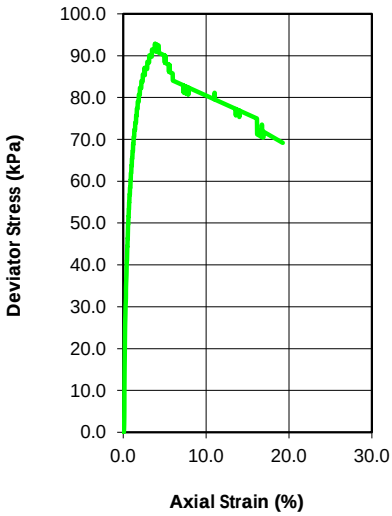
Date: 14-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.9 | | | |
| Dry Density (g/cm3) | 1.523 | | | |
| Saturation (%) | 97.32 | | | |
| Void Ratio | 0.773 | | | |
| Diameter (mm) | 72.300 | | | |
| Height (mm) | 150.400 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 25.2 | | | |
| Dry Density (g/cm3) | 1.529 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.766 | | | |
| Effective Stress (kPa) | 96.9 | | | |
| Back Press. (kPa) | 113.1 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

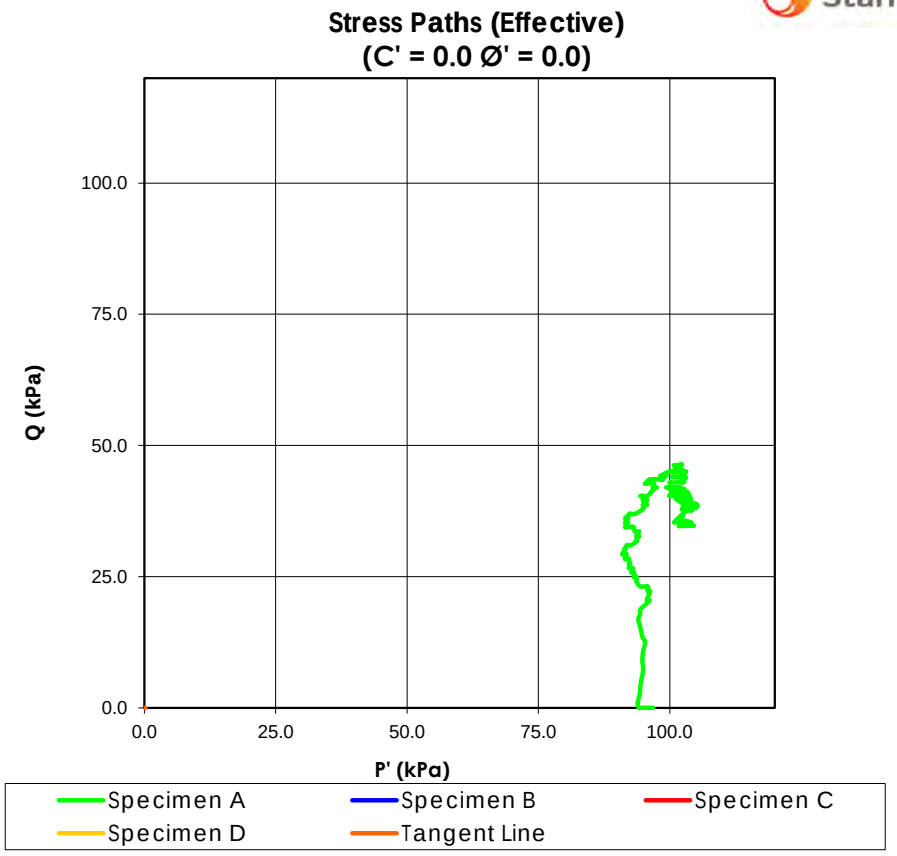
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 148.53 | | | |
| σ'3 at Failure (kPa) | 55.66 | | | |
| | | | | |
| | | | | |

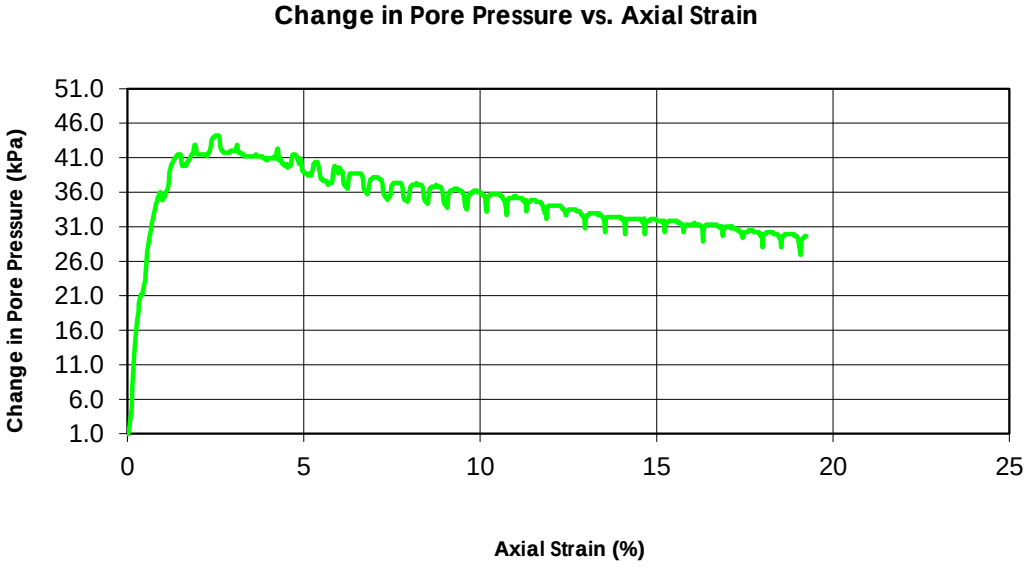
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC34 ST2 |
| **Depth:** | 1.5-2.1m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | Formerly D54 |

**Stantec Consulting Ltd.**

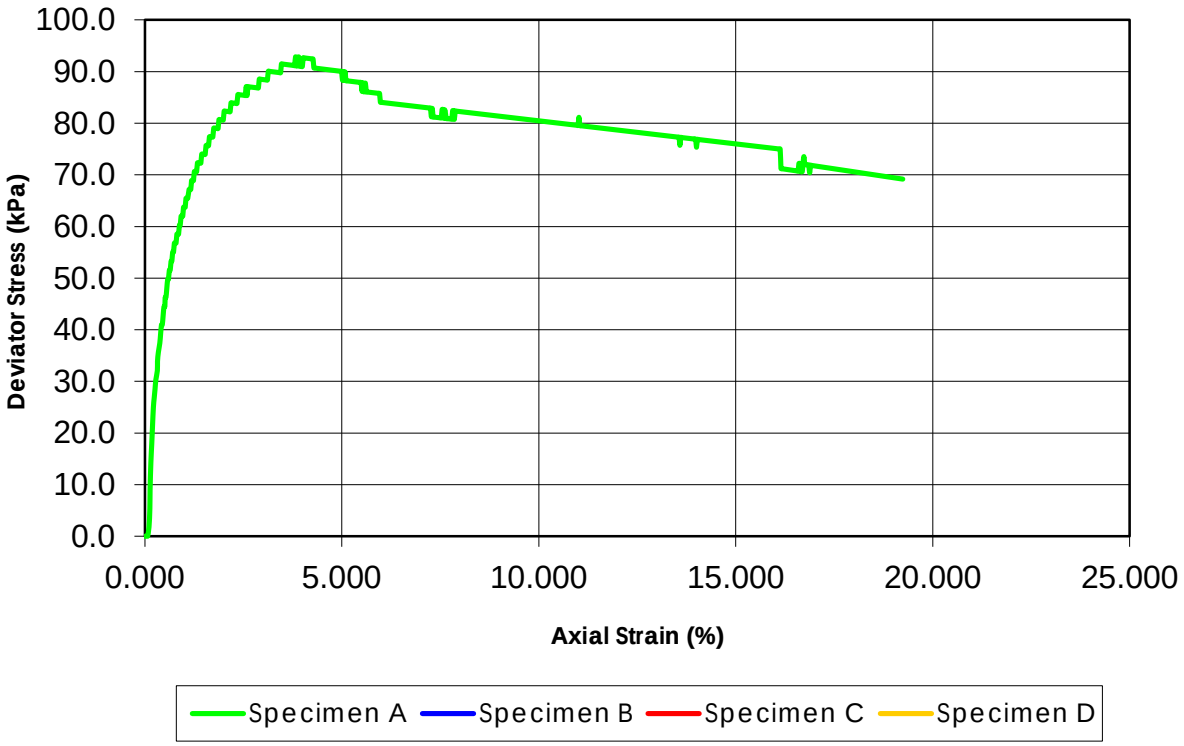
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

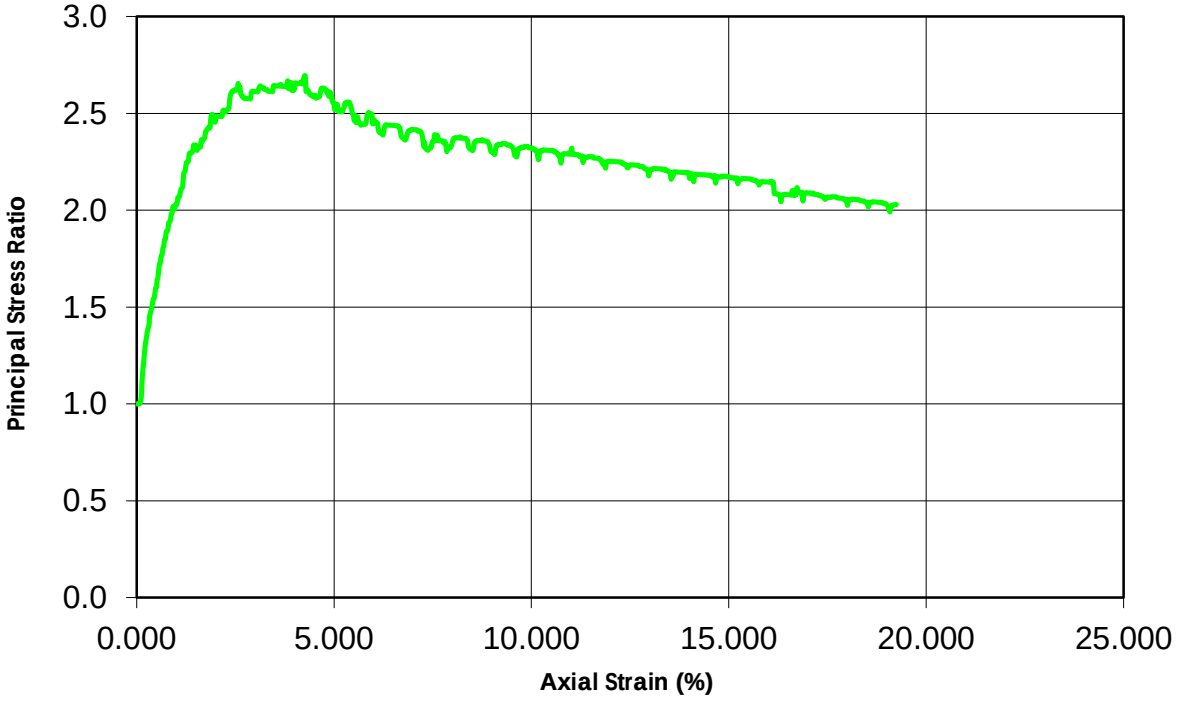


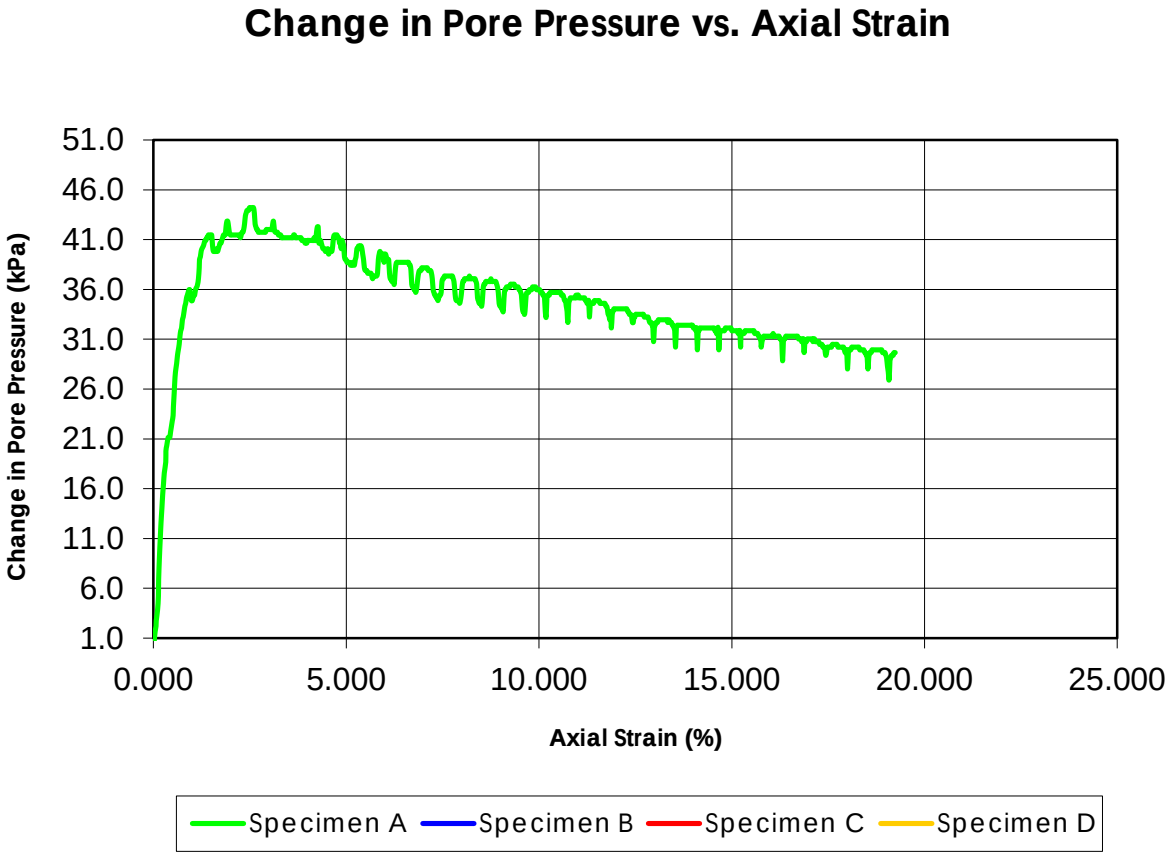



## Deviator Stress vs. Axial Strain



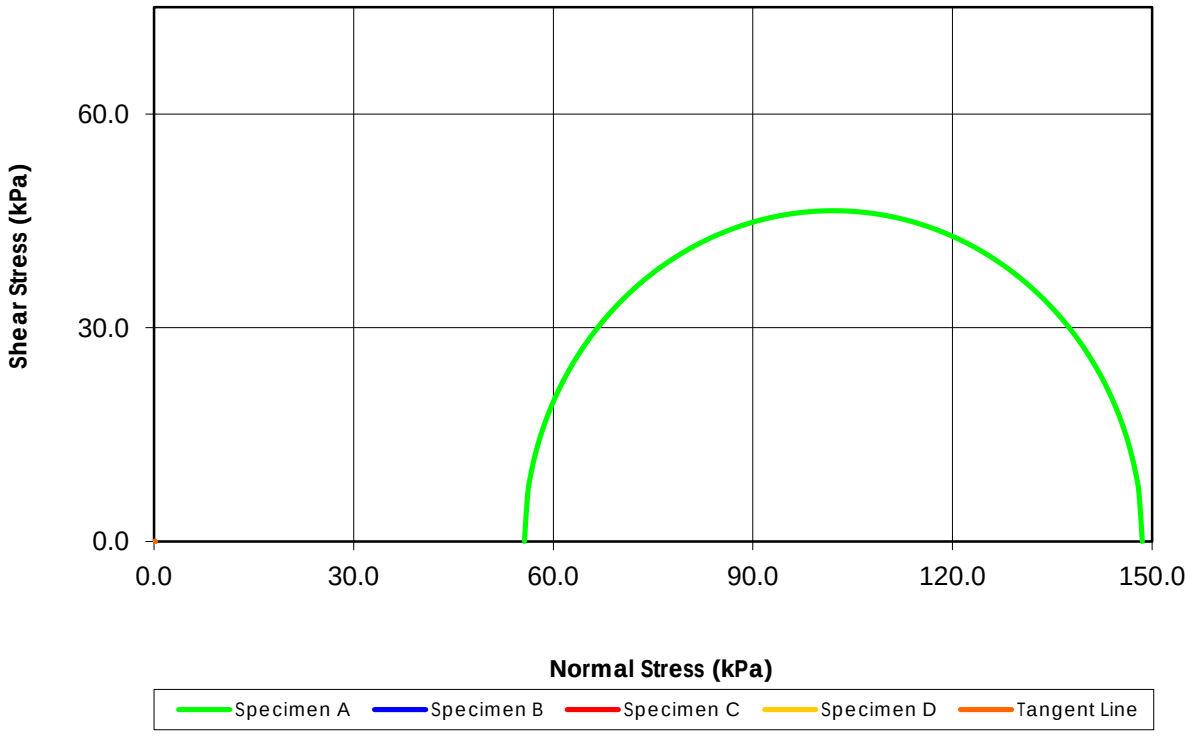

## Principal Stress Ratio vs. Axial Strain



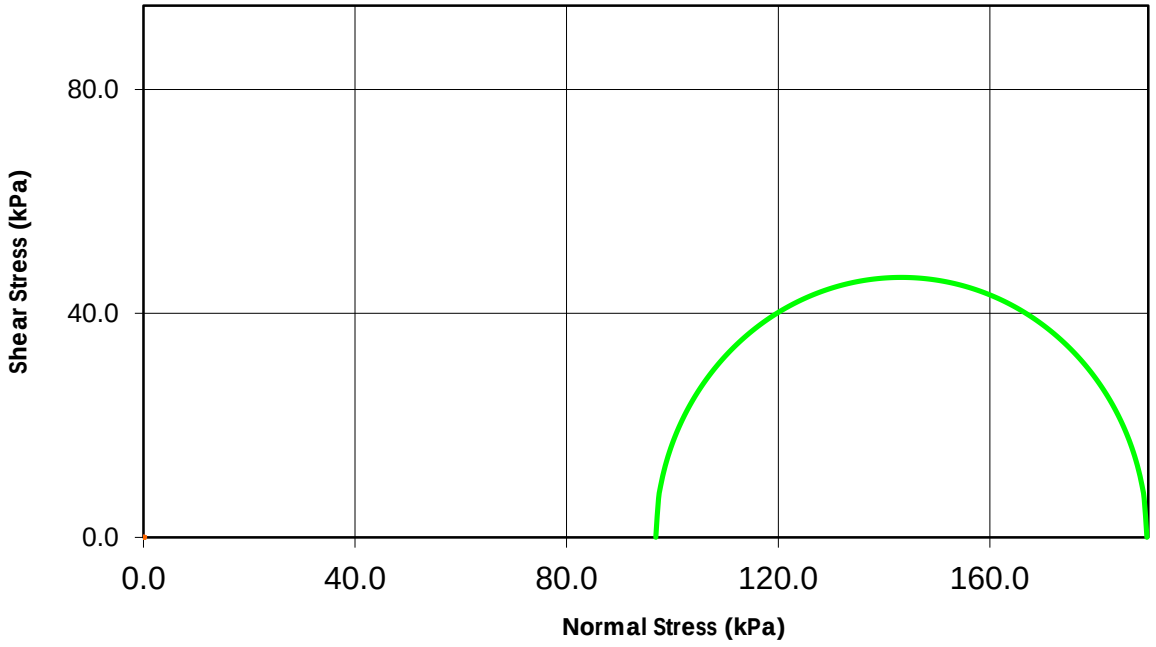

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
51.0
46.0
41.0
36.0
31.0
26.0
21.0
16.0
11.0
6.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

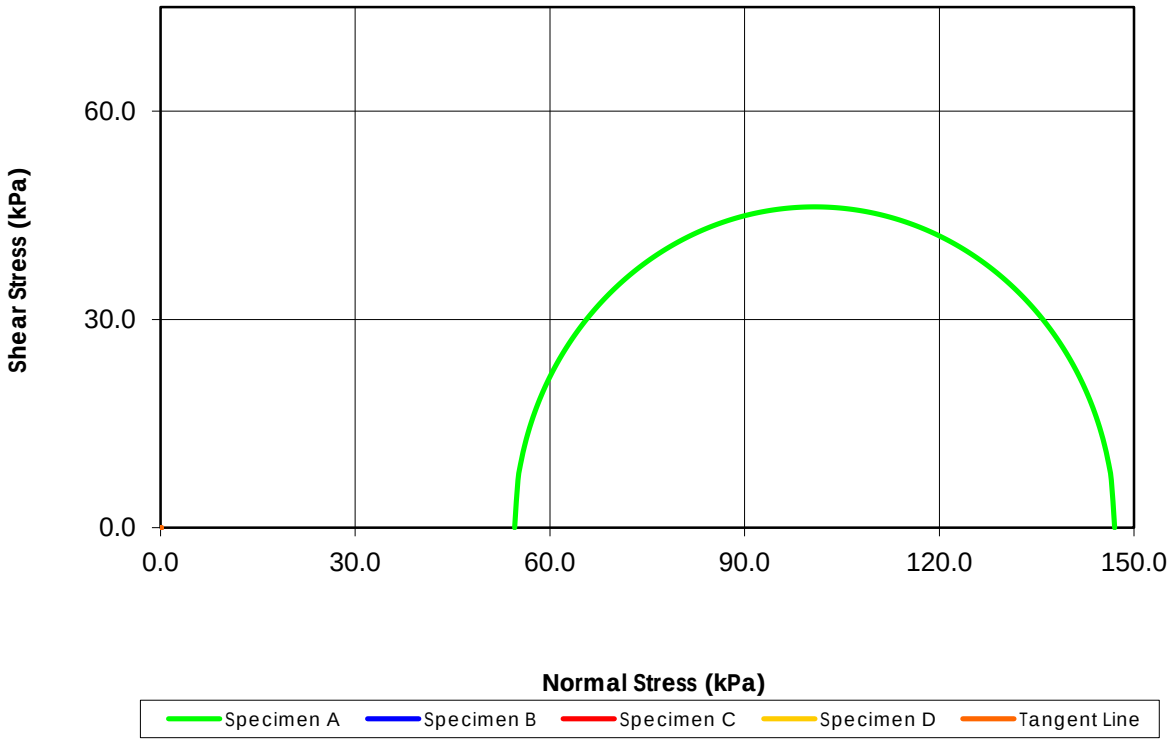



### Total Stress
### (C = 0.0 Ø = 0.0)

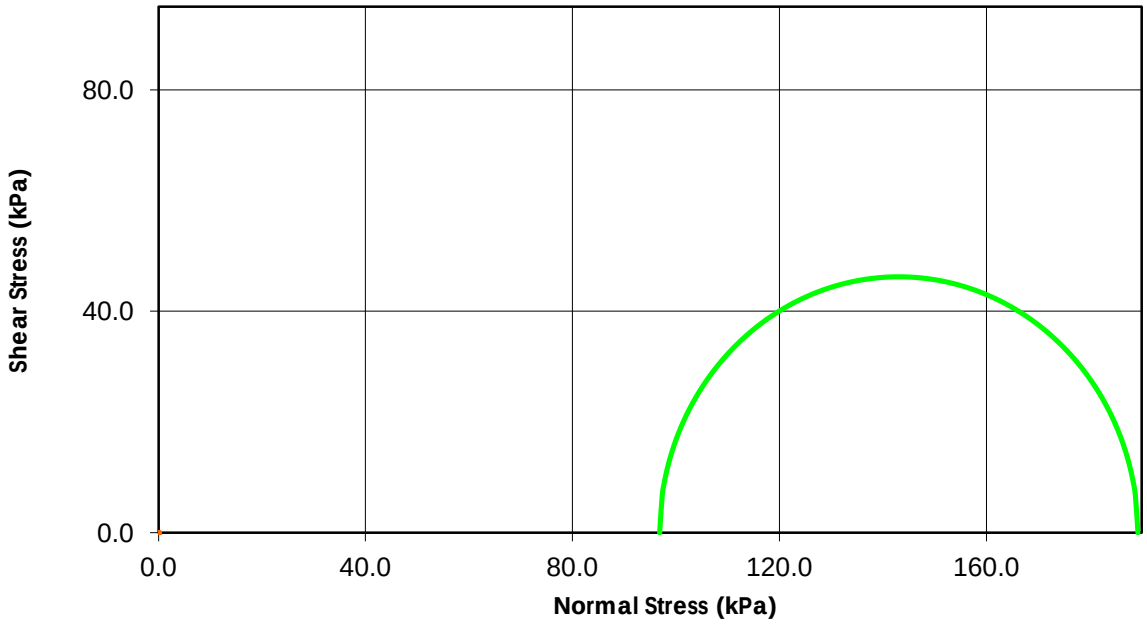


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

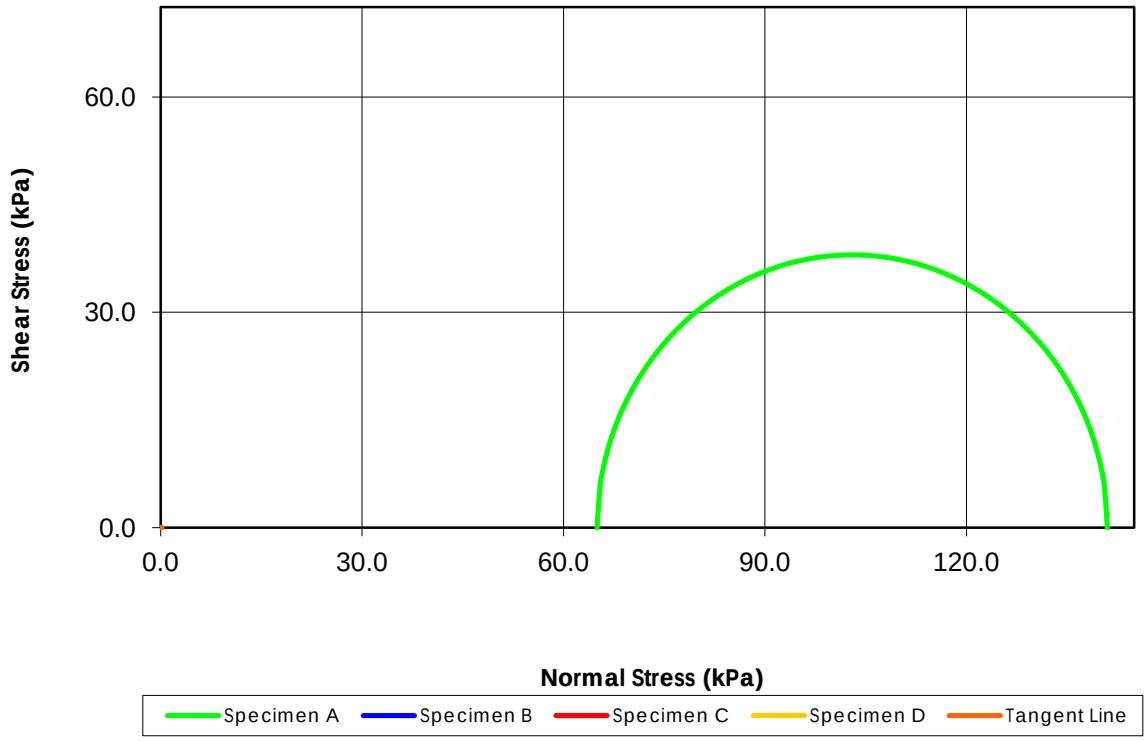



## Total Stress
## (C = 0.0 Ø = 0.0)

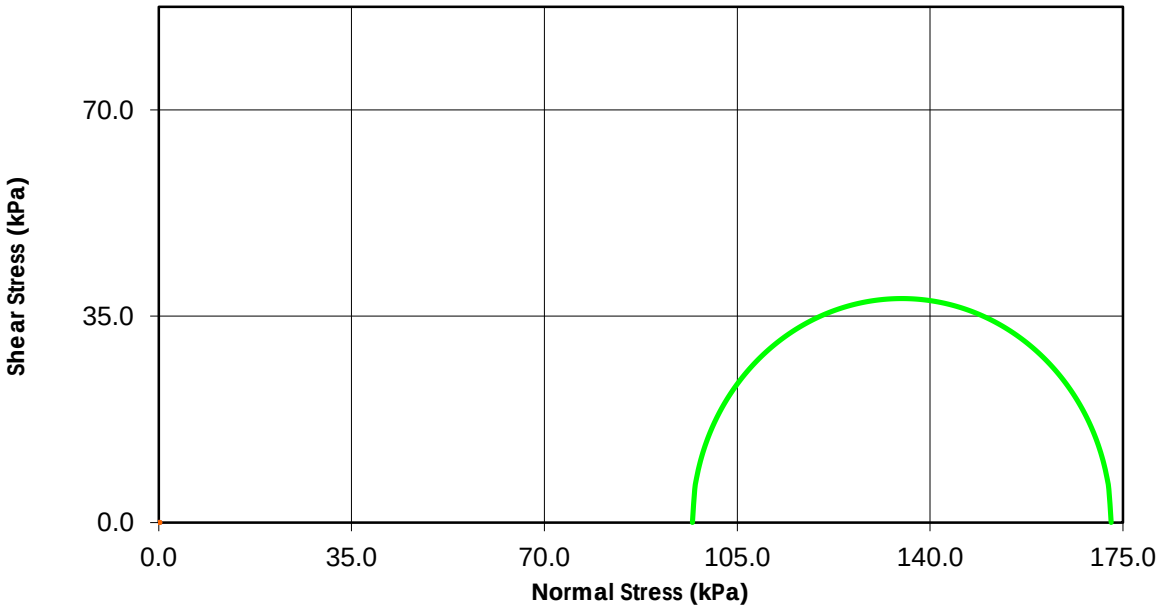


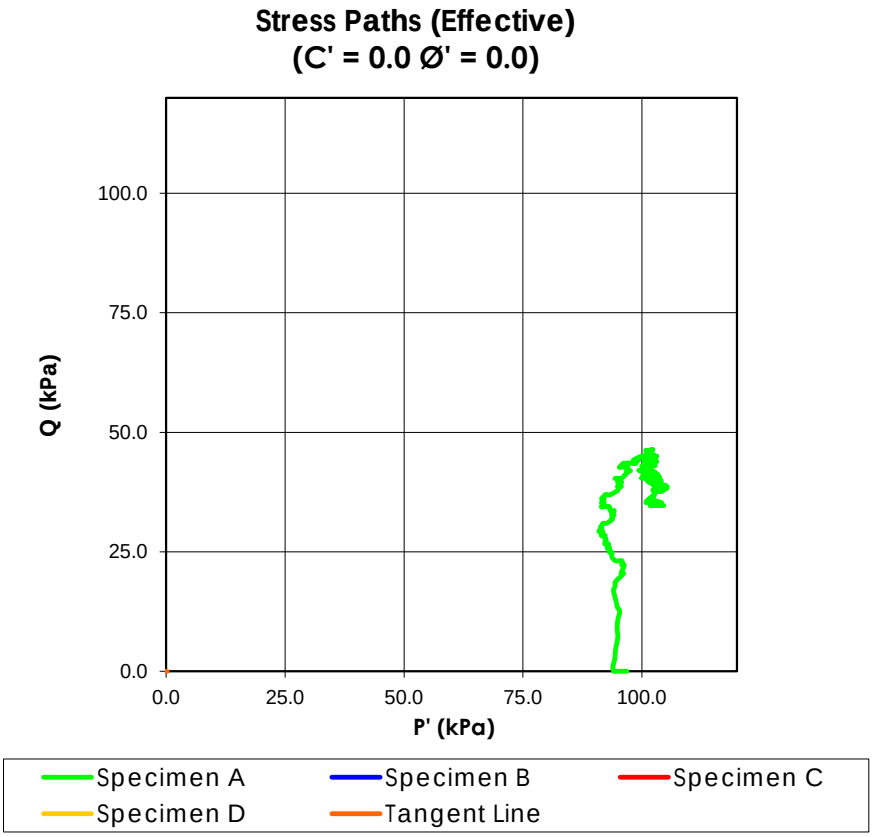
# Mohr Stress Circles at 15% Axial Strain Criterion

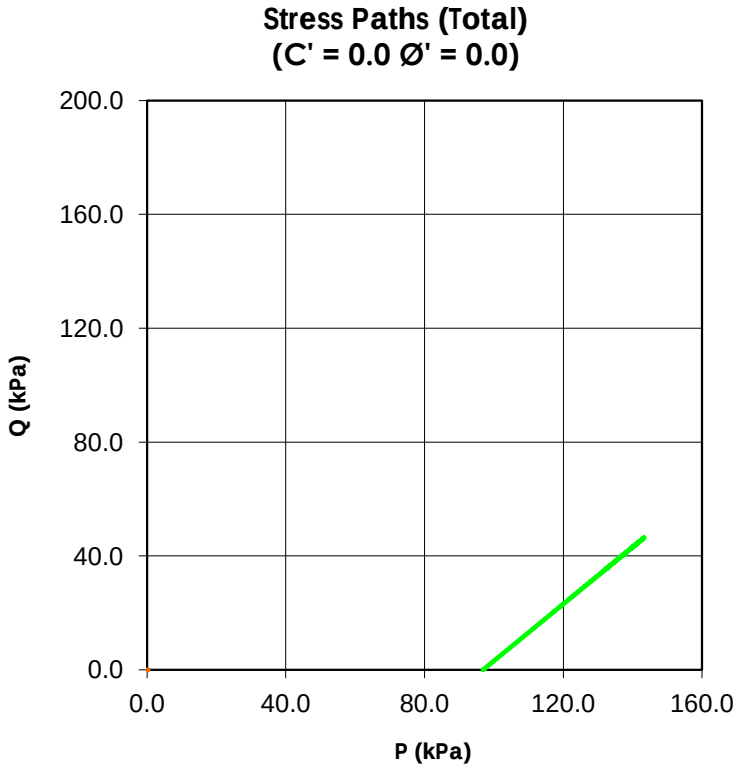
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

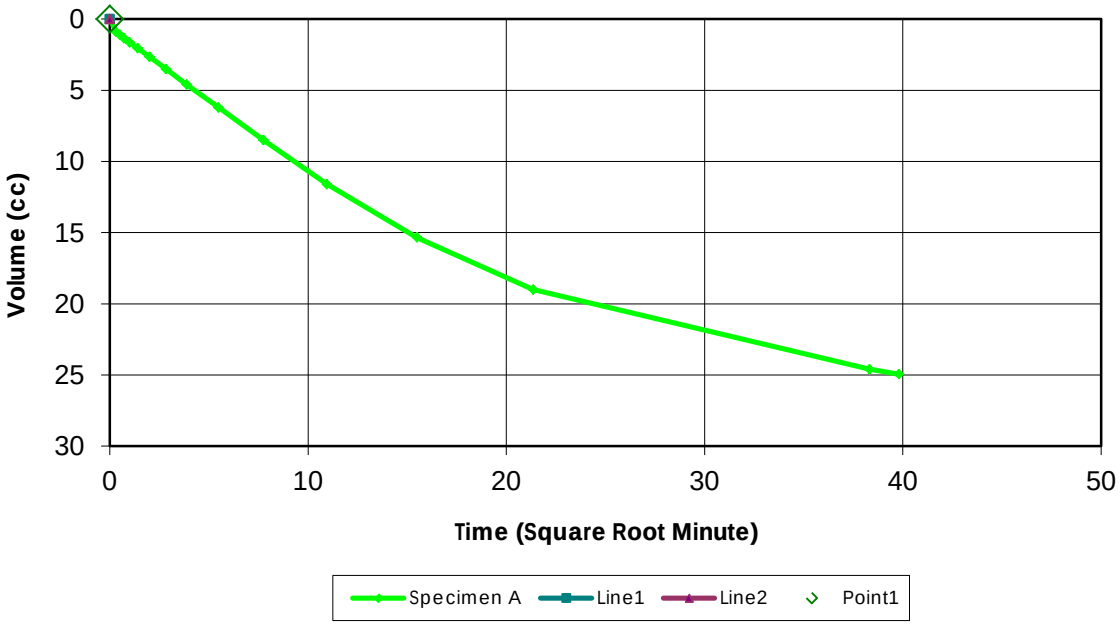



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
100.0
75.0
50.0
25.0
0.0
Q (kPa)
0.0
25.0
50.0
75.0
100.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

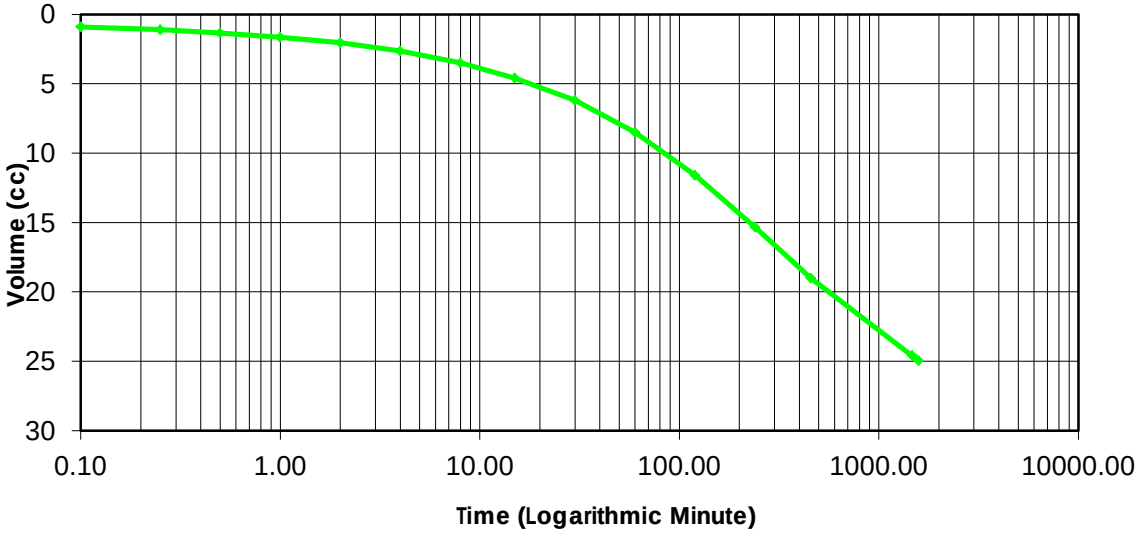

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
200.0
160.0
120.0
80.0
40.0
0.0
Q (kPa)
0.0
40.0
80.0
120.0
160.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.97

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 130.0 | 40.0 | 70.0 | 0.0 | 0.82 |
| 3 | 130.0 | 110.0 | 0.0 | 70.0 | |
| 4 | 130.0 | 110.0 | 0.0 | 0.0 | |
| 5 | 200.0 | 110.0 | 70.0 | 0.0 | 0.97 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 1.5-2.1m

| | |
|---|---|
| Cell Pressure (kPa) | 210 |
| Back Pressure (kPa) | 110 |
| Effective Pressure (kPa) | 100 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.3 |
| Initial Sample Height (mm) | 150.4 |
| Initial Sample Area (cm2) | 41.06 |
| Initial Volume (cm3) | 617.5 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 45.20 | N/A |
| 00:00:06 | 44.30 | 0.900 |
| 00:00:15 | 44.10 | 1.100 |
| 00:00:30 | 43.85 | 1.350 |
| 00:01:00 | 43.55 | 1.650 |
| 00:02:00 | 43.15 | 2.050 |
| 00:04:00 | 42.55 | 2.650 |
| 00:08:00 | 41.70 | 3.500 |
| 00:15:00 | 40.60 | 4.600 |
| 00:30:00 | 39.00 | 6.200 |
| 01:00:00 | 36.70 | 8.500 |
| 02:00:00 | 33.60 | 11.600 |
| 04:00:00 | 29.85 | 15.350 |
| 07:36:00 | 26.20 | 19.000 |
| 24:29:00 | 20.60 | 24.600 |
| 26:25:00 | 20.25 | 24.950 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

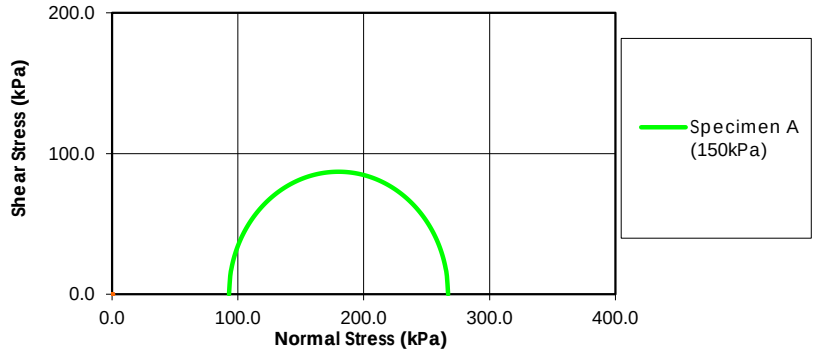
Stantec

Reviewed By C. Lamoureux

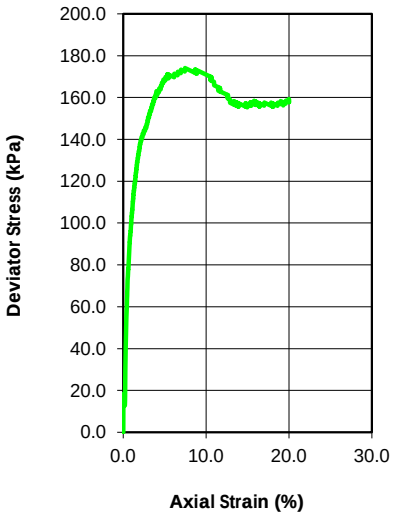
Date: 15-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 19.8 | | | |
| Dry Density (g/cm3) | 1.582 | | | |
| Saturation (%) | 75.55 | | | |
| Void Ratio | 0.707 | | | |
| Diameter (mm) | 72.00 | | | |
| Height (mm) | 157.50 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 17.5 | | | |
| Dry Density (g/cm3) | 1.426 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.894 | | | |
| Effective Stress (kPa) | 146.8 | | | |
| Back Press. (kPa) | 203.2 | | | |
| Rate of Strain | 0.022 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

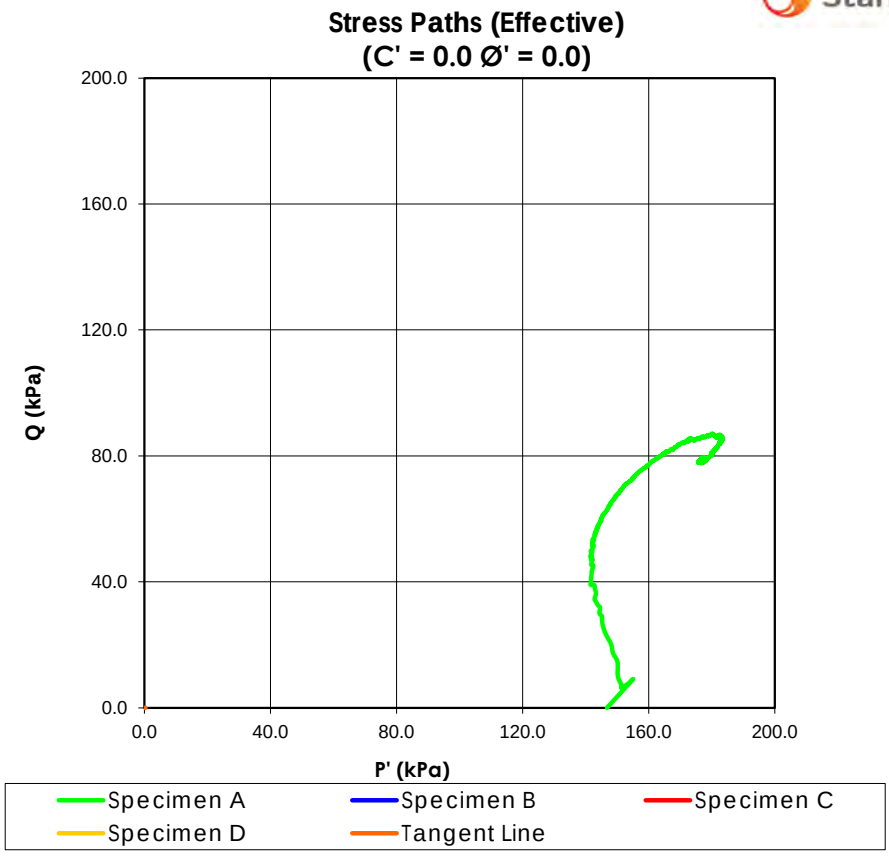
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 267.05 | | | |
| σ'3 at Failure (kPa) | 92.96 | | | |
| | | | | |
| | | | | |

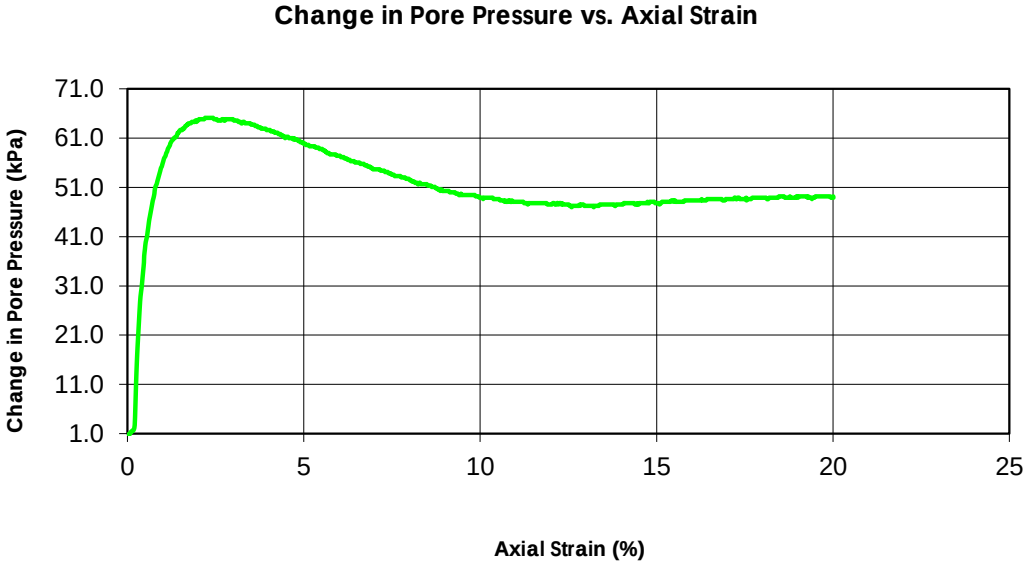
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.220 |
| **Boring Number:** | - |
| **Sample Number:** | DC34 ST8 |
| **Depth:** | 4.6-5.2m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | Formerly D54 ST8 |

**Stantec Consulting Ltd.**

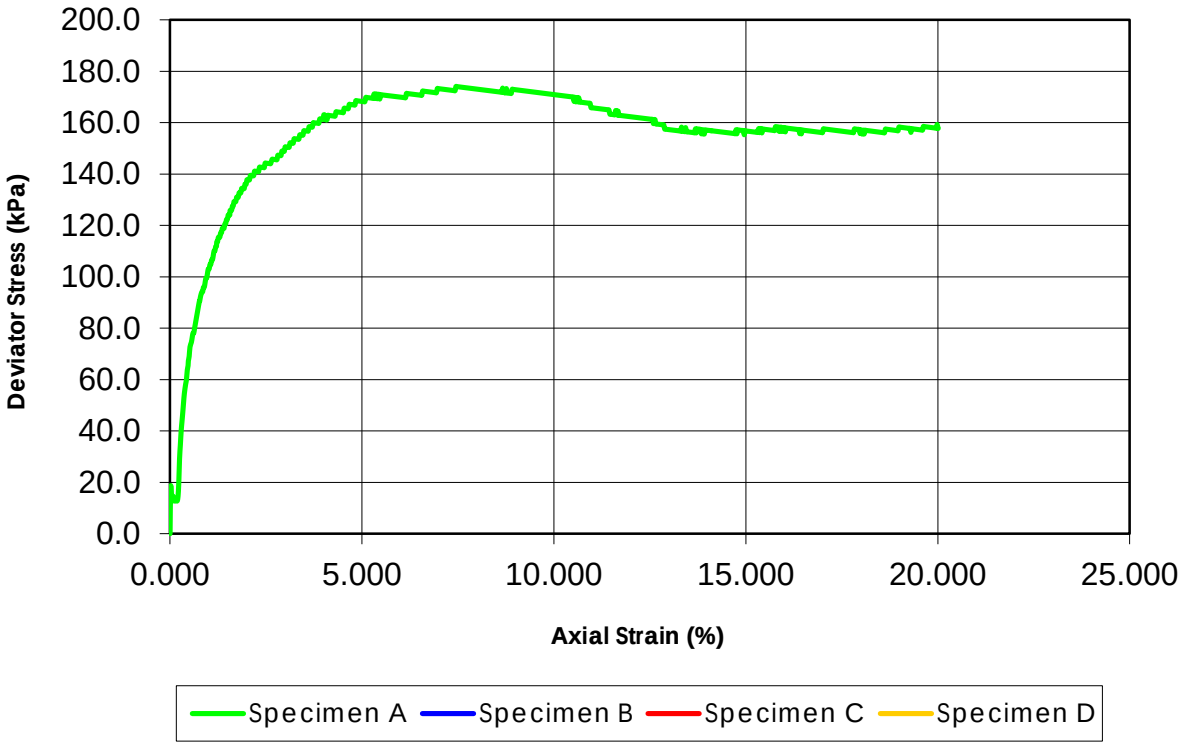
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

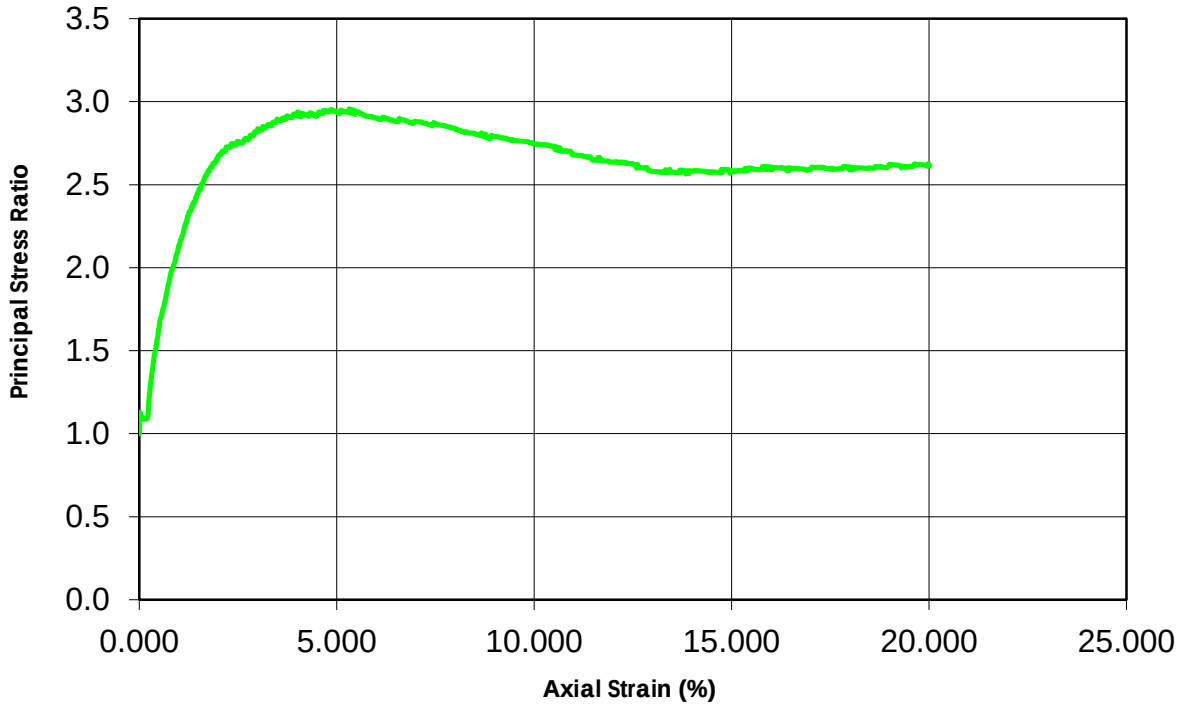


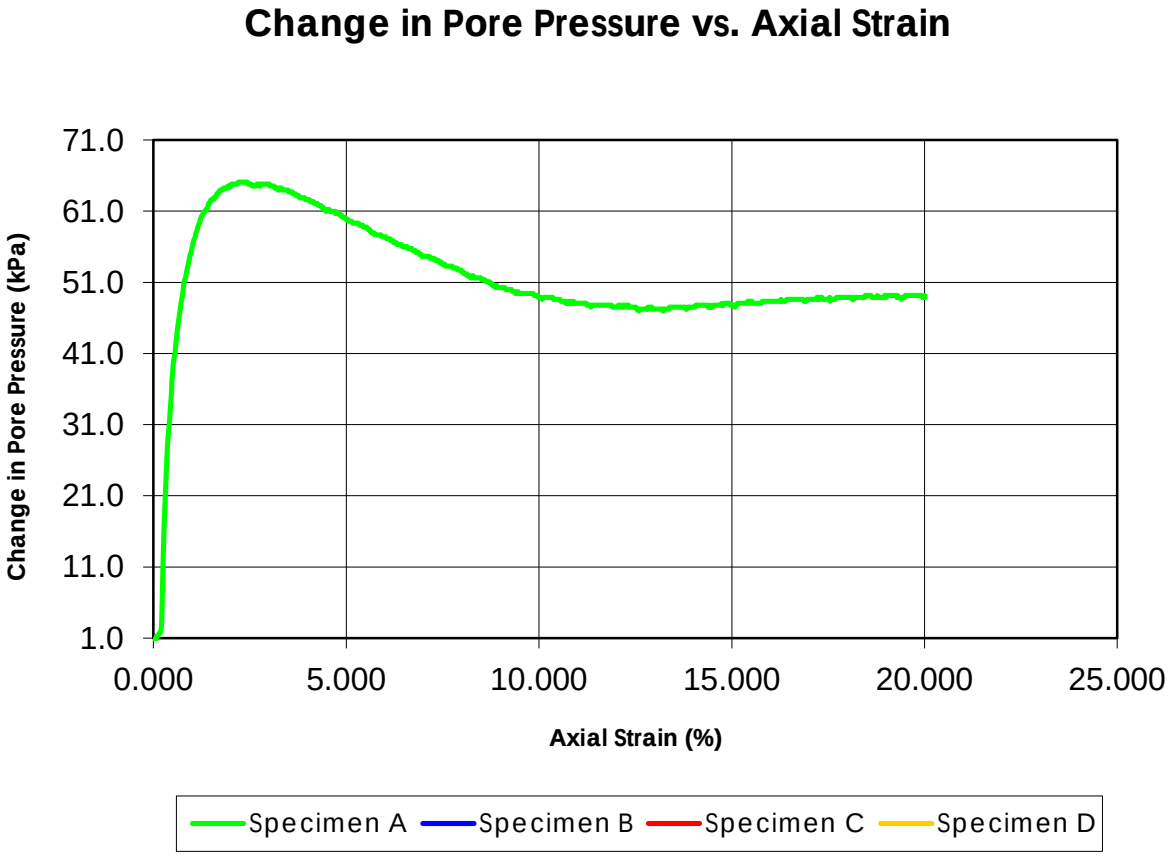



## Deviator Stress vs. Axial Strain



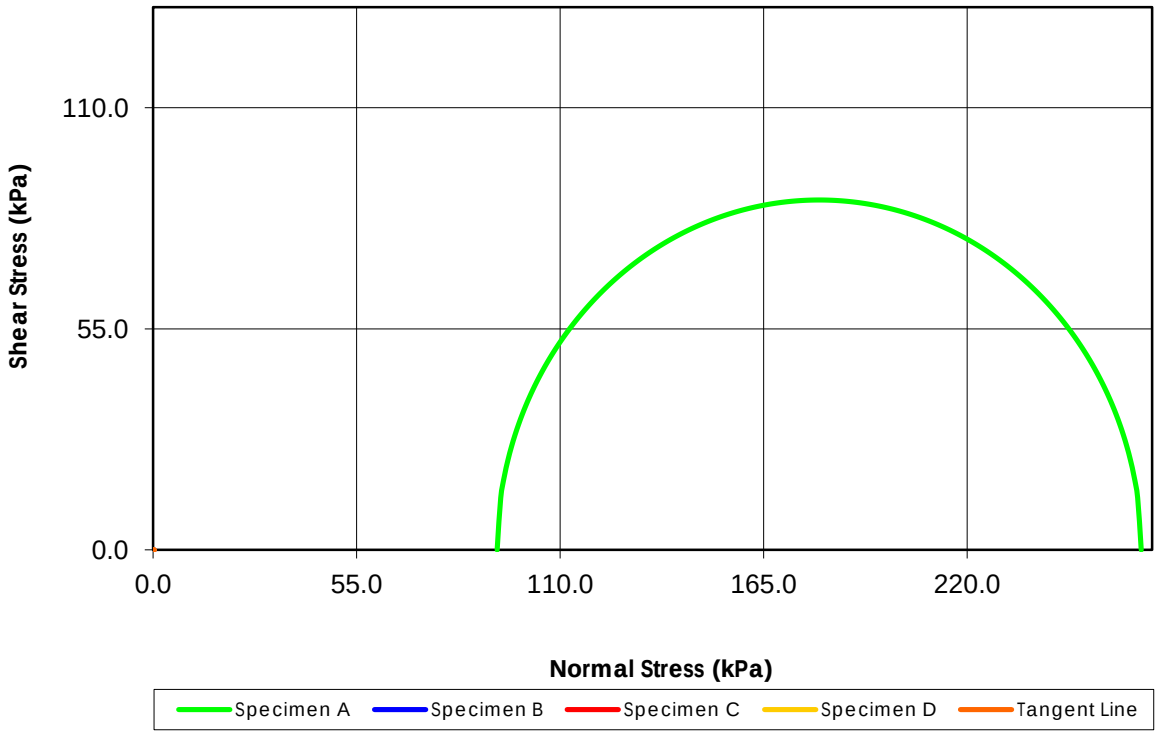

## Principal Stress Ratio vs. Axial Strain



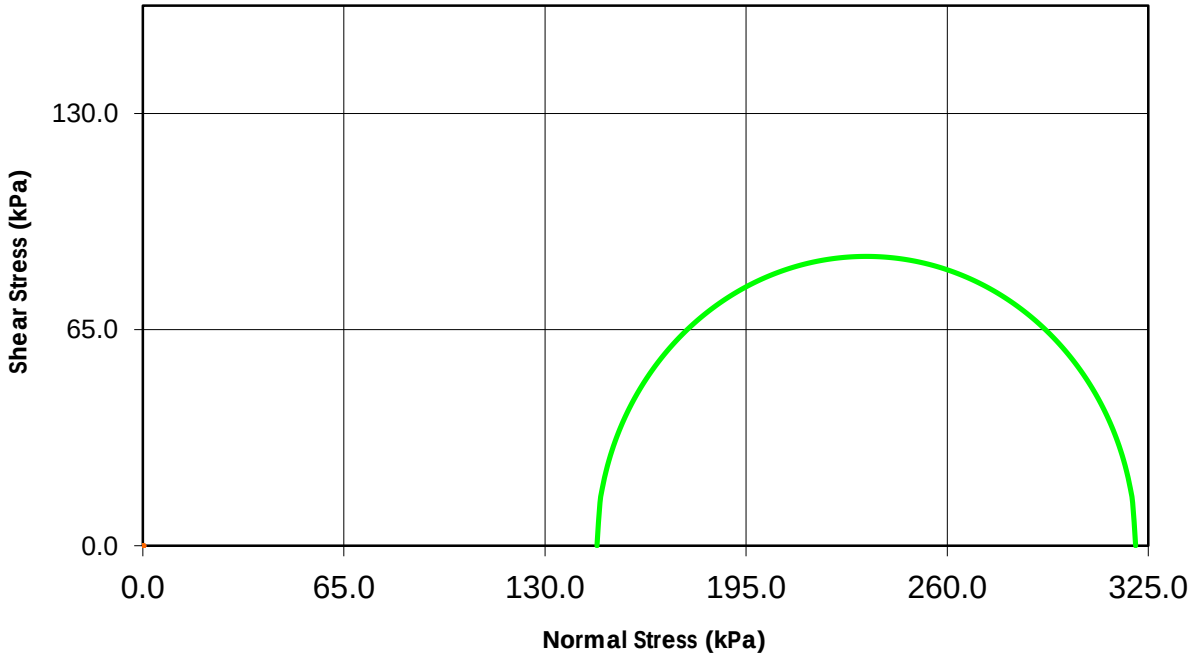

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
71.0
61.0
51.0
41.0
31.0
21.0
11.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

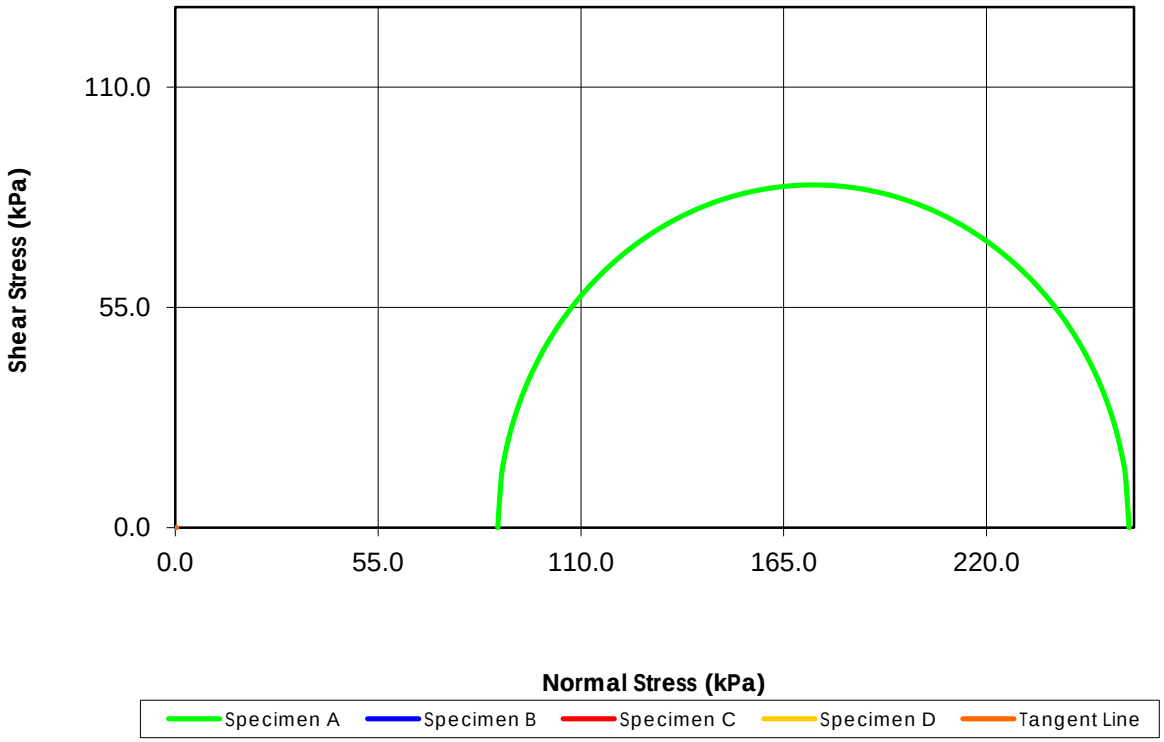



### Total Stress
### (C = 0.0 Ø = 0.0)

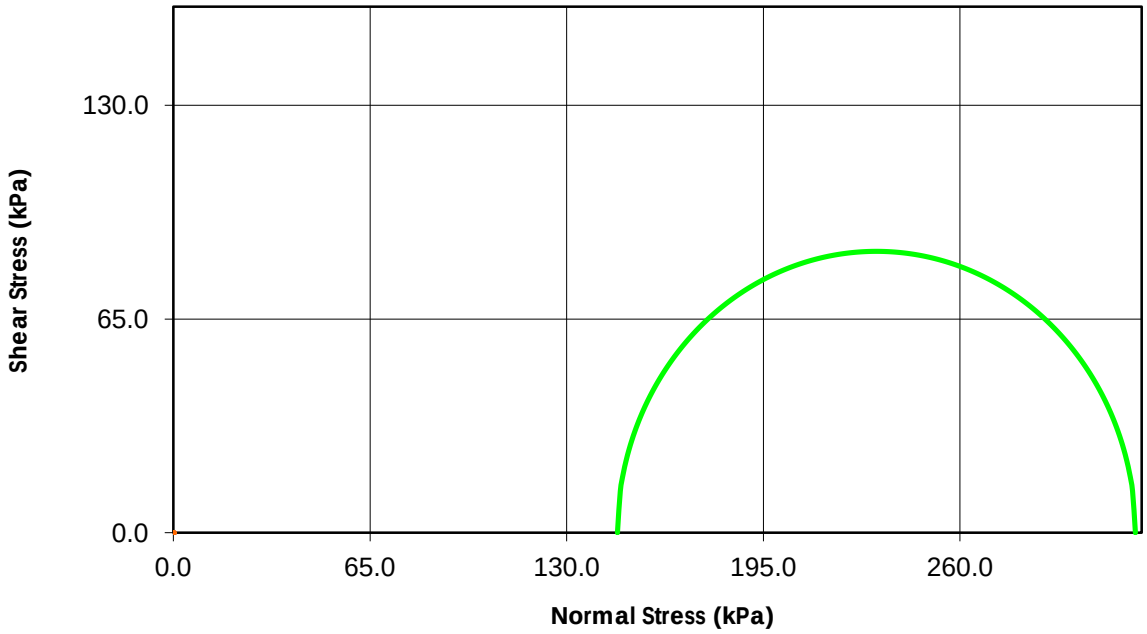


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

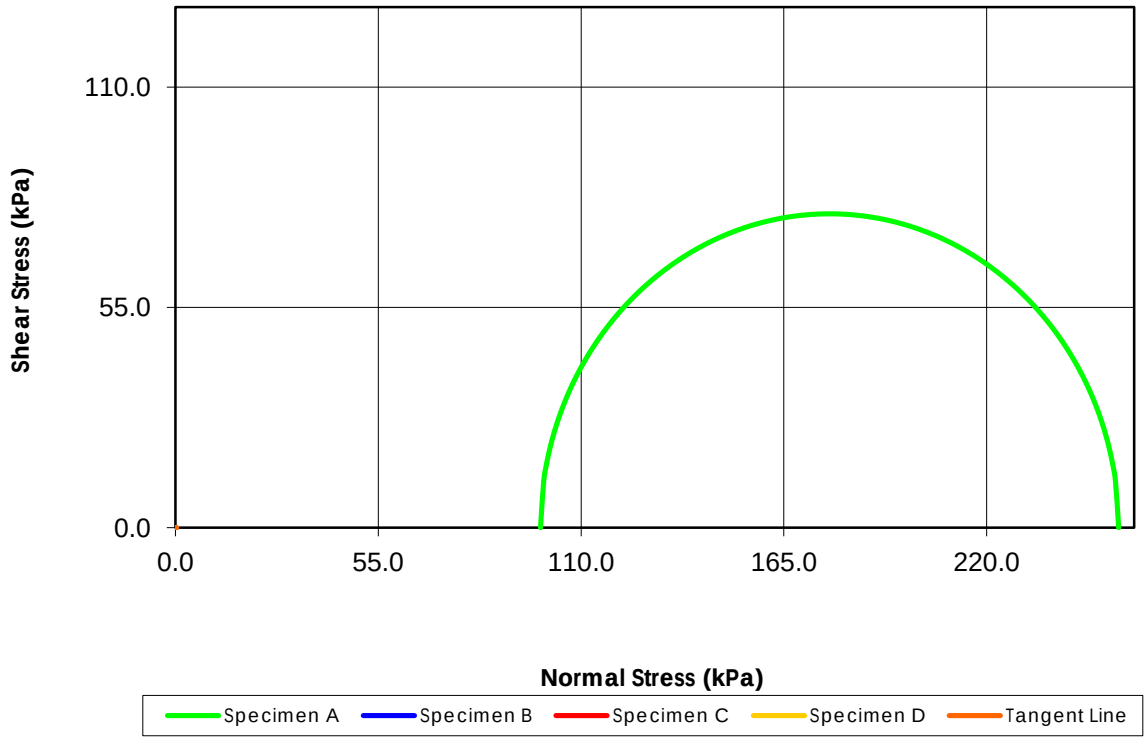



## Total Stress
## (C = 0.0 Ø = 0.0)

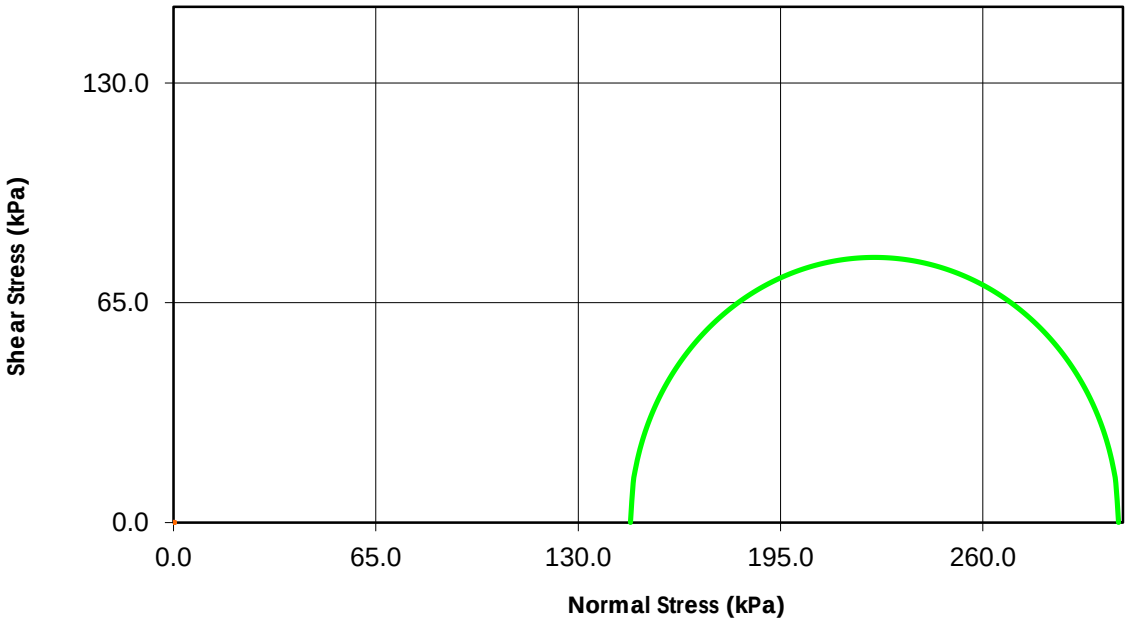


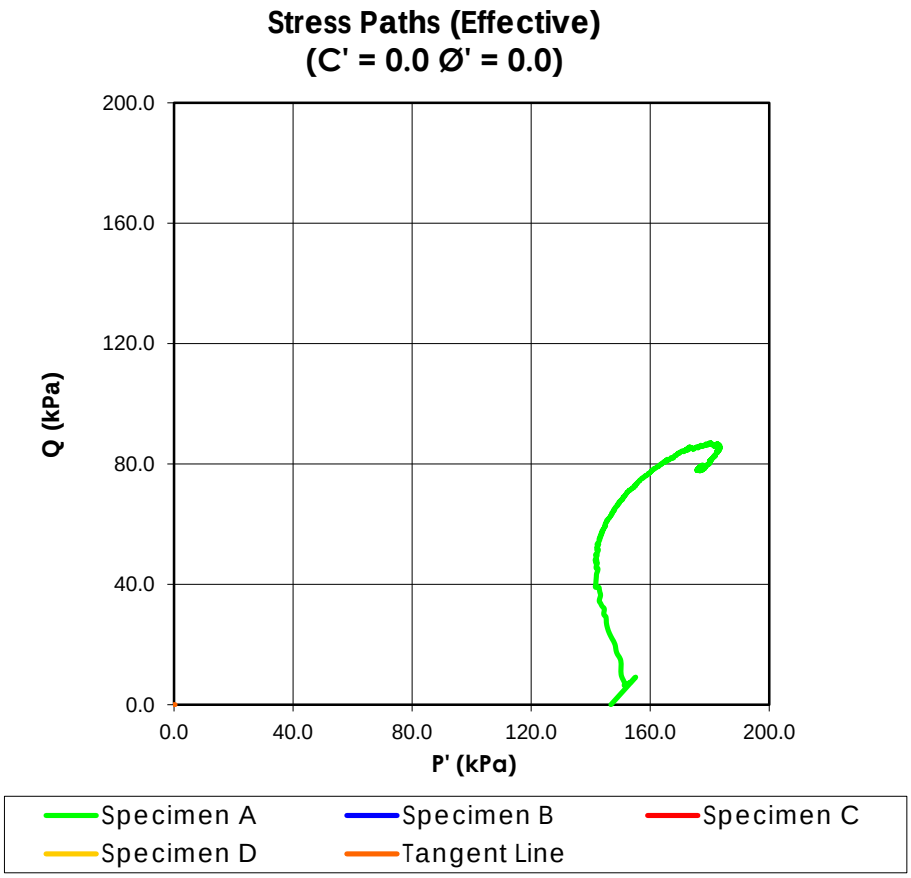
# Mohr Stress Circles at 15% Axial Strain Criterion

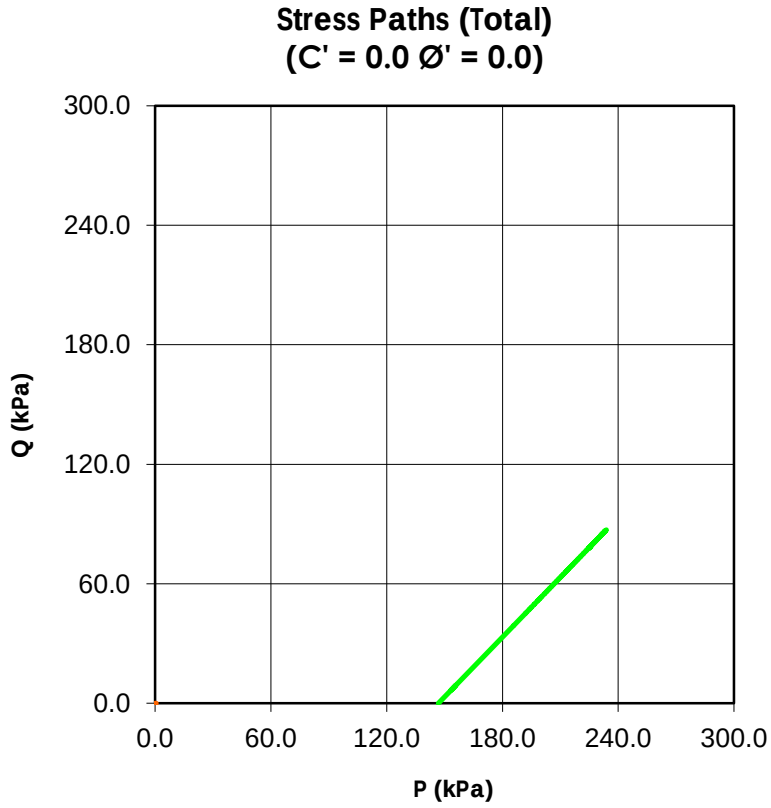
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

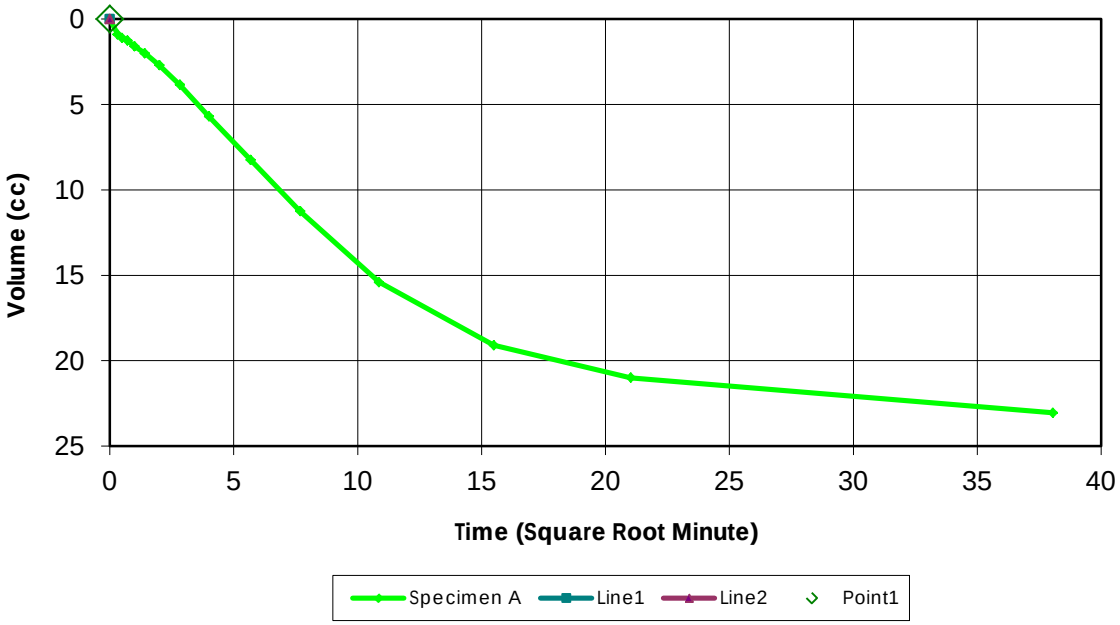



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
200.0
160.0
120.0
80.0
40.0
0.0
Q (kPa)
0.0
40.0
80.0
120.0
160.0
200.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

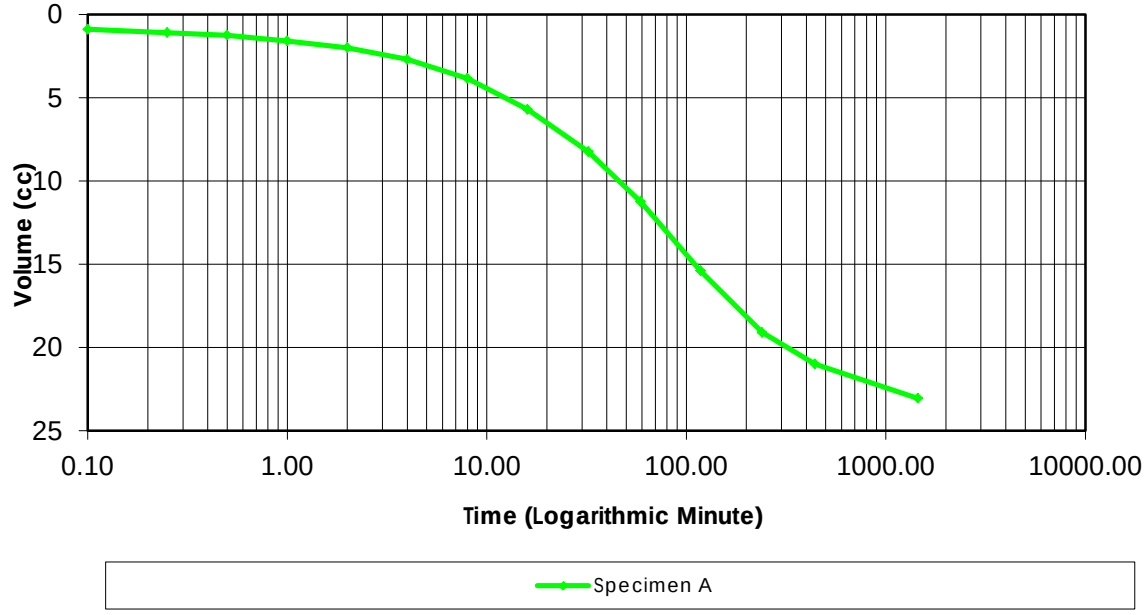

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 0.64 |
| 3 | 150.0 | 130.0 | 0.0 | 70.0 | |
| 4 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 5 | 220.0 | 130.0 | 70.0 | 0.0 | 0.71 |
| 6 | 220.0 | 200.0 | 0.0 | 70.0 | |
| 7 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 8 | 290.0 | 200.0 | 70.0 | 0.0 | 0.95 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.220

Project Name: SR1

Project Location:

Hole No. 0  Depth: 4.6-5.2m

| | |
|---|---|
| Cell Pressure (kPa) | 350 |
| Back Pressure (kPa) | 200 |
| Effective Pressure (kPa) | 150 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72 |
| Initial Sample Height (mm) | 157.5 |
| Initial Sample Area (cm2) | 40.72 |
| Initial Volume (cm3) | 641.3 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 45.50 | N/A |
| 00:00:06 | 44.60 | 0.900 |
| 00:00:15 | 44.40 | 1.100 |
| 00:00:30 | 44.25 | 1.250 |
| 00:01:00 | 43.90 | 1.600 |
| 00:02:00 | 43.50 | 2.000 |
| 00:04:00 | 42.80 | 2.700 |
| 00:08:00 | 41.65 | 3.850 |
| 00:16:00 | 39.80 | 5.700 |
| 00:32:20 | 37.25 | 8.250 |
| 00:59:02 | 34.25 | 11.250 |
| 01:58:00 | 30.10 | 15.400 |
| 04:00:00 | 26.40 | 19.100 |
| 07:22:00 | 24.50 | 21.000 |
| 24:08:00 | 22.45 | 23.050 |
| | | |

Laboratory Supervisor

**Stantec Consulting Ltd.**

**Unconsolidated Undrained Triaxial Test (ASTM D2850)**

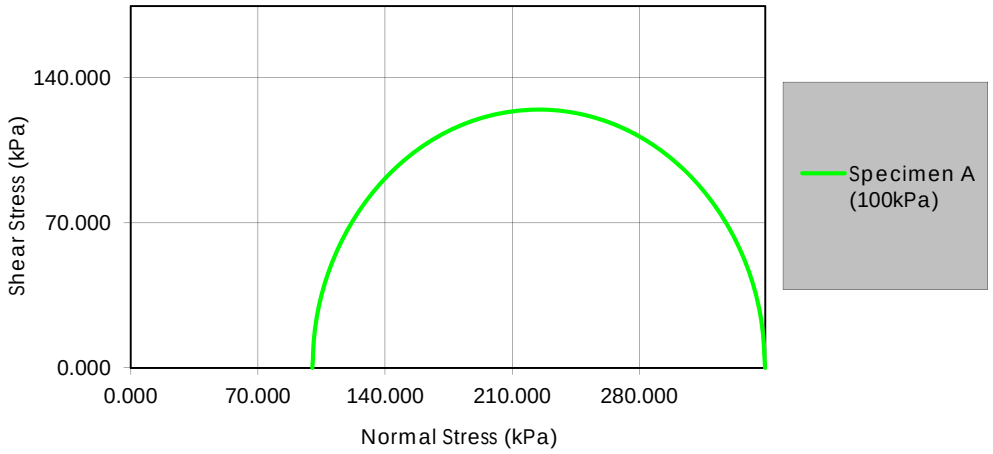
Stantec

Checked By: C.Lamouruex

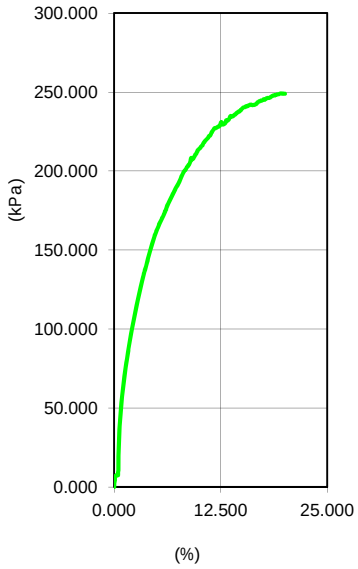
Date 28-Apr-16

Tested By: C.Tollifson

## Mohr Circles




## Stress-Strain Curve




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 13.3 | - | - | - |
| Dry Density (g/cm3) | 1.955 | - | - | - |
| Saturation (%) | 94.10 | - | - | - |
| Void Ratio | 0.38 | - | - | - |
| Diameter (mm) | 70.8 | - | - | - |
| Height (mm) | 141.5 | - | - | - |
| Liquid Limit | | | | |
| Plastic Limit | | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 12.8 | - | - | - |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | - | - | - |
| Peak Deviator Stress (kPa) | 249.188 | - | - | - |
| Axial Strain @ Failure (%) | 19.643 | - | - | - |
| | **Cell Pressure** | | | |
| Cell (kPa) | 100.0 | - | - | - |
| Back (kPa) | n/a | - | - | - |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 349.2 | - | - | - |
| σ3 (kPa) | 100.0 | - | - | - |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | - | Dark Brown Sandy Clay |
| Friction Angle Ø | - | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.220 | Job Number: | |
| Location: | - | Boring Number: | |
| Client: | Alberta Transportation | Sample Number: | DC1-BSC |
| Remarks: | | | |

# Stantec Consulting Ltd.

## Unconsolidated Undrained Triaxial Test (ASTM D2850)

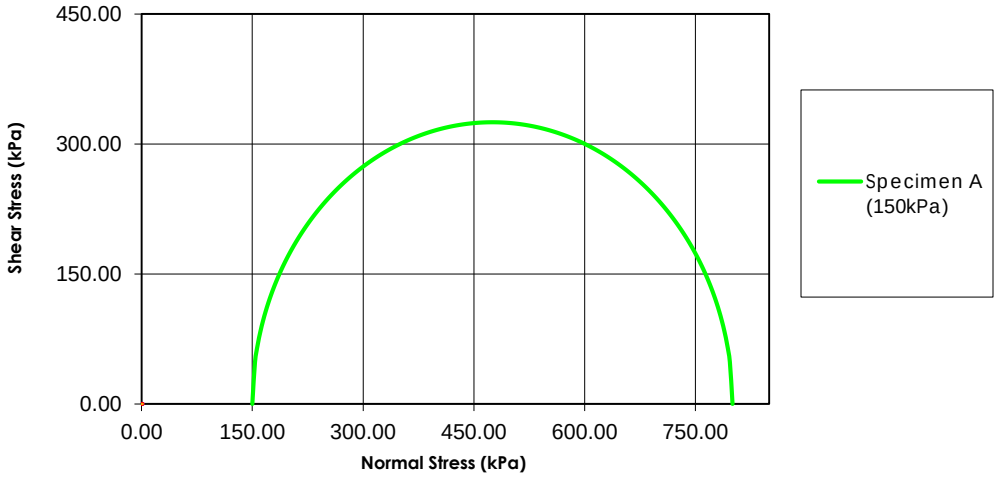
Stantec

Checked By: C. Lamoureux

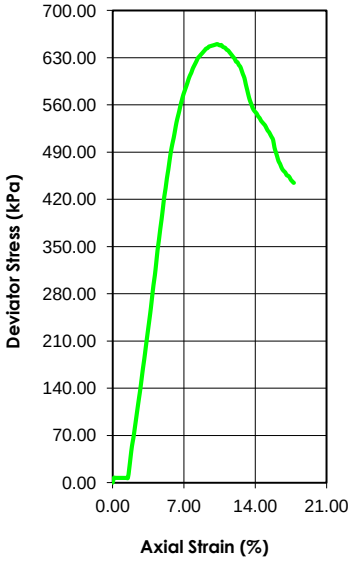
Date: 22-Jun-16

Tested By: C. Oost

### Mohr Circles




### Stress-Strain Curve

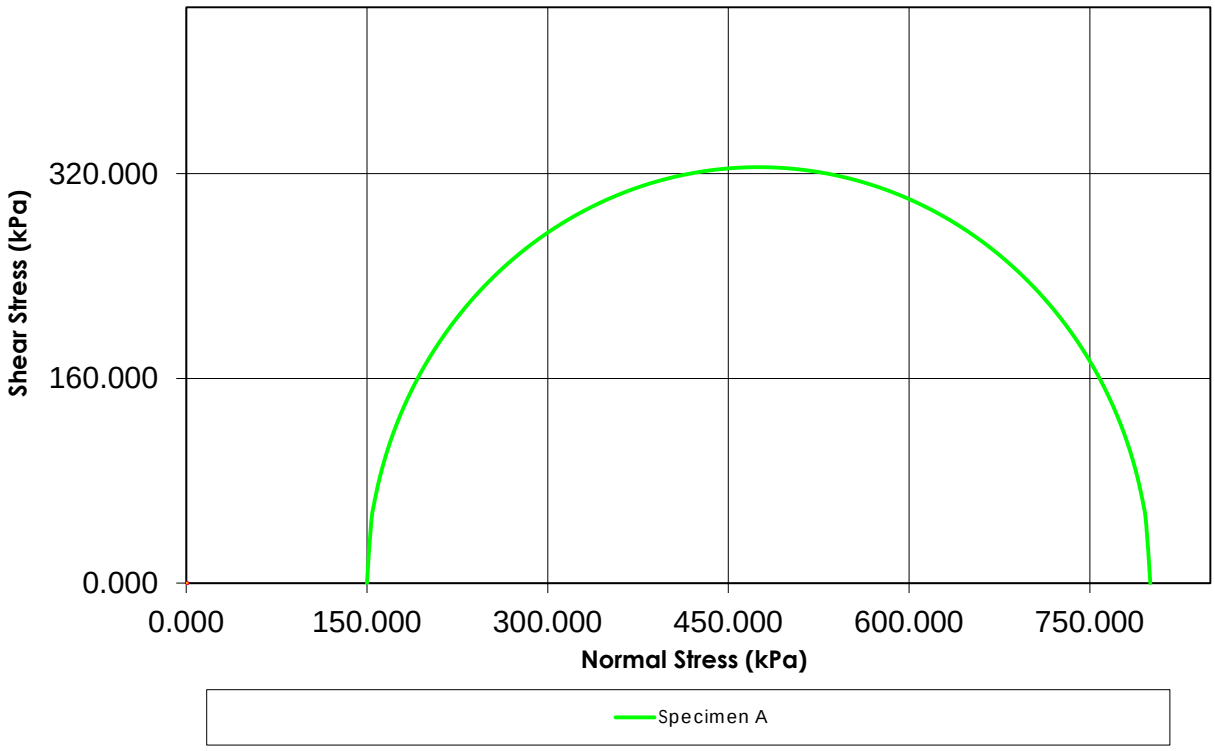


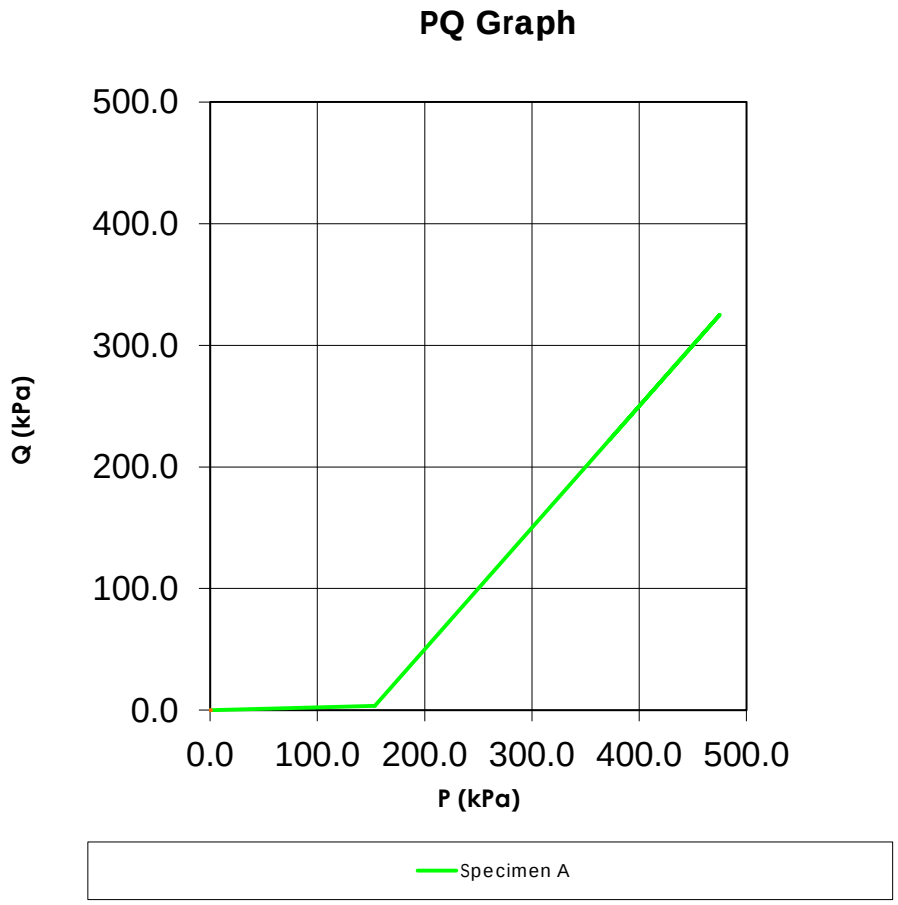

| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 17.7 | | | |
| Dry Density (g/cm3) | 1.819 | | | |
| Saturation (%) | 98.76 | | | |
| Void Ratio | 0.48 | | | |
| Diameter (mm) | 72.40 | | | |
| Height (mm) | 124.30 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 14.2 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | | | |
| Peak Dev. Stress (kPa) | 650.220 | | | |
| Axial Strain @ Failure (%) | 10.259 | | | |
| | **Cell Pressure** | | | |
| Cell (kPa) | 150.0 | | | |
| Back (kPa) | n/a | | | |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 800.2 | | | |
| σ3 (kPa) | 150.0 | | | |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Clay |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.230 | Job Number: | - |
| Location: | - | Boring Number: | - |
| Client: | Alberta Transportation | Sample Num: | DC8 ST2 |
| Remarks: | | | |

## Mohr Circles




PQ Graph
500.0
400.0
300.0
200.0
100.0
0.0
Q (kPa)
0.0
100.0
200.0
300.0
400.0
500.0
P (kPa)
Specimen A

## Specimen A Information
**UU Triaxial Test**

**Stantec Consulting Ltd.**

File Location
lab_110773396_uut_dc8st2.HSD

### Project Information

Project No. 110773396.302.702.2 Test Date: 23-Jun-16 Sample Number: DC8 ST2
Project Name: SR1
Client: Alberta Transportation
Sample Location: -
Sample Description: Brown Clay
Remarks: -

### Specimen A Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.70 LL: - PL: -

| Sample Parameters | Before Test | After Test |
|---|---|---|
| Diameter (mm) | 72.400 | |
| Height (mm) | 124.300 | |
| Weight (g) | 1095.70 | |
| Moisture (%) | 17.7 | 14.2 |
| Dry Density (g/cm3) | 1.819 | |
| Saturation (%) | 98.76 | |
| Void Ratio | 0.48 | |

### Specimen A Test Data

Rate of Strain: 2 (mm/min)
Cell Pressure: 150.0 (kPa)
Effective Confining Stress: 150.0 (kPa)
Peak Deviator Stress: 650.220 (kPa) at reading number: 77
Height\Diameter Ratio: 1.72
Axial Strain @ Failure: 10.259 (%)

| Read Number | Disp (mm) | Load Kn) | Axial Strain (%) | Deviator Stress (kPa) | Corr. Deviator Stress (kPa) | Principal Stresses $Q_1$ (kPa) | Principal Stresses $Q_3$ (kPa) | Principal Stresses 1:3 Ratio (kPa) | P (kPa) | Q (kPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2.849 | 0.0 | 0.000 | 0.000 | 0.000 | 150.0 | 150.0 | 1.00 | 0.0 | 0.0 |
| 1 | 3.000 | 0.0 | 0.122 | 7.138 | 7.130 | 157.1 | 150.0 | 1.05 | 153.6 | 3.6 |
| 2 | 3.171 | 0.0 | 0.259 | 7.138 | 7.120 | 157.1 | 150.0 | 1.05 | 153.6 | 3.6 |
| 3 | 3.337 | 0.0 | 0.392 | 7.138 | 7.110 | 157.1 | 150.0 | 1.05 | 153.6 | 3.6 |
| 4 | 3.513 | 0.0 | 0.534 | 7.138 | 7.100 | 157.1 | 150.0 | 1.05 | 153.6 | 3.6 |
| 5 | 3.684 | 0.0 | 0.672 | 7.138 | 7.090 | 157.1 | 150.0 | 1.05 | 153.5 | 3.5 |
| 6 | 3.852 | 0.0 | 0.807 | 7.138 | 7.081 | 157.1 | 150.0 | 1.05 | 153.5 | 3.5 |
| 7 | 4.020 | 0.0 | 0.942 | 7.138 | 7.071 | 157.1 | 150.0 | 1.05 | 153.5 | 3.5 |
| 8 | 4.194 | 0.0 | 1.082 | 7.138 | 7.061 | 157.1 | 150.0 | 1.05 | 153.5 | 3.5 |
| 9 | 4.362 | 0.0 | 1.217 | 7.138 | 7.052 | 157.1 | 150.0 | 1.05 | 153.5 | 3.5 |
| 10 | 4.530 | 0.0 | 1.352 | 7.138 | 7.042 | 157.0 | 150.0 | 1.05 | 153.5 | 3.5 |
| 11 | 4.703 | 0.0 | 1.492 | 7.138 | 7.032 | 157.0 | 150.0 | 1.05 | 153.5 | 3.5 |
| 12 | 4.871 | 0.1 | 1.627 | 21.415 | 21.067 | 171.1 | 150.0 | 1.14 | 160.5 | 10.5 |
| 13 | 5.039 | 0.2 | 1.762 | 39.261 | 38.569 | 188.6 | 150.0 | 1.26 | 169.3 | 19.3 |
| 14 | 5.202 | 0.2 | 1.893 | 55.323 | 54.275 | 204.3 | 150.0 | 1.36 | 177.1 | 27.1 |
| 15 | 5.378 | 0.3 | 2.035 | 67.815 | 66.435 | 216.4 | 150.0 | 1.44 | 183.2 | 33.2 |
| 16 | 5.541 | 0.3 | 2.166 | 82.092 | 80.314 | 230.3 | 150.0 | 1.54 | 190.2 | 40.2 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 5.720 | 0.4 | 2.310 | 98.153 | 95.886 | 245.9 | 150.0 | 1.64 | 197.9 | 47.9 |
| 18 | 5.877 | 0.5 | 2.436 | 112.430 | 109.691 | 259.7 | 150.0 | 1.73 | 204.8 | 54.8 |
| 19 | 6.059 | 0.5 | 2.582 | 128.491 | 125.173 | 275.2 | 150.0 | 1.83 | 212.6 | 62.6 |
| 20 | 6.224 | 0.6 | 2.715 | 142.768 | 138.891 | 288.9 | 150.0 | 1.93 | 219.4 | 69.4 |
| 21 | 6.384 | 0.7 | 2.844 | 158.830 | 154.313 | 304.3 | 150.0 | 2.03 | 227.2 | 77.2 |
| 22 | 6.547 | 0.7 | 2.975 | 174.891 | 169.688 | 319.7 | 150.0 | 2.13 | 234.8 | 84.8 |
| 23 | 6.706 | 0.8 | 3.103 | 189.168 | 183.297 | 333.3 | 150.0 | 2.22 | 241.6 | 91.6 |
| 24 | 6.866 | 0.9 | 3.232 | 205.229 | 198.597 | 348.6 | 150.0 | 2.32 | 249.3 | 99.3 |
| 25 | 7.026 | 0.9 | 3.360 | 221.291 | 213.854 | 363.9 | 150.0 | 2.43 | 256.9 | 106.9 |
| 26 | 7.191 | 1.0 | 3.493 | 237.352 | 229.060 | 379.1 | 150.0 | 2.53 | 264.5 | 114.5 |
| 27 | 7.357 | 1.1 | 3.626 | 253.414 | 244.224 | 394.2 | 150.0 | 2.63 | 272.1 | 122.1 |
| 28 | 7.514 | 1.1 | 3.753 | 269.475 | 259.362 | 409.4 | 150.0 | 2.73 | 279.7 | 129.7 |
| 29 | 7.668 | 1.2 | 3.877 | 287.321 | 276.182 | 426.2 | 150.0 | 2.84 | 288.1 | 138.1 |
| 30 | 7.828 | 1.3 | 4.005 | 305.167 | 292.944 | 442.9 | 150.0 | 2.95 | 296.5 | 146.5 |
| 31 | 8.001 | 1.3 | 4.145 | 321.228 | 307.913 | 457.9 | 150.0 | 3.05 | 304.0 | 154.0 |
| 32 | 8.153 | 1.4 | 4.267 | 339.074 | 324.606 | 474.6 | 150.0 | 3.16 | 312.3 | 162.3 |
| 33 | 8.324 | 1.5 | 4.404 | 360.490 | 344.612 | 494.6 | 150.0 | 3.30 | 322.3 | 172.3 |
| 34 | 8.489 | 1.6 | 4.537 | 376.551 | 359.465 | 509.5 | 150.0 | 3.40 | 329.7 | 179.7 |
| 35 | 8.654 | 1.6 | 4.670 | 394.397 | 375.977 | 526.0 | 150.0 | 3.51 | 338.0 | 188.0 |
| 36 | 8.820 | 1.7 | 4.803 | 410.458 | 390.742 | 540.7 | 150.0 | 3.60 | 345.4 | 195.4 |
| 37 | 8.982 | 1.8 | 4.934 | 428.305 | 407.171 | 557.2 | 150.0 | 3.71 | 353.6 | 203.6 |
| 38 | 9.139 | 1.8 | 5.061 | 446.151 | 423.573 | 573.6 | 150.0 | 3.82 | 361.8 | 211.8 |
| 39 | 9.307 | 1.9 | 5.196 | 460.427 | 436.505 | 586.5 | 150.0 | 3.91 | 368.3 | 218.3 |
| 40 | 9.464 | 2.0 | 5.322 | 476.489 | 451.129 | 601.1 | 150.0 | 4.01 | 375.6 | 225.6 |
| 41 | 9.635 | 2.0 | 5.460 | 490.766 | 463.972 | 614.0 | 150.0 | 4.09 | 382.0 | 232.0 |
| 42 | 9.801 | 2.1 | 5.593 | 506.827 | 478.482 | 628.5 | 150.0 | 4.19 | 389.2 | 239.2 |
| 43 | 9.960 | 2.2 | 5.721 | 521.104 | 491.291 | 641.3 | 150.0 | 4.28 | 395.6 | 245.6 |
| 44 | 10.134 | 2.2 | 5.861 | 533.596 | 502.323 | 652.3 | 150.0 | 4.35 | 401.2 | 251.2 |
| 45 | 10.302 | 2.2 | 5.996 | 544.304 | 511.667 | 661.7 | 150.0 | 4.41 | 405.8 | 255.8 |
| 46 | 10.465 | 2.3 | 6.127 | 556.796 | 522.682 | 672.7 | 150.0 | 4.48 | 411.3 | 261.3 |
| 47 | 10.627 | 2.4 | 6.258 | 569.288 | 533.665 | 683.7 | 150.0 | 4.56 | 416.8 | 266.8 |
| 48 | 10.806 | 2.4 | 6.402 | 579.996 | 542.866 | 692.9 | 150.0 | 4.62 | 421.4 | 271.4 |
| 49 | 10.963 | 2.4 | 6.528 | 588.919 | 550.474 | 700.5 | 150.0 | 4.67 | 425.2 | 275.2 |
| 50 | 11.129 | 2.5 | 6.661 | 599.626 | 559.685 | 709.7 | 150.0 | 4.73 | 429.8 | 279.8 |
| 51 | 11.294 | 2.5 | 6.794 | 608.549 | 567.205 | 717.2 | 150.0 | 4.78 | 433.6 | 283.6 |
| 52 | 11.459 | 2.5 | 6.927 | 617.472 | 574.700 | 724.7 | 150.0 | 4.83 | 437.4 | 287.4 |
| 53 | 11.622 | 2.6 | 7.058 | 624.611 | 580.527 | 730.5 | 150.0 | 4.87 | 440.3 | 290.3 |
| 54 | 11.787 | 2.6 | 7.191 | 631.749 | 586.322 | 736.3 | 150.0 | 4.91 | 443.2 | 293.2 |
| 55 | 11.952 | 2.6 | 7.324 | 638.888 | 592.097 | 742.1 | 150.0 | 4.95 | 446.0 | 296.0 |
| 56 | 12.101 | 2.7 | 7.443 | 646.026 | 597.939 | 747.9 | 150.0 | 4.99 | 449.0 | 299.0 |
| 57 | 12.278 | 2.7 | 7.585 | 653.164 | 603.620 | 753.6 | 150.0 | 5.02 | 451.8 | 301.8 |
| 58 | 12.440 | 2.7 | 7.716 | 658.518 | 607.706 | 757.7 | 150.0 | 5.05 | 453.9 | 303.9 |
| 59 | 12.605 | 2.7 | 7.849 | 665.657 | 613.409 | 763.4 | 150.0 | 5.09 | 456.7 | 306.7 |
| 60 | 12.765 | 2.8 | 7.978 | 671.010 | 617.479 | 767.5 | 150.0 | 5.12 | 458.7 | 308.7 |
| 61 | 12.933 | 2.8 | 8.113 | 676.364 | 621.492 | 771.5 | 150.0 | 5.14 | 460.7 | 310.7 |
| 62 | 13.096 | 2.8 | 8.244 | 681.718 | 625.520 | 775.5 | 150.0 | 5.17 | 462.8 | 312.8 |
| 63 | 13.253 | 2.8 | 8.370 | 687.072 | 629.564 | 779.6 | 150.0 | 5.20 | 464.8 | 314.8 |
| 64 | 13.426 | 2.9 | 8.510 | 690.641 | 631.870 | 781.9 | 150.0 | 5.21 | 465.9 | 315.9 |
| 65 | 13.584 | 2.9 | 8.636 | 694.210 | 634.258 | 784.3 | 150.0 | 5.23 | 467.1 | 317.1 |
| 66 | 13.760 | 2.9 | 8.778 | 697.779 | 636.529 | 786.5 | 150.0 | 5.24 | 468.3 | 318.3 |
| 67 | 13.922 | 2.9 | 8.909 | 701.349 | 638.868 | 788.9 | 150.0 | 5.26 | 469.4 | 319.4 |
| 68 | 14.090 | 2.9 | 9.044 | 704.918 | 641.166 | 791.2 | 150.0 | 5.27 | 470.6 | 320.6 |
| 69 | 14.248 | 2.9 | 9.170 | 708.487 | 643.517 | 793.5 | 150.0 | 5.29 | 471.8 | 321.8 |
| 70 | 14.416 | 2.9 | 9.305 | 710.272 | 644.178 | 794.2 | 150.0 | 5.29 | 472.1 | 322.1 |
| 71 | 14.589 | 2.9 | 9.445 | 713.841 | 646.418 | 796.4 | 150.0 | 5.31 | 473.2 | 323.2 |
| 72 | 14.757 | 3.0 | 9.580 | 715.625 | 647.066 | 797.1 | 150.0 | 5.31 | 473.5 | 323.5 |
| 73 | 14.920 | 3.0 | 9.711 | 717.410 | 647.742 | 797.7 | 150.0 | 5.32 | 473.9 | 323.9 |
| 74 | 15.099 | 3.0 | 9.855 | 719.195 | 648.317 | 798.3 | 150.0 | 5.32 | 474.2 | 324.2 |
| 75 | 15.267 | 3.0 | 9.990 | 720.979 | 648.951 | 799.0 | 150.0 | 5.33 | 474.5 | 324.5 |
| 76 | 15.432 | 3.0 | 10.123 | 722.764 | 649.596 | 799.6 | 150.0 | 5.33 | 474.8 | 324.8 |
| 77 | 15.600 | 3.0 | 10.259 | 724.549 | 650.220 | 800.2 | 150.0 | 5.33 | 475.1 | 325.1 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 15.760 | 3.0 | 10.387 | 724.549 | 649.289 | 799.3 | 150.0 | 5.33 | 474.6 | 324.6 |
| 79 | 15.934 | 3.0 | 10.527 | 724.549 | 648.277 | 798.3 | 150.0 | 5.32 | 474.1 | 324.1 |
| 80 | 16.105 | 3.0 | 10.664 | 726.333 | 648.875 | 798.9 | 150.0 | 5.33 | 474.4 | 324.4 |
| 81 | 16.275 | 3.0 | 10.802 | 724.549 | 646.285 | 796.3 | 150.0 | 5.31 | 473.1 | 323.1 |
| 82 | 16.430 | 3.0 | 10.926 | 724.549 | 645.386 | 795.4 | 150.0 | 5.30 | 472.7 | 322.7 |
| 83 | 16.595 | 3.0 | 11.059 | 724.549 | 644.422 | 794.4 | 150.0 | 5.30 | 472.2 | 322.2 |
| 84 | 16.758 | 3.0 | 11.190 | 722.764 | 641.890 | 791.9 | 150.0 | 5.28 | 470.9 | 320.9 |
| 85 | 16.923 | 3.0 | 11.323 | 722.764 | 640.928 | 790.9 | 150.0 | 5.27 | 470.5 | 320.5 |
| 86 | 17.088 | 3.0 | 11.456 | 720.979 | 638.387 | 788.4 | 150.0 | 5.26 | 469.2 | 319.2 |
| 87 | 17.254 | 3.0 | 11.589 | 719.195 | 635.850 | 785.9 | 150.0 | 5.24 | 467.9 | 317.9 |
| 88 | 17.416 | 3.0 | 11.719 | 717.410 | 633.334 | 783.3 | 150.0 | 5.22 | 466.7 | 316.7 |
| 89 | 17.573 | 3.0 | 11.846 | 715.625 | 630.855 | 780.9 | 150.0 | 5.21 | 465.4 | 315.4 |
| 90 | 17.744 | 2.9 | 11.983 | 713.841 | 628.300 | 778.3 | 150.0 | 5.19 | 464.2 | 314.2 |
| 91 | 17.907 | 2.9 | 12.114 | 710.272 | 624.230 | 774.2 | 150.0 | 5.16 | 462.1 | 312.1 |
| 92 | 18.075 | 2.9 | 12.249 | 710.272 | 623.270 | 773.3 | 150.0 | 5.16 | 461.6 | 311.6 |
| 93 | 18.245 | 2.9 | 12.387 | 706.702 | 619.166 | 769.2 | 150.0 | 5.13 | 459.6 | 309.6 |
| 94 | 18.422 | 2.9 | 12.528 | 704.918 | 616.603 | 766.6 | 150.0 | 5.11 | 458.3 | 308.3 |
| 95 | 18.590 | 2.9 | 12.664 | 699.564 | 610.974 | 761.0 | 150.0 | 5.07 | 455.5 | 305.5 |
| 96 | 18.747 | 2.9 | 12.790 | 694.210 | 605.421 | 755.4 | 150.0 | 5.04 | 452.7 | 302.7 |
| 97 | 18.929 | 2.8 | 12.936 | 688.856 | 599.744 | 749.7 | 150.0 | 5.00 | 449.9 | 299.9 |
| 98 | 19.083 | 2.8 | 13.060 | 679.933 | 591.131 | 741.1 | 150.0 | 4.94 | 445.6 | 295.6 |
| 99 | 19.259 | 2.8 | 13.202 | 671.010 | 582.422 | 732.4 | 150.0 | 4.88 | 441.2 | 291.2 |
| 100 | 19.430 | 2.7 | 13.340 | 662.087 | 573.767 | 723.8 | 150.0 | 4.83 | 436.9 | 286.9 |
| 101 | 19.593 | 2.7 | 13.470 | 654.949 | 566.724 | 716.7 | 150.0 | 4.78 | 433.4 | 283.4 |
| 102 | 19.766 | 2.7 | 13.610 | 649.595 | 561.184 | 711.2 | 150.0 | 4.74 | 430.6 | 280.6 |
| 103 | 19.923 | 2.7 | 13.736 | 644.241 | 555.745 | 705.7 | 150.0 | 4.70 | 427.9 | 277.9 |
| 104 | 20.102 | 2.6 | 13.881 | 640.672 | 551.743 | 701.7 | 150.0 | 4.68 | 425.9 | 275.9 |
| 105 | 20.271 | 2.6 | 14.016 | 638.888 | 549.343 | 699.3 | 150.0 | 4.66 | 424.7 | 274.7 |
| 106 | 20.430 | 2.6 | 14.144 | 637.103 | 546.989 | 697.0 | 150.0 | 4.65 | 423.5 | 273.5 |
| 107 | 20.601 | 2.6 | 14.282 | 633.534 | 543.054 | 693.1 | 150.0 | 4.62 | 421.5 | 271.5 |
| 108 | 20.778 | 2.6 | 14.424 | 631.749 | 540.628 | 690.6 | 150.0 | 4.60 | 420.3 | 270.3 |
| 109 | 20.946 | 2.6 | 14.559 | 628.180 | 536.724 | 686.7 | 150.0 | 4.58 | 418.4 | 268.4 |
| 110 | 21.103 | 2.6 | 14.685 | 626.395 | 534.408 | 684.4 | 150.0 | 4.56 | 417.2 | 267.2 |
| 111 | 21.268 | 2.6 | 14.818 | 624.611 | 532.055 | 682.1 | 150.0 | 4.55 | 416.0 | 266.0 |
| 112 | 21.439 | 2.6 | 14.956 | 622.826 | 529.679 | 679.7 | 150.0 | 4.53 | 414.8 | 264.8 |
| 113 | 21.604 | 2.6 | 15.089 | 619.257 | 525.820 | 675.8 | 150.0 | 4.51 | 412.9 | 262.9 |
| 114 | 21.769 | 2.5 | 15.222 | 615.688 | 521.970 | 672.0 | 150.0 | 4.48 | 411.0 | 261.0 |
| 115 | 21.929 | 2.5 | 15.350 | 613.903 | 519.668 | 669.7 | 150.0 | 4.46 | 409.8 | 259.8 |
| 116 | 22.097 | 2.5 | 15.485 | 610.334 | 515.821 | 665.8 | 150.0 | 4.44 | 407.9 | 257.9 |
| 117 | 22.265 | 2.5 | 15.621 | 606.765 | 511.984 | 662.0 | 150.0 | 4.41 | 406.0 | 256.0 |
| 118 | 22.425 | 2.5 | 15.749 | 603.196 | 508.197 | 658.2 | 150.0 | 4.39 | 404.1 | 254.1 |
| 119 | 22.591 | 2.4 | 15.882 | 590.703 | 496.887 | 646.9 | 150.0 | 4.31 | 398.4 | 248.4 |
| 120 | 22.756 | 2.4 | 16.015 | 583.565 | 490.106 | 640.1 | 150.0 | 4.27 | 395.1 | 245.1 |
| 121 | 22.927 | 2.4 | 16.153 | 576.426 | 483.319 | 633.3 | 150.0 | 4.22 | 391.7 | 241.7 |
| 122 | 23.092 | 2.4 | 16.286 | 569.288 | 476.576 | 626.6 | 150.0 | 4.18 | 388.3 | 238.3 |
| 123 | 23.266 | 2.3 | 16.425 | 565.719 | 472.798 | 622.8 | 150.0 | 4.15 | 386.4 | 236.4 |
| 124 | 23.436 | 2.3 | 16.563 | 560.365 | 467.554 | 617.6 | 150.0 | 4.12 | 383.8 | 233.8 |
| 125 | 23.602 | 2.3 | 16.696 | 556.796 | 463.835 | 613.8 | 150.0 | 4.09 | 381.9 | 231.9 |
| 126 | 23.770 | 2.3 | 16.831 | 555.011 | 461.598 | 611.6 | 150.0 | 4.08 | 380.8 | 230.8 |
| 127 | 23.938 | 2.3 | 16.966 | 553.227 | 459.366 | 609.4 | 150.0 | 4.06 | 379.7 | 229.7 |
| 128 | 24.092 | 2.3 | 17.090 | 549.657 | 455.720 | 605.7 | 150.0 | 4.04 | 377.9 | 227.9 |
| 129 | 24.263 | 2.3 | 17.228 | 549.657 | 454.964 | 605.0 | 150.0 | 4.03 | 377.5 | 227.5 |
| 130 | 24.428 | 2.3 | 17.361 | 547.873 | 452.758 | 602.8 | 150.0 | 4.02 | 376.4 | 226.4 |
| 131 | 24.588 | 2.2 | 17.489 | 544.304 | 449.109 | 599.1 | 150.0 | 3.99 | 374.6 | 224.6 |
| 132 | 24.748 | 2.2 | 17.618 | 542.519 | 446.939 | 596.9 | 150.0 | 3.98 | 373.5 | 223.5 |
| 133 | 24.916 | 2.2 | 17.753 | 540.734 | 444.738 | 594.7 | 150.0 | 3.96 | 372.4 | 222.4 |
| 134 | 24.960 | 2.2 | 17.788 | 540.734 | 444.546 | 594.5 | 150.0 | 3.96 | 372.3 | 222.3 |

Test Performed By: Checked By:

## Stantec Consulting Ltd.

**Unconsolidated Undrained Triaxial Test (ASTM D2850)**

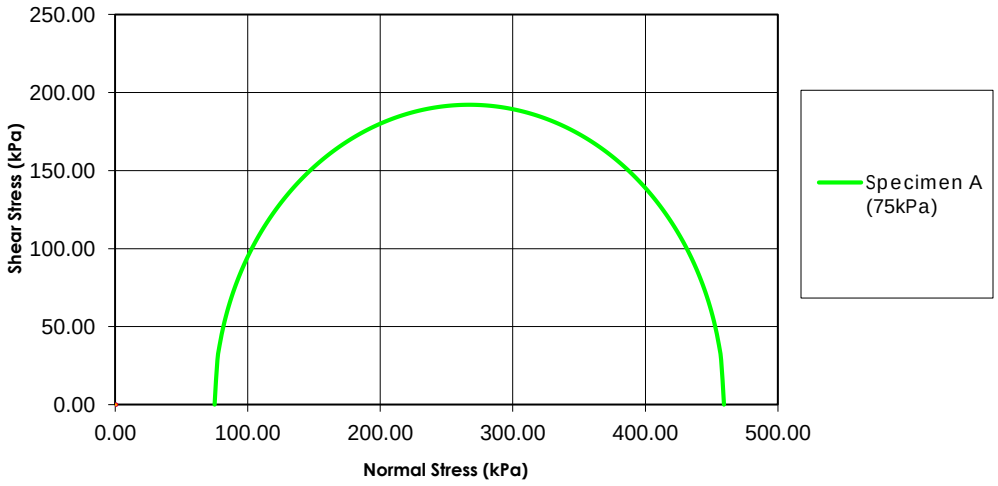
Stantec

Checked By: C. Lamoureux

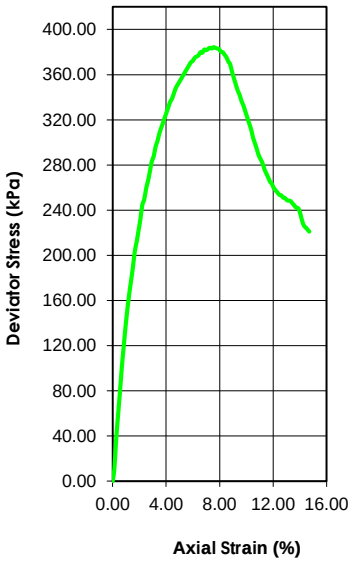
Date: 22-Jun-16

Tested By: C. Oost

### Mohr Circles



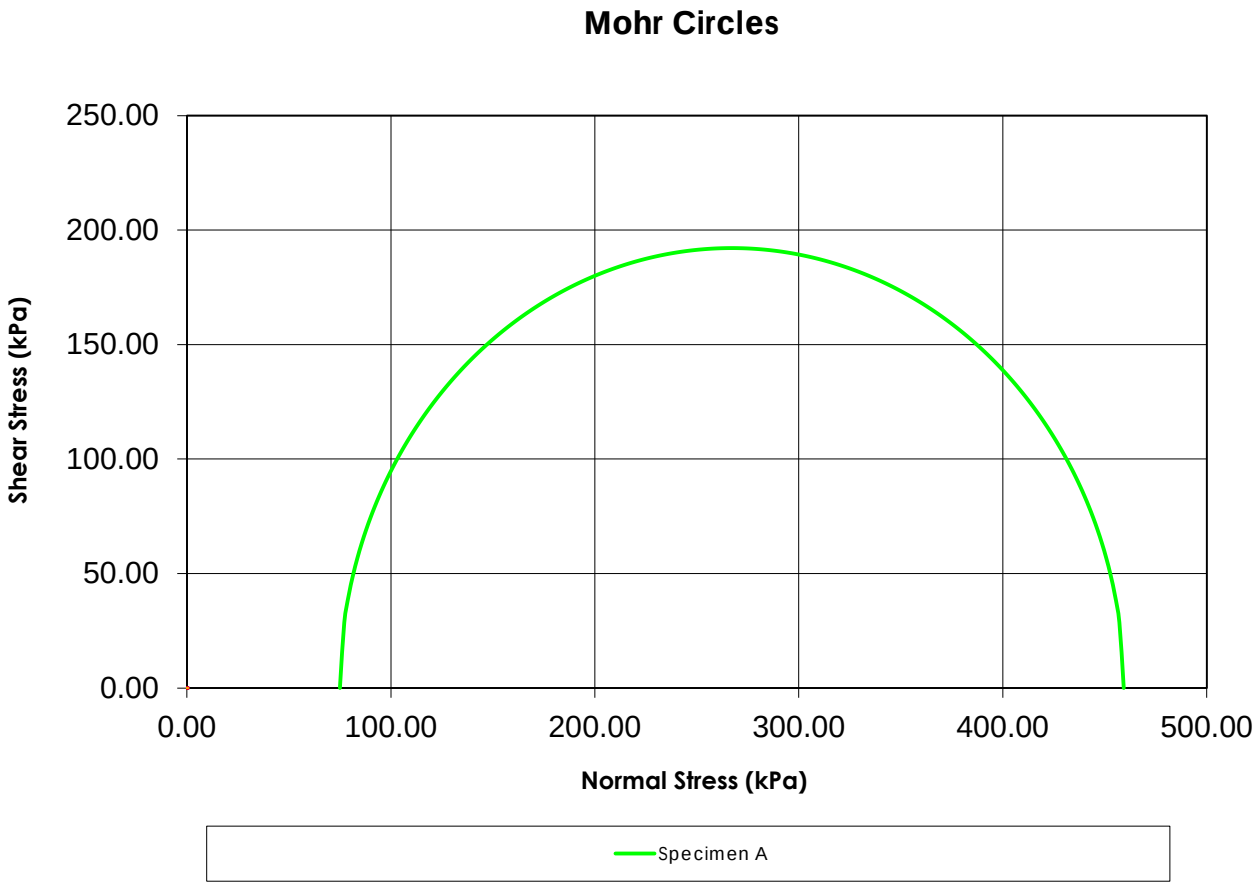

### Stress-Strain Curve

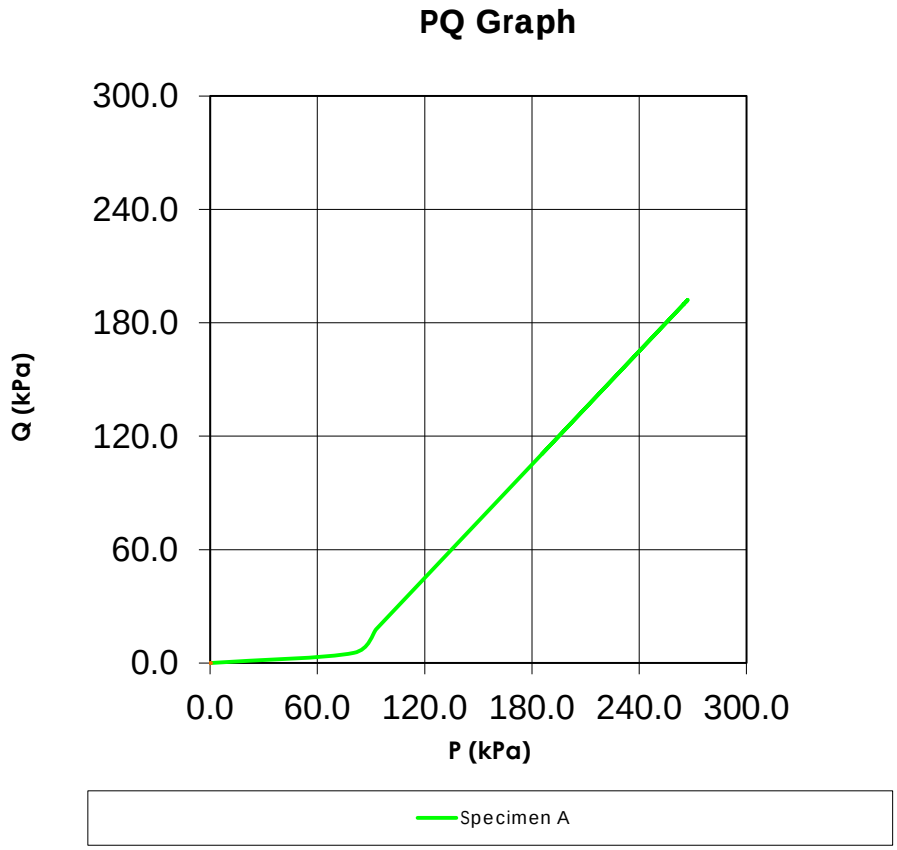



| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 24.7 | | | |
| Dry Density (g/cm3) | 1.593 | | | |
| Saturation (%) | 96.06 | | | |
| Void Ratio | 0.70 | | | |
| Diameter (mm) | 72.10 | | | |
| Height (mm) | 119.00 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 25.8 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | | | |
| Peak Dev. Stress (kPa) | 384.305 | | | |
| Axial Strain @ Failure (%) | 7.548 | | | |
| | **Cell Pressure** | | | |
| Cell (kPa) | 75.0 | | | |
| Back (kPa) | n/a | | | |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 459.3 | | | |
| σ3 (kPa) | 75.0 | | | |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Clay |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.230 | Job Number: | - |
| Location: | - | Boring Number: | - |
| Client: | Alberta Transportation | Sample Num: | DC14 ST2 |
| Remarks: | | | |


Mohr Circles
250.00
200.00
150.00
100.00
50.00
0.00
Shear Stress (kPa)
0.00
100.00
200.00
300.00
400.00
500.00
Normal Stress (kPa)
Specimen A


PQ Graph
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P (kPa)
Specimen A

| Specimen A Information<br>UU Triaxial Test | Stantec Consulting Ltd. |
|---|---|

File Location
lab_110773396_uut_dc14st2.HSD

## Project Information

Project No. 110773396.302.702.2 Test Date: 22-Jun-16 Sample Number: DC14 ST2
Project Name: SR1
Client: Alberta Transportation
Sample Location: -
Sample Description: Brown Clay
Remarks: -

## Specimen A Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.70 LL: - PL: -

| Sample Parameters | Before Test | After Test |
|---|---|---|
| Diameter (mm) | 72.10 | |
| Height (mm) | 119.00 | |
| Weight (g) | 965.20 | |
| Moisture (%) | 24.7 | 25.8 |
| Dry Density (g/cm3) | 1.593 | |
| Saturation (%) | 96.06 | |
| Void Ratio | 0.70 | |

## Specimen A Test Data

Rate of Strain: 2 (mm/min)
Cell Pressure: 75.0 (kPa)
Effective Confining Stress: 75.0 (kPa)
Peak Deviator Stress: 384.305 (kPa) at reading number: 54
Height\Diameter Ratio: 1.65
Axial Strain @ Failure: 7.548 (%)

| Read Number | Disp (mm) | Load Kn) | Axial Strain (%) | Deviator Stress (kPa) | Corr. Deviator Stress (kPa) | Principal Stresses | | | P (kPa) | Q (kPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $Q_1$ (kPa) | $Q_3$ (kPa) | 1:3 Ratio (kPa) | | |
| 0 | 3.293 | 0.0 | 0.000 | 0.000 | 0.000 | 75.0 | 75.0 | 1.00 | 0.0 | 0.0 |
| 1 | 3.441 | 0.1 | 0.125 | 10.797 | 10.783 | 85.8 | 75.0 | 1.14 | 80.4 | 5.4 |
| 2 | 3.596 | 0.2 | 0.255 | 35.990 | 35.898 | 110.9 | 75.0 | 1.48 | 92.9 | 17.9 |
| 3 | 3.761 | 0.2 | 0.394 | 57.583 | 57.357 | 132.4 | 75.0 | 1.76 | 103.7 | 28.7 |
| 4 | 3.937 | 0.3 | 0.542 | 79.177 | 78.748 | 153.7 | 75.0 | 2.05 | 114.4 | 39.4 |
| 5 | 4.100 | 0.4 | 0.678 | 100.771 | 100.087 | 175.1 | 75.0 | 2.33 | 125.0 | 50.0 |
| 6 | 4.260 | 0.5 | 0.813 | 118.766 | 117.801 | 192.8 | 75.0 | 2.57 | 133.9 | 58.9 |
| 7 | 4.425 | 0.6 | 0.952 | 136.761 | 135.459 | 210.5 | 75.0 | 2.81 | 142.7 | 67.7 |
| 8 | 4.590 | 0.6 | 1.091 | 152.956 | 151.288 | 226.3 | 75.0 | 3.02 | 150.6 | 75.6 |
| 9 | 4.758 | 0.7 | 1.232 | 167.352 | 165.291 | 240.3 | 75.0 | 3.20 | 157.6 | 82.6 |
| 10 | 4.929 | 0.7 | 1.375 | 179.948 | 177.474 | 252.5 | 75.0 | 3.37 | 163.7 | 88.7 |
| 11 | 5.095 | 0.8 | 1.514 | 192.545 | 189.629 | 264.6 | 75.0 | 3.53 | 169.8 | 94.8 |
| 12 | 5.260 | 0.9 | 1.653 | 206.941 | 203.520 | 278.5 | 75.0 | 3.71 | 176.8 | 101.8 |
| 13 | 5.431 | 0.9 | 1.797 | 215.938 | 212.058 | 287.1 | 75.0 | 3.83 | 181.0 | 106.0 |
| 14 | 5.601 | 0.9 | 1.940 | 226.735 | 222.336 | 297.3 | 75.0 | 3.96 | 186.2 | 111.2 |
| 15 | 5.767 | 1.0 | 2.079 | 237.532 | 232.593 | 307.6 | 75.0 | 4.10 | 191.3 | 116.3 |
| 16 | 5.929 | 1.0 | 2.216 | 250.128 | 244.586 | 319.6 | 75.0 | 4.26 | 197.3 | 122.3 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 6.100 | 1.1 | 2.359 | 255.527 | 249.498 | 324.5 | 75.0 | 4.33 | 199.7 | 124.7 |
| 18 | 6.279 | 1.1 | 2.510 | 266.324 | 259.639 | 334.6 | 75.0 | 4.46 | 204.8 | 129.8 |
| 19 | 6.447 | 1.1 | 2.651 | 273.522 | 266.270 | 341.3 | 75.0 | 4.55 | 208.1 | 133.1 |
| 20 | 6.610 | 1.2 | 2.788 | 282.519 | 274.643 | 349.6 | 75.0 | 4.66 | 212.3 | 137.3 |
| 21 | 6.772 | 1.2 | 2.924 | 291.516 | 282.992 | 358.0 | 75.0 | 4.77 | 216.5 | 141.5 |
| 22 | 6.946 | 1.2 | 3.070 | 296.915 | 287.799 | 362.8 | 75.0 | 4.84 | 218.9 | 143.9 |
| 23 | 7.109 | 1.3 | 3.207 | 305.912 | 296.102 | 371.1 | 75.0 | 4.95 | 223.1 | 148.1 |
| 24 | 7.271 | 1.3 | 3.343 | 311.311 | 300.902 | 375.9 | 75.0 | 5.01 | 225.5 | 150.5 |
| 25 | 7.434 | 1.3 | 3.480 | 318.509 | 307.425 | 382.4 | 75.0 | 5.10 | 228.7 | 153.7 |
| 26 | 7.588 | 1.3 | 3.610 | 323.907 | 312.215 | 387.2 | 75.0 | 5.16 | 231.1 | 156.1 |
| 27 | 7.756 | 1.4 | 3.751 | 329.306 | 316.954 | 392.0 | 75.0 | 5.23 | 233.5 | 158.5 |
| 28 | 7.916 | 1.4 | 3.885 | 334.704 | 321.700 | 396.7 | 75.0 | 5.29 | 235.9 | 160.9 |
| 29 | 8.081 | 1.4 | 4.024 | 340.103 | 326.416 | 401.4 | 75.0 | 5.35 | 238.2 | 163.2 |
| 30 | 8.247 | 1.4 | 4.163 | 345.501 | 331.118 | 406.1 | 75.0 | 5.41 | 240.6 | 165.6 |
| 31 | 8.404 | 1.4 | 4.295 | 350.899 | 335.828 | 410.8 | 75.0 | 5.48 | 242.9 | 167.9 |
| 32 | 8.574 | 1.5 | 4.439 | 354.498 | 338.764 | 413.8 | 75.0 | 5.52 | 244.4 | 169.4 |
| 33 | 8.740 | 1.5 | 4.577 | 359.897 | 343.423 | 418.4 | 75.0 | 5.58 | 246.7 | 171.7 |
| 34 | 8.905 | 1.5 | 4.716 | 365.295 | 348.067 | 423.1 | 75.0 | 5.64 | 249.0 | 174.0 |
| 35 | 9.070 | 1.5 | 4.855 | 368.894 | 350.983 | 426.0 | 75.0 | 5.68 | 250.5 | 175.5 |
| 36 | 9.241 | 1.5 | 4.999 | 372.493 | 353.873 | 428.9 | 75.0 | 5.72 | 251.9 | 176.9 |
| 37 | 9.412 | 1.5 | 5.142 | 376.092 | 356.752 | 431.8 | 75.0 | 5.76 | 253.4 | 178.4 |
| 38 | 9.580 | 1.6 | 5.284 | 379.691 | 359.630 | 434.6 | 75.0 | 5.80 | 254.8 | 179.8 |
| 39 | 9.745 | 1.6 | 5.423 | 383.290 | 362.506 | 437.5 | 75.0 | 5.83 | 256.3 | 181.3 |
| 40 | 9.916 | 1.6 | 5.566 | 386.889 | 365.354 | 440.4 | 75.0 | 5.87 | 257.7 | 182.7 |
| 41 | 10.087 | 1.6 | 5.710 | 390.488 | 368.192 | 443.2 | 75.0 | 5.91 | 259.1 | 184.1 |
| 42 | 10.258 | 1.6 | 5.853 | 394.087 | 371.020 | 446.0 | 75.0 | 5.95 | 260.5 | 185.5 |
| 43 | 10.420 | 1.6 | 5.990 | 395.887 | 372.174 | 447.2 | 75.0 | 5.96 | 261.1 | 186.1 |
| 44 | 10.600 | 1.6 | 6.140 | 399.485 | 374.956 | 450.0 | 75.0 | 6.00 | 262.5 | 187.5 |
| 45 | 10.770 | 1.6 | 6.284 | 401.285 | 376.069 | 451.1 | 75.0 | 6.01 | 263.0 | 188.0 |
| 46 | 10.938 | 1.7 | 6.425 | 403.084 | 377.186 | 452.2 | 75.0 | 6.03 | 263.6 | 188.6 |
| 47 | 11.107 | 1.7 | 6.566 | 406.683 | 379.979 | 455.0 | 75.0 | 6.07 | 265.0 | 190.0 |
| 48 | 11.272 | 1.7 | 6.705 | 406.683 | 379.414 | 454.4 | 75.0 | 6.06 | 264.7 | 189.7 |
| 49 | 11.440 | 1.7 | 6.847 | 410.282 | 382.192 | 457.2 | 75.0 | 6.10 | 266.1 | 191.1 |
| 50 | 11.605 | 1.7 | 6.985 | 410.282 | 381.622 | 456.6 | 75.0 | 6.09 | 265.8 | 190.8 |
| 51 | 11.779 | 1.7 | 7.131 | 412.082 | 382.695 | 457.7 | 75.0 | 6.10 | 266.3 | 191.3 |
| 52 | 11.936 | 1.7 | 7.263 | 413.881 | 383.820 | 458.8 | 75.0 | 6.12 | 266.9 | 191.9 |
| 53 | 12.107 | 1.7 | 7.407 | 413.881 | 383.226 | 458.2 | 75.0 | 6.11 | 266.6 | 191.6 |
| 54 | 12.275 | 1.7 | 7.548 | 415.681 | 384.305 | 459.3 | 75.0 | 6.12 | 267.2 | 192.2 |
| 55 | 12.435 | 1.7 | 7.682 | 415.681 | 383.747 | 458.7 | 75.0 | 6.12 | 266.9 | 191.9 |
| 56 | 12.600 | 1.7 | 7.821 | 415.681 | 383.169 | 458.2 | 75.0 | 6.11 | 266.6 | 191.6 |
| 57 | 12.760 | 1.7 | 7.956 | 415.681 | 382.611 | 457.6 | 75.0 | 6.10 | 266.3 | 191.3 |
| 58 | 12.925 | 1.7 | 8.094 | 413.881 | 380.380 | 455.4 | 75.0 | 6.07 | 265.2 | 190.2 |
| 59 | 13.093 | 1.7 | 8.236 | 413.881 | 379.795 | 454.8 | 75.0 | 6.06 | 264.9 | 189.9 |
| 60 | 13.256 | 1.7 | 8.372 | 412.082 | 377.581 | 452.6 | 75.0 | 6.03 | 263.8 | 188.8 |
| 61 | 13.421 | 1.7 | 8.511 | 410.282 | 375.362 | 450.4 | 75.0 | 6.00 | 262.7 | 187.7 |
| 62 | 13.592 | 1.7 | 8.655 | 406.683 | 371.486 | 446.5 | 75.0 | 5.95 | 260.7 | 185.7 |
| 63 | 13.746 | 1.7 | 8.784 | 404.884 | 369.317 | 444.3 | 75.0 | 5.92 | 259.7 | 184.7 |
| 64 | 13.928 | 1.6 | 8.937 | 397.686 | 362.144 | 437.1 | 75.0 | 5.83 | 256.1 | 181.1 |
| 65 | 14.090 | 1.6 | 9.074 | 392.288 | 356.692 | 431.7 | 75.0 | 5.76 | 253.3 | 178.3 |
| 66 | 14.253 | 1.6 | 9.210 | 386.889 | 351.255 | 426.3 | 75.0 | 5.68 | 250.6 | 175.6 |
| 67 | 14.427 | 1.6 | 9.356 | 381.491 | 345.797 | 420.8 | 75.0 | 5.61 | 247.9 | 172.9 |
| 68 | 14.595 | 1.6 | 9.498 | 377.892 | 342.001 | 417.0 | 75.0 | 5.56 | 246.0 | 171.0 |
| 69 | 14.760 | 1.5 | 9.637 | 372.493 | 336.598 | 411.6 | 75.0 | 5.49 | 243.3 | 168.3 |
| 70 | 14.925 | 1.5 | 9.775 | 368.894 | 332.833 | 407.8 | 75.0 | 5.44 | 241.4 | 166.4 |
| 71 | 15.099 | 1.5 | 9.921 | 363.496 | 327.432 | 402.4 | 75.0 | 5.37 | 238.7 | 163.7 |
| 72 | 15.275 | 1.5 | 10.069 | 358.097 | 322.039 | 397.0 | 75.0 | 5.29 | 236.0 | 161.0 |
| 73 | 15.449 | 1.4 | 10.215 | 352.699 | 316.669 | 391.7 | 75.0 | 5.22 | 233.3 | 158.3 |
| 74 | 15.622 | 1.4 | 10.361 | 347.300 | 311.316 | 386.3 | 75.0 | 5.15 | 230.7 | 155.7 |
| 75 | 15.782 | 1.4 | 10.496 | 340.103 | 304.407 | 379.4 | 75.0 | 5.06 | 227.2 | 152.2 |
| 76 | 15.961 | 1.4 | 10.646 | 334.704 | 299.071 | 374.1 | 75.0 | 4.99 | 224.5 | 149.5 |
| 77 | 16.129 | 1.4 | 10.787 | 329.306 | 293.783 | 368.8 | 75.0 | 4.92 | 221.9 | 146.9 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 16.295 | 1.3 | 10.926 | 323.907 | 288.516 | 363.5 | 75.0 | 4.85 | 219.3 | 144.3 |
| 79 | 16.477 | 1.3 | 11.079 | 320.308 | 284.821 | 359.8 | 75.0 | 4.80 | 217.4 | 142.4 |
| 80 | 16.647 | 1.3 | 11.223 | 316.709 | 281.166 | 356.2 | 75.0 | 4.75 | 215.6 | 140.6 |
| 81 | 16.813 | 1.3 | 11.361 | 311.311 | 275.941 | 350.9 | 75.0 | 4.68 | 213.0 | 138.0 |
| 82 | 16.978 | 1.3 | 11.500 | 307.712 | 272.324 | 347.3 | 75.0 | 4.63 | 211.2 | 136.2 |
| 83 | 17.143 | 1.2 | 11.639 | 304.113 | 268.716 | 343.7 | 75.0 | 4.58 | 209.4 | 134.4 |
| 84 | 17.309 | 1.2 | 11.778 | 300.514 | 265.119 | 340.1 | 75.0 | 4.53 | 207.6 | 132.6 |
| 85 | 17.471 | 1.2 | 11.915 | 298.714 | 263.123 | 338.1 | 75.0 | 4.51 | 206.6 | 131.6 |
| 86 | 17.637 | 1.2 | 12.054 | 295.115 | 259.543 | 334.5 | 75.0 | 4.46 | 204.8 | 129.8 |
| 87 | 17.796 | 1.2 | 12.188 | 293.316 | 257.566 | 332.6 | 75.0 | 4.43 | 203.8 | 128.8 |
| 88 | 17.964 | 1.2 | 12.329 | 291.516 | 255.575 | 330.6 | 75.0 | 4.41 | 202.8 | 127.8 |
| 89 | 18.127 | 1.2 | 12.466 | 289.717 | 253.601 | 328.6 | 75.0 | 4.38 | 201.8 | 126.8 |
| 90 | 18.292 | 1.2 | 12.605 | 289.717 | 253.199 | 328.2 | 75.0 | 4.38 | 201.6 | 126.6 |
| 91 | 18.452 | 1.2 | 12.739 | 287.917 | 251.239 | 326.2 | 75.0 | 4.35 | 200.6 | 125.6 |
| 92 | 18.615 | 1.2 | 12.876 | 287.917 | 250.846 | 325.8 | 75.0 | 4.34 | 200.4 | 125.4 |
| 93 | 18.794 | 1.2 | 13.026 | 286.118 | 248.848 | 323.8 | 75.0 | 4.32 | 199.4 | 124.4 |
| 94 | 18.959 | 1.2 | 13.165 | 286.118 | 248.450 | 323.5 | 75.0 | 4.31 | 199.2 | 124.2 |
| 95 | 19.122 | 1.2 | 13.302 | 286.118 | 248.059 | 323.1 | 75.0 | 4.31 | 199.0 | 124.0 |
| 96 | 19.287 | 1.2 | 13.441 | 284.318 | 246.104 | 321.1 | 75.0 | 4.28 | 198.1 | 123.1 |
| 97 | 19.463 | 1.2 | 13.589 | 282.519 | 244.128 | 319.1 | 75.0 | 4.26 | 197.1 | 122.1 |
| 98 | 19.623 | 1.2 | 13.723 | 280.720 | 242.196 | 317.2 | 75.0 | 4.23 | 196.1 | 121.1 |
| 99 | 19.797 | 1.2 | 13.869 | 280.720 | 241.787 | 316.8 | 75.0 | 4.22 | 195.9 | 120.9 |
| 100 | 19.954 | 1.1 | 14.001 | 277.121 | 238.321 | 313.3 | 75.0 | 4.18 | 194.2 | 119.2 |
| 101 | 20.125 | 1.1 | 14.145 | 269.923 | 231.743 | 306.7 | 75.0 | 4.09 | 190.9 | 115.9 |
| 102 | 20.290 | 1.1 | 14.283 | 264.524 | 226.741 | 301.7 | 75.0 | 4.02 | 188.4 | 113.4 |
| 103 | 20.458 | 1.1 | 14.425 | 262.725 | 224.827 | 299.8 | 75.0 | 4.00 | 187.4 | 112.4 |
| 104 | 20.634 | 1.1 | 14.573 | 260.925 | 222.901 | 297.9 | 75.0 | 3.97 | 186.5 | 111.5 |
| 105 | 20.791 | 1.1 | 14.705 | 259.126 | 221.022 | 296.0 | 75.0 | 3.95 | 185.5 | 110.5 |

Test Performed By: Checked By:

## Stantec Consulting Ltd.

**Unconsolidated Undrained Triaxial Test (ASTM D2850)**

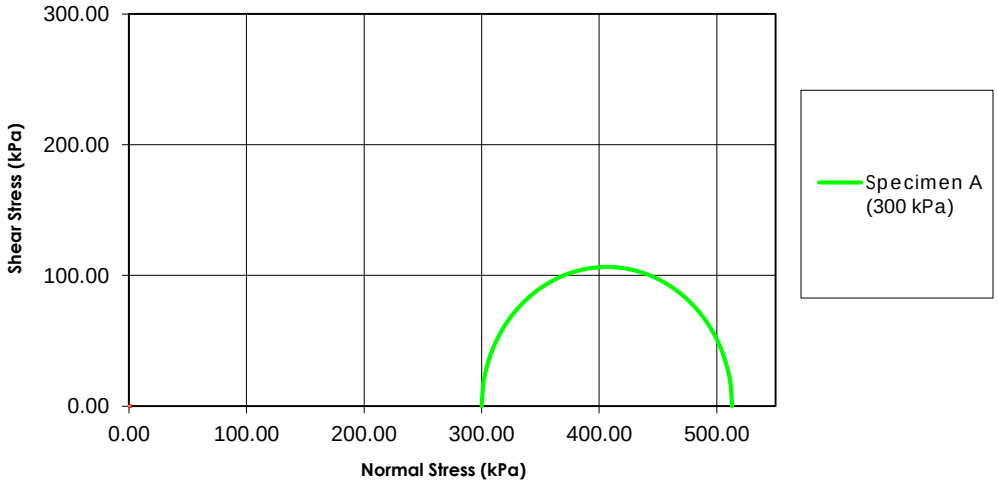
Stantec

Checked By: C. Lamoureux

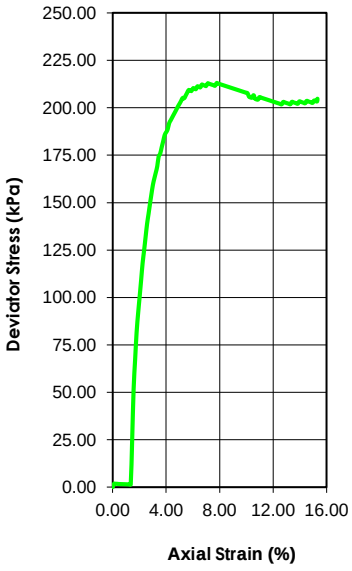
Date: 22-Jun-16

Tested By: C. Oost

### Mohr Circles



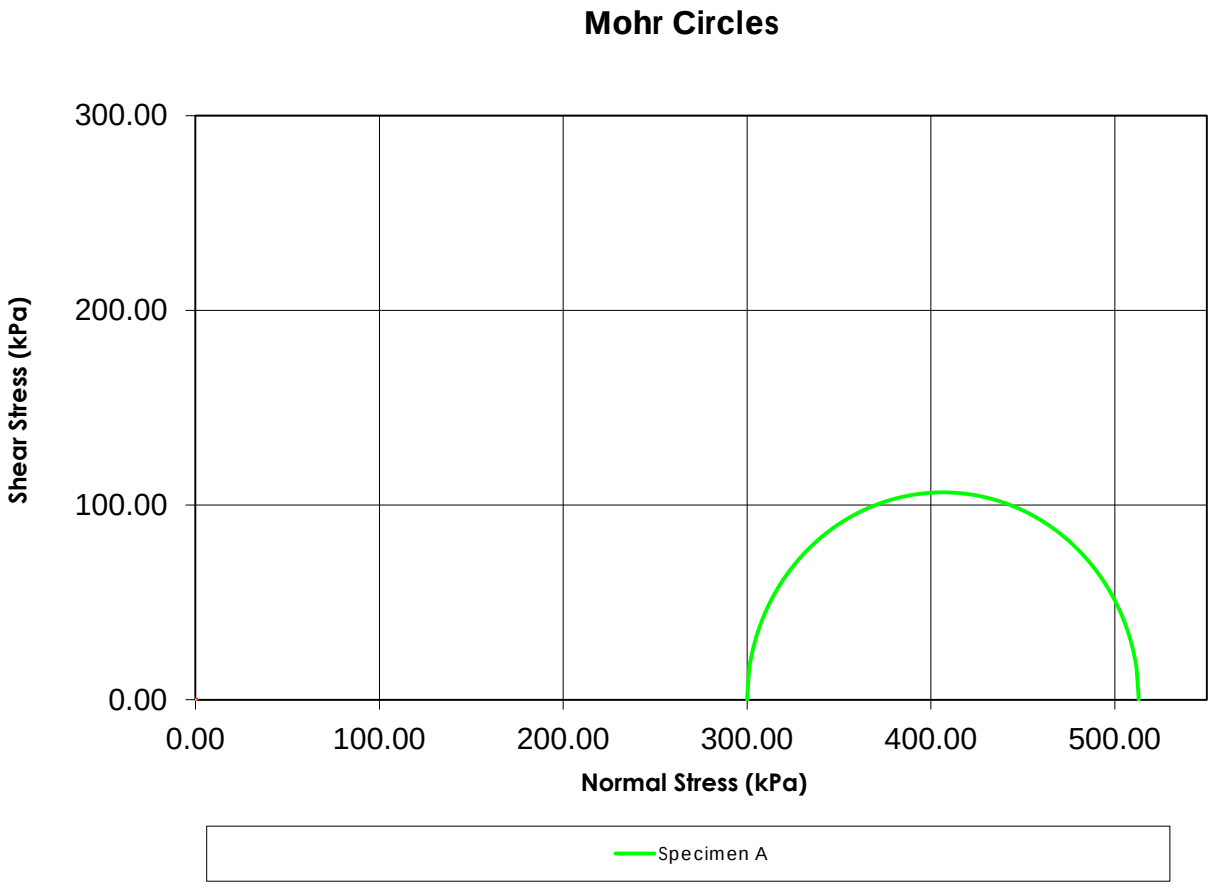

### Stress-Strain Curve

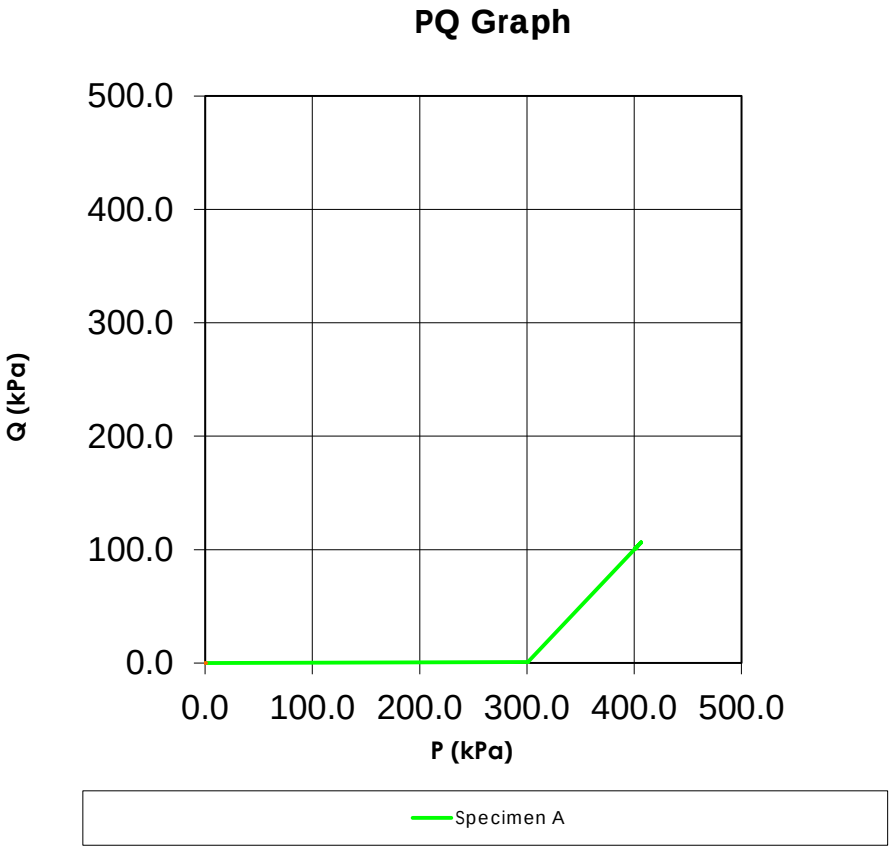



| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 28.1 | | | |
| Dry Density (g/cm3) | 1.606 | | | |
| Saturation (%) | 111.38 | | | |
| Void Ratio | 0.68 | | | |
| Diameter (mm) | 72.00 | | | |
| Height (mm) | 150.20 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 23.5 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | | | |
| Peak Dev. Stress (kPa) | 213.018 | | | |
| Axial Strain @ Failure (%) | 7.774 | | | |
| | **Cell Pressure** | | | |
| Cell (kPa) | 300.0 | | | |
| Back (kPa) | n/a | | | |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 513.0 | | | |
| σ3 (kPa) | 300.0 | | | |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Clay |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.230 | Job Number: | - |
| Location: | - | Boring Number: | - |
| Client: | Alberta Transportation | Sample Number: | DC14 ST4 |
| Remarks: | | | |


Mohr Circles
300.00
200.00
100.00
0.00
Shear Stress (kPa)
0.00
100.00
200.00
300.00
400.00
500.00
Normal Stress (kPa)
Specimen A


PQ Graph
500.0
400.0
300.0
200.0
100.0
0.0
Q (kPa)
0.0
100.0
200.0
300.0
400.0
500.0
P (kPa)
Specimen A

| Specimen A Information<br>UU Triaxial Test | Stantec Consulting Ltd. |
|---|---|

File Location
lab_110773396_uut_dc14st4.HSD

## Project Information

Project No. 110773396.302.702.2 Test Date: 23-Jun-16 Sample Number: DC14 ST4
Project Name: SR1
Client: Alberta Transportation
Sample Location: -
Sample Description: Brown Clay
Remarks: -

## Specimen A Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.70 LL: - PL: -

| Sample Parameters | Before Test | After Test |
|---|---|---|
| Diameter (mm) | 72.00 | |
| Height (mm) | 150.20 | |
| Weight (g) | 1258.2 | |
| Moisture (%) | 28.1 | 23.5 |
| Dry Density (g/cm3) | 1.606 | |
| Saturation (%) | 111.38 | |
| Void Ratio | 0.68 | |

## Specimen A Test Data

Rate of Strain: 2 (mm/min)
Cell Pressure: 300.0 (kPa)
Effective Confining Stress: 300.0 (kPa)
Peak Deviator Stress: 213.018 (kPa) at reading number: 70
Height\Diameter Ratio: 2.09
Axial Strain @ Failure: 7.774 (%)

| Read Number | Disp (mm) | Load Kn) | Axial Strain (%) | Deviator Stress (kPa) | Corr. Deviator Stress (kPa) | Principal Stresses | | | P (kPa) | Q (kPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $Q_1$ (kPa) | $Q_3$ (kPa) | 1:3 Ratio (kPa) | | |
| 0 | 3.215 | 0.0 | 0.000 | 0.000 | 0.000 | 300.0 | 300.0 | 1.00 | 0.0 | 0.0 |
| 1 | 3.364 | 0.0 | 0.099 | 1.804 | 1.803 | 301.8 | 300.0 | 1.01 | 300.9 | 0.9 |
| 2 | 3.530 | 0.0 | 0.209 | 1.804 | 1.801 | 301.8 | 300.0 | 1.01 | 300.9 | 0.9 |
| 3 | 3.703 | 0.0 | 0.325 | 1.804 | 1.799 | 301.8 | 300.0 | 1.01 | 300.9 | 0.9 |
| 4 | 3.874 | 0.0 | 0.438 | 1.804 | 1.694 | 301.7 | 300.0 | 1.01 | 300.8 | 0.8 |
| 5 | 4.056 | 0.0 | 0.559 | 1.804 | 1.664 | 301.7 | 300.0 | 1.01 | 300.8 | 0.8 |
| 6 | 4.224 | 0.0 | 0.671 | 1.804 | 1.636 | 301.6 | 300.0 | 1.01 | 300.8 | 0.8 |
| 7 | 4.392 | 0.0 | 0.783 | 1.804 | 1.607 | 301.6 | 300.0 | 1.01 | 300.8 | 0.8 |
| 8 | 4.565 | 0.0 | 0.899 | 1.804 | 1.578 | 301.6 | 300.0 | 1.01 | 300.8 | 0.8 |
| 9 | 4.739 | 0.0 | 1.014 | 1.804 | 1.549 | 301.5 | 300.0 | 1.01 | 300.8 | 0.8 |
| 10 | 4.896 | 0.0 | 1.119 | 1.804 | 1.523 | 301.5 | 300.0 | 1.01 | 300.8 | 0.8 |
| 11 | 5.075 | 0.0 | 1.238 | 1.804 | 1.493 | 301.5 | 300.0 | 1.00 | 300.7 | 0.7 |
| 12 | 5.243 | 0.0 | 1.350 | 1.804 | 1.465 | 301.5 | 300.0 | 1.00 | 300.7 | 0.7 |
| 13 | 5.414 | 0.1 | 1.464 | 27.067 | 26.671 | 326.7 | 300.0 | 1.09 | 313.3 | 13.3 |
| 14 | 5.566 | 0.2 | 1.565 | 52.330 | 51.511 | 351.5 | 300.0 | 1.17 | 325.8 | 25.8 |
| 15 | 5.739 | 0.3 | 1.680 | 68.570 | 67.418 | 367.4 | 300.0 | 1.22 | 333.7 | 33.7 |
| 16 | 5.902 | 0.4 | 1.789 | 83.006 | 81.522 | 381.5 | 300.0 | 1.27 | 340.8 | 40.8 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 6.081 | 0.4 | 1.908 | 93.833 | 92.043 | 392.0 | 300.0 | 1.31 | 346.0 | 46.0 |
| 18 | 6.252 | 0.4 | 2.022 | 102.856 | 100.776 | 400.8 | 300.0 | 1.34 | 350.4 | 50.4 |
| 19 | 6.417 | 0.5 | 2.132 | 111.878 | 109.493 | 409.5 | 300.0 | 1.36 | 354.7 | 54.7 |
| 20 | 6.580 | 0.5 | 2.240 | 120.901 | 118.193 | 418.2 | 300.0 | 1.39 | 359.1 | 59.1 |
| 21 | 6.753 | 0.5 | 2.355 | 128.119 | 125.101 | 425.1 | 300.0 | 1.42 | 362.6 | 62.6 |
| 22 | 6.916 | 0.6 | 2.464 | 135.336 | 132.002 | 432.0 | 300.0 | 1.44 | 366.0 | 66.0 |
| 23 | 7.081 | 0.6 | 2.574 | 142.554 | 138.886 | 438.9 | 300.0 | 1.46 | 369.4 | 69.4 |
| 24 | 7.244 | 0.6 | 2.682 | 147.968 | 144.000 | 444.0 | 300.0 | 1.48 | 372.0 | 72.0 |
| 25 | 7.398 | 0.6 | 2.785 | 153.381 | 149.110 | 449.1 | 300.0 | 1.50 | 374.6 | 74.6 |
| 26 | 7.560 | 0.7 | 2.893 | 158.795 | 154.201 | 454.2 | 300.0 | 1.51 | 377.1 | 77.1 |
| 27 | 7.731 | 0.7 | 3.007 | 164.208 | 159.271 | 459.3 | 300.0 | 1.53 | 379.6 | 79.6 |
| 28 | 7.888 | 0.7 | 3.111 | 167.817 | 162.596 | 462.6 | 300.0 | 1.54 | 381.3 | 81.3 |
| 29 | 8.062 | 0.7 | 3.227 | 171.426 | 165.895 | 465.9 | 300.0 | 1.55 | 382.9 | 82.9 |
| 30 | 8.224 | 0.7 | 3.335 | 175.035 | 169.198 | 469.2 | 300.0 | 1.56 | 384.6 | 84.6 |
| 31 | 8.379 | 0.7 | 3.438 | 180.449 | 174.245 | 474.2 | 300.0 | 1.58 | 387.1 | 87.1 |
| 32 | 8.550 | 0.8 | 3.551 | 182.253 | 175.781 | 475.8 | 300.0 | 1.59 | 387.9 | 87.9 |
| 33 | 8.715 | 0.8 | 3.661 | 185.862 | 179.057 | 479.1 | 300.0 | 1.60 | 389.5 | 89.5 |
| 34 | 8.889 | 0.8 | 3.777 | 189.471 | 182.315 | 482.3 | 300.0 | 1.61 | 391.2 | 91.2 |
| 35 | 9.054 | 0.8 | 3.887 | 193.080 | 185.575 | 485.6 | 300.0 | 1.62 | 392.8 | 92.8 |
| 36 | 9.222 | 0.8 | 3.999 | 194.885 | 187.091 | 487.1 | 300.0 | 1.62 | 393.5 | 93.5 |
| 37 | 9.390 | 0.8 | 4.111 | 196.689 | 188.603 | 488.6 | 300.0 | 1.63 | 394.3 | 94.3 |
| 38 | 9.558 | 0.8 | 4.223 | 200.298 | 191.840 | 491.8 | 300.0 | 1.64 | 395.9 | 95.9 |
| 39 | 9.726 | 0.8 | 4.335 | 202.102 | 193.342 | 493.3 | 300.0 | 1.64 | 396.7 | 96.7 |
| 40 | 9.894 | 0.8 | 4.447 | 203.907 | 194.840 | 494.8 | 300.0 | 1.65 | 397.4 | 97.4 |
| 41 | 10.062 | 0.9 | 4.558 | 205.711 | 196.334 | 496.3 | 300.0 | 1.65 | 398.2 | 98.2 |
| 42 | 10.233 | 0.9 | 4.672 | 207.516 | 197.820 | 497.8 | 300.0 | 1.66 | 398.9 | 98.9 |
| 43 | 10.398 | 0.9 | 4.782 | 209.320 | 199.310 | 499.3 | 300.0 | 1.66 | 399.7 | 99.7 |
| 44 | 10.561 | 0.9 | 4.891 | 211.125 | 200.800 | 500.8 | 300.0 | 1.67 | 400.4 | 100.4 |
| 45 | 10.743 | 0.9 | 5.012 | 212.929 | 202.258 | 502.3 | 300.0 | 1.67 | 401.1 | 101.1 |
| 46 | 10.914 | 0.9 | 5.125 | 214.734 | 203.728 | 503.7 | 300.0 | 1.68 | 401.9 | 101.9 |
| 47 | 11.079 | 0.9 | 5.235 | 216.538 | 205.202 | 505.2 | 300.0 | 1.68 | 402.6 | 102.6 |
| 48 | 11.250 | 0.9 | 5.349 | 216.538 | 204.955 | 505.0 | 300.0 | 1.68 | 402.5 | 102.5 |
| 49 | 11.415 | 0.9 | 5.459 | 218.343 | 206.423 | 506.4 | 300.0 | 1.69 | 403.2 | 103.2 |
| 50 | 11.580 | 0.9 | 5.569 | 220.147 | 207.887 | 507.9 | 300.0 | 1.69 | 403.9 | 103.9 |
| 51 | 11.748 | 0.9 | 5.681 | 221.952 | 209.342 | 509.3 | 300.0 | 1.70 | 404.7 | 104.7 |
| 52 | 11.919 | 0.9 | 5.795 | 221.952 | 209.090 | 509.1 | 300.0 | 1.70 | 404.5 | 104.5 |
| 53 | 12.074 | 0.9 | 5.898 | 221.952 | 208.862 | 508.9 | 300.0 | 1.70 | 404.4 | 104.4 |
| 54 | 12.244 | 0.9 | 6.011 | 223.756 | 210.306 | 510.3 | 300.0 | 1.70 | 405.2 | 105.2 |
| 55 | 12.410 | 0.9 | 6.121 | 223.756 | 210.059 | 510.1 | 300.0 | 1.70 | 405.0 | 105.0 |
| 56 | 12.570 | 0.9 | 6.228 | 223.756 | 209.821 | 509.8 | 300.0 | 1.70 | 404.9 | 104.9 |
| 57 | 12.727 | 0.9 | 6.332 | 225.561 | 211.277 | 511.3 | 300.0 | 1.70 | 405.6 | 105.6 |
| 58 | 12.895 | 0.9 | 6.444 | 225.561 | 211.025 | 511.0 | 300.0 | 1.70 | 405.5 | 105.5 |
| 59 | 13.066 | 0.9 | 6.558 | 225.561 | 210.768 | 510.8 | 300.0 | 1.70 | 405.4 | 105.4 |
| 60 | 13.228 | 0.9 | 6.666 | 227.365 | 212.209 | 512.2 | 300.0 | 1.71 | 406.1 | 106.1 |
| 61 | 13.388 | 0.9 | 6.773 | 227.365 | 211.967 | 512.0 | 300.0 | 1.71 | 406.0 | 106.0 |
| 62 | 13.548 | 0.9 | 6.879 | 227.365 | 211.725 | 511.7 | 300.0 | 1.71 | 405.9 | 105.9 |
| 63 | 13.719 | 0.9 | 6.993 | 227.365 | 211.466 | 511.5 | 300.0 | 1.70 | 405.7 | 105.7 |
| 64 | 13.889 | 0.9 | 7.106 | 229.170 | 212.884 | 512.9 | 300.0 | 1.71 | 406.4 | 106.4 |
| 65 | 14.046 | 0.9 | 7.211 | 229.170 | 212.644 | 512.6 | 300.0 | 1.71 | 406.3 | 106.3 |
| 66 | 14.225 | 0.9 | 7.330 | 229.170 | 212.371 | 512.4 | 300.0 | 1.71 | 406.2 | 106.2 |
| 67 | 14.394 | 0.9 | 7.442 | 229.170 | 212.115 | 512.1 | 300.0 | 1.71 | 406.1 | 106.1 |
| 68 | 14.551 | 0.9 | 7.547 | 229.170 | 211.875 | 511.9 | 300.0 | 1.71 | 405.9 | 105.9 |
| 69 | 14.721 | 0.9 | 7.660 | 229.170 | 211.614 | 511.6 | 300.0 | 1.71 | 405.8 | 105.8 |
| 70 | 14.892 | 1.0 | 7.774 | 230.974 | 213.018 | 513.0 | 300.0 | 1.71 | 406.5 | 106.5 |
| 71 | 15.052 | 1.0 | 7.881 | 230.974 | 212.772 | 512.8 | 300.0 | 1.71 | 406.4 | 106.4 |
| 72 | 15.226 | 1.0 | 7.996 | 230.974 | 212.505 | 512.5 | 300.0 | 1.71 | 406.3 | 106.3 |
| 73 | 15.385 | 1.0 | 8.103 | 230.974 | 212.259 | 512.3 | 300.0 | 1.71 | 406.1 | 106.1 |
| 74 | 15.565 | 1.0 | 8.222 | 230.974 | 211.984 | 512.0 | 300.0 | 1.71 | 406.0 | 106.0 |
| 75 | 15.733 | 1.0 | 8.334 | 230.974 | 211.726 | 511.7 | 300.0 | 1.71 | 405.9 | 105.9 |
| 76 | 15.895 | 1.0 | 8.442 | 230.974 | 211.476 | 511.5 | 300.0 | 1.70 | 405.7 | 105.7 |
| 77 | 16.061 | 1.0 | 8.552 | 230.974 | 211.221 | 511.2 | 300.0 | 1.70 | 405.6 | 105.6 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 16.237 | 1.0 | 8.669 | 230.974 | 210.950 | 511.0 | 300.0 | 1.70 | 405.5 | 105.5 |
| 79 | 16.397 | 1.0 | 8.776 | 230.974 | 210.704 | 510.7 | 300.0 | 1.70 | 405.4 | 105.4 |
| 80 | 16.578 | 1.0 | 8.897 | 230.974 | 210.425 | 510.4 | 300.0 | 1.70 | 405.2 | 105.2 |
| 81 | 16.741 | 1.0 | 9.005 | 230.974 | 210.175 | 510.2 | 300.0 | 1.70 | 405.1 | 105.1 |
| 82 | 16.904 | 1.0 | 9.113 | 230.974 | 209.925 | 509.9 | 300.0 | 1.70 | 405.0 | 105.0 |
| 83 | 17.074 | 1.0 | 9.227 | 230.974 | 209.662 | 509.7 | 300.0 | 1.70 | 404.8 | 104.8 |
| 84 | 17.237 | 1.0 | 9.335 | 230.974 | 209.412 | 509.4 | 300.0 | 1.70 | 404.7 | 104.7 |
| 85 | 17.391 | 1.0 | 9.438 | 230.974 | 209.175 | 509.2 | 300.0 | 1.70 | 404.6 | 104.6 |
| 86 | 17.546 | 1.0 | 9.541 | 230.974 | 208.938 | 508.9 | 300.0 | 1.70 | 404.5 | 104.5 |
| 87 | 17.711 | 1.0 | 9.651 | 230.974 | 208.683 | 508.7 | 300.0 | 1.70 | 404.3 | 104.3 |
| 88 | 17.884 | 1.0 | 9.766 | 230.974 | 208.416 | 508.4 | 300.0 | 1.69 | 404.2 | 104.2 |
| 89 | 18.036 | 1.0 | 9.867 | 230.974 | 208.183 | 508.2 | 300.0 | 1.69 | 404.1 | 104.1 |
| 90 | 18.210 | 1.0 | 9.983 | 230.974 | 207.916 | 507.9 | 300.0 | 1.69 | 404.0 | 104.0 |
| 91 | 18.369 | 1.0 | 10.089 | 230.974 | 207.671 | 507.7 | 300.0 | 1.69 | 403.8 | 103.8 |
| 92 | 18.535 | 0.9 | 10.199 | 229.170 | 205.796 | 505.8 | 300.0 | 1.69 | 402.9 | 102.9 |
| 93 | 18.708 | 0.9 | 10.315 | 229.170 | 205.531 | 505.5 | 300.0 | 1.69 | 402.8 | 102.8 |
| 94 | 18.874 | 0.9 | 10.425 | 229.170 | 205.279 | 505.3 | 300.0 | 1.68 | 402.6 | 102.6 |
| 95 | 19.044 | 1.0 | 10.539 | 230.974 | 206.633 | 506.6 | 300.0 | 1.69 | 403.3 | 103.3 |
| 96 | 19.207 | 0.9 | 10.647 | 229.170 | 204.770 | 504.8 | 300.0 | 1.68 | 402.4 | 102.4 |
| 97 | 19.378 | 0.9 | 10.761 | 229.170 | 204.510 | 504.5 | 300.0 | 1.68 | 402.3 | 102.3 |
| 98 | 19.535 | 0.9 | 10.865 | 229.170 | 204.270 | 504.3 | 300.0 | 1.68 | 402.1 | 102.1 |
| 99 | 19.700 | 1.0 | 10.975 | 230.974 | 205.624 | 505.6 | 300.0 | 1.69 | 402.8 | 102.8 |
| 100 | 19.871 | 1.0 | 11.089 | 230.974 | 205.362 | 505.4 | 300.0 | 1.68 | 402.7 | 102.7 |
| 101 | 20.034 | 1.0 | 11.197 | 230.974 | 205.112 | 505.1 | 300.0 | 1.68 | 402.6 | 102.6 |
| 102 | 20.193 | 1.0 | 11.304 | 230.974 | 204.866 | 504.9 | 300.0 | 1.68 | 402.4 | 102.4 |
| 103 | 20.361 | 1.0 | 11.416 | 230.974 | 204.607 | 504.6 | 300.0 | 1.68 | 402.3 | 102.3 |
| 104 | 20.532 | 1.0 | 11.529 | 230.974 | 204.345 | 504.3 | 300.0 | 1.68 | 402.2 | 102.2 |
| 105 | 20.698 | 1.0 | 11.639 | 230.974 | 204.090 | 504.1 | 300.0 | 1.68 | 402.0 | 102.0 |
| 106 | 20.863 | 1.0 | 11.749 | 230.974 | 203.836 | 503.8 | 300.0 | 1.68 | 401.9 | 101.9 |
| 107 | 21.039 | 1.0 | 11.867 | 230.974 | 203.565 | 503.6 | 300.0 | 1.68 | 401.8 | 101.8 |
| 108 | 21.207 | 1.0 | 11.979 | 230.974 | 203.307 | 503.3 | 300.0 | 1.68 | 401.7 | 101.7 |
| 109 | 21.367 | 1.0 | 12.085 | 230.974 | 203.061 | 503.1 | 300.0 | 1.68 | 401.5 | 101.5 |
| 110 | 21.535 | 1.0 | 12.197 | 230.974 | 202.802 | 502.8 | 300.0 | 1.68 | 401.4 | 101.4 |
| 111 | 21.706 | 1.0 | 12.311 | 230.974 | 202.540 | 502.5 | 300.0 | 1.68 | 401.3 | 101.3 |
| 112 | 21.877 | 1.0 | 12.424 | 230.974 | 202.277 | 502.3 | 300.0 | 1.67 | 401.1 | 101.1 |
| 113 | 22.048 | 1.0 | 12.538 | 230.974 | 202.014 | 502.0 | 300.0 | 1.67 | 401.0 | 101.0 |
| 114 | 22.202 | 1.0 | 12.641 | 230.974 | 201.777 | 501.8 | 300.0 | 1.67 | 400.9 | 100.9 |
| 115 | 22.370 | 1.0 | 12.753 | 232.779 | 203.093 | 503.1 | 300.0 | 1.68 | 401.5 | 101.5 |
| 116 | 22.530 | 1.0 | 12.859 | 232.779 | 202.845 | 502.8 | 300.0 | 1.68 | 401.4 | 101.4 |
| 117 | 22.692 | 1.0 | 12.967 | 232.779 | 202.593 | 502.6 | 300.0 | 1.68 | 401.3 | 101.3 |
| 118 | 22.866 | 1.0 | 13.083 | 232.779 | 202.324 | 502.3 | 300.0 | 1.67 | 401.2 | 101.2 |
| 119 | 23.026 | 1.0 | 13.189 | 232.779 | 202.077 | 502.1 | 300.0 | 1.67 | 401.0 | 101.0 |
| 120 | 23.183 | 1.0 | 13.294 | 232.779 | 201.833 | 501.8 | 300.0 | 1.67 | 400.9 | 100.9 |
| 121 | 23.345 | 1.0 | 13.402 | 234.583 | 203.144 | 503.1 | 300.0 | 1.68 | 401.6 | 101.6 |
| 122 | 23.508 | 1.0 | 13.510 | 234.583 | 202.890 | 502.9 | 300.0 | 1.68 | 401.4 | 101.4 |
| 123 | 23.679 | 1.0 | 13.624 | 234.583 | 202.623 | 502.6 | 300.0 | 1.68 | 401.3 | 101.3 |
| 124 | 23.844 | 1.0 | 13.734 | 234.583 | 202.365 | 502.4 | 300.0 | 1.67 | 401.2 | 101.2 |
| 125 | 24.015 | 1.0 | 13.848 | 234.583 | 202.098 | 502.1 | 300.0 | 1.67 | 401.0 | 101.0 |
| 126 | 24.183 | 1.0 | 13.960 | 236.388 | 203.388 | 503.4 | 300.0 | 1.68 | 401.7 | 101.7 |
| 127 | 24.346 | 1.0 | 14.068 | 236.388 | 203.133 | 503.1 | 300.0 | 1.68 | 401.6 | 101.6 |
| 128 | 24.516 | 1.0 | 14.182 | 236.388 | 202.864 | 502.9 | 300.0 | 1.68 | 401.4 | 101.4 |
| 129 | 24.676 | 1.0 | 14.288 | 236.388 | 202.612 | 502.6 | 300.0 | 1.68 | 401.3 | 101.3 |
| 130 | 24.839 | 1.0 | 14.396 | 236.388 | 202.356 | 502.4 | 300.0 | 1.67 | 401.2 | 101.2 |
| 131 | 25.004 | 1.0 | 14.506 | 238.192 | 203.639 | 503.6 | 300.0 | 1.68 | 401.8 | 101.8 |
| 132 | 25.172 | 1.0 | 14.618 | 238.192 | 203.372 | 503.4 | 300.0 | 1.68 | 401.7 | 101.7 |
| 133 | 25.338 | 1.0 | 14.728 | 238.192 | 203.110 | 503.1 | 300.0 | 1.68 | 401.6 | 101.6 |
| 134 | 25.500 | 1.0 | 14.837 | 238.192 | 202.852 | 502.9 | 300.0 | 1.68 | 401.4 | 101.4 |
| 135 | 25.679 | 1.0 | 14.956 | 238.192 | 202.568 | 502.6 | 300.0 | 1.68 | 401.3 | 101.3 |
| 136 | 25.844 | 1.0 | 15.066 | 239.997 | 203.839 | 503.8 | 300.0 | 1.68 | 401.9 | 101.9 |
| 137 | 26.004 | 1.0 | 15.172 | 239.997 | 203.583 | 503.6 | 300.0 | 1.68 | 401.8 | 101.8 |
| 138 | 26.178 | 1.0 | 15.288 | 239.997 | 203.306 | 503.3 | 300.0 | 1.68 | 401.7 | 101.7 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 26.222 | 1.0 | 15.317 | 241.801 | 204.764 | 504.8 | 300.0 | 1.68 | 402.4 | 102.4 |

Test Performed By: Checked By:

# Stantec Consulting Ltd.

## Unconsolidated Undrained Triaxial Test (ASTM D2850)

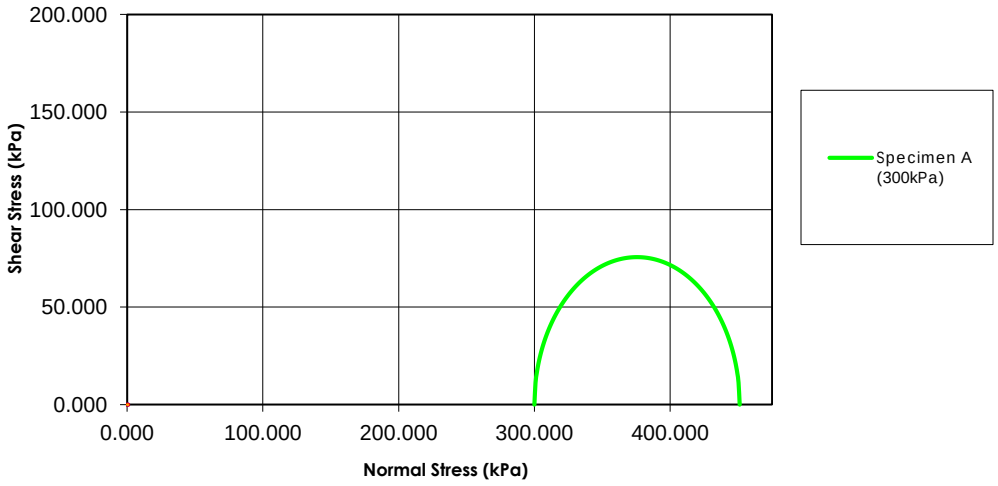
Stantec

Checked By: C. Lamoureux

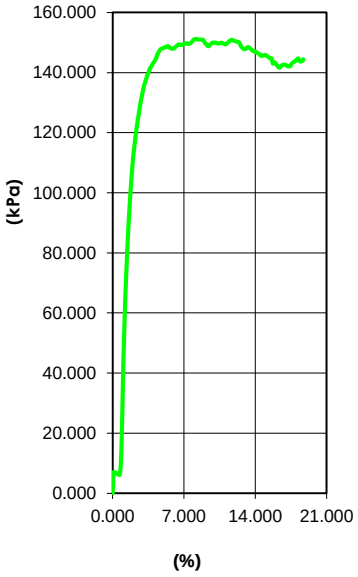
Date: 19-May-16

Tested By: C. Oost

### Mohr Circles



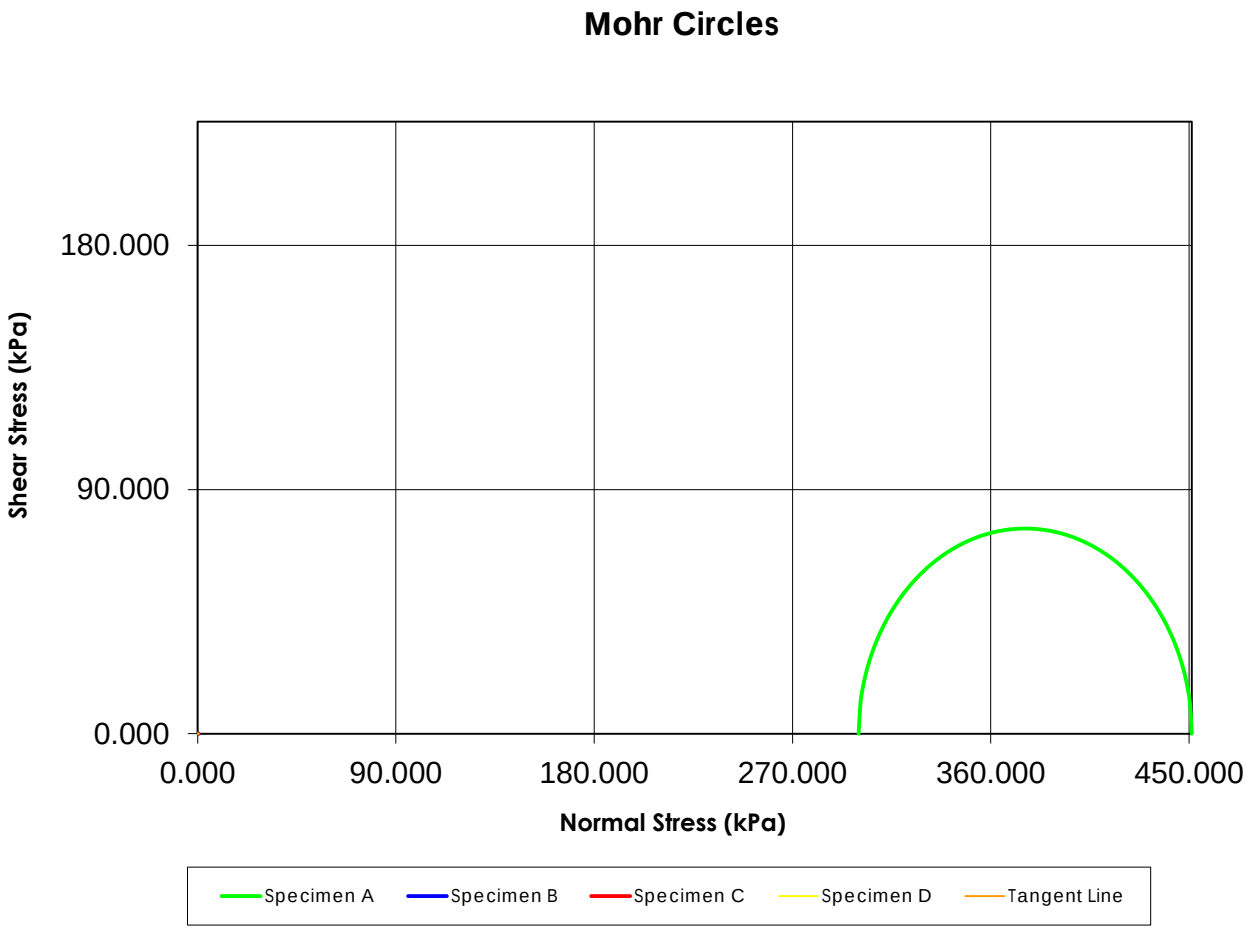

### Stress-Strain Curve

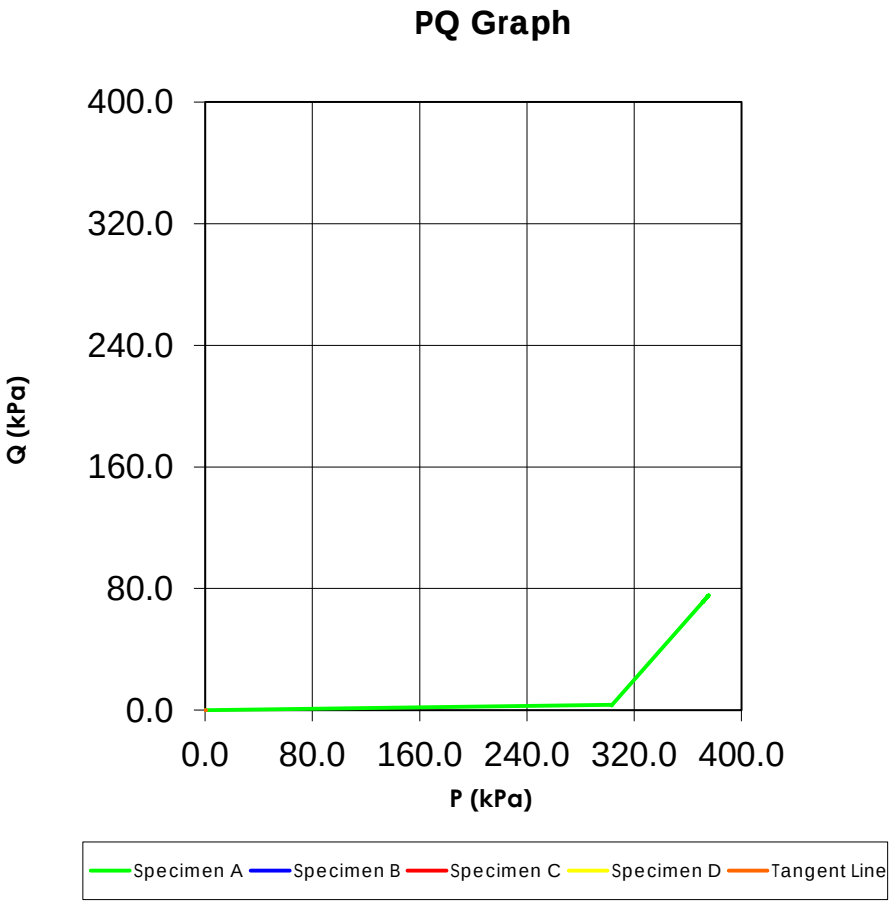



| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 26.69 | 0.00 | 0.00 | 0.00 |
| Dry Density (g/cm3) | 1.553 | 0.00 | 0.00 | 0.00 |
| Saturation (%) | 97.52 | 0.00 | 0.00 | 0.00 |
| Void Ratio | 0.74 | 0.00 | 0.00 | 0.00 |
| Diameter (mm) | 72.400 | 0.000 | 0.000 | 0.000 |
| Height (mm) | 145.900 | 0.000 | 0.000 | 0.000 |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 30.17 | 0.00 | 0.00 | 0.00 |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | 0.00 | 0.00 | 0.00 |
| Peak Deviator Stress (kPa) | 151.240 | 0.000 | 0.000 | 0.000 |
| Axial Strain @ Failure (%) | 8.177 | 0.000 | 0.000 | 0.000 |
| | Cell Pressure | | | |
| Cell (kPa) | 300.0 | 0.0 | 0.0 | 0.0 |
| Back (kPa) | n/a | n/a | n/a | n/a |
| | Principle Stresses at Failure | | | |
| σ1 (kPa) | 451.2 | 0.0 | 0.0 | 0.0 |
| σ3 (kPa) | 300.0 | 0.0 | 0.0 | 0.0 |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Clay |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.220 | Job Number: | - |
| Location: | - | Boring Number: | - |
| Client: | Alberta Transportation | Sample Number: | DC22 ST5 |
| Remarks: | | | |


Mohr Circles
180.000
90.000
0.000
Shear Stress (kPa)
0.000
90.000
180.000
270.000
360.000
450.000
Normal Stress (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line


PQ Graph
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

| Specimen A Information<br>UU Triaxial Test | Stantec Consulting Ltd. |
|---|---|

File Location
lab_110773396_uut_dc22st5.HSD

## Project Information

Project No. 110773396.302.702.2 Test Date: 20-May-16 Sample Number: DC22 ST5
Project Name: SR1
Client: Alberta Transportation
Sample Location: -
Sample Description: Brown Clay
Remarks:

## Specimen A Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.7 LL: - PL: -

| Sample Parameters | Before Test | After Test |
|---|---|---|
| Diameter (mm) | 72.400 | |
| Height (mm) | 145.900 | |
| Weight (g) | 1181.50 | |
| Moisture (%) | 26.69 | 30.17 |
| Dry Density (g/cm3) | 1.55 | |
| Saturation (%) | 97.52 | |
| Void Ratio | 0.74 | |

## Specimen A Test Data

Rate of Strain: 2 (mm/min)
Cell Pressure: 300.0 (kPa)
Effective Confining Stress: 300.0 (kPa)
Peak Deviator Stress: 151.240 (kPa) at reading number: 72
Height \ Diameter Ratio: 2.02
Axial Strain @ Failure: 8.177 (%)

| Read Number | Disp (mm) | Load Kn) | Axial Strain (%) | Deviator Stress (kPa) | Corr. Deviator Stress (kPa) | Principal Stresses | | | P (kPa) | Q (kPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $Q_1$ (kPa) | $Q_3$ (kPa) | 1:3 Ratio (kPa) | | |
| 0 | 2.275 | 0.0 | 0.000 | 0.000 | 0.000 | 300.0 | 300.0 | 1.00 | 0.0 | 0.0 |
| 1 | 2.432 | 0.1 | 0.107 | 7.107 | 7.100 | 307.1 | 300.0 | 1.02 | 303.5 | 3.5 |
| 2 | 2.596 | 0.1 | 0.220 | 6.929 | 6.914 | 306.9 | 300.0 | 1.02 | 303.5 | 3.5 |
| 3 | 2.769 | 0.1 | 0.338 | 6.752 | 6.729 | 306.7 | 300.0 | 1.02 | 303.4 | 3.4 |
| 4 | 2.935 | 0.1 | 0.452 | 6.574 | 6.544 | 306.5 | 300.0 | 1.02 | 303.3 | 3.3 |
| 5 | 3.105 | 0.0 | 0.569 | 6.219 | 6.183 | 306.2 | 300.0 | 1.02 | 303.1 | 3.1 |
| 6 | 3.275 | 0.0 | 0.685 | 6.219 | 6.176 | 306.2 | 300.0 | 1.02 | 303.1 | 3.1 |
| 7 | 3.431 | 0.1 | 0.792 | 9.239 | 9.166 | 309.2 | 300.0 | 1.03 | 304.6 | 4.6 |
| 8 | 3.601 | 0.1 | 0.909 | 21.144 | 20.952 | 321.0 | 300.0 | 1.07 | 310.5 | 10.5 |
| 9 | 3.757 | 0.2 | 1.016 | 39.267 | 38.868 | 338.9 | 300.0 | 1.13 | 319.4 | 19.4 |
| 10 | 3.922 | 0.2 | 1.129 | 53.837 | 53.229 | 353.2 | 300.0 | 1.18 | 326.6 | 26.6 |
| 11 | 4.084 | 0.3 | 1.239 | 65.563 | 64.751 | 364.8 | 300.0 | 1.22 | 332.4 | 32.4 |
| 12 | 4.245 | 0.3 | 1.350 | 75.513 | 74.494 | 374.5 | 300.0 | 1.25 | 337.2 | 37.2 |
| 13 | 4.412 | 0.4 | 1.465 | 84.397 | 83.161 | 383.2 | 300.0 | 1.28 | 341.6 | 41.6 |
| 14 | 4.579 | 0.4 | 1.579 | 92.215 | 90.759 | 390.8 | 300.0 | 1.30 | 345.4 | 45.4 |
| 15 | 4.744 | 0.4 | 1.692 | 98.967 | 97.293 | 397.3 | 300.0 | 1.32 | 348.6 | 48.6 |
| 16 | 4.908 | 0.5 | 1.805 | 104.830 | 102.939 | 402.9 | 300.0 | 1.34 | 351.5 | 51.5 |
| 17 | 5.073 | 0.5 | 1.917 | 110.161 | 108.049 | 408.0 | 300.0 | 1.36 | 354.0 | 54.0 |
| 18 | 5.237 | 0.5 | 2.030 | 114.780 | 112.450 | 412.5 | 300.0 | 1.37 | 356.2 | 56.2 |
| 19 | 5.407 | 0.5 | 2.146 | 118.512 | 115.968 | 416.0 | 300.0 | 1.39 | 358.0 | 58.0 |
| 20 | 5.568 | 0.5 | 2.257 | 121.887 | 119.136 | 419.1 | 300.0 | 1.40 | 359.6 | 59.6 |
| 21 | 5.738 | 0.5 | 2.373 | 125.086 | 122.117 | 422.1 | 300.0 | 1.41 | 361.1 | 61.1 |
| 22 | 5.908 | 0.6 | 2.490 | 127.928 | 124.744 | 424.7 | 300.0 | 1.42 | 362.4 | 62.4 |
| 23 | 6.077 | 0.6 | 2.606 | 130.594 | 127.191 | 427.2 | 300.0 | 1.42 | 363.6 | 63.6 |
| 24 | 6.236 | 0.6 | 2.715 | 133.259 | 129.641 | 429.6 | 300.0 | 1.43 | 364.8 | 64.8 |
| 25 | 6.398 | 0.6 | 2.826 | 135.391 | 131.565 | 431.6 | 300.0 | 1.44 | 365.8 | 65.8 |
| 26 | 6.565 | 0.6 | 2.940 | 137.523 | 133.480 | 433.5 | 300.0 | 1.44 | 366.7 | 66.7 |
| 27 | 6.732 | 0.6 | 3.055 | 139.655 | 135.389 | 435.4 | 300.0 | 1.45 | 367.7 | 67.7 |
| 28 | 6.899 | 0.6 | 3.169 | 141.077 | 136.606 | 436.6 | 300.0 | 1.46 | 368.3 | 68.3 |
| 29 | 7.061 | 0.6 | 3.280 | 142.498 | 137.824 | 437.8 | 300.0 | 1.46 | 368.9 | 68.9 |
| 30 | 7.228 | 0.6 | 3.394 | 143.920 | 139.034 | 439.0 | 300.0 | 1.46 | 369.5 | 69.5 |
| 31 | 7.390 | 0.6 | 3.505 | 144.986 | 139.903 | 439.9 | 300.0 | 1.47 | 370.0 | 70.0 |
| 32 | 7.562 | 0.6 | 3.623 | 146.407 | 141.102 | 441.1 | 300.0 | 1.47 | 370.6 | 70.6 |
| 33 | 7.731 | 0.6 | 3.740 | 147.295 | 141.787 | 441.8 | 300.0 | 1.47 | 370.9 | 70.9 |
| 34 | 7.898 | 0.6 | 3.854 | 148.184 | 142.473 | 442.5 | 300.0 | 1.47 | 371.2 | 71.2 |
| 35 | 8.071 | 0.6 | 3.972 | 149.072 | 143.151 | 443.2 | 300.0 | 1.48 | 371.6 | 71.6 |
| 36 | 8.238 | 0.6 | 4.087 | 149.783 | 143.662 | 443.7 | 300.0 | 1.48 | 371.8 | 71.8 |
| 37 | 8.399 | 0.6 | 4.197 | 150.671 | 144.347 | 444.3 | 300.0 | 1.48 | 372.2 | 72.2 |
| 38 | 8.564 | 0.6 | 4.310 | 151.737 | 145.197 | 445.2 | 300.0 | 1.48 | 372.6 | 72.6 |
| 39 | 8.720 | 0.7 | 4.417 | 152.981 | 146.223 | 446.2 | 300.0 | 1.49 | 373.1 | 73.1 |
| 40 | 8.885 | 0.7 | 4.530 | 153.870 | 146.899 | 446.9 | 300.0 | 1.49 | 373.4 | 73.4 |
| 41 | 9.049 | 0.7 | 4.643 | 154.758 | 147.573 | 447.6 | 300.0 | 1.49 | 373.8 | 73.8 |
| 42 | 9.221 | 0.7 | 4.761 | 155.291 | 147.898 | 447.9 | 300.0 | 1.49 | 373.9 | 73.9 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 43 | 9.386 | 0.7 | 4.873 | 155.646 | 148.061 | 448.1 | 300.0 | 1.49 | 374.0 | 74.0 |
| 44 | 9.558 | 0.7 | 4.992 | 156.002 | 148.215 | 448.2 | 300.0 | 1.49 | 374.1 | 74.1 |
| 45 | 9.717 | 0.7 | 5.101 | 156.357 | 148.382 | 448.4 | 300.0 | 1.49 | 374.2 | 74.2 |
| 46 | 9.884 | 0.7 | 5.215 | 156.712 | 148.540 | 448.5 | 300.0 | 1.50 | 374.3 | 74.3 |
| 47 | 10.051 | 0.7 | 5.330 | 157.068 | 148.697 | 448.7 | 300.0 | 1.50 | 374.3 | 74.3 |
| 48 | 10.221 | 0.7 | 5.446 | 157.423 | 148.850 | 448.9 | 300.0 | 1.50 | 374.4 | 74.4 |
| 49 | 10.390 | 0.7 | 5.562 | 157.068 | 148.332 | 448.3 | 300.0 | 1.49 | 374.2 | 74.2 |
| 50 | 10.560 | 0.7 | 5.678 | 157.068 | 148.149 | 448.1 | 300.0 | 1.49 | 374.1 | 74.1 |
| 51 | 10.743 | 0.7 | 5.803 | 157.068 | 147.952 | 448.0 | 300.0 | 1.49 | 374.0 | 74.0 |
| 52 | 10.899 | 0.7 | 5.911 | 157.245 | 147.951 | 448.0 | 300.0 | 1.49 | 374.0 | 74.0 |
| 53 | 11.069 | 0.7 | 6.027 | 157.601 | 148.102 | 448.1 | 300.0 | 1.49 | 374.1 | 74.1 |
| 54 | 11.225 | 0.7 | 6.134 | 158.134 | 148.433 | 448.4 | 300.0 | 1.49 | 374.2 | 74.2 |
| 55 | 11.395 | 0.7 | 6.251 | 158.667 | 148.749 | 448.7 | 300.0 | 1.50 | 374.4 | 74.4 |
| 56 | 11.552 | 0.7 | 6.358 | 159.200 | 149.078 | 449.1 | 300.0 | 1.50 | 374.5 | 74.5 |
| 57 | 11.721 | 0.7 | 6.474 | 159.733 | 149.392 | 449.4 | 300.0 | 1.50 | 374.7 | 74.7 |
| 58 | 11.891 | 0.7 | 6.590 | 159.733 | 149.206 | 449.2 | 300.0 | 1.50 | 374.6 | 74.6 |
| 59 | 12.047 | 0.7 | 6.698 | 160.088 | 149.366 | 449.4 | 300.0 | 1.50 | 374.7 | 74.7 |
| 60 | 12.222 | 0.7 | 6.818 | 160.088 | 149.174 | 449.2 | 300.0 | 1.50 | 374.6 | 74.6 |
| 61 | 12.381 | 0.7 | 6.927 | 160.444 | 149.330 | 449.3 | 300.0 | 1.50 | 374.7 | 74.7 |
| 62 | 12.543 | 0.7 | 7.038 | 160.977 | 149.648 | 449.6 | 300.0 | 1.50 | 374.8 | 74.8 |
| 63 | 12.718 | 0.7 | 7.157 | 161.154 | 149.620 | 449.6 | 300.0 | 1.50 | 374.8 | 74.8 |
| 64 | 12.882 | 0.7 | 7.270 | 161.510 | 149.768 | 449.8 | 300.0 | 1.50 | 374.9 | 74.9 |
| 65 | 13.049 | 0.7 | 7.384 | 161.510 | 149.583 | 449.6 | 300.0 | 1.50 | 374.8 | 74.8 |
| 66 | 13.214 | 0.7 | 7.497 | 161.687 | 149.565 | 449.6 | 300.0 | 1.50 | 374.8 | 74.8 |
| 67 | 13.381 | 0.7 | 7.612 | 162.043 | 149.709 | 449.7 | 300.0 | 1.50 | 374.9 | 74.9 |
| 68 | 13.537 | 0.7 | 7.719 | 162.576 | 150.027 | 450.0 | 300.0 | 1.50 | 375.0 | 75.0 |
| 69 | 13.704 | 0.7 | 7.833 | 163.286 | 150.496 | 450.5 | 300.0 | 1.50 | 375.2 | 75.2 |
| 70 | 13.874 | 0.7 | 7.950 | 163.997 | 150.960 | 451.0 | 300.0 | 1.50 | 375.5 | 75.5 |
| 71 | 14.038 | 0.7 | 8.062 | 164.353 | 151.102 | 451.1 | 300.0 | 1.50 | 375.6 | 75.6 |
| 72 | 14.205 | 0.7 | 8.177 | 164.708 | 151.240 | 451.2 | 300.0 | 1.50 | 375.6 | 75.6 |
| 73 | 14.372 | 0.7 | 8.291 | 164.708 | 151.052 | 451.1 | 300.0 | 1.50 | 375.5 | 75.5 |
| 74 | 14.542 | 0.7 | 8.407 | 164.886 | 151.023 | 451.0 | 300.0 | 1.50 | 375.5 | 75.5 |
| 75 | 14.706 | 0.7 | 8.520 | 165.063 | 151.000 | 451.0 | 300.0 | 1.50 | 375.5 | 75.5 |
| 76 | 14.871 | 0.7 | 8.633 | 165.241 | 150.976 | 451.0 | 300.0 | 1.50 | 375.5 | 75.5 |
| 77 | 15.035 | 0.7 | 8.745 | 165.419 | 150.952 | 451.0 | 300.0 | 1.50 | 375.5 | 75.5 |
| 78 | 15.207 | 0.7 | 8.863 | 165.596 | 150.919 | 450.9 | 300.0 | 1.50 | 375.5 | 75.5 |
| 79 | 15.379 | 0.7 | 8.982 | 165.241 | 150.400 | 450.4 | 300.0 | 1.50 | 375.2 | 75.2 |
| 80 | 15.552 | 0.7 | 9.100 | 164.708 | 149.720 | 449.7 | 300.0 | 1.50 | 374.9 | 74.9 |
| 81 | 15.726 | 0.7 | 9.219 | 164.530 | 149.362 | 449.4 | 300.0 | 1.50 | 374.7 | 74.7 |
| 82 | 15.893 | 0.7 | 9.334 | 164.175 | 148.851 | 448.9 | 300.0 | 1.50 | 374.4 | 74.4 |
| 83 | 16.060 | 0.7 | 9.448 | 164.353 | 148.824 | 448.8 | 300.0 | 1.50 | 374.4 | 74.4 |
| 84 | 16.227 | 0.7 | 9.563 | 165.063 | 149.279 | 449.3 | 300.0 | 1.50 | 374.6 | 74.6 |
| 85 | 16.384 | 0.7 | 9.670 | 165.596 | 149.583 | 449.6 | 300.0 | 1.50 | 374.8 | 74.8 |
| 86 | 16.551 | 0.7 | 9.785 | 166.129 | 149.874 | 449.9 | 300.0 | 1.50 | 374.9 | 74.9 |
| 87 | 16.718 | 0.7 | 9.899 | 166.485 | 150.004 | 450.0 | 300.0 | 1.50 | 375.0 | 75.0 |
| 88 | 16.885 | 0.7 | 10.013 | 166.662 | 149.974 | 450.0 | 300.0 | 1.50 | 375.0 | 75.0 |
| 89 | 17.047 | 0.7 | 10.124 | 166.840 | 149.949 | 449.9 | 300.0 | 1.50 | 375.0 | 75.0 |
| 90 | 17.216 | 0.7 | 10.241 | 166.840 | 149.755 | 449.8 | 300.0 | 1.50 | 374.9 | 74.9 |
| 91 | 17.373 | 0.7 | 10.348 | 167.018 | 149.735 | 449.7 | 300.0 | 1.50 | 374.9 | 74.9 |
| 92 | 17.543 | 0.7 | 10.464 | 167.195 | 149.700 | 449.7 | 300.0 | 1.50 | 374.8 | 74.8 |
| 93 | 17.699 | 0.7 | 10.571 | 167.551 | 149.838 | 449.8 | 300.0 | 1.50 | 374.9 | 74.9 |
| 94 | 17.869 | 0.7 | 10.688 | 167.906 | 149.961 | 450.0 | 300.0 | 1.50 | 375.0 | 75.0 |
| 95 | 18.038 | 0.7 | 10.804 | 167.906 | 149.766 | 449.8 | 300.0 | 1.50 | 374.9 | 74.9 |
| 96 | 18.208 | 0.7 | 10.920 | 167.906 | 149.570 | 449.6 | 300.0 | 1.50 | 374.8 | 74.8 |
| 97 | 18.378 | 0.7 | 11.036 | 167.906 | 149.375 | 449.4 | 300.0 | 1.50 | 374.7 | 74.7 |
| 98 | 18.534 | 0.7 | 11.144 | 168.261 | 149.511 | 449.5 | 300.0 | 1.50 | 374.8 | 74.8 |
| 99 | 18.706 | 0.7 | 11.262 | 168.795 | 149.785 | 449.8 | 300.0 | 1.50 | 374.9 | 74.9 |
| 100 | 18.865 | 0.7 | 11.371 | 169.505 | 150.231 | 450.2 | 300.0 | 1.50 | 375.1 | 75.1 |
| 101 | 19.035 | 0.7 | 11.487 | 170.038 | 150.506 | 450.5 | 300.0 | 1.50 | 375.3 | 75.3 |
| 102 | 19.199 | 0.7 | 11.600 | 170.571 | 150.785 | 450.8 | 300.0 | 1.50 | 375.4 | 75.4 |
| 103 | 19.364 | 0.7 | 11.712 | 170.927 | 150.907 | 450.9 | 300.0 | 1.50 | 375.5 | 75.5 |
| 104 | 19.533 | 0.7 | 11.829 | 170.927 | 150.708 | 450.7 | 300.0 | 1.50 | 375.4 | 75.4 |
| 105 | 19.690 | 0.7 | 11.936 | 170.927 | 150.525 | 450.5 | 300.0 | 1.50 | 375.3 | 75.3 |
| 106 | 19.867 | 0.7 | 12.058 | 171.104 | 150.473 | 450.5 | 300.0 | 1.50 | 375.2 | 75.2 |
| 107 | 20.037 | 0.7 | 12.174 | 171.104 | 150.274 | 450.3 | 300.0 | 1.50 | 375.1 | 75.1 |
| 108 | 20.204 | 0.7 | 12.288 | 171.282 | 150.234 | 450.2 | 300.0 | 1.50 | 375.1 | 75.1 |
| 109 | 20.368 | 0.7 | 12.401 | 171.282 | 150.041 | 450.0 | 300.0 | 1.50 | 375.0 | 75.0 |
| 110 | 20.543 | 0.7 | 12.521 | 170.749 | 149.370 | 449.4 | 300.0 | 1.50 | 374.7 | 74.7 |
| 111 | 20.705 | 0.7 | 12.632 | 170.038 | 148.559 | 448.6 | 300.0 | 1.50 | 374.3 | 74.3 |
| 112 | 20.882 | 0.7 | 12.753 | 169.861 | 148.198 | 448.2 | 300.0 | 1.49 | 374.1 | 74.1 |
| 113 | 21.049 | 0.7 | 12.868 | 169.683 | 147.848 | 447.8 | 300.0 | 1.49 | 373.9 | 73.9 |
| 114 | 21.209 | 0.7 | 12.977 | 169.861 | 147.818 | 447.8 | 300.0 | 1.49 | 373.9 | 73.9 |
| 115 | 21.373 | 0.7 | 13.090 | 170.216 | 147.935 | 447.9 | 300.0 | 1.49 | 374.0 | 74.0 |
| 116 | 21.530 | 0.7 | 13.197 | 170.927 | 148.370 | 448.4 | 300.0 | 1.49 | 374.2 | 74.2 |
| 117 | 21.694 | 0.7 | 13.310 | 171.282 | 148.485 | 448.5 | 300.0 | 1.49 | 374.2 | 74.2 |
| 118 | 21.858 | 0.7 | 13.422 | 171.282 | 148.292 | 448.3 | 300.0 | 1.49 | 374.1 | 74.1 |
| 119 | 22.025 | 0.7 | 13.537 | 171.104 | 147.942 | 447.9 | 300.0 | 1.49 | 374.0 | 74.0 |
| 120 | 22.192 | 0.7 | 13.651 | 170.927 | 147.593 | 447.6 | 300.0 | 1.49 | 373.8 | 73.8 |
| 121 | 22.359 | 0.7 | 13.766 | 170.749 | 147.244 | 447.2 | 300.0 | 1.49 | 373.6 | 73.6 |
| 122 | 22.526 | 0.7 | 13.880 | 170.749 | 147.049 | 447.0 | 300.0 | 1.49 | 373.5 | 73.5 |
| 123 | 22.693 | 0.7 | 13.995 | 170.927 | 147.006 | 447.0 | 300.0 | 1.49 | 373.5 | 73.5 |
| 124 | 22.860 | 0.7 | 14.109 | 170.927 | 146.811 | 446.8 | 300.0 | 1.49 | 373.4 | 73.4 |
| 125 | 23.027 | 0.7 | 14.223 | 170.749 | 146.463 | 446.5 | 300.0 | 1.49 | 373.2 | 73.2 |
| 126 | 23.205 | 0.7 | 14.345 | 170.749 | 146.255 | 446.3 | 300.0 | 1.49 | 373.1 | 73.1 |
| 127 | 23.372 | 0.7 | 14.460 | 170.571 | 145.908 | 445.9 | 300.0 | 1.49 | 373.0 | 73.0 |
| 128 | 23.539 | 0.7 | 14.574 | 170.394 | 145.560 | 445.6 | 300.0 | 1.49 | 372.8 | 72.8 |
| 129 | 23.695 | 0.7 | 14.681 | 170.749 | 145.681 | 445.7 | 300.0 | 1.49 | 372.8 | 72.8 |
| 130 | 23.862 | 0.7 | 14.796 | 170.927 | 145.637 | 445.6 | 300.0 | 1.49 | 372.8 | 72.8 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 131 | 24.035 | 0.7 | 14.914 | 171.460 | 145.889 | 445.9 | 300.0 | 1.49 | 372.9 | 72.9 |
| 132 | 24.199 | 0.7 | 15.026 | 171.637 | 145.846 | 445.8 | 300.0 | 1.49 | 372.9 | 72.9 |
| 133 | 24.361 | 0.7 | 15.137 | 171.460 | 145.505 | 445.5 | 300.0 | 1.49 | 372.8 | 72.8 |
| 134 | 24.528 | 0.7 | 15.252 | 171.460 | 145.309 | 445.3 | 300.0 | 1.48 | 372.7 | 72.7 |
| 135 | 24.703 | 0.7 | 15.372 | 171.282 | 144.953 | 445.0 | 300.0 | 1.48 | 372.5 | 72.5 |
| 136 | 24.859 | 0.7 | 15.479 | 171.282 | 144.769 | 444.8 | 300.0 | 1.48 | 372.4 | 72.4 |
| 137 | 25.034 | 0.7 | 15.599 | 171.460 | 144.714 | 444.7 | 300.0 | 1.48 | 372.4 | 72.4 |
| 138 | 25.204 | 0.7 | 15.715 | 169.683 | 143.017 | 443.0 | 300.0 | 1.48 | 371.5 | 71.5 |
| 139 | 25.368 | 0.7 | 15.828 | 170.571 | 143.574 | 443.6 | 300.0 | 1.48 | 371.8 | 71.8 |
| 140 | 25.535 | 0.7 | 15.942 | 170.394 | 143.229 | 443.2 | 300.0 | 1.48 | 371.6 | 71.6 |
| 141 | 25.710 | 0.7 | 16.062 | 170.038 | 142.727 | 442.7 | 300.0 | 1.48 | 371.4 | 71.4 |
| 142 | 25.892 | 0.7 | 16.187 | 169.683 | 142.216 | 442.2 | 300.0 | 1.47 | 371.1 | 71.1 |
| 143 | 26.062 | 0.7 | 16.303 | 169.328 | 141.721 | 441.7 | 300.0 | 1.47 | 370.9 | 70.9 |
| 144 | 26.219 | 0.7 | 16.411 | 169.505 | 141.688 | 441.7 | 300.0 | 1.47 | 370.8 | 70.8 |
| 145 | 26.388 | 0.7 | 16.527 | 170.216 | 142.084 | 442.1 | 300.0 | 1.47 | 371.0 | 71.0 |
| 146 | 26.550 | 0.7 | 16.638 | 170.927 | 142.488 | 442.5 | 300.0 | 1.47 | 371.2 | 71.2 |
| 147 | 26.714 | 0.7 | 16.751 | 171.282 | 142.591 | 442.6 | 300.0 | 1.48 | 371.3 | 71.3 |
| 148 | 26.876 | 0.7 | 16.861 | 171.637 | 142.697 | 442.7 | 300.0 | 1.48 | 371.3 | 71.3 |
| 149 | 27.043 | 0.7 | 16.976 | 171.637 | 142.500 | 442.5 | 300.0 | 1.48 | 371.3 | 71.3 |
| 150 | 27.207 | 0.7 | 17.089 | 171.637 | 142.307 | 442.3 | 300.0 | 1.47 | 371.2 | 71.2 |
| 151 | 27.372 | 0.7 | 17.201 | 171.637 | 142.114 | 442.1 | 300.0 | 1.47 | 371.1 | 71.1 |
| 152 | 27.536 | 0.7 | 17.314 | 171.815 | 142.067 | 442.1 | 300.0 | 1.47 | 371.0 | 71.0 |
| 153 | 27.708 | 0.7 | 17.432 | 172.170 | 142.158 | 442.2 | 300.0 | 1.47 | 371.1 | 71.1 |
| 154 | 27.873 | 0.7 | 17.545 | 173.236 | 142.843 | 442.8 | 300.0 | 1.48 | 371.4 | 71.4 |
| 155 | 28.040 | 0.7 | 17.659 | 173.947 | 143.230 | 443.2 | 300.0 | 1.48 | 371.6 | 71.6 |
| 156 | 28.207 | 0.7 | 17.773 | 174.658 | 143.615 | 443.6 | 300.0 | 1.48 | 371.8 | 71.8 |
| 157 | 28.369 | 0.7 | 17.884 | 175.013 | 143.713 | 443.7 | 300.0 | 1.48 | 371.9 | 71.9 |
| 158 | 28.538 | 0.7 | 18.001 | 175.724 | 144.093 | 444.1 | 300.0 | 1.48 | 372.0 | 72.0 |
| 159 | 28.708 | 0.7 | 18.117 | 176.435 | 144.470 | 444.5 | 300.0 | 1.48 | 372.2 | 72.2 |
| 160 | 28.877 | 0.8 | 18.233 | 176.968 | 144.701 | 444.7 | 300.0 | 1.48 | 372.4 | 72.4 |
| 161 | 29.047 | 0.7 | 18.349 | 176.079 | 143.770 | 443.8 | 300.0 | 1.48 | 371.9 | 71.9 |
| 162 | 29.204 | 0.7 | 18.457 | 176.257 | 143.726 | 443.7 | 300.0 | 1.48 | 371.9 | 71.9 |
| 163 | 29.376 | 0.8 | 18.575 | 176.612 | 143.807 | 443.8 | 300.0 | 1.48 | 371.9 | 71.9 |
| 164 | 29.545 | 0.8 | 18.691 | 177.323 | 144.180 | 444.2 | 300.0 | 1.48 | 372.1 | 72.1 |
| 165 | 29.569 | 0.8 | 18.707 | 177.678 | 144.440 | 444.4 | 300.0 | 1.48 | 372.2 | 72.2 |

Test Performed By: Checked By:

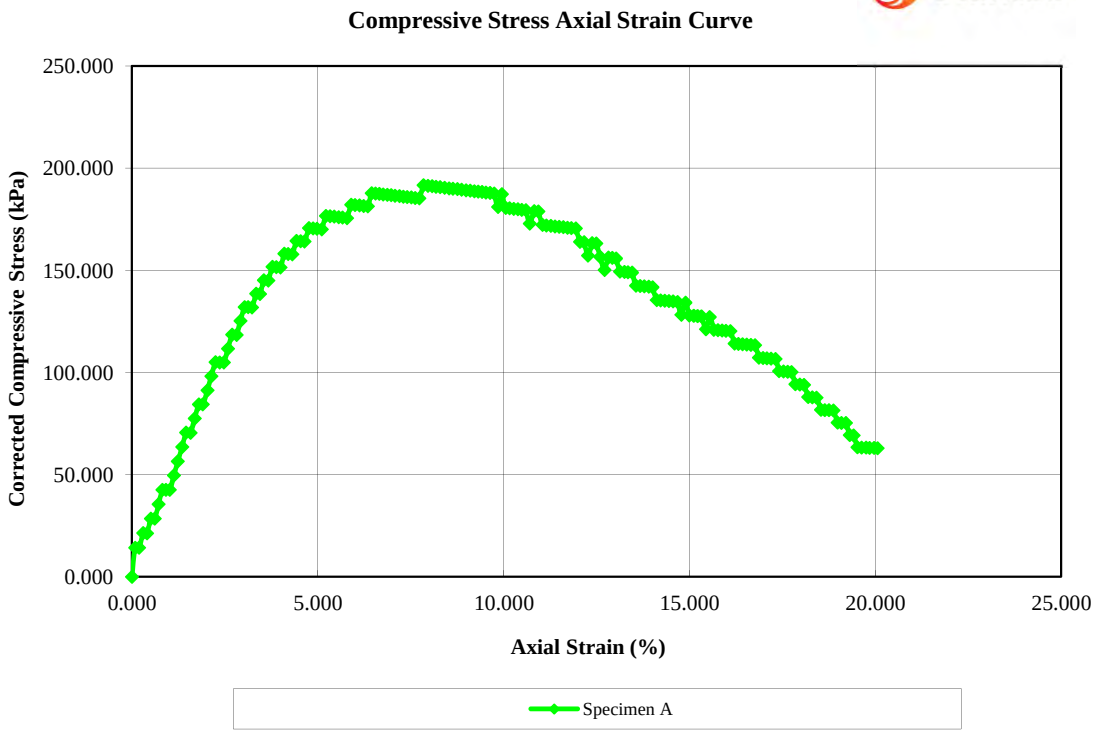
# Stantec Consulting Ltd.

## Unconfined Compression Test Report (ASTM D2166)

Checked By C.Lamoureux

Date 20-Apr-16

Tested By C.Tollifson




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.0 | | | |
| Dry Density (g/cm3) | 1.874 | | | |
| Saturation (%) | 85.59 | | | |
| Void Ratio | 0.44 | | | |
| Diameter (mm) | 71.9 | | | |
| Height (mm) | 151.0 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Unconfined Strength (kPa) | 191.606 | | | |
| Undrained Shear Strength (kgf/cm^2) | 0.977 | | | |
| Undrained Shear Strength (kPa) | 95.803 | | | |
| Rate of Strain (mm/min) | 2.000000 | | | |
| Strain at Failure (%) | 7.85 | | | |
| Description | | | | |

| Project Information | | Specimen Description | |
|---|---|---|---|
| Project Num | 110773396.302.702.220 | Specimen A | Brown Sandy Clay Trace Gravel |
| Project | SR1 | Specimen B | |
| Sampling Date | 07-Apr-16 | Specimen C | |
| Sample # | DC1-ST3 | Specimen D | |
| Client | Alberta Transportation | **Test Variables** | |
| | | Specific Gravity | 2.70 |
| | | Liquid Limit: | - |
| | | Plastic Limit: | - |

Remarks -

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Tel: (403) 253-7876
Fax: (403) 253-0021

# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C. Oost |
| Project Name | SR1 | Date Tested | 21-Jul-16 |
| Project Number | 110773396.302.702.220 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | DC6 | **Sample ID:** | RC20 |
| **Depth (m):** | 23.50 | **Moisture Conent (%):** | 2.1 |
| **Sample Diameter (cm):** | 6.03 | **Sample Weight (g):** | 905.8 |
| **Load Rate (MPa/sec):** | 0.78 | **Sample Length (cm):** | 13.06 |
| **Peak Load (kN):** | 114.49 | **Unit Weight (kg/m3):** | 2428 |
| **Compressive Stregth (MPa):** | 40.2 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | DC6 | **Sample ID:** | RC19 |
| **Depth (m):** | 22.2 | **Moisture Conent (%):** | 3.0 |
| **Sample Diameter (cm):** | 6.02 | **Sample Weight (g):** | 915.3 |
| **Load Rate (MPa/sec):** | 0.48 | **Sample Length (cm):** | 13.52 |
| **Peak Load (kN):** | 20.37 | **Unit Weight (kg/m3):** | 2379 |
| **Compressive Stregth (MPa):** | 7.15 | | |



Reviewed by: _____

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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C. Oost |
| Project Name | SR1 | Date Tested | 21-Jul-16 |
| Project Number | 110773396.302.702.220 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | DC7A | **Sample ID:** | RC6 |
| **Depth (m):** | 29.65 | **Moisture Conent (%):** | 2.1 |
| **Sample Diameter (cm):** | 6.09 | **Sample Weight (g):** | 1185.2 |
| **Load Rate (MPa/sec):** | 0.76 | **Sample Length (cm):** | 13.33 |
| **Peak Load (kN):** | 155.03 | **Unit Weight (kg/m3):** | 3059 |
| **Compressive Stregth (MPa):** | 53.2 | | |



Reviewed by: _____

## Stantec Consulting Ltd.

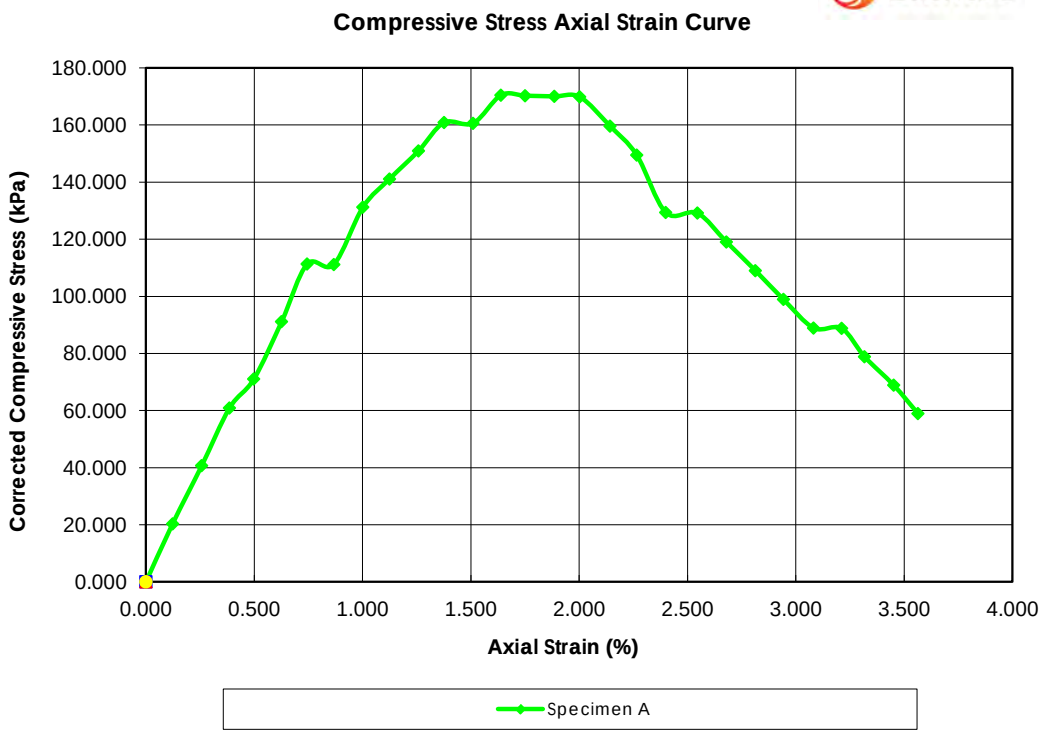
### Unconfined Compression Test Report (ASTM D2166)

Stantec

Reviewed By: C. Lamoureux

Date: 12-Jul-16

Tested By: C. Oost




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 16.7 | | | |
| Dry Density (g/cm3) | 1.766 | | | |
| Saturation (%) | 85.23 | | | |
| Void Ratio | 0.53 | | | |
| Diameter (mm) | 60.300 | | | |
| Height (mm) | 126.800 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Unconfined Strength (kPa) | 170.447 | | | |
| Undrained Shear Strength (kgf/cm^2) | 0.869 | | | |
| Undrained Shear Strength | 85.224 | | | |
| Rate of Strain (mm/min) | 1.902000 | | | |
| Strain at Failure (%) | 1.64 | | | |
| Description | | | | |

| Project Information | | Specimen Description | |
|---|---|---|---|
| Project Num | 110773396.302.702.220 | Specimen A | Bentonite Rock |
| Project | SR1 | Specimen B | |
| Samp. Date | 20-Apr-16 | Specimen C | |
| Sample # | DC7A RC4 | Specimen D | |
| Client | Alberta Transportation | **Test Variables** | |
| | | Specific Gravity | 2.70 |
| | | Liquid Limit: | - |
| | | Plastic Limit: | - |

Remarks

## Stantec Consulting Ltd.

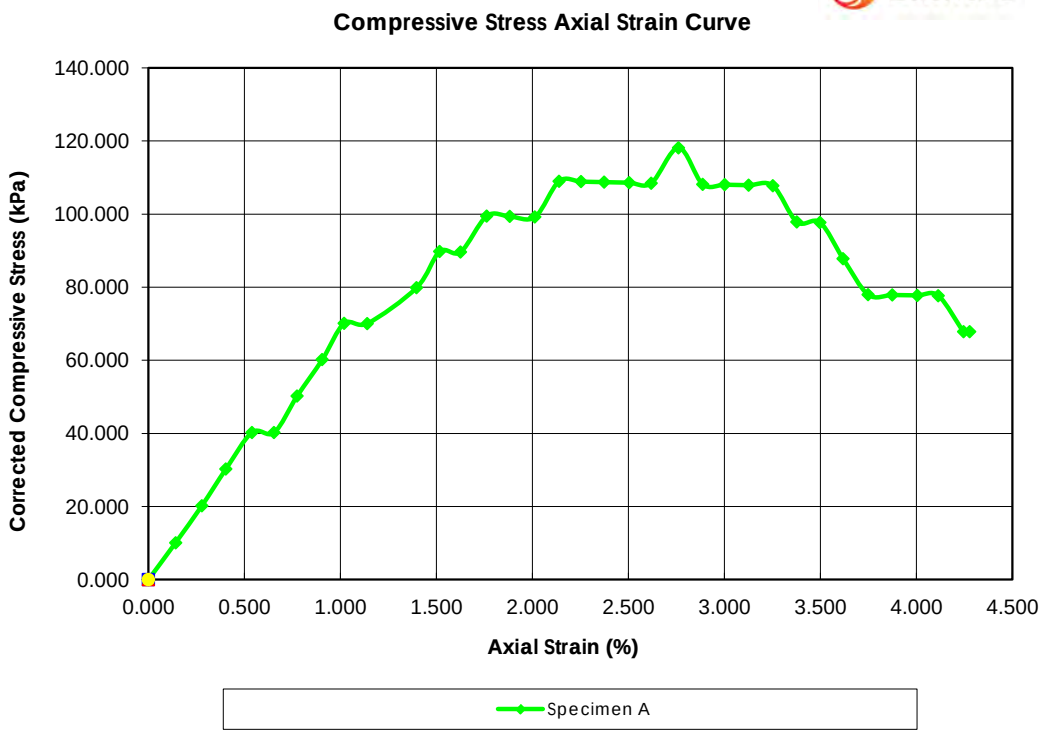
### Unconfined Compression Test Report (ASTM D2166)

Stantec

Reviewed By: C. Lamoureux

Date: 12-Jul-16

Tested By: C. Oost




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 18.9 | | | |
| Dry Density (g/cm3) | 1.651 | | | |
| Saturation (%) | 80.44 | | | |
| Void Ratio | 0.64 | | | |
| Diameter (mm) | 60.500 | | | |
| Height (mm) | 130.000 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Unconfined Strength (kPa) | 118.158 | | | |
| Undrained Shear Strength (kgf/cm^2) | 0.602 | | | |
| Undrained Shear Strength | 59.079 | | | |
| Rate of Strain (mm/min) | 1.950000 | | | |
| Strain at Failure (%) | 2.76 | | | |
| Description | | | | |

| Project Information | | Specimen Description | |
|---|---|---|---|
| Project Num | 110773396.302.702.220 | Specimen A | Bentonite Rock |
| Project | SR1 | Specimen B | |
| Samp. Date | 18-Apr-16 | Specimen C | |
| Sample # | DC7 RC21 | Specimen D | |
| Client | Alberta Transportation | **Test Variables** | |
| | | Specific Gravity | 2.70 |
| | | Liquid Limit: | - |
| | | Plastic Limit: | - |

Remarks

## Stantec Consulting Ltd.

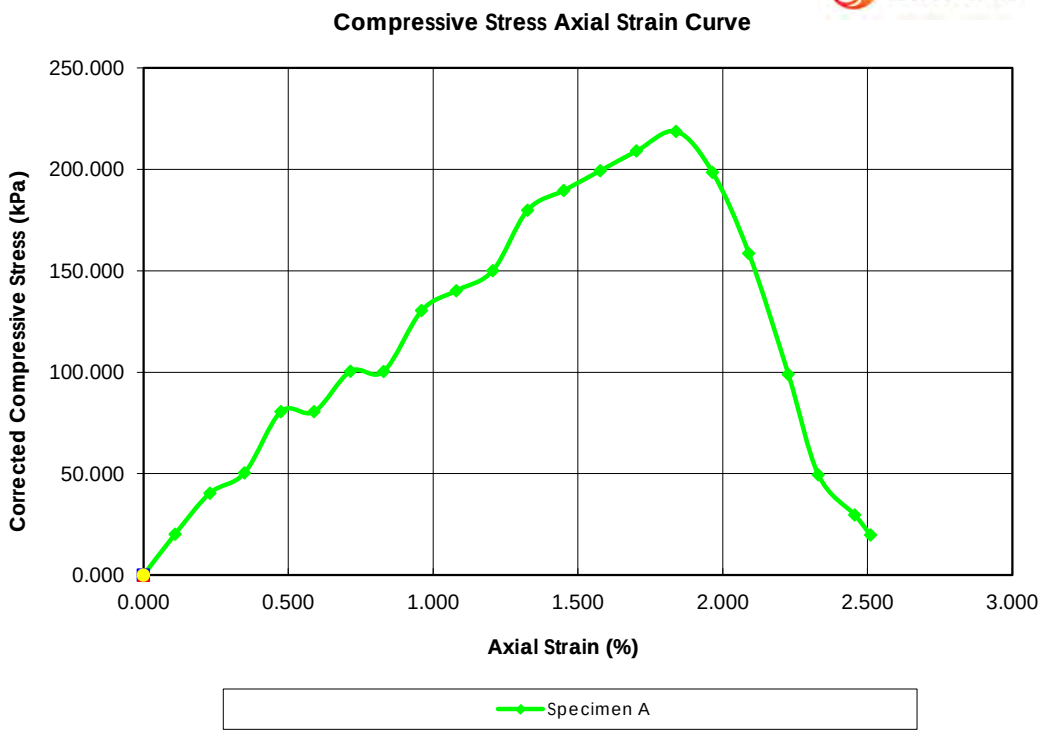
### Unconfined Compression Test Report (ASTM D2166)

Stantec

Reviewed By: C. Lamoureux

Date: 12-Jul-16

Tested By: C. Oost




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 21.5 | | | |
| Dry Density (g/cm3) | 1.661 | | | |
| Saturation (%) | 92.75 | | | |
| Void Ratio | 0.63 | | | |
| Diameter (mm) | 60.500 | | | |
| Height (mm) | 130.000 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Unconfined Strength (kPa) | 218.678 | | | |
| Undrained Shear Strength (kgf/cm^2) | 1.115 | | | |
| Undrained Shear Strength | 109.339 | | | |
| Rate of Strain (mm/min) | 1.950000 | | | |
| Strain at Failure (%) | 1.84 | | | |
| Description | | | | |

| Project Information | | Specimen Description | |
|---|---|---|---|
| Project Num | 110773396.302.702.220 | Specimen A | Bentonite Rock |
| Project | SR1 | Specimen B | |
| Samp. Date | 18-Apr-16 | Specimen C | |
| Sample # | DC7 RC25 | Specimen D | |
| Client | Alberta Transportation | **Test Variables** | |
| | | Specific Gravity | 2.70 |
| | | Liquid Limit: | - |
| | | Plastic Limit: | - |

Remarks

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# Slake Durability Index

ASTM D4644

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Sample ID DC4 RC20
Tested By: C. Oost
Date Tested: 21-Jul-16

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 56 |
| Average Water Temperature ('C) | 22.6 |
| Insitu Moisture Content (%) | 3.4 |
| Fragment Type | 2 |




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# Slake Durability Index

ASTM D4644

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Sample ID | DC6 RC15 |
| Tested By: | C. Oost |
| Date Tested: | 3-Aug-16 |

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 66.6 |
| Average Water Temperature ('C) | 19.7 |
| Insitu Moisture Content (%) | 4.4 |
| Fragment Type | 2 |




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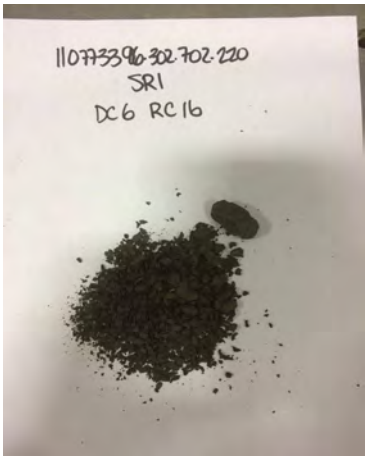
# Slake Durability Index

ASTM D4644

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Sample ID DC6 RC16
Tested By: C. Oost
Date Tested: 25-Jul-16

| | |
|---|---|
| Slake Durability Index - $I_d$(2) | 5.6 |
| Average Water Temperature ('C) | 24.0 |
| Insitu Moisture Content (%) | 5.9 |
| Fragment Type | 3 |



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# Slake Durability Index

ASTM D4644

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Sample ID DC6 RC19
Tested By: C. Oost
Date Tested: 28-Jul-16

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 55.3 |
| Average Water Temperature ('C) | 23.5 |
| Insitu Moisture Content (%) | 2.4 |
| Fragment Type | 1 |




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# Slake Durability Index

ASTM D4644

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Sample ID DC7A RC5 (28.3-28.4m)
Tested By: C. Oost
Date Tested: July 11, 2016

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 52.3 |
| Average Water Temperature ('C) | 21.8 |
| Insitu Moisture Content (%) | 4.9 |
| Fragment Type | 2 |




Reviewed by:

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# Slake Durability Index

ASTM D4644

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Sample ID | DC7 RC20 @ 23.6-23.7m |
| Tested By: | C. Oost |
| Date Tested: | July 14, 2016 |

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 1.8 |
| Average Water Temperature ('C) | 20.6 |
| Insitu Moisture Content (%) | 5.7 |
| Fragment Type | 3 |




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# Slake Durability Index

ASTM D4644

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.220
Sample ID DC8-RC29
Tested By: C.Tollifson
Date Tested: 6/6/2016

| | |
|---|---|
| Slake Durability Index - $I_d(2)$ | 67.8 |
| Average Water Temperature ('C) | 22.1 |
| Insitu Moisture Content (%) | 6.3 |
| Fragment Type | 3 |

Type 3 - sample is exclusively small fragments



Reviewed by:

# E. 4
Dam

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 10, 2016 |
| Date Tested: | July 6, 2016 |
| Tested By: | B. Pelkey |


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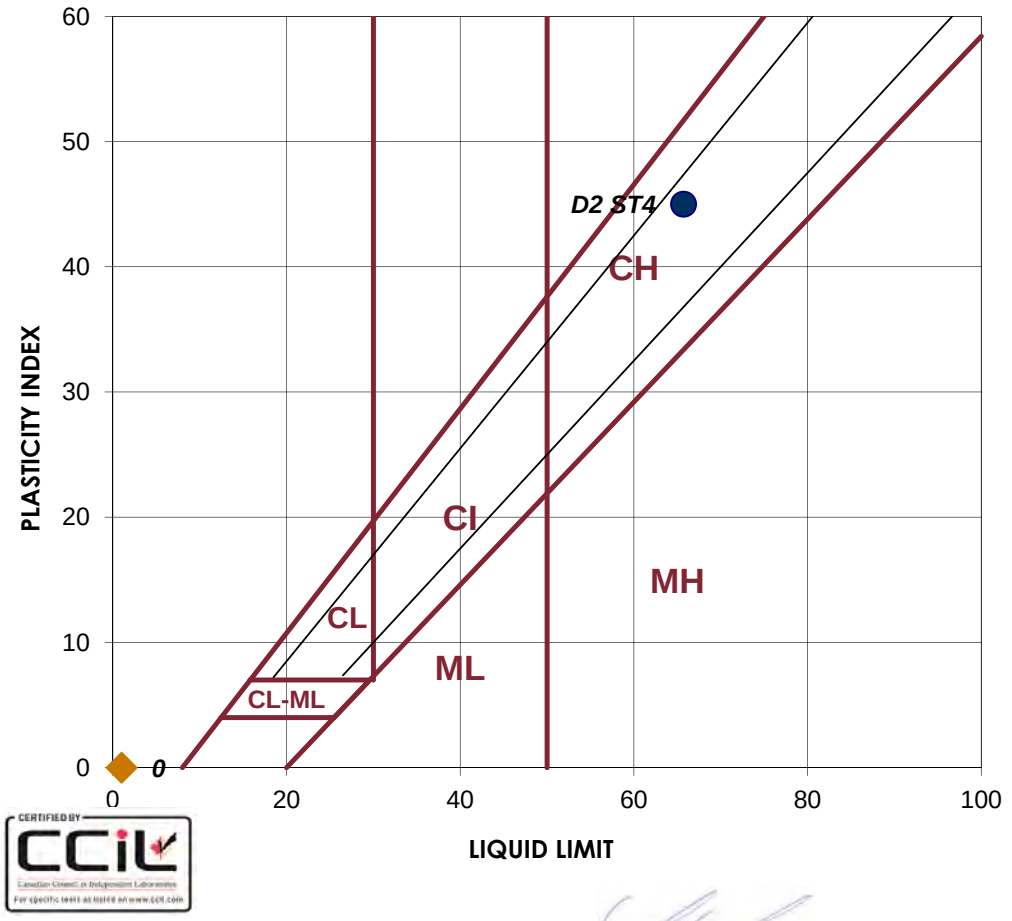
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D2 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 19.68 | 22.57 | Wt. Sample (wet+tare)(g) | | |
| 12.56 | 14.18 | Wt. Sample (dry+tare)(g) | | |
| 1.53 | 1.18 | Wt. Tare (g) | | |
| 11.0 | 13.0 | Wt. Dry Soil (g) | | |
| 7.1 | 8.4 | Wt. Water (g) | | |
| 64.6% | 64.5% | Water Content (%) | | |
| 65.7% | 65.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.33 | 26.47 | Wt. Sample (wet+tare)(g) | | |
| 21.71 | 24.27 | Wt. Sample (dry+tare)(g) | | |
| 13.81 | 13.78 | Wt. Tare (g) | | |
| 7.9 | 10.5 | Wt. Dry Soil (g) | | |
| 1.6 | 2.2 | Wt. Water (g) | | |
| 20.5% | 21.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 66 | | LL | |
| PL | 21 | | PL | |
| PI | 45 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |

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Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. STANTEC is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of STANTEC.

Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 10, 2016 |
| Date Tested: | July 6, 2016 |
| Tested By: | B. Pelkey |


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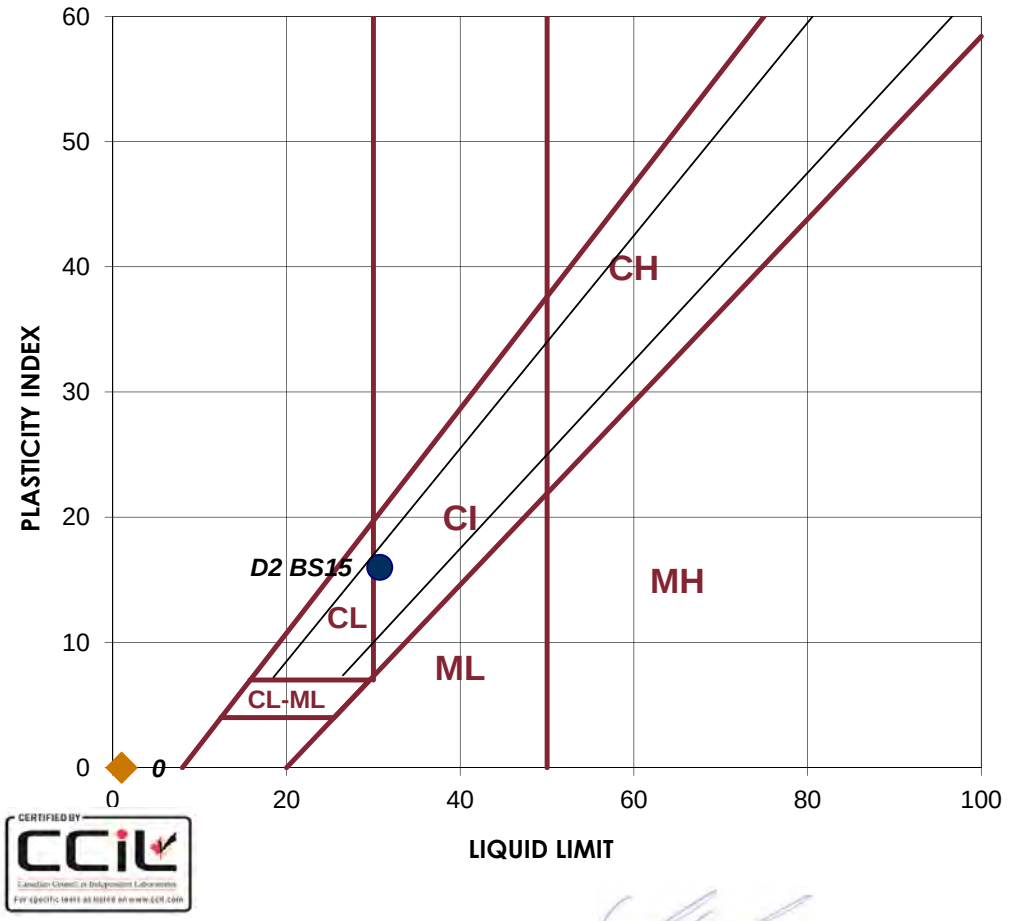
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D2 BS15 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 23 | Number of Blows | | |
| | | Container Number | | |
| 29.72 | 34.02 | Wt. Sample (wet+tare)(g) | | |
| 23.04 | 26.25 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.22 | Wt. Tare (g) | | |
| 21.5 | 25.0 | Wt. Dry Soil (g) | | |
| 6.7 | 7.8 | Wt. Water (g) | | |
| 31.0% | 31.0% | Water Content (%) | | |
| 30.7% | 30.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 29.05 | 28.19 | Wt. Sample (wet+tare)(g) | | |
| 27.24 | 26.56 | Wt. Sample (dry+tare)(g) | | |
| 15.65 | 15.81 | Wt. Tare (g) | | |
| 11.6 | 10.8 | Wt. Dry Soil (g) | | |
| 1.8 | 1.6 | Wt. Water (g) | | |
| 15.6% | 15.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 15 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CL*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 10, 2016 |
| Date Tested: | June 29, 2016 |
| Tested By: | B. Pelkey |

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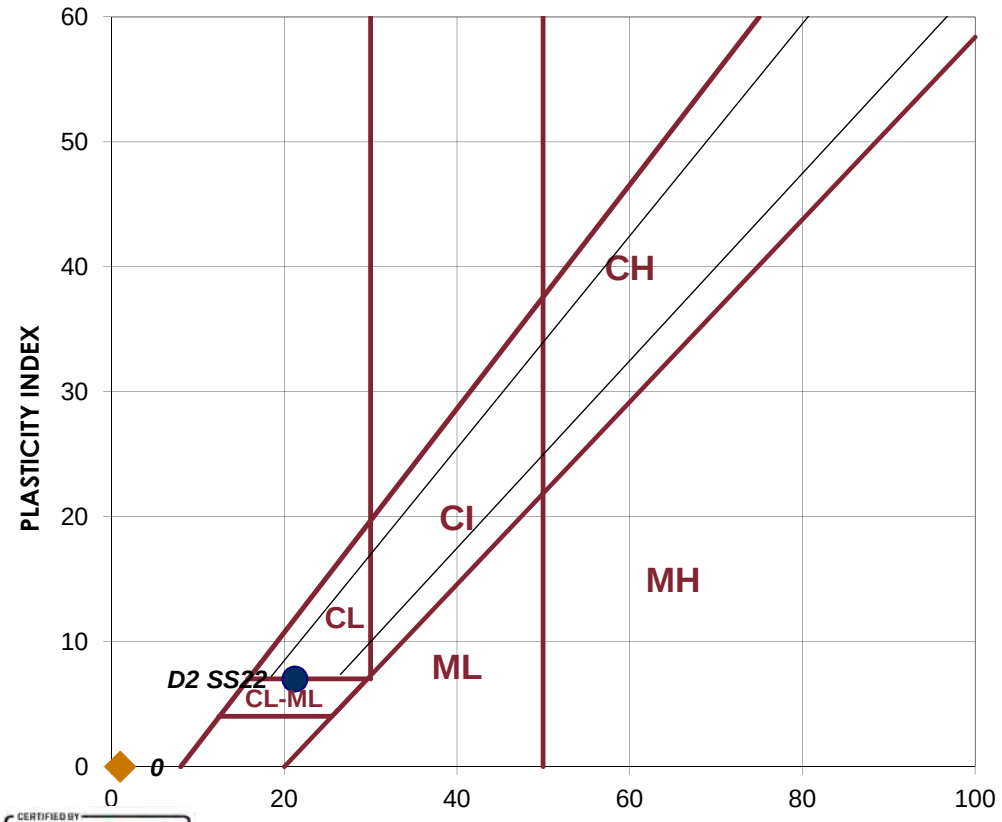
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D2 SS22 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 23 | Number of Blows | | |
| | | Container Number | | |
| 32.66 | 42.12 | Wt. Sample (wet+tare)(g) | | |
| 27.14 | 34.90 | Wt. Sample (dry+tare)(g) | | |
| 1.46 | 1.37 | Wt. Tare (g) | | |
| 25.7 | 33.5 | Wt. Dry Soil (g) | | |
| 5.5 | 7.2 | Wt. Water (g) | | |
| 21.5% | 21.5% | Water Content (%) | | |
| 21.2% | 21.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.64 | 26.51 | Wt. Sample (wet+tare)(g) | | |
| 24.2 | 25.02 | Wt. Sample (dry+tare)(g) | | |
| 13.81 | 14.14 | Wt. Tare (g) | | |
| 10.4 | 10.9 | Wt. Dry Soil (g) | | |
| 1.4 | 1.5 | Wt. Water (g) | | |
| 13.9% | 13.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 21 | | LL | |
| PL | 14 | | PL | |
| PI | 7 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-ML*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 29, 2016 |
| Date Tested: | September 4, 2016 |
| Tested By: | B. Pelkey |


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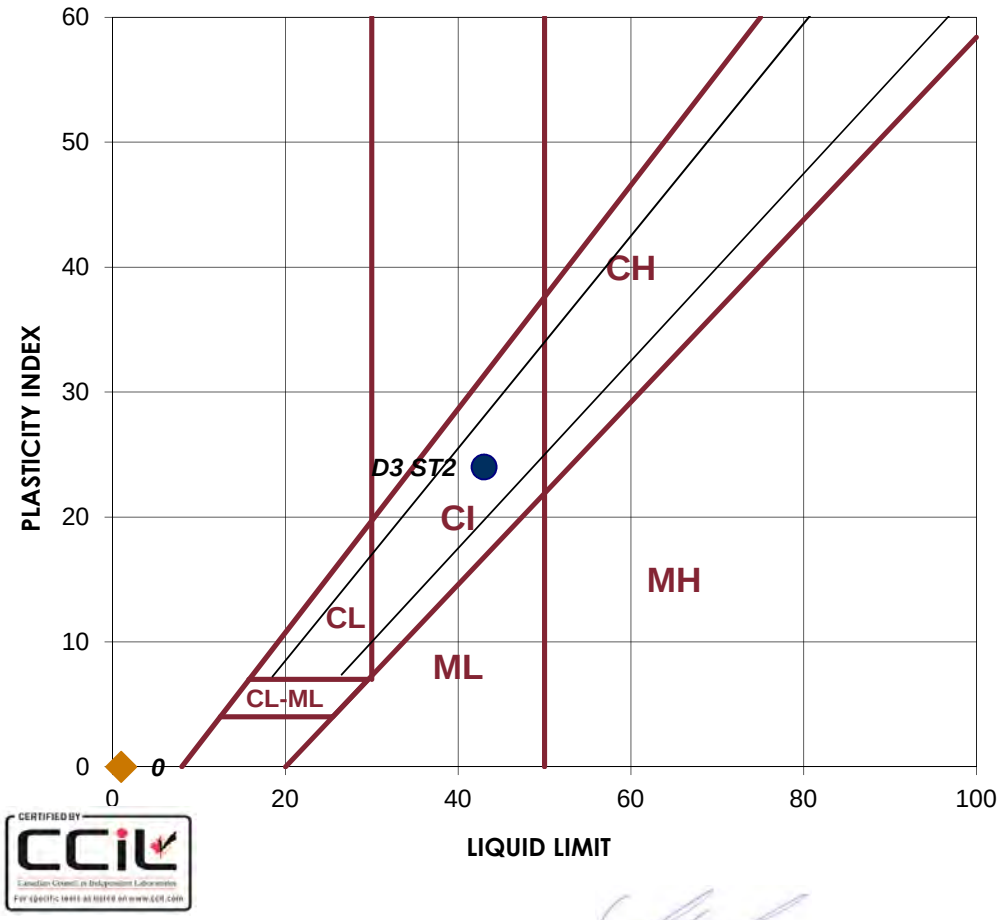
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D3 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 20 | Number of Blows | | |
| | | Container Number | | |
| 24.40 | 23.06 | Wt. Sample (wet+tare)(g) | | |
| 17.30 | 16.41 | Wt. Sample (dry+tare)(g) | | |
| 1.18 | 1.32 | Wt. Tare (g) | | |
| 16.1 | 15.1 | Wt. Dry Soil (g) | | |
| 7.1 | 6.7 | Wt. Water (g) | | |
| 44.0% | 44.1% | Water Content (%) | | |
| 43.1% | 42.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.34 | 24.47 | Wt. Sample (wet+tare)(g) | | |
| 25.97 | 22.78 | Wt. Sample (dry+tare)(g) | | |
| 13.78 | 13.91 | Wt. Tare (g) | | |
| 12.2 | 8.9 | Wt. Dry Soil (g) | | |
| 2.4 | 1.7 | Wt. Water (g) | | |
| 19.4% | 19.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 43 | | LL | |
| PL | 19 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 29, 2016 |
| Date Tested: | October 3, 2016 |
| Tested By: | E.Farries |


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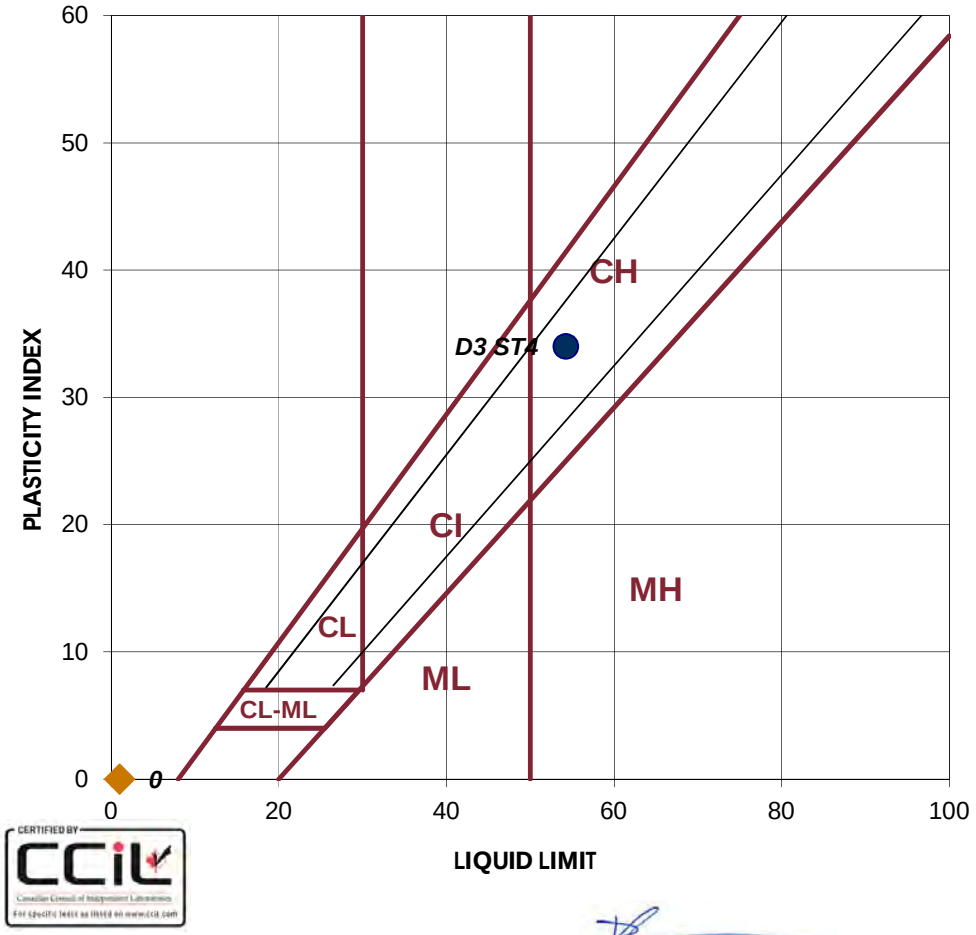
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D3 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 25.02 | 24.30 | Wt. Sample (wet+tare)(g) | | |
| 16.60 | 16.17 | Wt. Sample (dry+tare)(g) | | |
| 1.23 | 1.24 | Wt. Tare (g) | | |
| 15.4 | 14.9 | Wt. Dry Soil (g) | | |
| 8.4 | 8.1 | Wt. Water (g) | | |
| 54.8% | 54.5% | Water Content (%) | | |
| 54.2% | 54.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.62 | 24.69 | Wt. Sample (wet+tare)(g) | | |
| 24.45 | 22.92 | Wt. Sample (dry+tare)(g) | | |
| 13.76 | 14.14 | Wt. Tare (g) | | |
| 10.7 | 8.8 | Wt. Dry Soil (g) | | |
| 2.2 | 1.8 | Wt. Water (g) | | |
| 20.3% | 20.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 54 | | LL | |
| PL | 20 | | PL | |
| PI | 34 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 29, 2016 |
| Date Tested: | August 24, 2016 |
| Tested By: | B. Pelkey |


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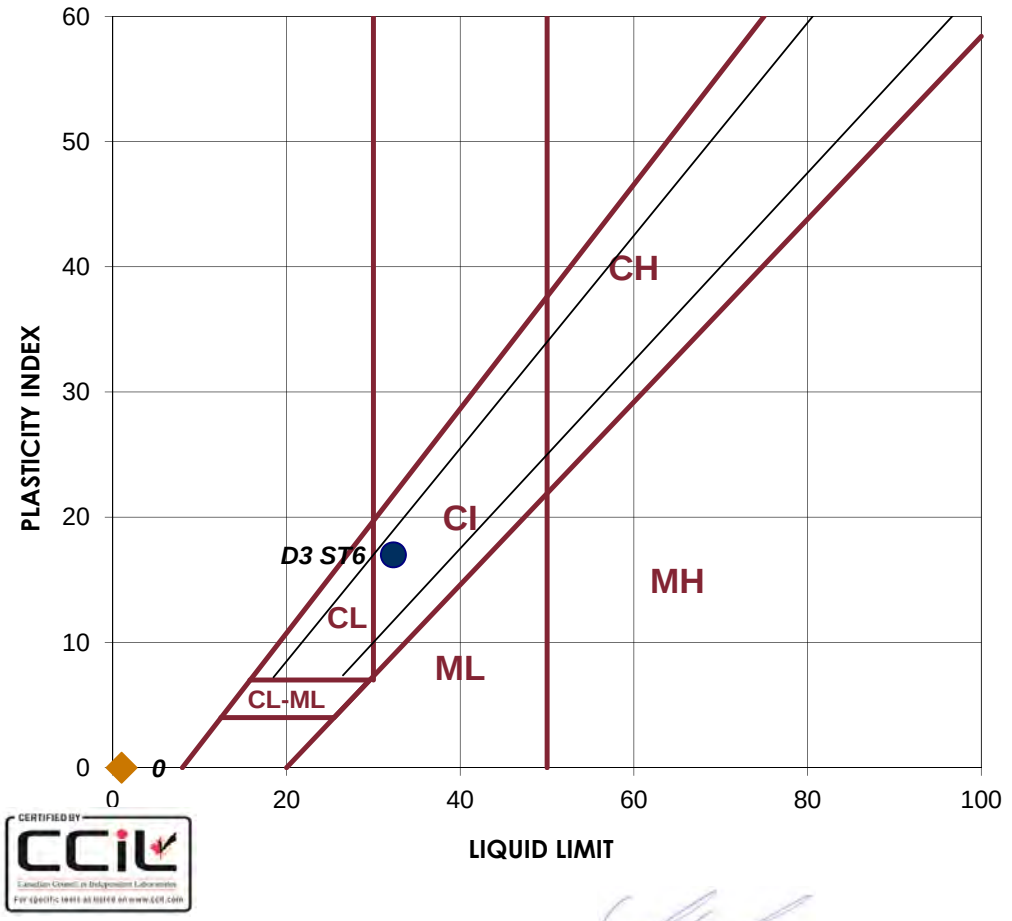
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D3 ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 26.00 | 31.39 | Wt. Sample (wet+tare)(g) | | |
| 20.00 | 24.04 | Wt. Sample (dry+tare)(g) | | |
| 1.53 | 1.49 | Wt. Tare (g) | | |
| 18.5 | 22.6 | Wt. Dry Soil (g) | | |
| 6.0 | 7.4 | Wt. Water (g) | | |
| 32.5% | 32.6% | Water Content (%) | | |
| 32.2% | 32.4% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.86 | 31.79 | Wt. Sample (wet+tare)(g) | | |
| 25.4 | 29.7 | Wt. Sample (dry+tare)(g) | | |
| 15.64 | 15.81 | Wt. Tare (g) | | |
| 9.8 | 13.9 | Wt. Dry Soil (g) | | |
| 1.5 | 2.1 | Wt. Water (g) | | |
| 15.0% | 15.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | |
| PL | 15 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | B. Pelkey |


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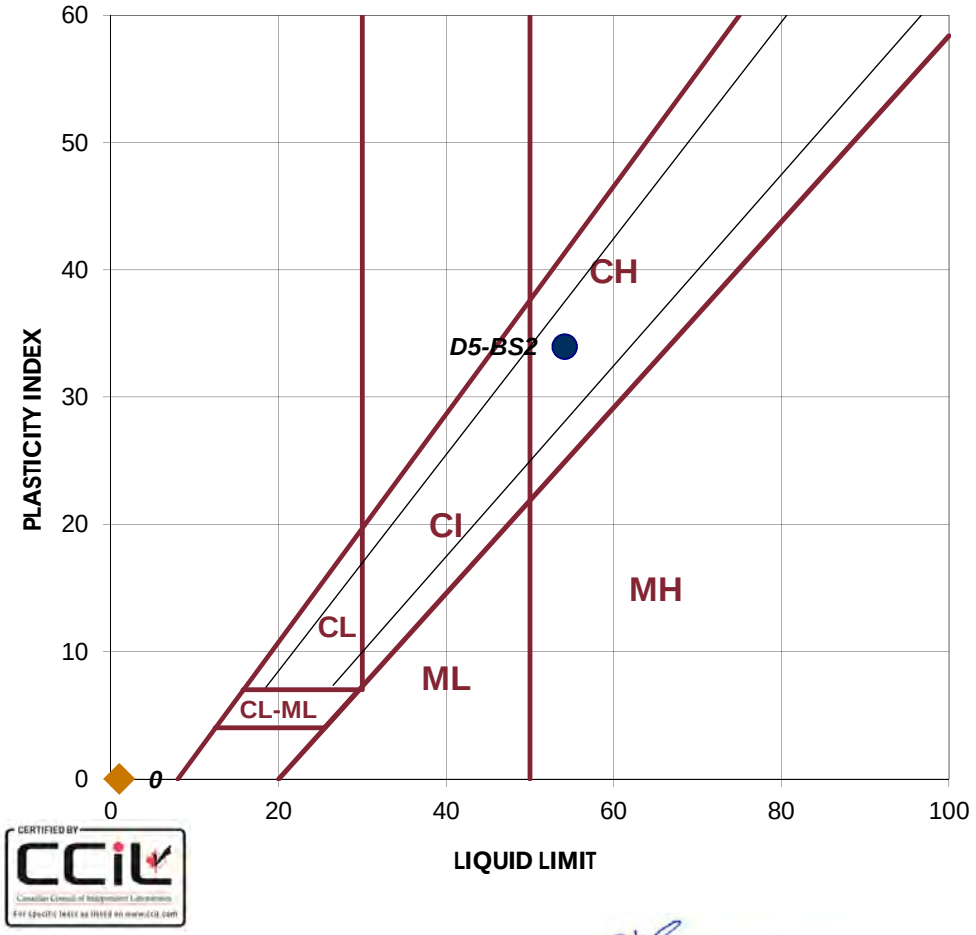
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D5-BS2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 21 | Number of Blows | | |
| | | Container Number | | |
| 18.95 | 18.23 | Wt. Sample (wet+tare)(g) | | |
| 12.66 | 12.18 | Wt. Sample (dry+tare)(g) | | |
| 1.30 | 1.21 | Wt. Tare (g) | | |
| 11.4 | 11.0 | Wt. Dry Soil (g) | | |
| 6.3 | 6.1 | Wt. Water (g) | | |
| 55.4% | 55.2% | Water Content (%) | | |
| 54.2% | 54.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.52 | 8.32 | Wt. Sample (wet+tare)(g) | | |
| 8.2 | 7.19 | Wt. Sample (dry+tare)(g) | | |
| 1.53 | 1.46 | Wt. Tare (g) | | |
| 6.7 | 5.7 | Wt. Dry Soil (g) | | |
| 1.3 | 1.1 | Wt. Water (g) | | |
| 19.8% | 19.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 54 | | LL | |
| PL | 20 | | PL | |
| PI | 34 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |






Reviewed By:

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | May 18, 2016 |
| Tested By: | C. Small |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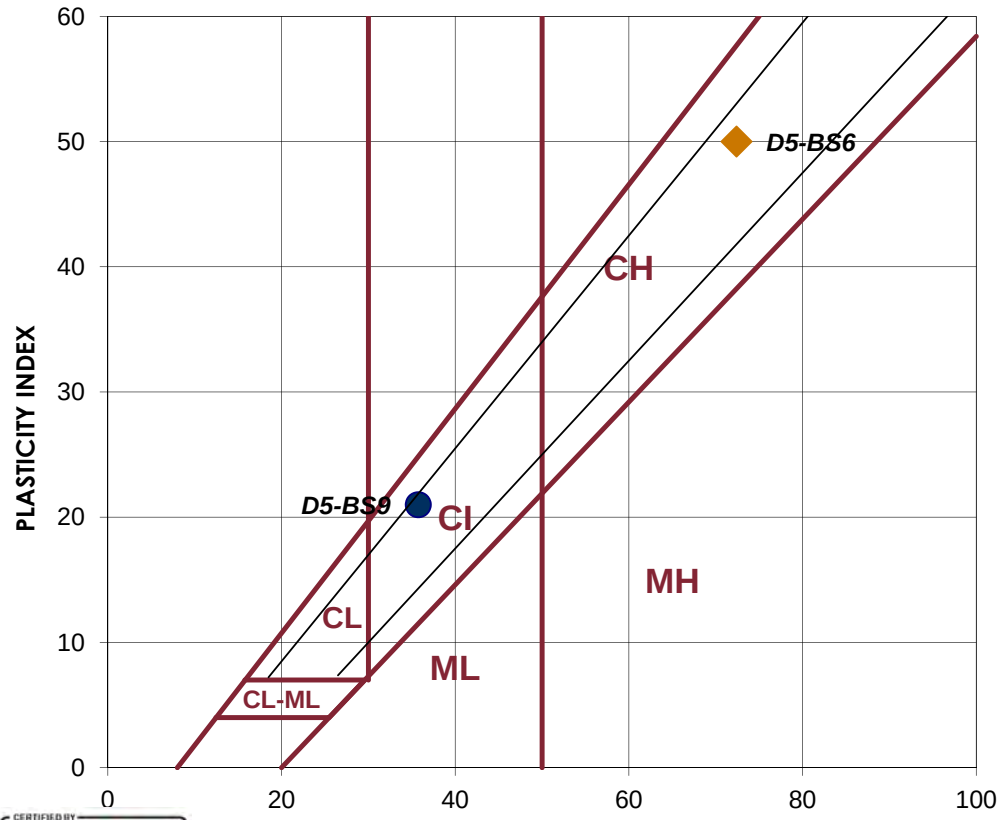
| Sample: D5-BS9 | | | Sample: D5-BS6 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 28 | Number of Blows | 23 | 22 |
| | | Container Number | | |
| 31.64 | 26.85 | Wt. Sample (wet+tare)(g) | 21.53 | 22.20 |
| 23.78 | 20.23 | Wt. Sample (dry+tare)(g) | 13.03 | 13.48 |
| 1.63 | 1.49 | Wt. Tare (g) | 1.47 | 1.55 |
| 22.2 | 18.7 | Wt. Dry Soil (g) | 11.6 | 11.9 |
| 7.9 | 6.6 | Wt. Water (g) | 8.5 | 8.7 |
| 35.5% | 35.3% | Water Content (%) | 73.5% | 73.1% |
| 35.7% | 35.8% | Corrected Water Content (%) | 72.8% | 72.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.25 | 11.23 | Wt. Sample (wet+tare)(g) | 10.61 | 10.5 |
| 10.84 | 9.93 | Wt. Sample (dry+tare)(g) | 9 | 8.89 |
| 1.49 | 1.39 | Wt. Tare (g) | 1.64 | 1.55 |
| 9.4 | 8.5 | Wt. Dry Soil (g) | 7.4 | 7.3 |
| 1.4 | 1.3 | Wt. Water (g) | 1.6 | 1.6 |
| 15.1% | 15.2% | Water Content (%) | 21.9% | 21.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | 72 |
| PL | 15 | | PL | 22 |
| PI | 21 | | PI | 50 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CH | |

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Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | October 28, 2016 |
| Tested By: | C. Woods |


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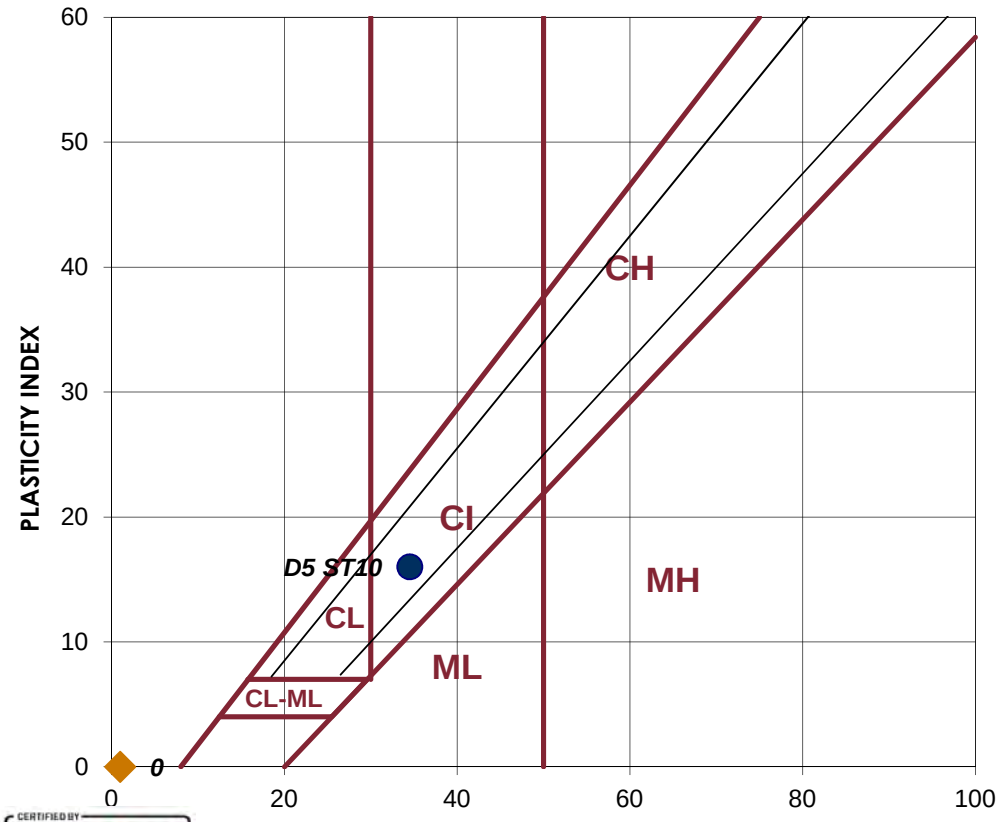
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D5 ST10 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 27 | Number of Blows | | |
| | | Container Number | | |
| 28.88 | 27.69 | Wt. Sample (wet+tare)(g) | | |
| 21.93 | 20.94 | Wt. Sample (dry+tare)(g) | | |
| 1.60 | 1.23 | Wt. Tare (g) | | |
| 20.3 | 19.7 | Wt. Dry Soil (g) | | |
| 7.0 | 6.8 | Wt. Water (g) | | |
| 34.2% | 34.2% | Water Content (%) | | |
| 34.5% | 34.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.77 | 27.53 | Wt. Sample (wet+tare)(g) | | |
| 22.22 | 25.35 | Wt. Sample (dry+tare)(g) | | |
| 13.84 | 13.72 | Wt. Tare (g) | | |
| 8.4 | 11.6 | Wt. Dry Soil (g) | | |
| 1.6 | 2.2 | Wt. Water (g) | | |
| 18.5% | 18.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 19 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | May 1, 2016 |
| Date Tested: | June 27, 2016 |
| Tested By: | B. Pelkey |


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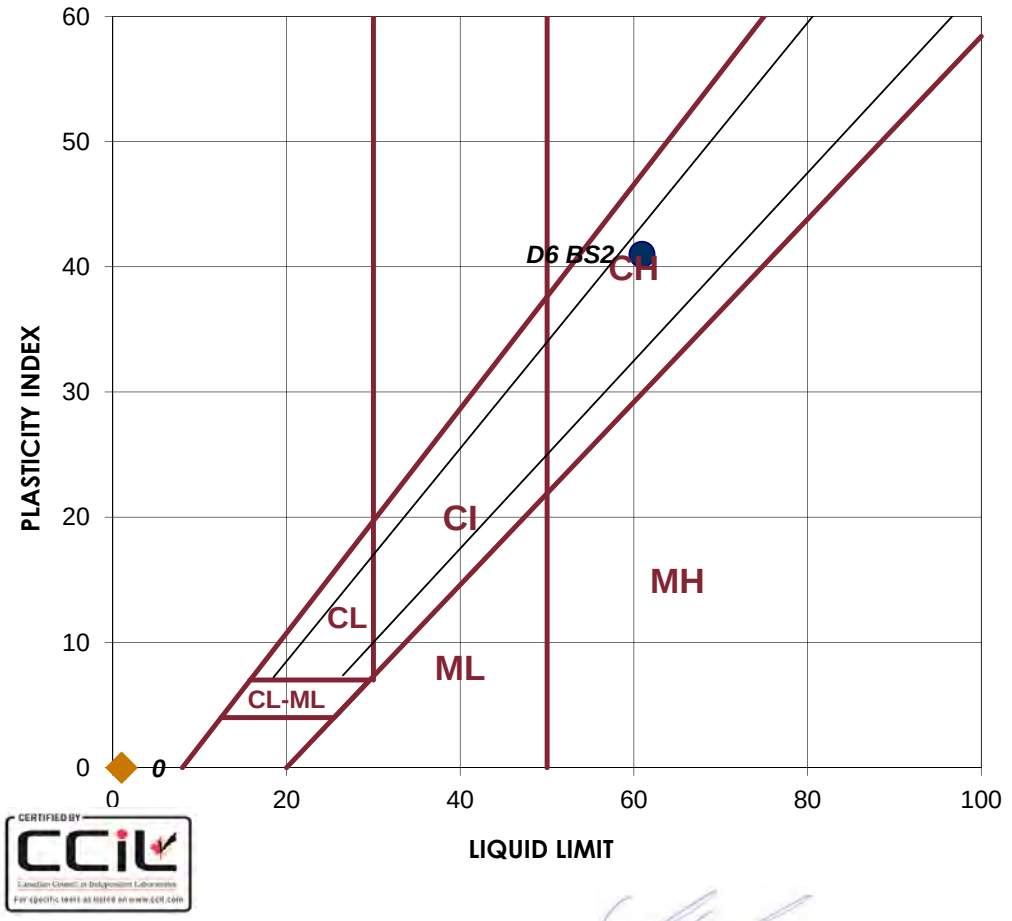
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D6 BS2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 18.88 | 24.96 | Wt. Sample (wet+tare)(g) | | |
| 12.42 | 16.20 | Wt. Sample (dry+tare)(g) | | |
| 1.61 | 1.58 | Wt. Tare (g) | | |
| 10.8 | 14.6 | Wt. Dry Soil (g) | | |
| 6.5 | 8.8 | Wt. Water (g) | | |
| 59.8% | 59.9% | Water Content (%) | | |
| 60.8% | 61.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.32 | 26.1 | Wt. Sample (wet+tare)(g) | | |
| 24.55 | 24.38 | Wt. Sample (dry+tare)(g) | | |
| 15.81 | 15.64 | Wt. Tare (g) | | |
| 8.7 | 8.7 | Wt. Dry Soil (g) | | |
| 1.8 | 1.7 | Wt. Water (g) | | |
| 20.3% | 19.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 61 | | LL | |
| PL | 20 | | PL | |
| PI | 41 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | May 2, 2016 |
| Date Tested: | June 22, 2016 |
| Tested By: | B. Pelkey |


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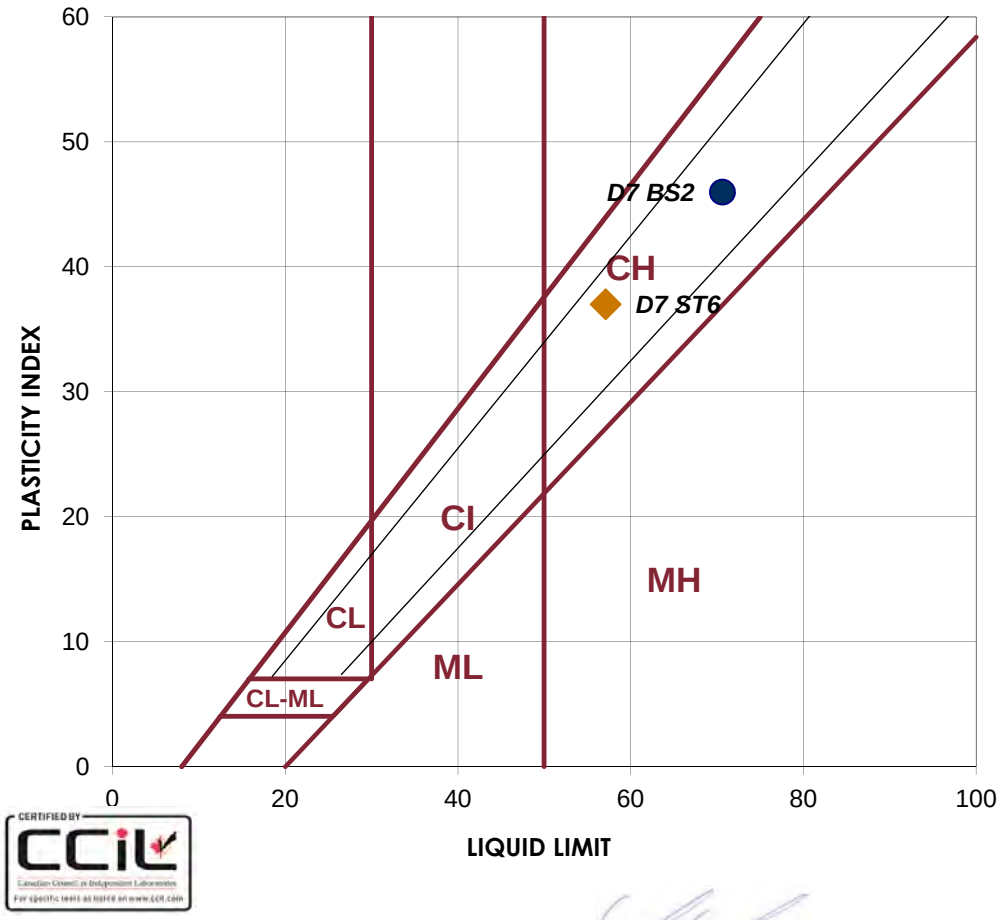
| Sample: D7 BS2 | | | Sample: D7 ST6 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 29 | Number of Blows | 29 | 30 |
| | | Container Number | | |
| 26.35 | 28.65 | Wt. Sample (wet+tare)(g) | 23.72 | 27.48 |
| 16.17 | 17.53 | Wt. Sample (dry+tare)(g) | 15.77 | 18.14 |
| 1.56 | 1.56 | Wt. Tare (g) | 1.56 | 1.45 |
| 14.6 | 16.0 | Wt. Dry Soil (g) | 14.2 | 16.7 |
| 10.2 | 11.1 | Wt. Water (g) | 8.0 | 9.3 |
| 69.7% | 69.6% | Water Content (%) | 55.9% | 56.0% |
| 70.3% | 70.9% | Corrected Water Content (%) | 57.0% | 57.2% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.71 | 8.97 | Wt. Sample (wet+tare)(g) | 27.9 | 30.78 |
| 7.19 | 7.47 | Wt. Sample (dry+tare)(g) | 25.91 | 28.33 |
| 1.16 | 1.45 | Wt. Tare (g) | 15.79 | 15.81 |
| 6.0 | 6.0 | Wt. Dry Soil (g) | 10.1 | 12.5 |
| 1.5 | 1.5 | Wt. Water (g) | 2.0 | 2.5 |
| 25.2% | 24.9% | Water Content (%) | 19.7% | 19.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 71 | | LL | 57 |
| PL | 25 | | PL | 20 |
| PI | 46 | | PI | 37 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CH | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | May 1, 2016 |
| Date Tested: | June 21, 2016 |
| Tested By: | B. Pelkey |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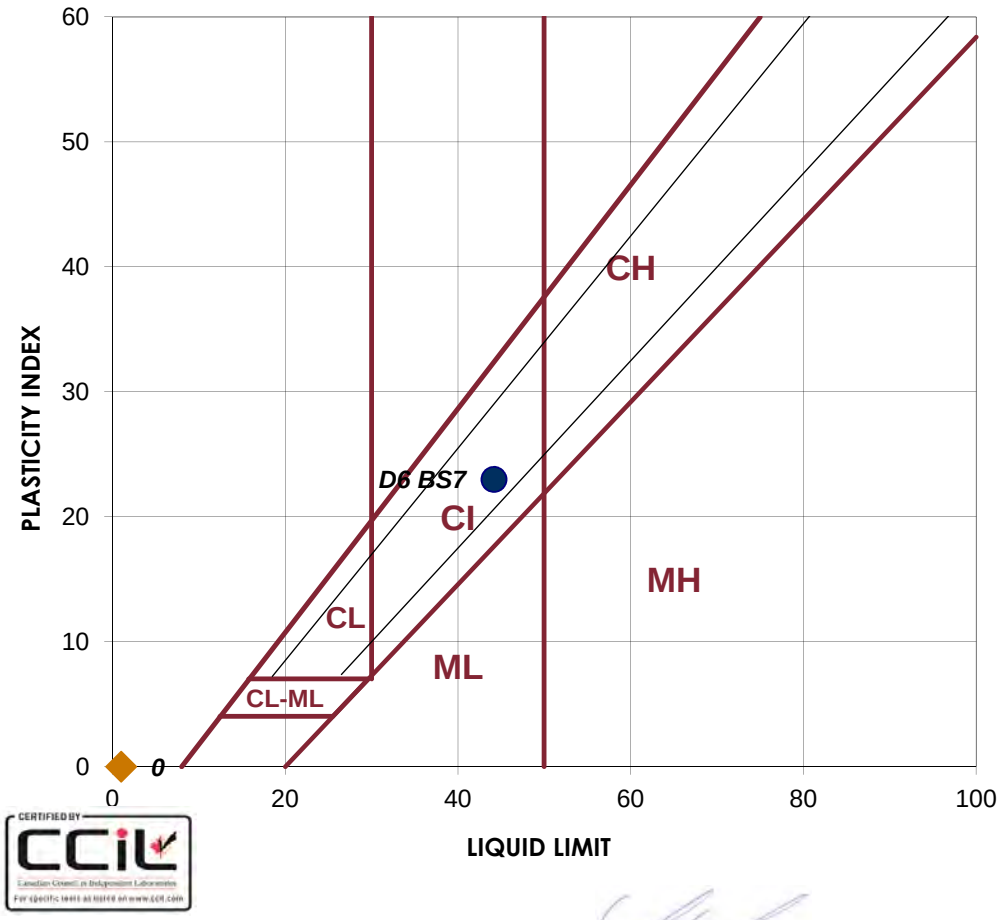
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D6 BS7 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 27.92 | 30.93 | Wt. Sample (wet+tare)(g) | | |
| 19.92 | 22.05 | Wt. Sample (dry+tare)(g) | | |
| 1.48 | 1.56 | Wt. Tare (g) | | |
| 18.4 | 20.5 | Wt. Dry Soil (g) | | |
| 8.0 | 8.9 | Wt. Water (g) | | |
| 43.4% | 43.3% | Water Content (%) | | |
| 44.2% | 44.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 31.24 | 30.56 | Wt. Sample (wet+tare)(g) | | |
| 28.48 | 27.97 | Wt. Sample (dry+tare)(g) | | |
| 15.82 | 15.65 | Wt. Tare (g) | | |
| 12.7 | 12.3 | Wt. Dry Soil (g) | | |
| 2.8 | 2.6 | Wt. Water (g) | | |
| 21.8% | 21.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 44 | | LL | |
| PL | 21 | | PL | |
| PI | 23 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | May 1, 2016 |
| Date Tested: | May 19, 2016 |
| Tested By: | C. Small |


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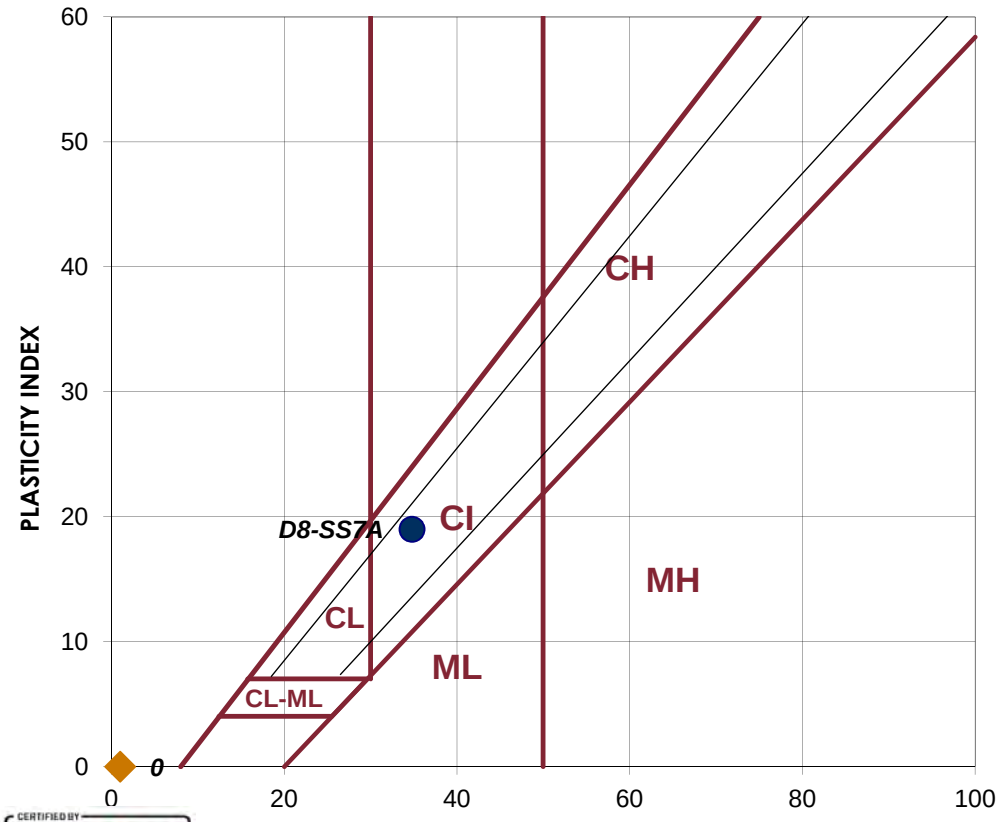
| Sample: D8-SS7A | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | | |
| | | Container Number | | |
| 28.21 | 27.02 | Wt. Sample (wet+tare)(g) | | |
| 21.24 | 20.35 | Wt. Sample (dry+tare)(g) | | |
| 1.25 | 1.22 | Wt. Tare (g) | | |
| 20.0 | 19.1 | Wt. Dry Soil (g) | | |
| 7.0 | 6.7 | Wt. Water (g) | | |
| 34.9% | 34.9% | Water Content (%) | | |
| 34.9% | 34.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.63 | 13.52 | Wt. Sample (wet+tare)(g) | | |
| 10.2 | 11.82 | Wt. Sample (dry+tare)(g) | | |
| 1.69 | 1.25 | Wt. Tare (g) | | |
| 8.5 | 10.6 | Wt. Dry Soil (g) | | |
| 1.4 | 1.7 | Wt. Water (g) | | |
| 16.8% | 16.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 16 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | May 1, 2016 |
| Date Tested: | May 19, 2016 |
| Tested By: | C. Small |


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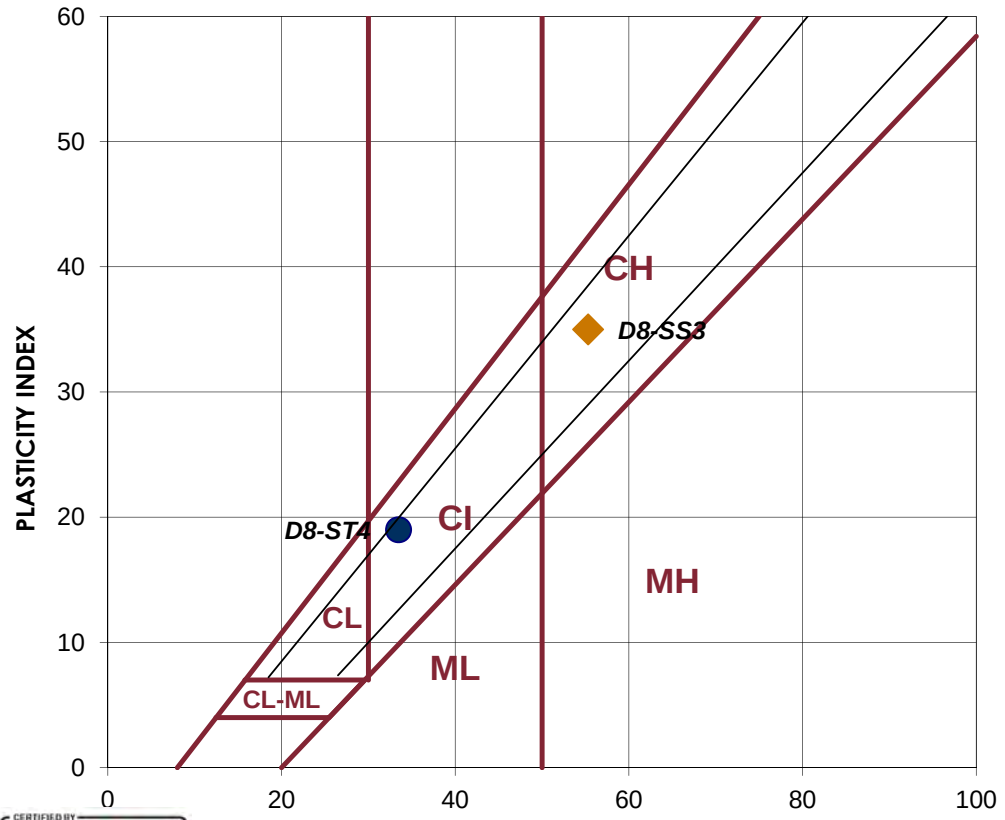
| Sample: D8-ST4 | | | Sample: D8-SS3 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 20 | Number of Blows | 27 | 26 |
| | | Container Number | | |
| 30.98 | 22.22 | Wt. Sample (wet+tare)(g) | 20.39 | 19.55 |
| 23.38 | 16.88 | Wt. Sample (dry+tare)(g) | 13.63 | 13.06 |
| 1.23 | 1.29 | Wt. Tare (g) | 1.29 | 1.27 |
| 22.2 | 15.6 | Wt. Dry Soil (g) | 12.3 | 11.8 |
| 7.6 | 5.3 | Wt. Water (g) | 6.8 | 6.5 |
| 34.3% | 34.3% | Water Content (%) | 54.8% | 55.0% |
| 33.6% | 33.3% | Corrected Water Content (%) | 55.3% | 55.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.38 | 10.97 | Wt. Sample (wet+tare)(g) | 10.78 | 10.77 |
| 8.37 | 9.74 | Wt. Sample (dry+tare)(g) | 9.2 | 9.2 |
| 1.33 | 1.21 | Wt. Tare (g) | 1.18 | 1.25 |
| 7.0 | 8.5 | Wt. Dry Soil (g) | 8.0 | 8.0 |
| 1.0 | 1.2 | Wt. Water (g) | 1.6 | 1.6 |
| 14.3% | 14.4% | Water Content (%) | 19.7% | 19.7% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | 55 |
| PL | 14 | | PL | 20 |
| PI | 19 | | PI | 35 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CH | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | May 1, 2016 |
| Date Tested: | May 18, 2016 |
| Tested By: | C. Small |


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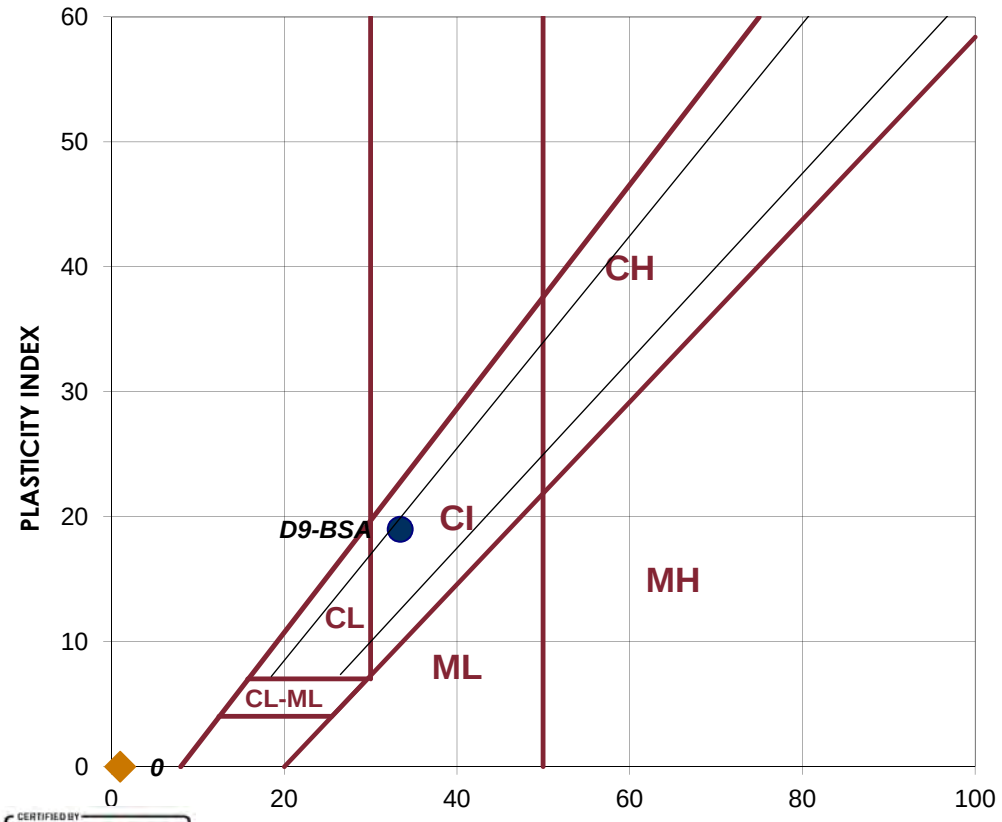
| Sample: D9-BSA | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 20 | Number of Blows | | |
| | | Container Number | | |
| 29.79 | 30.04 | Wt. Sample (wet+tare)(g) | | |
| 22.60 | 22.75 | Wt. Sample (dry+tare)(g) | | |
| 1.55 | 1.50 | Wt. Tare (g) | | |
| 21.1 | 21.3 | Wt. Dry Soil (g) | | |
| 7.2 | 7.3 | Wt. Water (g) | | |
| 34.2% | 34.3% | Water Content (%) | | |
| 33.4% | 33.4% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 14.09 | 11.22 | Wt. Sample (wet+tare)(g) | | |
| 12.57 | 10.07 | Wt. Sample (dry+tare)(g) | | |
| 1.52 | 1.52 | Wt. Tare (g) | | |
| 11.1 | 8.6 | Wt. Dry Soil (g) | | |
| 1.5 | 1.2 | Wt. Water (g) | | |
| 13.8% | 13.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | |
| PL | 14 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | May 9, 2016 |
| Tested By: | C. Oost |


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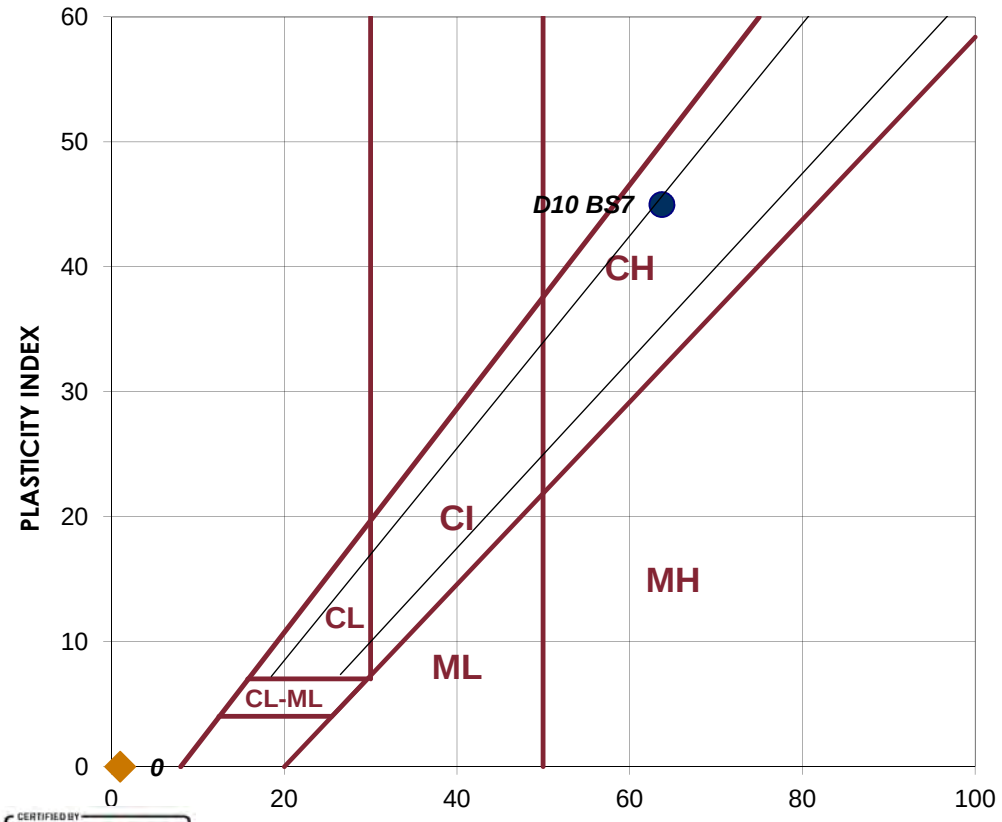
| Sample: D10 BS7 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 26 | Number of Blows | | |
| | | Container Number | | |
| 18.29 | 20.29 | Wt. Sample (wet+tare)(g) | | |
| 11.64 | 12.90 | Wt. Sample (dry+tare)(g) | | |
| 1.24 | 1.20 | Wt. Tare (g) | | |
| 10.4 | 11.7 | Wt. Dry Soil (g) | | |
| 6.7 | 7.4 | Wt. Water (g) | | |
| 63.9% | 63.2% | Water Content (%) | | |
| 63.9% | 63.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.62 | 8.45 | Wt. Sample (wet+tare)(g) | | |
| 7.44 | 7.3 | Wt. Sample (dry+tare)(g) | | |
| 1.14 | 1.17 | Wt. Tare (g) | | |
| 6.3 | 6.1 | Wt. Dry Soil (g) | | |
| 1.2 | 1.2 | Wt. Water (g) | | |
| 18.7% | 18.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 64 | | LL | |
| PL | 19 | | PL | |
| PI | 45 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | May 10, 2016 |
| Tested By: | C. Oost |


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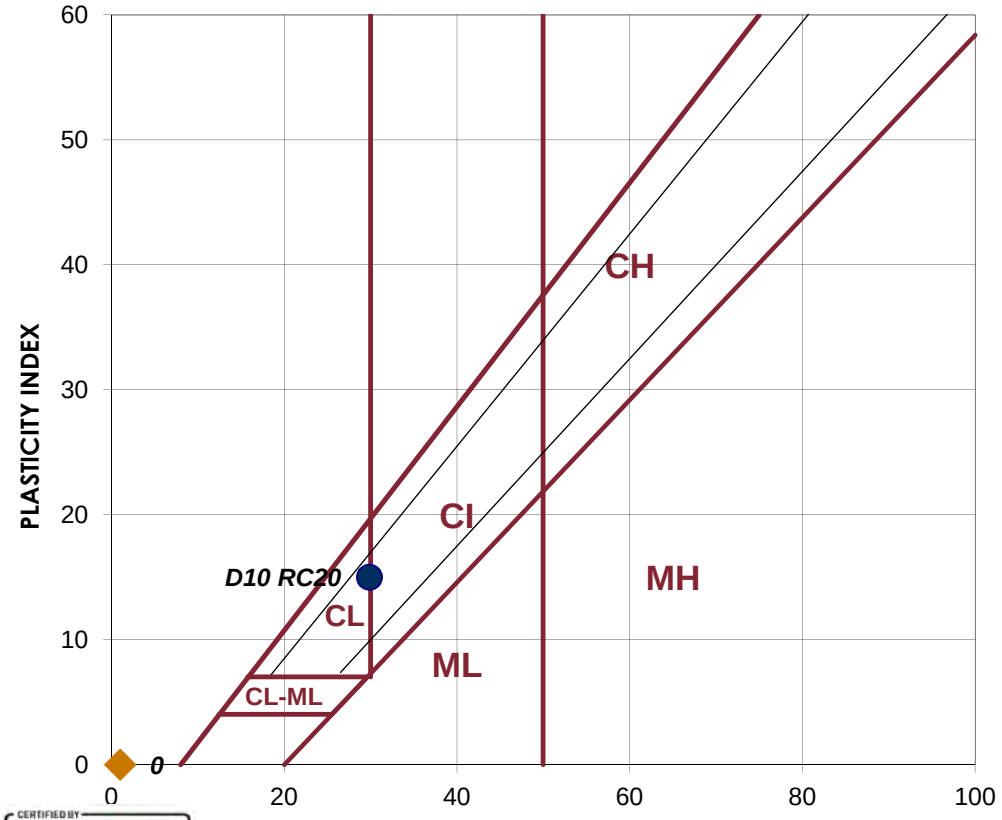
Tel: (403) 253-7876


| Sample: D10 RC20 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 26 | Number of Blows | | |
| | | Container Number | | |
| 13.26 | 15.08 | Wt. Sample (wet+tare)(g) | | |
| 10.48 | 11.91 | Wt. Sample (dry+tare)(g) | | |
| 1.16 | 1.21 | Wt. Tare (g) | | |
| 9.3 | 10.7 | Wt. Dry Soil (g) | | |
| 2.8 | 3.2 | Wt. Water (g) | | |
| 29.8% | 29.6% | Water Content (%) | | |
| 30.0% | 29.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 10.03 | 8.66 | Wt. Sample (wet+tare)(g) | | |
| 8.93 | 7.74 | Wt. Sample (dry+tare)(g) | | |
| 1.55 | 1.46 | Wt. Tare (g) | | |
| 7.4 | 6.3 | Wt. Dry Soil (g) | | |
| 1.1 | 0.9 | Wt. Water (g) | | |
| 14.9% | 14.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | |
| PL | 15 | | PL | |
| PI | 15 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CL-CI** | | | **NON-PLASTIC** | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | May 10, 2016 |
| Tested By: | C. Oost |


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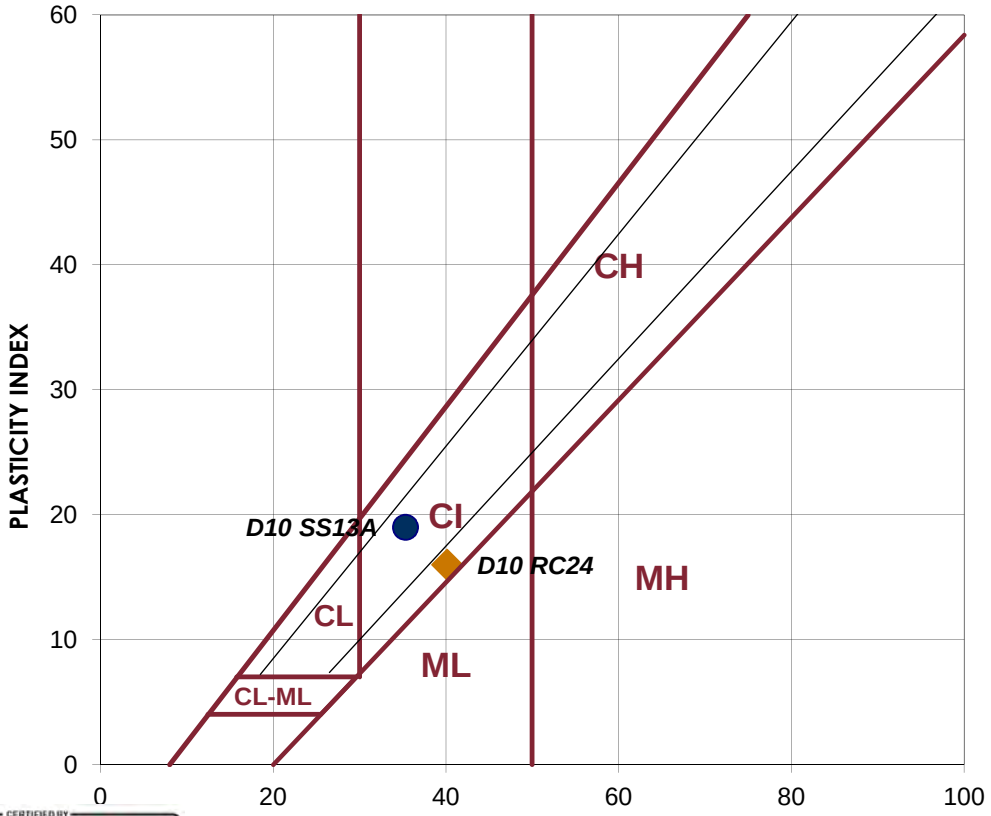
| Sample: D10 SS13A | | | Sample: D10 RC24 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | 24 | 26 |
| | | Container Number | | |
| 13.54 | 15.57 | Wt. Sample (wet+tare)(g) | 15.63 | 17.03 |
| 10.35 | 11.88 | Wt. Sample (dry+tare)(g) | 11.49 | 12.52 |
| 1.32 | 1.43 | Wt. Tare (g) | 1.22 | 1.22 |
| 9.0 | 10.5 | Wt. Dry Soil (g) | 10.3 | 11.3 |
| 3.2 | 3.7 | Wt. Water (g) | 4.1 | 4.5 |
| 35.3% | 35.3% | Water Content (%) | 40.3% | 39.9% |
| 35.3% | 35.3% | Corrected Water Content (%) | 40.1% | 40.1% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.42 | 8.74 | Wt. Sample (wet+tare)(g) | 9.39 | 10.14 |
| 8.32 | 7.75 | Wt. Sample (dry+tare)(g) | 7.88 | 8.49 |
| 1.4 | 1.56 | Wt. Tare (g) | 1.57 | 1.36 |
| 6.9 | 6.2 | Wt. Dry Soil (g) | 6.3 | 7.1 |
| 1.1 | 1.0 | Wt. Water (g) | 1.5 | 1.7 |
| 15.9% | 16.0% | Water Content (%) | 23.9% | 23.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | 40 |
| PL | 16 | | PL | 24 |
| PI | 19 | | PI | 16 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 13, 2016 |
| Date Tested: | May 3, 2016 |
| Tested By: | C.Tollifson |


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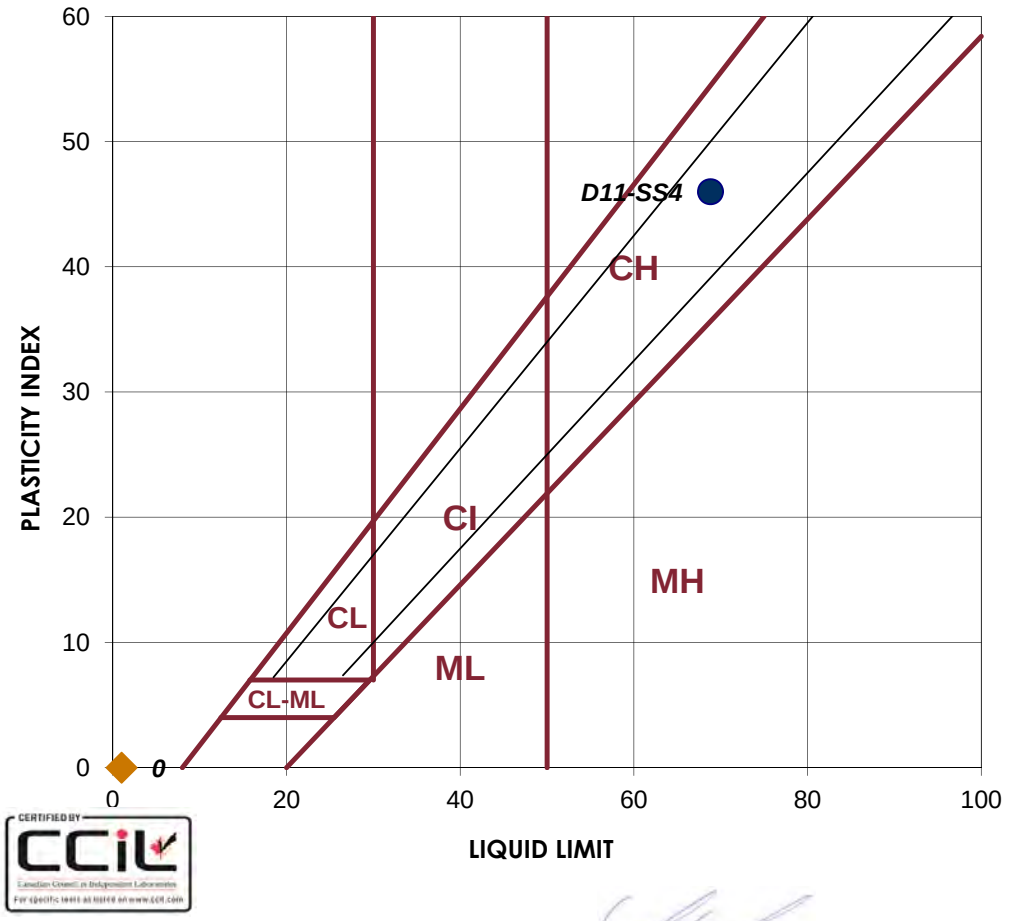
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D11-SS4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 26 | Number of Blows | | |
| | | Container Number | | |
| 21.46 | 21.35 | Wt. Sample (wet+tare)(g) | | |
| 13.41 | 13.39 | Wt. Sample (dry+tare)(g) | | |
| 1.62 | 1.75 | Wt. Tare (g) | | |
| 11.8 | 11.6 | Wt. Dry Soil (g) | | |
| 8.1 | 8.0 | Wt. Water (g) | | |
| 68.3% | 68.4% | Water Content (%) | | |
| 68.9% | 68.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.95 | 11.53 | Wt. Sample (wet+tare)(g) | | |
| 10.05 | 9.71 | Wt. Sample (dry+tare)(g) | | |
| 1.69 | 1.56 | Wt. Tare (g) | | |
| 8.4 | 8.2 | Wt. Dry Soil (g) | | |
| 1.9 | 1.8 | Wt. Water (g) | | |
| 22.7% | 22.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 69 | | LL | |
| PL | 23 | | PL | |
| PI | 46 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 1, 2016 |
| Date Tested: | April 29, 2016 |
| Tested By: | B. Pelkey |


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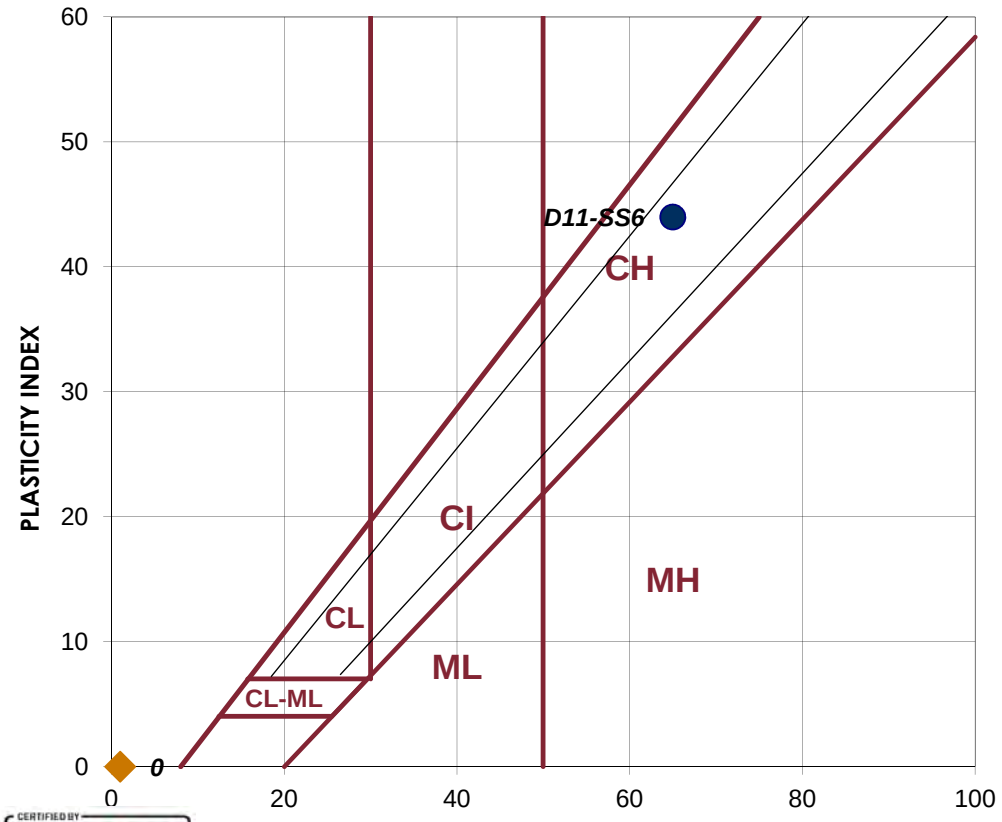
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D11-SS6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 27 | Number of Blows | | |
| BI | GD | Container Number | | |
| 30.18 | 29.92 | Wt. Sample (wet+tare)(g) | | |
| 19.25 | 18.54 | Wt. Sample (dry+tare)(g) | | |
| 1.48 | 1.68 | Wt. Tare (g) | | |
| 17.8 | 16.9 | Wt. Dry Soil (g) | | |
| 10.9 | 11.4 | Wt. Water (g) | | |
| 61.5% | 67.5% | Water Content (%) | | |
| 61.8% | 68.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| MC | AB | Container Number | | |
| 10.78 | 11.31 | Wt. Sample (wet+tare)(g) | | |
| 9.13 | 9.54 | Wt. Sample (dry+tare)(g) | | |
| 1.24 | 1.12 | Wt. Tare (g) | | |
| 7.9 | 8.4 | Wt. Dry Soil (g) | | |
| 1.7 | 1.8 | Wt. Water (g) | | |
| 20.9% | 21.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 65 | | LL | |
| PL | 21 | | PL | |
| PI | 44 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 13, 2016 |
| Date Tested: | April 29, 2016 |
| Tested By: | B. Pelkey |


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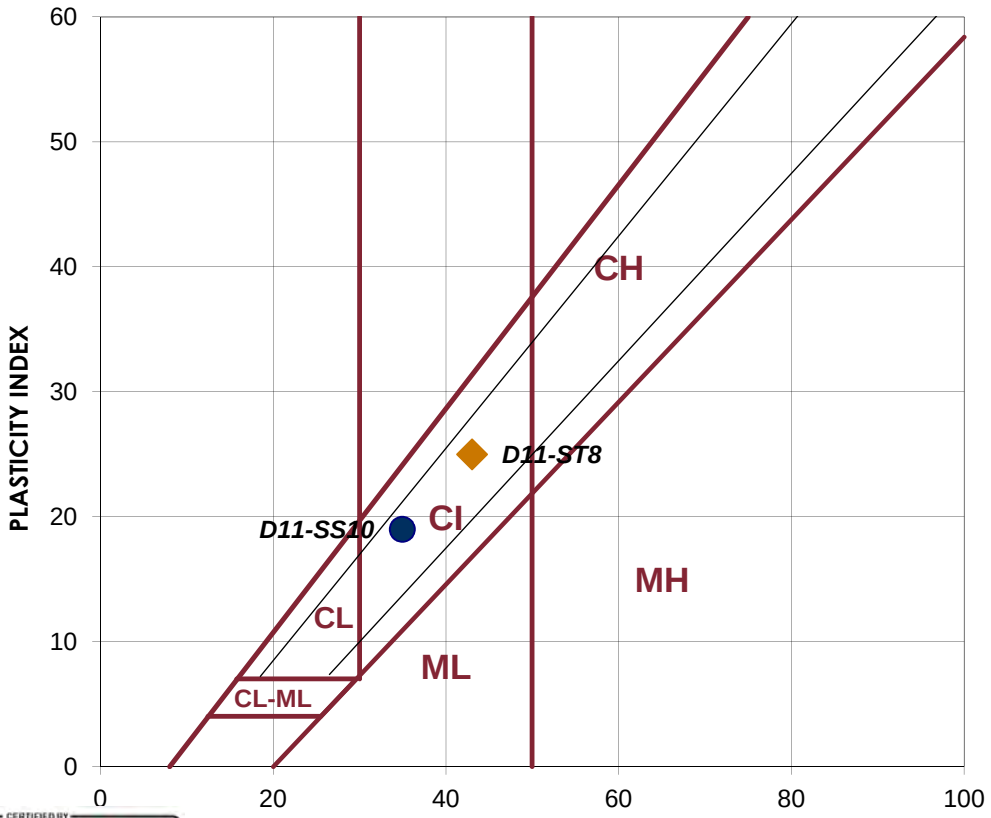
| Sample: D11-SS10 | | | Sample: D11-ST8 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 21 | Number of Blows | 28 | 27 |
| EZ | 6 | Container Number | KB | ZB |
| 35.31 | 35.86 | Wt. Sample (wet+tare)(g) | 32.76 | 34.53 |
| 26.41 | 26.78 | Wt. Sample (dry+tare)(g) | 23.34 | 24.60 |
| 1.50 | 1.30 | Wt. Tare (g) | 1.22 | 1.19 |
| 24.9 | 25.5 | Wt. Dry Soil (g) | 22.1 | 23.4 |
| 8.9 | 9.1 | Wt. Water (g) | 9.4 | 9.9 |
| 35.7% | 35.6% | Water Content (%) | 42.6% | 42.4% |
| 35.0% | 34.9% | Corrected Water Content (%) | 43.2% | 42.8% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| AR | CH | Container Number | GF | 9 |
| 13.36 | 13.46 | Wt. Sample (wet+tare)(g) | 12.83 | 12.34 |
| 11.64 | 11.78 | Wt. Sample (dry+tare)(g) | 11.1 | 10.65 |
| 1.22 | 1.53 | Wt. Tare (g) | 1.44 | 1.27 |
| 10.4 | 10.3 | Wt. Dry Soil (g) | 9.7 | 9.4 |
| 1.7 | 1.7 | Wt. Water (g) | 1.7 | 1.7 |
| 16.5% | 16.4% | Water Content (%) | 17.9% | 18.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | 43 |
| PL | 16 | | PL | 18 |
| PI | 19 | | PI | 25 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 15, 2016 |
| Date Tested: | May 2, 2016 |
| Tested By: | C.Oost |


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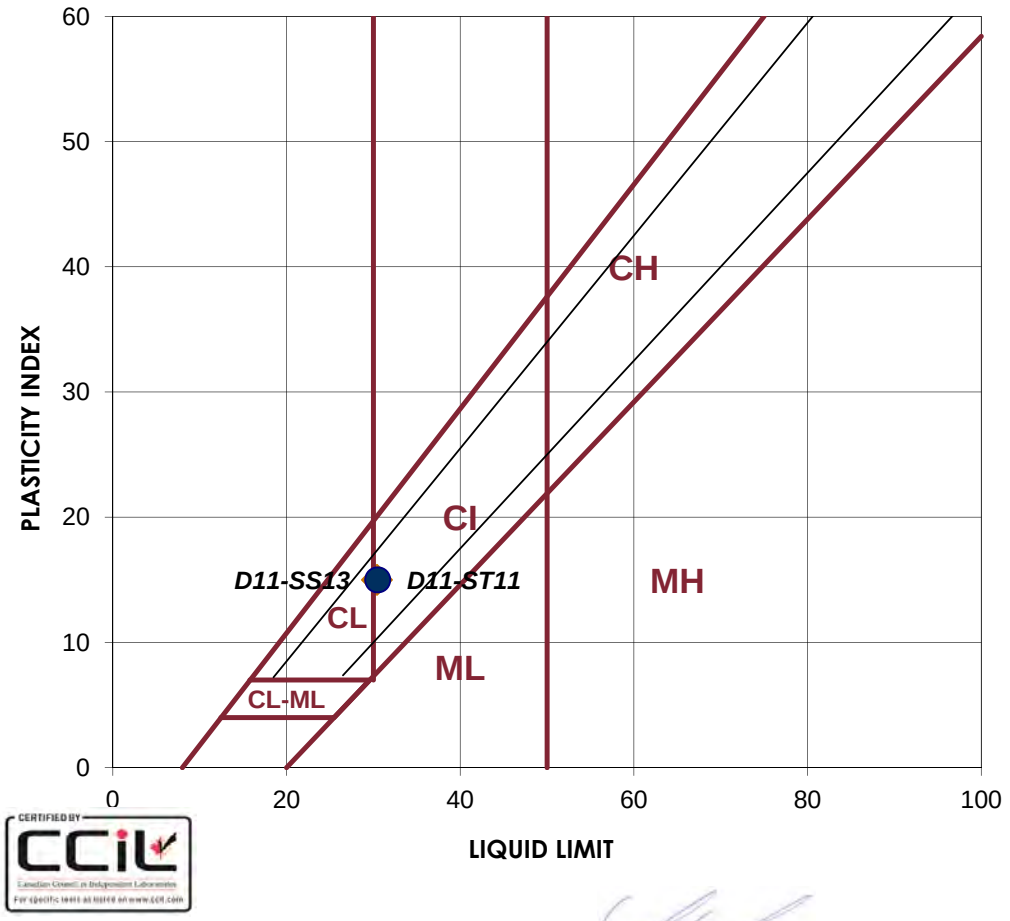
| Sample: D11-SS13 | | | Sample: D11-ST11 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 24 | Number of Blows | 26 | 27 |
| | | Container Number | | |
| 39.47 | 38.12 | Wt. Sample (wet+tare)(g) | 35.31 | 36.88 |
| 30.47 | 29.50 | Wt. Sample (dry+tare)(g) | 27.39 | 28.62 |
| 1.11 | 1.36 | Wt. Tare (g) | 1.19 | 1.23 |
| 29.4 | 28.1 | Wt. Dry Soil (g) | 26.2 | 27.4 |
| 9.0 | 8.6 | Wt. Water (g) | 7.9 | 8.3 |
| 30.7% | 30.6% | Water Content (%) | 30.2% | 30.2% |
| 30.5% | 30.5% | Corrected Water Content (%) | 30.4% | 30.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.72 | 8.65 | Wt. Sample (wet+tare)(g) | 8.09 | 8.12 |
| 7.77 | 7.74 | Wt. Sample (dry+tare)(g) | 7.25 | 7.28 |
| 1.47 | 1.52 | Wt. Tare (g) | 1.53 | 1.53 |
| 6.3 | 6.2 | Wt. Dry Soil (g) | 5.7 | 5.8 |
| 1.0 | 0.9 | Wt. Water (g) | 0.8 | 0.8 |
| 15.1% | 14.6% | Water Content (%) | 14.7% | 14.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | 30 |
| PL | 15 | | PL | 15 |
| PI | 15 | | PI | 15 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | CI-CL | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.220 |
| Date Received: | April 15, 2016 |
| Date Tested: | May 5, 2016 |
| Tested By: | B.Pelkey |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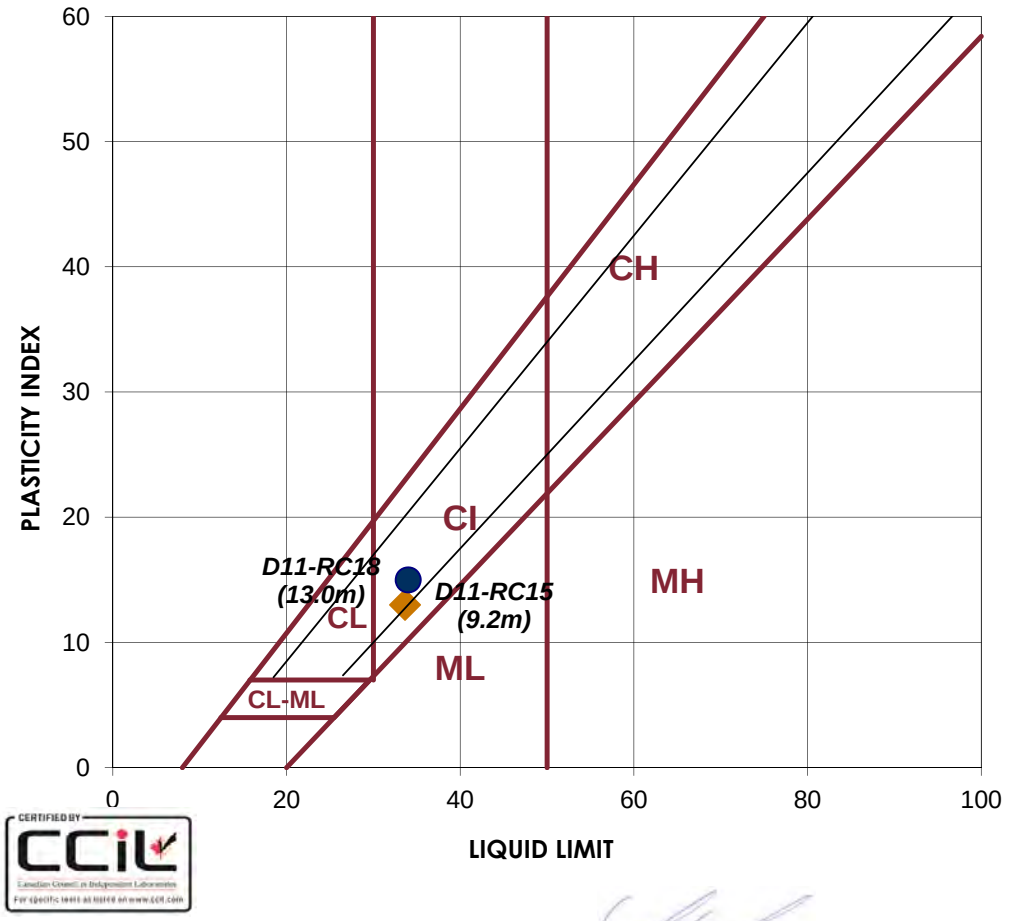
Tel: (403) 253-7876


| Sample: D11-RC18 (13.0m) | | | Sample: D11-RC15 (9.2m) | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | 27 | 29 |
| | | Container Number | | |
| 35.79 | 35.02 | Wt. Sample (wet+tare)(g) | 37.26 | 37.46 |
| 26.91 | 26.36 | Wt. Sample (dry+tare)(g) | 28.29 | 28.54 |
| 1.21 | 1.26 | Wt. Tare (g) | 1.34 | 1.58 |
| 25.7 | 25.1 | Wt. Dry Soil (g) | 27.0 | 27.0 |
| 8.9 | 8.7 | Wt. Water (g) | 9.0 | 8.9 |
| 34.6% | 34.5% | Water Content (%) | 33.3% | 33.1% |
| 34.0% | 34.0% | Corrected Water Content (%) | 33.6% | 33.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 10.93 | 14.14 | Wt. Sample (wet+tare)(g) | 13.98 | 12.66 |
| 9.38 | 12.08 | Wt. Sample (dry+tare)(g) | 11.8 | 10.71 |
| 1.22 | 1.23 | Wt. Tare (g) | 1.64 | 1.5 |
| 8.2 | 10.9 | Wt. Dry Soil (g) | 10.2 | 9.2 |
| 1.6 | 2.1 | Wt. Water (g) | 2.2 | 2.0 |
| 19.0% | 19.0% | Water Content (%) | 21.5% | 21.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 34 | | LL | 34 |
| PL | 19 | | PL | 21 |
| PI | 15 | | PI | 13 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | B. Pelkey and C. Oost |


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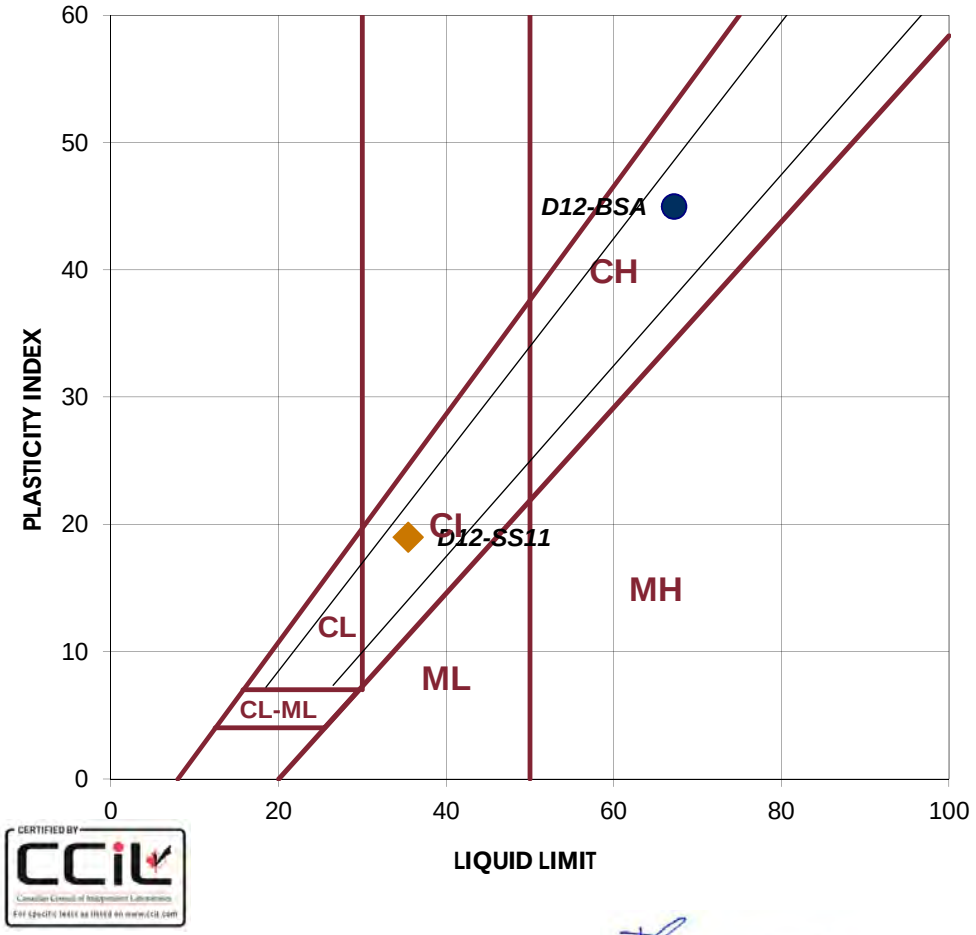
| Sample: D12-BSA | | | Sample: D12-SS11 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 28 | Number of Blows | 24 | 25 |
| | | Container Number | | |
| 18.60 | 17.66 | Wt. Sample (wet+tare)(g) | 19.04 | 18.90 |
| 11.77 | 11.07 | Wt. Sample (dry+tare)(g) | 14.40 | 14.24 |
| 1.53 | 1.14 | Wt. Tare (g) | 1.28 | 1.19 |
| 10.2 | 9.9 | Wt. Dry Soil (g) | 13.1 | 13.1 |
| 6.8 | 6.6 | Wt. Water (g) | 4.6 | 4.7 |
| 66.7% | 66.4% | Water Content (%) | 35.4% | 35.7% |
| 67.0% | 67.3% | Corrected Water Content (%) | 35.2% | 35.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 7.28 | 8.05 | Wt. Sample (wet+tare)(g) | 10.07 | 9.5 |
| 6.21 | 6.83 | Wt. Sample (dry+tare)(g) | 8.92 | 8.43 |
| 1.23 | 1.31 | Wt. Tare (g) | 1.55 | 1.5 |
| 5.0 | 5.5 | Wt. Dry Soil (g) | 7.4 | 6.9 |
| 1.1 | 1.2 | Wt. Water (g) | 1.2 | 1.1 |
| 21.5% | 22.1% | Water Content (%) | 15.6% | 15.4% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 67 | | LL | 35 |
| PL | 22 | | PL | 16 |
| PI | 45 | | PI | 19 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***CI*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | May 19, 2016 |
| Tested By: | C. Small |


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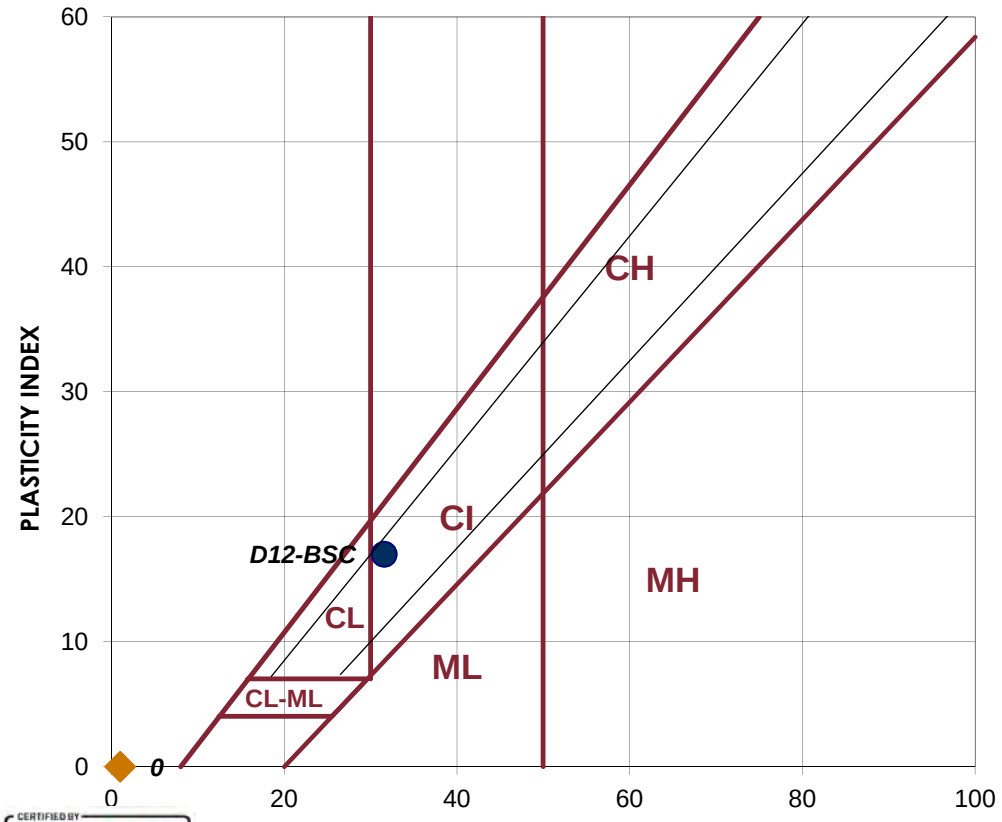
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D12-BSC | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 23 | Number of Blows | | |
| | | Container Number | | |
| 24.44 | 24.17 | Wt. Sample (wet+tare)(g) | | |
| 18.83 | 18.63 | Wt. Sample (dry+tare)(g) | | |
| 1.33 | 1.34 | Wt. Tare (g) | | |
| 17.5 | 17.3 | Wt. Dry Soil (g) | | |
| 5.6 | 5.5 | Wt. Water (g) | | |
| 32.1% | 32.0% | Water Content (%) | | |
| 31.4% | 31.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.58 | 10.39 | Wt. Sample (wet+tare)(g) | | |
| 7.63 | 9.23 | Wt. Sample (dry+tare)(g) | | |
| 1.19 | 1.6 | Wt. Tare (g) | | |
| 6.4 | 7.6 | Wt. Dry Soil (g) | | |
| 1.0 | 1.2 | Wt. Water (g) | | |
| 14.8% | 15.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | |
| PL | 15 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CL*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | May 25, 2016 |
| Tested By: | C. Oost |


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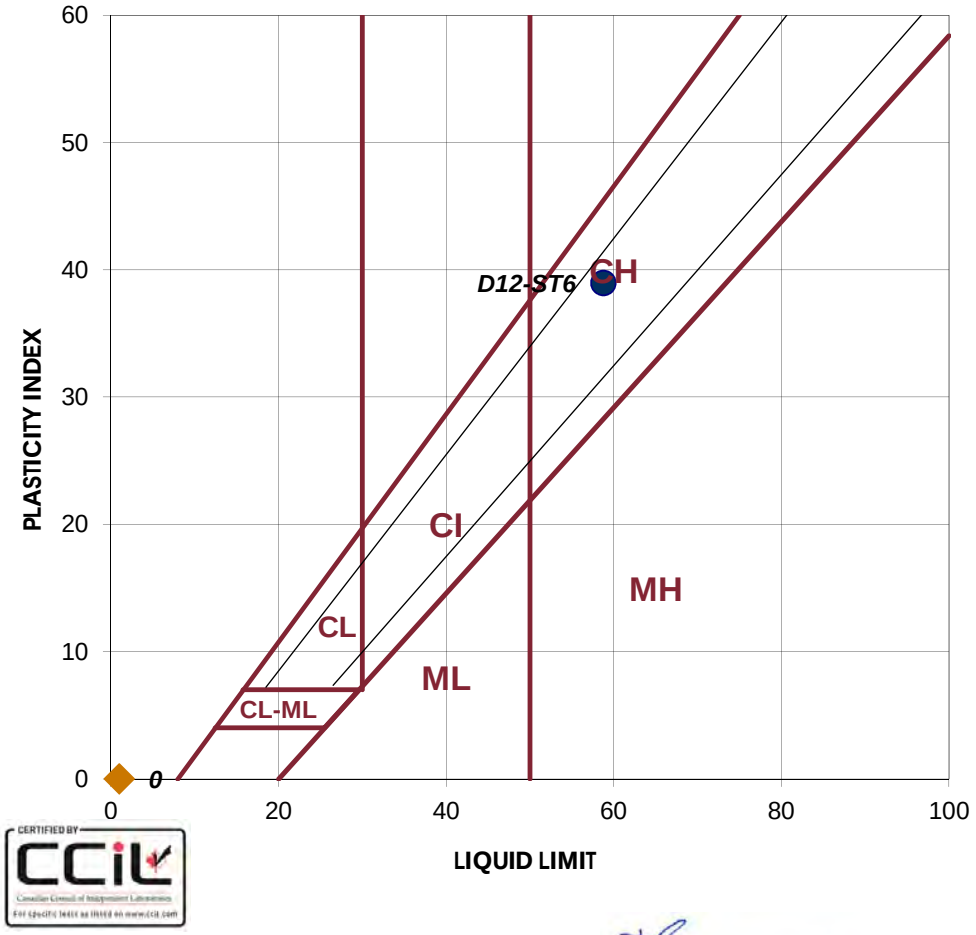
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D12-ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 23 | Number of Blows | | |
| | | Container Number | | |
| 11.13 | 11.03 | Wt. Sample (wet+tare)(g) | | |
| 7.44 | 7.42 | Wt. Sample (dry+tare)(g) | | |
| 1.24 | 1.31 | Wt. Tare (g) | | |
| 6.2 | 6.1 | Wt. Dry Soil (g) | | |
| 3.7 | 3.6 | Wt. Water (g) | | |
| 59.5% | 59.1% | Water Content (%) | | |
| 58.9% | 58.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 7.47 | 9.3 | Wt. Sample (wet+tare)(g) | | |
| 6.48 | 8.03 | Wt. Sample (dry+tare)(g) | | |
| 1.47 | 1.51 | Wt. Tare (g) | | |
| 5.0 | 6.5 | Wt. Dry Soil (g) | | |
| 1.0 | 1.3 | Wt. Water (g) | | |
| 19.8% | 19.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 59 | | LL | |
| PL | 20 | | PL | |
| PI | 39 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | May 17, 2016 |
| Date Tested: | June 29, 2016 |
| Tested By: | B. Pelkey |

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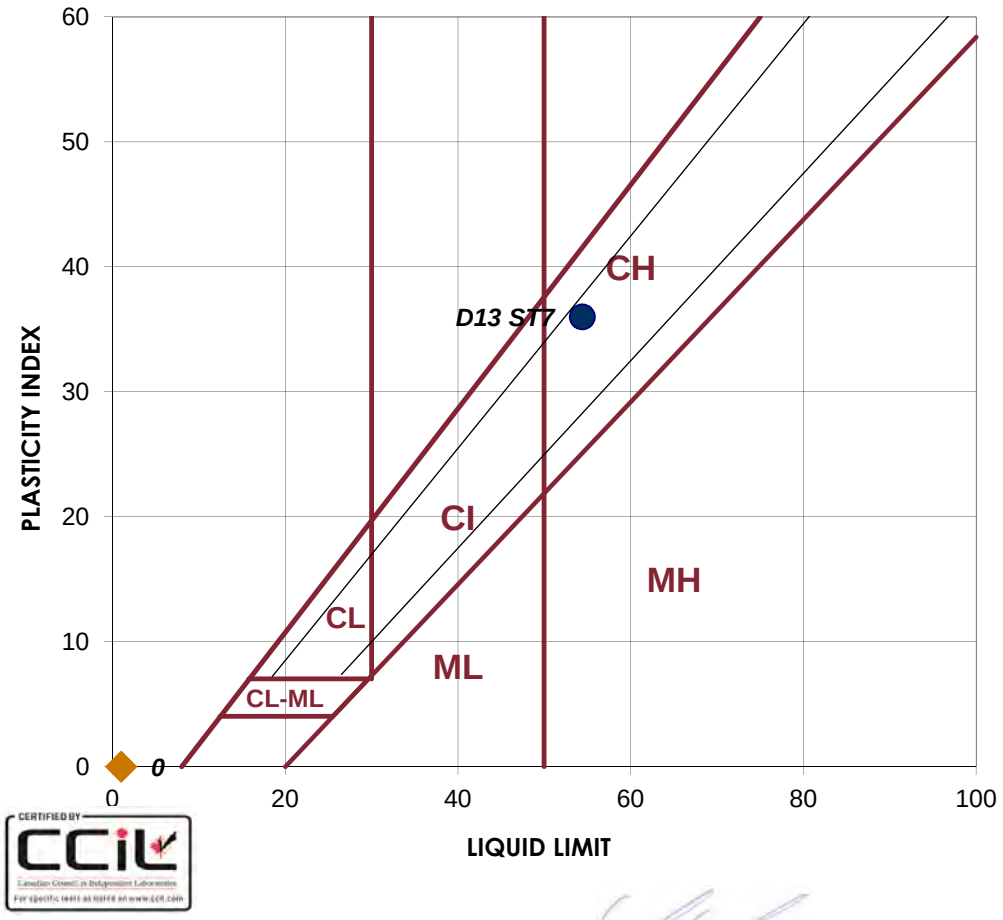
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D13 ST7 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 22.51 | 21.99 | Wt. Sample (wet+tare)(g) | | |
| 15.24 | 14.89 | Wt. Sample (dry+tare)(g) | | |
| 1.68 | 1.54 | Wt. Tare (g) | | |
| 13.6 | 13.4 | Wt. Dry Soil (g) | | |
| 7.3 | 7.1 | Wt. Water (g) | | |
| 53.6% | 53.2% | Water Content (%) | | |
| 54.6% | 54.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.23 | 24.71 | Wt. Sample (wet+tare)(g) | | |
| 21.79 | 22.98 | Wt. Sample (dry+tare)(g) | | |
| 13.79 | 13.76 | Wt. Tare (g) | | |
| 8.0 | 9.2 | Wt. Dry Soil (g) | | |
| 1.4 | 1.7 | Wt. Water (g) | | |
| 18.0% | 18.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 54 | | LL | |
| PL | 18 | | PL | |
| PI | 36 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | May 31, 2016 |
| Tested By: | C. Tollifson |


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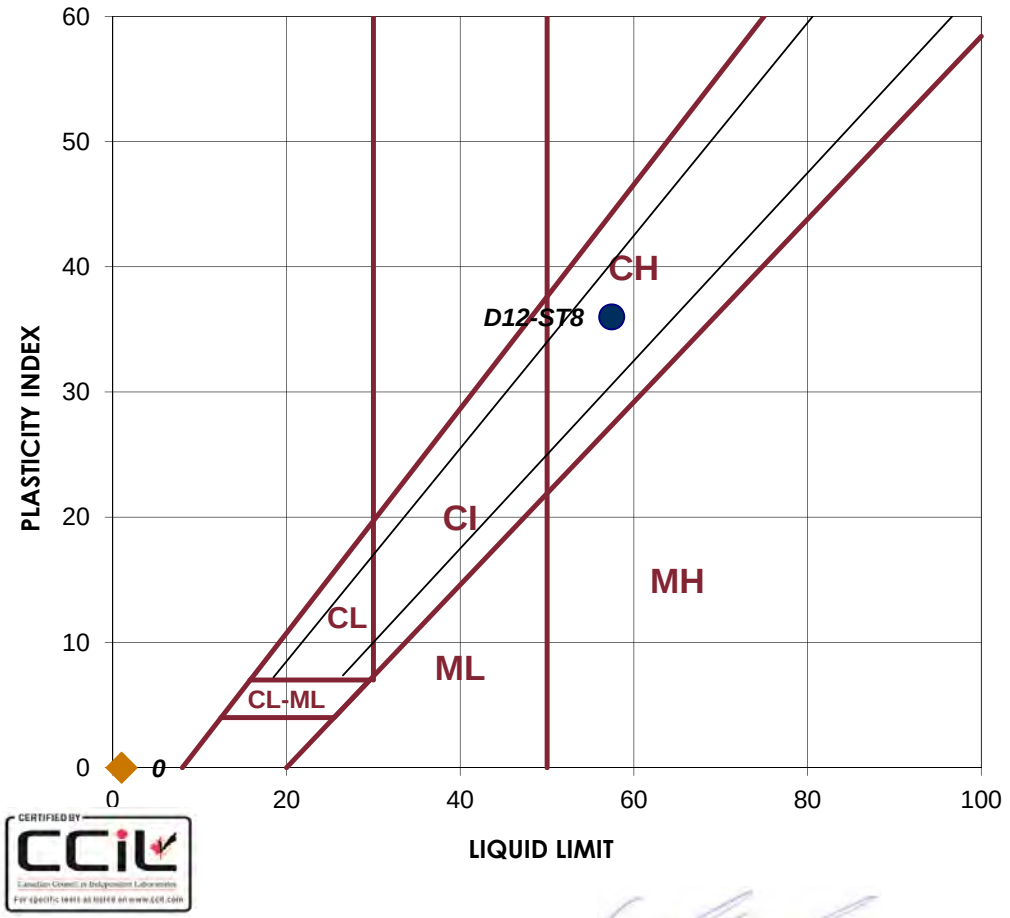
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D12-ST8 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 26 | Number of Blows | | |
| | | Container Number | | |
| 27.15 | 26.35 | Wt. Sample (wet+tare)(g) | | |
| 17.76 | 17.33 | Wt. Sample (dry+tare)(g) | | |
| 1.28 | 1.46 | Wt. Tare (g) | | |
| 16.5 | 15.9 | Wt. Dry Soil (g) | | |
| 9.4 | 9.0 | Wt. Water (g) | | |
| 57.0% | 56.8% | Water Content (%) | | |
| 57.8% | 57.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.55 | 7.92 | Wt. Sample (wet+tare)(g) | | |
| 9.81 | 6.83 | Wt. Sample (dry+tare)(g) | | |
| 1.64 | 1.52 | Wt. Tare (g) | | |
| 8.2 | 5.3 | Wt. Dry Soil (g) | | |
| 1.7 | 1.1 | Wt. Water (g) | | |
| 21.3% | 20.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 57 | | LL | |
| PL | 21 | | PL | |
| PI | 36 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |

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Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | June 22, 2016 |
| Tested By: | B. Pelkey |


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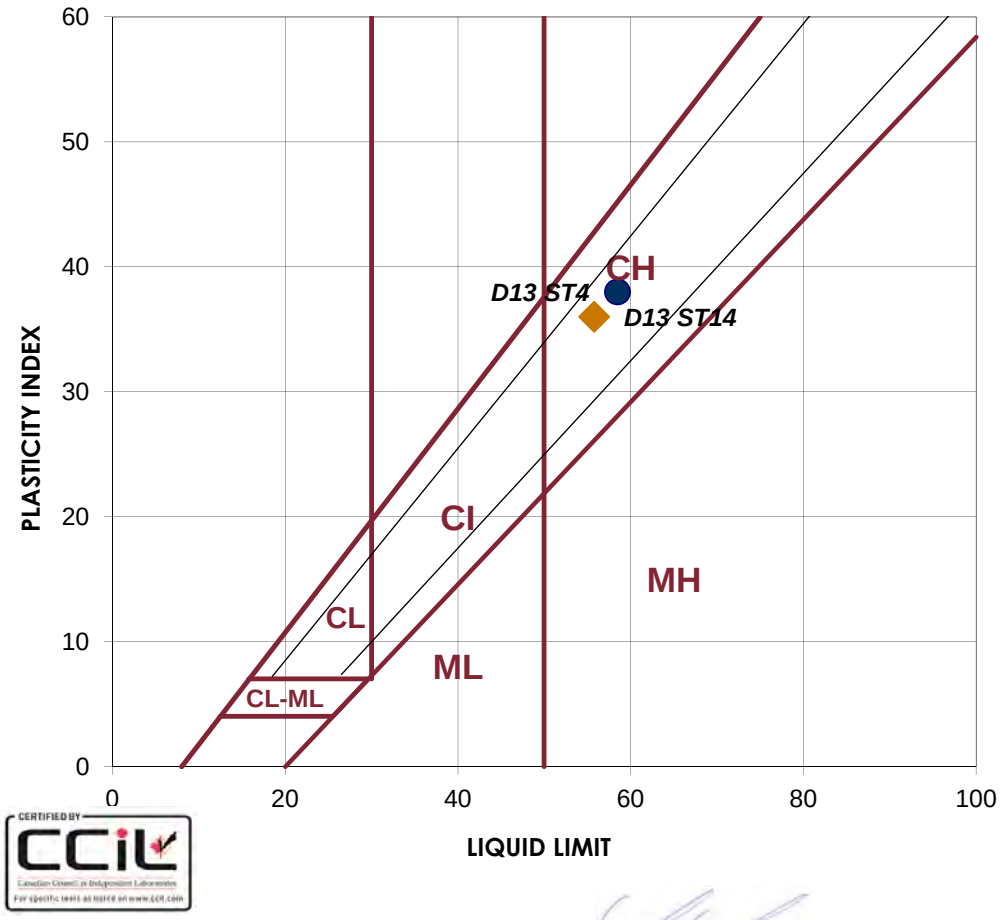
| Sample: D13 ST4 | | | Sample: D13 ST14 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 25 | Number of Blows | 22 | 21 |
| | | Container Number | | |
| 26.50 | 28.71 | Wt. Sample (wet+tare)(g) | 24.88 | 29.16 |
| 17.29 | 18.71 | Wt. Sample (dry+tare)(g) | 16.41 | 19.11 |
| 1.49 | 1.57 | Wt. Tare (g) | 1.51 | 1.38 |
| 15.8 | 17.1 | Wt. Dry Soil (g) | 14.9 | 17.7 |
| 9.2 | 10.0 | Wt. Water (g) | 8.5 | 10.1 |
| 58.3% | 58.3% | Water Content (%) | 56.8% | 56.7% |
| 58.6% | 58.3% | Corrected Water Content (%) | 56.0% | 55.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.8 | 23.78 | Wt. Sample (wet+tare)(g) | 26.54 | 23.27 |
| 23.28 | 22.5 | Wt. Sample (dry+tare)(g) | 24.7 | 22.02 |
| 15.65 | 15.82 | Wt. Tare (g) | 15.63 | 15.94 |
| 7.6 | 6.7 | Wt. Dry Soil (g) | 9.1 | 6.1 |
| 1.5 | 1.3 | Wt. Water (g) | 1.8 | 1.3 |
| 19.9% | 19.2% | Water Content (%) | 20.3% | 20.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 58 | | LL | 56 |
| PL | 20 | | PL | 20 |
| PI | 38 | | PI | 36 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CH | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 30, 2016 |
| Date Tested: | June 27, 2016 |
| Tested By: | B. Pelkey |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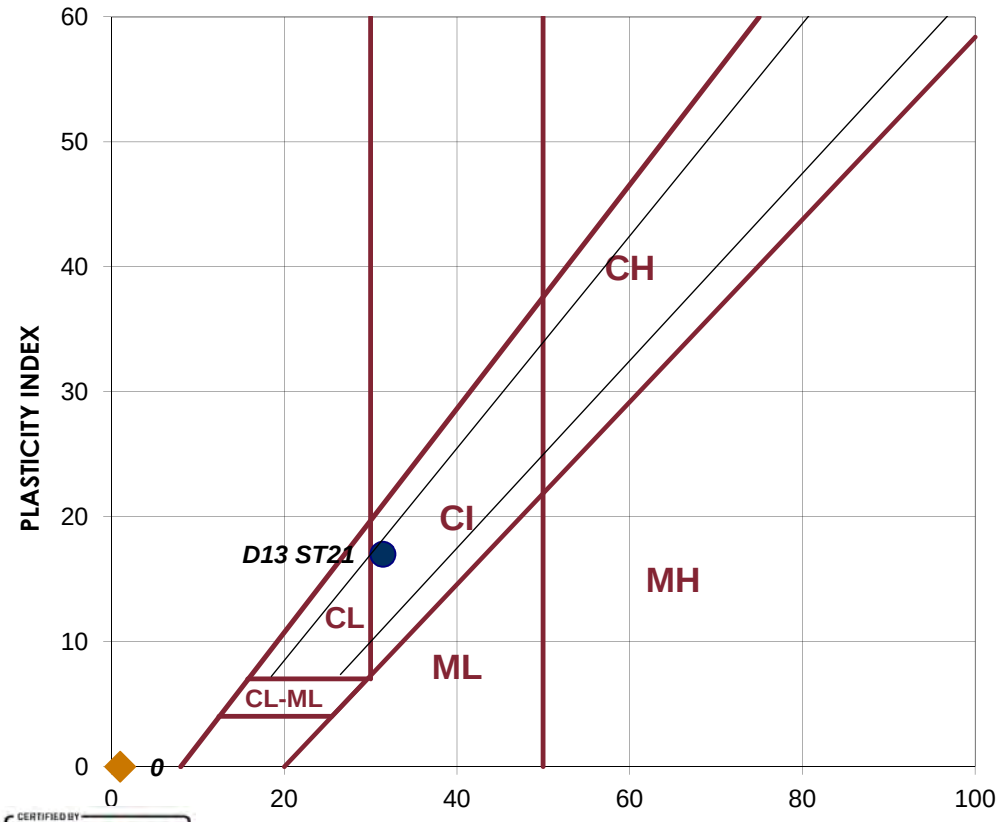
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D13 ST21 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 26 | Number of Blows | | |
| | | Container Number | | |
| 26.51 | 28.59 | Wt. Sample (wet+tare)(g) | | |
| 20.57 | 22.17 | Wt. Sample (dry+tare)(g) | | |
| 1.59 | 1.50 | Wt. Tare (g) | | |
| 19.0 | 20.7 | Wt. Dry Soil (g) | | |
| 5.9 | 6.4 | Wt. Water (g) | | |
| 31.3% | 31.1% | Water Content (%) | | |
| 31.6% | 31.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.58 | 30.4 | Wt. Sample (wet+tare)(g) | | |
| 27.04 | 28.69 | Wt. Sample (dry+tare)(g) | | |
| 15.94 | 15.8 | Wt. Tare (g) | | |
| 11.1 | 12.9 | Wt. Dry Soil (g) | | |
| 1.5 | 1.7 | Wt. Water (g) | | |
| 13.9% | 13.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 14 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 23, 2016 |
| Date Tested: | May 9, 2016 |
| Tested By: | C. Oost |


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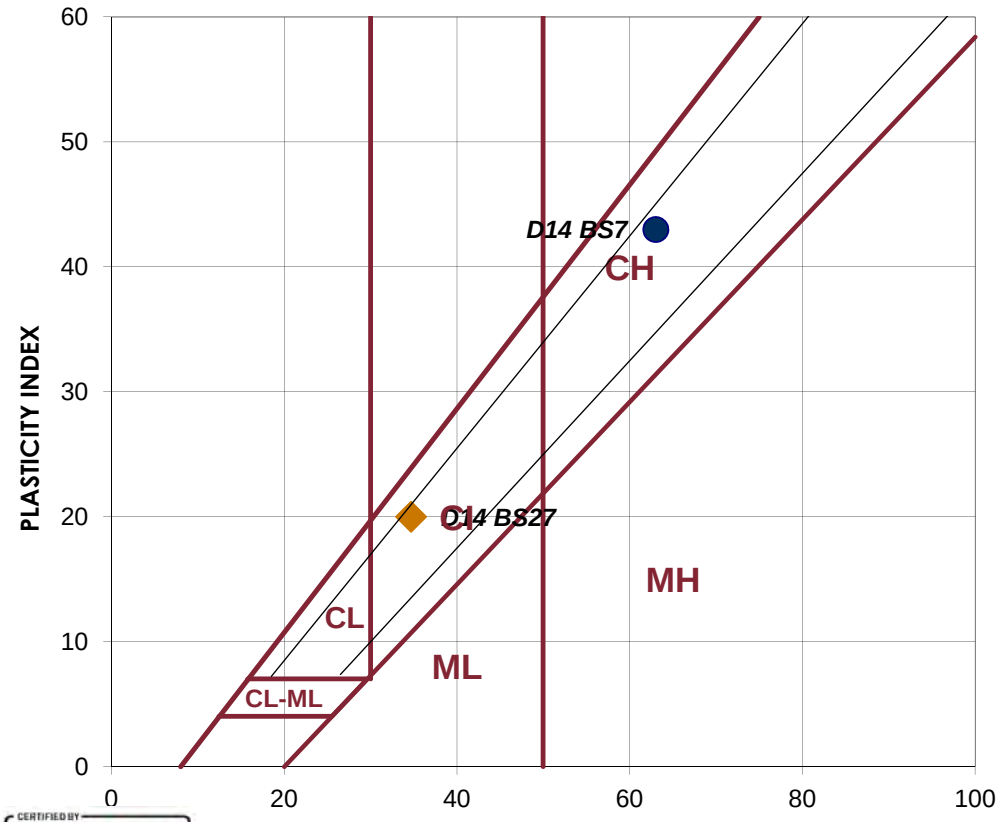
| Sample: D14 BS7 | | | Sample: D14 BS27 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 22 | Number of Blows | 26 | 24 |
| | | Container Number | | |
| 32.46 | 32.31 | Wt. Sample (wet+tare)(g) | 37.77 | 37.64 |
| 20.29 | 20.19 | Wt. Sample (dry+tare)(g) | 28.35 | 28.27 |
| 1.21 | 1.20 | Wt. Tare (g) | 1.16 | 1.25 |
| 19.1 | 19.0 | Wt. Dry Soil (g) | 27.2 | 27.0 |
| 12.2 | 12.1 | Wt. Water (g) | 9.4 | 9.4 |
| 63.8% | 63.8% | Water Content (%) | 34.6% | 34.7% |
| 63.1% | 62.8% | Corrected Water Content (%) | 34.8% | 34.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.42 | 10.16 | Wt. Sample (wet+tare)(g) | 8.17 | 9.53 |
| 8.13 | 8.68 | Wt. Sample (dry+tare)(g) | 7.31 | 8.51 |
| 1.56 | 1.66 | Wt. Tare (g) | 1.49 | 1.44 |
| 6.6 | 7.0 | Wt. Dry Soil (g) | 5.8 | 7.1 |
| 1.3 | 1.5 | Wt. Water (g) | 0.9 | 1.0 |
| 19.6% | 21.1% | Water Content (%) | 14.8% | 14.4% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 63 | | LL | 35 |
| PL | 20 | | PL | 15 |
| PI | 43 | | PI | 20 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CI | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 27, 2016 |
| Date Tested: | August 7, 2016 |
| Tested By: | B. Pelkey |


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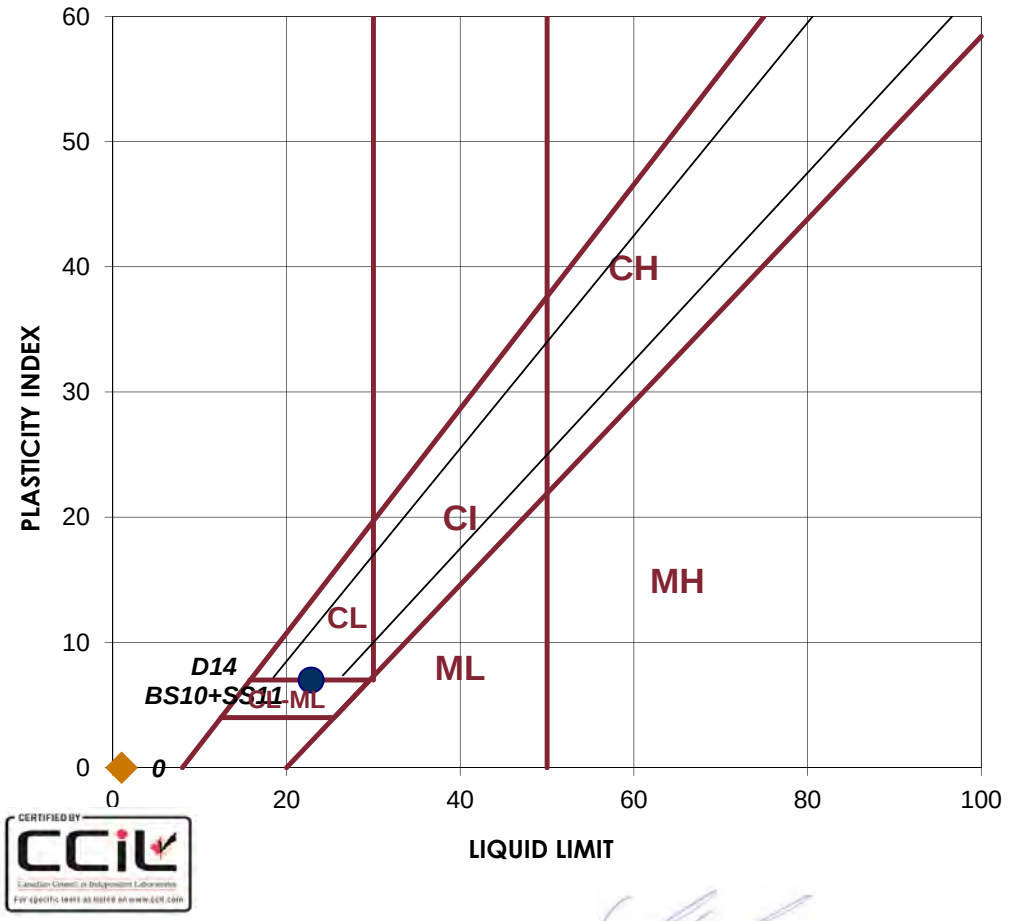
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D14 BS10+SS11 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 25 | Number of Blows | | |
| | | Container Number | | |
| 24.36 | 29.50 | Wt. Sample (wet+tare)(g) | | |
| 20.05 | 24.23 | Wt. Sample (dry+tare)(g) | | |
| 1.30 | 1.21 | Wt. Tare (g) | | |
| 18.8 | 23.0 | Wt. Dry Soil (g) | | |
| 4.3 | 5.3 | Wt. Water (g) | | |
| 23.0% | 22.9% | Water Content (%) | | |
| 22.8% | 22.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.49 | 27.68 | Wt. Sample (wet+tare)(g) | | |
| 25.64 | 25.8 | Wt. Sample (dry+tare)(g) | | |
| 13.81 | 13.88 | Wt. Tare (g) | | |
| 11.8 | 11.9 | Wt. Dry Soil (g) | | |
| 1.9 | 1.9 | Wt. Water (g) | | |
| 15.6% | 15.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | |
| PL | 16 | | PL | |
| PI | 7 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CL-ML** | | | **NON-PLASTIC** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 24, 2016 |
| Date Tested: | May 9, 2016 |
| Tested By: | C. Oost |


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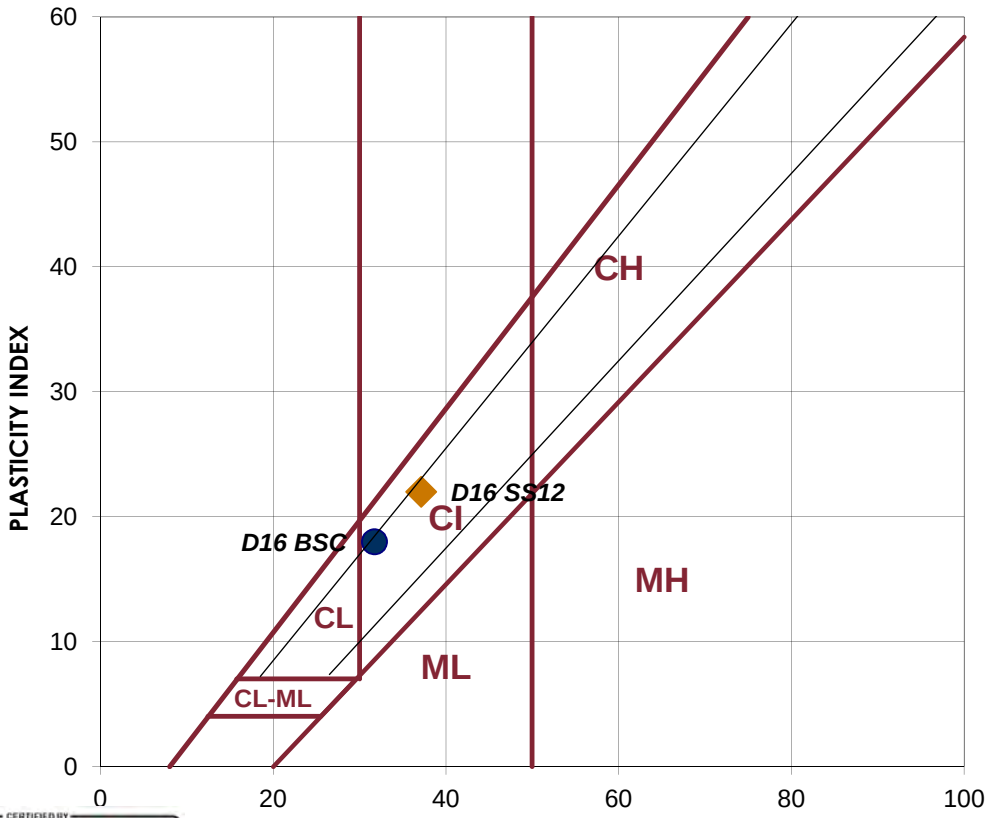
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D16 BSC | | | D16 SS12 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 22 | Number of Blows | 25 | 24 |
| | | Container Number | | |
| 35.23 | 36.15 | Wt. Sample (wet+tare)(g) | 34.91 | 36.26 |
| 26.95 | 27.70 | Wt. Sample (dry+tare)(g) | 25.80 | 26.77 |
| 1.15 | 1.30 | Wt. Tare (g) | 1.34 | 1.23 |
| 25.8 | 26.4 | Wt. Dry Soil (g) | 24.5 | 25.5 |
| 8.3 | 8.5 | Wt. Water (g) | 9.1 | 9.5 |
| 32.1% | 32.0% | Water Content (%) | 37.2% | 37.2% |
| 31.9% | 31.5% | Corrected Water Content (%) | 37.2% | 37.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.72 | 8.09 | Wt. Sample (wet+tare)(g) | 8.8 | 8.07 |
| 7.82 | 7.27 | Wt. Sample (dry+tare)(g) | 7.88 | 7.17 |
| 1.38 | 1.4 | Wt. Tare (g) | 1.58 | 1.57 |
| 6.4 | 5.9 | Wt. Dry Soil (g) | 6.3 | 5.6 |
| 0.9 | 0.8 | Wt. Water (g) | 0.9 | 0.9 |
| 14.0% | 14.0% | Water Content (%) | 14.6% | 16.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | 37 |
| PL | 14 | | PL | 15 |
| PI | 18 | | PI | 22 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | CI | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 23, 2016 |
| Date Tested: | May 10, 2016 |
| Tested By: | C. Oost |


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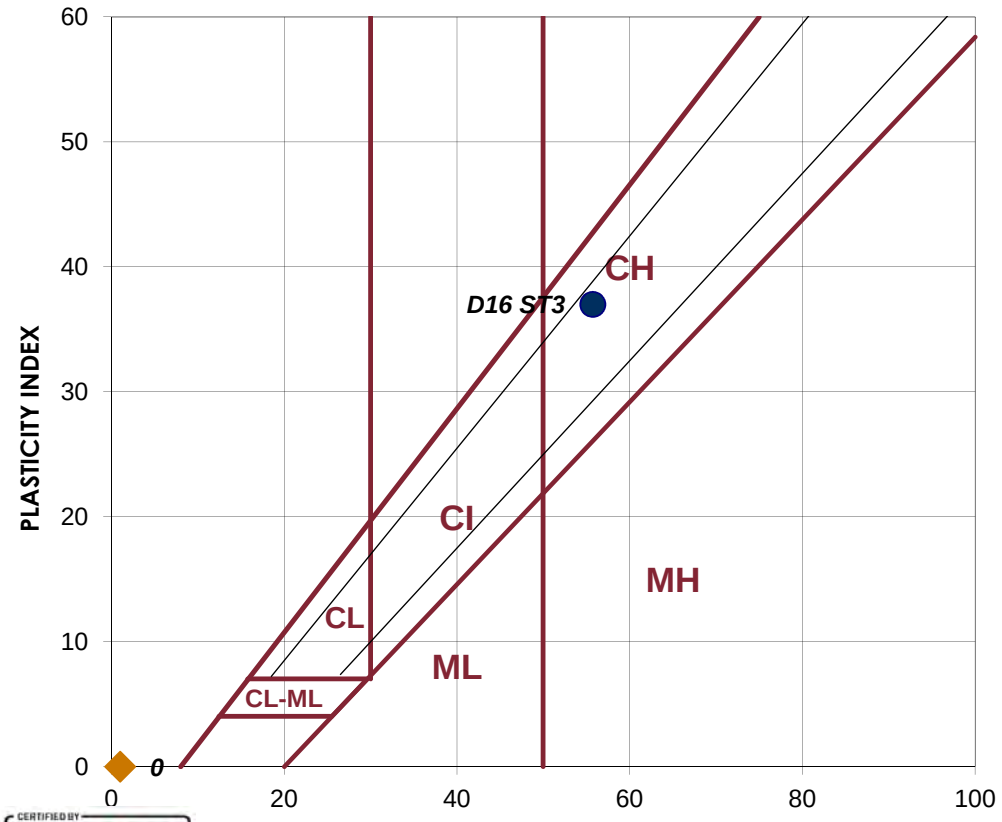
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D16 ST3 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | | |
| | | Container Number | | |
| 13.46 | 15.12 | Wt. Sample (wet+tare)(g) | | |
| 9.24 | 10.24 | Wt. Sample (dry+tare)(g) | | |
| 1.67 | 1.48 | Wt. Tare (g) | | |
| 7.6 | 8.8 | Wt. Dry Soil (g) | | |
| 4.2 | 4.9 | Wt. Water (g) | | |
| 55.7% | 55.7% | Water Content (%) | | |
| 55.7% | 55.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 9.1 | 8.59 | Wt. Sample (wet+tare)(g) | | |
| 7.89 | 7.47 | Wt. Sample (dry+tare)(g) | | |
| 1.44 | 1.5 | Wt. Tare (g) | | |
| 6.5 | 6.0 | Wt. Dry Soil (g) | | |
| 1.2 | 1.1 | Wt. Water (g) | | |
| 18.8% | 18.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 56 | | LL | |
| PL | 19 | | PL | |
| PI | 37 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 24, 2016 |
| Date Tested: | May 9, 2016 |
| Tested By: | C. Oost |


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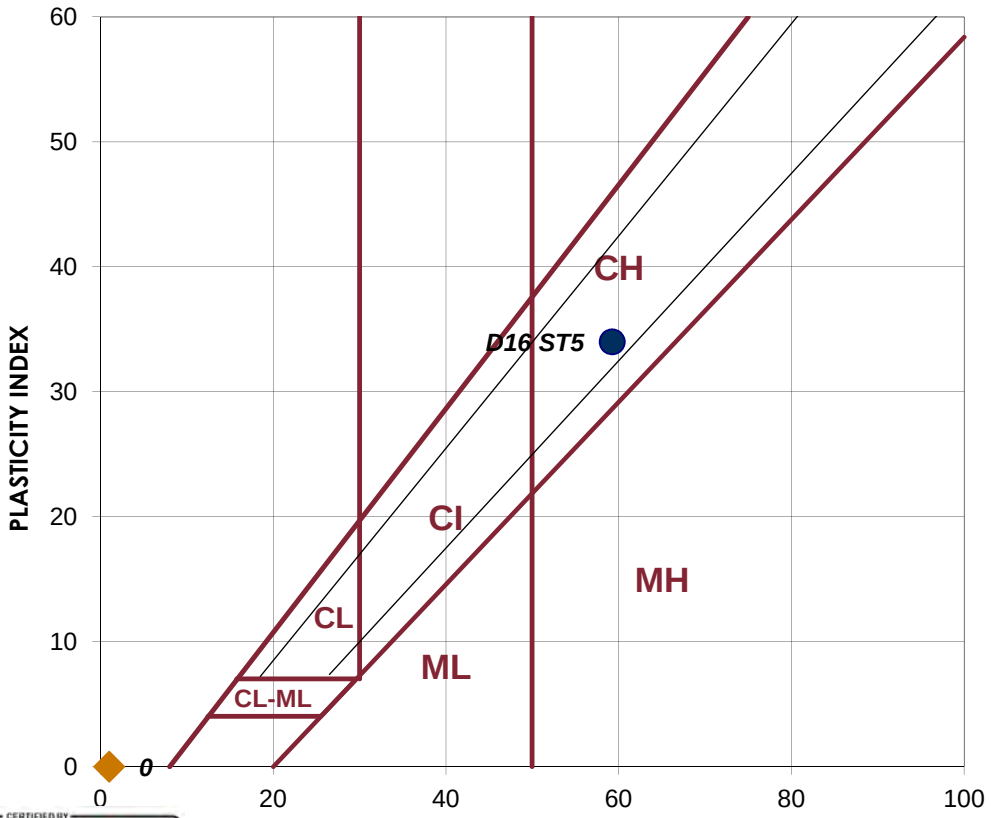
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D16 ST5 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | | |
| | | Container Number | | |
| 28.24 | 29.84 | Wt. Sample (wet+tare)(g) | | |
| 18.16 | 19.19 | Wt. Sample (dry+tare)(g) | | |
| 1.18 | 1.25 | Wt. Tare (g) | | |
| 17.0 | 17.9 | Wt. Dry Soil (g) | | |
| 10.1 | 10.7 | Wt. Water (g) | | |
| 59.4% | 59.4% | Water Content (%) | | |
| 59.4% | 59.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.46 | 8.39 | Wt. Sample (wet+tare)(g) | | |
| 7.34 | 6.8 | Wt. Sample (dry+tare)(g) | | |
| 1.49 | 1.71 | Wt. Tare (g) | | |
| 5.9 | 5.1 | Wt. Dry Soil (g) | | |
| 1.1 | 1.6 | Wt. Water (g) | | |
| 19.1% | 31.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 59 | | LL | |
| PL | 25 | | PL | |
| PI | 34 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 29, 2016 |
| Date Tested: | June 23, 2016 |
| Tested By: | B. Pelkey |


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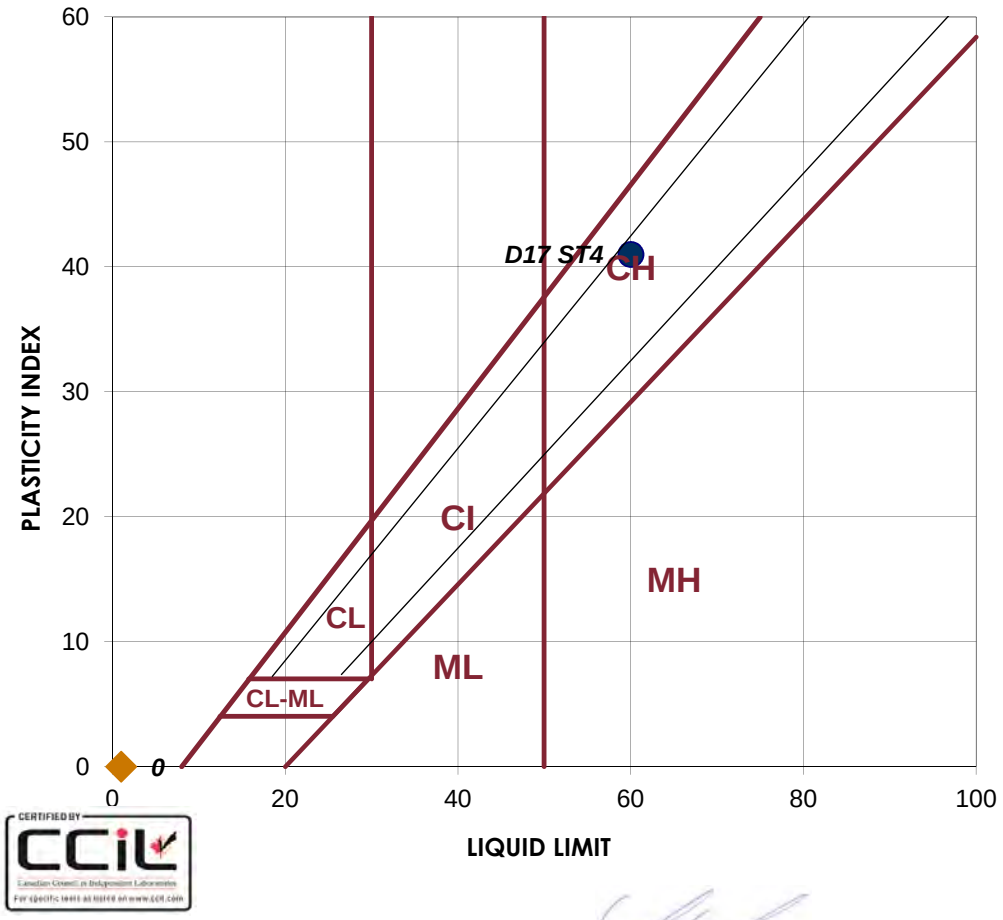
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D17 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 23 | Number of Blows | | |
| | | Container Number | | |
| 28.61 | 29.97 | Wt. Sample (wet+tare)(g) | | |
| 18.22 | 19.30 | Wt. Sample (dry+tare)(g) | | |
| 1.20 | 1.68 | Wt. Tare (g) | | |
| 17.0 | 17.6 | Wt. Dry Soil (g) | | |
| 10.4 | 10.7 | Wt. Water (g) | | |
| 61.0% | 60.6% | Water Content (%) | | |
| 60.1% | 59.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.2 | 25.09 | Wt. Sample (wet+tare)(g) | | |
| 23.67 | 23.58 | Wt. Sample (dry+tare)(g) | | |
| 15.78 | 15.81 | Wt. Tare (g) | | |
| 7.9 | 7.8 | Wt. Dry Soil (g) | | |
| 1.5 | 1.5 | Wt. Water (g) | | |
| 19.4% | 19.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 60 | | LL | |
| PL | 19 | | PL | |
| PI | 41 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 29, 2016 |
| Date Tested: | June 22, 2016 |
| Tested By: | C. Oost |


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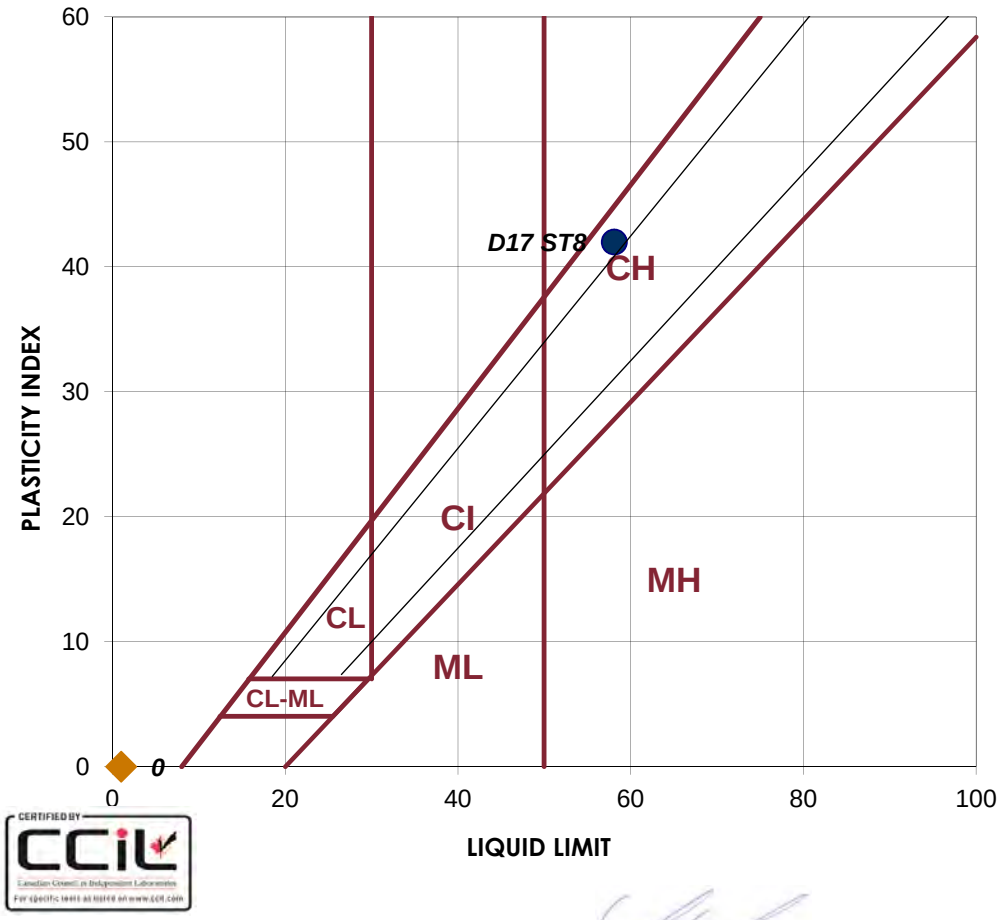
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D17 ST8 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 26 | Number of Blows | | |
| | | Container Number | | |
| 12.69 | 12.36 | Wt. Sample (wet+tare)(g) | | |
| 8.49 | 8.31 | Wt. Sample (dry+tare)(g) | | |
| 1.23 | 1.30 | Wt. Tare (g) | | |
| 7.3 | 7.0 | Wt. Dry Soil (g) | | |
| 4.2 | 4.1 | Wt. Water (g) | | |
| 57.9% | 57.8% | Water Content (%) | | |
| 58.1% | 58.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 7.81 | 8.3 | Wt. Sample (wet+tare)(g) | | |
| 6.94 | 7.39 | Wt. Sample (dry+tare)(g) | | |
| 1.55 | 1.52 | Wt. Tare (g) | | |
| 5.4 | 5.9 | Wt. Dry Soil (g) | | |
| 0.9 | 0.9 | Wt. Water (g) | | |
| 16.1% | 15.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 58 | | LL | |
| PL | 16 | | PL | |
| PI | 42 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 29, 2016 |
| Date Tested: | June 21, 2016 |
| Tested By: | B. Pelkey |


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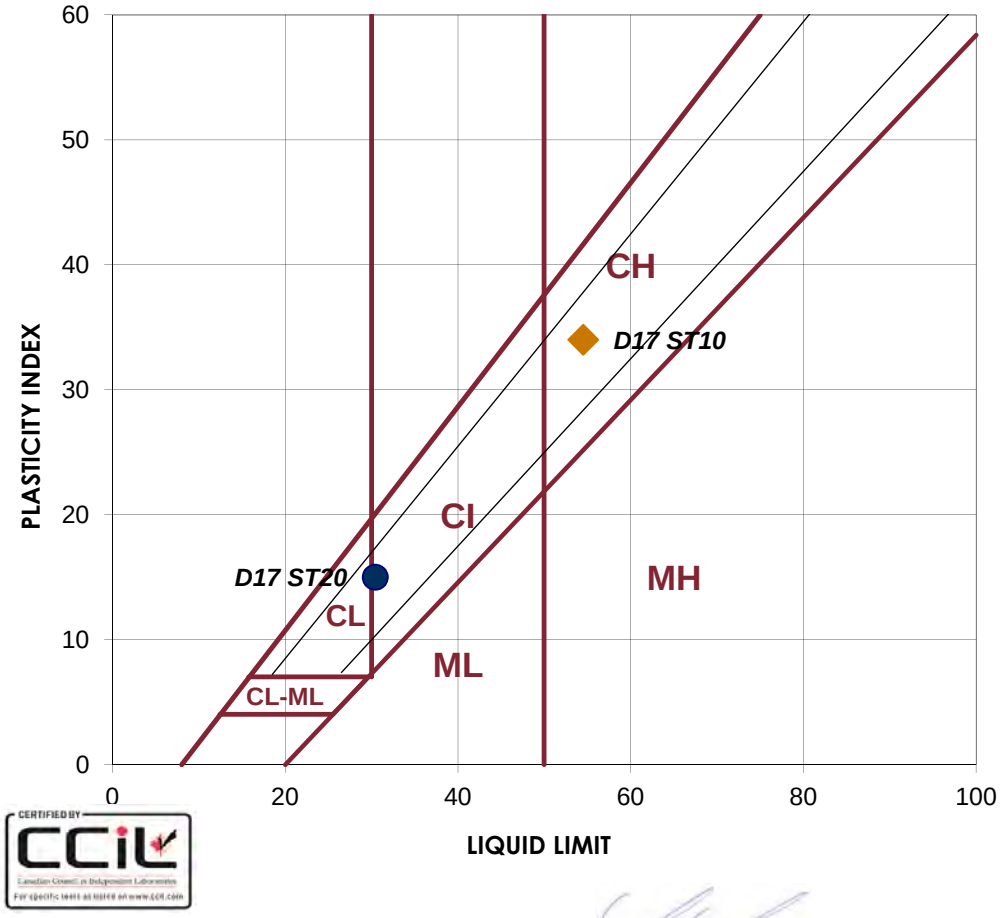
| Sample: D17 ST20 | | | Sample: D17 ST10 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 24 | Number of Blows | 28 | 27 |
| | | Container Number | | |
| 29.06 | 31.63 | Wt. Sample (wet+tare)(g) | 28.47 | 31.08 |
| 22.58 | 24.57 | Wt. Sample (dry+tare)(g) | 19.06 | 20.67 |
| 1.52 | 1.55 | Wt. Tare (g) | 1.60 | 1.34 |
| 21.1 | 23.0 | Wt. Dry Soil (g) | 17.5 | 19.3 |
| 6.5 | 7.1 | Wt. Water (g) | 9.4 | 10.4 |
| 30.8% | 30.7% | Water Content (%) | 53.9% | 53.9% |
| 30.3% | 30.5% | Corrected Water Content (%) | 54.6% | 54.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 29.13 | 30.41 | Wt. Sample (wet+tare)(g) | 32.35 | 26.98 |
| 27.42 | 28.53 | Wt. Sample (dry+tare)(g) | 29.58 | 25.11 |
| 15.94 | 15.83 | Wt. Tare (g) | 15.81 | 15.65 |
| 11.5 | 12.7 | Wt. Dry Soil (g) | 13.8 | 9.5 |
| 1.7 | 1.9 | Wt. Water (g) | 2.8 | 1.9 |
| 14.9% | 14.8% | Water Content (%) | 20.1% | 19.8% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | 54 |
| PL | 15 | | PL | 20 |
| PI | 15 | | PI | 34 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | CH | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 29, 2016 |
| Date Tested: | June 27, 2016 |
| Tested By: | B. Pelkey |


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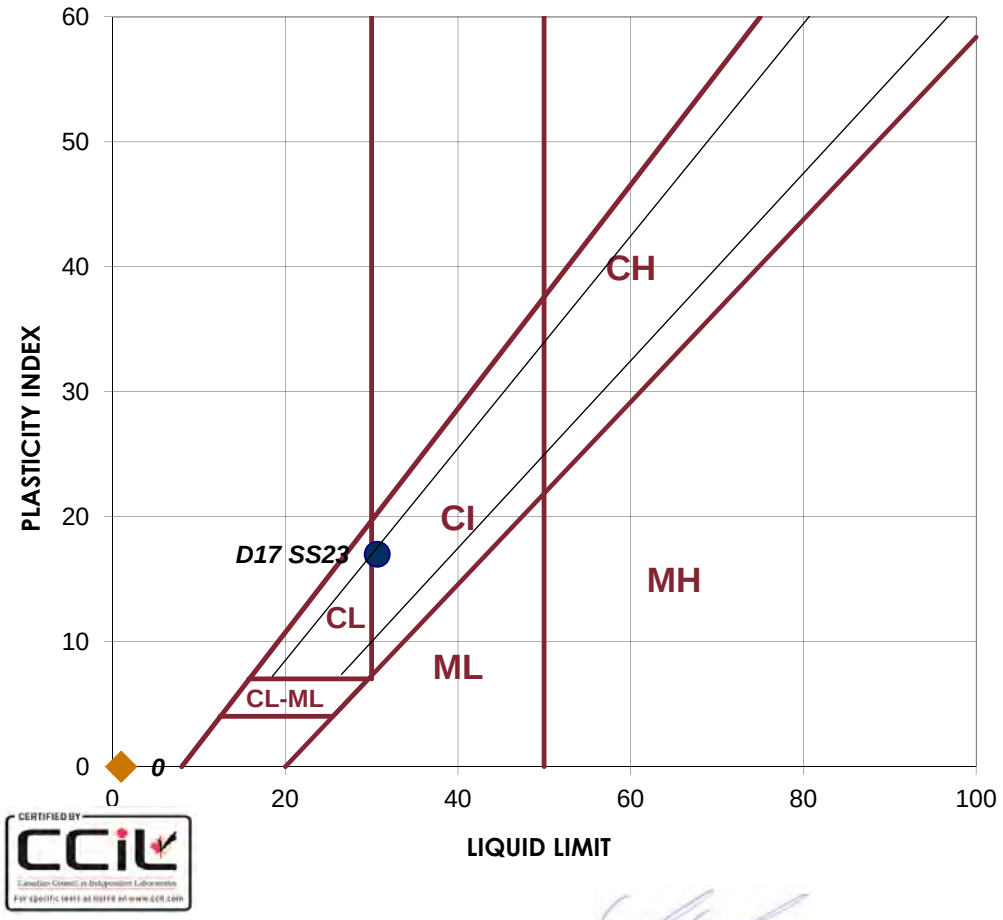
| Sample: D17 SS23 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 25 | Number of Blows | | |
| | | Container Number | | |
| 21.13 | 35.34 | Wt. Sample (wet+tare)(g) | | |
| 16.51 | 27.33 | Wt. Sample (dry+tare)(g) | | |
| 1.34 | 1.24 | Wt. Tare (g) | | |
| 15.2 | 26.1 | Wt. Dry Soil (g) | | |
| 4.6 | 8.0 | Wt. Water (g) | | |
| 30.5% | 30.7% | Water Content (%) | | |
| 30.6% | 30.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.68 | 28.5 | Wt. Sample (wet+tare)(g) | | |
| 25.33 | 26.93 | Wt. Sample (dry+tare)(g) | | |
| 15.78 | 15.8 | Wt. Tare (g) | | |
| 9.6 | 11.1 | Wt. Dry Soil (g) | | |
| 1.4 | 1.6 | Wt. Water (g) | | |
| 14.1% | 14.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 14 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 27, 2016 |
| Date Tested: | June 22, 2016 |
| Tested By: | C. Oost |


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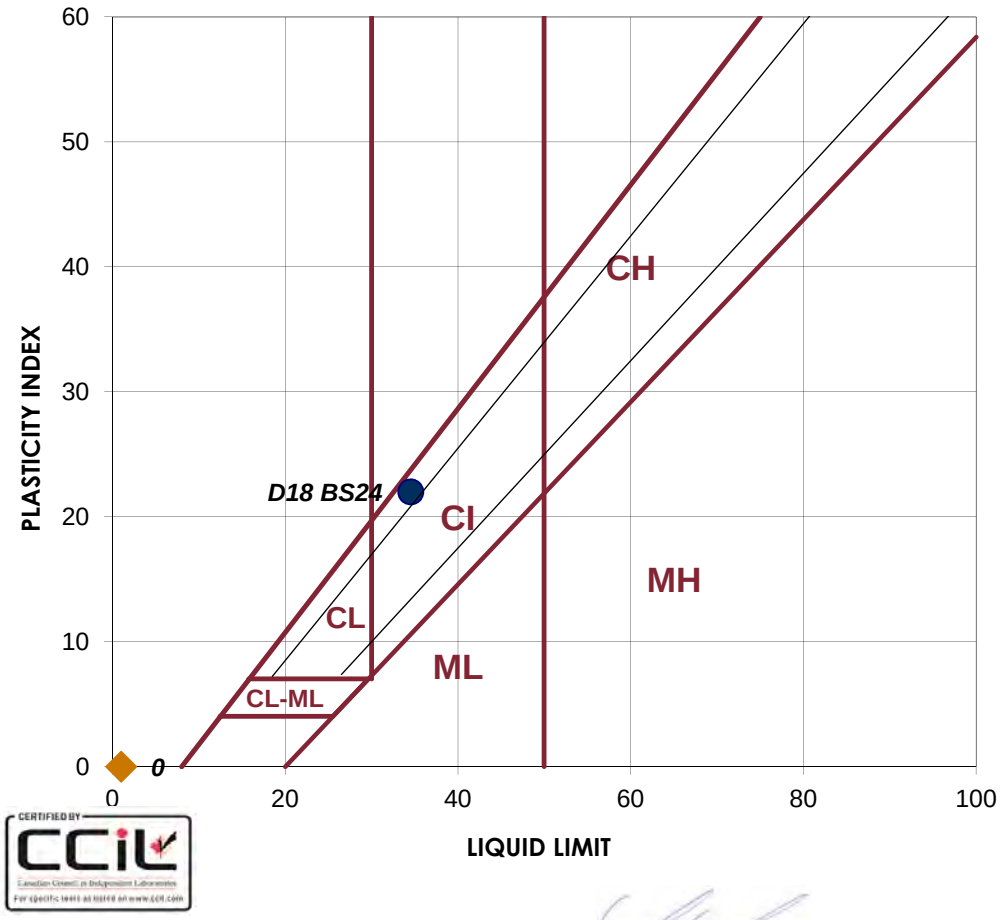
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D18 BS24 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 25 | Number of Blows | | |
| | | Container Number | | |
| 14.41 | 12.00 | Wt. Sample (wet+tare)(g) | | |
| 11.03 | 9.24 | Wt. Sample (dry+tare)(g) | | |
| 1.31 | 1.23 | Wt. Tare (g) | | |
| 9.7 | 8.0 | Wt. Dry Soil (g) | | |
| 3.4 | 2.8 | Wt. Water (g) | | |
| 34.8% | 34.5% | Water Content (%) | | |
| 34.6% | 34.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 10.24 | 8.34 | Wt. Sample (wet+tare)(g) | | |
| 9.25 | 7.56 | Wt. Sample (dry+tare)(g) | | |
| 1.61 | 1.46 | Wt. Tare (g) | | |
| 7.6 | 6.1 | Wt. Dry Soil (g) | | |
| 1.0 | 0.8 | Wt. Water (g) | | |
| 13.0% | 12.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 13 | | PL | |
| PI | 22 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 27, 2016 |
| Date Tested: | June 23, 2016 |
| Tested By: | B. Pelkey |


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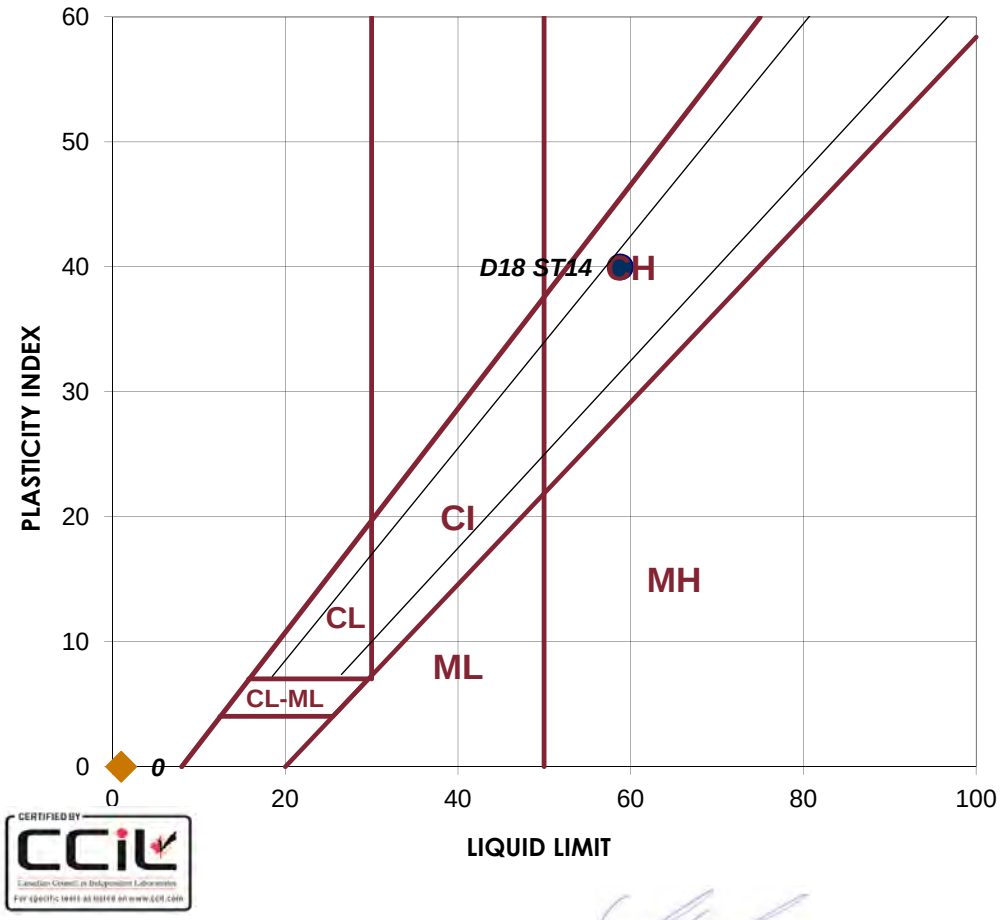
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D18 ST14 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 24 | Number of Blows | | |
| | | Container Number | | |
| 27.01 | 27.11 | Wt. Sample (wet+tare)(g) | | |
| 17.47 | 17.60 | Wt. Sample (dry+tare)(g) | | |
| 1.43 | 1.56 | Wt. Tare (g) | | |
| 16.0 | 16.0 | Wt. Dry Soil (g) | | |
| 9.5 | 9.5 | Wt. Water (g) | | |
| 59.5% | 59.3% | Water Content (%) | | |
| 58.6% | 59.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.32 | 24.43 | Wt. Sample (wet+tare)(g) | | |
| 22.98 | 23.04 | Wt. Sample (dry+tare)(g) | | |
| 15.95 | 15.81 | Wt. Tare (g) | | |
| 7.0 | 7.2 | Wt. Dry Soil (g) | | |
| 1.3 | 1.4 | Wt. Water (g) | | |
| 19.1% | 19.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 59 | | LL | |
| PL | 19 | | PL | |
| PI | 40 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 1, 2016 |
| Date Tested: | April 29, 2016 |
| Tested By: | B. Pelkey |


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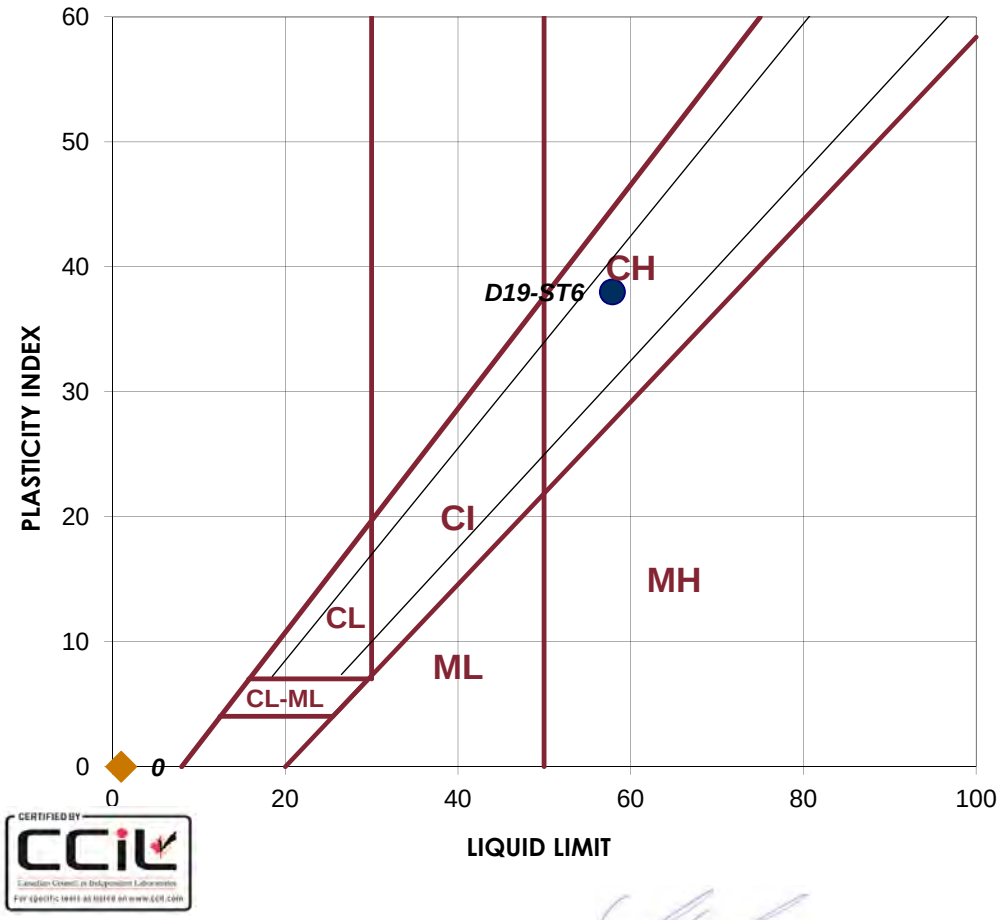
| Sample: D19-ST6 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 24 | Number of Blows | | |
| 100 | OX | Container Number | | |
| 32.99 | 30.57 | Wt. Sample (wet+tare)(g) | | |
| 21.35 | 19.91 | Wt. Sample (dry+tare)(g) | | |
| 1.24 | 1.49 | Wt. Tare (g) | | |
| 20.1 | 18.4 | Wt. Dry Soil (g) | | |
| 11.6 | 10.7 | Wt. Water (g) | | |
| 57.9% | 57.9% | Water Content (%) | | |
| 58.2% | 57.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| KF | KS | Container Number | | |
| 10.14 | 9.48 | Wt. Sample (wet+tare)(g) | | |
| 8.69 | 8.13 | Wt. Sample (dry+tare)(g) | | |
| 1.3 | 1.21 | Wt. Tare (g) | | |
| 7.4 | 6.9 | Wt. Dry Soil (g) | | |
| 1.5 | 1.4 | Wt. Water (g) | | |
| 19.6% | 19.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 58 | | LL | |
| PL | 20 | | PL | |
| PI | 38 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 21, 2016 |
| Date Tested: | May 3, 2016 |
| Tested By: | C.Tollifson |


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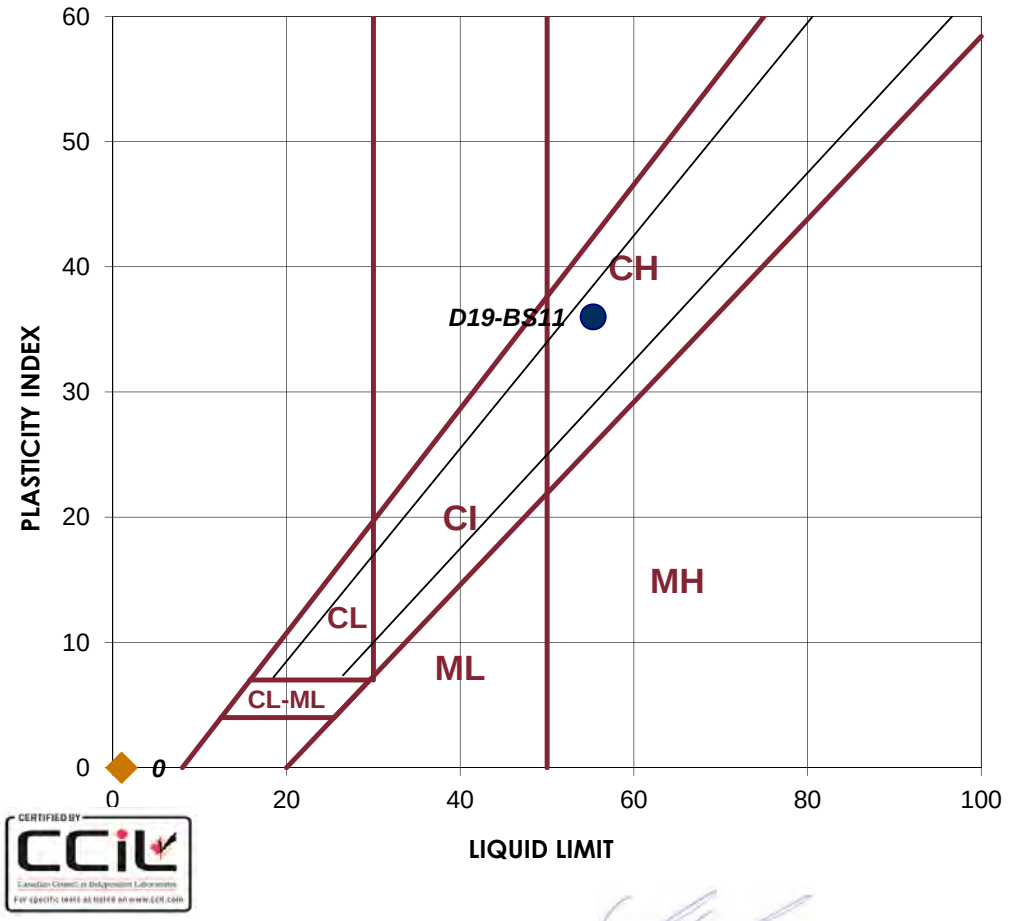
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D19-BS11 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 23 | Number of Blows | | |
| | | Container Number | | |
| 26.52 | 24.99 | Wt. Sample (wet+tare)(g) | | |
| 17.53 | 16.59 | Wt. Sample (dry+tare)(g) | | |
| 1.30 | 1.53 | Wt. Tare (g) | | |
| 16.2 | 15.1 | Wt. Dry Soil (g) | | |
| 9.0 | 8.4 | Wt. Water (g) | | |
| 55.4% | 55.8% | Water Content (%) | | |
| 55.4% | 55.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.65 | 14.57 | Wt. Sample (wet+tare)(g) | | |
| 10.85 | 12.45 | Wt. Sample (dry+tare)(g) | | |
| 1.18 | 1.42 | Wt. Tare (g) | | |
| 9.7 | 11.0 | Wt. Dry Soil (g) | | |
| 1.8 | 2.1 | Wt. Water (g) | | |
| 18.6% | 19.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 55 | | LL | |
| PL | 19 | | PL | |
| PI | 36 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 21, 2016 |
| Date Tested: | May 2, 2016 |
| Tested By: | B. Pelkey |


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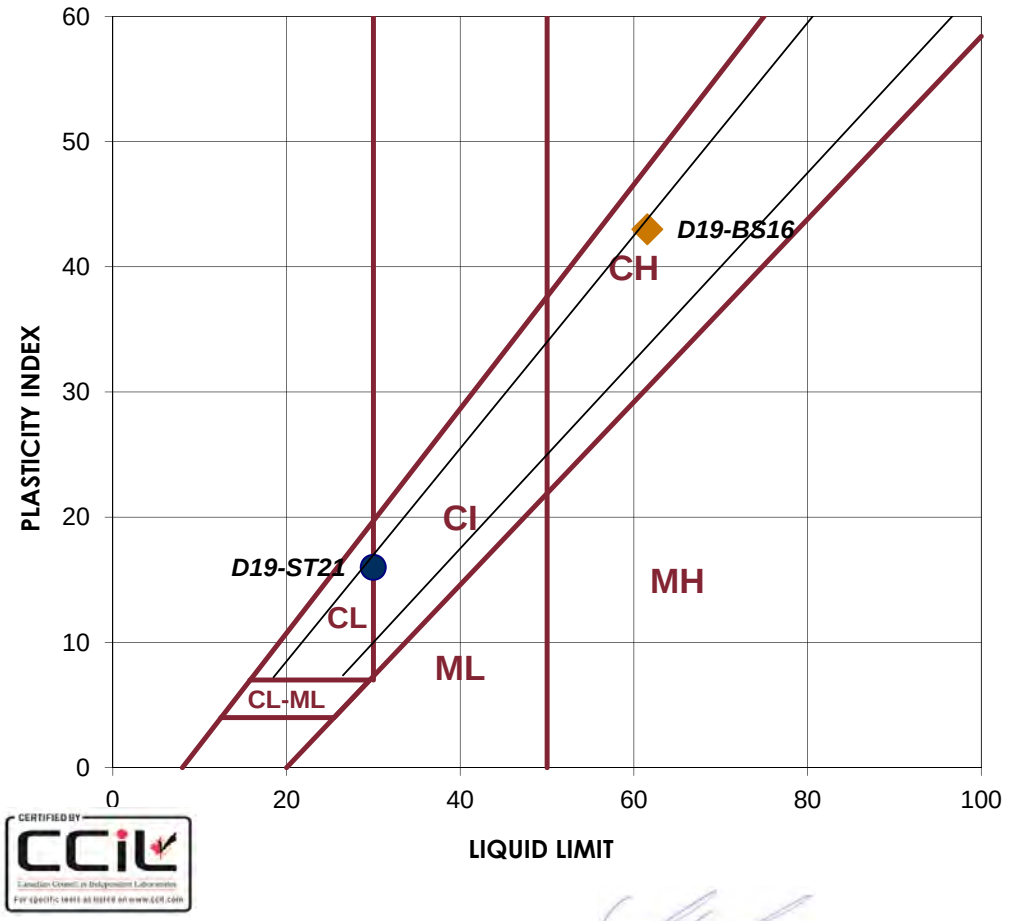
| Sample: D19-ST21 | | | Sample: D19-BS16 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 25 | Number of Blows | 25 | 25 |
| | | Container Number | | |
| 36.57 | 37.73 | Wt. Sample (wet+tare)(g) | 32.10 | 32.76 |
| 28.42 | 29.32 | Wt. Sample (dry+tare)(g) | 20.35 | 20.76 |
| 1.19 | 1.18 | Wt. Tare (g) | 1.24 | 1.28 |
| 27.2 | 28.1 | Wt. Dry Soil (g) | 19.1 | 19.5 |
| 8.2 | 8.4 | Wt. Water (g) | 11.8 | 12.0 |
| 29.9% | 29.9% | Water Content (%) | 61.5% | 61.6% |
| 30.1% | 29.9% | Corrected Water Content (%) | 61.5% | 61.6% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.63 | 8.73 | Wt. Sample (wet+tare)(g) | 8.6 | 8.31 |
| 7.74 | 7.85 | Wt. Sample (dry+tare)(g) | 7.49 | 7.22 |
| 1.57 | 1.7 | Wt. Tare (g) | 1.58 | 1.53 |
| 6.2 | 6.2 | Wt. Dry Soil (g) | 5.9 | 5.7 |
| 0.9 | 0.9 | Wt. Water (g) | 1.1 | 1.1 |
| 14.4% | 14.3% | Water Content (%) | 18.8% | 19.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | 62 |
| PL | 14 | | PL | 19 |
| PI | 16 | | PI | 43 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL-CI | | | CH | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 21, 2016 |
| Date Tested: | May 2, 2016 |
| Tested By: | B. Pelkey |


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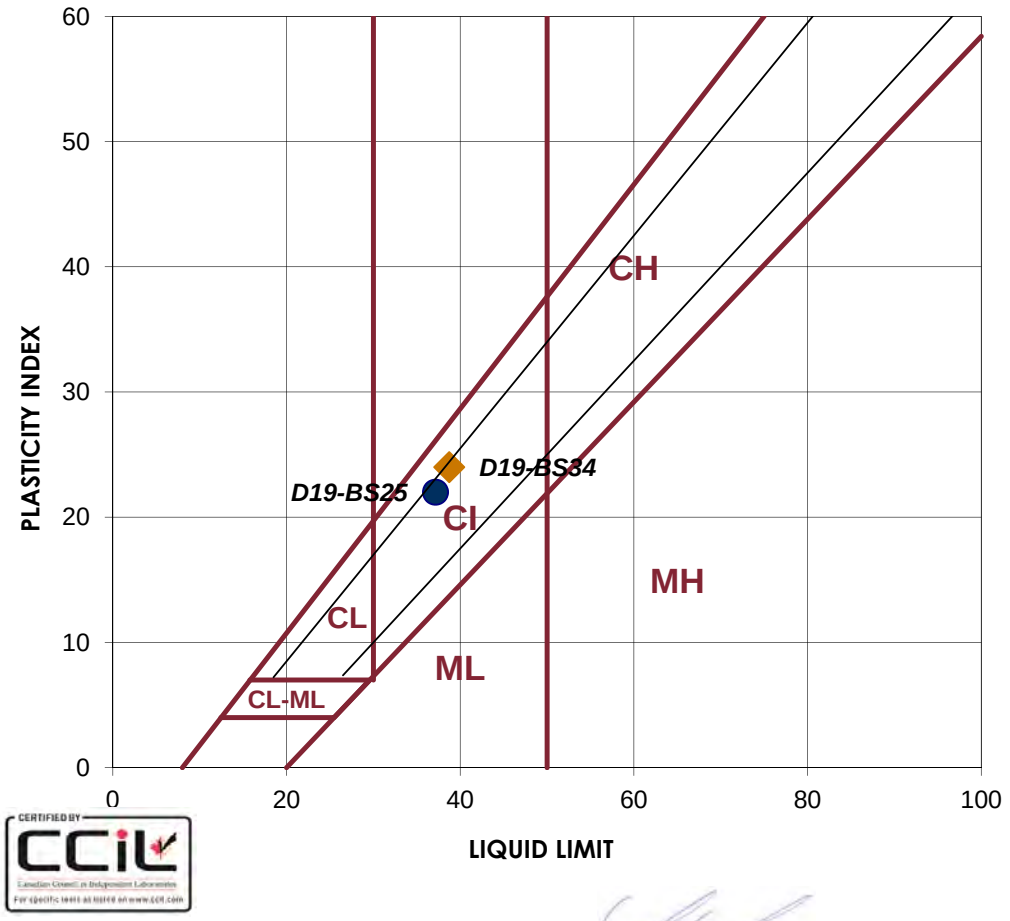
| Sample: D19-BS25 | | | Sample: D19-BS34 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | 24 | 23 |
| | | Container Number | | |
| 32.20 | 32.50 | Wt. Sample (wet+tare)(g) | 34.81 | 30.42 |
| 23.86 | 24.08 | Wt. Sample (dry+tare)(g) | 25.38 | 22.24 |
| 1.55 | 1.61 | Wt. Tare (g) | 1.27 | 1.23 |
| 22.3 | 22.5 | Wt. Dry Soil (g) | 24.1 | 21.0 |
| 8.3 | 8.4 | Wt. Water (g) | 9.4 | 8.2 |
| 37.4% | 37.5% | Water Content (%) | 39.1% | 38.9% |
| 37.0% | 37.3% | Corrected Water Content (%) | 38.9% | 38.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.62 | 12.56 | Wt. Sample (wet+tare)(g) | 12.95 | 14.32 |
| 12 | 11.07 | Wt. Sample (dry+tare)(g) | 11.45 | 12.59 |
| 1.34 | 1.22 | Wt. Tare (g) | 1.18 | 1.22 |
| 10.7 | 9.9 | Wt. Dry Soil (g) | 10.3 | 11.4 |
| 1.6 | 1.5 | Wt. Water (g) | 1.5 | 1.7 |
| 15.2% | 15.1% | Water Content (%) | 14.6% | 15.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | 39 |
| PL | 15 | | PL | 15 |
| PI | 22 | | PI | 24 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 21, 2016 |
| Date Tested: | May 2, 2016 |
| Tested By: | B. Pelkey |


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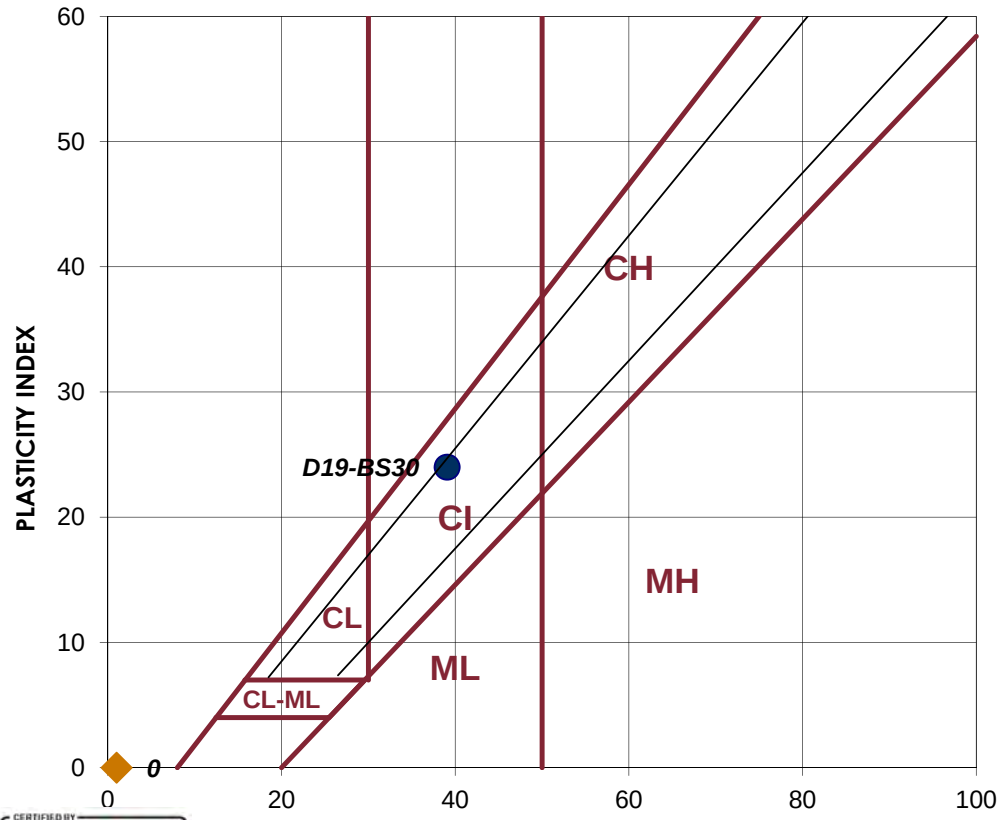
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D19-BS30 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 23 | Number of Blows | | |
| | | Container Number | | |
| 29.08 | 30.32 | Wt. Sample (wet+tare)(g) | | |
| 21.25 | 22.17 | Wt. Sample (dry+tare)(g) | | |
| 1.41 | 1.51 | Wt. Tare (g) | | |
| 19.8 | 20.7 | Wt. Dry Soil (g) | | |
| 7.8 | 8.2 | Wt. Water (g) | | |
| 39.5% | 39.4% | Water Content (%) | | |
| 39.1% | 39.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 11.43 | 13.47 | Wt. Sample (wet+tare)(g) | | |
| 10.16 | 11.92 | Wt. Sample (dry+tare)(g) | | |
| 1.69 | 1.54 | Wt. Tare (g) | | |
| 8.5 | 10.4 | Wt. Dry Soil (g) | | |
| 1.3 | 1.6 | Wt. Water (g) | | |
| 15.0% | 14.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | |
| PL | 15 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 21, 2016 |
| Date Tested: | May 3, 2016 |
| Tested By: | C.Tollifson |


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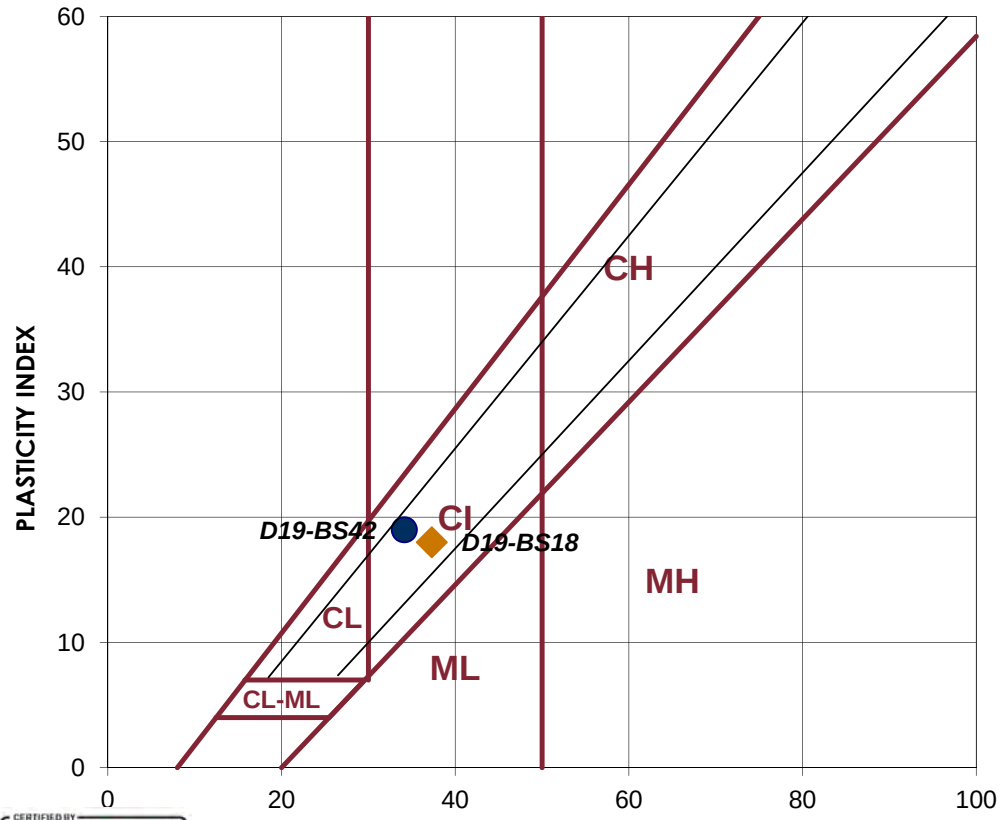
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D19-BS42 | | | D19-BS18 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 20 | 22 | Number of Blows | 20 | 20 |
| | | Container Number | | |
| 29.68 | 32.76 | Wt. Sample (wet+tare)(g) | 25.79 | 26.98 |
| 22.32 | 24.69 | Wt. Sample (dry+tare)(g) | 19.13 | 19.93 |
| 1.22 | 1.52 | Wt. Tare (g) | 1.72 | 1.56 |
| 21.1 | 23.2 | Wt. Dry Soil (g) | 17.4 | 18.4 |
| 7.4 | 8.1 | Wt. Water (g) | 6.7 | 7.1 |
| 34.9% | 34.8% | Water Content (%) | 38.3% | 38.4% |
| 34.0% | 34.3% | Corrected Water Content (%) | 37.2% | 37.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.95 | 10.41 | Wt. Sample (wet+tare)(g) | 11.3 | 12.81 |
| 11.49 | 9.24 | Wt. Sample (dry+tare)(g) | 9.68 | 11 |
| 1.75 | 1.18 | Wt. Tare (g) | 1.19 | 1.53 |
| 9.7 | 8.1 | Wt. Dry Soil (g) | 8.5 | 9.5 |
| 1.5 | 1.2 | Wt. Water (g) | 1.6 | 1.8 |
| 15.0% | 14.5% | Water Content (%) | 19.1% | 19.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 34 | | LL | 37 |
| PL | 15 | | PL | 19 |
| PI | 19 | | PI | 18 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |

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Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 22, 2016 |
| Date Tested: | May 5, 2016 |
| Tested By: | B.Pelkey |


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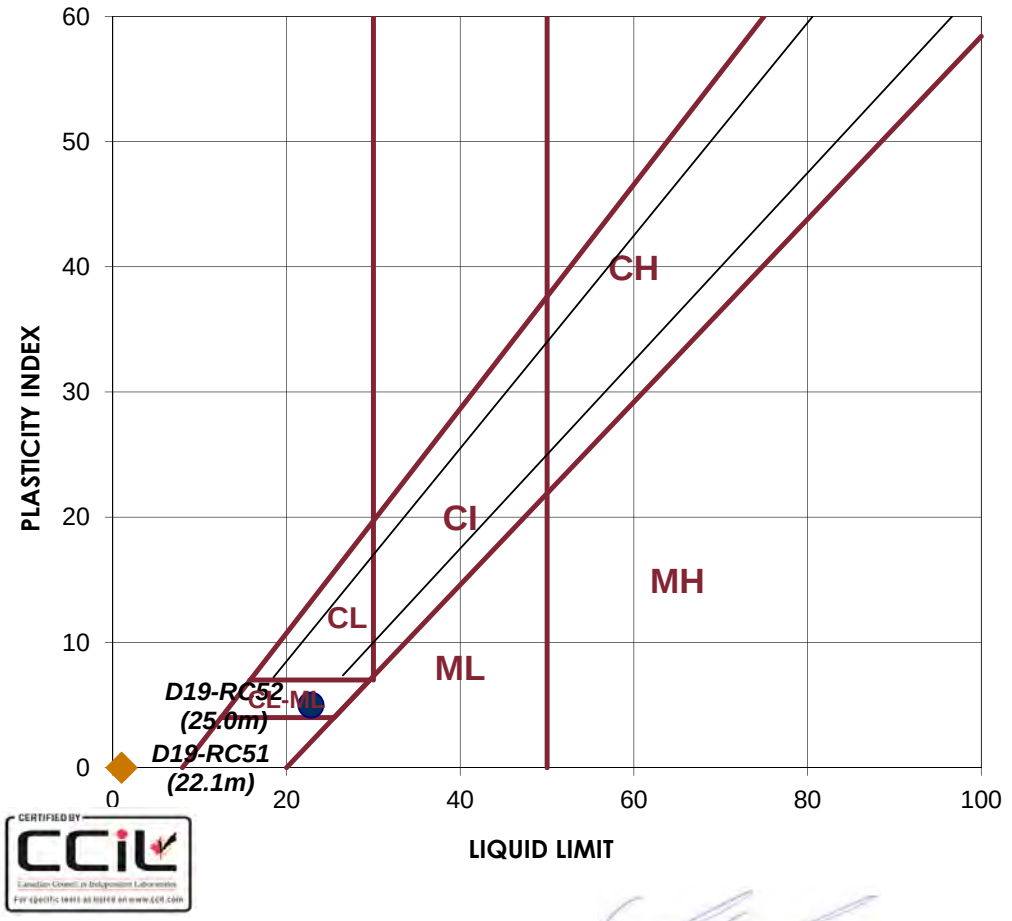
Tel: (403) 253-7876


| Sample: D19-RC52 (25.0m) | | | Sample: D19-RC51 (22.1m) | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 20 | 21 | Number of Blows | | |
| | | Container Number | | |
| 39.56 | 43.51 | Wt. Sample (wet+tare)(g) | | |
| 32.38 | 35.54 | Wt. Sample (dry+tare)(g) | | |
| 1.56 | 1.50 | Wt. Tare (g) | | |
| 30.8 | 34.0 | Wt. Dry Soil (g) | | |
| 7.2 | 8.0 | Wt. Water (g) | | |
| 23.3% | 23.4% | Water Content (%) | | |
| 22.7% | 22.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.19 | 12.84 | Wt. Sample (wet+tare)(g) | | |
| 11.35 | 11.15 | Wt. Sample (dry+tare)(g) | | |
| 1.55 | 1.64 | Wt. Tare (g) | | |
| 9.8 | 9.5 | Wt. Dry Soil (g) | | |
| 1.8 | 1.7 | Wt. Water (g) | | |
| 18.8% | 17.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | |
| PL | 18 | | PL | |
| PI | 5 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CL-ML** | | | **NON-PLASTIC** | |

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Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: May 10, 2016
Date Tested: May 18, 2016
Tested By: C. Oost

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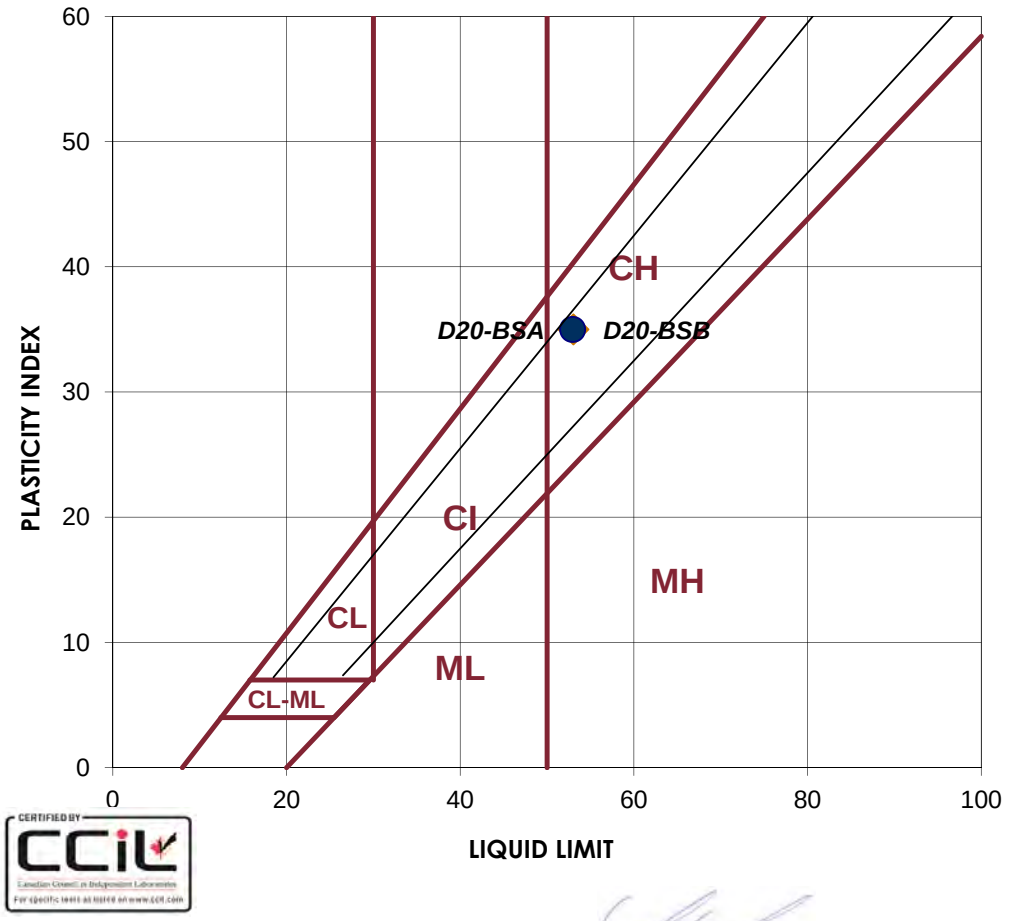
| Sample: D20-BSA | | | Sample: D20-BSB | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 23 | Number of Blows | 23 | 24 |
| | | Container Number | | |
| 19.27 | 15.04 | Wt. Sample (wet+tare)(g) | 23.78 | 25.91 |
| 13.00 | 10.26 | Wt. Sample (dry+tare)(g) | 15.90 | 17.40 |
| 1.24 | 1.30 | Wt. Tare (g) | 1.16 | 1.46 |
| 11.8 | 9.0 | Wt. Dry Soil (g) | 14.7 | 15.9 |
| 6.3 | 4.8 | Wt. Water (g) | 7.9 | 8.5 |
| 53.3% | 53.3% | Water Content (%) | 53.5% | 53.4% |
| 53.1% | 52.8% | Corrected Water Content (%) | 52.9% | 53.1% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.07 | 9.18 | Wt. Sample (wet+tare)(g) | 13.92 | 11.23 |
| 7.11 | 8.02 | Wt. Sample (dry+tare)(g) | 12.05 | 9.79 |
| 1.54 | 1.51 | Wt. Tare (g) | 1.66 | 1.61 |
| 5.6 | 6.5 | Wt. Dry Soil (g) | 10.4 | 8.2 |
| 1.0 | 1.2 | Wt. Water (g) | 1.9 | 1.4 |
| 17.2% | 17.8% | Water Content (%) | 18.0% | 17.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 53 | | LL | 53 |
| PL | 18 | | PL | 18 |
| PI | 35 | | PI | 35 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CH | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 26, 2016 |
| Date Tested: | May 19, 2016 |
| Tested By: | C. Small |


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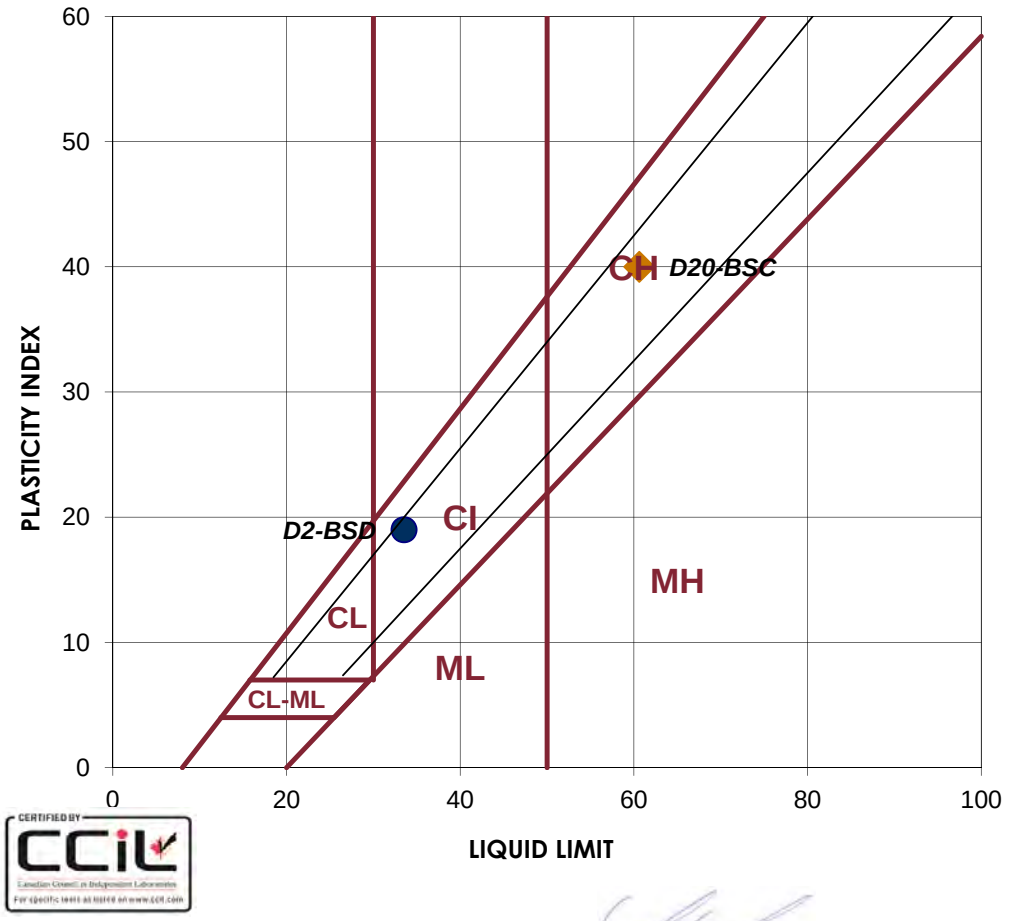
Tel: (403) 253-7876


| Sample: D2-BSD | | | Sample: D20-BSC | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | 22 | 21 |
| | | Container Number | | |
| 26.15 | 27.23 | Wt. Sample (wet+tare)(g) | 21.46 | 22.80 |
| 19.99 | 20.70 | Wt. Sample (dry+tare)(g) | 13.72 | 14.67 |
| 1.62 | 1.21 | Wt. Tare (g) | 1.19 | 1.49 |
| 18.4 | 19.5 | Wt. Dry Soil (g) | 12.5 | 13.2 |
| 6.2 | 6.5 | Wt. Water (g) | 7.7 | 8.1 |
| 33.5% | 33.5% | Water Content (%) | 61.8% | 61.7% |
| 33.5% | 33.5% | Corrected Water Content (%) | 60.8% | 60.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 8.62 | 9.46 | Wt. Sample (wet+tare)(g) | 12.17 | 12 |
| 7.68 | 8.4 | Wt. Sample (dry+tare)(g) | 10.36 | 10.15 |
| 1.36 | 1.26 | Wt. Tare (g) | 1.62 | 1.22 |
| 6.3 | 7.1 | Wt. Dry Soil (g) | 8.7 | 8.9 |
| 0.9 | 1.1 | Wt. Water (g) | 1.8 | 1.9 |
| 14.9% | 14.8% | Water Content (%) | 20.7% | 20.7% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 34 | | LL | 61 |
| PL | 15 | | PL | 21 |
| PI | 19 | | PI | 40 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CH | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | April 26, 2016 |
| Date Tested: | May 19, 2016 |
| Tested By: | C. Small |


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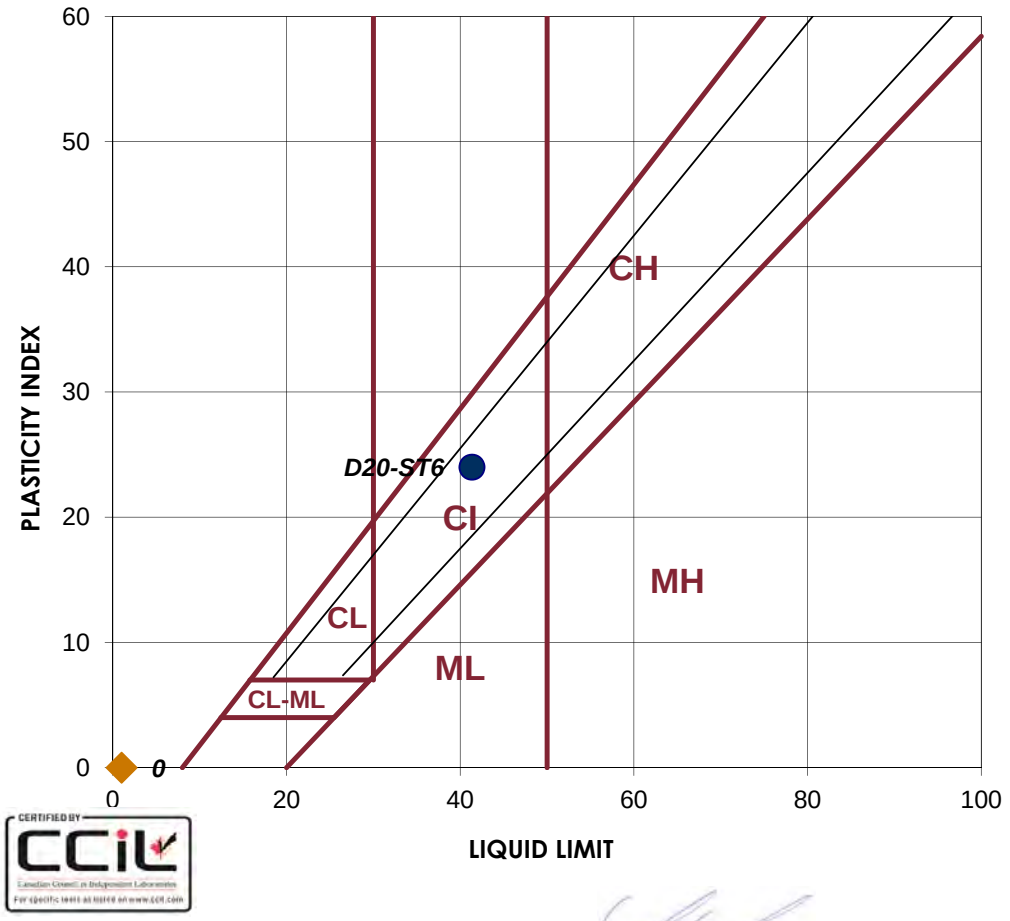
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D20-ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 29 | Number of Blows | | |
| | | Container Number | | |
| 21.36 | 24.36 | Wt. Sample (wet+tare)(g) | | |
| 15.52 | 17.68 | Wt. Sample (dry+tare)(g) | | |
| 1.20 | 1.23 | Wt. Tare (g) | | |
| 14.3 | 16.5 | Wt. Dry Soil (g) | | |
| 5.8 | 6.7 | Wt. Water (g) | | |
| 40.8% | 40.6% | Water Content (%) | | |
| 41.3% | 41.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 13.22 | 12.45 | Wt. Sample (wet+tare)(g) | | |
| 11.48 | 10.87 | Wt. Sample (dry+tare)(g) | | |
| 1.53 | 1.39 | Wt. Tare (g) | | |
| 10.0 | 9.5 | Wt. Dry Soil (g) | | |
| 1.7 | 1.6 | Wt. Water (g) | | |
| 17.5% | 16.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 41 | | LL | |
| PL | 17 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 8, 2016 |
| Date Tested: | August 9, 2016 |
| Tested By: | C. Oost and B. Pelkey |


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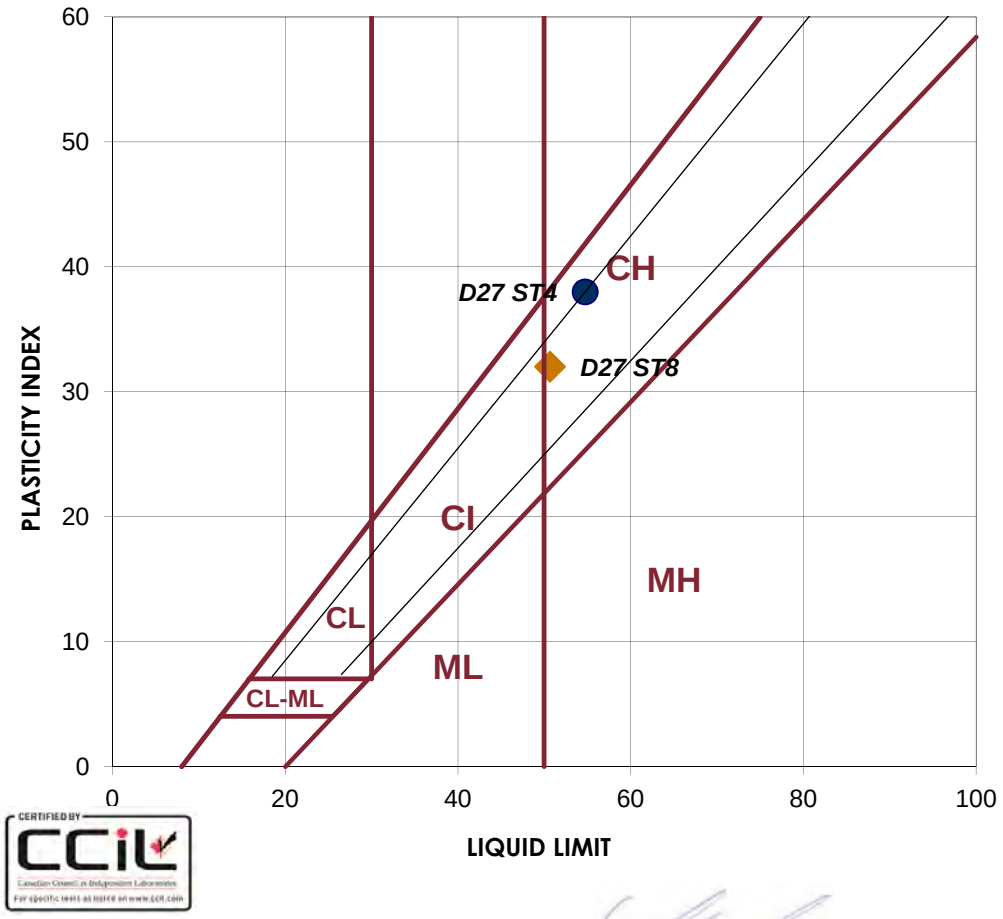
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D27 ST4 | | | D27 ST8 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 21 | Number of Blows | 24 | 24 |
| | | Container Number | | |
| 26.18 | 28.87 | Wt. Sample (wet+tare)(g) | 25.39 | 26.21 |
| 17.25 | 19.04 | Wt. Sample (dry+tare)(g) | 17.23 | 17.79 |
| 1.21 | 1.32 | Wt. Tare (g) | 1.19 | 1.25 |
| 16.0 | 17.7 | Wt. Dry Soil (g) | 16.0 | 16.5 |
| 8.9 | 9.8 | Wt. Water (g) | 8.2 | 8.4 |
| 55.7% | 55.5% | Water Content (%) | 50.9% | 50.9% |
| 55.1% | 54.3% | Corrected Water Content (%) | 50.6% | 50.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.85 | 23.33 | Wt. Sample (wet+tare)(g) | 24.19 | 25.12 |
| 21.82 | 22.23 | Wt. Sample (dry+tare)(g) | 22.54 | 23.31 |
| 15.81 | 15.78 | Wt. Tare (g) | 13.78 | 13.82 |
| 6.0 | 6.5 | Wt. Dry Soil (g) | 8.8 | 9.5 |
| 1.0 | 1.1 | Wt. Water (g) | 1.7 | 1.8 |
| 17.1% | 17.1% | Water Content (%) | 18.8% | 19.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 55 | | LL | 51 |
| PL | 17 | | PL | 19 |
| PI | 38 | | PI | 32 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CH-CI | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 8, 2016 |
| Date Tested: | October 3, 2016 |
| Tested By: | E.Farries |


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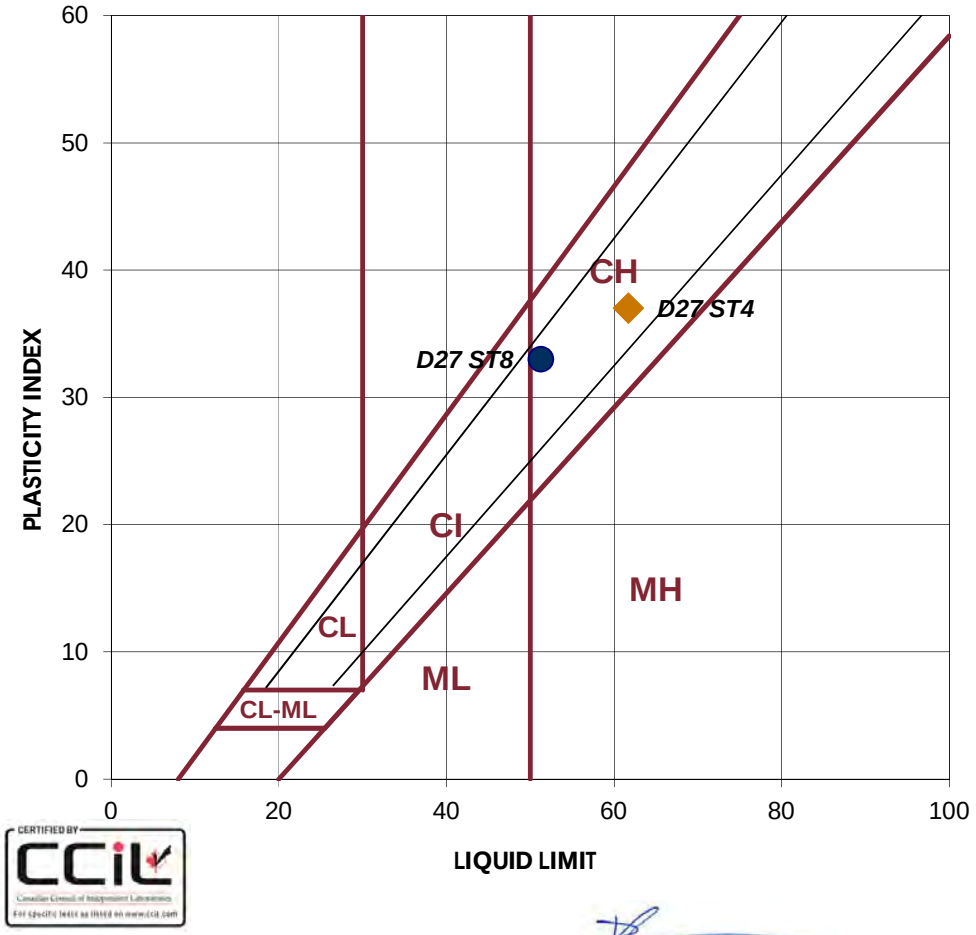
| Sample: D27 ST8 | | | Sample: D27 ST4 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 26 | Number of Blows | 30 | 29 |
| | | Container Number | | |
| 16.15 | 20.90 | Wt. Sample (wet+tare)(g) | 22.60 | 20.18 |
| 11.11 | 14.23 | Wt. Sample (dry+tare)(g) | 14.57 | 13.02 |
| 1.22 | 1.16 | Wt. Tare (g) | 1.27 | 1.20 |
| 9.9 | 13.1 | Wt. Dry Soil (g) | 13.3 | 11.8 |
| 5.0 | 6.7 | Wt. Water (g) | 8.0 | 7.2 |
| 51.0% | 51.0% | Water Content (%) | 60.4% | 60.6% |
| 51.2% | 51.3% | Corrected Water Content (%) | 61.7% | 61.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.98 | 24.87 | Wt. Sample (wet+tare)(g) | 23.86 | 21.93 |
| 22.45 | 23.14 | Wt. Sample (dry+tare)(g) | 21.82 | 20.29 |
| 13.86 | 13.78 | Wt. Tare (g) | 13.72 | 13.76 |
| 8.6 | 9.4 | Wt. Dry Soil (g) | 8.1 | 6.5 |
| 1.5 | 1.7 | Wt. Water (g) | 2.0 | 1.6 |
| 17.8% | 18.5% | Water Content (%) | 25.2% | 25.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 51 | | LL | 62 |
| PL | 18 | | PL | 25 |
| PI | 33 | | PI | 37 |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH-CI** ● | | | **CH** ◆ | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: July 8, 2016
Date Tested: August 13, 2016
Tested By: B. Pelkey

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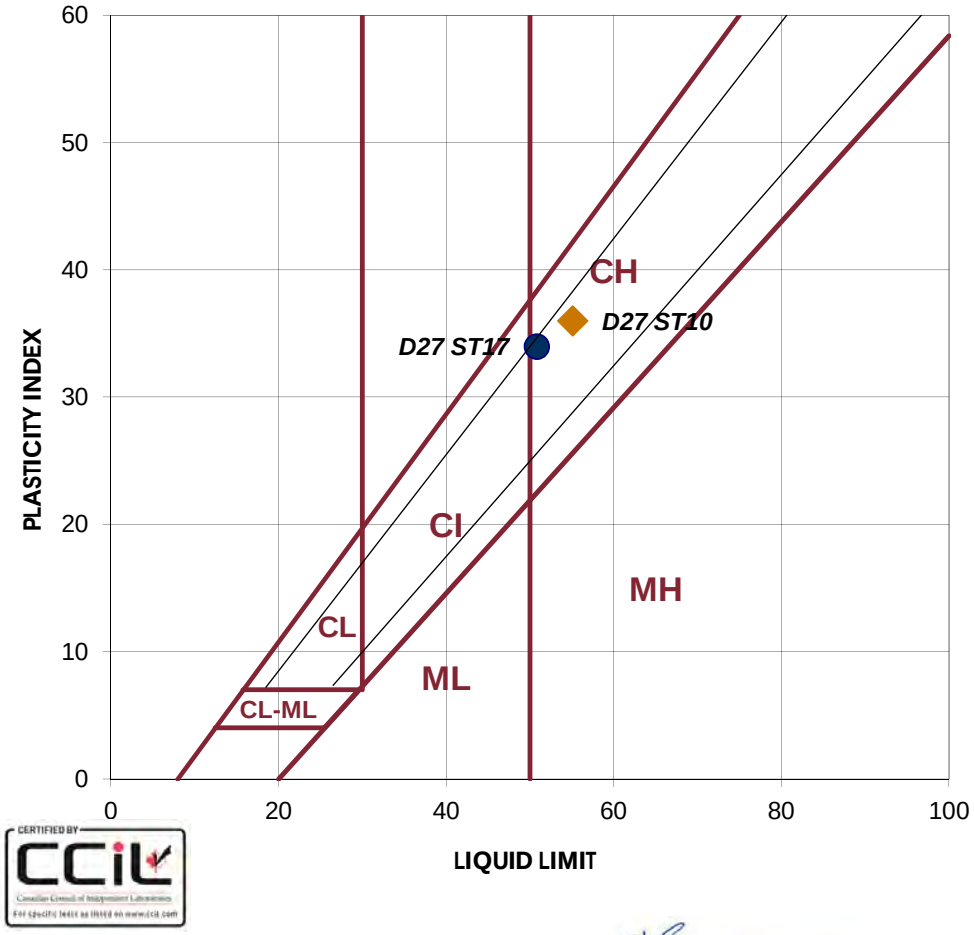
| Sample: D27 ST17 | | | Sample: D27 ST10 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 23 | Number of Blows | 26 | 28 |
| | | Container Number | | |
| 23.20 | 27.63 | Wt. Sample (wet+tare)(g) | 27.48 | 27.65 |
| 15.83 | 18.70 | Wt. Sample (dry+tare)(g) | 18.35 | 18.33 |
| 1.41 | 1.17 | Wt. Tare (g) | 1.61 | 1.27 |
| 14.4 | 17.5 | Wt. Dry Soil (g) | 16.7 | 17.1 |
| 7.4 | 8.9 | Wt. Water (g) | 9.1 | 9.3 |
| 51.1% | 50.9% | Water Content (%) | 54.5% | 54.6% |
| 51.1% | 50.4% | Corrected Water Content (%) | 54.8% | 55.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.93 | 24.67 | Wt. Sample (wet+tare)(g) | 26.54 | 25.47 |
| 22.44 | 23.1 | Wt. Sample (dry+tare)(g) | 24.51 | 23.59 |
| 13.78 | 14.12 | Wt. Tare (g) | 13.82 | 13.78 |
| 8.7 | 9.0 | Wt. Dry Soil (g) | 10.7 | 9.8 |
| 1.5 | 1.6 | Wt. Water (g) | 2.0 | 1.9 |
| 17.2% | 17.5% | Water Content (%) | 19.0% | 19.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 51 | | LL | 55 |
| PL | 17 | | PL | 19 |
| PI | 34 | | PI | 36 |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH-CI** | | | **CH** | |






Reviewed By:

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 8, 2016 |
| Date Tested: | August 24, 2016 |
| Tested By: | B. Pelkey |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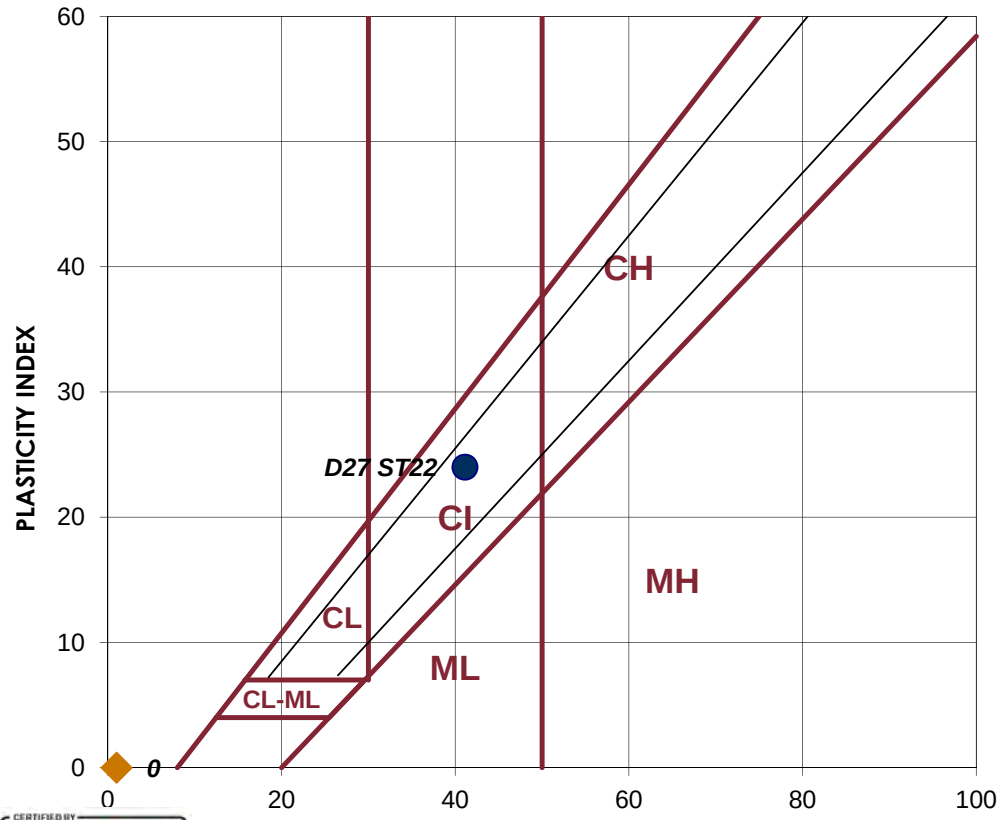
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D27 ST22 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 24 | Number of Blows | | |
| | | Container Number | | |
| 25.17 | 28.43 | Wt. Sample (wet+tare)(g) | | |
| 18.21 | 20.60 | Wt. Sample (dry+tare)(g) | | |
| 1.46 | 1.54 | Wt. Tare (g) | | |
| 16.8 | 19.1 | Wt. Dry Soil (g) | | |
| 7.0 | 7.8 | Wt. Water (g) | | |
| 41.6% | 41.1% | Water Content (%) | | |
| 41.3% | 40.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 31.26 | 28.49 | Wt. Sample (wet+tare)(g) | | |
| 28.69 | 26.31 | Wt. Sample (dry+tare)(g) | | |
| 13.87 | 13.78 | Wt. Tare (g) | | |
| 14.8 | 12.5 | Wt. Dry Soil (g) | | |
| 2.6 | 2.2 | Wt. Water (g) | | |
| 17.3% | 17.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 41 | | LL | |
| PL | 17 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 2, 2016 |
| Tested By: | B. Pelkey |


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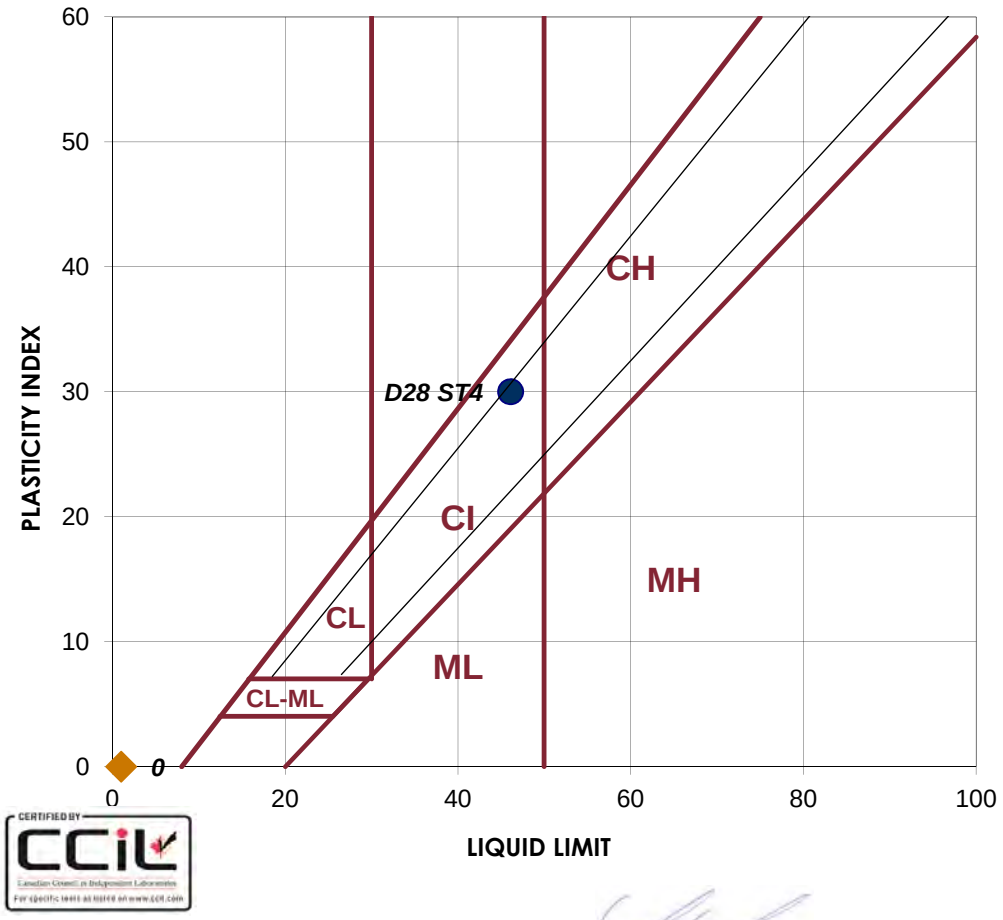
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D28 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 30 | 30 | Number of Blows | | |
| | | Container Number | | |
| 25.89 | 35.62 | Wt. Sample (wet+tare)(g) | | |
| 18.26 | 24.90 | Wt. Sample (dry+tare)(g) | | |
| 1.28 | 1.21 | Wt. Tare (g) | | |
| 17.0 | 23.7 | Wt. Dry Soil (g) | | |
| 7.6 | 10.7 | Wt. Water (g) | | |
| 44.9% | 45.3% | Water Content (%) | | |
| 45.9% | 46.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.29 | 23.67 | Wt. Sample (wet+tare)(g) | | |
| 21.11 | 22.28 | Wt. Sample (dry+tare)(g) | | |
| 13.8 | 13.92 | Wt. Tare (g) | | |
| 7.3 | 8.4 | Wt. Dry Soil (g) | | |
| 1.2 | 1.4 | Wt. Water (g) | | |
| 16.1% | 16.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 46 | | LL | |
| PL | 16 | | PL | |
| PI | 30 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 9, 2016 |
| Tested By: | B. Pelkey |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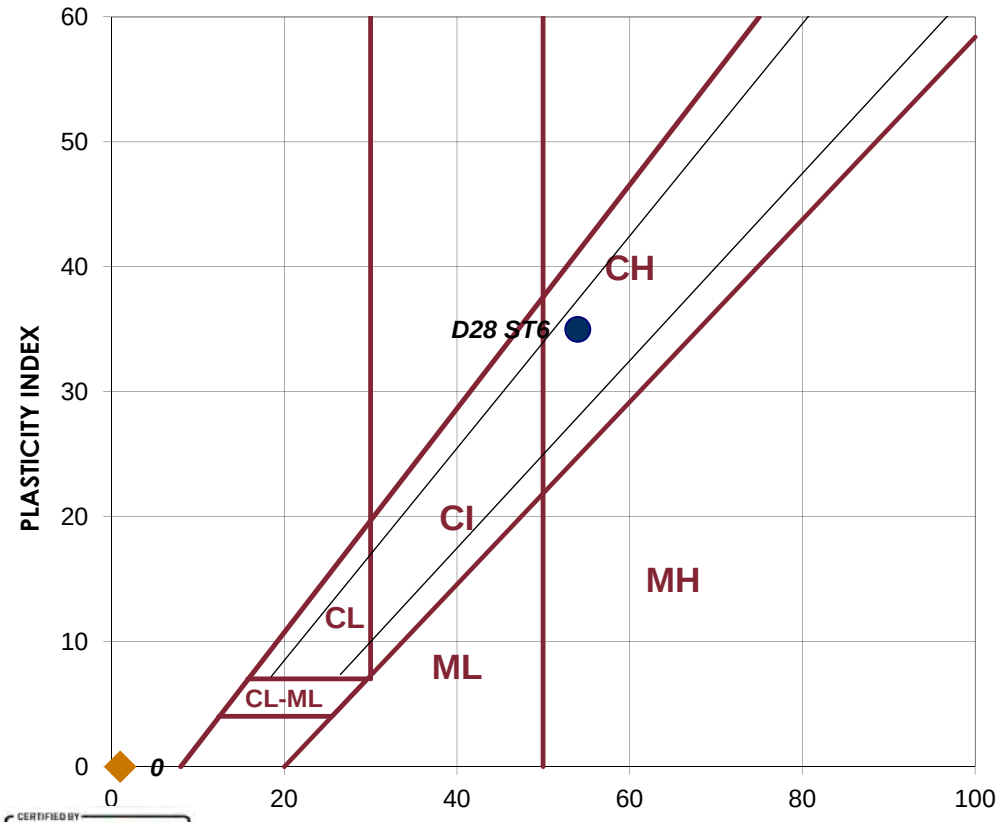
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D28 ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | | |
| | | Container Number | | |
| 28.97 | 24.74 | Wt. Sample (wet+tare)(g) | | |
| 19.17 | 16.42 | Wt. Sample (dry+tare)(g) | | |
| 1.33 | 1.21 | Wt. Tare (g) | | |
| 17.8 | 15.2 | Wt. Dry Soil (g) | | |
| 9.8 | 8.3 | Wt. Water (g) | | |
| 54.9% | 54.7% | Water Content (%) | | |
| 54.1% | 53.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.01 | 28.75 | Wt. Sample (wet+tare)(g) | | |
| 24.04 | 26.3 | Wt. Sample (dry+tare)(g) | | |
| 13.8 | 13.81 | Wt. Tare (g) | | |
| 10.2 | 12.5 | Wt. Dry Soil (g) | | |
| 2.0 | 2.5 | Wt. Water (g) | | |
| 19.2% | 19.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 54 | | LL | |
| PL | 19 | | PL | |
| PI | 35 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 30, 2016 |
| Date Tested: | July 20, 2016 |
| Tested By: | C. Oost |


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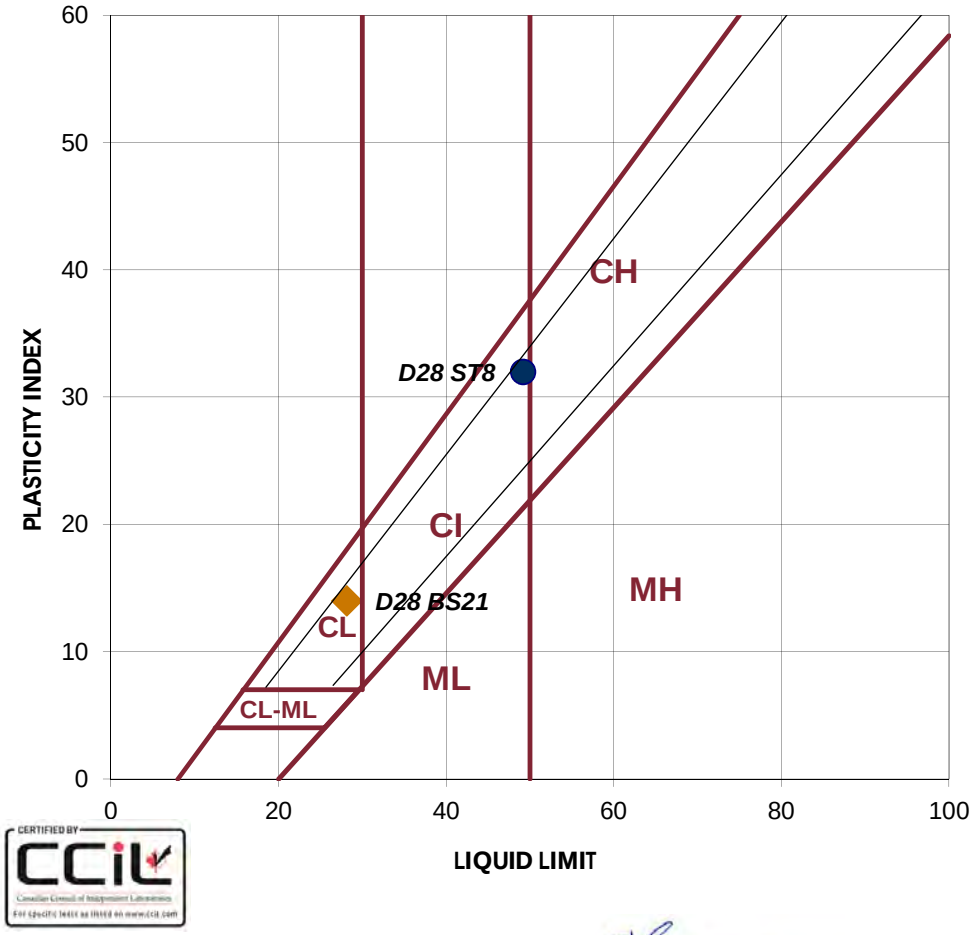
| Sample: D28 ST8 | | | Sample: D28 BS21 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | 24 | 24 |
| | | Container Number | | |
| 14.79 | 16.10 | Wt. Sample (wet+tare)(g) | 15.82 | 18.19 |
| 10.38 | 11.27 | Wt. Sample (dry+tare)(g) | 12.59 | 14.49 |
| 1.56 | 1.57 | Wt. Tare (g) | 1.21 | 1.32 |
| 8.8 | 9.7 | Wt. Dry Soil (g) | 11.4 | 13.2 |
| 4.4 | 4.8 | Wt. Water (g) | 3.2 | 3.7 |
| 50.0% | 49.8% | Water Content (%) | 28.4% | 28.1% |
| 49.2% | 49.0% | Corrected Water Content (%) | 28.2% | 28.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.31 | 23.42 | Wt. Sample (wet+tare)(g) | 23.95 | 24.73 |
| 21.38 | 22.36 | Wt. Sample (dry+tare)(g) | 22.95 | 23.69 |
| 15.78 | 15.94 | Wt. Tare (g) | 15.83 | 15.98 |
| 5.6 | 6.4 | Wt. Dry Soil (g) | 7.1 | 7.7 |
| 0.9 | 1.1 | Wt. Water (g) | 1.0 | 1.0 |
| 16.6% | 16.5% | Water Content (%) | 14.0% | 13.5% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 49 | | LL | 28 |
| PL | 17 | | PL | 14 |
| PI | 32 | | PI | 14 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CH*** | | | ***CL-CI*** | |






Reviewed By:

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 7, 2016 |
| Tested By: | B. Pelkey |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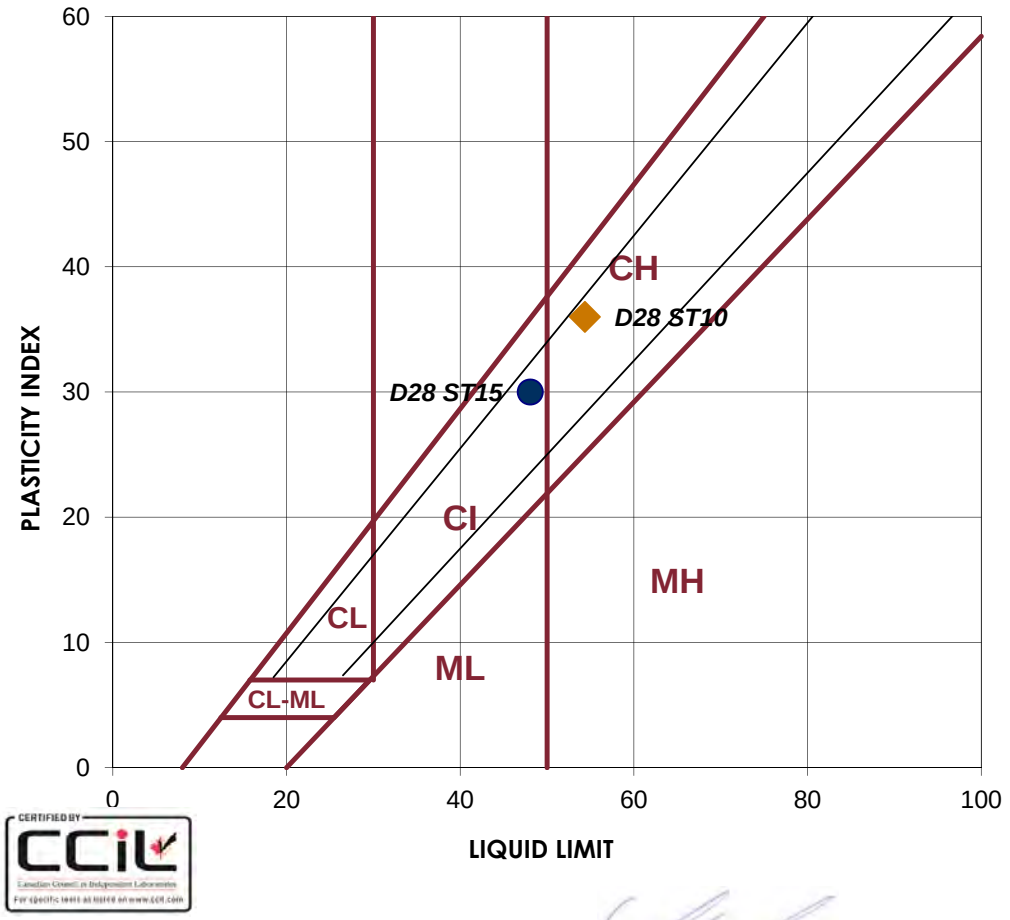
| Sample: D28 ST15 | | | Sample: D28 ST10 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | 30 | 29 |
| | | Container Number | | |
| 30.09 | 28.80 | Wt. Sample (wet+tare)(g) | 23.60 | 28.02 |
| 20.88 | 19.95 | Wt. Sample (dry+tare)(g) | 15.80 | 18.73 |
| 1.38 | 1.19 | Wt. Tare (g) | 1.16 | 1.29 |
| 19.5 | 18.8 | Wt. Dry Soil (g) | 14.6 | 17.4 |
| 9.2 | 8.9 | Wt. Water (g) | 7.8 | 9.3 |
| 47.2% | 47.2% | Water Content (%) | 53.3% | 53.3% |
| 48.1% | 48.0% | Corrected Water Content (%) | 54.5% | 54.2% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.28 | 25.05 | Wt. Sample (wet+tare)(g) | 28.74 | 24.49 |
| 24.39 | 23.36 | Wt. Sample (dry+tare)(g) | 26.41 | 22.86 |
| 13.77 | 13.81 | Wt. Tare (g) | 13.77 | 13.79 |
| 10.6 | 9.6 | Wt. Dry Soil (g) | 12.6 | 9.1 |
| 1.9 | 1.7 | Wt. Water (g) | 2.3 | 1.6 |
| 17.8% | 17.7% | Water Content (%) | 18.4% | 18.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 48 | | LL | 54 |
| PL | 18 | | PL | 18 |
| PI | 30 | | PI | 36 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CH | | | CH | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | November 2, 2016 |
| Tested By: | C. Woods |


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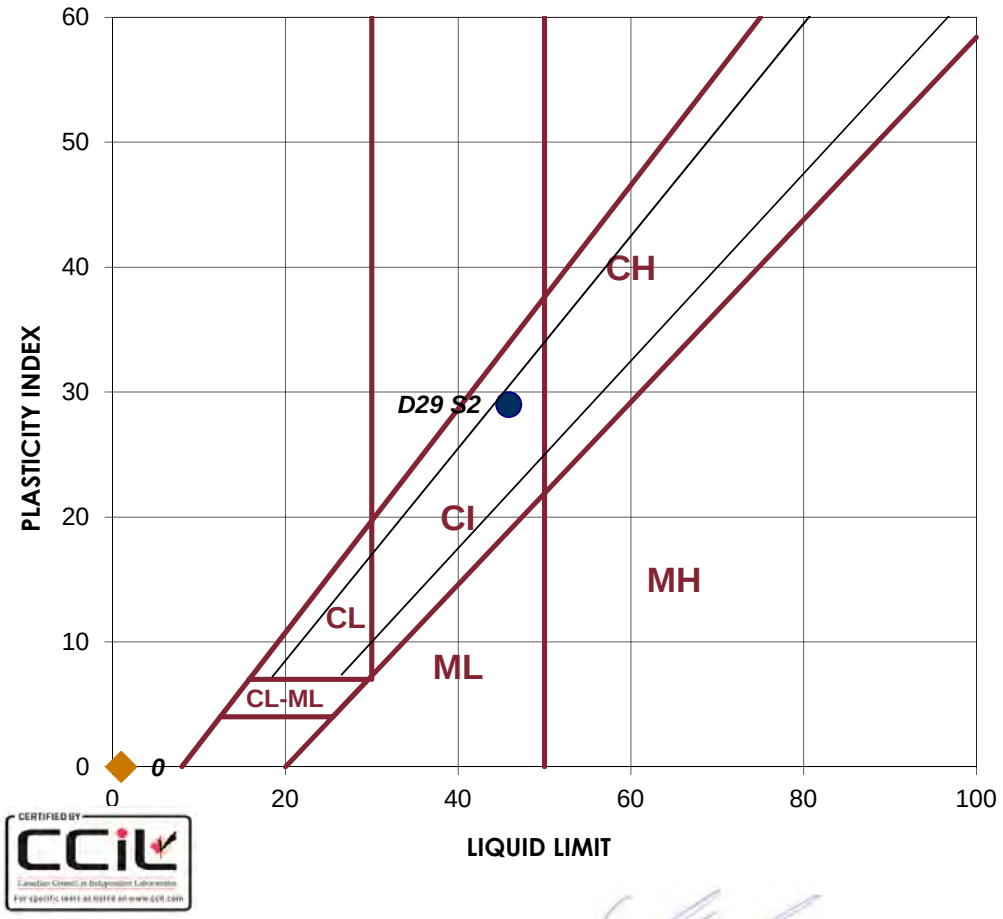
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D29 S2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | | |
| | | Container Number | | |
| 26.53 | 23.39 | Wt. Sample (wet+tare)(g) | | |
| 18.59 | 16.40 | Wt. Sample (dry+tare)(g) | | |
| 1.53 | 1.40 | Wt. Tare (g) | | |
| 17.1 | 15.0 | Wt. Dry Soil (g) | | |
| 7.9 | 7.0 | Wt. Water (g) | | |
| 46.5% | 46.6% | Water Content (%) | | |
| 45.8% | 45.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.96 | 25.68 | Wt. Sample (wet+tare)(g) | | |
| 24.16 | 23.93 | Wt. Sample (dry+tare)(g) | | |
| 13.76 | 13.72 | Wt. Tare (g) | | |
| 10.4 | 10.2 | Wt. Dry Soil (g) | | |
| 1.8 | 1.8 | Wt. Water (g) | | |
| 17.3% | 17.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 46 | | LL | |
| PL | 17 | | PL | |
| PI | 29 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 21, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |


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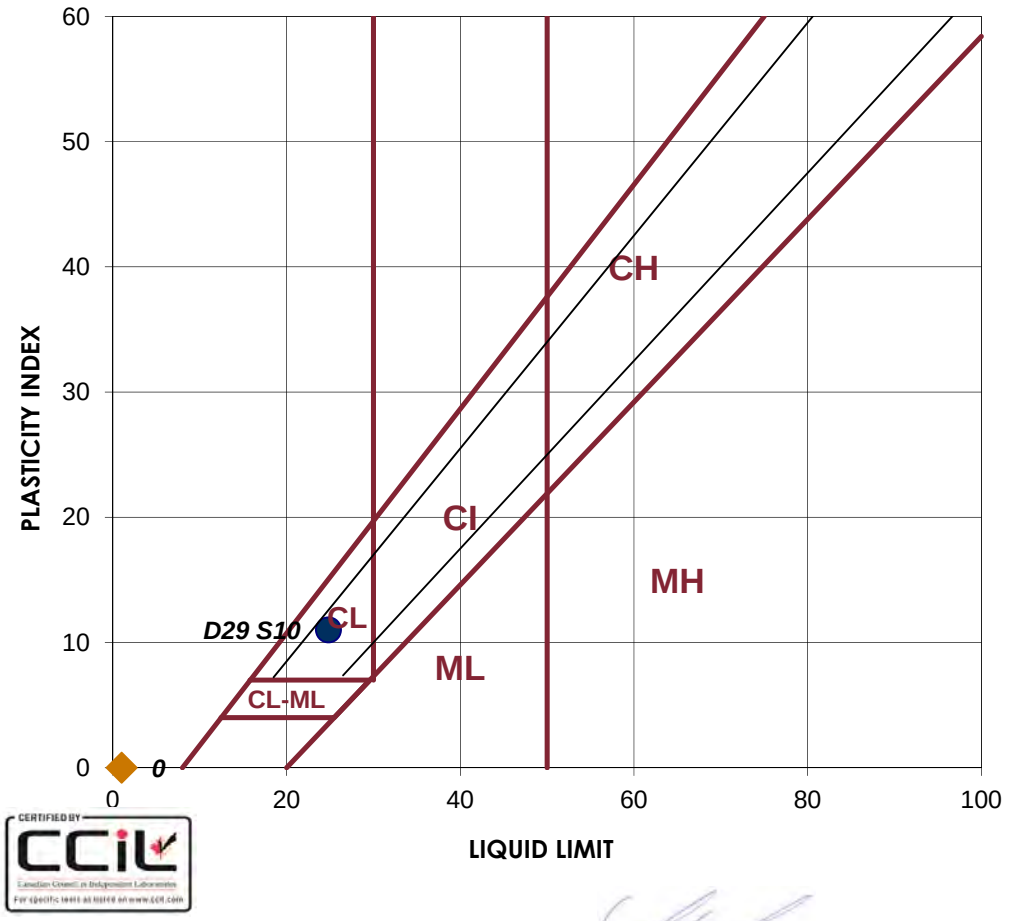
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D29 S10 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 22 | Number of Blows | | |
| | | Container Number | | |
| 22.90 | 29.75 | Wt. Sample (wet+tare)(g) | | |
| 18.54 | 24.03 | Wt. Sample (dry+tare)(g) | | |
| 1.22 | 1.24 | Wt. Tare (g) | | |
| 17.3 | 22.8 | Wt. Dry Soil (g) | | |
| 4.4 | 5.7 | Wt. Water (g) | | |
| 25.2% | 25.1% | Water Content (%) | | |
| 24.9% | 24.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.58 | 24.81 | Wt. Sample (wet+tare)(g) | | |
| 24.39 | 23.73 | Wt. Sample (dry+tare)(g) | | |
| 15.82 | 15.8 | Wt. Tare (g) | | |
| 8.6 | 7.9 | Wt. Dry Soil (g) | | |
| 1.2 | 1.1 | Wt. Water (g) | | |
| 13.9% | 13.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 25 | | LL | |
| PL | 14 | | PL | |
| PI | 11 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 14, 2016 |
| Date Tested: | October 12, 2016 |
| Tested By: | C.Small |


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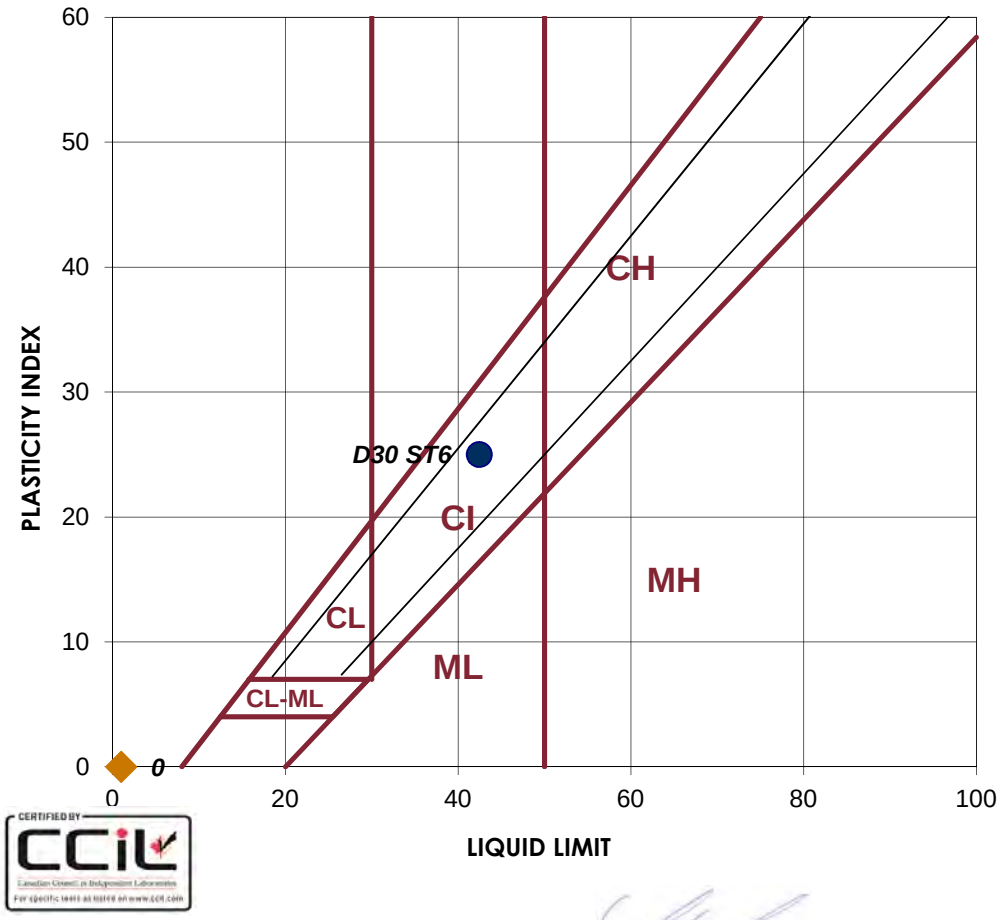
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D30 ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 20 | 22 | Number of Blows | | |
| | | Container Number | | |
| 24.33 | 27.76 | Wt. Sample (wet+tare)(g) | | |
| 17.32 | 19.85 | Wt. Sample (dry+tare)(g) | | |
| 1.18 | 1.58 | Wt. Tare (g) | | |
| 16.1 | 18.3 | Wt. Dry Soil (g) | | |
| 7.0 | 7.9 | Wt. Water (g) | | |
| 43.4% | 43.3% | Water Content (%) | | |
| 42.3% | 42.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.73 | 24.6 | Wt. Sample (wet+tare)(g) | | |
| 21.41 | 23.02 | Wt. Sample (dry+tare)(g) | | |
| 13.76 | 13.77 | Wt. Tare (g) | | |
| 7.7 | 9.3 | Wt. Dry Soil (g) | | |
| 1.3 | 1.6 | Wt. Water (g) | | |
| 17.3% | 17.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 42 | | LL | |
| PL | 17 | | PL | |
| PI | 25 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 4, 2016 |
| Date Tested: | October 4, 2016 |
| Tested By: | E.Farries |


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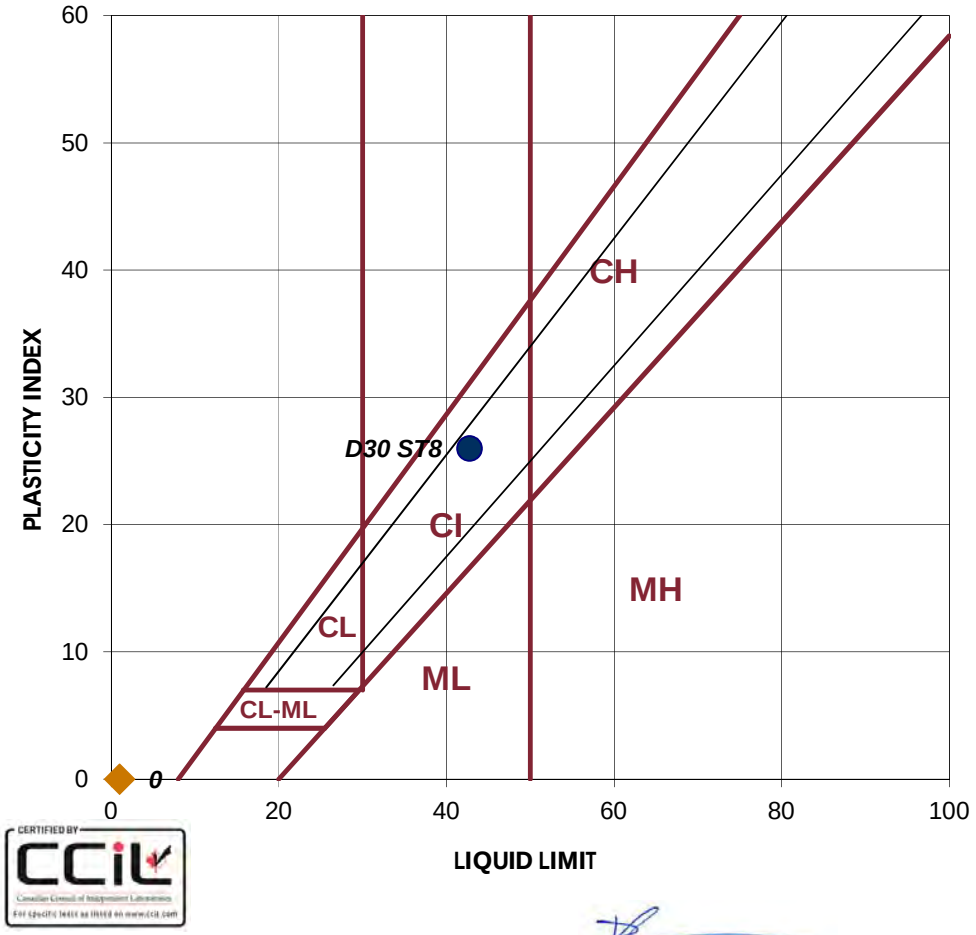
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D30 ST8 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 26 | Number of Blows | | |
| | | Container Number | | |
| 23.93 | 23.61 | Wt. Sample (wet+tare)(g) | | |
| 17.18 | 16.97 | Wt. Sample (dry+tare)(g) | | |
| 1.29 | 1.30 | Wt. Tare (g) | | |
| 15.9 | 15.7 | Wt. Dry Soil (g) | | |
| 6.8 | 6.6 | Wt. Water (g) | | |
| 42.5% | 42.4% | Water Content (%) | | |
| 42.9% | 42.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.57 | 23.46 | Wt. Sample (wet+tare)(g) | | |
| 23.04 | 22.1 | Wt. Sample (dry+tare)(g) | | |
| 13.79 | 13.89 | Wt. Tare (g) | | |
| 9.3 | 8.2 | Wt. Dry Soil (g) | | |
| 1.5 | 1.4 | Wt. Water (g) | | |
| 16.5% | 16.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 43 | | LL | |
| PL | 17 | | PL | |
| PI | 26 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 4, 2016 |
| Date Tested: | October 4, 2016 |
| Tested By: | E.Farries |


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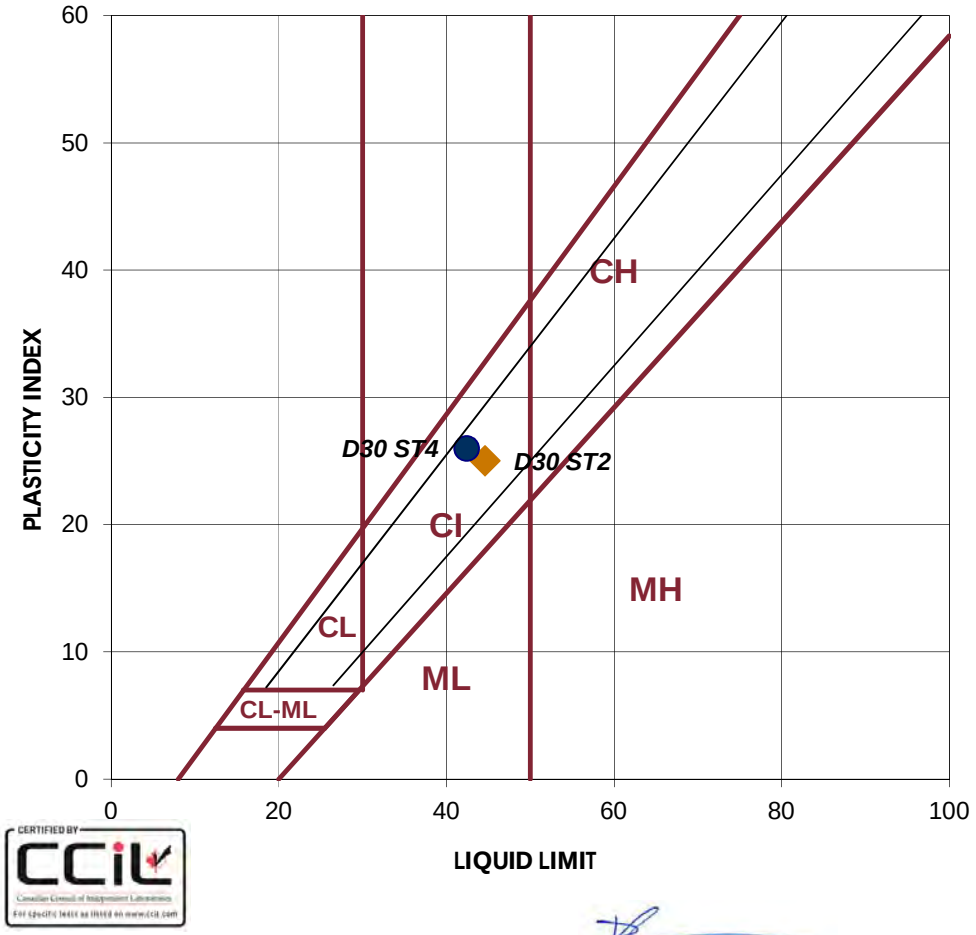
| Sample: D30 ST4 | | | Sample: D30 ST2 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 26 | Number of Blows | 22 | 23 |
| | | Container Number | | |
| 24.87 | 25.31 | Wt. Sample (wet+tare)(g) | 24.42 | 26.81 |
| 17.83 | 18.24 | Wt. Sample (dry+tare)(g) | 17.20 | 18.86 |
| 1.25 | 1.51 | Wt. Tare (g) | 1.26 | 1.21 |
| 16.6 | 16.7 | Wt. Dry Soil (g) | 15.9 | 17.7 |
| 7.0 | 7.1 | Wt. Water (g) | 7.2 | 8.0 |
| 42.5% | 42.3% | Water Content (%) | 45.3% | 45.0% |
| 42.3% | 42.5% | Corrected Water Content (%) | 44.6% | 44.6% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.81 | 21.43 | Wt. Sample (wet+tare)(g) | 24.76 | 25.31 |
| 21.59 | 20.39 | Wt. Sample (dry+tare)(g) | 22.92 | 23.33 |
| 13.76 | 13.77 | Wt. Tare (g) | 13.76 | 13.71 |
| 7.8 | 6.6 | Wt. Dry Soil (g) | 9.2 | 9.6 |
| 1.2 | 1.0 | Wt. Water (g) | 1.8 | 2.0 |
| 15.6% | 15.7% | Water Content (%) | 20.1% | 20.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 42 | | LL | 45 |
| PL | 16 | | PL | 20 |
| PI | 26 | | PI | 25 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 5, 2016 |
| Date Tested: | October 4, 2016 |
| Tested By: | E.Farries |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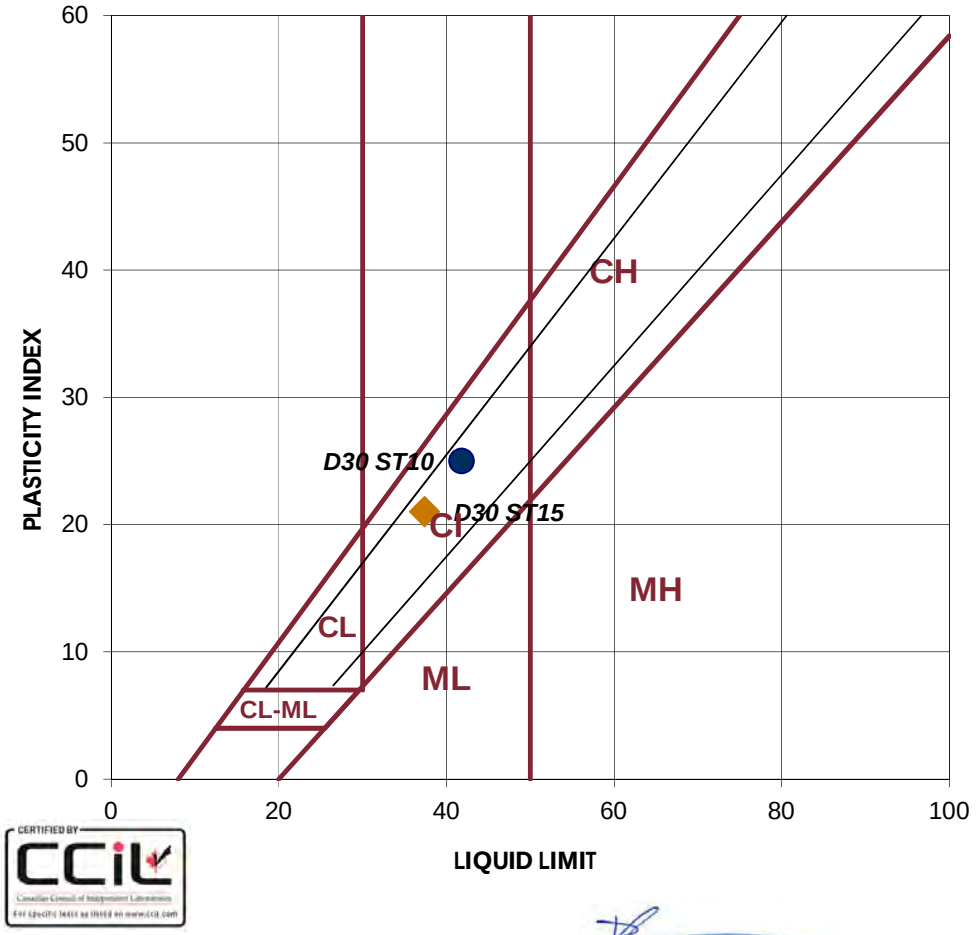
| Sample: D30 ST10 | | | Sample: D30 ST15 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 22 | Number of Blows | 22 | 23 |
| | | Container Number | | |
| 21.56 | 21.57 | Wt. Sample (wet+tare)(g) | 24.16 | 28.37 |
| 15.55 | 15.51 | Wt. Sample (dry+tare)(g) | 17.84 | 21.00 |
| 1.33 | 1.20 | Wt. Tare (g) | 1.18 | 1.49 |
| 14.2 | 14.3 | Wt. Dry Soil (g) | 16.7 | 19.5 |
| 6.0 | 6.1 | Wt. Water (g) | 6.3 | 7.4 |
| 42.3% | 42.3% | Water Content (%) | 37.9% | 37.8% |
| 41.8% | 41.7% | Corrected Water Content (%) | 37.3% | 37.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.9 | 23 | Wt. Sample (wet+tare)(g) | 24.83 | 25.9 |
| 24.14 | 21.71 | Wt. Sample (dry+tare)(g) | 23.32 | 24.27 |
| 13.86 | 13.77 | Wt. Tare (g) | 13.78 | 13.81 |
| 10.3 | 7.9 | Wt. Dry Soil (g) | 9.5 | 10.5 |
| 1.8 | 1.3 | Wt. Water (g) | 1.5 | 1.6 |
| 17.1% | 16.2% | Water Content (%) | 15.8% | 15.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 42 | | LL | 37 |
| PL | 17 | | PL | 16 |
| PI | 25 | | PI | 21 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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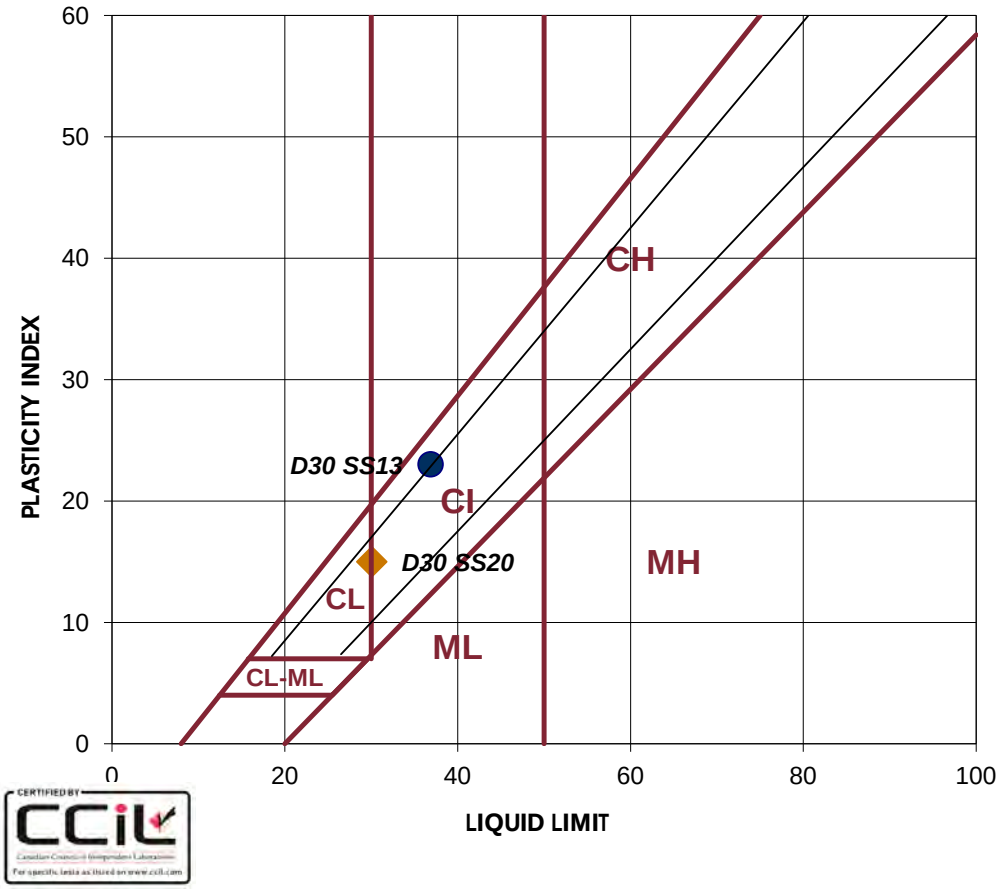
## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: August 5, 2016
Date Tested: November 1, 2016
Tested By: C. Woods

| Sample: D30 SS13 | | | Sample: D30 SS20 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 26 | Number of Blows | 29 | 29 |
| | | Container Number | | |
| 28.11 | 28.75 | Wt. Sample (wet+tare)(g) | 27.85 | 29.08 |
| 20.93 | 21.46 | Wt. Sample (dry+tare)(g) | 21.79 | 22.79 |
| 1.46 | 1.58 | Wt. Tare (g) | 1.29 | 1.45 |
| 19.5 | 19.9 | Wt. Dry Soil (g) | 20.5 | 21.3 |
| 7.2 | 7.3 | Wt. Water (g) | 6.1 | 6.3 |
| 36.9% | 36.7% | Water Content (%) | 29.6% | 29.5% |
| 36.9% | 36.8% | Corrected Water Content (%) | 30.1% | 30.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 29.76 | 30.65 | Wt. Sample (wet+tare)(g) | 28.2 | 25.54 |
| 28.05 | 28.83 | Wt. Sample (dry+tare)(g) | 26.56 | 24.26 |
| 15.94 | 15.97 | Wt. Tare (g) | 15.81 | 15.82 |
| 12.1 | 12.9 | Wt. Dry Soil (g) | 10.8 | 8.4 |
| 1.7 | 1.8 | Wt. Water (g) | 1.6 | 1.3 |
| 14.1% | 14.2% | Water Content (%) | 15.3% | 15.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | 30 |
| PL | 14 | | PL | 15 |
| PI | 23 | | PI | 15 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***CI-CL*** | |



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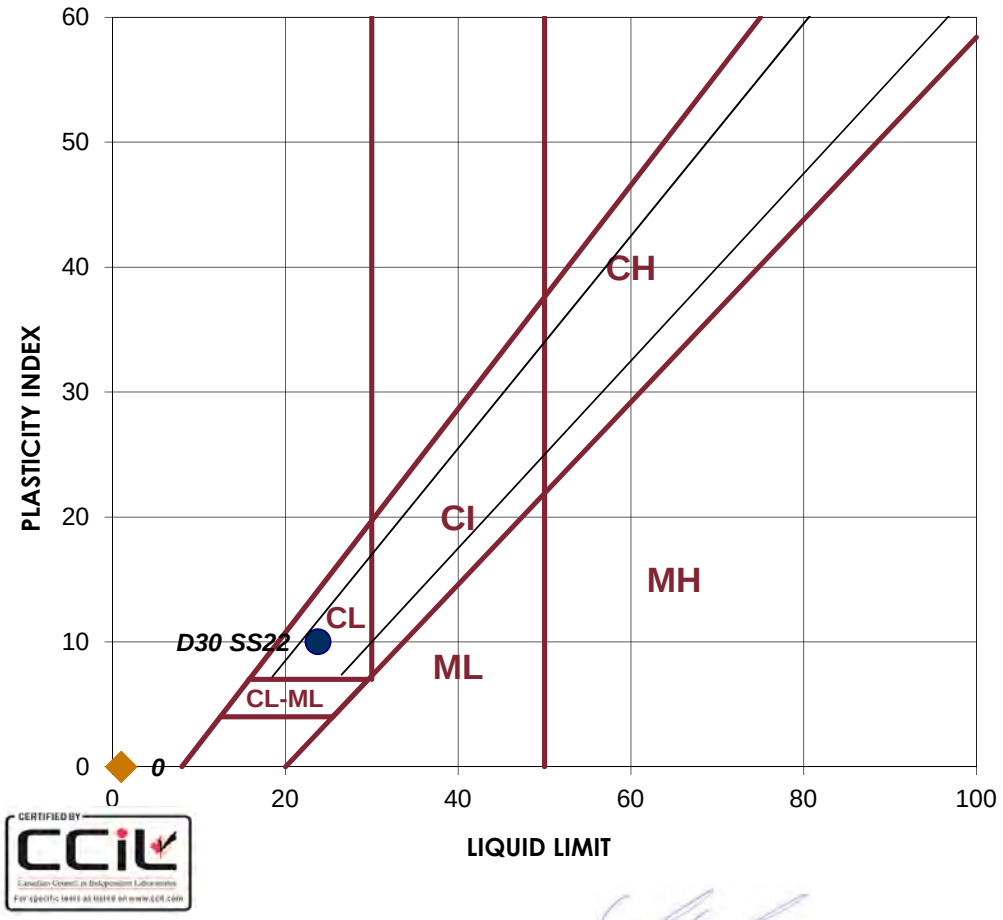
## Atterberg Limits
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 5, 2016 |
| Date Tested: | November 2, 2016 |
| Tested By: | C. Woods |

| Sample: | | | Sample: | |
|---|---|---|---|---|
| D30 SS22 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 24 | Number of Blows | | |
| | | Container Number | | |
| 27.53 | 30.35 | Wt. Sample (wet+tare)(g) | | |
| 22.43 | 24.82 | Wt. Sample (dry+tare)(g) | | |
| 1.18 | 1.60 | Wt. Tare (g) | | |
| 21.3 | 23.2 | Wt. Dry Soil (g) | | |
| 5.1 | 5.5 | Wt. Water (g) | | |
| 24.0% | 23.8% | Water Content (%) | | |
| 23.9% | 23.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.03 | 27.46 | Wt. Sample (wet+tare)(g) | | |
| 21.92 | 25.84 | Wt. Sample (dry+tare)(g) | | |
| 13.78 | 13.81 | Wt. Tare (g) | | |
| 8.1 | 12.0 | Wt. Dry Soil (g) | | |
| 1.1 | 1.6 | Wt. Water (g) | | |
| 13.6% | 13.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 24 | | LL | |
| PL | 14 | | PL | |
| PI | 10 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 21, 2016 |
| Date Tested: | November 1, 2016 |
| Tested By: | C. Woods |


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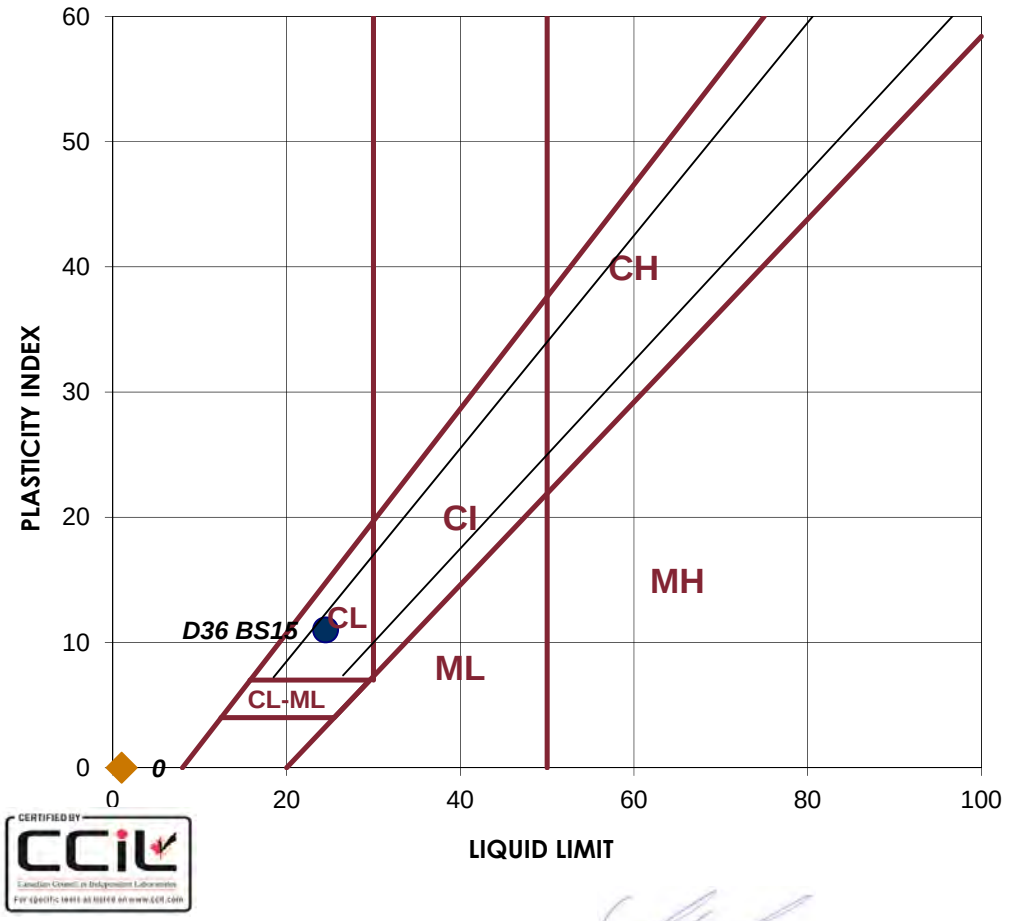
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 BS15 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 24 | Number of Blows | | |
| | | Container Number | | |
| 25.85 | 25.75 | Wt. Sample (wet+tare)(g) | | |
| 21.05 | 20.92 | Wt. Sample (dry+tare)(g) | | |
| 1.52 | 1.32 | Wt. Tare (g) | | |
| 19.5 | 19.6 | Wt. Dry Soil (g) | | |
| 4.8 | 4.8 | Wt. Water (g) | | |
| 24.6% | 24.6% | Water Content (%) | | |
| 24.5% | 24.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.64 | 25.03 | Wt. Sample (wet+tare)(g) | | |
| 24.24 | 23.7 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.82 | Wt. Tare (g) | | |
| 10.5 | 9.9 | Wt. Dry Soil (g) | | |
| 1.4 | 1.3 | Wt. Water (g) | | |
| 13.4% | 13.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 24 | | LL | |
| PL | 13 | | PL | |
| PI | 11 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 21, 2016 |
| Date Tested: | October 12, 2016 |
| Tested By: | C.Small |


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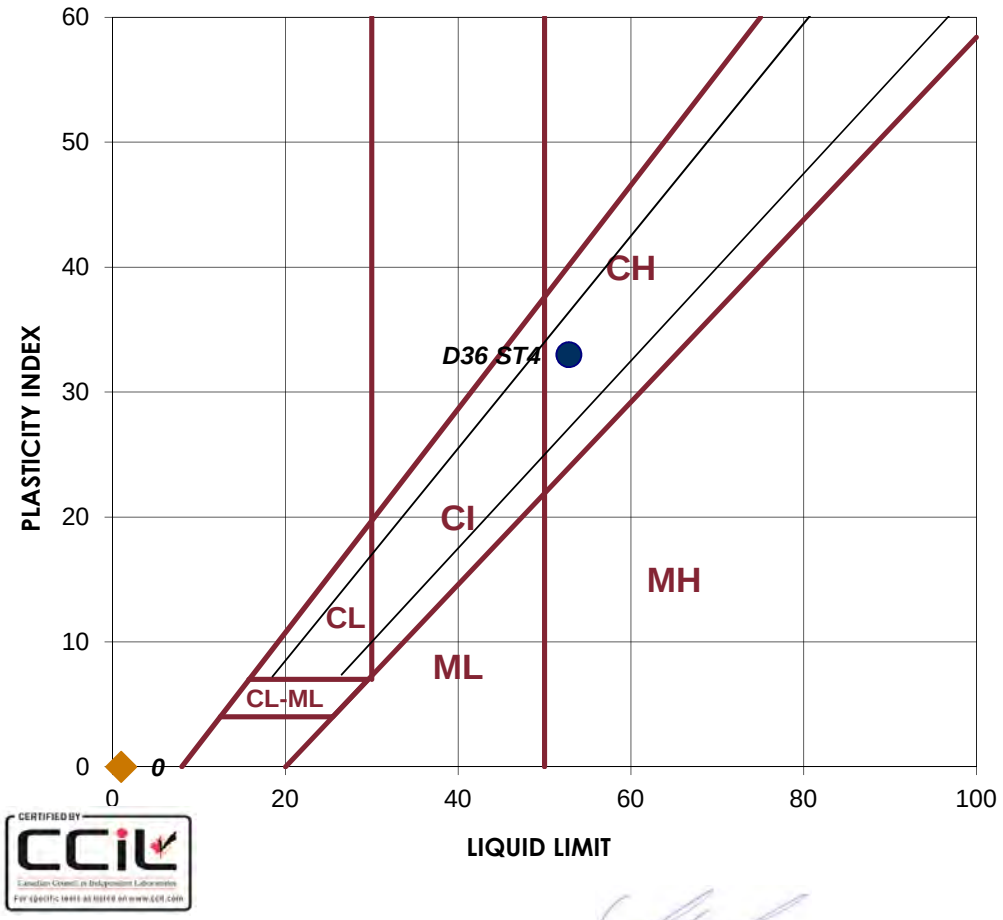
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 20 | Number of Blows | | |
| | | Container Number | | |
| 21.44 | 24.02 | Wt. Sample (wet+tare)(g) | | |
| 14.44 | 16.14 | Wt. Sample (dry+tare)(g) | | |
| 1.47 | 1.53 | Wt. Tare (g) | | |
| 13.0 | 14.6 | Wt. Dry Soil (g) | | |
| 7.0 | 7.9 | Wt. Water (g) | | |
| 54.0% | 53.9% | Water Content (%) | | |
| 53.1% | 52.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.25 | 24.61 | Wt. Sample (wet+tare)(g) | | |
| 21.71 | 22.82 | Wt. Sample (dry+tare)(g) | | |
| 13.8 | 13.77 | Wt. Tare (g) | | |
| 7.9 | 9.1 | Wt. Dry Soil (g) | | |
| 1.5 | 1.8 | Wt. Water (g) | | |
| 19.5% | 19.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 53 | | LL | |
| PL | 20 | | PL | |
| PI | 33 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 4, 2016 |
| Date Tested: | October 13, 2016 |
| Tested By: | C.Small |


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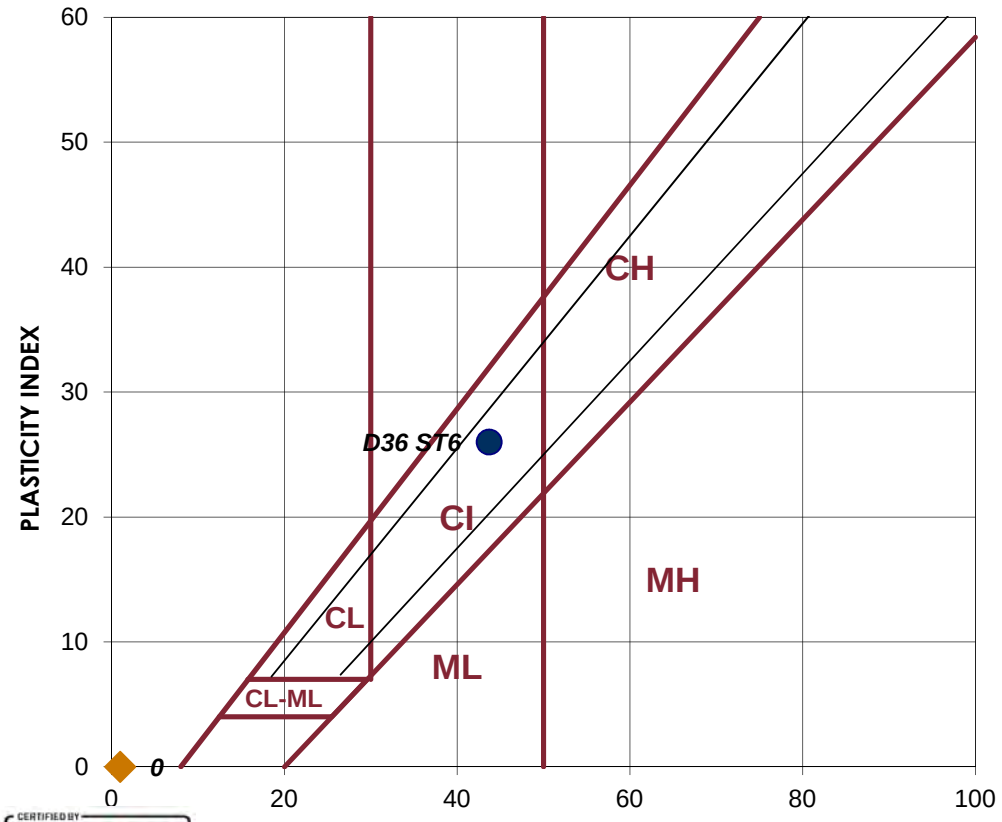
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 26 | Number of Blows | | |
| | | Container Number | | |
| 21.14 | 21.12 | Wt. Sample (wet+tare)(g) | | |
| 15.15 | 15.20 | Wt. Sample (dry+tare)(g) | | |
| 1.41 | 1.50 | Wt. Tare (g) | | |
| 13.7 | 13.7 | Wt. Dry Soil (g) | | |
| 6.0 | 5.9 | Wt. Water (g) | | |
| 43.6% | 43.2% | Water Content (%) | | |
| 44.0% | 43.4% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.35 | 26.53 | Wt. Sample (wet+tare)(g) | | |
| 24.72 | 24.89 | Wt. Sample (dry+tare)(g) | | |
| 15.81 | 15.8 | Wt. Tare (g) | | |
| 8.9 | 9.1 | Wt. Dry Soil (g) | | |
| 1.6 | 1.6 | Wt. Water (g) | | |
| 18.3% | 18.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 44 | | LL | |
| PL | 18 | | PL | |
| PI | 26 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | October 4, 2016 |
| Tested By: | E.Farries |


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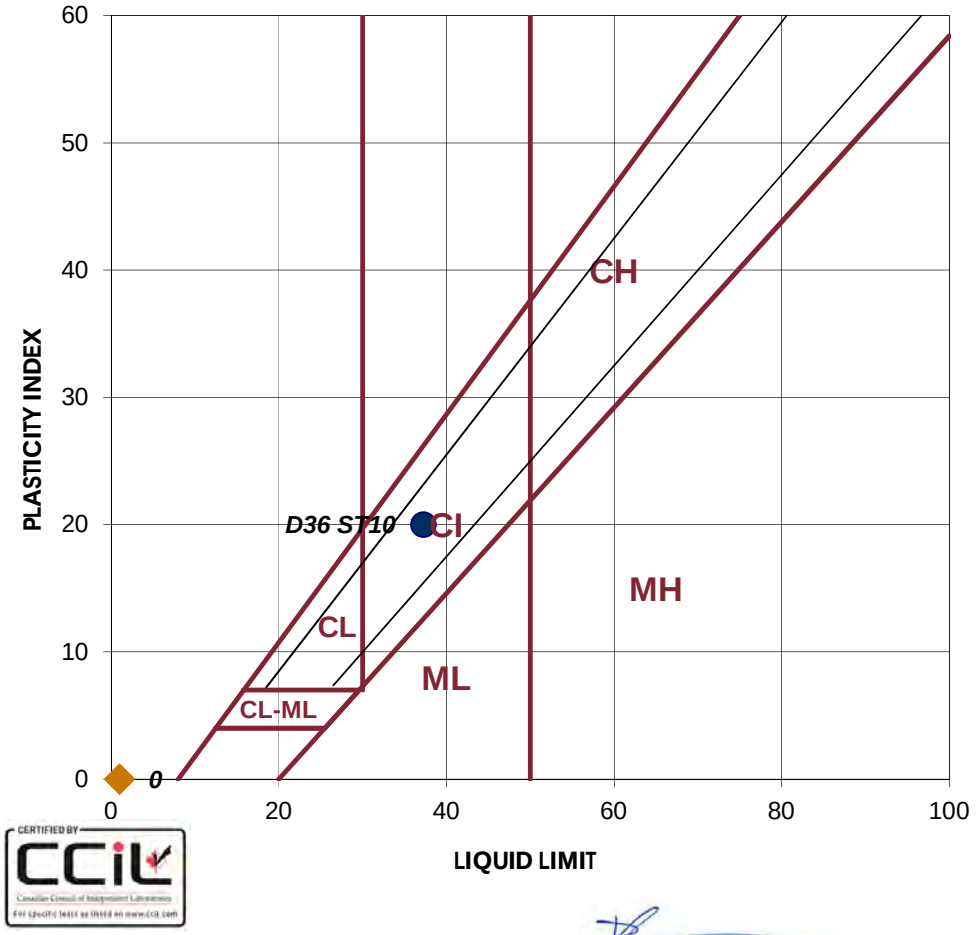
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 ST10 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 27 | Number of Blows | | |
| | | Container Number | | |
| 23.96 | 20.59 | Wt. Sample (wet+tare)(g) | | |
| 17.81 | 15.35 | Wt. Sample (dry+tare)(g) | | |
| 1.20 | 1.14 | Wt. Tare (g) | | |
| 16.6 | 14.2 | Wt. Dry Soil (g) | | |
| 6.2 | 5.2 | Wt. Water (g) | | |
| 37.0% | 36.9% | Water Content (%) | | |
| 37.2% | 37.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.74 | 25.13 | Wt. Sample (wet+tare)(g) | | |
| 26.03 | 23.81 | Wt. Sample (dry+tare)(g) | | |
| 15.79 | 15.79 | Wt. Tare (g) | | |
| 10.2 | 8.0 | Wt. Dry Soil (g) | | |
| 1.7 | 1.3 | Wt. Water (g) | | |
| 16.7% | 16.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | |
| PL | 17 | | PL | |
| PI | 20 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***NON-PLASTIC*** | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 21, 2016 |
| Date Tested: | August 24, 2016 |
| Tested By: | C. Oost and B. Pelkey |


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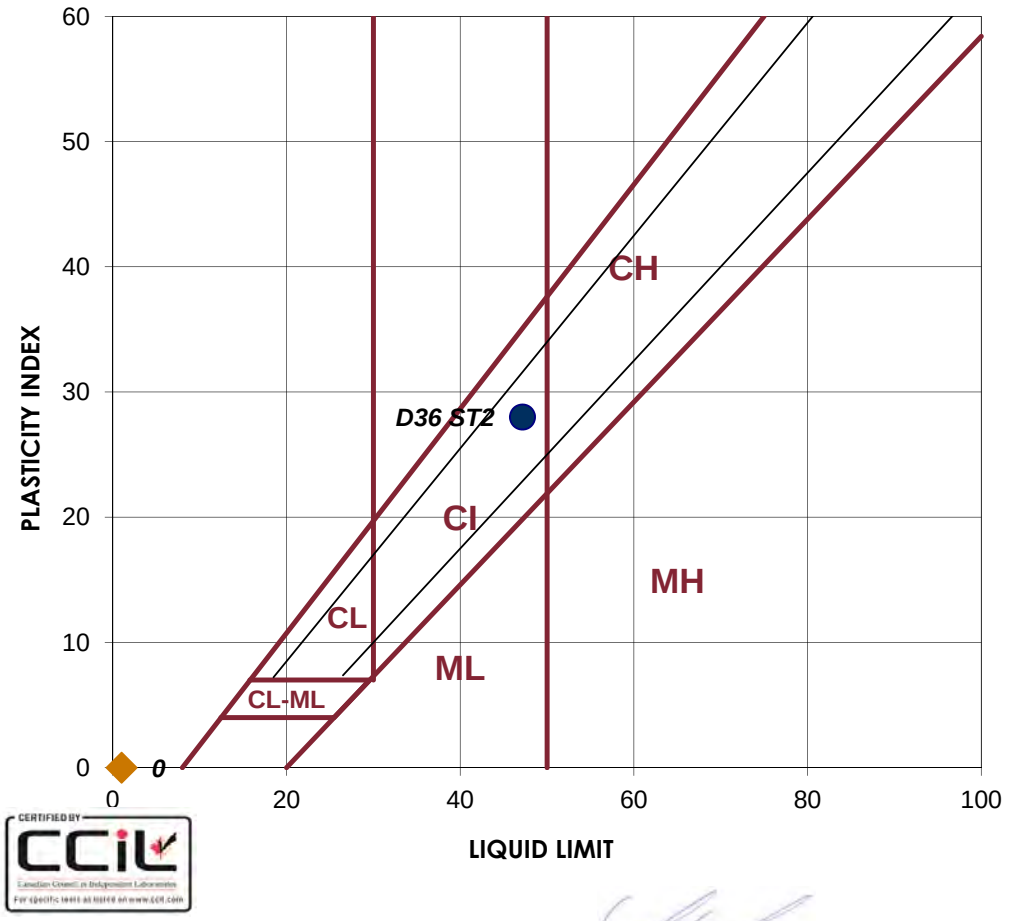
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 28 | Number of Blows | | |
| | | Container Number | | |
| 19.91 | 19.54 | Wt. Sample (wet+tare)(g) | | |
| 14.00 | 13.72 | Wt. Sample (dry+tare)(g) | | |
| 1.31 | 1.25 | Wt. Tare (g) | | |
| 12.7 | 12.5 | Wt. Dry Soil (g) | | |
| 5.9 | 5.8 | Wt. Water (g) | | |
| 46.6% | 46.7% | Water Content (%) | | |
| 47.0% | 47.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.59 | 26.25 | Wt. Sample (wet+tare)(g) | | |
| 25.36 | 24.24 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.77 | Wt. Tare (g) | | |
| 11.6 | 10.5 | Wt. Dry Soil (g) | | |
| 2.2 | 2.0 | Wt. Water (g) | | |
| 19.2% | 19.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 47 | | LL | |
| PL | 19 | | PL | |
| PI | 28 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | August 31, 2016 |
| Tested By: | B. Pelkey |


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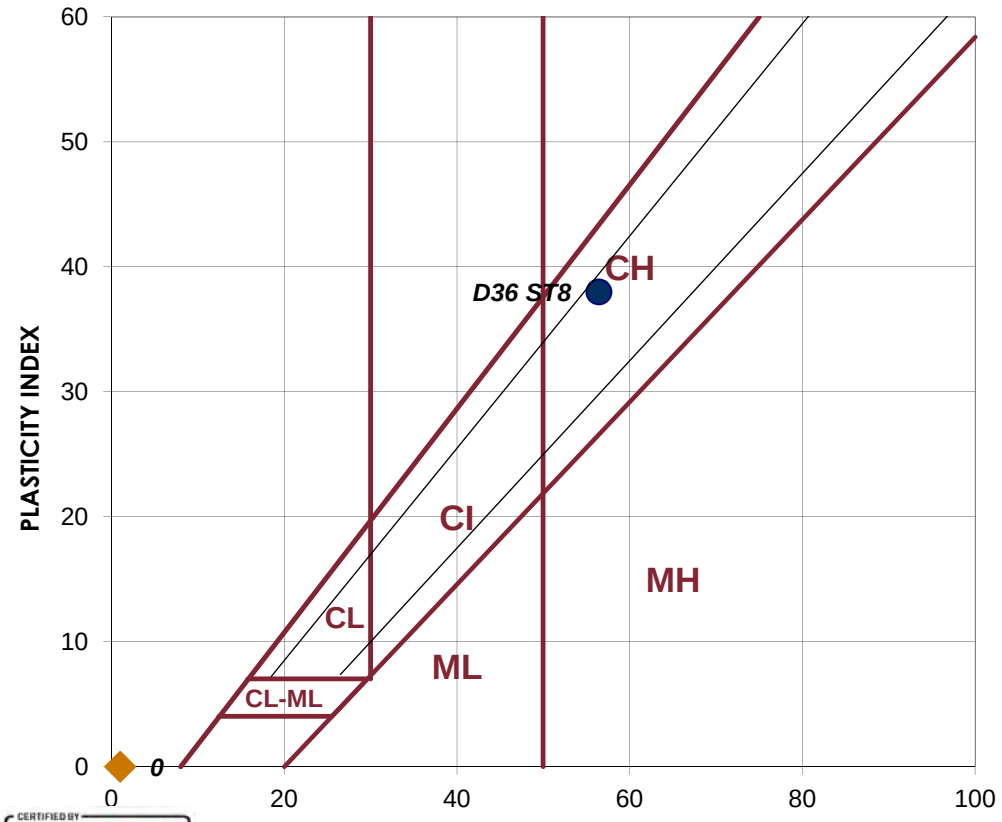
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 ST8 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | | |
| | | Container Number | | |
| 23.91 | 24.69 | Wt. Sample (wet+tare)(g) | | |
| 15.76 | 16.22 | Wt. Sample (dry+tare)(g) | | |
| 1.40 | 1.20 | Wt. Tare (g) | | |
| 14.4 | 15.0 | Wt. Dry Soil (g) | | |
| 8.2 | 8.5 | Wt. Water (g) | | |
| 56.8% | 56.4% | Water Content (%) | | |
| 56.8% | 56.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.25 | 26.78 | Wt. Sample (wet+tare)(g) | | |
| 24.34 | 24.75 | Wt. Sample (dry+tare)(g) | | |
| 13.92 | 13.82 | Wt. Tare (g) | | |
| 10.4 | 10.9 | Wt. Dry Soil (g) | | |
| 1.9 | 2.0 | Wt. Water (g) | | |
| 18.3% | 18.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 56 | | LL | |
| PL | 18 | | PL | |
| PI | 38 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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## Atterberg Limits

ASTM D4318

Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | September 11, 2016 |
| Tested By: | B. Pelkey |


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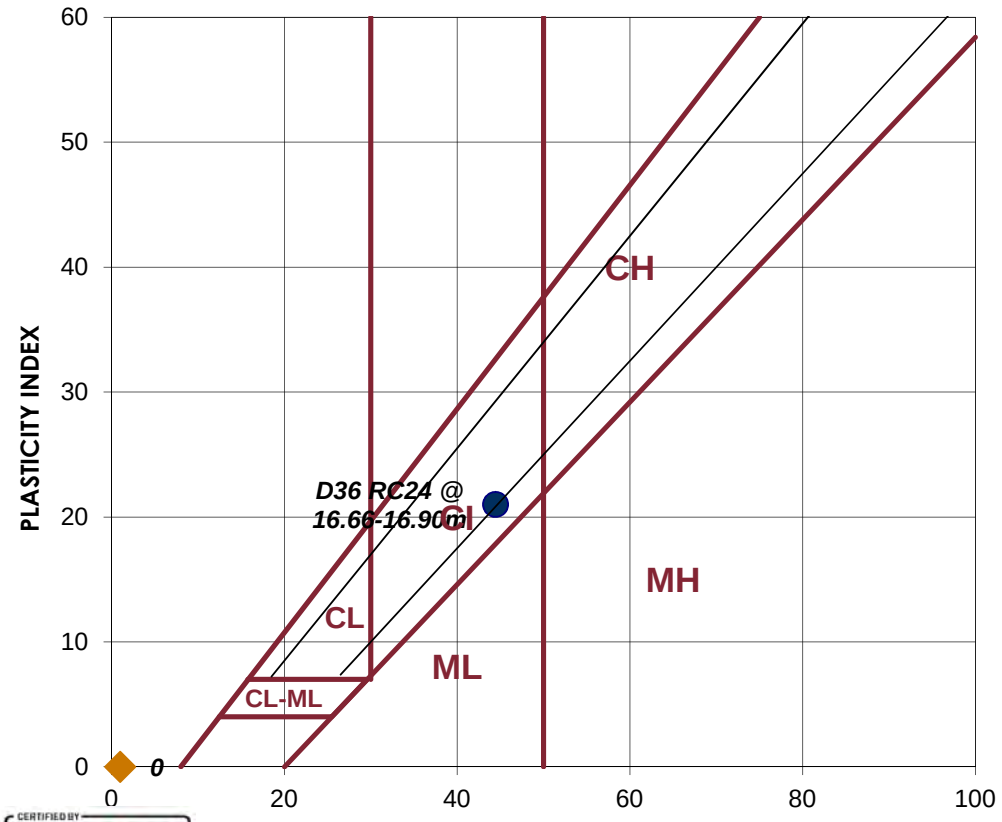
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 RC24 @ 16.66-16.90m | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 30 | 30 | Number of Blows | | |
| | | Container Number | | |
| 23.21 | 24.40 | Wt. Sample (wet+tare)(g) | | |
| 16.55 | 17.39 | Wt. Sample (dry+tare)(g) | | |
| 1.27 | 1.23 | Wt. Tare (g) | | |
| 15.3 | 16.2 | Wt. Dry Soil (g) | | |
| 6.7 | 7.0 | Wt. Water (g) | | |
| 43.6% | 43.4% | Water Content (%) | | |
| 44.6% | 44.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.63 | 28.2 | Wt. Sample (wet+tare)(g) | | |
| 25.1 | 25.62 | Wt. Sample (dry+tare)(g) | | |
| 13.89 | 14.14 | Wt. Tare (g) | | |
| 11.2 | 11.5 | Wt. Dry Soil (g) | | |
| 2.5 | 2.6 | Wt. Water (g) | | |
| 22.6% | 22.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 44 | | LL | |
| PL | 23 | | PL | |
| PI | 21 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | September 11, 2016 |
| Tested By: | B. Pelkey |


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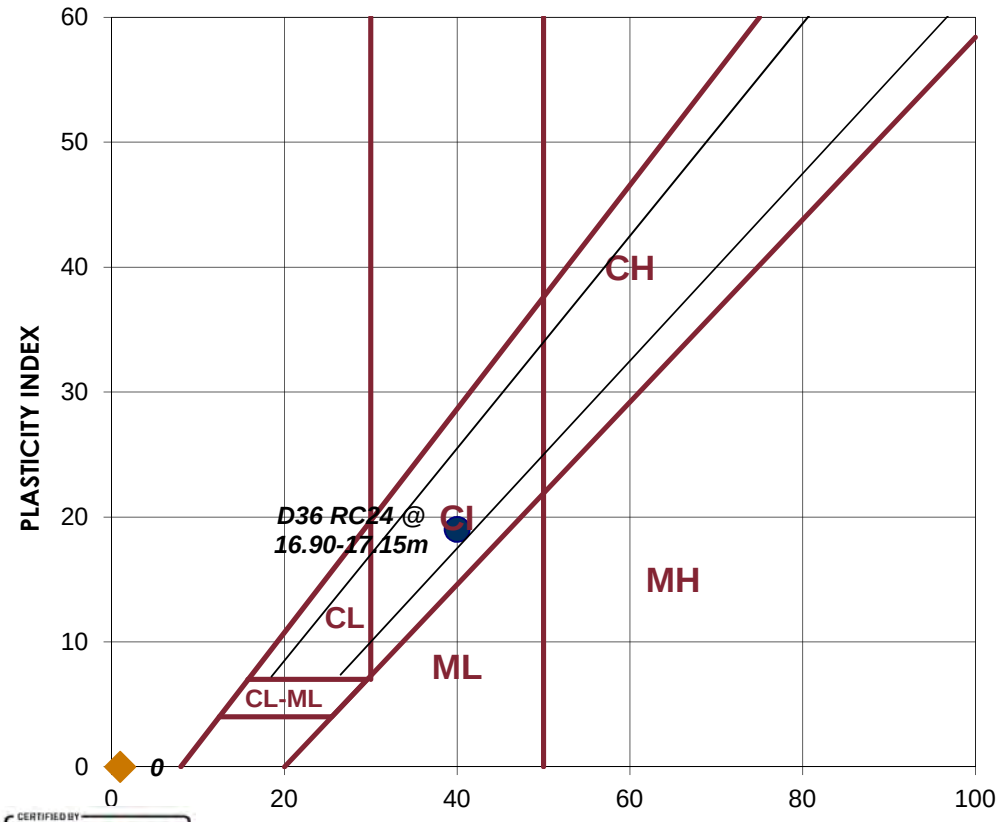
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 RC24 @ 16.90-17.15m | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 30 | 29 | Number of Blows | | |
| | | Container Number | | |
| 32.83 | 29.23 | Wt. Sample (wet+tare)(g) | | |
| 24.01 | 21.41 | Wt. Sample (dry+tare)(g) | | |
| 1.57 | 1.41 | Wt. Tare (g) | | |
| 22.4 | 20.0 | Wt. Dry Soil (g) | | |
| 8.8 | 7.8 | Wt. Water (g) | | |
| 39.3% | 39.1% | Water Content (%) | | |
| 40.2% | 39.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.55 | 27.68 | Wt. Sample (wet+tare)(g) | | |
| 25.98 | 25.27 | Wt. Sample (dry+tare)(g) | | |
| 13.79 | 13.72 | Wt. Tare (g) | | |
| 12.2 | 11.6 | Wt. Dry Soil (g) | | |
| 2.6 | 2.4 | Wt. Water (g) | | |
| 21.1% | 20.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 40 | | LL | |
| PL | 21 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | September 4, 2016 |
| Tested By: | B. Pelkey |


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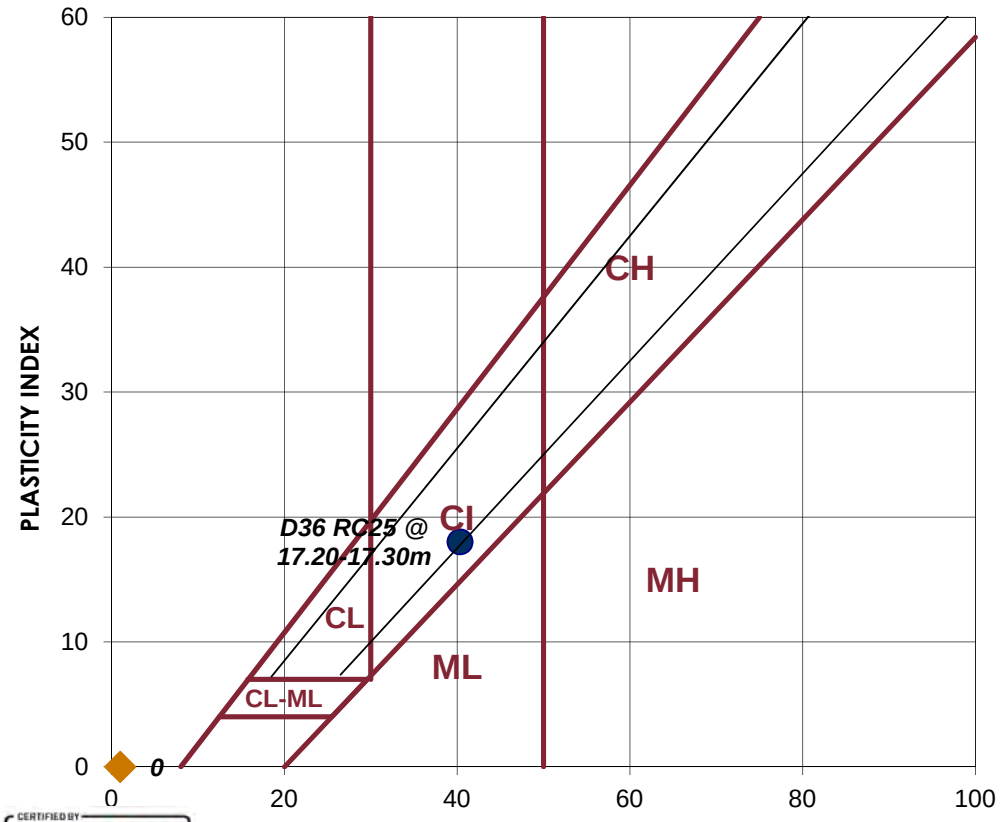
Canada T2C 1G4
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 RC25 @ 17.20-17.30m | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 23 | Number of Blows | | |
| | | Container Number | | |
| 31.63 | 35.61 | Wt. Sample (wet+tare)(g) | | |
| 22.83 | 25.68 | Wt. Sample (dry+tare)(g) | | |
| 1.23 | 1.21 | Wt. Tare (g) | | |
| 21.6 | 24.5 | Wt. Dry Soil (g) | | |
| 8.8 | 9.9 | Wt. Water (g) | | |
| 40.7% | 40.6% | Water Content (%) | | |
| 40.5% | 40.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.59 | 28.05 | Wt. Sample (wet+tare)(g) | | |
| 25.93 | 25.53 | Wt. Sample (dry+tare)(g) | | |
| 13.72 | 13.83 | Wt. Tare (g) | | |
| 12.2 | 11.7 | Wt. Dry Soil (g) | | |
| 2.7 | 2.5 | Wt. Water (g) | | |
| 21.8% | 21.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 40 | | LL | |
| PL | 22 | | PL | |
| PI | 18 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | September 11, 2016 |
| Tested By: | B. Pelkey |


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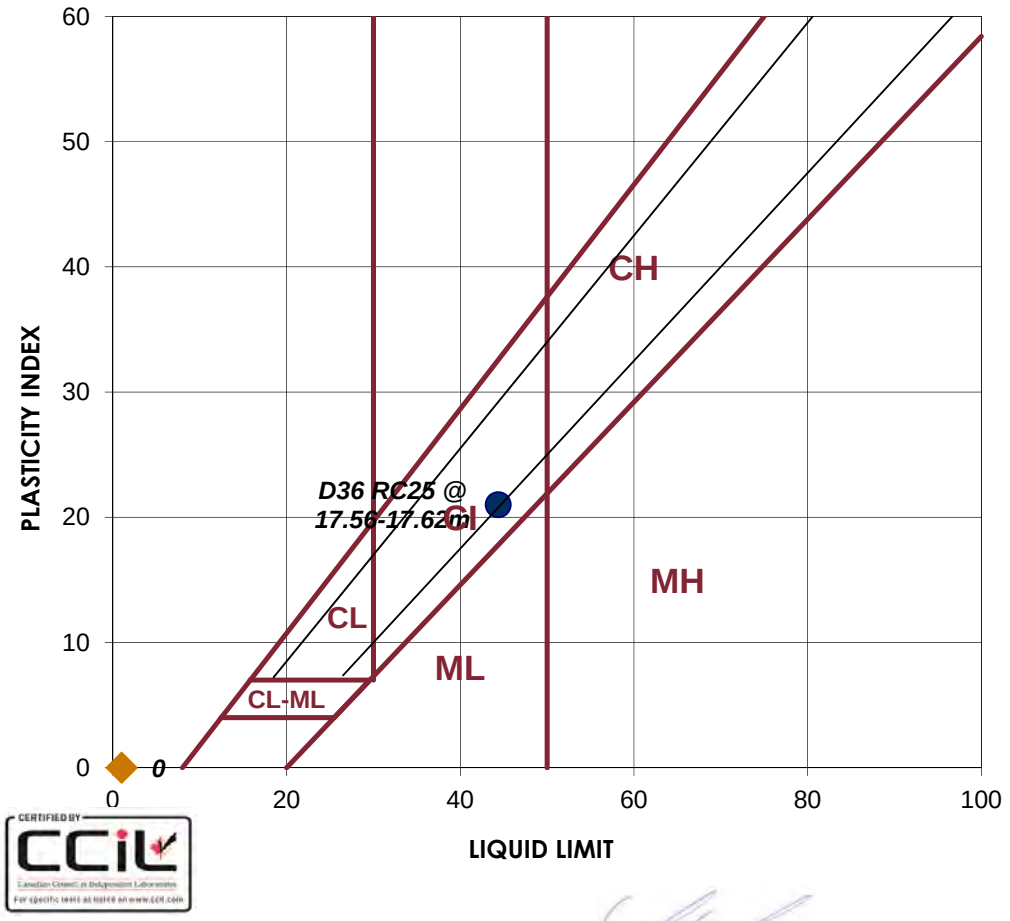
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 RC25 @ 17.56-17.62m | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 21.56 | 33.05 | Wt. Sample (wet+tare)(g) | | |
| 15.47 | 23.43 | Wt. Sample (dry+tare)(g) | | |
| 1.47 | 1.40 | Wt. Tare (g) | | |
| 14.0 | 22.0 | Wt. Dry Soil (g) | | |
| 6.1 | 9.6 | Wt. Water (g) | | |
| 43.5% | 43.7% | Water Content (%) | | |
| 44.3% | 44.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.88 | 28.53 | Wt. Sample (wet+tare)(g) | | |
| 26.06 | 25.78 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.76 | Wt. Tare (g) | | |
| 12.3 | 12.0 | Wt. Dry Soil (g) | | |
| 2.8 | 2.8 | Wt. Water (g) | | |
| 22.9% | 22.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 44 | | LL | |
| PL | 23 | | PL | |
| PI | 21 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | September 11, 2016 |
| Tested By: | B. Pelkey |


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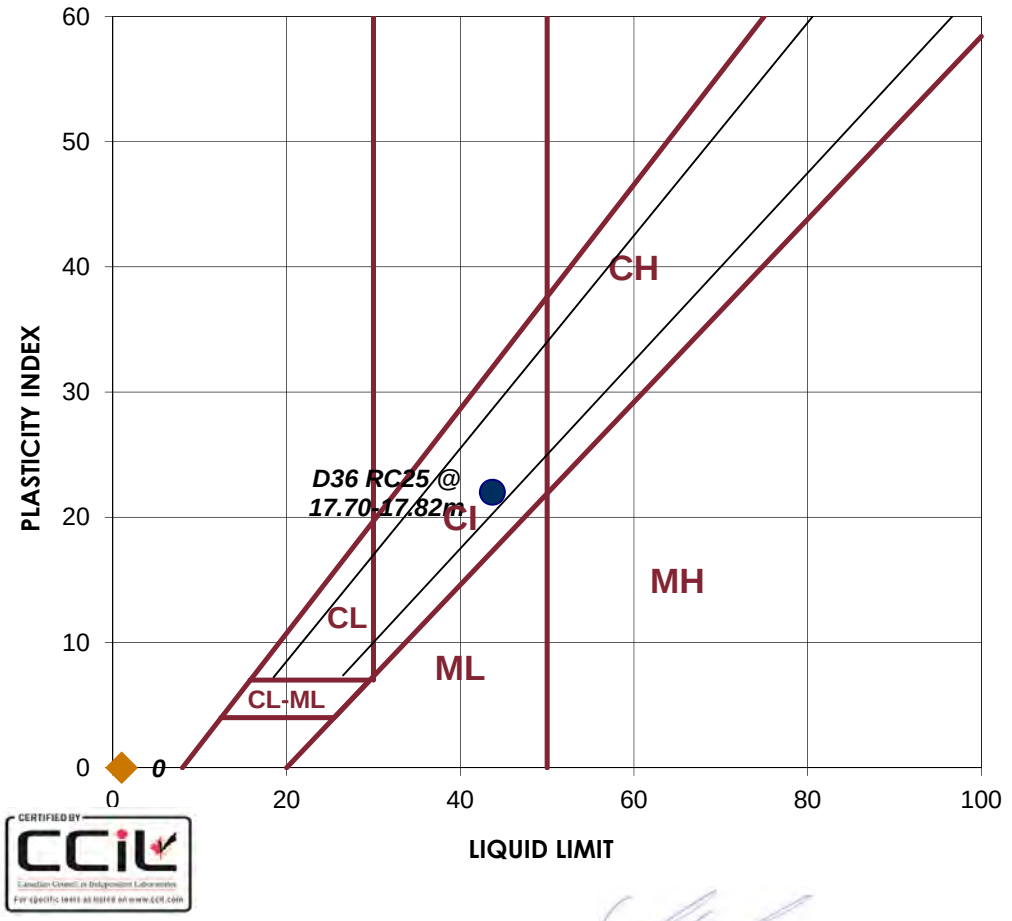
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 RC25 @ 17.70-17.82m | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 25 | Number of Blows | | |
| | | Container Number | | |
| 26.82 | 34.38 | Wt. Sample (wet+tare)(g) | | |
| 19.07 | 24.42 | Wt. Sample (dry+tare)(g) | | |
| 1.31 | 1.55 | Wt. Tare (g) | | |
| 17.8 | 22.9 | Wt. Dry Soil (g) | | |
| 7.8 | 10.0 | Wt. Water (g) | | |
| 43.6% | 43.6% | Water Content (%) | | |
| 43.8% | 43.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.95 | 26.02 | Wt. Sample (wet+tare)(g) | | |
| 23.77 | 23.77 | Wt. Sample (dry+tare)(g) | | |
| 13.88 | 13.76 | Wt. Tare (g) | | |
| 9.9 | 10.0 | Wt. Dry Soil (g) | | |
| 2.2 | 2.3 | Wt. Water (g) | | |
| 22.0% | 22.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 44 | | LL | |
| PL | 22 | | PL | |
| PI | 22 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | September 11, 2016 |
| Tested By: | B. Pelkey |


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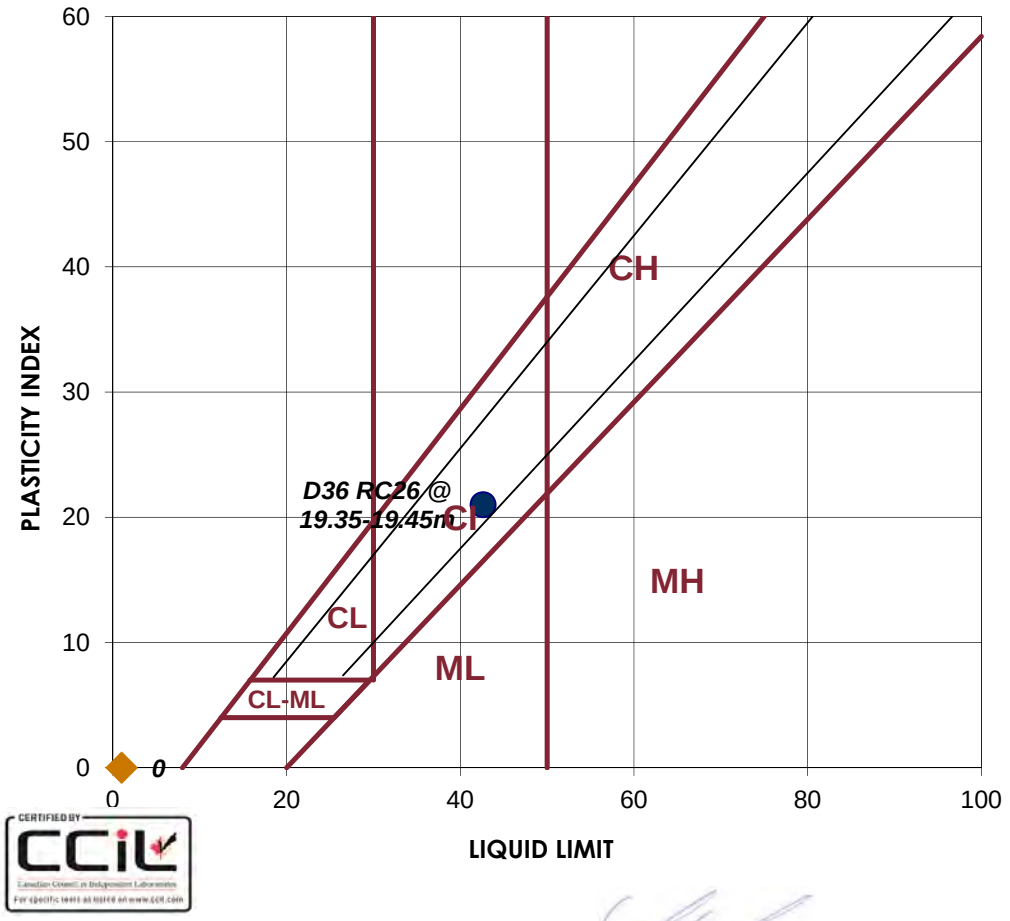
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 RC26 @ 19.35-19.45m | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 19.51 | 31.82 | Wt. Sample (wet+tare)(g) | | |
| 14.16 | 22.71 | Wt. Sample (dry+tare)(g) | | |
| 1.69 | 1.52 | Wt. Tare (g) | | |
| 12.5 | 21.2 | Wt. Dry Soil (g) | | |
| 5.4 | 9.1 | Wt. Water (g) | | |
| 42.9% | 43.0% | Water Content (%) | | |
| 42.5% | 42.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.16 | 31.28 | Wt. Sample (wet+tare)(g) | | |
| 25.55 | 28.07 | Wt. Sample (dry+tare)(g) | | |
| 13.83 | 13.85 | Wt. Tare (g) | | |
| 11.7 | 14.2 | Wt. Dry Soil (g) | | |
| 2.6 | 3.2 | Wt. Water (g) | | |
| 22.3% | 22.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 43 | | LL | |
| PL | 22 | | PL | |
| PI | 21 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | September 9, 2016 |
| Tested By: | B. Pelkey |


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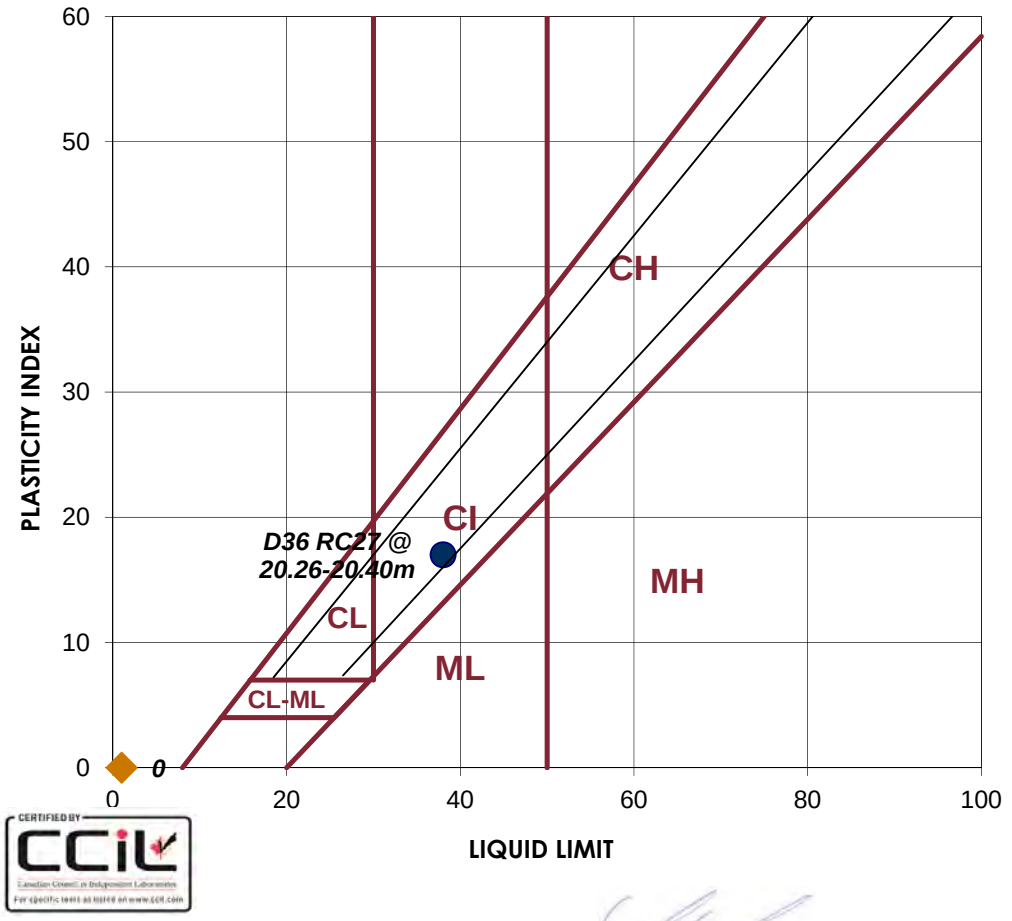
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D36 RC27 @ 20.26-20.40m | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 28 | Number of Blows | | |
| | | Container Number | | |
| 24.84 | 28.42 | Wt. Sample (wet+tare)(g) | | |
| 18.47 | 21.10 | Wt. Sample (dry+tare)(g) | | |
| 1.48 | 1.51 | Wt. Tare (g) | | |
| 17.0 | 19.6 | Wt. Dry Soil (g) | | |
| 6.4 | 7.3 | Wt. Water (g) | | |
| 37.5% | 37.4% | Water Content (%) | | |
| 38.2% | 37.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.98 | 28.57 | Wt. Sample (wet+tare)(g) | | |
| 24.69 | 25.95 | Wt. Sample (dry+tare)(g) | | |
| 13.87 | 13.71 | Wt. Tare (g) | | |
| 10.8 | 12.2 | Wt. Dry Soil (g) | | |
| 2.3 | 2.6 | Wt. Water (g) | | |
| 21.2% | 21.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 38 | | LL | |
| PL | 21 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | November 1, 2016 |
| Tested By: | C. Woods |


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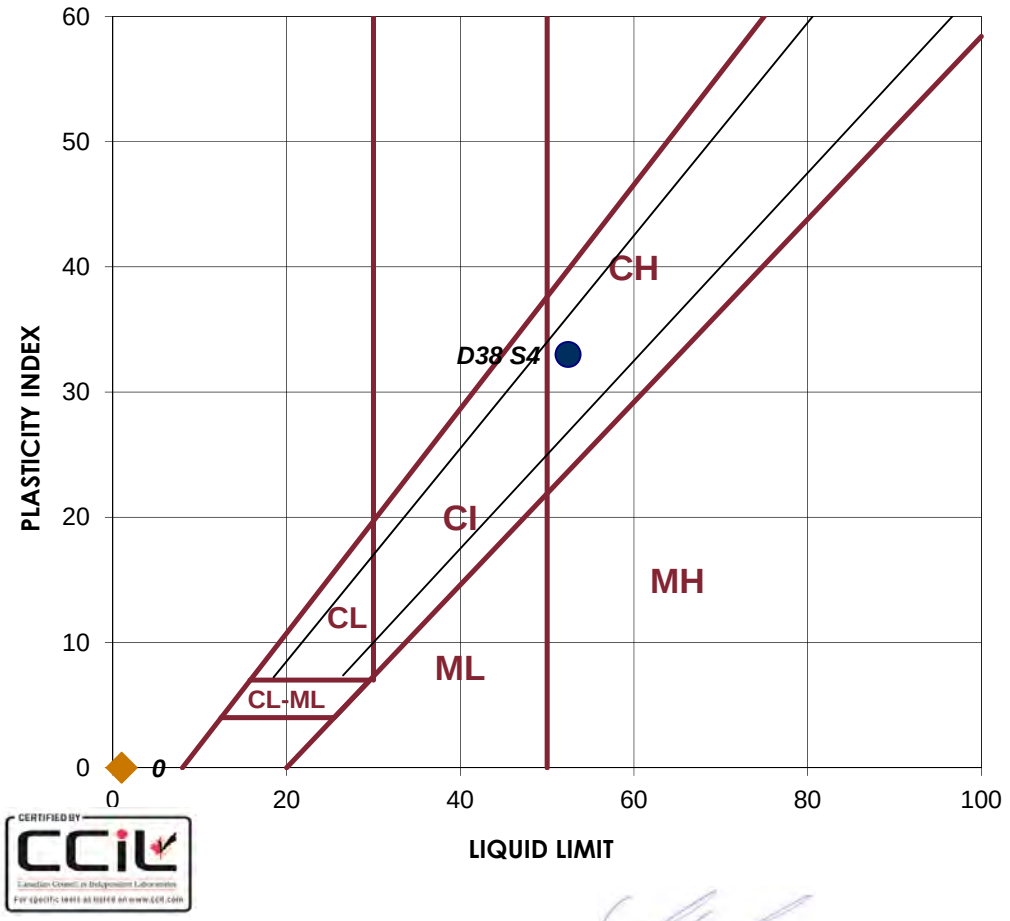
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D38 S4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 27.53 | 27.52 | Wt. Sample (wet+tare)(g) | | |
| 18.48 | 18.54 | Wt. Sample (dry+tare)(g) | | |
| 1.36 | 1.52 | Wt. Tare (g) | | |
| 17.1 | 17.0 | Wt. Dry Soil (g) | | |
| 9.1 | 9.0 | Wt. Water (g) | | |
| 52.9% | 52.8% | Water Content (%) | | |
| 52.3% | 52.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 30 | 24.96 | Wt. Sample (wet+tare)(g) | | |
| 27.79 | 23.52 | Wt. Sample (dry+tare)(g) | | |
| 15.81 | 15.77 | Wt. Tare (g) | | |
| 12.0 | 7.8 | Wt. Dry Soil (g) | | |
| 2.2 | 1.4 | Wt. Water (g) | | |
| 18.4% | 18.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 52 | | LL | |
| PL | 19 | | PL | |
| PI | 33 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |


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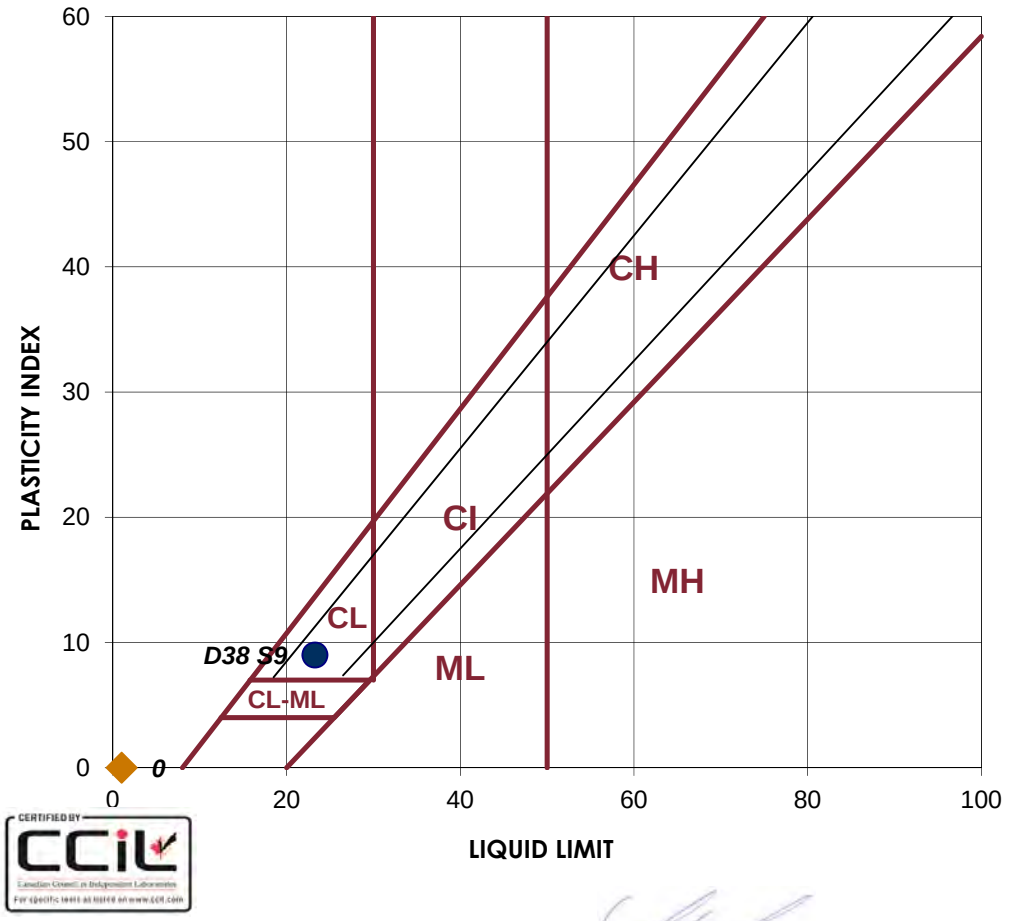
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D38 S9 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 27 | Number of Blows | | |
| | | Container Number | | |
| 26.69 | 25.29 | Wt. Sample (wet+tare)(g) | | |
| 21.96 | 20.79 | Wt. Sample (dry+tare)(g) | | |
| 1.52 | 1.18 | Wt. Tare (g) | | |
| 20.4 | 19.6 | Wt. Dry Soil (g) | | |
| 4.7 | 4.5 | Wt. Water (g) | | |
| 23.1% | 22.9% | Water Content (%) | | |
| 23.4% | 23.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.99 | 28.44 | Wt. Sample (wet+tare)(g) | | |
| 25.64 | 26.89 | Wt. Sample (dry+tare)(g) | | |
| 15.8 | 15.96 | Wt. Tare (g) | | |
| 9.8 | 10.9 | Wt. Dry Soil (g) | | |
| 1.4 | 1.6 | Wt. Water (g) | | |
| 13.7% | 14.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | |
| PL | 14 | | PL | |
| PI | 9 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 27, 2016 |
| Date Tested: | August 2, 2016 |
| Tested By: | B. Pelkey |


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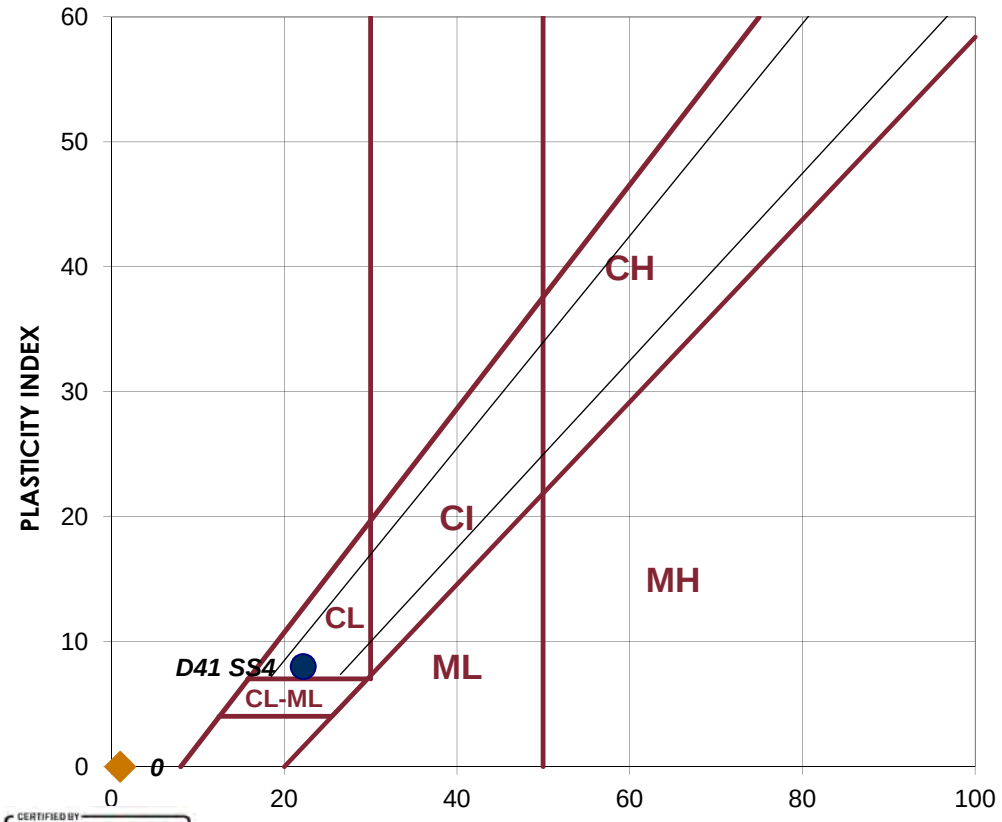
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D41 SS4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 27 | Number of Blows | | |
| | | Container Number | | |
| 32.08 | 34.14 | Wt. Sample (wet+tare)(g) | | |
| 26.60 | 28.27 | Wt. Sample (dry+tare)(g) | | |
| 1.64 | 1.53 | Wt. Tare (g) | | |
| 25.0 | 26.7 | Wt. Dry Soil (g) | | |
| 5.5 | 5.9 | Wt. Water (g) | | |
| 22.0% | 22.0% | Water Content (%) | | |
| 22.3% | 22.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 31.25 | 30.77 | Wt. Sample (wet+tare)(g) | | |
| 29.35 | 28.93 | Wt. Sample (dry+tare)(g) | | |
| 15.98 | 15.64 | Wt. Tare (g) | | |
| 13.4 | 13.3 | Wt. Dry Soil (g) | | |
| 1.9 | 1.8 | Wt. Water (g) | | |
| 14.2% | 13.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 22 | | LL | |
| PL | 14 | | PL | |
| PI | 8 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 22, 2016 |
| Date Tested: | September 9, 2016 |
| Tested By: | B. Pelkey |


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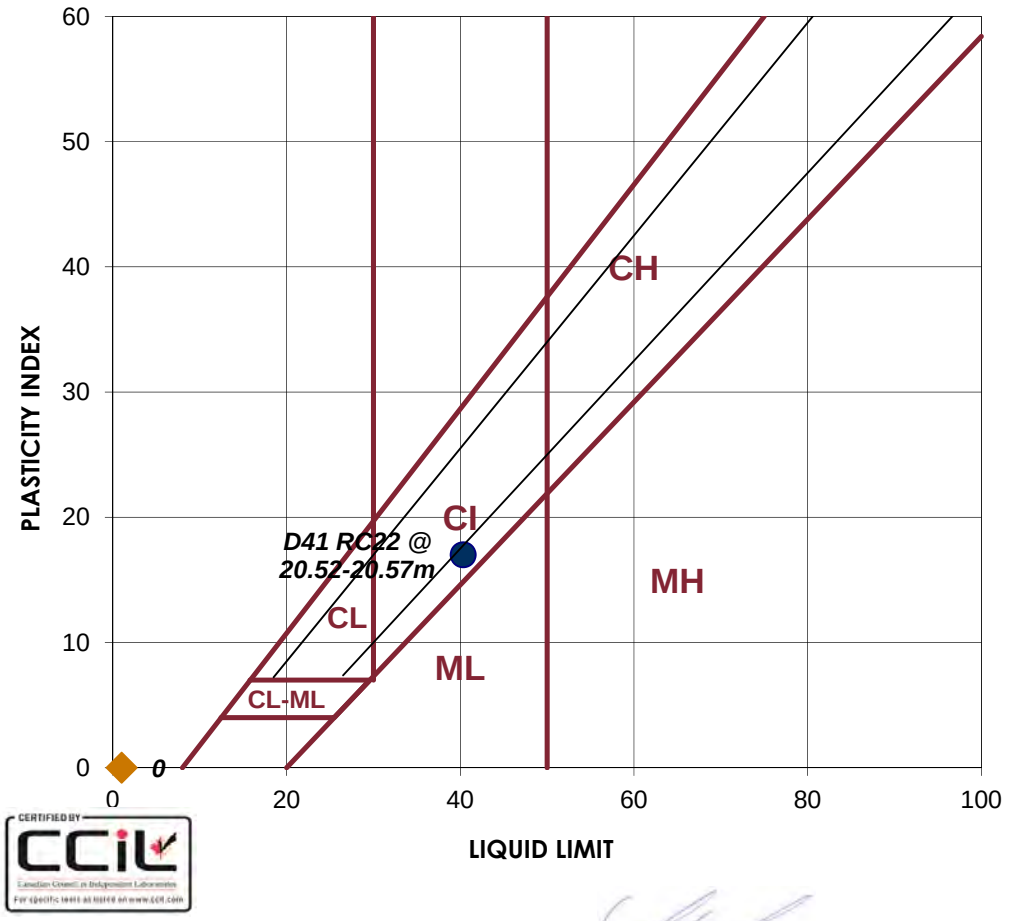
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D41 RC22 @ 20.52-20.57m | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 28 | Number of Blows | | |
| | | Container Number | | |
| 25.63 | 24.24 | Wt. Sample (wet+tare)(g) | | |
| 18.70 | 17.79 | Wt. Sample (dry+tare)(g) | | |
| 1.28 | 1.51 | Wt. Tare (g) | | |
| 17.4 | 16.3 | Wt. Dry Soil (g) | | |
| 6.9 | 6.5 | Wt. Water (g) | | |
| 39.8% | 39.6% | Water Content (%) | | |
| 40.5% | 40.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.39 | 22.89 | Wt. Sample (wet+tare)(g) | | |
| 24.83 | 21.16 | Wt. Sample (dry+tare)(g) | | |
| 13.9 | 13.76 | Wt. Tare (g) | | |
| 10.9 | 7.4 | Wt. Dry Soil (g) | | |
| 2.6 | 1.7 | Wt. Water (g) | | |
| 23.4% | 23.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 40 | | LL | |
| PL | 23 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| *CI* | | | ***NON-PLASTIC*** | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 27, 2016 |
| Date Tested: | November 3, 2016 |
| Tested By: | B. Pelkey |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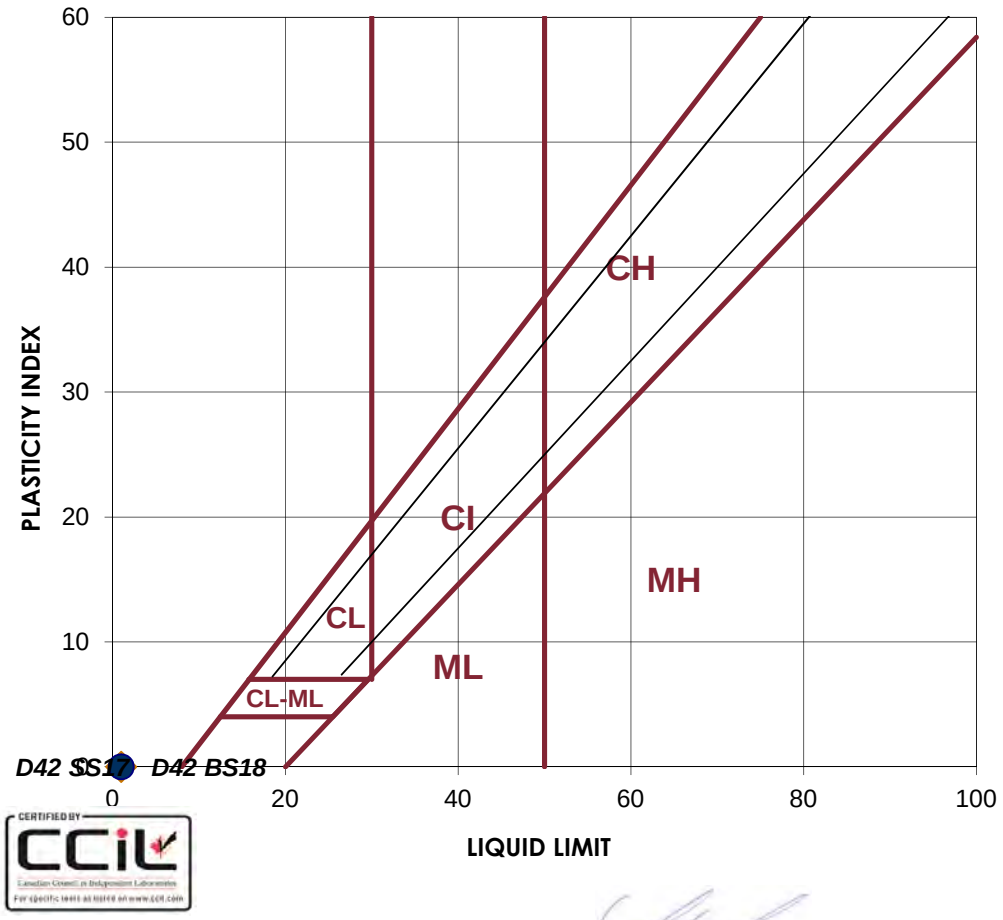
Tel: (403) 253-7876


| Sample: D42 SS17 | | | Sample: D42 BS18 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| Non-Plastic | | Number of Blows | Non-Plastic | |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| | | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| | | Wt. Sample (wet+tare)(g) | | |
| | | Wt. Sample (dry+tare)(g) | | |
| | | Wt. Tare (g) | | |
| | | Wt. Dry Soil (g) | | |
| | | Wt. Water (g) | | |
| | | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | | | LL | |
| PL | | | PL | |
| PI | | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| NON-PLASTIC | | | NON-PLASTIC | |

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Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. STANTEC is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of STANTEC.

Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: July 27, 2016
Date Tested: September 27, 2016
Tested By: B.Pelkey

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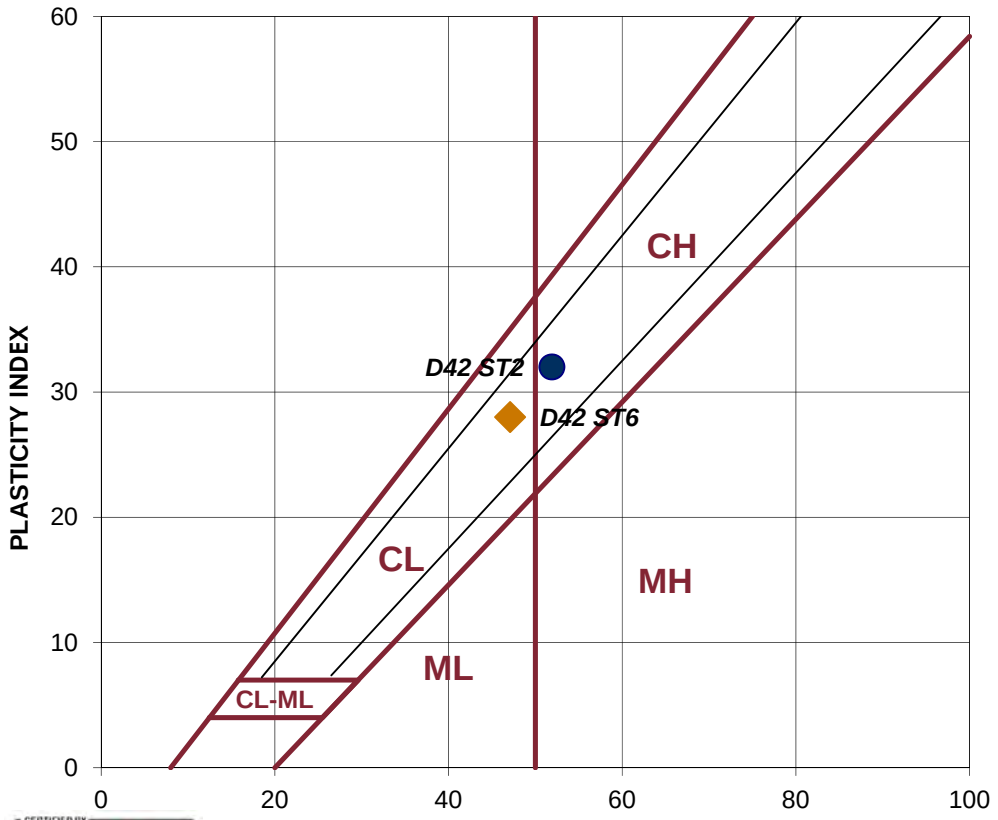
Tel: (403) 253-7876

| Sample: D42 ST2 | | | Sample: D42 ST6 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 28 | Number of Blows | 22 | 21 |
| | | Container Number | | |
| 22.57 | 25.48 | Wt. Sample (wet+tare)(g) | 18.06 | 21.16 |
| 15.29 | 17.35 | Wt. Sample (dry+tare)(g) | 12.61 | 14.67 |
| 1.24 | 1.28 | Wt. Tare (g) | 1.21 | 1.18 |
| 14.1 | 16.1 | Wt. Dry Soil (g) | 11.4 | 13.5 |
| 7.3 | 8.1 | Wt. Water (g) | 5.5 | 6.5 |
| 51.8% | 50.6% | Water Content (%) | 47.8% | 48.1% |
| 52.5% | 51.3% | Corrected Water Content (%) | 47.1% | 47.1% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.98 | 22.87 | Wt. Sample (wet+tare)(g) | 24.1 | 25.53 |
| 22.25 | 21.32 | Wt. Sample (dry+tare)(g) | 22.47 | 23.62 |
| 13.76 | 13.73 | Wt. Tare (g) | 13.86 | 13.76 |
| 8.5 | 7.6 | Wt. Dry Soil (g) | 8.6 | 9.9 |
| 1.7 | 1.6 | Wt. Water (g) | 1.6 | 1.9 |
| 20.4% | 20.4% | Water Content (%) | 18.9% | 19.4% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 52 | | LL | 47 |
| PL | 20 | | PL | 19 |
| PI | 32 | | PI | 28 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CL | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 27, 2016 |
| Date Tested: | October 11, 2016 |
| Tested By: | C.Small |


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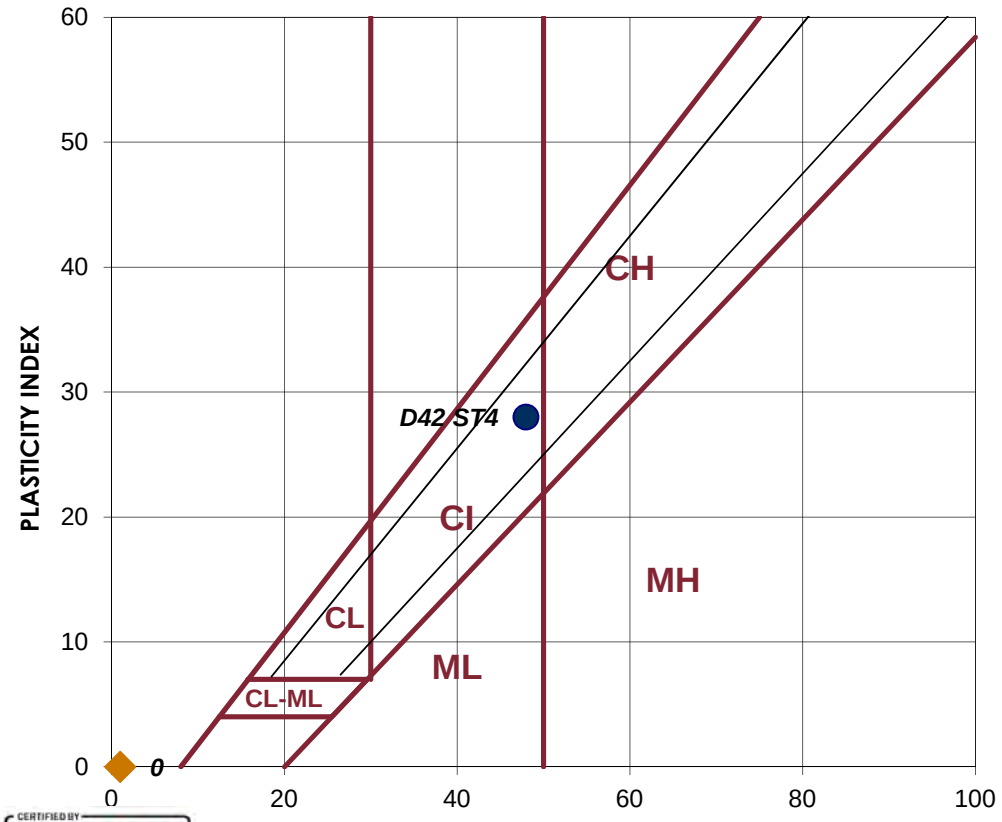
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D42 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 25 | Number of Blows | | |
| | | Container Number | | |
| 24.93 | 27.81 | Wt. Sample (wet+tare)(g) | | |
| 17.28 | 19.24 | Wt. Sample (dry+tare)(g) | | |
| 1.44 | 1.45 | Wt. Tare (g) | | |
| 15.8 | 17.8 | Wt. Dry Soil (g) | | |
| 7.7 | 8.6 | Wt. Water (g) | | |
| 48.3% | 48.2% | Water Content (%) | | |
| 47.8% | 48.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.82 | 22.6 | Wt. Sample (wet+tare)(g) | | |
| 22.97 | 21.17 | Wt. Sample (dry+tare)(g) | | |
| 13.73 | 13.79 | Wt. Tare (g) | | |
| 9.2 | 7.4 | Wt. Dry Soil (g) | | |
| 1.9 | 1.4 | Wt. Water (g) | | |
| 20.0% | 19.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 48 | | LL | |
| PL | 20 | | PL | |
| PI | 28 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 27, 2016 |
| Date Tested: | October 13, 2016 |
| Tested By: | C.Small |


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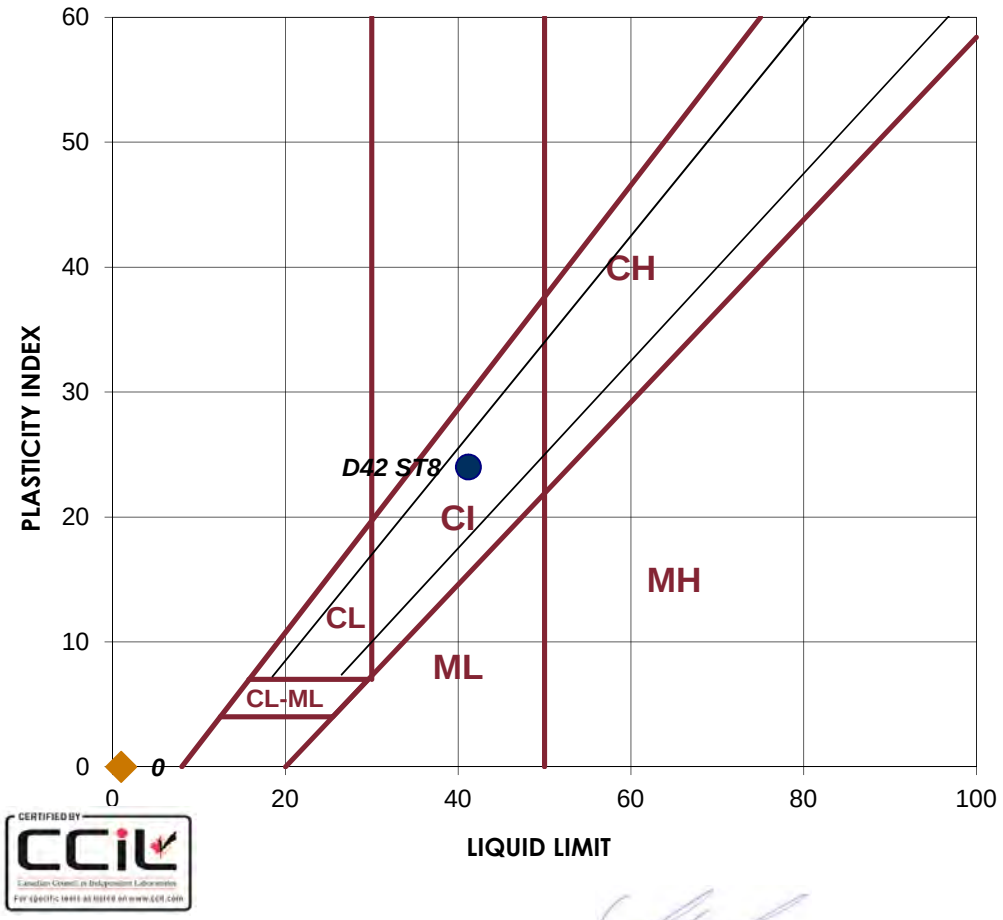
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D42 ST8 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 25 | Number of Blows | | |
| | | Container Number | | |
| 19.18 | 19.12 | Wt. Sample (wet+tare)(g) | | |
| 14.06 | 13.92 | Wt. Sample (dry+tare)(g) | | |
| 1.65 | 1.23 | Wt. Tare (g) | | |
| 12.4 | 12.7 | Wt. Dry Soil (g) | | |
| 5.1 | 5.2 | Wt. Water (g) | | |
| 41.3% | 41.0% | Water Content (%) | | |
| 41.5% | 41.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.73 | 24.46 | Wt. Sample (wet+tare)(g) | | |
| 21.45 | 22.88 | Wt. Sample (dry+tare)(g) | | |
| 13.92 | 13.79 | Wt. Tare (g) | | |
| 7.5 | 9.1 | Wt. Dry Soil (g) | | |
| 1.3 | 1.6 | Wt. Water (g) | | |
| 17.0% | 17.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 41 | | LL | |
| PL | 17 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 5, 2016 |
| Date Tested: | August 9, 2016 |
| Tested By: | B. Pelkey |


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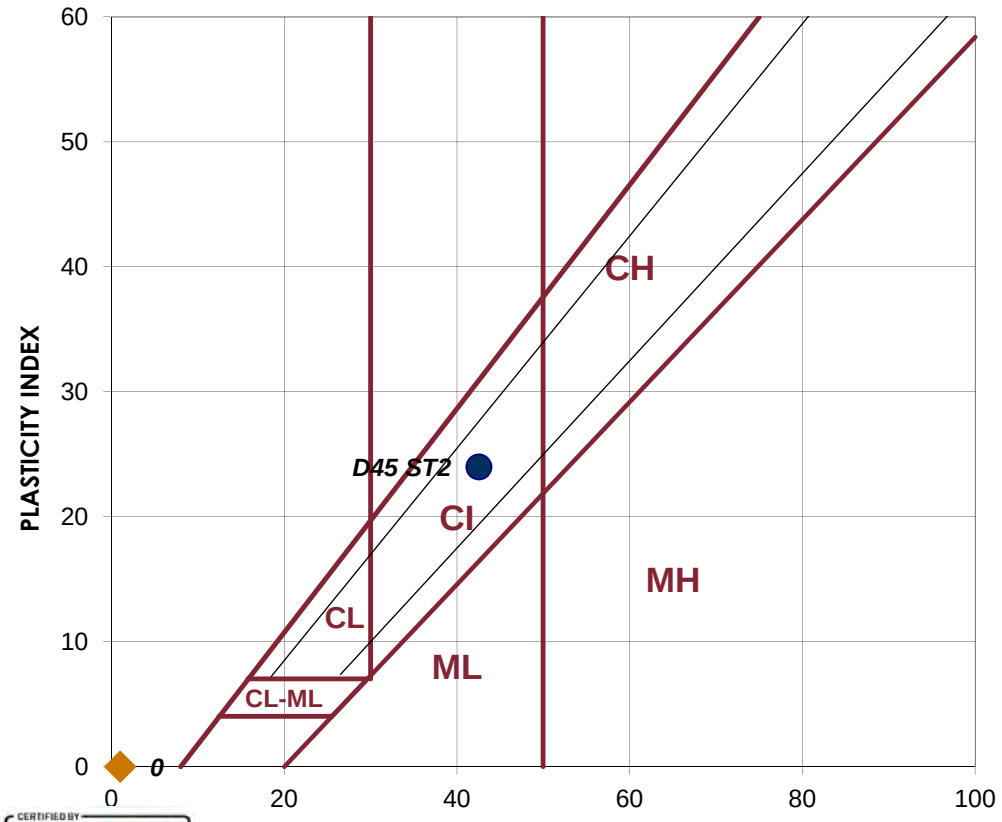
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D45 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 28 | Number of Blows | | |
| | | Container Number | | |
| 31.04 | 31.61 | Wt. Sample (wet+tare)(g) | | |
| 22.21 | 22.69 | Wt. Sample (dry+tare)(g) | | |
| 1.23 | 1.54 | Wt. Tare (g) | | |
| 21.0 | 21.2 | Wt. Dry Soil (g) | | |
| 8.8 | 8.9 | Wt. Water (g) | | |
| 42.1% | 42.2% | Water Content (%) | | |
| 42.3% | 42.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.94 | 24.56 | Wt. Sample (wet+tare)(g) | | |
| 23.2 | 22.84 | Wt. Sample (dry+tare)(g) | | |
| 13.92 | 13.77 | Wt. Tare (g) | | |
| 9.3 | 9.1 | Wt. Dry Soil (g) | | |
| 1.7 | 1.7 | Wt. Water (g) | | |
| 18.8% | 19.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 43 | | LL | |
| PL | 19 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 5, 2016 |
| Date Tested: | July 28, 2016 |
| Tested By: | B. Pelkey |


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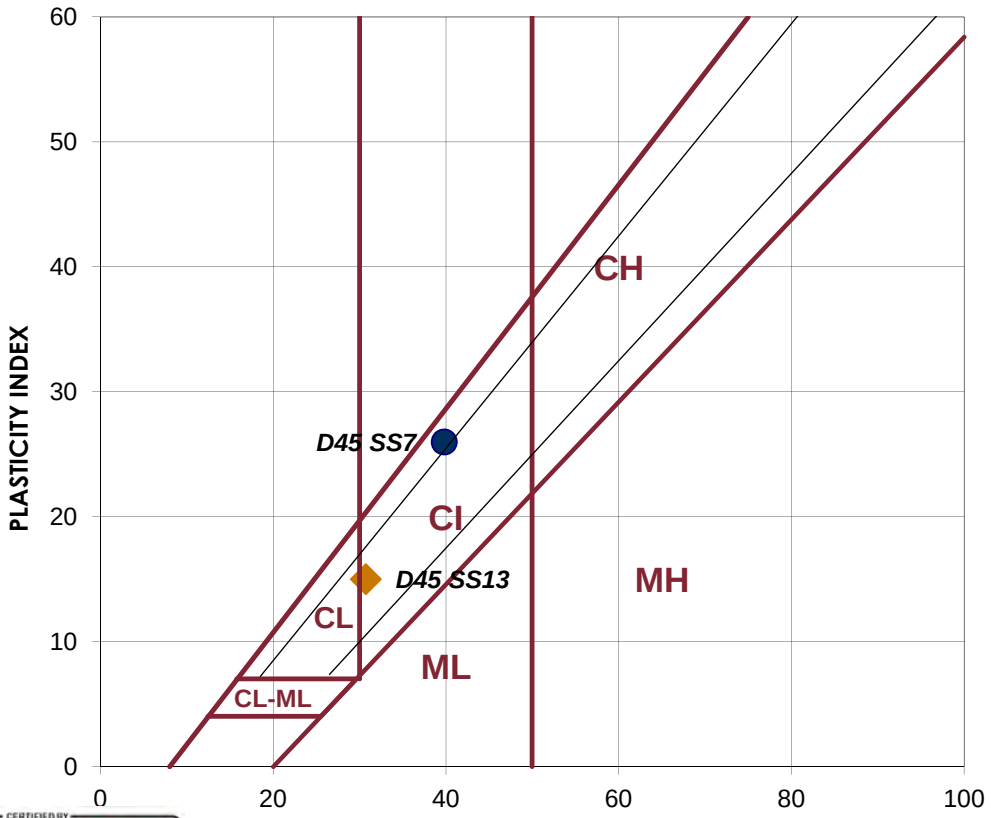
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D45 SS7 | | | D45 SS13 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 26 | Number of Blows | 27 | 28 |
| | | Container Number | | |
| 26.59 | 27.46 | Wt. Sample (wet+tare)(g) | 27.86 | 35.41 |
| 19.52 | 20.15 | Wt. Sample (dry+tare)(g) | 21.72 | 27.50 |
| 1.57 | 1.62 | Wt. Tare (g) | 1.54 | 1.37 |
| 18.0 | 18.5 | Wt. Dry Soil (g) | 20.2 | 26.1 |
| 7.1 | 7.3 | Wt. Water (g) | 6.1 | 7.9 |
| 39.4% | 39.4% | Water Content (%) | 30.4% | 30.3% |
| 39.9% | 39.6% | Corrected Water Content (%) | 30.7% | 30.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.14 | 26.52 | Wt. Sample (wet+tare)(g) | 28.49 | 26.37 |
| 25.45 | 24.97 | Wt. Sample (dry+tare)(g) | 26.49 | 24.65 |
| 13.88 | 14.14 | Wt. Tare (g) | 13.92 | 13.77 |
| 11.6 | 10.8 | Wt. Dry Soil (g) | 12.6 | 10.9 |
| 1.7 | 1.6 | Wt. Water (g) | 2.0 | 1.7 |
| 14.6% | 14.3% | Water Content (%) | 15.9% | 15.8% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 40 | | LL | 31 |
| PL | 14 | | PL | 16 |
| PI | 26 | | PI | 15 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI-CL | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 20, 2016 |
| Date Tested: | November 1, 2016 |
| Tested By: | B.Pelkey |


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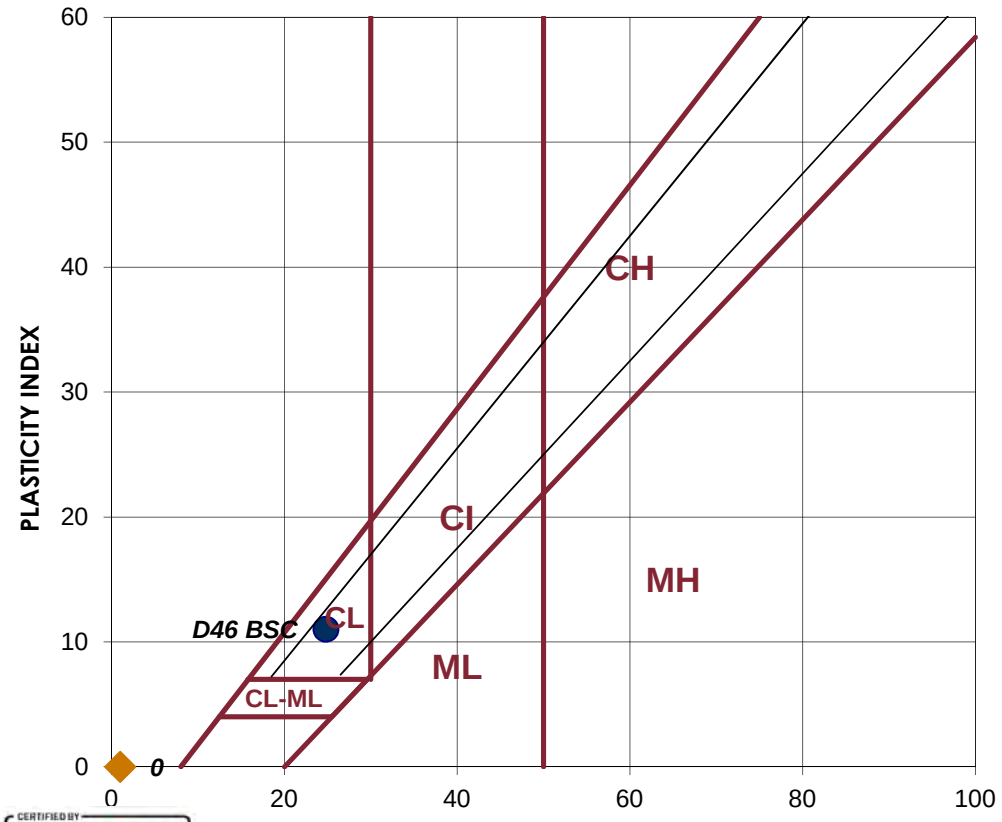
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D46 BSC | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 28 | Number of Blows | | |
| | | Container Number | | |
| 25.95 | 25.54 | Wt. Sample (wet+tare)(g) | | |
| 21.13 | 20.79 | Wt. Sample (dry+tare)(g) | | |
| 1.52 | 1.29 | Wt. Tare (g) | | |
| 19.6 | 19.5 | Wt. Dry Soil (g) | | |
| 4.8 | 4.8 | Wt. Water (g) | | |
| 24.6% | 24.4% | Water Content (%) | | |
| 24.9% | 24.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 29.18 | 27.56 | Wt. Sample (wet+tare)(g) | | |
| 27.32 | 25.93 | Wt. Sample (dry+tare)(g) | | |
| 13.85 | 13.87 | Wt. Tare (g) | | |
| 13.5 | 12.1 | Wt. Dry Soil (g) | | |
| 1.9 | 1.6 | Wt. Water (g) | | |
| 13.8% | 13.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 25 | | LL | |
| PL | 14 | | PL | |
| PI | 11 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CL** | | | **NON-PLASTIC** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 4, 2016 |
| Tested By: | B. Pelkey |


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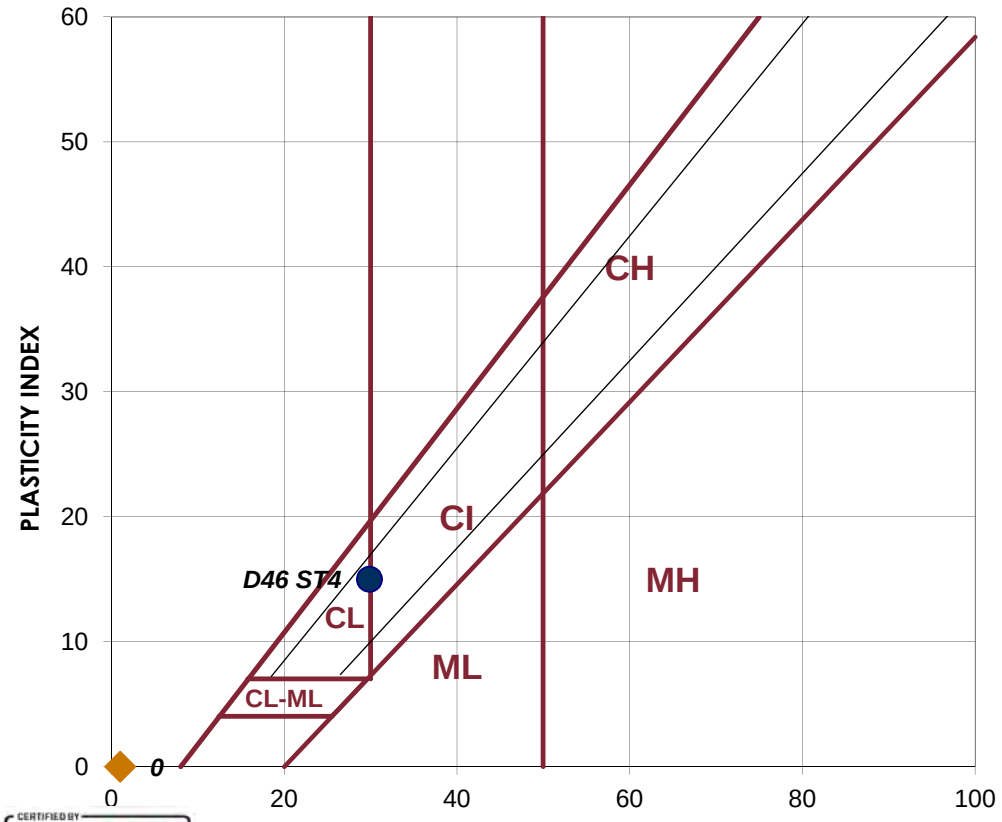
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D46 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 24.08 | 28.60 | Wt. Sample (wet+tare)(g) | | |
| 18.89 | 22.41 | Wt. Sample (dry+tare)(g) | | |
| 1.21 | 1.27 | Wt. Tare (g) | | |
| 17.7 | 21.1 | Wt. Dry Soil (g) | | |
| 5.2 | 6.2 | Wt. Water (g) | | |
| 29.4% | 29.3% | Water Content (%) | | |
| 29.9% | 29.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.64 | 29.83 | Wt. Sample (wet+tare)(g) | | |
| 25.82 | 27.77 | Wt. Sample (dry+tare)(g) | | |
| 13.78 | 13.92 | Wt. Tare (g) | | |
| 12.0 | 13.9 | Wt. Dry Soil (g) | | |
| 1.8 | 2.1 | Wt. Water (g) | | |
| 15.1% | 14.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | |
| PL | 15 | | PL | |
| PI | 15 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CL-CI** | | | **NON-PLASTIC** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 21, 2016 |
| Date Tested: | August 5, 2016 |
| Tested By: | C. Oost |


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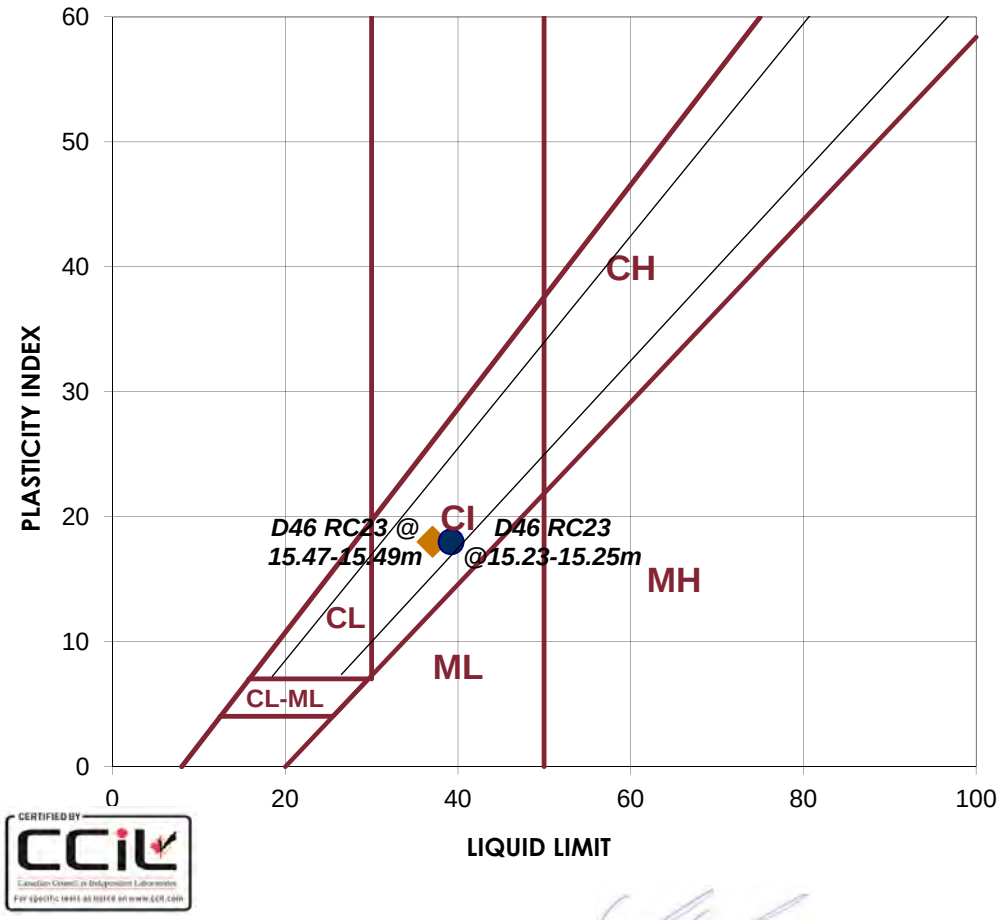
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D46 RC23 @ 15.47-15.49m | | | D46 RC23 @15.23-15.25m | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 26 | Number of Blows | 27 | 27 |
| | | Container Number | | |
| 18.49 | 17.52 | Wt. Sample (wet+tare)(g) | 19.09 | 21.10 |
| 13.74 | 12.95 | Wt. Sample (dry+tare)(g) | 14.31 | 15.79 |
| 1.55 | 1.19 | Wt. Tare (g) | 1.30 | 1.30 |
| 12.2 | 11.8 | Wt. Dry Soil (g) | 13.0 | 14.5 |
| 4.8 | 4.6 | Wt. Water (g) | 4.8 | 5.3 |
| 39.0% | 38.9% | Water Content (%) | 36.7% | 36.6% |
| 39.3% | 39.0% | Corrected Water Content (%) | 37.1% | 37.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 20.2 | 21.71 | Wt. Sample (wet+tare)(g) | 22.17 | 22.49 |
| 19.06 | 20.34 | Wt. Sample (dry+tare)(g) | 21.15 | 21.46 |
| 13.77 | 13.9 | Wt. Tare (g) | 15.81 | 15.98 |
| 5.3 | 6.4 | Wt. Dry Soil (g) | 5.3 | 5.5 |
| 1.1 | 1.4 | Wt. Water (g) | 1.0 | 1.0 |
| 21.6% | 21.3% | Water Content (%) | 19.1% | 18.8% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | 37 |
| PL | 21 | | PL | 19 |
| PI | 18 | | PI | 18 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 12, 2016 |
| Date Tested: | October 13, 2016 |
| Tested By: | C.Small |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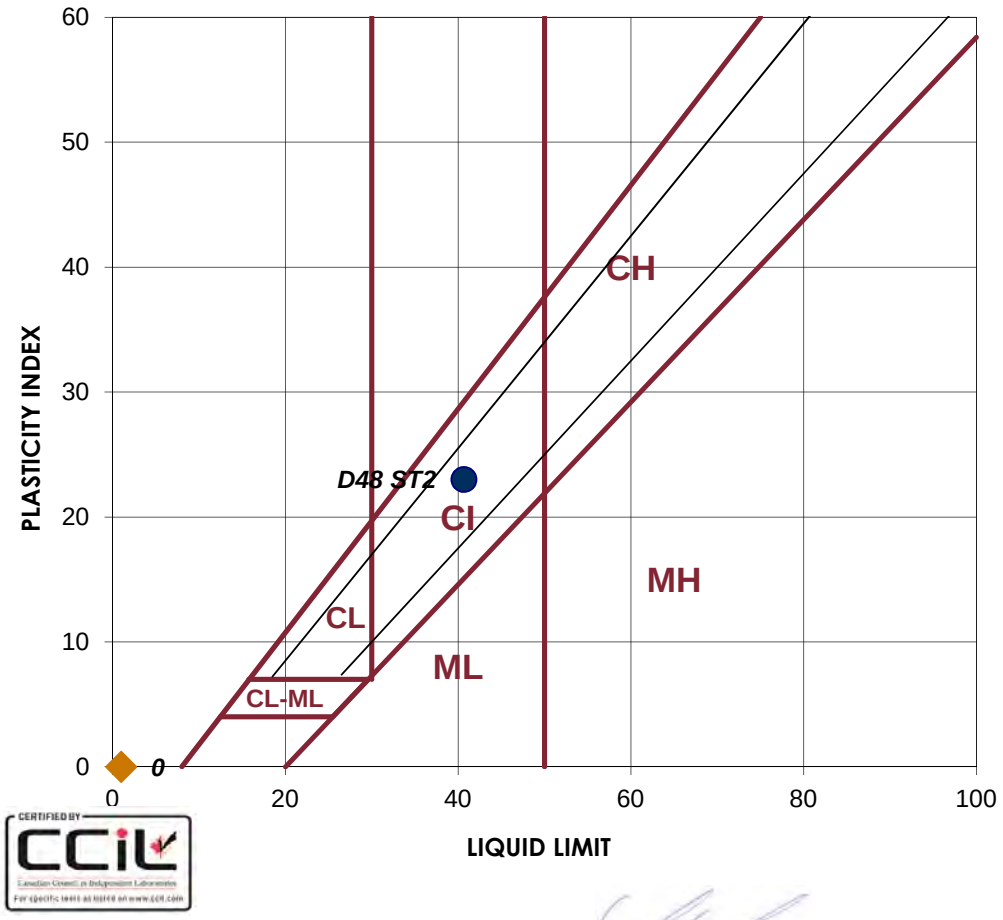
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D48 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 24 | Number of Blows | | |
| | | Container Number | | |
| 15.24 | 23.02 | Wt. Sample (wet+tare)(g) | | |
| 11.25 | 16.79 | Wt. Sample (dry+tare)(g) | | |
| 1.49 | 1.55 | Wt. Tare (g) | | |
| 9.8 | 15.2 | Wt. Dry Soil (g) | | |
| 4.0 | 6.2 | Wt. Water (g) | | |
| 40.9% | 40.9% | Water Content (%) | | |
| 40.7% | 40.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.49 | 26.69 | Wt. Sample (wet+tare)(g) | | |
| 24.54 | 24.73 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.77 | Wt. Tare (g) | | |
| 10.8 | 11.0 | Wt. Dry Soil (g) | | |
| 2.0 | 2.0 | Wt. Water (g) | | |
| 18.1% | 17.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 41 | | LL | |
| PL | 18 | | PL | |
| PI | 23 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 12, 2016 |
| Date Tested: | October 27, 2016 |
| Tested By: | C. Woods |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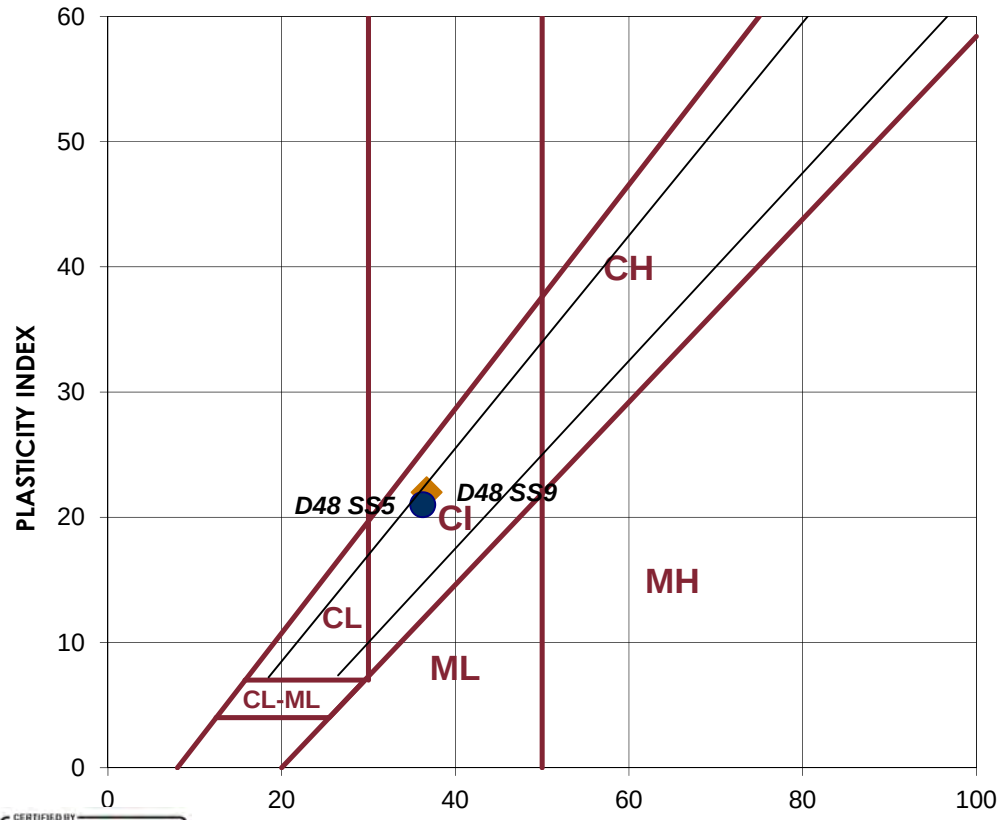
| Sample: D48 SS5 | | | Sample: D48 SS9 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 23 | Number of Blows | 22 | 22 |
| | | Container Number | | |
| 23.69 | 23.80 | Wt. Sample (wet+tare)(g) | 22.26 | 23.97 |
| 17.69 | 17.70 | Wt. Sample (dry+tare)(g) | 16.60 | 17.90 |
| 1.20 | 1.15 | Wt. Tare (g) | 1.50 | 1.52 |
| 16.5 | 16.6 | Wt. Dry Soil (g) | 15.1 | 16.4 |
| 6.0 | 6.1 | Wt. Water (g) | 5.7 | 6.1 |
| 36.4% | 36.9% | Water Content (%) | 37.5% | 37.1% |
| 36.0% | 36.5% | Corrected Water Content (%) | 36.9% | 36.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.48 | 23.85 | Wt. Sample (wet+tare)(g) | 23.9 | 23.73 |
| 23.92 | 22.55 | Wt. Sample (dry+tare)(g) | 22.61 | 22.43 |
| 13.72 | 13.84 | Wt. Tare (g) | 13.92 | 13.76 |
| 10.2 | 8.7 | Wt. Dry Soil (g) | 8.7 | 8.7 |
| 1.6 | 1.3 | Wt. Water (g) | 1.3 | 1.3 |
| 15.3% | 14.9% | Water Content (%) | 14.8% | 15.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | 37 |
| PL | 15 | | PL | 15 |
| PI | 21 | | PI | 22 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 12, 2016 |
| Date Tested: | October 28, 2016 |
| Tested By: | C. Woods |


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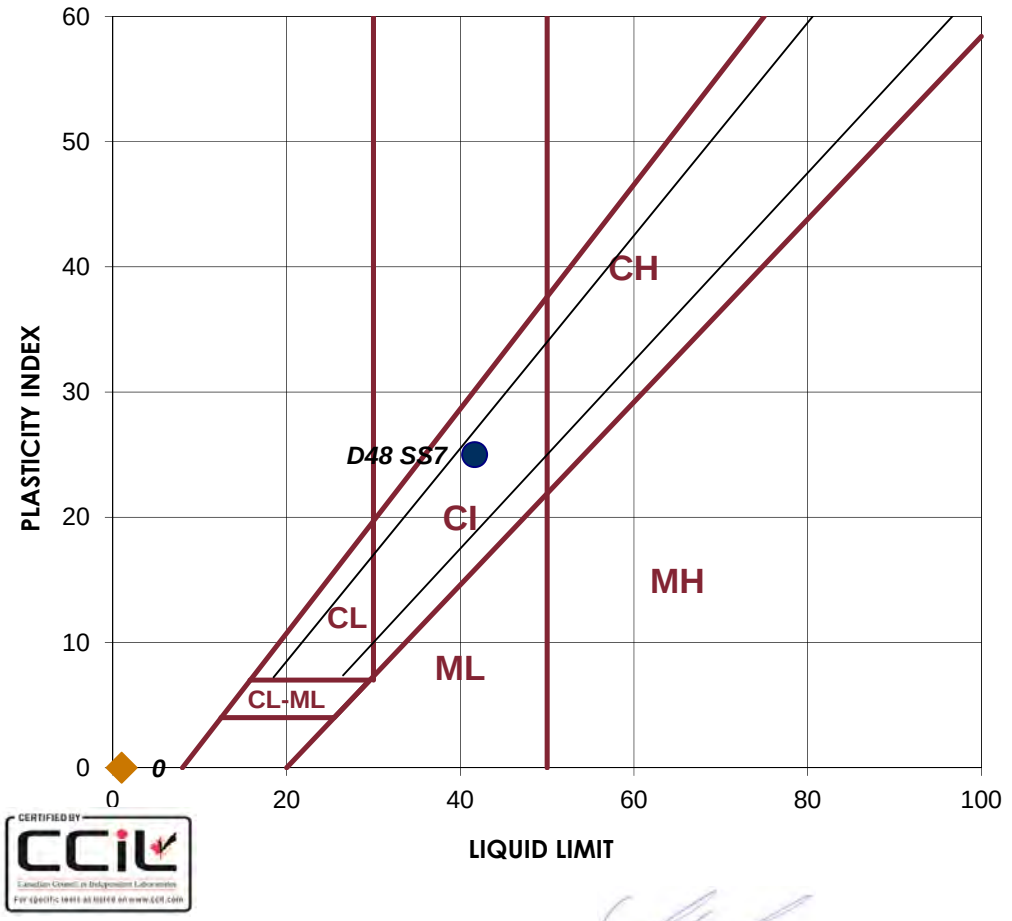
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D48 SS7 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | | |
| | | Container Number | | |
| 26.21 | 19.36 | Wt. Sample (wet+tare)(g) | | |
| 18.84 | 14.13 | Wt. Sample (dry+tare)(g) | | |
| 1.22 | 1.52 | Wt. Tare (g) | | |
| 17.6 | 12.6 | Wt. Dry Soil (g) | | |
| 7.4 | 5.2 | Wt. Water (g) | | |
| 41.8% | 41.5% | Water Content (%) | | |
| 41.8% | 41.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.84 | 24.38 | Wt. Sample (wet+tare)(g) | | |
| 25.75 | 22.81 | Wt. Sample (dry+tare)(g) | | |
| 13.9 | 13.76 | Wt. Tare (g) | | |
| 11.9 | 9.1 | Wt. Dry Soil (g) | | |
| 2.1 | 1.6 | Wt. Water (g) | | |
| 17.6% | 17.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 42 | | LL | |
| PL | 17 | | PL | |
| PI | 25 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: August 14, 2016
Date Tested: September 30, 2016
Tested By: B.Pelkey

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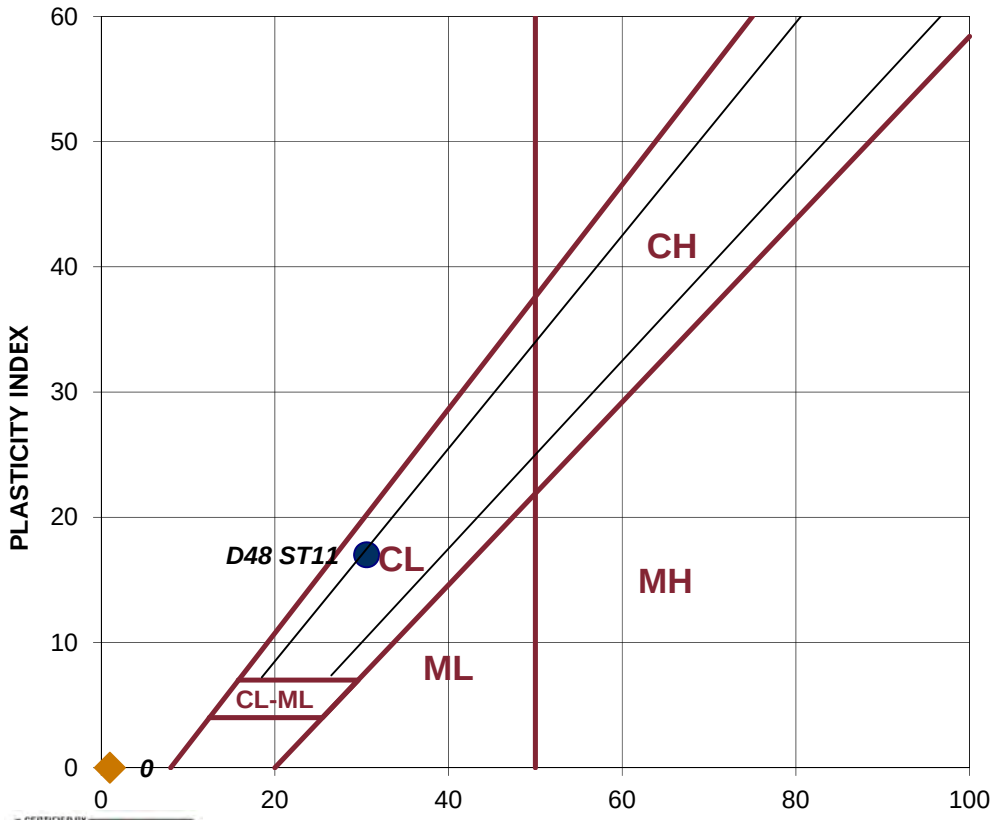
| Sample: D48 ST11 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | | |
| | | Container Number | | |
| 23.31 | 23.98 | Wt. Sample (wet+tare)(g) | | |
| 18.13 | 18.66 | Wt. Sample (dry+tare)(g) | | |
| 1.18 | 1.26 | Wt. Tare (g) | | |
| 17.0 | 17.4 | Wt. Dry Soil (g) | | |
| 5.2 | 5.3 | Wt. Water (g) | | |
| 30.6% | 30.6% | Water Content (%) | | |
| 30.6% | 30.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.65 | 24.38 | Wt. Sample (wet+tare)(g) | | |
| 26.03 | 23.13 | Wt. Sample (dry+tare)(g) | | |
| 14.13 | 13.82 | Wt. Tare (g) | | |
| 11.9 | 9.3 | Wt. Dry Soil (g) | | |
| 1.6 | 1.3 | Wt. Water (g) | | |
| 13.6% | 13.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 14 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 22, 2016 |
| Date Tested: | August 4, 2016 |
| Tested By: | B. Pelkey |


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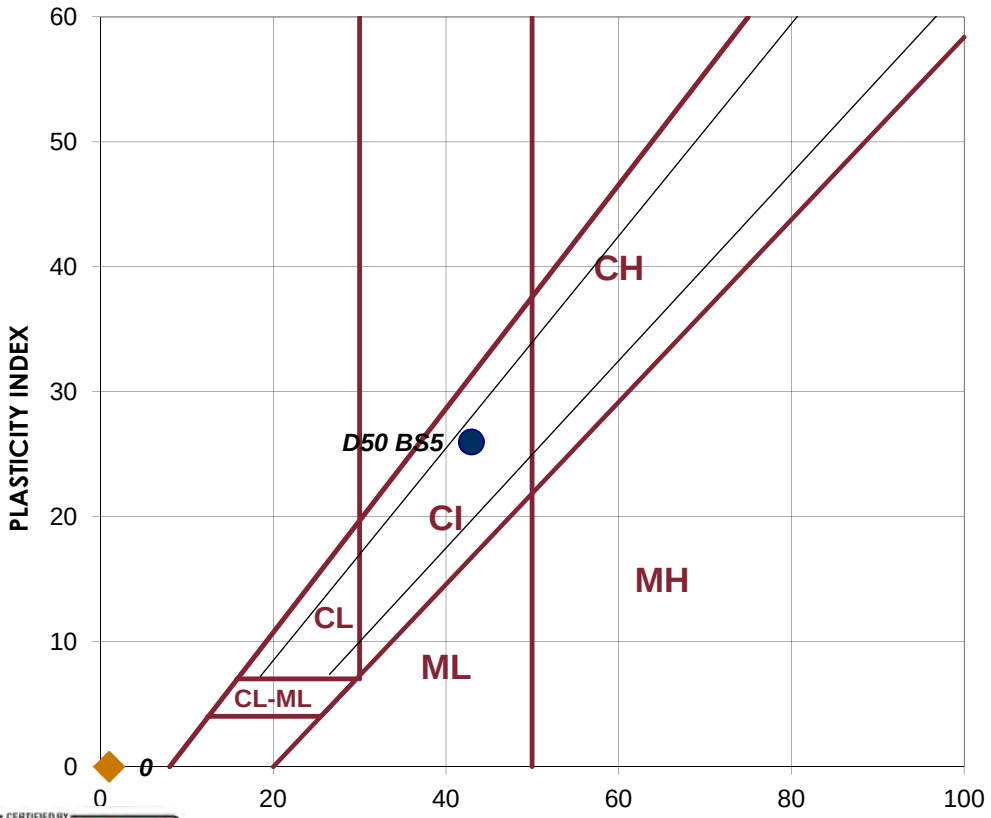
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D50 BS5 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 28 | Number of Blows | | |
| | | Container Number | | |
| 22.56 | 25.46 | Wt. Sample (wet+tare)(g) | | |
| 16.21 | 18.25 | Wt. Sample (dry+tare)(g) | | |
| 1.22 | 1.16 | Wt. Tare (g) | | |
| 15.0 | 17.1 | Wt. Dry Soil (g) | | |
| 6.4 | 7.2 | Wt. Water (g) | | |
| 42.4% | 42.2% | Water Content (%) | | |
| 43.1% | 42.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.77 | 29.89 | Wt. Sample (wet+tare)(g) | | |
| 24.08 | 27.55 | Wt. Sample (dry+tare)(g) | | |
| 14.14 | 13.87 | Wt. Tare (g) | | |
| 9.9 | 13.7 | Wt. Dry Soil (g) | | |
| 1.7 | 2.3 | Wt. Water (g) | | |
| 17.0% | 17.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 43 | | LL | |
| PL | 17 | | PL | |
| PI | 26 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 22, 2016 |
| Date Tested: | August 5, 2016 |
| Tested By: | B. Pelkey |


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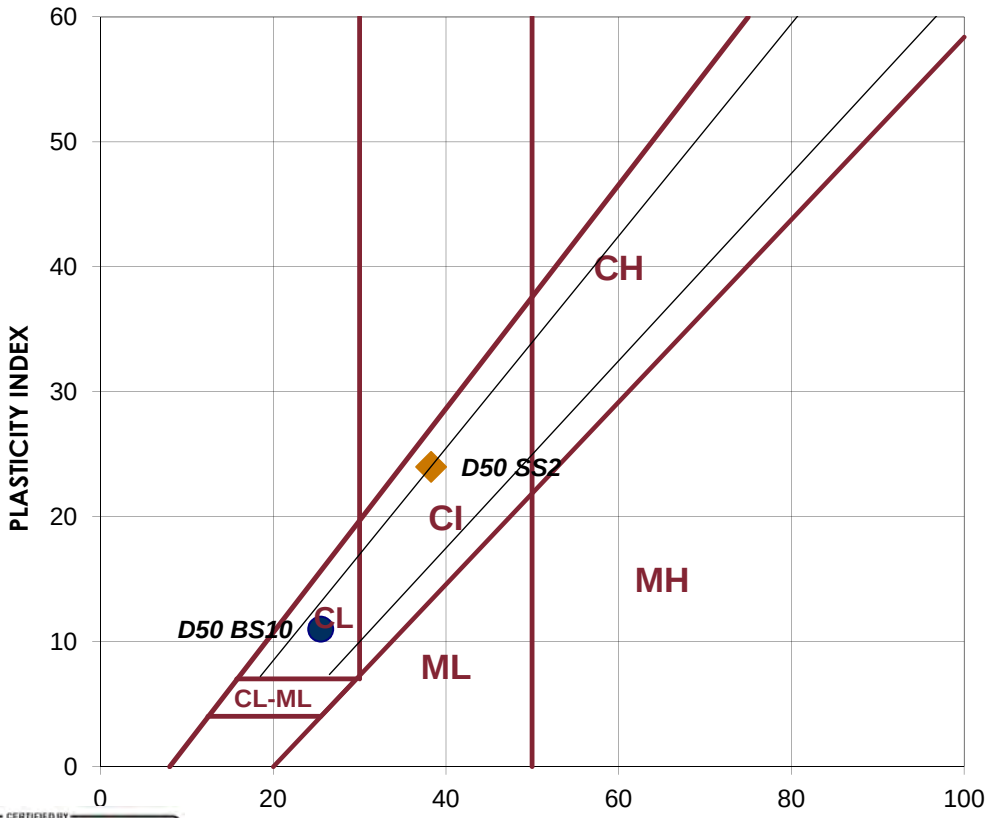
| Sample: D50 BS10 | | | Sample: D50 SS2 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 23 | Number of Blows | 26 | 28 |
| | | Container Number | | |
| 29.10 | 28.11 | Wt. Sample (wet+tare)(g) | 27.00 | 28.65 |
| 23.40 | 22.64 | Wt. Sample (dry+tare)(g) | 19.89 | 21.21 |
| 1.24 | 1.28 | Wt. Tare (g) | 1.18 | 1.54 |
| 22.2 | 21.4 | Wt. Dry Soil (g) | 18.7 | 19.7 |
| 5.7 | 5.5 | Wt. Water (g) | 7.1 | 7.4 |
| 25.7% | 25.6% | Water Content (%) | 38.0% | 37.8% |
| 25.6% | 25.4% | Corrected Water Content (%) | 38.2% | 38.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.47 | 25.96 | Wt. Sample (wet+tare)(g) | 25.34 | 24.65 |
| 25.82 | 24.47 | Wt. Sample (dry+tare)(g) | 23.99 | 23.28 |
| 13.82 | 13.86 | Wt. Tare (g) | 13.92 | 13.76 |
| 12.0 | 10.6 | Wt. Dry Soil (g) | 10.1 | 9.5 |
| 1.7 | 1.5 | Wt. Water (g) | 1.4 | 1.4 |
| 13.8% | 14.0% | Water Content (%) | 13.4% | 14.4% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 25 | | LL | 38 |
| PL | 14 | | PL | 14 |
| PI | 11 | | PI | 24 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CI | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 7, 2016 |
| Date Tested: | October 17, 2016 |
| Tested By: | B.Pelkey |


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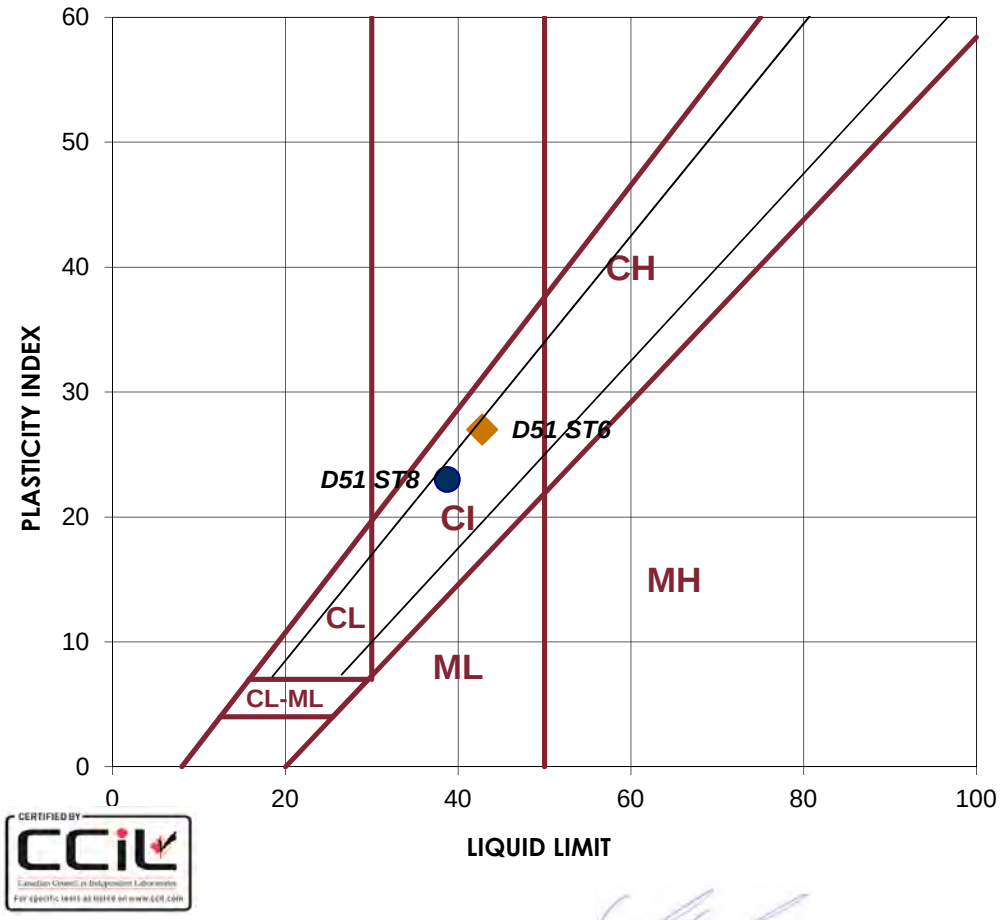
| Sample: D51 ST8 | | | Sample: D51 ST6 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | 29 | 30 |
| | | Container Number | | |
| 19.65 | 26.86 | Wt. Sample (wet+tare)(g) | 27.44 | 27.57 |
| 14.56 | 19.81 | Wt. Sample (dry+tare)(g) | 19.74 | 19.89 |
| 1.21 | 1.26 | Wt. Tare (g) | 1.40 | 1.55 |
| 13.4 | 18.6 | Wt. Dry Soil (g) | 18.3 | 18.3 |
| 5.1 | 7.1 | Wt. Water (g) | 7.7 | 7.7 |
| 38.1% | 38.0% | Water Content (%) | 42.0% | 41.9% |
| 38.8% | 38.7% | Corrected Water Content (%) | 42.7% | 42.8% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.04 | 22.55 | Wt. Sample (wet+tare)(g) | 25.52 | 25.4 |
| 24.33 | 21.36 | Wt. Sample (dry+tare)(g) | 23.87 | 23.75 |
| 13.77 | 13.77 | Wt. Tare (g) | 13.8 | 13.78 |
| 10.6 | 7.6 | Wt. Dry Soil (g) | 10.1 | 10.0 |
| 1.7 | 1.2 | Wt. Water (g) | 1.7 | 1.7 |
| 16.2% | 15.7% | Water Content (%) | 16.4% | 16.5% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | 43 |
| PL | 16 | | PL | 16 |
| PI | 23 | | PI | 27 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 22, 2016 |
| Date Tested: | August 24, 2016 |
| Tested By: | C. Oost |


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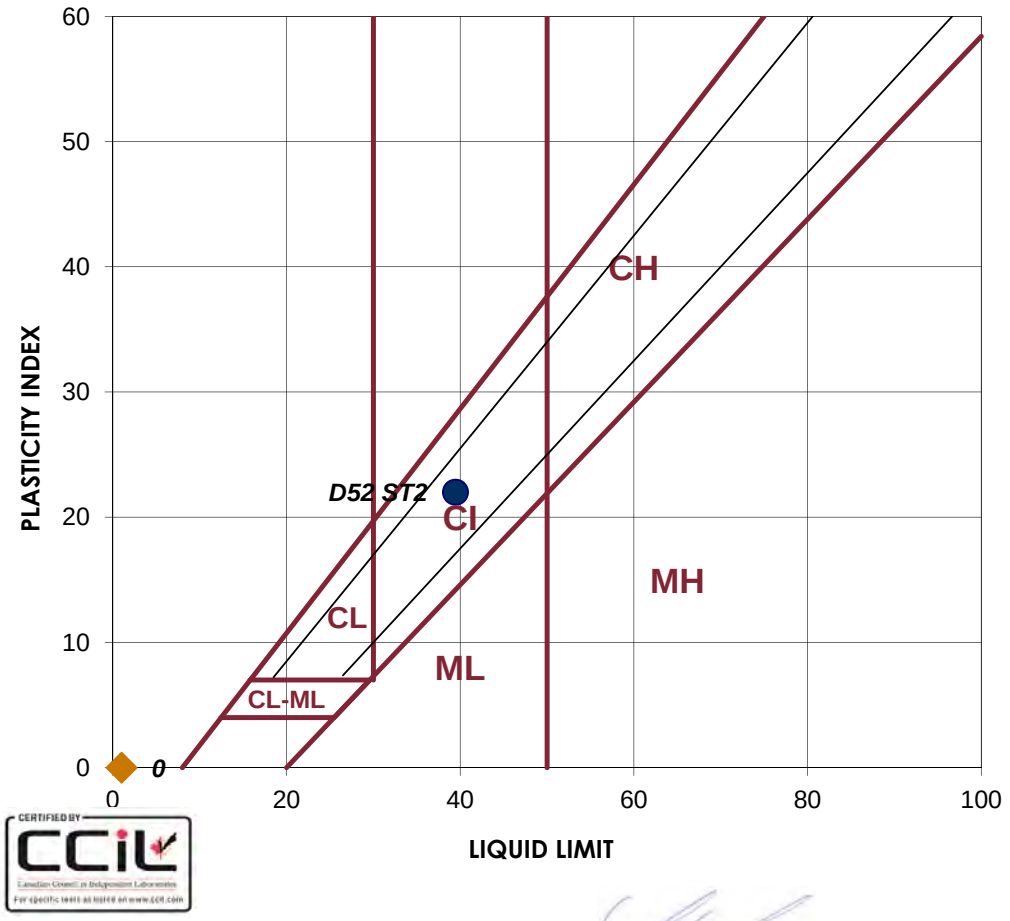
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D52 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 27 | Number of Blows | | |
| | | Container Number | | |
| 20.11 | 19.56 | Wt. Sample (wet+tare)(g) | | |
| 14.76 | 14.43 | Wt. Sample (dry+tare)(g) | | |
| 1.19 | 1.31 | Wt. Tare (g) | | |
| 13.6 | 13.1 | Wt. Dry Soil (g) | | |
| 5.4 | 5.1 | Wt. Water (g) | | |
| 39.4% | 39.1% | Water Content (%) | | |
| 39.4% | 39.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.35 | 21.96 | Wt. Sample (wet+tare)(g) | | |
| 21.13 | 20.8 | Wt. Sample (dry+tare)(g) | | |
| 13.92 | 13.8 | Wt. Tare (g) | | |
| 7.2 | 7.0 | Wt. Dry Soil (g) | | |
| 1.2 | 1.2 | Wt. Water (g) | | |
| 16.9% | 16.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | |
| PL | 17 | | PL | |
| PI | 22 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| *CI* | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 10, 2016 |
| Date Tested: | October 18, 2016 |
| Tested By: | B.Pelkey |


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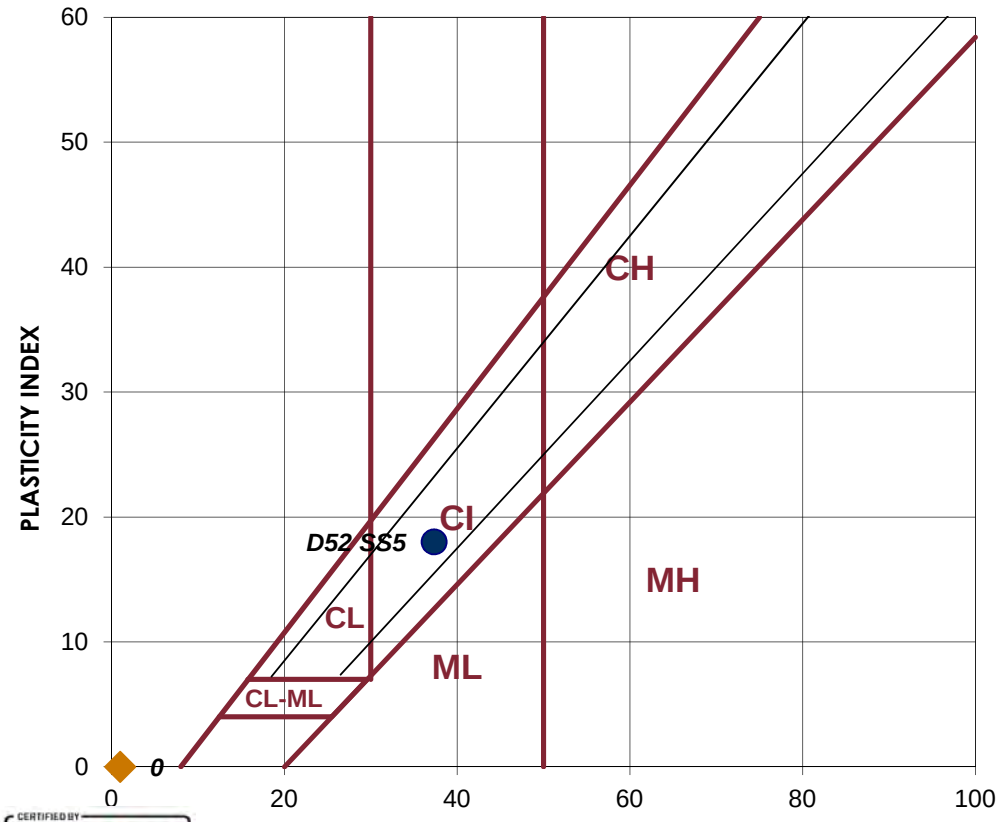
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D52 SS5 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 27 | Number of Blows | | |
| | | Container Number | | |
| 27.25 | 36.14 | Wt. Sample (wet+tare)(g) | | |
| 20.28 | 26.82 | Wt. Sample (dry+tare)(g) | | |
| 1.40 | 1.57 | Wt. Tare (g) | | |
| 18.9 | 25.3 | Wt. Dry Soil (g) | | |
| 7.0 | 9.3 | Wt. Water (g) | | |
| 36.9% | 36.9% | Water Content (%) | | |
| 37.4% | 37.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.34 | 28.46 | Wt. Sample (wet+tare)(g) | | |
| 25.46 | 26.44 | Wt. Sample (dry+tare)(g) | | |
| 15.78 | 15.81 | Wt. Tare (g) | | |
| 9.7 | 10.6 | Wt. Dry Soil (g) | | |
| 1.9 | 2.0 | Wt. Water (g) | | |
| 19.4% | 19.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | |
| PL | 19 | | PL | |
| PI | 18 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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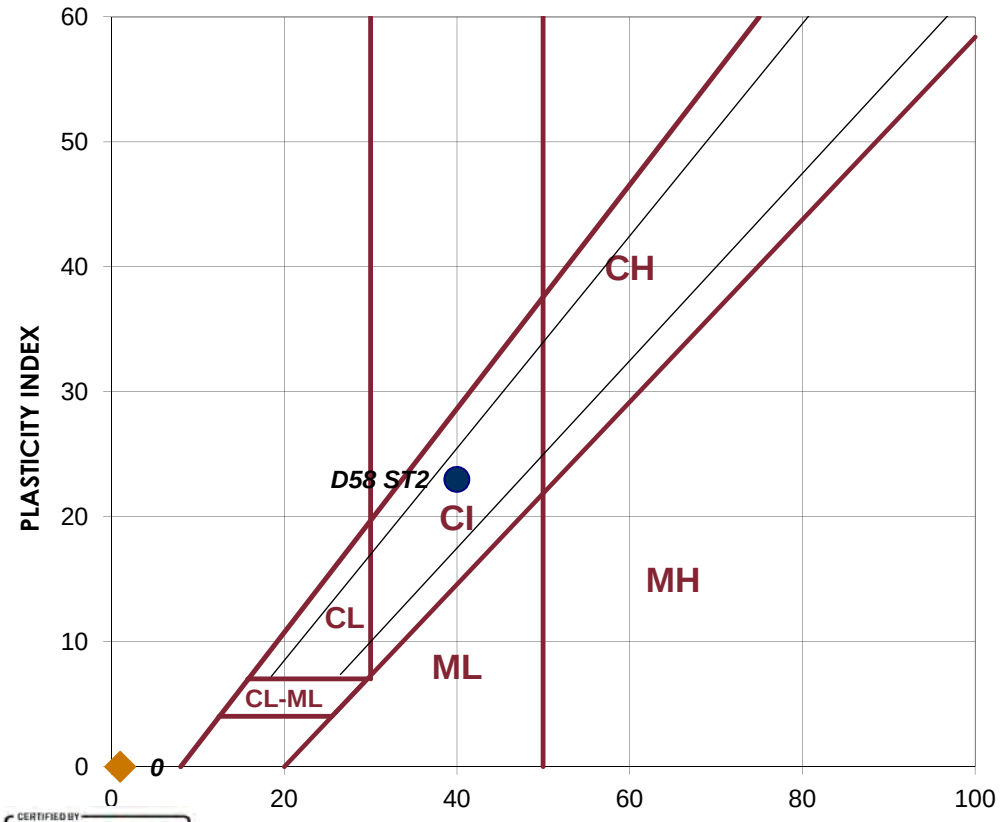
## Atterberg Limits
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 9, 2016 |
| Tested By: | B. Pelkey |

| Sample: | | | Sample: | |
|---|---|---|---|---|
| D58 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 27.40 | 32.20 | Wt. Sample (wet+tare)(g) | | |
| 19.89 | 23.31 | Wt. Sample (dry+tare)(g) | | |
| 1.28 | 1.21 | Wt. Tare (g) | | |
| 18.6 | 22.1 | Wt. Dry Soil (g) | | |
| 7.5 | 8.9 | Wt. Water (g) | | |
| 40.4% | 40.2% | Water Content (%) | | |
| 39.9% | 40.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.56 | 27.35 | Wt. Sample (wet+tare)(g) | | |
| 23.88 | 25.4 | Wt. Sample (dry+tare)(g) | | |
| 13.89 | 13.88 | Wt. Tare (g) | | |
| 10.0 | 11.5 | Wt. Dry Soil (g) | | |
| 1.7 | 2.0 | Wt. Water (g) | | |
| 16.8% | 16.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 40 | | LL | |
| PL | 17 | | PL | |
| PI | 23 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 20, 2016 |
| Date Tested: | July 25, 2016 |
| Tested By: | B. Pelkey |


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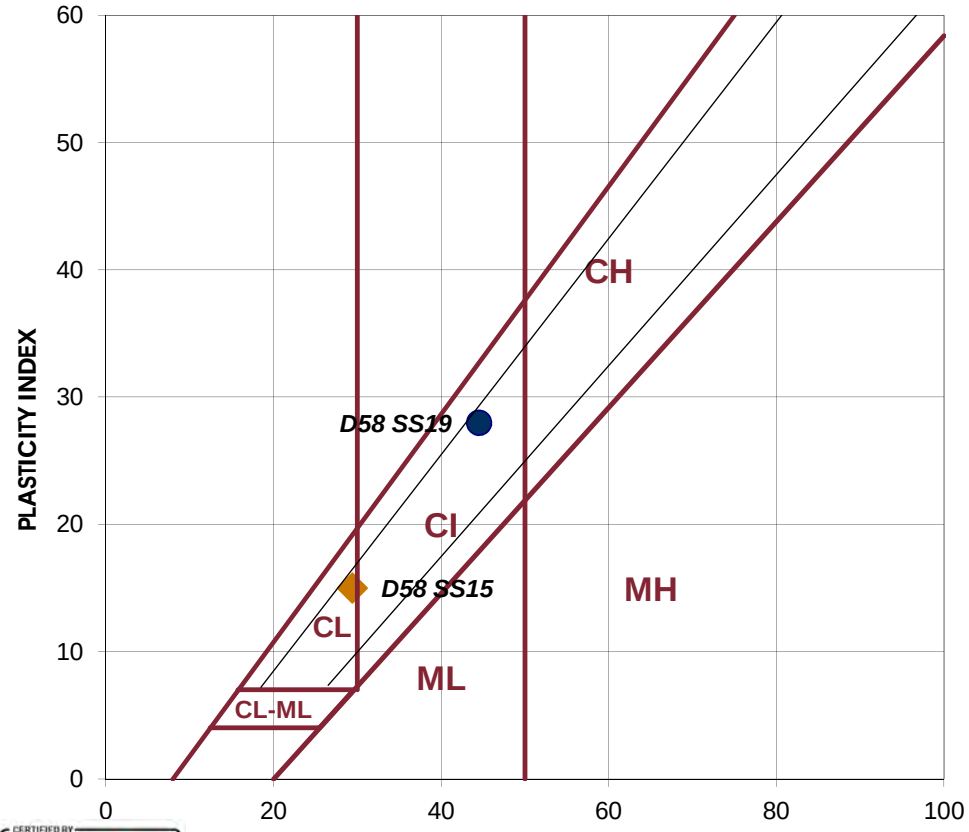
| Sample: D58 SS19 | | | Sample: D58 SS15 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | 28 | 29 |
| | | Container Number | | |
| 26.35 | 28.06 | Wt. Sample (wet+tare)(g) | 20.48 | 32.30 |
| 18.71 | 19.93 | Wt. Sample (dry+tare)(g) | 16.15 | 25.34 |
| 1.29 | 1.24 | Wt. Tare (g) | 1.14 | 1.30 |
| 17.4 | 18.7 | Wt. Dry Soil (g) | 15.0 | 24.0 |
| 7.6 | 8.1 | Wt. Water (g) | 4.3 | 7.0 |
| 43.9% | 43.5% | Water Content (%) | 28.8% | 29.0% |
| 44.7% | 44.3% | Corrected Water Content (%) | 29.2% | 29.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.02 | 24.29 | Wt. Sample (wet+tare)(g) | 25.12 | 24.33 |
| 23.5 | 22.92 | Wt. Sample (dry+tare)(g) | 23.78 | 23.07 |
| 13.76 | 14.13 | Wt. Tare (g) | 13.89 | 13.77 |
| 9.7 | 8.8 | Wt. Dry Soil (g) | 9.9 | 9.3 |
| 1.5 | 1.4 | Wt. Water (g) | 1.3 | 1.3 |
| 15.6% | 15.6% | Water Content (%) | 13.5% | 13.5% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 44 | | LL | 29 |
| PL | 16 | | PL | 14 |
| PI | 28 | | PI | 15 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***CL-CI*** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: June 20, 2016
Date Tested: August 5, 2016
Tested By: C. Oost

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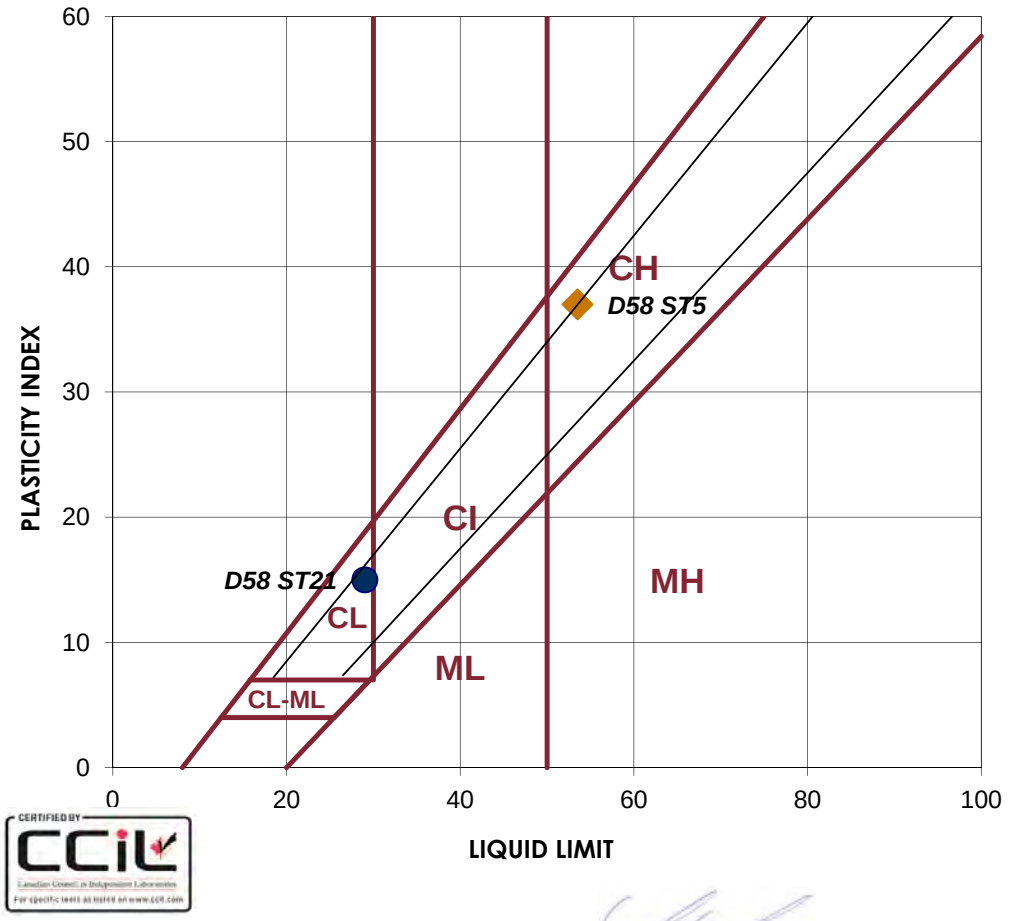
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D58 ST21 | | | D58 ST5 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | 23 | 24 |
| | | Container Number | | |
| 22.98 | 24.80 | Wt. Sample (wet+tare)(g) | 19.78 | 18.11 |
| 18.21 | 19.56 | Wt. Sample (dry+tare)(g) | 13.39 | 12.34 |
| 1.76 | 1.50 | Wt. Tare (g) | 1.59 | 1.59 |
| 16.5 | 18.1 | Wt. Dry Soil (g) | 11.8 | 10.8 |
| 4.8 | 5.2 | Wt. Water (g) | 6.4 | 5.8 |
| 29.0% | 29.0% | Water Content (%) | 54.2% | 53.7% |
| 29.0% | 29.0% | Corrected Water Content (%) | 53.6% | 53.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 21.9 | 20.61 | Wt. Sample (wet+tare)(g) | 7.92 | 8.76 |
| 20.9 | 19.78 | Wt. Sample (dry+tare)(g) | 6.98 | 7.67 |
| 13.79 | 13.8 | Wt. Tare (g) | 1.56 | 1.24 |
| 7.1 | 6.0 | Wt. Dry Soil (g) | 5.4 | 6.4 |
| 1.0 | 0.8 | Wt. Water (g) | 0.9 | 1.1 |
| 14.1% | 13.9% | Water Content (%) | 17.3% | 17.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 29 | | LL | 54 |
| PL | 14 | | PL | 17 |
| PI | 15 | | PI | 37 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL-CI | | | CH | |

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**Atterberg Limits**
ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received:
Date Tested: July 28, 2016
Tested By: B. Pelkey

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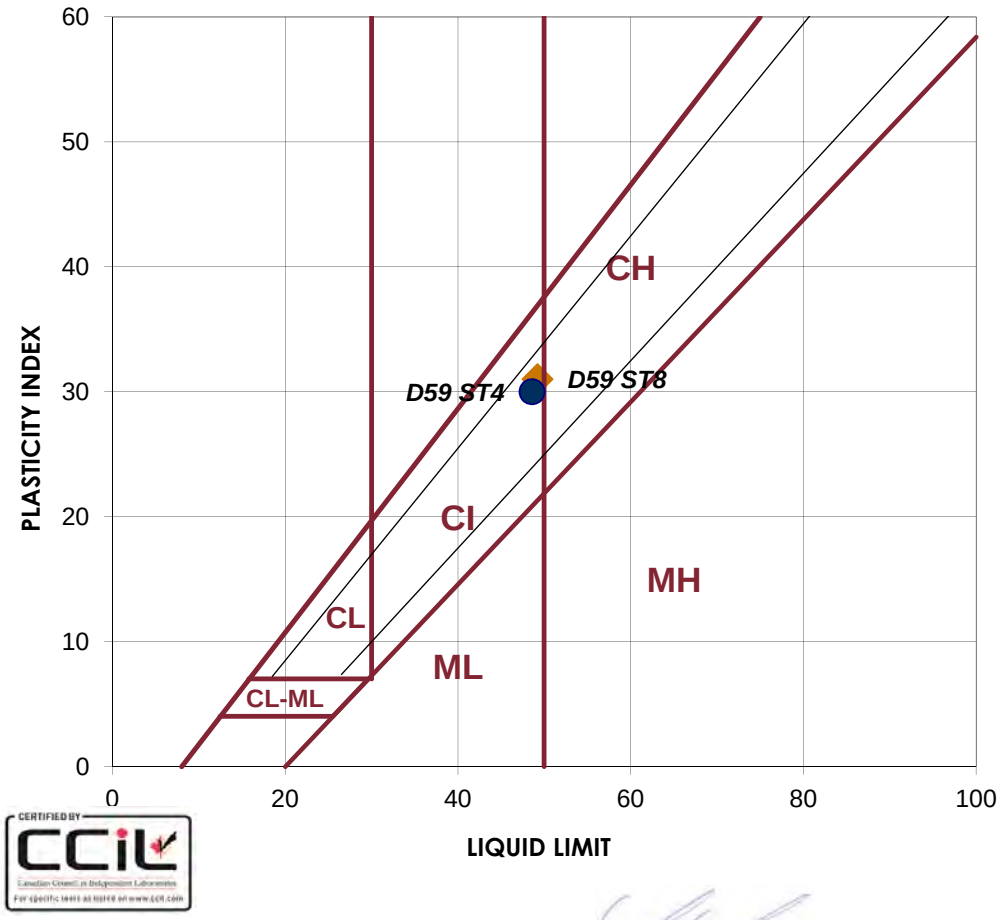
| Sample: D59 ST4 | | | Sample: D59 ST8 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 26 | Number of Blows | 29 | 28 |
| | | Container Number | | |
| 25.79 | 21.71 | Wt. Sample (wet+tare)(g) | 18.10 | 25.25 |
| 17.80 | 15.09 | Wt. Sample (dry+tare)(g) | 12.58 | 17.44 |
| 1.31 | 1.30 | Wt. Tare (g) | 1.18 | 1.31 |
| 16.5 | 13.8 | Wt. Dry Soil (g) | 11.4 | 16.1 |
| 8.0 | 6.6 | Wt. Water (g) | 5.5 | 7.8 |
| 48.5% | 48.0% | Water Content (%) | 48.4% | 48.4% |
| 48.9% | 48.2% | Corrected Water Content (%) | 49.3% | 49.1% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.93 | 24.82 | Wt. Sample (wet+tare)(g) | 27.09 | 24.82 |
| 21.49 | 23.08 | Wt. Sample (dry+tare)(g) | 25.1 | 23.13 |
| 13.83 | 13.8 | Wt. Tare (g) | 13.78 | 13.79 |
| 7.7 | 9.3 | Wt. Dry Soil (g) | 11.3 | 9.3 |
| 1.4 | 1.7 | Wt. Water (g) | 2.0 | 1.7 |
| 18.8% | 18.8% | Water Content (%) | 17.6% | 18.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 49 | | LL | 49 |
| PL | 19 | | PL | 18 |
| PI | 30 | | PI | 31 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CH | | | CI | |






Reviewed By:

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 28, 2016 |
| Date Tested: | July 22, 2016 |
| Tested By: | C. Oost |


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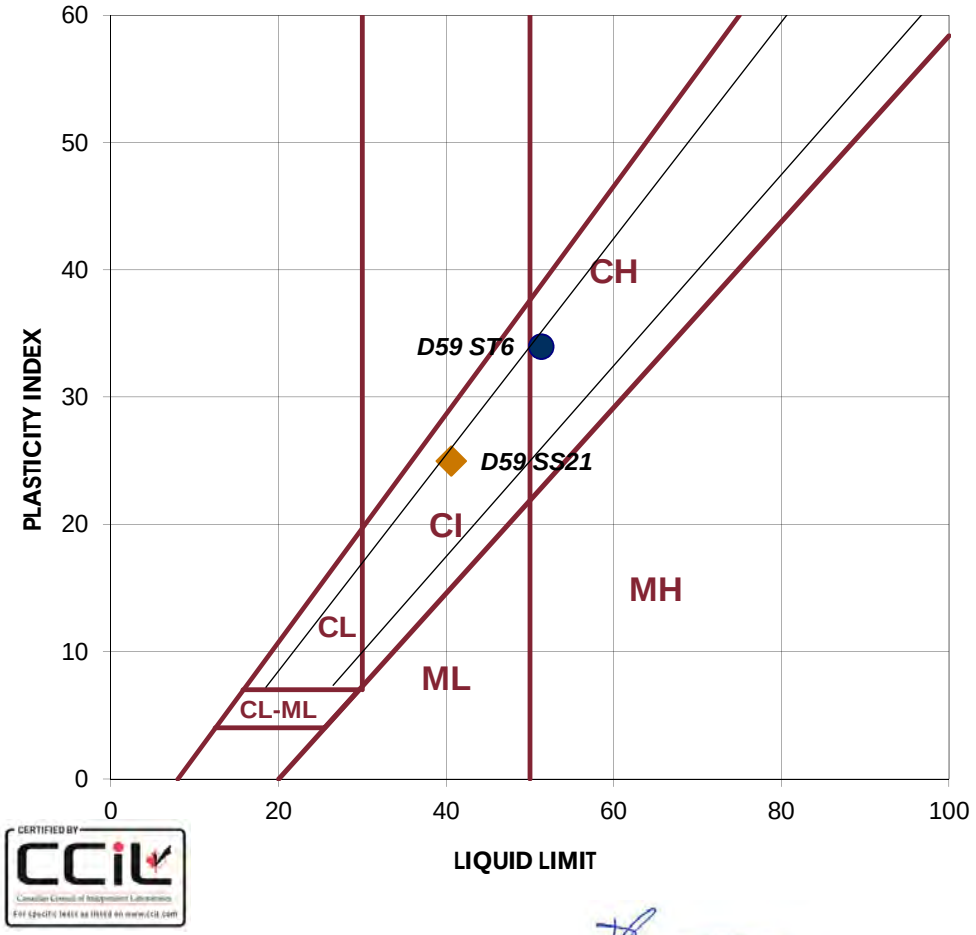
| Sample: D59 ST6 | | | Sample: D59 SS21 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 23 | Number of Blows | 24 | 23 |
| | | Container Number | | |
| 14.23 | 15.59 | Wt. Sample (wet+tare)(g) | 15.27 | 16.41 |
| 9.93 | 10.79 | Wt. Sample (dry+tare)(g) | 11.29 | 12.01 |
| 1.64 | 1.53 | Wt. Tare (g) | 1.57 | 1.25 |
| 8.3 | 9.3 | Wt. Dry Soil (g) | 9.7 | 10.8 |
| 4.3 | 4.8 | Wt. Water (g) | 4.0 | 4.4 |
| 51.9% | 51.8% | Water Content (%) | 40.9% | 40.9% |
| 51.3% | 51.3% | Corrected Water Content (%) | 40.7% | 40.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 21.29 | 20.86 | Wt. Sample (wet+tare)(g) | 23 | 23.99 |
| 20.22 | 19.85 | Wt. Sample (dry+tare)(g) | 22.02 | 22.91 |
| 13.78 | 13.82 | Wt. Tare (g) | 15.8 | 15.94 |
| 6.4 | 6.0 | Wt. Dry Soil (g) | 6.2 | 7.0 |
| 1.1 | 1.0 | Wt. Water (g) | 1.0 | 1.1 |
| 16.6% | 16.7% | Water Content (%) | 15.8% | 15.5% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 51 | | LL | 41 |
| PL | 17 | | PL | 16 |
| PI | 34 | | PI | 25 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH-CI*** | | | ***CI*** | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 28, 2016 |
| Date Tested: | August 2, 2016 |
| Tested By: | B. Pelkey |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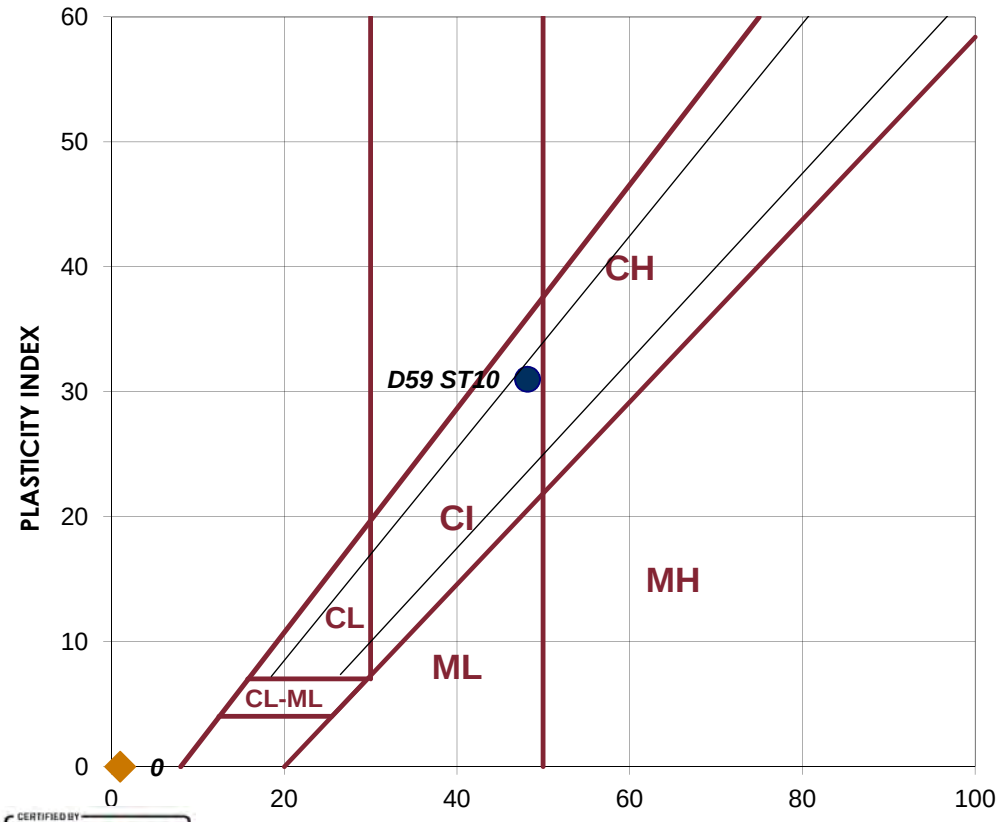
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D59 ST10 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 29.70 | 25.92 | Wt. Sample (wet+tare)(g) | | |
| 20.64 | 18.00 | Wt. Sample (dry+tare)(g) | | |
| 1.58 | 1.18 | Wt. Tare (g) | | |
| 19.1 | 16.8 | Wt. Dry Soil (g) | | |
| 9.1 | 7.9 | Wt. Water (g) | | |
| 47.5% | 47.1% | Water Content (%) | | |
| 48.4% | 47.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.74 | 24.32 | Wt. Sample (wet+tare)(g) | | |
| 25.73 | 22.84 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.87 | Wt. Tare (g) | | |
| 12.0 | 9.0 | Wt. Dry Soil (g) | | |
| 2.0 | 1.5 | Wt. Water (g) | | |
| 16.8% | 16.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 48 | | LL | |
| PL | 17 | | PL | |
| PI | 31 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CH*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 28, 2016 |
| Date Tested: | August 5, 2016 |
| Tested By: | C. Oost |

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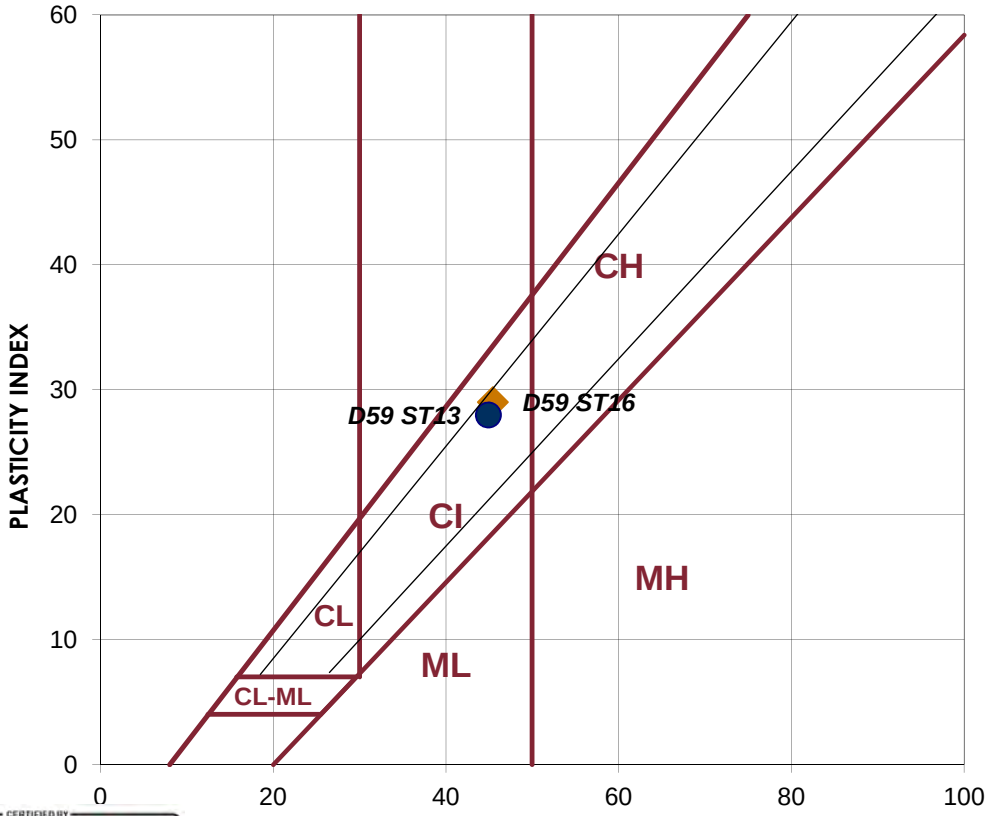
| Sample: D59 ST13 | | | Sample: D59 ST16 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | 23 | 24 |
| | | Container Number | | |
| 21.41 | 19.91 | Wt. Sample (wet+tare)(g) | 20.76 | 22.20 |
| 15.18 | 14.16 | Wt. Sample (dry+tare)(g) | 14.62 | 15.62 |
| 1.56 | 1.51 | Wt. Tare (g) | 1.20 | 1.24 |
| 13.6 | 12.7 | Wt. Dry Soil (g) | 13.4 | 14.4 |
| 6.2 | 5.8 | Wt. Water (g) | 6.1 | 6.6 |
| 45.7% | 45.5% | Water Content (%) | 45.8% | 45.8% |
| 45.0% | 44.8% | Corrected Water Content (%) | 45.3% | 45.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.62 | 22.52 | Wt. Sample (wet+tare)(g) | 22.11 | 23.34 |
| 21.65 | 21.58 | Wt. Sample (dry+tare)(g) | 21.24 | 22.29 |
| 15.84 | 15.94 | Wt. Tare (g) | 15.65 | 15.83 |
| 5.8 | 5.6 | Wt. Dry Soil (g) | 5.6 | 6.5 |
| 1.0 | 0.9 | Wt. Water (g) | 0.9 | 1.1 |
| 16.7% | 16.7% | Water Content (%) | 15.6% | 16.3% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 45 | | LL | 45 |
| PL | 17 | | PL | 16 |
| PI | 28 | | PI | 29 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: July 24, 2016
Date Tested: October 13, 2016
Tested By: C.Small

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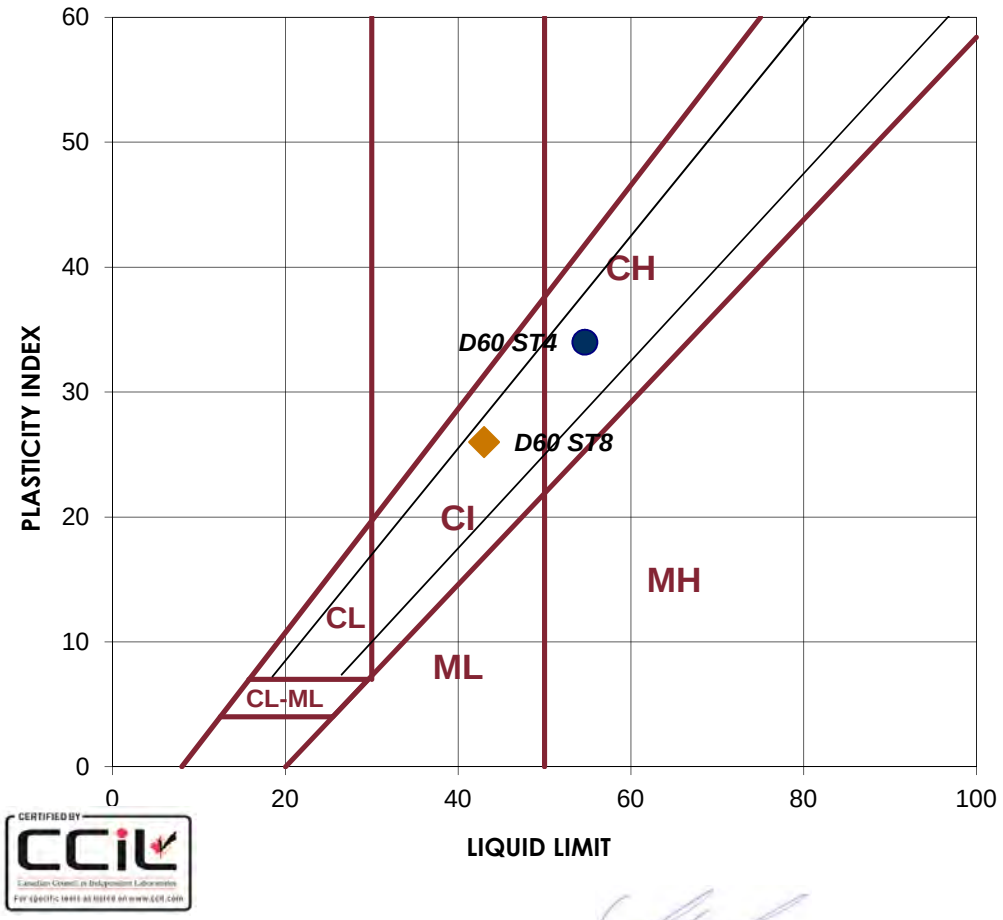
| Sample: D60 ST4 | | | Sample: D60 ST8 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 28 | Number of Blows | 23 | 23 |
| | | Container Number | | |
| 20.82 | 25.12 | Wt. Sample (wet+tare)(g) | 26.49 | 26.87 |
| 14.04 | 16.78 | Wt. Sample (dry+tare)(g) | 18.92 | 19.20 |
| 1.50 | 1.29 | Wt. Tare (g) | 1.52 | 1.53 |
| 12.5 | 15.5 | Wt. Dry Soil (g) | 17.4 | 17.7 |
| 6.8 | 8.3 | Wt. Water (g) | 7.6 | 7.7 |
| 54.1% | 53.8% | Water Content (%) | 43.5% | 43.4% |
| 54.8% | 54.6% | Corrected Water Content (%) | 43.1% | 43.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.5 | 23.14 | Wt. Sample (wet+tare)(g) | 24.52 | 24.65 |
| 21.8 | 21.57 | Wt. Sample (dry+tare)(g) | 22.91 | 23.04 |
| 13.83 | 13.85 | Wt. Tare (g) | 13.77 | 13.72 |
| 8.0 | 7.7 | Wt. Dry Soil (g) | 9.1 | 9.3 |
| 1.7 | 1.6 | Wt. Water (g) | 1.6 | 1.6 |
| 21.3% | 20.3% | Water Content (%) | 17.6% | 17.3% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 55 | | LL | 43 |
| PL | 21 | | PL | 17 |
| PI | 34 | | PI | 26 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CI | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 24, 2016 |
| Date Tested: | August 24, 2016 |
| Tested By: | B. Pelkey |

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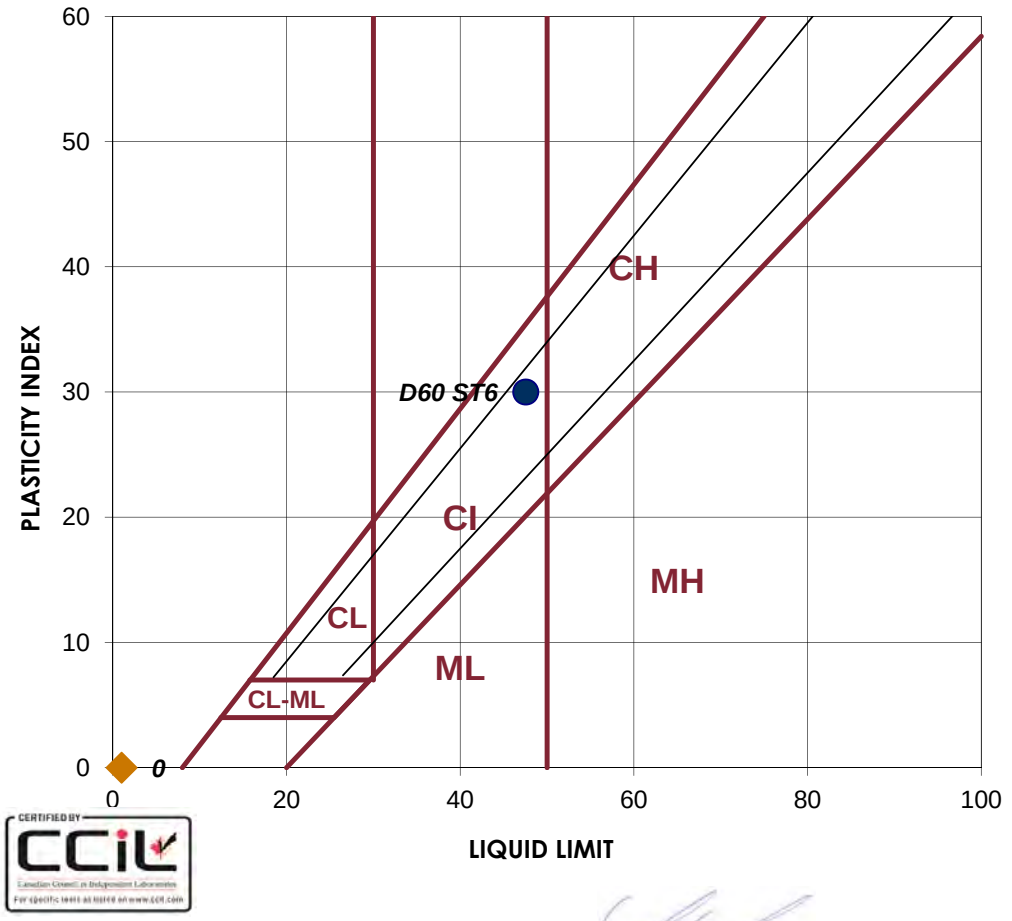
Tel: (403) 253-7876

| Sample: | | | Sample: | |
|---|---|---|---|---|
| D60 ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 22 | Number of Blows | | |
| | | Container Number | | |
| 27.38 | 25.80 | Wt. Sample (wet+tare)(g) | | |
| 18.90 | 17.84 | Wt. Sample (dry+tare)(g) | | |
| 1.27 | 1.24 | Wt. Tare (g) | | |
| 17.6 | 16.6 | Wt. Dry Soil (g) | | |
| 8.5 | 8.0 | Wt. Water (g) | | |
| 48.1% | 48.0% | Water Content (%) | | |
| 47.9% | 47.2% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 32.61 | 29.64 | Wt. Sample (wet+tare)(g) | | |
| 30.02 | 27.55 | Wt. Sample (dry+tare)(g) | | |
| 15.8 | 15.94 | Wt. Tare (g) | | |
| 14.2 | 11.6 | Wt. Dry Soil (g) | | |
| 2.6 | 2.1 | Wt. Water (g) | | |
| 18.2% | 18.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 48 | | LL | |
| PL | 18 | | PL | |
| PI | 30 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| *CI* | | | ***NON-PLASTIC*** | |



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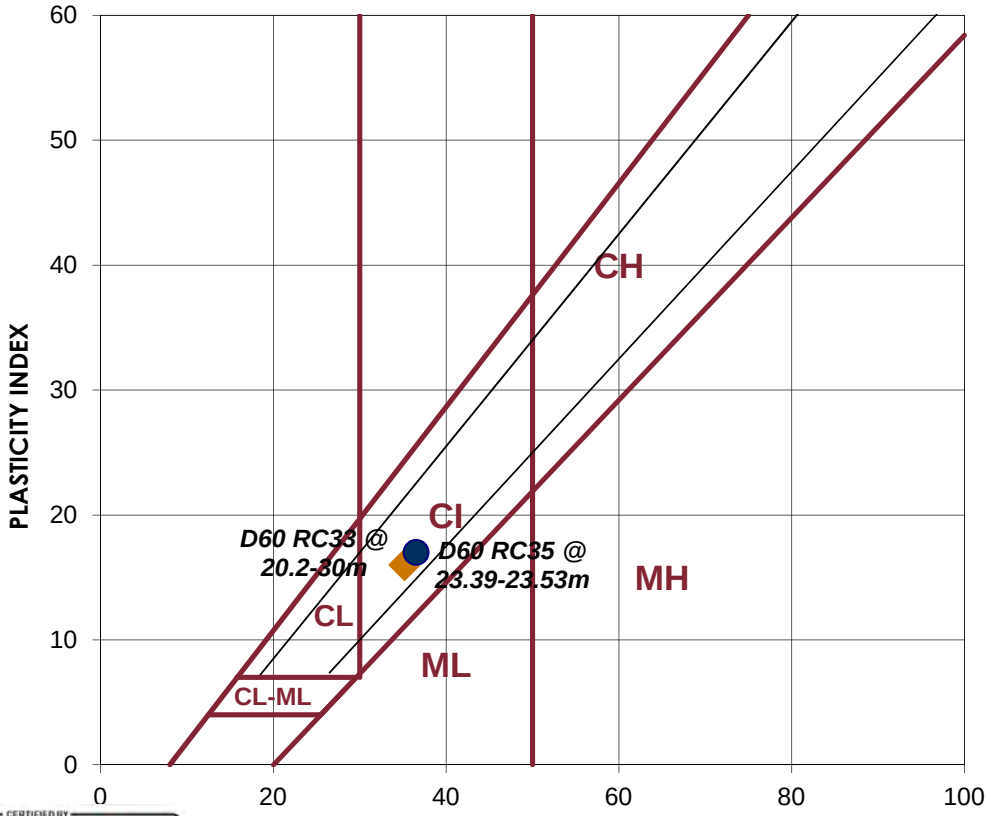
## Atterberg Limits
ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: July 27, 2016
Date Tested: September 3, 2016
Tested By: C. Small

| Sample: | | | Sample: | |
|---|---|---|---|---|
| D60 RC33 @ 20.2-30m | | | D60 RC35 @ 23.39-23.53m | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | 20 | 22 |
| | | Container Number | | |
| 26.91 | 32.24 | Wt. Sample (wet+tare)(g) | 26.76 | 28.68 |
| 20.12 | 24.09 | Wt. Sample (dry+tare)(g) | 20.06 | 21.50 |
| 1.24 | 1.34 | Wt. Tare (g) | 1.46 | 1.48 |
| 18.9 | 22.8 | Wt. Dry Soil (g) | 18.6 | 20.0 |
| 6.8 | 8.2 | Wt. Water (g) | 6.7 | 7.2 |
| 36.0% | 35.8% | Water Content (%) | 36.0% | 35.9% |
| 36.6% | 36.5% | Corrected Water Content (%) | 35.1% | 35.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 12.73 | 11.83 | Wt. Sample (wet+tare)(g) | 10.68 | 12.78 |
| 10.75 | 10.05 | Wt. Sample (dry+tare)(g) | 9.15 | 10.93 |
| 1.22 | 1.16 | Wt. Tare (g) | 1.21 | 1.33 |
| 9.5 | 8.9 | Wt. Dry Soil (g) | 7.9 | 9.6 |
| 2.0 | 1.8 | Wt. Water (g) | 1.5 | 1.9 |
| 20.8% | 20.0% | Water Content (%) | 19.3% | 19.3% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | 35 |
| PL | 20 | | PL | 19 |
| PI | 17 | | PI | 16 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | June 25, 2016 |
| Date Tested: | August 24, 2016 |
| Tested By: | C. Oost |


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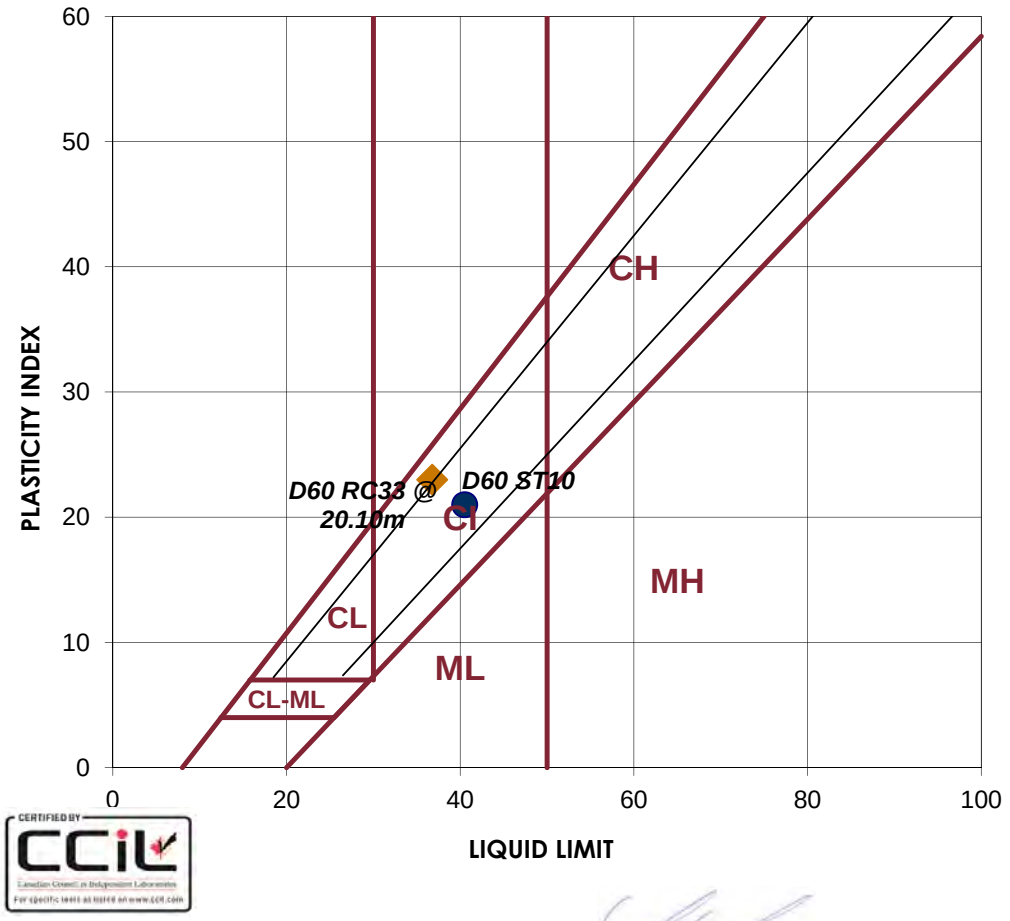
| Sample: D60 RC33 @ 20.10m | | | Sample: D60 ST10 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 26 | Number of Blows | 26 | 24 |
| | | Container Number | | |
| 20.16 | 19.93 | Wt. Sample (wet+tare)(g) | 23.70 | 22.63 |
| 14.72 | 14.55 | Wt. Sample (dry+tare)(g) | 17.67 | 16.91 |
| 1.27 | 1.29 | Wt. Tare (g) | 1.32 | 1.31 |
| 13.5 | 13.3 | Wt. Dry Soil (g) | 16.4 | 15.6 |
| 5.4 | 5.4 | Wt. Water (g) | 6.0 | 5.7 |
| 40.4% | 40.6% | Water Content (%) | 36.9% | 36.7% |
| 40.2% | 40.8% | Corrected Water Content (%) | 37.1% | 36.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.14 | 20.85 | Wt. Sample (wet+tare)(g) | 23.48 | 21.85 |
| 20.75 | 19.67 | Wt. Sample (dry+tare)(g) | 22.3 | 20.84 |
| 13.91 | 13.83 | Wt. Tare (g) | 14.15 | 13.78 |
| 6.8 | 5.8 | Wt. Dry Soil (g) | 8.2 | 7.1 |
| 1.4 | 1.2 | Wt. Water (g) | 1.2 | 1.0 |
| 20.3% | 20.2% | Water Content (%) | 14.5% | 14.3% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 41 | | LL | 37 |
| PL | 20 | | PL | 14 |
| PI | 21 | | PI | 23 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318

Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 27, 2016 |
| Date Tested: | September 4, 2016 |
| Tested By: | B. Pelkey |


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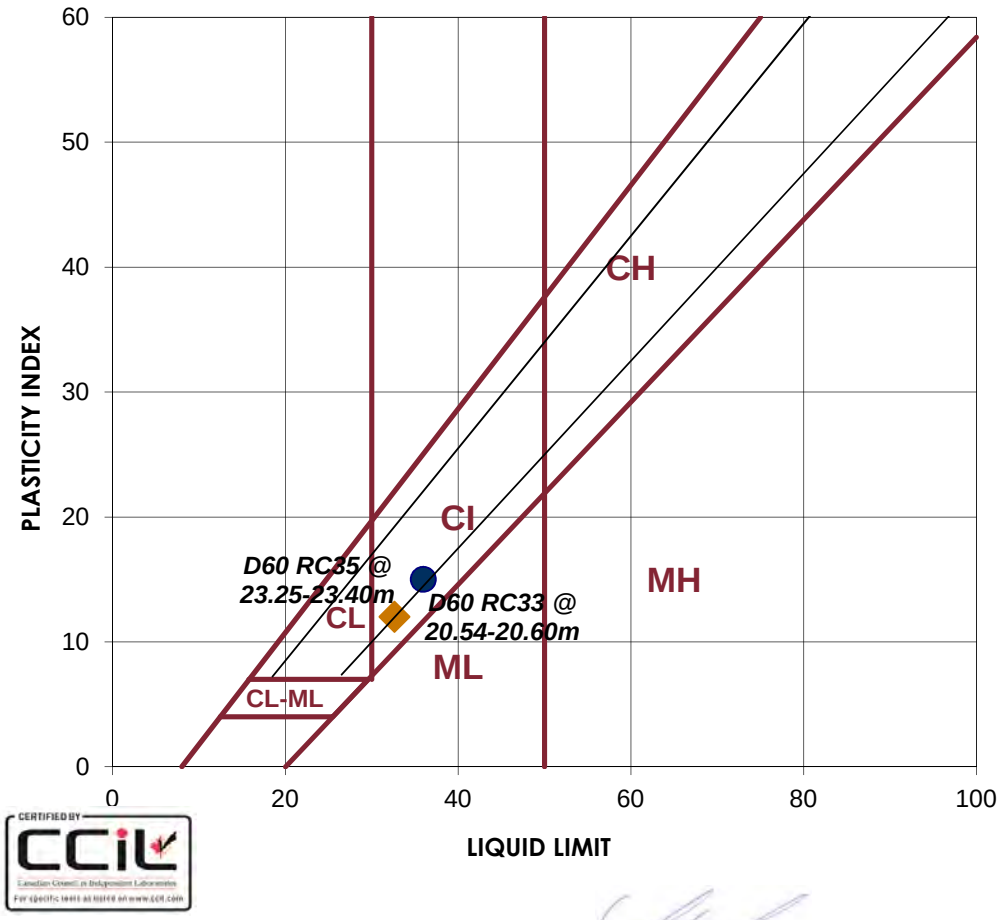
| Sample: D60 RC35 @ 23.25-23.40m | | | Sample: D60 RC33 @ 20.54-20.60m | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 23 | Number of Blows | 24 | 23 |
| | | Container Number | | |
| 33.37 | 37.39 | Wt. Sample (wet+tare)(g) | 30.38 | 32.46 |
| 24.80 | 27.75 | Wt. Sample (dry+tare)(g) | 23.16 | 24.76 |
| 1.25 | 1.20 | Wt. Tare (g) | 1.22 | 1.35 |
| 23.6 | 26.6 | Wt. Dry Soil (g) | 21.9 | 23.4 |
| 8.6 | 9.6 | Wt. Water (g) | 7.2 | 7.7 |
| 36.4% | 36.3% | Water Content (%) | 32.9% | 32.9% |
| 36.0% | 35.9% | Corrected Water Content (%) | 32.7% | 32.6% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.02 | 25.22 | Wt. Sample (wet+tare)(g) | 29.5 | 31.64 |
| 24.71 | 23.24 | Wt. Sample (dry+tare)(g) | 27.08 | 28.86 |
| 13.76 | 13.76 | Wt. Tare (g) | 15.78 | 15.81 |
| 11.0 | 9.5 | Wt. Dry Soil (g) | 11.3 | 13.1 |
| 2.3 | 2.0 | Wt. Water (g) | 2.4 | 2.8 |
| 21.1% | 20.9% | Water Content (%) | 21.4% | 21.3% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | 33 |
| PL | 21 | | PL | 21 |
| PI | 15 | | PI | 12 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | July 27, 2016 |
| Date Tested: | August 31, 2016 |
| Tested By: | B. Pelkey |


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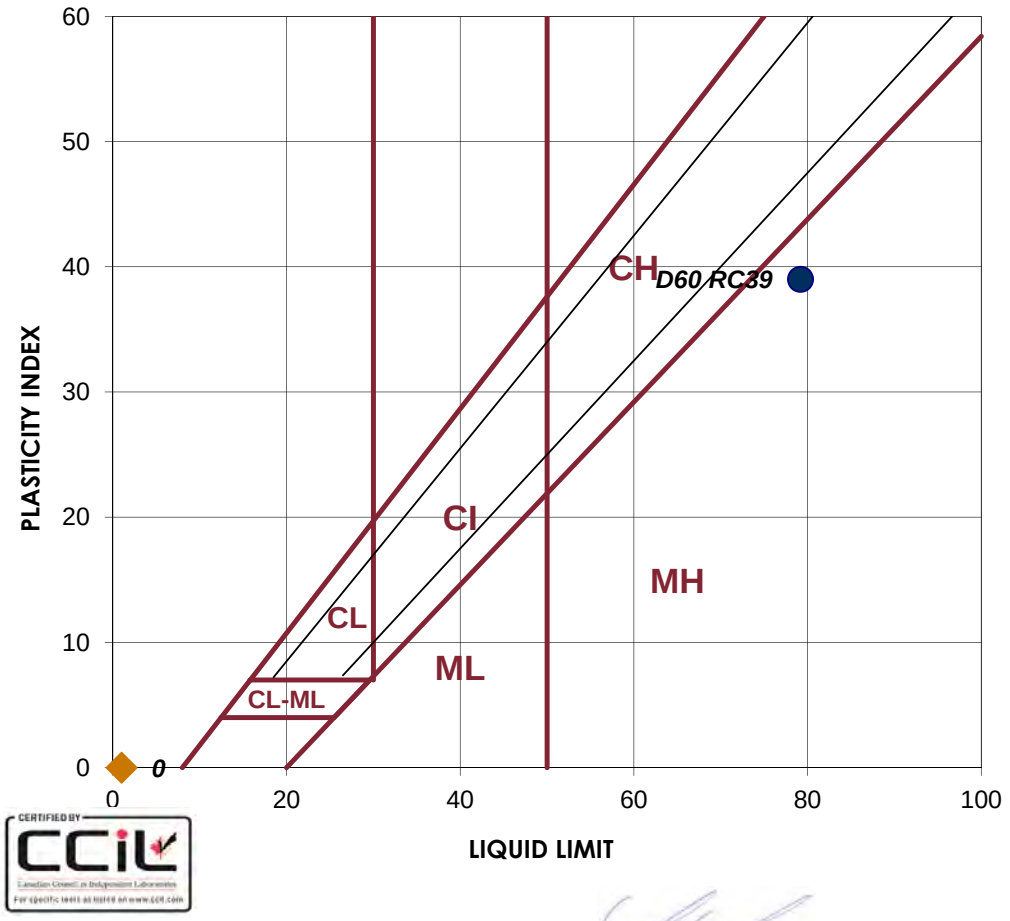
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D60 RC39 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 22 | Number of Blows | | |
| | | Container Number | | |
| 21.77 | 23.71 | Wt. Sample (wet+tare)(g) | | |
| 12.70 | 13.82 | Wt. Sample (dry+tare)(g) | | |
| 1.53 | 1.47 | Wt. Tare (g) | | |
| 11.2 | 12.4 | Wt. Dry Soil (g) | | |
| 9.1 | 9.9 | Wt. Water (g) | | |
| 81.2% | 80.1% | Water Content (%) | | |
| 79.5% | 78.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.2 | 25.53 | Wt. Sample (wet+tare)(g) | | |
| 21.24 | 22.21 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.79 | Wt. Tare (g) | | |
| 7.5 | 8.4 | Wt. Dry Soil (g) | | |
| 3.0 | 3.3 | Wt. Water (g) | | |
| 39.6% | 39.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 79 | | LL | |
| PL | 40 | | PL | |
| PI | 39 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***MH*** | | | ***NON-PLASTIC*** | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 18, 2016 |
| Date Tested: | September 29, 2016 |
| Tested By: | B.Pelkey |


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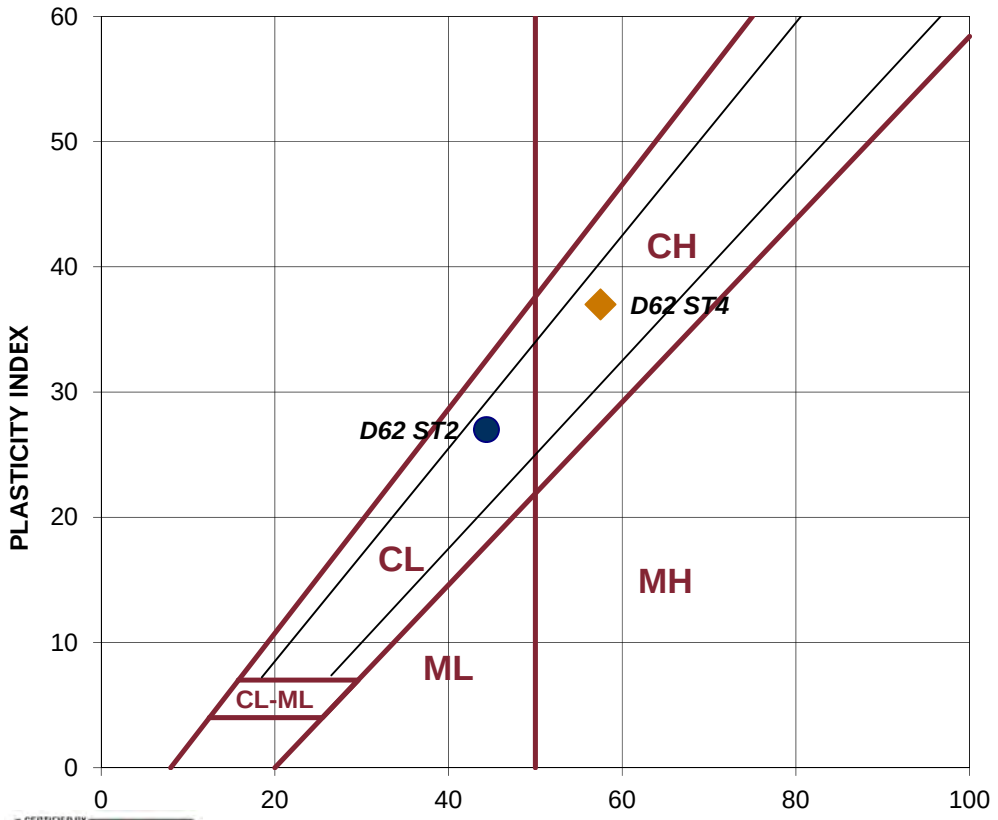
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D62 ST2 | | | D62 ST4 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 27 | Number of Blows | 25 | 25 |
| | | Container Number | | |
| 25.14 | 23.87 | Wt. Sample (wet+tare)(g) | 23.82 | 20.75 |
| 17.81 | 17.03 | Wt. Sample (dry+tare)(g) | 15.66 | 13.66 |
| 1.22 | 1.25 | Wt. Tare (g) | 1.49 | 1.31 |
| 16.6 | 15.8 | Wt. Dry Soil (g) | 14.2 | 12.4 |
| 7.3 | 6.8 | Wt. Water (g) | 8.2 | 7.1 |
| 44.2% | 43.3% | Water Content (%) | 57.6% | 57.4% |
| 45.0% | 43.8% | Corrected Water Content (%) | 57.6% | 57.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.42 | 24.8 | Wt. Sample (wet+tare)(g) | 23.01 | 23.64 |
| 24.67 | 23.23 | Wt. Sample (dry+tare)(g) | 21.48 | 22.01 |
| 14.14 | 13.77 | Wt. Tare (g) | 13.82 | 13.84 |
| 10.5 | 9.5 | Wt. Dry Soil (g) | 7.7 | 8.2 |
| 1.8 | 1.6 | Wt. Water (g) | 1.5 | 1.6 |
| 16.6% | 16.6% | Water Content (%) | 20.0% | 20.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 44 | | LL | 57 |
| PL | 17 | | PL | 20 |
| PI | 27 | | PI | 37 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CH | |

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Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: August 18, 2016
Date Tested: September 27, 2016
Tested By: B.Pelkey

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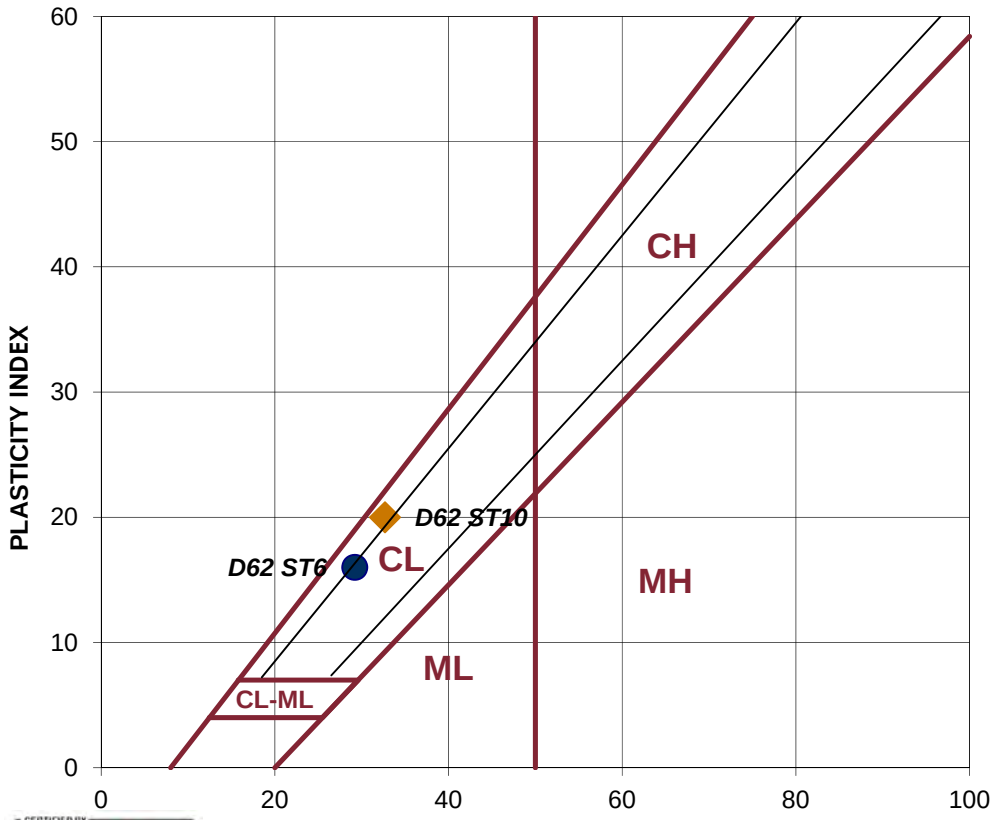
| Sample: D62 ST6 | | | Sample: D62 ST10 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | 22 | 22 |
| | | Container Number | | |
| 28.05 | 25.72 | Wt. Sample (wet+tare)(g) | 21.60 | 16.75 |
| 22.07 | 20.28 | Wt. Sample (dry+tare)(g) | 16.49 | 12.89 |
| 1.26 | 1.28 | Wt. Tare (g) | 1.16 | 1.21 |
| 20.8 | 19.0 | Wt. Dry Soil (g) | 15.3 | 11.7 |
| 6.0 | 5.4 | Wt. Water (g) | 5.1 | 3.9 |
| 28.7% | 28.6% | Water Content (%) | 33.3% | 33.0% |
| 29.3% | 29.2% | Corrected Water Content (%) | 32.8% | 32.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.76 | 24.4 | Wt. Sample (wet+tare)(g) | 26.04 | 28.01 |
| 24.34 | 23.15 | Wt. Sample (dry+tare)(g) | 24.83 | 26.55 |
| 13.9 | 13.79 | Wt. Tare (g) | 15.96 | 15.62 |
| 10.4 | 9.4 | Wt. Dry Soil (g) | 8.9 | 10.9 |
| 1.4 | 1.3 | Wt. Water (g) | 1.2 | 1.5 |
| 13.6% | 13.4% | Water Content (%) | 13.6% | 13.4% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 29 | | LL | 33 |
| PL | 13 | | PL | 13 |
| PI | 16 | | PI | 20 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CL | |



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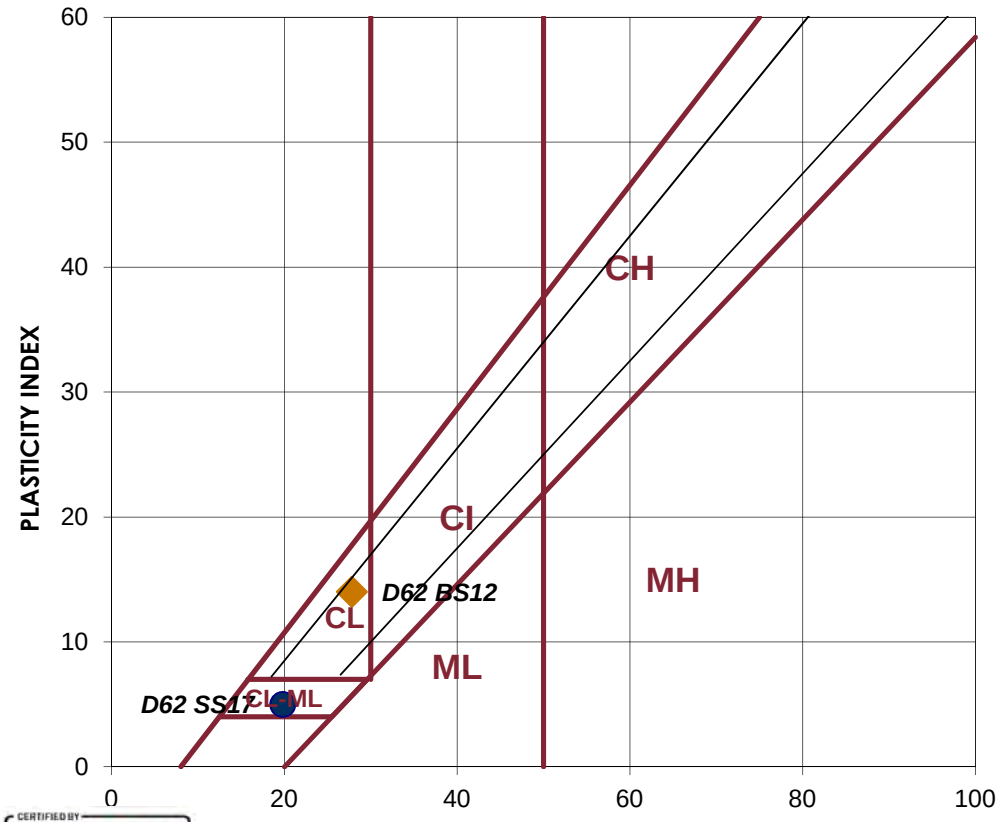
## Atterberg Limits
ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Date Received: August 18, 2016
Date Tested: October 18, 2016
Tested By: B.Pelkey

| Sample: D62 SS17 | | | Sample: D62 BS12 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 23 | Number of Blows | 24 | 22 |
| | | Container Number | | |
| 21.20 | 21.70 | Wt. Sample (wet+tare)(g) | 24.02 | 29.95 |
| 17.84 | 18.33 | Wt. Sample (dry+tare)(g) | 19.06 | 23.71 |
| 1.18 | 1.46 | Wt. Tare (g) | 1.44 | 1.48 |
| 16.7 | 16.9 | Wt. Dry Soil (g) | 17.6 | 22.2 |
| 3.4 | 3.4 | Wt. Water (g) | 5.0 | 6.2 |
| 20.2% | 20.0% | Water Content (%) | 28.1% | 28.1% |
| 19.9% | 19.8% | Corrected Water Content (%) | 28.0% | 27.6% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 30.02 | 31.7 | Wt. Sample (wet+tare)(g) | 27.55 | 29.91 |
| 27.95 | 29.36 | Wt. Sample (dry+tare)(g) | 25.87 | 27.92 |
| 13.76 | 13.72 | Wt. Tare (g) | 13.83 | 13.82 |
| 14.2 | 15.6 | Wt. Dry Soil (g) | 12.0 | 14.1 |
| 2.1 | 2.3 | Wt. Water (g) | 1.7 | 2.0 |
| 14.6% | 15.0% | Water Content (%) | 14.0% | 14.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 20 | | LL | 28 |
| PL | 15 | | PL | 14 |
| PI | 5 | | PI | 14 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-ML*** | | | ***CL*** | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 8, 2016 |
| Date Tested: | September 12, 2016 |
| Tested By: | B. Pelkey |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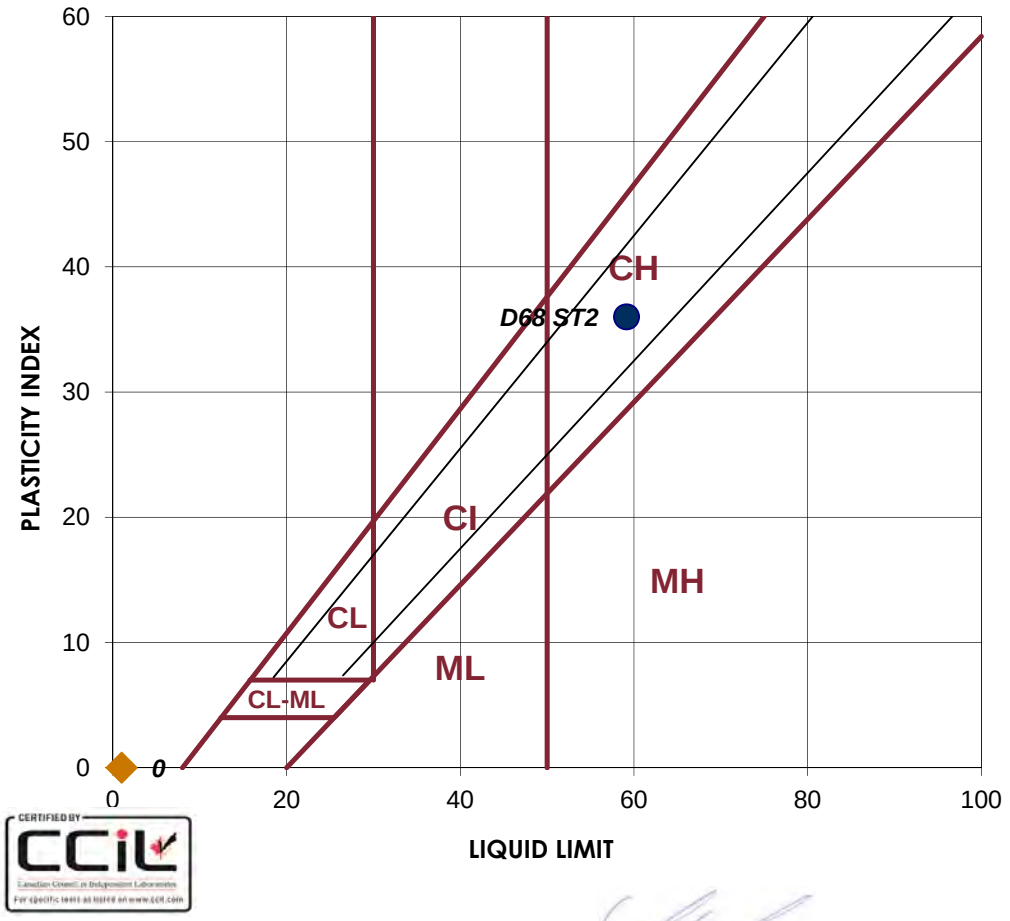
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D68 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 26 | Number of Blows | | |
| | | Container Number | | |
| 24.40 | 26.60 | Wt. Sample (wet+tare)(g) | | |
| 15.89 | 17.31 | Wt. Sample (dry+tare)(g) | | |
| 1.58 | 1.52 | Wt. Tare (g) | | |
| 14.3 | 15.8 | Wt. Dry Soil (g) | | |
| 8.5 | 9.3 | Wt. Water (g) | | |
| 59.5% | 58.8% | Water Content (%) | | |
| 59.2% | 59.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.73 | 26.04 | Wt. Sample (wet+tare)(g) | | |
| 24.29 | 23.73 | Wt. Sample (dry+tare)(g) | | |
| 13.76 | 13.83 | Wt. Tare (g) | | |
| 10.5 | 9.9 | Wt. Dry Soil (g) | | |
| 2.4 | 2.3 | Wt. Water (g) | | |
| 23.2% | 23.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 59 | | LL | |
| PL | 23 | | PL | |
| PI | 36 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 8, 2016 |
| Date Tested: | September 14, 2016 |
| Tested By: | C. Small |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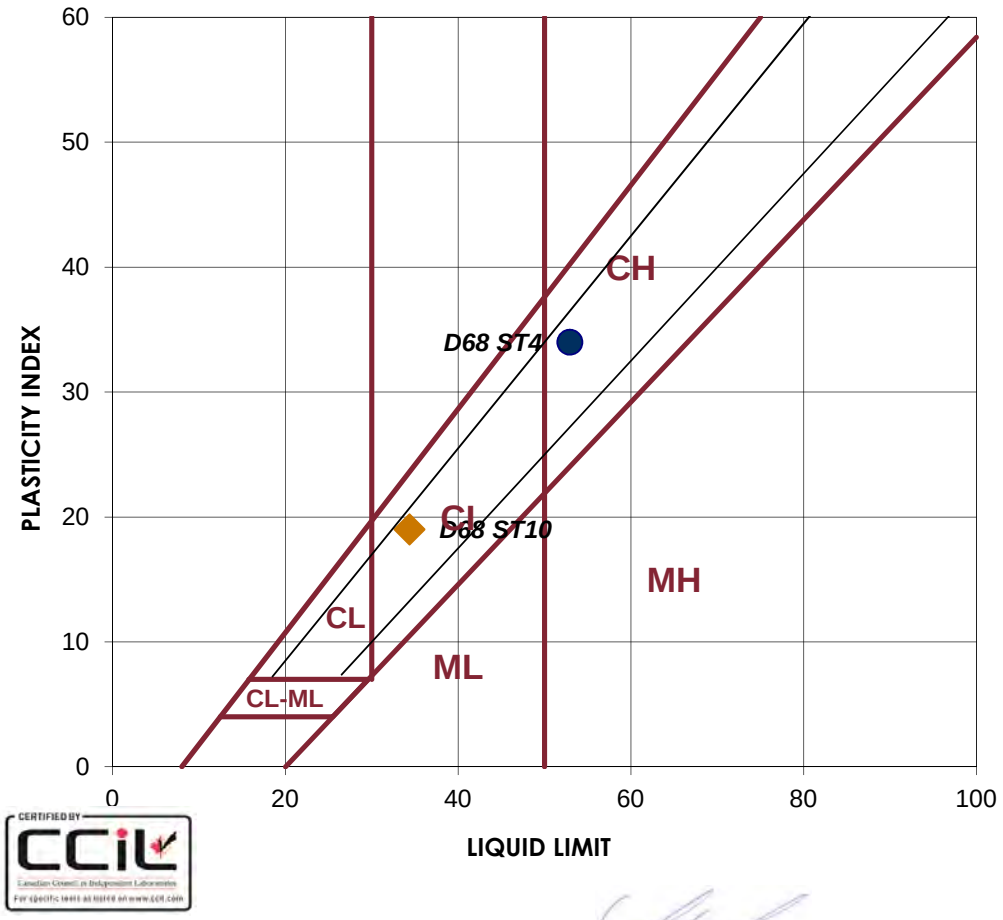
| Sample: D68 ST4 | | | Sample: D68 ST10 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 29 | Number of Blows | 22 | 24 |
| | | Container Number | | |
| 22.32 | 20.86 | Wt. Sample (wet+tare)(g) | 26.04 | 28.16 |
| 15.19 | 14.23 | Wt. Sample (dry+tare)(g) | 19.67 | 21.33 |
| 1.48 | 1.54 | Wt. Tare (g) | 1.35 | 1.63 |
| 13.7 | 12.7 | Wt. Dry Soil (g) | 18.3 | 19.7 |
| 7.1 | 6.6 | Wt. Water (g) | 6.4 | 6.8 |
| 52.0% | 52.2% | Water Content (%) | 34.8% | 34.7% |
| 52.7% | 53.2% | Corrected Water Content (%) | 34.2% | 34.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.2 | 22.25 | Wt. Sample (wet+tare)(g) | 25.62 | 25 |
| 23.4 | 20.93 | Wt. Sample (dry+tare)(g) | 24.12 | 23.54 |
| 13.77 | 13.76 | Wt. Tare (g) | 13.78 | 13.73 |
| 9.6 | 7.2 | Wt. Dry Soil (g) | 10.3 | 9.8 |
| 1.8 | 1.3 | Wt. Water (g) | 1.5 | 1.5 |
| 18.7% | 18.4% | Water Content (%) | 14.5% | 14.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 53 | | LL | 34 |
| PL | 19 | | PL | 15 |
| PI | 34 | | PI | 19 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CI | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 8, 2016 |
| Date Tested: | September 14, 2016 |
| Tested By: | B. Pelkey |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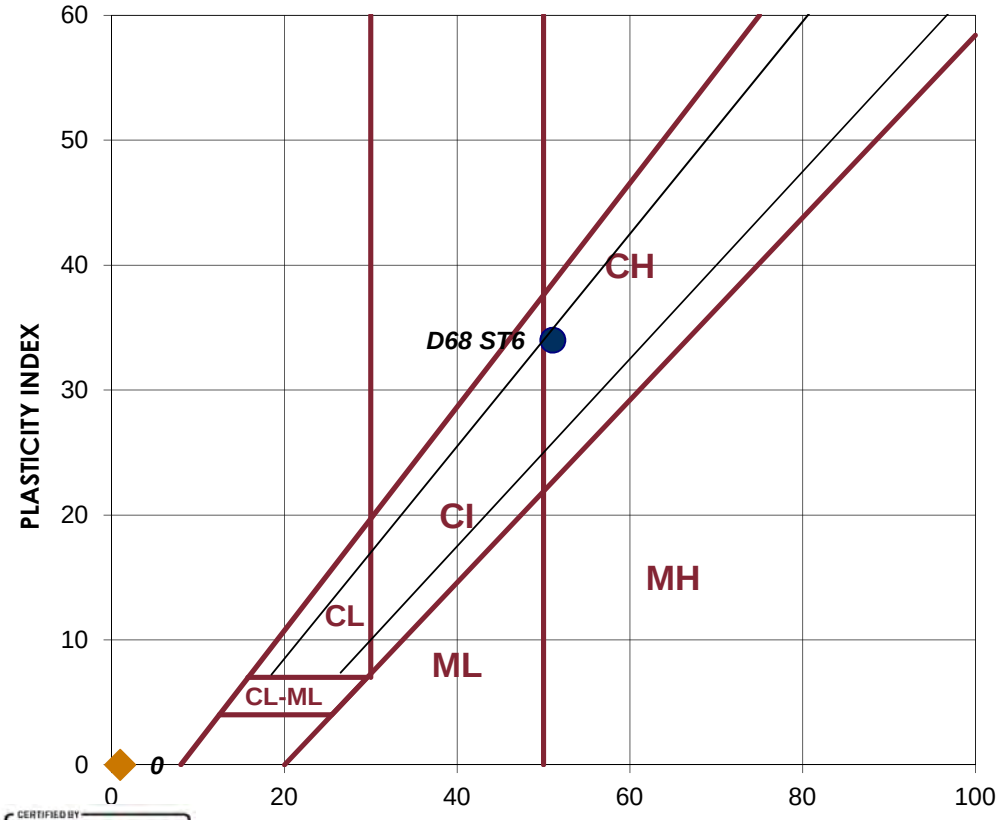
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| D68 ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 28 | Number of Blows | | |
| | | Container Number | | |
| 25.62 | 29.26 | Wt. Sample (wet+tare)(g) | | |
| 17.50 | 19.89 | Wt. Sample (dry+tare)(g) | | |
| 1.36 | 1.25 | Wt. Tare (g) | | |
| 16.1 | 18.6 | Wt. Dry Soil (g) | | |
| 8.1 | 9.4 | Wt. Water (g) | | |
| 50.3% | 50.3% | Water Content (%) | | |
| 51.2% | 51.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.33 | 28.22 | Wt. Sample (wet+tare)(g) | | |
| 22.78 | 26.06 | Wt. Sample (dry+tare)(g) | | |
| 13.79 | 13.81 | Wt. Tare (g) | | |
| 9.0 | 12.3 | Wt. Dry Soil (g) | | |
| 1.6 | 2.2 | Wt. Water (g) | | |
| 17.2% | 17.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 51 | | LL | |
| PL | 17 | | PL | |
| PI | 34 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH-CI*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 9, 2016 |
| Date Tested: | November 2, 2016 |
| Tested By: | C. Woods |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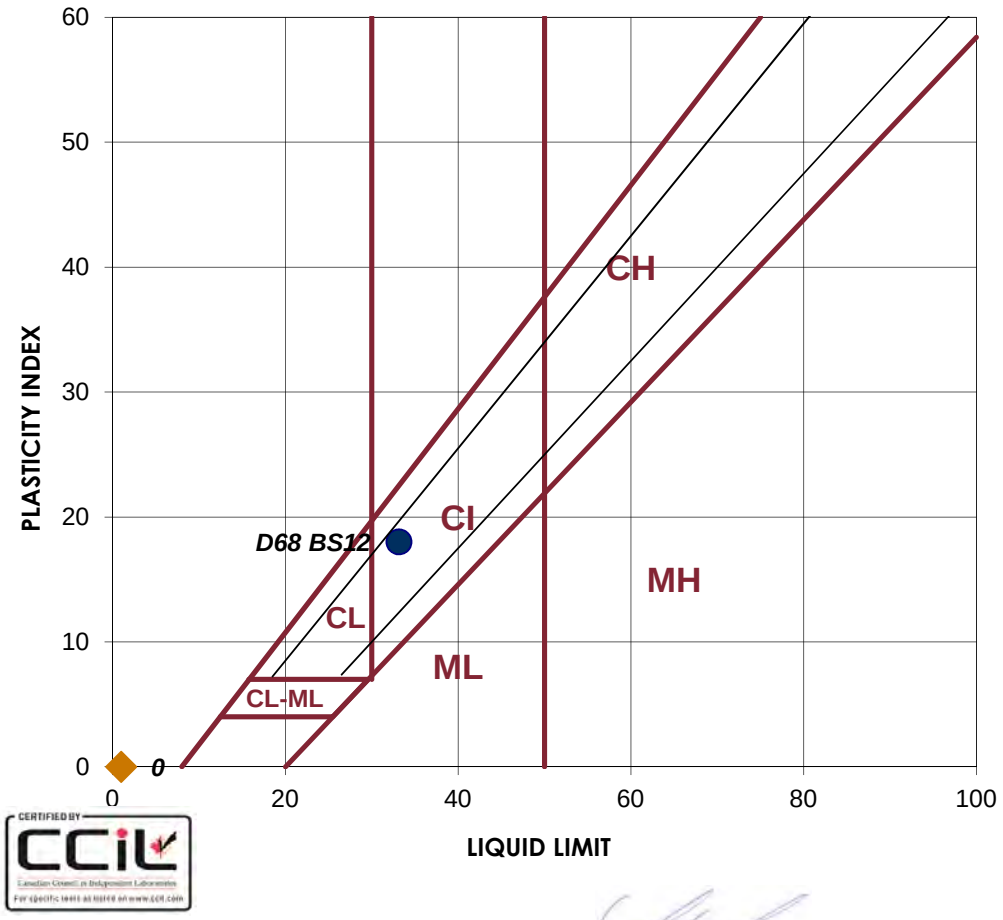
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D68 BS12 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | | |
| | | Container Number | | |
| 27.44 | 27.77 | Wt. Sample (wet+tare)(g) | | |
| 20.88 | 21.19 | Wt. Sample (dry+tare)(g) | | |
| 1.18 | 1.37 | Wt. Tare (g) | | |
| 19.7 | 19.8 | Wt. Dry Soil (g) | | |
| 6.6 | 6.6 | Wt. Water (g) | | |
| 33.3% | 33.2% | Water Content (%) | | |
| 33.3% | 33.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.53 | 25.59 | Wt. Sample (wet+tare)(g) | | |
| 26.58 | 24.05 | Wt. Sample (dry+tare)(g) | | |
| 13.8 | 13.77 | Wt. Tare (g) | | |
| 12.8 | 10.3 | Wt. Dry Soil (g) | | |
| 2.0 | 1.5 | Wt. Water (g) | | |
| 15.3% | 15.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | |
| PL | 15 | | PL | |
| PI | 18 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 8, 2016 |
| Date Tested: | September 12, 2016 |
| Tested By: | B. Pelkey |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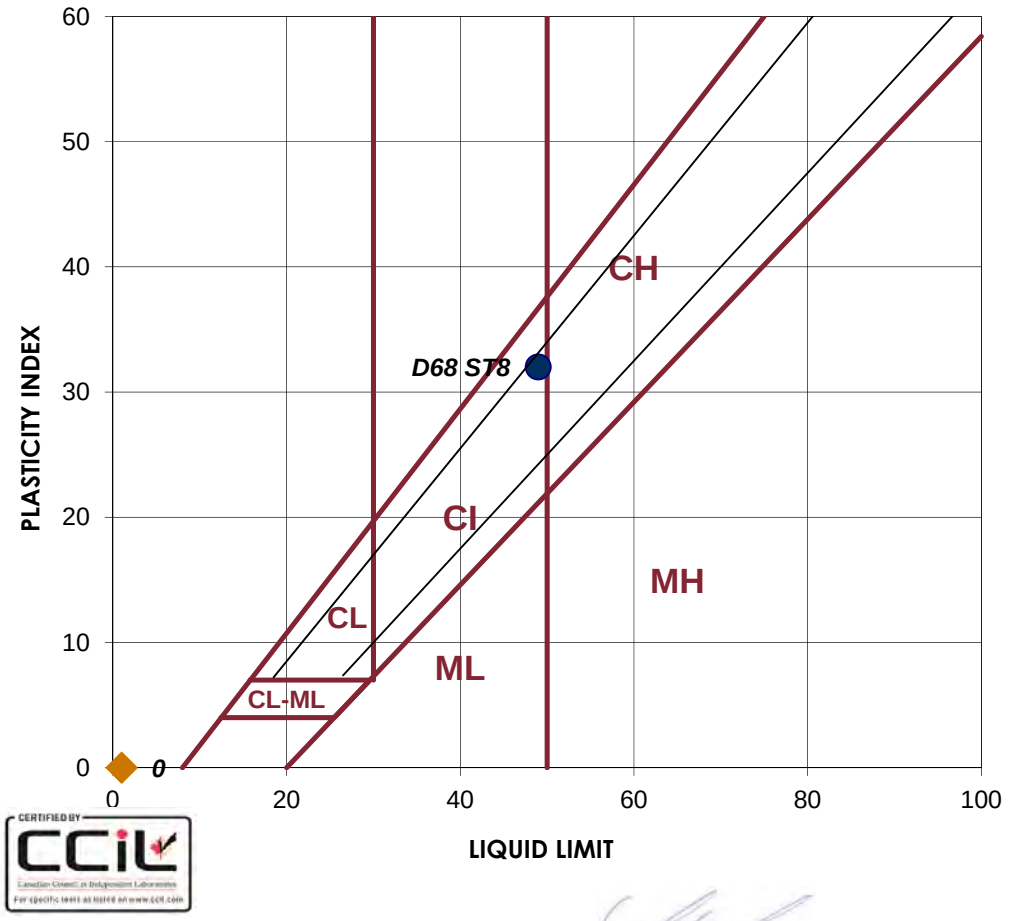
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D68 ST8 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 27 | Number of Blows | | |
| | | Container Number | | |
| 29.02 | 25.06 | Wt. Sample (wet+tare)(g) | | |
| 20.03 | 17.32 | Wt. Sample (dry+tare)(g) | | |
| 1.50 | 1.23 | Wt. Tare (g) | | |
| 18.5 | 16.1 | Wt. Dry Soil (g) | | |
| 9.0 | 7.7 | Wt. Water (g) | | |
| 48.5% | 48.1% | Water Content (%) | | |
| 49.4% | 48.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 30.14 | 25.05 | Wt. Sample (wet+tare)(g) | | |
| 27.8 | 23.41 | Wt. Sample (dry+tare)(g) | | |
| 13.87 | 13.77 | Wt. Tare (g) | | |
| 13.9 | 9.6 | Wt. Dry Soil (g) | | |
| 2.3 | 1.6 | Wt. Water (g) | | |
| 16.8% | 17.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 49 | | LL | |
| PL | 17 | | PL | |
| PI | 32 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CI-CH** | | | **NON-PLASTIC** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.230 |
| Date Received: | August 8, 2016 |
| Date Tested: | September 12, 2016 |
| Tested By: | B. Pelkey |


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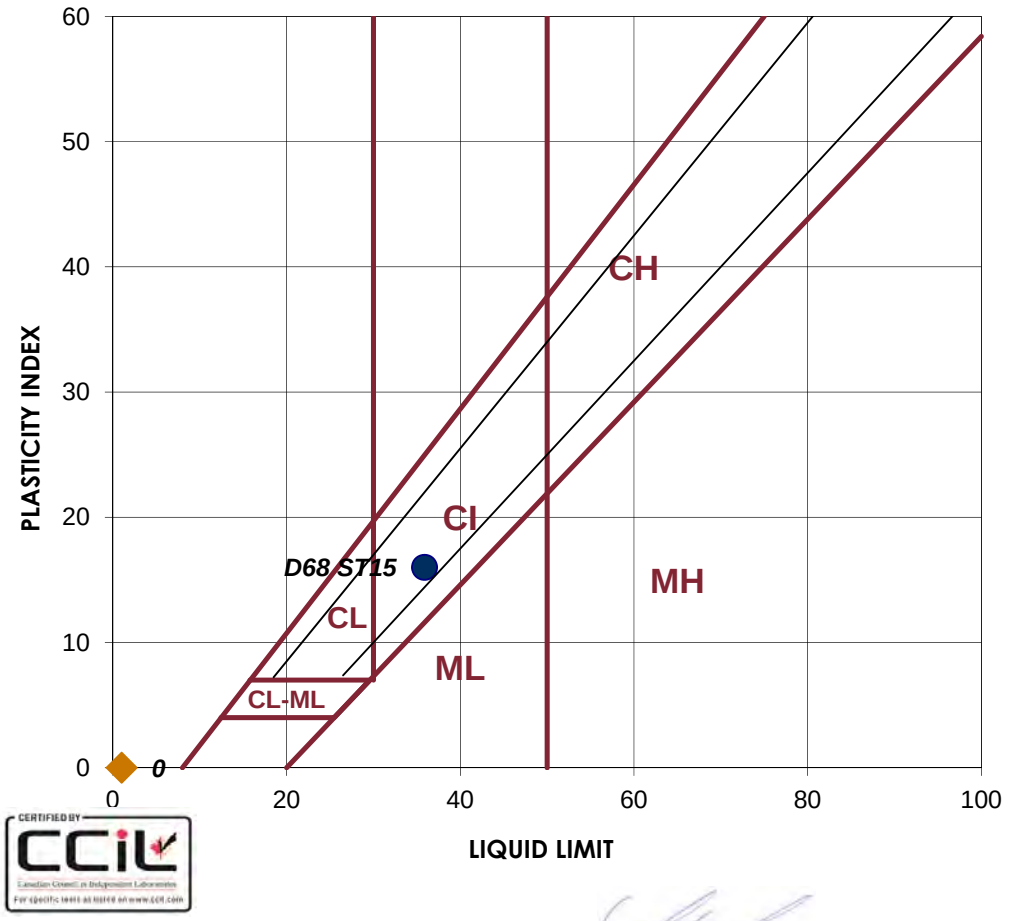
| Sample: | | | Sample: | |
|---|---|---|---|---|
| D68 ST15 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | | |
| | | Container Number | | |
| 23.14 | 23.44 | Wt. Sample (wet+tare)(g) | | |
| 17.35 | 17.59 | Wt. Sample (dry+tare)(g) | | |
| 1.25 | 1.25 | Wt. Tare (g) | | |
| 16.1 | 16.3 | Wt. Dry Soil (g) | | |
| 5.8 | 5.9 | Wt. Water (g) | | |
| 36.0% | 35.8% | Water Content (%) | | |
| 36.0% | 35.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.96 | 27.41 | Wt. Sample (wet+tare)(g) | | |
| 25.2 | 25.57 | Wt. Sample (dry+tare)(g) | | |
| 13.85 | 13.72 | Wt. Tare (g) | | |
| 11.4 | 11.9 | Wt. Dry Soil (g) | | |
| 2.8 | 1.8 | Wt. Water (g) | | |
| 24.3% | 15.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | |
| PL | 20 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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Stantec

# Carbonate Content of Soils

ASTM D4373

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Tested By: B.Pelkey
Date Tested: 11-04-16

| Sample ID | Carbonate Conent (%) |
|---|---|
| D30 SS3 | 26.1% |
| D30 SS23 | 14.9% |
| | |
| | |
| | |
| | |
| | |



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Stantec

# Carbonate Content of Soils

ASTM D4373

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Tested By: B.Pelkey
Date Tested: 11-03-16

| Sample ID | Carbonate Conent (%) |
|---|---|
| D30 BS19 | 13.9% |
| D30 SS11 | 28.0% |
| | |
| | |
| | |
| | |
| | |



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Stantec

# Carbonate Content of Soils

ASTM D4373

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Tested By: B.Pelkey
Date Tested: 11-02-16

| Sample ID | Carbonate Conent (%) |
|---|---|
| D42 SS3 | 24.2% |
| D42 SS7 | 18.6% |
| | |
| | |
| | |
| | |
| | |



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# Carbonate Content of Soils

ASTM D4373

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230
Tested By: B. Pelkey
Date Tested: July 29, 2016

| Sample ID | Carbonate Content (%) |
|---|---|
| D59-ST13 | 35.5% |
| | |
| | |
| | |
| | |
| | |
| | |



Reviewed by: _____

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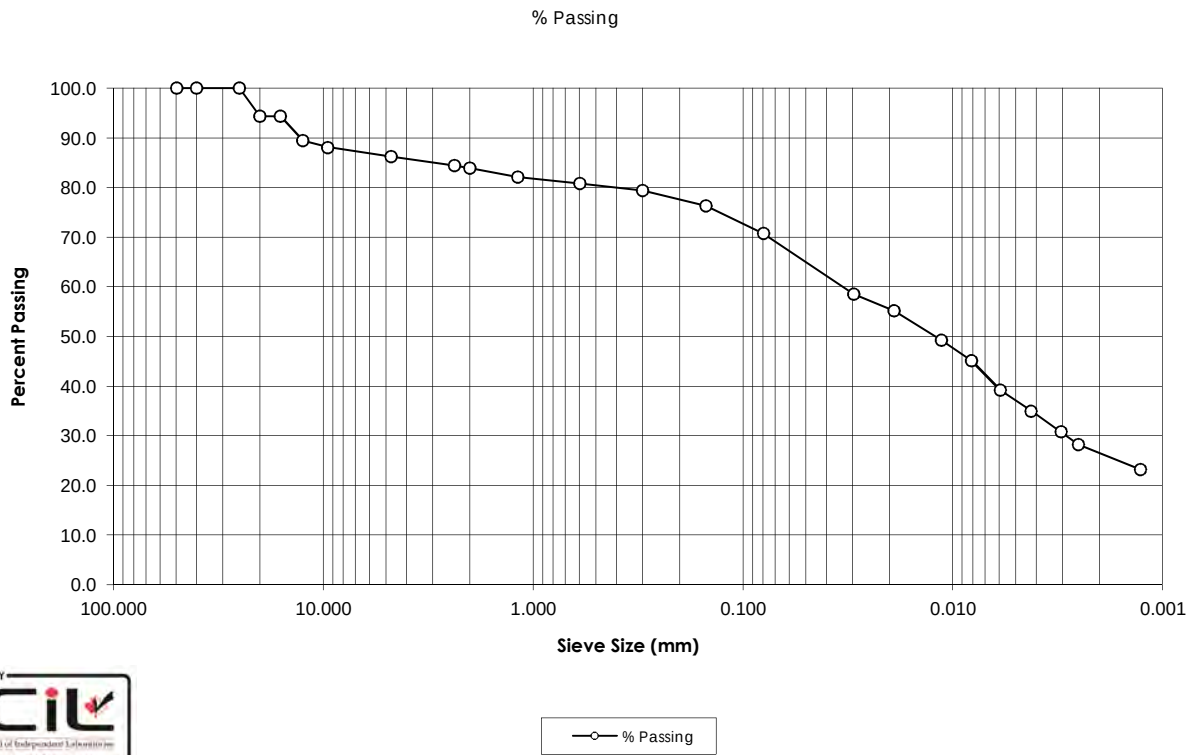
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS15
SOURCE: D2
TESTED BY: C. Oost

DATE TESTED: July 4, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay (CI-CL), Some Sand, Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 39.2 |
| 40.0 | 100.0 | 0.0042 | 35.0 |
| 25.0 | 100.0 | 0.0031 | 30.8 |
| 20.0 | 94.3 | 0.0025 | 28.3 |
| 16.0 | 94.3 | 0.0013 | 23.2 |
| 12.5 | 89.5 | | |
| 9.5 | 88.1 | | |
| 4.75 | 86.2 | | |
| 2.36 | 84.4 | | |
| 2.00 | 83.9 | | |
| 1.18 | 82.2 | | |
| 0.600 | 80.8 | | |
| 0.300 | 79.5 | | |
| 0.150 | 76.3 | | |
| 0.080 | 70.8 | | |
| 0.0295 | 58.6 | | |
| 0.0190 | 55.2 | | |
| 0.0113 | 49.3 | | |
| 0.0081 | 45.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 13.8% | $D_{10}$: | - |
| Sand: | 15.4% | $D_{30}$: | 0.0029 |
| Silt: | 44.2% | $D_{60}$: | 0.0360 |
| Clay: | 26.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:**



Reviewed by:

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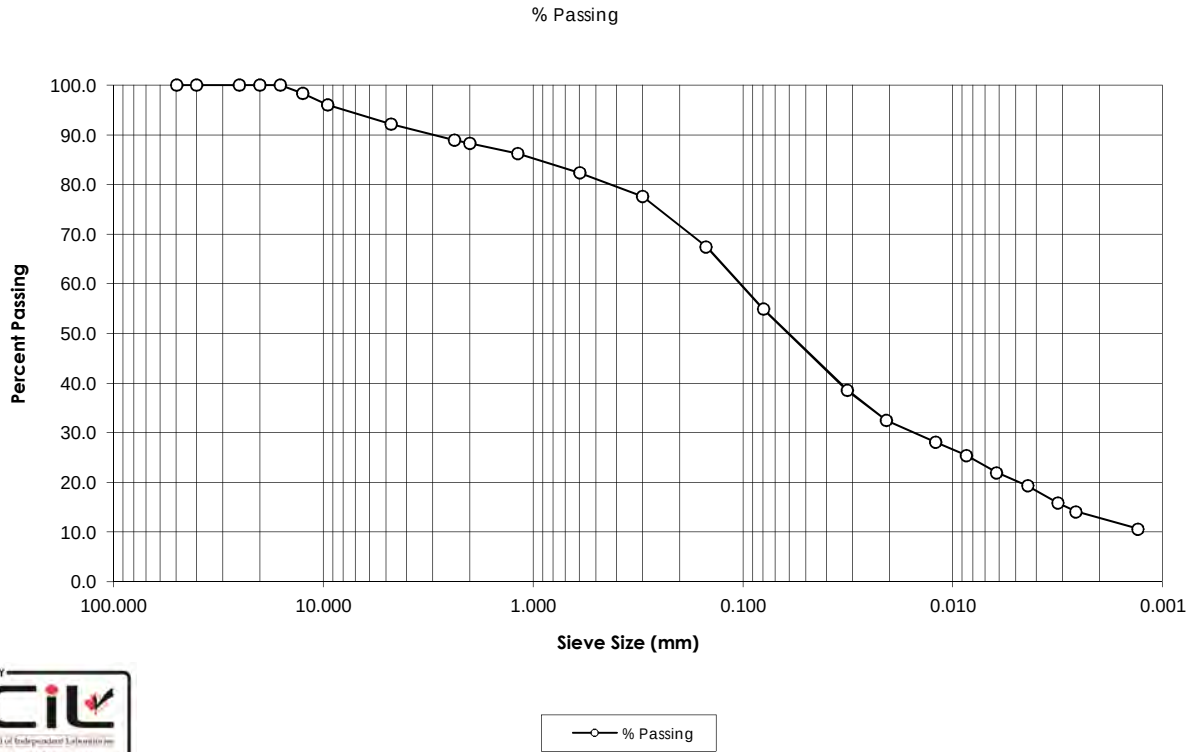
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS22
SOURCE: D2
TESTED BY: B. Pelkey

DATE TESTED: June 27, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay and Sand (CL-ML) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 22.0 |
| 40.0 | 100.0 | 0.0044 | 19.4 |
| 25.0 | 100.0 | 0.0031 | 15.9 |
| 20.0 | 100.0 | 0.0026 | 14.1 |
| 16.0 | 100.0 | 0.0013 | 10.6 |
| 12.5 | 98.3 | | |
| 9.5 | 96.1 | | |
| 4.75 | 92.2 | | |
| 2.36 | 88.9 | | |
| 2.00 | 88.3 | | |
| 1.18 | 86.3 | | |
| 0.600 | 82.4 | | |
| 0.300 | 77.6 | | |
| 0.150 | 67.5 | | |
| 0.080 | 55.0 | | |
| 0.0317 | 38.6 | | |
| 0.0207 | 32.4 | | |
| 0.0121 | 28.1 | | |
| 0.0086 | 25.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.8% | $D_{10}$: | - |
| Sand: | 37.3% | $D_{30}$: | 0.0160 |
| Silt: | 42.1% | $D_{60}$: | 0.1099 |
| Clay: | 12.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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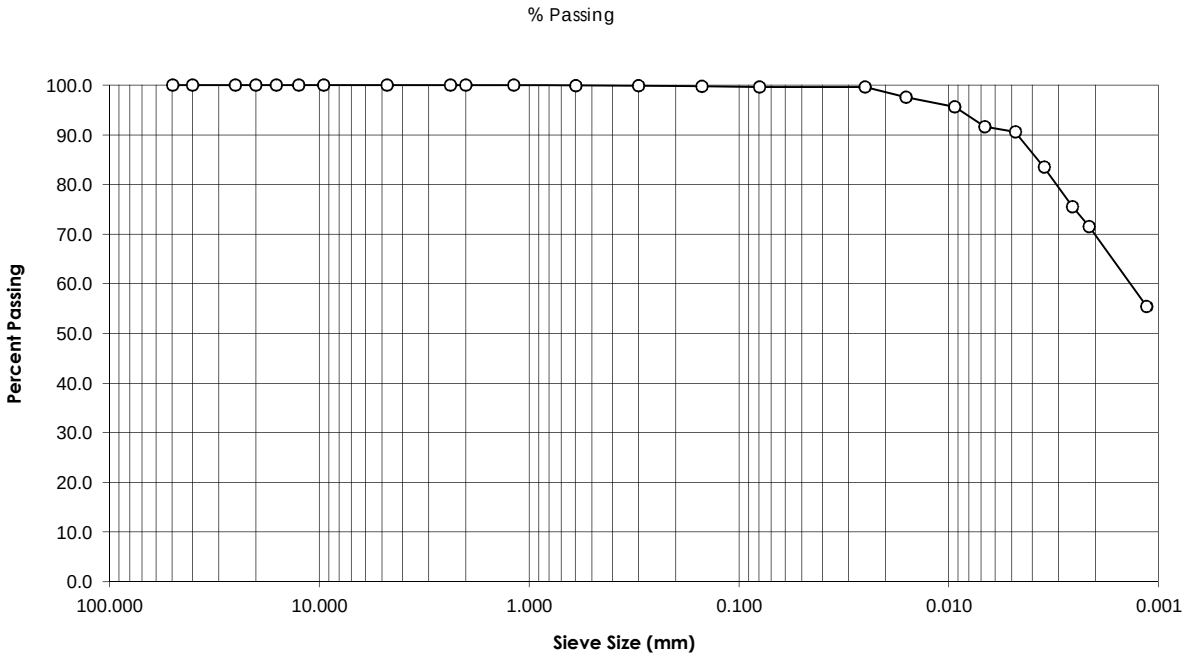
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D2
TESTED BY: B. Pelkey

DATE TESTED: June 29, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0048 | 90.6 |
| 40.0 | 100.0 | 0.0035 | 83.6 |
| 25.0 | 100.0 | 0.0026 | 75.5 |
| 20.0 | 100.0 | 0.0021 | 71.5 |
| 16.0 | 100.0 | 0.0011 | 55.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.8 | | |
| 0.080 | 99.7 | | |
| 0.0251 | 99.6 | | |
| 0.0160 | 97.6 | | |
| 0.0093 | 95.6 | | |
| 0.0067 | 91.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.3% | $D_{30}$: | - |
| Silt: | 29.9% | $D_{60}$: | 0.0015 |
| Clay: | 69.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. Stantec is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of Stantec.

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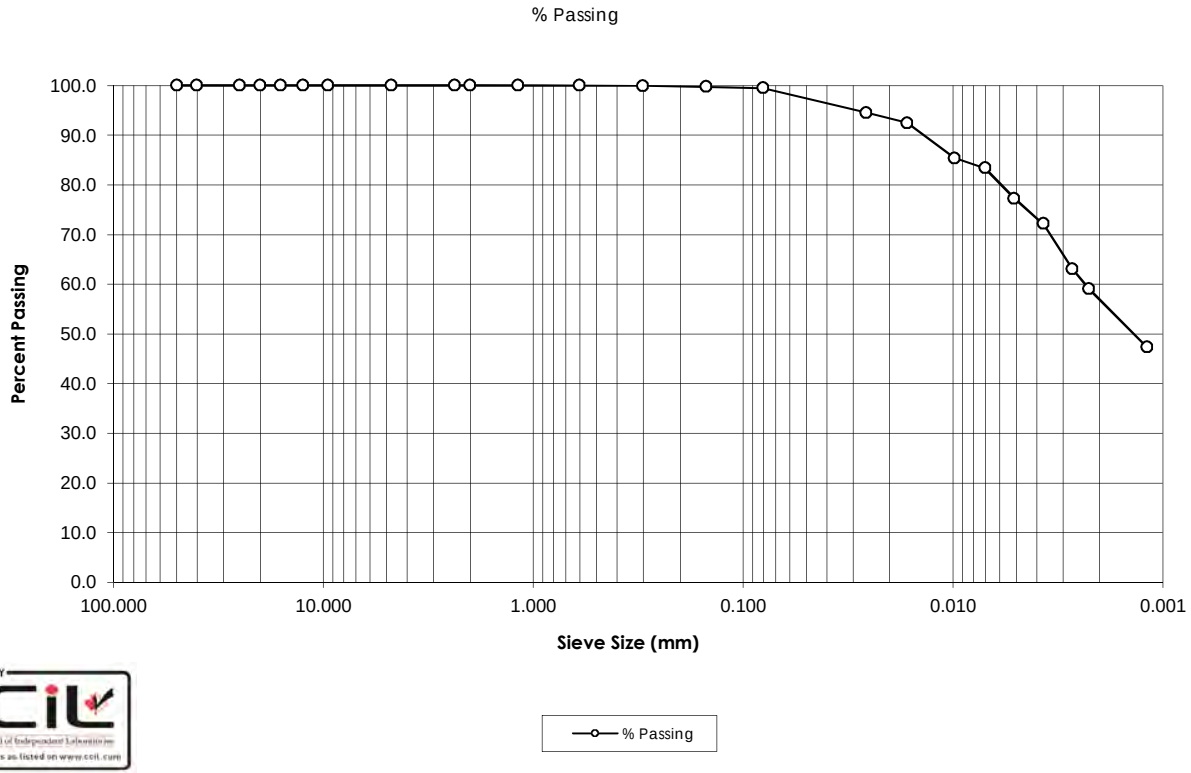
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST2
SOURCE: D3
TESTED BY: J. Upham

DATE TESTED: September 1, 2016
DATE RECEIVED: June 29, 2016
SAMPLE DESCRIPTION: Clay (CI)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 77.3 |
| 40.0 | 100.0 | 0.0037 | 72.2 |
| 25.0 | 100.0 | 0.0027 | 63.1 |
| 20.0 | 100.0 | 0.0022 | 59.0 |
| 16.0 | 100.0 | 0.0012 | 47.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.8 | | |
| 0.080 | 99.5 | | |
| 0.0259 | 94.5 | | |
| 0.0165 | 92.5 | | |
| 0.0098 | 85.4 | | |
| 0.0070 | 83.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.5% | $D_{30}$: | - |
| Silt: | 42.6% | $D_{60}$: | 0.0024 |
| Clay: | 56.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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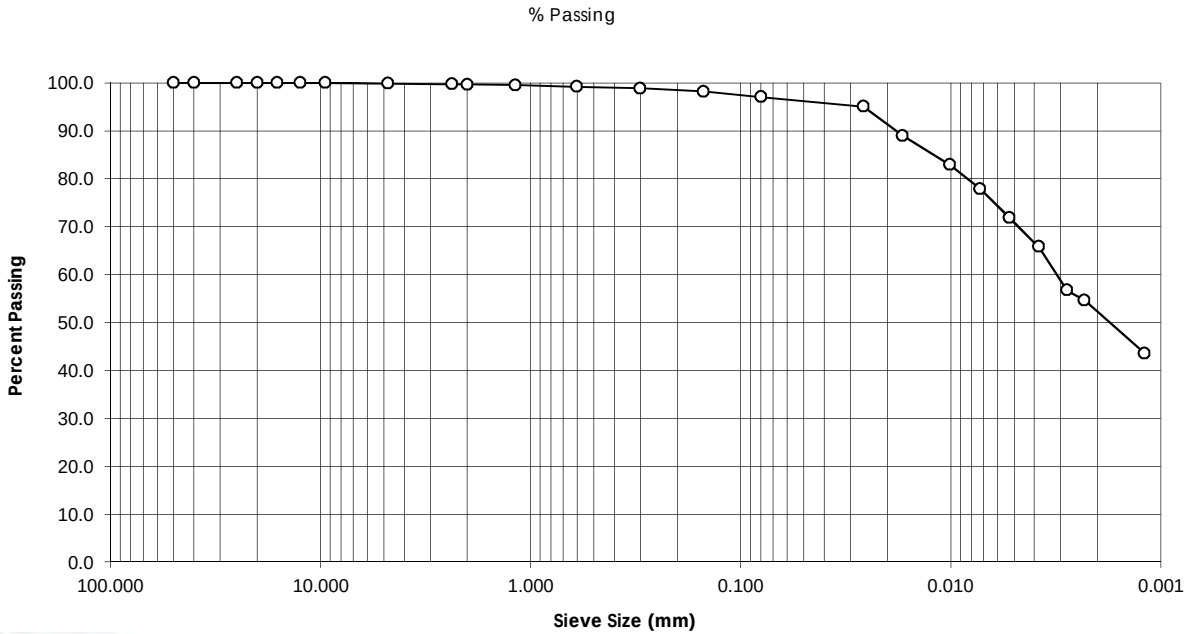
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D3
TESTED BY: C.Oost

DATE TESTED: August 9, 2016
DATE RECEIVED: June 29, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0052** | **71.8** |
| **40.0** | **100.0** | **0.0038** | **65.8** |
| **25.0** | **100.0** | **0.0028** | **56.7** |
| **20.0** | **100.0** | **0.0023** | **54.7** |
| **16.0** | **100.0** | **0.0012** | **43.6** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.9** | | |
| **2.36** | **99.7** | | |
| **2.00** | **99.7** | | |
| **1.18** | **99.5** | | |
| **0.600** | **99.2** | | |
| **0.300** | **98.9** | | |
| **0.150** | **98.2** | | |
| **0.080** | **97.1** | | |
| **0.0259** | **95.0** | | |
| **0.0169** | **89.0** | | |
| **0.0100** | **82.9** | | |
| **0.0072** | **77.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.1% | $D_{10}$: | - |
| Sand: | 2.8% | $D_{30}$: | - |
| Silt: | 44.8% | $D_{60}$: | 0.0032 |
| Clay: | 52.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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Stantec

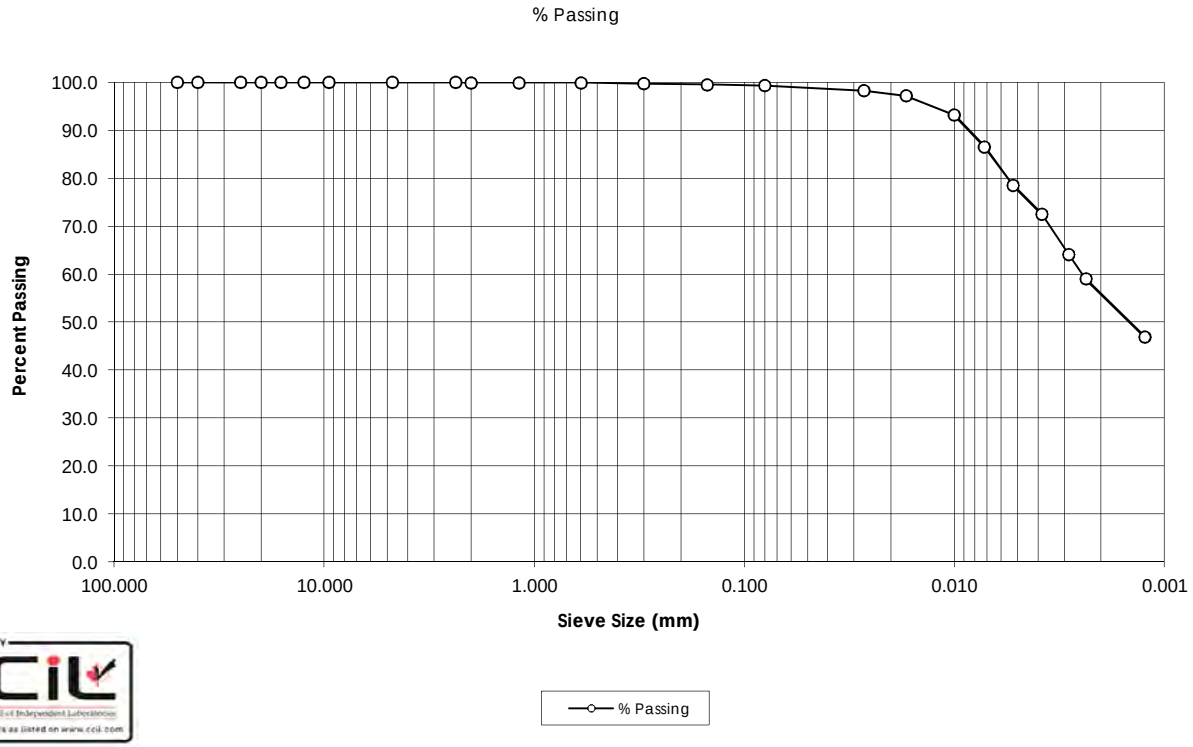
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS2
SOURCE: D5
TESTED BY: J. Upham

DATE TESTED: May 18, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0053** | **78.5** |
| **40.0** | **100.0** | **0.0038** | **72.5** |
| **25.0** | **100.0** | **0.0028** | **64.0** |
| **20.0** | **100.0** | **0.0024** | **59.0** |
| **16.0** | **100.0** | **0.0012** | **46.9** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.9** | | |
| **0.600** | **99.9** | | |
| **0.300** | **99.7** | | |
| **0.150** | **99.5** | | |
| **0.080** | **99.3** | | |
| **0.0269** | **98.3** | | |
| **0.0170** | **97.3** | | |
| **0.0100** | **93.2** | | |
| **0.0072** | **86.6** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.7% | $D_{30}$: | - |
| Silt: | 43.5% | $D_{60}$: | 0.0025 |
| Clay: | 55.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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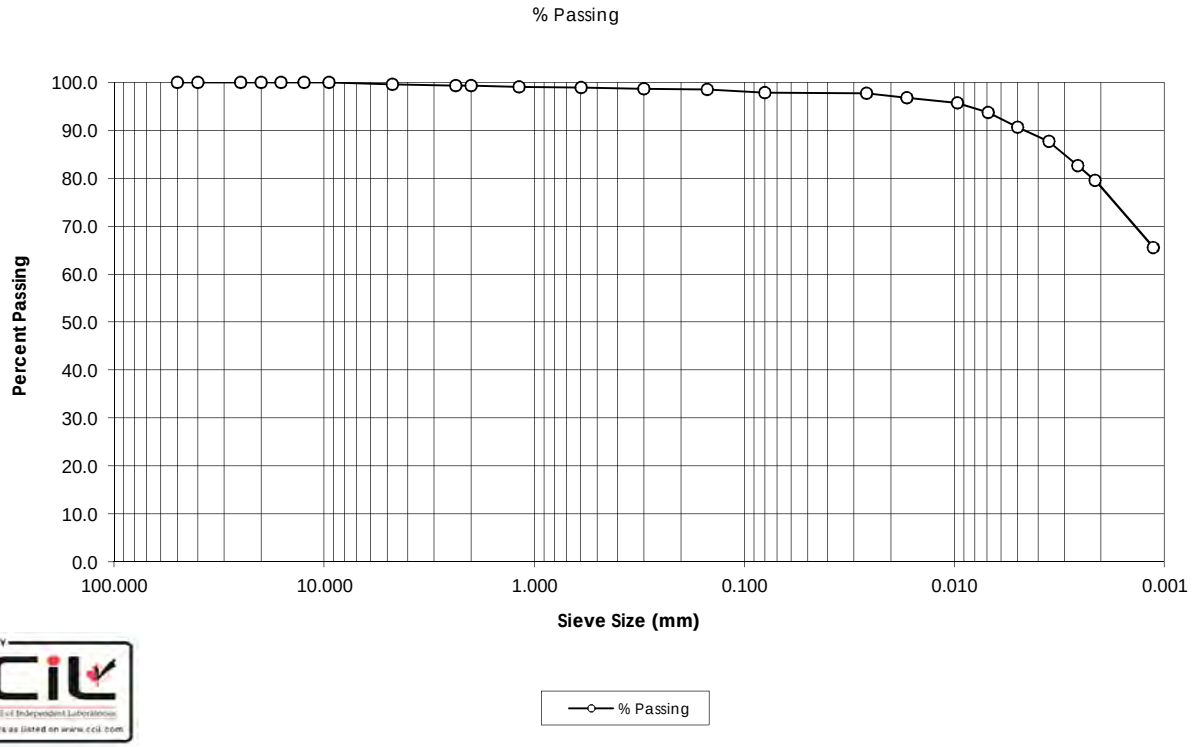
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS6
SOURCE: D5
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0050** | **90.7** |
| **40.0** | **100.0** | **0.0036** | **87.7** |
| **25.0** | **100.0** | **0.0026** | **82.6** |
| **20.0** | **100.0** | **0.0021** | **79.6** |
| **16.0** | **100.0** | **0.0011** | **65.5** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.6** | | |
| **2.36** | **99.4** | | |
| **2.00** | **99.3** | | |
| **1.18** | **99.1** | | |
| **0.600** | **98.9** | | |
| **0.300** | **98.7** | | |
| **0.150** | **98.5** | | |
| **0.080** | **97.9** | | |
| **0.0262** | **97.8** | | |
| **0.0168** | **96.8** | | |
| **0.0097** | **95.7** | | |
| **0.0069** | **93.7** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 1.6% | $D_{30}$: | - |
| Silt: | 19.8% | $D_{60}$: | - |
| Clay: | 78.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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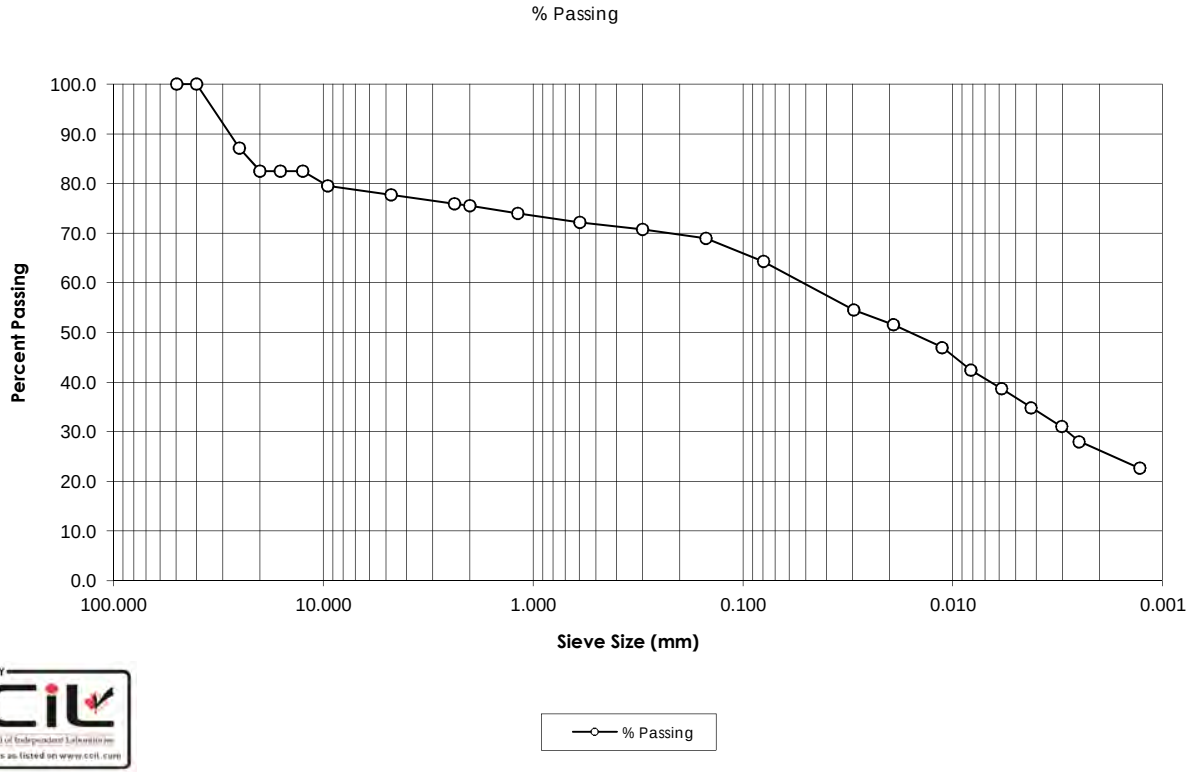
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS9
SOURCE: D5
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Gravely Clay (CI) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 38.7 |
| 40.0 | 100.0 | 0.0042 | 34.9 |
| 25.0 | 87.1 | 0.0030 | 31.1 |
| 20.0 | 82.5 | 0.0025 | 28.0 |
| 16.0 | 82.5 | 0.0013 | 22.7 |
| 12.5 | 82.5 | | |
| 9.5 | 79.5 | | |
| 4.75 | 77.8 | | |
| 2.36 | 75.9 | | |
| 2.00 | 75.5 | | |
| 1.18 | 74.0 | | |
| 0.600 | 72.2 | | |
| 0.300 | 70.8 | | |
| 0.150 | 69.0 | | |
| 0.080 | 64.4 | | |
| 0.0296 | 54.6 | | |
| 0.0191 | 51.5 | | |
| 0.0112 | 47.0 | | |
| 0.0082 | 42.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 22.2% | $D_{10}$: | - |
| Sand: | 13.4% | $D_{30}$: | 0.0028 |
| Silt: | 38.1% | $D_{60}$: | 0.0585 |
| Clay: | 26.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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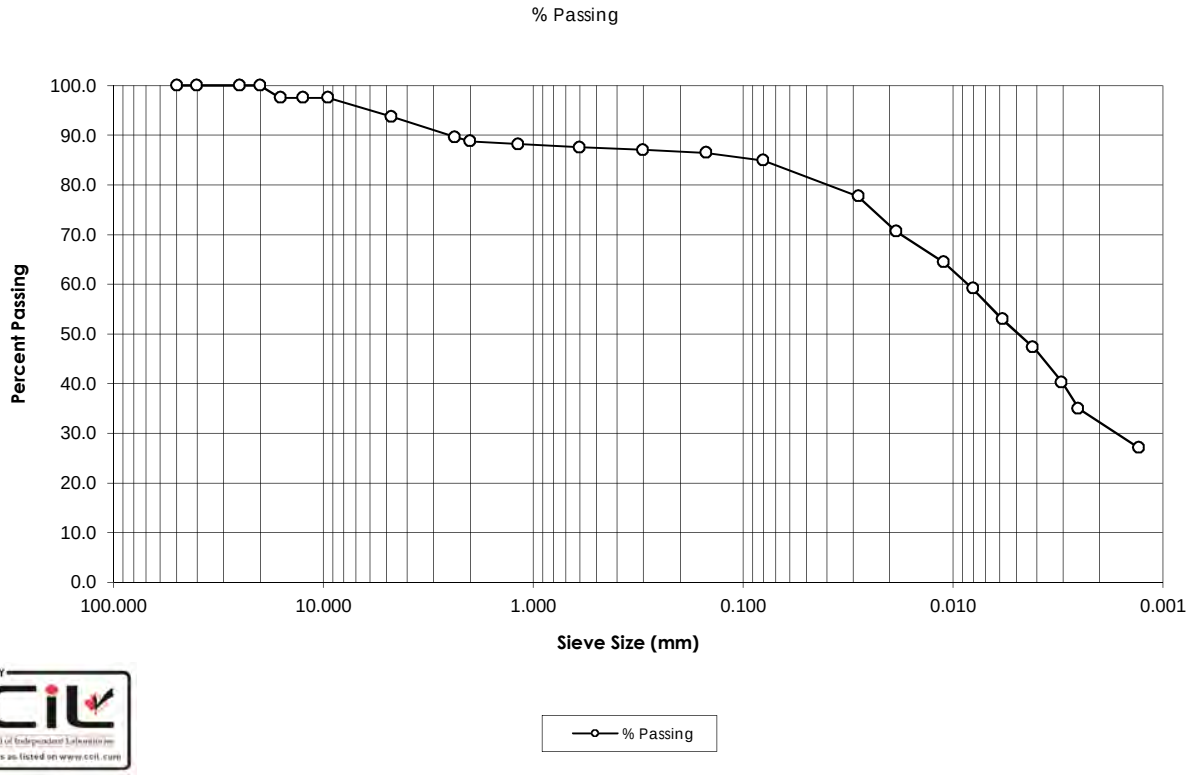
SAMPLE No.: ST10
SOURCE: D5
TESTED BY: B. Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 53.0 |
| 40.0 | 100.0 | 0.0042 | 47.3 |
| 25.0 | 100.0 | 0.0030 | 40.3 |
| 20.0 | 100.0 | 0.0025 | 35.0 |
| 16.0 | 97.5 | 0.0013 | 27.0 |
| 12.5 | 97.5 | | |
| 9.5 | 97.5 | | |
| 4.75 | 93.8 | | |
| 2.36 | 89.6 | | |
| 2.00 | 88.8 | | |
| 1.18 | 88.2 | | |
| 0.600 | 87.6 | | |
| 0.300 | 87.1 | | |
| 0.150 | 86.4 | | |
| 0.080 | 84.9 | | |
| 0.0282 | 77.7 | | |
| 0.0186 | 70.6 | | |
| 0.0111 | 64.5 | | |
| 0.0080 | 59.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.2% | $D_{10}$: | - |
| Sand: | 8.8% | $D_{30}$: | 0.0018 |
| Silt: | 52.7% | $D_{60}$: | 0.0085 |
| Clay: | 32.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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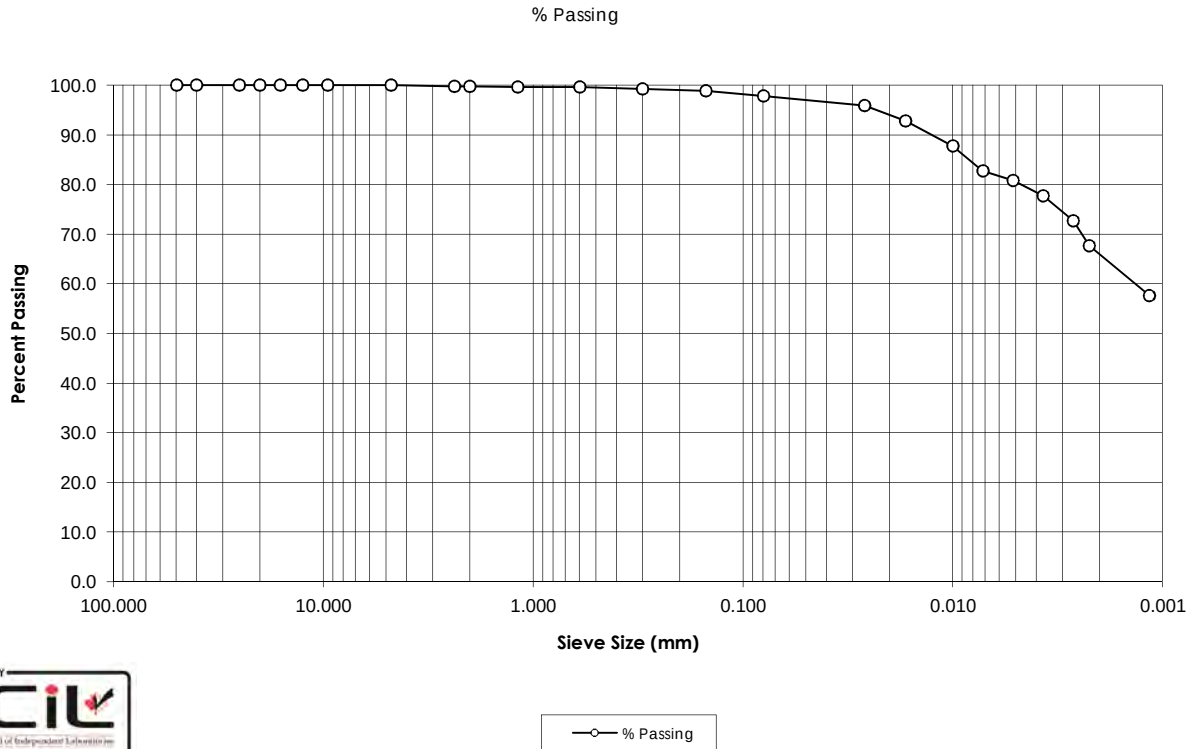
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS2
SOURCE: D6
TESTED BY: B. Pelkey

DATE TESTED: June 20, 2016
DATE RECEIVED: May 1, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 80.8 |
| 40.0 | 100.0 | 0.0037 | 77.8 |
| 25.0 | 100.0 | 0.0027 | 72.8 |
| 20.0 | 100.0 | 0.0022 | 67.7 |
| 16.0 | 100.0 | 0.0012 | 57.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.8 | | |
| 2.00 | 99.8 | | |
| 1.18 | 99.6 | | |
| 0.600 | 99.6 | | |
| 0.300 | 99.2 | | |
| 0.150 | 98.8 | | |
| 0.080 | 97.8 | | |
| 0.0262 | 95.9 | | |
| 0.0168 | 92.8 | | |
| 0.0100 | 87.8 | | |
| 0.0072 | 82.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.2% | $D_{30}$: | - |
| Silt: | 31.7% | $D_{60}$: | 0.0014 |
| Clay: | 66.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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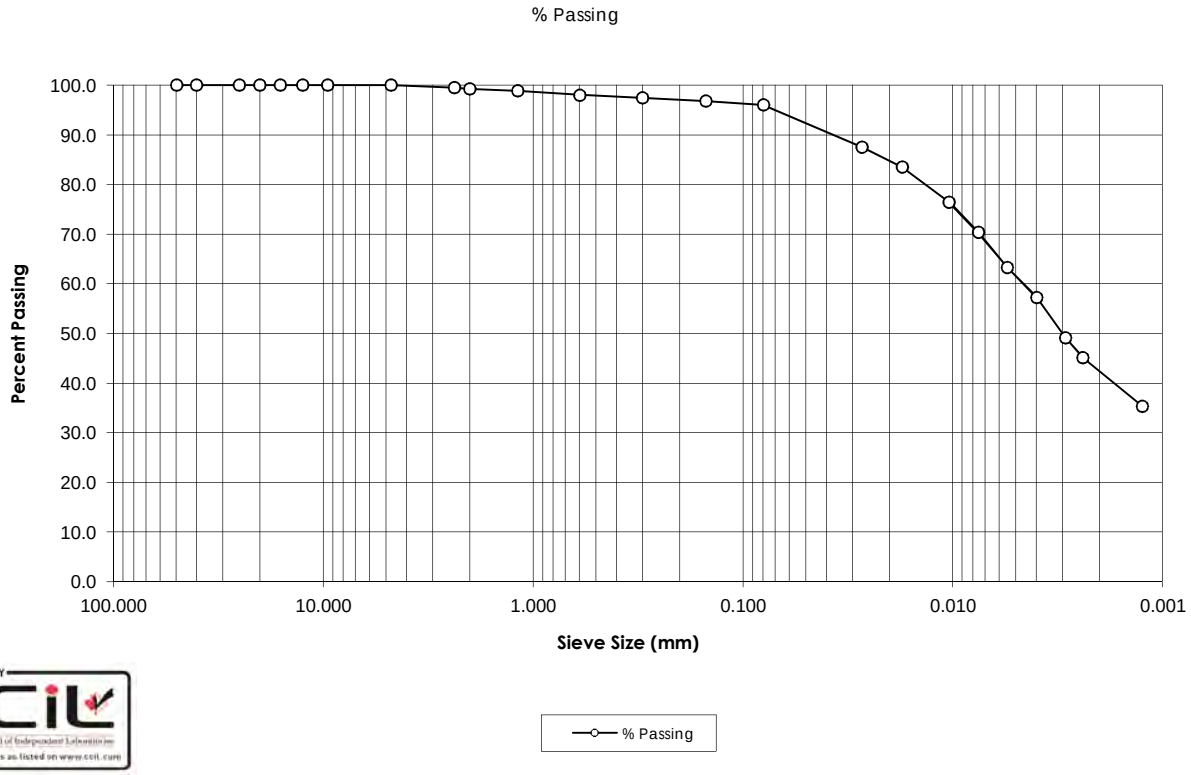
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS7
SOURCE: D6
TESTED BY: B. Pelkey

DATE TESTED: June 20, 2016
DATE RECEIVED: May 1, 2016
SAMPLE DESCRIPTION: Clay (Cl) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 63.3 |
| 40.0 | 100.0 | 0.0040 | 57.2 |
| 25.0 | 100.0 | 0.0029 | 49.1 |
| 20.0 | 100.0 | 0.0024 | 45.1 |
| 16.0 | 100.0 | 0.0013 | 35.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.5 | | |
| 2.00 | 99.3 | | |
| 1.18 | 98.8 | | |
| 0.600 | 98.0 | | |
| 0.300 | 97.4 | | |
| 0.150 | 96.8 | | |
| 0.080 | 96.0 | | |
| 0.0271 | 87.6 | | |
| 0.0174 | 83.5 | | |
| 0.0104 | 76.4 | | |
| 0.0076 | 70.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 4.0% | $D_{30}$: | - |
| Silt: | 53.6% | $D_{60}$: | 0.0047 |
| Clay: | 42.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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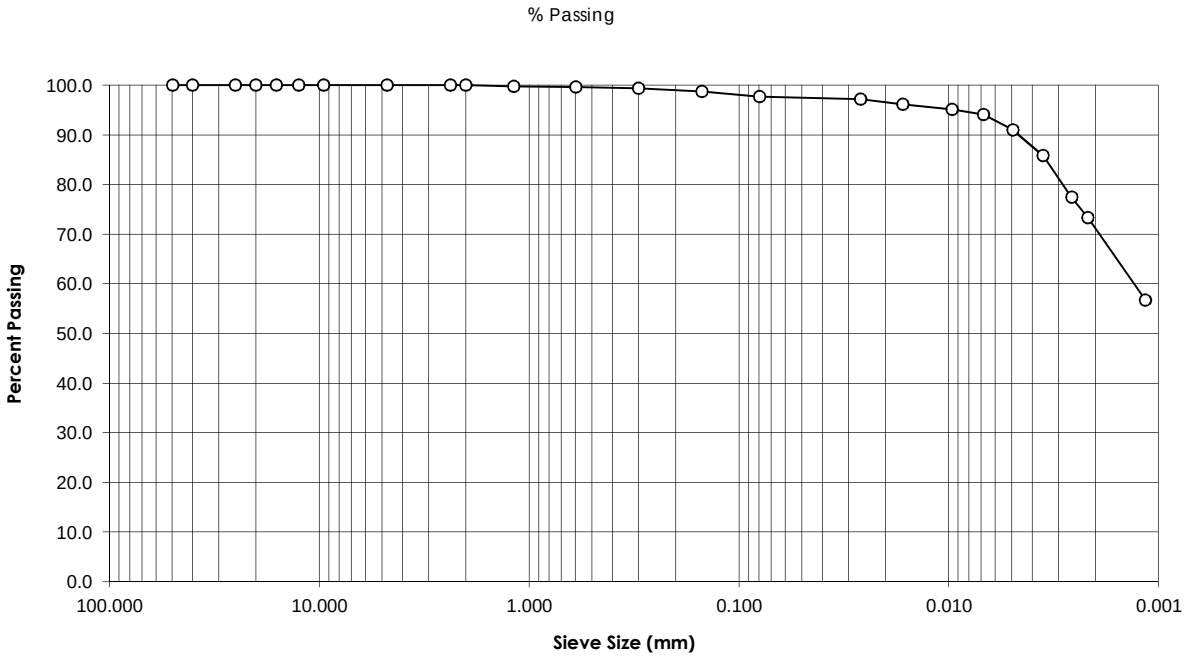
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS2
SOURCE: D7
TESTED BY: B. Pelkey

DATE TESTED: June 22, 2016
DATE RECEIVED: May 2, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0049 | 91.0 |
| 40.0 | 100.0 | 0.0036 | 85.8 |
| 25.0 | 100.0 | 0.0026 | 77.5 |
| 20.0 | 100.0 | 0.0022 | 73.3 |
| 16.0 | 100.0 | 0.0012 | 56.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 99.8 | | |
| 0.600 | 99.6 | | |
| 0.300 | 99.4 | | |
| 0.150 | 98.7 | | |
| 0.080 | 97.7 | | |
| 0.0262 | 97.2 | | |
| 0.0166 | 96.2 | | |
| 0.0096 | 95.2 | | |
| 0.0068 | 94.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.3% | $D_{30}$: | - |
| Silt: | 26.5% | $D_{60}$: | 0.0014 |
| Clay: | 71.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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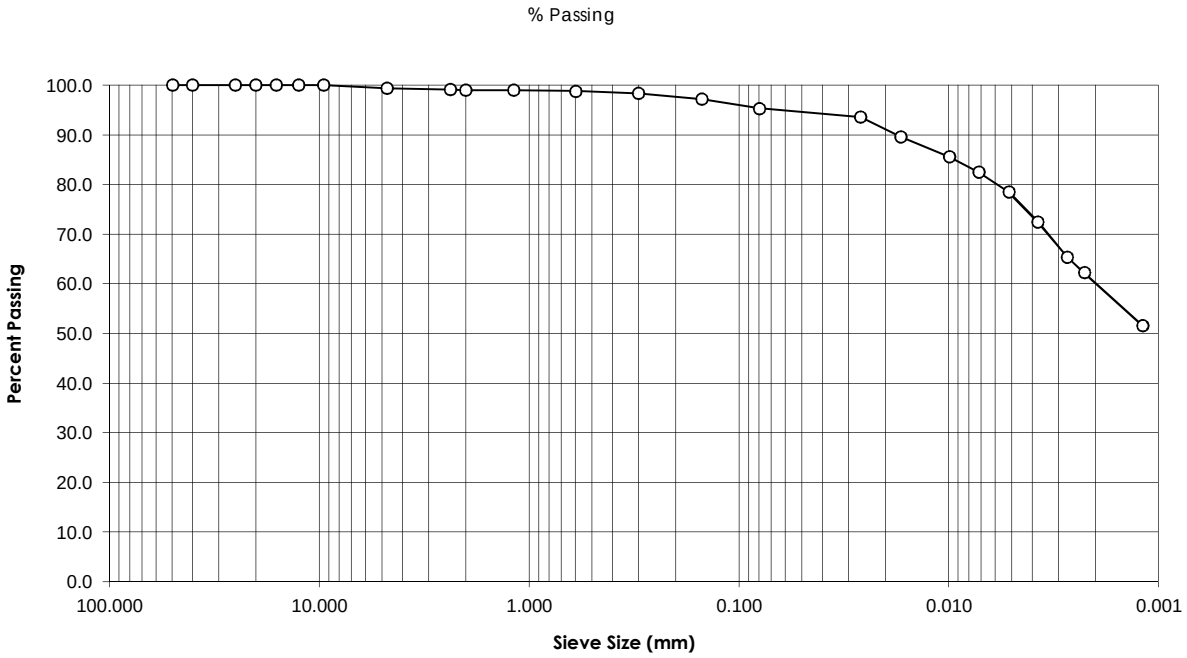
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST6
SOURCE: D7
TESTED BY: B. Pelkey

DATE TESTED: June 20, 2016
DATE RECEIVED: May 2, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 78.5 |
| 40.0 | 100.0 | 0.0038 | 72.4 |
| 25.0 | 100.0 | 0.0027 | 65.3 |
| 20.0 | 100.0 | 0.0023 | 62.3 |
| 16.0 | 100.0 | 0.0012 | 51.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.4 | | |
| 2.36 | 99.1 | | |
| 2.00 | 99.0 | | |
| 1.18 | 99.0 | | |
| 0.600 | 98.8 | | |
| 0.300 | 98.4 | | |
| 0.150 | 97.2 | | |
| 0.080 | 95.3 | | |
| 0.0262 | 93.6 | | |
| 0.0169 | 89.6 | | |
| 0.0099 | 85.5 | | |
| 0.0072 | 82.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.6% | $D_{10}$: | - |
| Sand: | 4.0% | $D_{30}$: | - |
| Silt: | 35.1% | $D_{60}$: | 0.0020 |
| Clay: | 60.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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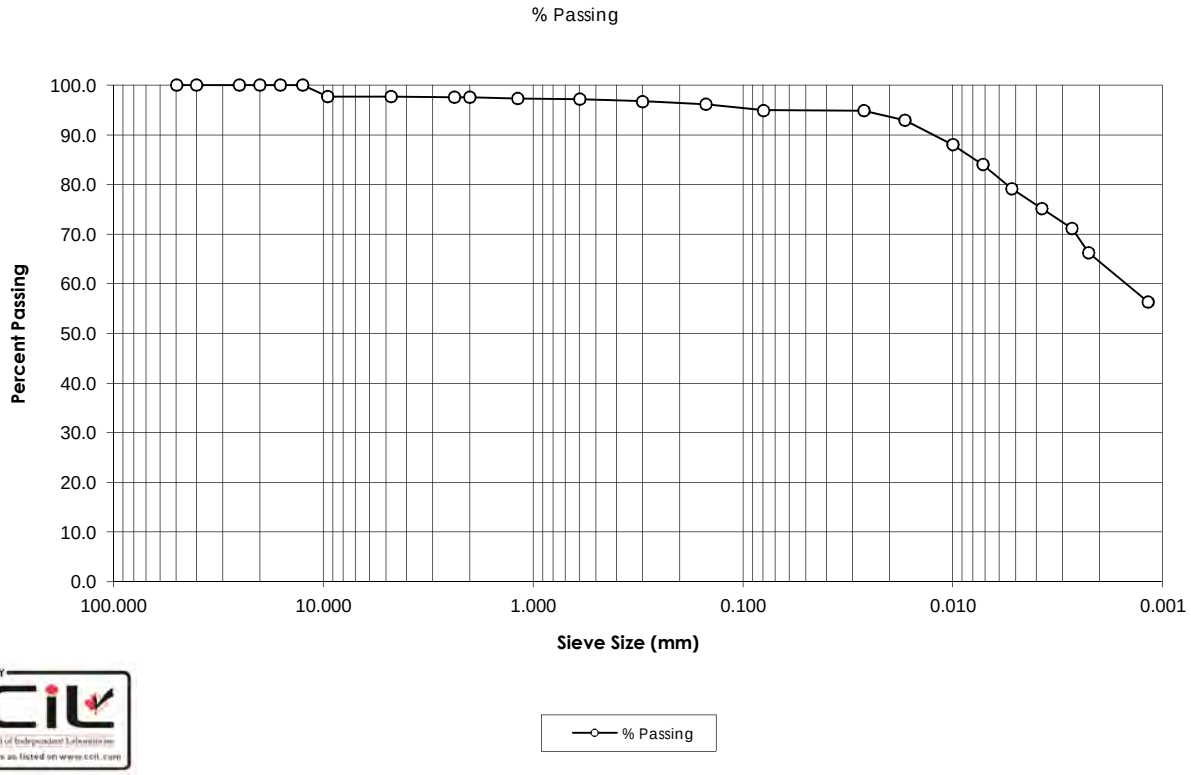
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS3
SOURCE: D8
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: May 1, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 79.1 |
| 40.0 | 100.0 | 0.0038 | 75.1 |
| 25.0 | 100.0 | 0.0027 | 71.2 |
| 20.0 | 100.0 | 0.0023 | 66.2 |
| 16.0 | 100.0 | 0.0012 | 56.4 |
| 12.5 | 100.0 | | |
| 9.5 | 97.7 | | |
| 4.75 | 97.7 | | |
| 2.36 | 97.6 | | |
| 2.00 | 97.5 | | |
| 1.18 | 97.3 | | |
| 0.600 | 97.1 | | |
| 0.300 | 96.7 | | |
| 0.150 | 96.1 | | |
| 0.080 | 94.9 | | |
| 0.0265 | 94.9 | | |
| 0.0169 | 92.9 | | |
| 0.0100 | 88.0 | | |
| 0.0072 | 84.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.3% | $D_{10}$: | - |
| Sand: | 2.8% | $D_{30}$: | - |
| Silt: | 30.5% | $D_{60}$: | 0.0016 |
| Clay: | 64.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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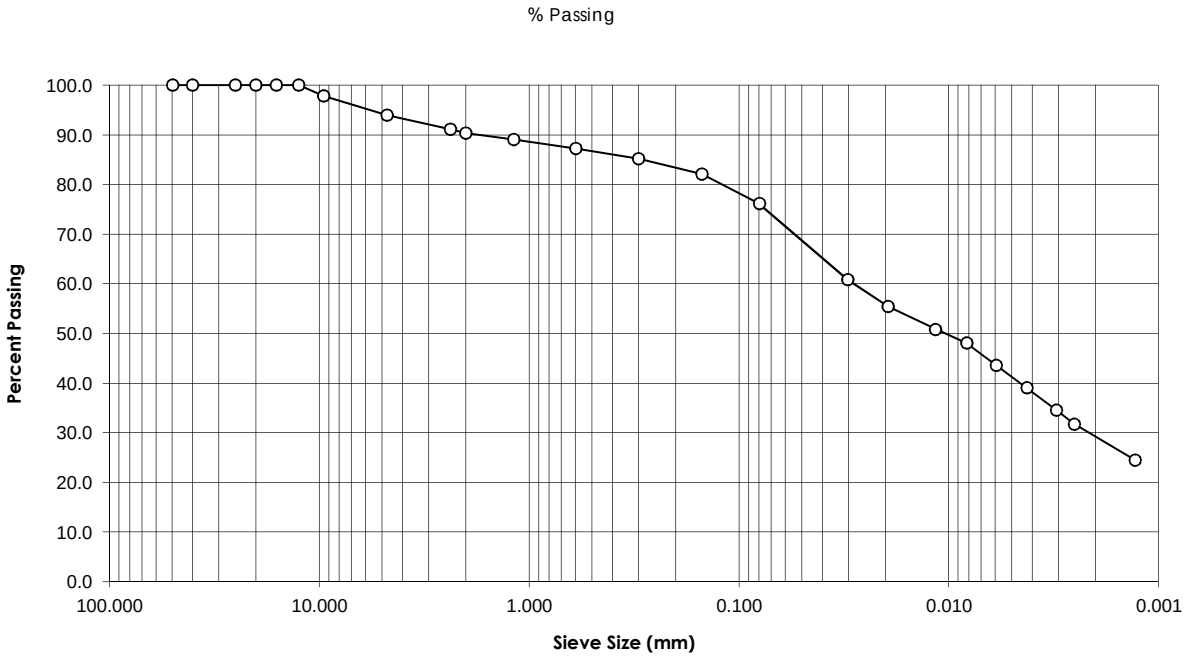
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS7A
SOURCE: D8
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: May 1, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 43.6 |
| 40.0 | 100.0 | 0.0043 | 39.0 |
| 25.0 | 100.0 | 0.0031 | 34.5 |
| 20.0 | 100.0 | 0.0025 | 31.8 |
| 16.0 | 100.0 | 0.0013 | 24.5 |
| 12.5 | 100.0 | | |
| 9.5 | 97.8 | | |
| 4.75 | 93.9 | | |
| 2.36 | 91.2 | | |
| 2.00 | 90.3 | | |
| 1.18 | 89.1 | | |
| 0.600 | 87.2 | | |
| 0.300 | 85.2 | | |
| 0.150 | 82.1 | | |
| 0.080 | 76.2 | | |
| 0.0302 | 60.8 | | |
| 0.0195 | 55.4 | | |
| 0.0116 | 50.9 | | |
| 0.0082 | 48.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.1% | $D_{10}$: | - |
| Sand: | 17.7% | $D_{30}$: | 0.0023 |
| Silt: | 47.0% | $D_{60}$: | 0.0286 |
| Clay: | 29.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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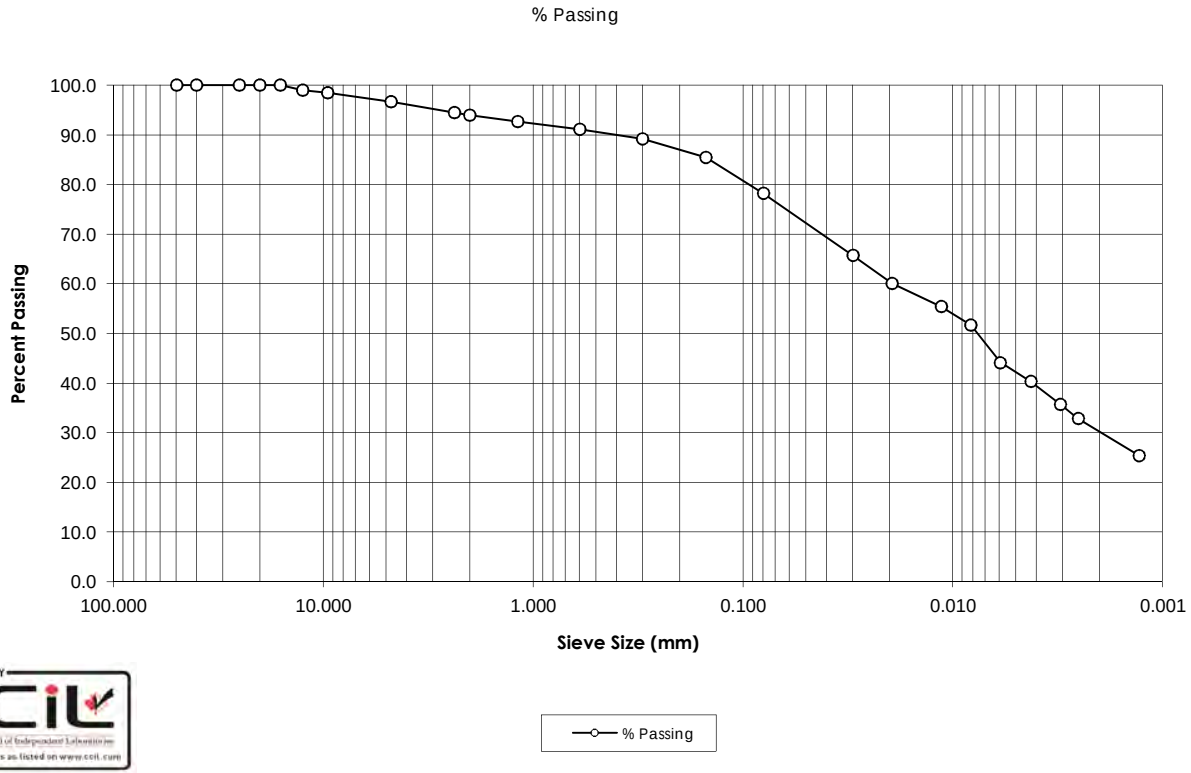
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D8
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: May 1, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 44.2 |
| 40.0 | 100.0 | 0.0043 | 40.4 |
| 25.0 | 100.0 | 0.0031 | 35.7 |
| 20.0 | 100.0 | 0.0025 | 32.9 |
| 16.0 | 100.0 | 0.0013 | 25.4 |
| 12.5 | 99.0 | | |
| 9.5 | 98.5 | | |
| 4.75 | 96.6 | | |
| 2.36 | 94.5 | | |
| 2.00 | 94.0 | | |
| 1.18 | 92.7 | | |
| 0.600 | 91.1 | | |
| 0.300 | 89.2 | | |
| 0.150 | 85.5 | | |
| 0.080 | 78.2 | | |
| 0.0299 | 65.8 | | |
| 0.0194 | 60.1 | | |
| 0.0114 | 55.4 | | |
| 0.0082 | 51.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.4% | $D_{10}$: | - |
| Sand: | 18.4% | $D_{30}$: | 0.0021 |
| Silt: | 48.0% | $D_{60}$: | 0.0192 |
| Clay: | 30.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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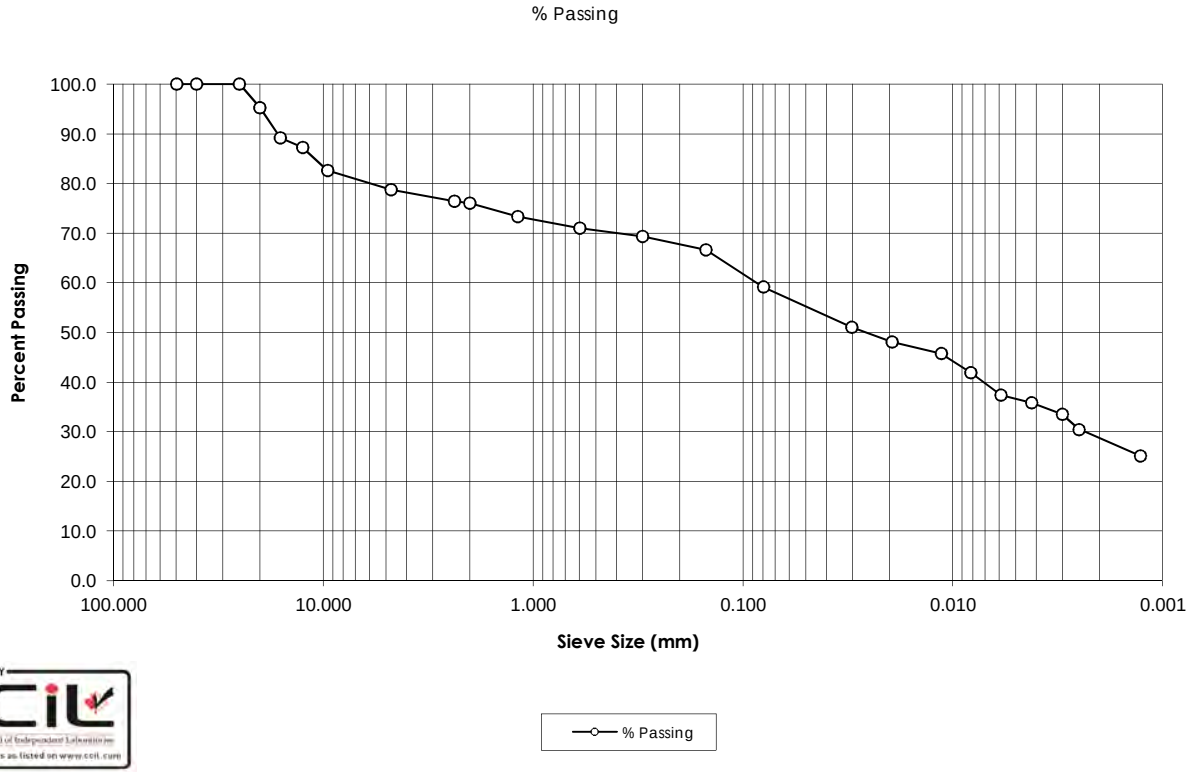
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BSA
SOURCE: D9
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: May 1, 2016
SAMPLE DESCRIPTION: Gravely Clay (CI) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 37.4 |
| 40.0 | 100.0 | 0.0042 | 35.8 |
| 25.0 | 100.0 | 0.0030 | 33.6 |
| 20.0 | 95.2 | 0.0025 | 30.5 |
| 16.0 | 89.1 | 0.0013 | 25.2 |
| 12.5 | 87.2 | | |
| 9.5 | 82.6 | | |
| 4.75 | 78.7 | | |
| 2.36 | 76.5 | | |
| 2.00 | 76.1 | | |
| 1.18 | 73.3 | | |
| 0.600 | 71.0 | | |
| 0.300 | 69.3 | | |
| 0.150 | 66.7 | | |
| 0.080 | 59.1 | | |
| 0.0302 | 51.1 | | |
| 0.0194 | 48.0 | | |
| 0.0114 | 45.8 | | |
| 0.0082 | 41.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 21.3% | $D_{10}$: | - |
| Sand: | 19.6% | $D_{30}$: | 0.0024 |
| Silt: | 30.4% | $D_{60}$: | 0.0885 |
| Clay: | 28.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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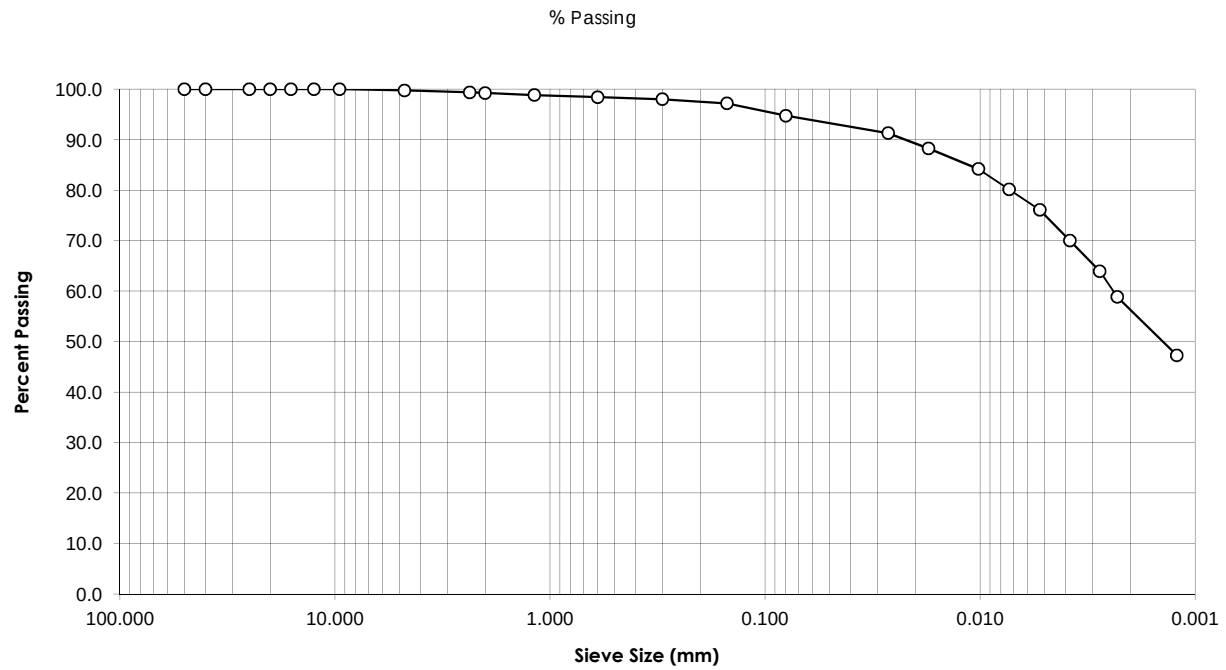
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS7
SOURCE: D10
TESTED BY: M. Pilkington

DATE TESTED: May 6, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 76.1 |
| 40.0 | 100.0 | 0.0038 | 70.0 |
| 25.0 | 100.0 | 0.0028 | 63.9 |
| 20.0 | 100.0 | 0.0023 | 58.8 |
| 16.0 | 100.0 | 0.0012 | 47.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.8 | | |
| 2.36 | 99.4 | | |
| 2.00 | 99.3 | | |
| 1.18 | 98.8 | | |
| 0.600 | 98.4 | | |
| 0.300 | 98.0 | | |
| 0.150 | 97.2 | | |
| 0.080 | 94.7 | | |
| 0.0267 | 91.3 | | |
| 0.0173 | 88.2 | | |
| 0.0102 | 84.2 | | |
| 0.0073 | 80.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.3% | $D_{10}$: | - |
| Sand: | 5.0% | $D_{30}$: | - |
| Silt: | 38.4% | $D_{60}$: | 0.0024 |
| Clay: | 56.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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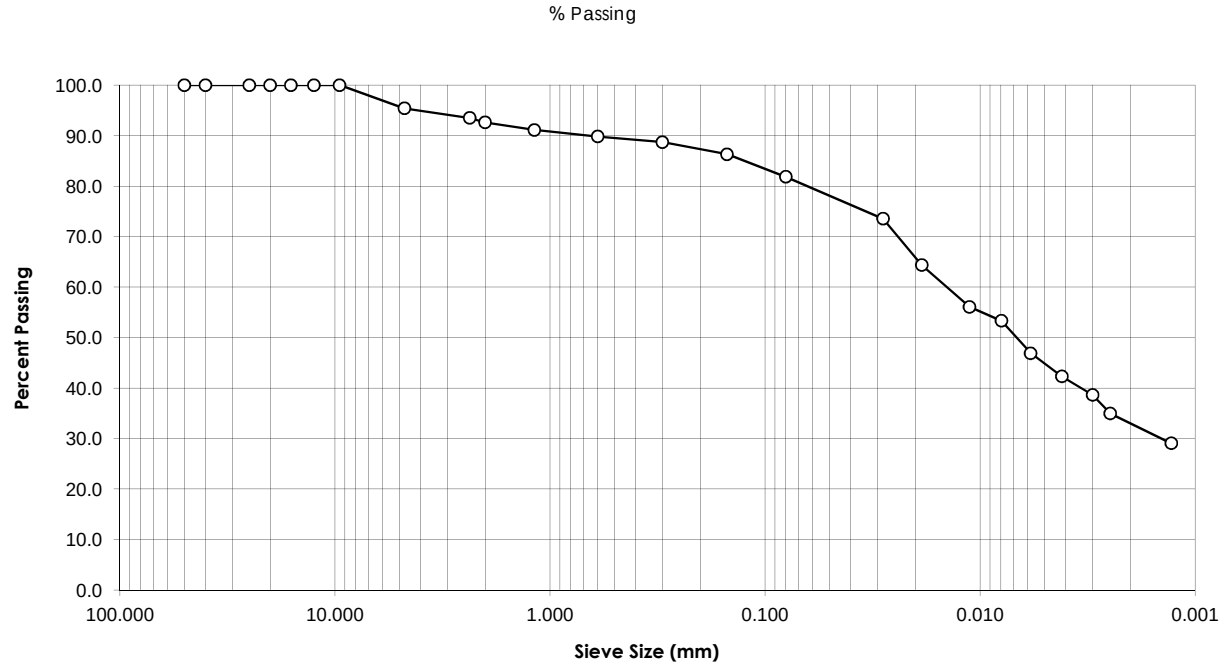
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS13A
SOURCE: D10
TESTED BY: M. Pilkington

DATE TESTED: May 6, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 46.9 |
| 40.0 | 100.0 | 0.0042 | 42.3 |
| 25.0 | 100.0 | 0.0030 | 38.6 |
| 20.0 | 100.0 | 0.0025 | 34.9 |
| 16.0 | 100.0 | 0.0013 | 29.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 95.4 | | |
| 2.36 | 93.5 | | |
| 2.00 | 92.6 | | |
| 1.18 | 91.1 | | |
| 0.600 | 89.8 | | |
| 0.300 | 88.7 | | |
| 0.150 | 86.3 | | |
| 0.080 | 81.8 | | |
| 0.0282 | 73.5 | | |
| 0.0186 | 64.3 | | |
| 0.0112 | 56.1 | | |
| 0.0080 | 53.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.6% | $D_{10}$: | - |
| Sand: | 13.6% | $D_{30}$: | 0.0015 |
| Silt: | 48.8% | $D_{60}$: | 0.0148 |
| Clay: | 33.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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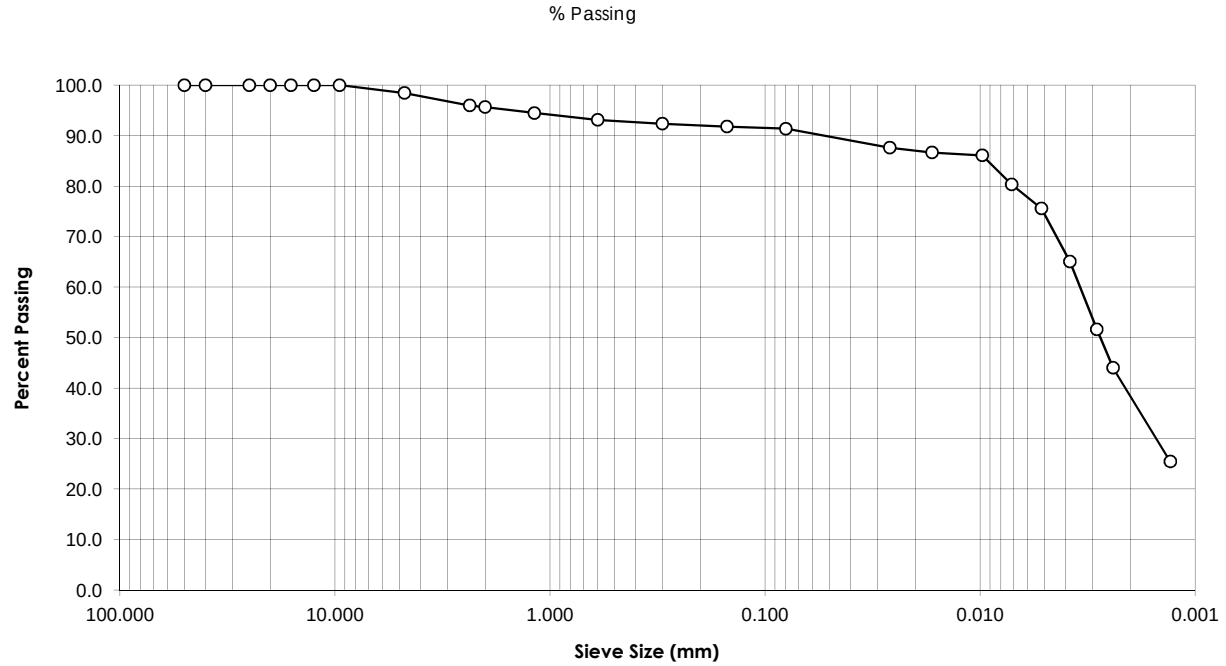
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC24
SOURCE: D10
TESTED BY: M. Pilkington

DATE TESTED: April 30, 2016
DATE RECEIVED: April 24, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 75.6 |
| 40.0 | 100.0 | 0.0038 | 65.0 |
| 25.0 | 100.0 | 0.0029 | 51.7 |
| 20.0 | 100.0 | 0.0024 | 44.0 |
| 16.0 | 100.0 | 0.0013 | 25.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.5 | | |
| 2.36 | 96.0 | | |
| 2.00 | 95.6 | | |
| 1.18 | 94.5 | | |
| 0.600 | 93.1 | | |
| 0.300 | 92.4 | | |
| 0.150 | 91.8 | | |
| 0.080 | 91.4 | | |
| 0.0262 | 87.6 | | |
| 0.0167 | 86.7 | | |
| 0.0098 | 86.1 | | |
| 0.0071 | 80.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.5% | $D_{10}$: | - |
| Sand: | 7.1% | $D_{30}$: | 0.0016 |
| Silt: | 53.0% | $D_{60}$: | 0.0035 |
| Clay: | 38.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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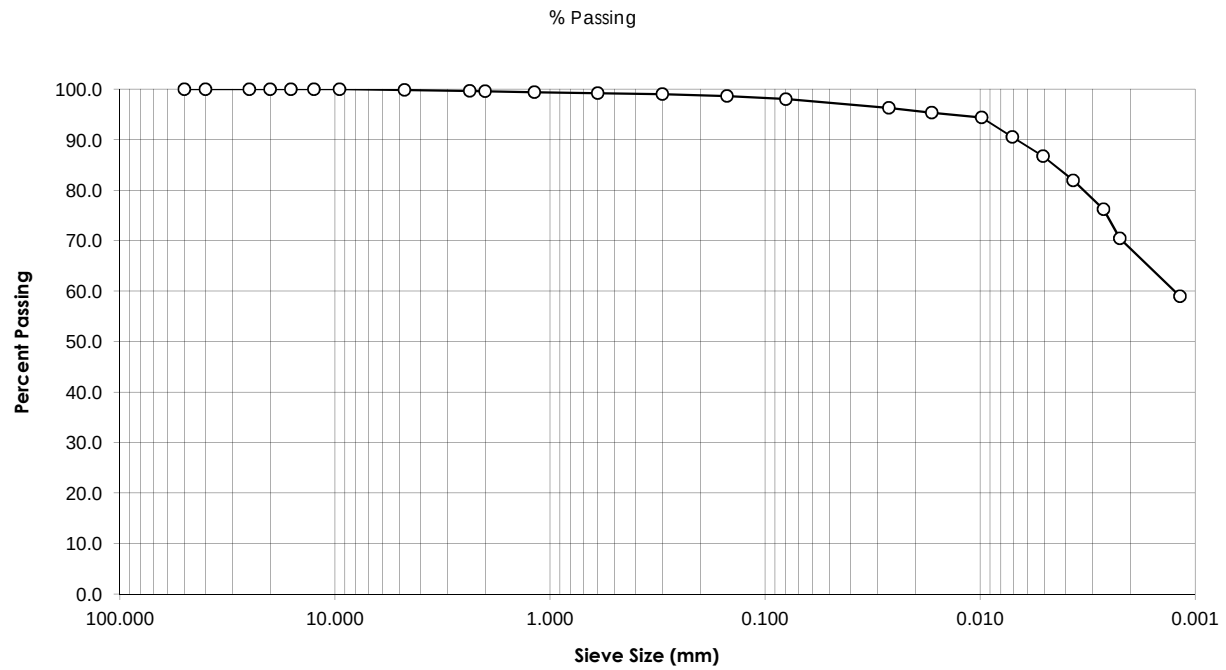
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS4
SOURCE: D11
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 14, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 86.7 |
| 40.0 | 100.0 | 0.0037 | 81.9 |
| 25.0 | 100.0 | 0.0027 | 76.2 |
| 20.0 | 100.0 | 0.0022 | 70.4 |
| 16.0 | 100.0 | 0.0012 | 59.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.9 | | |
| 2.36 | 99.7 | | |
| 2.00 | 99.6 | | |
| 1.18 | 99.4 | | |
| 0.600 | 99.2 | | |
| 0.300 | 99.0 | | |
| 0.150 | 98.6 | | |
| 0.080 | 98.0 | | |
| 0.0265 | 96.3 | | |
| 0.0168 | 95.3 | | |
| 0.0098 | 94.4 | | |
| 0.0071 | 90.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.1% | $D_{10}$: | - |
| Sand: | 1.8% | $D_{30}$: | - |
| Silt: | 29.6% | $D_{60}$: | 0.0013 |
| Clay: | 68.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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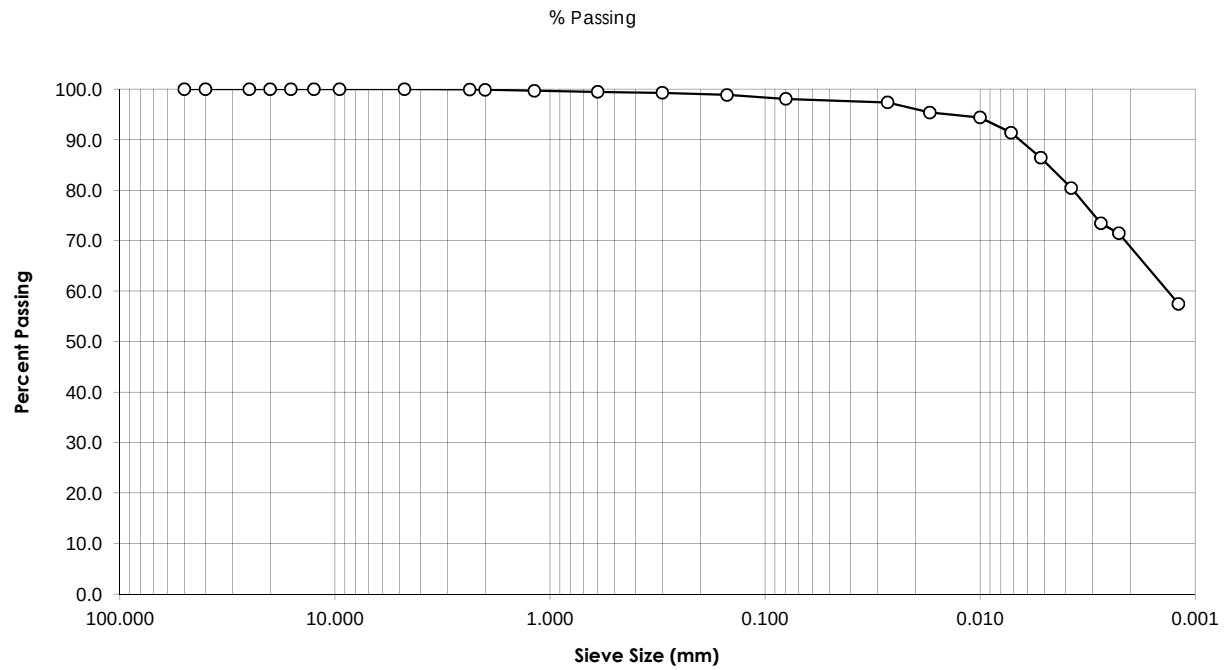
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS6
SOURCE: D11
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 14, 2016
SAMPLE DESCRIPTION: Clay, Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 86.4 |
| 40.0 | 100.0 | 0.0038 | 80.4 |
| 25.0 | 100.0 | 0.0027 | 73.4 |
| 20.0 | 100.0 | 0.0023 | 71.4 |
| 16.0 | 100.0 | 0.0012 | 57.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.7 | | |
| 0.600 | 99.5 | | |
| 0.300 | 99.3 | | |
| 0.150 | 98.9 | | |
| 0.080 | 98.1 | | |
| 0.0269 | 97.4 | | |
| 0.0171 | 95.4 | | |
| 0.0100 | 94.4 | | |
| 0.0072 | 91.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.9% | $D_{30}$: | - |
| Silt: | 29.3% | $D_{60}$: | 0.0014 |
| Clay: | 68.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description derived from Atterberg and Grain Size test results

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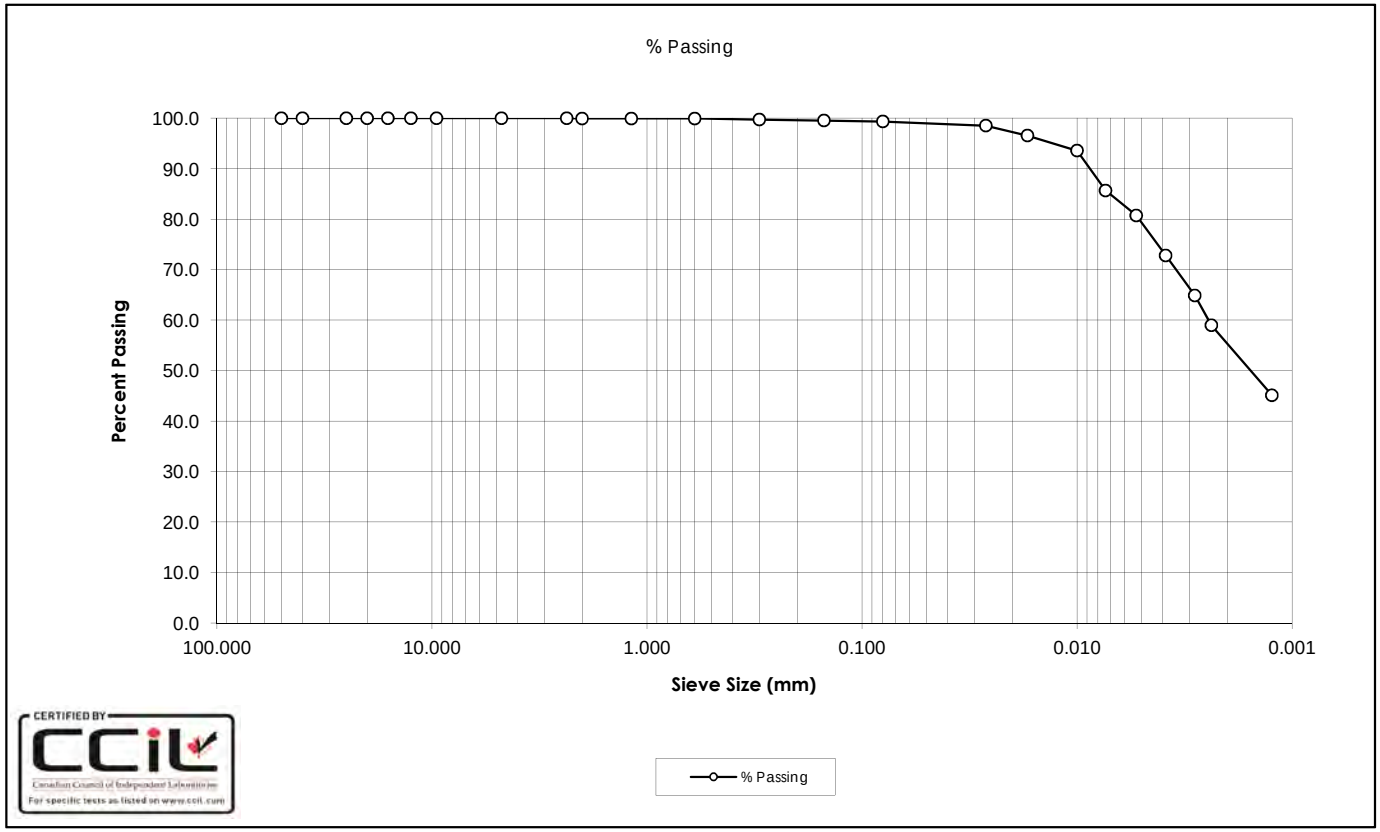
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST8
SOURCE: D11
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 14, 2016
SAMPLE DESCRIPTION: Clay, Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 80.7 |
| 40.0 | 100.0 | 0.0039 | 72.8 |
| 25.0 | 100.0 | 0.0028 | 64.9 |
| 20.0 | 100.0 | 0.0024 | 59.0 |
| 16.0 | 100.0 | 0.0012 | 45.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.7 | | |
| 0.150 | 99.5 | | |
| 0.080 | 99.3 | | |
| 0.0265 | 98.5 | | |
| 0.0170 | 96.6 | | |
| 0.0100 | 93.6 | | |
| 0.0074 | 85.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.7% | $D_{30}$: | - |
| Silt: | 44.0% | $D_{60}$: | 0.0025 |
| Clay: | 55.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description derived from Atterberg and Grain Size test results

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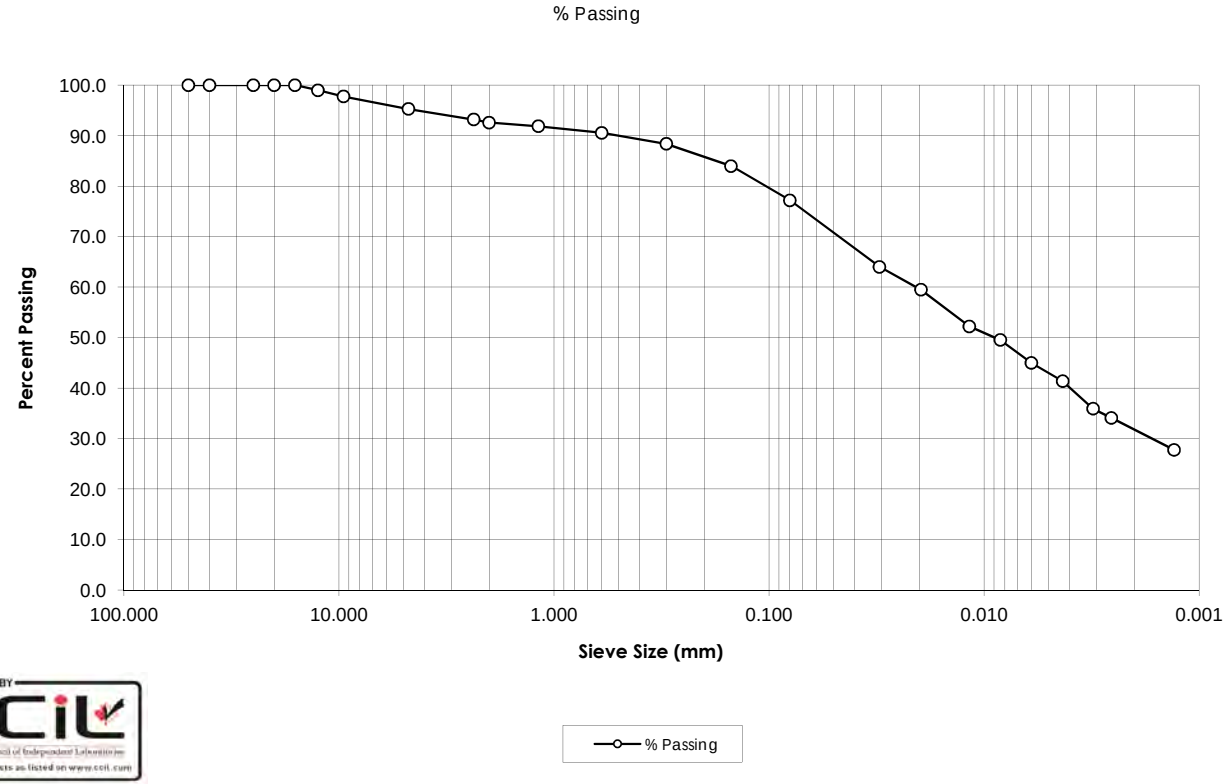
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS10
SOURCE: D11
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 14, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0060** | **45.0** |
| **40.0** | **100.0** | **0.0043** | **41.3** |
| **25.0** | **100.0** | **0.0031** | **35.9** |
| **20.0** | **100.0** | **0.0026** | **34.1** |
| **16.0** | **100.0** | **0.0013** | **27.7** |
| **12.5** | **99.0** | | |
| **9.5** | **97.7** | | |
| **4.75** | **95.3** | | |
| **2.36** | **93.2** | | |
| **2.00** | **92.6** | | |
| **1.18** | **91.9** | | |
| **0.600** | **90.6** | | |
| **0.300** | **88.4** | | |
| **0.150** | **84.0** | | |
| **0.080** | **77.2** | | |
| **0.0306** | **64.0** | | |
| **0.0196** | **59.5** | | |
| **0.0117** | **52.2** | | |
| **0.0084** | **49.5** | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.7% | $D_{10}$: | - |
| Sand: | 18.1% | $D_{30}$: | 0.0018 |
| Silt: | 45.4% | $D_{60}$: | 0.0209 |
| Clay: | 31.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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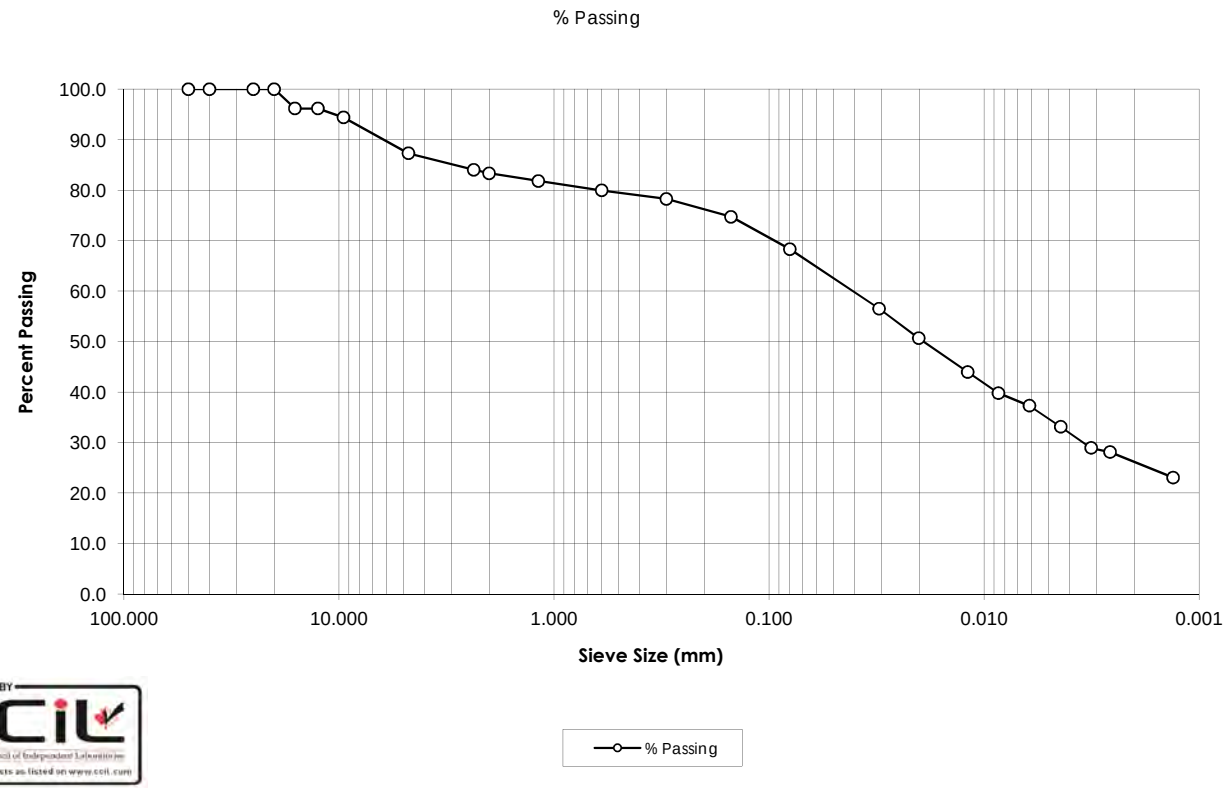
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST11
SOURCE: D11
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 14, 2016
SAMPLE DESCRIPTION: Clay (CI-CL), Some Sand and Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 37.3 |
| 40.0 | 100.0 | 0.0044 | 33.1 |
| 25.0 | 100.0 | 0.0032 | 28.9 |
| 20.0 | 100.0 | 0.0026 | 28.1 |
| 16.0 | 96.2 | 0.0013 | 23.1 |
| 12.5 | 96.2 | | |
| 9.5 | 94.4 | | |
| 4.75 | 87.3 | | |
| 2.36 | 84.0 | | |
| 2.00 | 83.3 | | |
| 1.18 | 81.8 | | |
| 0.600 | 80.0 | | |
| 0.300 | 78.3 | | |
| 0.150 | 74.7 | | |
| 0.080 | 68.3 | | |
| 0.0307 | 56.5 | | |
| 0.0201 | 50.7 | | |
| 0.0119 | 44.0 | | |
| 0.0086 | 39.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.7% | $D_{10}$: | - |
| Sand: | 19.0% | $D_{30}$: | 0.0035 |
| Silt: | 42.1% | $D_{60}$: | 0.0463 |
| Clay: | 26.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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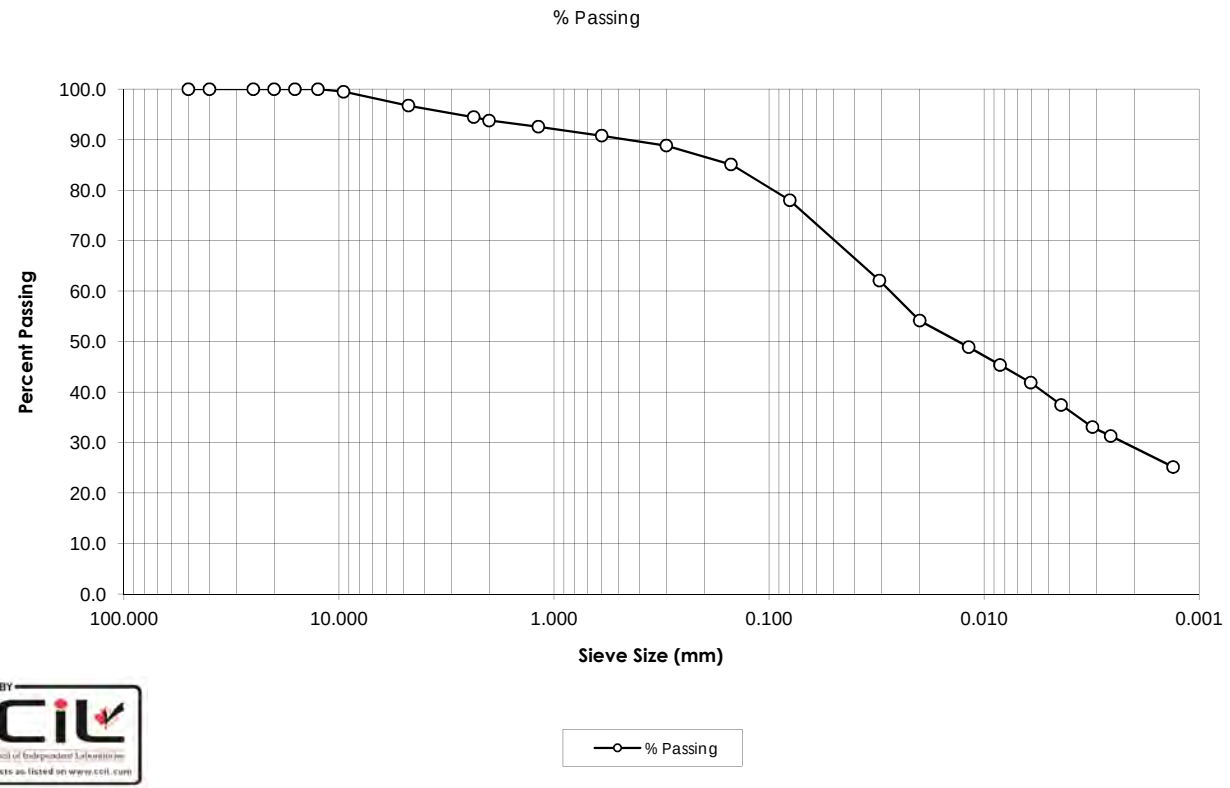
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS13
SOURCE: D11
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 14, 2016
SAMPLE DESCRIPTION: Clay (CI-CL), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 41.8 |
| 40.0 | 100.0 | 0.0044 | 37.5 |
| 25.0 | 100.0 | 0.0031 | 33.1 |
| 20.0 | 100.0 | 0.0026 | 31.3 |
| 16.0 | 100.0 | 0.0013 | 25.1 |
| 12.5 | 100.0 | | |
| 9.5 | 99.5 | | |
| 4.75 | 96.7 | | |
| 2.36 | 94.5 | | |
| 2.00 | 93.8 | | |
| 1.18 | 92.5 | | |
| 0.600 | 90.8 | | |
| 0.300 | 88.8 | | |
| 0.150 | 85.1 | | |
| 0.080 | 78.0 | | |
| 0.0306 | 62.1 | | |
| 0.0199 | 54.2 | | |
| 0.0118 | 48.9 | | |
| 0.0084 | 45.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.3% | $D_{10}$: | - |
| Sand: | 18.8% | $D_{30}$: | 0.0023 |
| Silt: | 49.0% | $D_{60}$: | 0.0279 |
| Clay: | 29.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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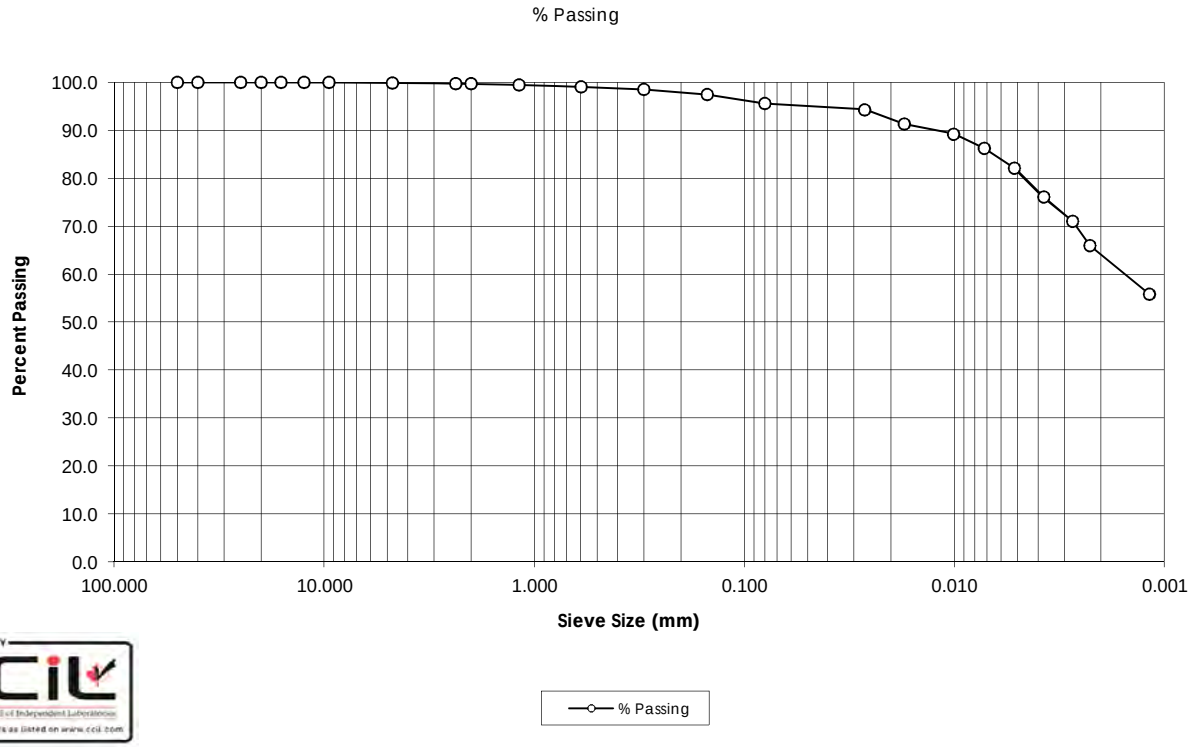
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BSA
SOURCE: D12
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0052** | **82.2** |
| **40.0** | **100.0** | **0.0038** | **76.1** |
| **25.0** | **100.0** | **0.0027** | **71.0** |
| **20.0** | **100.0** | **0.0023** | **65.9** |
| **16.0** | **100.0** | **0.0012** | **55.8** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.9** | | |
| **2.36** | **99.8** | | |
| **2.00** | **99.7** | | |
| **1.18** | **99.5** | | |
| **0.600** | **99.1** | | |
| **0.300** | **98.5** | | |
| **0.150** | **97.5** | | |
| **0.080** | **95.6** | | |
| **0.0267** | **94.3** | | |
| **0.0173** | **91.3** | | |
| **0.0101** | **89.3** | | |
| **0.0072** | **86.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.1% | $D_{10}$: | - |
| Sand: | 4.3% | $D_{30}$: | - |
| Silt: | 31.6% | $D_{60}$: | 0.0017 |
| Clay: | 64.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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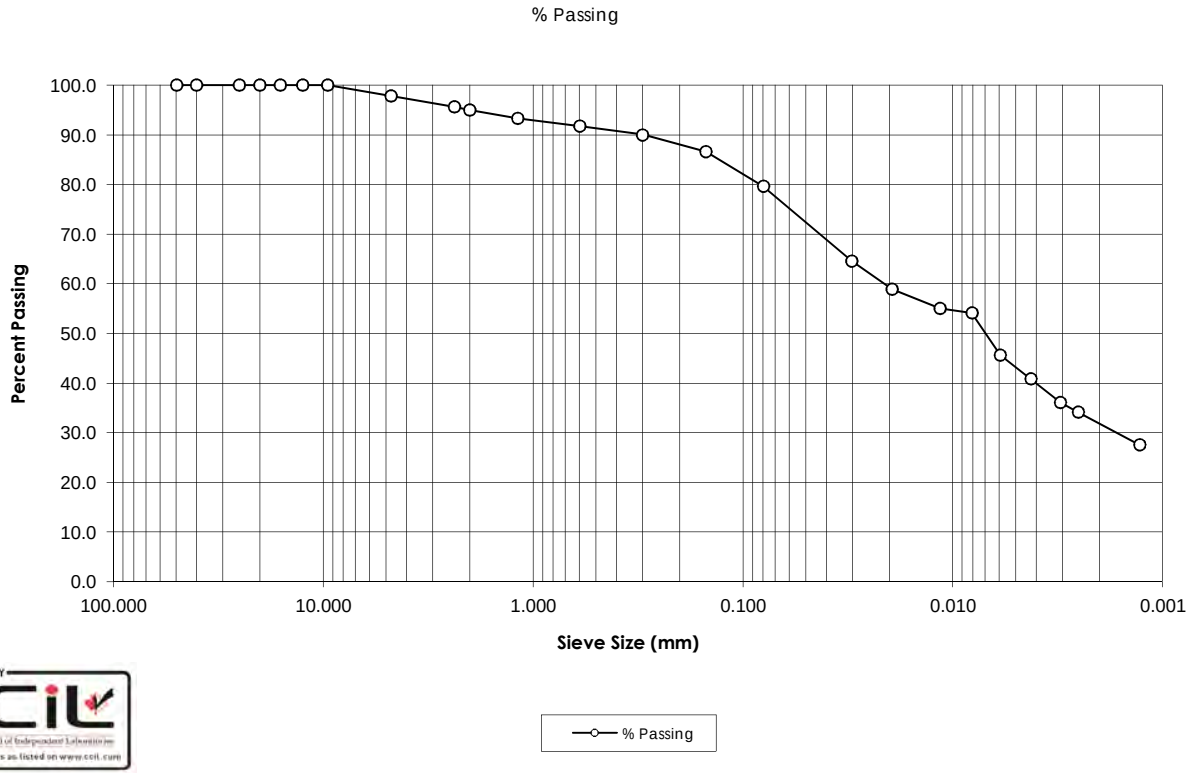
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BSC
SOURCE: D12
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 45.6 |
| 40.0 | 100.0 | 0.0043 | 40.8 |
| 25.0 | 100.0 | 0.0031 | 36.1 |
| 20.0 | 100.0 | 0.0025 | 34.2 |
| 16.0 | 100.0 | 0.0013 | 27.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 97.8 | | |
| 2.36 | 95.6 | | |
| 2.00 | 95.0 | | |
| 1.18 | 93.3 | | |
| 0.600 | 91.8 | | |
| 0.300 | 90.0 | | |
| 0.150 | 86.6 | | |
| 0.080 | 79.7 | | |
| 0.0302 | 64.6 | | |
| 0.0195 | 58.9 | | |
| 0.0115 | 55.1 | | |
| 0.0081 | 54.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.2% | $D_{10}$: | - |
| Sand: | 18.1% | $D_{30}$: | 0.0018 |
| Silt: | 47.8% | $D_{60}$: | 0.0217 |
| Clay: | 31.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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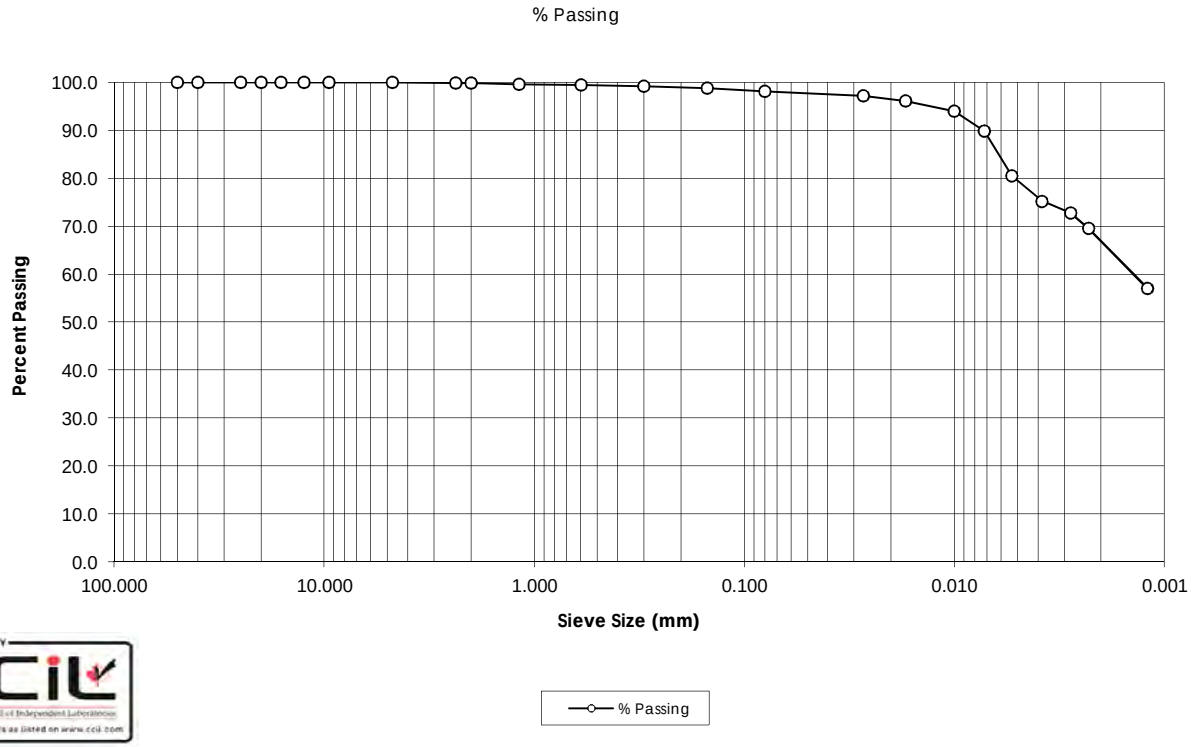
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST6
SOURCE: D12
TESTED BY: J. Upham

DATE TESTED: May 14, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0053** | **80.5** |
| **40.0** | **100.0** | **0.0038** | **75.2** |
| **25.0** | **100.0** | **0.0028** | **72.7** |
| **20.0** | **100.0** | **0.0023** | **69.6** |
| **16.0** | **100.0** | **0.0012** | **57.1** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.9** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.7** | | |
| **0.600** | **99.4** | | |
| **0.300** | **99.2** | | |
| **0.150** | **98.8** | | |
| **0.080** | **98.2** | | |
| **0.0270** | **97.2** | | |
| **0.0171** | **96.1** | | |
| **0.0100** | **94.0** | | |
| **0.0072** | **89.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.8% | $D_{30}$: | - |
| Silt: | 31.2% | $D_{60}$: | 0.0015 |
| Clay: | 67.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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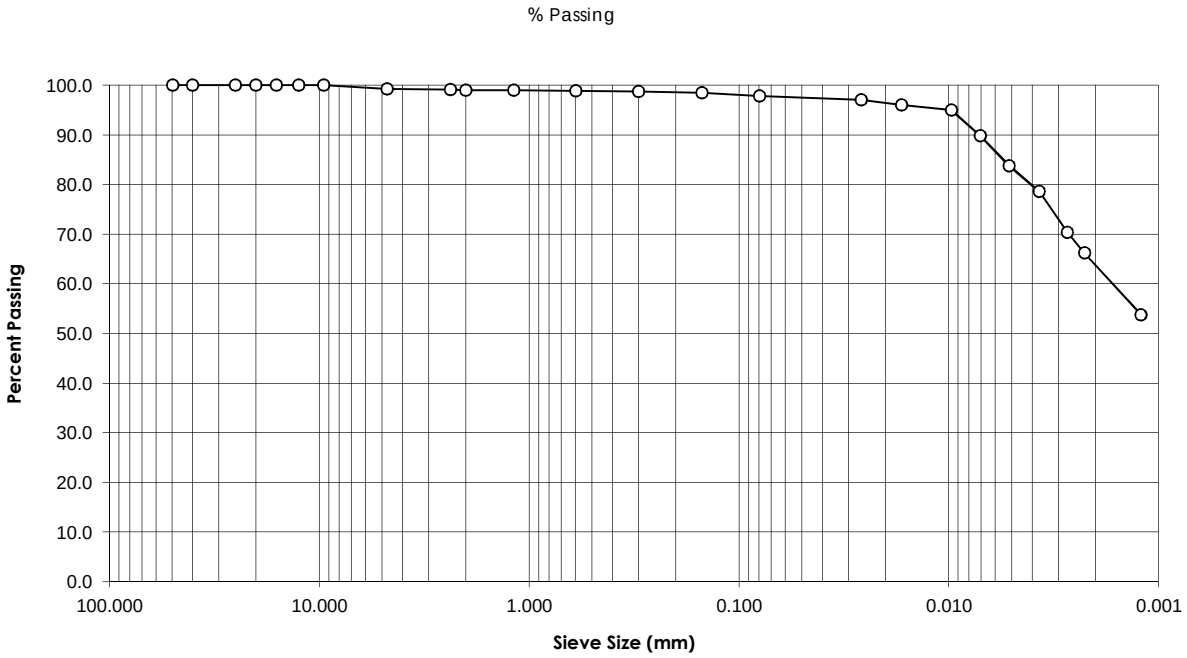
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST8
SOURCE: D12
TESTED BY: C. Oost

DATE TESTED: May 19, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 83.7 |
| 40.0 | 100.0 | 0.0037 | 78.6 |
| 25.0 | 100.0 | 0.0027 | 70.4 |
| 20.0 | 100.0 | 0.0023 | 66.3 |
| 16.0 | 100.0 | 0.0012 | 53.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.3 | | |
| 2.36 | 99.1 | | |
| 2.00 | 98.9 | | |
| 1.18 | 98.9 | | |
| 0.600 | 98.9 | | |
| 0.300 | 98.8 | | |
| 0.150 | 98.4 | | |
| 0.080 | 97.8 | | |
| 0.0262 | 97.1 | | |
| 0.0168 | 96.1 | | |
| 0.0097 | 95.0 | | |
| 0.0071 | 89.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.7% | $D_{10}$: | - |
| Sand: | 1.5% | $D_{30}$: | - |
| Silt: | 33.9% | $D_{60}$: | 0.0018 |
| Clay: | 63.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. Stantec is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of Stantec.

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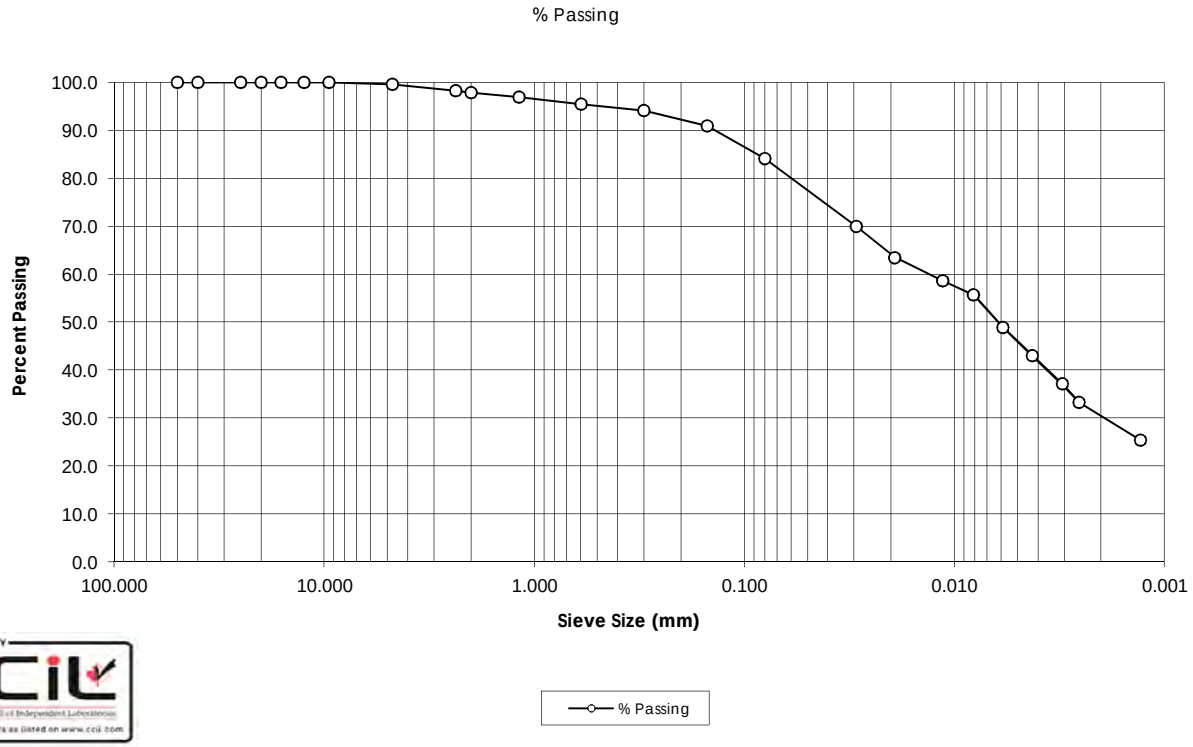
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS11
SOURCE: D12
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0059** | **48.8** |
| **40.0** | **100.0** | **0.0043** | **43.0** |
| **25.0** | **100.0** | **0.0031** | **37.1** |
| **20.0** | **100.0** | **0.0025** | **33.2** |
| **16.0** | **100.0** | **0.0013** | **25.4** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.6** | | |
| **2.36** | **98.3** | | |
| **2.00** | **97.9** | | |
| **1.18** | **96.9** | | |
| **0.600** | **95.5** | | |
| **0.300** | **94.1** | | |
| **0.150** | **91.0** | | |
| **0.080** | **84.1** | | |
| **0.0292** | **69.9** | | |
| **0.0192** | **63.5** | | |
| **0.0114** | **58.6** | | |
| **0.0081** | **55.7** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 15.5% | $D_{30}$: | 0.0021 |
| Silt: | 53.7% | $D_{60}$: | 0.0137 |
| Clay: | 30.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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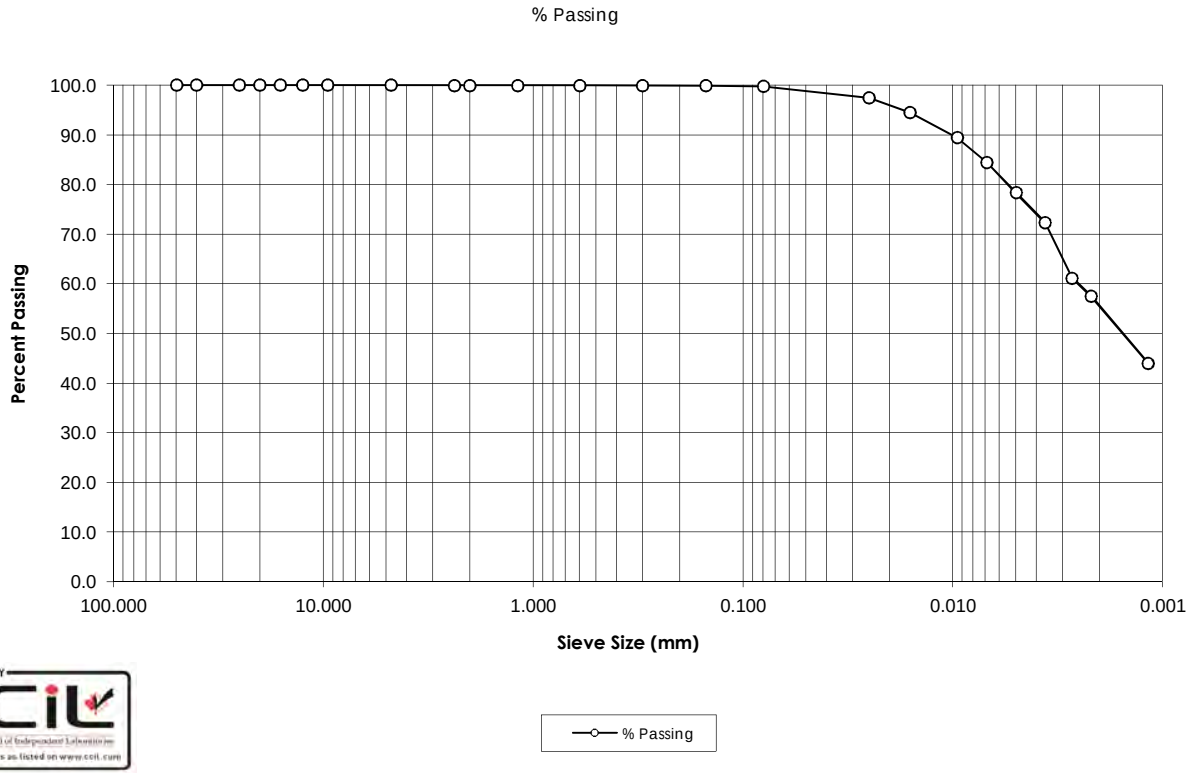
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D13
TESTED BY: C. Oost

DATE TESTED: June 28, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0050 | 78.3 |
| 40.0 | 100.0 | 0.0036 | 72.3 |
| 25.0 | 100.0 | 0.0027 | 61.2 |
| 20.0 | 100.0 | 0.0022 | 57.5 |
| 16.0 | 100.0 | 0.0012 | 44.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.8 | | |
| 0.0249 | 97.5 | | |
| 0.0160 | 94.5 | | |
| 0.0095 | 89.4 | | |
| 0.0069 | 84.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.2% | $D_{30}$: | - |
| Silt: | 44.2% | $D_{60}$: | 0.0025 |
| Clay: | 55.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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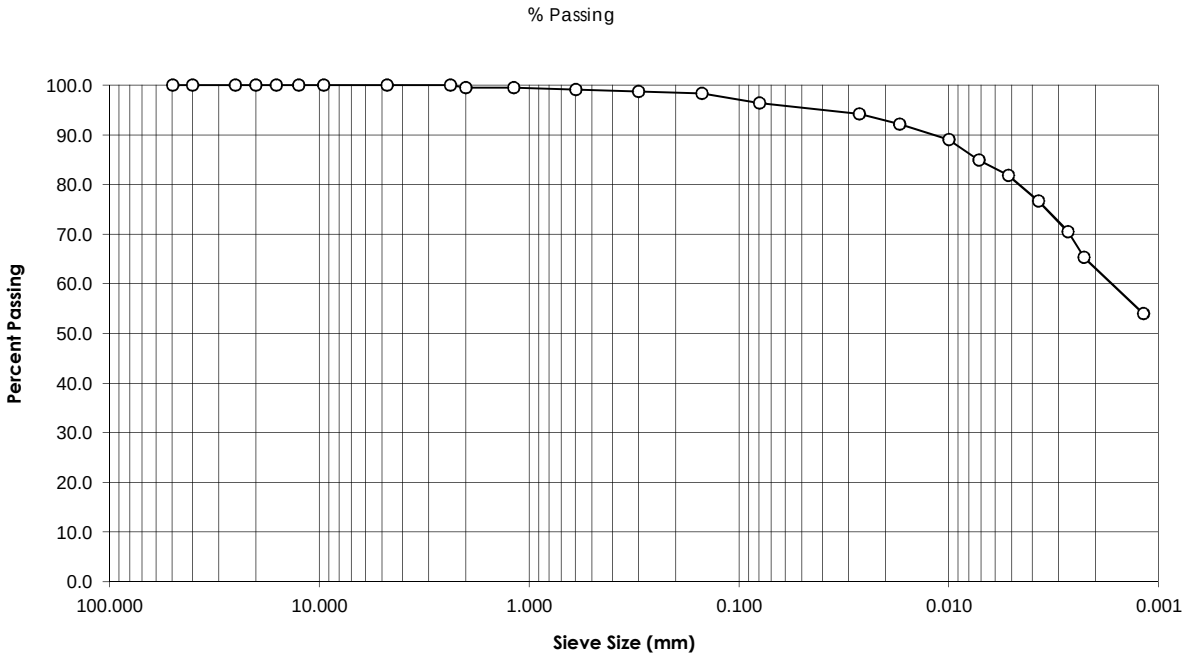
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST7
SOURCE: D13
TESTED BY: B. Pelkey

DATE TESTED: June 20, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 81.8 |
| 40.0 | 100.0 | 0.0037 | 76.7 |
| 25.0 | 100.0 | 0.0027 | 70.5 |
| 20.0 | 100.0 | 0.0023 | 65.3 |
| 16.0 | 100.0 | 0.0012 | 54.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 99.6 | | |
| 1.18 | 99.6 | | |
| 0.600 | 99.1 | | |
| 0.300 | 98.7 | | |
| 0.150 | 98.3 | | |
| 0.080 | 96.4 | | |
| 0.0267 | 94.2 | | |
| 0.0171 | 92.1 | | |
| 0.0100 | 89.1 | | |
| 0.0072 | 84.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 3.6% | $D_{30}$: | - |
| Silt: | 33.2% | $D_{60}$: | 0.0018 |
| Clay: | 63.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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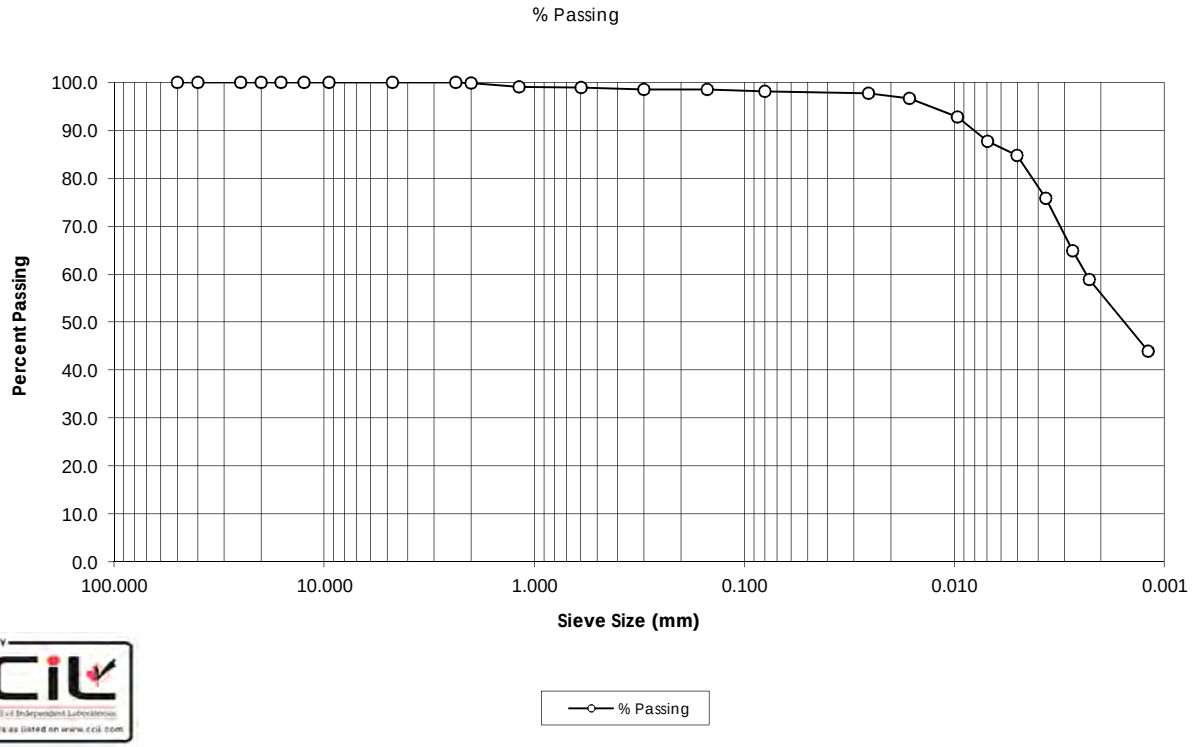
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST14
SOURCE: D13
TESTED BY: B. Pelkey

DATE TESTED: June 20, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0050** | **84.8** |
| **40.0** | **100.0** | **0.0037** | **75.8** |
| **25.0** | **100.0** | **0.0027** | **64.9** |
| **20.0** | **100.0** | **0.0023** | **58.9** |
| **16.0** | **100.0** | **0.0012** | **44.0** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.0** | | |
| **0.600** | **99.0** | | |
| **0.300** | **98.6** | | |
| **0.150** | **98.5** | | |
| **0.080** | **98.1** | | |
| **0.0256** | **97.7** | | |
| **0.0164** | **96.7** | | |
| **0.0096** | **92.7** | | |
| **0.0069** | **87.8** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.9% | $D_{30}$: | - |
| Silt: | 42.3% | $D_{60}$: | 0.0024 |
| Clay: | 55.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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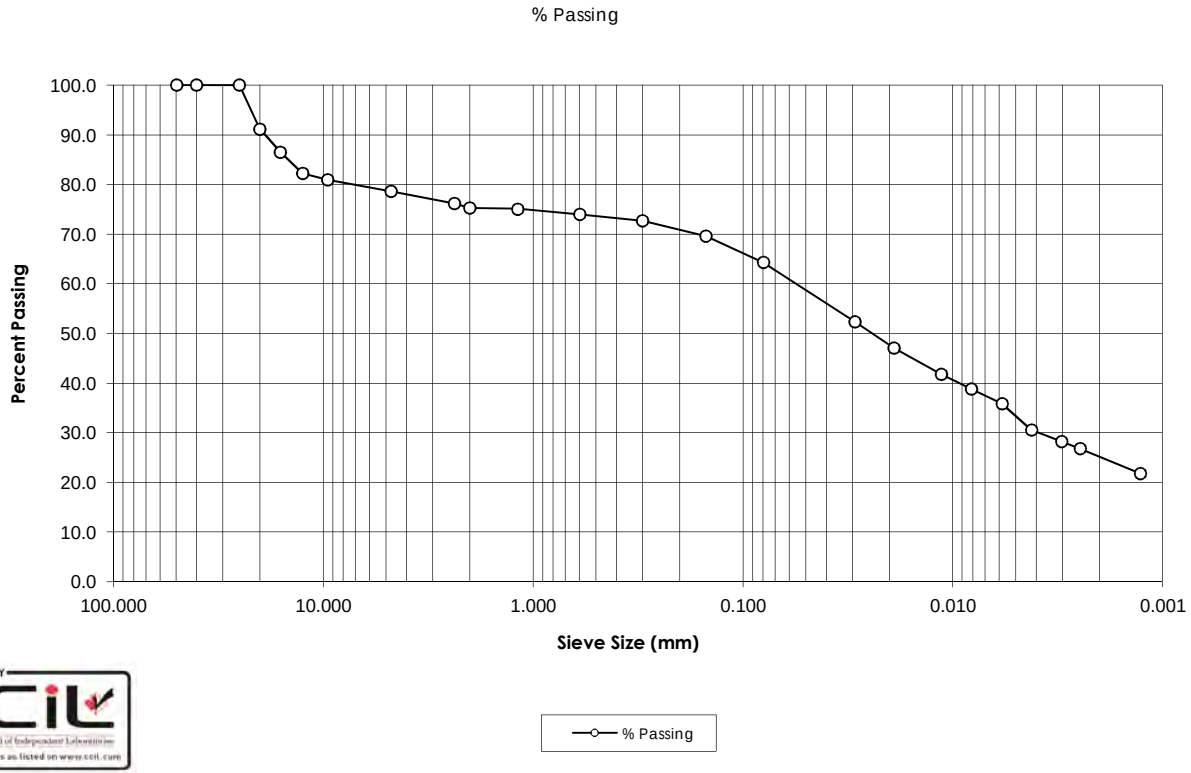
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST21
SOURCE: D13
TESTED BY: B. Pelkey

DATE TESTED: June 20, 2016
DATE RECEIVED: April 30, 2016
SAMPLE DESCRIPTION: Gravelly Clay (CI-CL) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 35.8 |
| 40.0 | 100.0 | 0.0042 | 30.5 |
| 25.0 | 100.0 | 0.0030 | 28.3 |
| 20.0 | 91.1 | 0.0025 | 26.8 |
| 16.0 | 86.4 | 0.0013 | 21.8 |
| 12.5 | 82.2 | | |
| 9.5 | 80.9 | | |
| 4.75 | 78.6 | | |
| 2.36 | 76.2 | | |
| 2.00 | 75.2 | | |
| 1.18 | 75.1 | | |
| 0.600 | 74.0 | | |
| 0.300 | 72.7 | | |
| 0.150 | 69.6 | | |
| 0.080 | 64.3 | | |
| 0.0292 | 52.4 | | |
| 0.0190 | 47.1 | | |
| 0.0113 | 41.8 | | |
| 0.0081 | 38.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 21.4% | $D_{10}$: | - |
| Sand: | 14.3% | $D_{30}$: | 0.0039 |
| Silt: | 39.1% | $D_{60}$: | 0.0629 |
| Clay: | 25.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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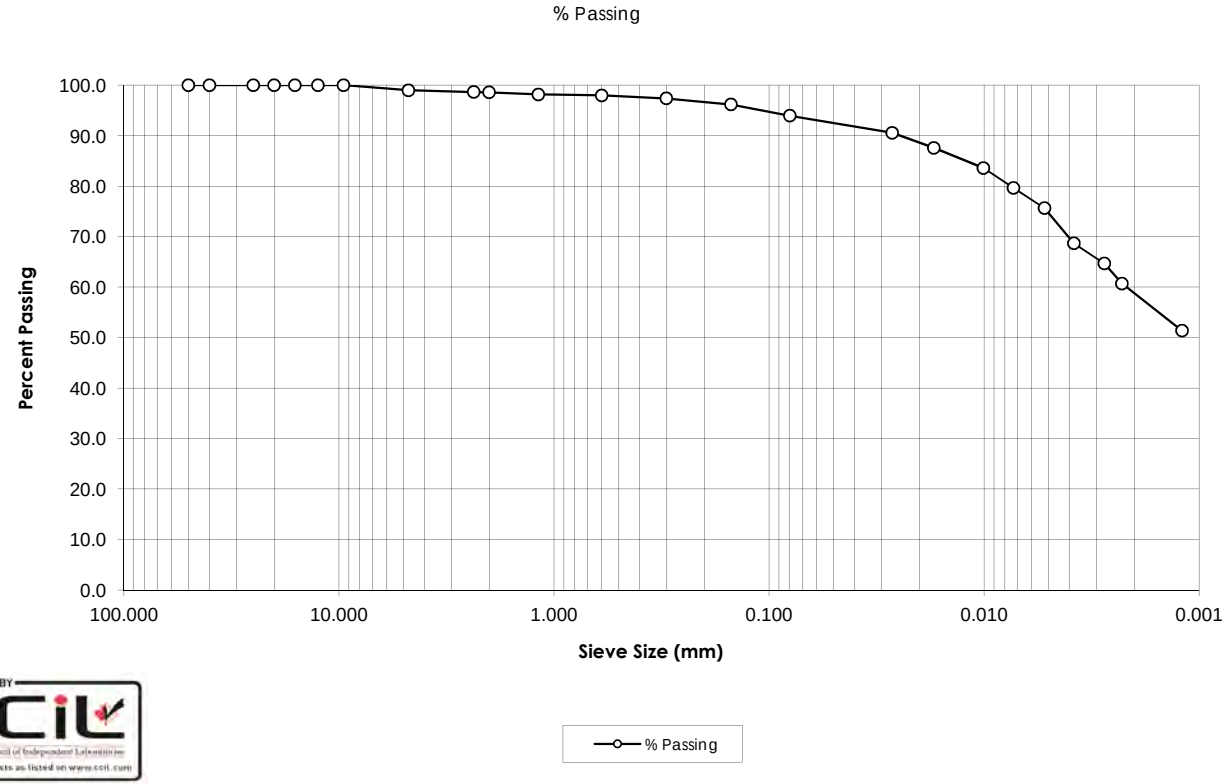
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS7
SOURCE: D14
TESTED BY: M. Pilkington

DATE TESTED: May 6, 2016
DATE RECEIVED: April 23, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 75.6 |
| 40.0 | 100.0 | 0.0038 | 68.7 |
| 25.0 | 100.0 | 0.0028 | 64.7 |
| 20.0 | 100.0 | 0.0023 | 60.7 |
| 16.0 | 100.0 | 0.0012 | 51.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.0 | | |
| 2.36 | 98.6 | | |
| 2.00 | 98.6 | | |
| 1.18 | 98.2 | | |
| 0.600 | 98.0 | | |
| 0.300 | 97.4 | | |
| 0.150 | 96.2 | | |
| 0.080 | 94.0 | | |
| 0.0267 | 90.6 | | |
| 0.0171 | 87.6 | | |
| 0.0101 | 83.6 | | |
| 0.0073 | 79.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.0% | $D_{10}$: | - |
| Sand: | 5.0% | $D_{30}$: | - |
| Silt: | 35.2% | $D_{60}$: | 0.0022 |
| Clay: | 58.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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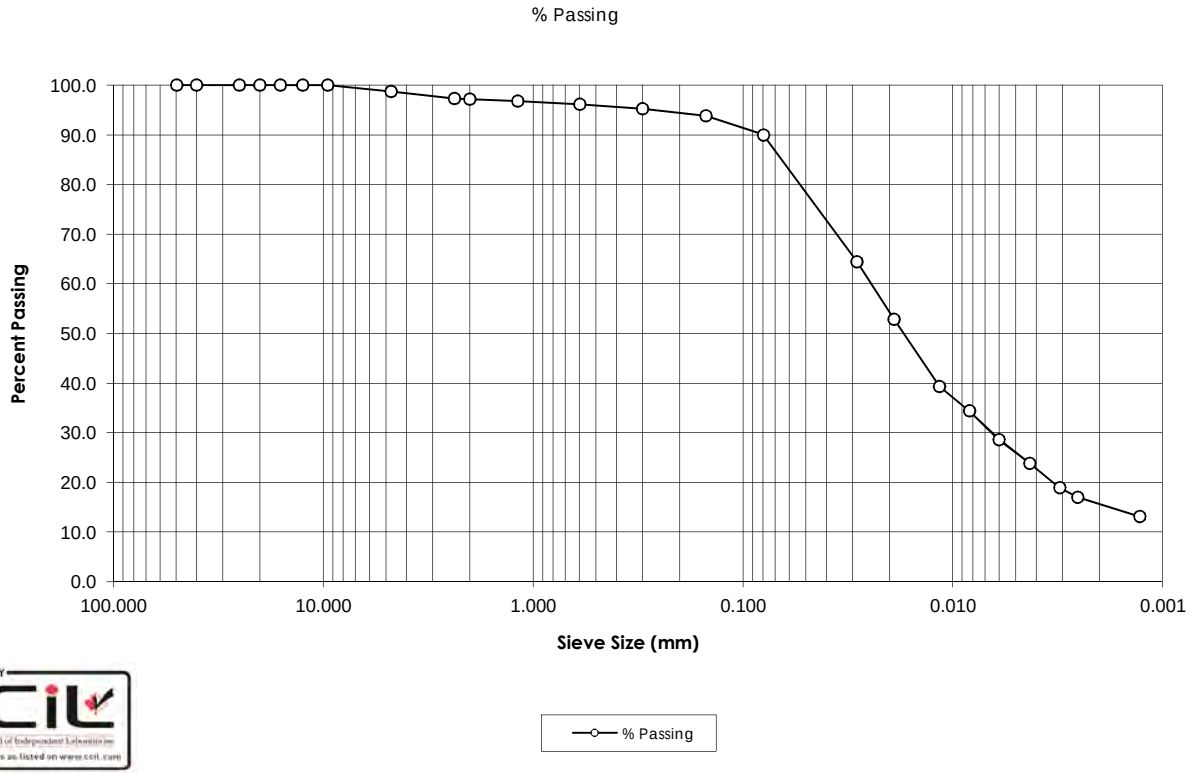
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS10+SS11
SOURCE: D14
TESTED BY: B. Pelkey

DATE TESTED: July 27, 2016
DATE RECEIVED: N/A
SAMPLE DESCRIPTION: Clayey Silt (CL-ML) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 28.6 |
| 40.0 | 100.0 | 0.0043 | 23.8 |
| 25.0 | 100.0 | 0.0031 | 19.0 |
| 20.0 | 100.0 | 0.0025 | 17.0 |
| 16.0 | 100.0 | 0.0013 | 13.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.7 | | |
| 2.36 | 97.4 | | |
| 2.00 | 97.2 | | |
| 1.18 | 96.8 | | |
| 0.600 | 96.1 | | |
| 0.300 | 95.2 | | |
| 0.150 | 93.8 | | |
| 0.080 | 90.0 | | |
| 0.0286 | 64.4 | | |
| 0.0190 | 52.8 | | |
| 0.0116 | 39.3 | | |
| 0.0083 | 34.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.3% | $D_{10}$: | - |
| Sand: | 8.7% | $D_{30}$: | 0.0066 |
| Silt: | 74.4% | $D_{60}$: | 0.0251 |
| Clay: | 15.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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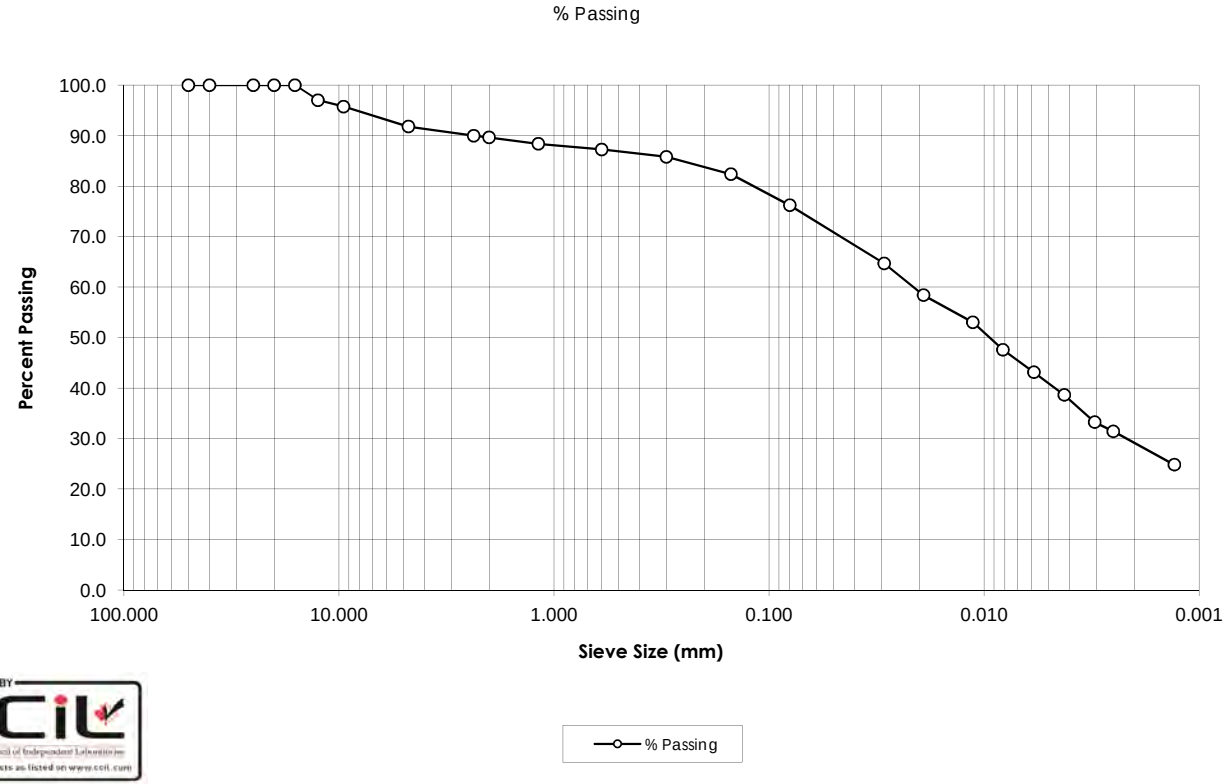
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS27
SOURCE: D14
TESTED BY: M. Pilkington

DATE TESTED: May 6, 2016
DATE RECEIVED: April 23, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0059** | **43.1** |
| **40.0** | **100.0** | **0.0042** | **38.6** |
| **25.0** | **100.0** | **0.0031** | **33.2** |
| **20.0** | **100.0** | **0.0025** | **31.4** |
| **16.0** | **100.0** | **0.0013** | **24.8** |
| **12.5** | **97.0** | | |
| **9.5** | **95.8** | | |
| **4.75** | **91.8** | | |
| **2.36** | **90.0** | | |
| **2.00** | **89.6** | | |
| **1.18** | **88.4** | | |
| **0.600** | **87.3** | | |
| **0.300** | **85.8** | | |
| **0.150** | **82.4** | | |
| **0.080** | **76.2** | | |
| **0.0291** | **64.7** | | |
| **0.0191** | **58.4** | | |
| **0.0112** | **53.0** | | |
| **0.0082** | **47.6** | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.2% | $D_{10}$: | - |
| Sand: | 15.6% | $D_{30}$: | 0.0023 |
| Silt: | 47.1% | $D_{60}$: | 0.0218 |
| Clay: | 29.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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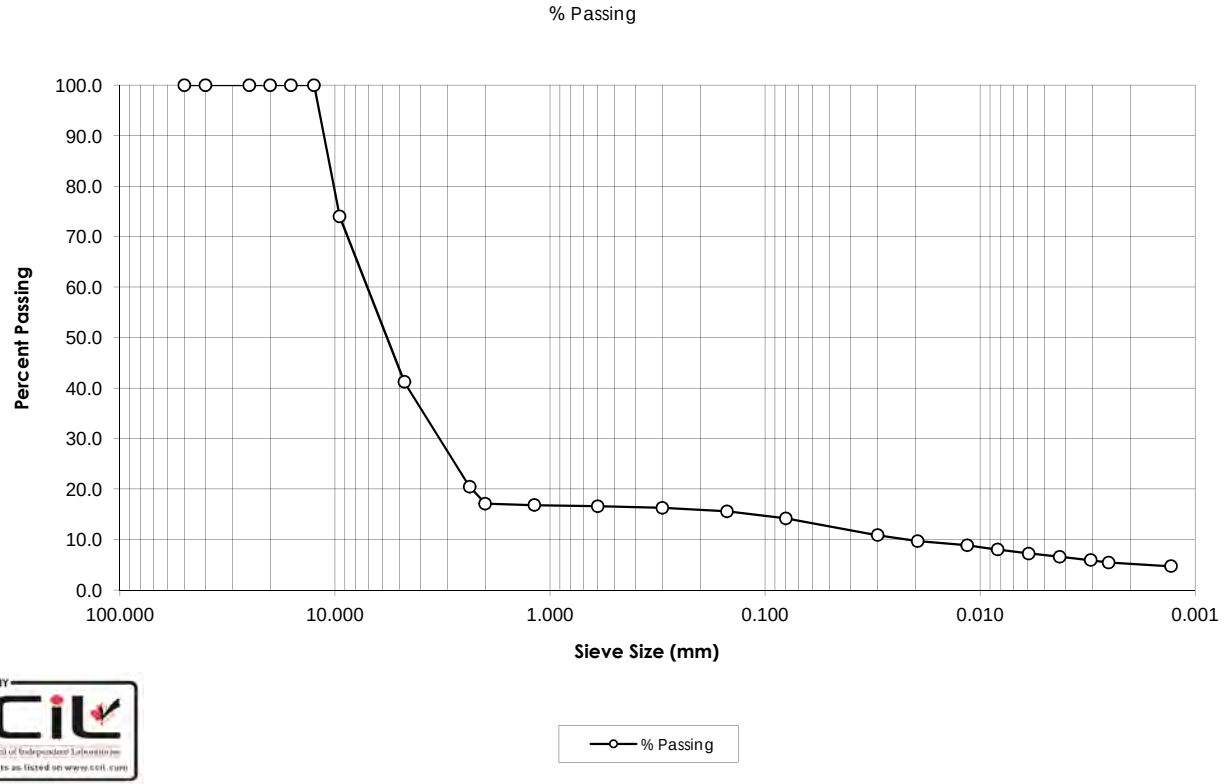
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BSC
SOURCE: D16
TESTED BY: M. Pilkington

DATE TESTED: May 6, 2016
DATE RECEIVED: April 24, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) and Sandy Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 7.2 |
| 40.0 | 100.0 | 0.0043 | 6.6 |
| 25.0 | 100.0 | 0.0031 | 5.9 |
| 20.0 | 100.0 | 0.0025 | 5.4 |
| 16.0 | 100.0 | 0.0013 | 4.7 |
| 12.5 | 100.0 | | |
| 9.5 | 74.0 | | |
| 4.75 | 41.2 | | |
| 2.36 | 20.4 | | |
| 2.00 | 17.1 | | |
| 1.18 | 16.8 | | |
| 0.600 | 16.6 | | |
| 0.300 | 16.3 | | |
| 0.150 | 15.6 | | |
| 0.080 | 14.2 | | |
| 0.0299 | 10.8 | | |
| 0.0195 | 9.7 | | |
| 0.0115 | 8.9 | | |
| 0.0083 | 8.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 58.8% | $D_{10}$: | 0.0224 |
| Sand: | 27.0% | $D_{30}$: | 3.6668 |
| Silt: | 9.0% | $D_{60}$: | 7.7992 |
| Clay: | 5.2% | $C_u$: | 348.95 |
| | | $C_c$: | 77.13 |

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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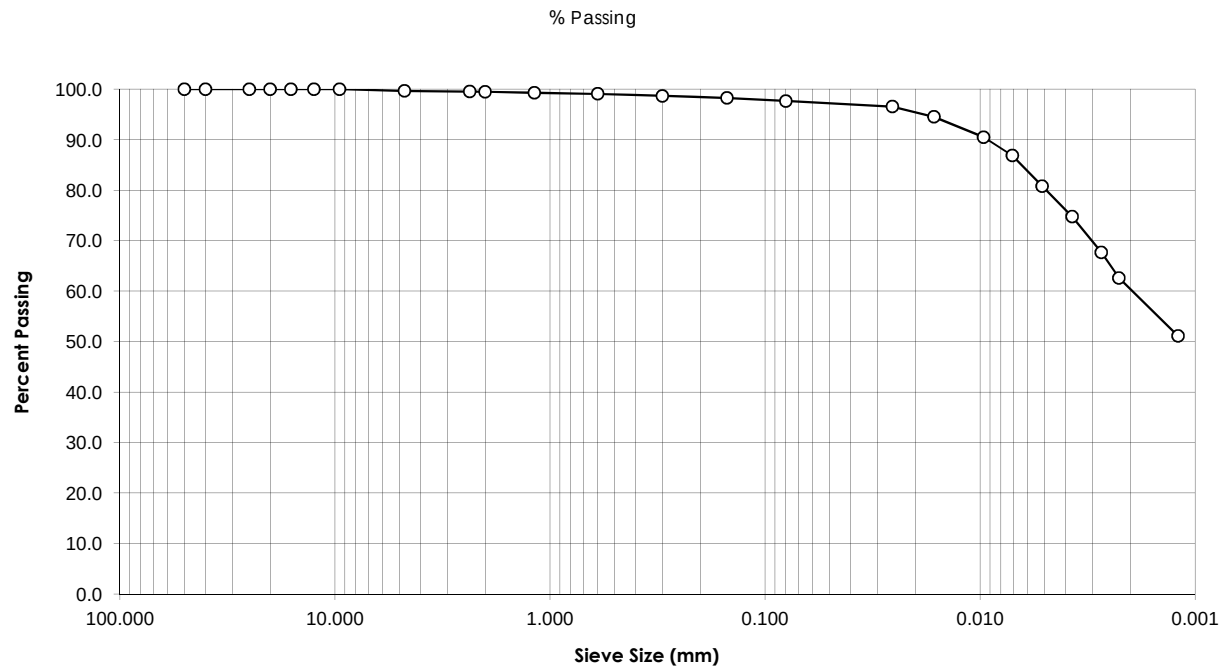
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST3
SOURCE: D16
TESTED BY: M. Pilkington

DATE TESTED: May 9, 2016
DATE RECEIVED: April 24, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 80.8 |
| 40.0 | 100.0 | 0.0037 | 74.7 |
| 25.0 | 100.0 | 0.0027 | 67.7 |
| 20.0 | 100.0 | 0.0023 | 62.6 |
| 16.0 | 100.0 | 0.0012 | 51.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.7 | | |
| 2.36 | 99.5 | | |
| 2.00 | 99.5 | | |
| 1.18 | 99.3 | | |
| 0.600 | 99.1 | | |
| 0.300 | 98.7 | | |
| 0.150 | 98.3 | | |
| 0.080 | 97.7 | | |
| 0.0255 | 96.6 | | |
| 0.0164 | 94.5 | | |
| 0.0096 | 90.5 | | |
| 0.0071 | 86.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.3% | $D_{10}$: | - |
| Sand: | 2.0% | $D_{30}$: | - |
| Silt: | 37.3% | $D_{60}$: | 0.0020 |
| Clay: | 60.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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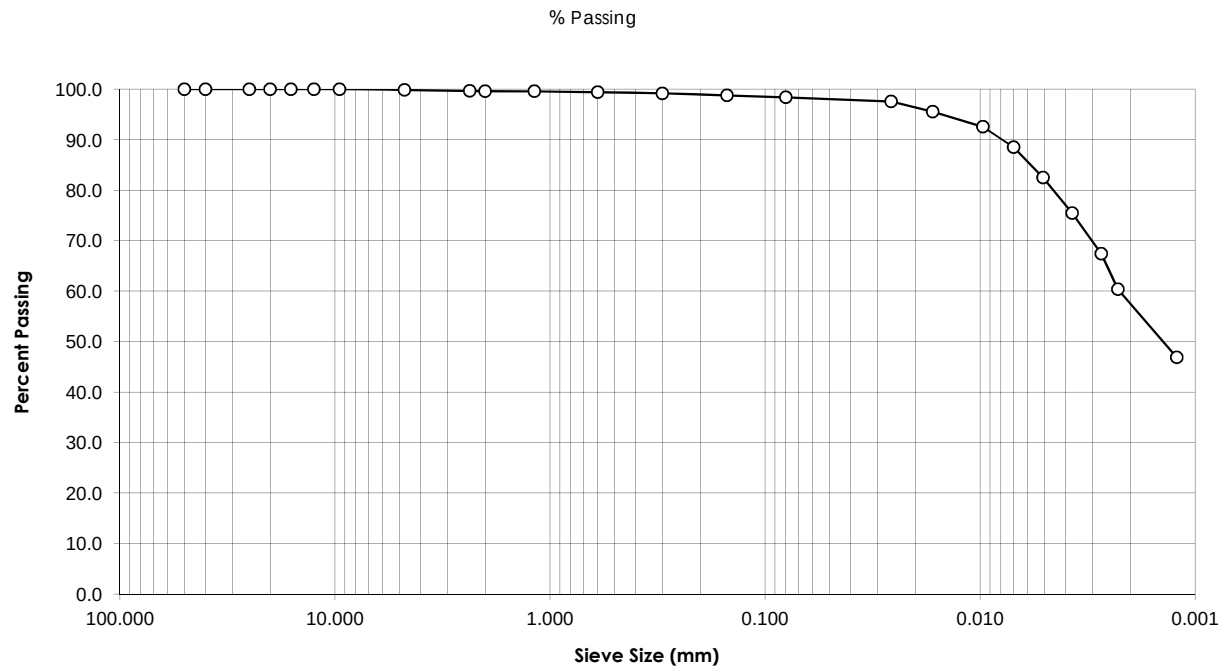
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST5
SOURCE: D16
TESTED BY: M. Pilkington

DATE TESTED: May 6, 2016
DATE RECEIVED: April 24, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 82.5 |
| 40.0 | 100.0 | 0.0037 | 75.4 |
| 25.0 | 100.0 | 0.0027 | 67.4 |
| 20.0 | 100.0 | 0.0023 | 60.4 |
| 16.0 | 100.0 | 0.0012 | 46.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.9 | | |
| 2.36 | 99.7 | | |
| 2.00 | 99.6 | | |
| 1.18 | 99.6 | | |
| 0.600 | 99.4 | | |
| 0.300 | 99.2 | | |
| 0.150 | 98.8 | | |
| 0.080 | 98.4 | | |
| 0.0259 | 97.6 | | |
| 0.0166 | 95.6 | | |
| 0.0097 | 92.5 | | |
| 0.0070 | 88.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.1% | $D_{10}$: | - |
| Sand: | 1.5% | $D_{30}$: | - |
| Silt: | 40.9% | $D_{60}$: | 0.0023 |
| Clay: | 57.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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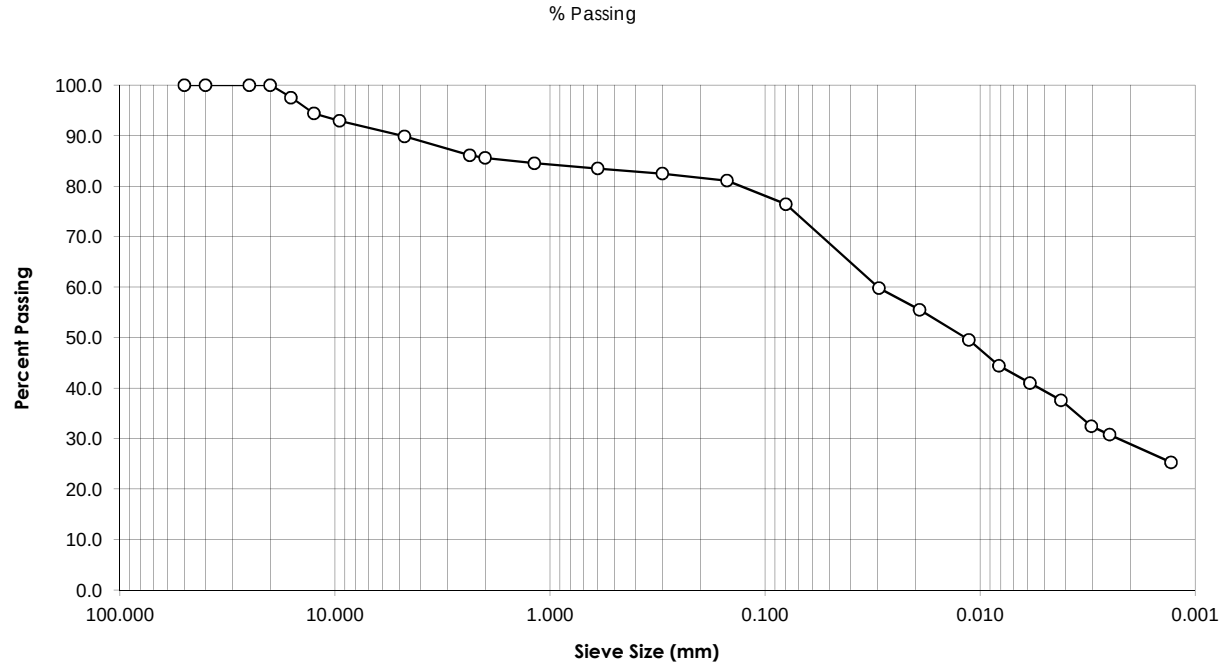
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS12
SOURCE: D16
TESTED BY: M. Pilkington

DATE TESTED: May 6, 2016
DATE RECEIVED: April 24, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 41.0 |
| 40.0 | 100.0 | 0.0042 | 37.6 |
| 25.0 | 100.0 | 0.0030 | 32.5 |
| 20.0 | 100.0 | 0.0025 | 30.7 |
| 16.0 | 97.5 | 0.0013 | 25.3 |
| 12.5 | 94.4 | | |
| 9.5 | 92.9 | | |
| 4.75 | 89.9 | | |
| 2.36 | 86.1 | | |
| 2.00 | 85.6 | | |
| 1.18 | 84.5 | | |
| 0.600 | 83.5 | | |
| 0.300 | 82.5 | | |
| 0.150 | 81.1 | | |
| 0.080 | 76.4 | | |
| 0.0294 | 59.8 | | |
| 0.0191 | 55.5 | | |
| 0.0112 | 49.5 | | |
| 0.0082 | 44.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 10.1% | $D_{10}$: | - |
| Sand: | 13.4% | $D_{30}$: | 0.0023 |
| Silt: | 47.5% | $D_{60}$: | 0.0302 |
| Clay: | 28.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results.

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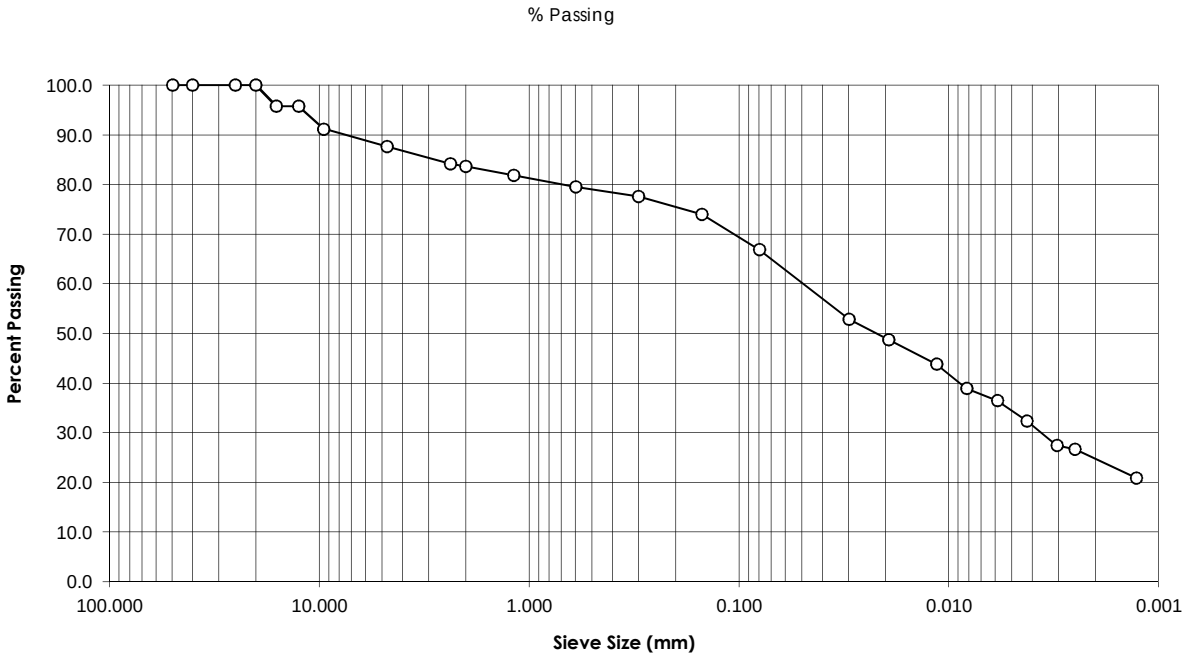
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS23
SOURCE: D17
TESTED BY: B. Pelkey

DATE TESTED: June 22, 2016
DATE RECEIVED: January 0, 1900
SAMPLE DESCRIPTION: Sandy Clay (CI-CL) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 36.5 |
| 40.0 | 100.0 | 0.0042 | 32.4 |
| 25.0 | 100.0 | 0.0031 | 27.5 |
| 20.0 | 100.0 | 0.0025 | 26.7 |
| 16.0 | 95.8 | 0.0013 | 20.9 |
| 12.5 | 95.8 | | |
| 9.5 | 91.2 | | |
| 4.75 | 87.7 | | |
| 2.36 | 84.2 | | |
| 2.00 | 83.7 | | |
| 1.18 | 81.9 | | |
| 0.600 | 79.6 | | |
| 0.300 | 77.6 | | |
| 0.150 | 74.0 | | |
| 0.080 | 66.9 | | |
| 0.0298 | 52.8 | | |
| 0.0192 | 48.7 | | |
| 0.0114 | 43.8 | | |
| 0.0082 | 38.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.3% | $D_{10}$: | - |
| Sand: | 20.8% | $D_{30}$: | 0.0037 |
| Silt: | 42.1% | $D_{60}$: | 0.0570 |
| Clay: | 24.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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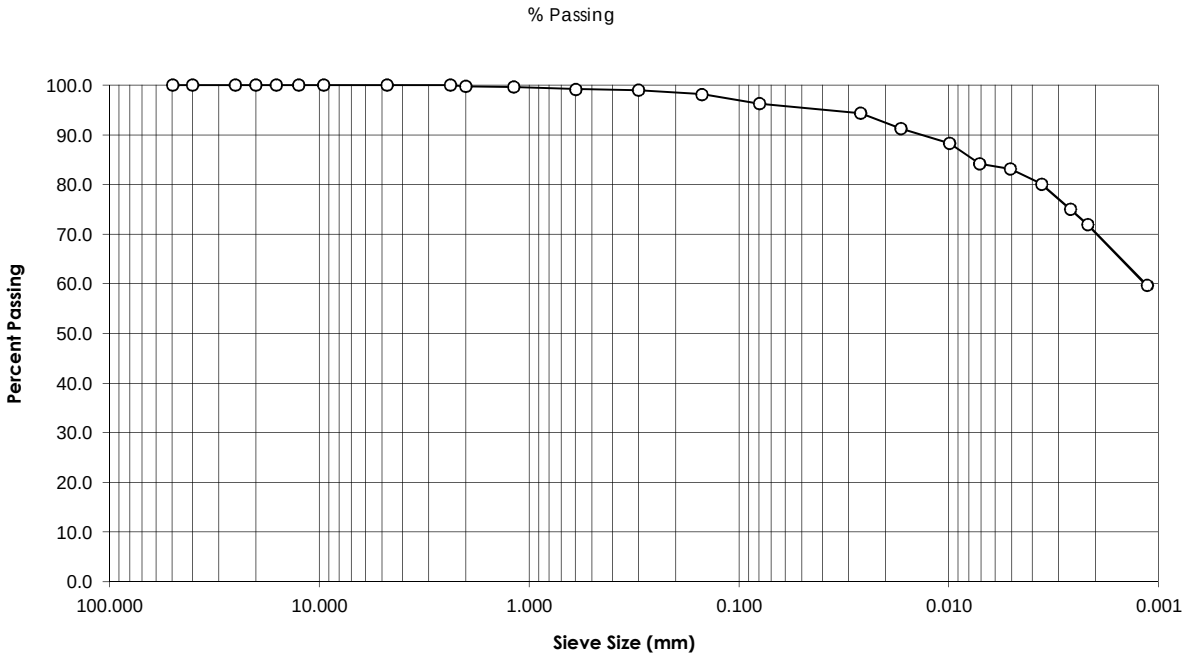
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D17
TESTED BY: B. Pelkey

DATE TESTED: June 22, 2016
DATE RECEIVED: April 29, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 83.2 |
| 40.0 | 100.0 | 0.0036 | 80.1 |
| 25.0 | 100.0 | 0.0026 | 75.0 |
| 20.0 | 100.0 | 0.0022 | 72.0 |
| 16.0 | 100.0 | 0.0011 | 59.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 99.8 | | |
| 1.18 | 99.6 | | |
| 0.600 | 99.2 | | |
| 0.300 | 99.0 | | |
| 0.150 | 98.2 | | |
| 0.080 | 96.3 | | |
| 0.0262 | 94.4 | | |
| 0.0169 | 91.3 | | |
| 0.0099 | 88.3 | | |
| 0.0071 | 84.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 3.7% | $D_{30}$: | - |
| Silt: | 25.9% | $D_{60}$: | 0.0012 |
| Clay: | 70.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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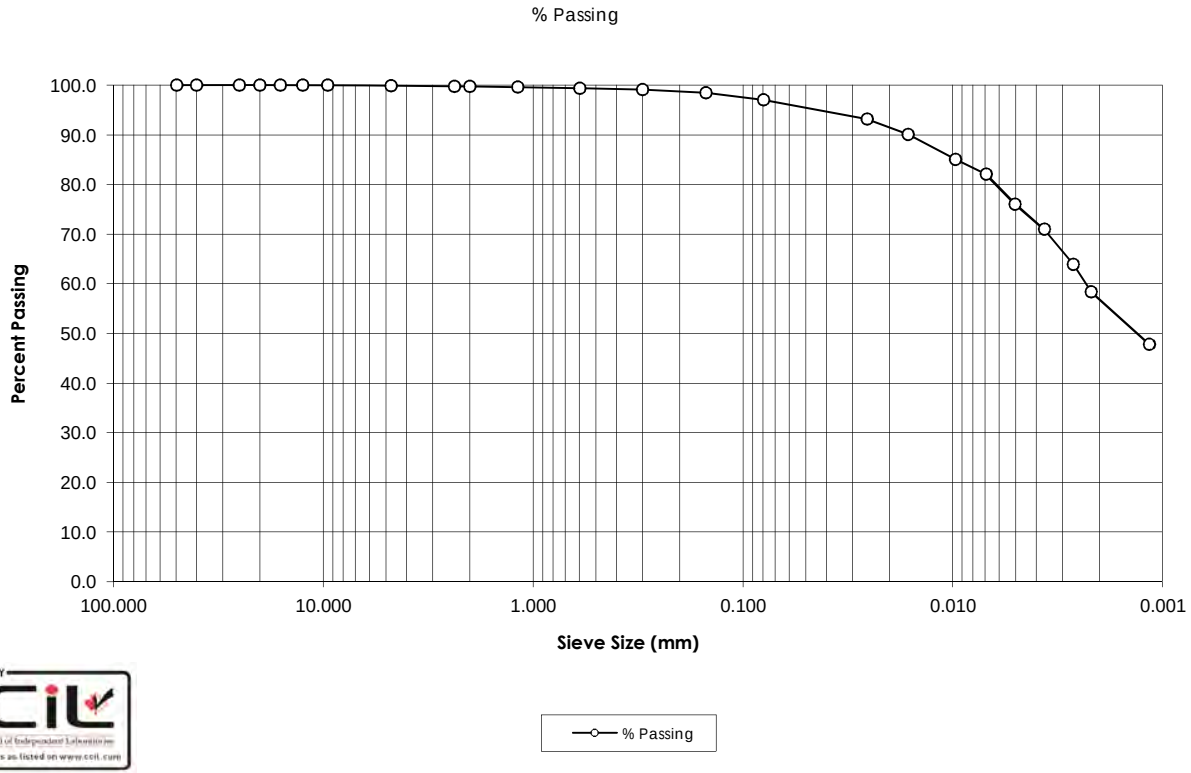
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST8
SOURCE: D17
TESTED BY: C. Oost

DATE TESTED: June 28, 2016
DATE RECEIVED: April 29, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 76.0 |
| 40.0 | 100.0 | 0.0037 | 71.0 |
| 25.0 | 100.0 | 0.0027 | 64.0 |
| 20.0 | 100.0 | 0.0022 | 58.3 |
| 16.0 | 100.0 | 0.0012 | 47.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.9 | | |
| 2.36 | 99.8 | | |
| 2.00 | 99.7 | | |
| 1.18 | 99.6 | | |
| 0.600 | 99.4 | | |
| 0.300 | 99.1 | | |
| 0.150 | 98.4 | | |
| 0.080 | 97.1 | | |
| 0.0256 | 93.1 | | |
| 0.0163 | 90.1 | | |
| 0.0097 | 85.1 | | |
| 0.0069 | 82.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.1% | $D_{10}$: | - |
| Sand: | 2.8% | $D_{30}$: | - |
| Silt: | 40.2% | $D_{60}$: | 0.0023 |
| Clay: | 56.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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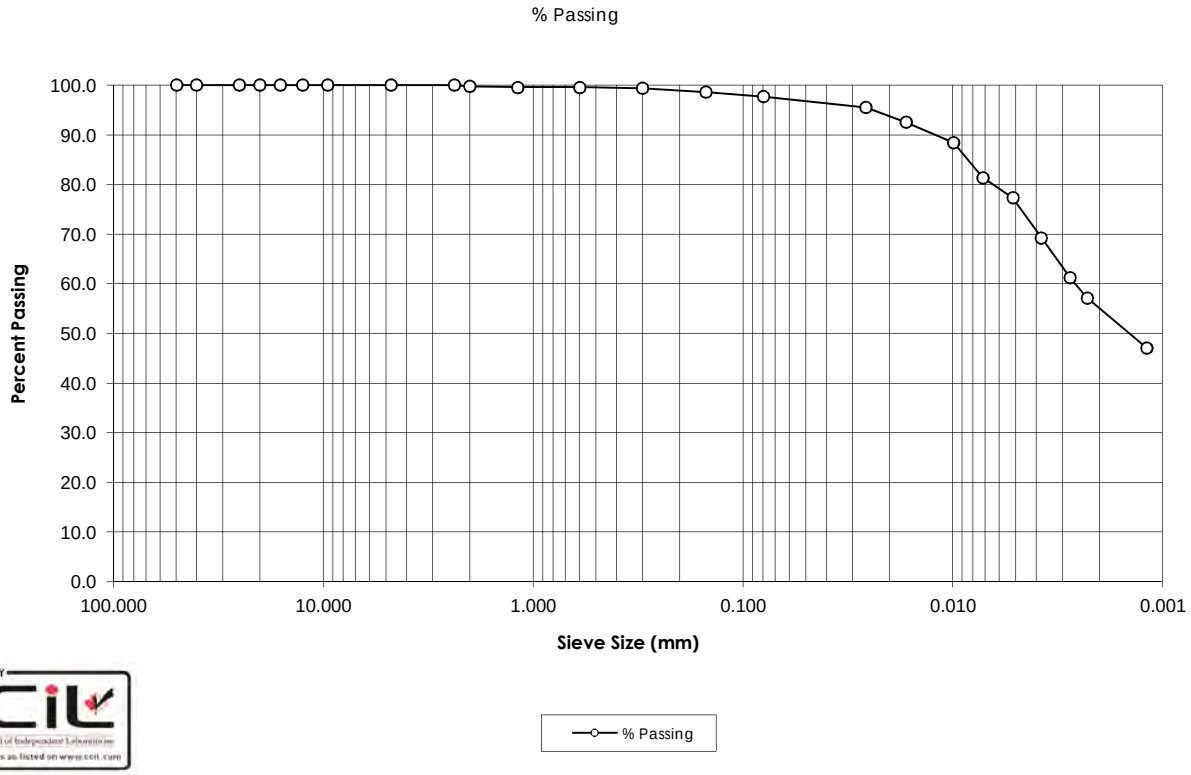
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST10
SOURCE: D17
TESTED BY: B. Pelkey

DATE TESTED: June 22, 2016
DATE RECEIVED: April 29, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 77.4 |
| 40.0 | 100.0 | 0.0038 | 69.3 |
| 25.0 | 100.0 | 0.0028 | 61.2 |
| 20.0 | 100.0 | 0.0023 | 57.2 |
| 16.0 | 100.0 | 0.0012 | 47.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 99.8 | | |
| 1.18 | 99.6 | | |
| 0.600 | 99.6 | | |
| 0.300 | 99.4 | | |
| 0.150 | 98.5 | | |
| 0.080 | 97.7 | | |
| 0.0259 | 95.5 | | |
| 0.0167 | 92.5 | | |
| 0.0099 | 88.5 | | |
| 0.0072 | 81.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.3% | $D_{30}$: | - |
| Silt: | 42.6% | $D_{60}$: | 0.0026 |
| Clay: | 55.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. Stantec is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of Stantec.

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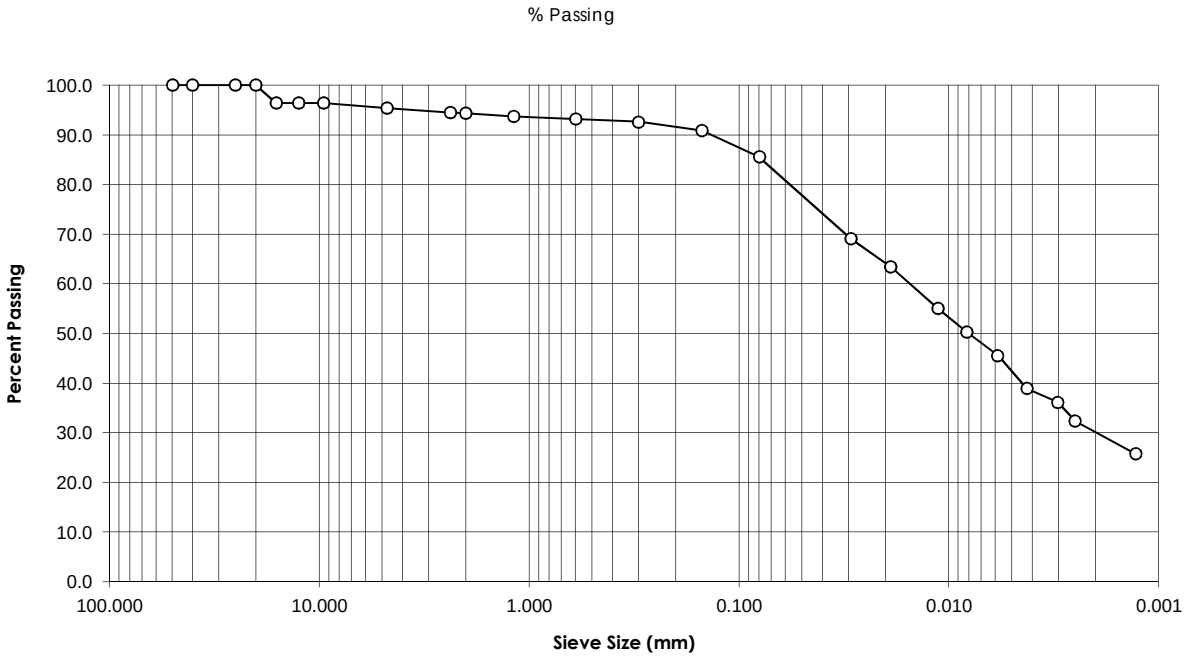
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST20
SOURCE: D17
TESTED BY: B. Pelkey

DATE TESTED: June 20, 2016
DATE RECEIVED: April 29, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 45.6 |
| 40.0 | 100.0 | 0.0043 | 39.0 |
| 25.0 | 100.0 | 0.0030 | 36.2 |
| 20.0 | 100.0 | 0.0025 | 32.4 |
| 16.0 | 96.5 | 0.0013 | 25.8 |
| 12.5 | 96.5 | | |
| 9.5 | 96.5 | | |
| 4.75 | 95.3 | | |
| 2.36 | 94.5 | | |
| 2.00 | 94.3 | | |
| 1.18 | 93.8 | | |
| 0.600 | 93.2 | | |
| 0.300 | 92.6 | | |
| 0.150 | 90.9 | | |
| 0.080 | 85.6 | | |
| 0.0291 | 69.1 | | |
| 0.0189 | 63.5 | | |
| 0.0112 | 55.0 | | |
| 0.0082 | 50.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.7% | $D_{10}$: | - |
| Sand: | 9.8% | $D_{30}$: | 0.0021 |
| Silt: | 55.4% | $D_{60}$: | 0.0159 |
| Clay: | 30.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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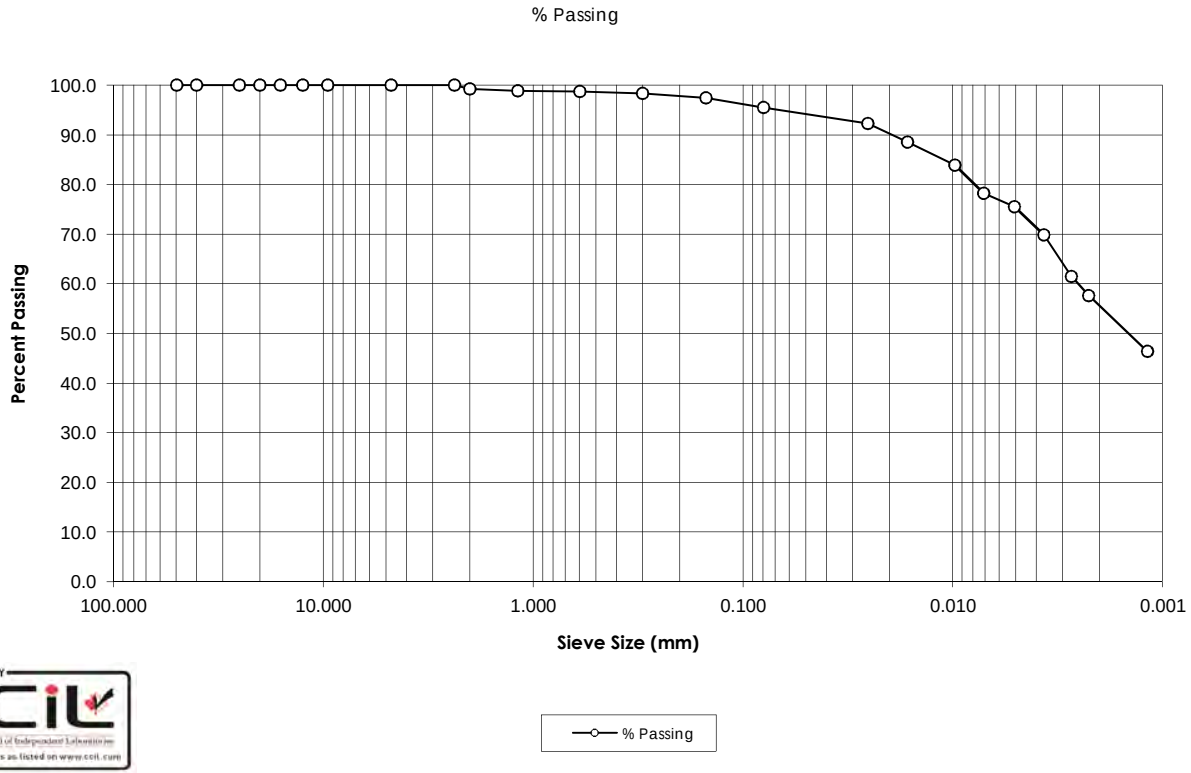
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST14
SOURCE: D18
TESTED BY: B. Pelkey

DATE TESTED: June 22, 2016
DATE RECEIVED: April 26, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 75.5 |
| 40.0 | 100.0 | 0.0037 | 69.9 |
| 25.0 | 100.0 | 0.0027 | 61.4 |
| 20.0 | 100.0 | 0.0023 | 57.7 |
| 16.0 | 100.0 | 0.0012 | 46.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 99.3 | | |
| 1.18 | 98.9 | | |
| 0.600 | 98.7 | | |
| 0.300 | 98.3 | | |
| 0.150 | 97.4 | | |
| 0.080 | 95.5 | | |
| 0.0254 | 92.3 | | |
| 0.0164 | 88.6 | | |
| 0.0098 | 83.9 | | |
| 0.0071 | 78.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 4.5% | $D_{30}$: | - |
| Silt: | 39.9% | $D_{60}$: | 0.0025 |
| Clay: | 55.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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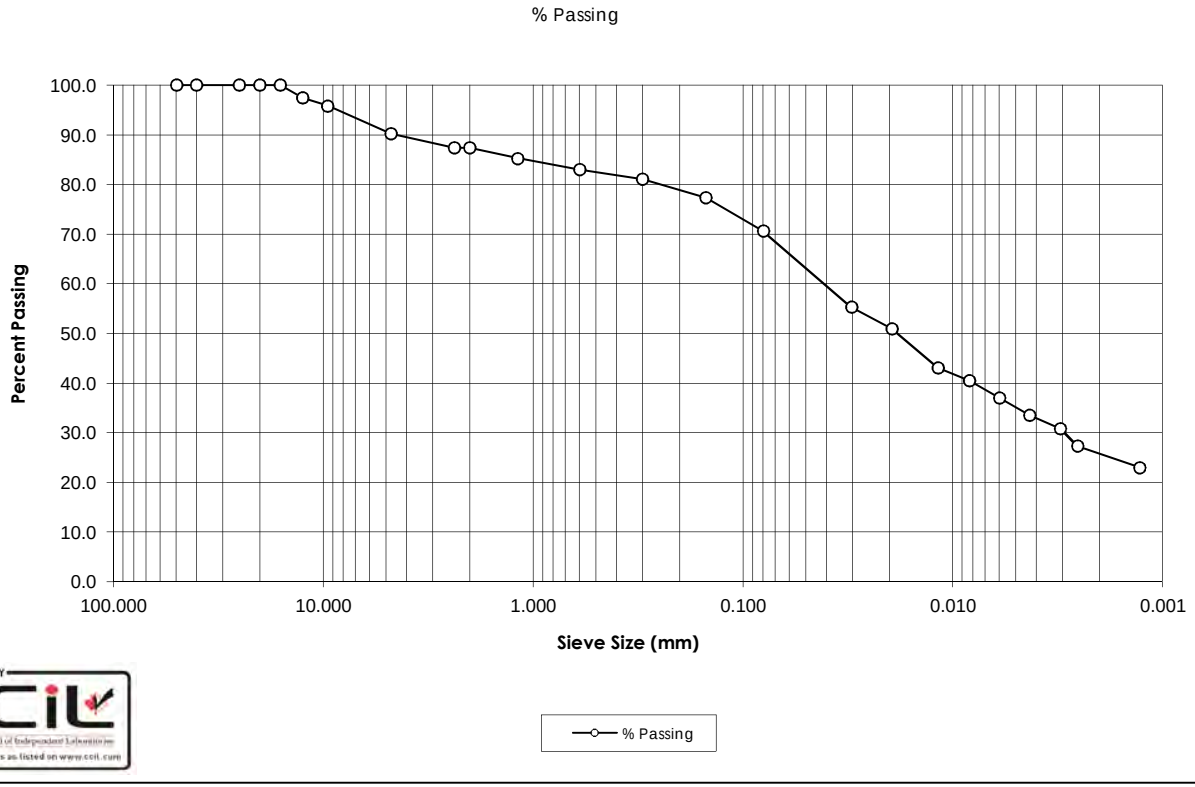
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS24
SOURCE: D18
TESTED BY: B. Pelkey

DATE TESTED: June 20, 2016
DATE RECEIVED: April 26, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 37.0 |
| 40.0 | 100.0 | 0.0043 | 33.5 |
| 25.0 | 100.0 | 0.0031 | 30.9 |
| 20.0 | 100.0 | 0.0025 | 27.4 |
| 16.0 | 100.0 | 0.0013 | 23.0 |
| 12.5 | 97.4 | | |
| 9.5 | 95.8 | | |
| 4.75 | 90.2 | | |
| 2.36 | 87.4 | | |
| 2.00 | 87.4 | | |
| 1.18 | 85.3 | | |
| 0.600 | 83.0 | | |
| 0.300 | 81.0 | | |
| 0.150 | 77.3 | | |
| 0.080 | 70.6 | | |
| 0.0304 | 55.3 | | |
| 0.0195 | 50.9 | | |
| 0.0117 | 43.1 | | |
| 0.0083 | 40.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.8% | $D_{10}$: | - |
| Sand: | 19.6% | $D_{30}$: | 0.0029 |
| Silt: | 44.8% | $D_{60}$: | 0.0469 |
| Clay: | 25.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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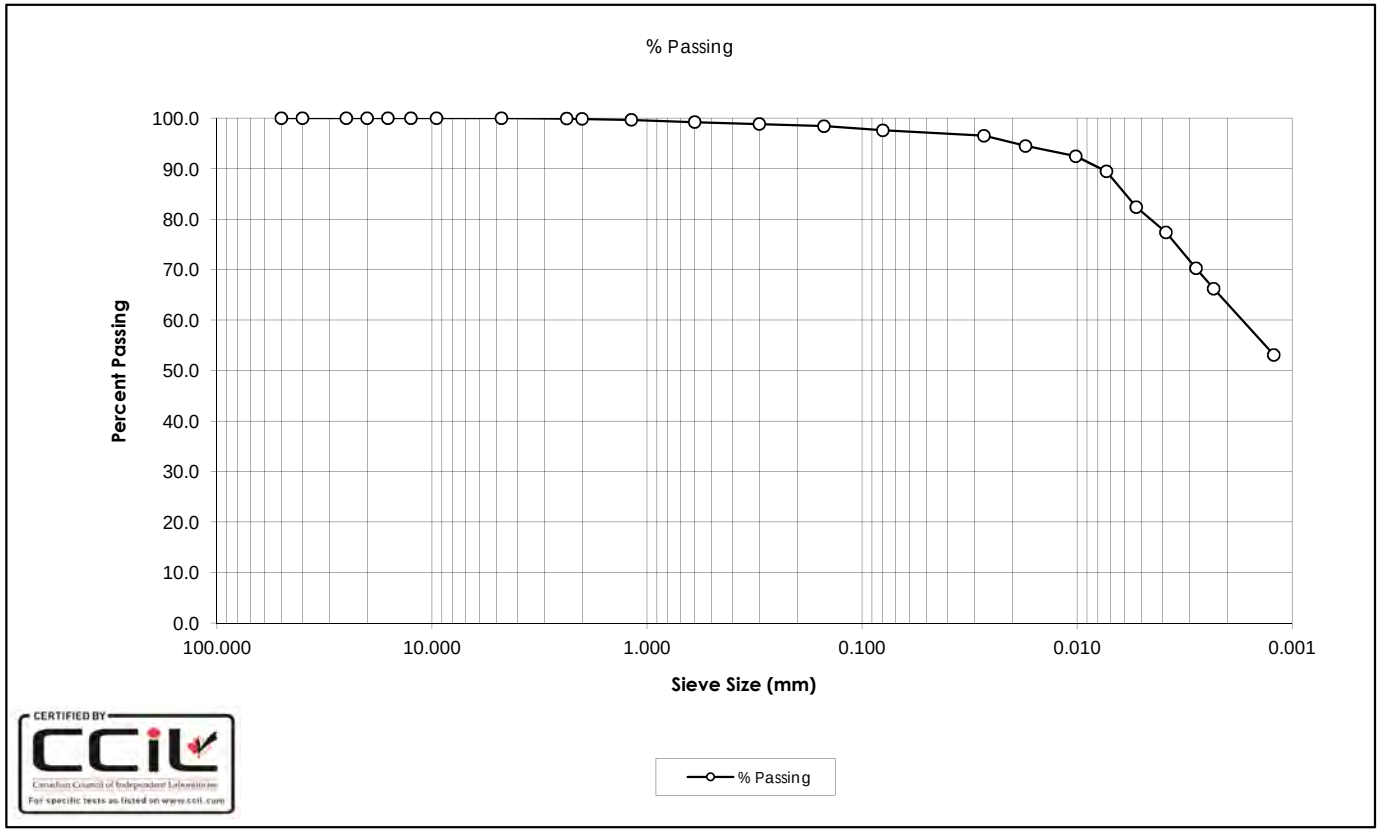
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST6
SOURCE: D19
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 22, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 82.4 |
| 40.0 | 100.0 | 0.0038 | 77.3 |
| 25.0 | 100.0 | 0.0028 | 70.3 |
| 20.0 | 100.0 | 0.0023 | 66.2 |
| 16.0 | 100.0 | 0.0012 | 53.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.8 | | |
| 1.18 | 99.6 | | |
| 0.600 | 99.2 | | |
| 0.300 | 98.8 | | |
| 0.150 | 98.4 | | |
| 0.080 | 97.6 | | |
| 0.0270 | 96.5 | | |
| 0.0173 | 94.5 | | |
| 0.0101 | 92.5 | | |
| 0.0073 | 89.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.4% | $D_{30}$: | - |
| Silt: | 34.3% | $D_{60}$: | 0.0018 |
| Clay: | 63.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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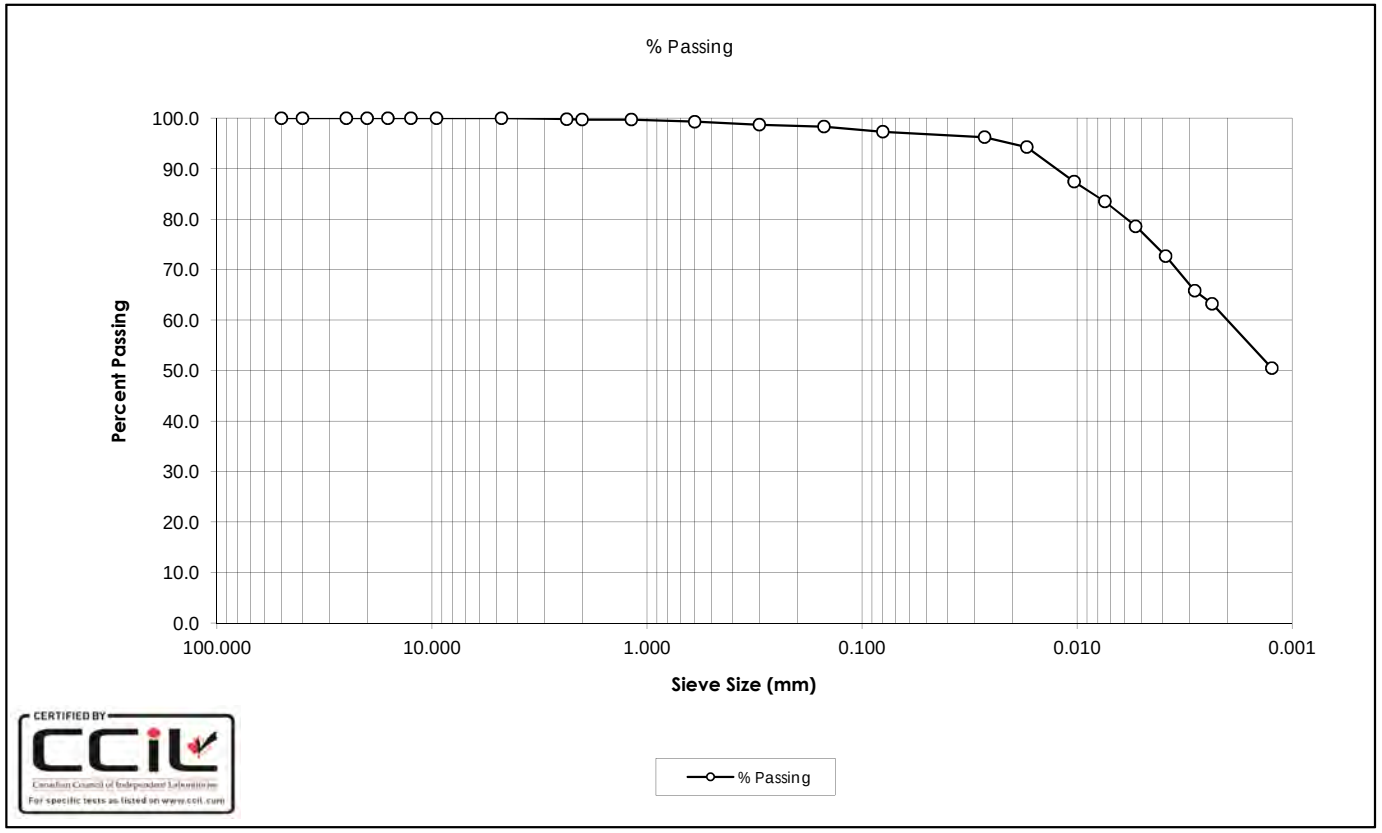
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS11
SOURCE: D19
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 21, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0053** | **78.6** |
| **40.0** | **100.0** | **0.0039** | **72.7** |
| **25.0** | **100.0** | **0.0028** | **65.8** |
| **20.0** | **100.0** | **0.0024** | **63.3** |
| **16.0** | **100.0** | **0.0012** | **50.5** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.8** | | |
| **2.00** | **99.7** | | |
| **1.18** | **99.7** | | |
| **0.600** | **99.3** | | |
| **0.300** | **98.7** | | |
| **0.150** | **98.3** | | |
| **0.080** | **97.3** | | |
| **0.0269** | **96.3** | | |
| **0.0171** | **94.3** | | |
| **0.0103** | **87.4** | | |
| **0.0074** | **83.5** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.7% | $D_{30}$: | - |
| Silt: | 37.3% | $D_{60}$: | 0.0021 |
| Clay: | 60.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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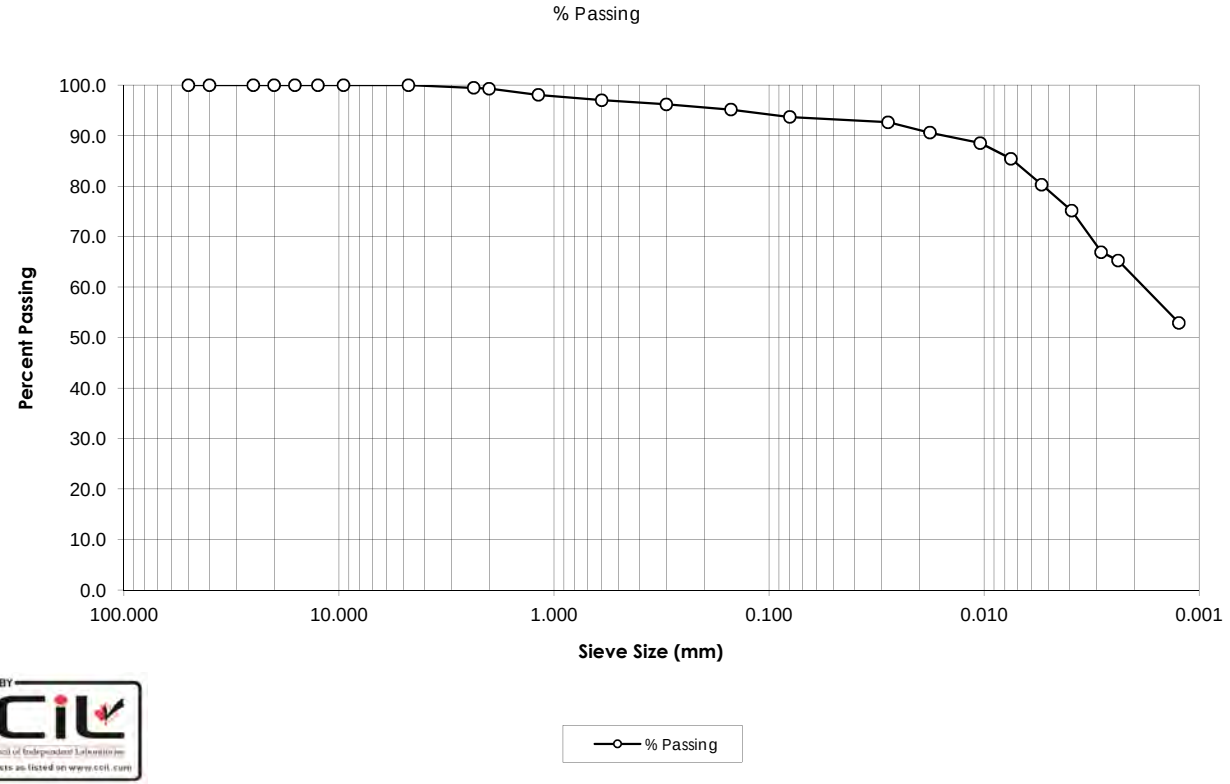
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS16
SOURCE: D19
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 21, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 80.3 |
| 40.0 | 100.0 | 0.0039 | 75.1 |
| 25.0 | 100.0 | 0.0028 | 66.9 |
| 20.0 | 100.0 | 0.0024 | 65.3 |
| 16.0 | 100.0 | 0.0012 | 52.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.5 | | |
| 2.00 | 99.3 | | |
| 1.18 | 98.1 | | |
| 0.600 | 97.0 | | |
| 0.300 | 96.2 | | |
| 0.150 | 95.2 | | |
| 0.080 | 93.7 | | |
| 0.0279 | 92.6 | | |
| 0.0178 | 90.6 | | |
| 0.0104 | 88.5 | | |
| 0.0075 | 85.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 6.3% | $D_{30}$: | - |
| Silt: | 31.7% | $D_{60}$: | 0.0019 |
| Clay: | 62.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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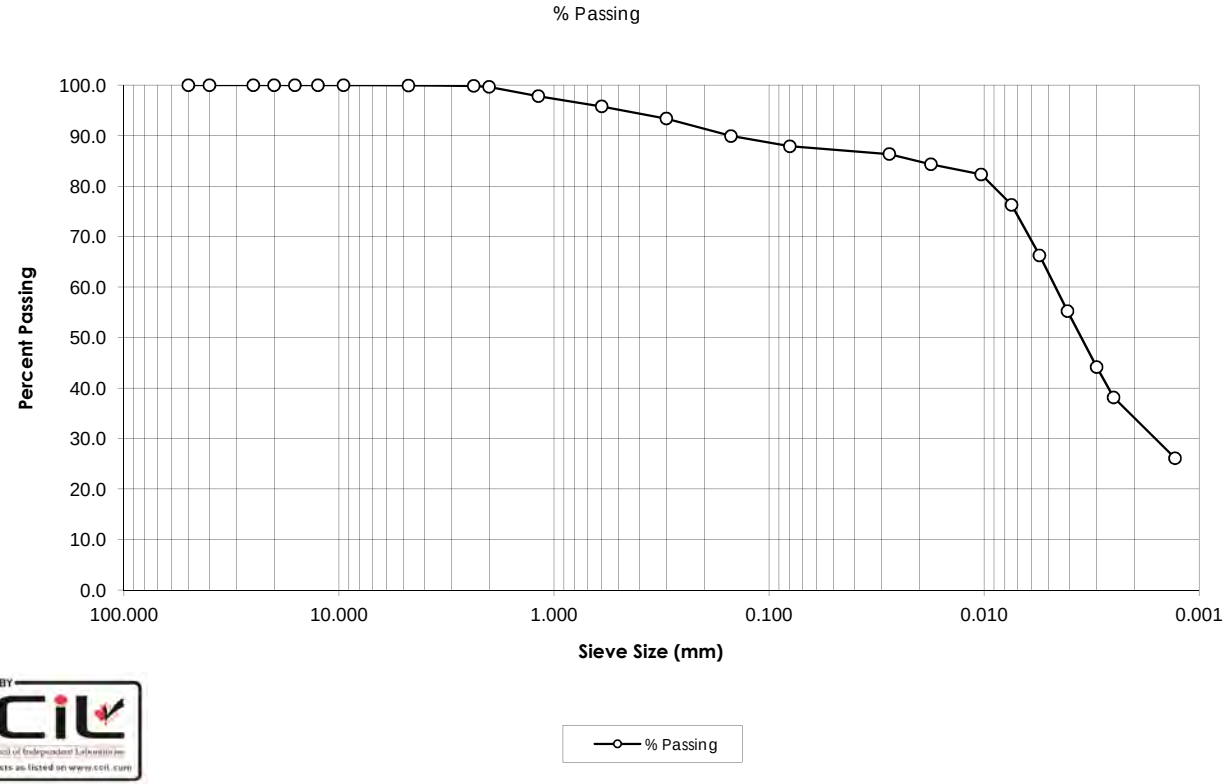
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS18
SOURCE: D19
TESTED BY: B.Pelkey

DATE TESTED: May 2, 2016
DATE RECEIVED: April 21, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 66.3 |
| 40.0 | 100.0 | 0.0041 | 55.2 |
| 25.0 | 100.0 | 0.0030 | 44.2 |
| 20.0 | 100.0 | 0.0025 | 38.1 |
| 16.0 | 100.0 | 0.0013 | 26.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.7 | | |
| 1.18 | 97.8 | | |
| 0.600 | 95.8 | | |
| 0.300 | 93.4 | | |
| 0.150 | 89.9 | | |
| 0.080 | 87.9 | | |
| 0.0275 | 86.3 | | |
| 0.0176 | 84.3 | | |
| 0.0103 | 82.3 | | |
| 0.0074 | 76.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 12.0% | $D_{30}$: | 0.0017 |
| Silt: | 53.8% | $D_{60}$: | 0.0047 |
| Clay: | 34.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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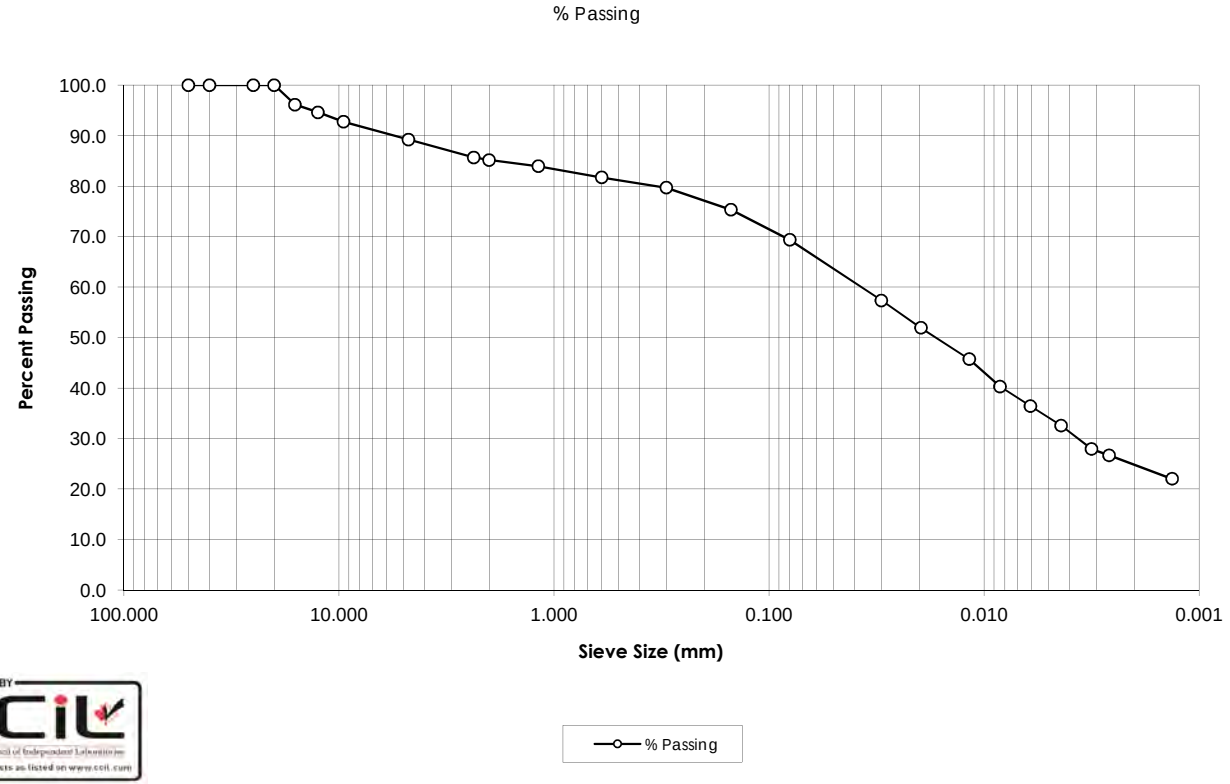
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST21
SOURCE: D19
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 21, 2016
SAMPLE DESCRIPTION: Clay (CL-CI), Some Sand and Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 36.4 |
| 40.0 | 100.0 | 0.0044 | 32.6 |
| 25.0 | 100.0 | 0.0032 | 27.9 |
| 20.0 | 100.0 | 0.0026 | 26.7 |
| 16.0 | 96.1 | 0.0013 | 22.0 |
| 12.5 | 94.6 | | |
| 9.5 | 92.7 | | |
| 4.75 | 89.2 | | |
| 2.36 | 85.7 | | |
| 2.00 | 85.2 | | |
| 1.18 | 83.9 | | |
| 0.600 | 81.7 | | |
| 0.300 | 79.7 | | |
| 0.150 | 75.3 | | |
| 0.080 | 69.4 | | |
| 0.0300 | 57.4 | | |
| 0.0196 | 51.9 | | |
| 0.0117 | 45.7 | | |
| 0.0084 | 40.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 10.8% | $D_{10}$: | - |
| Sand: | 19.9% | $D_{30}$: | 0.0037 |
| Silt: | 44.6% | $D_{60}$: | 0.0418 |
| Clay: | 24.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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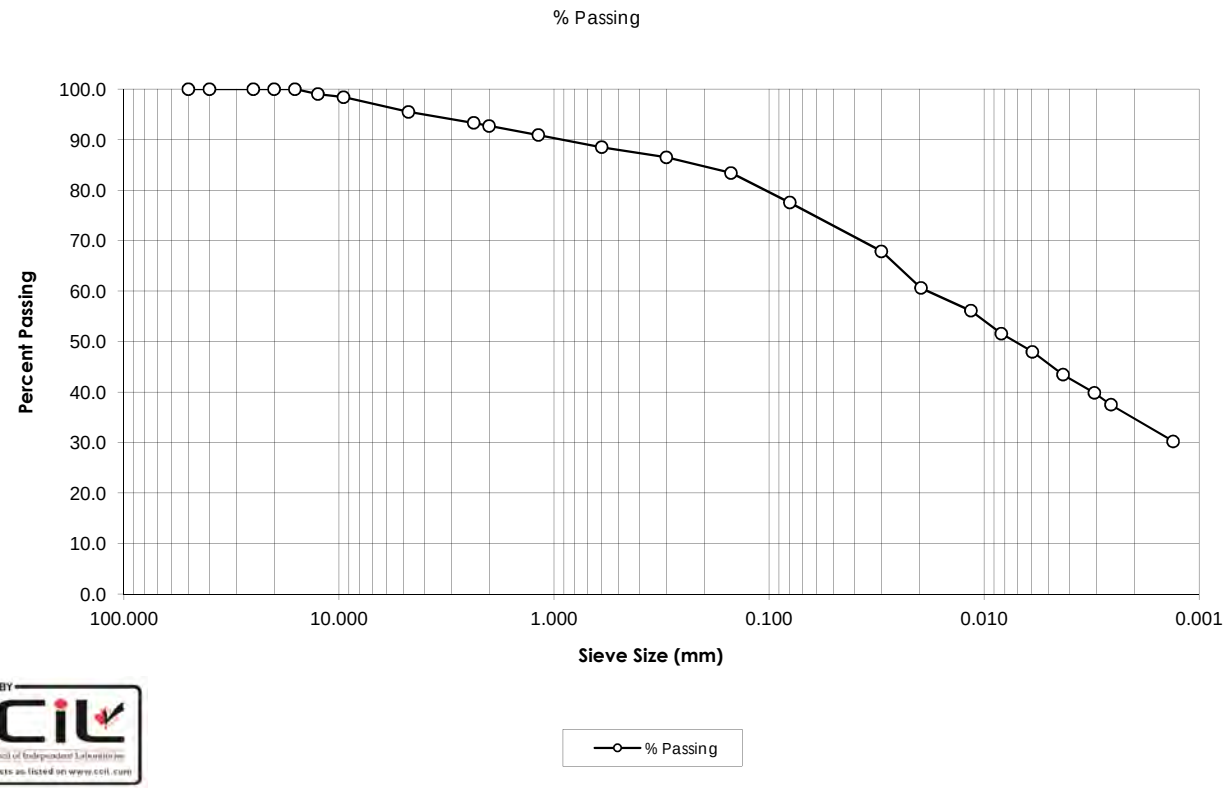
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS25
SOURCE: D19
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 21, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 48.0 |
| 40.0 | 100.0 | 0.0043 | 43.4 |
| 25.0 | 100.0 | 0.0031 | 39.8 |
| 20.0 | 100.0 | 0.0026 | 37.5 |
| 16.0 | 100.0 | 0.0013 | 30.2 |
| 12.5 | 99.0 | | |
| 9.5 | 98.4 | | |
| 4.75 | 95.5 | | |
| 2.36 | 93.3 | | |
| 2.00 | 92.7 | | |
| 1.18 | 90.9 | | |
| 0.600 | 88.5 | | |
| 0.300 | 86.5 | | |
| 0.150 | 83.4 | | |
| 0.080 | 77.5 | | |
| 0.0300 | 67.9 | | |
| 0.0196 | 60.6 | | |
| 0.0115 | 56.1 | | |
| 0.0083 | 51.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.5% | $D_{10}$: | - |
| Sand: | 18.0% | $D_{30}$: | - |
| Silt: | 42.8% | $D_{60}$: | 0.0185 |
| Clay: | 34.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** (MUSCS) Sample description derived from Atterberg and Grain Size test results

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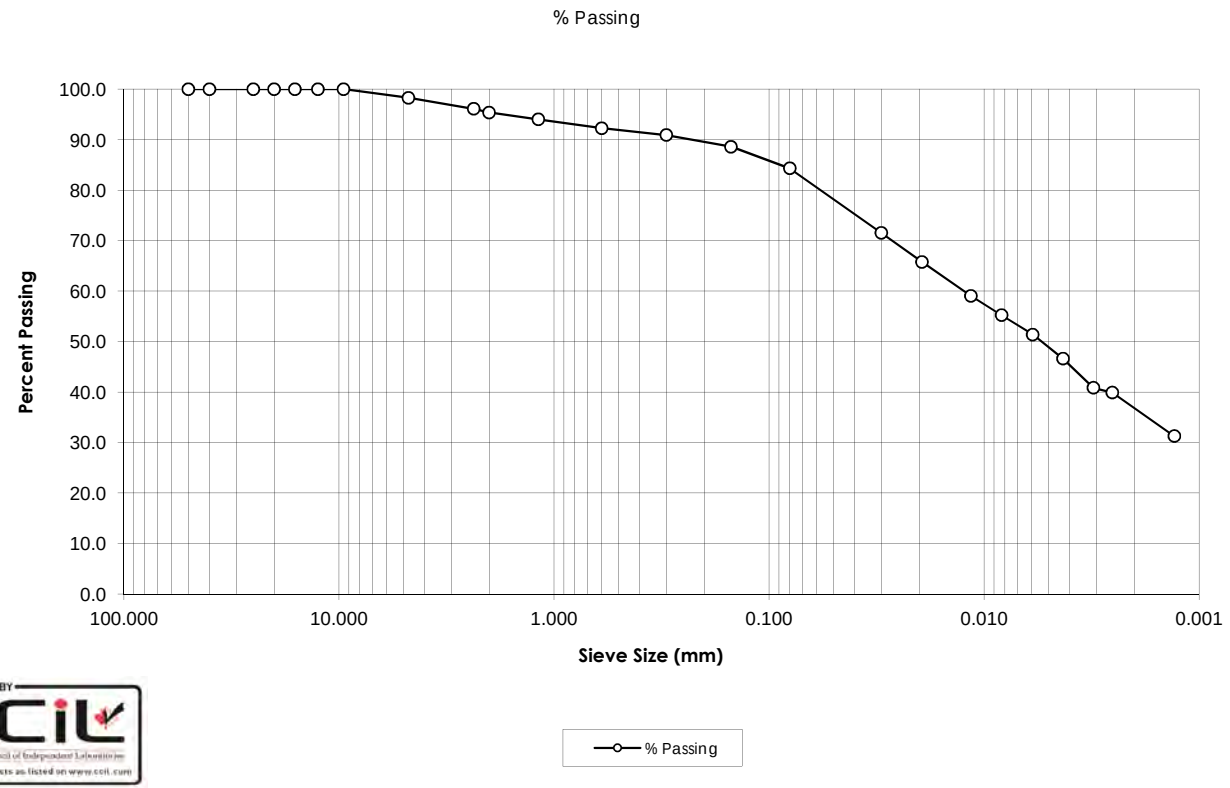
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS30
SOURCE: D19
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 22, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 51.4 |
| 40.0 | 100.0 | 0.0043 | 46.6 |
| 25.0 | 100.0 | 0.0031 | 40.8 |
| 20.0 | 100.0 | 0.0025 | 39.9 |
| 16.0 | 100.0 | 0.0013 | 31.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.3 | | |
| 2.36 | 96.1 | | |
| 2.00 | 95.4 | | |
| 1.18 | 94.0 | | |
| 0.600 | 92.3 | | |
| 0.300 | 90.9 | | |
| 0.150 | 88.6 | | |
| 0.080 | 84.3 | | |
| 0.0300 | 71.5 | | |
| 0.0194 | 65.8 | | |
| 0.0115 | 59.1 | | |
| 0.0083 | 55.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.7% | $D_{10}$: | - |
| Sand: | 13.9% | $D_{30}$: | - |
| Silt: | 47.5% | $D_{60}$: | 0.0127 |
| Clay: | 36.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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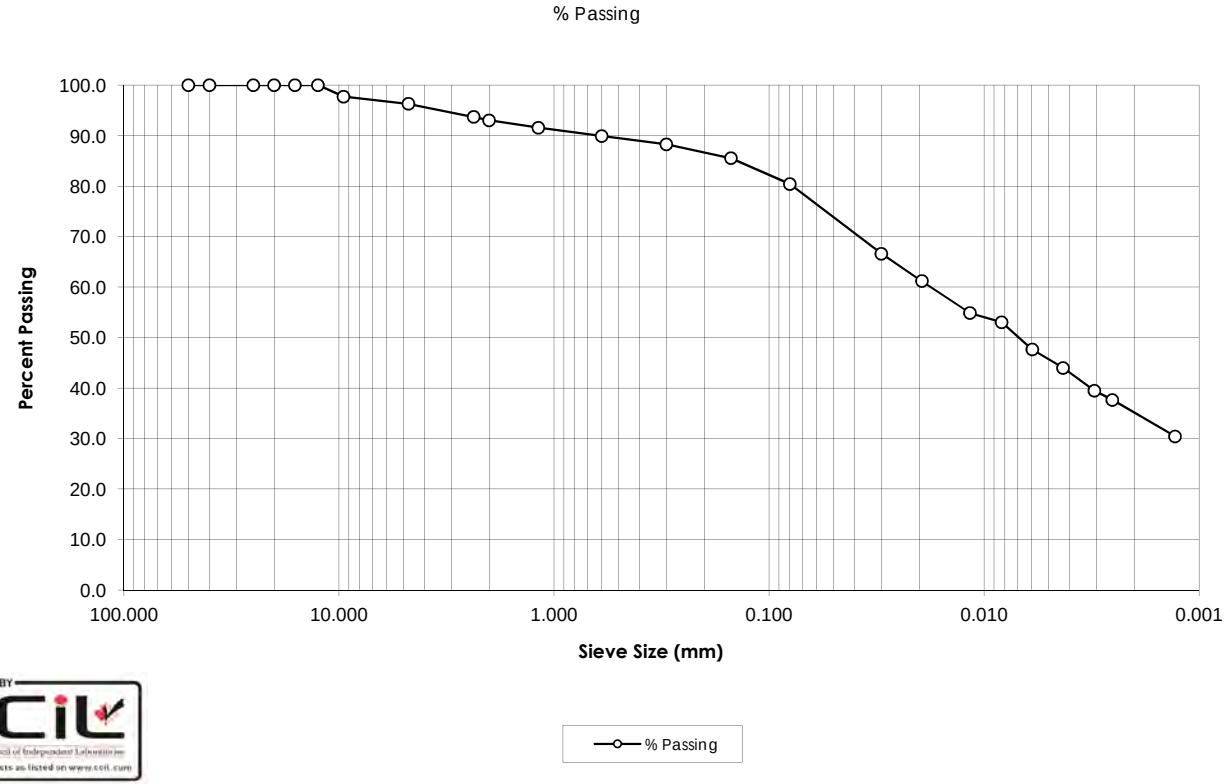
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS34
SOURCE: D19
TESTED BY: C. Tollifson

DATE TESTED: April 27, 2016
DATE RECEIVED: April 22, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 47.6 |
| 40.0 | 100.0 | 0.0043 | 44.0 |
| 25.0 | 100.0 | 0.0031 | 39.5 |
| 20.0 | 100.0 | 0.0025 | 37.7 |
| 16.0 | 100.0 | 0.0013 | 30.4 |
| 12.5 | 100.0 | | |
| 9.5 | 97.7 | | |
| 4.75 | 96.3 | | |
| 2.36 | 93.7 | | |
| 2.00 | 93.0 | | |
| 1.18 | 91.6 | | |
| 0.600 | 89.9 | | |
| 0.300 | 88.3 | | |
| 0.150 | 85.5 | | |
| 0.080 | 80.4 | | |
| 0.0300 | 66.6 | | |
| 0.0194 | 61.2 | | |
| 0.0116 | 54.8 | | |
| 0.0083 | 53.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.7% | $D_{10}$: | - |
| Sand: | 15.9% | $D_{30}$: | - |
| Silt: | 45.3% | $D_{60}$: | 0.0180 |
| Clay: | 35.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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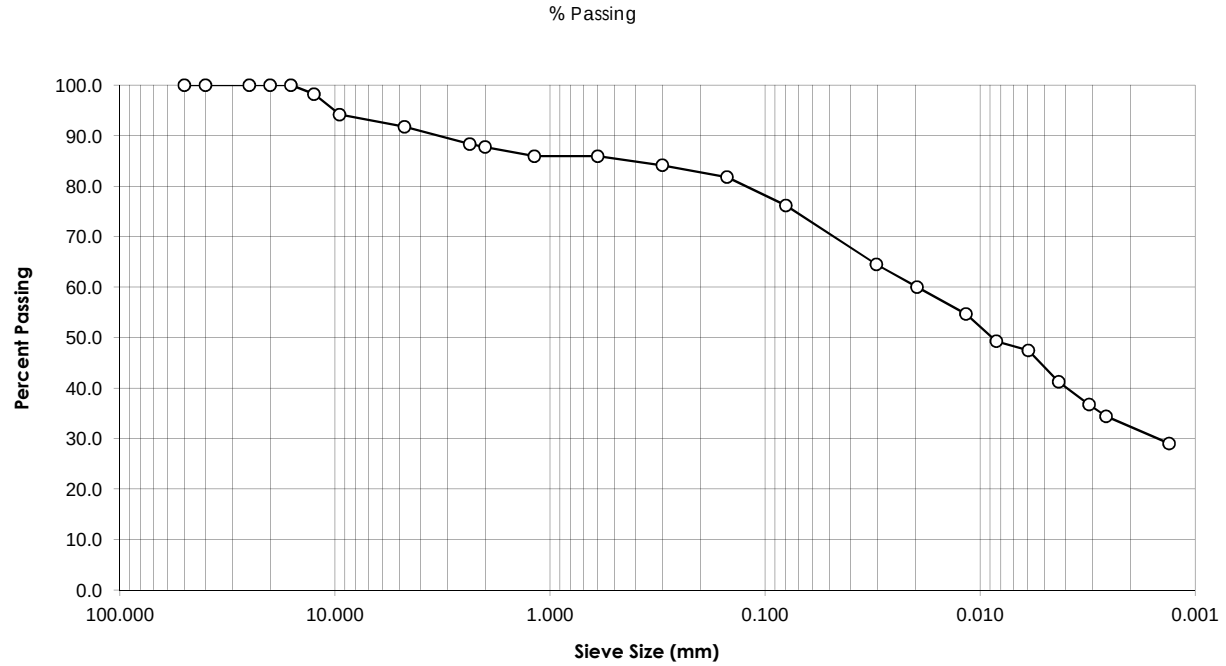
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS42
SOURCE: D19
TESTED BY: C. Tollifson

DATE TESTED: April 29, 2016
DATE RECEIVED: April 21, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 47.5 |
| 40.0 | 100.0 | 0.0043 | 41.2 |
| 25.0 | 100.0 | 0.0031 | 36.7 |
| 20.0 | 100.0 | 0.0026 | 34.4 |
| 16.0 | 100.0 | 0.0013 | 29.0 |
| 12.5 | 98.2 | | |
| 9.5 | 94.2 | | |
| 4.75 | 91.8 | | |
| 2.36 | 88.3 | | |
| 2.00 | 87.8 | | |
| 1.18 | 85.9 | | |
| 0.600 | 85.9 | | |
| 0.300 | 84.1 | | |
| 0.150 | 81.8 | | |
| 0.080 | 76.2 | | |
| 0.0303 | 64.5 | | |
| 0.0196 | 60.0 | | |
| 0.0116 | 54.6 | | |
| 0.0084 | 49.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.2% | $D_{10}$: | - |
| Sand: | 15.6% | $D_{30}$: | 0.0016 |
| Silt: | 43.8% | $D_{60}$: | 0.0196 |
| Clay: | 32.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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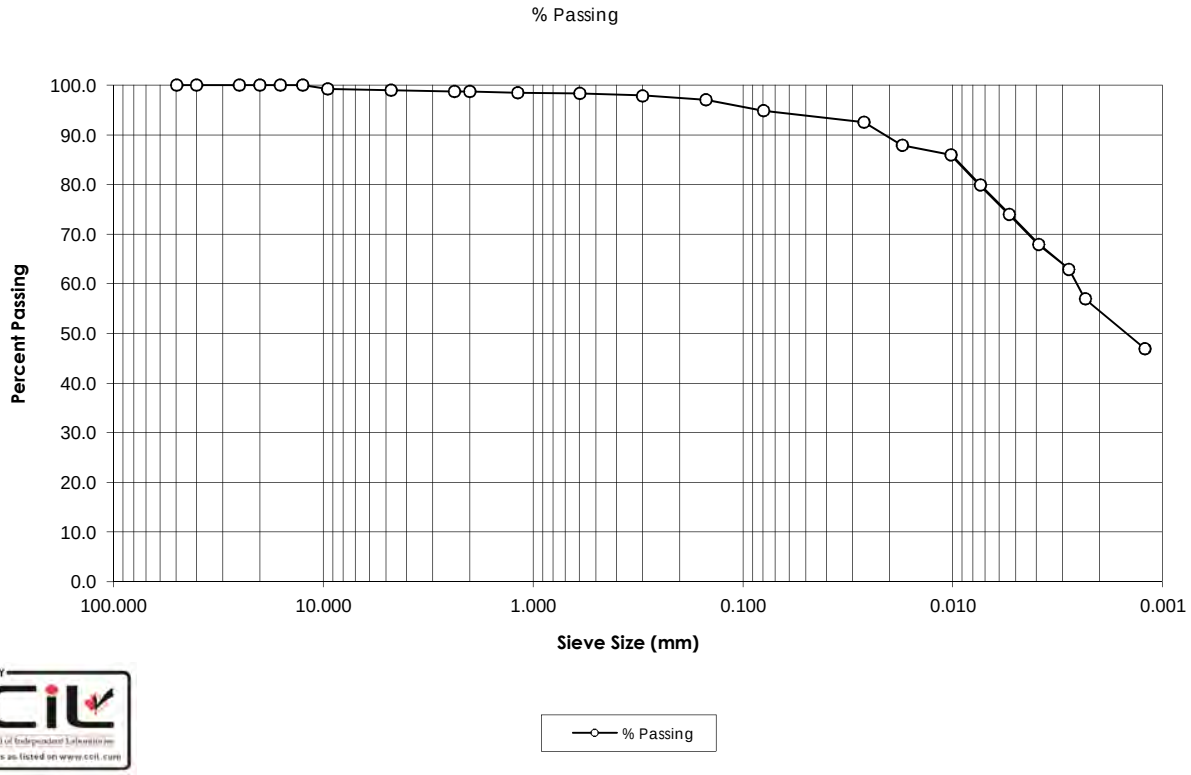
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BSA
SOURCE: D20
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: April 25, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 74.0 |
| 40.0 | 100.0 | 0.0039 | 68.0 |
| 25.0 | 100.0 | 0.0028 | 63.0 |
| 20.0 | 100.0 | 0.0023 | 57.0 |
| 16.0 | 100.0 | 0.0012 | 47.0 |
| 12.5 | 100.0 | | |
| 9.5 | 99.2 | | |
| 4.75 | 99.0 | | |
| 2.36 | 98.7 | | |
| 2.00 | 98.7 | | |
| 1.18 | 98.5 | | |
| 0.600 | 98.3 | | |
| 0.300 | 97.9 | | |
| 0.150 | 97.1 | | |
| 0.080 | 94.9 | | |
| 0.0264 | 92.5 | | |
| 0.0174 | 87.9 | | |
| 0.0102 | 86.0 | | |
| 0.0074 | 80.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.0% | $D_{10}$: | - |
| Sand: | 4.1% | $D_{30}$: | - |
| Silt: | 40.3% | $D_{60}$: | 0.0026 |
| Clay: | 54.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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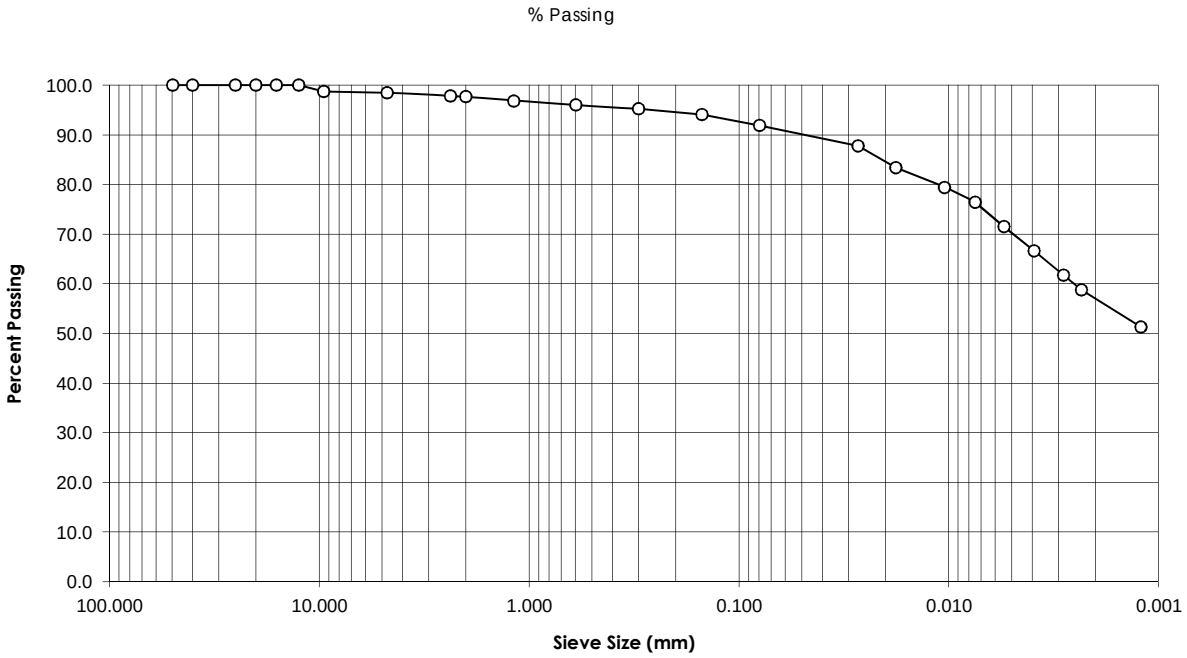
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BSB
SOURCE: D20
TESTED BY: M. Pilkington

DATE TESTED: May 18, 2016
DATE RECEIVED: May 10, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 71.6 |
| 40.0 | 100.0 | 0.0039 | 66.6 |
| 25.0 | 100.0 | 0.0028 | 61.7 |
| 20.0 | 100.0 | 0.0023 | 58.8 |
| 16.0 | 100.0 | 0.0012 | 51.3 |
| 12.5 | 100.0 | | |
| 9.5 | 98.8 | | |
| 4.75 | 98.5 | | |
| 2.36 | 97.9 | | |
| 2.00 | 97.7 | | |
| 1.18 | 96.9 | | |
| 0.600 | 96.1 | | |
| 0.300 | 95.3 | | |
| 0.150 | 94.1 | | |
| 0.080 | 91.9 | | |
| 0.0270 | 87.7 | | |
| 0.0178 | 83.4 | | |
| 0.0105 | 79.5 | | |
| 0.0075 | 76.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.5% | $D_{10}$: | - |
| Sand: | 6.6% | $D_{30}$: | - |
| Silt: | 34.9% | $D_{60}$: | 0.0025 |
| Clay: | 57.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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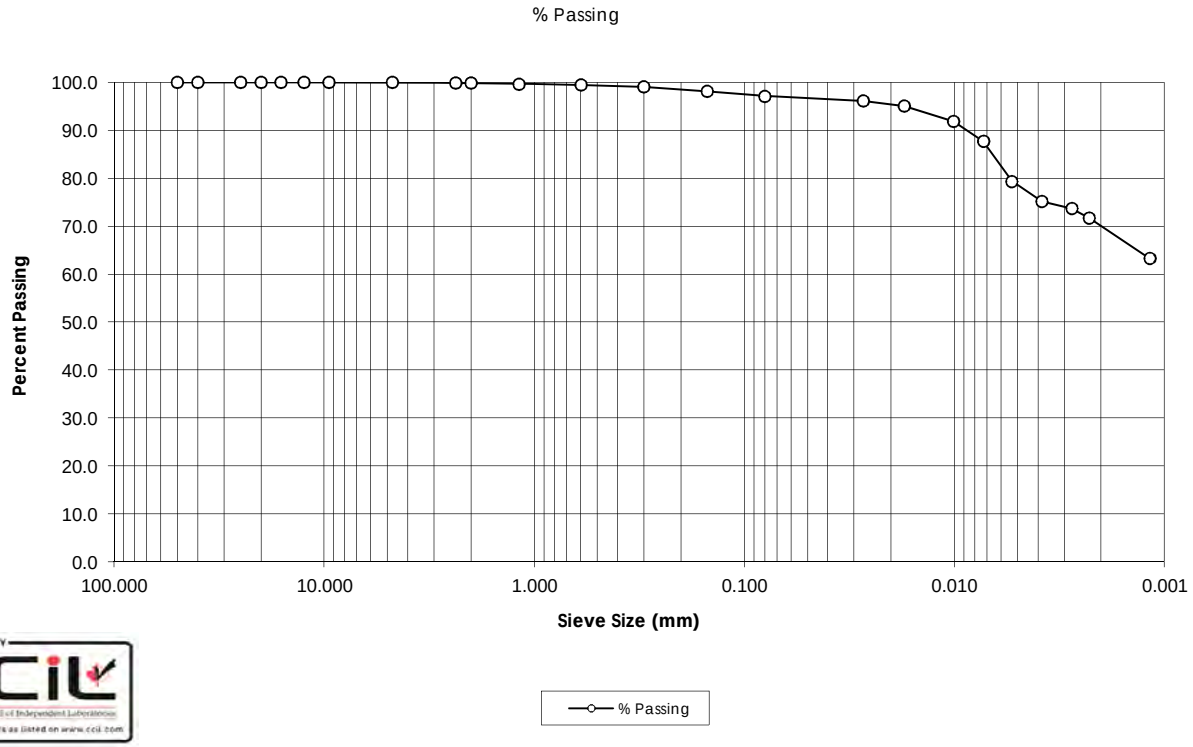
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BSC
SOURCE: D20
TESTED BY: C. Oost

DATE TESTED: May 19, 2016
DATE RECEIVED: April 26, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0053** | **79.4** |
| **40.0** | **100.0** | **0.0038** | **75.2** |
| **25.0** | **100.0** | **0.0028** | **73.7** |
| **20.0** | **100.0** | **0.0023** | **71.6** |
| **16.0** | **100.0** | **0.0012** | **63.3** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.9** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.7** | | |
| **0.600** | **99.5** | | |
| **0.300** | **99.0** | | |
| **0.150** | **98.2** | | |
| **0.080** | **97.1** | | |
| **0.0270** | **96.1** | | |
| **0.0173** | **95.0** | | |
| **0.0101** | **91.9** | | |
| **0.0073** | **87.7** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.9% | $D_{30}$: | - |
| Silt: | 27.1% | $D_{60}$: | - |
| Clay: | 70.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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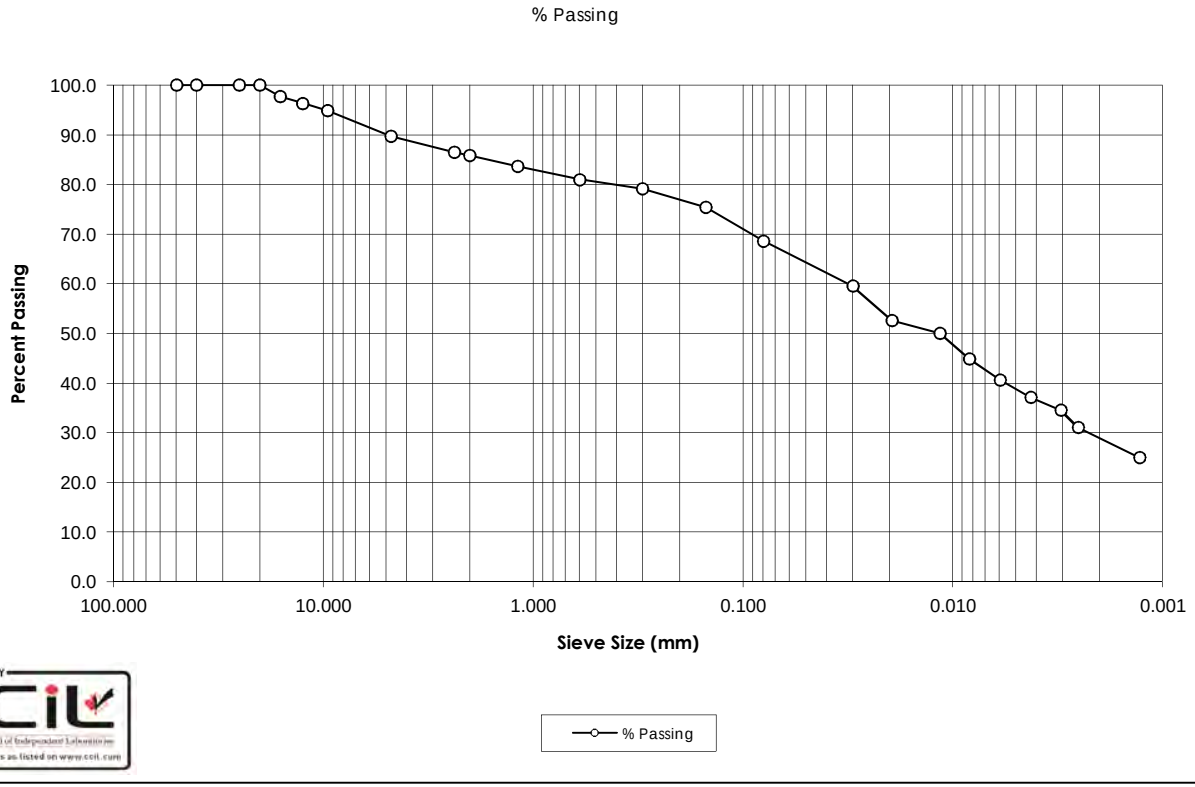
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BSD
SOURCE: D20
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: April 25, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 40.6 |
| 40.0 | 100.0 | 0.0043 | 37.1 |
| 25.0 | 100.0 | 0.0031 | 34.5 |
| 20.0 | 100.0 | 0.0025 | 31.1 |
| 16.0 | 97.7 | 0.0013 | 25.0 |
| 12.5 | 96.3 | | |
| 9.5 | 94.8 | | |
| 4.75 | 89.8 | | |
| 2.36 | 86.5 | | |
| 2.00 | 85.9 | | |
| 1.18 | 83.6 | | |
| 0.600 | 81.0 | | |
| 0.300 | 79.1 | | |
| 0.150 | 75.4 | | |
| 0.080 | 68.6 | | |
| 0.0299 | 59.5 | | |
| 0.0195 | 52.6 | | |
| 0.0115 | 50.0 | | |
| 0.0083 | 44.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 10.2% | $D_{10}$: | - |
| Sand: | 21.1% | $D_{30}$: | 0.0023 |
| Silt: | 39.7% | $D_{60}$: | 0.0326 |
| Clay: | 29.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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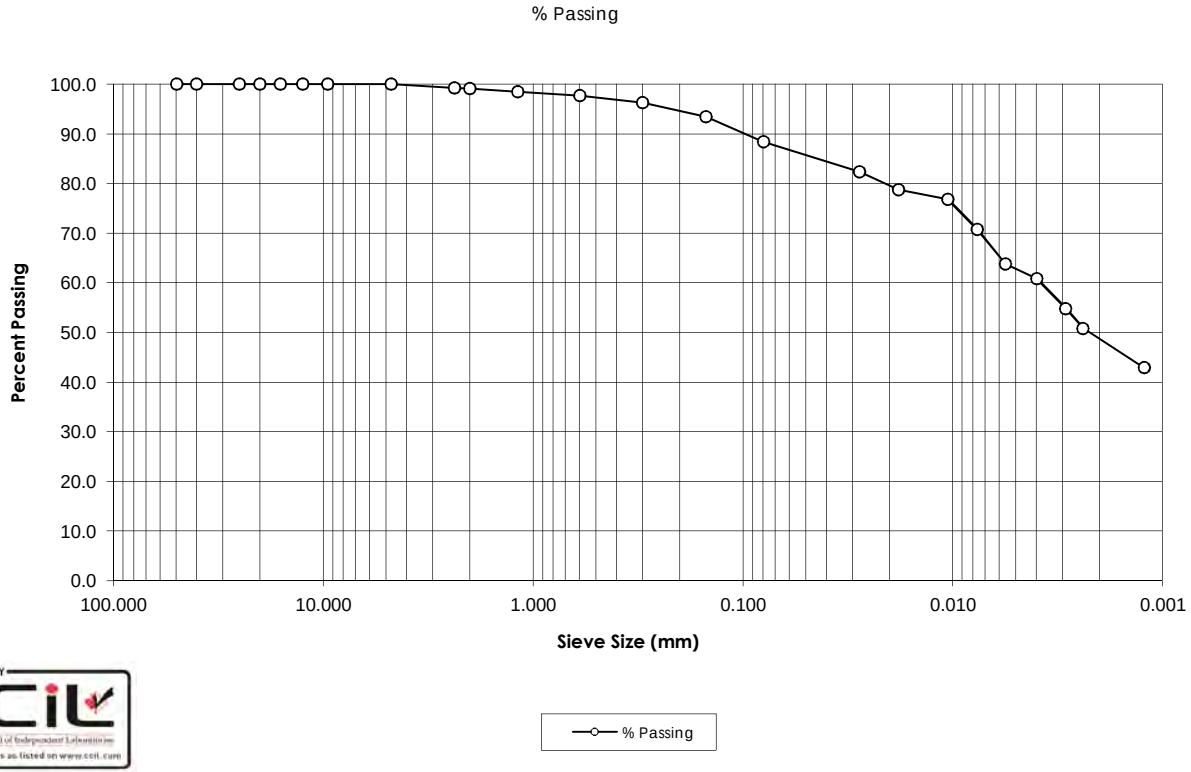
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST6
SOURCE: D20
TESTED BY: C. Oost

DATE TESTED: May 13, 2016
DATE RECEIVED: April 25, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0056 | 63.8 |
| 40.0 | 100.0 | 0.0040 | 60.8 |
| 25.0 | 100.0 | 0.0029 | 54.8 |
| 20.0 | 100.0 | 0.0024 | 50.9 |
| 16.0 | 100.0 | 0.0012 | 42.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.3 | | |
| 2.00 | 99.1 | | |
| 1.18 | 98.5 | | |
| 0.600 | 97.7 | | |
| 0.300 | 96.3 | | |
| 0.150 | 93.4 | | |
| 0.080 | 88.4 | | |
| 0.0279 | 82.4 | | |
| 0.0181 | 78.8 | | |
| 0.0105 | 76.8 | | |
| 0.0076 | 70.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 11.6% | $D_{30}$: | - |
| Silt: | 39.7% | $D_{60}$: | 0.0038 |
| Clay: | 48.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. Stantec is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of Stantec.

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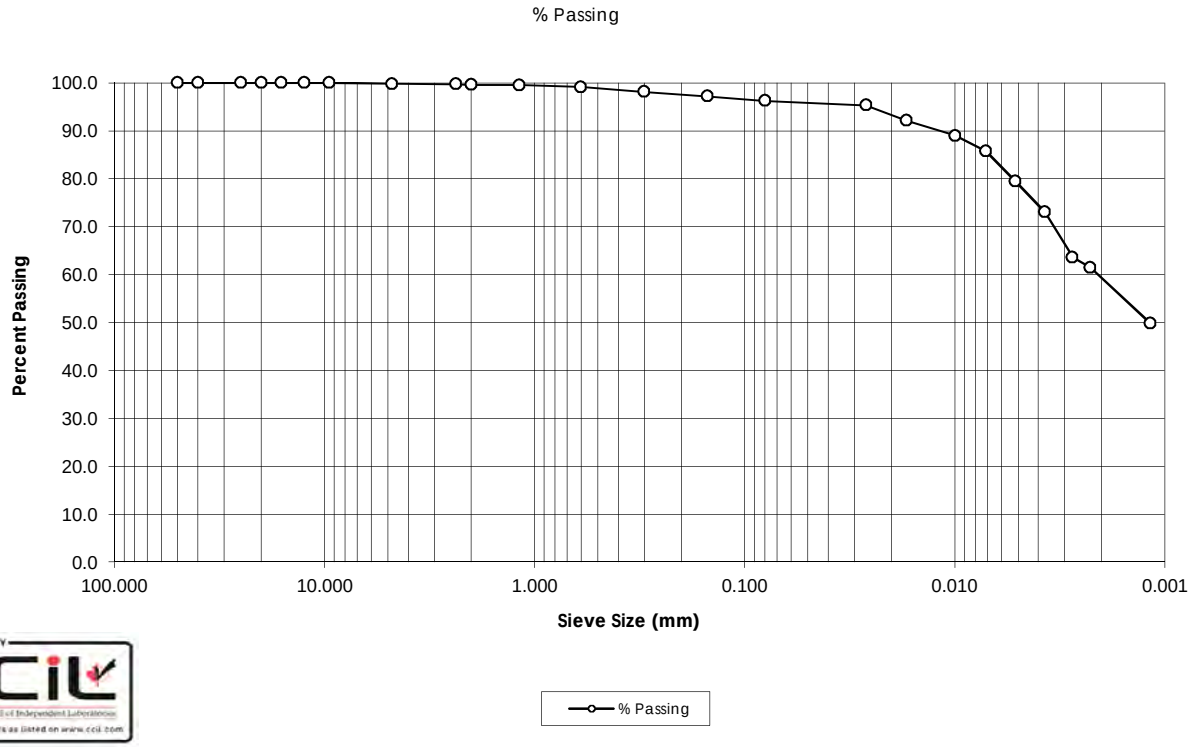
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D27
TESTED BY: C.Oost

DATE TESTED: August 9, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0051** | **79.4** |
| **40.0** | **100.0** | **0.0037** | **73.1** |
| **25.0** | **100.0** | **0.0027** | **63.6** |
| **20.0** | **100.0** | **0.0023** | **61.5** |
| **16.0** | **100.0** | **0.0012** | **49.9** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.8** | | |
| **2.36** | **99.7** | | |
| **2.00** | **99.6** | | |
| **1.18** | **99.5** | | |
| **0.600** | **99.1** | | |
| **0.300** | **98.2** | | |
| **0.150** | **97.2** | | |
| **0.080** | **96.2** | | |
| **0.0264** | **95.3** | | |
| **0.0169** | **92.1** | | |
| **0.0099** | **89.0** | | |
| **0.0071** | **85.8** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 3.6% | $D_{30}$: | - |
| Silt: | 36.9% | $D_{60}$: | 0.0021 |
| Clay: | 59.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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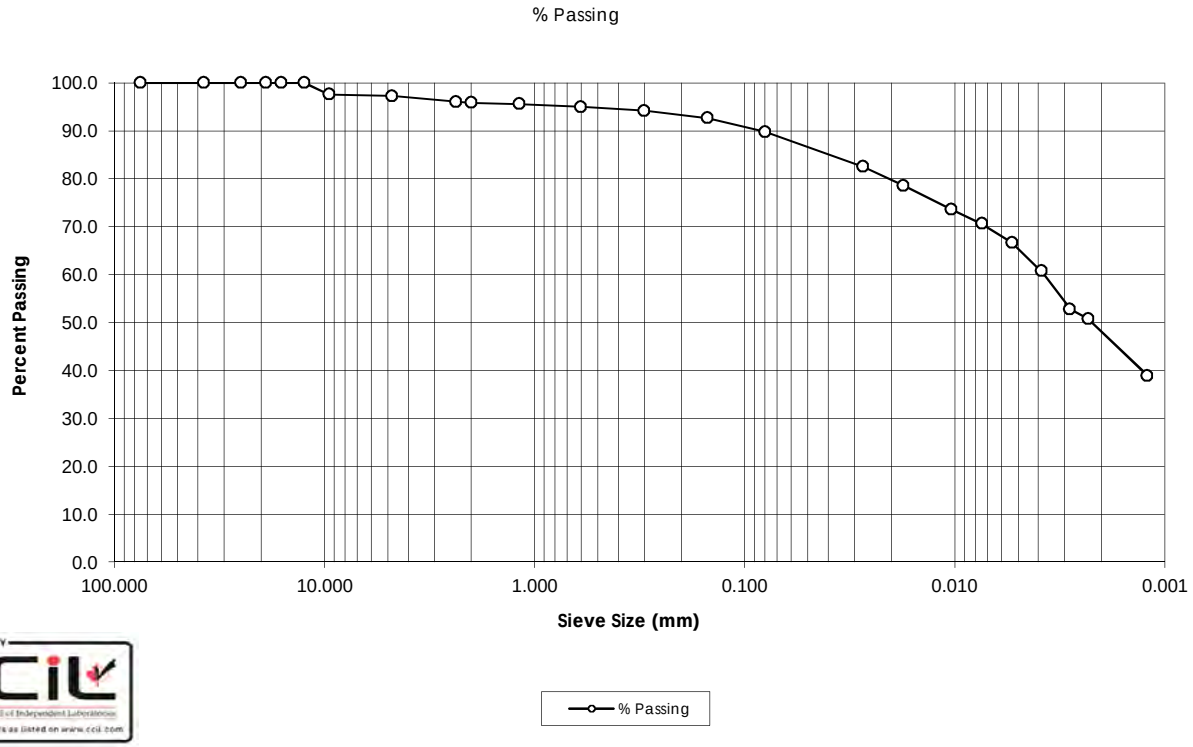
SAMPLE No.: ST8
SOURCE: D27
TESTED BY: C.Oost

DATE TESTED: August 9, 2016
DATE RECEIVED: July 8, 2016
SAMPLE DESCRIPTION: Clay (CH-CI), Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0053** | **66.6** |
| **37.5** | **100.0** | **0.0039** | **60.7** |
| **25.0** | **100.0** | **0.0028** | **52.8** |
| **19.0** | **100.0** | **0.0023** | **50.8** |
| **16.0** | **100.0** | **0.0012** | **38.9** |
| **12.5** | **100.0** | | |
| **9.5** | **97.6** | | |
| **4.75** | **97.2** | | |
| **2.36** | **96.1** | | |
| **2.00** | **95.9** | | |
| **1.18** | **95.6** | | |
| **0.600** | **95.0** | | |
| **0.300** | **94.2** | | |
| **0.150** | **92.6** | | |
| **0.080** | **89.7** | | |
| **0.0272** | **82.5** | | |
| **0.0175** | **78.6** | | |
| **0.0104** | **73.6** | | |
| **0.0074** | **70.6** | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.8% | $D_{10}$: | - |
| Sand: | 7.5% | $D_{30}$: | - |
| Silt: | 41.6% | $D_{60}$: | 0.0038 |
| Clay: | 48.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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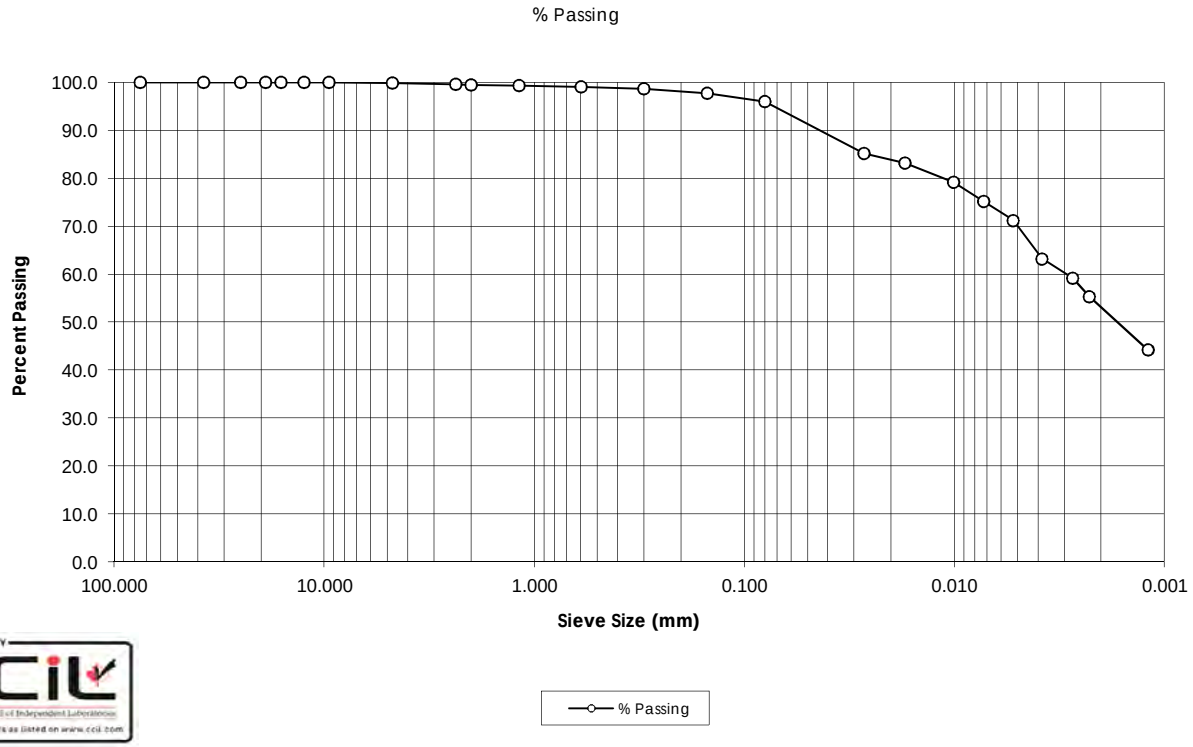
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST10
SOURCE: D27
TESTED BY: B. Pelkey

DATE TESTED: August 12, 2016
DATE RECEIVED: July 8, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0052** | **71.2** |
| **37.5** | **100.0** | **0.0038** | **63.2** |
| **25.0** | **100.0** | **0.0027** | **59.2** |
| **19.0** | **100.0** | **0.0023** | **55.2** |
| **16.0** | **100.0** | **0.0012** | **44.2** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.8** | | |
| **2.36** | **99.6** | | |
| **2.00** | **99.5** | | |
| **1.18** | **99.3** | | |
| **0.600** | **99.1** | | |
| **0.300** | **98.7** | | |
| **0.150** | **97.7** | | |
| **0.080** | **96.0** | | |
| **0.0269** | **85.2** | | |
| **0.0172** | **83.2** | | |
| **0.0101** | **79.2** | | |
| **0.0073** | **75.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 3.8% | $D_{30}$: | - |
| Silt: | 43.1% | $D_{60}$: | 0.0030 |
| Clay: | 53.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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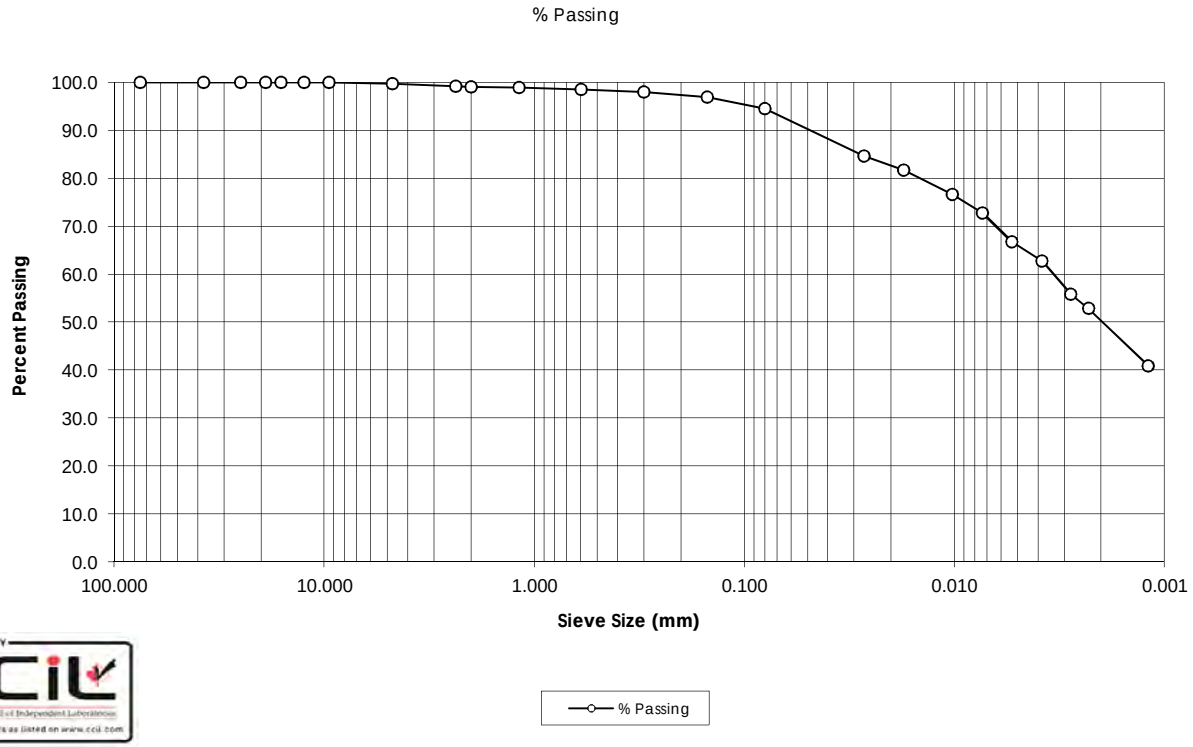
SAMPLE No.: ST17
SOURCE: D27
TESTED BY: B. Pelkey

DATE TESTED: August 12, 2016
DATE RECEIVED: July 8, 2016
SAMPLE DESCRIPTION: Clay (CH-CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0053** | **66.8** |
| **37.5** | **100.0** | **0.0038** | **62.8** |
| **25.0** | **100.0** | **0.0028** | **55.8** |
| **19.0** | **100.0** | **0.0023** | **52.9** |
| **16.0** | **100.0** | **0.0012** | **40.9** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.8** | | |
| **2.36** | **99.3** | | |
| **2.00** | **99.1** | | |
| **1.18** | **98.9** | | |
| **0.600** | **98.6** | | |
| **0.300** | **98.1** | | |
| **0.150** | **96.9** | | |
| **0.080** | **94.5** | | |
| **0.0269** | **84.7** | | |
| **0.0174** | **81.7** | | |
| **0.0102** | **76.7** | | |
| **0.0073** | **72.7** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 5.2% | $D_{30}$: | - |
| Silt: | 44.2% | $D_{60}$: | 0.0034 |
| Clay: | 50.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

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# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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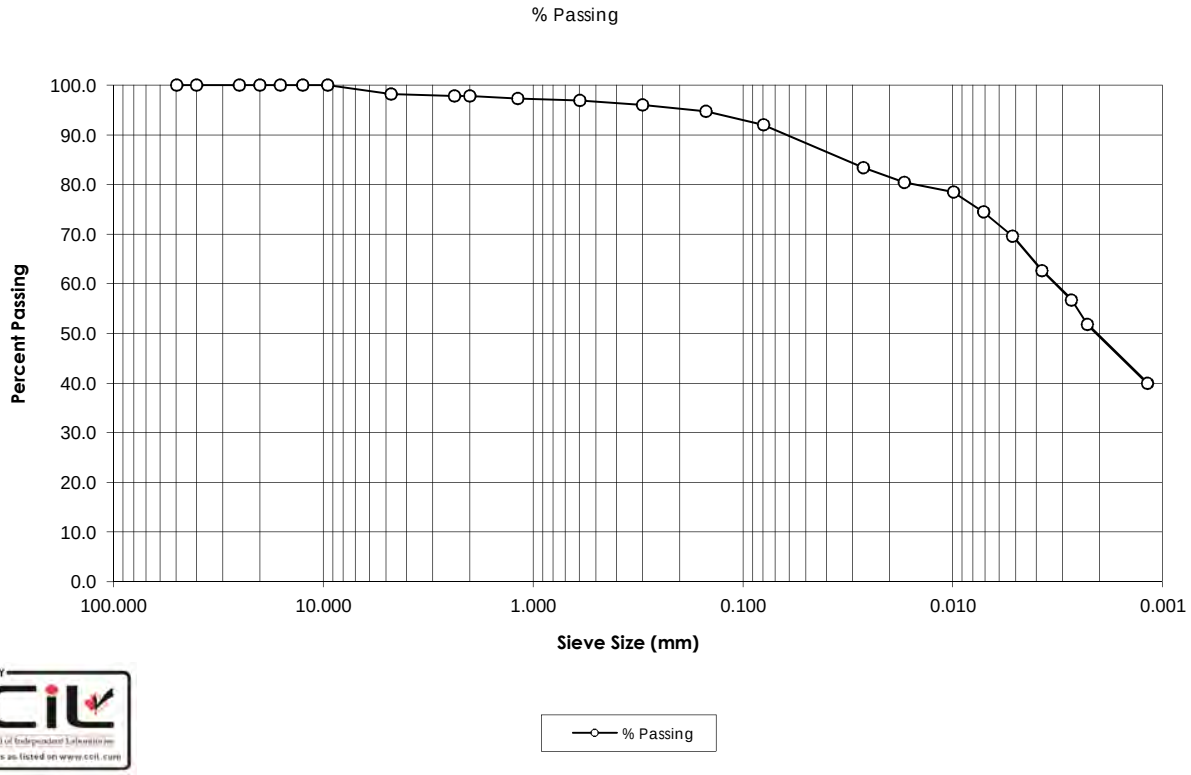
SAMPLE No.: ST4
SOURCE: D28
TESTED BY: B. Pelkey

DATE TESTED: July 26, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 69.6 |
| 40.0 | 100.0 | 0.0038 | 62.7 |
| 25.0 | 100.0 | 0.0027 | 56.8 |
| 20.0 | 100.0 | 0.0023 | 51.8 |
| 16.0 | 100.0 | 0.0012 | 40.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.2 | | |
| 2.36 | 97.9 | | |
| 2.00 | 97.8 | | |
| 1.18 | 97.4 | | |
| 0.600 | 96.9 | | |
| 0.300 | 96.1 | | |
| 0.150 | 94.7 | | |
| 0.080 | 92.0 | | |
| 0.0266 | 83.4 | | |
| 0.0170 | 80.4 | | |
| 0.0099 | 78.5 | | |
| 0.0071 | 74.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.8% | $D_{10}$: | - |
| Sand: | 6.2% | $D_{30}$: | - |
| Silt: | 42.5% | $D_{60}$: | 0.0033 |
| Clay: | 49.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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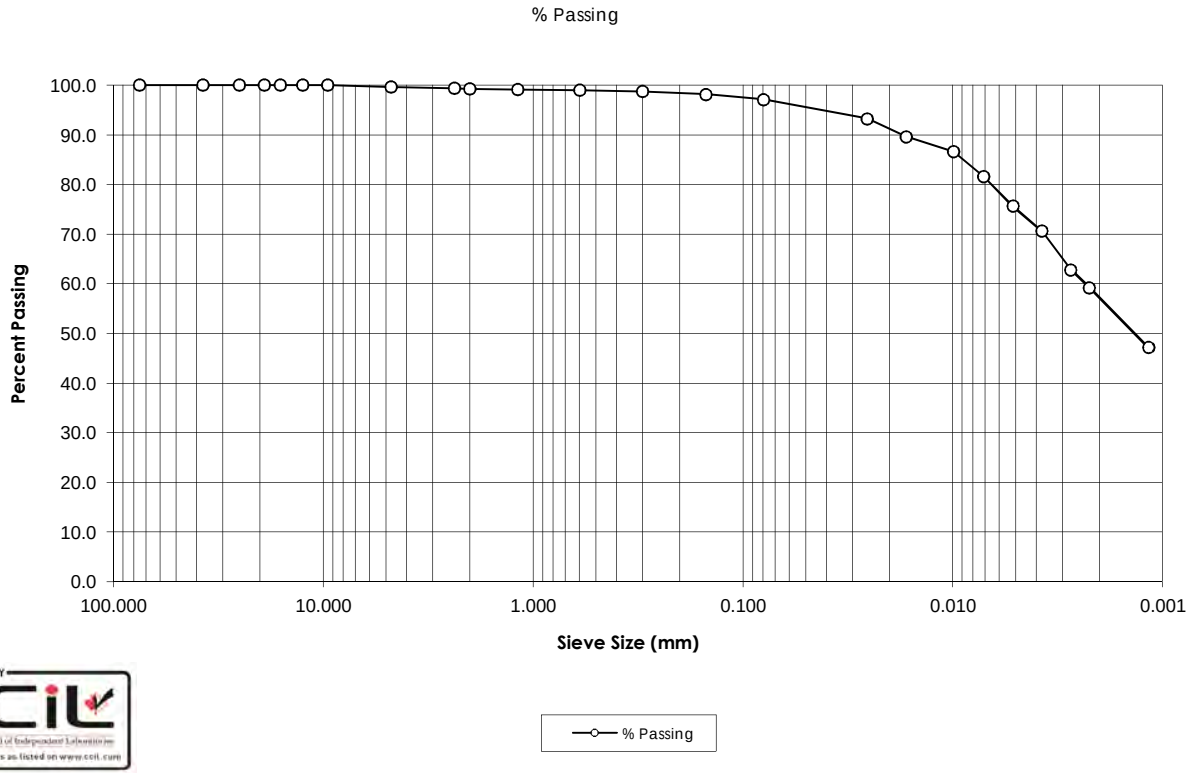
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST6
SOURCE: D28
TESTED BY: B. Pelkey

DATE TESTED: August 7, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0052 | 75.6 |
| 37.5 | 100.0 | 0.0038 | 70.6 |
| 25.0 | 100.0 | 0.0027 | 62.8 |
| 19.0 | 100.0 | 0.0022 | 59.2 |
| 16.0 | 100.0 | 0.0012 | 47.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.6 | | |
| 2.36 | 99.3 | | |
| 2.00 | 99.3 | | |
| 1.18 | 99.2 | | |
| 0.600 | 99.0 | | |
| 0.300 | 98.7 | | |
| 0.150 | 98.2 | | |
| 0.080 | 97.1 | | |
| 0.0256 | 93.3 | | |
| 0.0167 | 89.7 | | |
| 0.0099 | 86.6 | | |
| 0.0071 | 81.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 2.5% | $D_{30}$: | - |
| Silt: | 39.9% | $D_{60}$: | 0.0023 |
| Clay: | 57.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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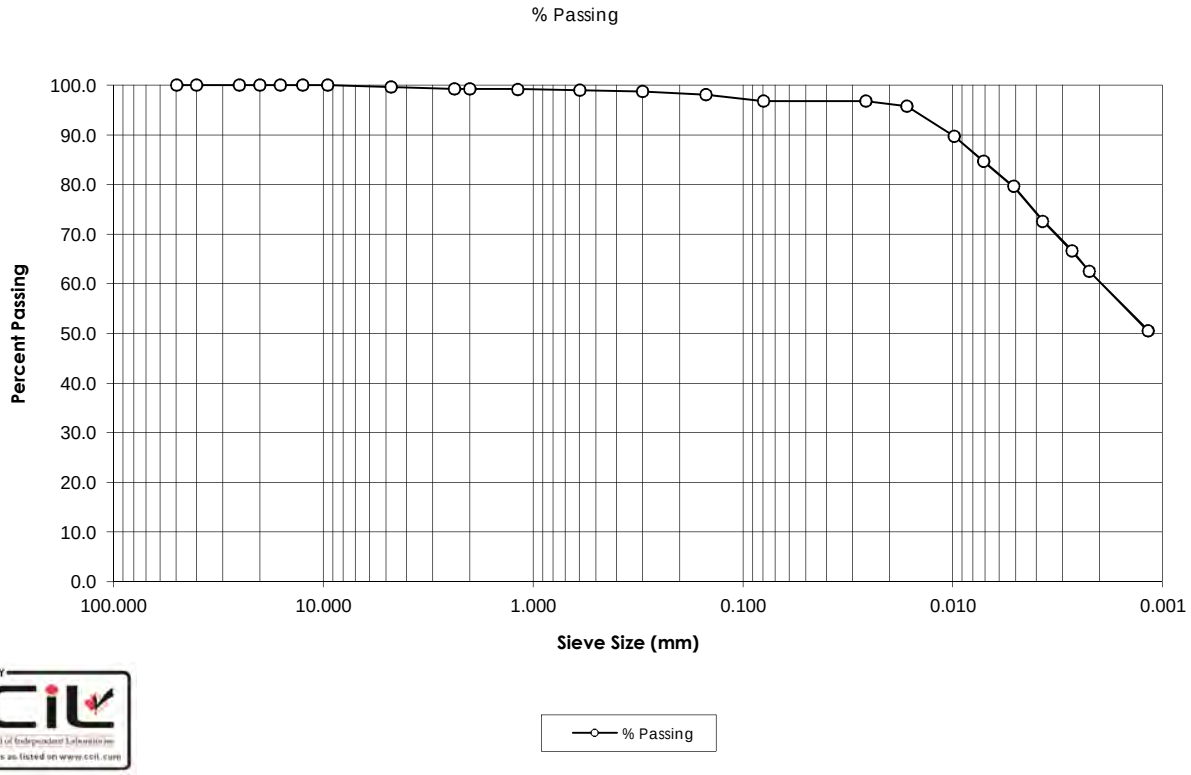
SAMPLE No.: SS07
SOURCE: D28
TESTED BY: C. Oost

DATE TESTED: July 18, 2016
DATE RECEIVED: July 5, 2016
SAMPLE DESCRIPTION: Fines, Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 79.7 |
| 40.0 | 100.0 | 0.0037 | 72.6 |
| 25.0 | 100.0 | 0.0027 | 66.6 |
| 20.0 | 100.0 | 0.0022 | 62.6 |
| 16.0 | 100.0 | 0.0012 | 50.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.6 | | |
| 2.36 | 99.3 | | |
| 2.00 | 99.3 | | |
| 1.18 | 99.2 | | |
| 0.600 | 99.0 | | |
| 0.300 | 98.7 | | |
| 0.150 | 98.1 | | |
| 0.080 | 96.8 | | |
| 0.0259 | 96.8 | | |
| 0.0165 | 95.8 | | |
| 0.0098 | 89.7 | | |
| 0.0071 | 84.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 2.8% | $D_{30}$: | - |
| Silt: | 36.3% | $D_{60}$: | 0.0020 |
| Clay: | 60.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size test results only



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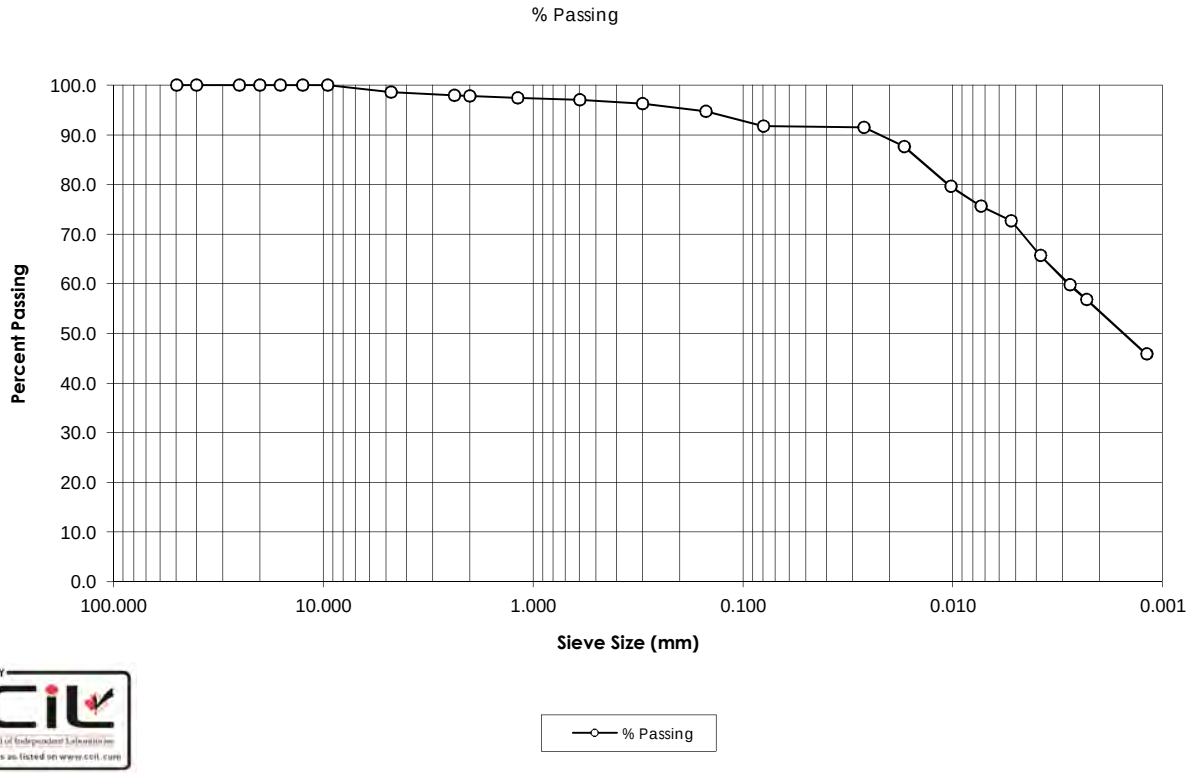
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST8
SOURCE: D28
TESTED BY: C. Oost and B. Pelkey

DATE TESTED: July 18, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CI-CH) Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 72.7 |
| 40.0 | 100.0 | 0.0038 | 65.8 |
| 25.0 | 100.0 | 0.0028 | 59.8 |
| 20.0 | 100.0 | 0.0023 | 56.8 |
| 16.0 | 100.0 | 0.0012 | 45.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.6 | | |
| 2.36 | 97.9 | | |
| 2.00 | 97.8 | | |
| 1.18 | 97.5 | | |
| 0.600 | 97.0 | | |
| 0.300 | 96.3 | | |
| 0.150 | 94.8 | | |
| 0.080 | 91.8 | | |
| 0.0264 | 91.6 | | |
| 0.0170 | 87.6 | | |
| 0.0102 | 79.7 | | |
| 0.0073 | 75.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.4% | $D_{10}$: | - |
| Sand: | 6.8% | $D_{30}$: | - |
| Silt: | 37.3% | $D_{60}$: | 0.0028 |
| Clay: | 54.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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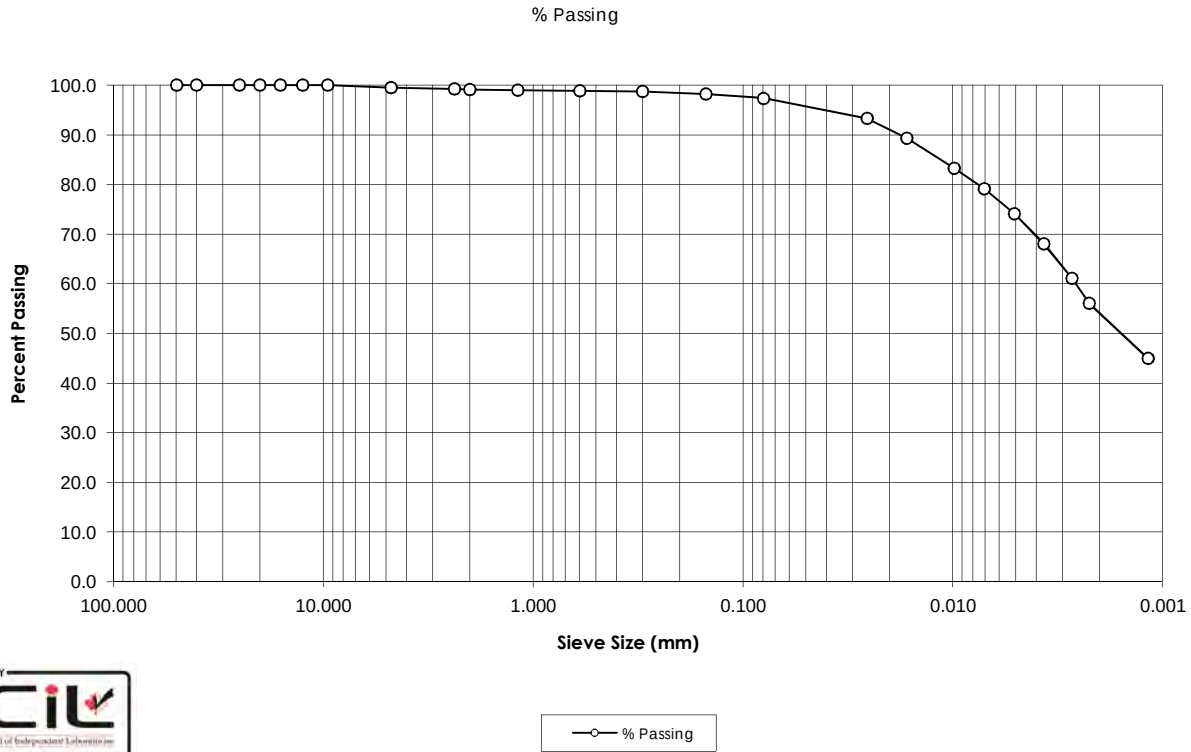
SAMPLE No.: ST10
SOURCE: D28
TESTED BY: B. Pelkey

DATE TESTED: July 26, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 74.2 |
| 40.0 | 100.0 | 0.0037 | 68.1 |
| 25.0 | 100.0 | 0.0027 | 61.1 |
| 20.0 | 100.0 | 0.0022 | 56.0 |
| 16.0 | 100.0 | 0.0012 | 44.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.5 | | |
| 2.36 | 99.2 | | |
| 2.00 | 99.1 | | |
| 1.18 | 99.0 | | |
| 0.600 | 98.9 | | |
| 0.300 | 98.7 | | |
| 0.150 | 98.2 | | |
| 0.080 | 97.4 | | |
| 0.0256 | 93.3 | | |
| 0.0165 | 89.3 | | |
| 0.0098 | 83.2 | | |
| 0.0071 | 79.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.5% | $D_{10}$: | - |
| Sand: | 2.1% | $D_{30}$: | - |
| Silt: | 43.3% | $D_{60}$: | 0.0026 |
| Clay: | 54.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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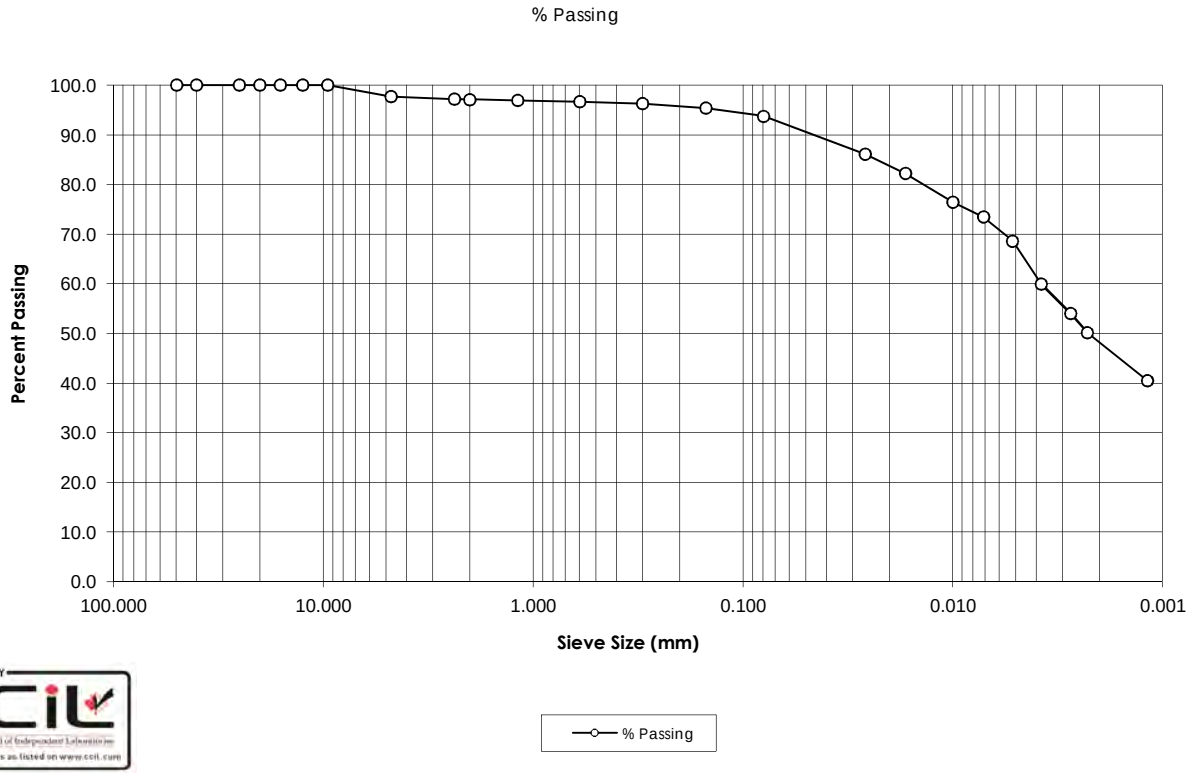
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST15
SOURCE: D28
TESTED BY: B. Pelkey

DATE TESTED: July 26, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CI-CH) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 68.6 |
| 40.0 | 100.0 | 0.0038 | 59.9 |
| 25.0 | 100.0 | 0.0027 | 54.1 |
| 20.0 | 100.0 | 0.0023 | 50.2 |
| 16.0 | 100.0 | 0.0012 | 40.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 97.7 | | |
| 2.36 | 97.2 | | |
| 2.00 | 97.1 | | |
| 1.18 | 97.0 | | |
| 0.600 | 96.7 | | |
| 0.300 | 96.3 | | |
| 0.150 | 95.4 | | |
| 0.080 | 93.8 | | |
| 0.0261 | 86.1 | | |
| 0.0168 | 82.2 | | |
| 0.0100 | 76.4 | | |
| 0.0071 | 73.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.3% | $D_{10}$: | - |
| Sand: | 4.0% | $D_{30}$: | - |
| Silt: | 45.5% | $D_{60}$: | 0.0038 |
| Clay: | 48.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230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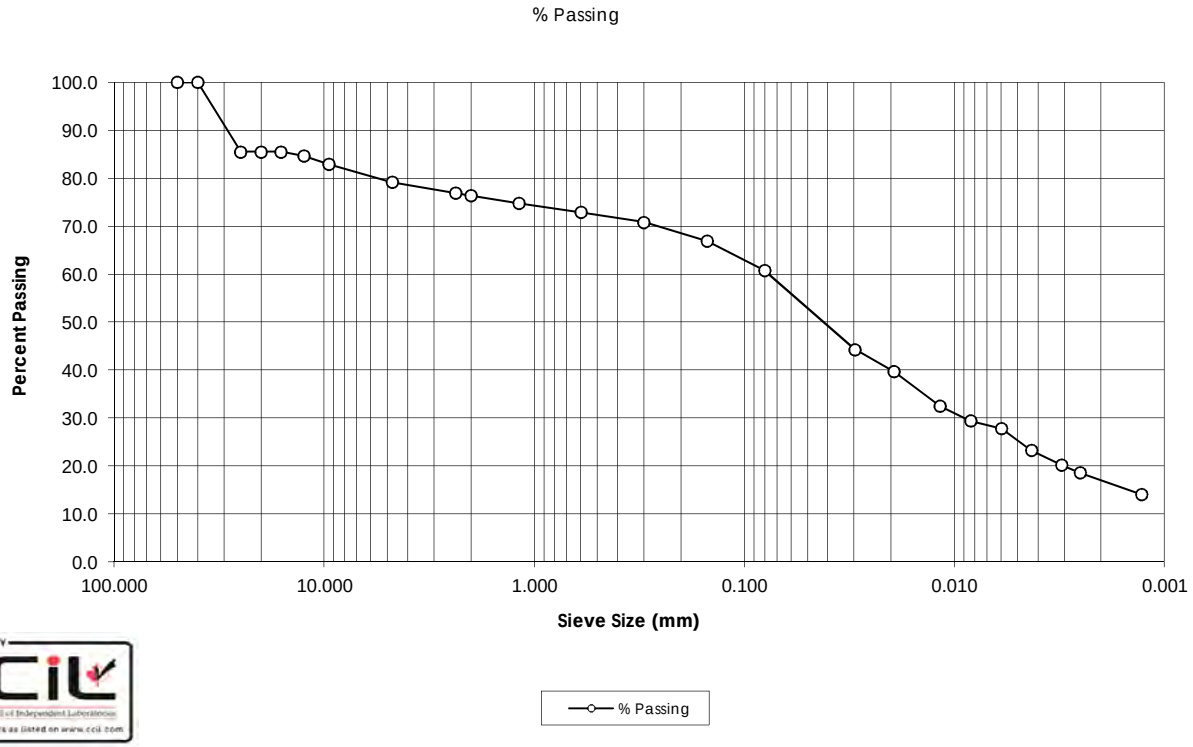
SAMPLE No.: BS21
SOURCE: D28
TESTED BY: C. Oost

DATE TESTED: July 18, 2016
DATE RECEIVED: July 8, 2016
SAMPLE DESCRIPTION: Gravelly Clay (CL-CI) Some Sand




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0060** | **27.8** |
| **40.0** | **100.0** | **0.0043** | **23.2** |
| **25.0** | **85.5** | **0.0031** | **20.1** |
| **20.0** | **85.5** | **0.0025** | **18.6** |
| **16.0** | **85.5** | **0.0013** | **14.0** |
| **12.5** | **84.6** | | |
| **9.5** | **83.0** | | |
| **4.75** | **79.2** | | |
| **2.36** | **76.9** | | |
| **2.00** | **76.4** | | |
| **1.18** | **74.8** | | |
| **0.600** | **72.9** | | |
| **0.300** | **70.8** | | |
| **0.150** | **66.9** | | |
| **0.080** | **60.8** | | |
| **0.0297** | **44.3** | | |
| **0.0193** | **39.7** | | |
| **0.0117** | **32.4** | | |
| **0.0084** | **29.4** | | |

| | | | |
|---|---|---|---|
| Gravel: | 20.8% | $D_{10}$: | - |
| Sand: | 18.4% | $D_{30}$: | 0.0091 |
| Silt: | 43.8% | $D_{60}$: | 0.0780 |
| Clay: | 17.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

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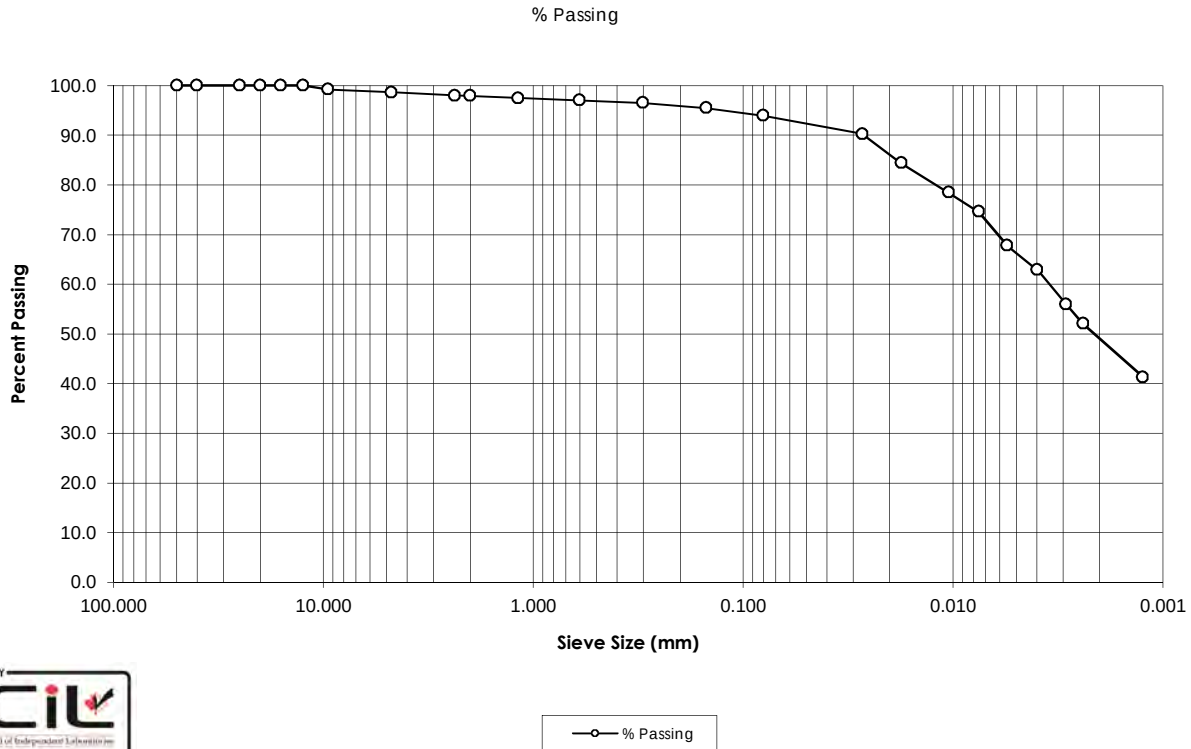
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: S2
SOURCE: D29
TESTED BY: B. Pelkey

DATE TESTED: October 28, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (Cl), Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 67.7 |
| 40.0 | 100.0 | 0.0040 | 62.9 |
| 25.0 | 100.0 | 0.0029 | 56.0 |
| 20.0 | 100.0 | 0.0024 | 52.1 |
| 16.0 | 100.0 | 0.0012 | 41.3 |
| 12.5 | 100.0 | | |
| 9.5 | 99.3 | | |
| 4.75 | 98.6 | | |
| 2.36 | 98.0 | | |
| 2.00 | 97.9 | | |
| 1.18 | 97.5 | | |
| 0.600 | 97.0 | | |
| 0.300 | 96.5 | | |
| 0.150 | 95.5 | | |
| 0.080 | 94.0 | | |
| 0.0270 | 90.3 | | |
| 0.0176 | 84.4 | | |
| 0.0105 | 78.5 | | |
| 0.0075 | 74.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.4% | $D_{10}$: | - |
| Sand: | 4.7% | $D_{30}$: | - |
| Silt: | 44.9% | $D_{60}$: | 0.0035 |
| Clay: | 49.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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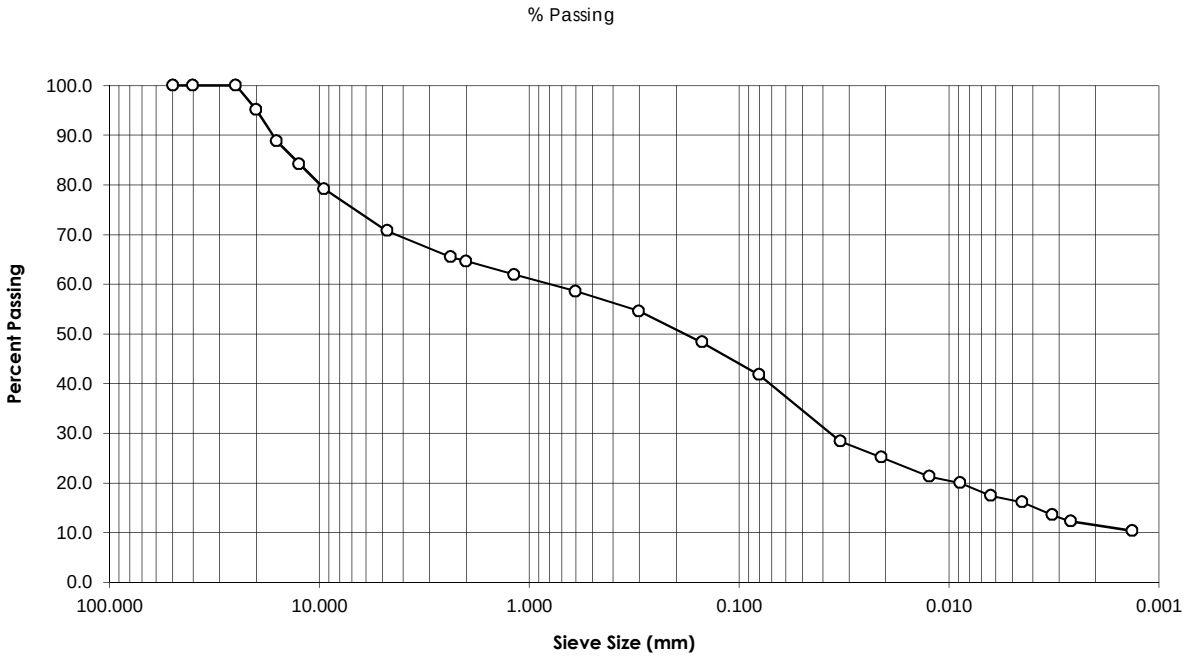
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: S10
SOURCE: D29
TESTED BY: B. Pelkey

DATE TESTED: November 3, 2016
DATE RECEIVED: July 21, 2016
SAMPLE DESCRIPTION: Clayey (CL) Gravel with Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 17.4 |
| 40.0 | 100.0 | 0.0045 | 16.1 |
| 25.0 | 100.0 | 0.0032 | 13.5 |
| 20.0 | 95.1 | 0.0026 | 12.2 |
| 16.0 | 88.8 | 0.0013 | 10.3 |
| 12.5 | 84.2 | | |
| 9.5 | 79.2 | | |
| 4.75 | 70.7 | | |
| 2.36 | 65.5 | | |
| 2.00 | 64.6 | | |
| 1.18 | 61.9 | | |
| 0.600 | 58.6 | | |
| 0.300 | 54.6 | | |
| 0.150 | 48.3 | | |
| 0.080 | 41.7 | | |
| 0.0328 | 28.4 | | |
| 0.0210 | 25.1 | | |
| 0.0124 | 21.3 | | |
| 0.0088 | 20.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 29.3% | $D_{10}$: | - |
| Sand: | 29.0% | $D_{30}$: | 0.0396 |
| Silt: | 30.3% | $D_{60}$: | 0.8518 |
| Clay: | 11.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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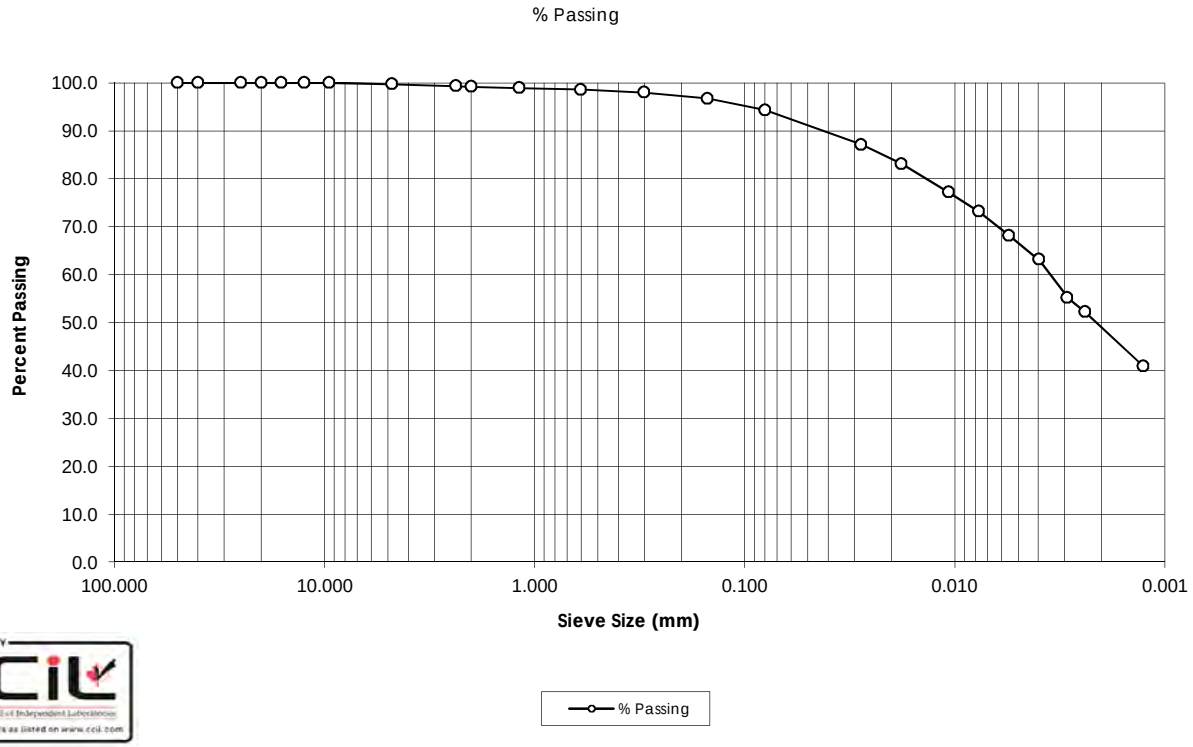
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST2
SOURCE: D30
TESTED BY: C.Oost

DATE TESTED: September 20, 2016
DATE RECEIVED: August 4, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0055** | **68.2** |
| **40.0** | **100.0** | **0.0040** | **63.2** |
| **25.0** | **100.0** | **0.0029** | **55.2** |
| **20.0** | **100.0** | **0.0024** | **52.2** |
| **16.0** | **100.0** | **0.0013** | **40.9** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.7** | | |
| **2.36** | **99.3** | | |
| **2.00** | **99.2** | | |
| **1.18** | **99.0** | | |
| **0.600** | **98.6** | | |
| **0.300** | **97.9** | | |
| **0.150** | **96.7** | | |
| **0.080** | **94.3** | | |
| **0.0279** | **87.1** | | |
| **0.0179** | **83.1** | | |
| **0.0106** | **77.1** | | |
| **0.0076** | **73.1** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.3% | $D_{10}$: | - |
| Sand: | 5.4% | $D_{30}$: | - |
| Silt: | 45.3% | $D_{60}$: | 0.0036 |
| Clay: | 49.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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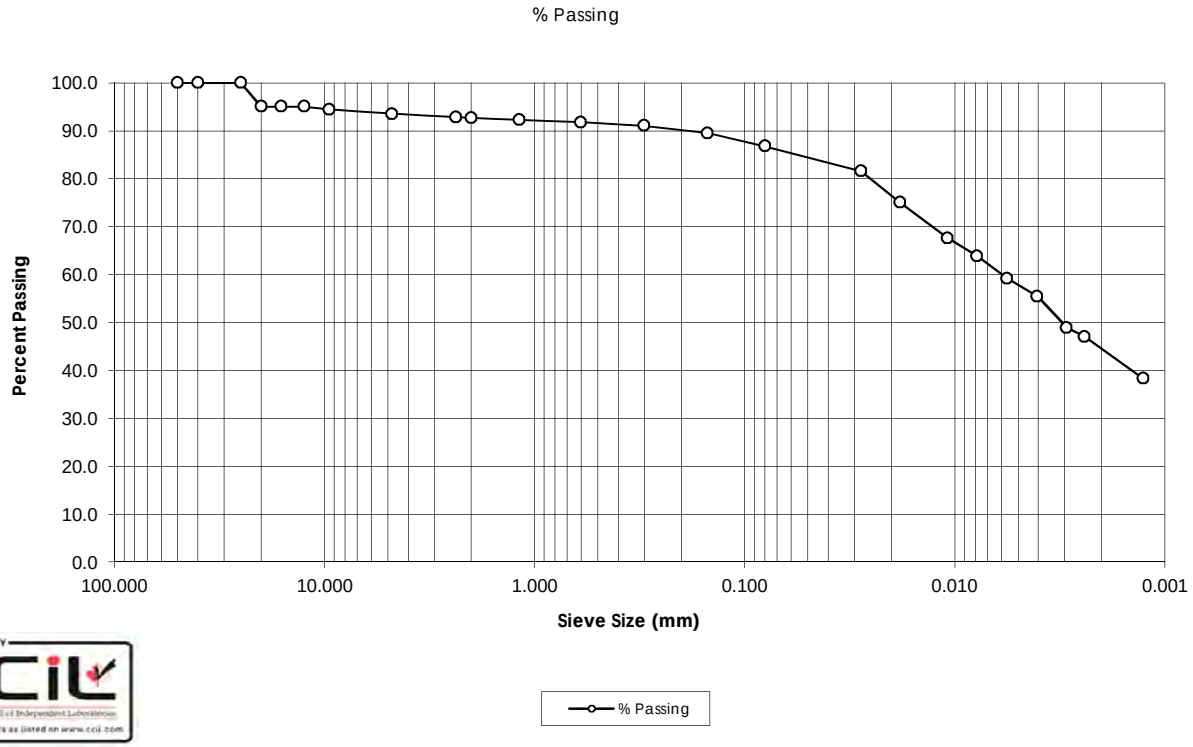
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D30
TESTED BY: C.Oost

DATE TESTED: September 20, 2016
DATE RECEIVED: August 4, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0056** | **59.2** |
| **40.0** | **100.0** | **0.0041** | **55.4** |
| **25.0** | **100.0** | **0.0029** | **48.9** |
| **20.0** | **95.0** | **0.0024** | **47.0** |
| **16.0** | **95.0** | **0.0013** | **38.3** |
| **12.5** | **95.0** | | |
| **9.5** | **94.5** | | |
| **4.75** | **93.5** | | |
| **2.36** | **92.8** | | |
| **2.00** | **92.7** | | |
| **1.18** | **92.3** | | |
| **0.600** | **91.8** | | |
| **0.300** | **91.1** | | |
| **0.150** | **89.5** | | |
| **0.080** | **86.7** | | |
| **0.0279** | **81.6** | | |
| **0.0181** | **75.1** | | |
| **0.0108** | **67.6** | | |
| **0.0078** | **63.8** | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.5% | $D_{10}$: | - |
| Sand: | 6.8% | $D_{30}$: | - |
| Silt: | 42.2% | $D_{60}$: | 0.0060 |
| Clay: | 44.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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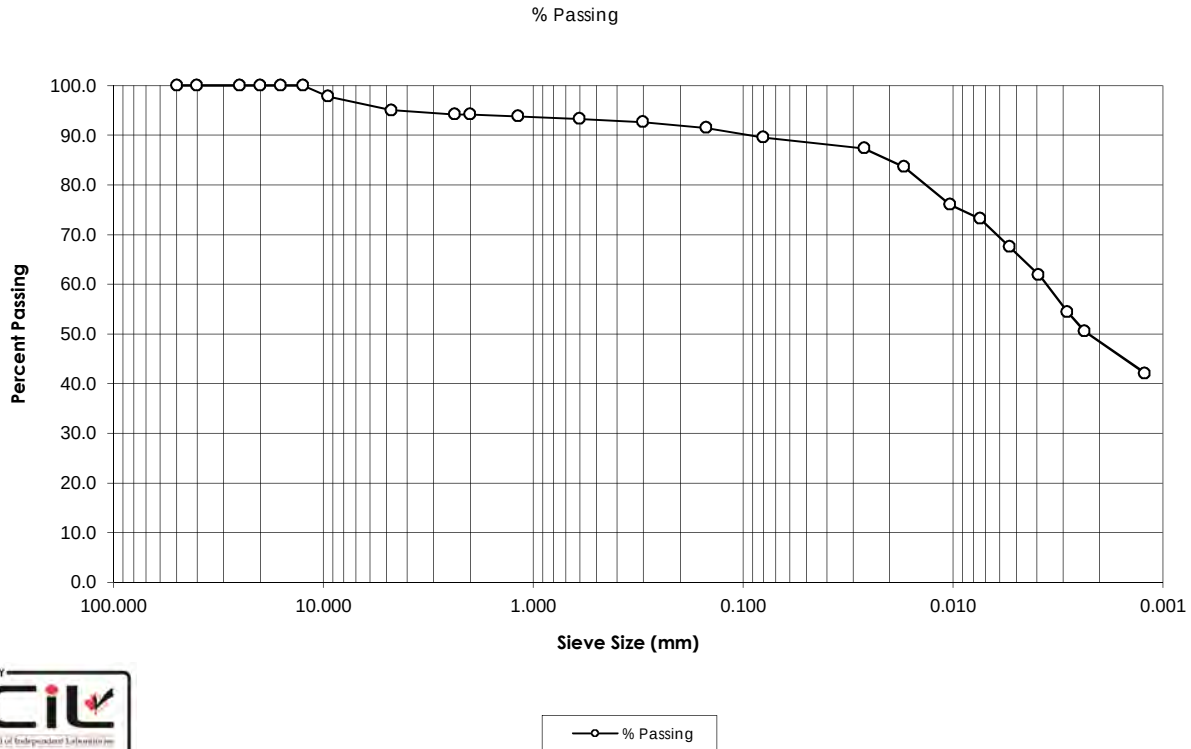
SAMPLE No.: ST6
SOURCE: D30
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: August 4, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 67.6 |
| 40.0 | 100.0 | 0.0039 | 61.9 |
| 25.0 | 100.0 | 0.0028 | 54.4 |
| 20.0 | 100.0 | 0.0024 | 50.6 |
| 16.0 | 100.0 | 0.0012 | 42.1 |
| 12.5 | 100.0 | | |
| 9.5 | 97.8 | | |
| 4.75 | 95.0 | | |
| 2.36 | 94.2 | | |
| 2.00 | 94.2 | | |
| 1.18 | 93.8 | | |
| 0.600 | 93.3 | | |
| 0.300 | 92.7 | | |
| 0.150 | 91.5 | | |
| 0.080 | 89.5 | | |
| 0.0265 | 87.4 | | |
| 0.0171 | 83.6 | | |
| 0.0103 | 76.1 | | |
| 0.0074 | 73.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.0% | $D_{10}$: | - |
| Sand: | 5.5% | $D_{30}$: | - |
| Silt: | 41.1% | $D_{60}$: | 0.0037 |
| Clay: | 48.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) drerived from both the Grain Size and Atterberg test results.

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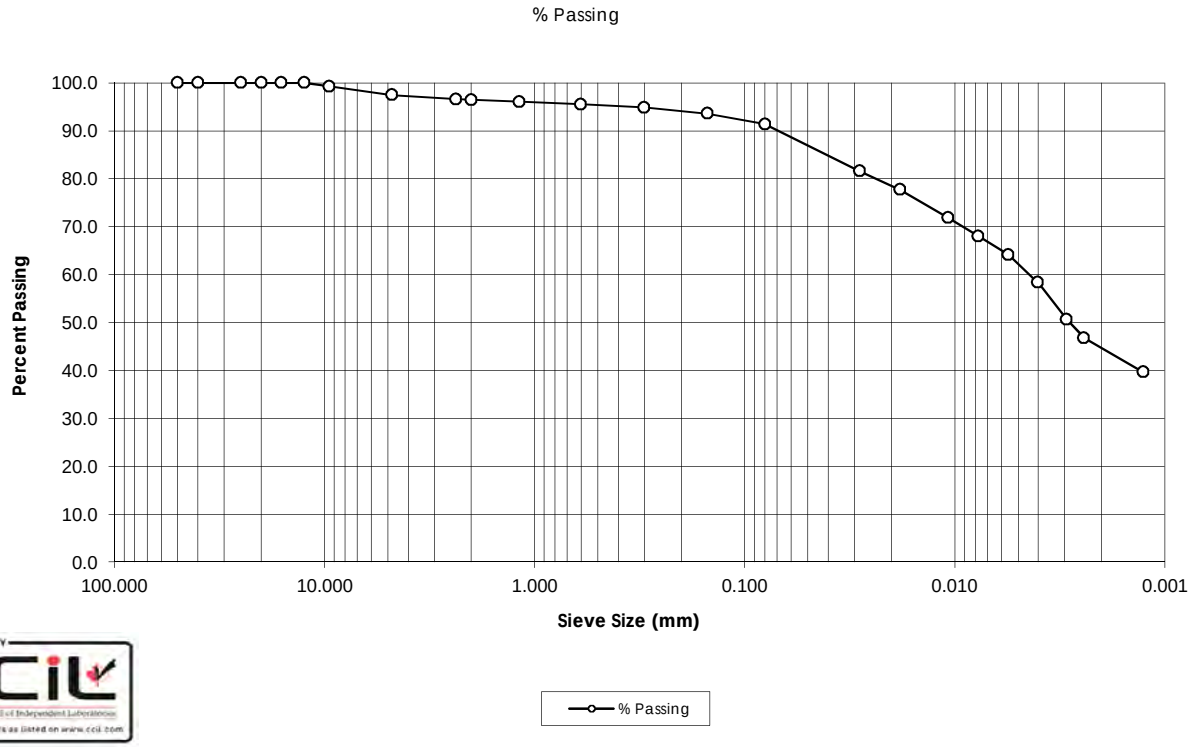
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST8
SOURCE: D30
TESTED BY: C.Oost

DATE TESTED: September 21, 2016
DATE RECEIVED: August 4, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0055** | **64.1** |
| **40.0** | **100.0** | **0.0040** | **58.4** |
| **25.0** | **100.0** | **0.0029** | **50.6** |
| **20.0** | **100.0** | **0.0024** | **46.8** |
| **16.0** | **100.0** | **0.0013** | **39.6** |
| **12.5** | **100.0** | | |
| **9.5** | **99.3** | | |
| **4.75** | **97.5** | | |
| **2.36** | **96.6** | | |
| **2.00** | **96.5** | | |
| **1.18** | **96.0** | | |
| **0.600** | **95.5** | | |
| **0.300** | **94.9** | | |
| **0.150** | **93.6** | | |
| **0.080** | **91.4** | | |
| **0.0282** | **81.5** | | |
| **0.0181** | **77.7** | | |
| **0.0108** | **71.9** | | |
| **0.0077** | **68.0** | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.5% | $D_{10}$: | - |
| Sand: | 6.1% | $D_{30}$: | - |
| Silt: | 46.7% | $D_{60}$: | 0.0045 |
| Clay: | 44.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230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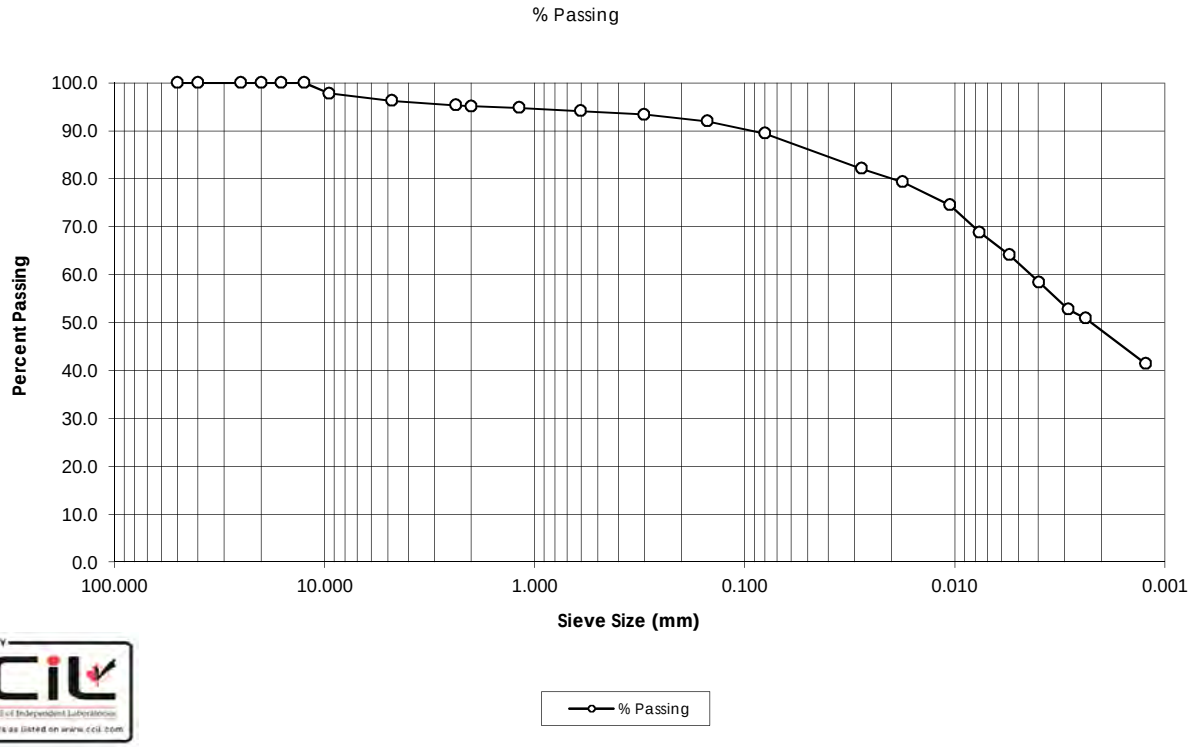
SAMPLE No.: ST10
SOURCE: D30
TESTED BY: B.Pelkey

DATE TESTED: October 3, 2016
DATE RECEIVED: August 5, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0055** | **64.1** |
| **40.0** | **100.0** | **0.0040** | **58.4** |
| **25.0** | **100.0** | **0.0029** | **52.7** |
| **20.0** | **100.0** | **0.0024** | **50.8** |
| **16.0** | **100.0** | **0.0012** | **41.3** |
| **12.5** | **100.0** | | |
| **9.5** | **97.8** | | |
| **4.75** | **96.2** | | |
| **2.36** | **95.3** | | |
| **2.00** | **95.1** | | |
| **1.18** | **94.8** | | |
| **0.600** | **94.1** | | |
| **0.300** | **93.4** | | |
| **0.150** | **91.9** | | |
| **0.080** | **89.5** | | |
| **0.0277** | **82.1** | | |
| **0.0176** | **79.3** | | |
| **0.0105** | **74.5** | | |
| **0.0076** | **68.8** | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.8% | $D_{10}$: | - |
| Sand: | 6.8% | $D_{30}$: | - |
| Silt: | 41.1% | $D_{60}$: | 0.0044 |
| Clay: | 48.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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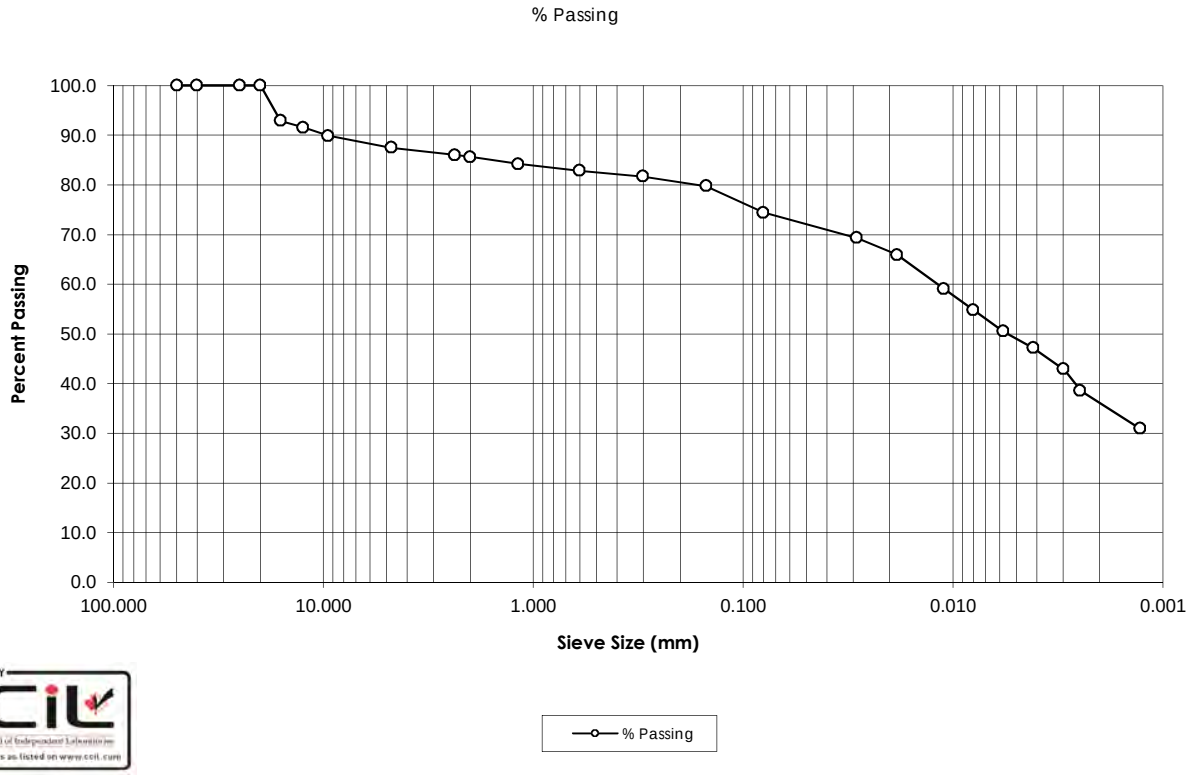
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS13
SOURCE: D30
TESTED BY: B. Pelkey

DATE TESTED: October 25, 2016
DATE RECEIVED: August 5, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 50.6 |
| 40.0 | 100.0 | 0.0041 | 47.1 |
| 25.0 | 100.0 | 0.0030 | 42.9 |
| 20.0 | 100.0 | 0.0025 | 38.6 |
| 16.0 | 92.9 | 0.0013 | 30.9 |
| 12.5 | 91.5 | | |
| 9.5 | 89.9 | | |
| 4.75 | 87.5 | | |
| 2.36 | 86.0 | | |
| 2.00 | 85.6 | | |
| 1.18 | 84.2 | | |
| 0.600 | 82.8 | | |
| 0.300 | 81.7 | | |
| 0.150 | 79.7 | | |
| 0.080 | 74.4 | | |
| 0.0287 | 69.3 | | |
| 0.0185 | 65.9 | | |
| 0.0111 | 59.1 | | |
| 0.0080 | 54.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.5% | $D_{10}$: | - |
| Sand: | 13.0% | $D_{30}$: | - |
| Silt: | 38.3% | $D_{60}$: | 0.0121 |
| Clay: | 36.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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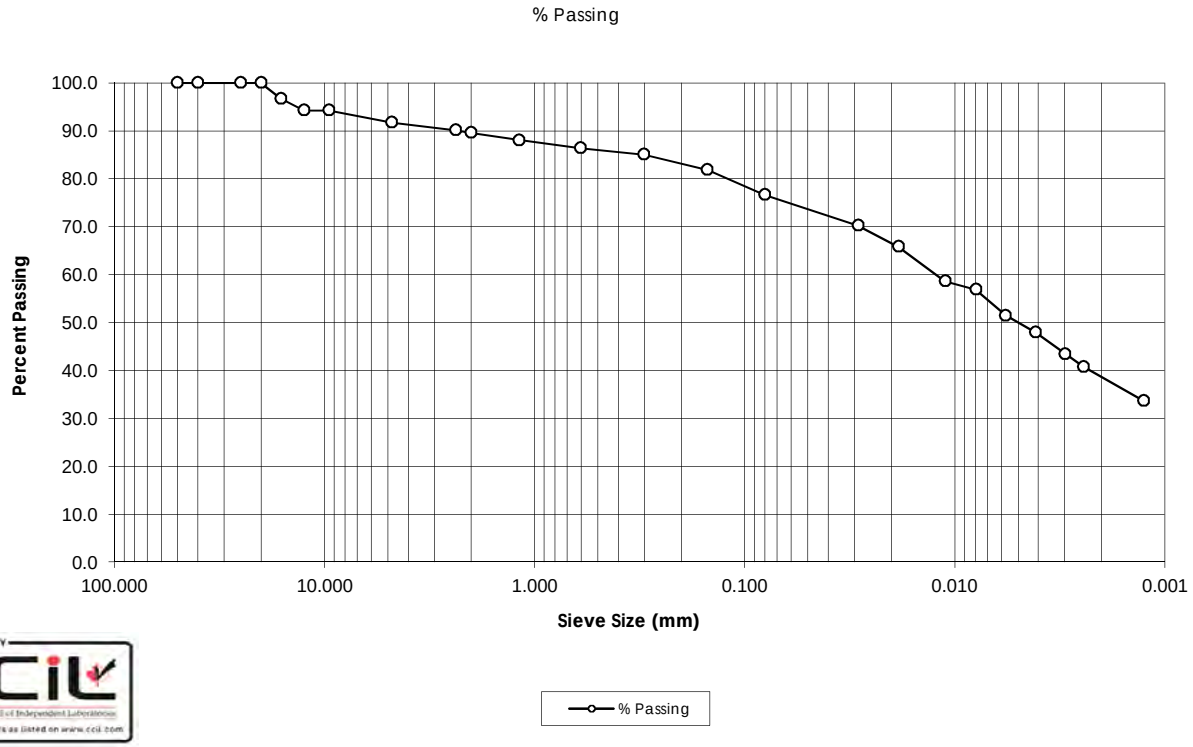
SAMPLE No.: ST15
SOURCE: D30
TESTED BY: B.Pelkey

DATE TESTED: September 29, 2016
DATE RECEIVED: August 5, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0057** | **51.5** |
| **40.0** | **100.0** | **0.0041** | **47.9** |
| **25.0** | **100.0** | **0.0030** | **43.4** |
| **20.0** | **100.0** | **0.0024** | **40.7** |
| **16.0** | **96.7** | **0.0013** | **33.6** |
| **12.5** | **94.3** | | |
| **9.5** | **94.3** | | |
| **4.75** | **91.7** | | |
| **2.36** | **90.1** | | |
| **2.00** | **89.5** | | |
| **1.18** | **88.0** | | |
| **0.600** | **86.4** | | |
| **0.300** | **85.0** | | |
| **0.150** | **81.8** | | |
| **0.080** | **76.6** | | |
| **0.0287** | **70.2** | | |
| **0.0185** | **65.8** | | |
| **0.0111** | **58.6** | | |
| **0.0079** | **56.8** | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.3% | $D_{10}$: | - |
| Sand: | 15.1% | $D_{30}$: | - |
| Silt: | 38.0% | $D_{60}$: | 0.0126 |
| Clay: | 38.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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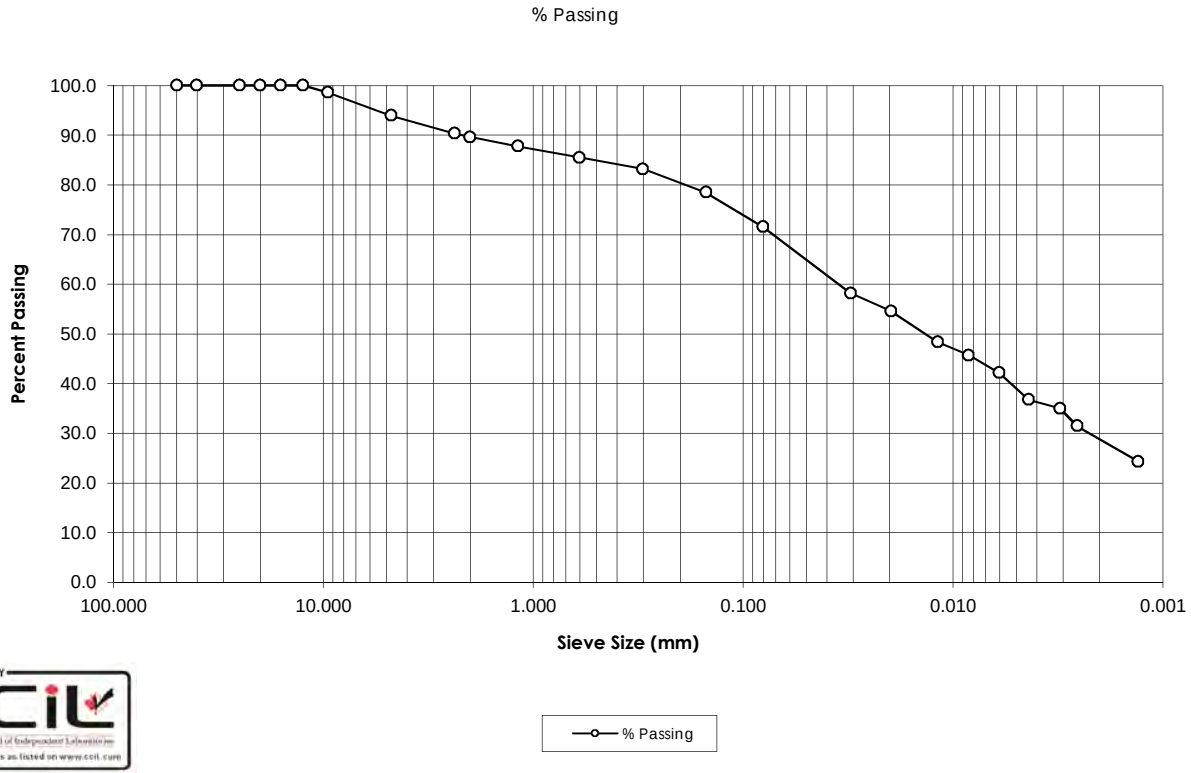
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS20
SOURCE: D30
TESTED BY: B. Pelkey

DATE TESTED: October 25, 2016
DATE RECEIVED: August 5, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI-CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 42.1 |
| 40.0 | 100.0 | 0.0043 | 36.7 |
| 25.0 | 100.0 | 0.0031 | 35.0 |
| 20.0 | 100.0 | 0.0026 | 31.4 |
| 16.0 | 100.0 | 0.0013 | 24.3 |
| 12.5 | 100.0 | | |
| 9.5 | 98.6 | | |
| 4.75 | 93.9 | | |
| 2.36 | 90.3 | | |
| 2.00 | 89.6 | | |
| 1.18 | 87.8 | | |
| 0.600 | 85.5 | | |
| 0.300 | 83.2 | | |
| 0.150 | 78.5 | | |
| 0.080 | 71.5 | | |
| 0.0307 | 58.2 | | |
| 0.0197 | 54.6 | | |
| 0.0118 | 48.3 | | |
| 0.0084 | 45.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.1% | $D_{10}$: | - |
| Sand: | 22.4% | $D_{30}$: | 0.0023 |
| Silt: | 42.7% | $D_{60}$: | 0.0382 |
| Clay: | 28.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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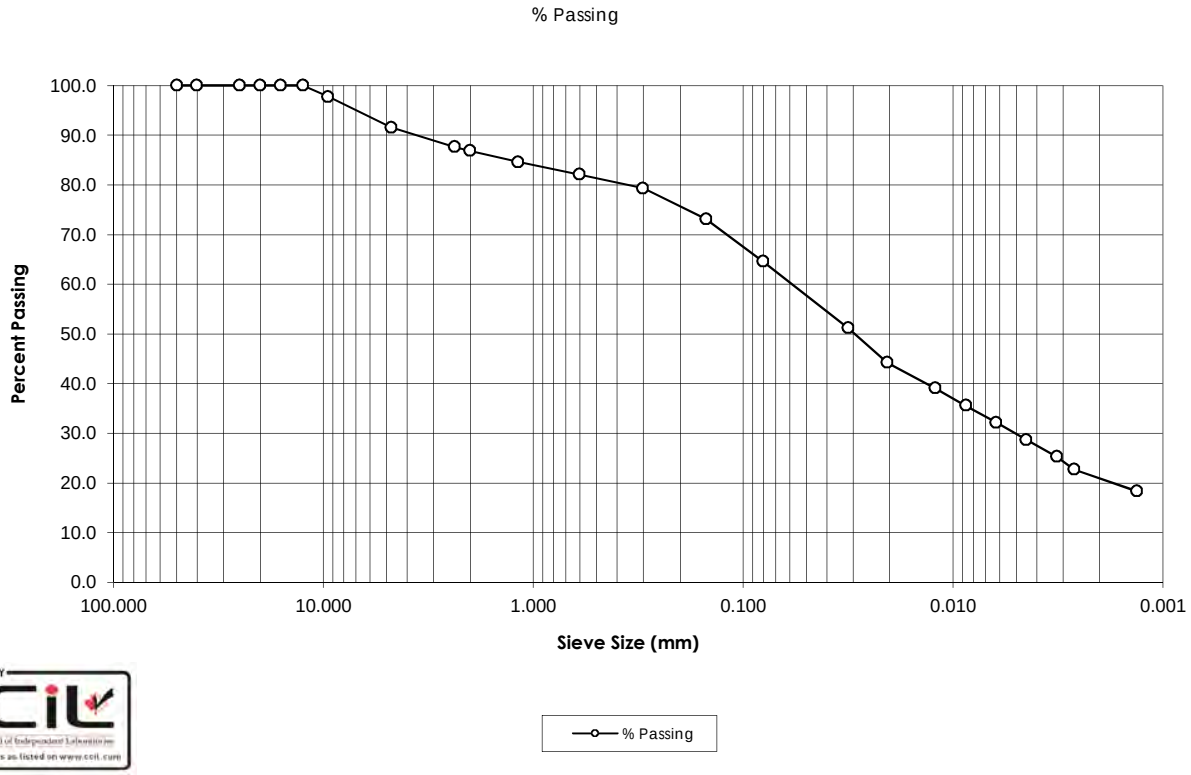
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS22
SOURCE: D30
TESTED BY: B. Pelkey

DATE TESTED: October 25, 2016
DATE RECEIVED: August 5, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 32.1 |
| 40.0 | 100.0 | 0.0045 | 28.7 |
| 25.0 | 100.0 | 0.0032 | 25.2 |
| 20.0 | 100.0 | 0.0026 | 22.6 |
| 16.0 | 100.0 | 0.0013 | 18.3 |
| 12.5 | 100.0 | | |
| 9.5 | 97.7 | | |
| 4.75 | 91.6 | | |
| 2.36 | 87.6 | | |
| 2.00 | 86.8 | | |
| 1.18 | 84.6 | | |
| 0.600 | 82.1 | | |
| 0.300 | 79.3 | | |
| 0.150 | 73.2 | | |
| 0.080 | 64.6 | | |
| 0.0315 | 51.1 | | |
| 0.0206 | 44.2 | | |
| 0.0121 | 39.0 | | |
| 0.0087 | 35.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.4% | $D_{10}$: | - |
| Sand: | 27.0% | $D_{30}$: | 0.0052 |
| Silt: | 43.7% | $D_{60}$: | 0.0647 |
| Clay: | 20.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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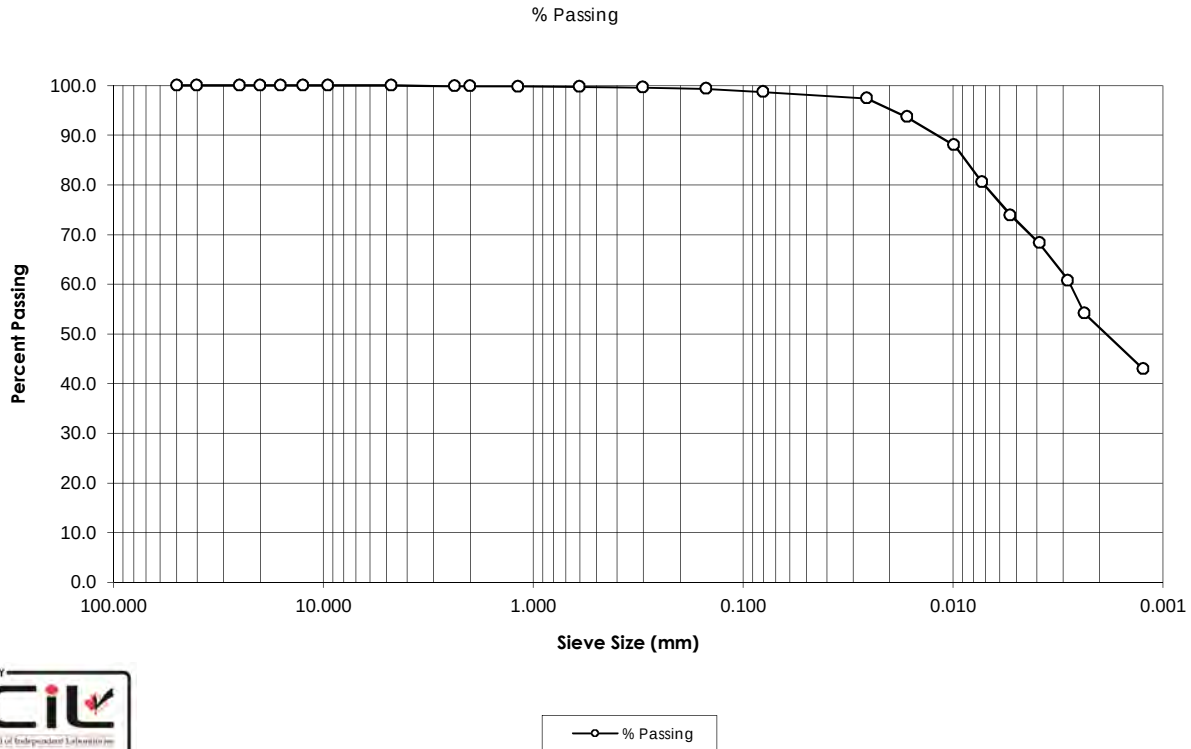
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D36
TESTED BY: C. Oost

DATE TESTED: October 4, 2016
DATE RECEIVED: July 21, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 73.9 |
| 40.0 | 100.0 | 0.0039 | 68.3 |
| 25.0 | 100.0 | 0.0028 | 60.8 |
| 20.0 | 100.0 | 0.0024 | 54.2 |
| 16.0 | 100.0 | 0.0012 | 42.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.8 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.6 | | |
| 0.150 | 99.3 | | |
| 0.080 | 98.7 | | |
| 0.0256 | 97.4 | | |
| 0.0166 | 93.7 | | |
| 0.0099 | 88.0 | | |
| 0.0073 | 80.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.3% | $D_{30}$: | - |
| Silt: | 47.5% | $D_{60}$: | 0.0028 |
| Clay: | 51.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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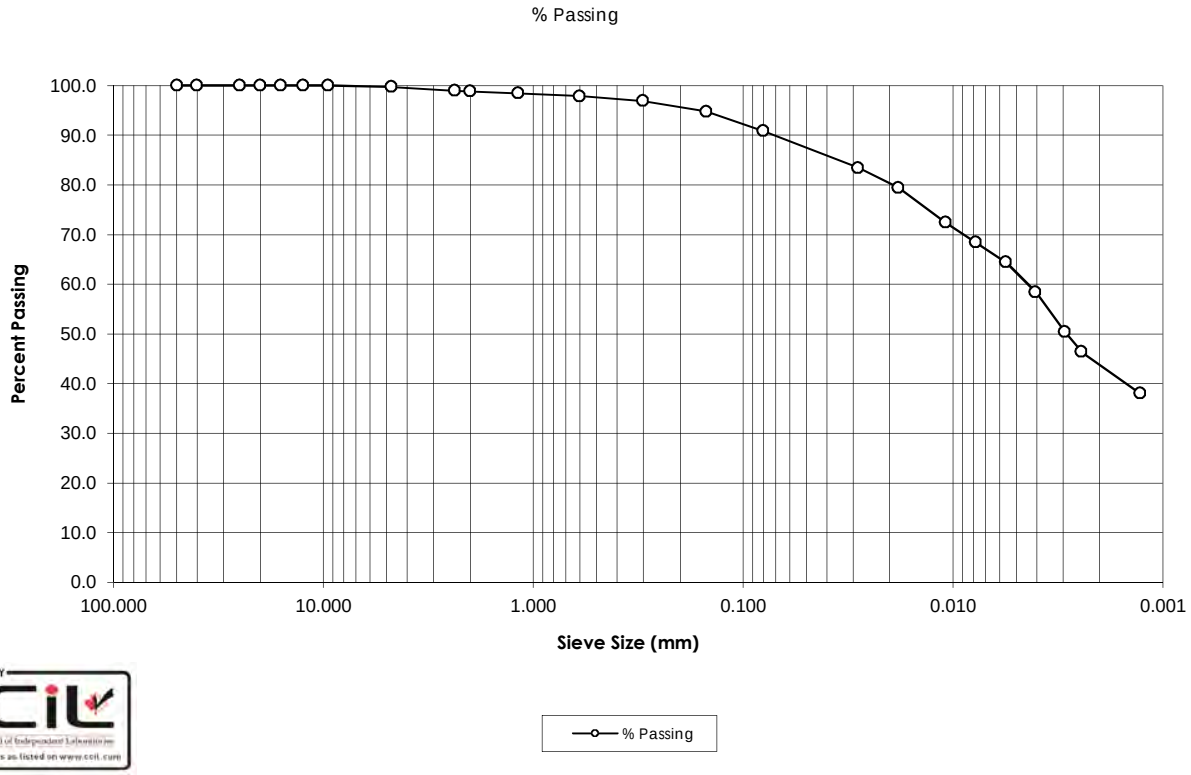
SAMPLE No.: ST6
SOURCE: D36
TESTED BY: C. Oost

DATE TESTED: September 20, 2016
DATE RECEIVED: August 4, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0056 | 64.4 |
| 40.0 | 100.0 | 0.0041 | 58.4 |
| 25.0 | 100.0 | 0.0029 | 50.4 |
| 20.0 | 100.0 | 0.0024 | 46.4 |
| 16.0 | 100.0 | 0.0013 | 38.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.7 | | |
| 2.36 | 99.0 | | |
| 2.00 | 98.8 | | |
| 1.18 | 98.4 | | |
| 0.600 | 97.9 | | |
| 0.300 | 96.9 | | |
| 0.150 | 94.8 | | |
| 0.080 | 90.8 | | |
| 0.0284 | 83.4 | | |
| 0.0182 | 79.4 | | |
| 0.0108 | 72.4 | | |
| 0.0078 | 68.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.3% | $D_{10}$: | - |
| Sand: | 8.9% | $D_{30}$: | - |
| Silt: | 47.0% | $D_{60}$: | 0.0045 |
| Clay: | 43.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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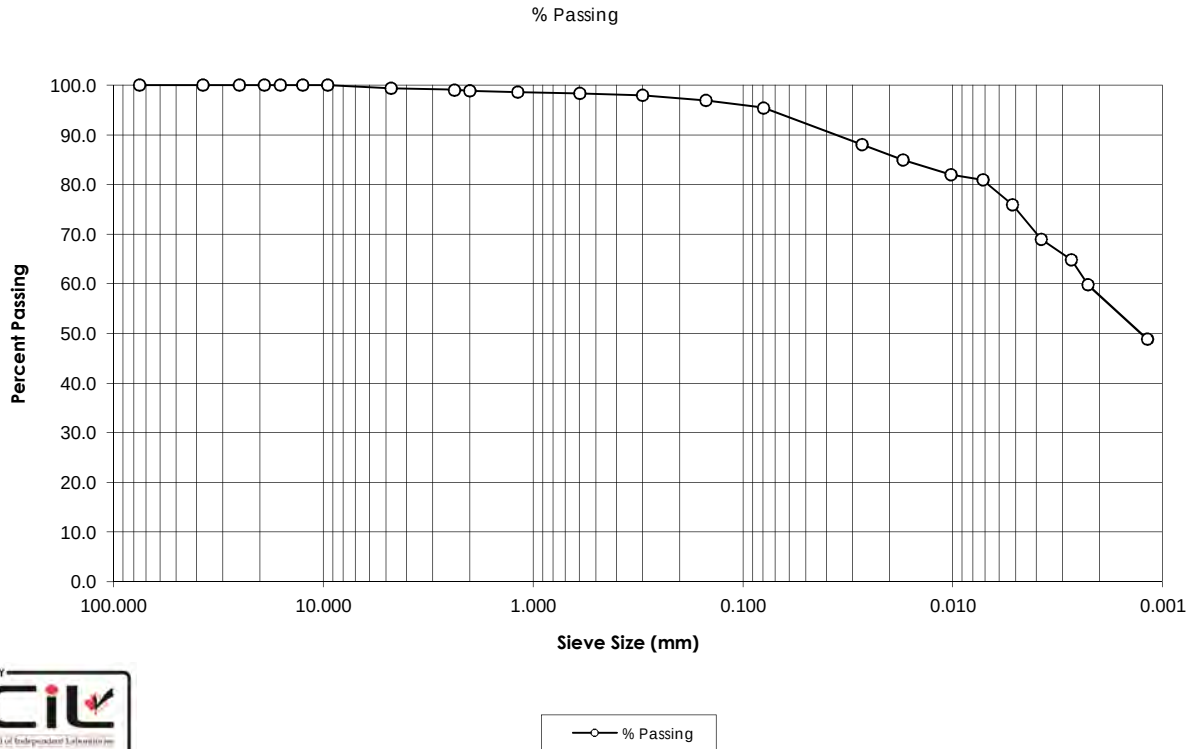
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST8
SOURCE: D36
TESTED BY: B. Pelkey

DATE TESTED: August 25, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0052 | 75.9 |
| 37.5 | 100.0 | 0.0038 | 68.9 |
| 25.0 | 100.0 | 0.0027 | 64.9 |
| 19.0 | 100.0 | 0.0023 | 59.9 |
| 16.0 | 100.0 | 0.0012 | 48.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.4 | | |
| 2.36 | 99.1 | | |
| 2.00 | 98.9 | | |
| 1.18 | 98.6 | | |
| 0.600 | 98.3 | | |
| 0.300 | 98.0 | | |
| 0.150 | 97.0 | | |
| 0.080 | 95.4 | | |
| 0.0271 | 88.0 | | |
| 0.0172 | 85.0 | | |
| 0.0102 | 82.0 | | |
| 0.0072 | 81.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.6% | $D_{10}$: | - |
| Sand: | 4.0% | $D_{30}$: | - |
| Silt: | 37.7% | $D_{60}$: | 0.0023 |
| Clay: | 57.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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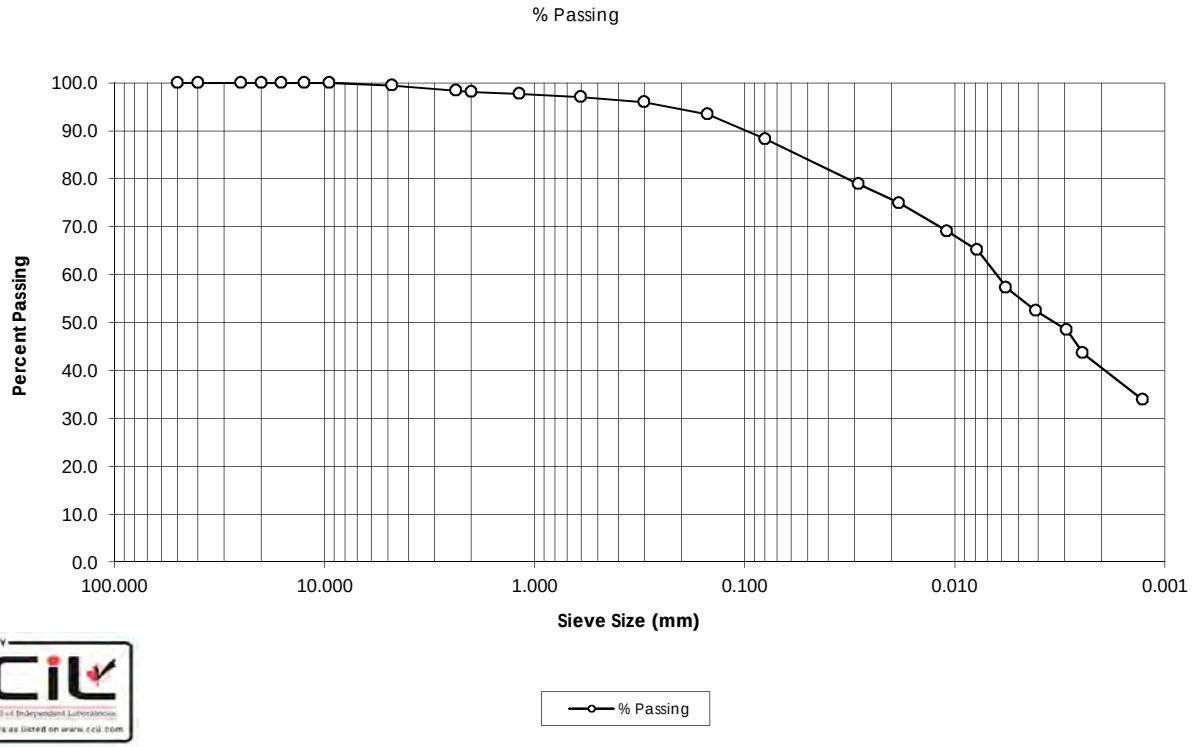
SAMPLE No.: ST10
SOURCE: D36
TESTED BY: B.Pelkey

DATE TESTED: October 3, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0057** | **57.3** |
| **40.0** | **100.0** | **0.0041** | **52.4** |
| **25.0** | **100.0** | **0.0029** | **48.5** |
| **20.0** | **100.0** | **0.0025** | **43.6** |
| **16.0** | **100.0** | **0.0013** | **33.9** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.5** | | |
| **2.36** | **98.4** | | |
| **2.00** | **98.1** | | |
| **1.18** | **97.7** | | |
| **0.600** | **97.1** | | |
| **0.300** | **96.0** | | |
| **0.150** | **93.5** | | |
| **0.080** | **88.3** | | |
| **0.0285** | **78.9** | | |
| **0.0184** | **74.9** | | |
| **0.0109** | **69.1** | | |
| **0.0078** | **65.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.5% | $D_{10}$: | - |
| Sand: | 11.1% | $D_{30}$: | - |
| Silt: | 47.7% | $D_{60}$: | 0.0064 |
| Clay: | 40.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

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## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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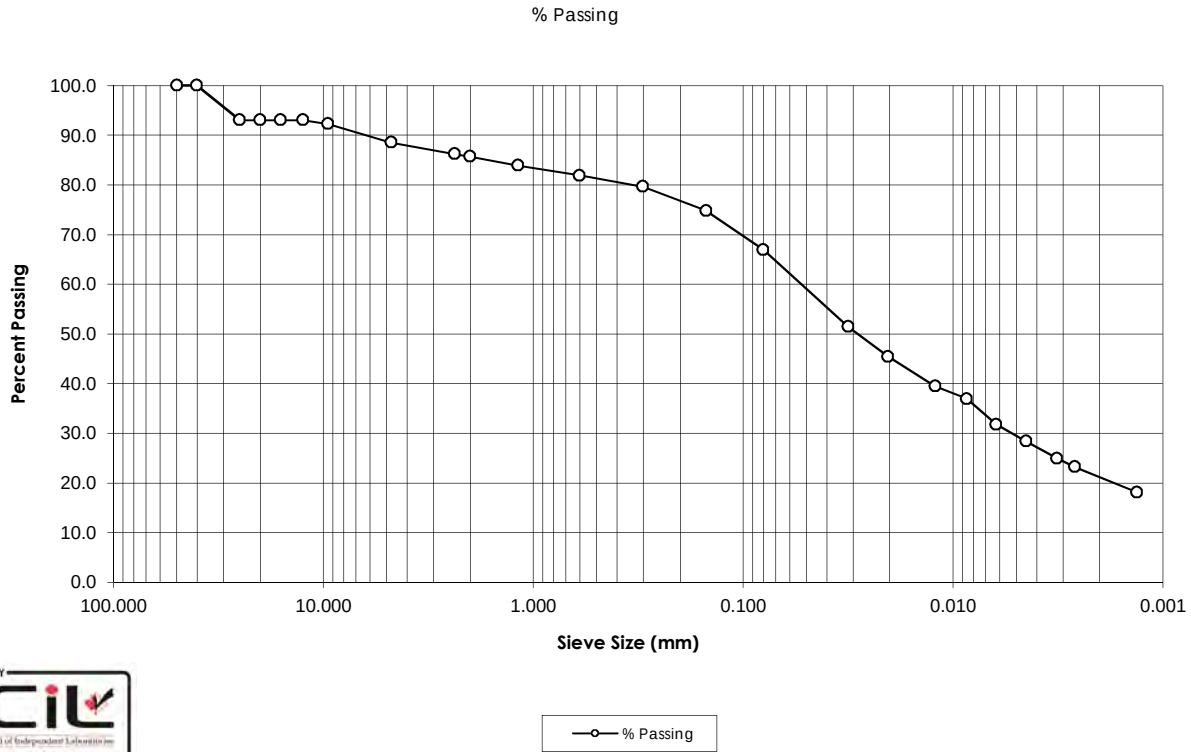
SAMPLE No.: BS15
SOURCE: D36
TESTED BY: B. Pelkey

DATE TESTED: October 25, 2016
DATE RECEIVED: July 21, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Some Gravel

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 31.8 |
| 40.0 | 100.0 | 0.0045 | 28.4 |
| 25.0 | 93.1 | 0.0032 | 24.9 |
| 20.0 | 93.1 | 0.0026 | 23.2 |
| 16.0 | 93.1 | 0.0013 | 18.1 |
| 12.5 | 93.1 | | |
| 9.5 | 92.2 | | |
| 4.75 | 88.6 | | |
| 2.36 | 86.2 | | |
| 2.00 | 85.7 | | |
| 1.18 | 83.9 | | |
| 0.600 | 81.9 | | |
| 0.300 | 79.6 | | |
| 0.150 | 74.8 | | |
| 0.080 | 67.0 | | |
| 0.0315 | 51.4 | | |
| 0.0204 | 45.4 | | |
| 0.0121 | 39.5 | | |
| 0.0086 | 36.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 11.4% | $D_{10}$: | - |
| Sand: | 21.6% | $D_{30}$: | 0.0053 |
| Silt: | 45.8% | $D_{60}$: | 0.0598 |
| Clay: | 21.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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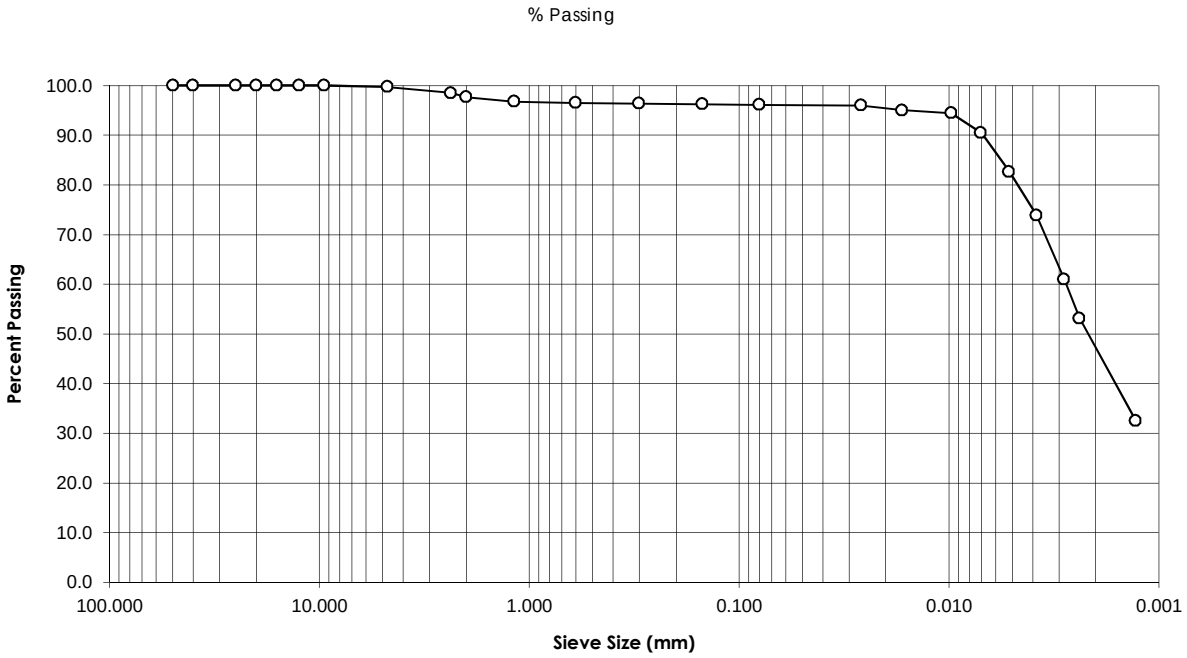
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC24 @ 16.66-16.90m
SOURCE: D36
TESTED BY: C. Oost

DATE TESTED: September 6, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 82.7 |
| 40.0 | 100.0 | 0.0038 | 73.8 |
| 25.0 | 100.0 | 0.0028 | 61.0 |
| 20.0 | 100.0 | 0.0024 | 53.1 |
| 16.0 | 100.0 | 0.0013 | 32.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.8 | | |
| 2.36 | 98.5 | | |
| 2.00 | 97.7 | | |
| 1.18 | 96.8 | | |
| 0.600 | 96.5 | | |
| 0.300 | 96.4 | | |
| 0.150 | 96.2 | | |
| 0.080 | 96.2 | | |
| 0.0262 | 96.0 | | |
| 0.0167 | 95.1 | | |
| 0.0098 | 94.5 | | |
| 0.0071 | 90.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 3.6% | $D_{30}$: | - |
| Silt: | 49.0% | $D_{60}$: | 0.0028 |
| Clay: | 47.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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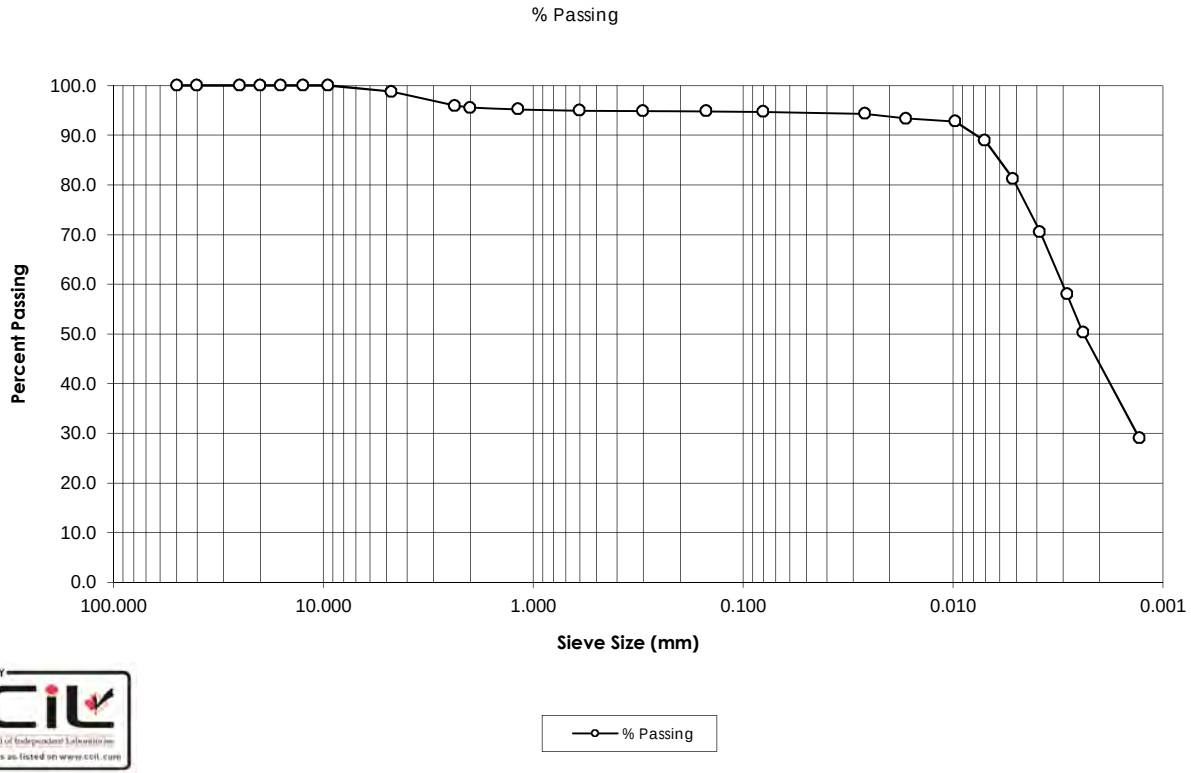
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC24 @ 16.90-17.15m
SOURCE: D36
TESTED BY: C. Oost

DATE TESTED: September 6, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 81.2 |
| 40.0 | 100.0 | 0.0039 | 70.6 |
| 25.0 | 100.0 | 0.0029 | 58.0 |
| 20.0 | 100.0 | 0.0024 | 50.3 |
| 16.0 | 100.0 | 0.0013 | 29.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.8 | | |
| 2.36 | 96.0 | | |
| 2.00 | 95.6 | | |
| 1.18 | 95.2 | | |
| 0.600 | 94.9 | | |
| 0.300 | 94.9 | | |
| 0.150 | 94.8 | | |
| 0.080 | 94.7 | | |
| 0.0262 | 94.3 | | |
| 0.0167 | 93.4 | | |
| 0.0098 | 92.8 | | |
| 0.0071 | 88.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.2% | $D_{10}$: | - |
| Sand: | 4.0% | $D_{30}$: | 0.0014 |
| Silt: | 50.7% | $D_{60}$: | 0.0030 |
| Clay: | 44.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. Stantec is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of Stantec.

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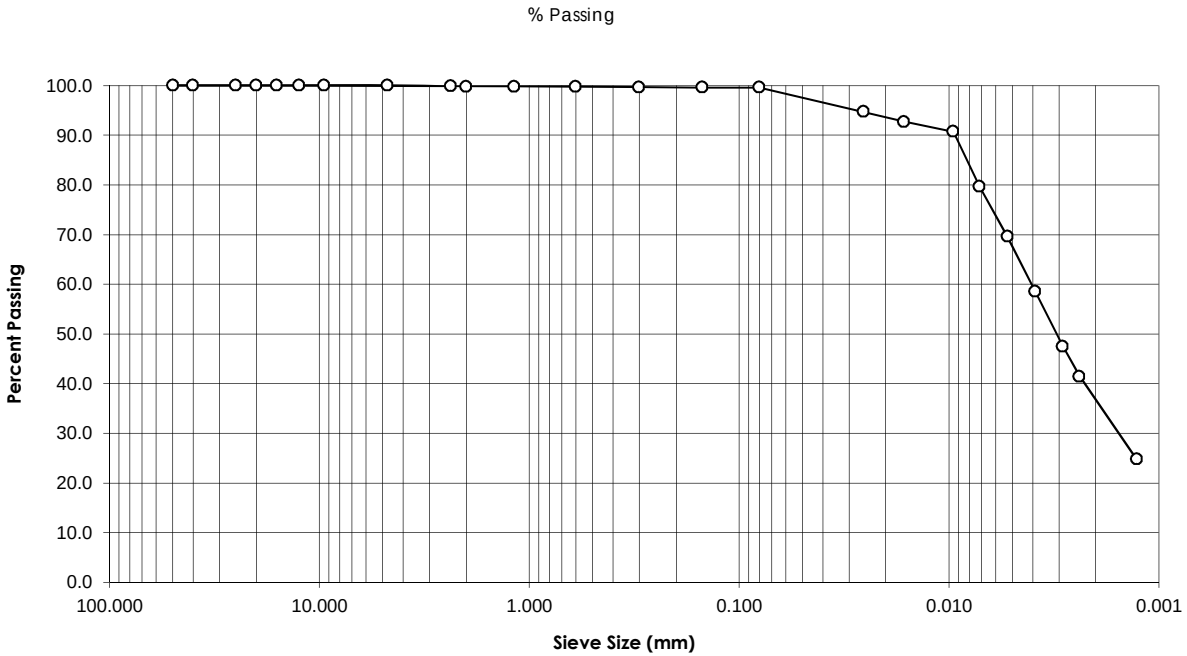
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC25 @ 17.20-17.30m
SOURCE: D36
TESTED BY: J. Upham

DATE TESTED: September 1, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CI)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 69.6 |
| 40.0 | 100.0 | 0.0039 | 58.5 |
| 25.0 | 100.0 | 0.0029 | 47.5 |
| 20.0 | 100.0 | 0.0024 | 41.4 |
| 16.0 | 100.0 | 0.0013 | 24.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.8 | | |
| 1.18 | 99.8 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.7 | | |
| 0.150 | 99.6 | | |
| 0.080 | 99.6 | | |
| 0.0256 | 94.7 | | |
| 0.0164 | 92.7 | | |
| 0.0095 | 90.7 | | |
| 0.0071 | 79.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.4% | $D_{30}$: | 0.0017 |
| Silt: | 63.0% | $D_{60}$: | 0.0041 |
| Clay: | 36.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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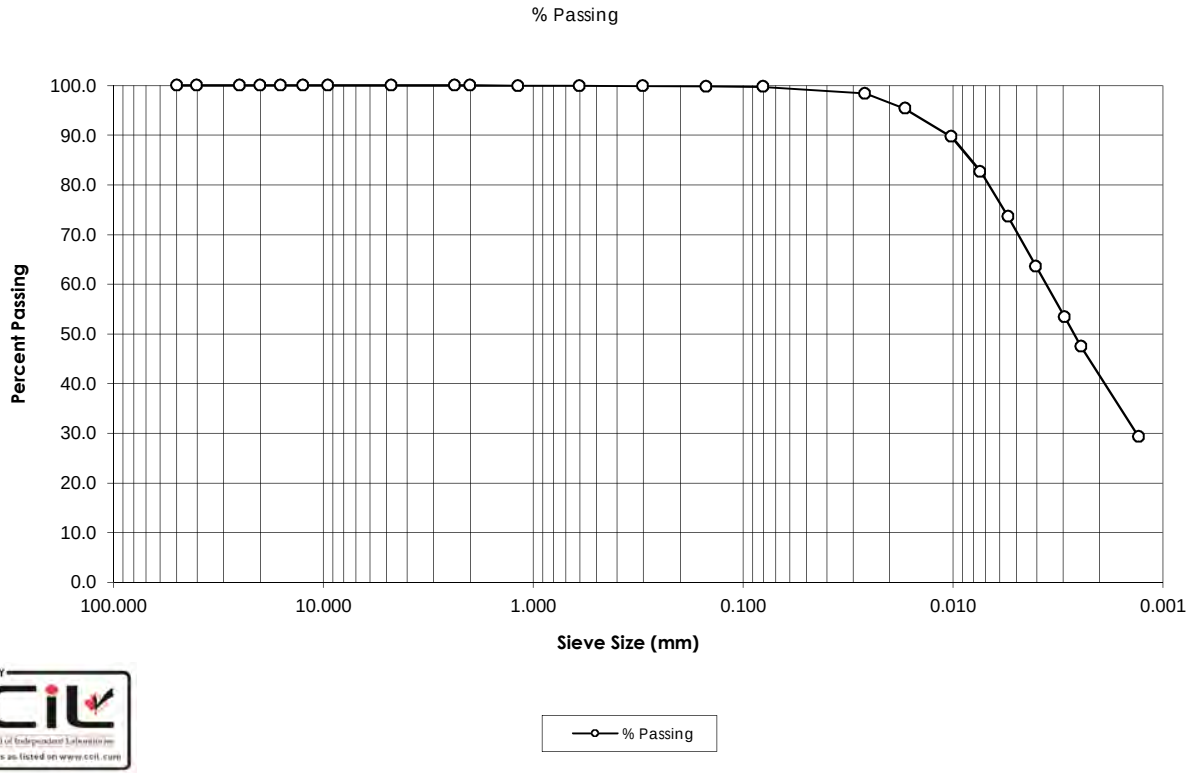
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC25 @ 17.56-17.62m
SOURCE: D36
TESTED BY: C. Oost

DATE TESTED: September 6, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CI)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 73.6 |
| 40.0 | 100.0 | 0.0040 | 63.5 |
| 25.0 | 100.0 | 0.0029 | 53.4 |
| 20.0 | 100.0 | 0.0025 | 47.4 |
| 16.0 | 100.0 | 0.0013 | 29.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.8 | | |
| 0.080 | 99.7 | | |
| 0.0262 | 98.4 | | |
| 0.0169 | 95.4 | | |
| 0.0102 | 89.7 | | |
| 0.0074 | 82.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.3% | $D_{30}$: | 0.0014 |
| Silt: | 58.2% | $D_{60}$: | 0.0037 |
| Clay: | 41.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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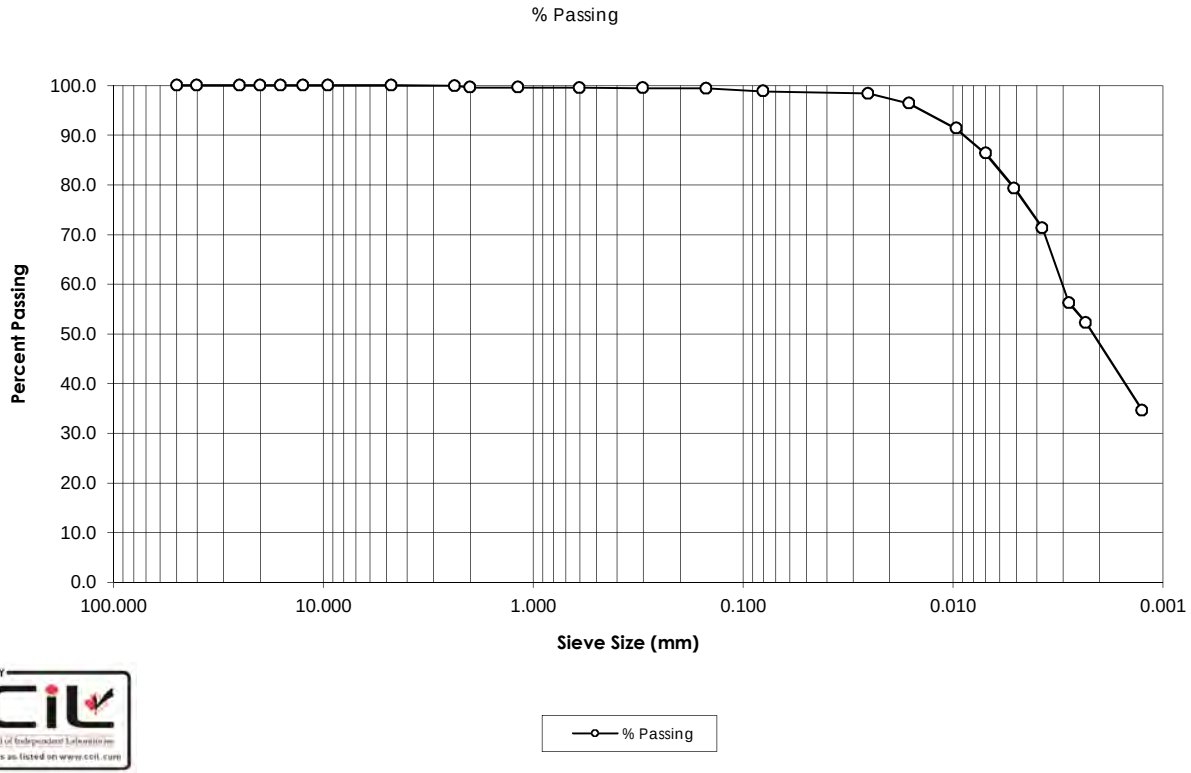
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC25 @ 17.70-17.82m
SOURCE: D36
TESTED BY: C. Oost

DATE TESTED: September 8, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 79.3 |
| 40.0 | 100.0 | 0.0038 | 71.3 |
| 25.0 | 100.0 | 0.0028 | 56.2 |
| 20.0 | 100.0 | 0.0023 | 52.2 |
| 16.0 | 100.0 | 0.0013 | 34.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.6 | | |
| 1.18 | 99.6 | | |
| 0.600 | 99.5 | | |
| 0.300 | 99.5 | | |
| 0.150 | 99.4 | | |
| 0.080 | 98.8 | | |
| 0.0254 | 98.4 | | |
| 0.0162 | 96.4 | | |
| 0.0096 | 91.4 | | |
| 0.0070 | 86.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.2% | $D_{30}$: | - |
| Silt: | 51.0% | $D_{60}$: | 0.0031 |
| Clay: | 47.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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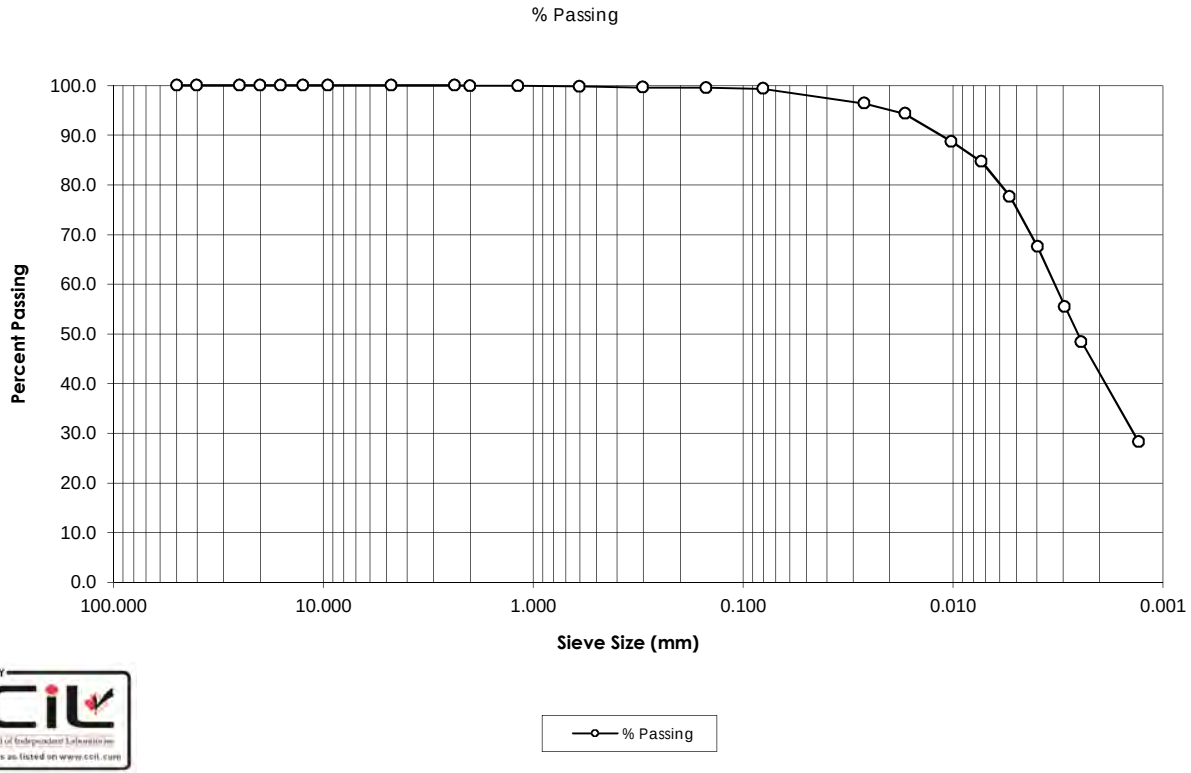
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC26 @ 19.35-19.45m
SOURCE: D36
TESTED BY: C. Oost

DATE TESTED: September 6, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CI)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 77.6 |
| 40.0 | 100.0 | 0.0040 | 67.5 |
| 25.0 | 100.0 | 0.0029 | 55.4 |
| 20.0 | 100.0 | 0.0024 | 48.4 |
| 16.0 | 100.0 | 0.0013 | 28.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.6 | | |
| 0.150 | 99.5 | | |
| 0.080 | 99.4 | | |
| 0.0264 | 96.4 | | |
| 0.0169 | 94.4 | | |
| 0.0102 | 88.7 | | |
| 0.0073 | 84.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.6% | $D_{30}$: | 0.0014 |
| Silt: | 57.4% | $D_{60}$: | 0.0033 |
| Clay: | 42.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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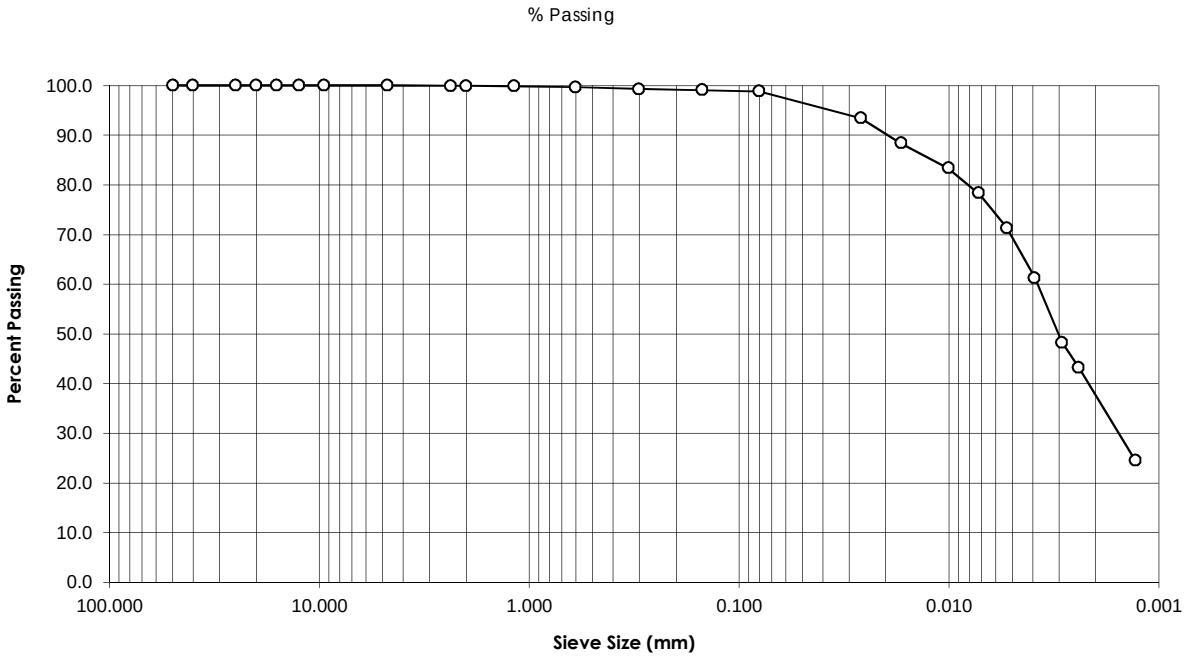
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC27 @ 20.26-20.40m
SOURCE: D36
TESTED BY: C. Oost

DATE TESTED: September 6, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 71.3 |
| 40.0 | 100.0 | 0.0039 | 61.3 |
| 25.0 | 100.0 | 0.0029 | 48.2 |
| 20.0 | 100.0 | 0.0024 | 43.2 |
| 16.0 | 100.0 | 0.0013 | 24.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.7 | | |
| 0.300 | 99.3 | | |
| 0.150 | 99.1 | | |
| 0.080 | 98.9 | | |
| 0.0262 | 93.4 | | |
| 0.0169 | 88.4 | | |
| 0.0101 | 83.4 | | |
| 0.0072 | 78.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.1% | $D_{30}$: | 0.0017 |
| Silt: | 61.3% | $D_{60}$: | 0.0038 |
| Clay: | 37.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230


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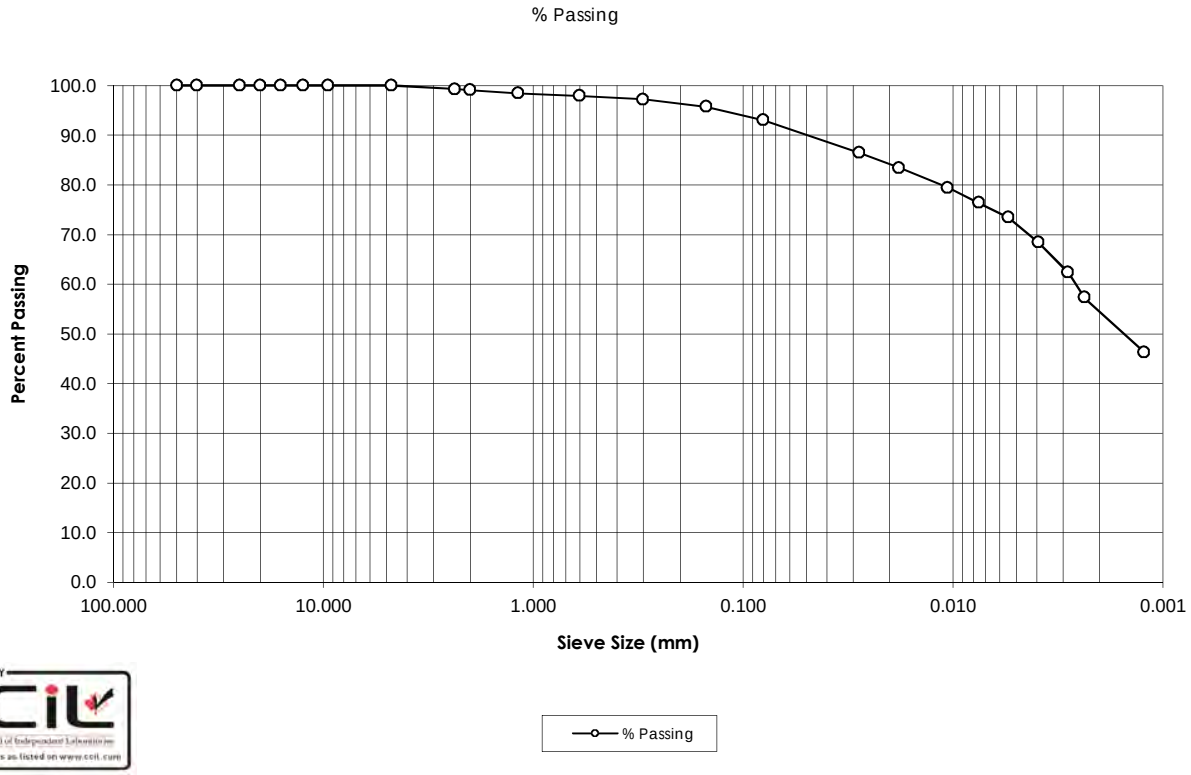
SAMPLE No.: S4
SOURCE: D38
TESTED BY: B. Pelkey

DATE TESTED: October 28, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 73.4 |
| 40.0 | 100.0 | 0.0039 | 68.4 |
| 25.0 | 100.0 | 0.0028 | 62.4 |
| 20.0 | 100.0 | 0.0024 | 57.4 |
| 16.0 | 100.0 | 0.0012 | 46.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.3 | | |
| 2.00 | 99.1 | | |
| 1.18 | 98.5 | | |
| 0.600 | 97.9 | | |
| 0.300 | 97.2 | | |
| 0.150 | 95.7 | | |
| 0.080 | 93.0 | | |
| 0.0279 | 86.5 | | |
| 0.0181 | 83.5 | | |
| 0.0106 | 79.4 | | |
| 0.0075 | 76.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 7.0% | $D_{30}$: | - |
| Silt: | 38.5% | $D_{60}$: | 0.0026 |
| Clay: | 54.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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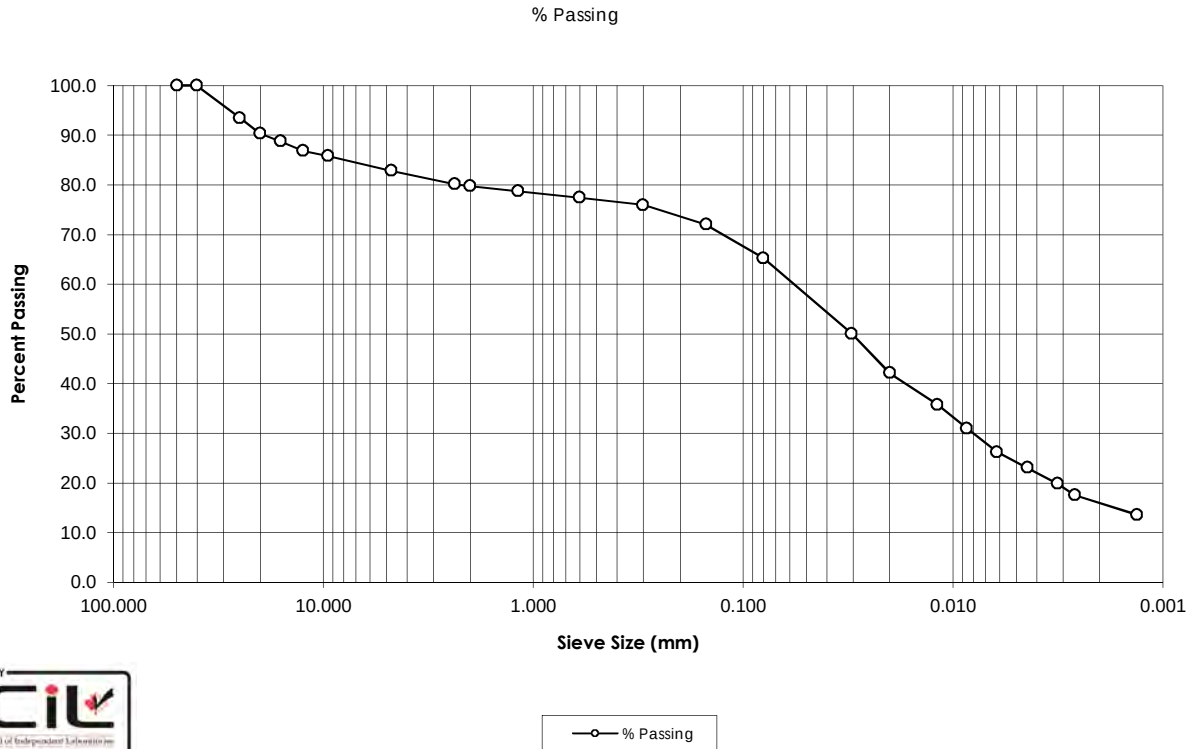
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: S9
SOURCE: D38
TESTED BY: B. Pelkey

DATE TESTED: November 2, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CL), Some Sand, Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 26.2 |
| 40.0 | 100.0 | 0.0044 | 23.0 |
| 25.0 | 93.5 | 0.0032 | 19.9 |
| 20.0 | 90.3 | 0.0026 | 17.5 |
| 16.0 | 88.8 | 0.0013 | 13.5 |
| 12.5 | 86.8 | | |
| 9.5 | 85.8 | | |
| 4.75 | 82.8 | | |
| 2.36 | 80.2 | | |
| 2.00 | 79.8 | | |
| 1.18 | 78.7 | | |
| 0.600 | 77.5 | | |
| 0.300 | 75.9 | | |
| 0.150 | 72.1 | | |
| 0.080 | 65.2 | | |
| 0.0304 | 50.1 | | |
| 0.0200 | 42.1 | | |
| 0.0119 | 35.8 | | |
| 0.0086 | 31.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 17.2% | $D_{10}$: | - |
| Sand: | 17.6% | $D_{30}$: | 0.0081 |
| Silt: | 49.3% | $D_{60}$: | 0.0643 |
| Clay: | 15.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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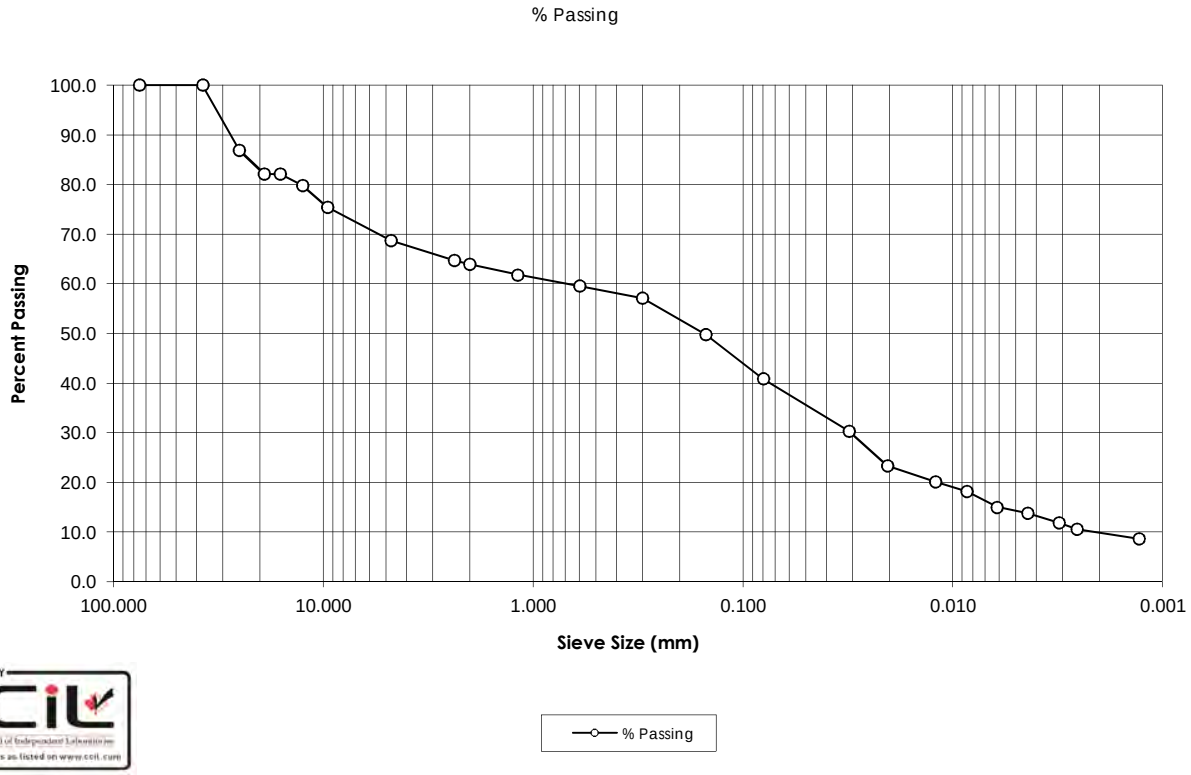
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS4
SOURCE: D41
TESTED BY: C. Oost

DATE TESTED: July 28, 2016
DATE RECEIVED: June 27, 2016
SAMPLE DESCRIPTION: Gravelly, Sandy Clay (CL)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0062 | 15.0 |
| 37.5 | 100.0 | 0.0044 | 13.8 |
| 25.0 | 86.8 | 0.0031 | 11.8 |
| 19.0 | 82.1 | 0.0026 | 10.6 |
| 16.0 | 82.1 | 0.0013 | 8.7 |
| 12.5 | 79.8 | | |
| 9.5 | 75.4 | | |
| 4.75 | 68.7 | | |
| 2.36 | 64.7 | | |
| 2.00 | 63.9 | | |
| 1.18 | 61.8 | | |
| 0.600 | 59.5 | | |
| 0.300 | 57.1 | | |
| 0.150 | 49.8 | | |
| 0.080 | 40.8 | | |
| 0.0311 | 30.3 | | |
| 0.0204 | 23.3 | | |
| 0.0120 | 20.1 | | |
| 0.0085 | 18.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 31.3% | $D_{10}$: | 0.0022 |
| Sand: | 27.9% | $D_{30}$: | 0.0307 |
| Silt: | 30.9% | $D_{60}$: | 0.7244 |
| Clay: | 9.9% | $C_u$: | 328.53 |
| | | $C_c$: | 0.59 |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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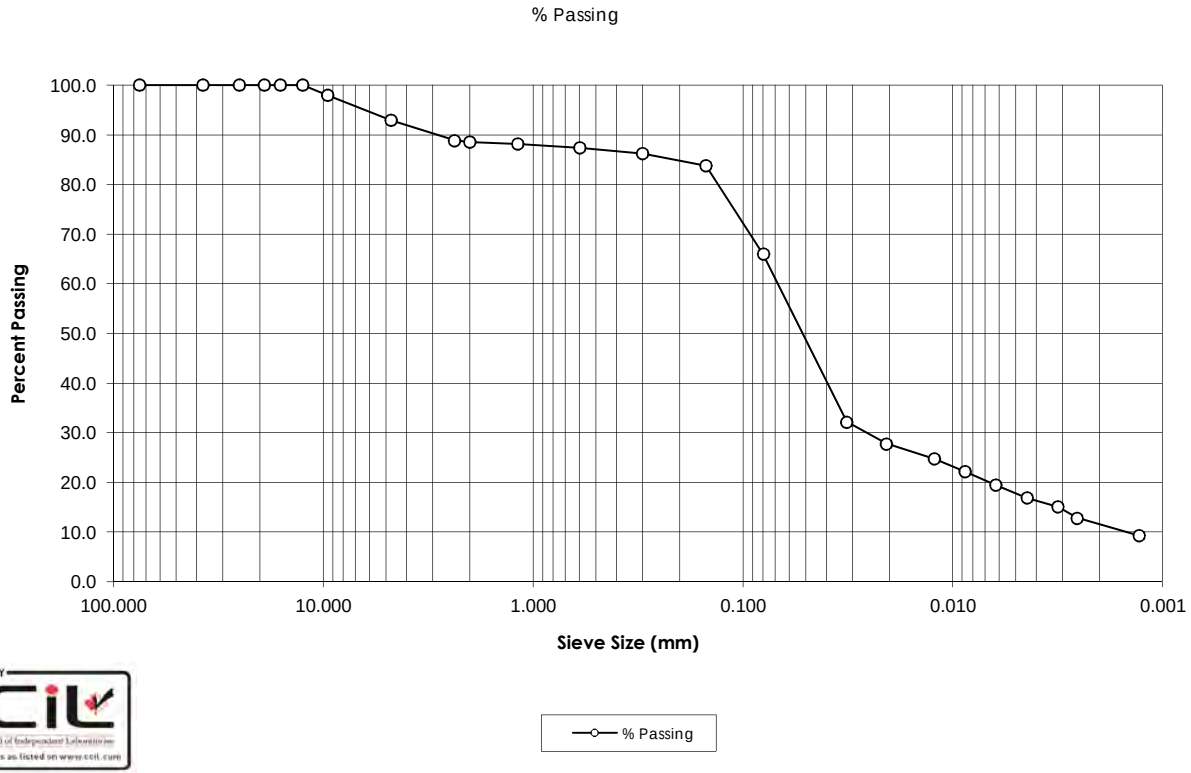
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS12
SOURCE: D41
TESTED BY: C. Oost

DATE TESTED: July 25, 2016
DATE RECEIVED: June 27, 2016
SAMPLE DESCRIPTION: Sandy Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0062 | 19.5 |
| 37.5 | 100.0 | 0.0044 | 16.9 |
| 25.0 | 100.0 | 0.0031 | 15.1 |
| 19.0 | 100.0 | 0.0026 | 12.8 |
| 16.0 | 100.0 | 0.0013 | 9.3 |
| 12.5 | 100.0 | | |
| 9.5 | 97.9 | | |
| 4.75 | 93.0 | | |
| 2.36 | 88.9 | | |
| 2.00 | 88.6 | | |
| 1.18 | 88.1 | | |
| 0.600 | 87.4 | | |
| 0.300 | 86.2 | | |
| 0.150 | 83.7 | | |
| 0.080 | 66.0 | | |
| 0.0320 | 32.2 | | |
| 0.0207 | 27.8 | | |
| 0.0122 | 24.8 | | |
| 0.0087 | 22.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.0% | $D_{10}$: | 0.0016 |
| Sand: | 27.0% | $D_{30}$: | 0.0266 |
| Silt: | 54.4% | $D_{60}$: | 0.0737 |
| Clay: | 11.6% | $C_u$: | 46.87 |
| | | $C_c$: | 6.12 |

**Comments:** Sample description (USCS) derived from Grain Size test results only

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. Stantec is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of Stantec.

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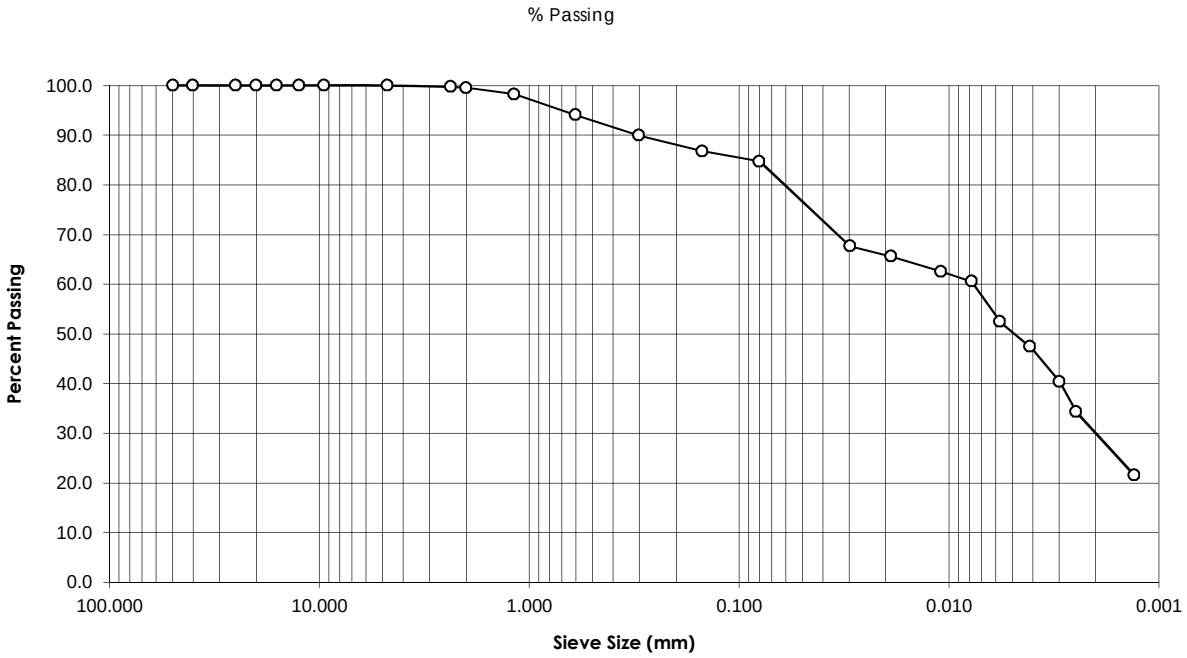
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC22 @ 20.52-20.57m
SOURCE: D41
TESTED BY: C. Oost

DATE TESTED: September 6, 2016
DATE RECEIVED: July 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 52.5 |
| 40.0 | 100.0 | 0.0041 | 47.4 |
| 25.0 | 100.0 | 0.0030 | 40.4 |
| 20.0 | 100.0 | 0.0025 | 34.3 |
| 16.0 | 100.0 | 0.0013 | 21.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.8 | | |
| 2.00 | 99.5 | | |
| 1.18 | 98.3 | | |
| 0.600 | 94.0 | | |
| 0.300 | 89.9 | | |
| 0.150 | 86.8 | | |
| 0.080 | 84.7 | | |
| 0.0295 | 67.6 | | |
| 0.0189 | 65.6 | | |
| 0.0110 | 62.6 | | |
| 0.0078 | 60.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 15.3% | $D_{30}$: | 0.0021 |
| Silt: | 54.7% | $D_{60}$: | 0.0077 |
| Clay: | 30.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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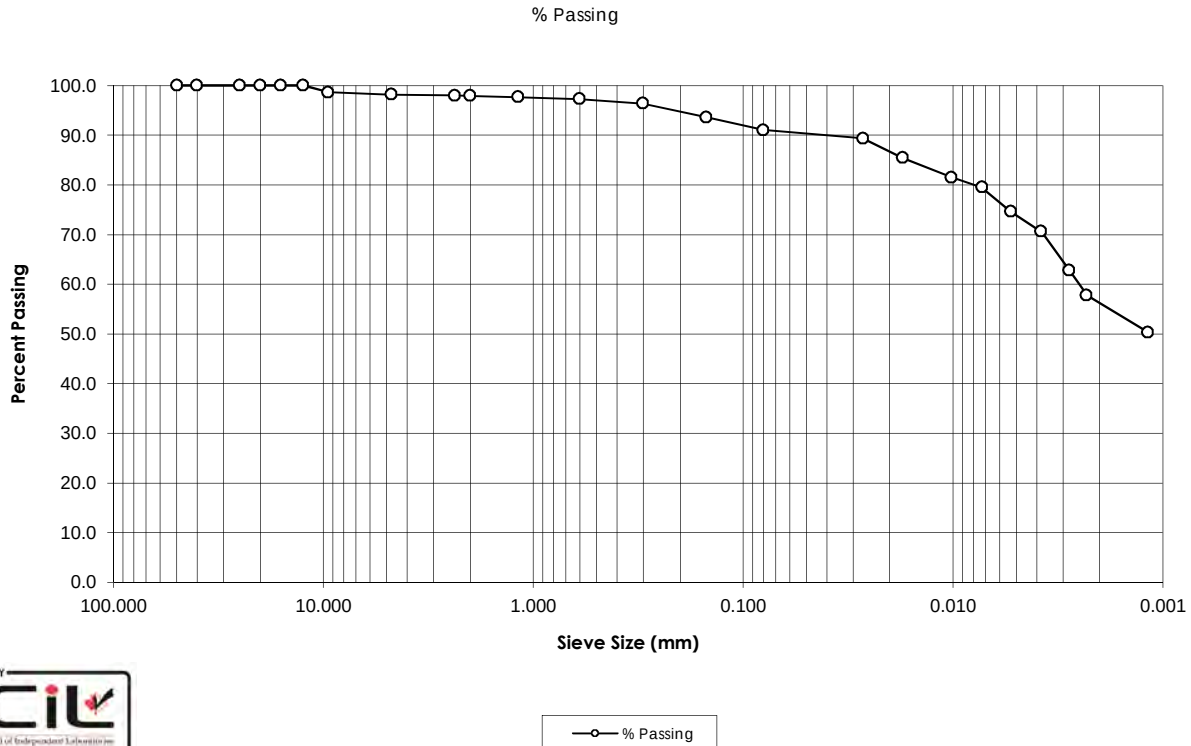
SAMPLE No.: ST2
SOURCE: D42
TESTED BY: CO

DATE TESTED: September 16, 2016
DATE RECEIVED: July 27, 2016
SAMPLE DESCRIPTION: Fat Clay, Trace Sand, Trace Gravel

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0053** | **74.6** |
| **40.0** | **100.0** | **0.0038** | **70.6** |
| **25.0** | **100.0** | **0.0028** | **62.7** |
| **20.0** | **100.0** | **0.0023** | **57.8** |
| **16.0** | **100.0** | **0.0012** | **50.3** |
| **12.5** | **100.0** | | |
| **9.5** | **98.7** | | |
| **4.75** | **98.2** | | |
| **2.36** | **98.0** | | |
| **2.00** | **97.9** | | |
| **1.18** | **97.7** | | |
| **0.600** | **97.3** | | |
| **0.300** | **96.4** | | |
| **0.150** | **93.6** | | |
| **0.080** | **91.1** | | |
| **0.0269** | **89.4** | | |
| **0.0173** | **85.4** | | |
| **0.0102** | **81.5** | | |
| **0.0073** | **79.5** | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.8% | $D_{10}$: | - |
| Sand: | 7.1% | $D_{30}$: | - |
| Silt: | 34.9% | $D_{60}$: | 0.0025 |
| Clay: | 56.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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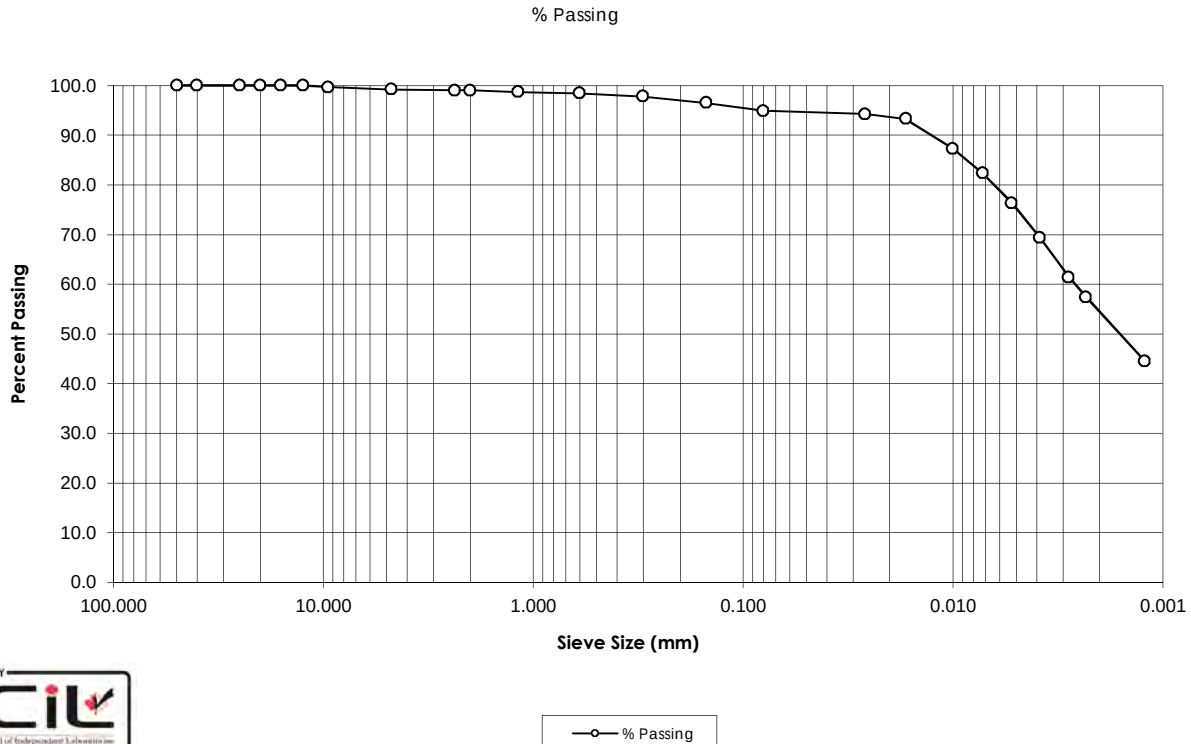
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D42
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: July 27, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 76.3 |
| 40.0 | 100.0 | 0.0038 | 69.4 |
| 25.0 | 100.0 | 0.0028 | 61.4 |
| 20.0 | 100.0 | 0.0023 | 57.4 |
| 16.0 | 100.0 | 0.0012 | 44.4 |
| 12.5 | 100.0 | | |
| 9.5 | 99.7 | | |
| 4.75 | 99.2 | | |
| 2.36 | 99.0 | | |
| 2.00 | 99.0 | | |
| 1.18 | 98.7 | | |
| 0.600 | 98.4 | | |
| 0.300 | 97.8 | | |
| 0.150 | 96.5 | | |
| 0.080 | 94.9 | | |
| 0.0262 | 94.3 | | |
| 0.0168 | 93.3 | | |
| 0.0100 | 87.3 | | |
| 0.0072 | 82.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.8% | $D_{10}$: | - |
| Sand: | 4.4% | $D_{30}$: | - |
| Silt: | 40.5% | $D_{60}$: | 0.0026 |
| Clay: | 54.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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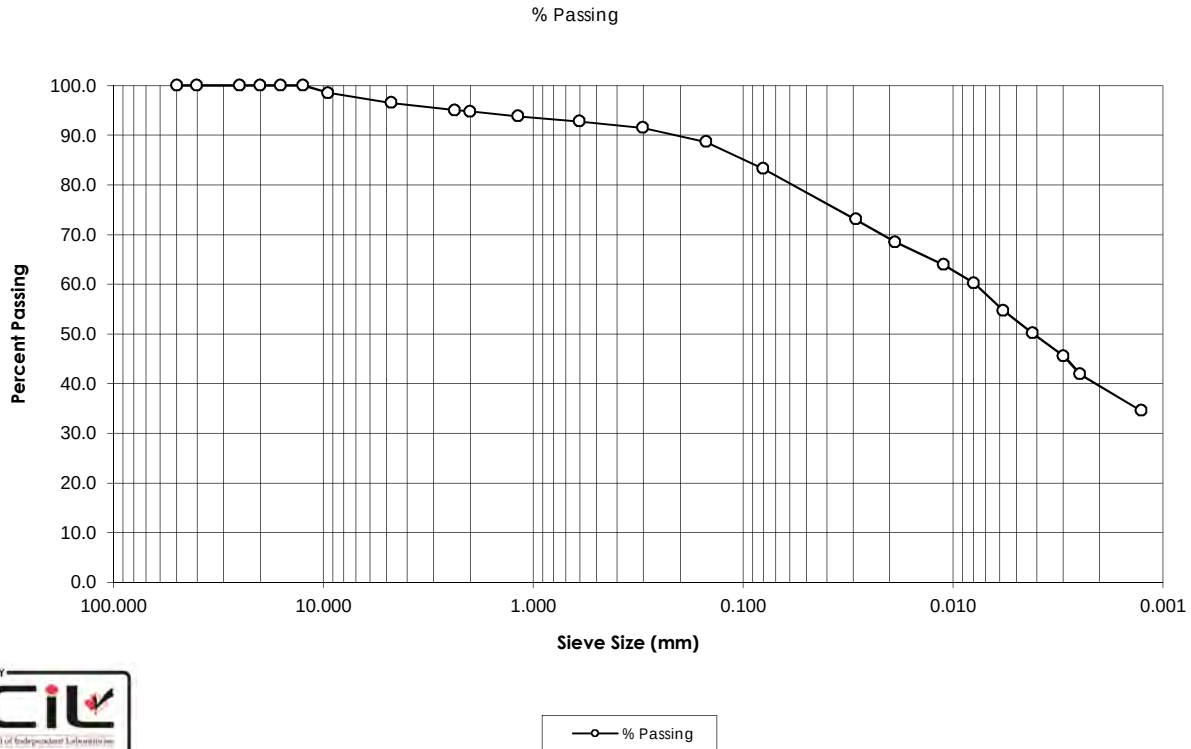
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST8
SOURCE: D42
TESTED BY: C. Oost

DATE TESTED: October 4, 2016
DATE RECEIVED: July 27, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 54.7 |
| 40.0 | 100.0 | 0.0042 | 50.1 |
| 25.0 | 100.0 | 0.0030 | 45.5 |
| 20.0 | 100.0 | 0.0025 | 41.9 |
| 16.0 | 100.0 | 0.0013 | 34.5 |
| 12.5 | 100.0 | | |
| 9.5 | 98.5 | | |
| 4.75 | 96.5 | | |
| 2.36 | 95.0 | | |
| 2.00 | 94.8 | | |
| 1.18 | 93.8 | | |
| 0.600 | 92.8 | | |
| 0.300 | 91.5 | | |
| 0.150 | 88.7 | | |
| 0.080 | 83.2 | | |
| 0.0290 | 73.1 | | |
| 0.0189 | 68.5 | | |
| 0.0111 | 63.9 | | |
| 0.0079 | 60.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.5% | $D_{10}$: | - |
| Sand: | 13.3% | $D_{30}$: | - |
| Silt: | 43.7% | $D_{60}$: | 0.0079 |
| Clay: | 39.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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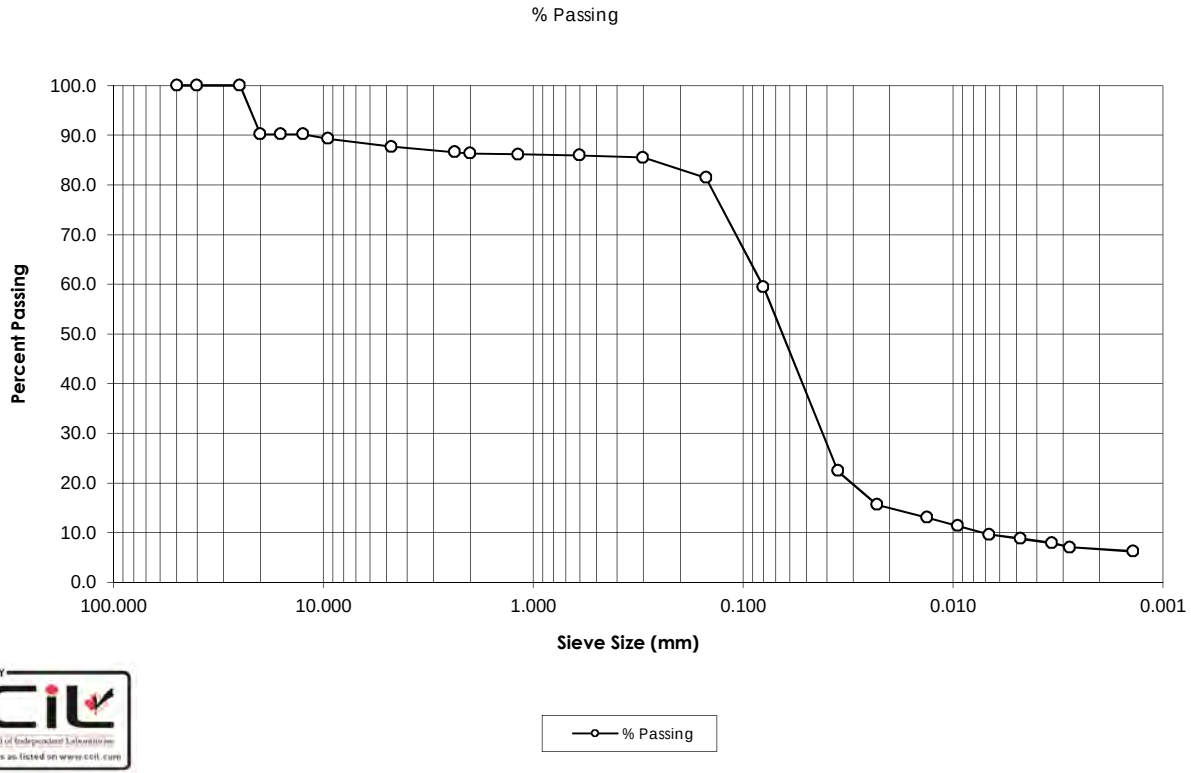
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS17
SOURCE: D42
TESTED BY: B. Pelkey

DATE TESTED: October 26, 2016
DATE RECEIVED: July 27, 2016
SAMPLE DESCRIPTION: Sandy Silt, Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0067 | 9.6 |
| 40.0 | 100.0 | 0.0048 | 8.7 |
| 25.0 | 100.0 | 0.0034 | 7.9 |
| 20.0 | 90.2 | 0.0028 | 7.0 |
| 16.0 | 90.2 | 0.0014 | 6.2 |
| 12.5 | 90.2 | | |
| 9.5 | 89.3 | | |
| 4.75 | 87.7 | | |
| 2.36 | 86.6 | | |
| 2.00 | 86.3 | | |
| 1.18 | 86.2 | | |
| 0.600 | 85.9 | | |
| 0.300 | 85.5 | | |
| 0.150 | 81.4 | | |
| 0.080 | 59.4 | | |
| 0.0354 | 22.5 | | |
| 0.0229 | 15.6 | | |
| 0.0133 | 13.0 | | |
| 0.0095 | 11.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.3% | $D_{10}$: | 0.0074 |
| Sand: | 28.3% | $D_{30}$: | 0.0487 |
| Silt: | 52.8% | $D_{60}$: | 0.0823 |
| Clay: | 6.6% | $C_u$: | 11.10 |
| | | $C_c$: | 3.88 |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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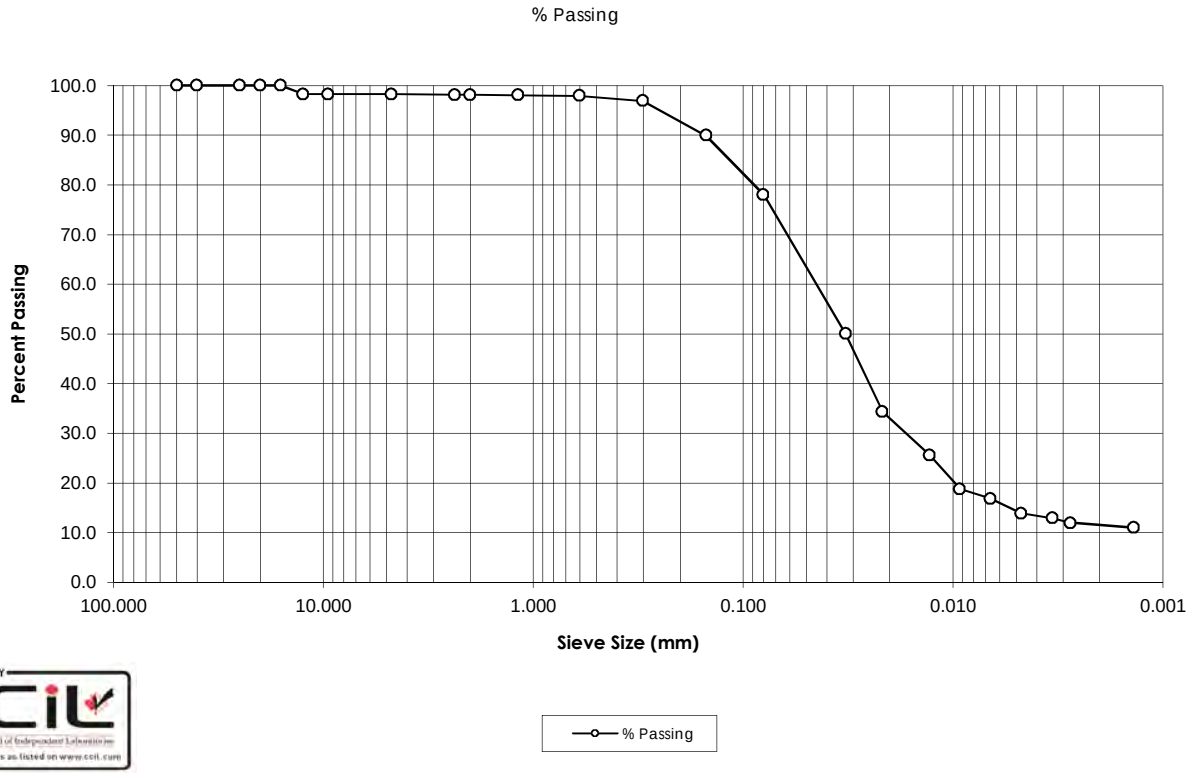
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS18
SOURCE: D42
TESTED BY: B. Pelkey

DATE TESTED: October 26, 2016
DATE RECEIVED: July 27, 2016
SAMPLE DESCRIPTION: Sandy Silt, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0066 | 16.8 |
| 40.0 | 100.0 | 0.0047 | 13.9 |
| 25.0 | 100.0 | 0.0033 | 12.9 |
| 20.0 | 100.0 | 0.0028 | 11.9 |
| 16.0 | 100.0 | 0.0014 | 10.9 |
| 12.5 | 98.2 | | |
| 9.5 | 98.2 | | |
| 4.75 | 98.2 | | |
| 2.36 | 98.1 | | |
| 2.00 | 98.1 | | |
| 1.18 | 98.0 | | |
| 0.600 | 98.0 | | |
| 0.300 | 96.9 | | |
| 0.150 | 89.9 | | |
| 0.080 | 78.0 | | |
| 0.0325 | 50.0 | | |
| 0.0217 | 34.4 | | |
| 0.0129 | 25.6 | | |
| 0.0093 | 18.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.8% | $D_{10}$: | - |
| Sand: | 20.2% | $D_{30}$: | 0.0177 |
| Silt: | 66.6% | $D_{60}$: | 0.0520 |
| Clay: | 11.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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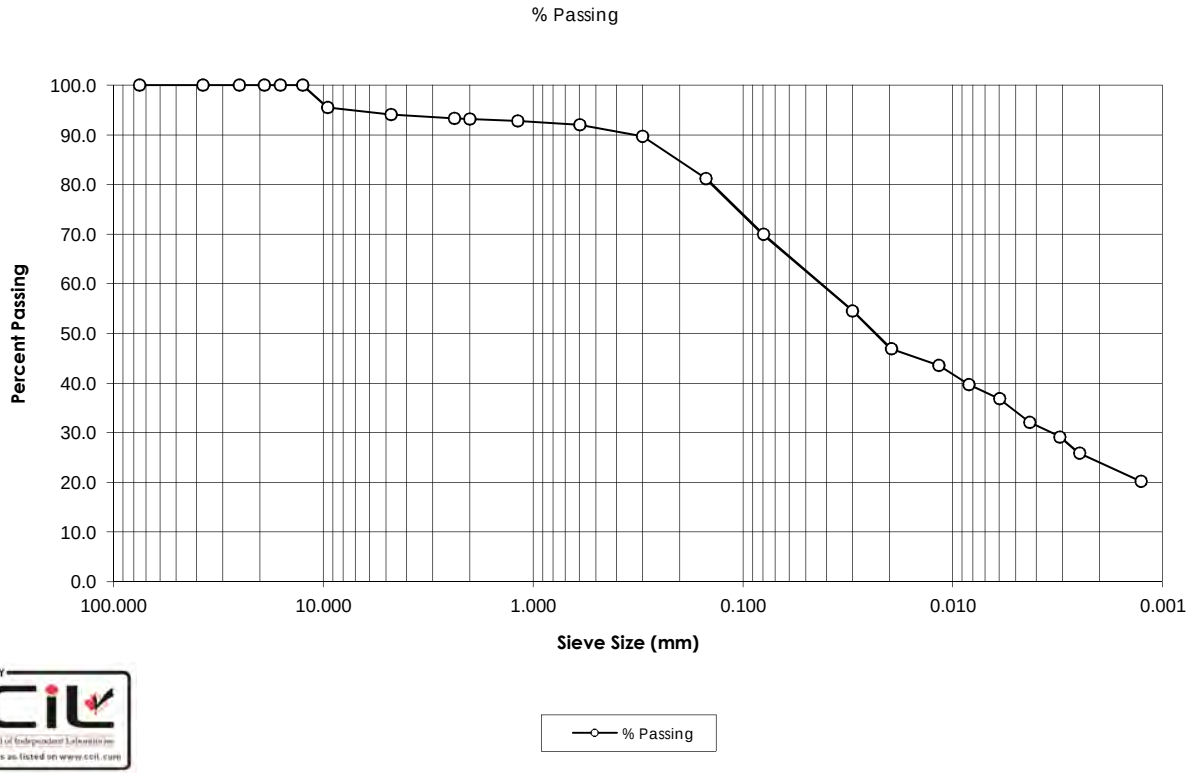
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST2
SOURCE: D45
TESTED BY: B. Pelkey

DATE TESTED: August 7, 2016
DATE RECEIVED: July 5, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0060 | 36.8 |
| 37.5 | 100.0 | 0.0043 | 32.1 |
| 25.0 | 100.0 | 0.0031 | 29.2 |
| 19.0 | 100.0 | 0.0025 | 26.0 |
| 16.0 | 100.0 | 0.0013 | 20.2 |
| 12.5 | 100.0 | | |
| 9.5 | 95.5 | | |
| 4.75 | 94.1 | | |
| 2.36 | 93.3 | | |
| 2.00 | 93.2 | | |
| 1.18 | 92.8 | | |
| 0.600 | 92.1 | | |
| 0.300 | 89.7 | | |
| 0.150 | 81.2 | | |
| 0.080 | 70.0 | | |
| 0.0301 | 54.6 | | |
| 0.0196 | 47.0 | | |
| 0.0116 | 43.5 | | |
| 0.0084 | 39.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.9% | $D_{10}$: | - |
| Sand: | 24.1% | $D_{30}$: | 0.0034 |
| Silt: | 46.0% | $D_{60}$: | 0.0490 |
| Clay: | 24.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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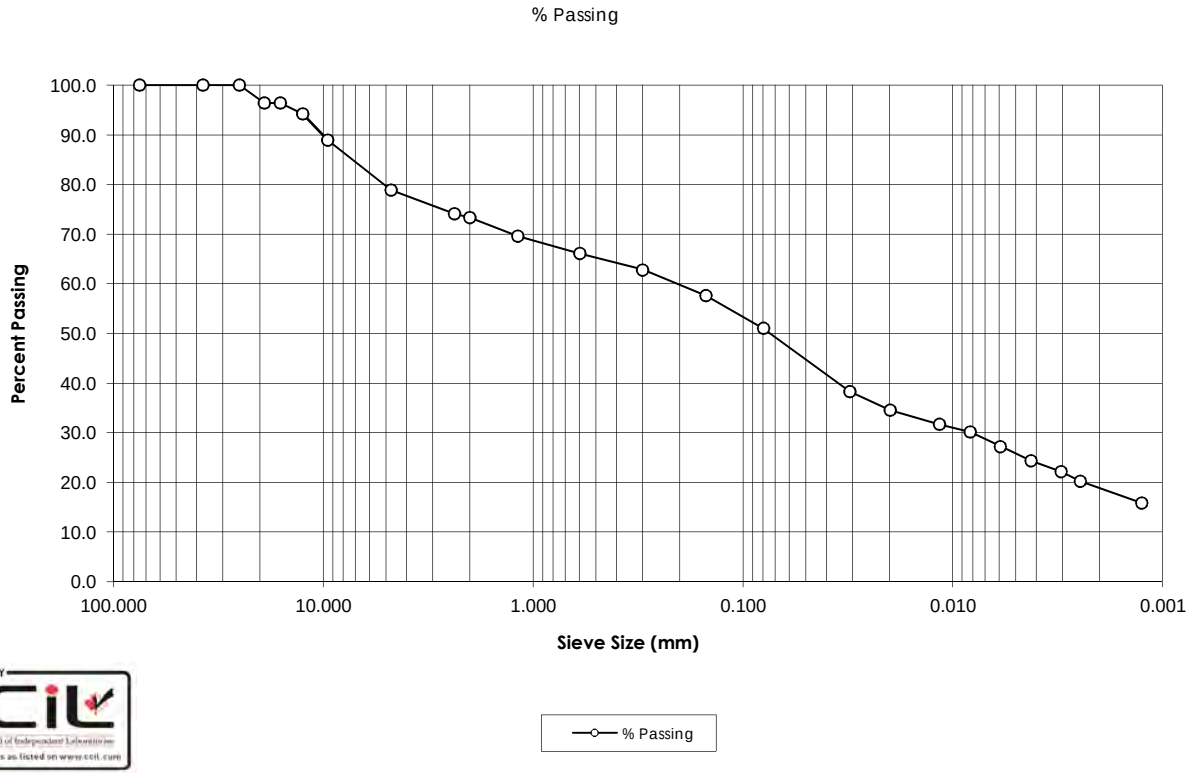
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D46
TESTED BY: C. Oost

DATE TESTED: July 25, 2016
DATE RECEIVED: June 20, 2016
SAMPLE DESCRIPTION: Sandy, Gravelly Clay (CL-CI)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0059** | **27.3** |
| **37.5** | **100.0** | **0.0042** | **24.3** |
| **25.0** | **100.0** | **0.0030** | **22.1** |
| **19.0** | **96.5** | **0.0025** | **20.2** |
| **16.0** | **96.5** | **0.0013** | **15.8** |
| **12.5** | **94.3** | | |
| **9.5** | **88.9** | | |
| **4.75** | **78.9** | | |
| **2.36** | **74.1** | | |
| **2.00** | **73.3** | | |
| **1.18** | **69.6** | | |
| **0.600** | **66.1** | | |
| **0.300** | **62.8** | | |
| **0.150** | **57.6** | | |
| **0.080** | **51.0** | | |
| **0.0309** | **38.3** | | |
| **0.0198** | **34.6** | | |
| **0.0116** | **31.7** | | |
| **0.0083** | **30.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 21.1% | $D_{10}$: | - |
| Sand: | 27.9% | $D_{30}$: | 0.0081 |
| Silt: | 32.2% | $D_{60}$: | 0.2196 |
| Clay: | 18.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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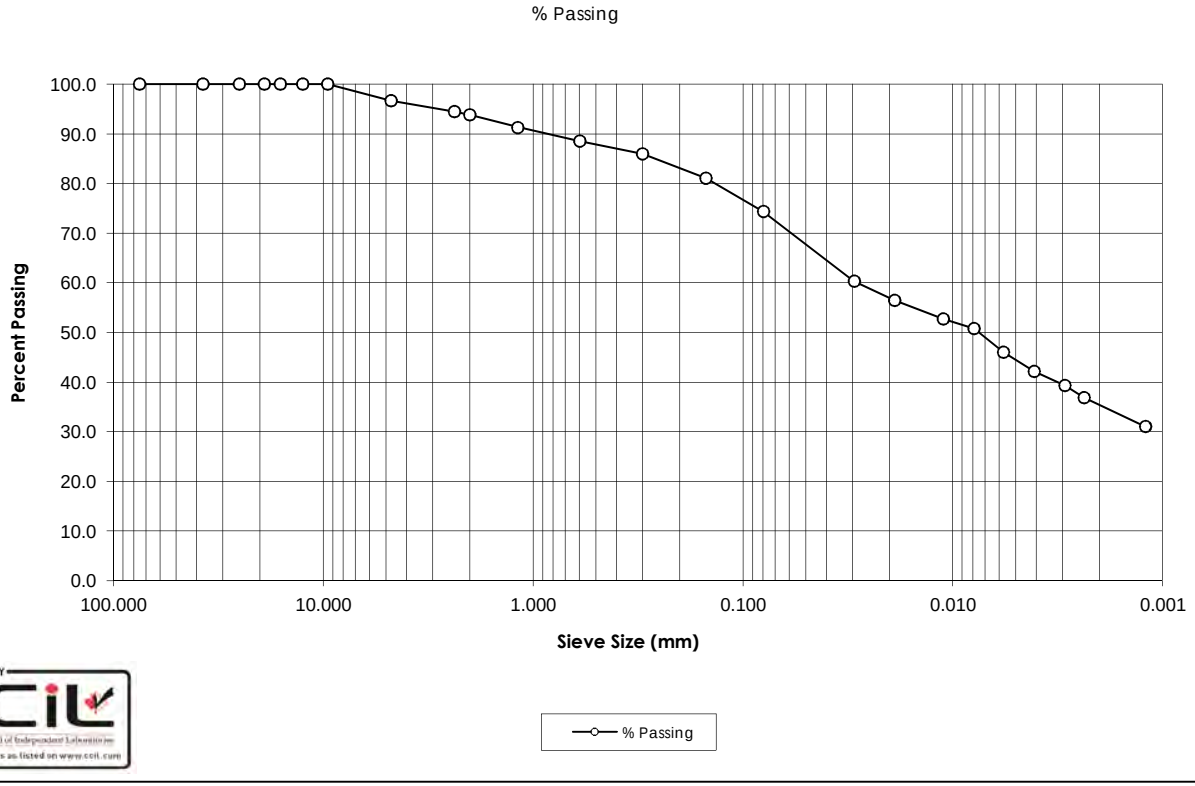
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS7
SOURCE: D45
TESTED BY: C. Oost

DATE TESTED: July 25, 2016
DATE RECEIVED: July 5, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0057 | 46.0 |
| 37.5 | 100.0 | 0.0041 | 42.2 |
| 25.0 | 100.0 | 0.0029 | 39.3 |
| 19.0 | 100.0 | 0.0024 | 36.8 |
| 16.0 | 100.0 | 0.0012 | 31.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 96.6 | | |
| 2.36 | 94.4 | | |
| 2.00 | 93.9 | | |
| 1.18 | 91.3 | | |
| 0.600 | 88.5 | | |
| 0.300 | 86.0 | | |
| 0.150 | 81.0 | | |
| 0.080 | 74.4 | | |
| 0.0295 | 60.3 | | |
| 0.0189 | 56.5 | | |
| 0.0111 | 52.7 | | |
| 0.0079 | 50.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.4% | $D_{10}$: | - |
| Sand: | 22.2% | $D_{30}$: | - |
| Silt: | 39.0% | $D_{60}$: | 0.0286 |
| Clay: | 35.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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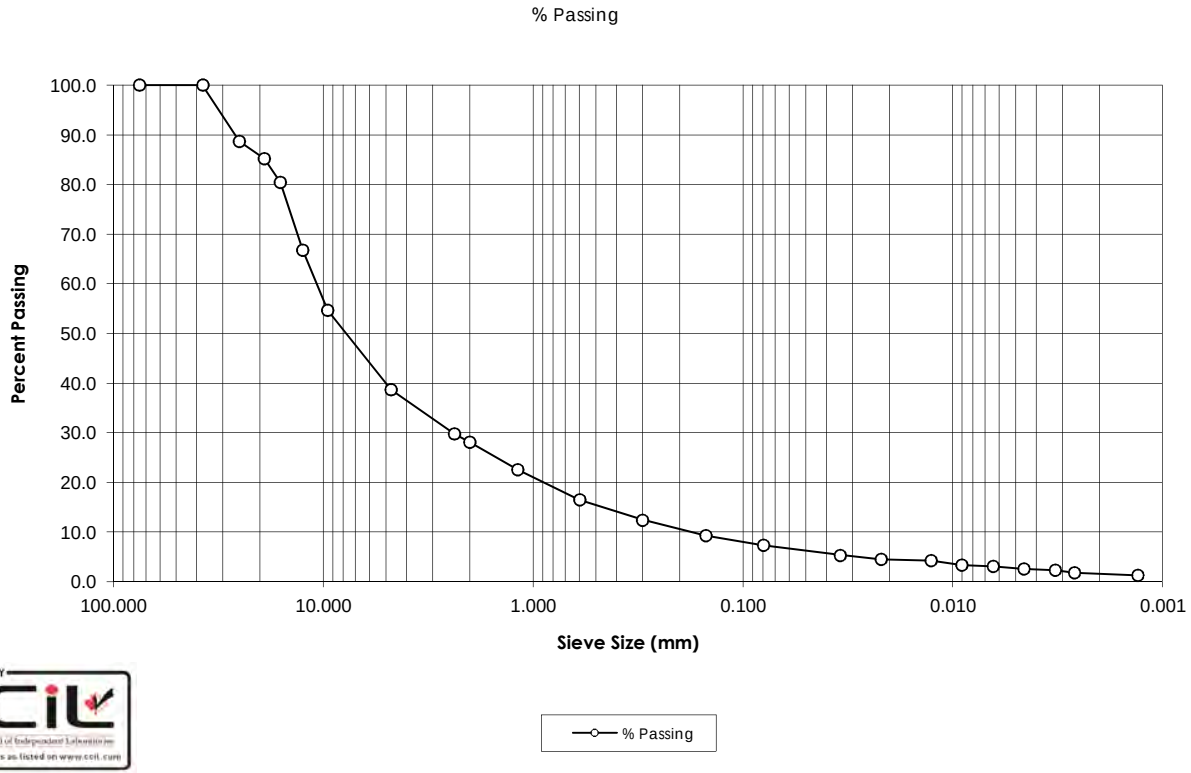
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS11
SOURCE: D45
TESTED BY: C. Oost

DATE TESTED: July 25, 2016
DATE RECEIVED: July 5, 2016
SAMPLE DESCRIPTION: Well-graded Gravel with Fines and Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0064** | **3.1** |
| **37.5** | **100.0** | **0.0046** | **2.6** |
| **25.0** | **88.7** | **0.0032** | **2.3** |
| **19.0** | **85.2** | **0.0026** | **1.8** |
| **16.0** | **80.5** | **0.0013** | **1.3** |
| **12.5** | **66.8** | | |
| **9.5** | **54.6** | | |
| **4.75** | **38.7** | | |
| **2.36** | **29.7** | | |
| **2.00** | **28.1** | | |
| **1.18** | **22.5** | | |
| **0.600** | **16.5** | | |
| **0.300** | **12.5** | | |
| **0.150** | **9.3** | | |
| **0.080** | **7.4** | | |
| **0.0343** | **5.4** | | |
| **0.0220** | **4.5** | | |
| **0.0127** | **4.2** | | |
| **0.0091** | **3.4** | | |

| | | | |
|---|---|---|---|
| Gravel: | 61.3% | $D_{10}$: | 0.1857 |
| Sand: | 31.3% | $D_{30}$: | 2.4376 |
| Silt: | 5.7% | $D_{60}$: | 10.9026 |
| Clay: | 1.6% | $C_u$: | 58.70 |
| | | $C_c$: | 2.93 |

**Comments:** Sample description (USCS) derived from Grain Size test results only



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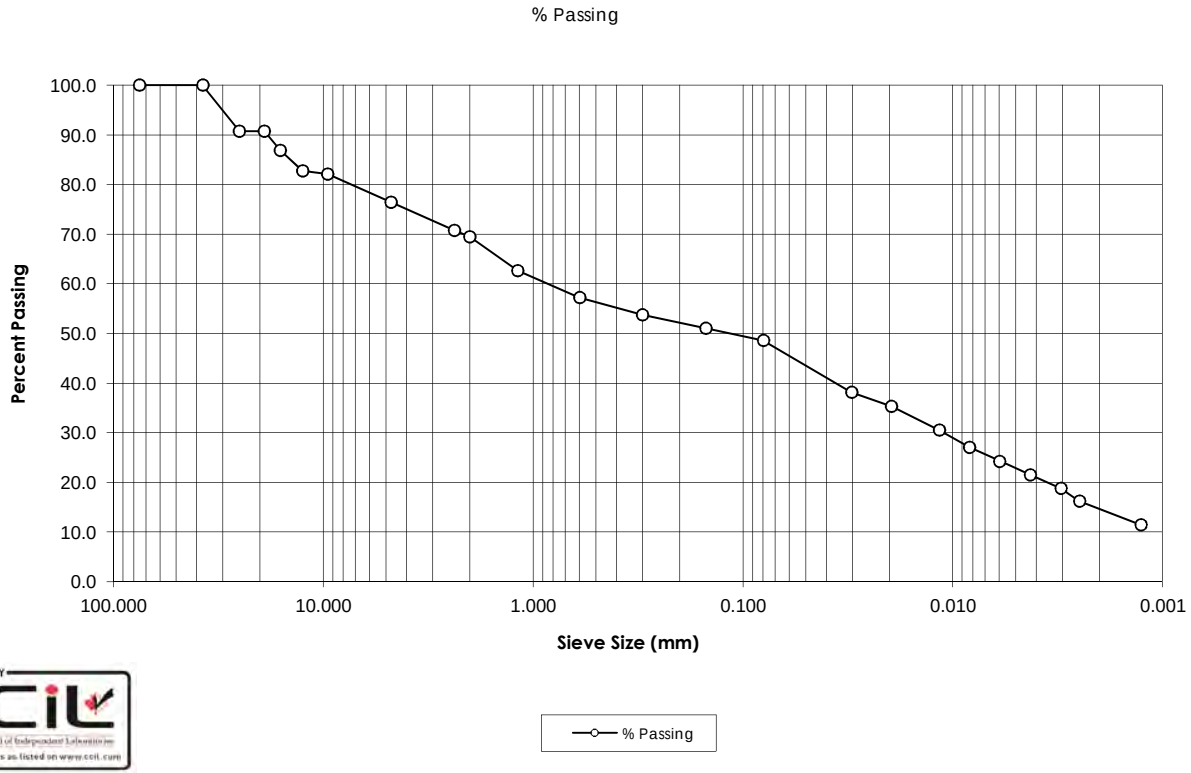
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS13
SOURCE: D45
TESTED BY: C. Oost

DATE TESTED: July 25, 2016
DATE RECEIVED: July 5, 2016
SAMPLE DESCRIPTION: Sandy, Gravelly Clay (CI-CL)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0060** | **24.3** |
| **37.5** | **100.0** | **0.0043** | **21.5** |
| **25.0** | **90.7** | **0.0031** | **18.8** |
| **19.0** | **90.7** | **0.0025** | **16.3** |
| **16.0** | **86.8** | **0.0013** | **11.5** |
| **12.5** | **82.7** | | |
| **9.5** | **82.2** | | |
| **4.75** | **76.5** | | |
| **2.36** | **70.7** | | |
| **2.00** | **69.4** | | |
| **1.18** | **62.7** | | |
| **0.600** | **57.2** | | |
| **0.300** | **53.7** | | |
| **0.150** | **51.0** | | |
| **0.080** | **48.6** | | |
| **0.0303** | **38.1** | | |
| **0.0195** | **35.4** | | |
| **0.0116** | **30.5** | | |
| **0.0083** | **27.1** | | |

| | | | |
|---|---|---|---|
| Gravel: | 23.5% | $D_{10}$: | - |
| Sand: | 27.9% | $D_{30}$: | 0.0111 |
| Silt: | 33.9% | $D_{60}$: | 0.9033 |
| Clay: | 14.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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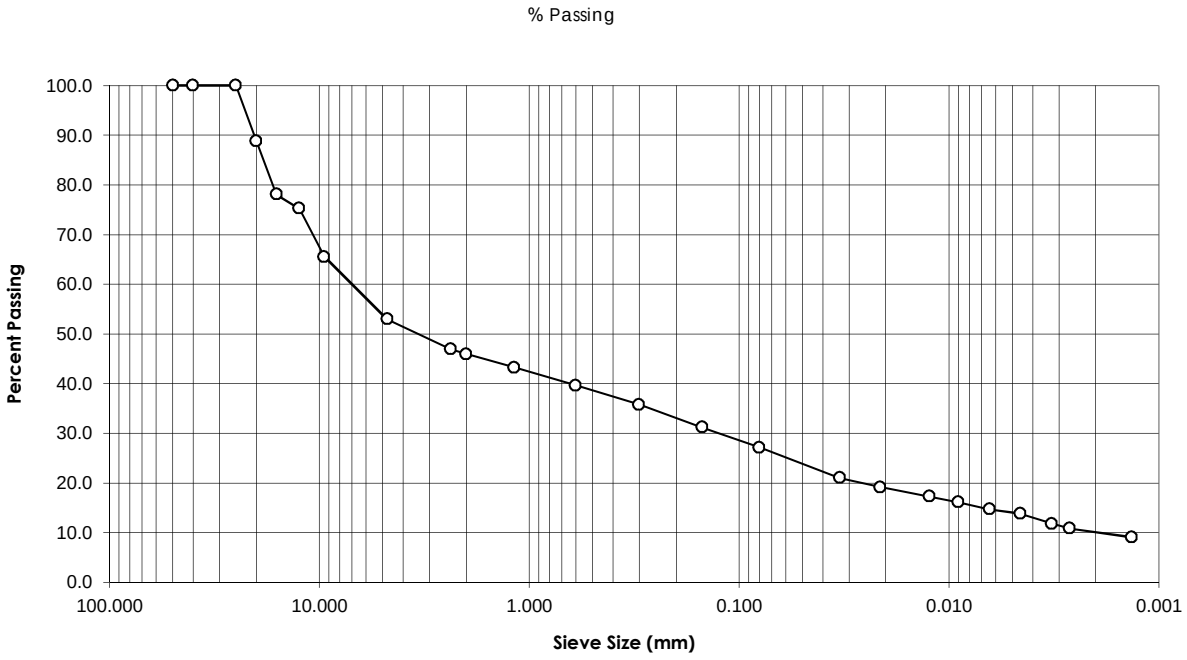
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BSC
SOURCE: D46
TESTED BY: B.Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: June 20, 2016
SAMPLE DESCRIPTION: Clayey (CL) Gravel with Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0064 | 14.7 |
| 40.0 | 100.0 | 0.0046 | 13.8 |
| 25.0 | 100.0 | 0.0032 | 11.8 |
| 20.0 | 88.8 | 0.0027 | 10.8 |
| 16.0 | 78.1 | 0.0013 | 9.0 |
| 12.5 | 75.3 | | |
| 9.5 | 65.5 | | |
| 4.75 | 53.0 | | |
| 2.36 | 46.9 | | |
| 2.00 | 45.9 | | |
| 1.18 | 43.2 | | |
| 0.600 | 39.6 | | |
| 0.300 | 35.8 | | |
| 0.150 | 31.2 | | |
| 0.080 | 27.1 | | |
| 0.0332 | 21.0 | | |
| 0.0213 | 19.1 | | |
| 0.0124 | 17.3 | | |
| 0.0090 | 16.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 47.0% | $D_{10}$: | 0.0021 |
| Sand: | 25.9% | $D_{30}$: | 0.1303 |
| Silt: | 17.0% | $D_{60}$: | 7.5364 |
| Clay: | 10.1% | $C_u$: | 3620.90 |
| | | $C_c$: | 1.08 |

**Comments:** Sample description (MUSCS) derived from both the Grian Size and Atterberg Limits test results.

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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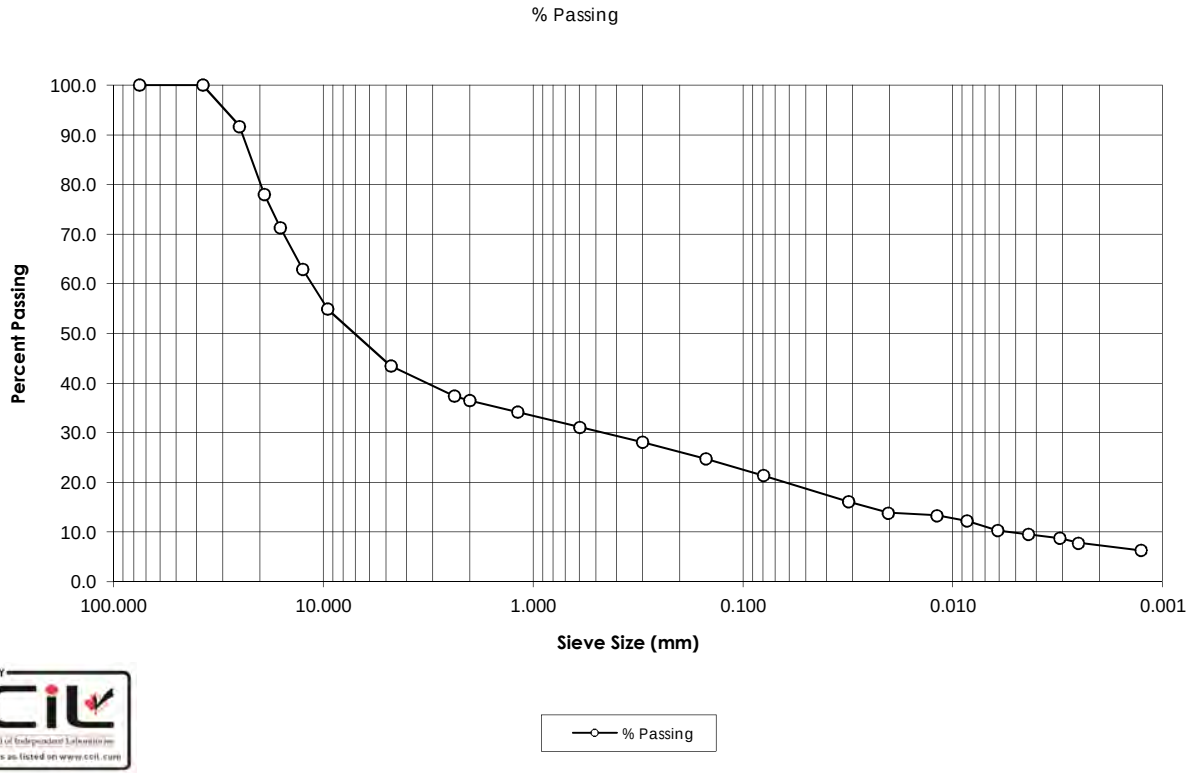
SAMPLE No.: BS13
SOURCE: D46
TESTED BY: C. Oost

DATE TESTED: July 25, 2016
DATE RECEIVED: June 21, 2016
SAMPLE DESCRIPTION: Gravel with Sand and Fines




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0061** | **10.3** |
| **37.5** | **100.0** | **0.0044** | **9.6** |
| **25.0** | **91.7** | **0.0031** | **8.8** |
| **19.0** | **78.0** | **0.0025** | **7.8** |
| **16.0** | **71.2** | **0.0013** | **6.3** |
| **12.5** | **62.9** | | |
| **9.5** | **54.9** | | |
| **4.75** | **43.4** | | |
| **2.36** | **37.4** | | |
| **2.00** | **36.5** | | |
| **1.18** | **34.2** | | |
| **0.600** | **31.1** | | |
| **0.300** | **28.2** | | |
| **0.150** | **24.8** | | |
| **0.080** | **21.4** | | |
| **0.0314** | **16.1** | | |
| **0.0203** | **13.9** | | |
| **0.0119** | **13.3** | | |
| **0.0085** | **12.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 56.6% | $D_{10}$: | 0.0054 |
| Sand: | 22.1% | $D_{30}$: | 0.4896 |
| Silt: | 14.1% | $D_{60}$: | 11.4543 |
| Clay: | 7.3% | $C_u$: | 2118.77 |
| | | $C_c$: | 3.87 |

**Comments:** Sample description (USCS) derived from Grain Size test results only



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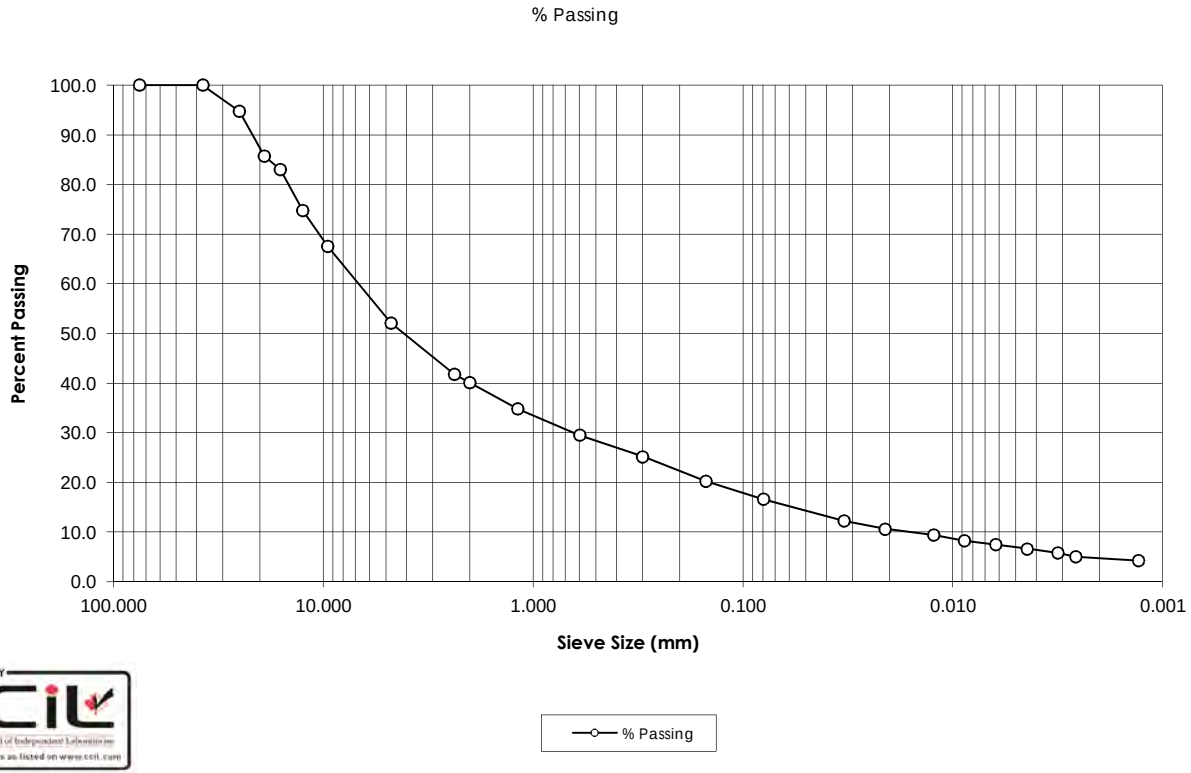
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS17
SOURCE: D46
TESTED BY: C. Oost

DATE TESTED: July 28, 2016
DATE RECEIVED: June 21, 2016
SAMPLE DESCRIPTION: Gravel with Sand and Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0062 | 7.4 |
| 37.5 | 100.0 | 0.0044 | 6.6 |
| 25.0 | 94.7 | 0.0032 | 5.8 |
| 19.0 | 85.7 | 0.0026 | 5.0 |
| 16.0 | 83.0 | 0.0013 | 4.2 |
| 12.5 | 74.7 | | |
| 9.5 | 67.5 | | |
| 4.75 | 52.1 | | |
| 2.36 | 41.8 | | |
| 2.00 | 40.1 | | |
| 1.18 | 34.8 | | |
| 0.600 | 29.5 | | |
| 0.300 | 25.2 | | |
| 0.150 | 20.2 | | |
| 0.080 | 16.7 | | |
| 0.0329 | 12.2 | | |
| 0.0211 | 10.6 | | |
| 0.0123 | 9.4 | | |
| 0.0088 | 8.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 47.9% | $D_{10}$: | 0.0165 |
| Sand: | 35.4% | $D_{30}$: | 0.6551 |
| Silt: | 11.9% | $D_{60}$: | 7.3391 |
| Clay: | 4.7% | $C_u$: | 445.43 |
| | | $C_c$: | 3.55 |

**Comments:** Sample description (USCS) derived from Grain Size test results only



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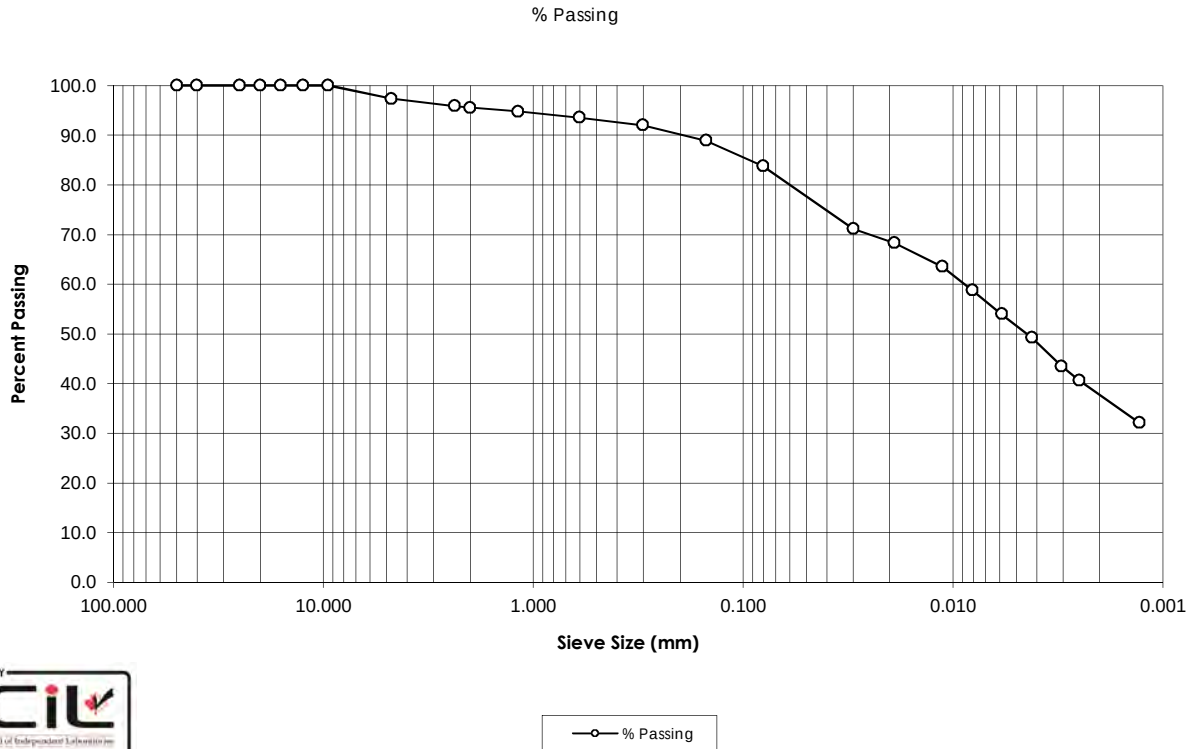
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST2
SOURCE: D48
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Clay (Cl), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 54.0 |
| 40.0 | 100.0 | 0.0042 | 49.2 |
| 25.0 | 100.0 | 0.0030 | 43.5 |
| 20.0 | 100.0 | 0.0025 | 40.6 |
| 16.0 | 100.0 | 0.0013 | 32.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 97.4 | | |
| 2.36 | 95.9 | | |
| 2.00 | 95.6 | | |
| 1.18 | 94.8 | | |
| 0.600 | 93.6 | | |
| 0.300 | 92.0 | | |
| 0.150 | 88.9 | | |
| 0.080 | 83.8 | | |
| 0.0298 | 71.2 | | |
| 0.0190 | 68.3 | | |
| 0.0112 | 63.5 | | |
| 0.0081 | 58.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.6% | $D_{10}$: | - |
| Sand: | 13.6% | $D_{30}$: | - |
| Silt: | 46.0% | $D_{60}$: | 0.0089 |
| Clay: | 37.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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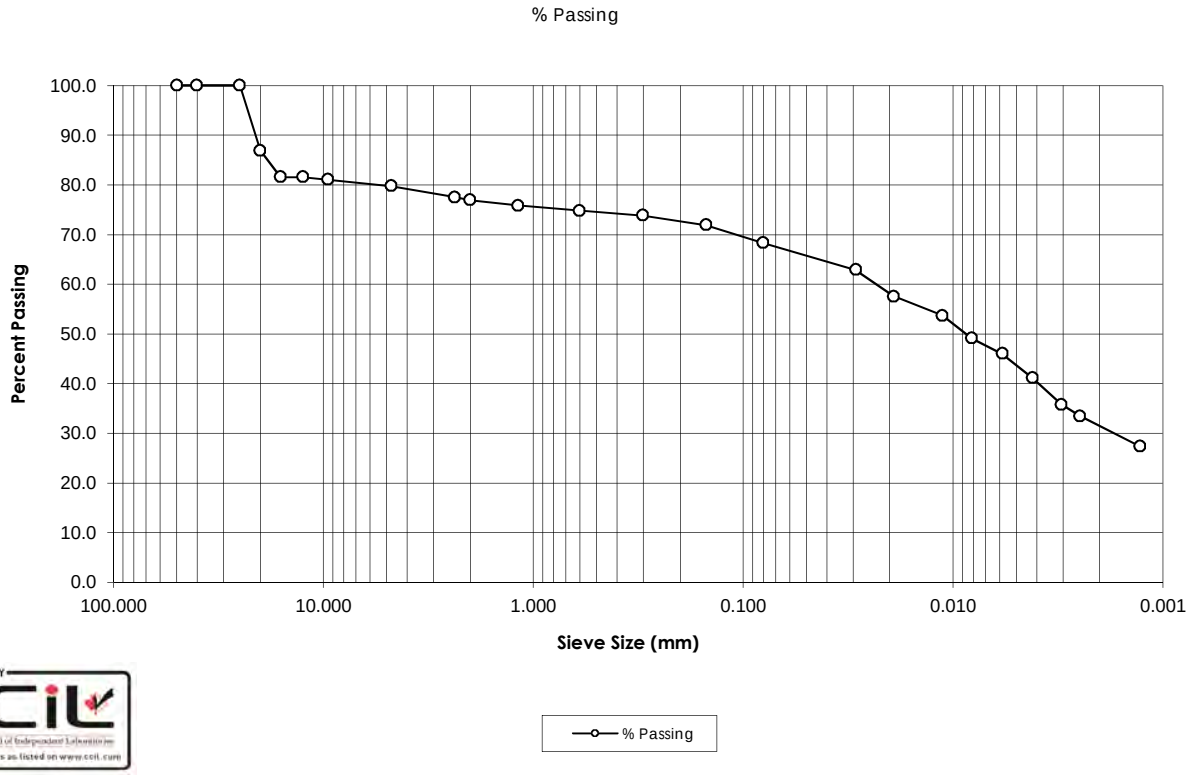
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS5
SOURCE: D48
TESTED BY: B. Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Gravelly Clay (Cl), Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 46.0 |
| 40.0 | 100.0 | 0.0042 | 41.1 |
| 25.0 | 100.0 | 0.0030 | 35.7 |
| 20.0 | 86.9 | 0.0025 | 33.4 |
| 16.0 | 81.6 | 0.0013 | 27.3 |
| 12.5 | 81.6 | | |
| 9.5 | 81.1 | | |
| 4.75 | 79.7 | | |
| 2.36 | 77.5 | | |
| 2.00 | 76.9 | | |
| 1.18 | 75.8 | | |
| 0.600 | 74.8 | | |
| 0.300 | 73.8 | | |
| 0.150 | 71.9 | | |
| 0.080 | 68.3 | | |
| 0.0291 | 62.9 | | |
| 0.0191 | 57.5 | | |
| 0.0112 | 53.7 | | |
| 0.0081 | 49.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 20.3% | $D_{10}$: | - |
| Sand: | 11.4% | $D_{30}$: | 0.0018 |
| Silt: | 36.9% | $D_{60}$: | 0.0238 |
| Clay: | 31.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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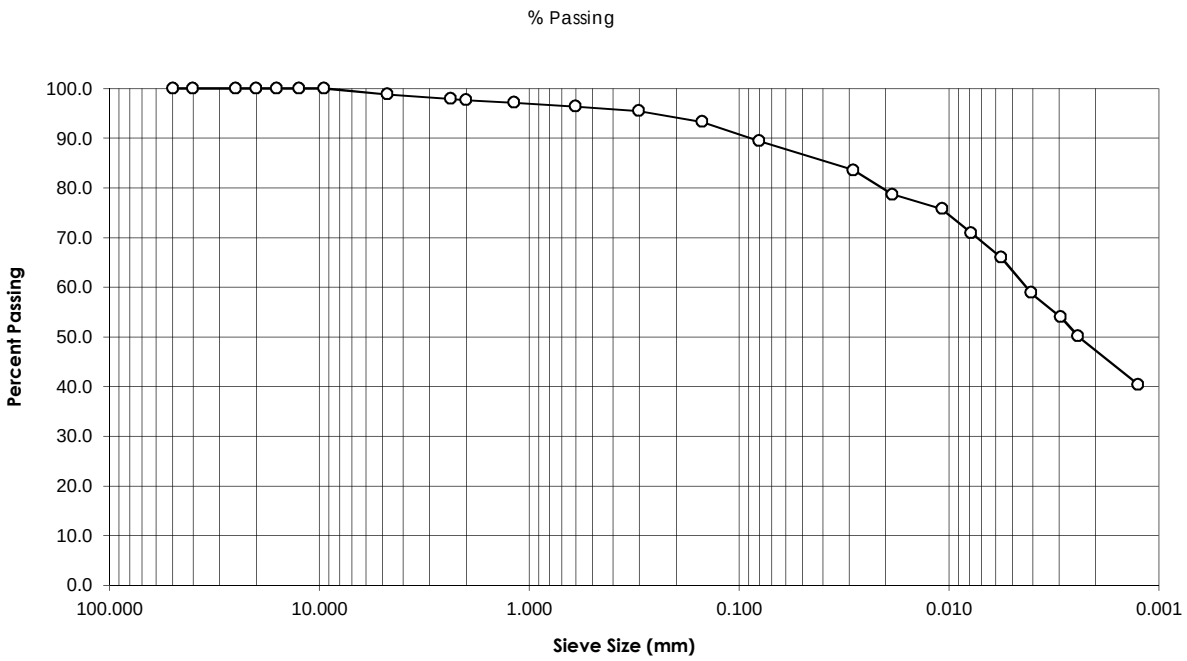
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS7
SOURCE: D48
TESTED BY: B. Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 66.1 |
| 40.0 | 100.0 | 0.0041 | 58.9 |
| 25.0 | 100.0 | 0.0029 | 54.0 |
| 20.0 | 100.0 | 0.0024 | 50.1 |
| 16.0 | 100.0 | 0.0013 | 40.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.8 | | |
| 2.36 | 98.0 | | |
| 2.00 | 97.7 | | |
| 1.18 | 97.1 | | |
| 0.600 | 96.4 | | |
| 0.300 | 95.5 | | |
| 0.150 | 93.3 | | |
| 0.080 | 89.5 | | |
| 0.0286 | 83.5 | | |
| 0.0186 | 78.7 | | |
| 0.0108 | 75.8 | | |
| 0.0078 | 70.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.2% | $D_{10}$: | - |
| Sand: | 9.4% | $D_{30}$: | - |
| Silt: | 42.2% | $D_{60}$: | 0.0043 |
| Clay: | 47.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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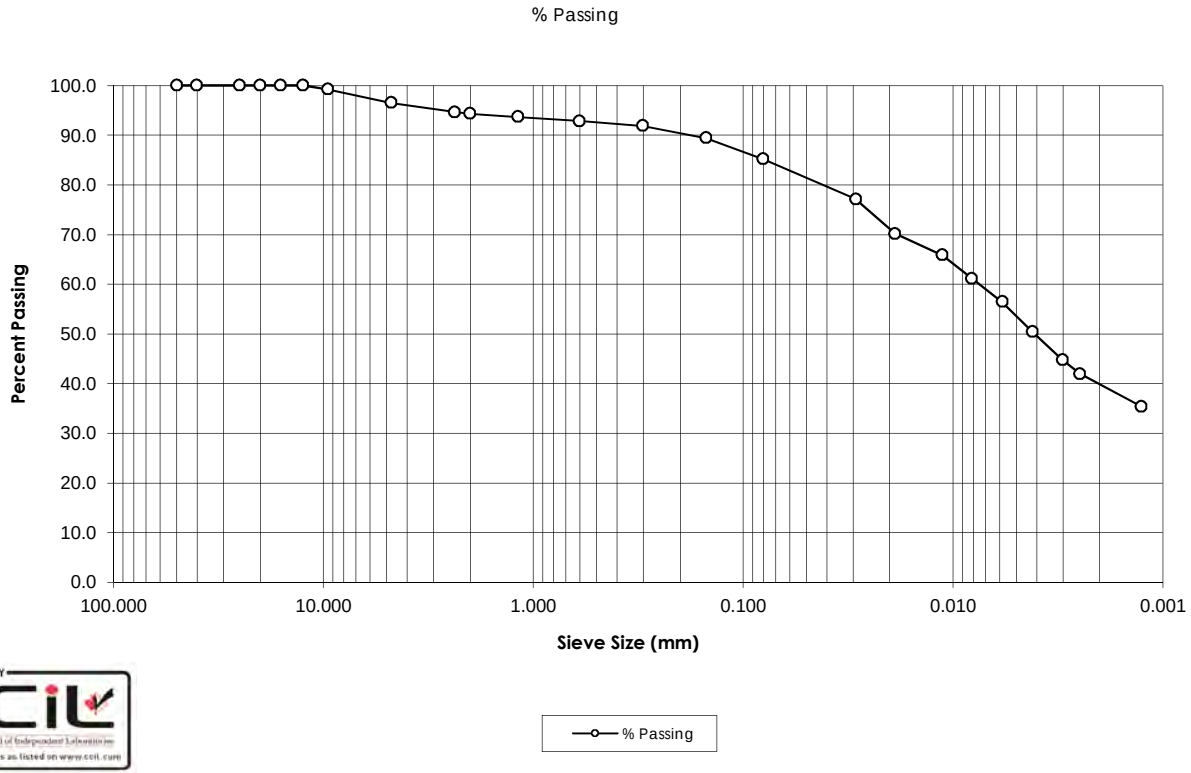
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS9
SOURCE: D48
TESTED BY: B. Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 56.4 |
| 40.0 | 100.0 | 0.0042 | 50.4 |
| 25.0 | 100.0 | 0.0030 | 44.8 |
| 20.0 | 100.0 | 0.0025 | 41.9 |
| 16.0 | 100.0 | 0.0013 | 35.4 |
| 12.5 | 100.0 | | |
| 9.5 | 99.2 | | |
| 4.75 | 96.5 | | |
| 2.36 | 94.7 | | |
| 2.00 | 94.4 | | |
| 1.18 | 93.7 | | |
| 0.600 | 92.8 | | |
| 0.300 | 91.9 | | |
| 0.150 | 89.4 | | |
| 0.080 | 85.2 | | |
| 0.0291 | 77.1 | | |
| 0.0189 | 70.2 | | |
| 0.0112 | 65.8 | | |
| 0.0081 | 61.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.5% | $D_{10}$: | - |
| Sand: | 11.3% | $D_{30}$: | - |
| Silt: | 45.4% | $D_{60}$: | 0.0076 |
| Clay: | 39.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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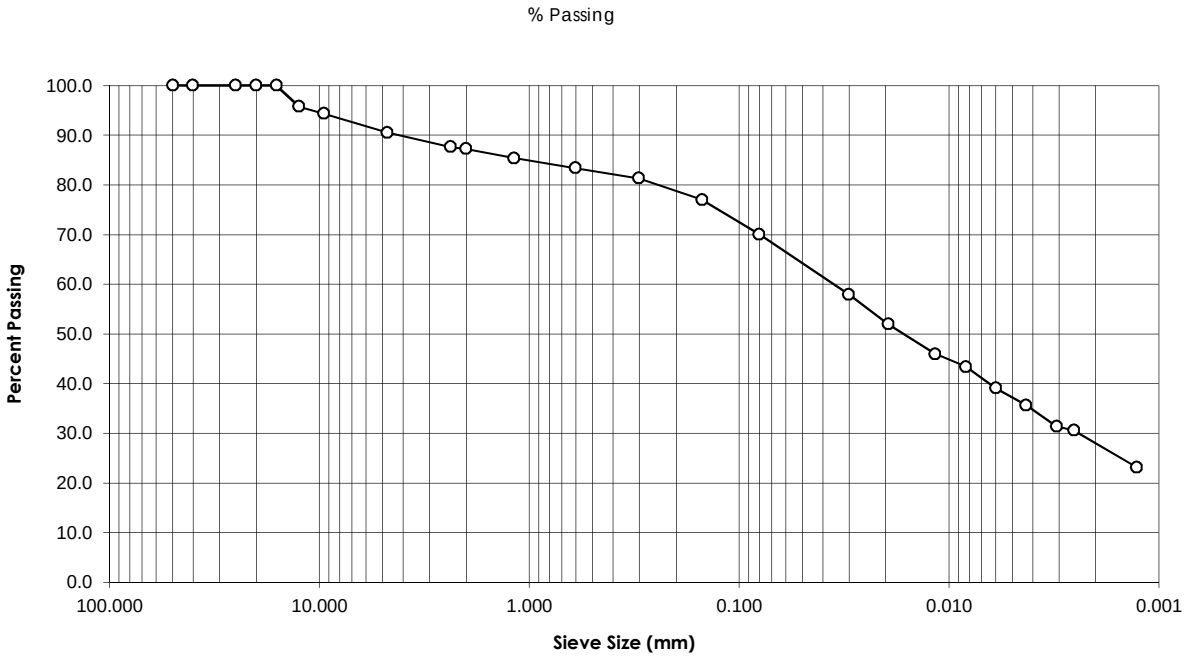
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST11
SOURCE: D48
TESTED BY: C.Oost

DATE TESTED: September 16, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 39.1 |
| 40.0 | 100.0 | 0.0043 | 35.6 |
| 25.0 | 100.0 | 0.0031 | 31.4 |
| 20.0 | 100.0 | 0.0025 | 30.5 |
| 16.0 | 100.0 | 0.0013 | 23.1 |
| 12.5 | 95.7 | | |
| 9.5 | 94.3 | | |
| 4.75 | 90.5 | | |
| 2.36 | 87.7 | | |
| 2.00 | 87.2 | | |
| 1.18 | 85.4 | | |
| 0.600 | 83.4 | | |
| 0.300 | 81.3 | | |
| 0.150 | 77.0 | | |
| 0.080 | 70.1 | | |
| 0.0300 | 57.9 | | |
| 0.0194 | 51.9 | | |
| 0.0116 | 45.9 | | |
| 0.0083 | 43.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.5% | $D_{10}$: | - |
| Sand: | 20.5% | $D_{30}$: | 0.0025 |
| Silt: | 42.1% | $D_{60}$: | 0.0393 |
| Clay: | 28.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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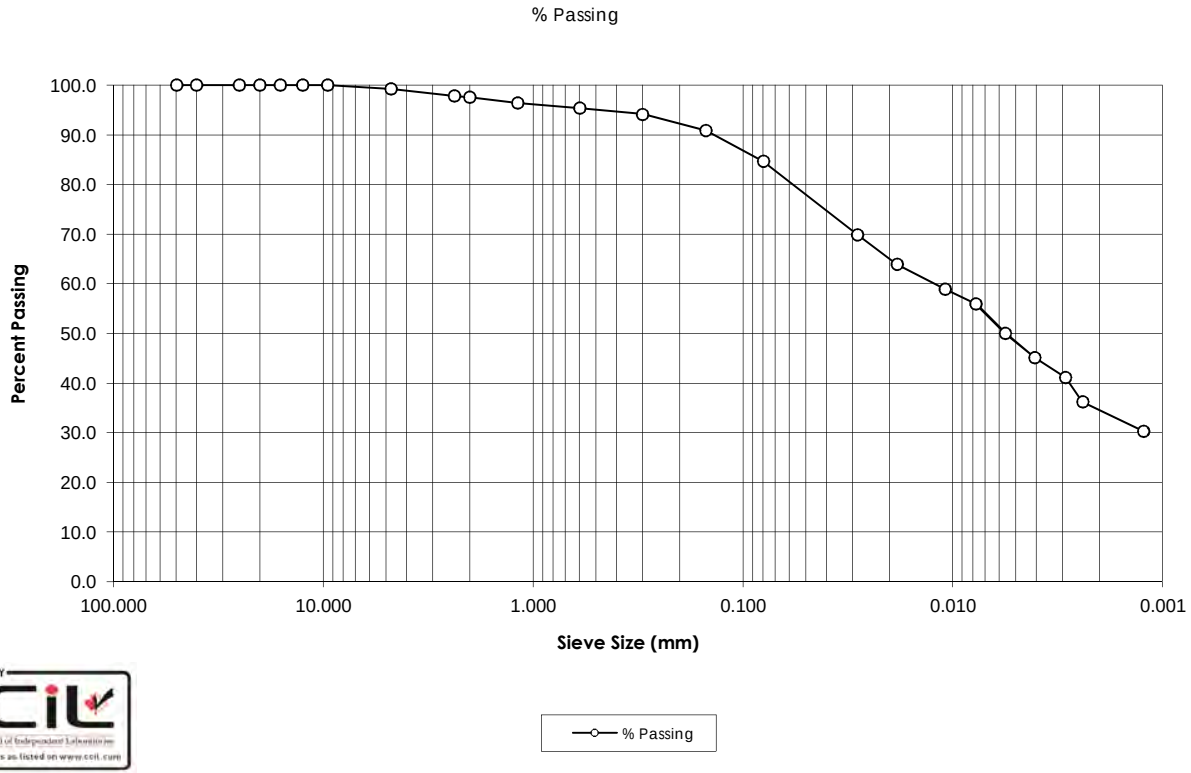
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS2
SOURCE: D50
TESTED BY: C. Oost

DATE TESTED: July 28, 2016
DATE RECEIVED: June 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0056 | 50.0 |
| 40.0 | 100.0 | 0.0040 | 45.1 |
| 25.0 | 100.0 | 0.0029 | 41.1 |
| 20.0 | 100.0 | 0.0024 | 36.2 |
| 16.0 | 100.0 | 0.0012 | 30.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.3 | | |
| 2.36 | 97.8 | | |
| 2.00 | 97.6 | | |
| 1.18 | 96.4 | | |
| 0.600 | 95.3 | | |
| 0.300 | 94.2 | | |
| 0.150 | 90.9 | | |
| 0.080 | 84.7 | | |
| 0.0284 | 69.8 | | |
| 0.0184 | 63.9 | | |
| 0.0109 | 58.9 | | |
| 0.0077 | 56.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.7% | $D_{10}$: | - |
| Sand: | 14.5% | $D_{30}$: | - |
| Silt: | 50.2% | $D_{60}$: | 0.0125 |
| Clay: | 34.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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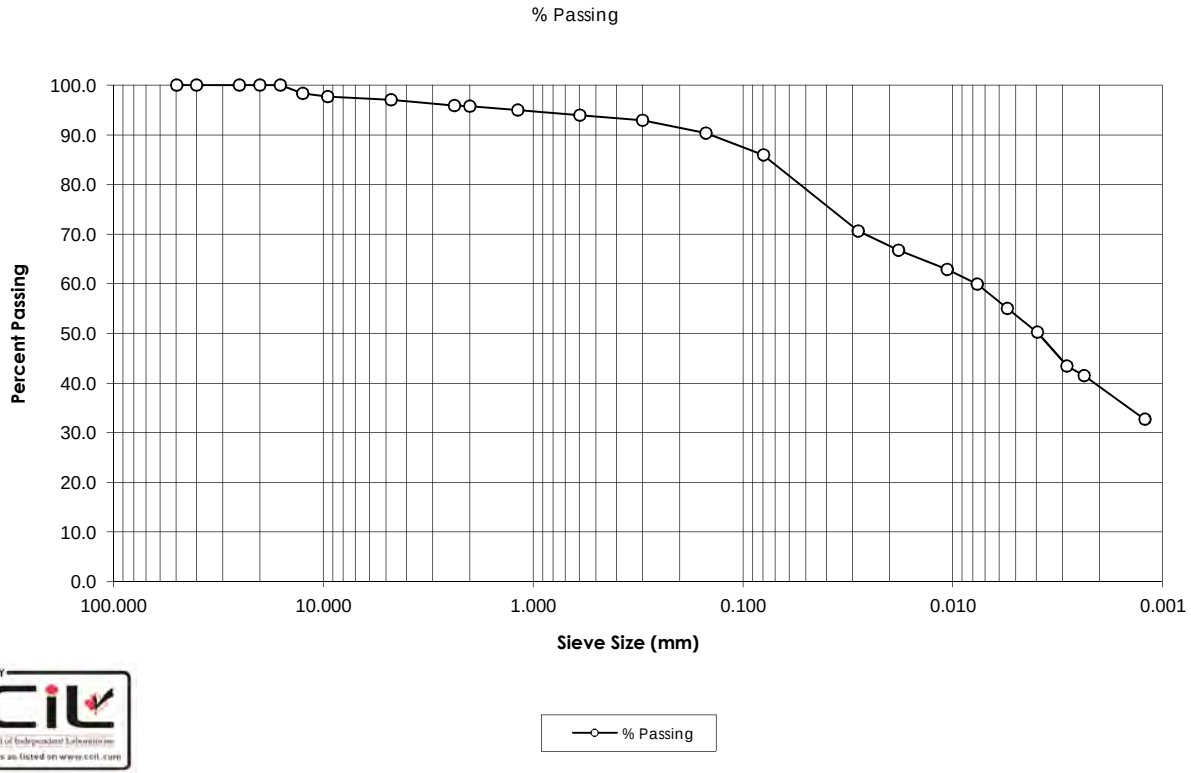
SAMPLE No.: BS5
SOURCE: D50
TESTED BY: C. Oost

DATE TESTED: July 28, 2016
DATE RECEIVED: June 22, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 55.1 |
| 40.0 | 100.0 | 0.0040 | 50.2 |
| 25.0 | 100.0 | 0.0029 | 43.4 |
| 20.0 | 100.0 | 0.0024 | 41.5 |
| 16.0 | 100.0 | 0.0012 | 32.7 |
| 12.5 | 98.4 | | |
| 9.5 | 97.7 | | |
| 4.75 | 97.0 | | |
| 2.36 | 95.9 | | |
| 2.00 | 95.7 | | |
| 1.18 | 95.0 | | |
| 0.600 | 94.0 | | |
| 0.300 | 93.0 | | |
| 0.150 | 90.4 | | |
| 0.080 | 86.0 | | |
| 0.0281 | 70.7 | | |
| 0.0181 | 66.8 | | |
| 0.0106 | 62.9 | | |
| 0.0076 | 60.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.0% | $D_{10}$: | - |
| Sand: | 11.1% | $D_{30}$: | - |
| Silt: | 46.7% | $D_{60}$: | 0.0077 |
| Clay: | 39.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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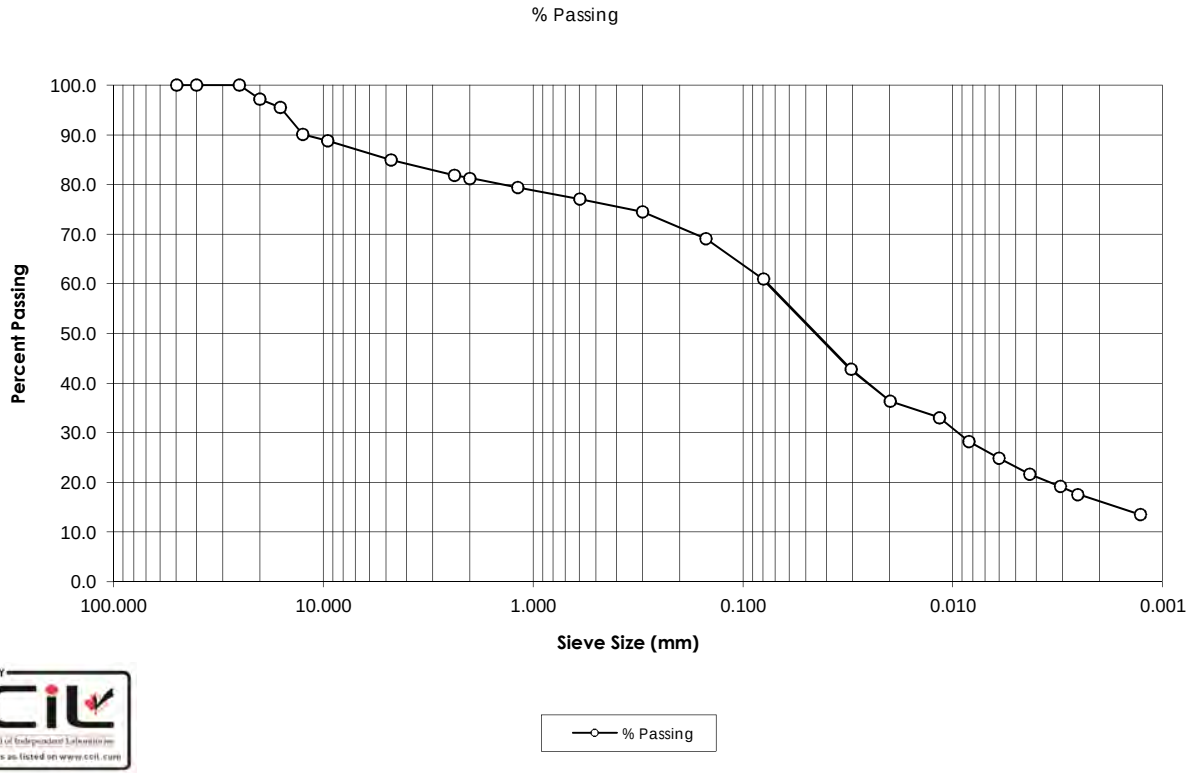
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS10
SOURCE: D50
TESTED BY: C. Oost

DATE TESTED: July 28, 2016
DATE RECEIVED: June 22, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 24.9 |
| 40.0 | 100.0 | 0.0043 | 21.7 |
| 25.0 | 100.0 | 0.0031 | 19.2 |
| 20.0 | 97.2 | 0.0025 | 17.6 |
| 16.0 | 95.6 | 0.0013 | 13.5 |
| 12.5 | 90.1 | | |
| 9.5 | 88.8 | | |
| 4.75 | 85.0 | | |
| 2.36 | 81.9 | | |
| 2.00 | 81.3 | | |
| 1.18 | 79.4 | | |
| 0.600 | 77.1 | | |
| 0.300 | 74.5 | | |
| 0.150 | 69.1 | | |
| 0.080 | 61.0 | | |
| 0.0306 | 42.9 | | |
| 0.0198 | 36.3 | | |
| 0.0116 | 33.1 | | |
| 0.0084 | 28.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 15.0% | $D_{10}$: | - |
| Sand: | 24.0% | $D_{30}$: | 0.0096 |
| Silt: | 44.8% | $D_{60}$: | 0.0776 |
| Clay: | 16.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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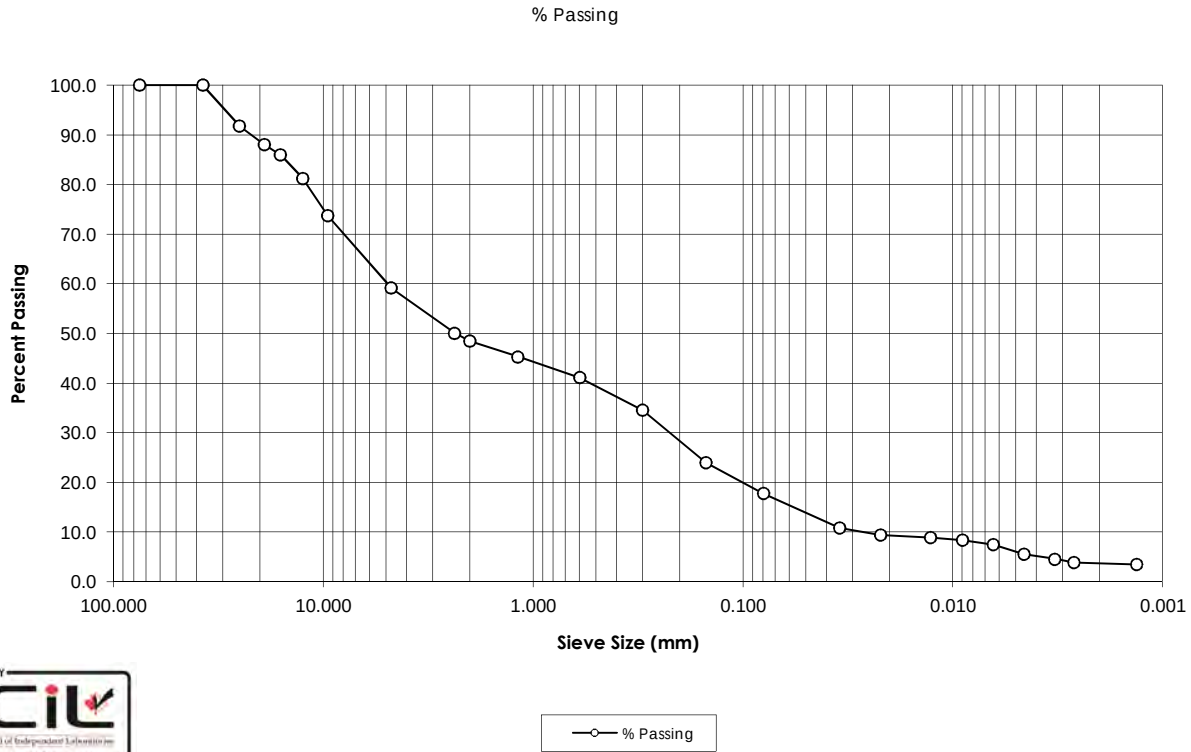
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS16B
SOURCE: D50
TESTED BY: B. Pelkey

DATE TESTED: August 7, 2016
DATE RECEIVED: June 22, 2016
SAMPLE DESCRIPTION: Sand with Gravel and Fines




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0064** | **7.5** |
| **37.5** | **100.0** | **0.0046** | **5.6** |
| **25.0** | **91.8** | **0.0033** | **4.6** |
| **19.0** | **88.1** | **0.0027** | **3.9** |
| **16.0** | **86.0** | **0.0013** | **3.4** |
| **12.5** | **81.2** | | |
| **9.5** | **73.7** | | |
| **4.75** | **59.2** | | |
| **2.36** | **50.1** | | |
| **2.00** | **48.5** | | |
| **1.18** | **45.3** | | |
| **0.600** | **41.1** | | |
| **0.300** | **34.5** | | |
| **0.150** | **23.9** | | |
| **0.080** | **17.8** | | |
| **0.0345** | **10.8** | | |
| **0.0220** | **9.4** | | |
| **0.0127** | **8.9** | | |
| **0.0090** | **8.4** | | |

| | | | |
|---|---|---|---|
| Gravel: | 40.8% | $D_{10}$: | 0.0275 |
| Sand: | 41.4% | $D_{30}$: | 0.2425 |
| Silt: | 14.0% | $D_{60}$: | 5.0414 |
| Clay: | 3.7% | $C_u$: | 183.27 |
| | | $C_c$: | 0.42 |

**Comments:** Sample description (MUSCS) derived from Grain Size test results only

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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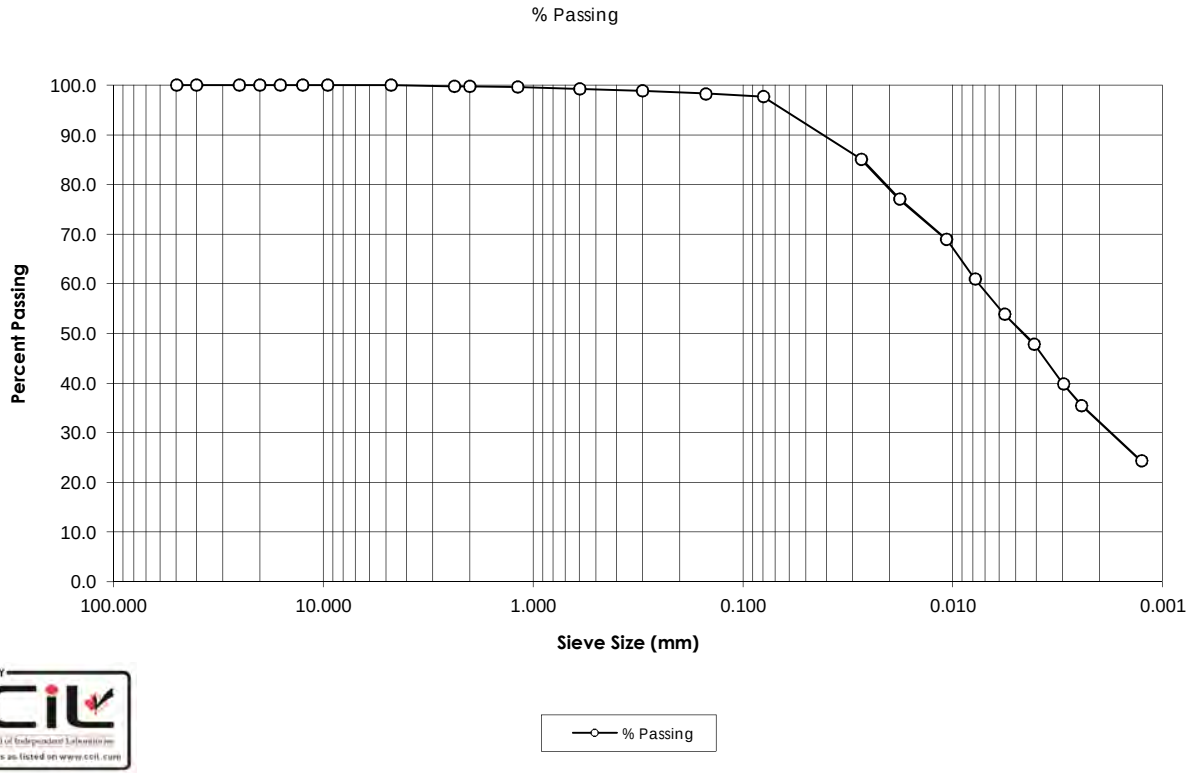
SAMPLE No.: SS18A
SOURCE: D50
TESTED BY: B. Pelkey

DATE TESTED: August 7, 2016
DATE RECEIVED: June 22, 2016
SAMPLE DESCRIPTION: Fines Trace Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0057** | **53.9** |
| **40.0** | **100.0** | **0.0041** | **47.9** |
| **25.0** | **100.0** | **0.0030** | **39.8** |
| **20.0** | **100.0** | **0.0024** | **35.4** |
| **16.0** | **100.0** | **0.0013** | **24.3** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.8** | | |
| **2.00** | **99.8** | | |
| **1.18** | **99.6** | | |
| **0.600** | **99.3** | | |
| **0.300** | **98.9** | | |
| **0.150** | **98.3** | | |
| **0.080** | **97.7** | | |
| **0.0272** | **85.1** | | |
| **0.0179** | **77.0** | | |
| **0.0107** | **69.0** | | |
| **0.0078** | **60.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.3% | $D_{30}$: | 0.0019 |
| Silt: | 65.6% | $D_{60}$: | 0.0075 |
| Clay: | 32.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Grain Size test results only



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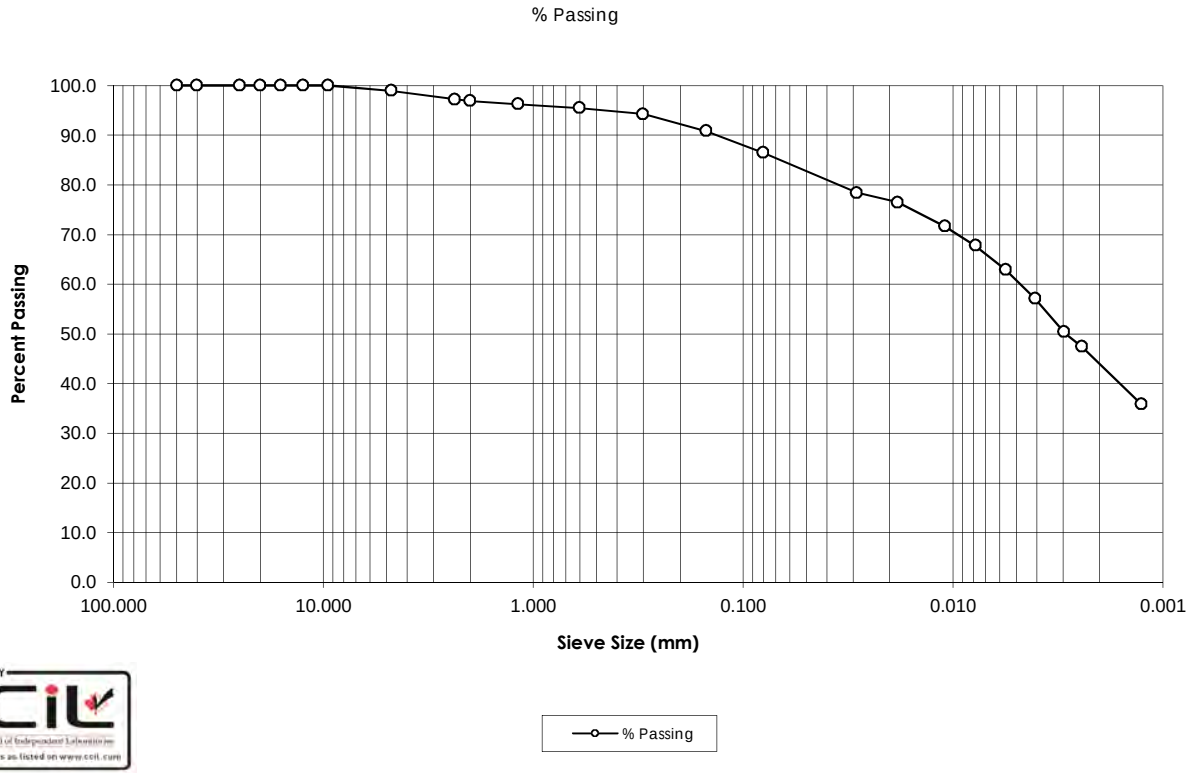
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 1107733936.302.702.230

SAMPLE No.: ST6
SOURCE: D51
TESTED BY: B. Pelkey

DATE TESTED: October 12, 2016
DATE RECEIVED: September 9, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0056 | 62.9 |
| 40.0 | 100.0 | 0.0041 | 57.1 |
| 25.0 | 100.0 | 0.0030 | 50.3 |
| 20.0 | 100.0 | 0.0024 | 47.4 |
| 16.0 | 100.0 | 0.0013 | 35.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.9 | | |
| 2.36 | 97.2 | | |
| 2.00 | 96.9 | | |
| 1.18 | 96.3 | | |
| 0.600 | 95.5 | | |
| 0.300 | 94.3 | | |
| 0.150 | 90.8 | | |
| 0.080 | 86.4 | | |
| 0.0287 | 78.4 | | |
| 0.0184 | 76.5 | | |
| 0.0109 | 71.6 | | |
| 0.0078 | 67.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.1% | $D_{10}$: | - |
| Sand: | 12.5% | $D_{30}$: | - |
| Silt: | 42.5% | $D_{60}$: | 0.0048 |
| Clay: | 44.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both Grain Size and Atterberg Limit test results.

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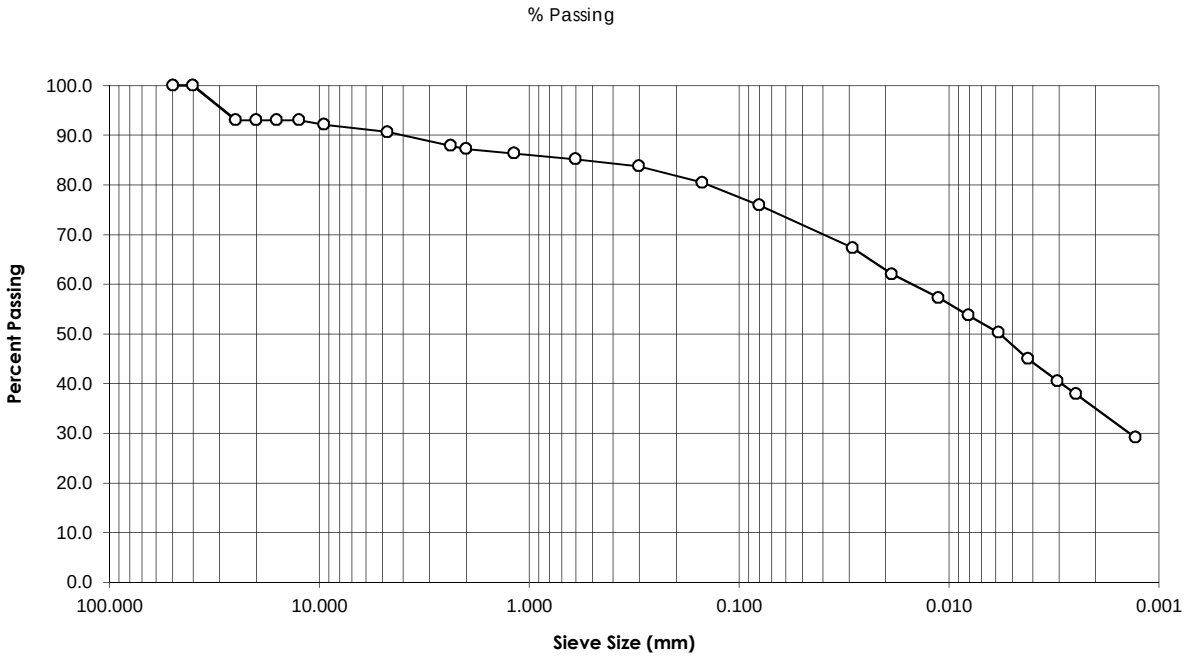
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 1107733936.302.702.230

SAMPLE No.: ST8
SOURCE: D51
TESTED BY: B. Pelkey

DATE TESTED: October 11, 2016
DATE RECEIVED: September 9, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 50.2 |
| 40.0 | 100.0 | 0.0042 | 44.9 |
| 25.0 | 93.0 | 0.0030 | 40.5 |
| 20.0 | 93.0 | 0.0025 | 37.9 |
| 16.0 | 93.0 | 0.0013 | 29.1 |
| 12.5 | 93.0 | | |
| 9.5 | 92.1 | | |
| 4.75 | 90.7 | | |
| 2.36 | 87.9 | | |
| 2.00 | 87.2 | | |
| 1.18 | 86.3 | | |
| 0.600 | 85.2 | | |
| 0.300 | 83.7 | | |
| 0.150 | 80.5 | | |
| 0.080 | 75.9 | | |
| 0.0288 | 67.3 | | |
| 0.0187 | 62.0 | | |
| 0.0112 | 57.3 | | |
| 0.0081 | 53.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.3% | $D_{10}$: | - |
| Sand: | 14.8% | $D_{30}$: | 0.0014 |
| Silt: | 40.9% | $D_{60}$: | 0.0156 |
| Clay: | 35.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both Grain Size and Atterberg Limit test results.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 1107733936.302.702.230

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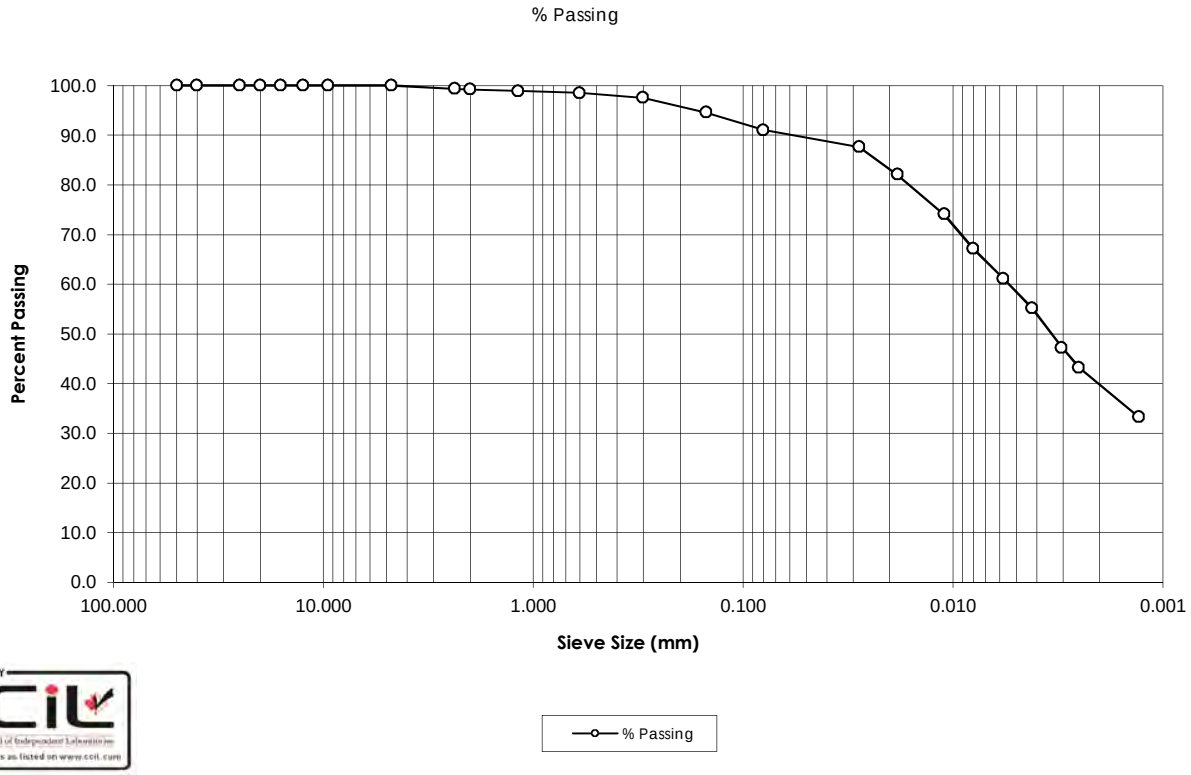
SAMPLE No.: SS5
SOURCE: D52
TESTED BY: B. Pelkey

DATE TESTED: October 14, 2016
DATE RECEIVED: June 10, 2016
SAMPLE DESCRIPTION: Clay (Cl), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 61.2 |
| 40.0 | 100.0 | 0.0042 | 55.2 |
| 25.0 | 100.0 | 0.0030 | 47.2 |
| 20.0 | 100.0 | 0.0025 | 43.2 |
| 16.0 | 100.0 | 0.0013 | 33.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.4 | | |
| 2.00 | 99.3 | | |
| 1.18 | 98.9 | | |
| 0.600 | 98.5 | | |
| 0.300 | 97.6 | | |
| 0.150 | 94.6 | | |
| 0.080 | 91.1 | | |
| 0.0279 | 87.7 | | |
| 0.0184 | 82.1 | | |
| 0.0110 | 74.1 | | |
| 0.0080 | 67.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 8.9% | $D_{30}$: | - |
| Silt: | 51.3% | $D_{60}$: | 0.0055 |
| Clay: | 39.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both Grain Size and Atterberg Limit test results.



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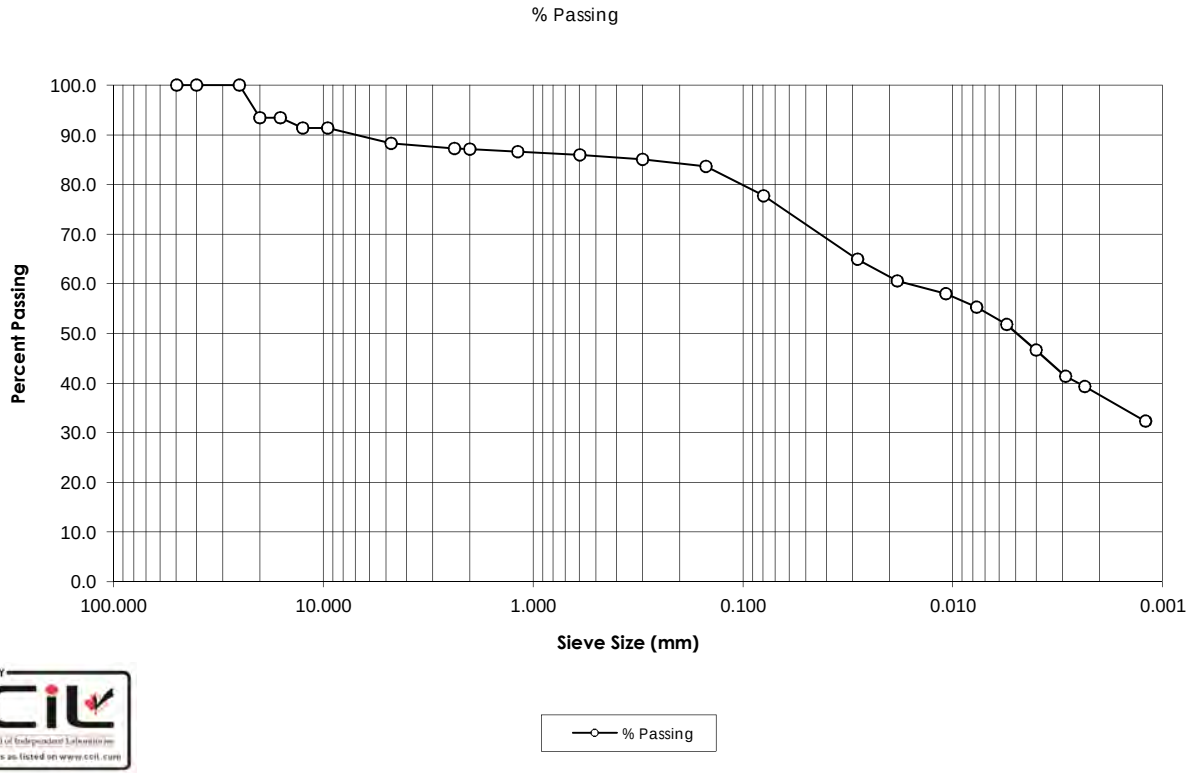
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST2
SOURCE: D58
TESTED BY: B. Pelkey

DATE TESTED: August 7, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 51.9 |
| 40.0 | 100.0 | 0.0040 | 46.6 |
| 25.0 | 100.0 | 0.0029 | 41.4 |
| 20.0 | 93.4 | 0.0023 | 39.3 |
| 16.0 | 93.4 | 0.0012 | 32.4 |
| 12.5 | 91.4 | | |
| 9.5 | 91.4 | | |
| 4.75 | 88.3 | | |
| 2.36 | 87.3 | | |
| 2.00 | 87.1 | | |
| 1.18 | 86.7 | | |
| 0.600 | 86.0 | | |
| 0.300 | 85.1 | | |
| 0.150 | 83.6 | | |
| 0.080 | 77.8 | | |
| 0.0285 | 64.9 | | |
| 0.0184 | 60.6 | | |
| 0.0108 | 58.0 | | |
| 0.0077 | 55.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 11.7% | $D_{10}$: | - |
| Sand: | 10.5% | $D_{30}$: | - |
| Silt: | 40.1% | $D_{60}$: | 0.0168 |
| Clay: | 37.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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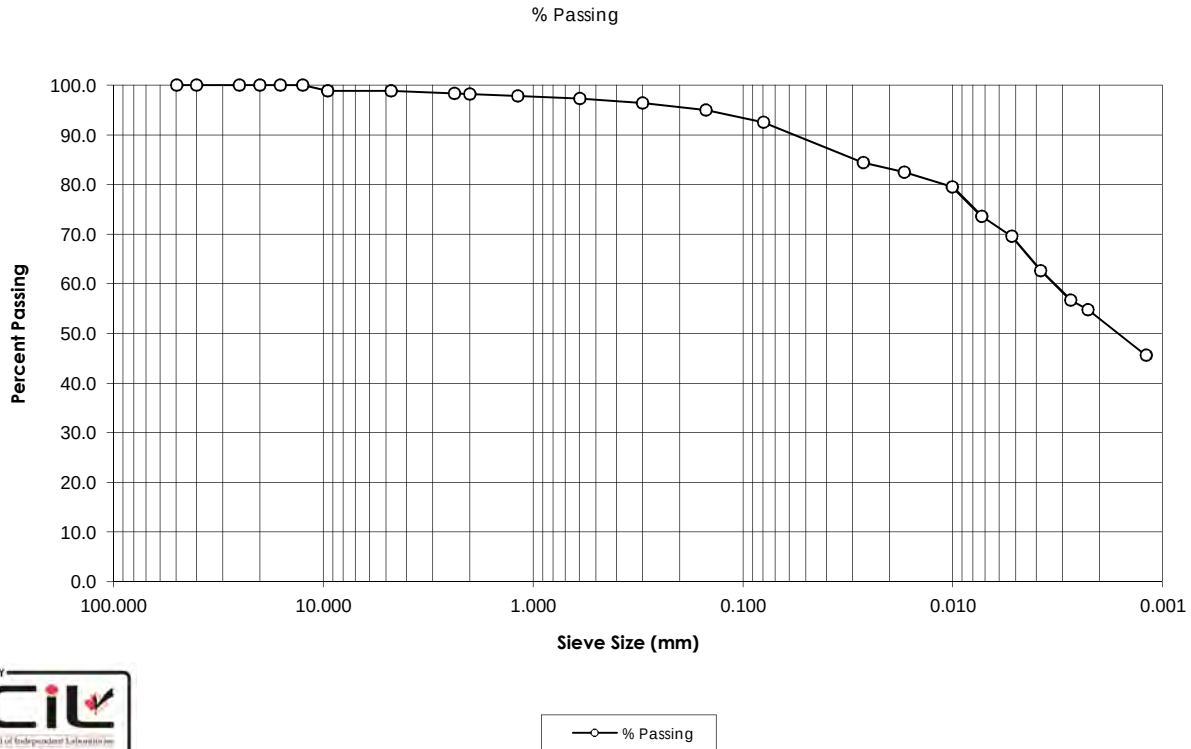
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST5
SOURCE: D58
TESTED BY: B. Pelkey

DATE TESTED: August 2, 2016
DATE RECEIVED: June 20, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 69.6 |
| 40.0 | 100.0 | 0.0038 | 62.7 |
| 25.0 | 100.0 | 0.0027 | 56.7 |
| 20.0 | 100.0 | 0.0023 | 54.7 |
| 16.0 | 100.0 | 0.0012 | 45.6 |
| 12.5 | 100.0 | | |
| 9.5 | 98.9 | | |
| 4.75 | 98.9 | | |
| 2.36 | 98.4 | | |
| 2.00 | 98.2 | | |
| 1.18 | 97.8 | | |
| 0.600 | 97.3 | | |
| 0.300 | 96.5 | | |
| 0.150 | 95.0 | | |
| 0.080 | 92.5 | | |
| 0.0267 | 84.5 | | |
| 0.0170 | 82.5 | | |
| 0.0100 | 79.5 | | |
| 0.0073 | 73.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.1% | $D_{10}$: | - |
| Sand: | 6.4% | $D_{30}$: | - |
| Silt: | 39.6% | $D_{60}$: | 0.0033 |
| Clay: | 53.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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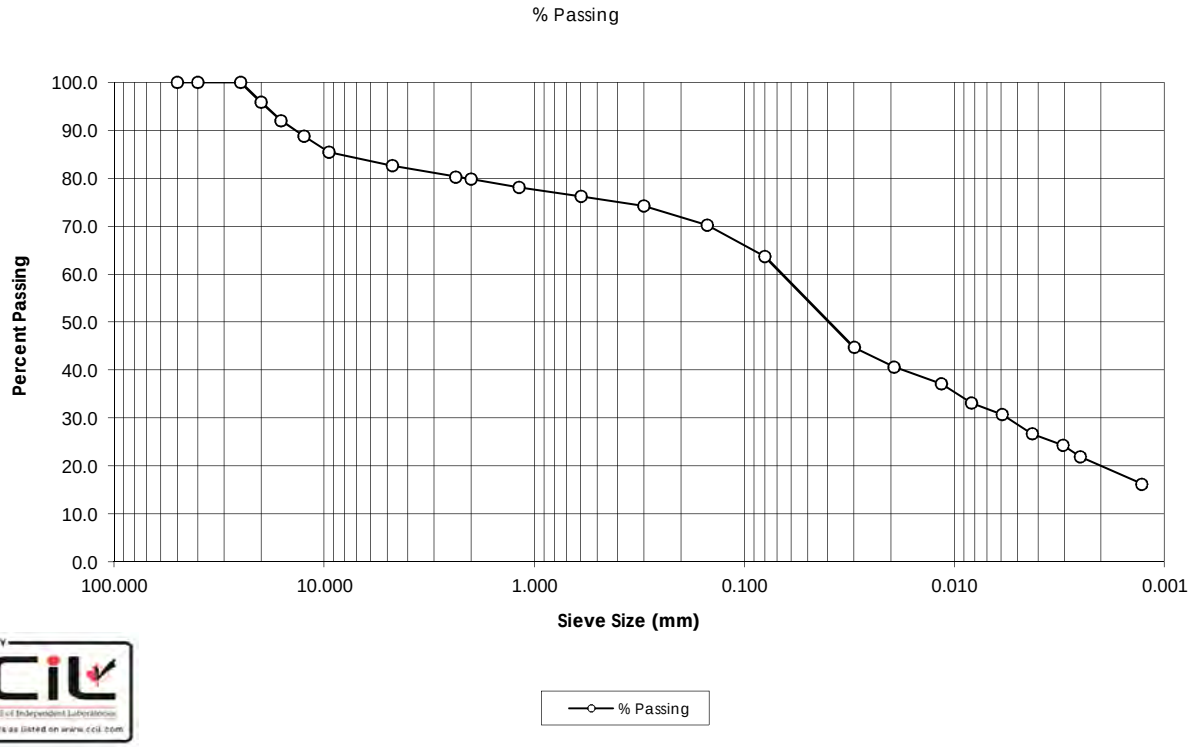
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: SS15
SOURCE: D58
TESTED BY: C. Oost

DATE TESTED: July 18, 2016
DATE RECEIVED: June 21, 2016
SAMPLE DESCRIPTION: Clay (CL-CI) Some Sand Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0059** | **30.7** |
| **40.0** | **100.0** | **0.0043** | **26.7** |
| **25.0** | **100.0** | **0.0030** | **24.3** |
| **20.0** | **95.9** | **0.0025** | **21.9** |
| **16.0** | **92.1** | **0.0013** | **16.2** |
| **12.5** | **88.8** | | |
| **9.5** | **85.5** | | |
| **4.75** | **82.7** | | |
| **2.36** | **80.3** | | |
| **2.00** | **79.9** | | |
| **1.18** | **78.2** | | |
| **0.600** | **76.2** | | |
| **0.300** | **74.2** | | |
| **0.150** | **70.3** | | |
| **0.080** | **63.7** | | |
| **0.0300** | **44.7** | | |
| **0.0194** | **40.7** | | |
| **0.0115** | **37.1** | | |
| **0.0083** | **33.1** | | |

| | | | |
|---|---|---|---|
| Gravel: | 17.3% | $D_{10}$: | - |
| Sand: | 19.0% | $D_{30}$: | 0.0056 |
| Silt: | 43.7% | $D_{60}$: | 0.0716 |
| Clay: | 20.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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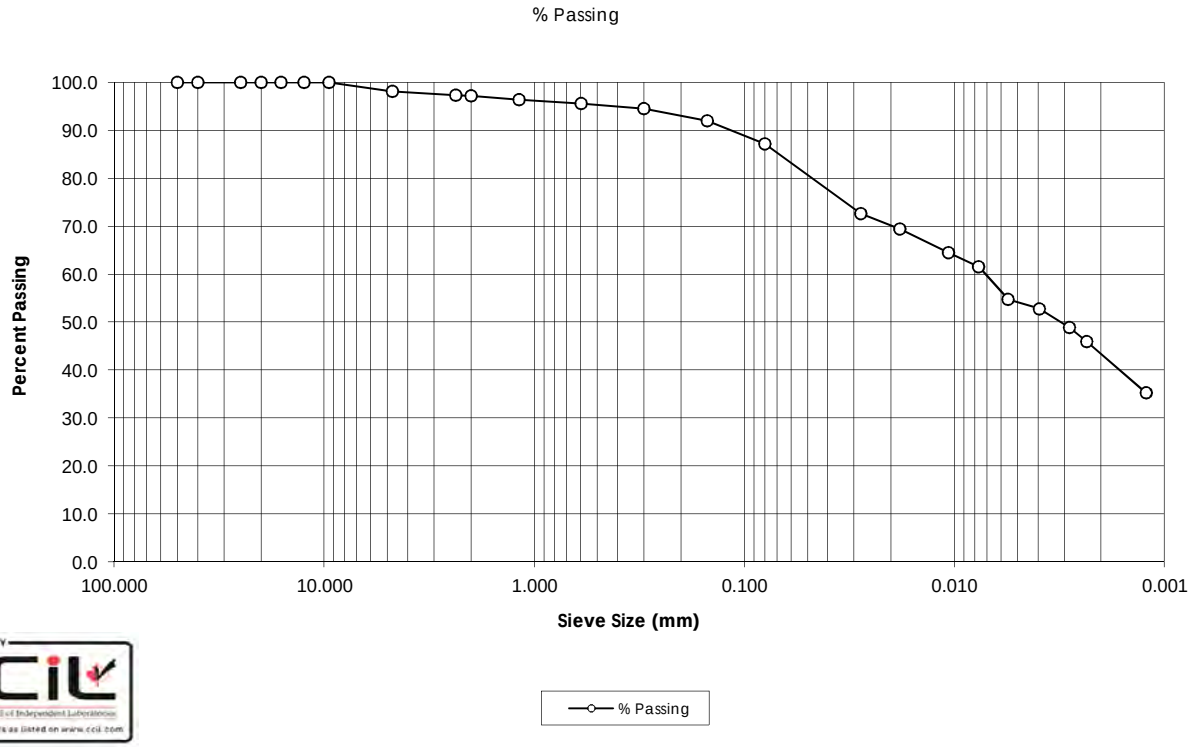
SAMPLE No.: SS19
SOURCE: D58
TESTED BY: C. Oost

DATE TESTED: July 18, 2016
DATE RECEIVED: June 21, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0055** | **54.8** |
| **40.0** | **100.0** | **0.0040** | **52.8** |
| **25.0** | **100.0** | **0.0028** | **48.9** |
| **20.0** | **100.0** | **0.0023** | **46.0** |
| **16.0** | **100.0** | **0.0012** | **35.3** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **98.1** | | |
| **2.36** | **97.4** | | |
| **2.00** | **97.2** | | |
| **1.18** | **96.4** | | |
| **0.600** | **95.6** | | |
| **0.300** | **94.5** | | |
| **0.150** | **92.0** | | |
| **0.080** | **87.2** | | |
| **0.0278** | **72.7** | | |
| **0.0182** | **69.4** | | |
| **0.0107** | **64.5** | | |
| **0.0077** | **61.6** | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.9% | $D_{10}$: | - |
| Sand: | 10.9% | $D_{30}$: | - |
| Silt: | 43.8% | $D_{60}$: | 0.0072 |
| Clay: | 43.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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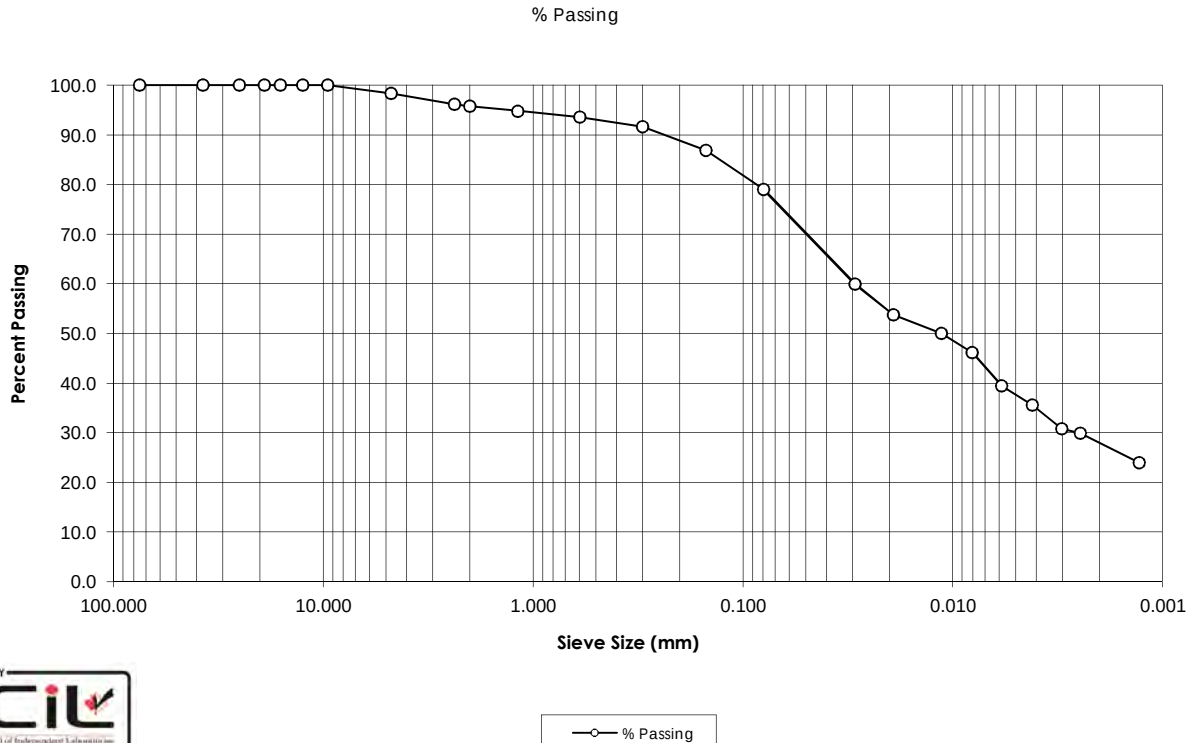
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST21
SOURCE: D58
TESTED BY: B. Pelkey

DATE TESTED: August 2, 2016
DATE RECEIVED: June 28, 2016
SAMPLE DESCRIPTION: Clay (CL-CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0058 | 39.4 |
| 37.5 | 100.0 | 0.0042 | 35.6 |
| 25.0 | 100.0 | 0.0030 | 30.8 |
| 19.0 | 100.0 | 0.0025 | 29.9 |
| 16.0 | 100.0 | 0.0013 | 23.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.4 | | |
| 2.36 | 96.2 | | |
| 2.00 | 95.8 | | |
| 1.18 | 94.8 | | |
| 0.600 | 93.6 | | |
| 0.300 | 91.7 | | |
| 0.150 | 86.9 | | |
| 0.080 | 79.1 | | |
| 0.0291 | 59.9 | | |
| 0.0192 | 53.8 | | |
| 0.0113 | 50.0 | | |
| 0.0081 | 46.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.6% | $D_{10}$: | - |
| Sand: | 19.3% | $D_{30}$: | 0.0025 |
| Silt: | 51.1% | $D_{60}$: | 0.0294 |
| Clay: | 27.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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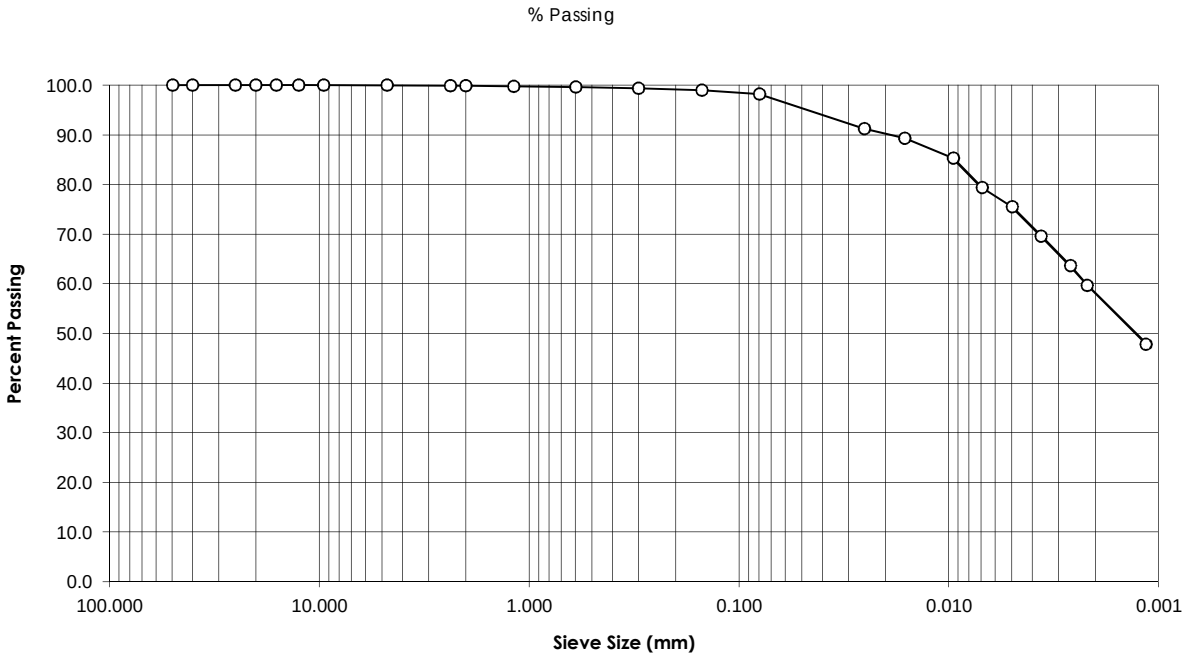
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D59
TESTED BY: B. Pelkey

DATE TESTED: July 27, 2016
DATE RECEIVED: June 28, 2016
SAMPLE DESCRIPTION: Clay (CI-CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0050 | 75.5 |
| 40.0 | 100.0 | 0.0036 | 69.6 |
| 25.0 | 100.0 | 0.0026 | 63.7 |
| 20.0 | 100.0 | 0.0022 | 59.7 |
| 16.0 | 100.0 | 0.0011 | 47.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.8 | | |
| 1.18 | 99.8 | | |
| 0.600 | 99.6 | | |
| 0.300 | 99.4 | | |
| 0.150 | 99.0 | | |
| 0.080 | 98.3 | | |
| 0.0253 | 91.3 | | |
| 0.0162 | 89.3 | | |
| 0.0095 | 85.3 | | |
| 0.0069 | 79.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.7% | $D_{30}$: | - |
| Silt: | 40.1% | $D_{60}$: | 0.0022 |
| Clay: | 58.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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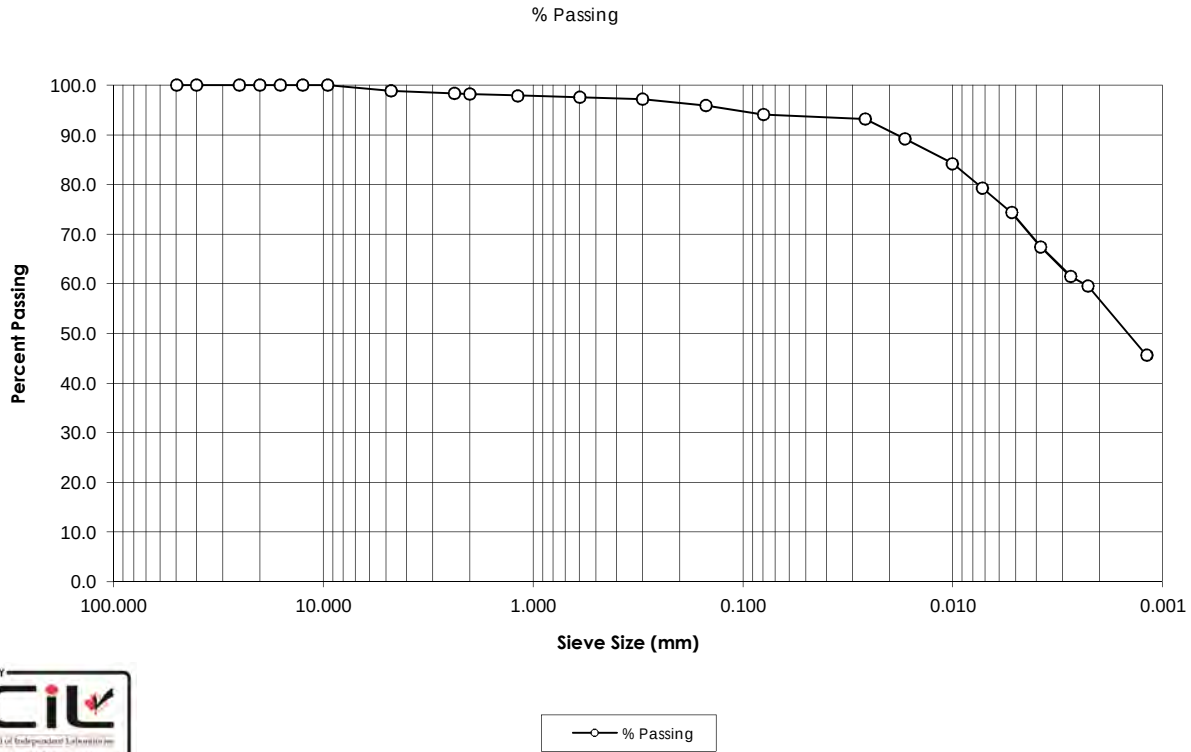
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST6
SOURCE: D59
TESTED BY: C. Oost

DATE TESTED: July 18, 2016
DATE RECEIVED: June 28, 2016
SAMPLE DESCRIPTION: Clay (CH-CL) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 74.4 |
| 40.0 | 100.0 | 0.0038 | 67.4 |
| 25.0 | 100.0 | 0.0027 | 61.5 |
| 20.0 | 100.0 | 0.0023 | 59.5 |
| 16.0 | 100.0 | 0.0012 | 45.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.9 | | |
| 2.36 | 98.4 | | |
| 2.00 | 98.2 | | |
| 1.18 | 97.9 | | |
| 0.600 | 97.6 | | |
| 0.300 | 97.2 | | |
| 0.150 | 95.9 | | |
| 0.080 | 94.0 | | |
| 0.0261 | 93.1 | | |
| 0.0169 | 89.2 | | |
| 0.0100 | 84.2 | | |
| 0.0072 | 79.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.1% | $D_{10}$: | - |
| Sand: | 4.9% | $D_{30}$: | - |
| Silt: | 37.2% | $D_{60}$: | 0.0024 |
| Clay: | 56.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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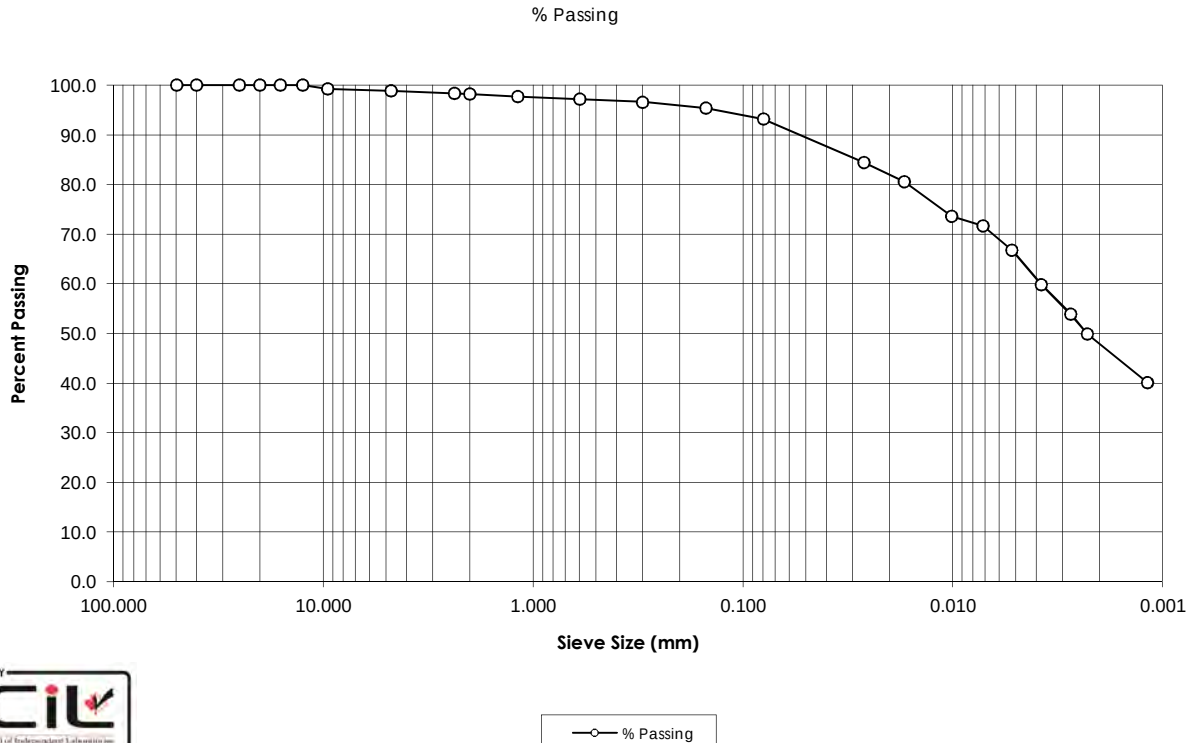
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST8
SOURCE: D59
TESTED BY: B. Pelkey

DATE TESTED: July 27, 2016
DATE RECEIVED: June 28, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 66.7 |
| 40.0 | 100.0 | 0.0038 | 59.8 |
| 25.0 | 100.0 | 0.0027 | 53.9 |
| 20.0 | 100.0 | 0.0023 | 49.9 |
| 16.0 | 100.0 | 0.0012 | 40.1 |
| 12.5 | 100.0 | | |
| 9.5 | 99.2 | | |
| 4.75 | 98.9 | | |
| 2.36 | 98.3 | | |
| 2.00 | 98.2 | | |
| 1.18 | 97.7 | | |
| 0.600 | 97.2 | | |
| 0.300 | 96.6 | | |
| 0.150 | 95.3 | | |
| 0.080 | 93.2 | | |
| 0.0264 | 84.5 | | |
| 0.0170 | 80.5 | | |
| 0.0101 | 73.6 | | |
| 0.0072 | 71.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.1% | $D_{10}$: | - |
| Sand: | 5.7% | $D_{30}$: | - |
| Silt: | 45.2% | $D_{60}$: | 0.0038 |
| Clay: | 48.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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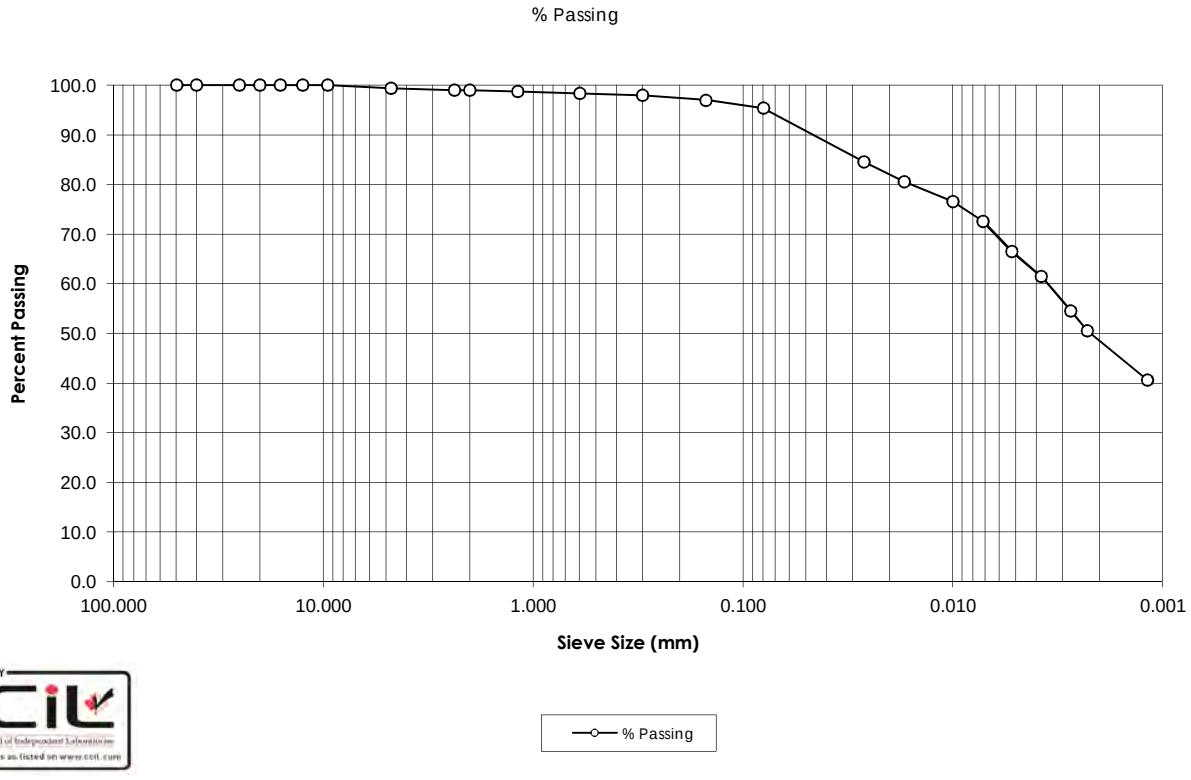
SAMPLE No.: ST10
SOURCE: D59
TESTED BY: B. Pelkey

DATE TESTED: July 27, 2016
DATE RECEIVED: June 28, 2016
SAMPLE DESCRIPTION: Clay (CL-CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 66.5 |
| 40.0 | 100.0 | 0.0038 | 61.5 |
| 25.0 | 100.0 | 0.0027 | 54.5 |
| 20.0 | 100.0 | 0.0023 | 50.5 |
| 16.0 | 100.0 | 0.0012 | 40.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.4 | | |
| 2.36 | 99.0 | | |
| 2.00 | 99.0 | | |
| 1.18 | 98.7 | | |
| 0.600 | 98.3 | | |
| 0.300 | 97.9 | | |
| 0.150 | 97.0 | | |
| 0.080 | 95.4 | | |
| 0.0264 | 84.5 | | |
| 0.0170 | 80.5 | | |
| 0.0100 | 76.5 | | |
| 0.0072 | 72.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.6% | $D_{10}$: | - |
| Sand: | 4.0% | $D_{30}$: | - |
| Silt: | 46.8% | $D_{60}$: | 0.0036 |
| Clay: | 48.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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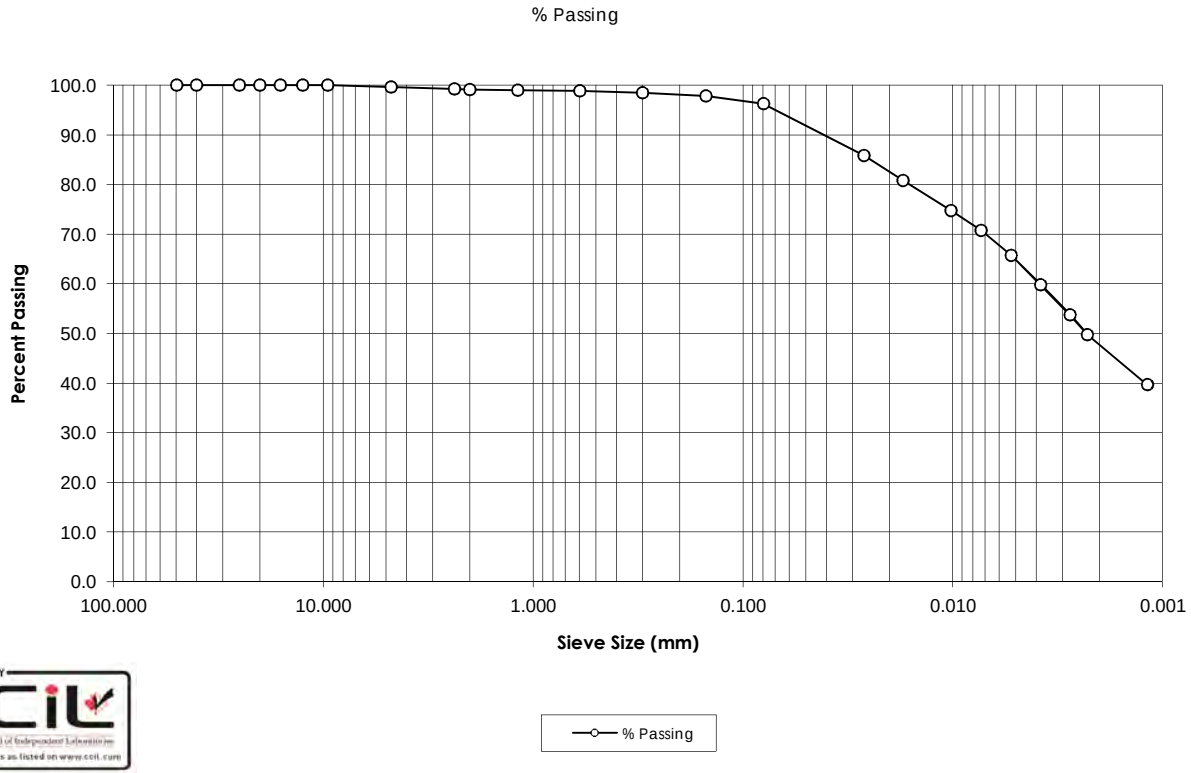
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST13
SOURCE: D59
TESTED BY: B. Pelkey

DATE TESTED: July 26, 2016
DATE RECEIVED: June 28, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 65.8 |
| 40.0 | 100.0 | 0.0038 | 59.8 |
| 25.0 | 100.0 | 0.0028 | 53.8 |
| 20.0 | 100.0 | 0.0023 | 49.7 |
| 16.0 | 100.0 | 0.0012 | 39.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.6 | | |
| 2.36 | 99.3 | | |
| 2.00 | 99.1 | | |
| 1.18 | 99.0 | | |
| 0.600 | 98.8 | | |
| 0.300 | 98.5 | | |
| 0.150 | 97.8 | | |
| 0.080 | 96.3 | | |
| 0.0264 | 85.8 | | |
| 0.0172 | 80.8 | | |
| 0.0102 | 74.8 | | |
| 0.0073 | 70.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 3.4% | $D_{30}$: | - |
| Silt: | 48.6% | $D_{60}$: | 0.0039 |
| Clay: | 47.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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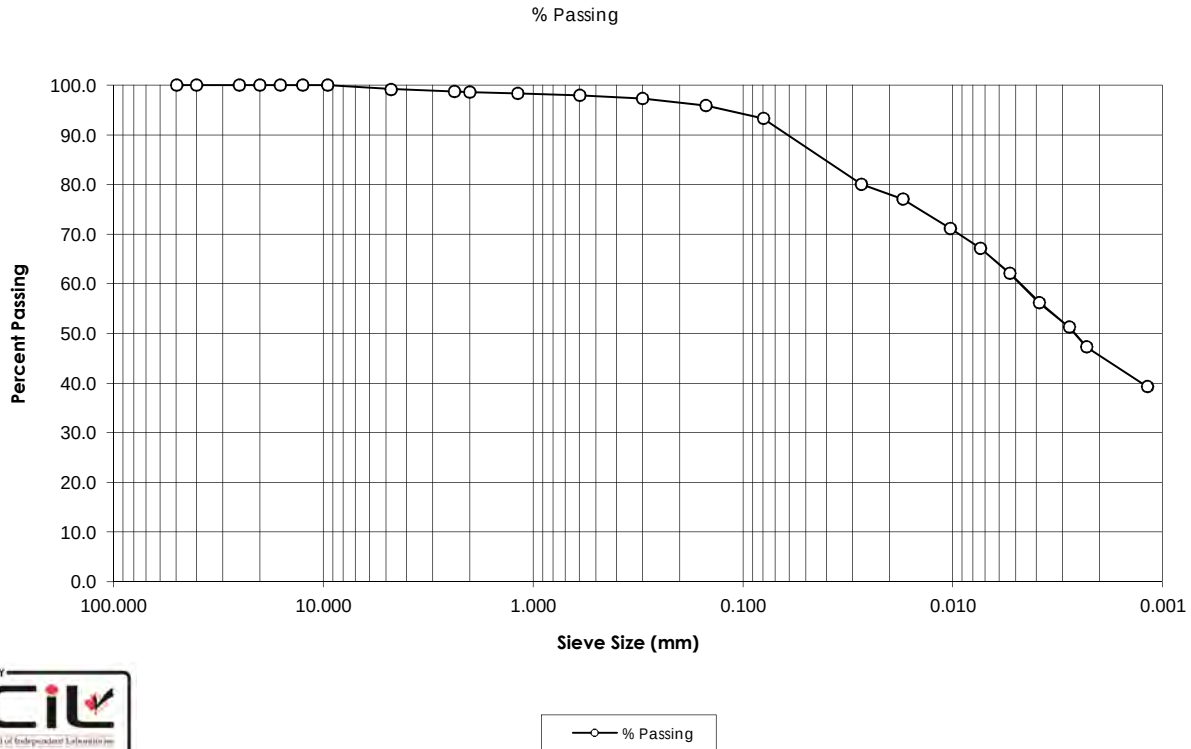
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST16
SOURCE: D59
TESTED BY: B. Pelkey

DATE TESTED: July 26, 2016
DATE RECEIVED: June 28, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 62.2 |
| 40.0 | 100.0 | 0.0039 | 56.2 |
| 25.0 | 100.0 | 0.0028 | 51.3 |
| 20.0 | 100.0 | 0.0023 | 47.3 |
| 16.0 | 100.0 | 0.0012 | 39.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.2 | | |
| 2.36 | 98.7 | | |
| 2.00 | 98.6 | | |
| 1.18 | 98.4 | | |
| 0.600 | 97.9 | | |
| 0.300 | 97.3 | | |
| 0.150 | 95.9 | | |
| 0.080 | 93.3 | | |
| 0.0272 | 80.1 | | |
| 0.0173 | 77.1 | | |
| 0.0103 | 71.1 | | |
| 0.0074 | 67.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.8% | $D_{10}$: | - |
| Sand: | 5.9% | $D_{30}$: | - |
| Silt: | 47.7% | $D_{60}$: | 0.0048 |
| Clay: | 45.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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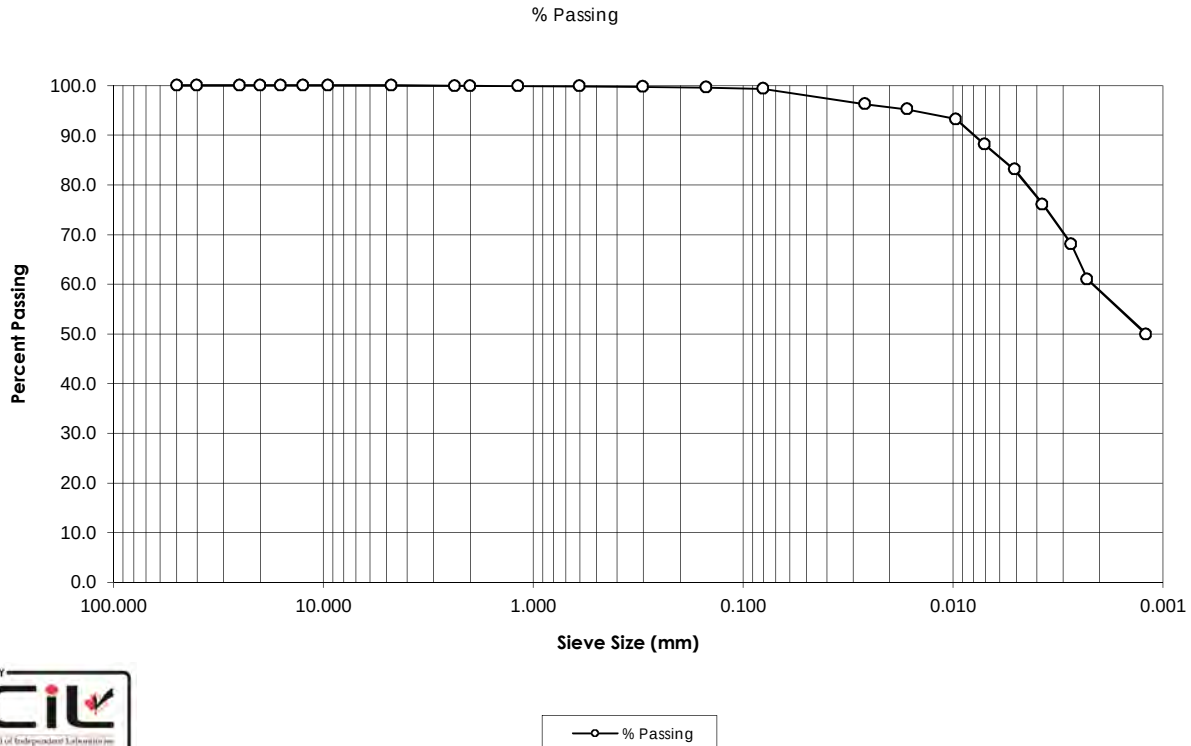
SAMPLE No.: ST4
SOURCE: D60
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: July 24, 2016
SAMPLE DESCRIPTION: Clay (CH)

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 83.1 |
| 40.0 | 100.0 | 0.0037 | 76.1 |
| 25.0 | 100.0 | 0.0027 | 68.0 |
| 20.0 | 100.0 | 0.0023 | 61.0 |
| 16.0 | 100.0 | 0.0012 | 49.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.7 | | |
| 0.150 | 99.6 | | |
| 0.080 | 99.4 | | |
| 0.0262 | 96.2 | | |
| 0.0166 | 95.2 | | |
| 0.0097 | 93.2 | | |
| 0.0071 | 88.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.6% | $D_{30}$: | - |
| Silt: | 40.7% | $D_{60}$: | 0.0022 |
| Clay: | 58.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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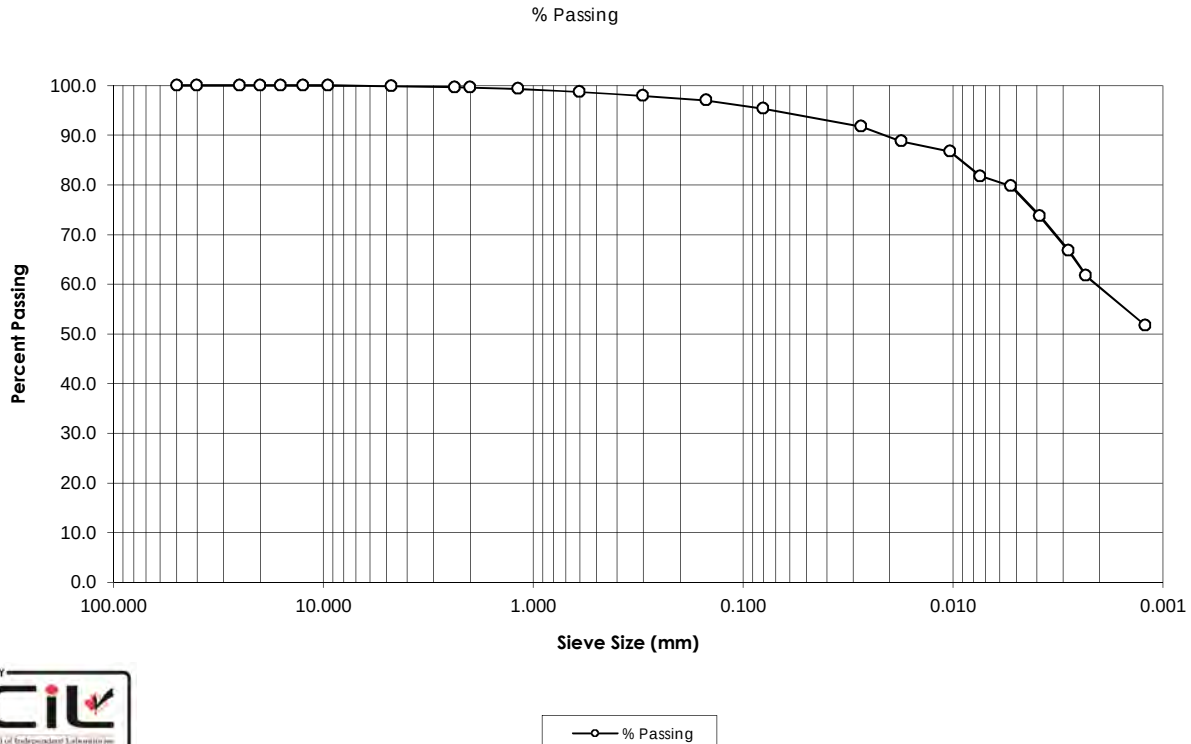
SAMPLE No.: ST8
SOURCE: D60
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: July 24, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 79.7 |
| 40.0 | 100.0 | 0.0038 | 73.7 |
| 25.0 | 100.0 | 0.0028 | 66.7 |
| 20.0 | 100.0 | 0.0023 | 61.7 |
| 16.0 | 100.0 | 0.0012 | 51.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.9 | | |
| 2.36 | 99.7 | | |
| 2.00 | 99.6 | | |
| 1.18 | 99.4 | | |
| 0.600 | 98.7 | | |
| 0.300 | 98.0 | | |
| 0.150 | 97.0 | | |
| 0.080 | 95.3 | | |
| 0.0274 | 91.8 | | |
| 0.0176 | 88.8 | | |
| 0.0103 | 86.7 | | |
| 0.0074 | 81.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.1% | $D_{10}$: | - |
| Sand: | 4.5% | $D_{30}$: | - |
| Silt: | 35.9% | $D_{60}$: | 0.0021 |
| Clay: | 59.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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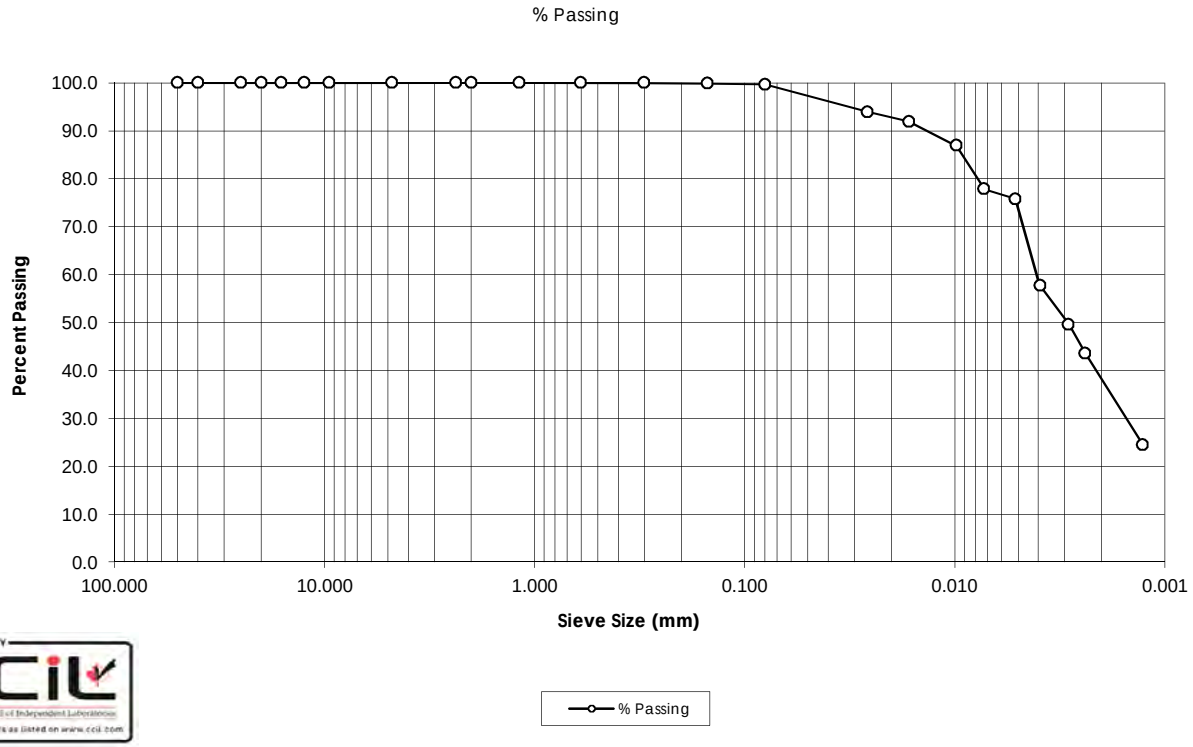
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC33 @ 20.20-20.30m
SOURCE: D60
TESTED BY: B.Pelkey

DATE TESTED: September 2, 2016
DATE RECEIVED: July 27, 2016
SAMPLE DESCRIPTION: Clay (CI)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0051** | **75.8** |
| **40.0** | **100.0** | **0.0039** | **57.6** |
| **25.0** | **100.0** | **0.0029** | **49.6** |
| **20.0** | **100.0** | **0.0024** | **43.5** |
| **16.0** | **100.0** | **0.0013** | **24.4** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **100.0** | | |
| **1.18** | **100.0** | | |
| **0.600** | **100.0** | | |
| **0.300** | **100.0** | | |
| **0.150** | **99.9** | | |
| **0.080** | **99.7** | | |
| **0.0259** | **93.9** | | |
| **0.0165** | **91.9** | | |
| **0.0098** | **86.9** | | |
| **0.0072** | **77.8** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.3% | $D_{30}$: | 0.0017 |
| Silt: | 61.5% | $D_{60}$: | 0.0041 |
| Clay: | 38.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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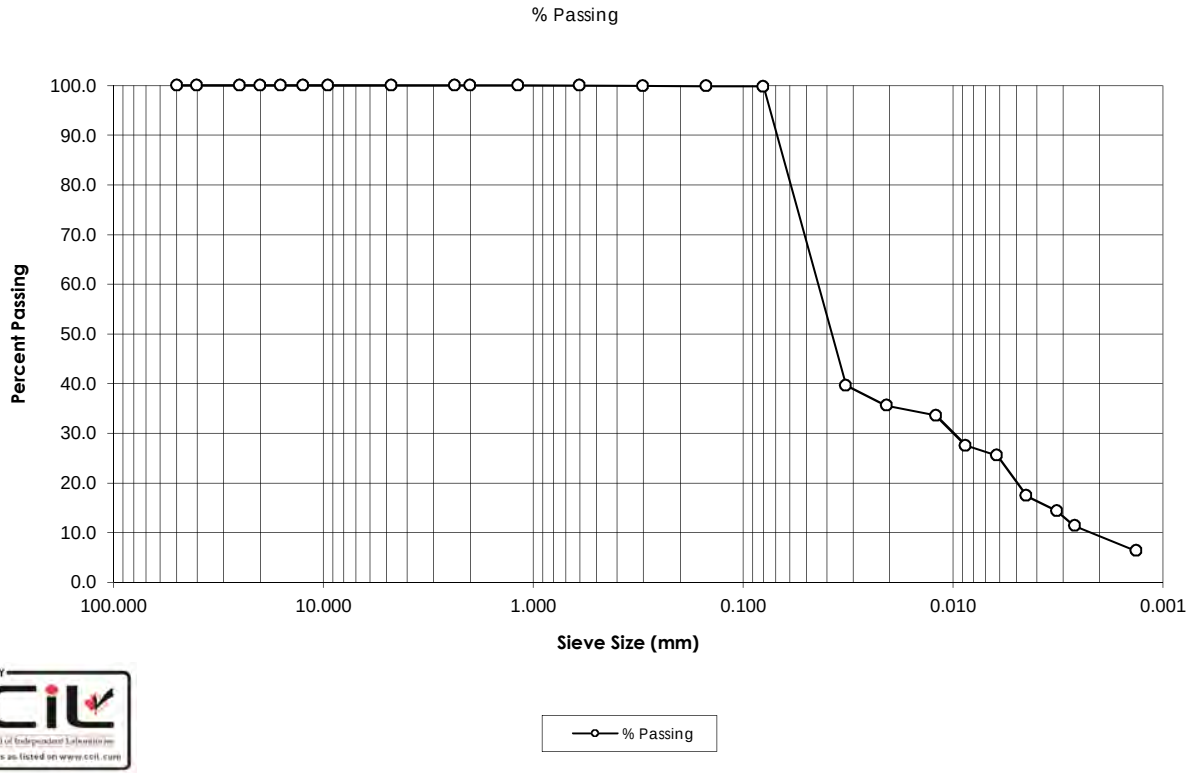
SAMPLE No.: RC33 @ 20.54-20.60m
SOURCE: D60
TESTED BY: J. Upham

DATE TESTED: September 1, 2016
DATE RECEIVED: July 27, 2016
SAMPLE DESCRIPTION: Clay (Cl)




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 25.5 |
| 40.0 | 100.0 | 0.0045 | 17.4 |
| 25.0 | 100.0 | 0.0032 | 14.4 |
| 20.0 | 100.0 | 0.0026 | 11.3 |
| 16.0 | 100.0 | 0.0013 | 6.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.8 | | |
| 0.0324 | 39.6 | | |
| 0.0207 | 35.6 | | |
| 0.0121 | 33.6 | | |
| 0.0087 | 27.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | 0.0024 |
| Sand: | 0.2% | $D_{30}$: | 0.0102 |
| Silt: | 90.5% | $D_{60}$: | 0.0538 |
| Clay: | 9.3% | $C_u$: | 22.78 |
| | | $C_c$: | 0.81 |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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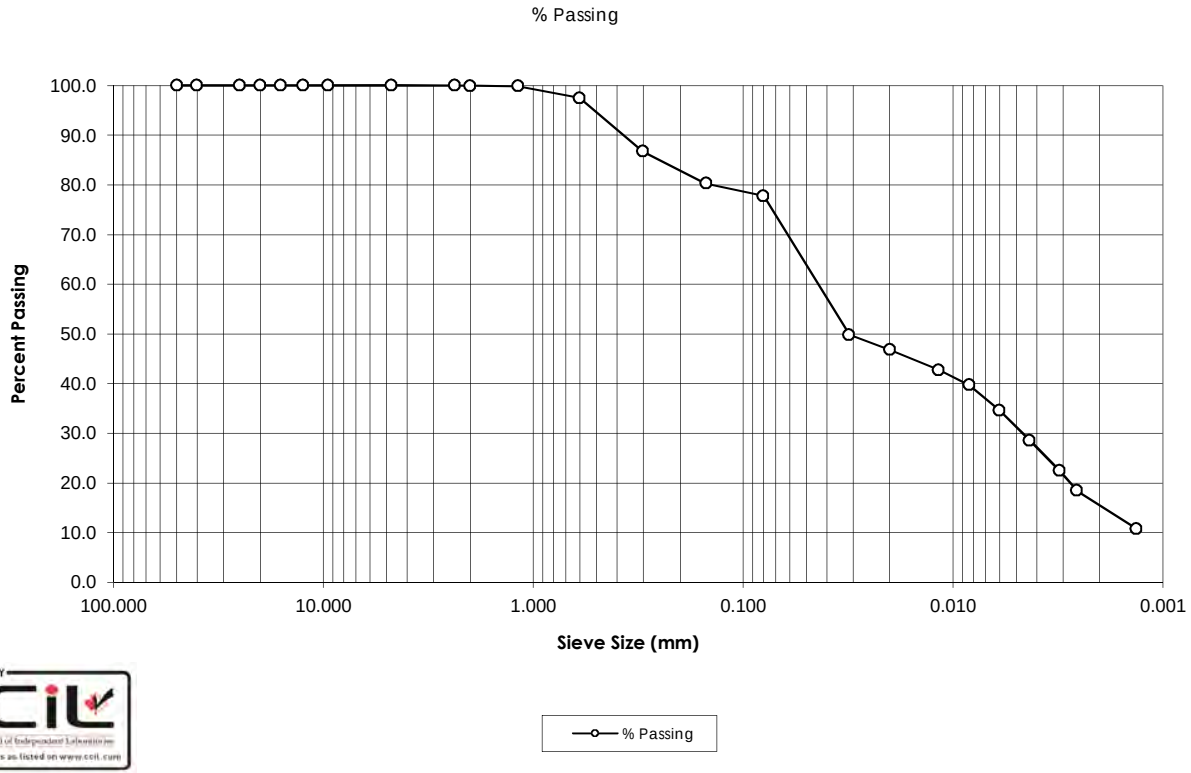
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC35 @ 23.25-23.40m
SOURCE: D60
TESTED BY: J. Upham

DATE TESTED: September 1, 2016
DATE RECEIVED: July 24, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 34.6 |
| 40.0 | 100.0 | 0.0043 | 28.5 |
| 25.0 | 100.0 | 0.0031 | 22.5 |
| 20.0 | 100.0 | 0.0026 | 18.4 |
| 16.0 | 100.0 | 0.0013 | 10.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 97.5 | | |
| 0.300 | 86.7 | | |
| 0.150 | 80.3 | | |
| 0.080 | 77.7 | | |
| 0.0313 | 49.8 | | |
| 0.0199 | 46.8 | | |
| 0.0117 | 42.7 | | |
| 0.0084 | 39.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 22.3% | $D_{30}$: | 0.0047 |
| Silt: | 62.3% | $D_{60}$: | 0.0517 |
| Clay: | 15.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230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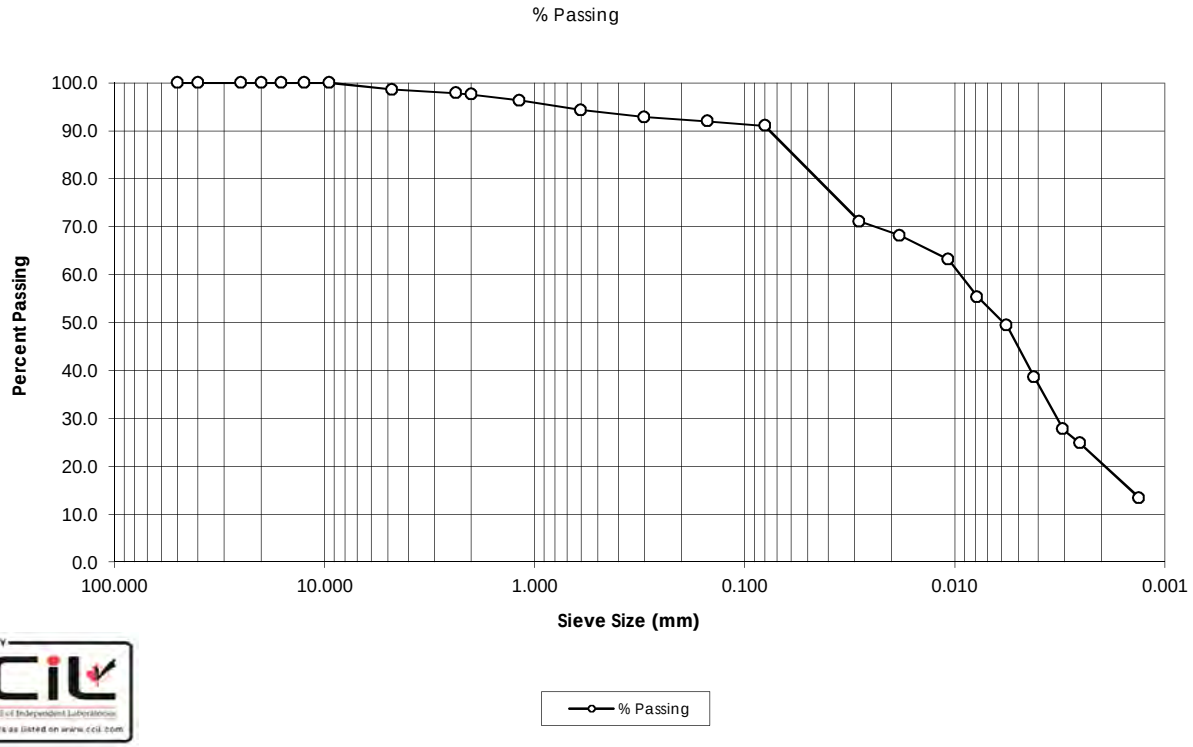
SAMPLE No.: RC35 @ 23.34-23.53m
SOURCE: D60
TESTED BY: B.Pelkey

DATE TESTED: September 3, 2016
DATE RECEIVED: July 27, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0057** | **49.4** |
| **40.0** | **100.0** | **0.0042** | **38.6** |
| **25.0** | **100.0** | **0.0031** | **27.8** |
| **20.0** | **100.0** | **0.0025** | **24.8** |
| **16.0** | **100.0** | **0.0013** | **13.4** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **98.6** | | |
| **2.36** | **97.8** | | |
| **2.00** | **97.6** | | |
| **1.18** | **96.3** | | |
| **0.600** | **94.3** | | |
| **0.300** | **92.8** | | |
| **0.150** | **92.0** | | |
| **0.080** | **91.0** | | |
| **0.0284** | **71.1** | | |
| **0.0183** | **68.1** | | |
| **0.0108** | **63.2** | | |
| **0.0078** | **55.3** | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.4% | $D_{10}$: | - |
| Sand: | 7.6% | $D_{30}$: | 0.0033 |
| Silt: | 70.3% | $D_{60}$: | 0.0096 |
| Clay: | 20.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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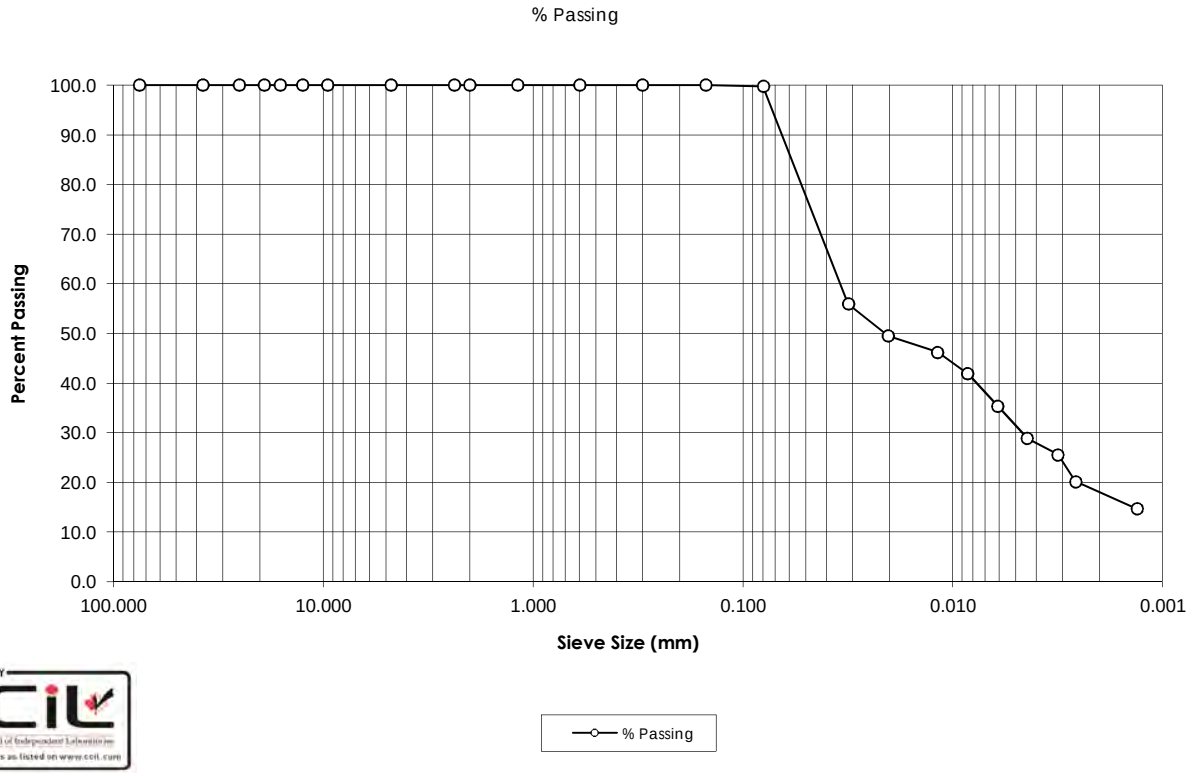
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: RC39 @ 30.16m - 30.24m
SOURCE: D60
TESTED BY: C. Oost

DATE TESTED: August 25, 2016
DATE RECEIVED: July 27, 2016
SAMPLE DESCRIPTION: Silt (MH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0061 | 35.4 |
| 37.5 | 100.0 | 0.0044 | 28.9 |
| 25.0 | 100.0 | 0.0031 | 25.6 |
| 19.0 | 100.0 | 0.0026 | 20.2 |
| 16.0 | 100.0 | 0.0013 | 14.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 100.0 | | |
| 0.150 | 100.0 | | |
| 0.080 | 99.8 | | |
| 0.0314 | 56.0 | | |
| 0.0203 | 49.5 | | |
| 0.0118 | 46.2 | | |
| 0.0085 | 41.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.2% | $D_{30}$: | 0.0047 |
| Silt: | 81.7% | $D_{60}$: | 0.0373 |
| Clay: | 18.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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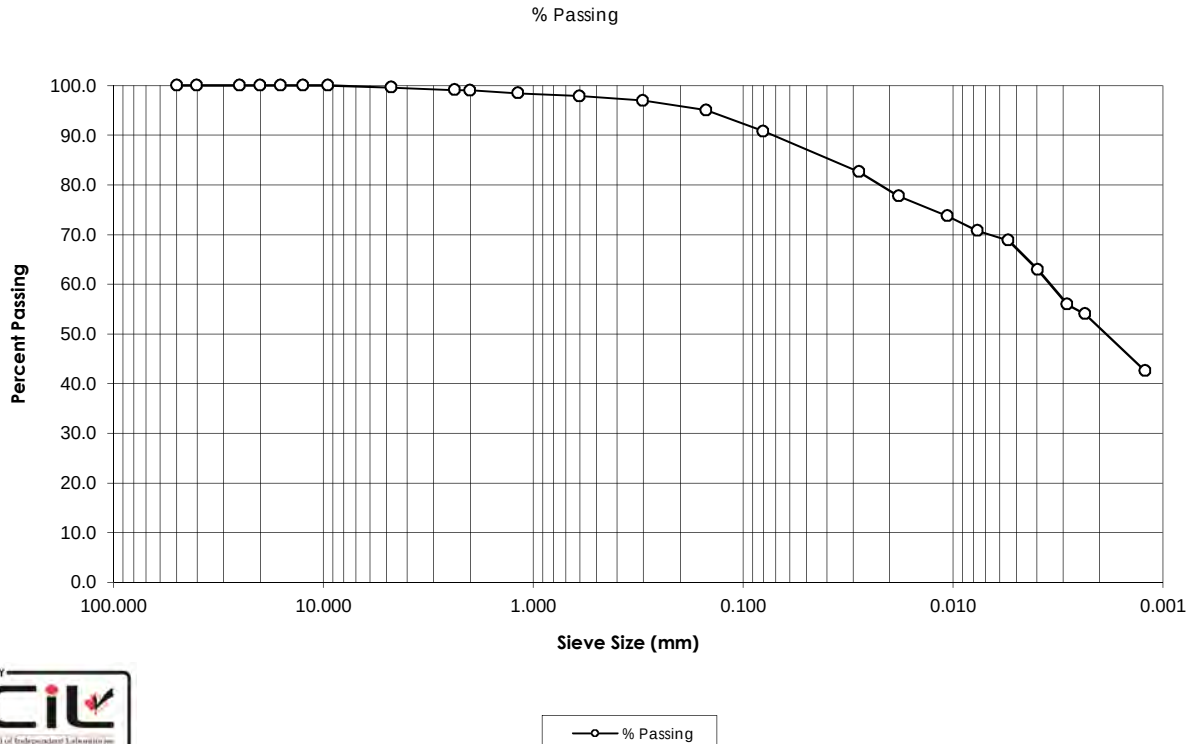
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST2
SOURCE: D62
TESTED BY: C.Oost

DATE TESTED: September 16, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (CL), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 68.8 |
| 40.0 | 100.0 | 0.0039 | 62.9 |
| 25.0 | 100.0 | 0.0028 | 55.9 |
| 20.0 | 100.0 | 0.0023 | 54.0 |
| 16.0 | 100.0 | 0.0012 | 42.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.6 | | |
| 2.36 | 99.1 | | |
| 2.00 | 99.1 | | |
| 1.18 | 98.5 | | |
| 0.600 | 97.9 | | |
| 0.300 | 97.0 | | |
| 0.150 | 95.1 | | |
| 0.080 | 90.8 | | |
| 0.0279 | 82.6 | | |
| 0.0181 | 77.7 | | |
| 0.0106 | 73.7 | | |
| 0.0076 | 70.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 8.8% | $D_{30}$: | - |
| Silt: | 39.6% | $D_{60}$: | 0.0035 |
| Clay: | 51.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived using both the Grain Size and Atterberg Limit test results.

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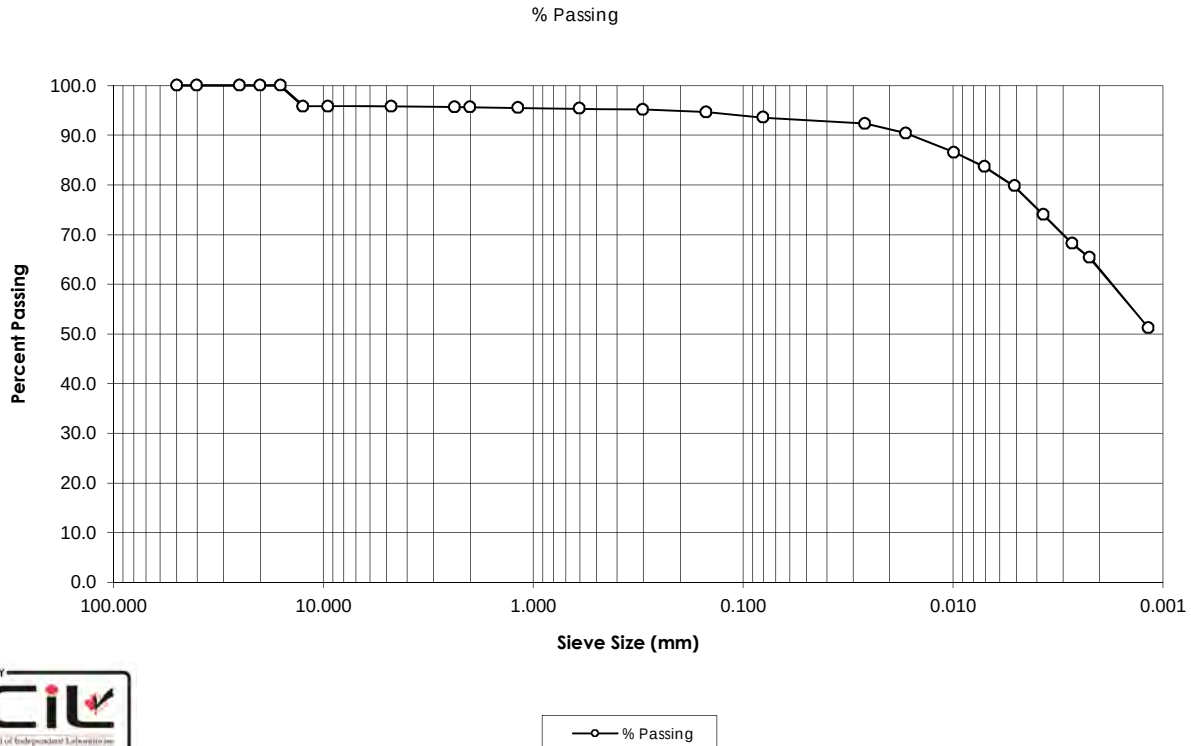
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D62
TESTED BY: C.Oost

DATE TESTED: September 16, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Gravel, Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 79.8 |
| 40.0 | 100.0 | 0.0037 | 74.0 |
| 25.0 | 100.0 | 0.0027 | 68.2 |
| 20.0 | 100.0 | 0.0022 | 65.3 |
| 16.0 | 100.0 | 0.0012 | 51.2 |
| 12.5 | 95.8 | | |
| 9.5 | 95.8 | | |
| 4.75 | 95.8 | | |
| 2.36 | 95.7 | | |
| 2.00 | 95.6 | | |
| 1.18 | 95.5 | | |
| 0.600 | 95.3 | | |
| 0.300 | 95.1 | | |
| 0.150 | 94.6 | | |
| 0.080 | 93.6 | | |
| 0.0262 | 92.3 | | |
| 0.0168 | 90.4 | | |
| 0.0099 | 86.6 | | |
| 0.0071 | 83.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.2% | $D_{10}$: | - |
| Sand: | 2.2% | $D_{30}$: | - |
| Silt: | 30.7% | $D_{60}$: | 0.0019 |
| Clay: | 62.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived using both the Grain Size and Atterberg Limit test results.

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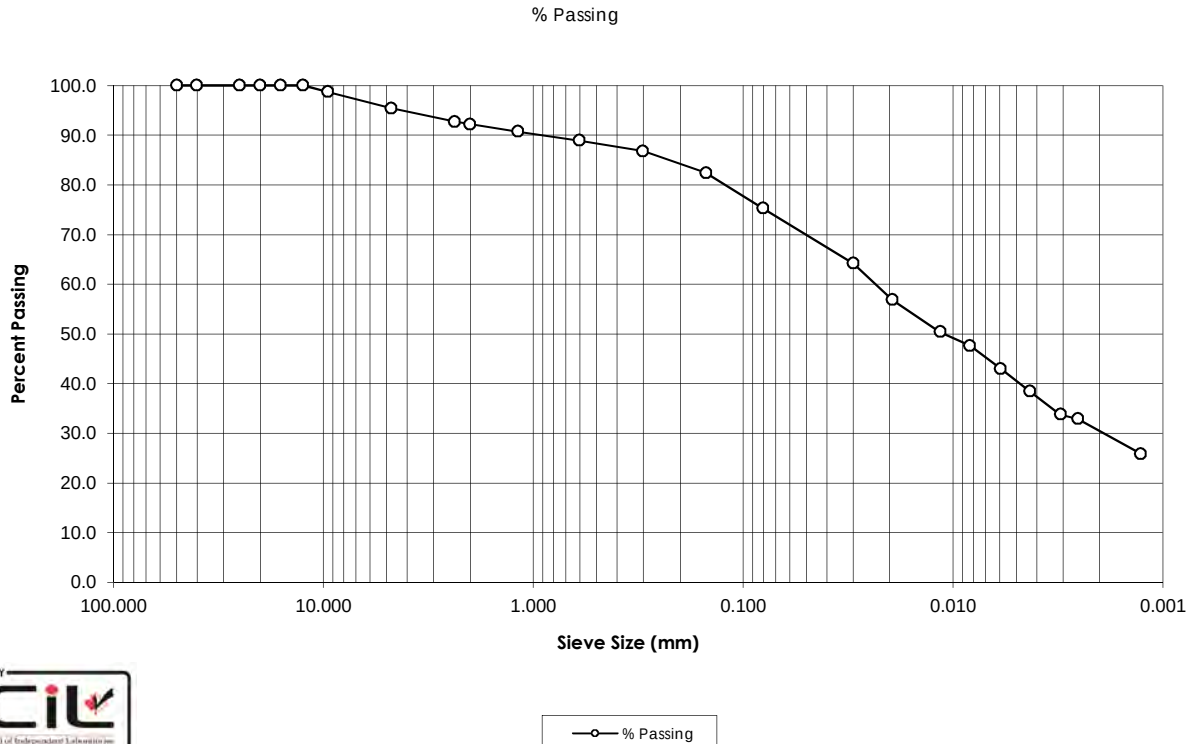
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST6
SOURCE: D62
TESTED BY: C.Oost

DATE TESTED: September 16, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 43.0 |
| 40.0 | 100.0 | 0.0043 | 38.4 |
| 25.0 | 100.0 | 0.0031 | 33.8 |
| 20.0 | 100.0 | 0.0025 | 32.8 |
| 16.0 | 100.0 | 0.0013 | 25.8 |
| 12.5 | 100.0 | | |
| 9.5 | 98.7 | | |
| 4.75 | 95.4 | | |
| 2.36 | 92.7 | | |
| 2.00 | 92.2 | | |
| 1.18 | 90.7 | | |
| 0.600 | 88.9 | | |
| 0.300 | 86.8 | | |
| 0.150 | 82.4 | | |
| 0.080 | 75.3 | | |
| 0.0298 | 64.2 | | |
| 0.0194 | 56.8 | | |
| 0.0115 | 50.4 | | |
| 0.0083 | 47.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.6% | $D_{10}$: | - |
| Sand: | 20.2% | $D_{30}$: | 0.0021 |
| Silt: | 44.8% | $D_{60}$: | 0.0241 |
| Clay: | 30.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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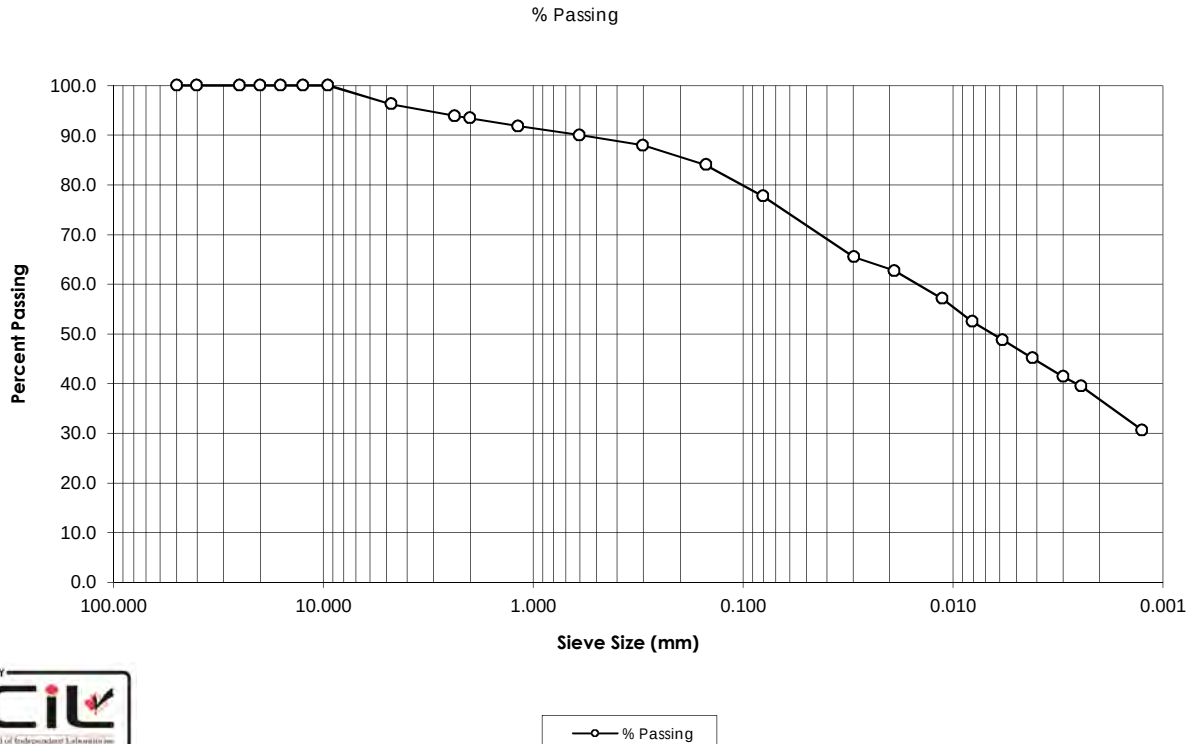
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST10
SOURCE: D62
TESTED BY: C.Oost

DATE TESTED: September 16, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Lean Clay, Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 48.8 |
| 40.0 | 100.0 | 0.0042 | 45.1 |
| 25.0 | 100.0 | 0.0030 | 41.3 |
| 20.0 | 100.0 | 0.0025 | 39.5 |
| 16.0 | 100.0 | 0.0013 | 30.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 96.3 | | |
| 2.36 | 93.9 | | |
| 2.00 | 93.4 | | |
| 1.18 | 91.8 | | |
| 0.600 | 90.0 | | |
| 0.300 | 87.9 | | |
| 0.150 | 84.0 | | |
| 0.080 | 77.7 | | |
| 0.0295 | 65.5 | | |
| 0.0190 | 62.7 | | |
| 0.0112 | 57.1 | | |
| 0.0081 | 52.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.7% | $D_{10}$: | - |
| Sand: | 18.6% | $D_{30}$: | - |
| Silt: | 40.9% | $D_{60}$: | 0.0153 |
| Clay: | 36.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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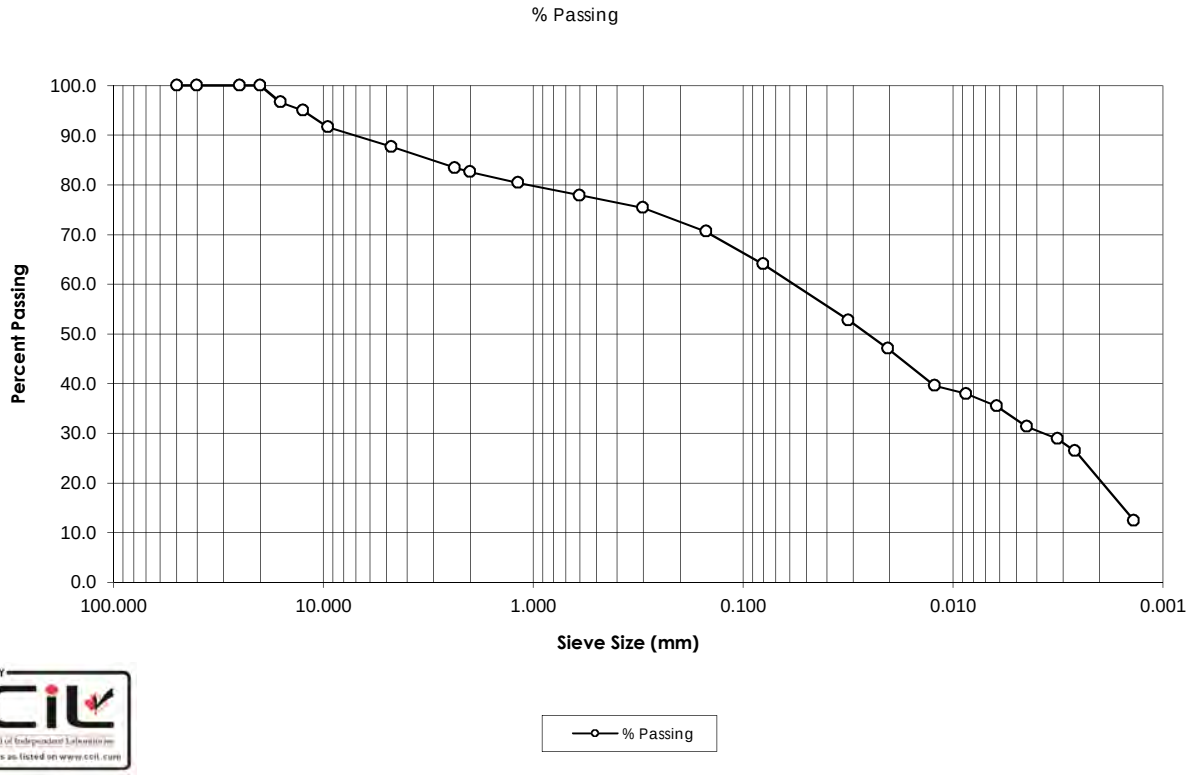
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: BS12
SOURCE: D62
TESTED BY: B. Pelkey

DATE TESTED: October 14, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 35.5 |
| 40.0 | 100.0 | 0.0044 | 31.3 |
| 25.0 | 100.0 | 0.0032 | 28.9 |
| 20.0 | 100.0 | 0.0026 | 26.4 |
| 16.0 | 96.7 | 0.0014 | 12.4 |
| 12.5 | 95.0 | | |
| 9.5 | 91.6 | | |
| 4.75 | 87.7 | | |
| 2.36 | 83.4 | | |
| 2.00 | 82.6 | | |
| 1.18 | 80.4 | | |
| 0.600 | 77.9 | | |
| 0.300 | 75.4 | | |
| 0.150 | 70.6 | | |
| 0.080 | 64.0 | | |
| 0.0314 | 52.8 | | |
| 0.0203 | 47.0 | | |
| 0.0122 | 39.6 | | |
| 0.0087 | 37.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 12.3% | $D_{10}$: | - |
| Sand: | 23.7% | $D_{30}$: | 0.0038 |
| Silt: | 43.5% | $D_{60}$: | 0.0637 |
| Clay: | 20.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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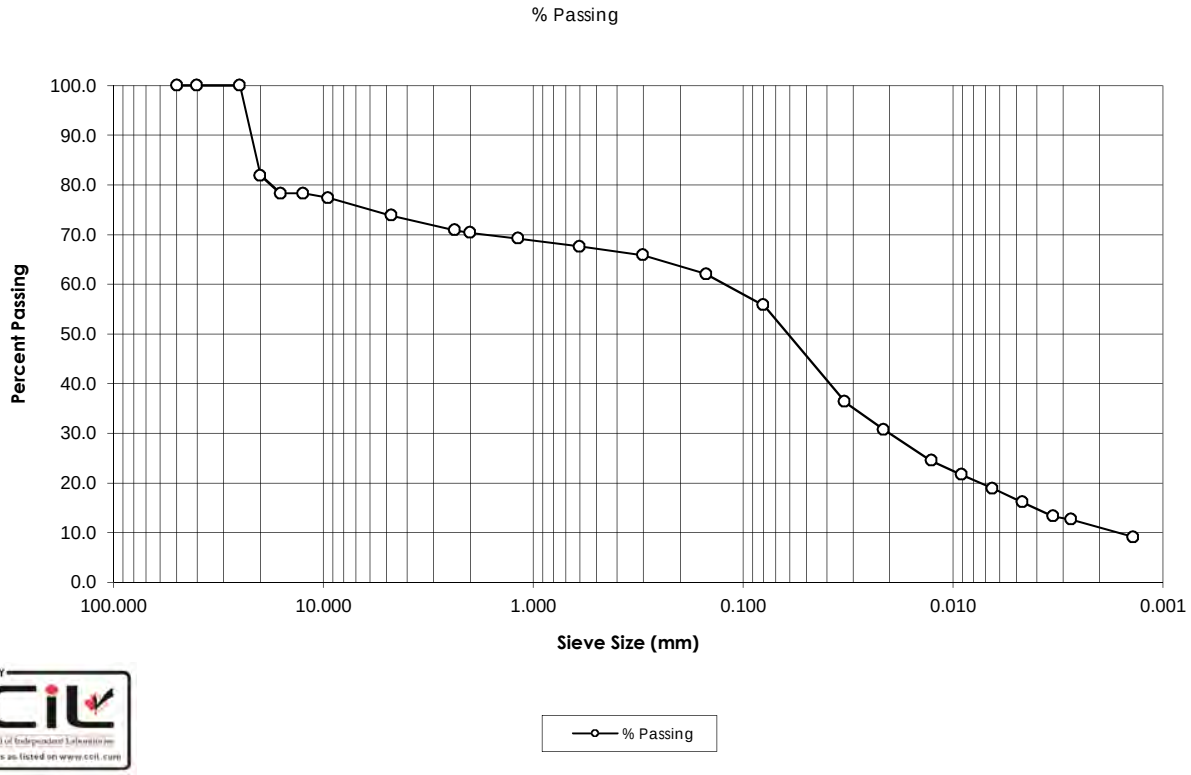
SAMPLE No.: SS17
SOURCE: D62
TESTED BY: B. Pelkey

DATE TESTED: October 14, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Gravelly Clay (CL-ML), Some Sand




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0065** | **18.9** |
| **40.0** | **100.0** | **0.0047** | **16.1** |
| **25.0** | **100.0** | **0.0033** | **13.3** |
| **20.0** | **81.9** | **0.0027** | **12.6** |
| **16.0** | **78.3** | **0.0014** | **9.1** |
| **12.5** | **78.3** | | |
| **9.5** | **77.4** | | |
| **4.75** | **73.9** | | |
| **2.36** | **70.8** | | |
| **2.00** | **70.3** | | |
| **1.18** | **69.2** | | |
| **0.600** | **67.6** | | |
| **0.300** | **65.9** | | |
| **0.150** | **62.0** | | |
| **0.080** | **55.8** | | |
| **0.0329** | **36.3** | | |
| **0.0213** | **30.7** | | |
| **0.0127** | **24.5** | | |
| **0.0091** | **21.7** | | |

| | | | |
|---|---|---|---|
| Gravel: | 26.1% | $D_{10}$: | 0.0018 |
| Sand: | 18.1% | $D_{30}$: | 0.0204 |
| Silt: | 44.8% | $D_{60}$: | 0.1280 |
| Clay: | 11.0% | $C_u$: | 71.81 |
| | | $C_c$: | 1.83 |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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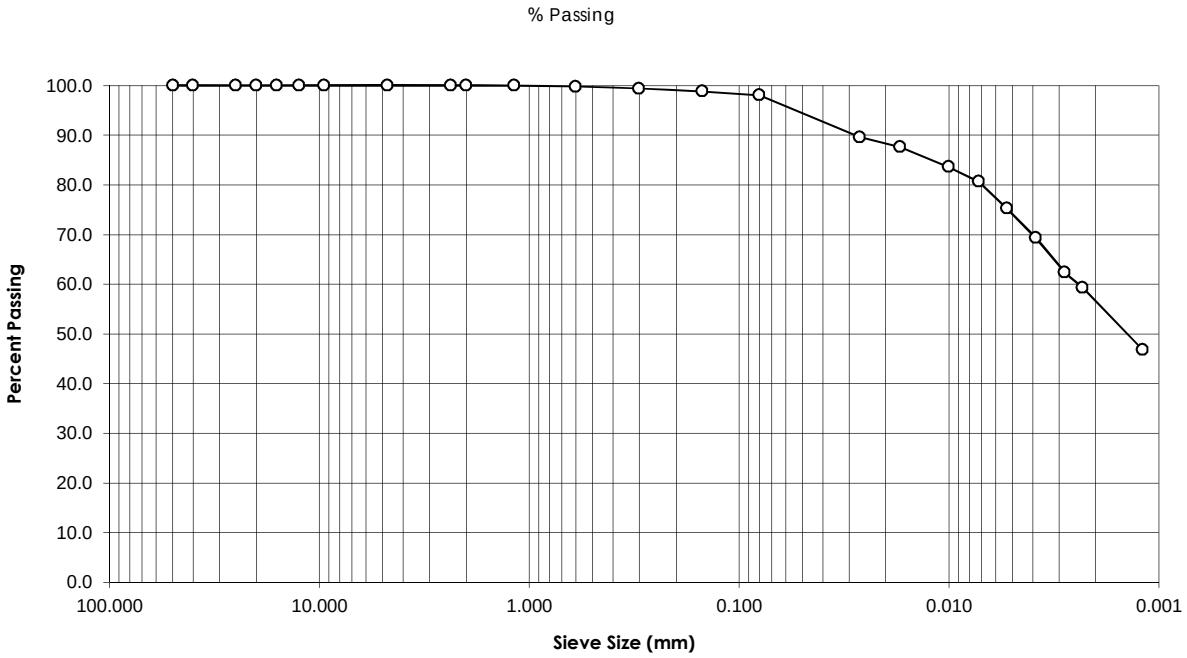
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST2
SOURCE: D68
TESTED BY: B. Pelkey

DATE TESTED: September 11, 2016
DATE RECEIVED: August 8, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 75.3 |
| 40.0 | 100.0 | 0.0038 | 69.3 |
| 25.0 | 100.0 | 0.0028 | 62.3 |
| 20.0 | 100.0 | 0.0023 | 59.3 |
| 16.0 | 100.0 | 0.0012 | 46.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.4 | | |
| 0.150 | 98.9 | | |
| 0.080 | 98.1 | | |
| 0.0267 | 89.6 | | |
| 0.0171 | 87.6 | | |
| 0.0101 | 83.6 | | |
| 0.0072 | 80.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.9% | $D_{30}$: | - |
| Silt: | 41.5% | $D_{60}$: | 0.0024 |
| Clay: | 56.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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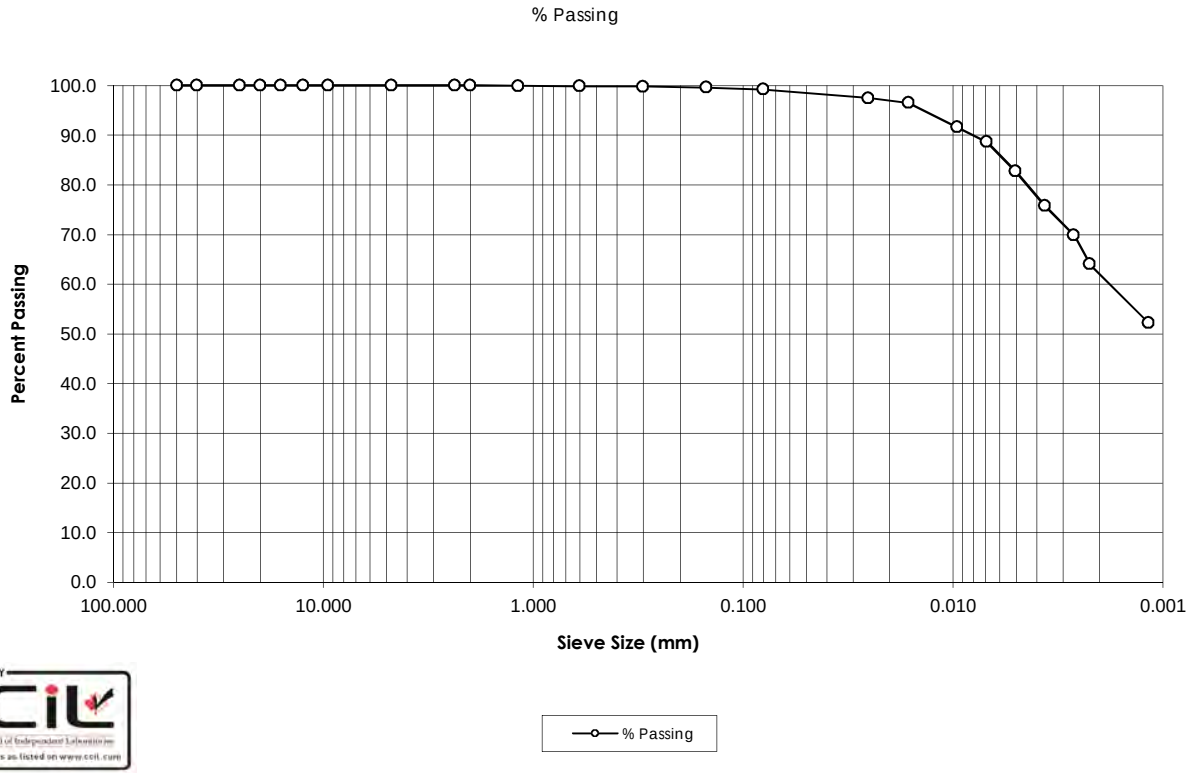
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST4
SOURCE: D68
TESTED BY: B. Pelkey

DATE TESTED: September 12, 2016
DATE RECEIVED: August 8, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0050 | 82.7 |
| 40.0 | 100.0 | 0.0037 | 75.8 |
| 25.0 | 100.0 | 0.0027 | 69.9 |
| 20.0 | 100.0 | 0.0022 | 64.0 |
| 16.0 | 100.0 | 0.0012 | 52.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.8 | | |
| 0.150 | 99.6 | | |
| 0.080 | 99.2 | | |
| 0.0253 | 97.5 | | |
| 0.0162 | 96.5 | | |
| 0.0096 | 91.6 | | |
| 0.0069 | 88.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.8% | $D_{30}$: | - |
| Silt: | 37.2% | $D_{60}$: | 0.0019 |
| Clay: | 62.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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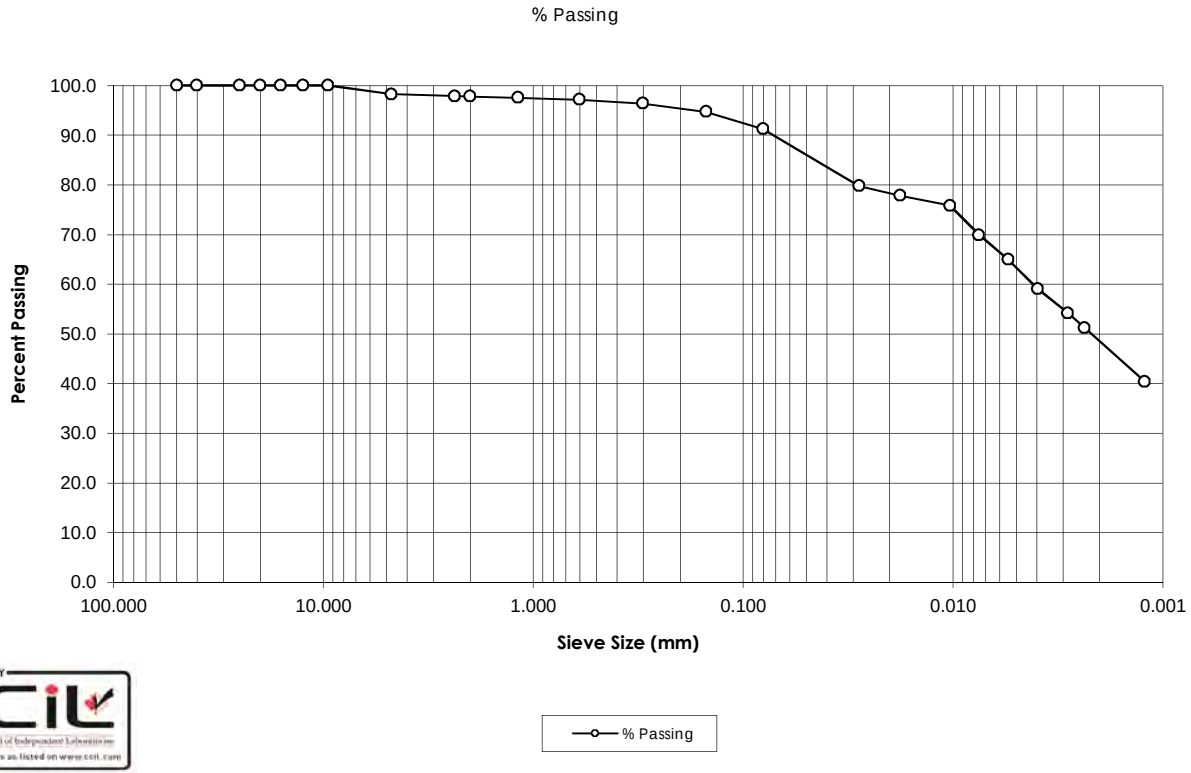
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST6
SOURCE: D68
TESTED BY: B. Pelkey

DATE TESTED: September 12, 2016
DATE RECEIVED: August 8, 2016
SAMPLE DESCRIPTION: Clay (CH-CI) Trace Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 65.0 |
| 40.0 | 100.0 | 0.0040 | 59.1 |
| 25.0 | 100.0 | 0.0028 | 54.2 |
| 20.0 | 100.0 | 0.0024 | 51.2 |
| 16.0 | 100.0 | 0.0012 | 40.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.3 | | |
| 2.36 | 97.9 | | |
| 2.00 | 97.8 | | |
| 1.18 | 97.5 | | |
| 0.600 | 97.2 | | |
| 0.300 | 96.4 | | |
| 0.150 | 94.7 | | |
| 0.080 | 91.2 | | |
| 0.0279 | 79.8 | | |
| 0.0178 | 77.8 | | |
| 0.0104 | 75.8 | | |
| 0.0075 | 69.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.7% | $D_{10}$: | - |
| Sand: | 7.1% | $D_{30}$: | - |
| Silt: | 42.7% | $D_{60}$: | 0.0042 |
| Clay: | 48.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. Stantec is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of Stantec.

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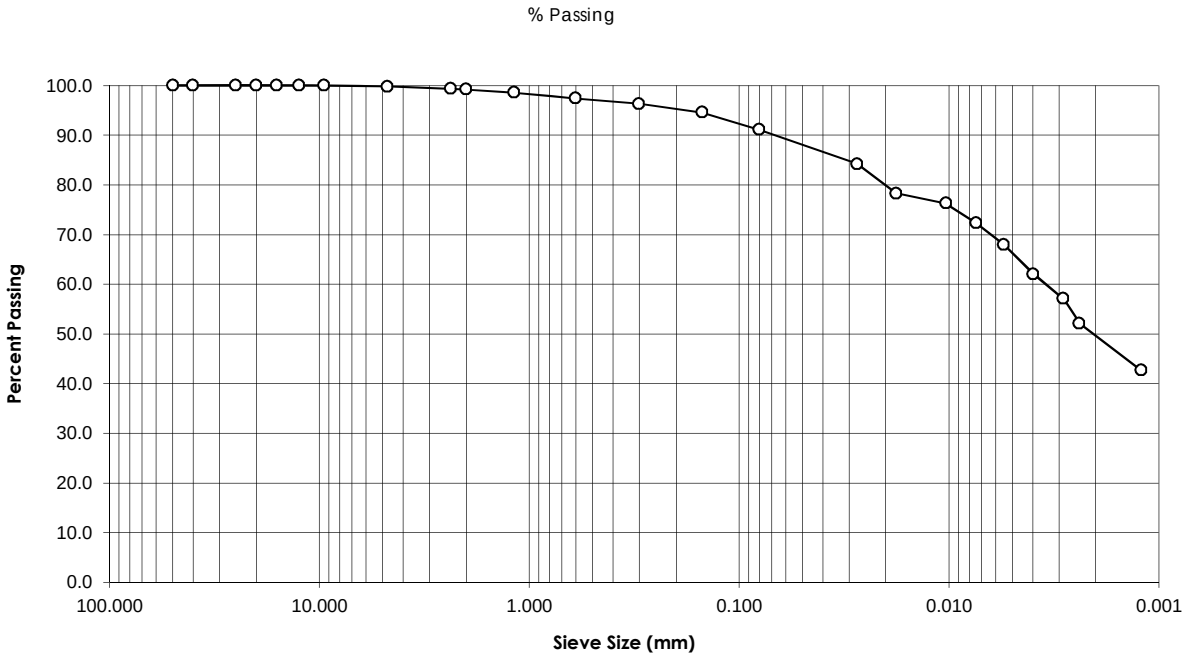
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST8
SOURCE: D68
TESTED BY: B. Pelkey

DATE TESTED: September 11, 2016
DATE RECEIVED: August 8, 2016
SAMPLE DESCRIPTION: Clay (CI-CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 68.0 |
| 40.0 | 100.0 | 0.0040 | 62.0 |
| 25.0 | 100.0 | 0.0028 | 57.1 |
| 20.0 | 100.0 | 0.0024 | 52.1 |
| 16.0 | 100.0 | 0.0012 | 42.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.8 | | |
| 2.36 | 99.3 | | |
| 2.00 | 99.2 | | |
| 1.18 | 98.6 | | |
| 0.600 | 97.4 | | |
| 0.300 | 96.3 | | |
| 0.150 | 94.6 | | |
| 0.080 | 91.1 | | |
| 0.0274 | 84.2 | | |
| 0.0178 | 78.3 | | |
| 0.0104 | 76.3 | | |
| 0.0074 | 72.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 8.7% | $D_{30}$: | - |
| Silt: | 41.5% | $D_{60}$: | 0.0035 |
| Clay: | 49.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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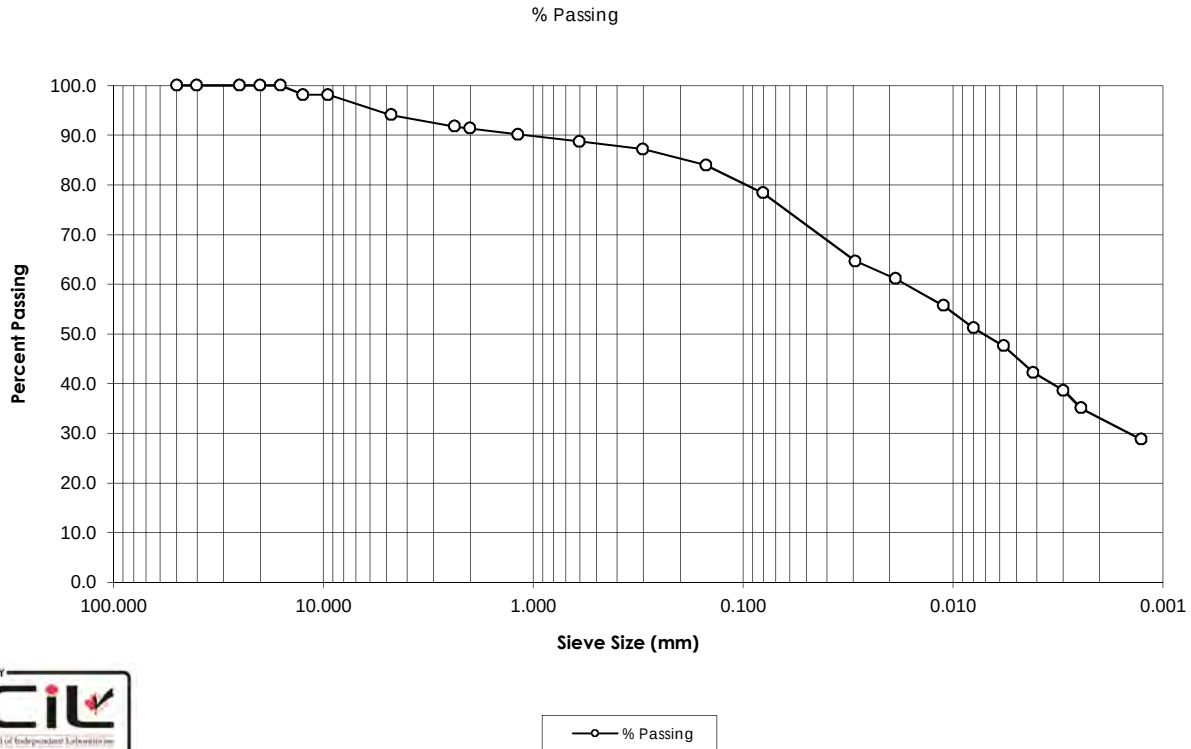
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

SAMPLE No.: ST10
SOURCE: D68
TESTED BY: B. Pelkey

DATE TESTED: September 12, 2016
DATE RECEIVED: August 8, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 47.6 |
| 40.0 | 100.0 | 0.0041 | 42.2 |
| 25.0 | 100.0 | 0.0030 | 38.6 |
| 20.0 | 100.0 | 0.0025 | 35.0 |
| 16.0 | 100.0 | 0.0013 | 28.7 |
| 12.5 | 98.1 | | |
| 9.5 | 98.1 | | |
| 4.75 | 94.1 | | |
| 2.36 | 91.8 | | |
| 2.00 | 91.3 | | |
| 1.18 | 90.1 | | |
| 0.600 | 88.7 | | |
| 0.300 | 87.2 | | |
| 0.150 | 83.9 | | |
| 0.080 | 78.3 | | |
| 0.0291 | 64.6 | | |
| 0.0187 | 61.1 | | |
| 0.0111 | 55.7 | | |
| 0.0080 | 51.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.9% | $D_{10}$: | - |
| Sand: | 15.8% | $D_{30}$: | 0.0015 |
| Silt: | 45.3% | $D_{60}$: | 0.0173 |
| Clay: | 33.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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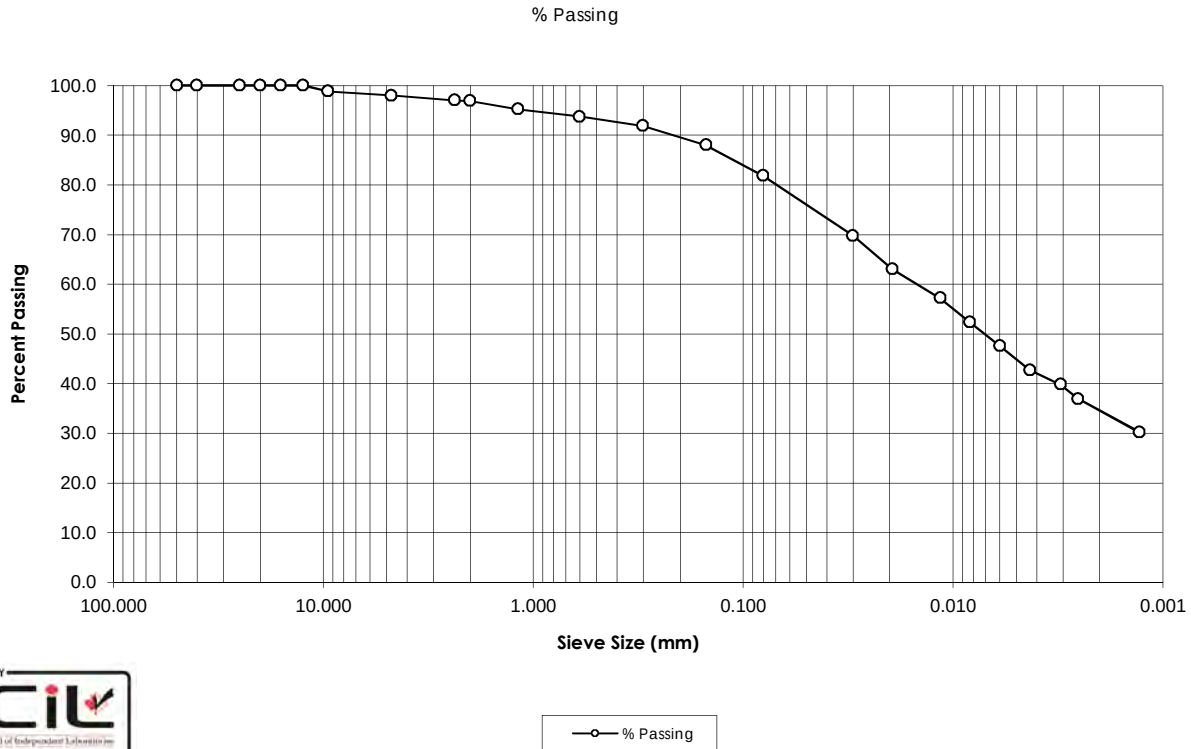
SAMPLE No.: BS12
SOURCE: D68
TESTED BY: B. Pelkey

DATE TESTED: October 26, 2016
DATE RECEIVED: August 9, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 47.6 |
| 40.0 | 100.0 | 0.0043 | 42.7 |
| 25.0 | 100.0 | 0.0031 | 39.8 |
| 20.0 | 100.0 | 0.0025 | 36.9 |
| 16.0 | 100.0 | 0.0013 | 30.2 |
| 12.5 | 100.0 | | |
| 9.5 | 98.8 | | |
| 4.75 | 98.0 | | |
| 2.36 | 97.1 | | |
| 2.00 | 96.9 | | |
| 1.18 | 95.3 | | |
| 0.600 | 93.7 | | |
| 0.300 | 91.9 | | |
| 0.150 | 88.0 | | |
| 0.080 | 81.9 | | |
| 0.0300 | 69.8 | | |
| 0.0194 | 63.0 | | |
| 0.0115 | 57.2 | | |
| 0.0083 | 52.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.0% | $D_{10}$: | - |
| Sand: | 16.1% | $D_{30}$: | - |
| Silt: | 47.3% | $D_{60}$: | 0.0154 |
| Clay: | 34.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.230

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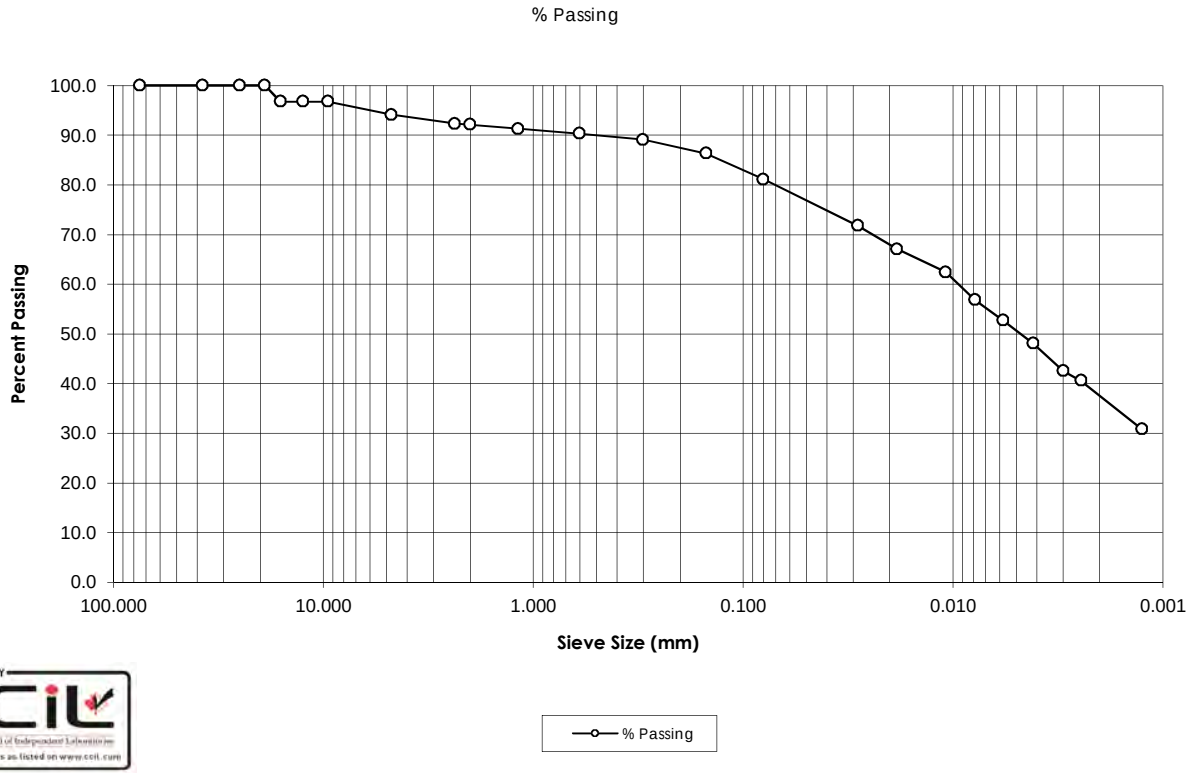
SAMPLE No.: ST15
SOURCE: D68
TESTED BY: B. Pelkey

DATE TESTED: September 11, 2016
DATE RECEIVED: August 8, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0057 | 52.7 |
| 37.5 | 100.0 | 0.0041 | 48.1 |
| 25.0 | 100.0 | 0.0030 | 42.5 |
| 19.0 | 100.0 | 0.0025 | 40.6 |
| 16.0 | 96.8 | 0.0013 | 30.7 |
| 12.5 | 96.8 | | |
| 9.5 | 96.8 | | |
| 4.75 | 94.1 | | |
| 2.36 | 92.4 | | |
| 2.00 | 92.1 | | |
| 1.18 | 91.3 | | |
| 0.600 | 90.3 | | |
| 0.300 | 89.1 | | |
| 0.150 | 86.3 | | |
| 0.080 | 81.1 | | |
| 0.0284 | 71.7 | | |
| 0.0184 | 67.1 | | |
| 0.0108 | 62.4 | | |
| 0.0078 | 56.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.9% | $D_{10}$: | - |
| Sand: | 13.0% | $D_{30}$: | - |
| Silt: | 43.5% | $D_{60}$: | 0.0096 |
| Clay: | 37.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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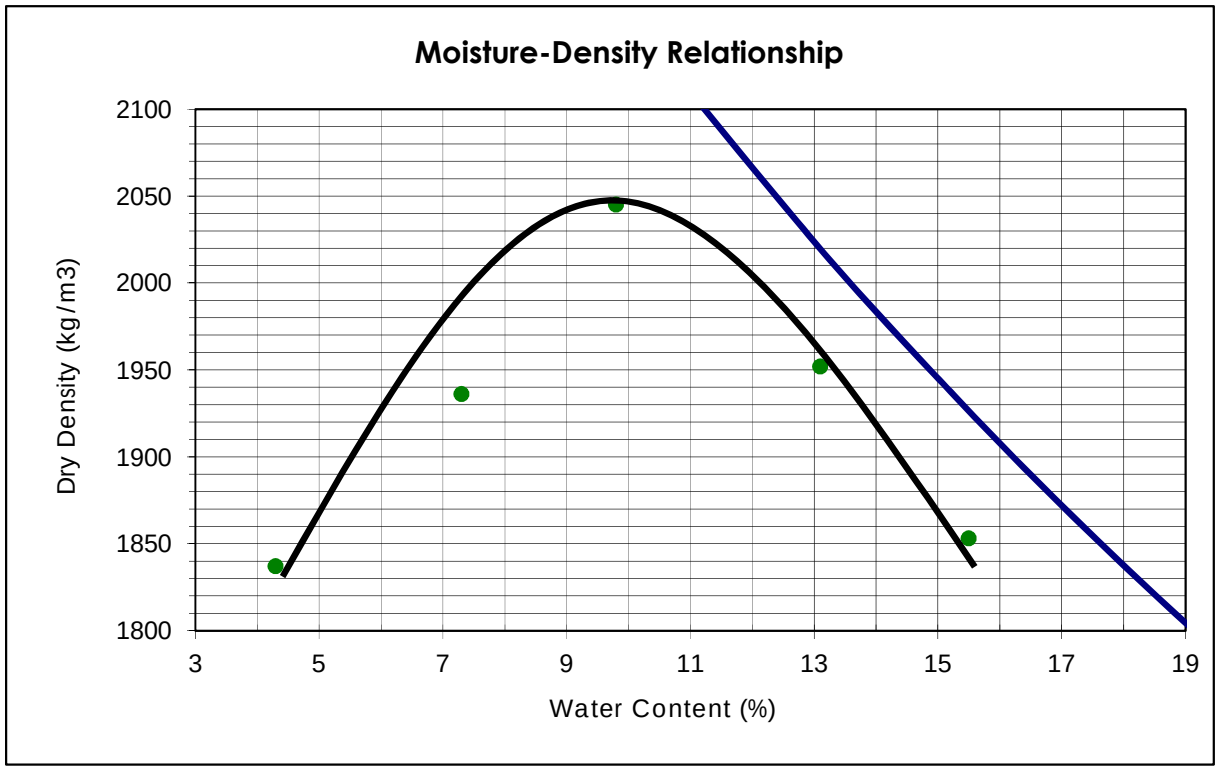
Fax: (403) 253-0021

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | June 20, 2016 |
| Project Name: | SR1 | Date Tested: | October 26, 2016 |
| Project No.: | 110773396.302.702.230 | Tested By: | M.Pilkington |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1837 | 1936 | 2045 | 1952 | 1853 |
| MOISTURE CONTENT (%) | 4.3 | 7.3 | 9.8 | 13.1 | 15.5 |

**Source of Sample:** D46 BSC
**Visual Soil Description:** Clayey (CL) Gravel with Sand
**Maximum Dry Density (kg/m3):** 2050
**Optimum M.C. (%):** 9.5
**Natural M.C.(%):** -






Reviewed by: _____

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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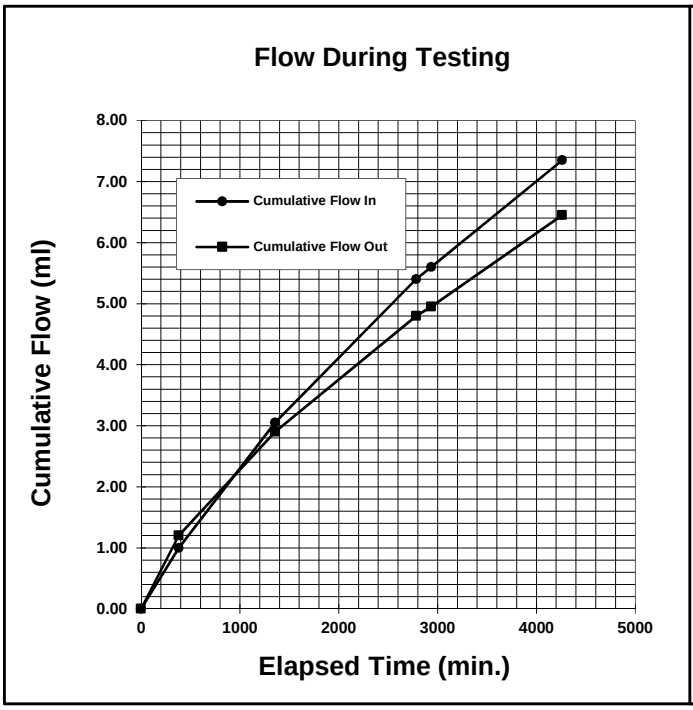
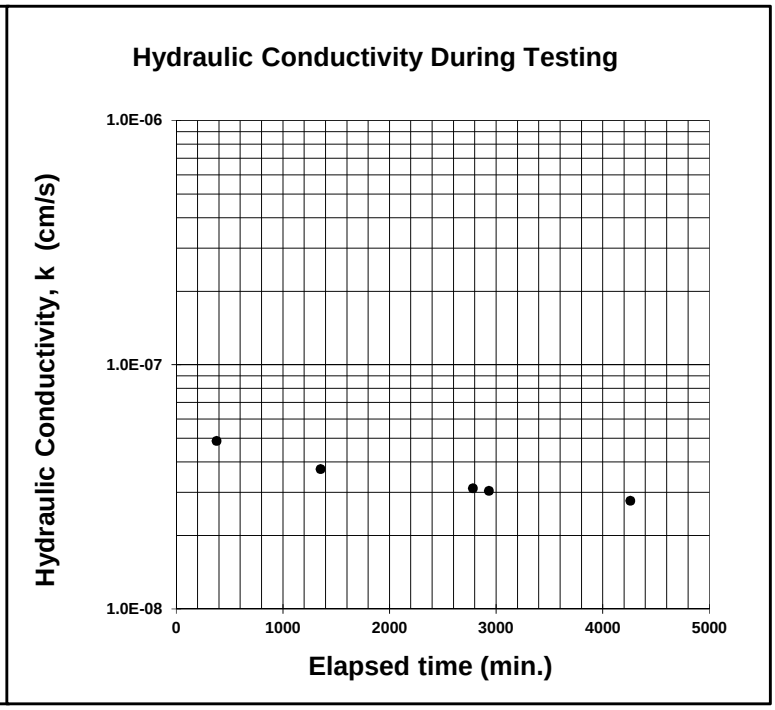
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 19, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Trace Gravel | **SAMPLE No.:** | D5 ST10 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 9.50 | Length (cm) | 9.58 |
| Diameter (cm) | 7.17 | Diameter (cm) | 7.26 |
| Area (cm ²) | 40.38 | Area (cm ²) | 41.40 |
| Total Mass (g) | 809.5 | Total Mass (g) | 832.8 |
| Volume (cm³) | 383.6 | Volume (cm³) | 396.6 |
| Water Content (%) | 14.4 | Water Content (%) | 17.9 |
| Degree of Saturation (%) | 84 | Beta Saturation (%) | 92 |
| Wet Density (g/cm³) | 2.110 | Wet Density (g/cm³) | 2.100 |
| Dry Density(g/cm³) | 1.844 | Dry Density(g/cm³) | 1.781 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 220 | Cell Pressure (kPa) | 240 |
| Top Cap Pressure(kPa) | 200 | Top Cap Pressure (kPa) | 220 |
| Bottom Cap Pressure(kPa) | 200 | Bottom Cap Pressure(kPa) | 200 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 21.5 |




**Hydraulic Conductivity (cm/s) = 3.5E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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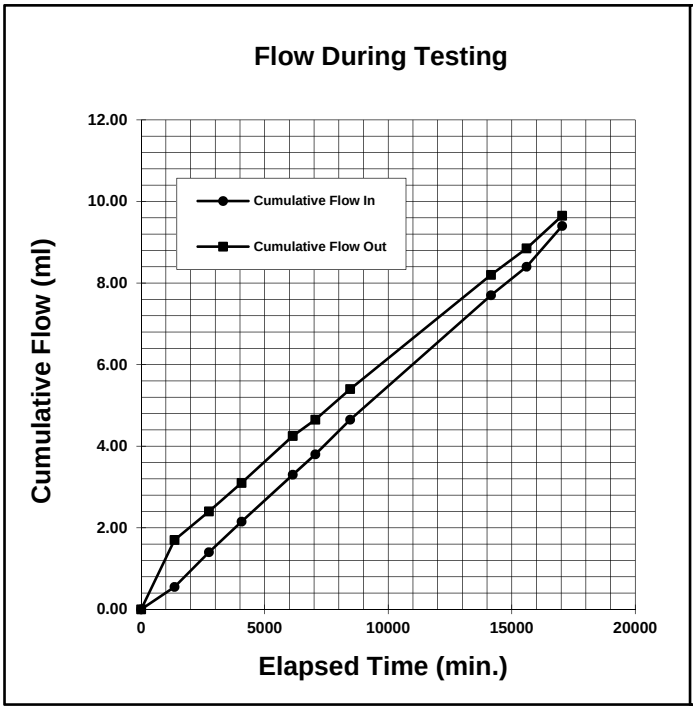
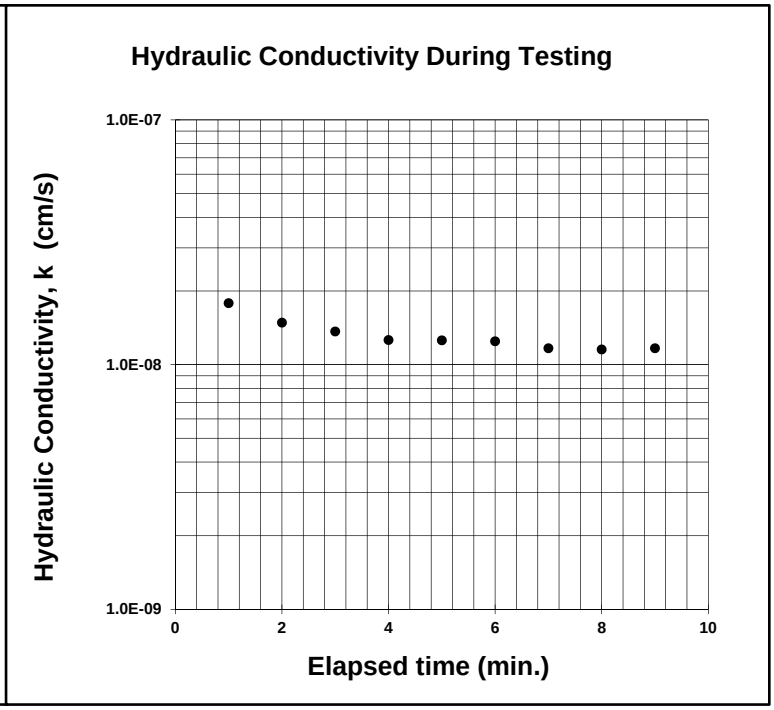
Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | June 10, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D13 ST7 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 11.02 | Length (cm) | 11.14 |
| Diameter (cm) | 7.28 | Diameter (cm) | 7.33 |
| Area (cm ²) | 41.62 | Area (cm ²) | 42.20 |
| Total Mass (g) | 913.3 | Total Mass (g) | 931.7 |
| Volume (cm³) | 458.7 | Volume (cm³) | 470.1 |
| Water Content (%) | 25.2 | Water Content (%) | 27.4 |
| Degree of Saturation (%) | 98 | Beta Saturation (%) | 98 |
| Wet Density (g/cm³) | 1.991 | Wet Density (g/cm³) | 1.982 |
| Dry Density(g/cm³) | 1.591 | Dry Density(g/cm³) | 1.556 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 430 | Cell Pressure (kPa) | 430 |
| Top Cap Pressure(kPa) | 410 | Top Cap Pressure (kPa) | 410 |
| Bottom Cap Pressure(kPa) | 410 | Bottom Cap Pressure(kPa) | 390 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 18.5 |




**Hydraulic Conductivity (cm/s) = 1.3E-08**

Reviewed by:

Stantec

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Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | June 10, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D13 ST14 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 7.98 |
| Diameter (cm) | 7.28 |
| Area (cm ²) | 41.62 |
| Total Mass (g) | 656.1 |
| Volume (cm³) | 332.2 |
| Water Content (%) | 27.9 |
| Degree of Saturation (%) | 101 |
| Wet Density (g/cm³) | 1.975 |
| Dry Density(g/cm³) | 1.544 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

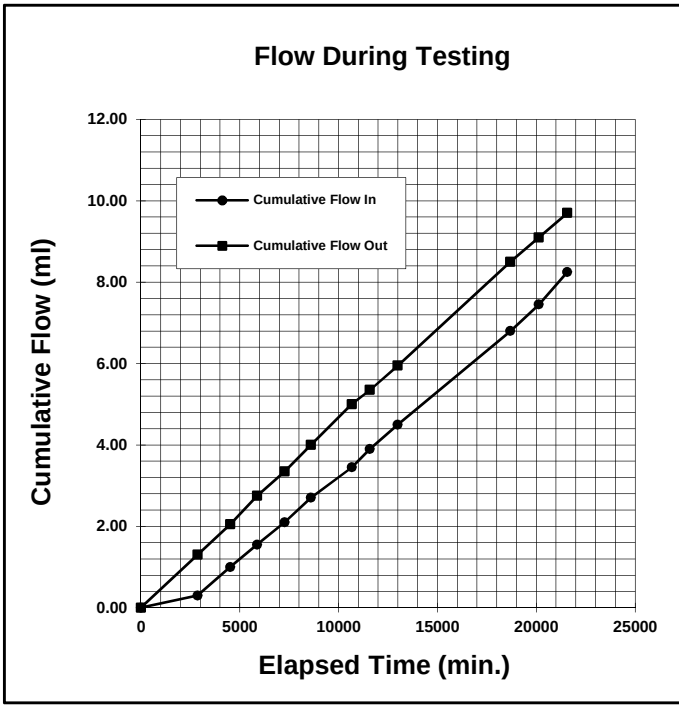
| | |
|---|---|
| Length (cm) | 8.07 |
| Diameter (cm) | 7.29 |
| Area (cm ²) | 41.74 |
| Total Mass (g) | 663.5 |
| Volume (cm³) | 336.8 |
| Water Content (%) | 30.2 |
| Beta Saturation (%) | 100 |
| Wet Density (g/cm³) | 1.970 |
| Dry Density(g/cm³) | 1.513 |

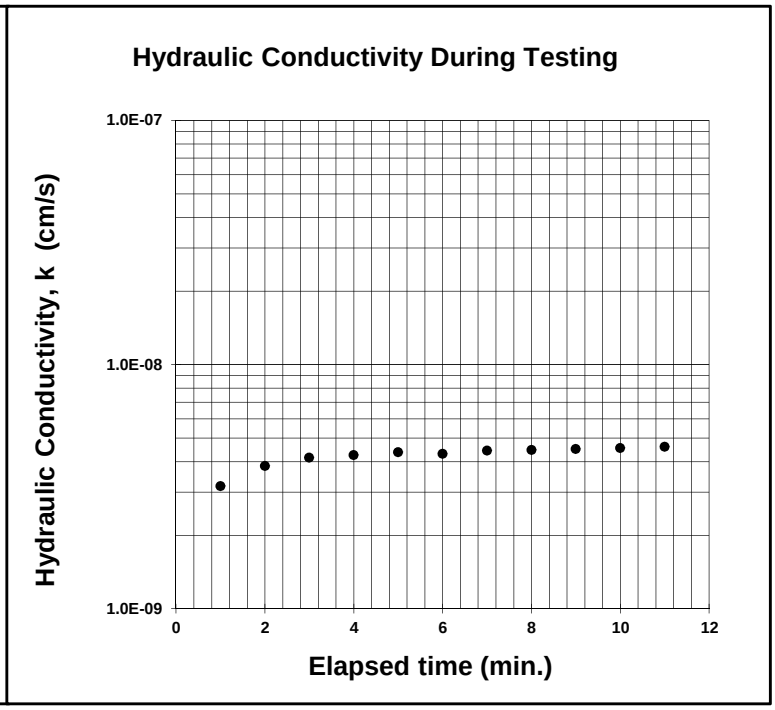
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 400 |
| Top Cap Pressure(kPa) | 380 |
| Bottom Cap Pressure(kPa) | 380 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 360 |
| Top Cap Pressure (kPa) | 340 |
| Bottom Cap Pressure(kPa) | 320 |
| Hydraulic Gradient | 25.6 |




**Hydraulic Conductivity (cm/s) = 4.5E-09**

Reviewed by:

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# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | June 10, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D17 ST10 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 12.28 |
| Diameter (cm) | 7.26 |
| Area (cm ²) | 41.40 |
| Total Mass (g) | 1010.6 |
| Volume (cm³) | 508.3 |
| Water Content (%) | 26.5 |
| Degree of Saturation (%) | 100 |
| Wet Density (g/cm³) | 1.988 |
| Dry Density(g/cm³) | 1.571 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

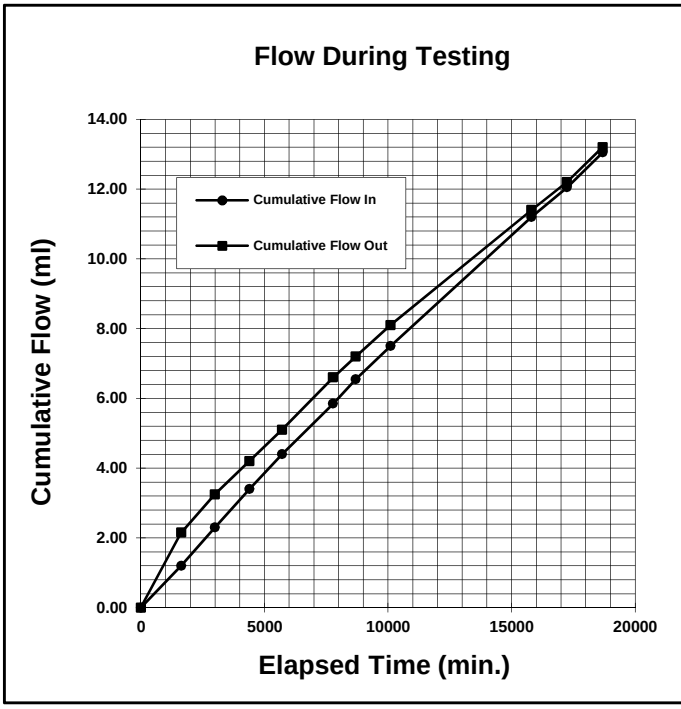
| | |
|---|---|
| Length (cm) | 12.42 |
| Diameter (cm) | 7.3 |
| Area (cm ²) | 41.85 |
| Total Mass (g) | 1025.2 |
| Volume (cm³) | 519.8 |
| Water Content (%) | 28.0 |
| Beta Saturation (%) | 99 |
| Wet Density (g/cm³) | 1.972 |
| Dry Density(g/cm³) | 1.540 |

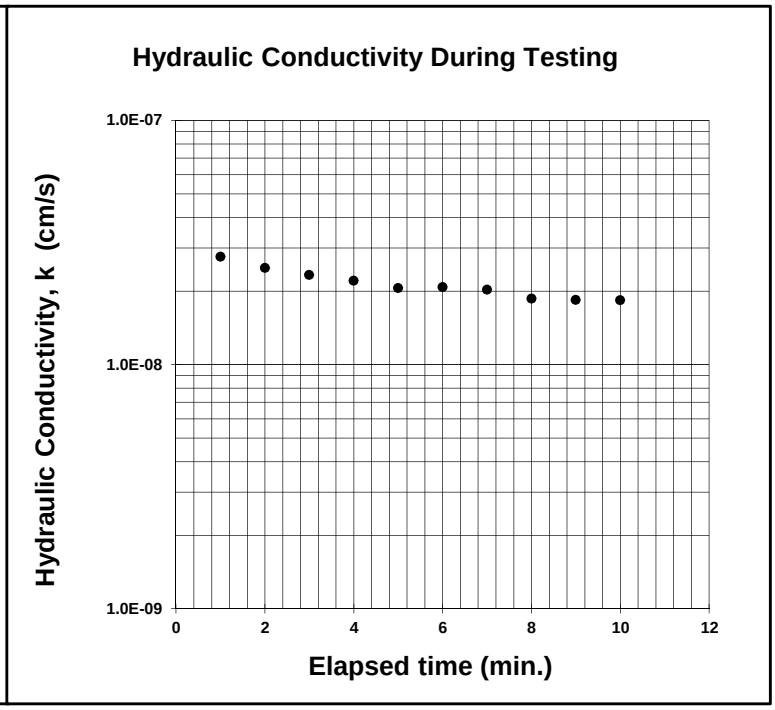
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 400 |
| Top Cap Pressure(kPa) | 380 |
| Bottom Cap Pressure(kPa) | 380 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 360 |
| Top Cap Pressure (kPa) | 340 |
| Bottom Cap Pressure(kPa) | 320 |
| Hydraulic Gradient | 16.6 |




**Hydraulic Conductivity (cm/s) = 2.1E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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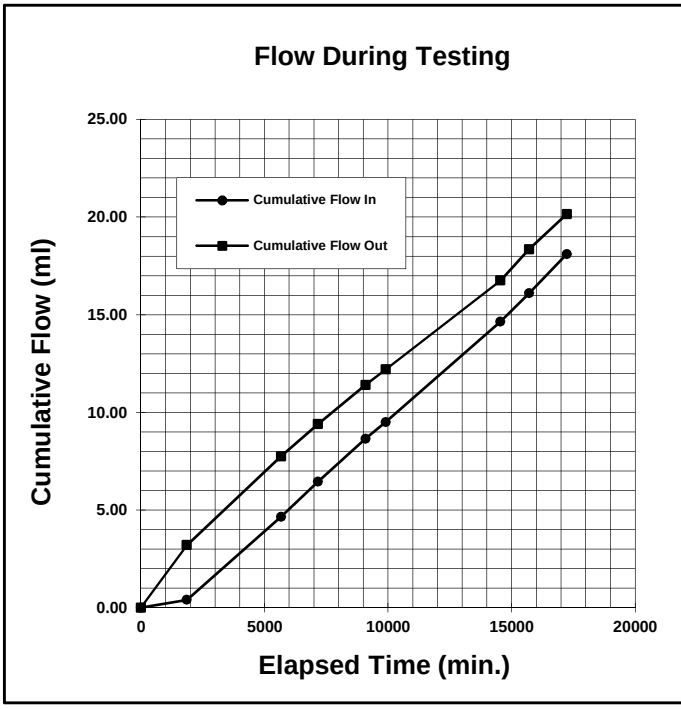
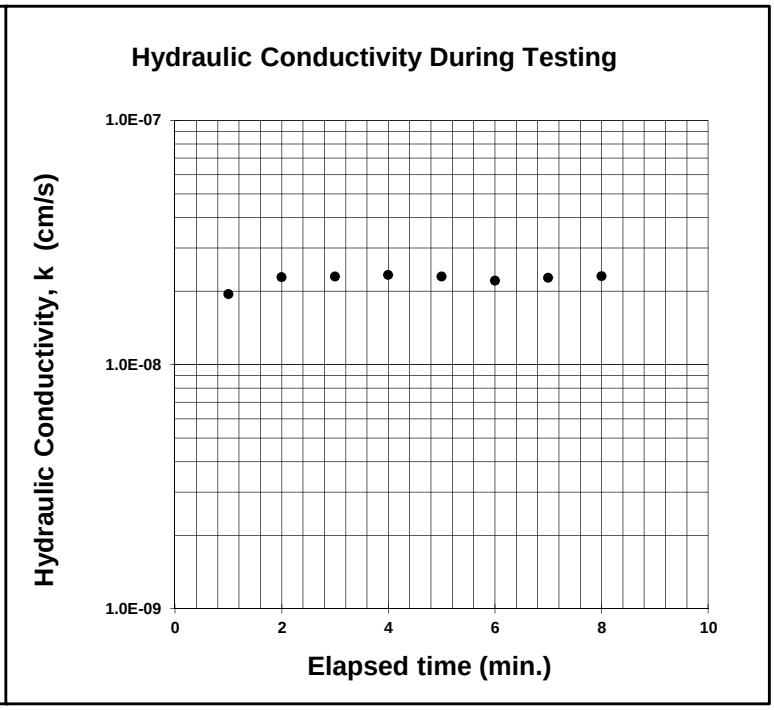
Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | August 3, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D28 ST6 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 10.75 | Length (cm) | 10.86 |
| Diameter (cm) | 7.23 | Diameter (cm) | 7.27 |
| Area (cm ²) | 41.06 | Area (cm ²) | 41.51 |
| Total Mass (g) | 906.1 | Total Mass (g) | 916.4 |
| Volume (cm³) | 441.3 | Volume (cm³) | 450.8 |
| Water Content (%) | 24.1 | Water Content (%) | 23.3 |
| Degree of Saturation (%) | 103 | Beta Saturation (%) | 98 |
| Wet Density (g/cm³) | 2.053 | Wet Density (g/cm³) | 2.033 |
| Dry Density(g/cm³) | 1.654 | Dry Density(g/cm³) | 1.649 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 80 | Cell Pressure (kPa) | 150 |
| Top Cap Pressure(kPa) | 60 | Top Cap Pressure (kPa) | 130 |
| Bottom Cap Pressure(kPa) | 60 | Bottom Cap Pressure(kPa) | 110 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 19.0 |




**Hydraulic Conductivity (cm/s) = 2.3E-08**

Reviewed by:

**LABORATORY**
199 Henlow Bay
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Stantec

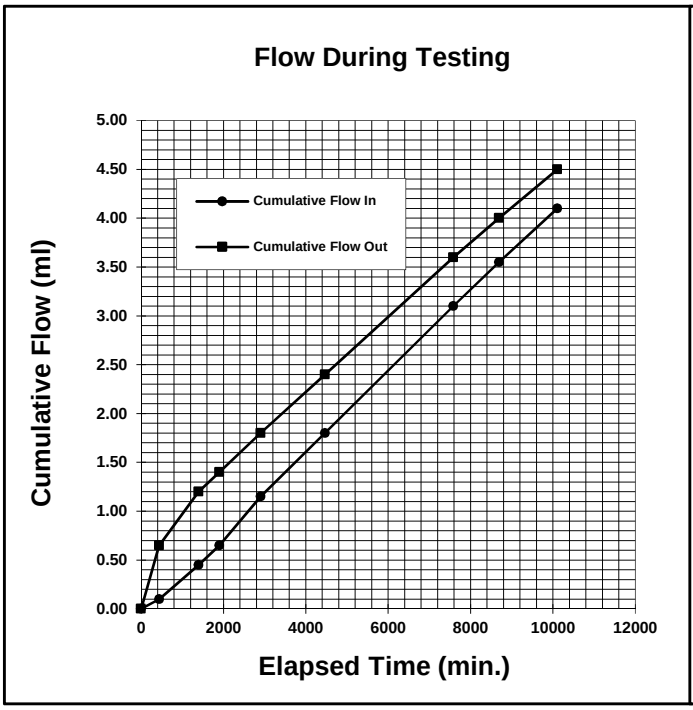
# Flexible Wall Hydraulic Conductivity Test ASTM D5084

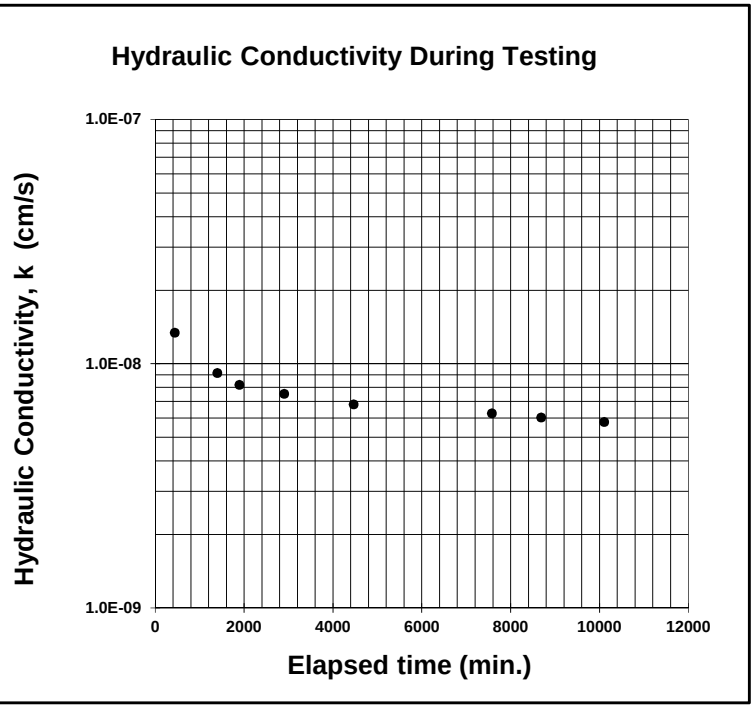
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 29, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Trace Sand | **SAMPLE No.:** | D29 S2 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 9.24 | Length (cm) | 9.29 |
| Diameter (cm) | 7.17 | Diameter (cm) | 7.26 |
| Area (cm ²) | 40.38 | Area (cm ²) | 41.40 |
| Total Mass (g) | 768.0 | Total Mass (g) | 779.6 |
| Volume (cm³) | 373.1 | Volume (cm³) | 384.6 |
| Water Content (%) | 22.1 | Water Content (%) | 21.6 |
| Degree of Saturation (%) | 99 | Beta Saturation (%) | 93 |
| Wet Density (g/cm³) | 2.059 | Wet Density (g/cm³) | 2.027 |
| Dry Density(g/cm³) | 1.686 | Dry Density(g/cm³) | 1.668 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 360 | Cell Pressure (kPa) | 430 |
| Top Cap Pressure(kPa) | 340 | Top Cap Pressure (kPa) | 410 |
| Bottom Cap Pressure(kPa) | 340 | Bottom Cap Pressure(kPa) | 390 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 22.1 |




**Hydraulic Conductivity (cm/s) = 6.8E-09**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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**LABORATORY**
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Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

Tested by: C. Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 2, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D36 ST4 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 10.82 |
| Diameter (cm) | 7.20 |
| Area (cm ²) | 40.72 |
| Total Mass (g) | 896.1 |
| Volume (cm³) | 440.5 |
| Water Content (%) | 23.7 |
| Degree of Saturation (%) | 100 |
| Wet Density (g/cm³) | 2.034 |
| Dry Density(g/cm³) | 1.645 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

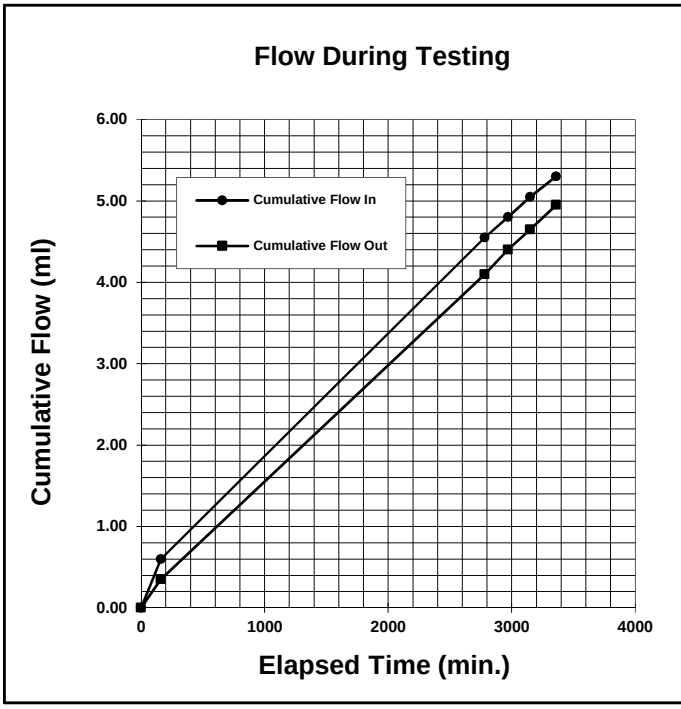
| | |
|---|---|
| Length (cm) | 11.00 |
| Diameter (cm) | 7.24 |
| Area (cm ²) | 41.17 |
| Total Mass (g) | 914.7 |
| Volume (cm³) | 452.9 |
| Water Content (%) | 23.6 |
| Beta Saturation (%) | 100 |
| Wet Density (g/cm³) | 2.020 |
| Dry Density(g/cm³) | 1.634 |

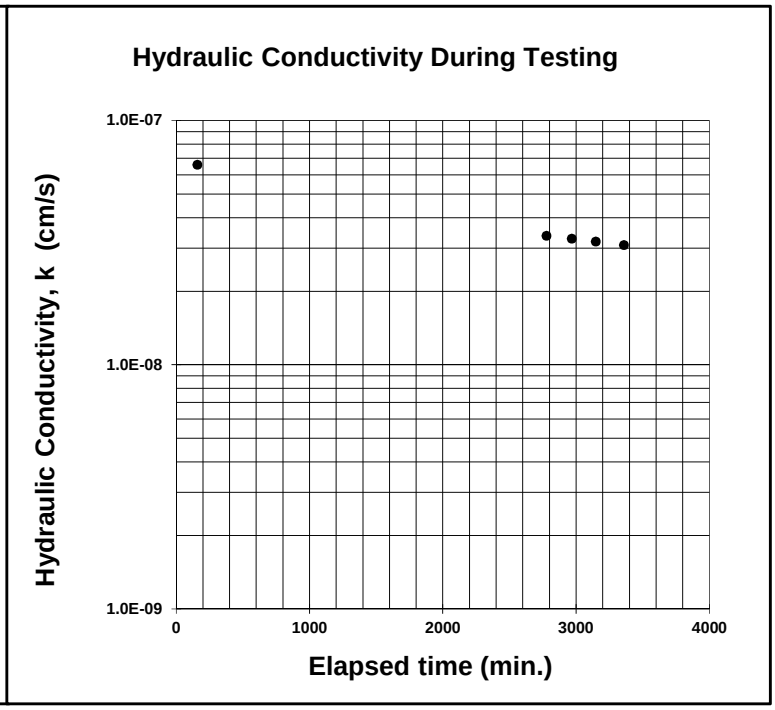
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 150 |
| Top Cap Pressure(kPa) | 130 |
| Bottom Cap Pressure(kPa) | 130 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 170 |
| Top Cap Pressure (kPa) | 150 |
| Bottom Cap Pressure(kPa) | 130 |
| Hydraulic Gradient | 18.8 |




**Hydraulic Conductivity (cm/s) = 3.2E-08**

Reviewed by:

Stantec

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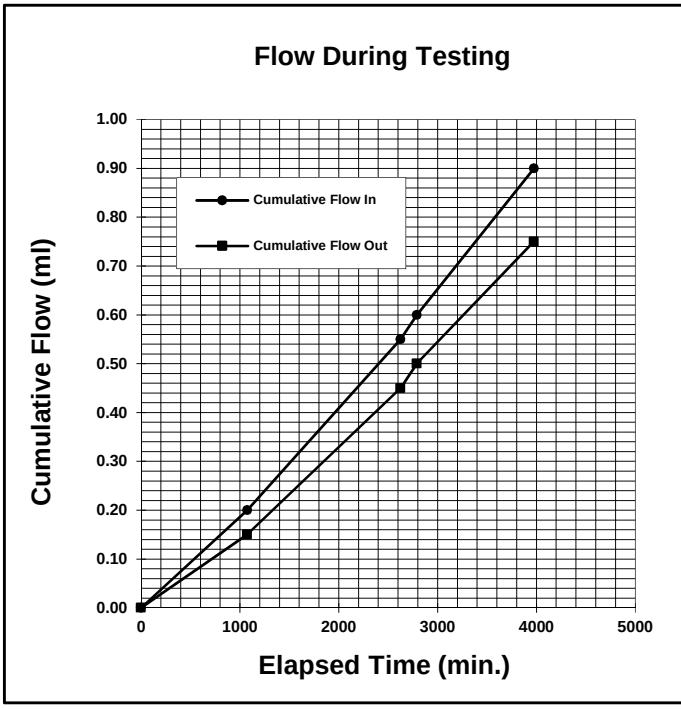
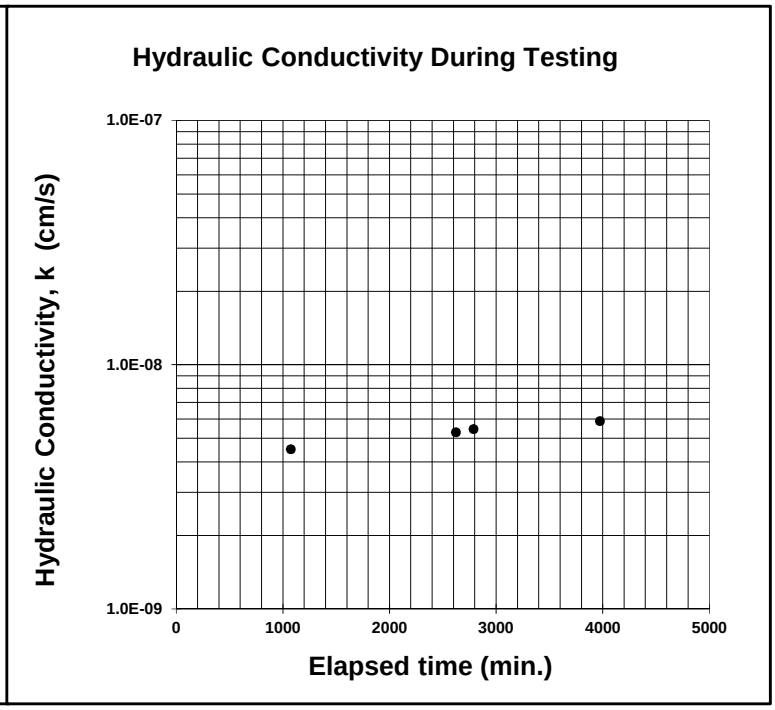
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 26, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Trace Sand | **SAMPLE No.:** | D38 S4 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 11.86 | Length (cm) | 12.05 |
| Diameter (cm) | 6.90 | Diameter (cm) | 7.16 |
| Area (cm ²) | 37.39 | Area (cm ²) | 40.26 |
| Total Mass (g) | 896.1 | Total Mass (g) | 917.6 |
| Volume (cm³) | 443.5 | Volume (cm³) | 485.2 |
| Water Content (%) | 28.6 | Water Content (%) | 29.0 |
| Degree of Saturation (%) | 108 | Beta Saturation (%) | 92 |
| Wet Density (g/cm³) | 2.021 | Wet Density (g/cm³) | 1.891 |
| Dry Density(g/cm³) | 1.571 | Dry Density(g/cm³) | 1.466 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 150 | Cell Pressure (kPa) | 170 |
| Top Cap Pressure(kPa) | 130 | Top Cap Pressure (kPa) | 150 |
| Bottom Cap Pressure(kPa) | 130 | Bottom Cap Pressure(kPa) | 130 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 17.2 |




**Hydraulic Conductivity (cm/s) = 5.3E-09**

Reviewed by:

Stantec

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Tested by: C. Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 2, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D42 ST4 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 10.41 |
| Diameter (cm) | 7.28 |
| Area (cm ²) | 41.62 |
| Total Mass (g) | 866.8 |
| Volume (cm³) | 433.3 |
| Water Content (%) | 21.6 |
| Degree of Saturation (%) | 91 |
| Wet Density (g/cm³) | 2.000 |
| Dry Density(g/cm³) | 1.645 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

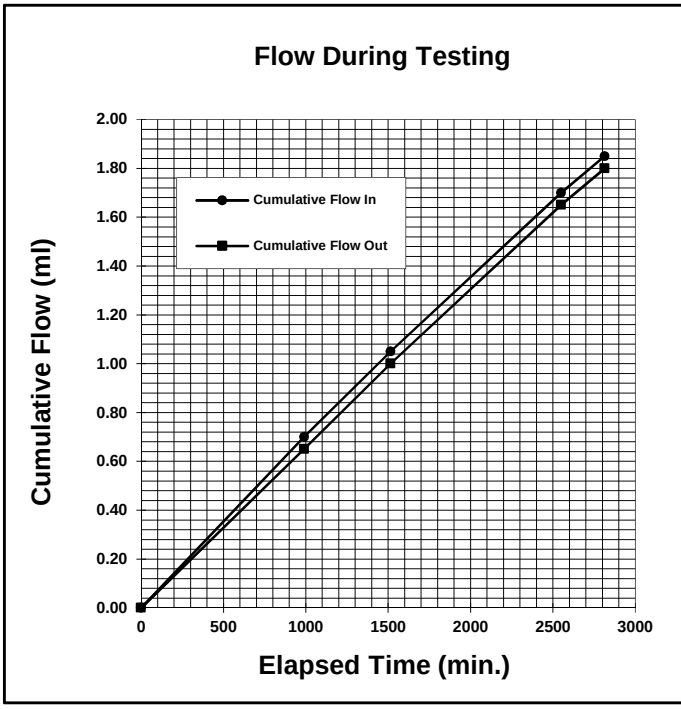
| | |
|---|---|
| Length (cm) | 10.48 |
| Diameter (cm) | 7.25 |
| Area (cm ²) | 41.28 |
| Total Mass (g) | 881.6 |
| Volume (cm³) | 432.6 |
| Water Content (%) | 20.2 |
| Beta Saturation (%) | 97 |
| Wet Density (g/cm³) | 2.038 |
| Dry Density(g/cm³) | 1.696 |

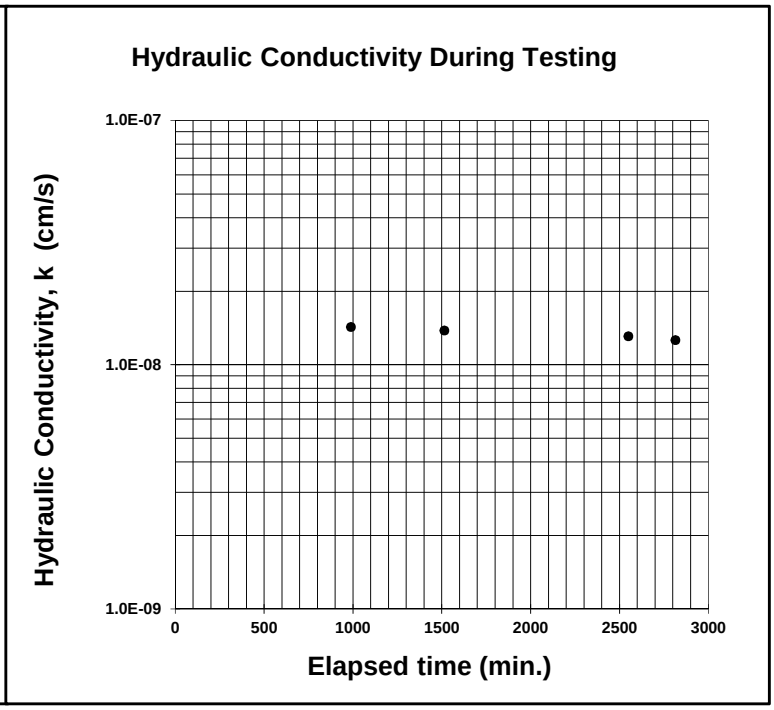
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 290 |
| Top Cap Pressure(kPa) | 270 |
| Bottom Cap Pressure(kPa) | 270 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 360 |
| Top Cap Pressure (kPa) | 340 |
| Bottom Cap Pressure(kPa) | 320 |
| Hydraulic Gradient | 19.6 |




**Hydraulic Conductivity (cm/s) = 1.3E-08**

Reviewed by:

Stantec

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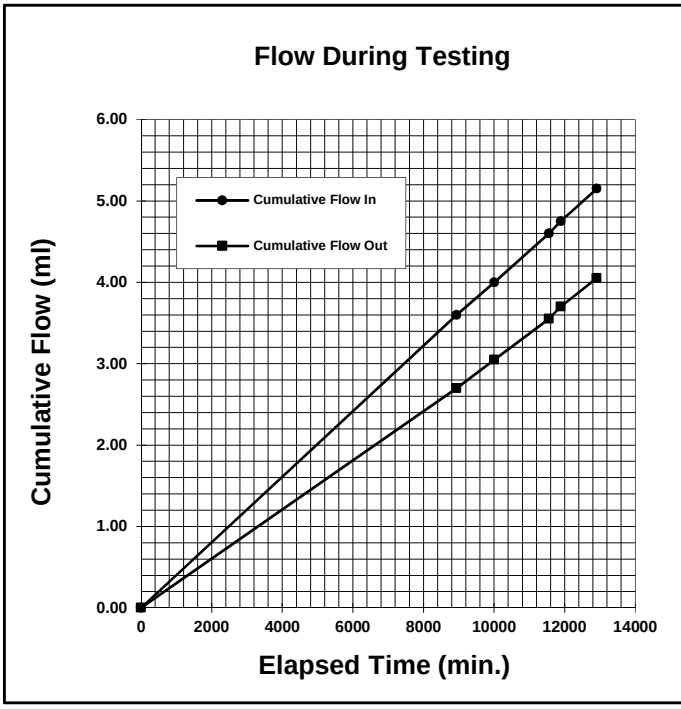
Tel: (403) 253-7876

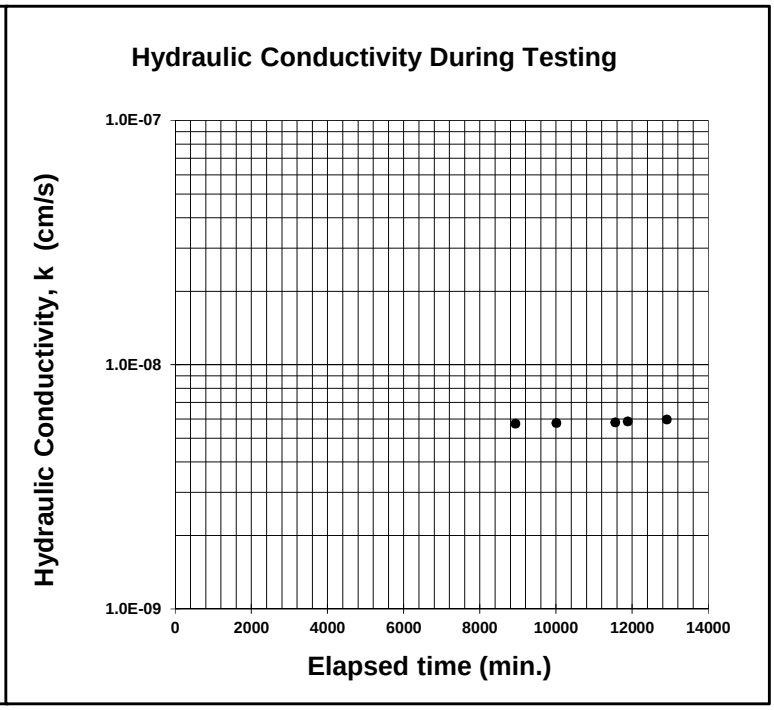
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | November 3, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Trace Gravel | **SAMPLE No.:** | D42 ST8 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 9.28 | Length (cm) | 9.55 |
| Diameter (cm) | 7.25 | Diameter (cm) | 7.33 |
| Area (cm ²) | 41.28 | Area (cm ²) | 42.20 |
| Total Mass (g) | 808.0 | Total Mass (g) | 825.6 |
| Volume (cm³) | 383.1 | Volume (cm³) | 403.0 |
| Water Content (%) | 19.4 | Water Content (%) | 20.4 |
| Degree of Saturation (%) | 99 | Beta Saturation (%) | 94 |
| Wet Density (g/cm³) | 2.109 | Wet Density (g/cm³) | 2.049 |
| Dry Density(g/cm³) | 1.766 | Dry Density(g/cm³) | 1.701 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 360 | Cell Pressure (kPa) | 430 |
| Top Cap Pressure(kPa) | 340 | Top Cap Pressure (kPa) | 410 |
| Bottom Cap Pressure(kPa) | 340 | Bottom Cap Pressure(kPa) | 390 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 22.0 |




**Hydraulic Conductivity (cm/s) = 5.8E-09**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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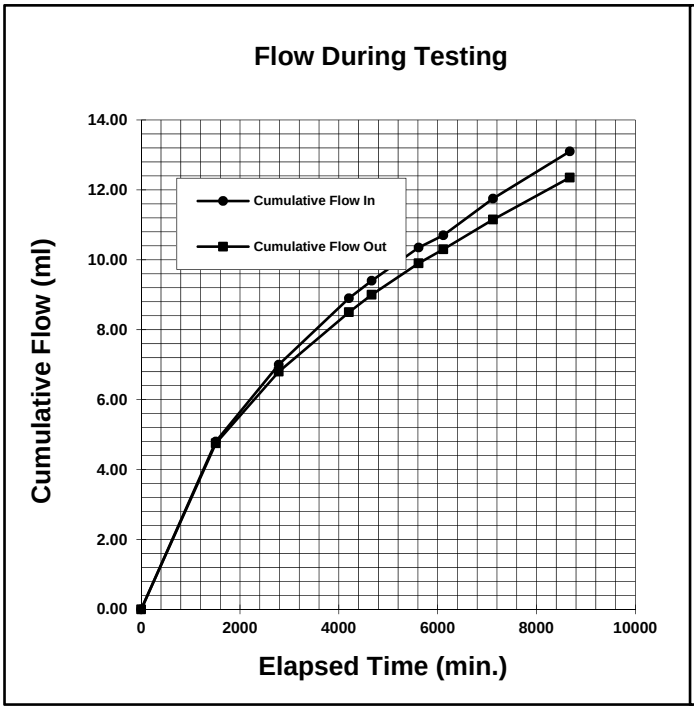
Tel: (403) 253-7876

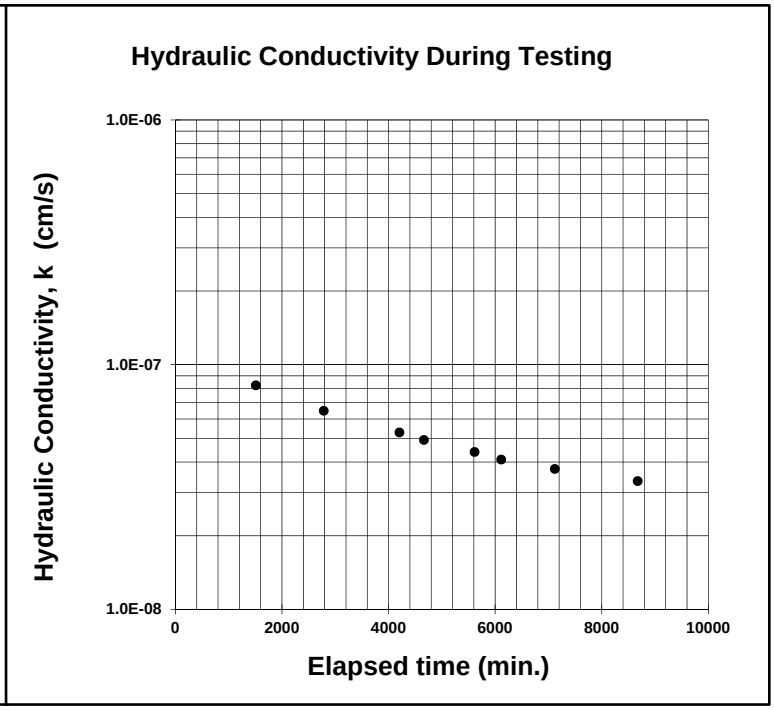
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 26, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Tr. Sand, Tr. Gravel | **SAMPLE No.:** | D46 BSC |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 11.82 | Length (cm) | 11.82 |
| Diameter (cm) | 7.25 | Diameter (cm) | 7.25 |
| Area (cm ²) | 41.28 | Area (cm ²) | 41.28 |
| Total Mass (g) | 1086.2 | Total Mass (g) | 1100.3 |
| Volume (cm³) | 488.0 | Volume (cm³) | 488.0 |
| Water Content (%) | 11.3 | Water Content (%) | 12.3 |
| Degree of Saturation (%) | 87 | Beta Saturation (%) | 92 |
| Wet Density (g/cm³) | 2.226 | Wet Density (g/cm³) | 2.255 |
| Dry Density(g/cm³) | 2.000 | Dry Density(g/cm³) | 2.009 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 360 | Cell Pressure (kPa) | 380 |
| Top Cap Pressure(kPa) | 340 | Top Cap Pressure (kPa) | 360 |
| Bottom Cap Pressure(kPa) | 340 | Bottom Cap Pressure(kPa) | 340 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 17.3 |




**Hydraulic Conductivity (cm/s) = 5.1E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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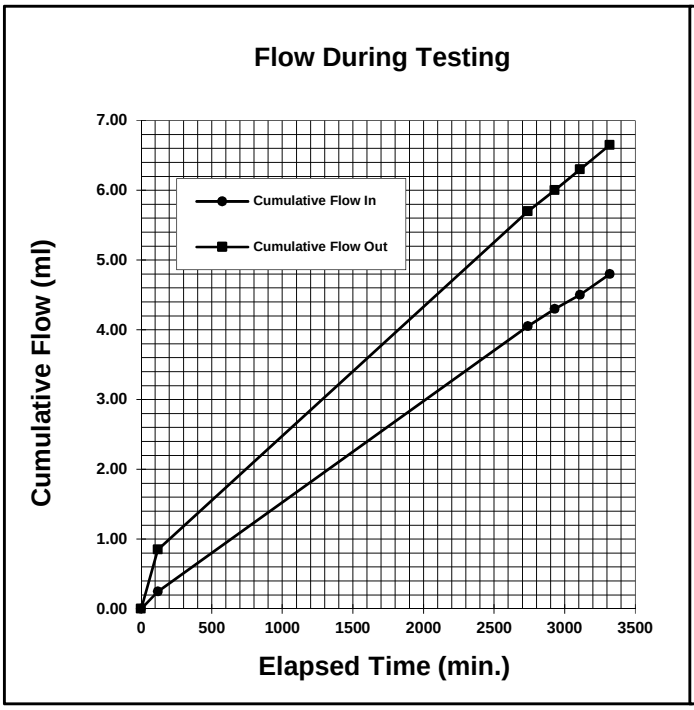
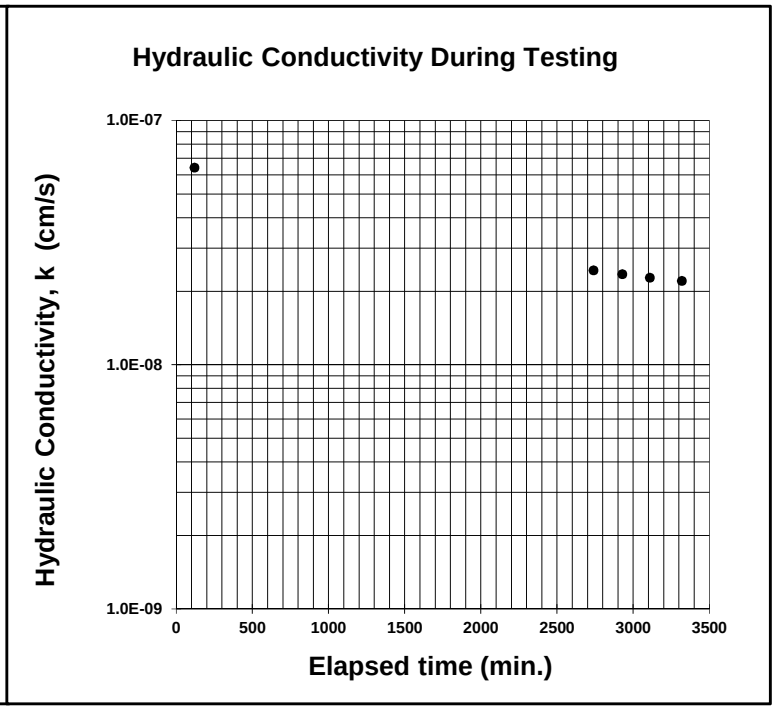
Tested by: C. Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 2, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D48 ST2 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 8.70 | Length (cm) | 8.87 |
| Diameter (cm) | 7.22 | Diameter (cm) | 7.34 |
| Area (cm ²) | 40.94 | Area (cm ²) | 42.31 |
| Total Mass (g) | 765.7 | Total Mass (g) | 794.4 |
| Volume (cm³) | 356.2 | Volume (cm³) | 375.3 |
| Water Content (%) | 14.4 | Water Content (%) | 14.9 |
| Degree of Saturation (%) | 89 | Beta Saturation (%) | 97 |
| Wet Density (g/cm³) | 2.150 | Wet Density (g/cm³) | 2.117 |
| Dry Density(g/cm³) | 1.880 | Dry Density(g/cm³) | 1.843 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 290 | Cell Pressure (kPa) | 360 |
| Top Cap Pressure(kPa) | 270 | Top Cap Pressure (kPa) | 340 |
| Bottom Cap Pressure(kPa) | 270 | Bottom Cap Pressure(kPa) | 320 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 23.4 |




**Hydraulic Conductivity (cm/s) = 2.3E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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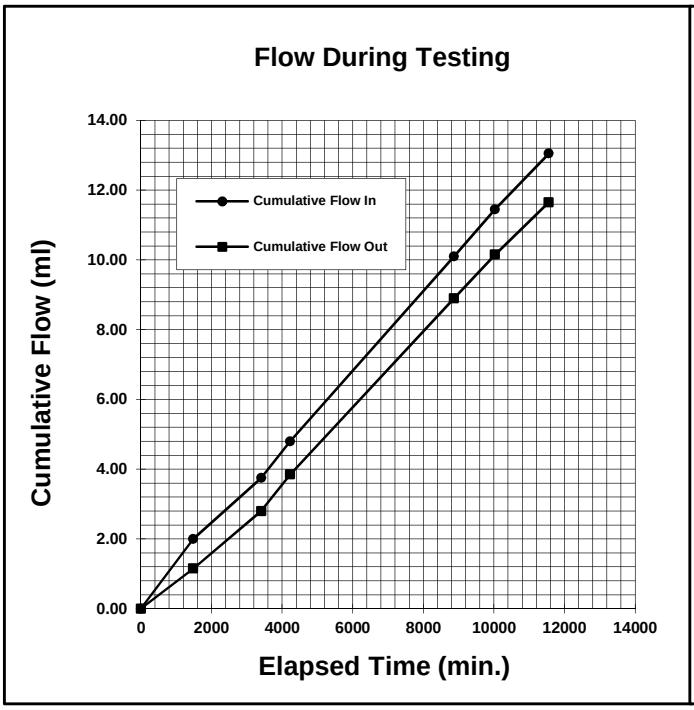
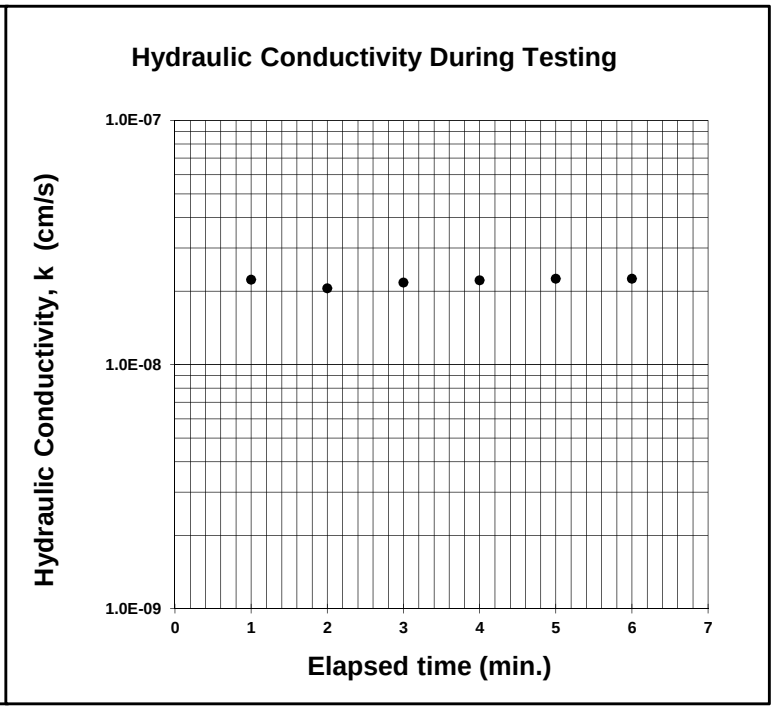
Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | August 3, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D58 ST2 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 10.84 | Length (cm) | 11.10 |
| Diameter (cm) | 7.27 | Diameter (cm) | 7.34 |
| Area (cm ²) | 41.51 | Area (cm ²) | 42.31 |
| Total Mass (g) | 915.6 | Total Mass (g) | 950.5 |
| Volume (cm³) | 450.0 | Volume (cm³) | 469.7 |
| Water Content (%) | 19.4 | Water Content (%) | 23.0 |
| Degree of Saturation (%) | 90 | Beta Saturation (%) | 99 |
| Wet Density (g/cm³) | 2.035 | Wet Density (g/cm³) | 2.024 |
| Dry Density(g/cm³) | 1.704 | Dry Density(g/cm³) | 1.645 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 150 | Cell Pressure (kPa) | 220 |
| Top Cap Pressure(kPa) | 130 | Top Cap Pressure (kPa) | 200 |
| Bottom Cap Pressure(kPa) | 130 | Bottom Cap Pressure(kPa) | 180 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 18.8 |




**Hydraulic Conductivity (cm/s) = 2.2E-08**

Reviewed by:

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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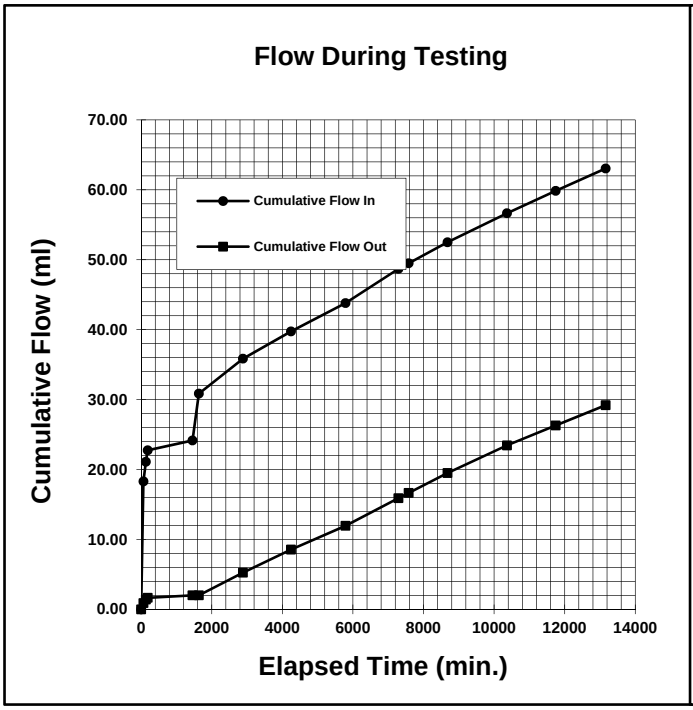
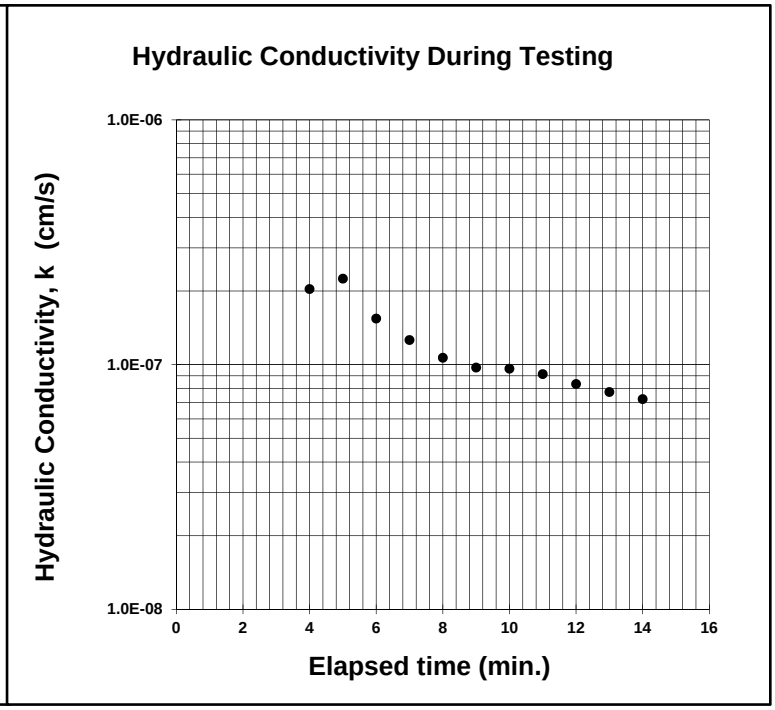
Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | July 20, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D59 ST10 |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 11.30 | Length (cm) | 11.39 |
| Diameter (cm) | 7.25 | Diameter (cm) | 7.3 |
| Area (cm ²) | 41.28 | Area (cm ²) | 41.85 |
| Total Mass (g) | 947.3 | Total Mass (g) | 954.2 |
| Volume (cm³) | 466.5 | Volume (cm³) | 476.7 |
| Water Content (%) | 24.7 | Water Content (%) | 25.0 |
| Degree of Saturation (%) | 101 | Beta Saturation (%) | 100 |
| Wet Density (g/cm³) | 2.031 | Wet Density (g/cm³) | 2.002 |
| Dry Density(g/cm³) | 1.629 | Dry Density(g/cm³) | 1.602 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 400 | Cell Pressure (kPa) | 170 |
| Top Cap Pressure(kPa) | 380 | Top Cap Pressure (kPa) | 150 |
| Bottom Cap Pressure(kPa) | 380 | Bottom Cap Pressure(kPa) | 130 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 18.0 |




**Hydraulic Conductivity (cm/s) = 9.4E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

**OFFICE**
325 - 25th Street SE
Suite 200
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Tel: (403) 716-8000

**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | July 25, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D59 ST16 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 10.90 |
| Diameter (cm) | 7.26 |
| Area (cm ²) | 41.40 |
| Total Mass (g) | 930.5 |
| Volume (cm³) | 451.2 |
| Water Content (%) | 22.4 |
| Degree of Saturation (%) | 101 |
| Wet Density (g/cm³) | 2.062 |
| Dry Density(g/cm³) | 1.685 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

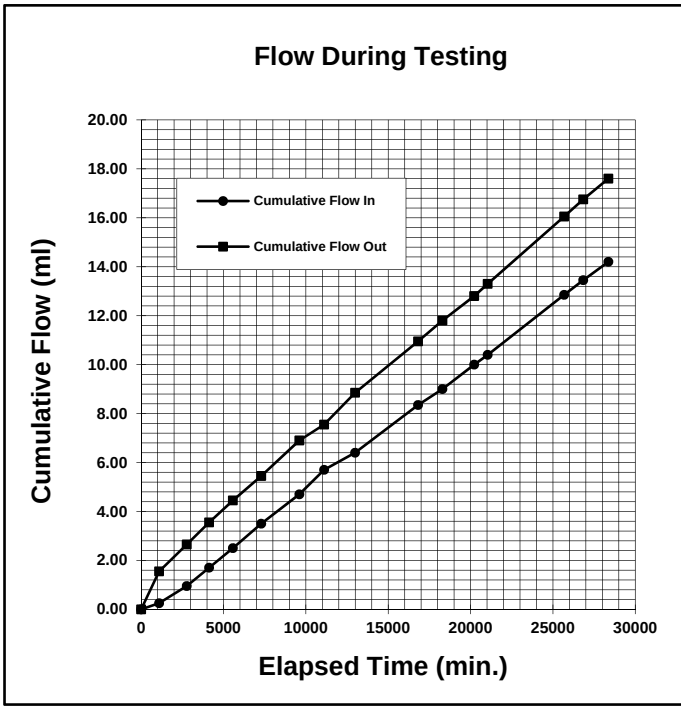
| | |
|---|---|
| Length (cm) | 7.30 |
| Diameter (cm) | 11.06 |
| Area (cm ²) | 96.07 |
| Total Mass (g) | 940.7 |
| Volume (cm³) | 701.3 |
| Water Content (%) | 23.3 |
| Beta Saturation (%) | 96 |
| Wet Density (g/cm³) | 1.341 |
| Dry Density(g/cm³) | 1.088 |

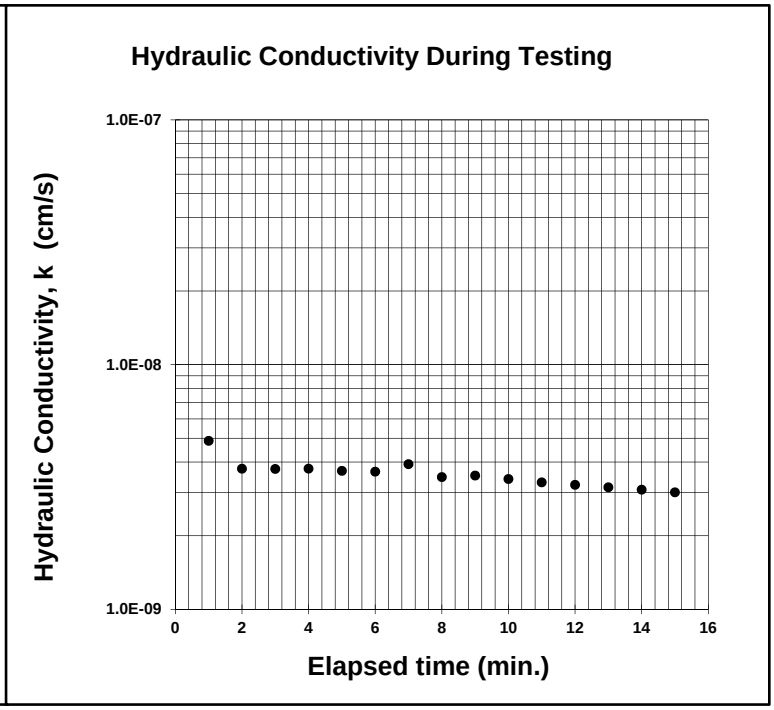
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 80 |
| Top Cap Pressure(kPa) | 60 |
| Bottom Cap Pressure(kPa) | 60 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 100 |
| Top Cap Pressure (kPa) | 80 |
| Bottom Cap Pressure(kPa) | 60 |
| Hydraulic Gradient | 18.7 |




**Hydraulic Conductivity (cm/s) = 3.2E-09**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

**OFFICE**
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**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

Tested by: C. Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 2, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D60 ST4 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 9.62 |
| Diameter (cm) | 7.07 |
| Area (cm ²) | 39.26 |
| Total Mass (g) | 788.4 |
| Volume (cm³) | 377.7 |
| Water Content (%) | 23.7 |
| Degree of Saturation (%) | 107 |
| Wet Density (g/cm³) | 2.088 |
| Dry Density(g/cm³) | 1.688 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

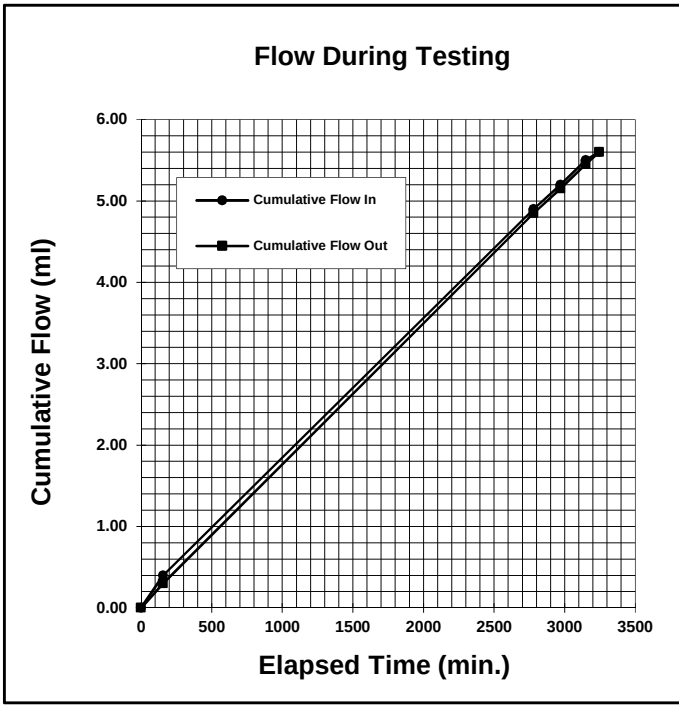
| | |
|---|---|
| Length (cm) | 9.73 |
| Diameter (cm) | 7.25 |
| Area (cm ²) | 41.28 |
| Total Mass (g) | 798.8 |
| Volume (cm³) | 401.7 |
| Water Content (%) | 20.7 |
| Beta Saturation (%) | 96 |
| Wet Density (g/cm³) | 1.989 |
| Dry Density(g/cm³) | 1.648 |

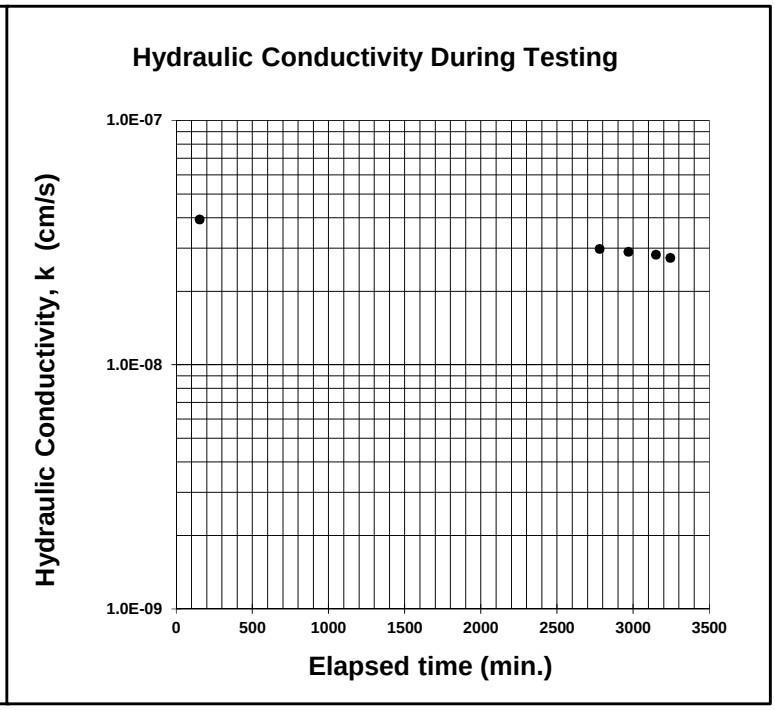
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 220 |
| Top Cap Pressure(kPa) | 200 |
| Bottom Cap Pressure(kPa) | 200 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 310 |
| Top Cap Pressure (kPa) | 290 |
| Bottom Cap Pressure(kPa) | 270 |
| Hydraulic Gradient | 21.2 |




**Hydraulic Conductivity (cm/s) = 3.1E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | August 31, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | D68 ST8 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 11.44 |
| Diameter (cm) | 7.26 |
| Area (cm ²) | 41.40 |
| Total Mass (g) | 863.4 |
| Volume (cm³) | 473.6 |
| Water Content (%) | 37.0 |
| Degree of Saturation (%) | 97 |
| Wet Density (g/cm³) | 1.823 |
| Dry Density(g/cm³) | 1.331 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

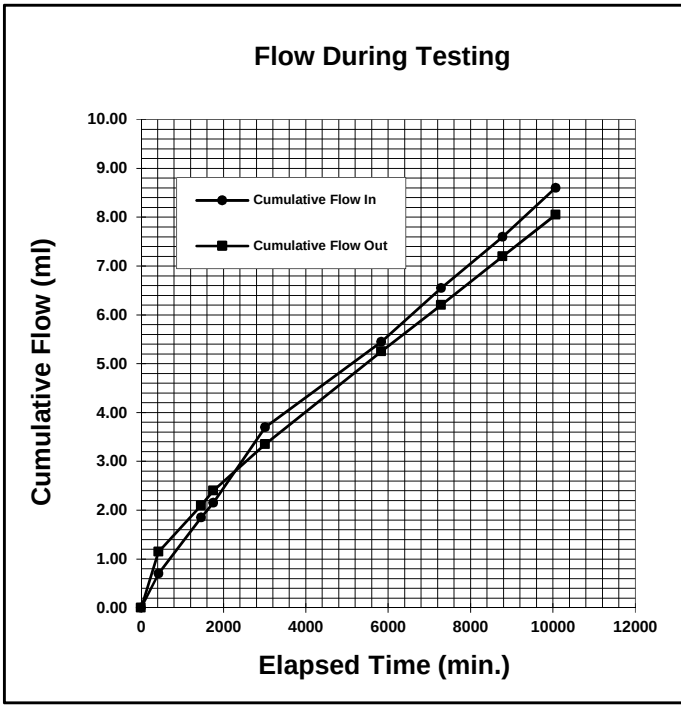
| | |
|---|---|
| Length (cm) | 11.75 |
| Diameter (cm) | 7.13 |
| Area (cm ²) | 39.93 |
| Total Mass (g) | 881.6 |
| Volume (cm³) | 469.1 |
| Water Content (%) | 24.1 |
| Beta Saturation (%) | 97 |
| Wet Density (g/cm³) | 1.879 |
| Dry Density(g/cm³) | 1.514 |

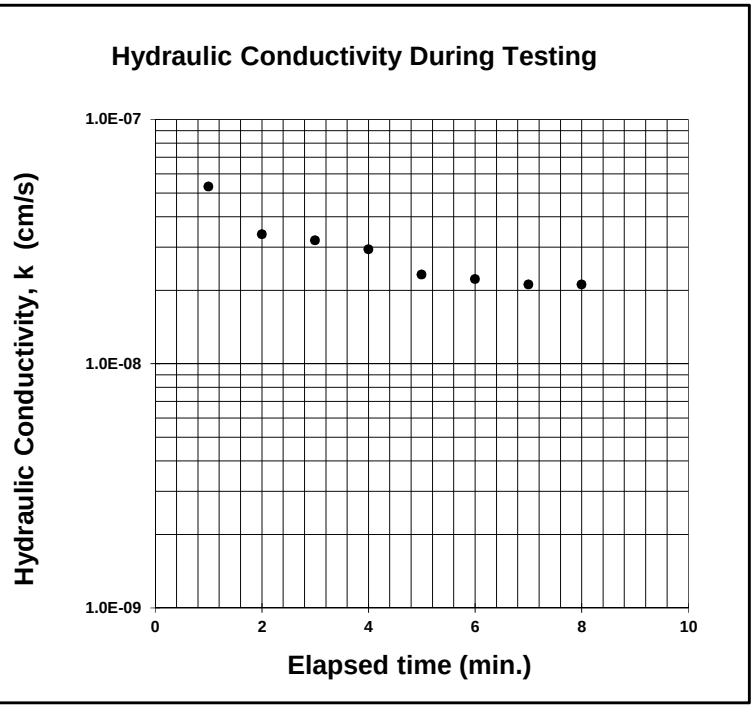
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 220 |
| Top Cap Pressure(kPa) | 200 |
| Bottom Cap Pressure(kPa) | 200 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 290 |
| Top Cap Pressure (kPa) | 270 |
| Bottom Cap Pressure(kPa) | 250 |
| Hydraulic Gradient | 17.8 |



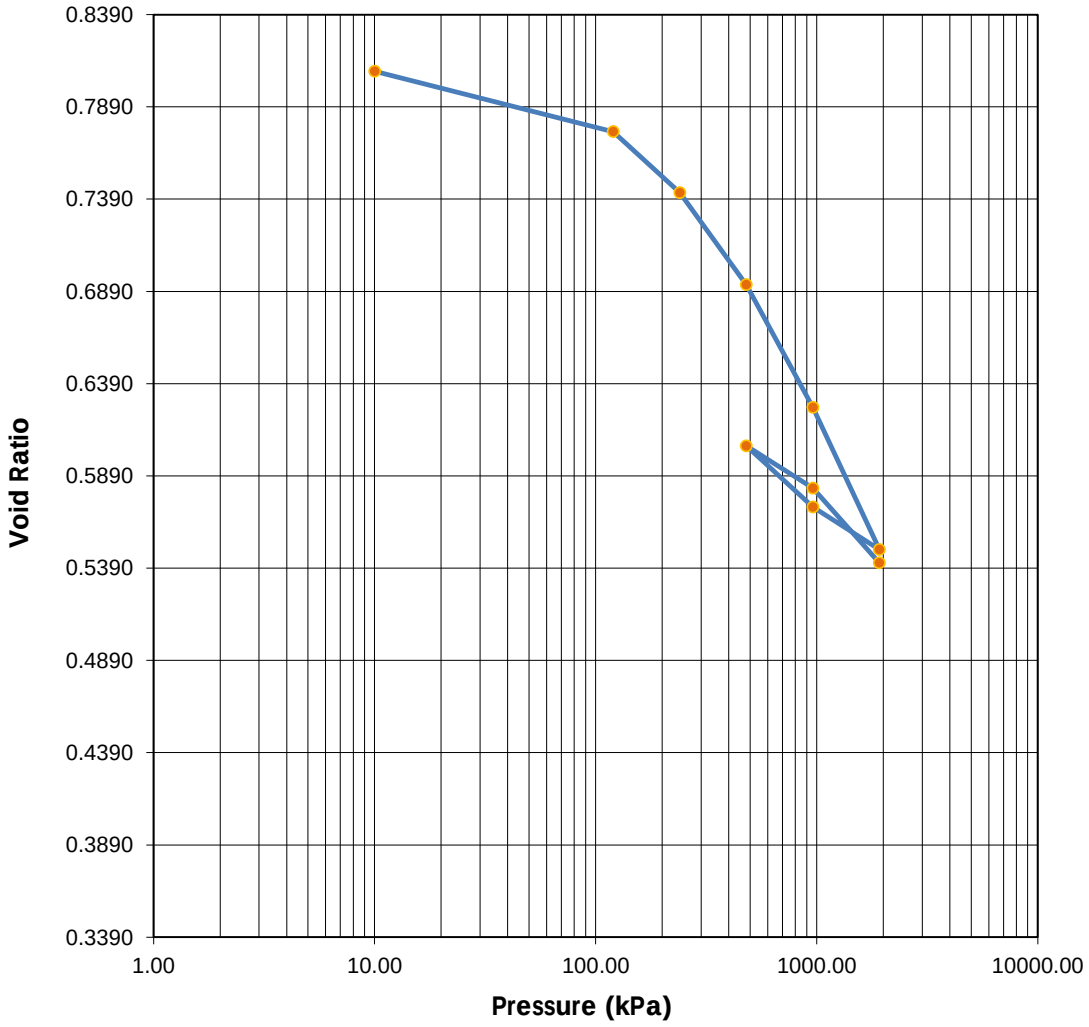




**Hydraulic Conductivity (cm/s) = 2.6E-08**

Reviewed by:

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 27.5 | 25.7 | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Dry Density (g/cm3):** | 1.490 | 1.682 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 91.59 | 114.60 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8071 | 0.5408 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 1.5-1.95m

**Sample Number:** D2 ST4 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads at 15kPa, 30kPa, and 60kPa omitted due to swelling

**Tested By:** C. Oost **Reviewed By:** C. Lamoureux

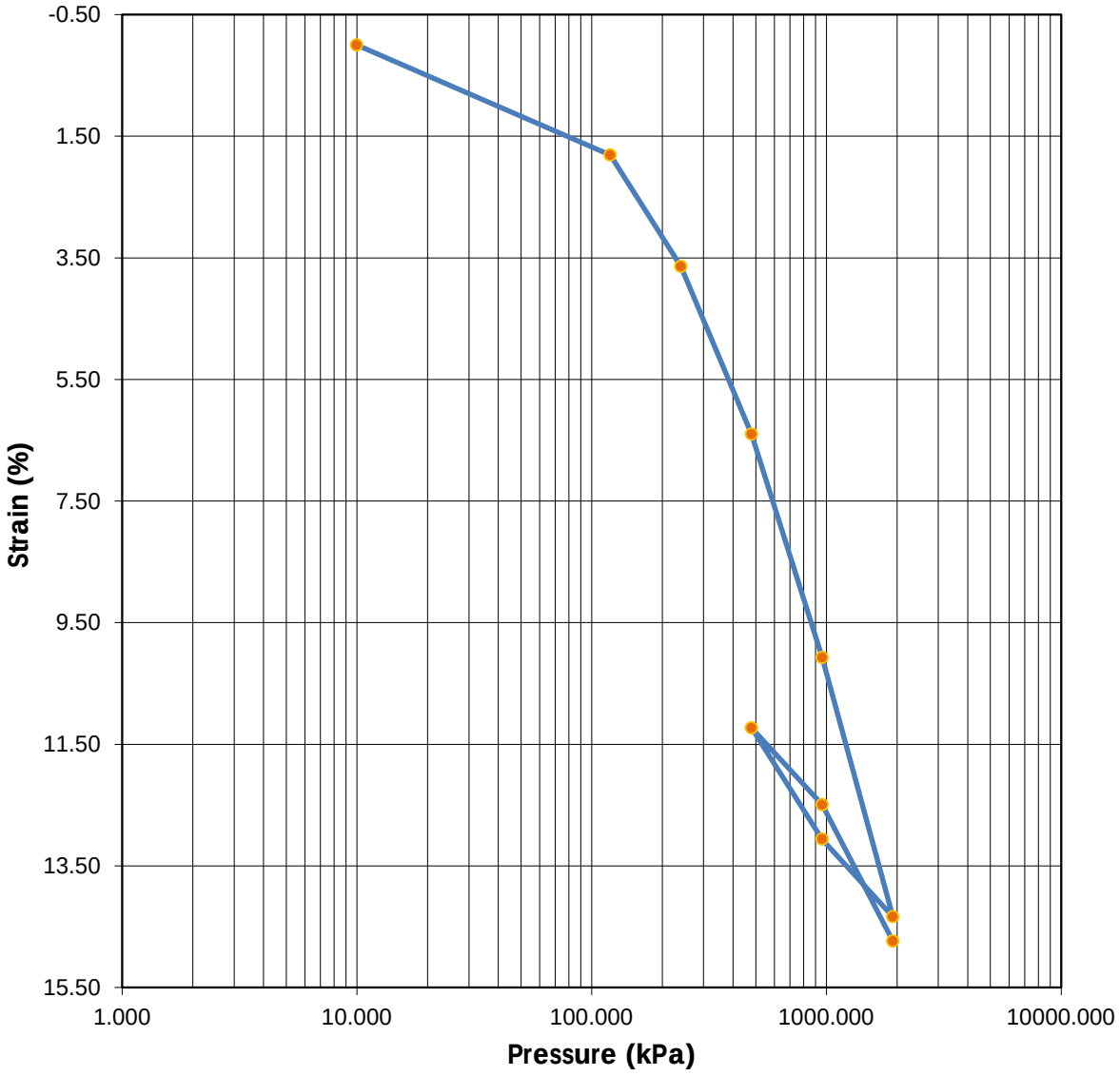
# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 27.5 | 25.7 | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Dry Density (g/cm3):** | 1.490 | 1.682 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 91.59 | 114.60 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8071 | 0.5408 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 1.5-1.95m | **Remarks:** |
| **Sample Number:** | D2 ST4 | **Boring Number:** | Loads at 15kPa, 30kPa, and 60kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

Stantec Consulting Ltd.
Calgary Laboratory
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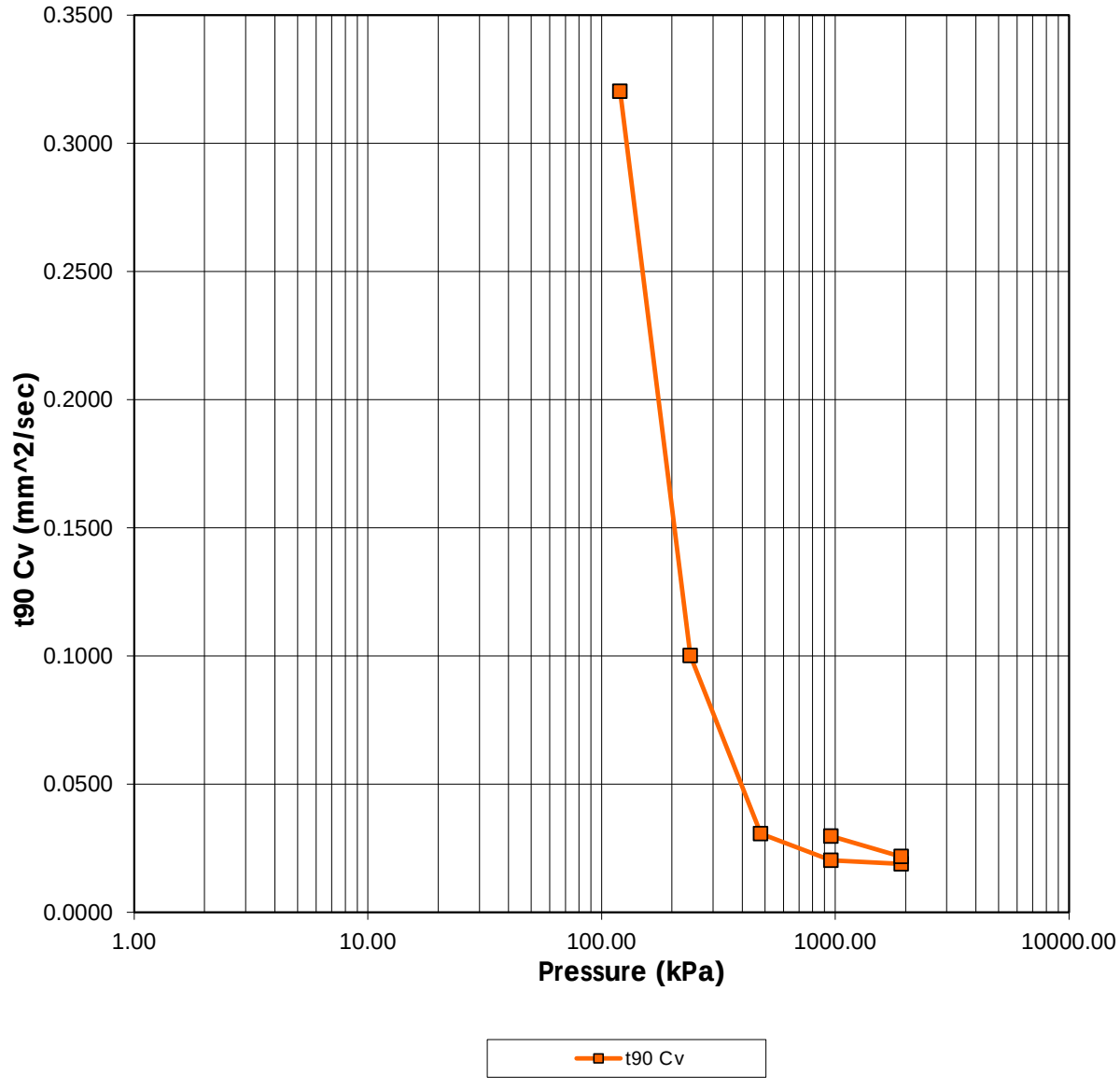
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 27.5 | 25.7 | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Dry Density (g/cm3):** | 1.490 | 1.682 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 91.59 | 114.60 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8071 | 0.5408 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 1.5-1.95m | **Remarks:** |
| **Sample Number:** | D2 ST4 | **Boring Number:** | Loads at 15kPa, 30kPa, and 60kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

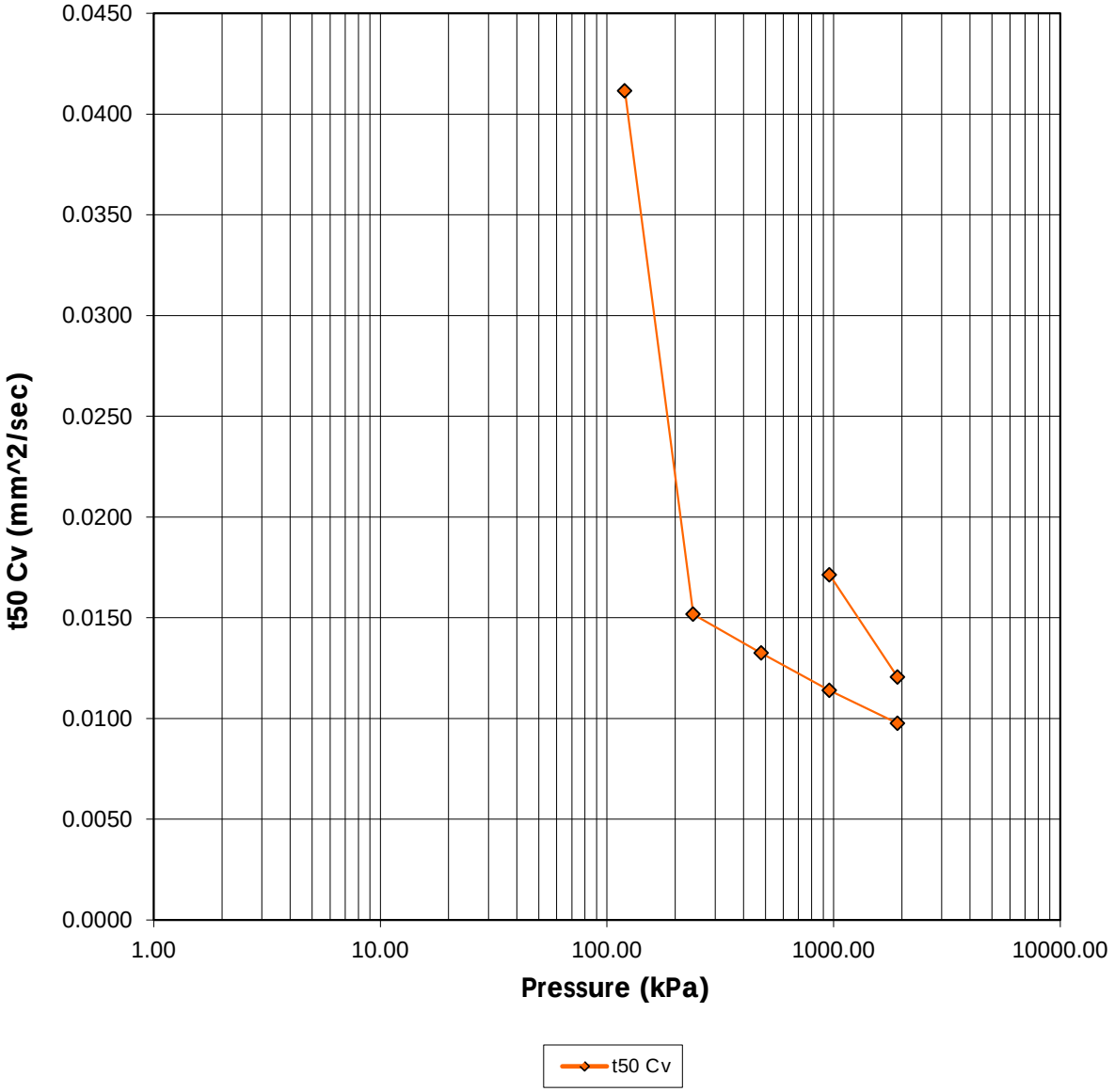
# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 27.5 | 25.7 | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Dry Density (g/cm3):** | 1.490 | 1.682 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 91.59 | 114.60 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8071 | 0.5408 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 1.5-1.95m | **Remarks:** |
| **Sample Number:** | D2 ST4 | **Boring Number:** | Loads at 15kPa, 30kPa, and 60kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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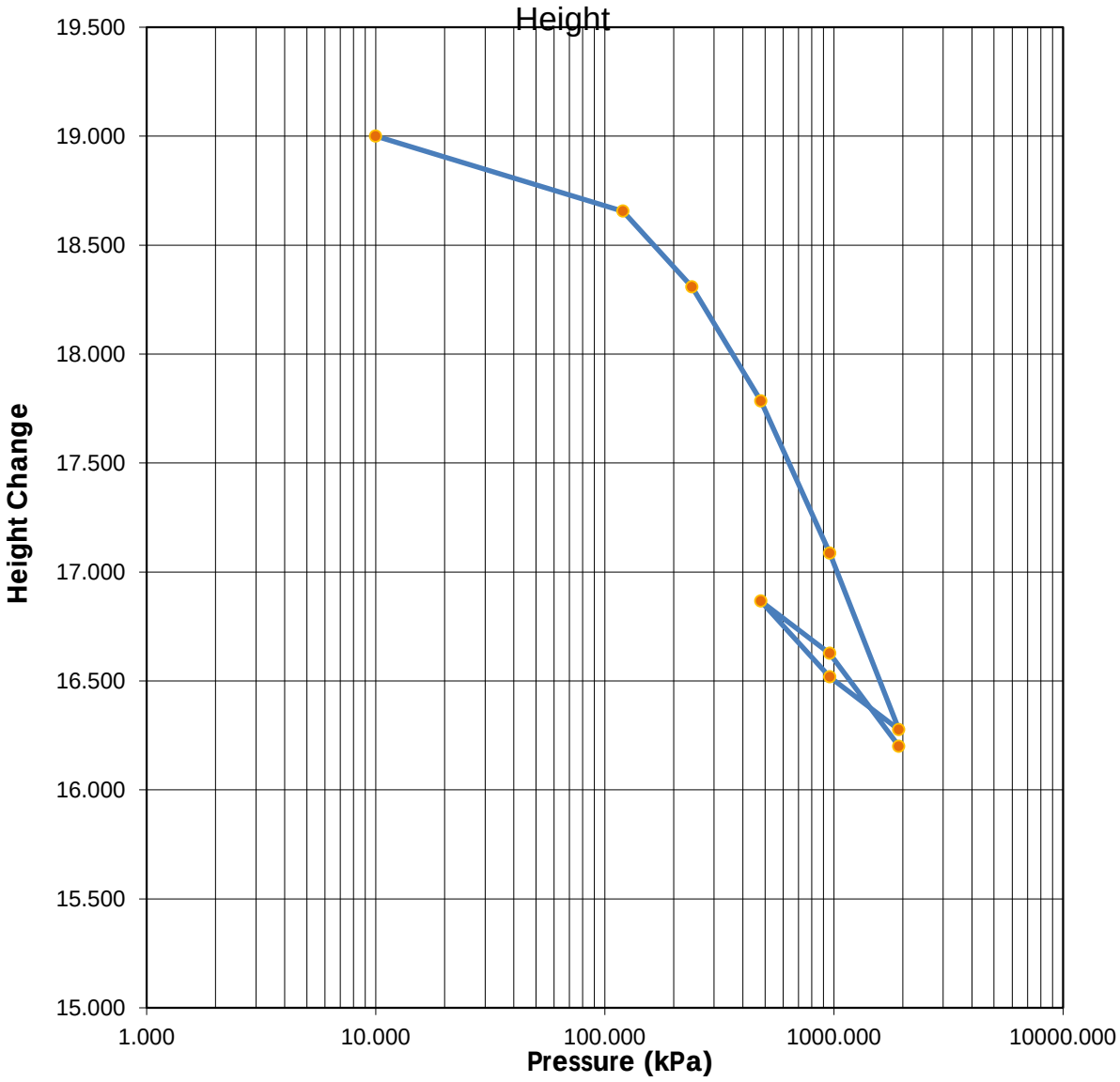
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 27.5 | 25.7 | **Liquid Limits:** | - | **Test Date:** | 28-Jun-16 |
| **Dry Density (g/cm3):** | 1.490 | 1.682 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 91.59 | 114.60 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8071 | 0.5408 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 1.5-1.95m

**Sample Number:** D2 ST4 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads at 15kPa, 30kPa, and 60kPa omitted due to swelling

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Sample Description:** Brown Clay
**Remarks:** Loads at 15kPa, 30kPa, and 60kPa omitted due to swelling

**Test Number:**
**Test Date:** 28-Jun-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 19.0000 | 8.4930 | 0.00 | 0.8083 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 10.000 | 0.0000 | 19.0000 | 8.4930 | 0.00 | 0.8083 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 15.000 | -0.0060 | 19.0060 | 8.4990 | -0.03 | 0.8089 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 30.000 | 0.1100 | 18.8900 | 8.3830 | 0.58 | 0.7978 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 60.000 | 0.1660 | 18.8340 | 8.3270 | 0.87 | 0.7925 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | 120.000 | 0.3440 | 18.6560 | 8.1490 | 1.81 | 0.7756 | 3.840 | 6.942 | 0.320 | 0.041 |
| 6 | 240.000 | 0.6920 | 18.3080 | 7.8010 | 3.64 | 0.7425 | 11.835 | 18.145 | 0.100 | 0.015 |
| 7 | 480.000 | 1.2160 | 17.7840 | 7.2770 | 6.40 | 0.6926 | 36.490 | 19.606 | 0.031 | 0.013 |
| 8 | 960.000 | 1.9140 | 17.0860 | 6.5790 | 10.07 | 0.6262 | 50.989 | 21.039 | 0.020 | 0.011 |
| 9 | 1920.000 | 2.7240 | 16.2760 | 5.7690 | 14.34 | 0.5491 | 49.552 | 22.307 | 0.019 | 0.010 |
| 10 | 960.000 | 2.4820 | 16.5180 | 6.0110 | 13.06 | 0.5721 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 480.000 | 2.1340 | 16.8660 | 6.3590 | 11.23 | 0.6052 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 960.000 | 2.3740 | 16.6260 | 6.1190 | 12.49 | 0.5824 | 32.896 | 13.255 | 0.030 | 0.017 |
| 13 | 1920.000 | 2.8000 | 16.2000 | 5.6930 | 14.74 | 0.5418 | 42.761 | 17.894 | 0.022 | 0.012 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 28-Jun-16

**Sample Number:** D2 ST4 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 1.5-1.95m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** - **Initial Void Ratio:** 0.8071 **Initial Height (mm):** 19.0000
**Plastic Limit:** - **Plasticity Index (%):** - **Initial Diameter (mm):** 50.0000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 61.5300

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 30.34 | 59.17 |
| Dry Soil + Container (g) | 24.08 | 47.34 |
| Weight of Container (g) | 1.34 | 1.28 |
| Moisture Content (%) | 27.53 | 25.68 |
| Void Ratio | 0.8071 | 0.5408 |
| Saturation (%) | 91.59 | 114.60 |
| Dry Density (g/cm3) | 1.490 | 1.682 |

# Consolidation Test Results
## (Sequence 1) Load 10.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

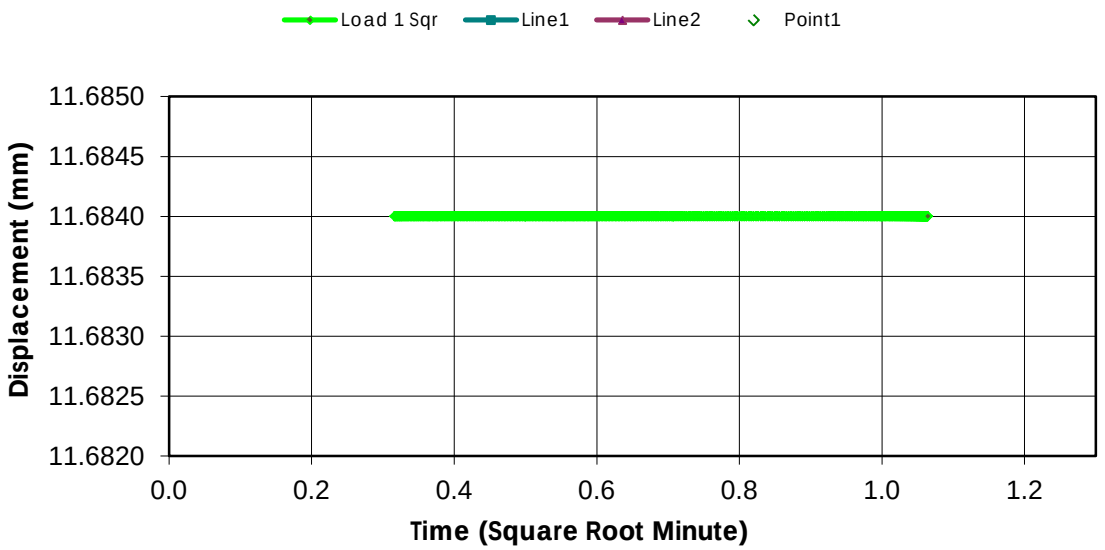
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

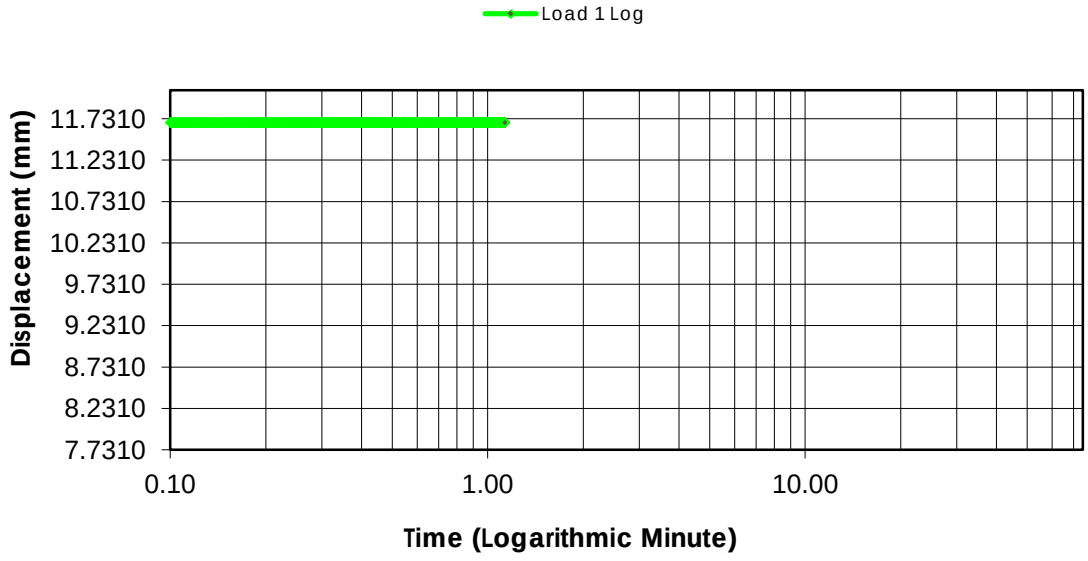
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.6840 | 0.0000 | 0.0000 | 0.8071 |
| 1 | 00:00:06 | 11.6840 | 0.0000 | 0.0000 | 0.8071 |
| 2 | 00:00:15 | 11.6840 | 0.0000 | 0.0000 | 0.8071 |
| 3 | 00:00:30 | 11.6840 | 0.0000 | 0.0000 | 0.8071 |
| 4 | 00:01:00 | 11.6840 | 0.0000 | 0.0000 | 0.8071 |
| 5 | 00:01:08 | 11.6840 | 0.0000 | 0.0000 | 0.8071 |

# Consolidation Test Results
## (Sequence 1) Load 10.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 120.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

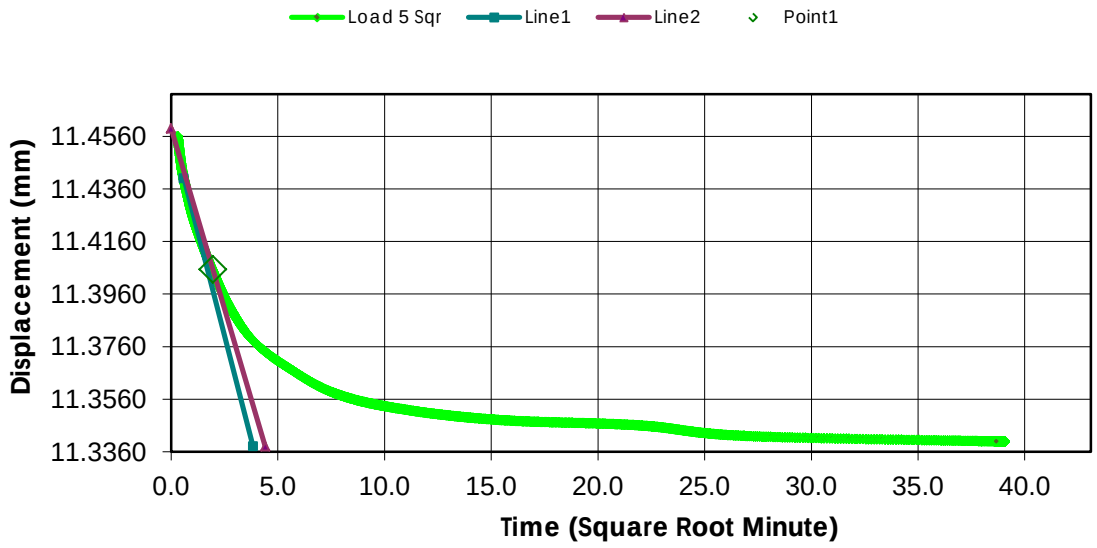
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

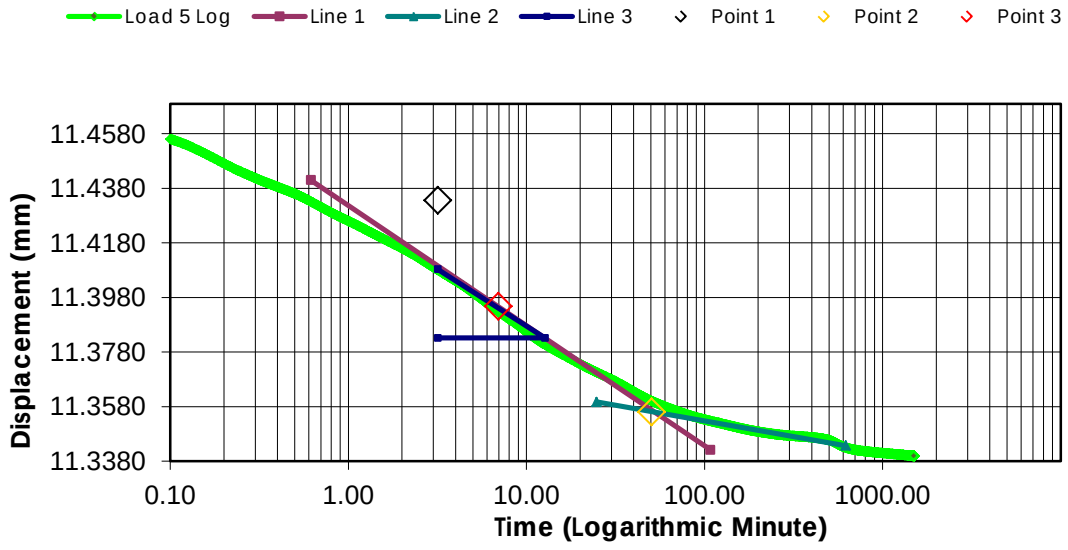
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.5180 | 0.1660 | 0.8737 | 0.7913 |
| 1 | 00:00:06 | 11.4560 | 0.2280 | 1.2000 | 0.7854 |
| 2 | 00:00:15 | 11.4440 | 0.2400 | 1.2632 | 0.7842 |
| 3 | 00:00:30 | 11.4360 | 0.2480 | 1.3053 | 0.7835 |
| 4 | 00:01:00 | 11.4260 | 0.2580 | 1.3579 | 0.7825 |
| 5 | 00:02:00 | 11.4160 | 0.2680 | 1.4105 | 0.7816 |
| 6 | 00:04:00 | 11.4040 | 0.2800 | 1.4737 | 0.7804 |
| 7 | 00:08:00 | 11.3900 | 0.2940 | 1.5474 | 0.7791 |
| 8 | 00:15:01 | 11.3780 | 0.3060 | 1.6105 | 0.7780 |
| 9 | 00:30:02 | 11.3680 | 0.3160 | 1.6632 | 0.7770 |
| 10 | 01:00:04 | 11.3580 | 0.3260 | 1.7158 | 0.7761 |
| 11 | 02:00:09 | 11.3520 | 0.3320 | 1.7474 | 0.7755 |
| 12 | 04:00:17 | 11.3480 | 0.3360 | 1.7684 | 0.7751 |
| 13 | 08:00:35 | 11.3460 | 0.3380 | 1.7789 | 0.7749 |
| 14 | 12:00:52 | 11.3420 | 0.3420 | 1.8000 | 0.7745 |
| 15 | 24:01:44 | 11.3400 | 0.3440 | 1.8105 | 0.7744 |
| 16 | 24:54:55 | 11.3400 | 0.3440 | 1.8105 | 0.7744 |

# Consolidation Test Results
## (Sequence 5) Load 120.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 240.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

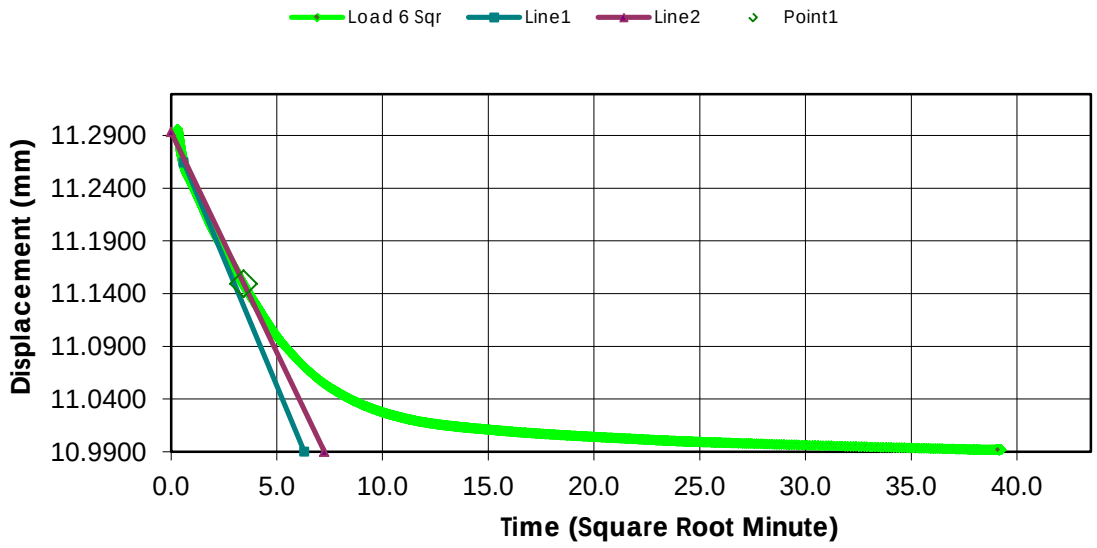
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

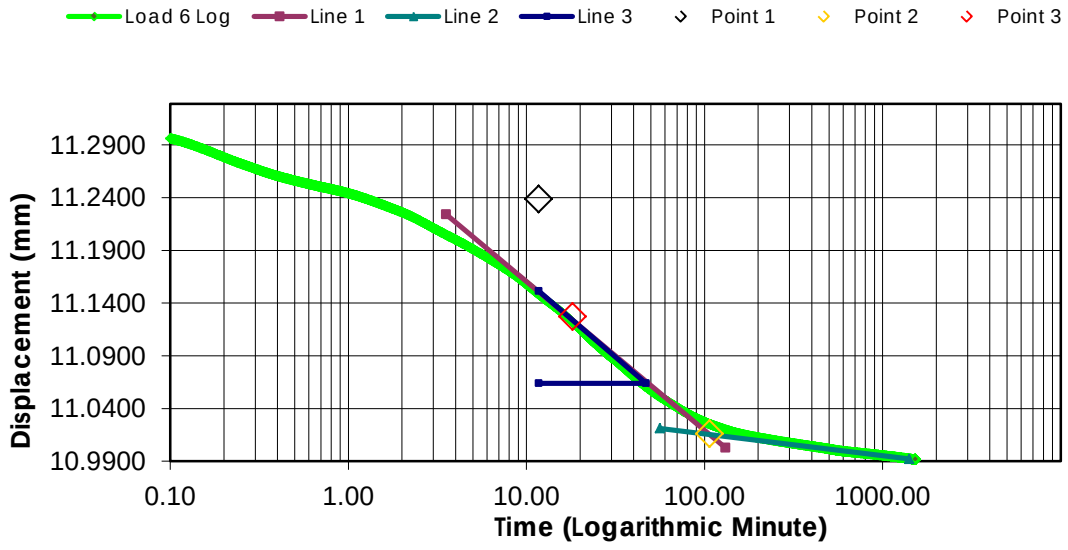
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.3400 | 0.3440 | 1.8105 | 0.7744 |
| 1 | 00:00:06 | 11.2960 | 0.3880 | 2.0421 | 0.7702 |
| 2 | 00:00:15 | 11.2720 | 0.4120 | 2.1684 | 0.7679 |
| 3 | 00:00:30 | 11.2560 | 0.4280 | 2.2526 | 0.7664 |
| 4 | 00:01:00 | 11.2440 | 0.4400 | 2.3158 | 0.7652 |
| 5 | 00:02:00 | 11.2260 | 0.4580 | 2.4105 | 0.7635 |
| 6 | 00:04:00 | 11.2000 | 0.4840 | 2.5474 | 0.7610 |
| 7 | 00:08:00 | 11.1700 | 0.5140 | 2.7053 | 0.7582 |
| 8 | 00:15:01 | 11.1340 | 0.5500 | 2.8947 | 0.7548 |
| 9 | 00:30:02 | 11.0880 | 0.5960 | 3.1368 | 0.7504 |
| 10 | 01:00:04 | 11.0480 | 0.6360 | 3.3474 | 0.7466 |
| 11 | 02:00:08 | 11.0220 | 0.6620 | 3.4842 | 0.7441 |
| 12 | 04:00:17 | 11.0100 | 0.6740 | 3.5474 | 0.7430 |
| 13 | 08:00:34 | 11.0020 | 0.6820 | 3.5895 | 0.7422 |
| 14 | 12:00:52 | 10.9980 | 0.6860 | 3.6105 | 0.7418 |
| 15 | 24:01:44 | 10.9920 | 0.6920 | 3.6421 | 0.7413 |
| 16 | 25:27:56 | 10.9920 | 0.6920 | 3.6421 | 0.7413 |

# Consolidation Test Results
## (Sequence 6) Load 240.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 480.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

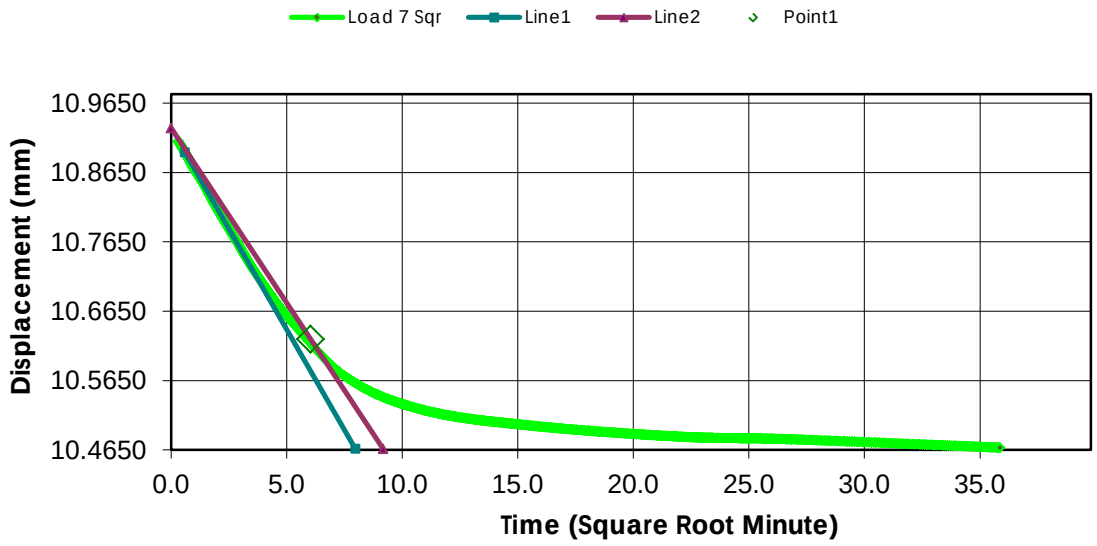
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

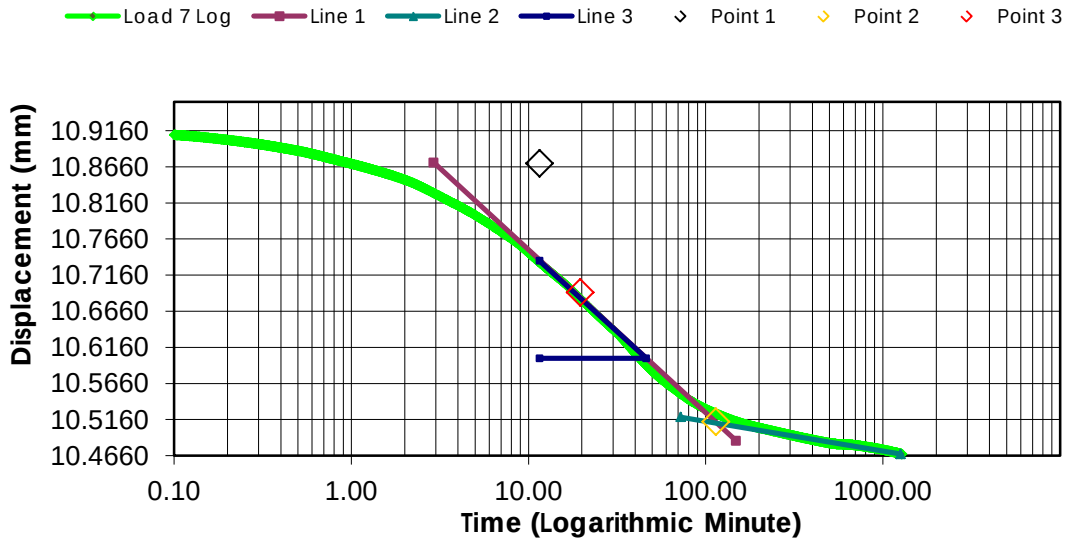
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.9920 | 0.6920 | 3.6421 | 0.7413 |
| 1 | 00:00:06 | 10.9100 | 0.7740 | 4.0737 | 0.7335 |
| 2 | 00:00:15 | 10.9000 | 0.7840 | 4.1263 | 0.7325 |
| 3 | 00:00:30 | 10.8880 | 0.7960 | 4.1895 | 0.7314 |
| 4 | 00:01:00 | 10.8700 | 0.8140 | 4.2842 | 0.7296 |
| 5 | 00:02:00 | 10.8480 | 0.8360 | 4.4000 | 0.7276 |
| 6 | 00:04:01 | 10.8120 | 0.8720 | 4.5895 | 0.7241 |
| 7 | 00:08:01 | 10.7660 | 0.9180 | 4.8316 | 0.7198 |
| 8 | 00:15:01 | 10.7100 | 0.9740 | 5.1263 | 0.7144 |
| 9 | 00:30:03 | 10.6400 | 1.0440 | 5.4947 | 0.7078 |
| 10 | 01:00:05 | 10.5660 | 1.1180 | 5.8842 | 0.7007 |
| 11 | 02:00:09 | 10.5220 | 1.1620 | 6.1158 | 0.6966 |
| 12 | 04:00:18 | 10.5000 | 1.1840 | 6.2316 | 0.6945 |
| 13 | 08:00:35 | 10.4840 | 1.2000 | 6.3158 | 0.6929 |
| 14 | 12:00:52 | 10.4800 | 1.2040 | 6.3368 | 0.6926 |
| 15 | 21:26:56 | 10.4680 | 1.2160 | 6.4000 | 0.6914 |

# Consolidation Test Results
## (Sequence 7) Load 480.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 960.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

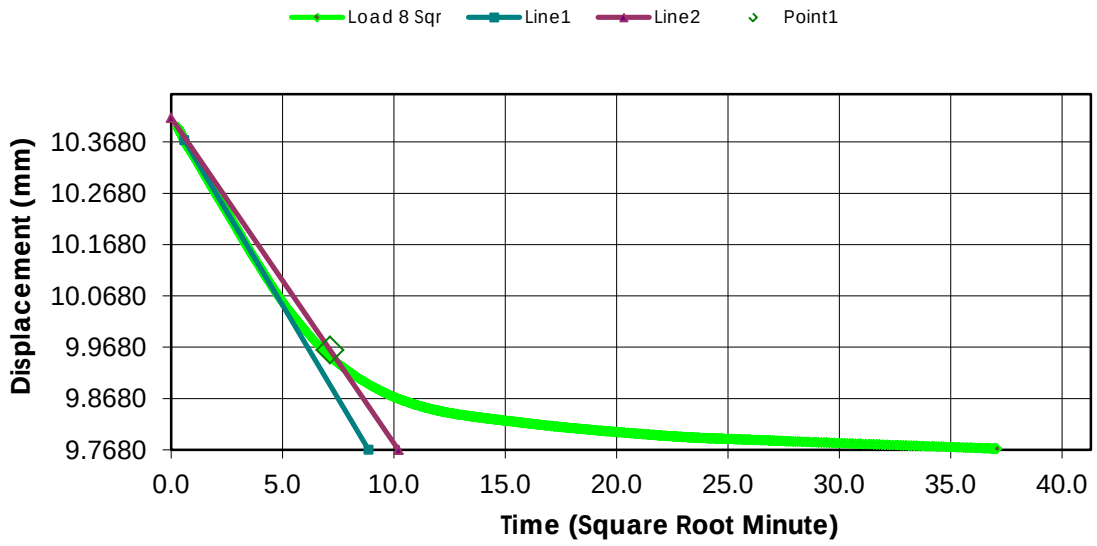
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

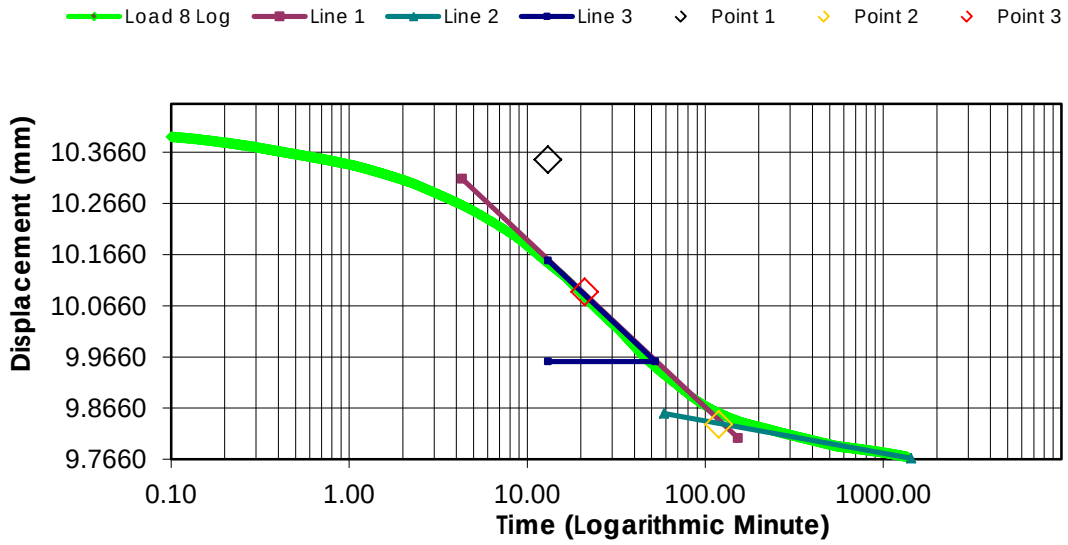
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.4680 | 1.2160 | 6.4000 | 0.6914 |
| 1 | 00:00:06 | 10.3960 | 1.2880 | 6.7789 | 0.6846 |
| 2 | 00:00:15 | 10.3800 | 1.3040 | 6.8632 | 0.6830 |
| 3 | 00:00:30 | 10.3620 | 1.3220 | 6.9579 | 0.6813 |
| 4 | 00:01:00 | 10.3420 | 1.3420 | 7.0632 | 0.6794 |
| 5 | 00:02:00 | 10.3120 | 1.3720 | 7.2211 | 0.6766 |
| 6 | 00:04:00 | 10.2680 | 1.4160 | 7.4526 | 0.6724 |
| 7 | 00:08:01 | 10.2080 | 1.4760 | 7.7684 | 0.6667 |
| 8 | 00:15:01 | 10.1320 | 1.5520 | 8.1684 | 0.6595 |
| 9 | 00:30:02 | 10.0300 | 1.6540 | 8.7053 | 0.6498 |
| 10 | 01:00:05 | 9.9280 | 1.7560 | 9.2421 | 0.6401 |
| 11 | 02:00:09 | 9.8560 | 1.8280 | 9.6211 | 0.6332 |
| 12 | 04:00:18 | 9.8220 | 1.8620 | 9.8000 | 0.6300 |
| 13 | 08:00:35 | 9.7960 | 1.8880 | 9.9368 | 0.6275 |
| 14 | 12:00:52 | 9.7860 | 1.8980 | 9.9895 | 0.6266 |
| 15 | 22:55:52 | 9.7700 | 1.9140 | 10.0737 | 0.6250 |

# Consolidation Test Results
## (Sequence 8) Load 960.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1920.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

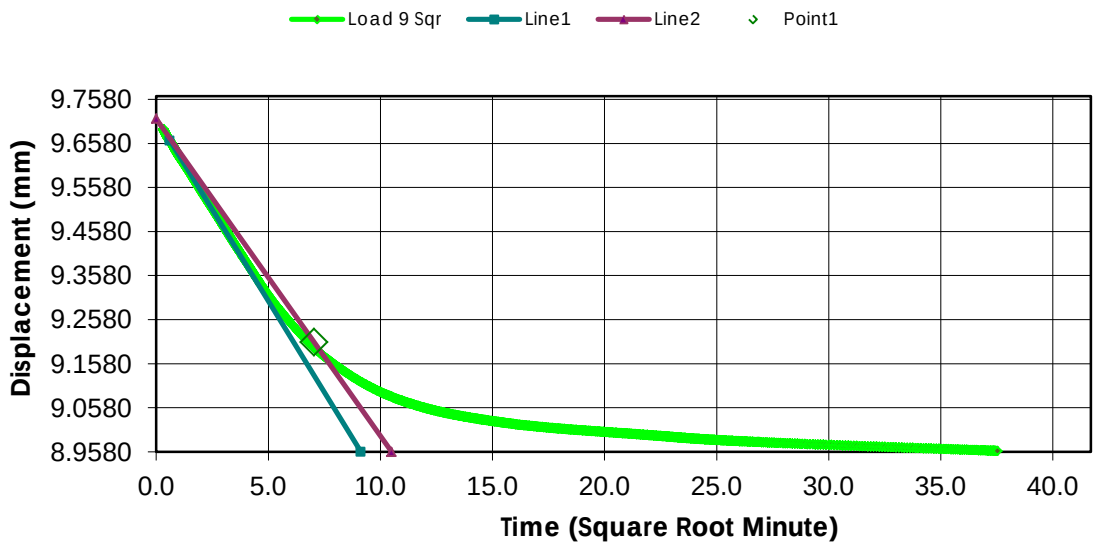
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

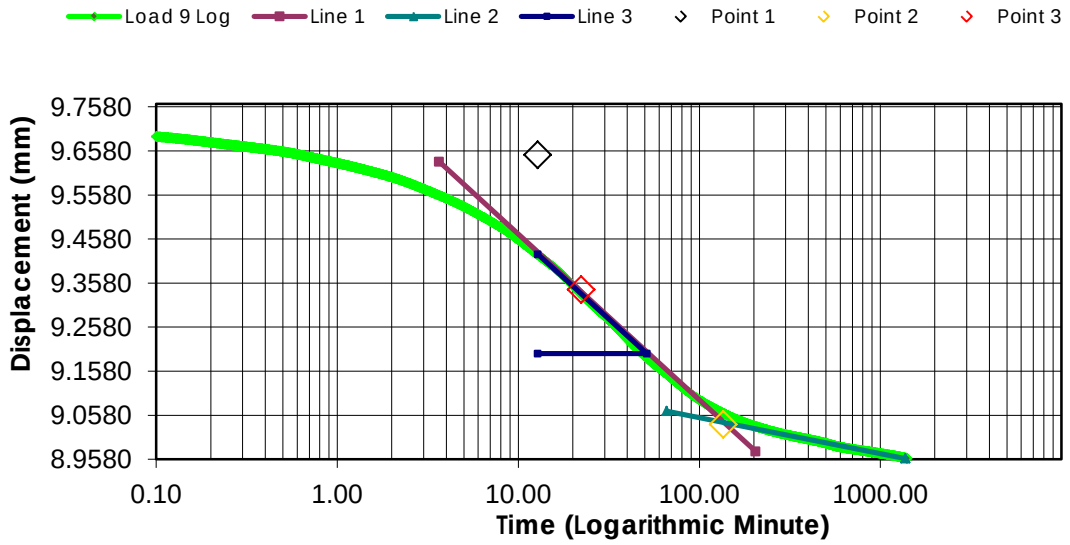
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.7700 | 1.9140 | 10.0737 | 0.6250 |
| 1 | 00:00:06 | 9.6900 | 1.9940 | 10.4947 | 0.6174 |
| 2 | 00:00:15 | 9.6720 | 2.0120 | 10.5895 | 0.6157 |
| 3 | 00:00:30 | 9.6560 | 2.0280 | 10.6737 | 0.6142 |
| 4 | 00:01:00 | 9.6300 | 2.0540 | 10.8105 | 0.6117 |
| 5 | 00:02:00 | 9.5980 | 2.0860 | 10.9789 | 0.6087 |
| 6 | 00:04:00 | 9.5500 | 2.1340 | 11.2316 | 0.6041 |
| 7 | 00:08:00 | 9.4840 | 2.2000 | 11.5789 | 0.5978 |
| 8 | 00:15:01 | 9.4000 | 2.2840 | 12.0211 | 0.5898 |
| 9 | 00:30:02 | 9.2820 | 2.4020 | 12.6421 | 0.5786 |
| 10 | 01:00:04 | 9.1640 | 2.5200 | 13.2632 | 0.5674 |
| 11 | 02:00:08 | 9.0740 | 2.6100 | 13.7368 | 0.5588 |
| 12 | 04:00:17 | 9.0240 | 2.6600 | 14.0000 | 0.5541 |
| 13 | 08:00:34 | 8.9960 | 2.6880 | 14.1474 | 0.5514 |
| 14 | 12:00:52 | 8.9800 | 2.7040 | 14.2316 | 0.5499 |
| 15 | 23:28:53 | 8.9600 | 2.7240 | 14.3368 | 0.5480 |

# Consolidation Test Results
## (Sequence 9) Load 1920.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 960.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

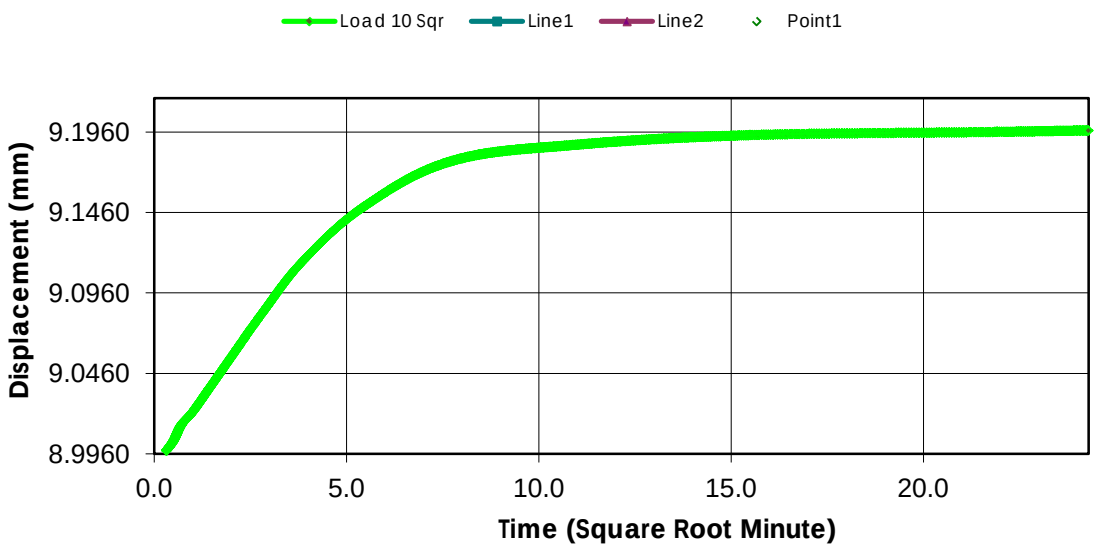
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

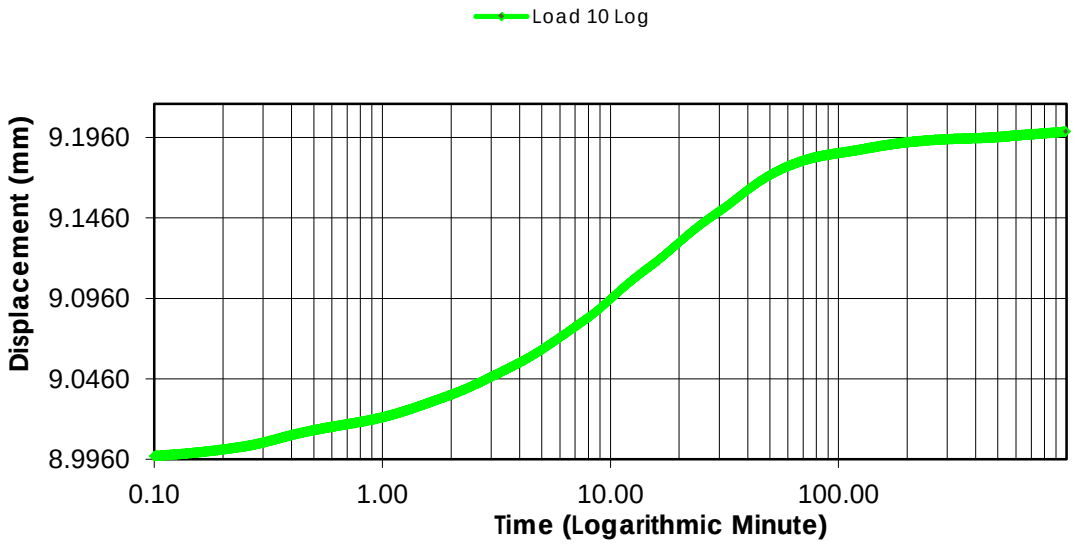
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.9600 | 2.7240 | 14.3368 | 0.5480 |
| 1 | 00:00:06 | 8.9980 | 2.6860 | 14.1368 | 0.5516 |
| 2 | 00:00:15 | 9.0040 | 2.6800 | 14.1053 | 0.5522 |
| 3 | 00:00:30 | 9.0140 | 2.6700 | 14.0526 | 0.5531 |
| 4 | 00:01:00 | 9.0220 | 2.6620 | 14.0105 | 0.5539 |
| 5 | 00:02:00 | 9.0360 | 2.6480 | 13.9368 | 0.5552 |
| 6 | 00:04:00 | 9.0560 | 2.6280 | 13.8316 | 0.5571 |
| 7 | 00:08:00 | 9.0840 | 2.6000 | 13.6842 | 0.5598 |
| 8 | 00:15:01 | 9.1160 | 2.5680 | 13.5158 | 0.5628 |
| 9 | 00:30:02 | 9.1500 | 2.5340 | 13.3368 | 0.5661 |
| 10 | 01:00:04 | 9.1780 | 2.5060 | 13.1895 | 0.5687 |
| 11 | 02:00:08 | 9.1880 | 2.4960 | 13.1368 | 0.5697 |
| 12 | 04:00:17 | 9.1940 | 2.4900 | 13.1053 | 0.5702 |
| 13 | 08:00:34 | 9.1960 | 2.4880 | 13.0947 | 0.5704 |
| 14 | 12:00:52 | 9.1980 | 2.4860 | 13.0842 | 0.5706 |
| 15 | 23:36:58 | 9.2020 | 2.4820 | 13.0632 | 0.5710 |

# Consolidation Test Results
## (Sequence 10) Rebound 960.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 480.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

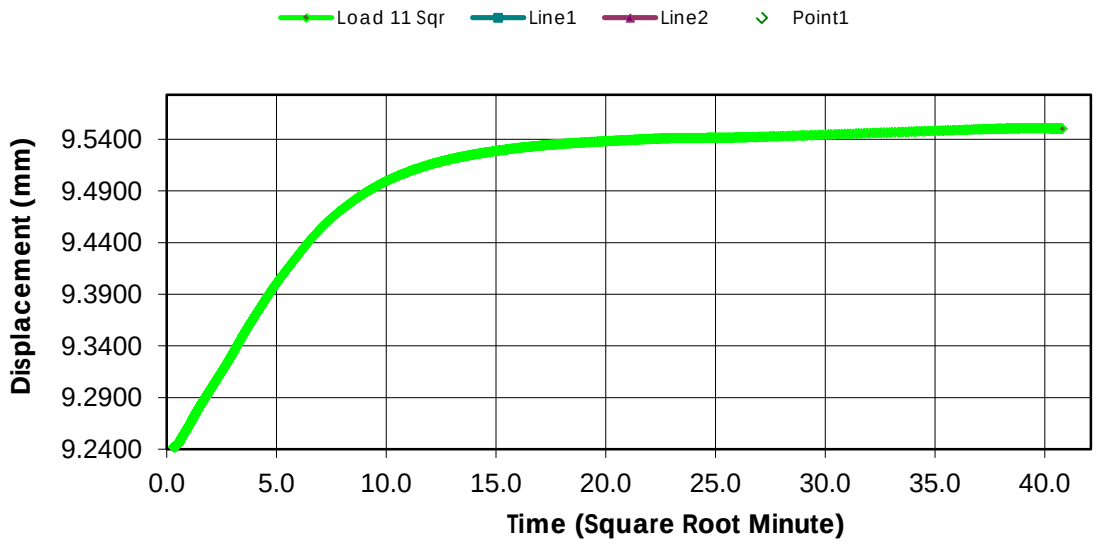
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

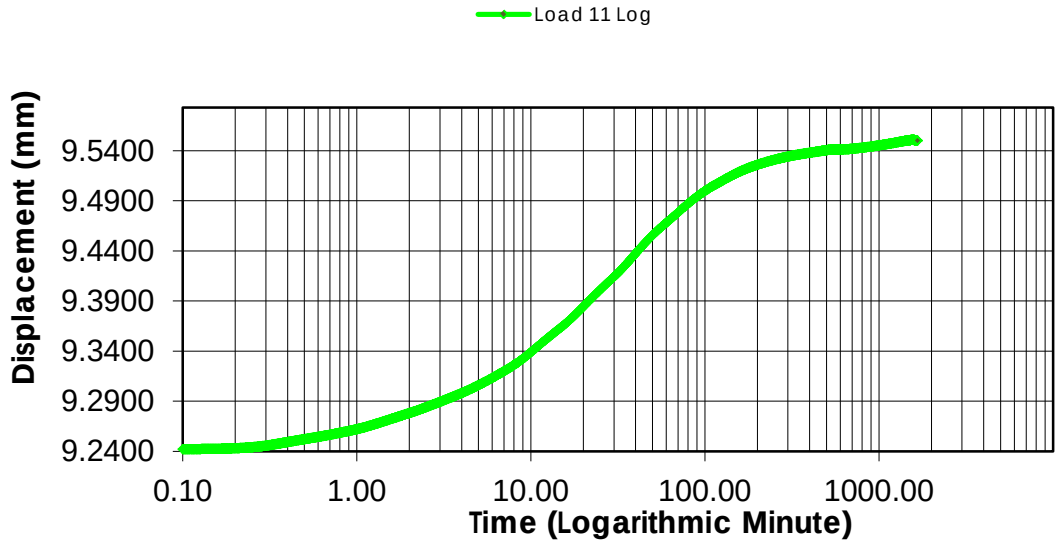
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.2020 | 2.4820 | 13.0632 | 0.5710 |
| 1 | 00:00:06 | 9.2420 | 2.4420 | 12.8526 | 0.5748 |
| 2 | 00:00:15 | 9.2440 | 2.4400 | 12.8421 | 0.5750 |
| 3 | 00:00:30 | 9.2520 | 2.4320 | 12.8000 | 0.5758 |
| 4 | 00:01:00 | 9.2620 | 2.4220 | 12.7474 | 0.5767 |
| 5 | 00:02:00 | 9.2780 | 2.4060 | 12.6632 | 0.5782 |
| 6 | 00:04:00 | 9.2980 | 2.3860 | 12.5579 | 0.5801 |
| 7 | 00:08:00 | 9.3260 | 2.3580 | 12.4105 | 0.5828 |
| 8 | 00:15:01 | 9.3640 | 2.3200 | 12.2105 | 0.5864 |
| 9 | 00:30:02 | 9.4140 | 2.2700 | 11.9474 | 0.5912 |
| 10 | 01:00:04 | 9.4680 | 2.2160 | 11.6632 | 0.5963 |
| 11 | 02:00:08 | 9.5080 | 2.1760 | 11.4526 | 0.6001 |
| 12 | 04:00:17 | 9.5300 | 2.1540 | 11.3368 | 0.6022 |
| 13 | 08:00:34 | 9.5400 | 2.1440 | 11.2842 | 0.6032 |
| 14 | 12:00:52 | 9.5420 | 2.1420 | 11.2737 | 0.6033 |
| 15 | 24:01:44 | 9.5500 | 2.1340 | 11.2316 | 0.6041 |
| 16 | 27:44:43 | 9.5500 | 2.1340 | 11.2316 | 0.6041 |

# Consolidation Test Results
## (Sequence 11) Rebound 480.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 960.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

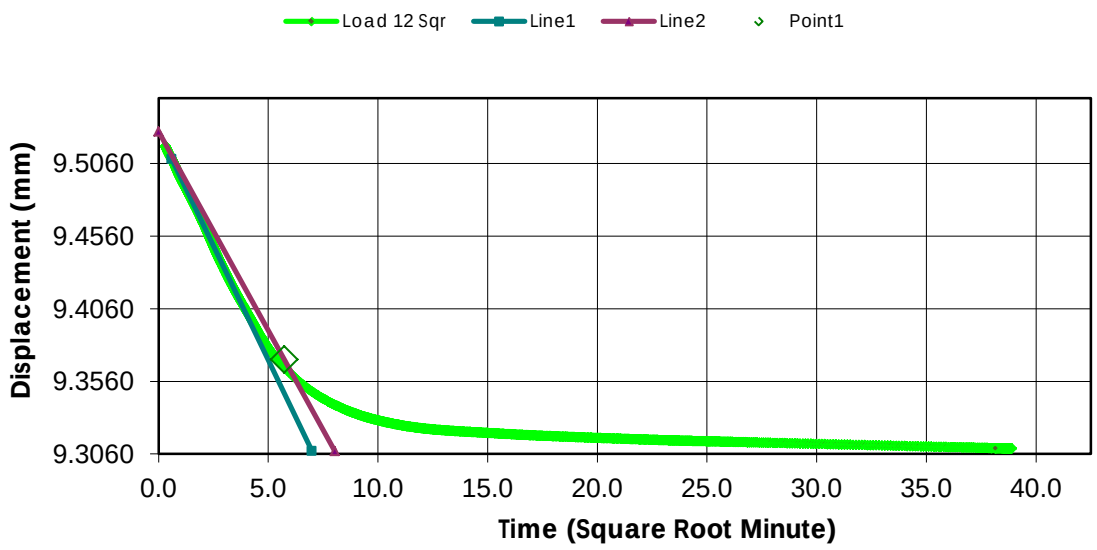
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

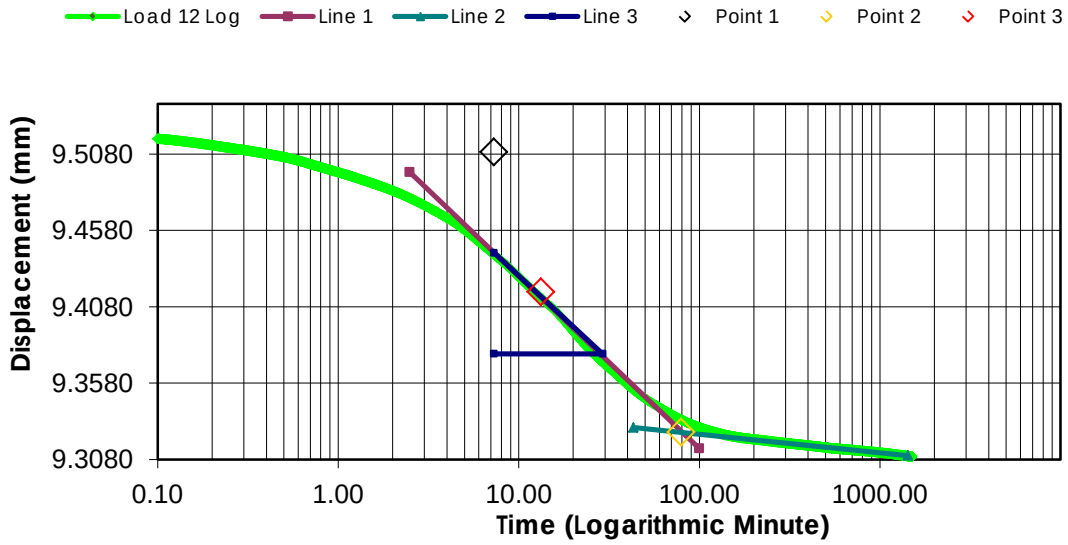
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5500 | 2.1340 | 11.2316 | 0.6041 |
| 1 | 00:00:06 | 9.5180 | 2.1660 | 11.4000 | 0.6011 |
| 2 | 00:00:15 | 9.5120 | 2.1720 | 11.4316 | 0.6005 |
| 3 | 00:00:30 | 9.5060 | 2.1780 | 11.4632 | 0.5999 |
| 4 | 00:01:00 | 9.4960 | 2.1880 | 11.5158 | 0.5990 |
| 5 | 00:02:00 | 9.4840 | 2.2000 | 11.5789 | 0.5978 |
| 6 | 00:04:01 | 9.4660 | 2.2180 | 11.6737 | 0.5961 |
| 7 | 00:08:01 | 9.4380 | 2.2460 | 11.8211 | 0.5935 |
| 8 | 00:15:01 | 9.4080 | 2.2760 | 11.9789 | 0.5906 |
| 9 | 00:30:02 | 9.3700 | 2.3140 | 12.1789 | 0.5870 |
| 10 | 01:00:05 | 9.3420 | 2.3420 | 12.3263 | 0.5843 |
| 11 | 02:00:09 | 9.3260 | 2.3580 | 12.4105 | 0.5828 |
| 12 | 04:00:18 | 9.3200 | 2.3640 | 12.4421 | 0.5822 |
| 13 | 08:00:35 | 9.3160 | 2.3680 | 12.4632 | 0.5819 |
| 14 | 12:00:53 | 9.3140 | 2.3700 | 12.4737 | 0.5817 |
| 15 | 24:01:45 | 9.3100 | 2.3740 | 12.4947 | 0.5813 |
| 16 | 24:14:32 | 9.3100 | 2.3740 | 12.4947 | 0.5813 |

# Consolidation Test Results
## (Sequence 12) Load 960.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1920.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 28-Jun-16
**Test Number:**

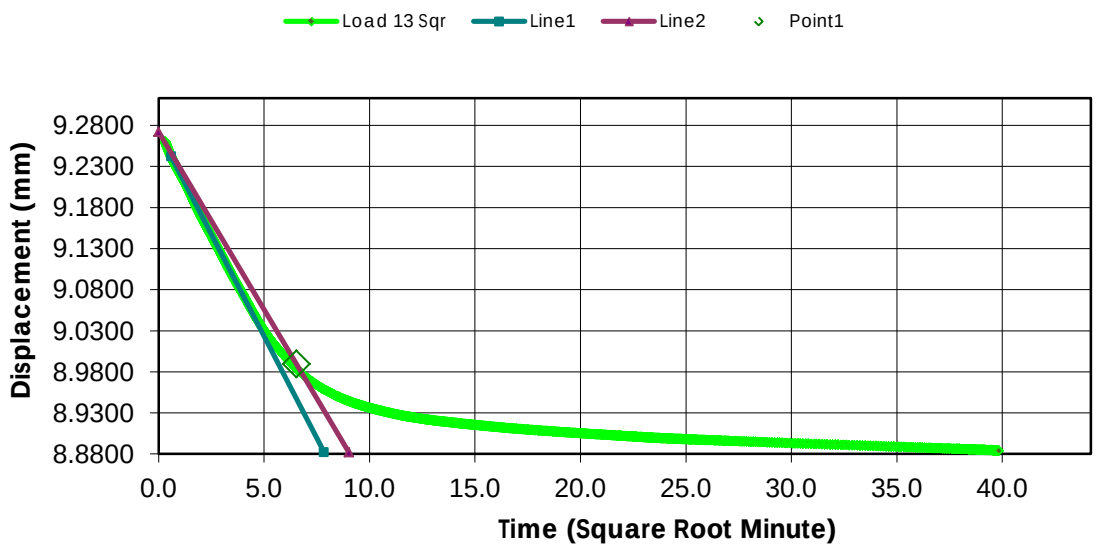
**Sample Number:** D2 ST4
**Boring Number:**
**Depth:** 1.5-1.95m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

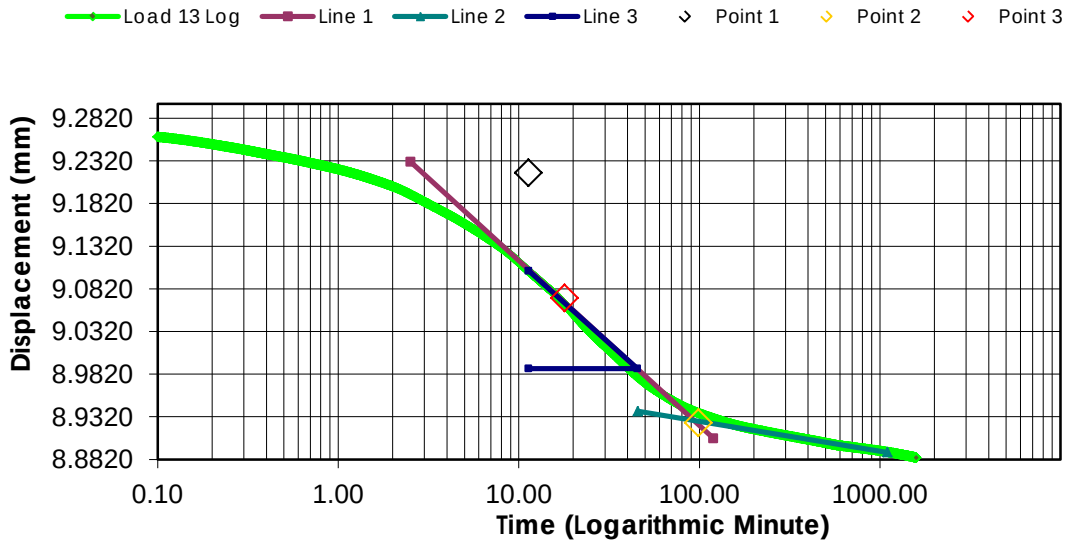
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.3100 | 2.3740 | 12.4947 | 0.5813 |
| 1 | 00:00:06 | 9.2600 | 2.4240 | 12.7579 | 0.5765 |
| 2 | 00:00:15 | 9.2480 | 2.4360 | 12.8211 | 0.5754 |
| 3 | 00:00:30 | 9.2360 | 2.4480 | 12.8842 | 0.5742 |
| 4 | 00:01:00 | 9.2220 | 2.4620 | 12.9579 | 0.5729 |
| 5 | 00:02:00 | 9.2020 | 2.4820 | 13.0632 | 0.5710 |
| 6 | 00:04:00 | 9.1700 | 2.5140 | 13.2316 | 0.5680 |
| 7 | 00:08:00 | 9.1300 | 2.5540 | 13.4421 | 0.5642 |
| 8 | 00:15:01 | 9.0800 | 2.6040 | 13.7053 | 0.5594 |
| 9 | 00:30:02 | 9.0140 | 2.6700 | 14.0526 | 0.5531 |
| 10 | 01:00:04 | 8.9600 | 2.7240 | 14.3368 | 0.5480 |
| 11 | 02:00:09 | 8.9300 | 2.7540 | 14.4947 | 0.5451 |
| 12 | 04:00:17 | 8.9140 | 2.7700 | 14.5789 | 0.5436 |
| 13 | 08:00:35 | 8.9020 | 2.7820 | 14.6421 | 0.5425 |
| 14 | 12:00:52 | 8.8960 | 2.7880 | 14.6737 | 0.5419 |
| 15 | 24:01:44 | 8.8860 | 2.7980 | 14.7263 | 0.5410 |
| 16 | 26:27:00 | 8.8840 | 2.8000 | 14.7368 | 0.5408 |

# Consolidation Test Results
## (Sequence 13) Load 1920.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



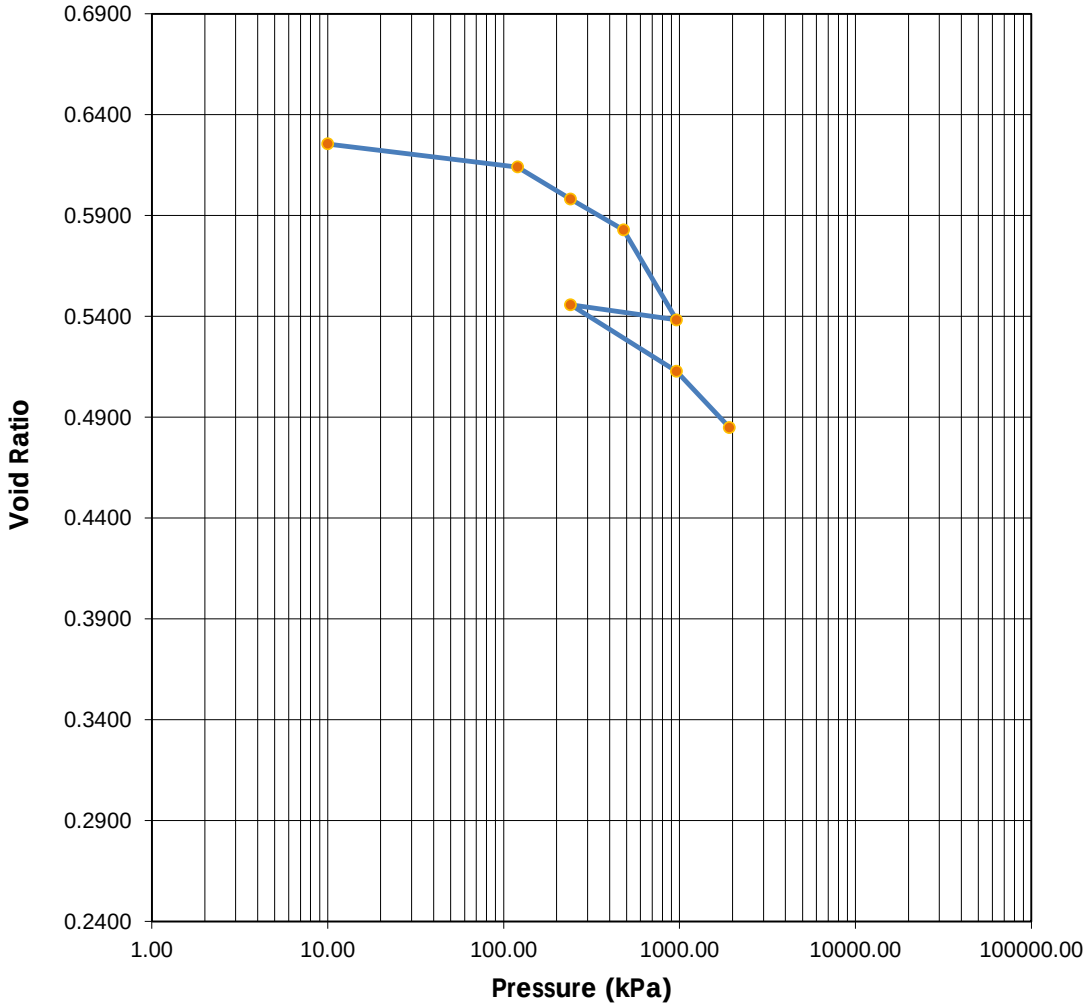
# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Moisture (%):** | 16.31 | 21.48 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.659 | 1.709 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 70.15 | 99.95 | | | | |
| **Void Ratio:** | 0.6244 | 0.4844 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Black/Grey Clay, Trace Sand and Gravel

**Project Number:** 110773396.302.702.230 **Depth:** 1.8-2.3m

**Sample Number:** D8-ST4 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

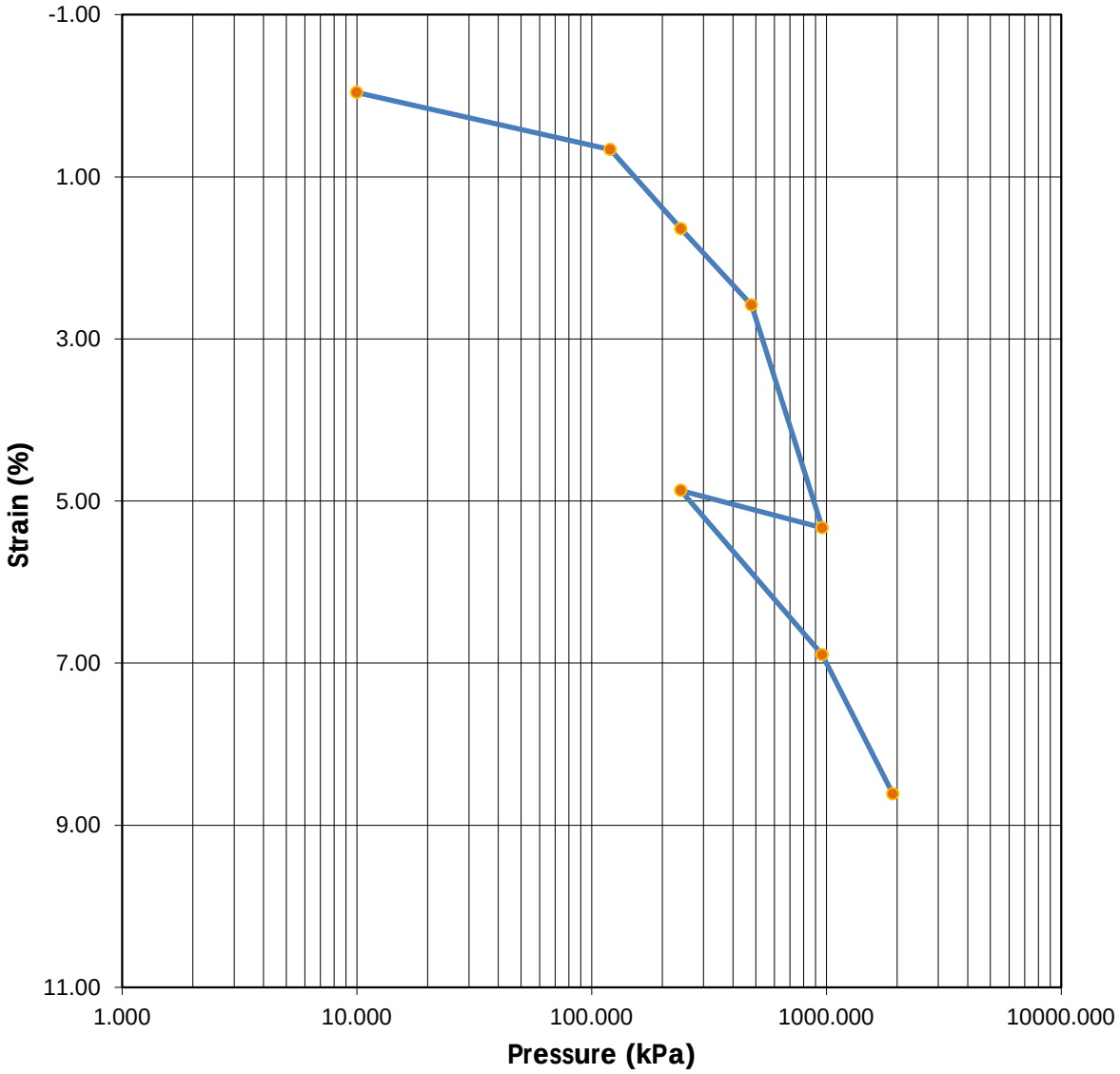
**Remarks:**
Swelling at loads 30kPa & 60kPa; omitted and not reported

**Tested By:**

**Reviewed By:**

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 16.31 | 21.48 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.659 | 1.709 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 70.15 | 99.95 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6244 | 0.4844 | **Specific Gravity:** | 2.700 | Assumed | |

**Sample Description:** Black/Grey Clay, Trace Sand and Gravel

**Project Number:** 110773396.302.702.230 **Depth:** 1.8-2.3m

**Sample Number:** D8-ST4 **Boring Number:**

**Project:** SR1

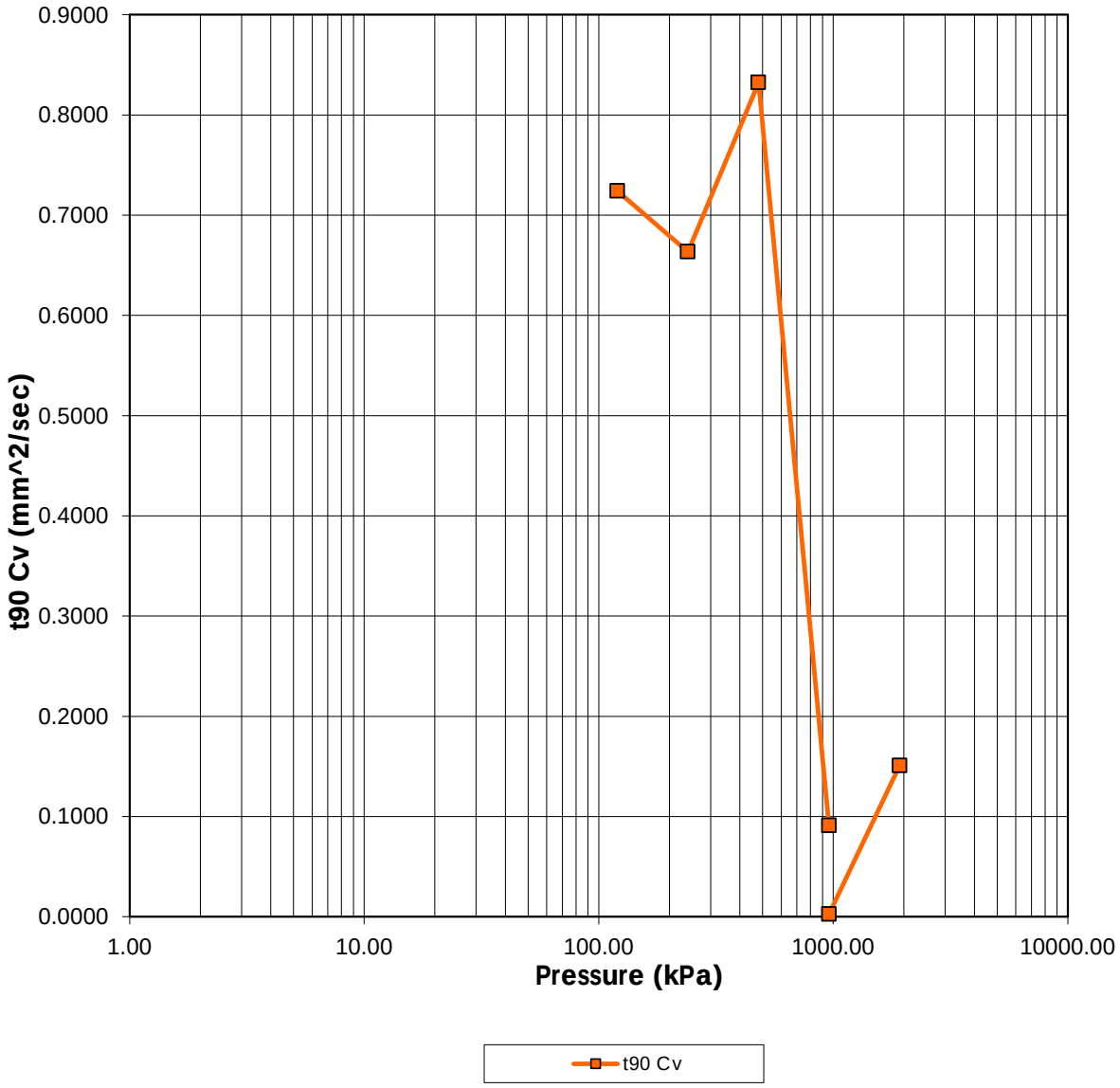
**Client:** Alberta Transportation

**Location:**

**Remarks:**
Swelling at loads 30kPa & 60kPa; omitted and not reported

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 16.31 | 21.48 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.659 | 1.709 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 70.15 | 99.95 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6244 | 0.4844 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Black/Grey Clay, Trace Sand and Gravel

**Project Number:** 110773396.302.702.230 **Depth:** 1.8-2.3m

**Sample Number:** D8-ST4 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

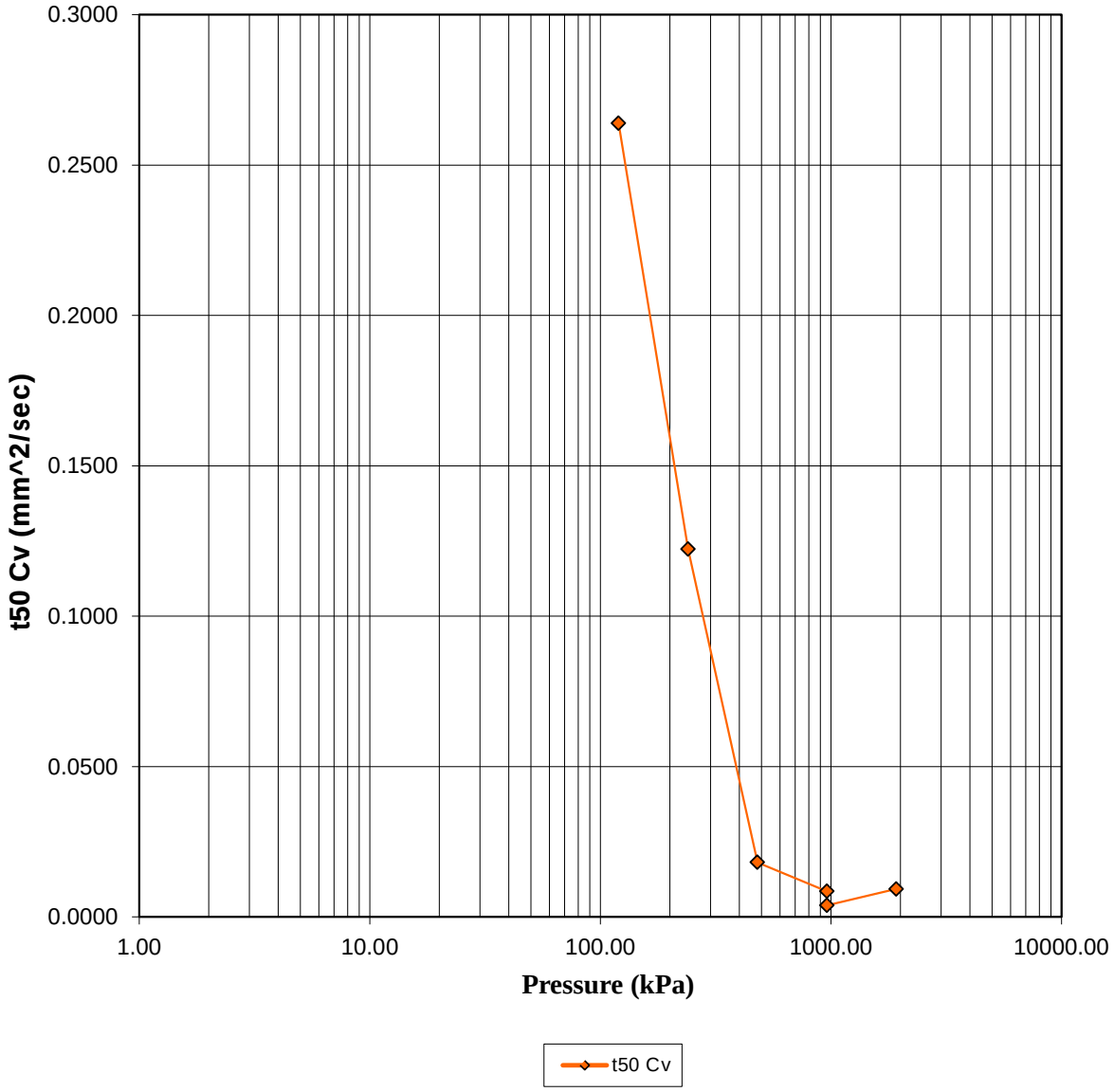
**Remarks:**
Swelling at loads 30kPa & 60kPa; omitted and not reported

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 16.31 | 21.48 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.659 | 1.709 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 70.15 | 99.95 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6244 | 0.4844 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Black/Grey Clay, Trace Sand and Gravel

**Project Number:** 110773396.302.702.230 **Depth:** 1.8-2.3m

**Sample Number:** D8-ST4 **Boring Number:**

**Project:** SR1

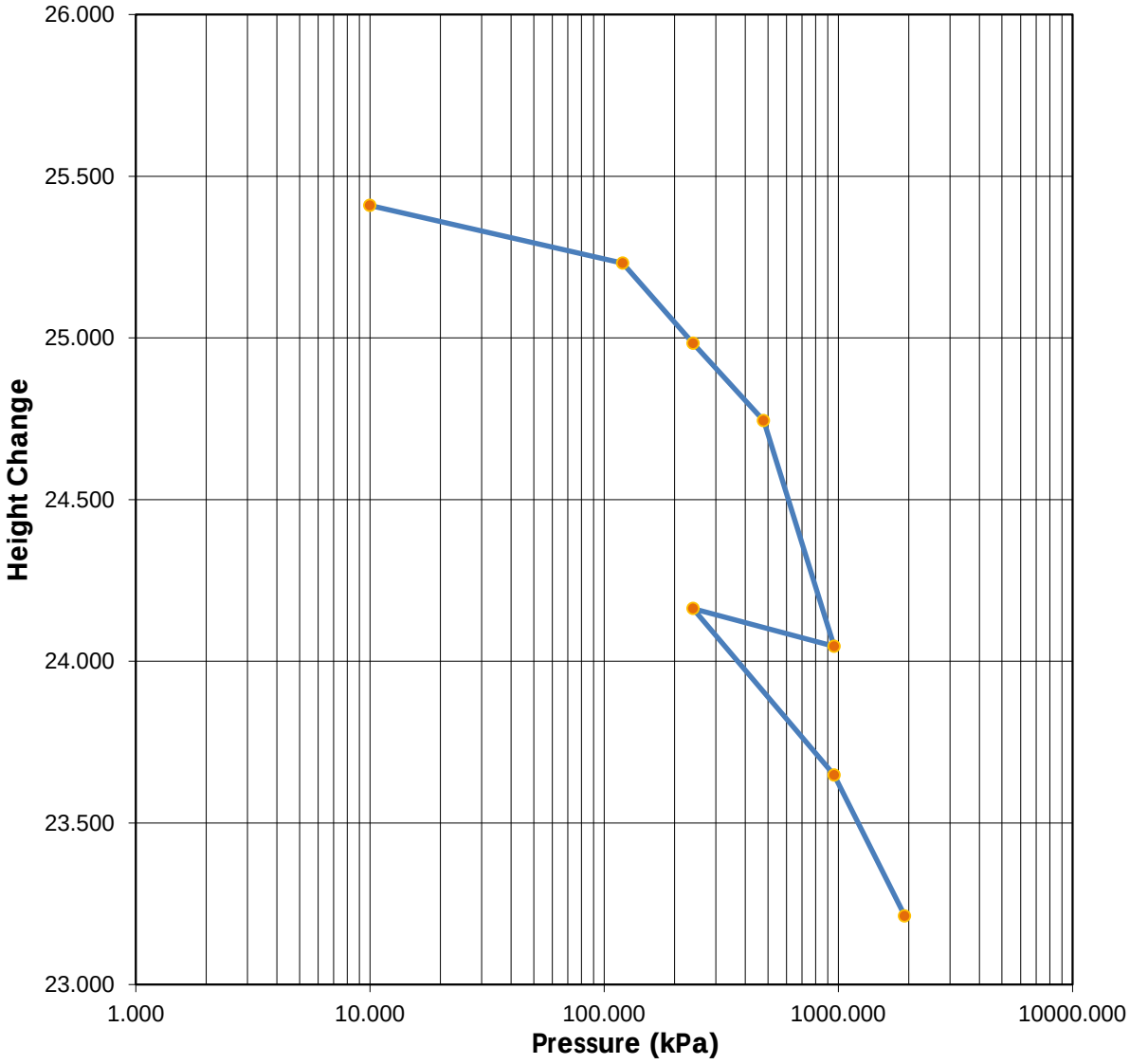
**Client:** Alberta Transportation

**Location:**

**Remarks:**
Swelling at loads 30kPa & 60kPa; omitted and not reported

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 16.31 | 21.48 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.659 | 1.709 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 70.15 | 99.95 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6244 | 0.4844 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Black/Grey Clay, Trace Sand and Gravel

**Project Number:** 110773396.302.702.230 **Depth:** 1.8-2.3m

**Sample Number:** D8-ST4 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Swelling at loads 30kPa & 60kPa; omitted and not reported

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D8-ST4
**Boring Number:**
**Depth:** 1.8-2.3m
**Sample Type:** Undisturbed

**Sample Description:**
Black/Grey Clay, Trace Sand and Gravel
**Remarks:**

**Test Number:**
**Test Date:** 12-May-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.4000 | 9.7681 | 0.00 | 0.6249 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 10.000 | -0.0100 | 25.4100 | 9.7781 | -0.04 | 0.6255 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 30.000 | -0.0300 | 25.4300 | 9.7981 | -0.12 | 0.6268 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 60.000 | -0.0170 | 25.4170 | 9.7851 | -0.07 | 0.6260 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 120.000 | 0.1690 | 25.2310 | 9.5991 | 0.67 | 0.6141 | 3.105 | 1.980 | 0.724 | 0.264 |
| 5 | 240.000 | 0.4170 | 24.9830 | 9.3511 | 1.64 | 0.5982 | 3.324 | 4.190 | 0.664 | 0.122 |
| 6 | 480.000 | 0.6560 | 24.7440 | 9.1121 | 2.58 | 0.5829 | 2.599 | 27.751 | 0.832 | 0.018 |
| 7 | 960.000 | 1.3540 | 24.0460 | 8.4141 | 5.33 | 0.5383 | 22.457 | 55.751 | 0.091 | 0.009 |
| 8 | 240.000 | 1.2370 | 24.1630 | 8.5311 | 4.87 | 0.5457 | 0.000 | 0.000 | 0.000 | 0.000 |
| 9 | 960.000 | 1.7520 | 23.6480 | 8.0161 | 6.90 | 0.5128 | 760.584 | 119.317 | 0.003 | 0.004 |
| 10 | 1920.000 | 2.1880 | 23.2120 | 7.5801 | 8.61 | 0.4849 | 12.624 | 47.772 | 0.151 | 0.009 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16

**Sample Number:** D8-ST4 **Sample Description:**
**Boring Number:** Black/Grey Clay, Trace Sand and Gravel
**Depth:** 1.8-2.3m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**

| | | | | | |
|---|---|---|---|---|---|
| **Liquid Limit:** | - | **Initial Void Ratio:** | 0.6244 | **Initial Height (mm):** | 25.4000 |
| **Plastic Limit:** | - | **Plasticity Index (%):** | - | **Initial Diameter (mm):** | 63.4000 |
| **Specific Gravity:** | 2.7000 Assumed | **Weight of Ring (g):** | 111.6000 | | |

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 20.34 | 46.38 |
| Dry Soil + Container (g) | 17.69 | 38.44 |
| Weight of Container (g) | 1.44 | 1.47 |
| Moisture Content (%) | 16.31 | 21.48 |
| Void Ratio | 0.6244 | 0.4844 |
| Saturation (%) | 70.15 | 99.95 |
| Dry Density (g/cm3) | 1.66 | 1.71 |

# Consolidation Test Results
## (Sequence 1) Load 10.000 kpa

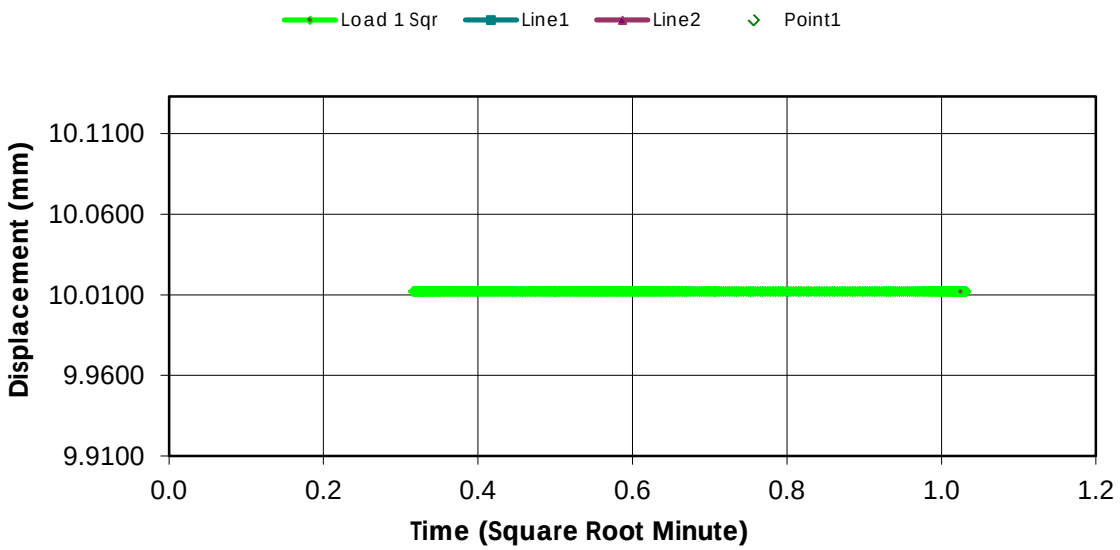
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D8-ST4 **Soil Description:**
**Boring Number:** Black/Grey Clay, Trace Sand and Gravel
**Depth:** 1.8-2.3m **Remarks:**
**Sample Type:** Undisturbed

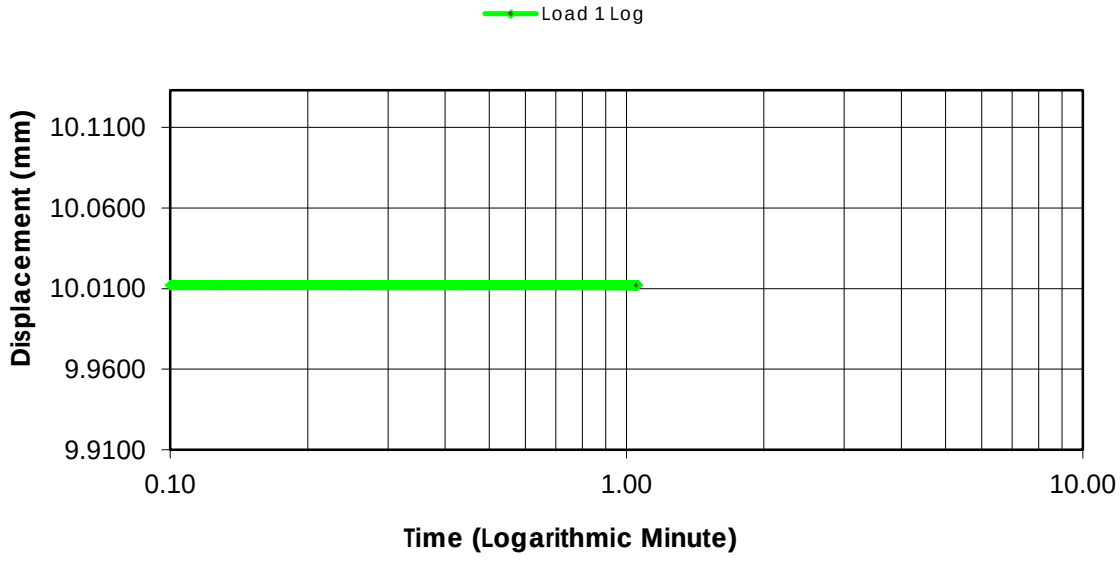
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.0120 | 0.0000 | 0.0000 | 0.6244 |
| 1 | 00:00:06 | 10.0120 | -0.0100 | -0.0394 | 0.6250 |
| 2 | 00:00:15 | 10.0120 | -0.0100 | -0.0394 | 0.6250 |
| 3 | 00:00:30 | 10.0120 | -0.0100 | -0.0394 | 0.6250 |
| 4 | 00:01:00 | 10.0120 | -0.0100 | -0.0394 | 0.6250 |
| 5 | 00:01:03 | 10.0120 | -0.0100 | -0.0394 | 0.6250 |

# Consolidation Test Results
## (Sequence 1) Load 10.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 120.000 kpa

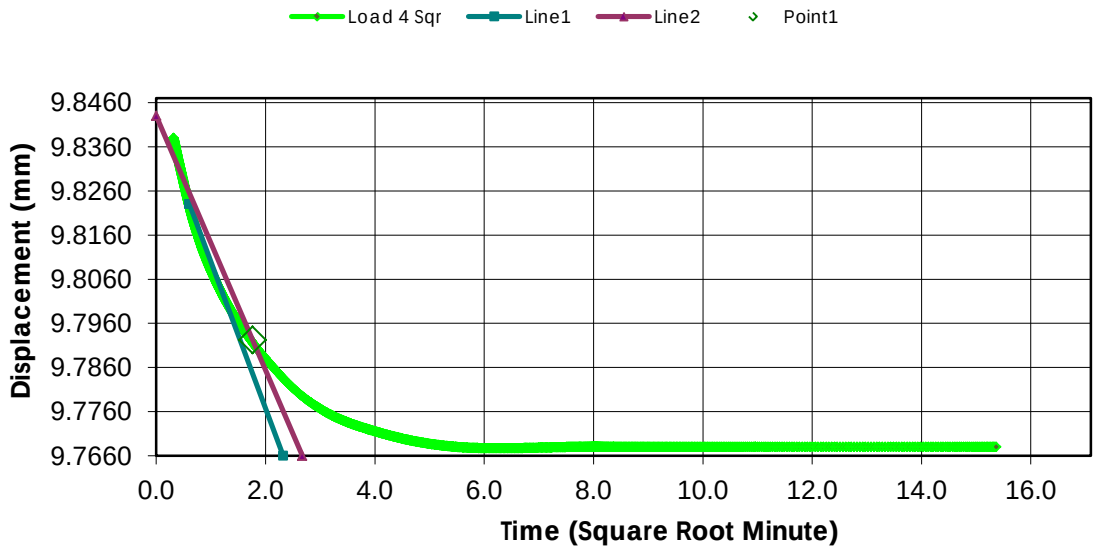
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D8-ST4 **Soil Description:**
**Boring Number:** Black/Grey Clay, Trace Sand and Gravel
**Depth:** 1.8-2.3m **Remarks:**
**Sample Type:** Undisturbed

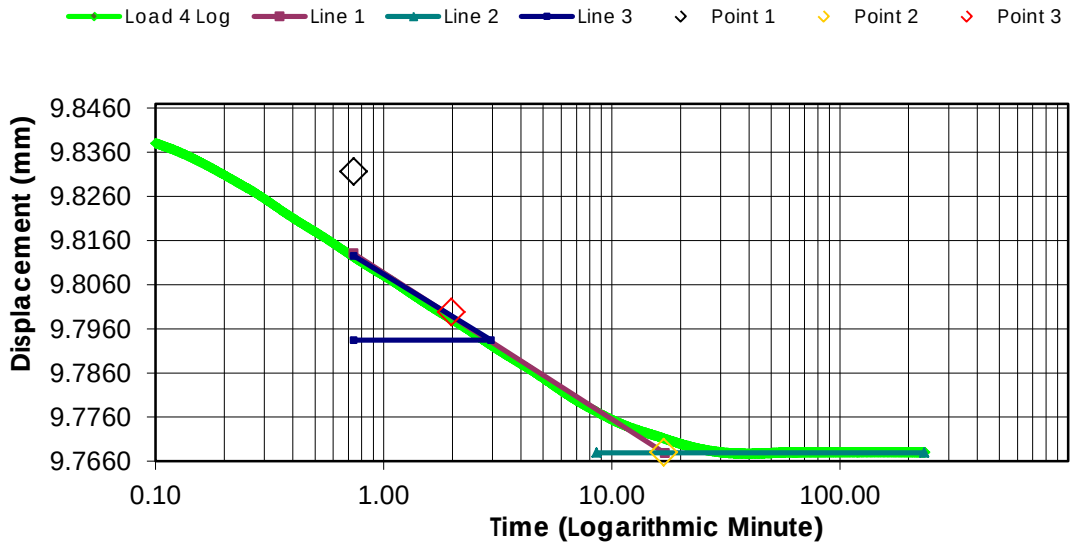
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.9740 | -0.0170 | -0.0669 | 0.6254 |
| 1 | 00:00:06 | 9.8380 | 0.0990 | 0.3898 | 0.6180 |
| 2 | 00:00:15 | 9.8280 | 0.1090 | 0.4291 | 0.6174 |
| 3 | 00:00:30 | 9.8180 | 0.1190 | 0.4685 | 0.6167 |
| 4 | 00:01:00 | 9.8080 | 0.1290 | 0.5079 | 0.6161 |
| 5 | 00:02:00 | 9.7980 | 0.1390 | 0.5472 | 0.6155 |
| 6 | 00:04:00 | 9.7880 | 0.1490 | 0.5866 | 0.6148 |
| 7 | 00:08:01 | 9.7780 | 0.1590 | 0.6260 | 0.6142 |
| 8 | 00:15:01 | 9.7720 | 0.1650 | 0.6496 | 0.6138 |
| 9 | 00:30:02 | 9.7680 | 0.1690 | 0.6654 | 0.6135 |
| 10 | 01:00:05 | 9.7680 | 0.1690 | 0.6654 | 0.6135 |
| 11 | 01:09:57 | 9.7680 | 0.1690 | 0.6654 | 0.6135 |
| 12 | 02:00:11 | 9.7680 | 0.1690 | 0.6654 | 0.6135 |
| 13 | 03:56:13 | 9.7680 | 0.1690 | 0.6654 | 0.6135 |

# Consolidation Test Results
## (Sequence 4) Load 120.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 240.000 kpa

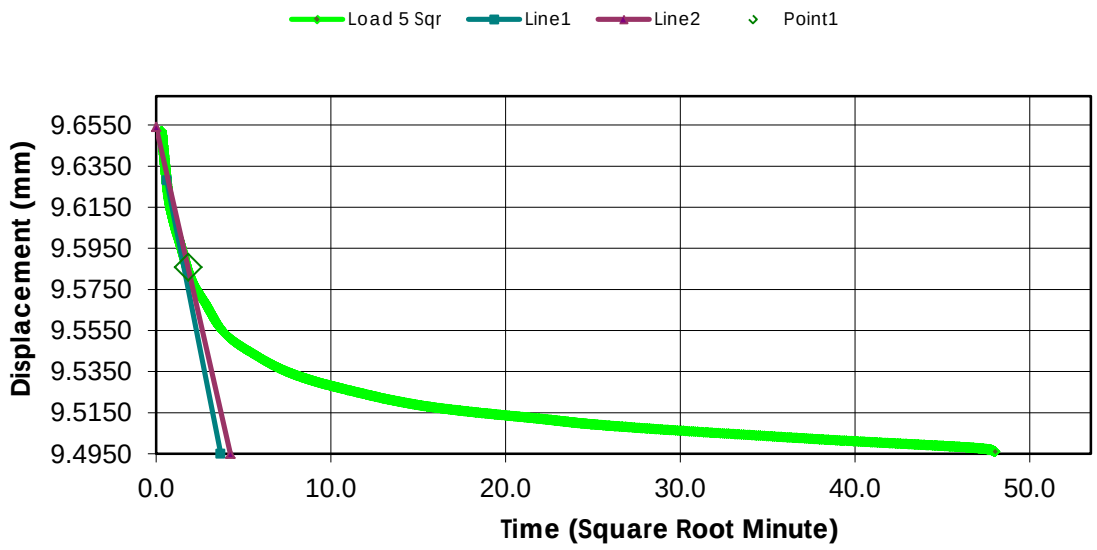
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D8-ST4 **Soil Description:**
**Boring Number:** Black/Grey Clay, Trace Sand and Gravel
**Depth:** 1.8-2.3m **Remarks:**
**Sample Type:** Undisturbed

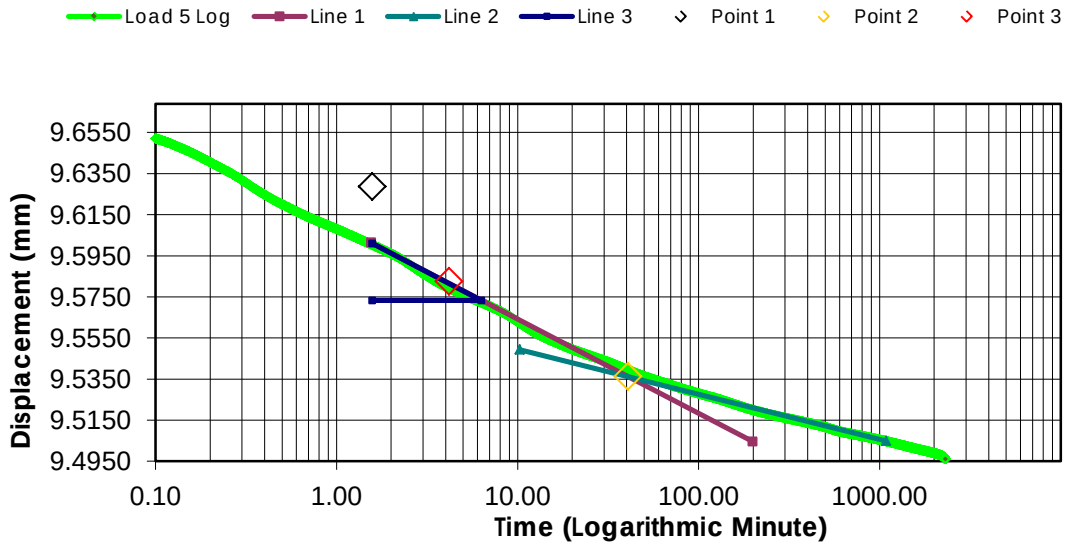
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.7680 | 0.1690 | 0.6654 | 0.6135 |
| 1 | 00:00:06 | 9.6520 | 0.2610 | 1.0276 | 0.6077 |
| 2 | 00:00:15 | 9.6360 | 0.2770 | 1.0906 | 0.6066 |
| 3 | 00:00:30 | 9.6200 | 0.2930 | 1.1535 | 0.6056 |
| 4 | 00:01:00 | 9.6080 | 0.3050 | 1.2008 | 0.6048 |
| 5 | 00:02:00 | 9.5960 | 0.3170 | 1.2480 | 0.6041 |
| 6 | 00:04:00 | 9.5800 | 0.3330 | 1.3110 | 0.6031 |
| 7 | 00:08:01 | 9.5680 | 0.3450 | 1.3583 | 0.6023 |
| 8 | 00:15:01 | 9.5540 | 0.3590 | 1.4134 | 0.6014 |
| 9 | 00:30:03 | 9.5440 | 0.3690 | 1.4528 | 0.6008 |
| 10 | 01:00:05 | 9.5340 | 0.3790 | 1.4921 | 0.6001 |
| 11 | 02:00:10 | 9.5260 | 0.3870 | 1.5236 | 0.5996 |
| 12 | 04:00:19 | 9.5180 | 0.3950 | 1.5551 | 0.5991 |
| 13 | 08:00:40 | 9.5120 | 0.4010 | 1.5787 | 0.5987 |
| 14 | 12:01:02 | 9.5080 | 0.4050 | 1.5945 | 0.5985 |
| 15 | 24:02:05 | 9.5020 | 0.4110 | 1.6181 | 0.5981 |
| 16 | 36:03:09 | 9.4980 | 0.4150 | 1.6339 | 0.5978 |
| 17 | 38:26:31 | 9.4960 | 0.4170 | 1.6417 | 0.5977 |

# Consolidation Test Results
## (Sequence 5) Load 240.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 480.000 kpa

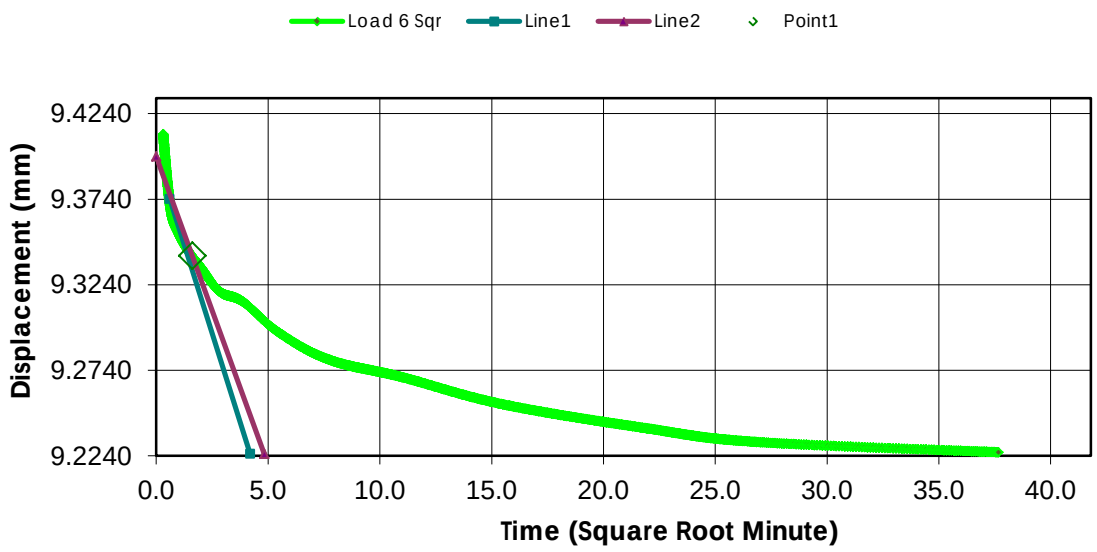
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D8-ST4 **Soil Description:**
**Boring Number:** Black/Grey Clay, Trace Sand and Gravel
**Depth:** 1.8-2.3m **Remarks:**
**Sample Type:** Undisturbed

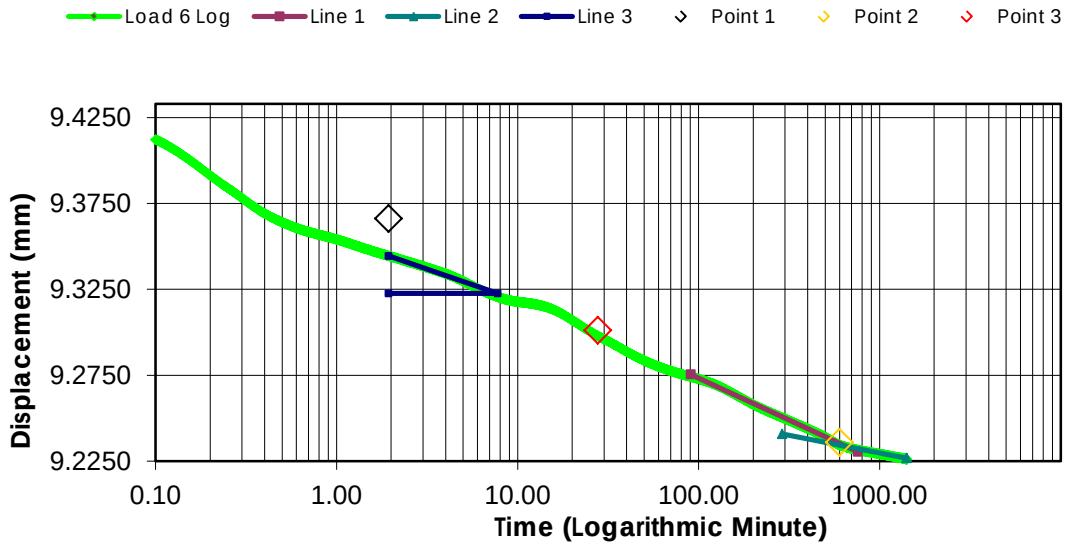
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.4960 | 0.4170 | 1.6417 | 0.5977 |
| 1 | 00:00:06 | 9.4120 | 0.4700 | 1.8504 | 0.5943 |
| 2 | 00:00:15 | 9.3840 | 0.4980 | 1.9606 | 0.5925 |
| 3 | 00:00:30 | 9.3640 | 0.5180 | 2.0394 | 0.5912 |
| 4 | 00:01:00 | 9.3540 | 0.5280 | 2.0787 | 0.5906 |
| 5 | 00:02:00 | 9.3440 | 0.5380 | 2.1181 | 0.5899 |
| 6 | 00:04:01 | 9.3340 | 0.5480 | 2.1575 | 0.5893 |
| 7 | 00:08:01 | 9.3200 | 0.5620 | 2.2126 | 0.5884 |
| 8 | 00:15:02 | 9.3140 | 0.5680 | 2.2362 | 0.5880 |
| 9 | 00:30:03 | 9.2960 | 0.5860 | 2.3071 | 0.5869 |
| 10 | 01:00:06 | 9.2800 | 0.6020 | 2.3701 | 0.5859 |
| 11 | 02:00:11 | 9.2700 | 0.6120 | 2.4094 | 0.5852 |
| 12 | 04:00:22 | 9.2540 | 0.6280 | 2.4724 | 0.5842 |
| 13 | 08:00:43 | 9.2400 | 0.6420 | 2.5276 | 0.5833 |
| 14 | 12:01:04 | 9.2320 | 0.6500 | 2.5591 | 0.5828 |
| 15 | 23:38:48 | 9.2260 | 0.6560 | 2.5827 | 0.5824 |

# Consolidation Test Results
## (Sequence 6) Load 480.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 960.000 kpa

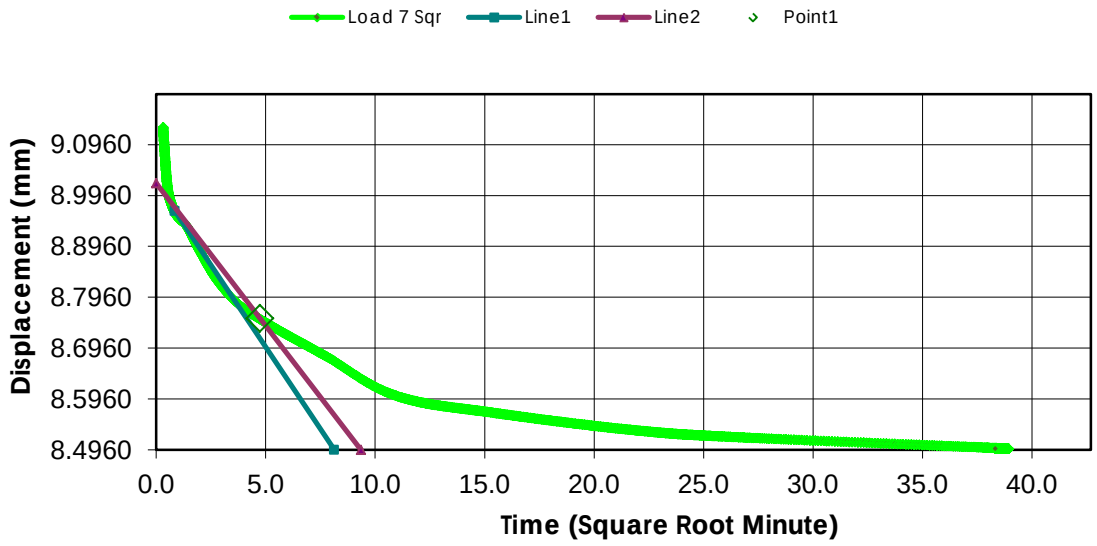
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D8-ST4 **Soil Description:**
**Boring Number:** Black/Grey Clay, Trace Sand and Gravel
**Depth:** 1.8-2.3m **Remarks:**
**Sample Type:** Undisturbed

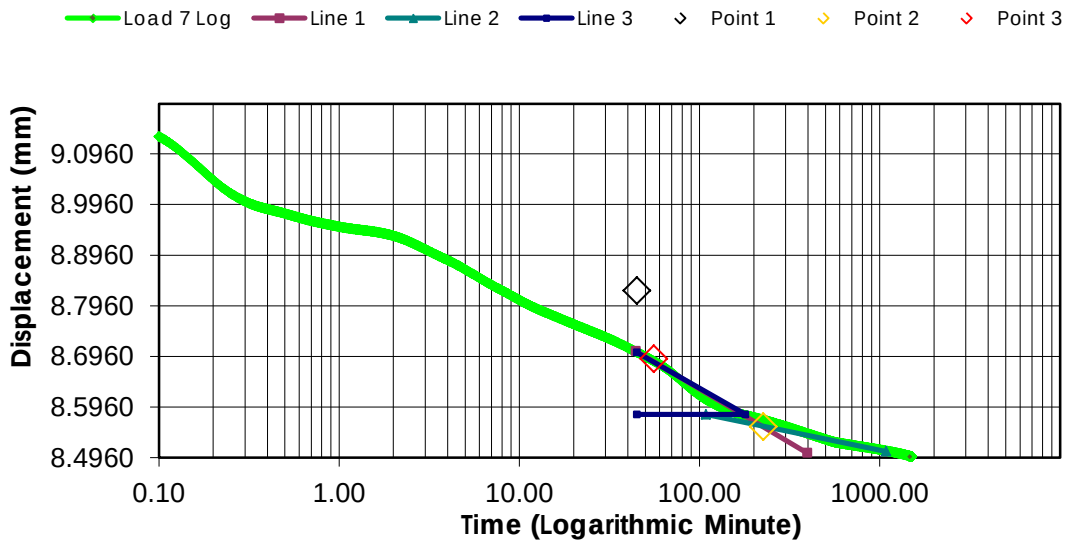
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.2260 | 0.6560 | 2.5827 | 0.5824 |
| 1 | 00:00:06 | 9.1300 | 0.7220 | 2.8425 | 0.5782 |
| 2 | 00:00:15 | 9.0180 | 0.8340 | 3.2835 | 0.5710 |
| 3 | 00:00:30 | 8.9780 | 0.8740 | 3.4409 | 0.5685 |
| 4 | 00:01:00 | 8.9520 | 0.9000 | 3.5433 | 0.5668 |
| 5 | 00:02:00 | 8.9340 | 0.9180 | 3.6142 | 0.5656 |
| 6 | 00:04:00 | 8.8860 | 0.9660 | 3.8032 | 0.5626 |
| 7 | 00:08:01 | 8.8260 | 1.0260 | 4.0394 | 0.5587 |
| 8 | 00:15:01 | 8.7780 | 1.0740 | 4.2283 | 0.5557 |
| 9 | 00:30:03 | 8.7340 | 1.1180 | 4.4016 | 0.5529 |
| 10 | 01:00:05 | 8.6800 | 1.1720 | 4.6142 | 0.5494 |
| 11 | 02:00:11 | 8.6020 | 1.2500 | 4.9213 | 0.5444 |
| 12 | 04:00:21 | 8.5680 | 1.2840 | 5.0551 | 0.5422 |
| 13 | 08:00:43 | 8.5340 | 1.3180 | 5.1890 | 0.5401 |
| 14 | 12:01:04 | 8.5200 | 1.3320 | 5.2441 | 0.5392 |
| 15 | 24:02:04 | 8.5000 | 1.3520 | 5.3228 | 0.5379 |
| 16 | 24:28:52 | 8.4980 | 1.3540 | 5.3307 | 0.5378 |

# Consolidation Test Results
## (Sequence 7) Load 960.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Rebound 240.000 kpa

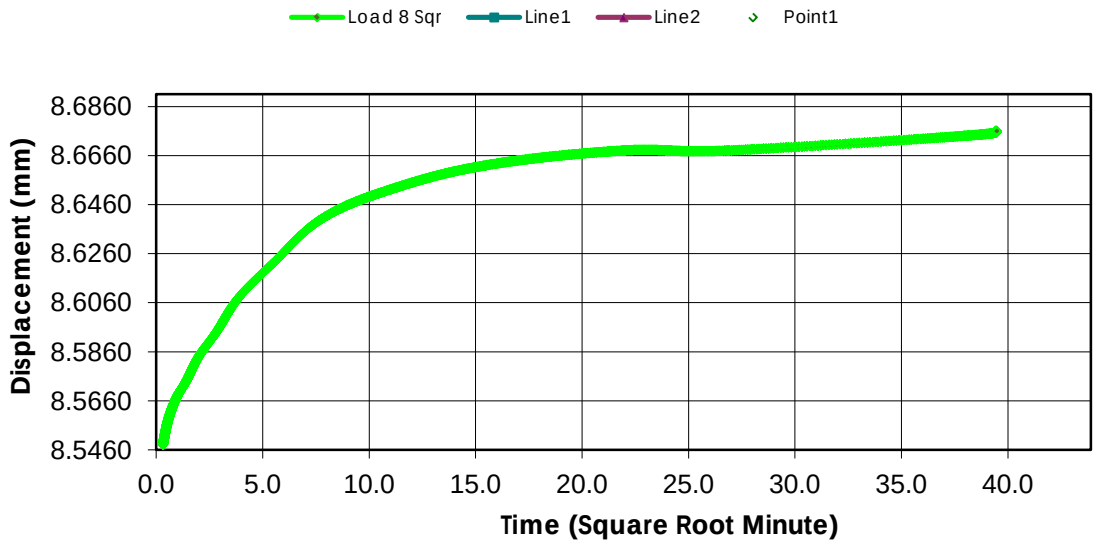
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D8-ST4 **Soil Description:**
**Boring Number:** Black/Grey Clay, Trace Sand and Gravel
**Depth:** 1.8-2.3m **Remarks:**
**Sample Type:** Undisturbed

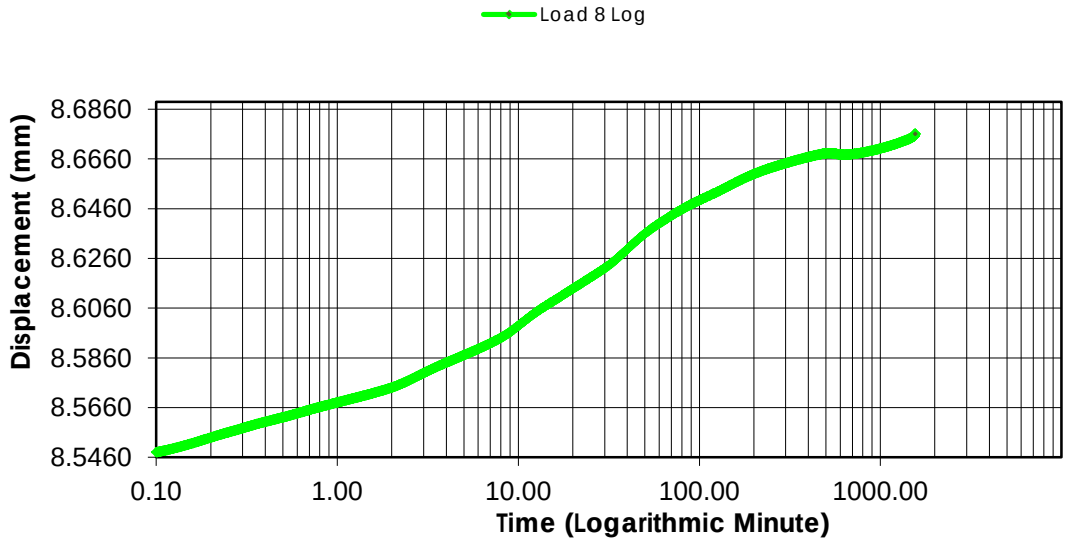
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.4980 | 1.3540 | 5.3307 | 0.5378 |
| 1 | 00:00:06 | 8.5480 | 1.3650 | 5.3740 | 0.5371 |
| 2 | 00:00:15 | 8.5560 | 1.3570 | 5.3425 | 0.5376 |
| 3 | 00:00:30 | 8.5620 | 1.3510 | 5.3189 | 0.5380 |
| 4 | 00:01:00 | 8.5680 | 1.3450 | 5.2953 | 0.5383 |
| 5 | 00:02:00 | 8.5740 | 1.3390 | 5.2717 | 0.5387 |
| 6 | 00:04:00 | 8.5840 | 1.3290 | 5.2323 | 0.5394 |
| 7 | 00:08:01 | 8.5940 | 1.3190 | 5.1929 | 0.5400 |
| 8 | 00:15:01 | 8.6080 | 1.3050 | 5.1378 | 0.5409 |
| 9 | 00:30:03 | 8.6220 | 1.2910 | 5.0827 | 0.5418 |
| 10 | 01:00:05 | 8.6400 | 1.2730 | 5.0118 | 0.5429 |
| 11 | 02:00:10 | 8.6520 | 1.2610 | 4.9646 | 0.5437 |
| 12 | 04:00:21 | 8.6620 | 1.2510 | 4.9252 | 0.5444 |
| 13 | 08:00:43 | 8.6680 | 1.2450 | 4.9016 | 0.5447 |
| 14 | 12:01:04 | 8.6680 | 1.2450 | 4.9016 | 0.5447 |
| 15 | 24:02:08 | 8.6740 | 1.2390 | 4.8780 | 0.5451 |
| 16 | 25:59:23 | 8.6760 | 1.2370 | 4.8701 | 0.5452 |

# Consolidation Test Results
## (Sequence 8) Rebound 240.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 960.000 kpa

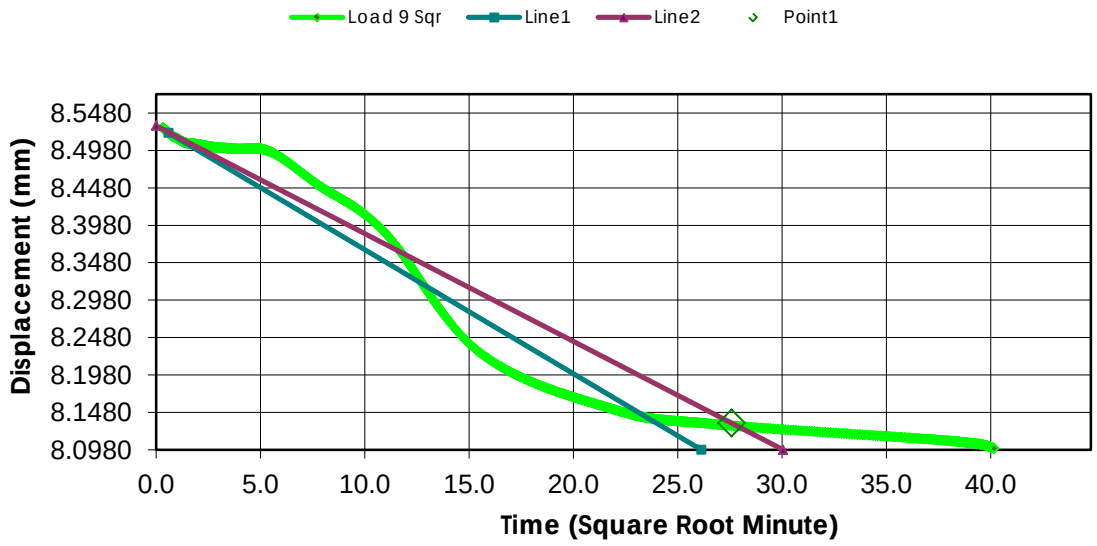
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D8-ST4 **Soil Description:**
**Boring Number:** Black/Grey Clay, Trace Sand and Gravel
**Depth:** 1.8-2.3m **Remarks:**
**Sample Type:** Undisturbed

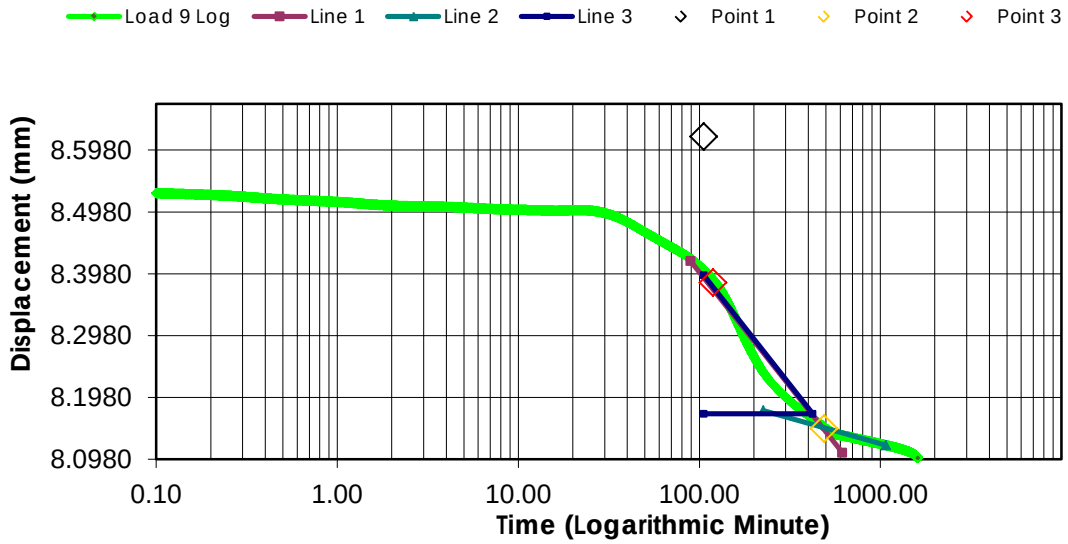
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.6760 | 1.2370 | 4.8701 | 0.5452 |
| 1 | 00:00:06 | 8.5280 | 1.3240 | 5.2126 | 0.5397 |
| 2 | 00:00:15 | 8.5240 | 1.3280 | 5.2283 | 0.5394 |
| 3 | 00:00:30 | 8.5180 | 1.3340 | 5.2520 | 0.5390 |
| 4 | 00:01:00 | 8.5140 | 1.3380 | 5.2677 | 0.5388 |
| 5 | 00:02:00 | 8.5080 | 1.3440 | 5.2913 | 0.5384 |
| 6 | 00:04:00 | 8.5060 | 1.3460 | 5.2992 | 0.5383 |
| 7 | 00:08:01 | 8.5020 | 1.3500 | 5.3150 | 0.5380 |
| 8 | 00:15:01 | 8.5000 | 1.3520 | 5.3228 | 0.5379 |
| 9 | 00:30:03 | 8.4960 | 1.3560 | 5.3386 | 0.5376 |
| 10 | 01:00:05 | 8.4520 | 1.4000 | 5.5118 | 0.5348 |
| 11 | 02:00:10 | 8.3880 | 1.4640 | 5.7638 | 0.5307 |
| 12 | 04:00:21 | 8.2280 | 1.6240 | 6.3937 | 0.5205 |
| 13 | 08:00:42 | 8.1520 | 1.7000 | 6.6929 | 0.5156 |
| 14 | 12:01:04 | 8.1320 | 1.7200 | 6.7717 | 0.5144 |
| 15 | 24:02:08 | 8.1100 | 1.7420 | 6.8583 | 0.5130 |
| 16 | 26:53:20 | 8.1000 | 1.7520 | 6.8976 | 0.5123 |

# Consolidation Test Results
## (Sequence 9) Load 960.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Load 1920.000 kpa

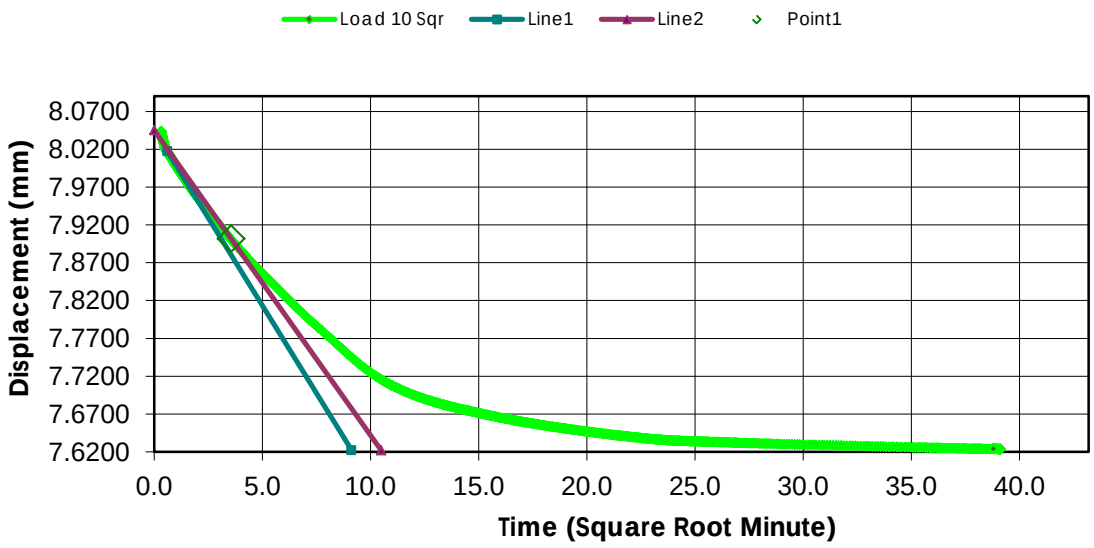
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D8-ST4 **Soil Description:**
**Boring Number:** Black/Grey Clay, Trace Sand and Gravel
**Depth:** 1.8-2.3m **Remarks:**
**Sample Type:** Undisturbed

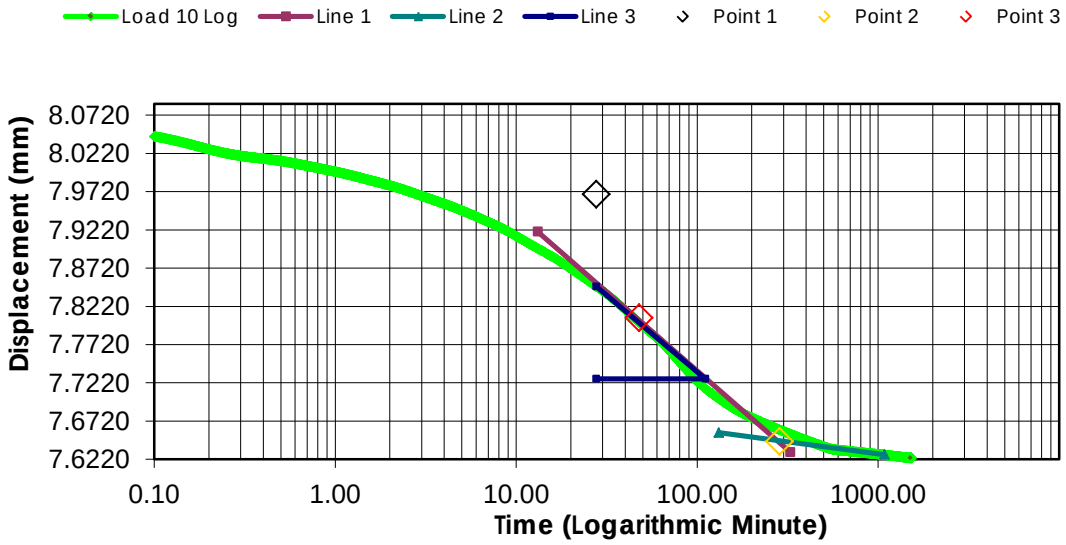
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.1000 | 1.7520 | 6.8976 | 0.5123 |
| 1 | 00:00:06 | 8.0440 | 1.7680 | 6.9606 | 0.5113 |
| 2 | 00:00:15 | 8.0220 | 1.7900 | 7.0472 | 0.5099 |
| 3 | 00:00:30 | 8.0120 | 1.8000 | 7.0866 | 0.5092 |
| 4 | 00:01:00 | 7.9980 | 1.8140 | 7.1417 | 0.5083 |
| 5 | 00:02:00 | 7.9800 | 1.8320 | 7.2126 | 0.5072 |
| 6 | 00:04:00 | 7.9560 | 1.8560 | 7.3071 | 0.5057 |
| 7 | 00:08:01 | 7.9260 | 1.8860 | 7.4252 | 0.5037 |
| 8 | 00:15:01 | 7.8900 | 1.9220 | 7.5669 | 0.5014 |
| 9 | 00:30:03 | 7.8420 | 1.9700 | 7.7559 | 0.4984 |
| 10 | 01:00:05 | 7.7800 | 2.0320 | 8.0000 | 0.4944 |
| 11 | 02:00:11 | 7.7080 | 2.1040 | 8.2835 | 0.4898 |
| 12 | 04:00:21 | 7.6680 | 2.1440 | 8.4409 | 0.4872 |
| 13 | 08:00:43 | 7.6400 | 2.1720 | 8.5512 | 0.4855 |
| 14 | 12:01:04 | 7.6320 | 2.1800 | 8.5827 | 0.4849 |
| 15 | 24:02:08 | 7.6240 | 2.1880 | 8.6142 | 0.4844 |
| 16 | 25:05:28 | 7.6240 | 2.1880 | 8.6142 | 0.4844 |

# Consolidation Test Results
## (Sequence 10) Load 1920.000 kpa

### Consolidation Graph (Squareroot Time)

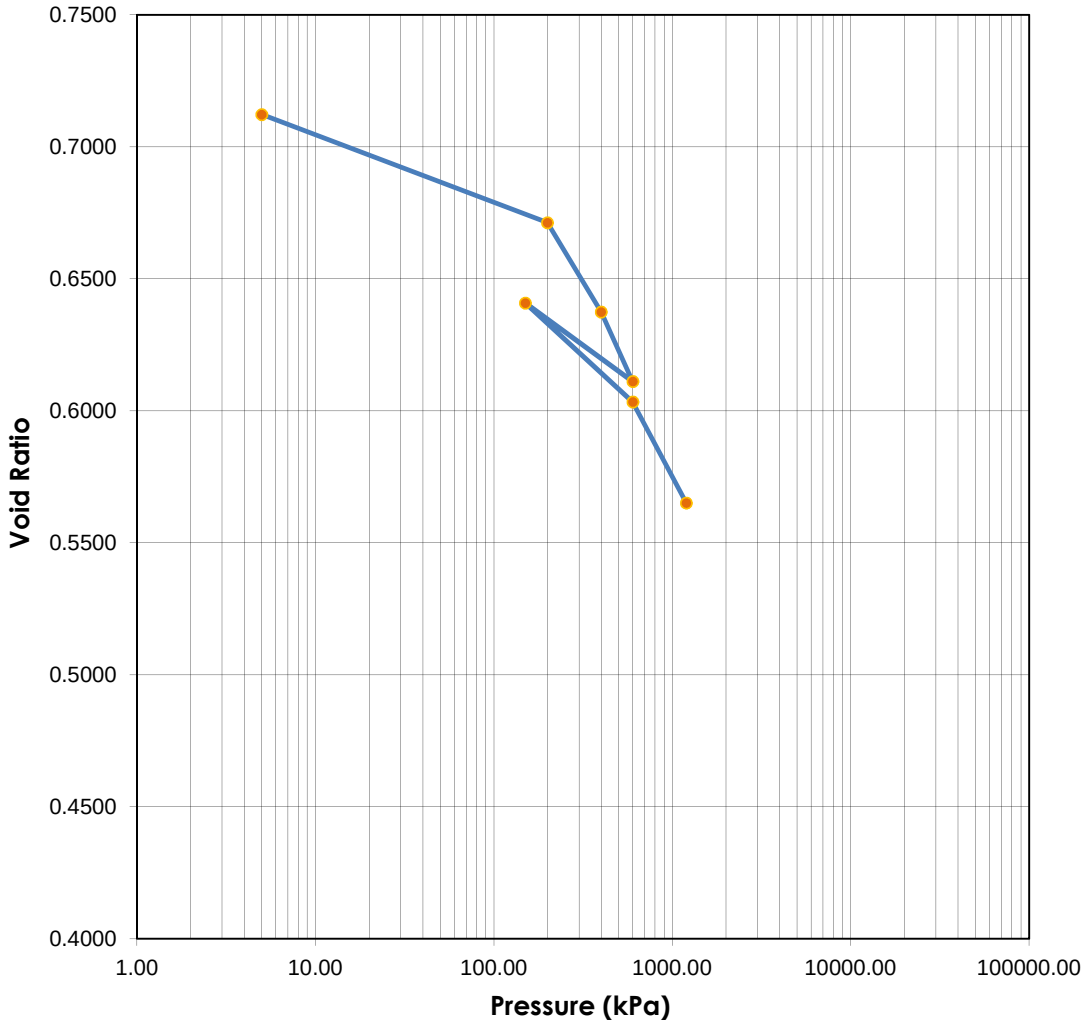



### Consolidation Graph (Logarithmic Time)



# Stantec Consulting Ltd.
## One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876




| | Before | After | | | |
|---|---|---|---|---|---|
| **Moisture (%):** | 26.3 | 26.8 | **Liquid Limits:** | - | **Test Date:** 06-May-16 |
| **Dry Density (g/cm3):** | 1.574 | 1.688 | **Plastic Limits:** | - | |
| **Saturation (%):** | 99.43 | 120.76 | **Plasticity Index (%):** | - | |
| **Void Ratio:** | 0.7111 | 0.5641 | **Specific Gravity:** | 2.700 | Assumed |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 1.6-1.9m

**Sample Number:** D11-ST3 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

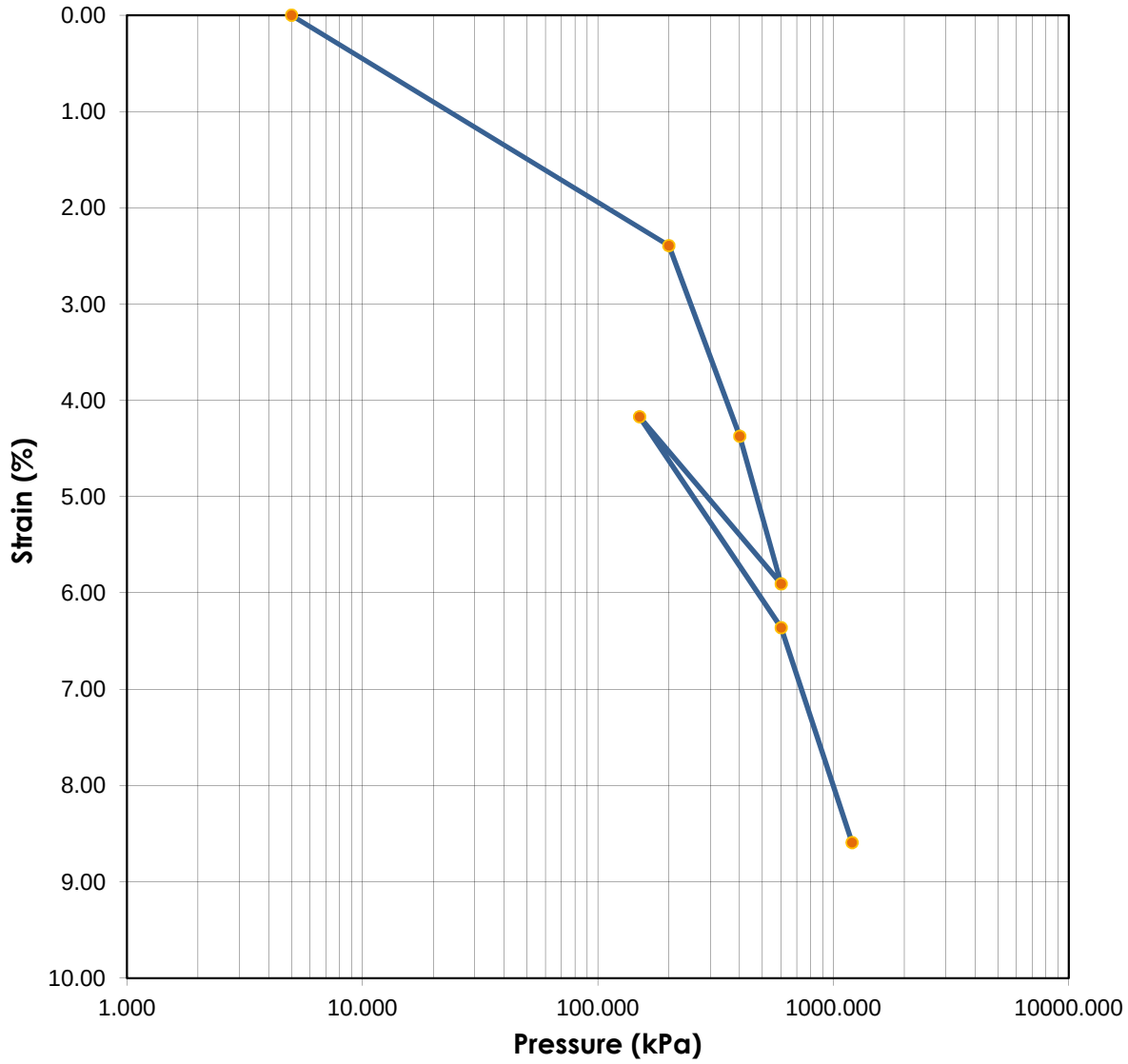
**Remarks:**
Sample swelled first 3 loads - consolidation began at 200kPa load.

**Tested By:** C.Tollifson **Reviewed By:** C.Lamoureux

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Moisture (%):** | 26.3 | 26.8 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.574 | 1.688 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 99.43 | 120.76 | | | | |
| **Void Ratio:** | 0.7111 | 0.5641 | **Specific Gravity:** | 2.700 | Assumed | |

**Sample Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 1.6-1.9m

**Sample Number:** D11-ST3 **Boring Number:**

**Project:** SR1

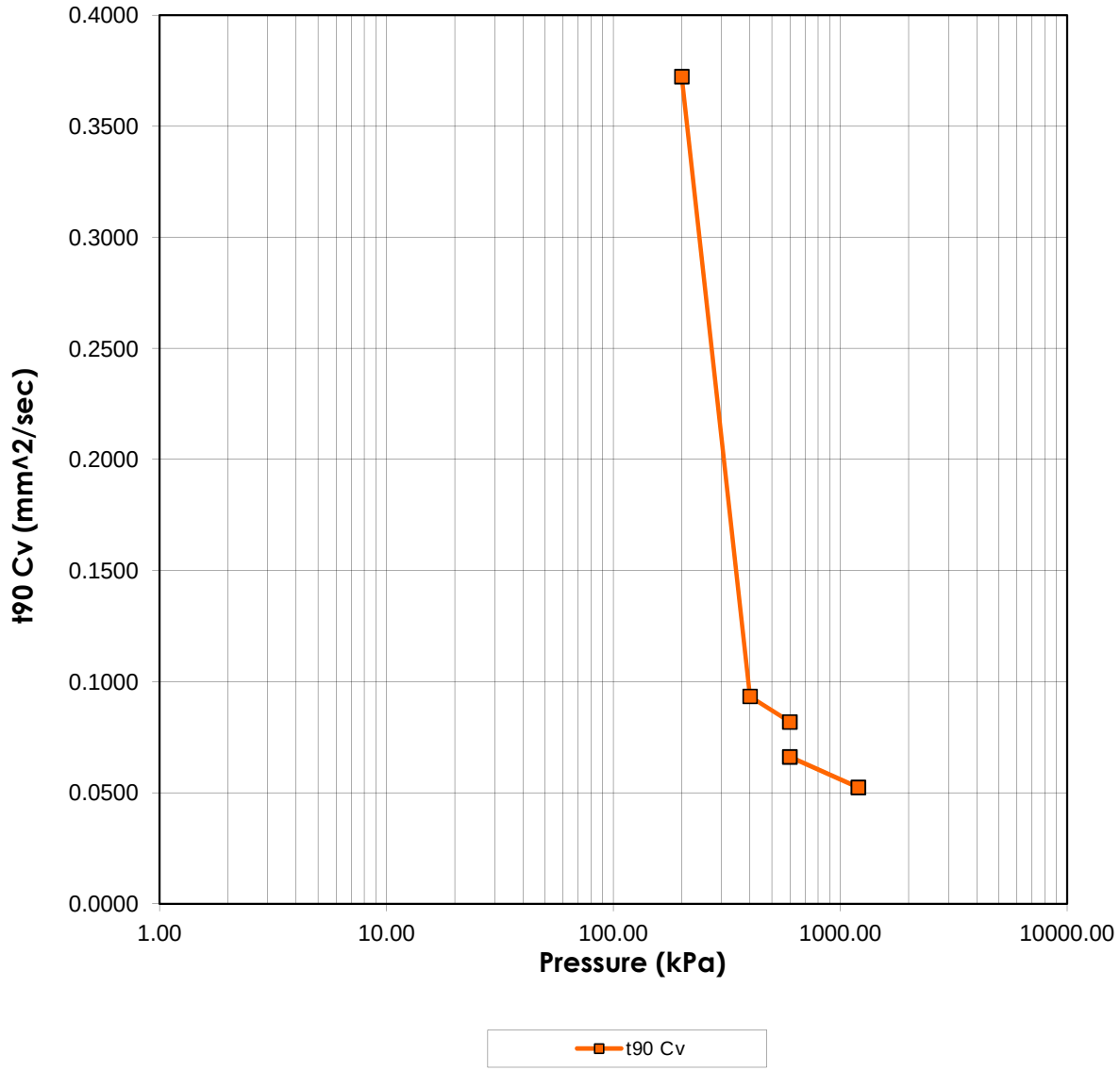
**Client:** Alberta Transportation

**Location:**

**Remarks:**

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 26.3 | 26.8 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.574 | 1.688 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 99.43 | 120.76 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.7111 | 0.5641 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 1.6-1.9m

**Sample Number:** D11-ST3 **Boring Number:**

**Project:** SR1

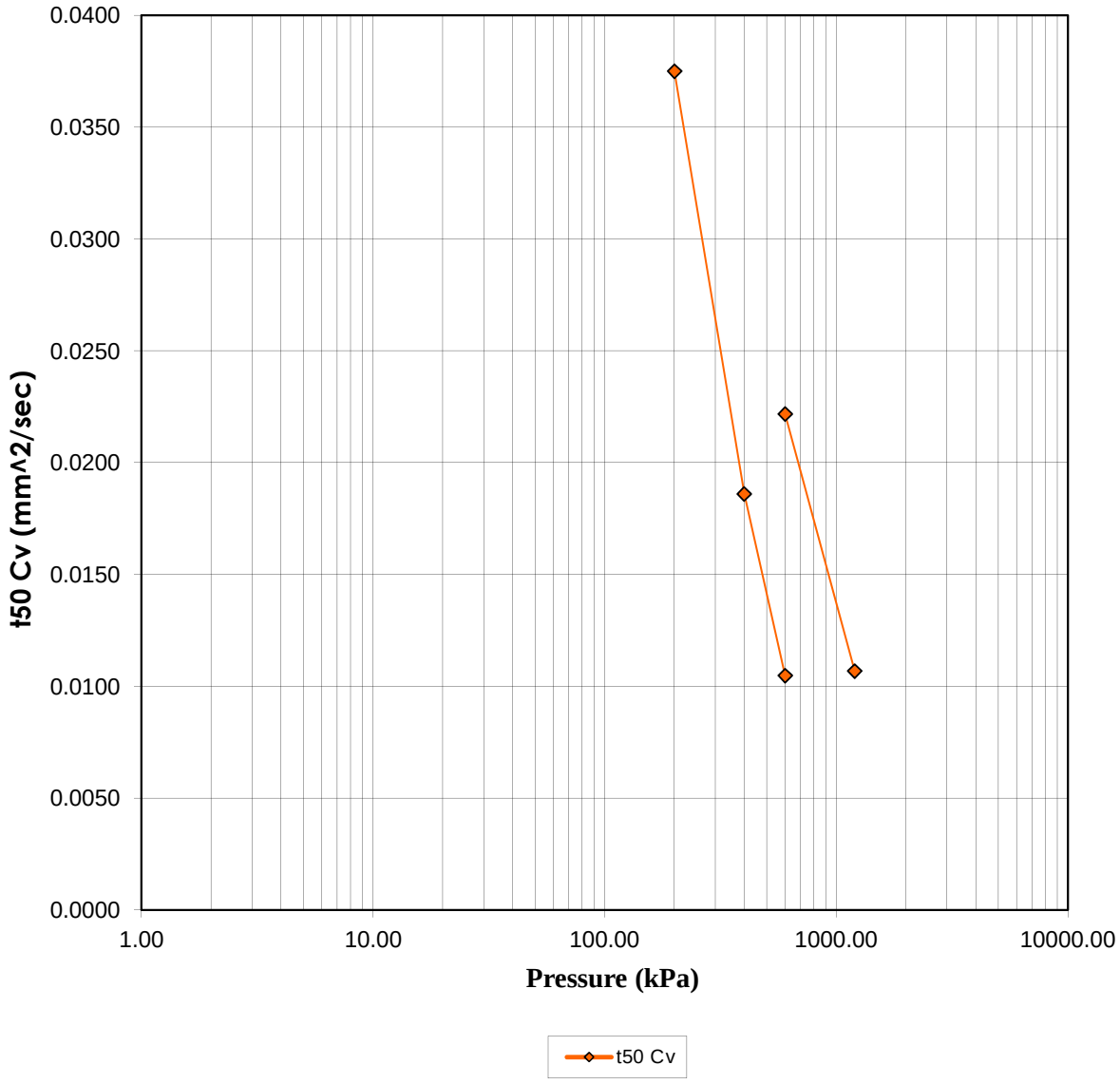
**Client:** Alberta Transportation

**Location:**

**Remarks:**

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 26.3 | 26.8 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.574 | 1.688 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 99.43 | 120.76 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.7111 | 0.5641 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 1.6-1.9m

**Sample Number:** D11-ST3 **Boring Number:**

**Project:** SR1

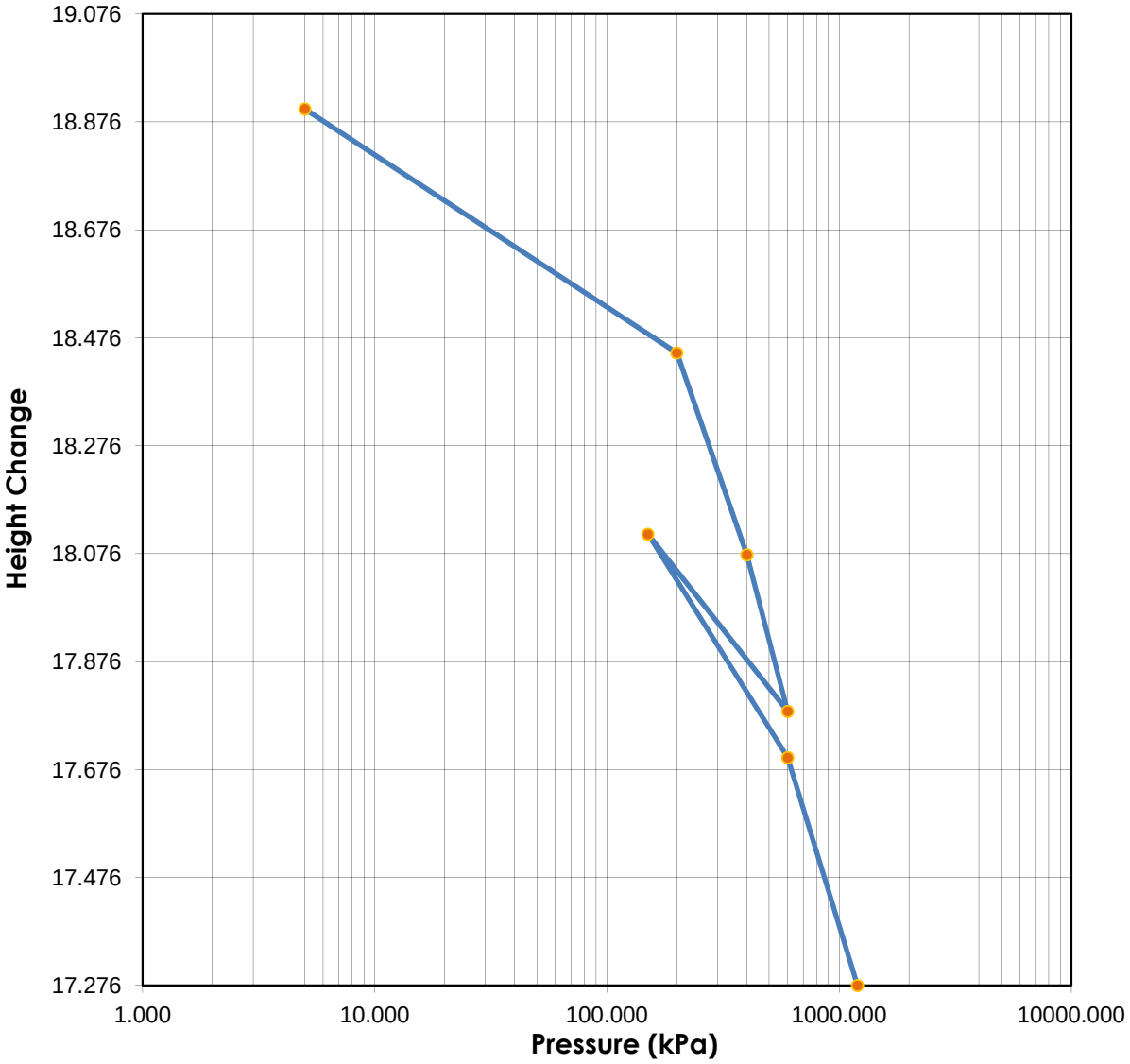
**Client:** Alberta Transportation

**Location:**

**Remarks:**

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 26.3 | 26.8 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.574 | 1.688 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 99.43 | 120.76 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.7111 | 0.5641 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 1.6-1.9m

**Sample Number:** D11-ST3 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435
## Summary

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D11-ST3
**Boring Number:**
**Depth:** 1.6-1.9m
**Sample Type:** Undisturbed

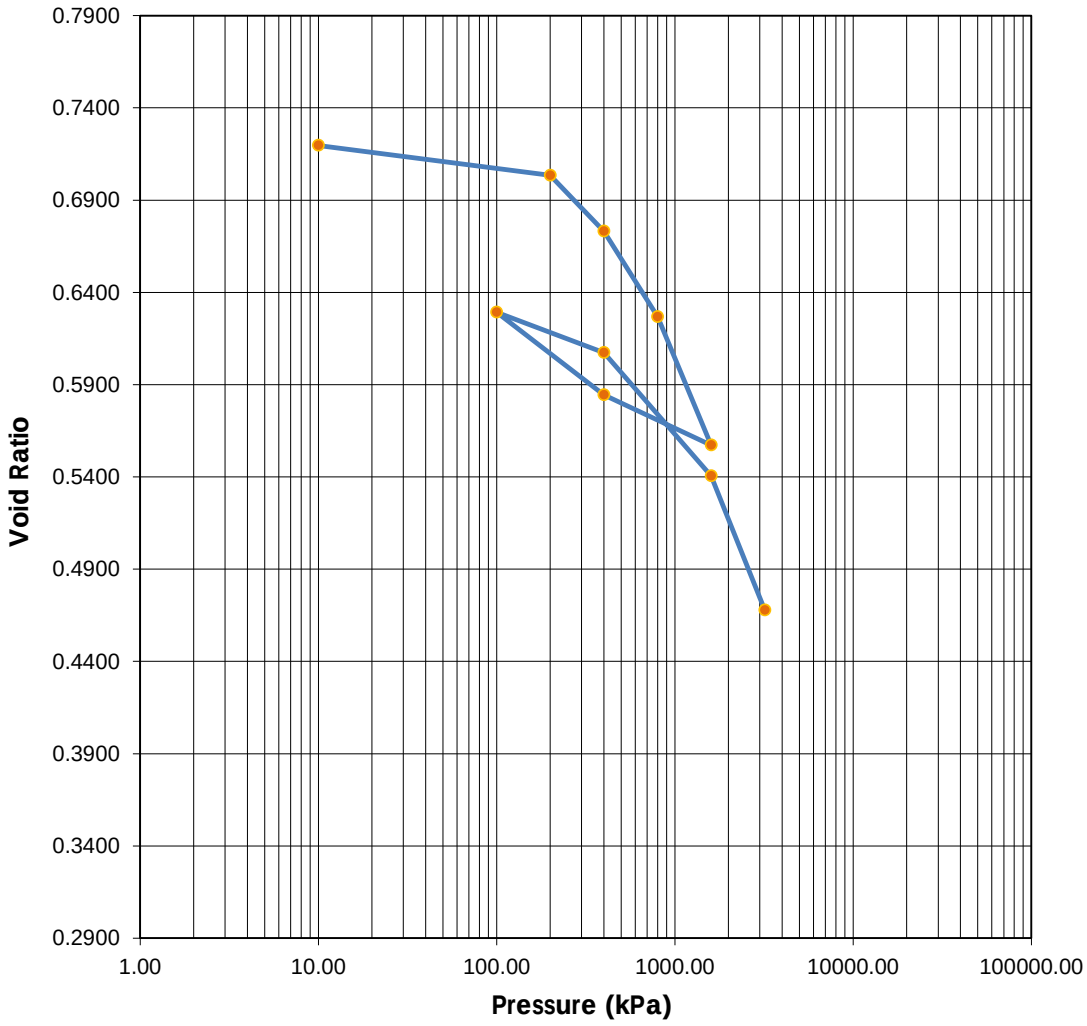
**Sample Description:** Brown Clay
**Remarks:**

**Test Number:**
**Test Date:** 06-May-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 18.9000 | 7.8618 | 0.00 | 0.7122 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 18.9000 | 7.8618 | 0.00 | 0.7122 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 50.000 | 0.3540 | 18.5460 | 7.5078 | 1.87 | 0.6802 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 100.000 | 0.3400 | 18.5600 | 7.5218 | 1.80 | 0.6814 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 200.000 | 0.4520 | 18.4480 | 7.4098 | 2.39 | 0.6713 | 3.229 | 7.449 | 0.372 | 0.038 |
| 5 | 400.000 | 0.8260 | 18.0740 | 7.0358 | 4.37 | 0.6374 | 12.362 | 14.413 | 0.093 | 0.019 |
| 6 | 600.000 | 1.1160 | 17.7840 | 6.7458 | 5.90 | 0.6111 | 13.655 | 24.757 | 0.082 | 0.010 |
| 7 | 150.000 | 0.7880 | 18.1120 | 7.0738 | 4.17 | 0.6408 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8 | 600.000 | 1.2020 | 17.6980 | 6.6598 | 6.36 | 0.6033 | 16.743 | 11.592 | 0.066 | 0.022 |
| 9 | 1200.000 | 1.6240 | 17.2760 | 6.2378 | 8.59 | 0.5651 | 20.146 | 22.921 | 0.052 | 0.011 |

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Moisture (%):** | 27.18 | 19.93 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.567 | 1.834 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 101.54 | 113.89 | | | | |
| **Void Ratio:** | 0.7220 | 0.4697 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Light Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.7-3.2m

**Sample Number:** D12-ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

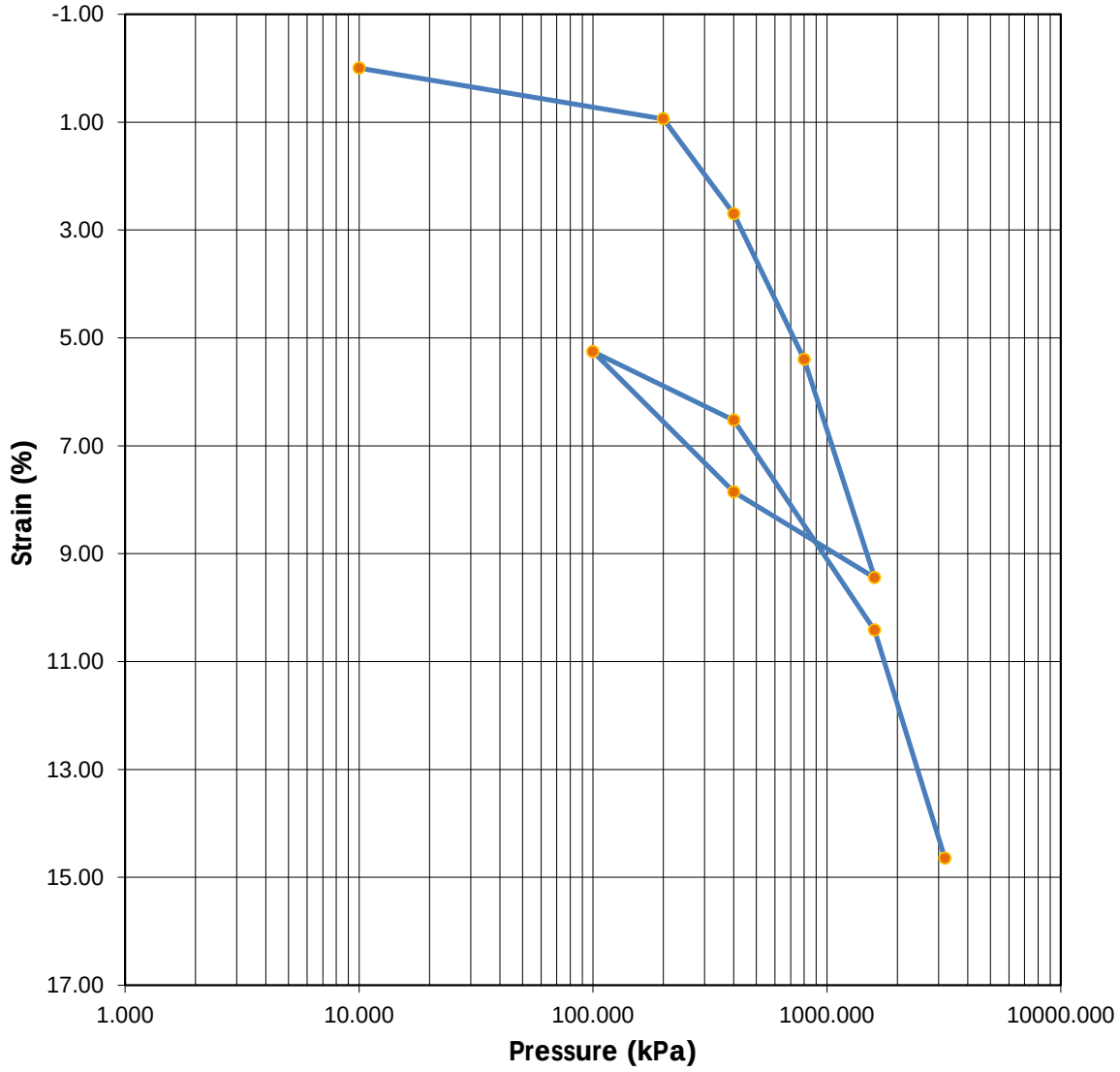
**Remarks:**
Swelling at loads 25kPa, 50kPa, & 100kPa; omitted and not reported

**Tested By:**

**Reviewed By:**

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 27.18 | 19.93 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.567 | 1.834 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 101.54 | 113.89 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.7220 | 0.4697 | **Specific Gravity:** | 2.700 | Assumed | |

**Sample Description:** Light Brown Clay

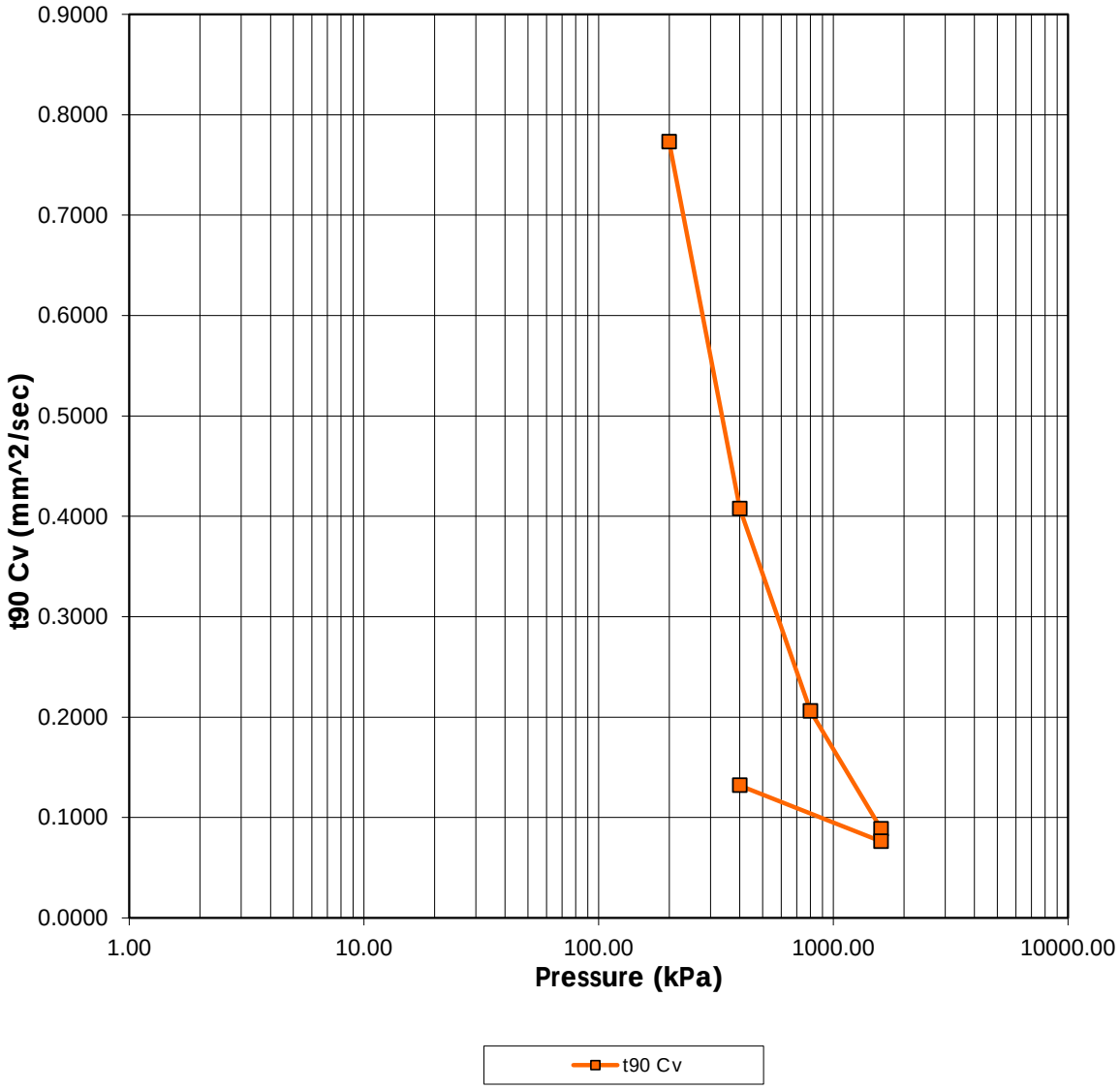
**Project Number:** 110773396.302.702.230 **Depth:** 2.7-3.2m
**Sample Number:** D12-ST6 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportation
**Location:**

**Remarks:**
Swelling at loads 25kPa, 50kPa, & 100kPa; omitted and not reported

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 27.18 | 19.93 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.567 | 1.834 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 101.54 | 113.89 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.7220 | 0.4697 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Light Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.7-3.2m

**Sample Number:** D12-ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

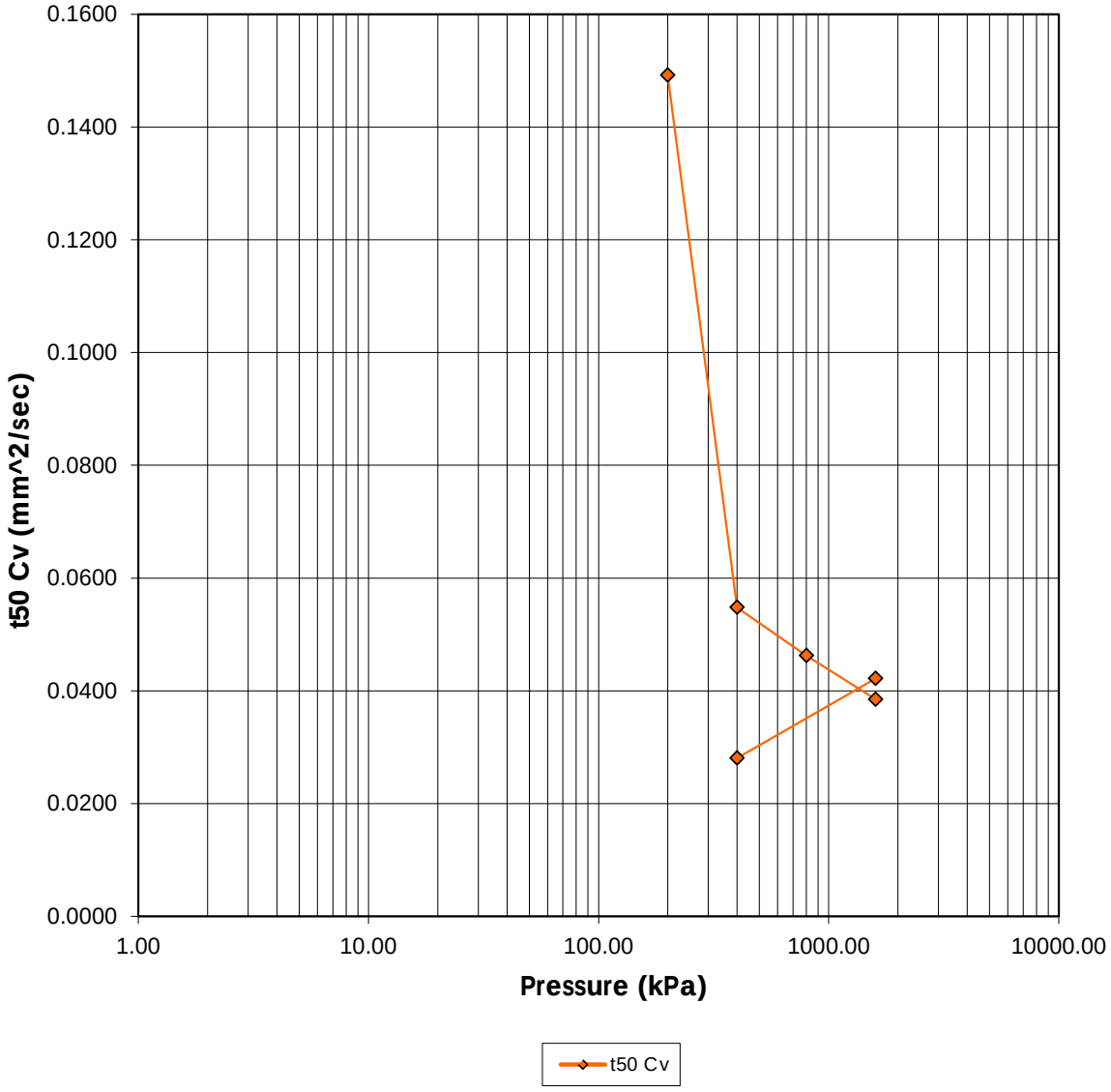
**Location:**

**Remarks:**
Swelling at loads 25kPa, 50kPa, & 100kPa; omitted and not reported

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435

### Test Results




| | Before | After | | | |
|---|---|---|---|---|---|
| **Moisture (%):** | 27.18 | 19.93 | **Liquid Limits:** | - | **Test Date:** 12-May-16 |
| **Dry Density (g/cm3):** | 1.567 | 1.834 | **Plastic Limits:** | - | |
| **Saturation (%):** | 101.54 | 113.89 | **Plasticity Index (%):** | - | |
| **Void Ratio:** | 0.7220 | 0.4697 | **Specific Gravity:** | 2.700 | Assumed |

**Soil Description:** Light Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.7-3.2m

**Sample Number:** D12-ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

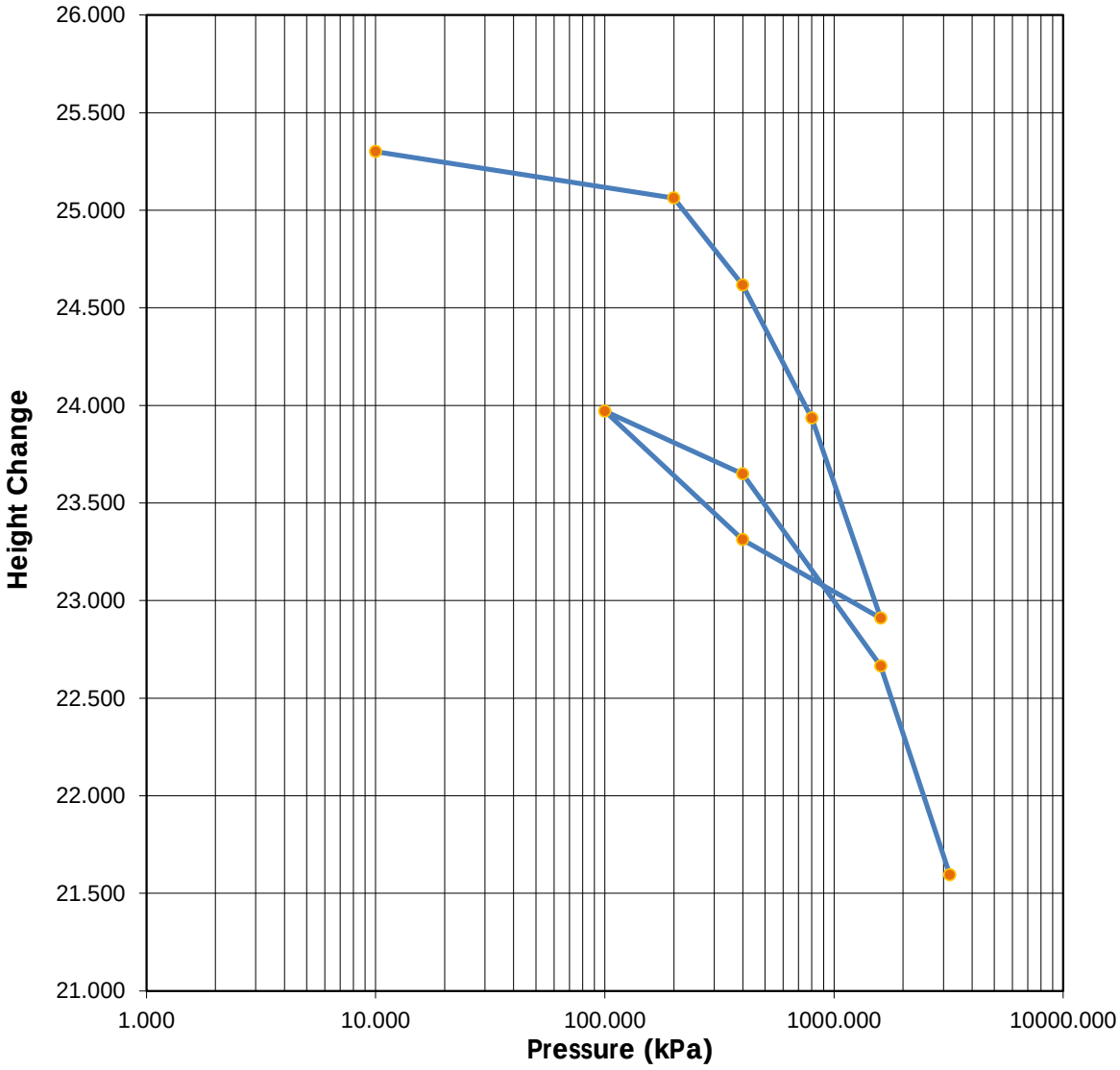
**Location:**

**Remarks:**
Swelling at loads 25kPa, 50kPa, & 100kPa; omitted and not reported

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435

### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 27.18 | 19.93 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.567 | 1.834 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 101.54 | 113.89 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.7220 | 0.4697 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Light Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.7-3.2m

**Sample Number:** D12-ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Swelling at loads 25kPa, 50kPa, & 100kPa; omitted and not reported

# Consolidation Test Results

## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Sample Description:** Light Brown Clay
**Remarks:**

**Test Number:**
**Test Date:** 12-May-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.3000 | 10.5875 | 0.00 | 0.7196 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 10.000 | 0.0000 | 25.3000 | 10.5875 | 0.00 | 0.7196 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 25.000 | 0.0320 | 25.2680 | 10.5555 | 0.13 | 0.7175 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 50.000 | 0.0240 | 25.2760 | 10.5635 | 0.09 | 0.7180 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 100.000 | 0.0880 | 25.2120 | 10.4995 | 0.35 | 0.7136 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | 200.000 | 0.2380 | 25.0620 | 10.3495 | 0.94 | 0.7035 | 2.871 | 3.456 | 0.773 | 0.149 |
| 6 | 400.000 | 0.6840 | 24.6160 | 9.9035 | 2.70 | 0.6731 | 5.253 | 9.080 | 0.408 | 0.055 |
| 7 | 800.000 | 1.3660 | 23.9340 | 9.2215 | 5.40 | 0.6268 | 9.835 | 10.165 | 0.206 | 0.046 |
| 8 | 1600.000 | 2.3900 | 22.9100 | 8.1975 | 9.45 | 0.5572 | 20.976 | 11.194 | 0.088 | 0.038 |
| 9 | 400.000 | 1.9880 | 23.3120 | 8.5995 | 7.86 | 0.5845 | 0.000 | 0.000 | 0.000 | 0.000 |
| 10 | 100.000 | 1.3300 | 23.9700 | 9.2575 | 5.26 | 0.6292 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 400.000 | 1.6520 | 23.6480 | 8.9355 | 6.53 | 0.6073 | 14.986 | 16.366 | 0.132 | 0.028 |
| 12 | 1600.000 | 2.6360 | 22.6640 | 7.9515 | 10.42 | 0.5405 | 23.836 | 10.000 | 0.076 | 0.042 |
| 13 | 3200.000 | 3.7060 | 21.5940 | 6.8815 | 14.65 | 0.4677 | 0.000 | 0.000 | 0.000 | 0.000 |

Predicted value indicated with *

# Consolidation Test

## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16

**Sample Number:** D12-ST6 **Sample Description:**
**Boring Number:** Light Brown Clay
**Depth:** 2.7-3.2m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** - **Initial Void Ratio:** 0.7220 **Initial Height (mm):** 25.3000
**Plastic Limit:** - **Plasticity Index (%):** - **Initial Diameter (mm):** 50.6000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 89.7100

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 13.17 | 14.76 |
| Dry Soil + Container (g) | 10.65 | 12.55 |
| Weight of Container (g) | 1.38 | 1.46 |
| Moisture Content (%) | 27.18 | 19.93 |
| Void Ratio | 0.7220 | 0.4697 |
| Saturation (%) | 101.54 | 113.89 |
| Dry Density (g/cm3) | 1.57 | 1.83 |

# Consolidation Test Results

## (Sequence 1) Load 10.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

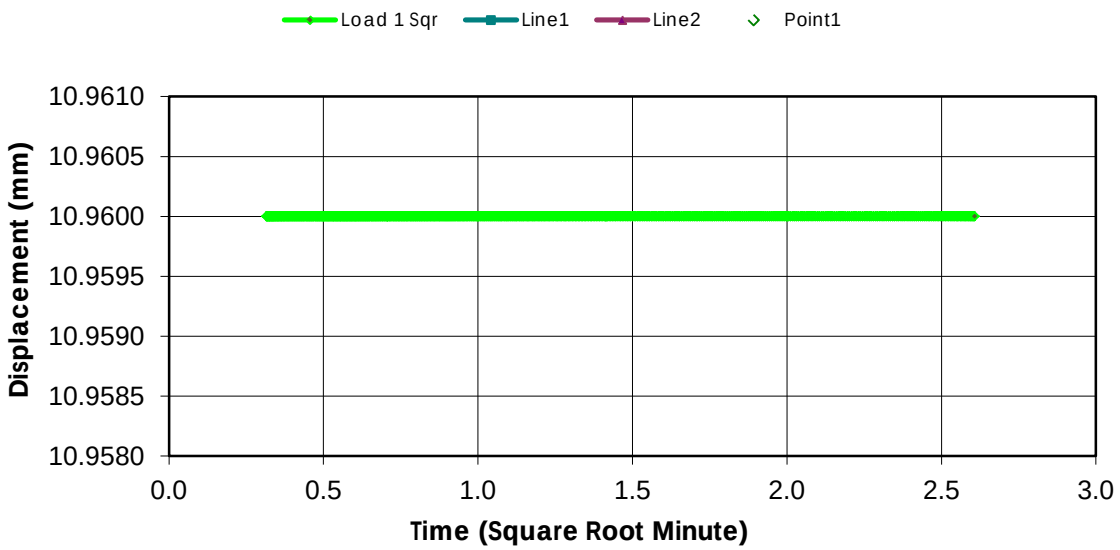
**Soil Description:** Light Brown Clay
**Remarks:**

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.9600 | 0.0000 | 0.0000 | 0.7220 |
| 1 | 00:00:06 | 10.9600 | 0.0000 | 0.0000 | 0.7220 |
| 2 | 00:00:15 | 10.9600 | 0.0000 | 0.0000 | 0.7220 |
| 3 | 00:00:30 | 10.9600 | 0.0000 | 0.0000 | 0.7220 |
| 4 | 00:01:00 | 10.9600 | 0.0000 | 0.0000 | 0.7220 |
| 5 | 00:02:00 | 10.9600 | 0.0000 | 0.0000 | 0.7220 |
| 6 | 00:04:00 | 10.9600 | 0.0000 | 0.0000 | 0.7220 |
| 7 | 00:06:48 | 10.9600 | 0.0000 | 0.0000 | 0.7220 |

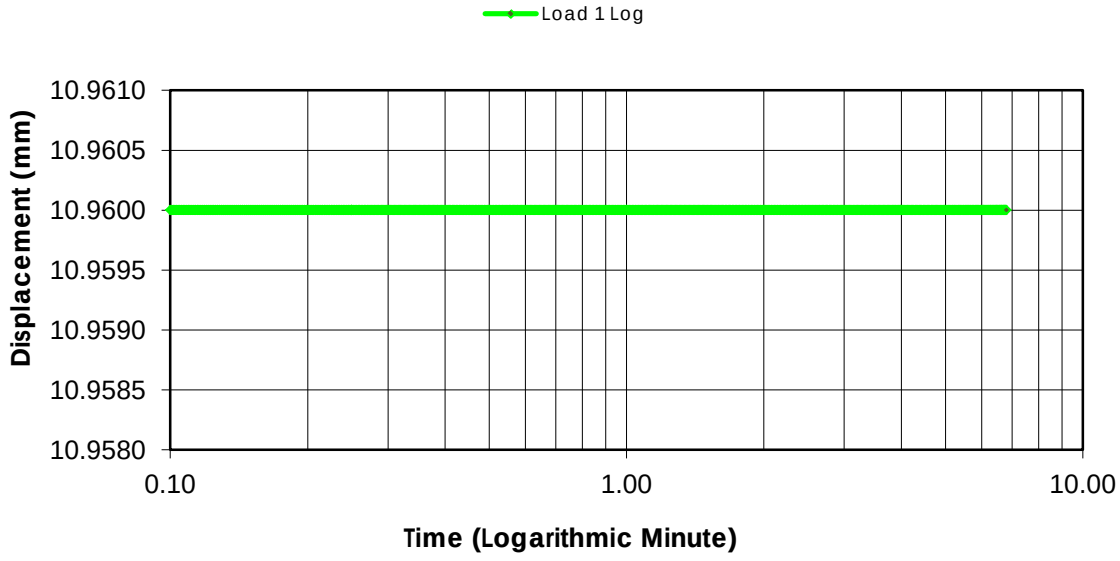
# Consolidation Test Results

## (Sequence 1) Load 10.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results

## (Sequence 5) Load 200.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

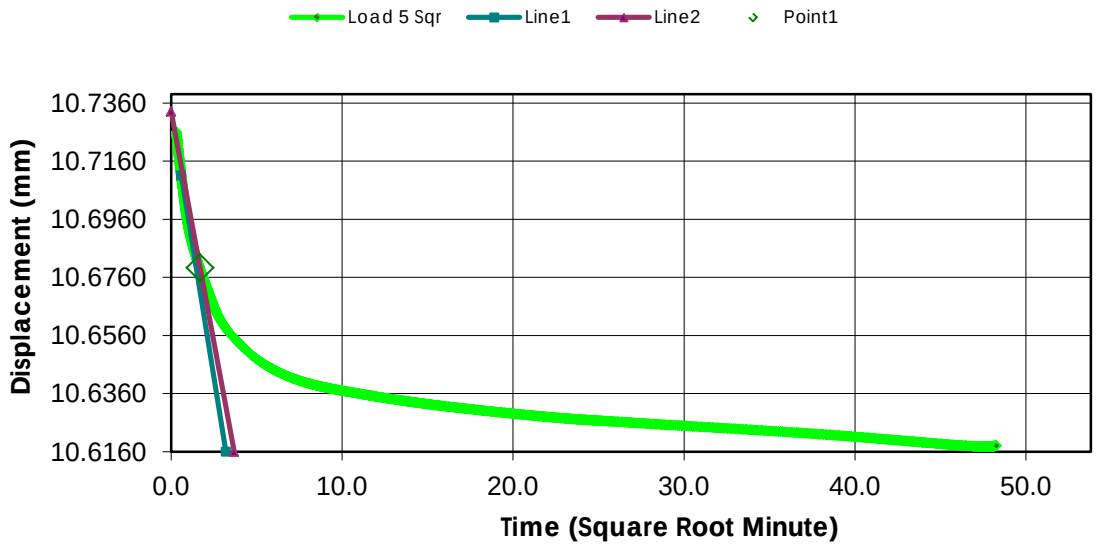
**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Light Brown Clay
**Remarks:**

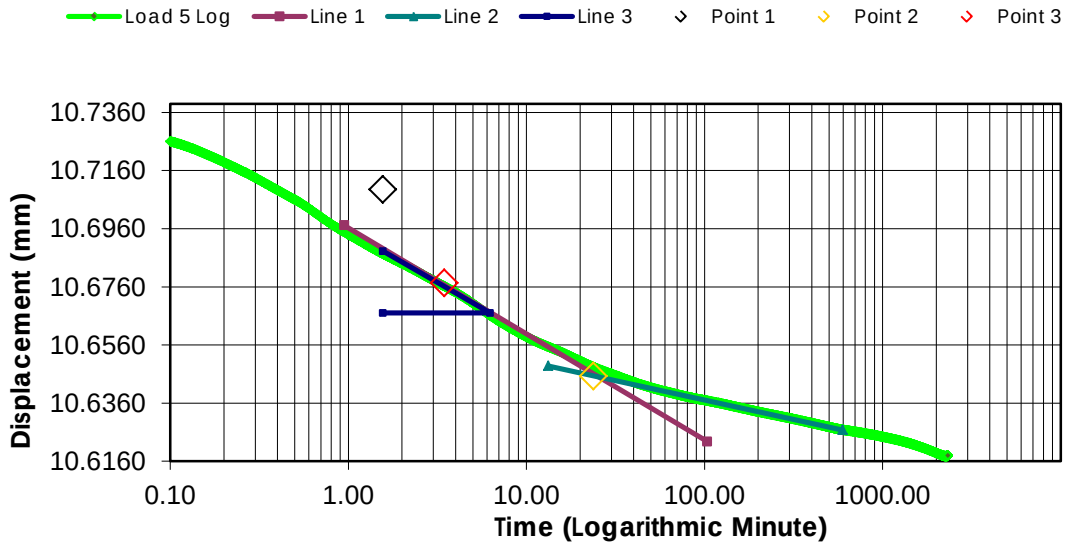
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.8000 | 0.0880 | 0.3478 | 0.7160 |
| 1 | 00:00:06 | 10.7260 | 0.1300 | 0.5138 | 0.7131 |
| 2 | 00:00:15 | 10.7160 | 0.1400 | 0.5534 | 0.7124 |
| 3 | 00:00:30 | 10.7060 | 0.1500 | 0.5929 | 0.7117 |
| 4 | 00:01:00 | 10.6940 | 0.1620 | 0.6403 | 0.7109 |
| 5 | 00:02:00 | 10.6840 | 0.1720 | 0.6798 | 0.7102 |
| 6 | 00:04:01 | 10.6740 | 0.1820 | 0.7194 | 0.7096 |
| 7 | 00:08:01 | 10.6620 | 0.1940 | 0.7668 | 0.7087 |
| 8 | 00:15:02 | 10.6540 | 0.2020 | 0.7984 | 0.7082 |
| 9 | 00:30:03 | 10.6460 | 0.2100 | 0.8300 | 0.7077 |
| 10 | 01:00:05 | 10.6400 | 0.2160 | 0.8538 | 0.7073 |
| 11 | 02:00:10 | 10.6360 | 0.2200 | 0.8696 | 0.7070 |
| 12 | 04:00:20 | 10.6320 | 0.2240 | 0.8854 | 0.7067 |
| 13 | 08:00:41 | 10.6280 | 0.2280 | 0.9012 | 0.7064 |
| 14 | 12:01:01 | 10.6260 | 0.2300 | 0.9091 | 0.7063 |
| 15 | 24:02:00 | 10.6220 | 0.2340 | 0.9249 | 0.7060 |
| 16 | 36:03:00 | 10.6180 | 0.2380 | 0.9407 | 0.7058 |
| 17 | 38:50:30 | 10.6180 | 0.2380 | 0.9407 | 0.7058 |

# Consolidation Test Results
## (Sequence 5) Load 200.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results

## (Sequence 6) Load 400.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

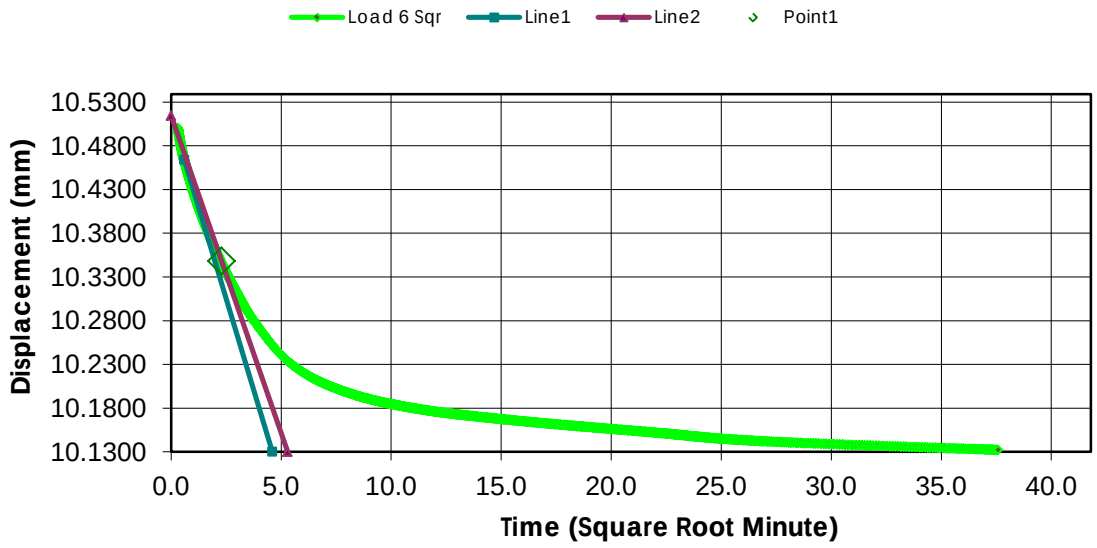
**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Light Brown Clay
**Remarks:**

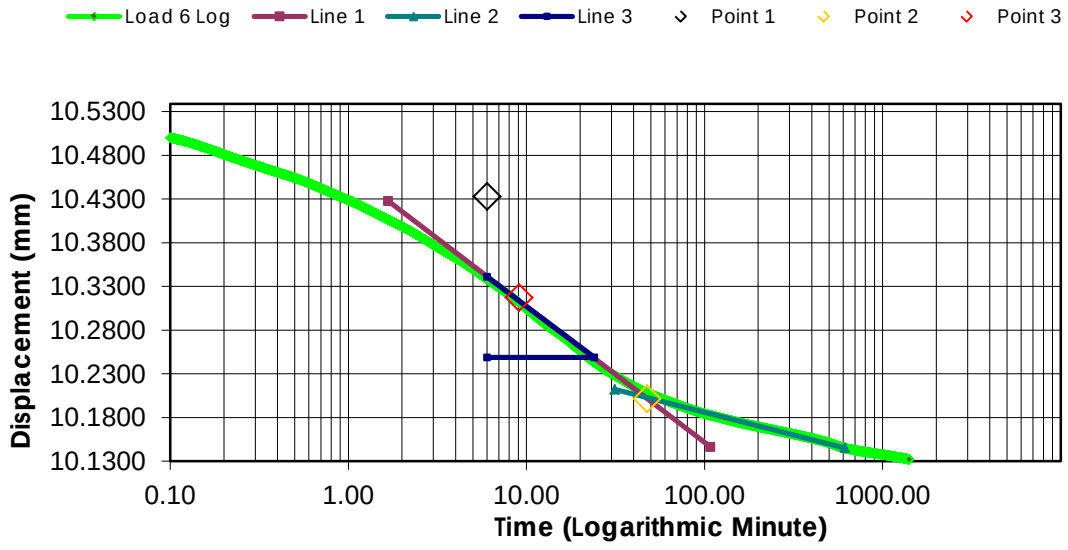
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.6180 | 0.2380 | 0.9407 | 0.7058 |
| 1 | 00:00:06 | 10.5000 | 0.3160 | 1.2490 | 0.7004 |
| 2 | 00:00:15 | 10.4740 | 0.3420 | 1.3518 | 0.6987 |
| 3 | 00:00:30 | 10.4540 | 0.3620 | 1.4308 | 0.6973 |
| 4 | 00:01:01 | 10.4280 | 0.3880 | 1.5336 | 0.6955 |
| 5 | 00:02:01 | 10.3980 | 0.4180 | 1.6522 | 0.6935 |
| 6 | 00:04:01 | 10.3620 | 0.4540 | 1.7945 | 0.6911 |
| 7 | 00:08:01 | 10.3200 | 0.4960 | 1.9605 | 0.6882 |
| 8 | 00:15:02 | 10.2760 | 0.5400 | 2.1344 | 0.6852 |
| 9 | 00:30:03 | 10.2300 | 0.5860 | 2.3162 | 0.6821 |
| 10 | 01:00:05 | 10.2000 | 0.6160 | 2.4348 | 0.6800 |
| 11 | 02:00:10 | 10.1800 | 0.6360 | 2.5138 | 0.6787 |
| 12 | 04:00:20 | 10.1660 | 0.6500 | 2.5692 | 0.6777 |
| 13 | 08:00:41 | 10.1520 | 0.6640 | 2.6245 | 0.6768 |
| 14 | 12:01:00 | 10.1420 | 0.6740 | 2.6640 | 0.6761 |
| 15 | 23:32:39 | 10.1320 | 0.6840 | 2.7036 | 0.6754 |

# Consolidation Test Results
## (Sequence 6) Load 400.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 800.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

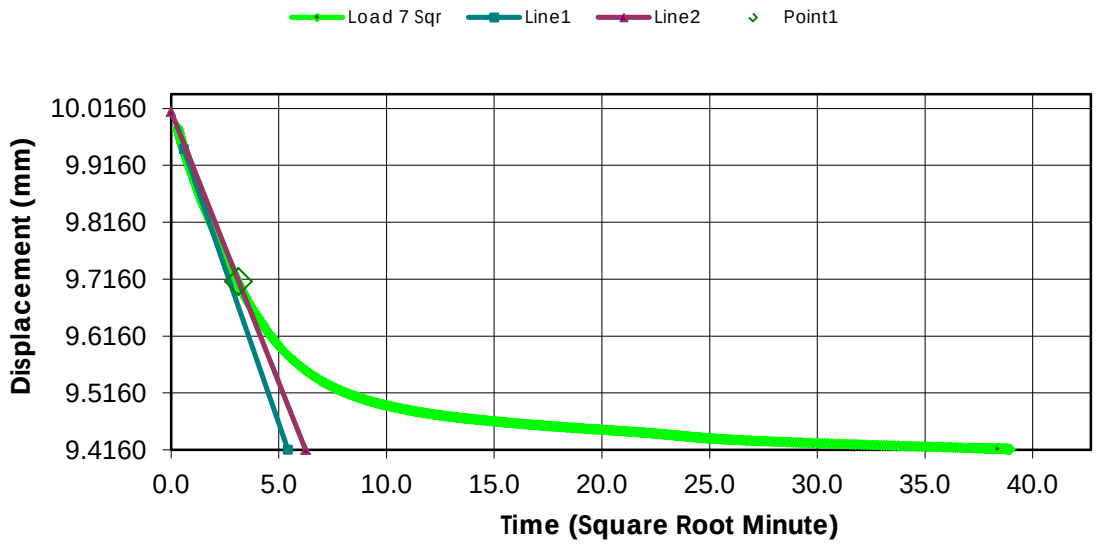
**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Light Brown Clay
**Remarks:**

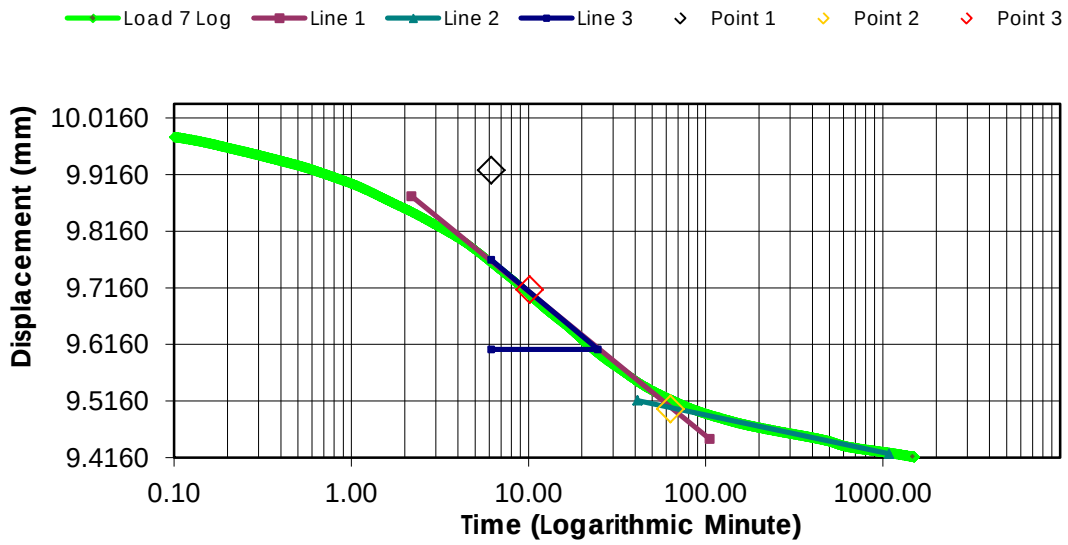
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.1320 | 0.6840 | 2.7036 | 0.6754 |
| 1 | 00:00:06 | 9.9820 | 0.8020 | 3.1700 | 0.6674 |
| 2 | 00:00:15 | 9.9560 | 0.8280 | 3.2727 | 0.6656 |
| 3 | 00:00:30 | 9.9320 | 0.8520 | 3.3676 | 0.6640 |
| 4 | 00:01:00 | 9.9000 | 0.8840 | 3.4941 | 0.6618 |
| 5 | 00:02:00 | 9.8560 | 0.9280 | 3.6680 | 0.6588 |
| 6 | 00:04:00 | 9.8040 | 0.9800 | 3.8735 | 0.6553 |
| 7 | 00:08:00 | 9.7320 | 1.0520 | 4.1581 | 0.6504 |
| 8 | 00:15:01 | 9.6580 | 1.1260 | 4.4506 | 0.6453 |
| 9 | 00:30:02 | 9.5800 | 1.2040 | 4.7589 | 0.6400 |
| 10 | 01:00:05 | 9.5220 | 1.2620 | 4.9881 | 0.6361 |
| 11 | 02:00:10 | 9.4860 | 1.2980 | 5.1304 | 0.6336 |
| 12 | 04:00:20 | 9.4640 | 1.3200 | 5.2174 | 0.6321 |
| 13 | 08:00:40 | 9.4460 | 1.3380 | 5.2885 | 0.6309 |
| 14 | 12:01:00 | 9.4320 | 1.3520 | 5.3439 | 0.6299 |
| 15 | 24:02:00 | 9.4180 | 1.3660 | 5.3992 | 0.6290 |
| 16 | 24:30:28 | 9.4180 | 1.3660 | 5.3992 | 0.6290 |

# Consolidation Test Results
## (Sequence 7) Load 800.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 1600.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

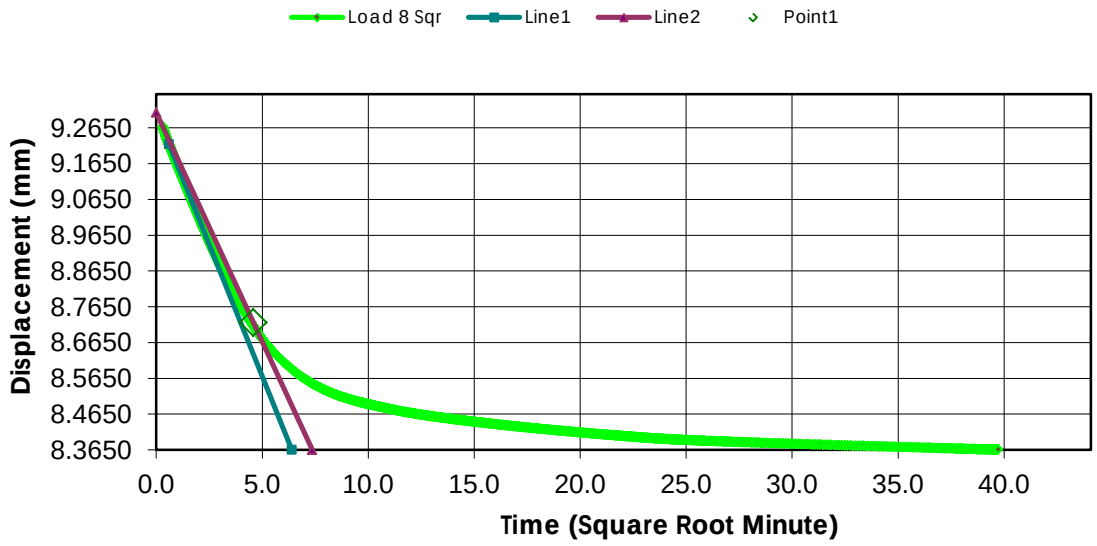
**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Light Brown Clay
**Remarks:**

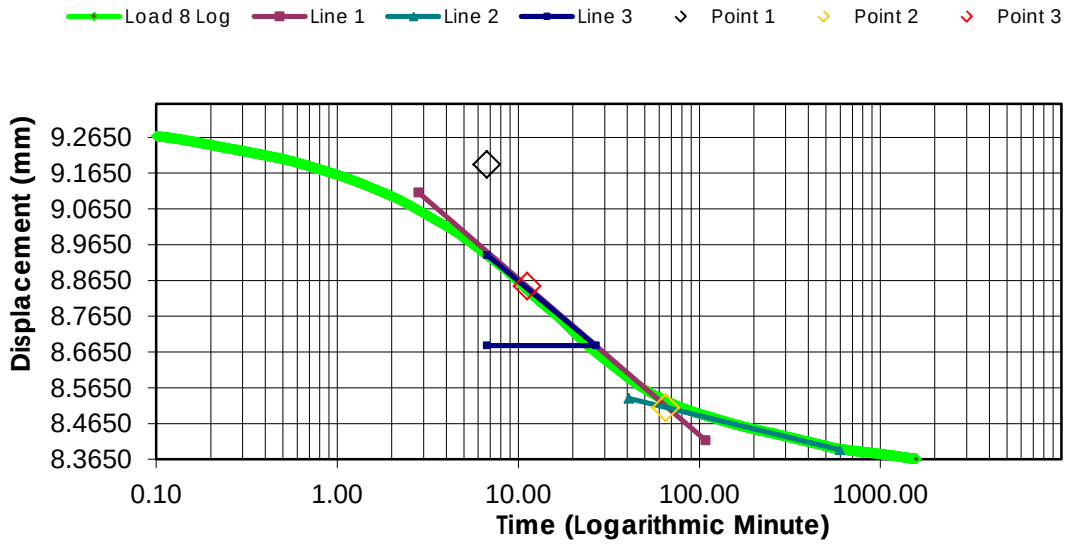
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.4180 | 1.3660 | 5.3992 | 0.6290 |
| 1 | 00:00:06 | 9.2680 | 1.4880 | 5.8814 | 0.6207 |
| 2 | 00:00:15 | 9.2340 | 1.5220 | 6.0158 | 0.6184 |
| 3 | 00:00:30 | 9.2040 | 1.5520 | 6.1344 | 0.6163 |
| 4 | 00:01:00 | 9.1600 | 1.5960 | 6.3083 | 0.6133 |
| 5 | 00:02:00 | 9.1000 | 1.6560 | 6.5455 | 0.6092 |
| 6 | 00:04:00 | 9.0160 | 1.7400 | 6.8775 | 0.6035 |
| 7 | 00:08:01 | 8.9040 | 1.8520 | 7.3202 | 0.5959 |
| 8 | 00:15:01 | 8.7800 | 1.9760 | 7.8103 | 0.5875 |
| 9 | 00:30:03 | 8.6420 | 2.1140 | 8.3557 | 0.5781 |
| 10 | 01:00:05 | 8.5380 | 2.2180 | 8.7668 | 0.5710 |
| 11 | 02:00:09 | 8.4800 | 2.2760 | 8.9960 | 0.5670 |
| 12 | 04:00:19 | 8.4400 | 2.3160 | 9.1542 | 0.5643 |
| 13 | 08:00:40 | 8.4040 | 2.3520 | 9.2964 | 0.5619 |
| 14 | 12:00:59 | 8.3880 | 2.3680 | 9.3597 | 0.5608 |
| 15 | 24:01:59 | 8.3680 | 2.3880 | 9.4387 | 0.5594 |
| 16 | 26:18:10 | 8.3660 | 2.3900 | 9.4466 | 0.5593 |

# Consolidation Test Results
## (Sequence 8) Load 1600.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Rebound 400.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

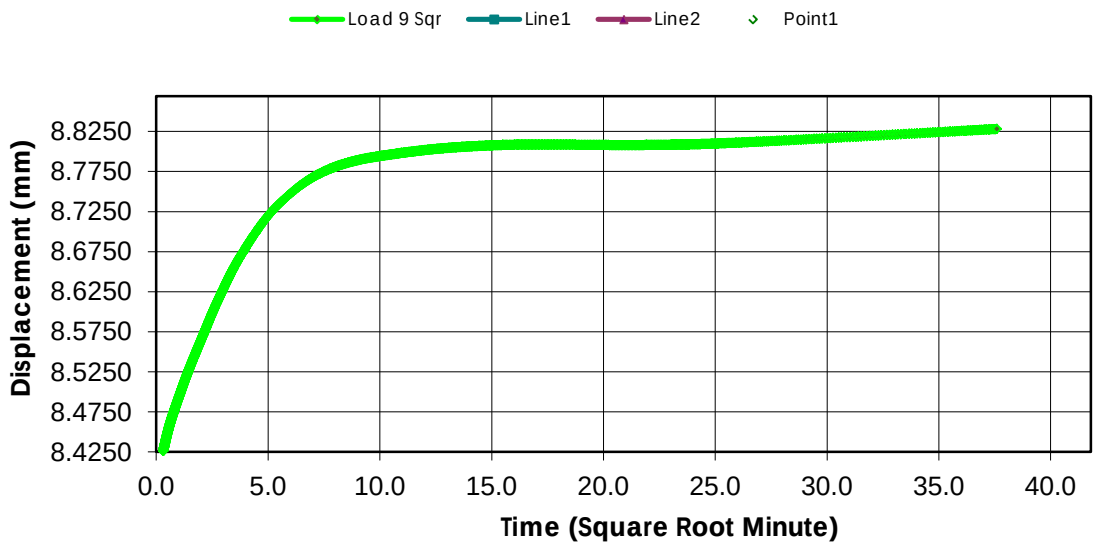
**Soil Description:** Light Brown Clay
**Remarks:**

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.3660 | 2.3900 | 9.4466 | 0.5593 |
| 1 | 00:00:06 | 8.4260 | 2.3900 | 9.4466 | 0.5593 |
| 2 | 00:00:15 | 8.4480 | 2.3680 | 9.3597 | 0.5608 |
| 3 | 00:00:30 | 8.4680 | 2.3480 | 9.2806 | 0.5621 |
| 4 | 00:01:00 | 8.4920 | 2.3240 | 9.1858 | 0.5638 |
| 5 | 00:02:00 | 8.5240 | 2.2920 | 9.0593 | 0.5660 |
| 6 | 00:04:00 | 8.5640 | 2.2520 | 8.9012 | 0.5687 |
| 7 | 00:08:00 | 8.6180 | 2.1980 | 8.6878 | 0.5724 |
| 8 | 00:15:01 | 8.6740 | 2.1420 | 8.4664 | 0.5762 |
| 9 | 00:30:02 | 8.7340 | 2.0820 | 8.2293 | 0.5802 |
| 10 | 01:00:05 | 8.7780 | 2.0380 | 8.0553 | 0.5832 |
| 11 | 02:00:10 | 8.7980 | 2.0180 | 7.9763 | 0.5846 |
| 12 | 04:00:19 | 8.8080 | 2.0080 | 7.9368 | 0.5853 |
| 13 | 08:00:39 | 8.8080 | 2.0080 | 7.9368 | 0.5853 |
| 14 | 12:00:59 | 8.8120 | 2.0040 | 7.9210 | 0.5856 |
| 15 | 23:33:47 | 8.8280 | 1.9880 | 7.8577 | 0.5866 |

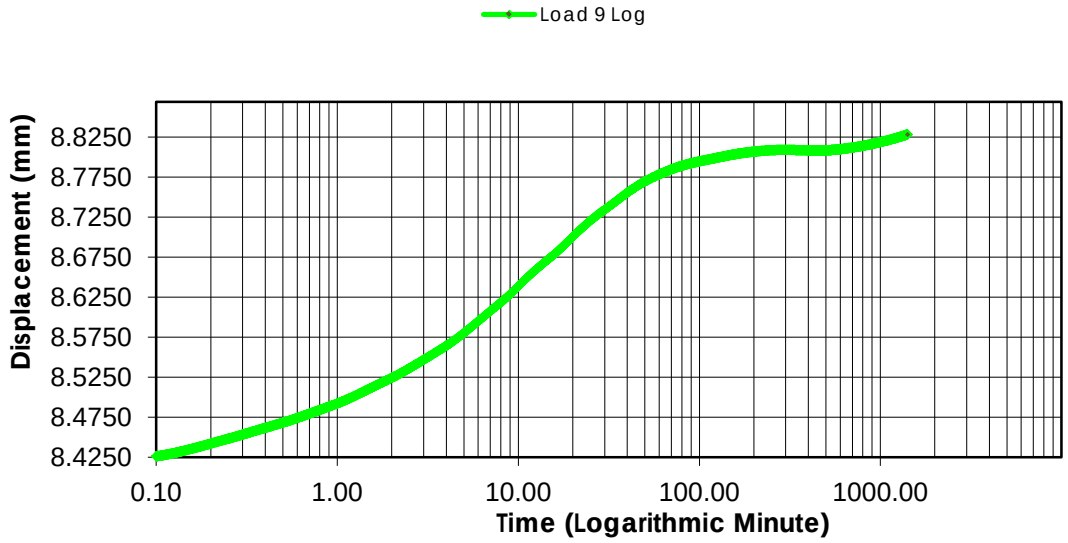
# Consolidation Test Results

## (Sequence 9) Rebound 400.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results

## (Sequence 10) Rebound 100.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

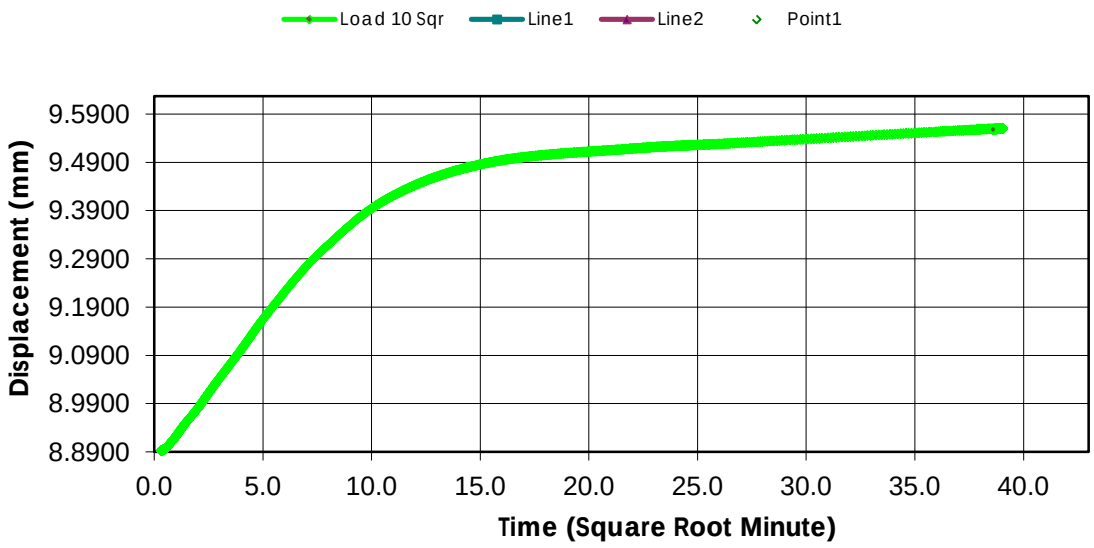
**Soil Description:** Light Brown Clay
**Remarks:**

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.8280 | 1.9880 | 7.8577 | 0.5866 |
| 1 | 00:00:06 | 8.8920 | 1.9960 | 7.8893 | 0.5861 |
| 2 | 00:00:15 | 8.8960 | 1.9920 | 7.8735 | 0.5864 |
| 3 | 00:00:30 | 8.9060 | 1.9820 | 7.8340 | 0.5871 |
| 4 | 00:01:00 | 8.9220 | 1.9660 | 7.7708 | 0.5881 |
| 5 | 00:02:01 | 8.9480 | 1.9400 | 7.6680 | 0.5899 |
| 6 | 00:04:01 | 8.9800 | 1.9080 | 7.5415 | 0.5921 |
| 7 | 00:08:01 | 9.0320 | 1.8560 | 7.3360 | 0.5956 |
| 8 | 00:15:02 | 9.0940 | 1.7940 | 7.0909 | 0.5998 |
| 9 | 00:30:03 | 9.1920 | 1.6960 | 6.7036 | 0.6065 |
| 10 | 01:00:05 | 9.3080 | 1.5800 | 6.2451 | 0.6144 |
| 11 | 02:00:10 | 9.4200 | 1.4680 | 5.8024 | 0.6220 |
| 12 | 04:00:20 | 9.4900 | 1.3980 | 5.5257 | 0.6268 |
| 13 | 08:00:41 | 9.5180 | 1.3700 | 5.4150 | 0.6287 |
| 14 | 12:01:00 | 9.5300 | 1.3580 | 5.3676 | 0.6295 |
| 15 | 24:02:01 | 9.5580 | 1.3300 | 5.2569 | 0.6314 |
| 16 | 24:50:21 | 9.5580 | 1.3300 | 5.2569 | 0.6314 |

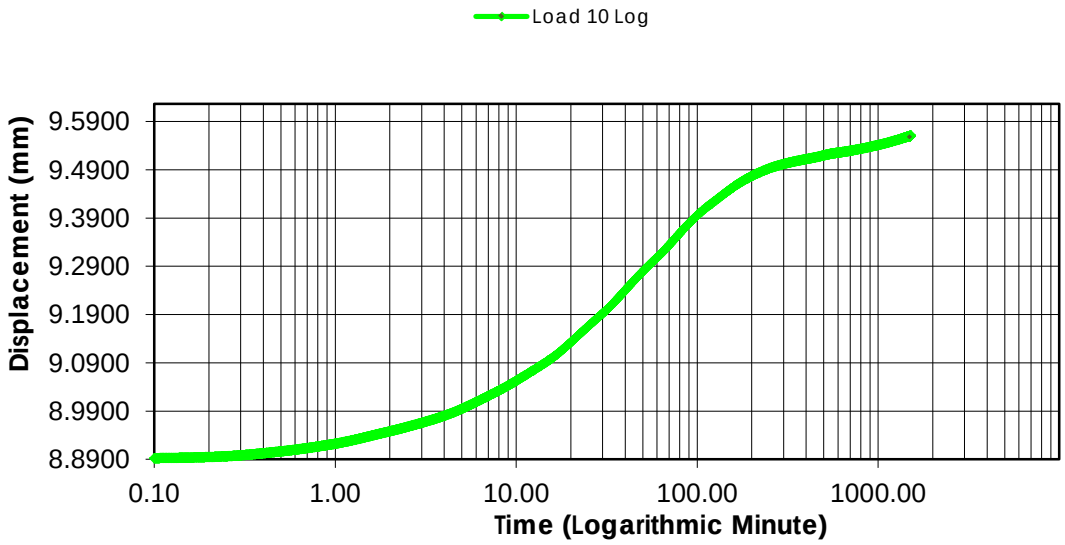
# Consolidation Test Results

## (Sequence 10) Rebound 100.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Load 400.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

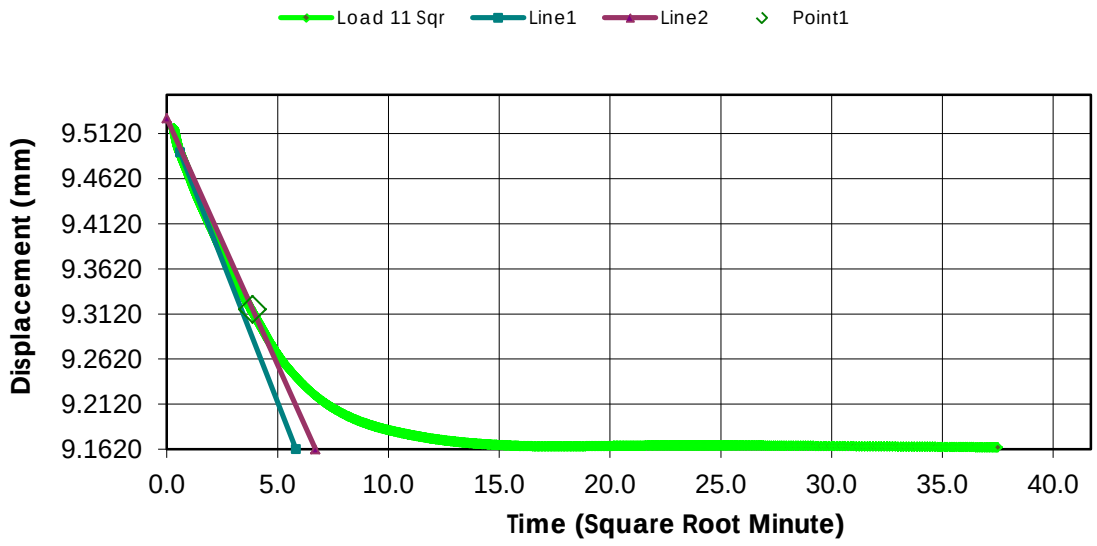
**Soil Description:** Light Brown Clay
**Remarks:**

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5580 | 1.3300 | 5.2569 | 0.6314 |
| 1 | 00:00:06 | 9.5180 | 1.2980 | 5.1304 | 0.6336 |
| 2 | 00:00:15 | 9.4980 | 1.3180 | 5.2095 | 0.6322 |
| 3 | 00:00:30 | 9.4840 | 1.3320 | 5.2648 | 0.6313 |
| 4 | 00:01:00 | 9.4660 | 1.3500 | 5.3360 | 0.6301 |
| 5 | 00:02:00 | 9.4400 | 1.3760 | 5.4387 | 0.6283 |
| 6 | 00:04:00 | 9.4080 | 1.4080 | 5.5652 | 0.6261 |
| 7 | 00:08:00 | 9.3640 | 1.4520 | 5.7391 | 0.6231 |
| 8 | 00:15:01 | 9.3140 | 1.5020 | 5.9368 | 0.6197 |
| 9 | 00:30:02 | 9.2520 | 1.5640 | 6.1818 | 0.6155 |
| 10 | 01:00:05 | 9.2040 | 1.6120 | 6.3715 | 0.6122 |
| 11 | 02:00:10 | 9.1780 | 1.6380 | 6.4743 | 0.6105 |
| 12 | 04:00:20 | 9.1660 | 1.6500 | 6.5217 | 0.6097 |
| 13 | 08:00:40 | 9.1660 | 1.6500 | 6.5217 | 0.6097 |
| 14 | 12:01:00 | 9.1660 | 1.6500 | 6.5217 | 0.6097 |
| 15 | 23:26:52 | 9.1640 | 1.6520 | 6.5296 | 0.6095 |

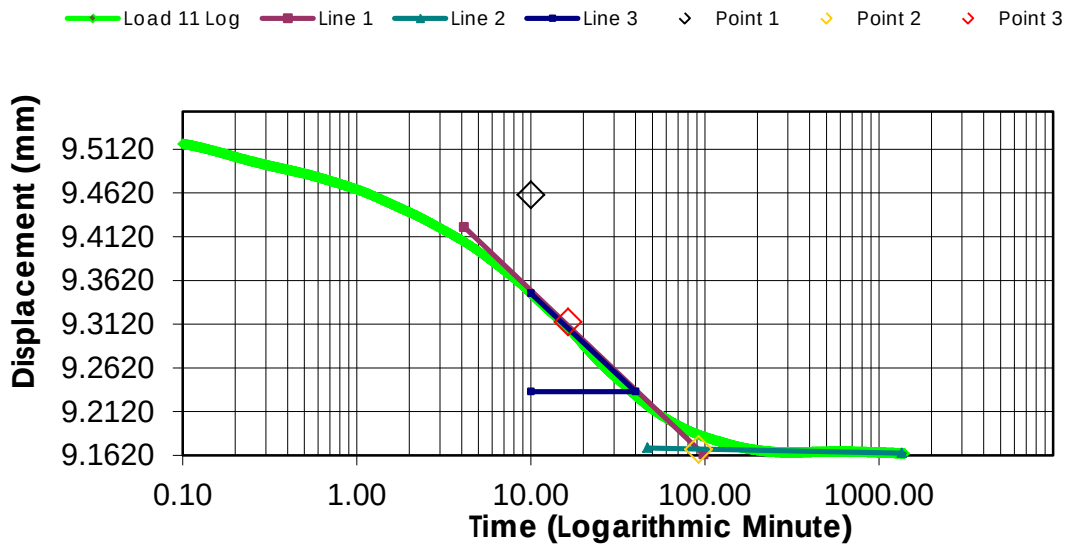
# Consolidation Test Results

## (Sequence 11) Load 400.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 1600.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

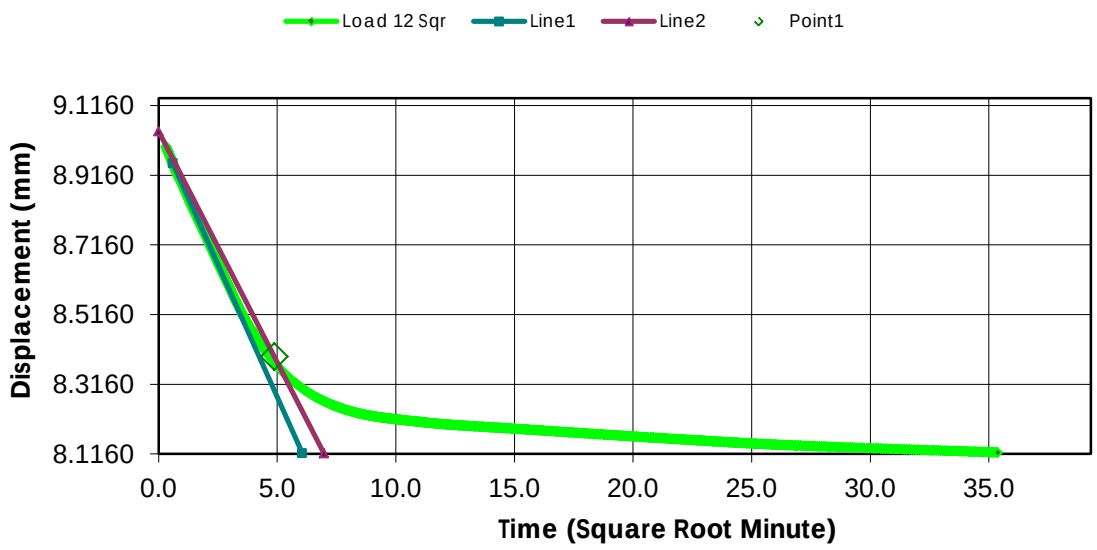
**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Light Brown Clay
**Remarks:**

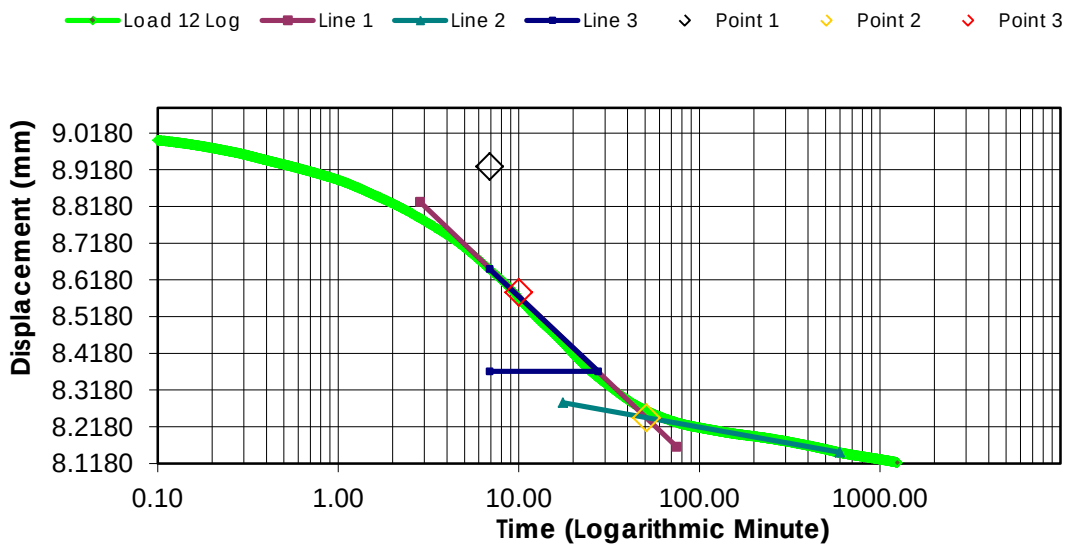
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.1640 | 1.6520 | 6.5296 | 0.6095 |
| 1 | 00:00:06 | 8.9980 | 1.7580 | 6.9486 | 0.6023 |
| 2 | 00:00:15 | 8.9680 | 1.7880 | 7.0672 | 0.6003 |
| 3 | 00:00:30 | 8.9320 | 1.8240 | 7.2095 | 0.5978 |
| 4 | 00:01:00 | 8.8900 | 1.8660 | 7.3755 | 0.5949 |
| 5 | 00:02:00 | 8.8260 | 1.9300 | 7.6285 | 0.5906 |
| 6 | 00:04:01 | 8.7400 | 2.0160 | 7.9684 | 0.5847 |
| 7 | 00:08:01 | 8.6180 | 2.1380 | 8.4506 | 0.5764 |
| 8 | 00:15:02 | 8.4780 | 2.2780 | 9.0040 | 0.5669 |
| 9 | 00:30:03 | 8.3360 | 2.4200 | 9.5652 | 0.5572 |
| 10 | 01:00:05 | 8.2460 | 2.5100 | 9.9210 | 0.5511 |
| 11 | 02:00:10 | 8.2080 | 2.5480 | 10.0711 | 0.5485 |
| 12 | 04:00:20 | 8.1860 | 2.5700 | 10.1581 | 0.5470 |
| 13 | 08:00:40 | 8.1580 | 2.5980 | 10.2688 | 0.5451 |
| 14 | 12:01:00 | 8.1400 | 2.6160 | 10.3399 | 0.5439 |
| 15 | 20:51:44 | 8.1200 | 2.6360 | 10.4190 | 0.5425 |

# Consolidation Test Results
## (Sequence 12) Load 1600.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 3200.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

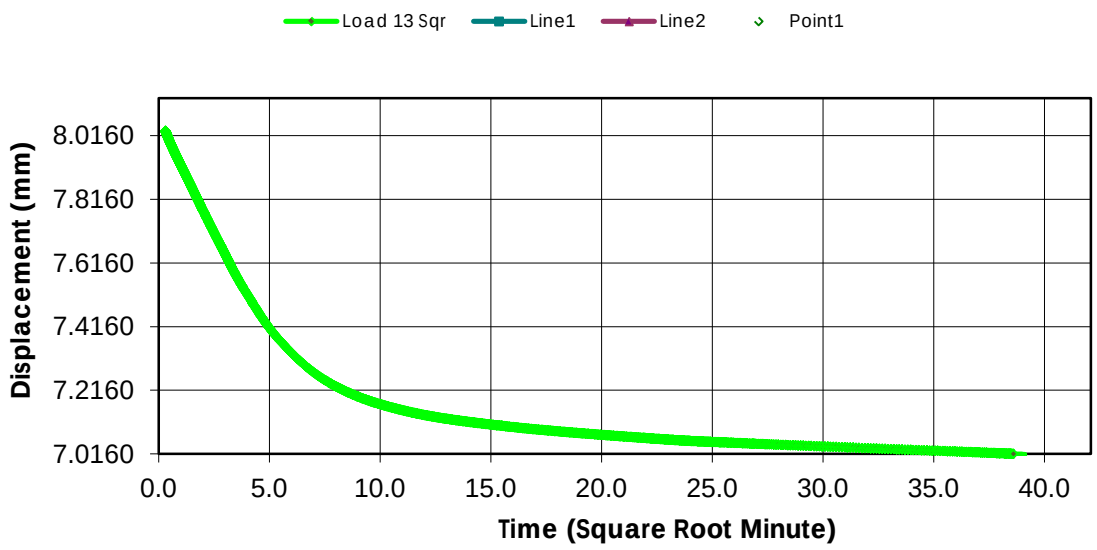
**Sample Number:** D12-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Light Brown Clay
**Remarks:**

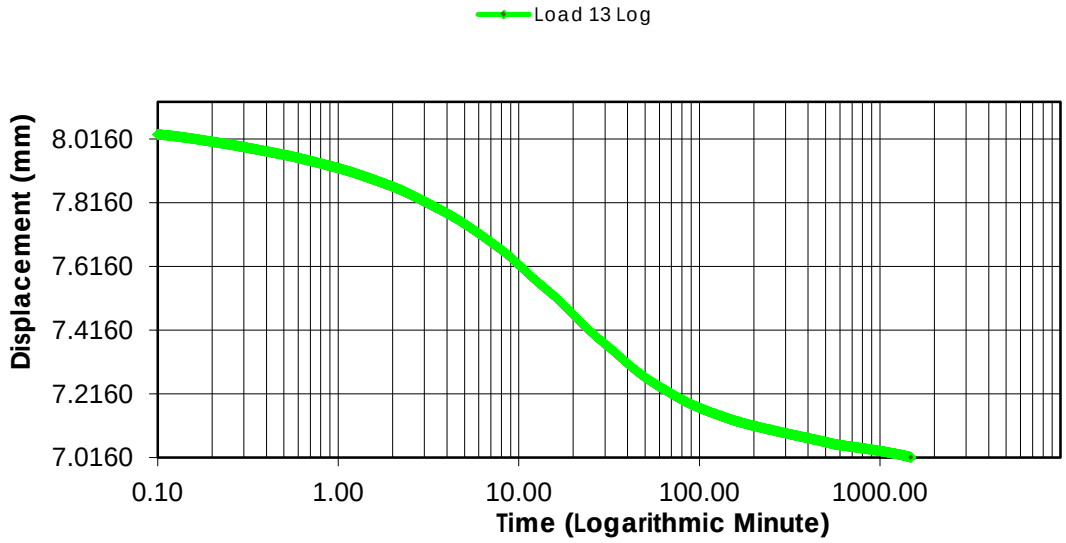
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.1200 | 2.6360 | 10.4190 | 0.5425 |
| 1 | 00:00:06 | 8.0300 | 2.6900 | 10.6324 | 0.5389 |
| 2 | 00:00:15 | 7.9980 | 2.7220 | 10.7589 | 0.5367 |
| 3 | 00:00:30 | 7.9660 | 2.7540 | 10.8854 | 0.5345 |
| 4 | 00:01:00 | 7.9240 | 2.7960 | 11.0514 | 0.5317 |
| 5 | 00:02:00 | 7.8660 | 2.8540 | 11.2806 | 0.5277 |
| 6 | 00:04:00 | 7.7820 | 2.9380 | 11.6127 | 0.5220 |
| 7 | 00:08:00 | 7.6680 | 3.0520 | 12.0632 | 0.5142 |
| 8 | 00:15:01 | 7.5320 | 3.1880 | 12.6008 | 0.5050 |
| 9 | 00:30:02 | 7.3720 | 3.3480 | 13.2332 | 0.4941 |
| 10 | 01:00:04 | 7.2380 | 3.4820 | 13.7628 | 0.4850 |
| 11 | 02:00:08 | 7.1540 | 3.5660 | 14.0949 | 0.4792 |
| 12 | 04:00:16 | 7.1040 | 3.6160 | 14.2925 | 0.4758 |
| 13 | 08:00:32 | 7.0660 | 3.6540 | 14.4427 | 0.4733 |
| 14 | 12:00:48 | 7.0480 | 3.6720 | 14.5138 | 0.4720 |
| 15 | 24:01:36 | 7.0180 | 3.7020 | 14.6324 | 0.4700 |
| 16 | 25:02:04 | 7.0140 | 3.7060 | 14.6482 | 0.4697 |

# Consolidation Test Results
## (Sequence 13) Load 3200.000 kpa

### Consolidation Graph (Squareroot Time)

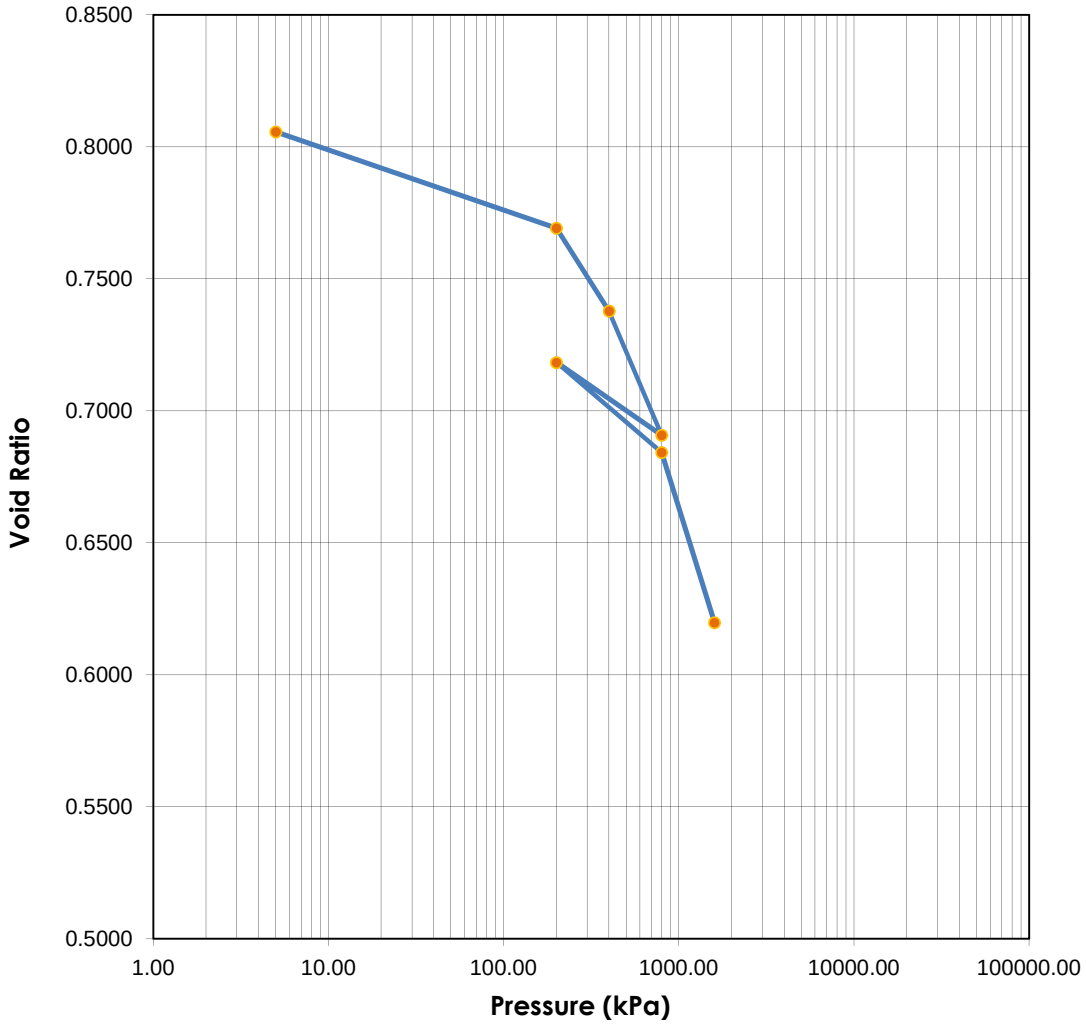



### Consolidation Graph (Logarithmic Time)



# Stantec Consulting Ltd.
## One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876




| | Before | After | | | |
|---|---|---|---|---|---|
| **Moisture (%):** | 30.9 | 25.0 | **Liquid Limits:** | - | **Test Date:** 06-May-16 |
| **Dry Density (g/cm3):** | 1.493 | 1.679 | **Plastic Limits:** | - | |
| **Saturation (%):** | 102.98 | 110.99 | **Plasticity Index (%):** | - | |
| **Void Ratio:** | 0.8064 | 0.6205 | **Specific Gravity:** | 2.700 | Assumed |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 4.6-5.1m

**Sample Number:** D14-ST11 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

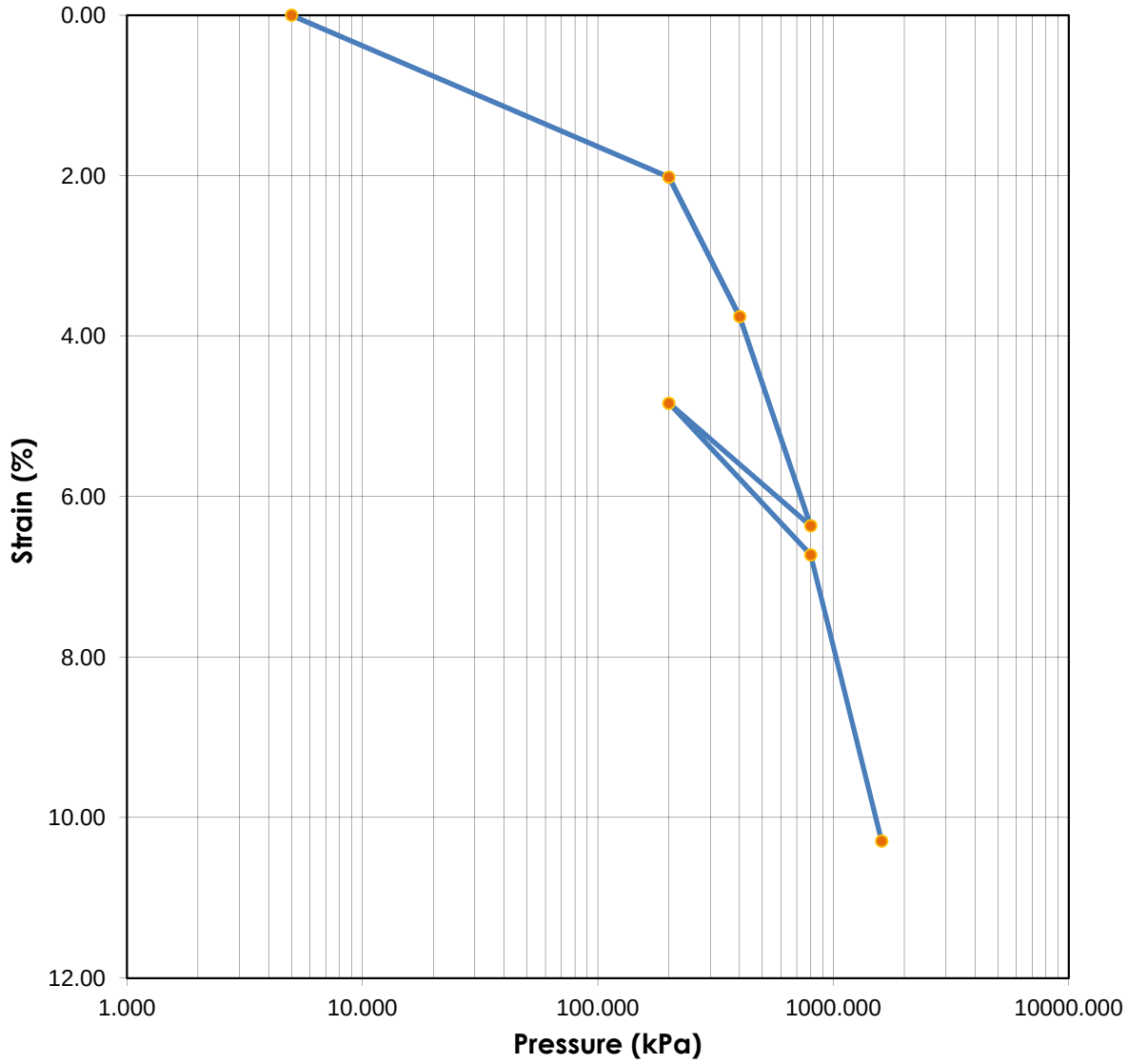
**Location:**

**Remarks:**
Sample swelled first 3 loads - consolidation began at 200kPa load.

**Tested By:** C.Tollifson **Reviewed By:** C.Lamoureux

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 30.9 | 25.0 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.493 | 1.679 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 102.98 | 110.99 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8064 | 0.6205 | **Specific Gravity:** | 2.700 | Assumed | |

**Sample Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 4.6-5.1m

**Sample Number:** D14-ST11 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**

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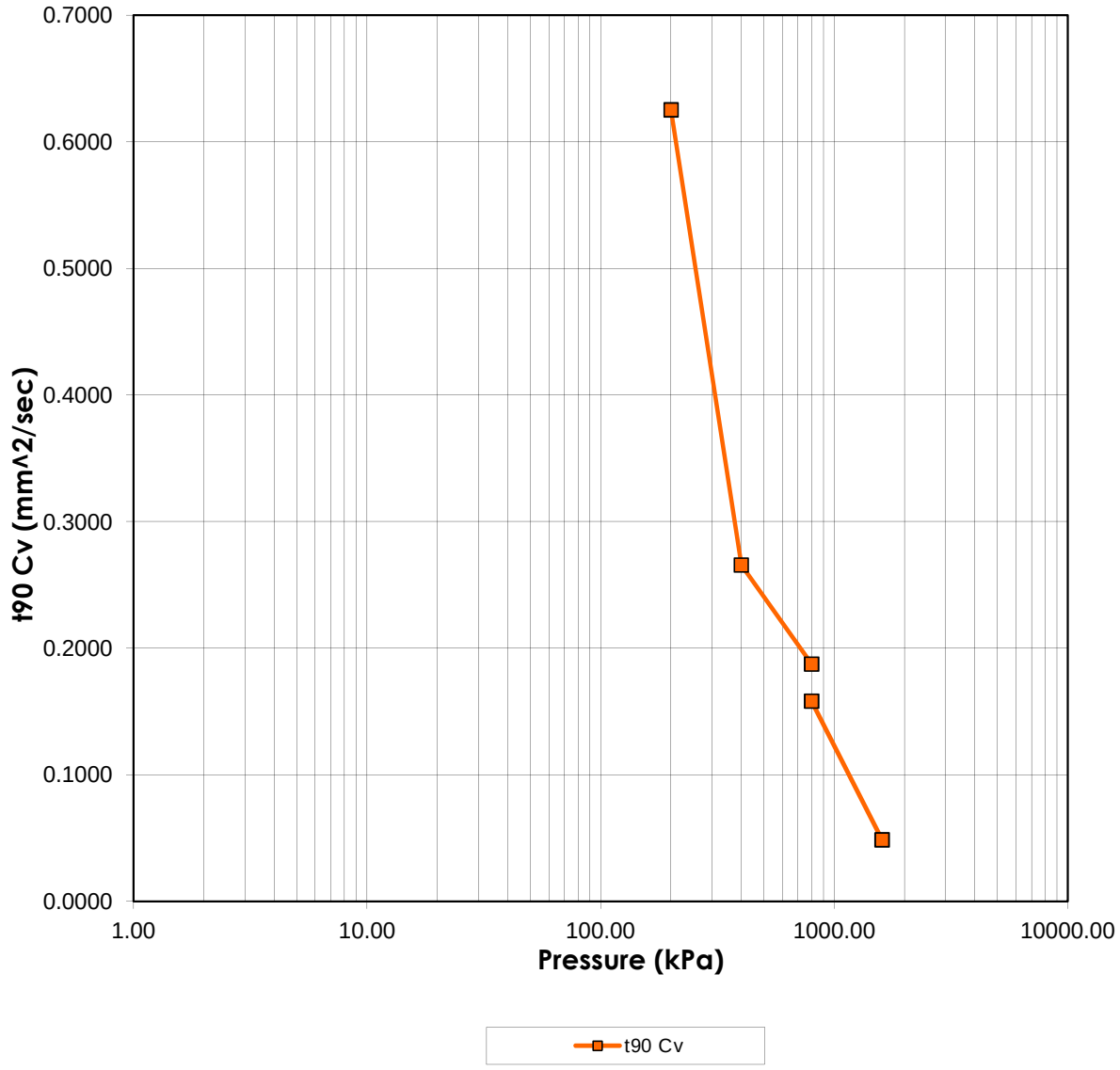
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 30.9 | 25.0 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.493 | 1.679 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 102.98 | 110.99 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8064 | 0.6205 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 4.6-5.1m

**Sample Number:** D14-ST11 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**

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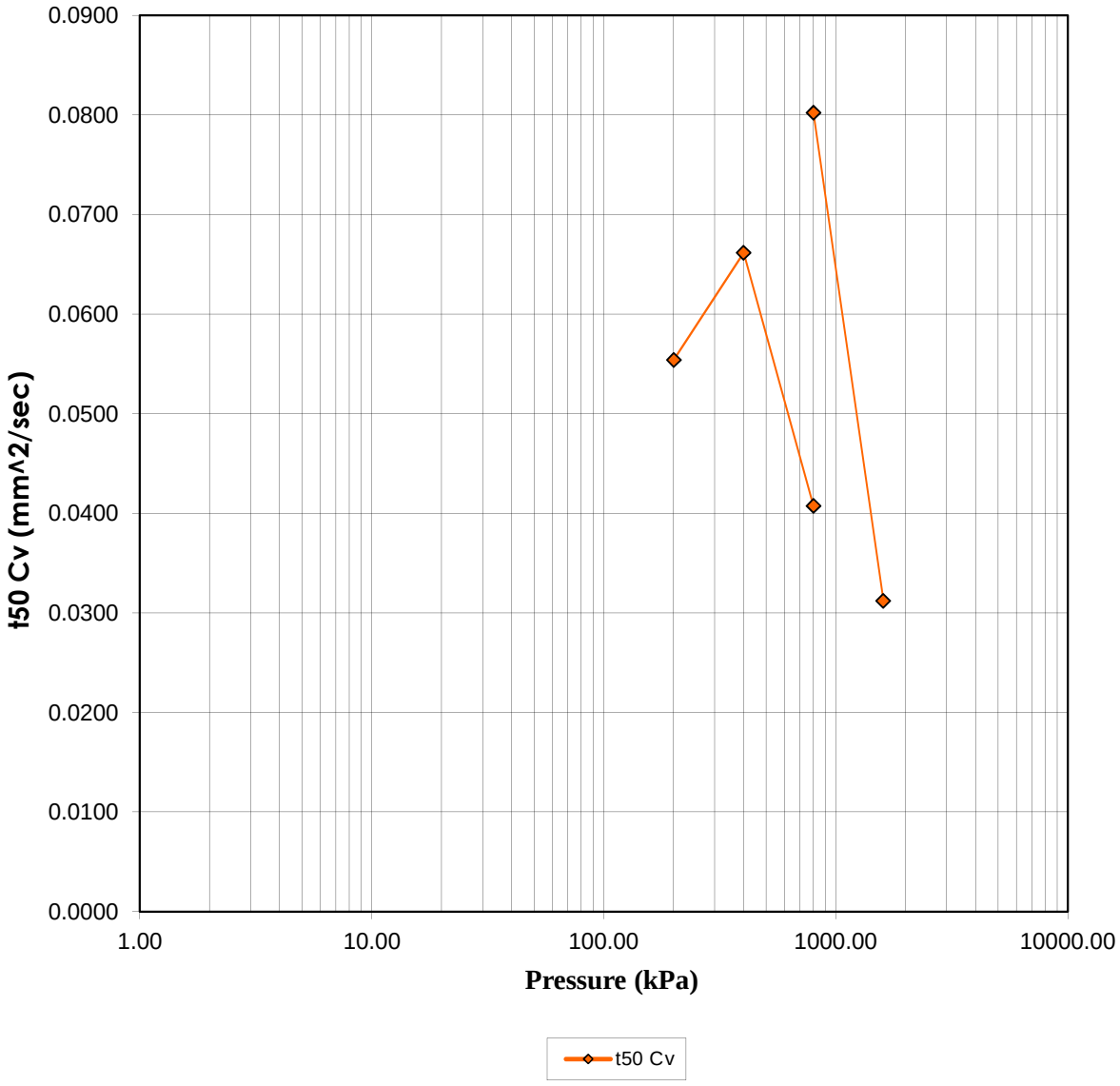
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 30.9 | 25.0 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.493 | 1.679 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 102.98 | 110.99 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8064 | 0.6205 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 4.6-5.1m

**Sample Number:** D14-ST11 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

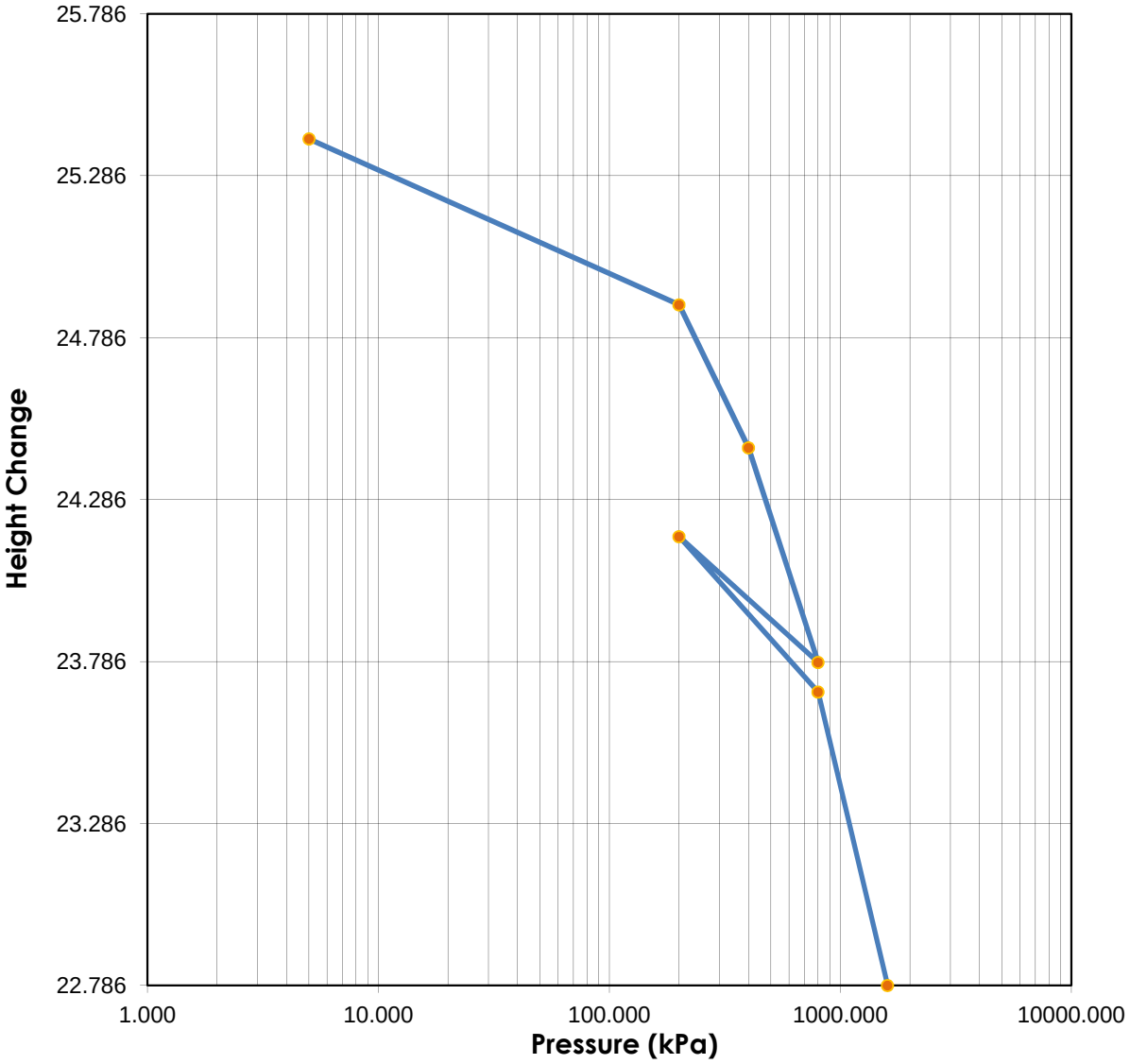
**Location:**

**Remarks:**

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 30.9 | 25.0 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.493 | 1.679 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 102.98 | 110.99 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.8064 | 0.6205 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 4.6-5.1m

**Sample Number:** D14-ST11 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**

Stantec

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Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D14-ST11
**Boring Number:**
**Depth:** 4.6-5.1m
**Sample Type:** Undisturbed

**Sample Description:**
Brown Clay
**Remarks:**

**Test Number:**
**Test Date:** 06-May-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.4000 | 11.3329 | 0.00 | 0.8056 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 25.4000 | 11.3329 | 0.00 | 0.8056 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 50.000 | 0.1480 | 25.2520 | 11.1849 | 0.58 | 0.7951 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 100.000 | 0.2660 | 25.1340 | 11.0669 | 1.05 | 0.7867 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 200.000 | 0.5120 | 24.8880 | 10.8209 | 2.02 | 0.7692 | 3.501 | 9.176 | 0.625 | 0.055 |
| 5 | 400.000 | 0.9540 | 24.4460 | 10.3789 | 3.76 | 0.7378 | 7.947 | 7.414 | 0.266 | 0.066 |
| 6 | 800.000 | 1.6160 | 23.7840 | 9.7169 | 6.36 | 0.6908 | 10.659 | 11.392 | 0.188 | 0.041 |
| 7 | 200.000 | 1.2280 | 24.1720 | 10.1049 | 4.83 | 0.7183 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8 | 800.000 | 1.7080 | 23.6920 | 9.6249 | 6.72 | 0.6842 | 12.541 | 5.742 | 0.158 | 0.080 |
| 9 | 1600.000 | 2.6140 | 22.7860 | 8.7189 | 10.29 | 0.6198 | 37.665 | 13.653 | 0.049 | 0.031 |

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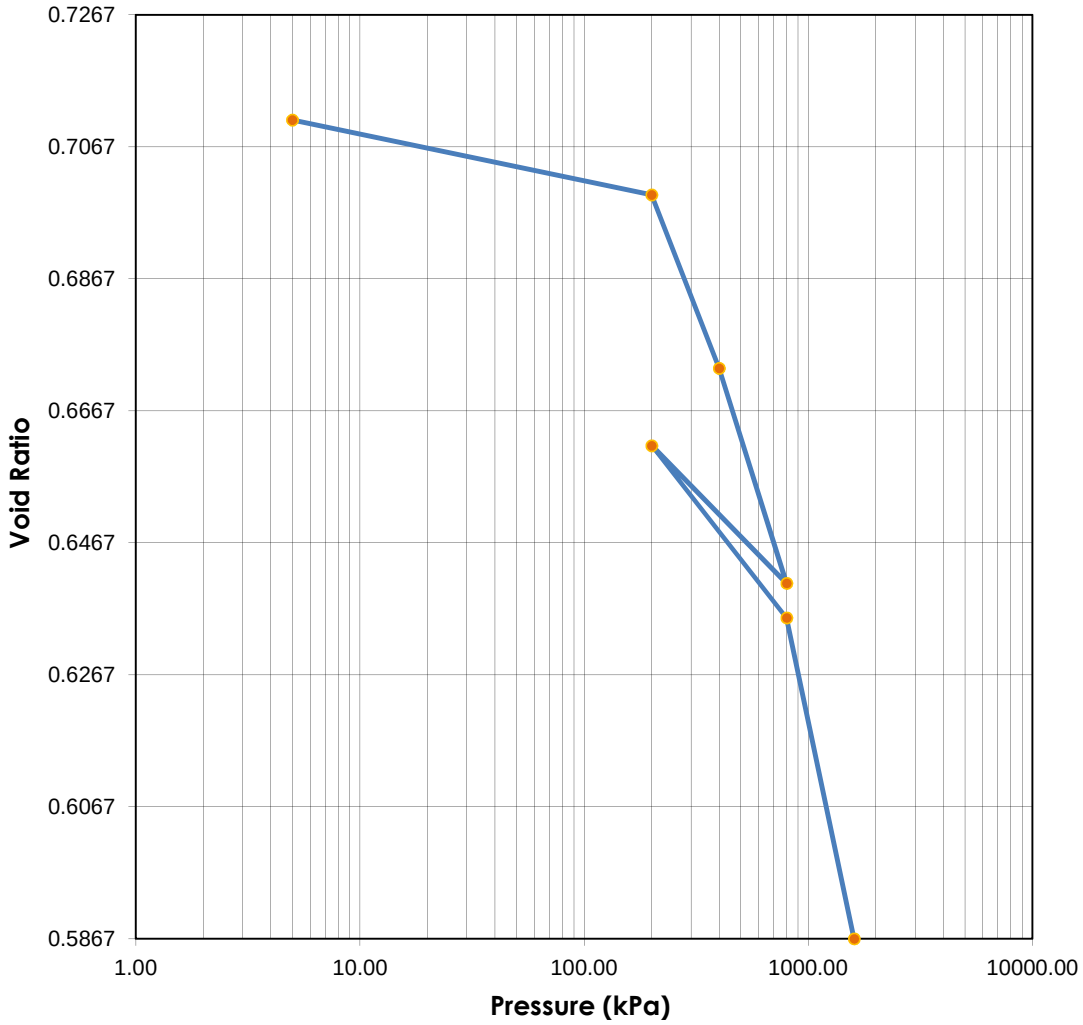
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | |
|---|---|---|---|---|---|
| **Moisture (%):** | 26.4 | 25.3 | **Liquid Limits:** | - | **Test Date:** 06-May-16 |
| **Dry Density (g/cm3):** | 1.575 | 1.702 | **Plastic Limits:** | - | |
| **Saturation (%):** | 99.90 | 116.29 | **Plasticity Index (%):** | - | |
| **Void Ratio:** | 0.7107 | 0.5866 | **Specific Gravity:** | 2.700 | Assumed |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 3.0-3.45m

**Sample Number:** D16-ST3 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:** Sample swelled first 3 loads - consolidation began at 200kPa load.

**Tested By:** C.Tollifson **Reviewed By:** C.Lamoureux

Stantec Consulting Ltd.
Calgary Laboratory
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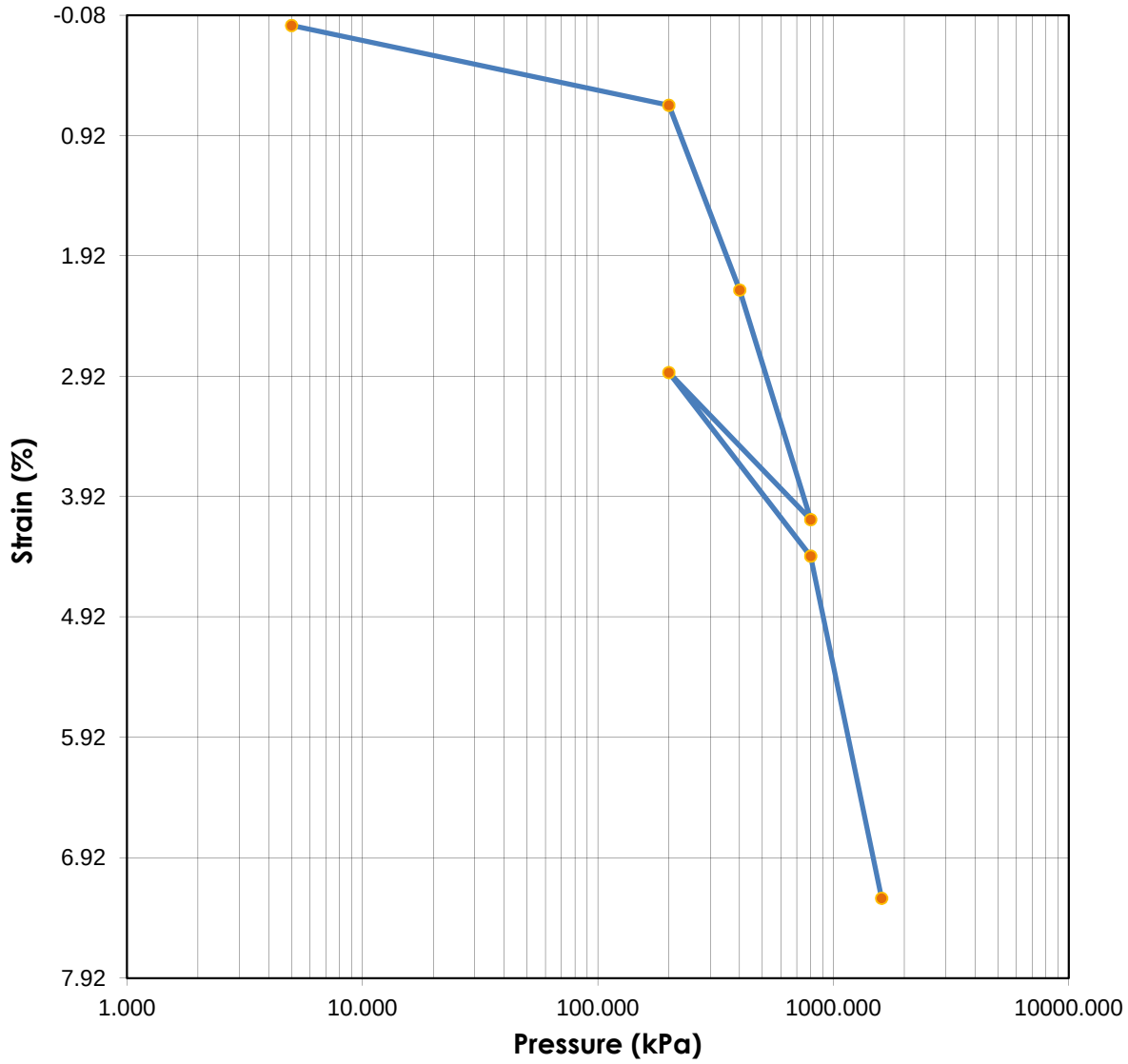
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Moisture (%):** | 26.4 | 25.3 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.575 | 1.702 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 99.90 | 116.29 | | | | |
| **Void Ratio:** | 0.7107 | 0.5866 | **Specific Gravity:** | 2.700 | Assumed | |

**Sample Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 3.0-3.45m
**Sample Number:** D16-ST3 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportation
**Location:**

**Remarks:**

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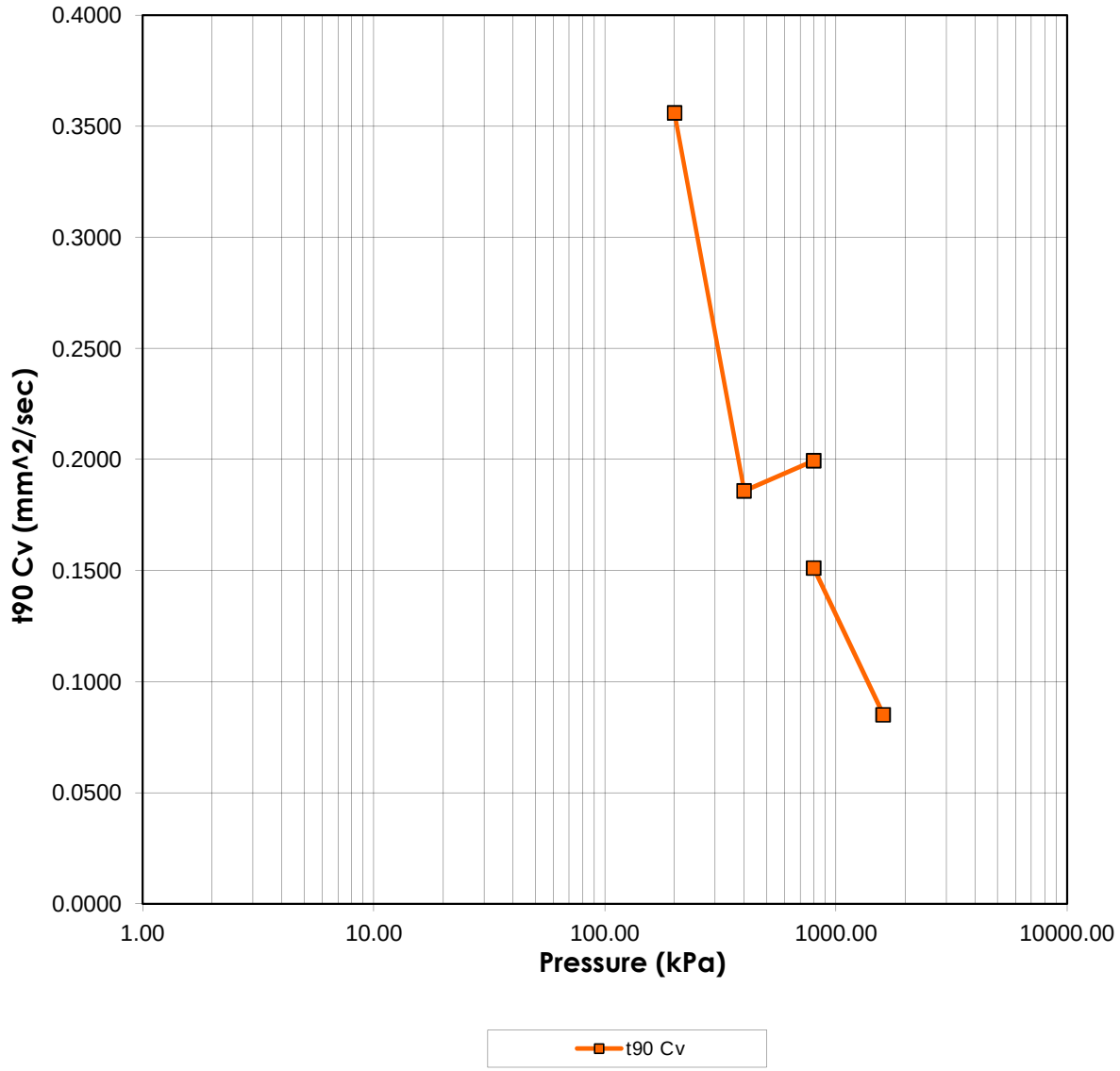
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 26.4 | 25.3 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.575 | 1.702 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 99.90 | 116.29 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.7107 | 0.5866 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 3.0-3.45m

**Sample Number:** D16-ST3 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**

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10830 - 46th Street SE
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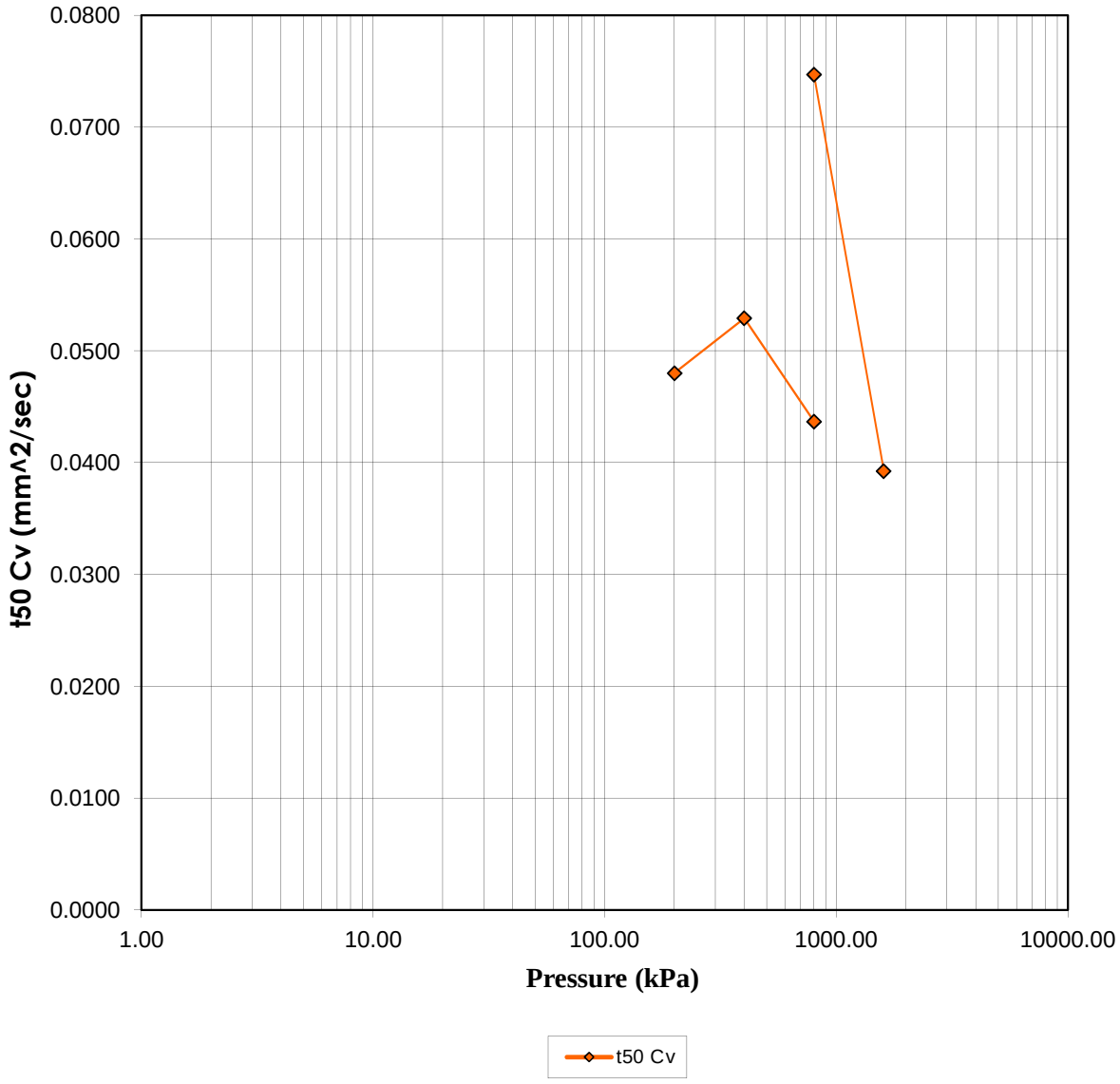
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 26.4 | 25.3 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.575 | 1.702 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 99.90 | 116.29 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.7107 | 0.5866 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 3.0-3.45m

**Sample Number:** D16-ST3 **Boring Number:**

**Project:** SR1

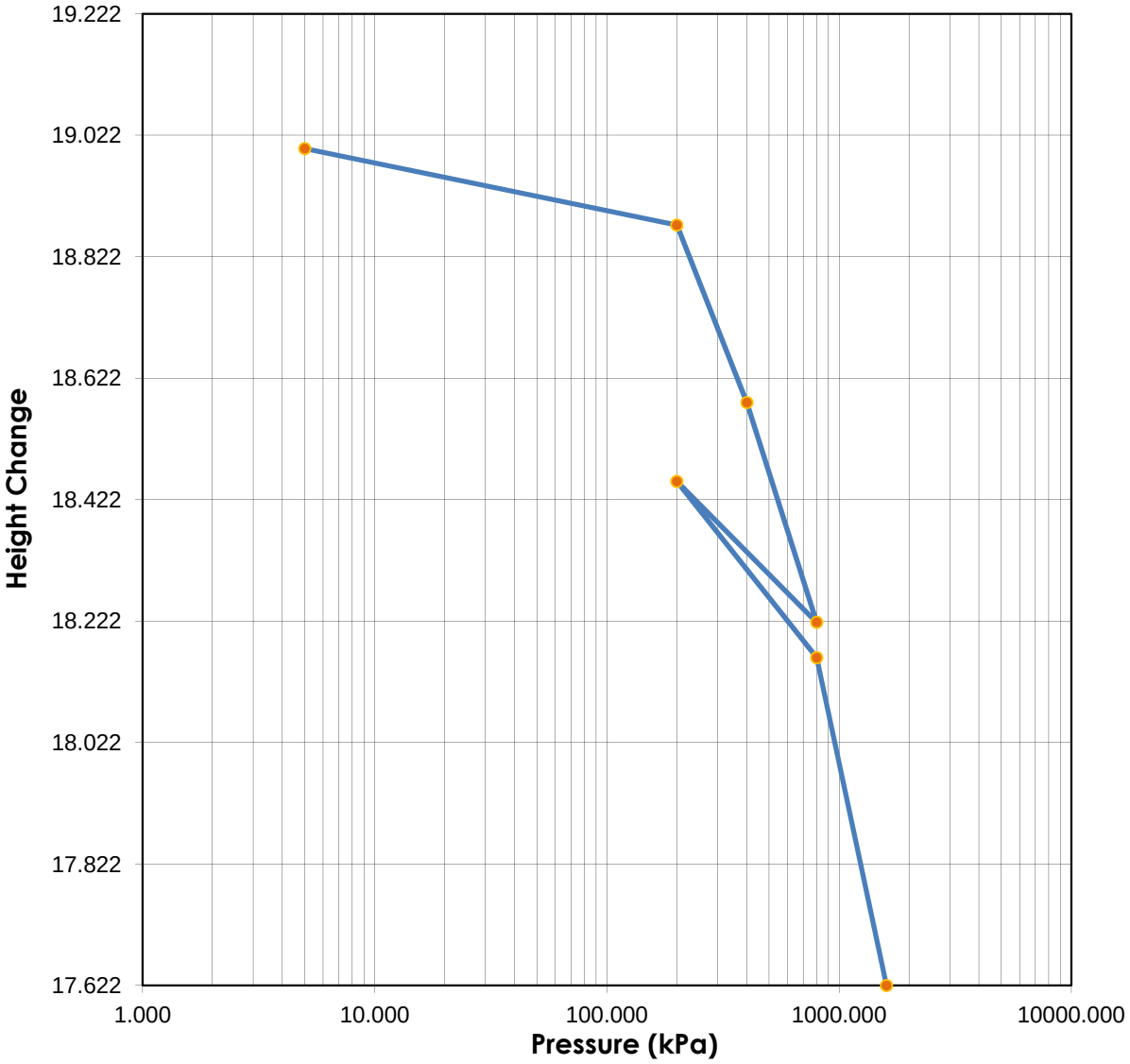
**Client:** Alberta Transportation

**Location:**

**Remarks:**

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 26.4 | 25.3 | **Liquid Limits:** | - | **Test Date:** | 06-May-16 |
| **Dry Density (g/cm3):** | 1.575 | 1.702 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 99.90 | 116.29 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.7107 | 0.5866 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 3.0-3.45m | **Remarks:** |
| **Sample Number:** | D16-ST3 | **Boring Number:** | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D16-ST3
**Boring Number:**
**Depth:** 3.0-3.45m
**Sample Type:** Undisturbed

**Sample Description:**
Brown Clay
**Remarks:**

**Test Number:**
**Test Date:** 06-May-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 19.0000 | 7.8939 | 0.00 | 0.7108 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 19.0000 | 7.8939 | 0.00 | 0.7108 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 50.000 | 0.0000 | 19.0000 | 7.8939 | 0.00 | 0.7108 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 100.000 | -0.0160 | 19.0160 | 7.9099 | -0.08 | 0.7122 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 200.000 | 0.1260 | 18.8740 | 7.7679 | 0.66 | 0.6994 | 3.535 | 6.090 | 0.356 | 0.048 |
| 5 | 400.000 | 0.4180 | 18.5820 | 7.4759 | 2.20 | 0.6731 | 6.562 | 5.356 | 0.186 | 0.053 |
| 6 | 800.000 | 0.7800 | 18.2200 | 7.1139 | 4.11 | 0.6405 | 5.880 | 6.237 | 0.199 | 0.044 |
| 7 | 200.000 | 0.5480 | 18.4520 | 7.3459 | 2.88 | 0.6614 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8 | 800.000 | 0.8380 | 18.1620 | 7.0559 | 4.41 | 0.6353 | 7.707 | 3.624 | 0.151 | 0.075 |
| 9 | 1600.000 | 1.3780 | 17.6220 | 6.5159 | 7.25 | 0.5867 | 12.890 | 6.493 | 0.085 | 0.039 |

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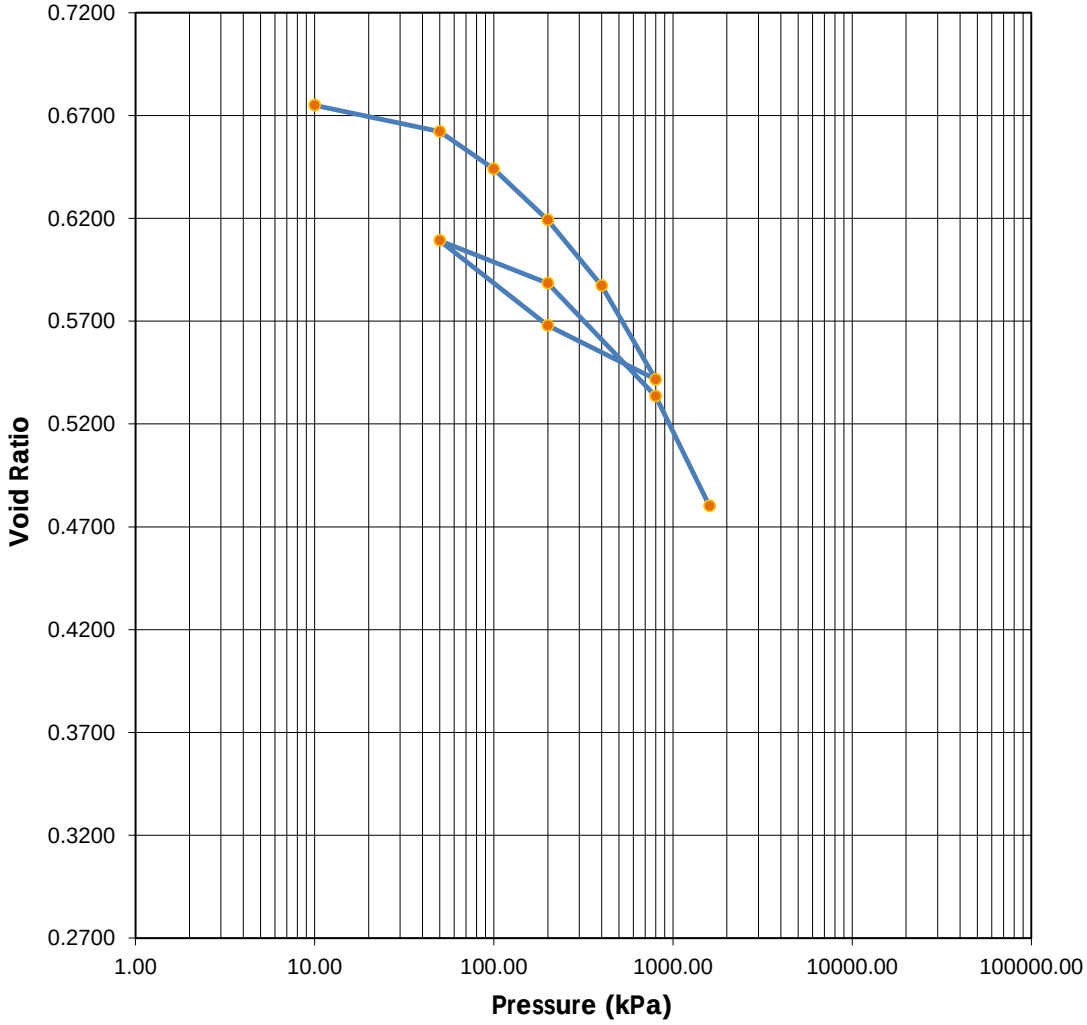
# One-Dimensional Consolidation Test
## ASTM D2435

### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.18 | 22.79 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.609 | 1.652 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.31 | 97.05 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6748 | 0.4800 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 2.7-3.2m | **Remarks:** |
| **Sample Number:** | D20-ST6 | **Boring Number:** | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

**Tested By:** **Reviewed By:**

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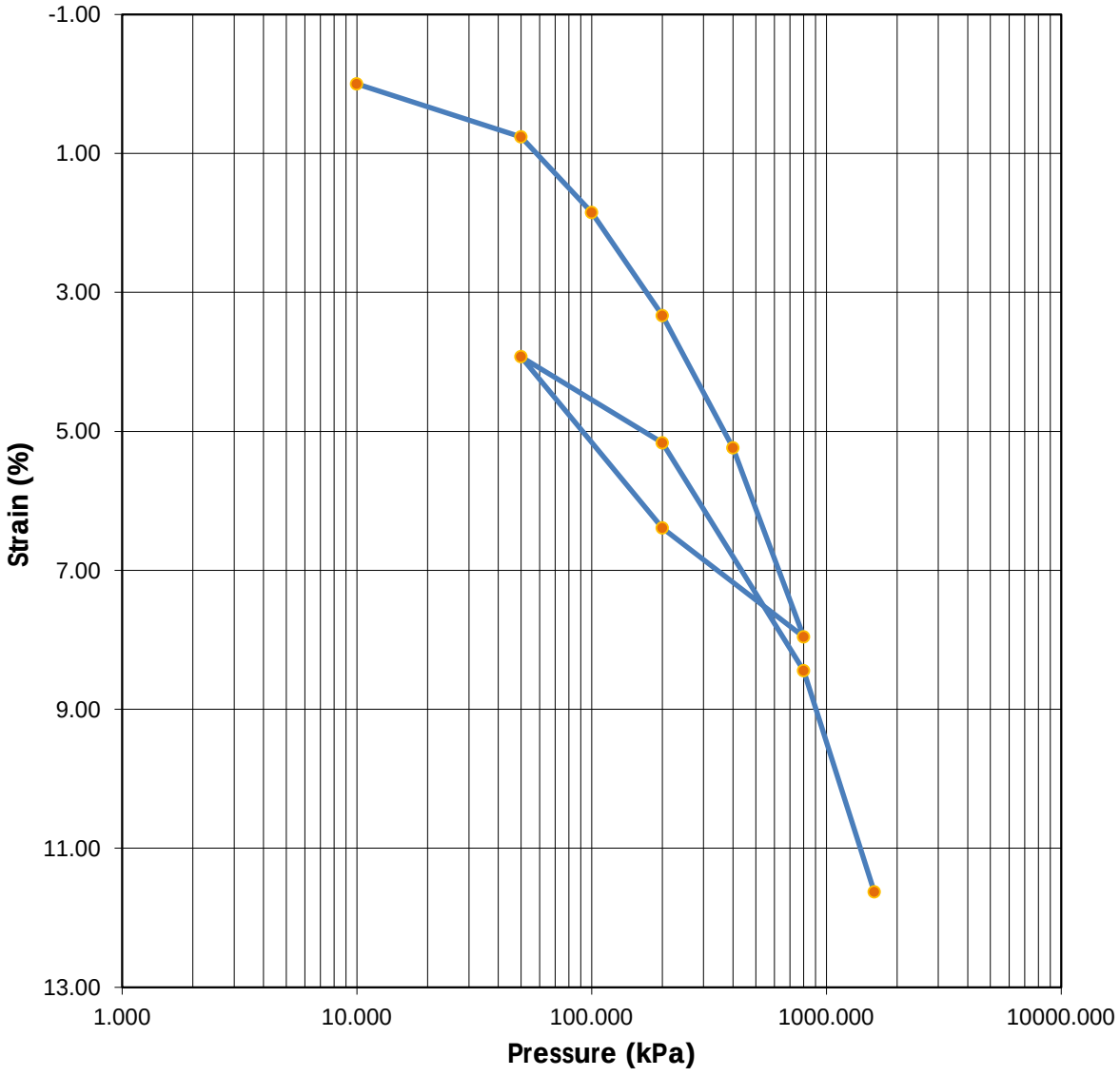
# One-Dimensional Consolidation Test
## ASTM D2435

### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.18 | 22.79 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.609 | 1.652 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.31 | 97.05 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6748 | 0.4800 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 2.7-3.2m | **Remarks:** |
| **Sample Number:** | D20-ST6 | **Boring Number:** | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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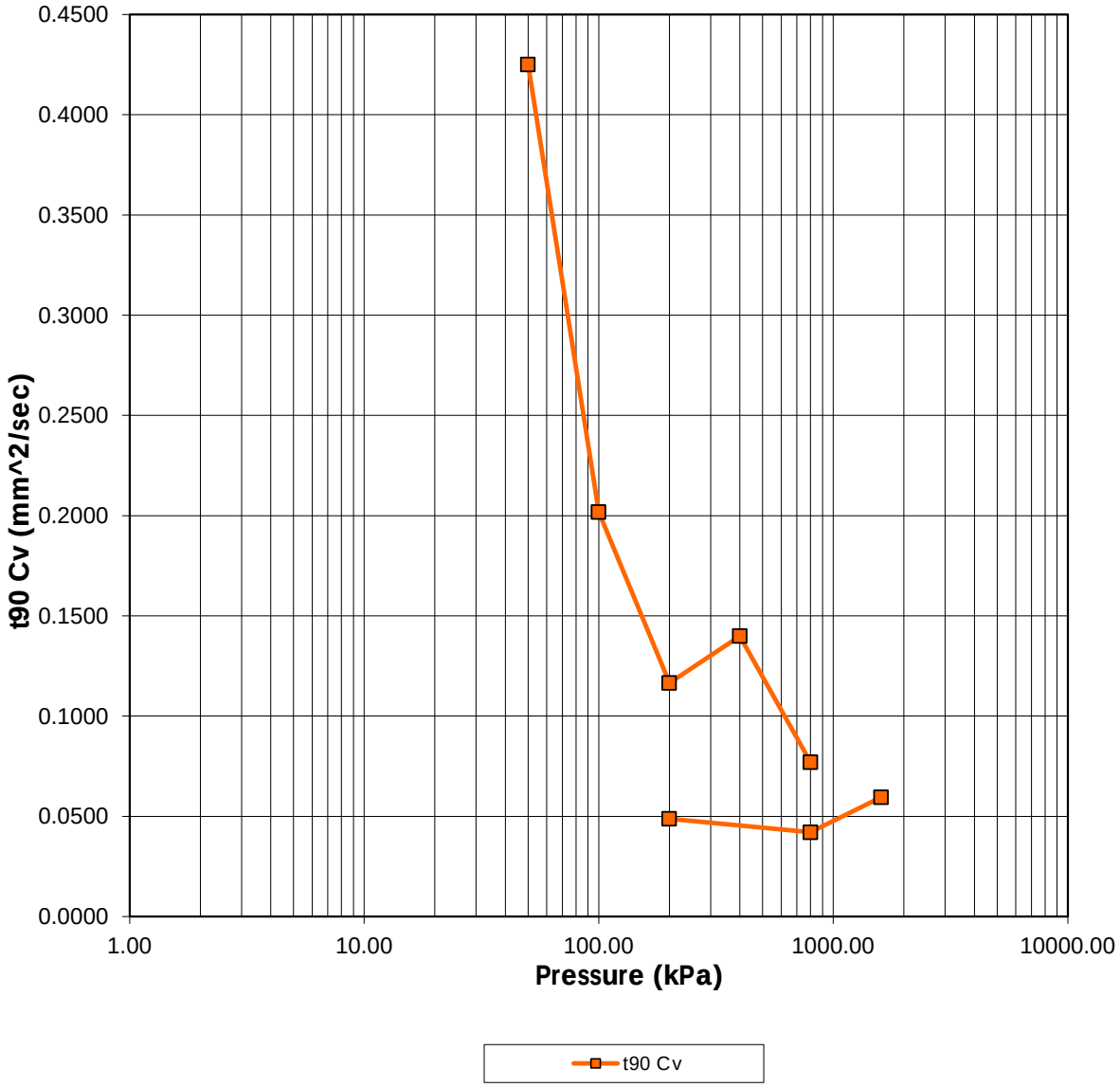
# One-Dimensional Consolidation Test
## ASTM D2435

### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.18 | 22.79 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.609 | 1.652 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.31 | 97.05 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6748 | 0.4800 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 2.7-3.2m | **Remarks:** |
| **Sample Number:** | D20-ST6 | **Boring Number:** | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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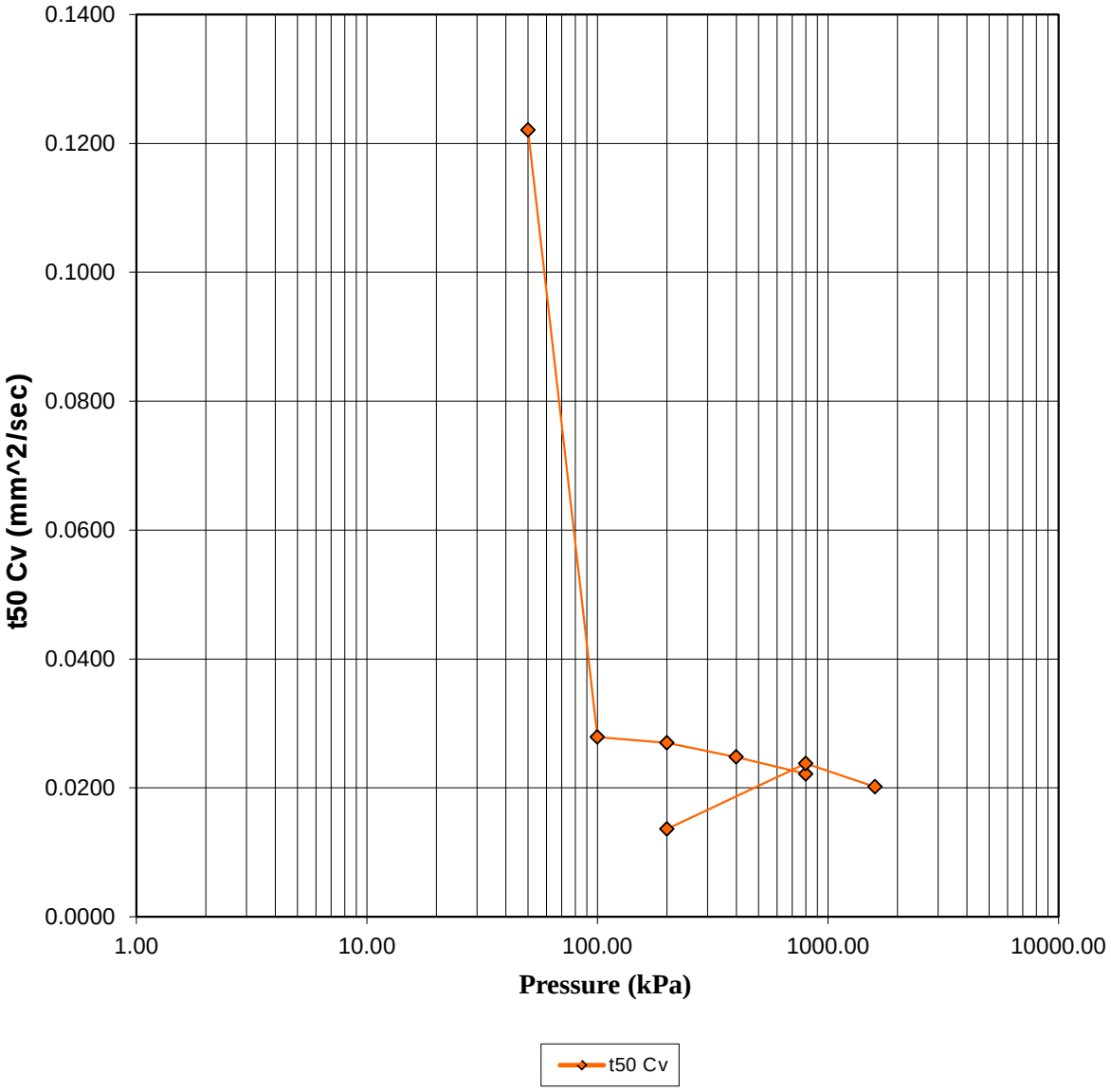
# One-Dimensional Consolidation Test
## ASTM D2435

### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.18 | 22.79 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.609 | 1.652 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.31 | 97.05 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6748 | 0.4800 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 2.7-3.2m | **Remarks:** |
| **Sample Number:** | D20-ST6 | **Boring Number:** | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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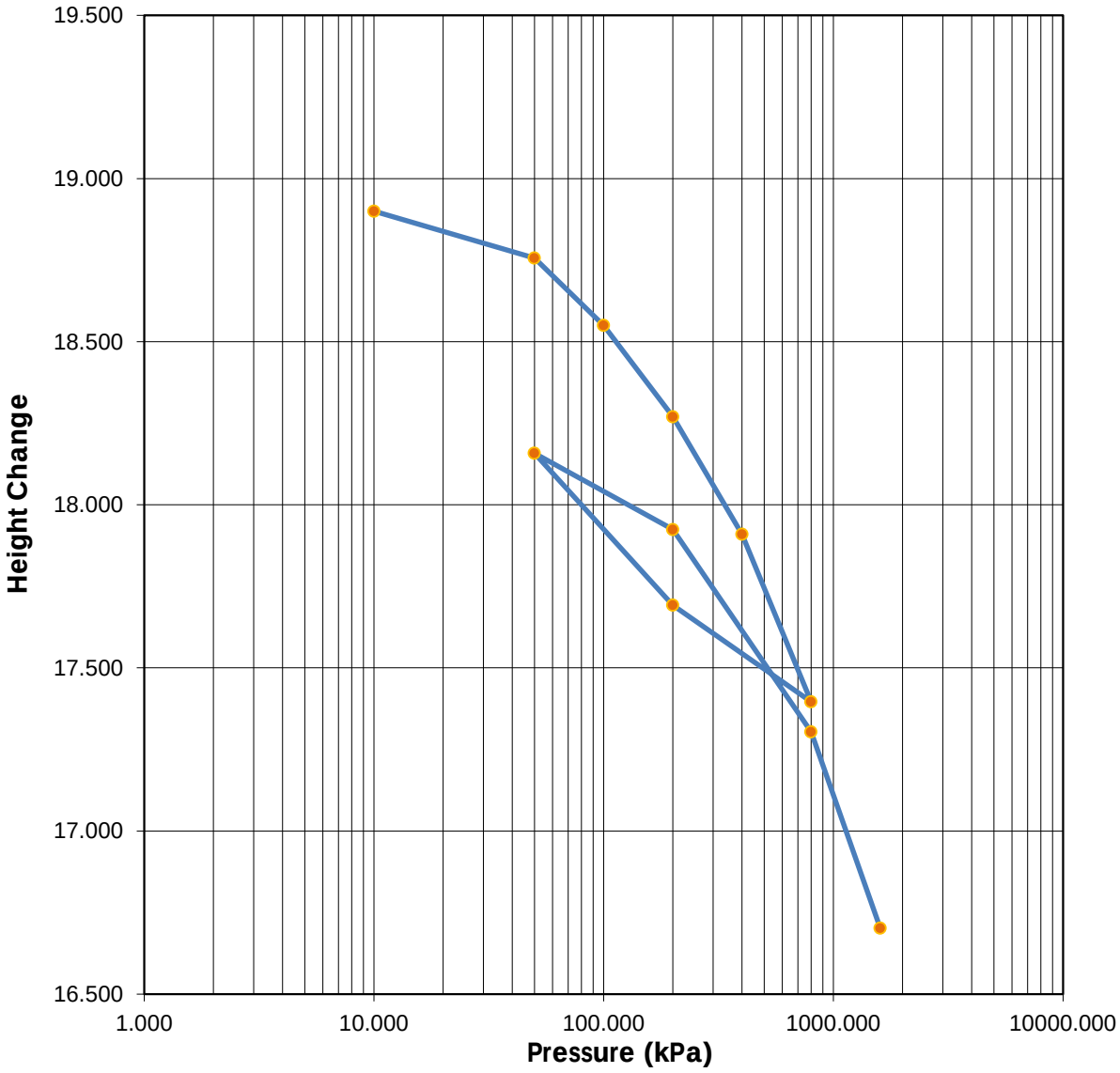
# One-Dimensional Consolidation Test
## ASTM D2435

### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.18 | 22.79 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.609 | 1.652 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.31 | 97.05 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6748 | 0.4800 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.7-3.2m

**Sample Number:** D20-ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Sample Description:** Brown Clay
**Remarks:**

**Test Number:**
**Test Date:** 12-May-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 18.9000 | 7.6158 | 0.00 | 0.6749 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 10.000 | 0.0000 | 18.9000 | 7.6158 | 0.00 | 0.6749 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 50.000 | 0.1440 | 18.7560 | 7.4718 | 0.76 | 0.6622 | 2.924 | 2.365 | 0.425 | 0.122 |
| 3 | 100.000 | 0.3500 | 18.5500 | 7.2658 | 1.85 | 0.6439 | 6.024 | 10.129 | 0.202 | 0.028 |
| 4 | 200.000 | 0.6300 | 18.2700 | 6.9858 | 3.33 | 0.6191 | 10.120 | 10.157 | 0.117 | 0.027 |
| 5 | 400.000 | 0.9900 | 17.9100 | 6.6258 | 5.24 | 0.5872 | 8.103 | 10.626 | 0.140 | 0.025 |
| 6 | 800.000 | 1.5040 | 17.3960 | 6.1118 | 7.96 | 0.5416 | 13.891 | 11.207 | 0.077 | 0.022 |
| 7 | 200.000 | 1.2080 | 17.6920 | 6.4078 | 6.39 | 0.5679 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8 | 50.000 | 0.7420 | 18.1580 | 6.8738 | 3.93 | 0.6092 | 0.000 | 0.000 | 0.000 | 0.000 |
| 9 | 200.000 | 0.9760 | 17.9240 | 6.6398 | 5.16 | 0.5884 | 23.307 | 19.383 | 0.049 | 0.014 |
| 10 | 800.000 | 1.5960 | 17.3040 | 6.0198 | 8.44 | 0.5335 | 25.176 | 10.339 | 0.042 | 0.024 |
| 11 | 1600.000 | 2.1980 | 16.7020 | 5.4178 | 11.63 | 0.4801 | 16.577 | 11.359 | 0.059 | 0.020 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16

**Sample Number:** D20-ST6 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 2.7-3.2m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** 0.0000 **Initial Void Ratio:** 0.6748 **Initial Height (mm):** 18.9000
**Plastic Limit:** 0.0000 **Plasticity Index (%):** 0.0000 **Initial Diameter (mm):** 49.9000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 61.5300

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 20.16 | 19.90 |
| Dry Soil + Container (g) | 16.47 | 16.49 |
| Weight of Container (g) | 1.21 | 1.53 |
| Moisture Content (%) | 24.18 | 22.79 |
| Void Ratio | 0.6748 | 0.4800 |
| Saturation (%) | 96.31 | 97.05 |
| Dry Density (g/cm3) | 1.61 | 1.65 |

# Consolidation Test Results
## (Sequence 1) Load 10.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

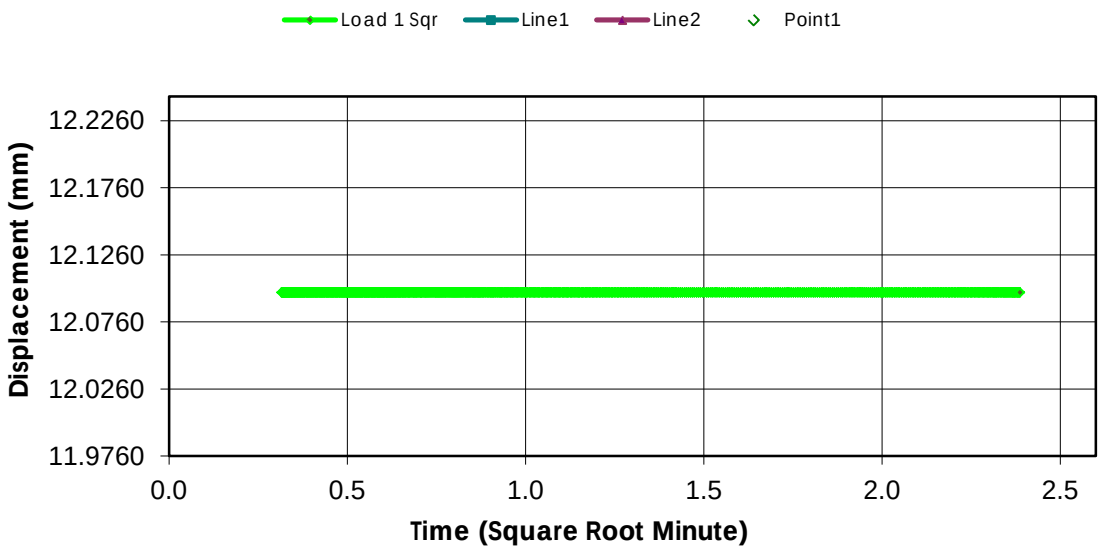
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

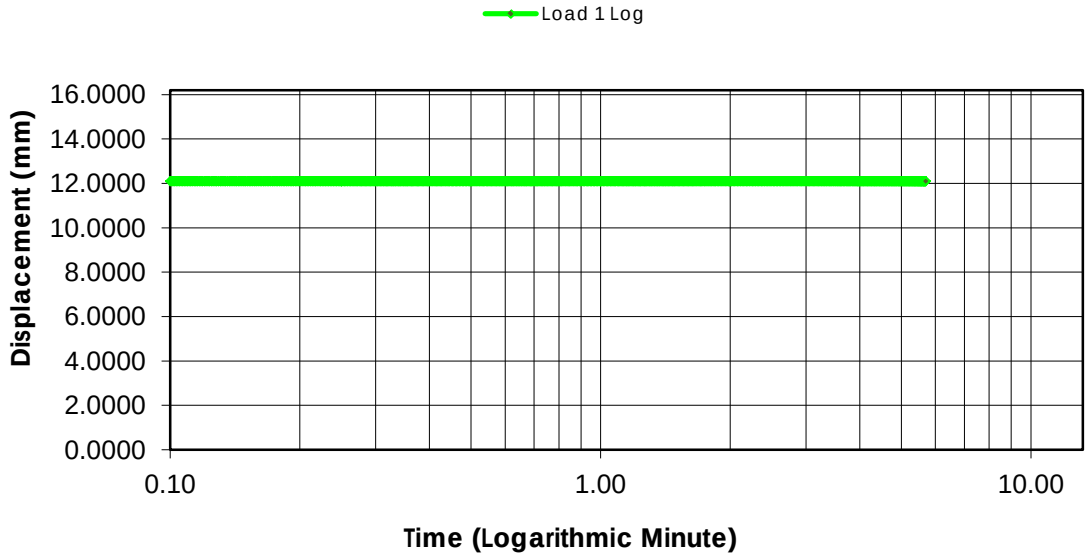
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 12.0980 | 0.0000 | 0.0000 | 0.6748 |
| 1 | 00:00:06 | 12.0980 | 0.0000 | 0.0000 | 0.6748 |
| 2 | 00:00:15 | 12.0980 | 0.0000 | 0.0000 | 0.6748 |
| 3 | 00:00:30 | 12.0980 | 0.0000 | 0.0000 | 0.6748 |
| 4 | 00:01:00 | 12.0980 | 0.0000 | 0.0000 | 0.6748 |
| 5 | 00:02:00 | 12.0980 | 0.0000 | 0.0000 | 0.6748 |
| 6 | 00:04:00 | 12.0980 | 0.0000 | 0.0000 | 0.6748 |
| 7 | 00:05:42 | 12.0980 | 0.0000 | 0.0000 | 0.6748 |

# Consolidation Test Results
## (Sequence 1) Load 10.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 2) Load 50.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

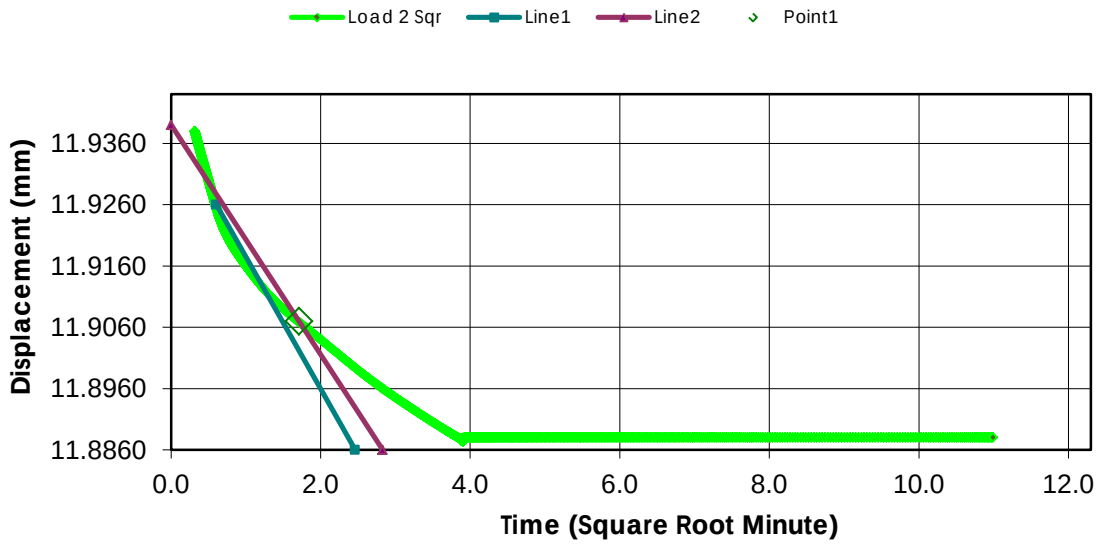
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

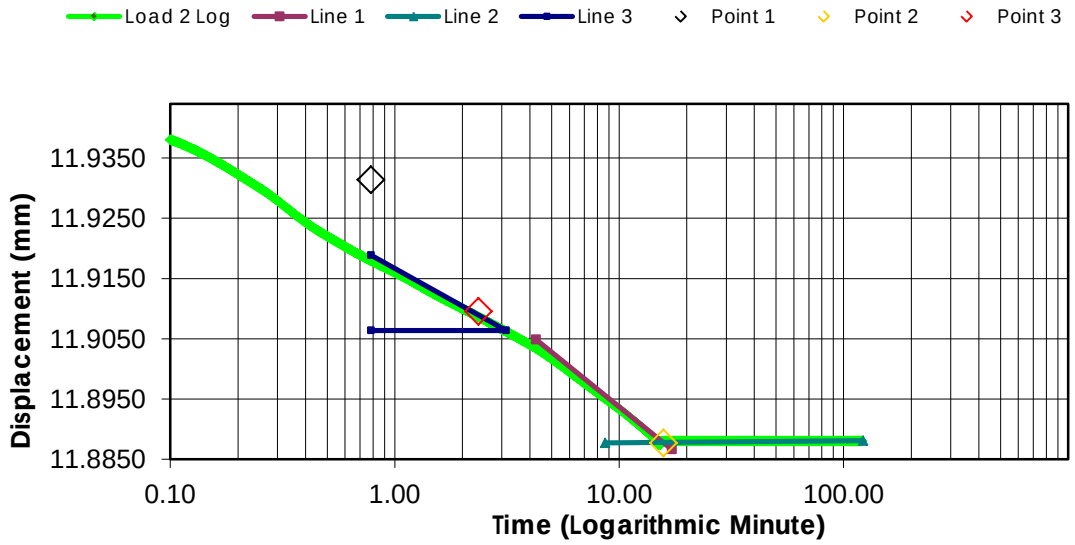
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 12.0980 | 0.0000 | 0.0000 | 0.6748 |
| 1 | 00:00:06 | 11.9380 | 0.0940 | 0.4974 | 0.6664 |
| 2 | 00:00:15 | 11.9300 | 0.1020 | 0.5397 | 0.6657 |
| 3 | 00:00:30 | 11.9220 | 0.1100 | 0.5820 | 0.6650 |
| 4 | 00:01:00 | 11.9160 | 0.1160 | 0.6138 | 0.6645 |
| 5 | 00:02:00 | 11.9100 | 0.1220 | 0.6455 | 0.6640 |
| 6 | 00:04:00 | 11.9040 | 0.1280 | 0.6772 | 0.6634 |
| 7 | 00:08:00 | 11.8960 | 0.1360 | 0.7196 | 0.6627 |
| 8 | 00:14:44 | 11.8880 | 0.1440 | 0.7619 | 0.6620 |
| 9 | 00:16:00 | 11.8880 | 0.1440 | 0.7619 | 0.6620 |
| 10 | 00:30:00 | 11.8880 | 0.1440 | 0.7619 | 0.6620 |
| 11 | 01:00:20 | 11.8880 | 0.1440 | 0.7619 | 0.6620 |
| 12 | 02:00:48 | 11.8880 | 0.1440 | 0.7619 | 0.6620 |

# Consolidation Test Results
## (Sequence 2) Load 50.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 3) Load 100.000 kpa

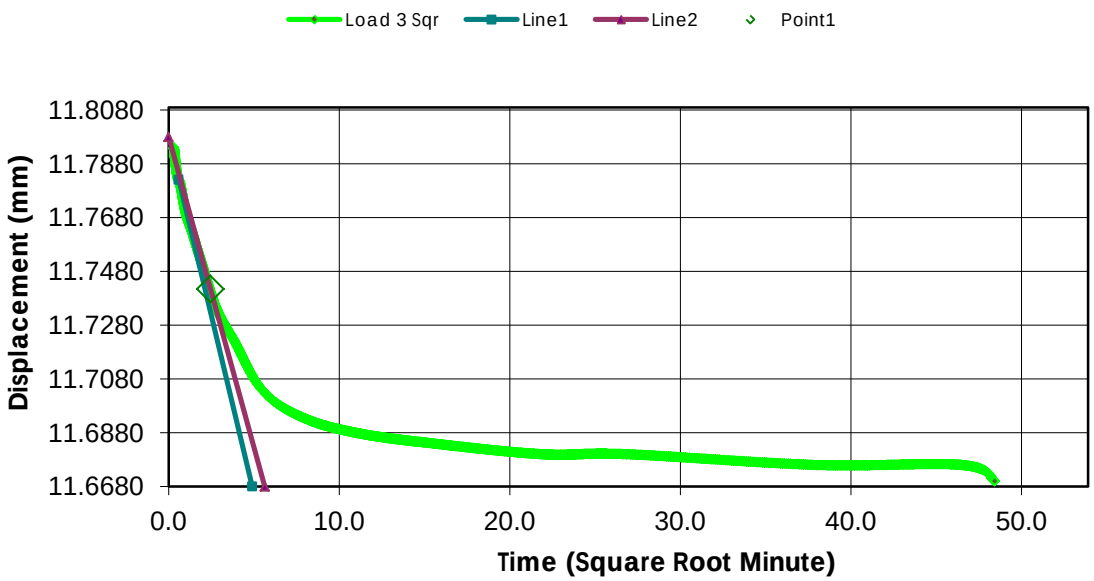
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 12-May-16
**Test Number:**

**Sample Number:** D20-ST6 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 2.7-3.2m **Remarks:**
**Sample Type:** Undisturbed

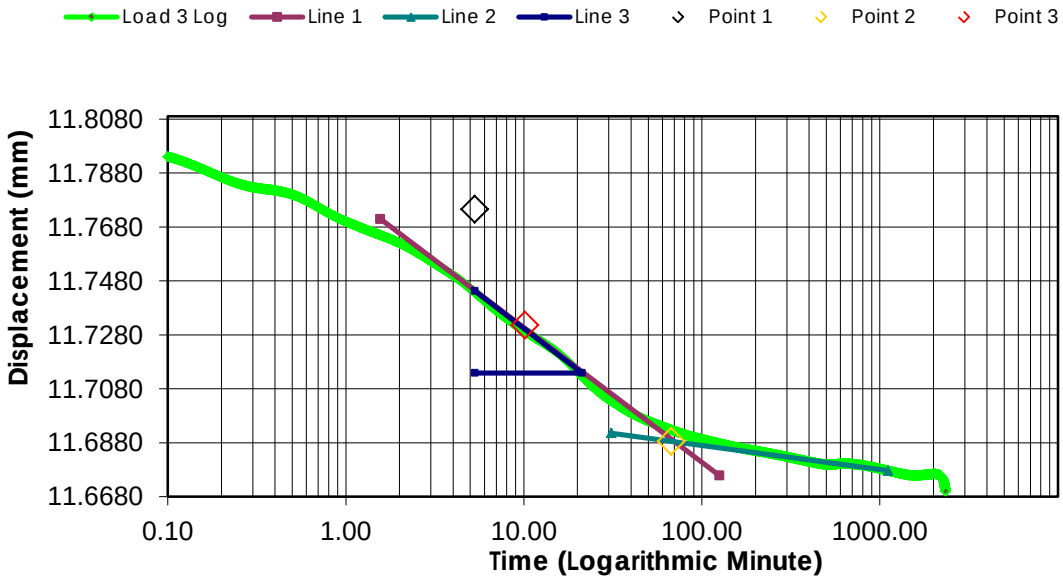
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.8880 | 0.1440 | 0.7619 | 0.6620 |
| 1 | 00:00:06 | 11.7940 | 0.2260 | 1.1958 | 0.6547 |
| 2 | 00:00:15 | 11.7840 | 0.2360 | 1.2487 | 0.6539 |
| 3 | 00:00:30 | 11.7800 | 0.2400 | 1.2698 | 0.6535 |
| 4 | 00:01:00 | 11.7700 | 0.2500 | 1.3228 | 0.6526 |
| 5 | 00:02:00 | 11.7620 | 0.2580 | 1.3651 | 0.6519 |
| 6 | 00:04:00 | 11.7500 | 0.2700 | 1.4286 | 0.6508 |
| 7 | 00:08:01 | 11.7340 | 0.2860 | 1.5132 | 0.6494 |
| 8 | 00:15:01 | 11.7220 | 0.2980 | 1.5767 | 0.6484 |
| 9 | 00:30:03 | 11.7040 | 0.3160 | 1.6720 | 0.6468 |
| 10 | 01:00:05 | 11.6940 | 0.3260 | 1.7249 | 0.6459 |
| 11 | 02:00:11 | 11.6880 | 0.3320 | 1.7566 | 0.6454 |
| 12 | 04:00:19 | 11.6840 | 0.3360 | 1.7778 | 0.6450 |
| 13 | 08:00:40 | 11.6800 | 0.3400 | 1.7989 | 0.6446 |
| 14 | 12:01:01 | 11.6800 | 0.3400 | 1.7989 | 0.6446 |
| 15 | 24:02:05 | 11.6760 | 0.3440 | 1.8201 | 0.6443 |
| 16 | 36:03:09 | 11.6760 | 0.3440 | 1.8201 | 0.6443 |
| 17 | 39:06:11 | 11.6700 | 0.3500 | 1.8519 | 0.6438 |

# Consolidation Test Results
## (Sequence 3) Load 100.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 200.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

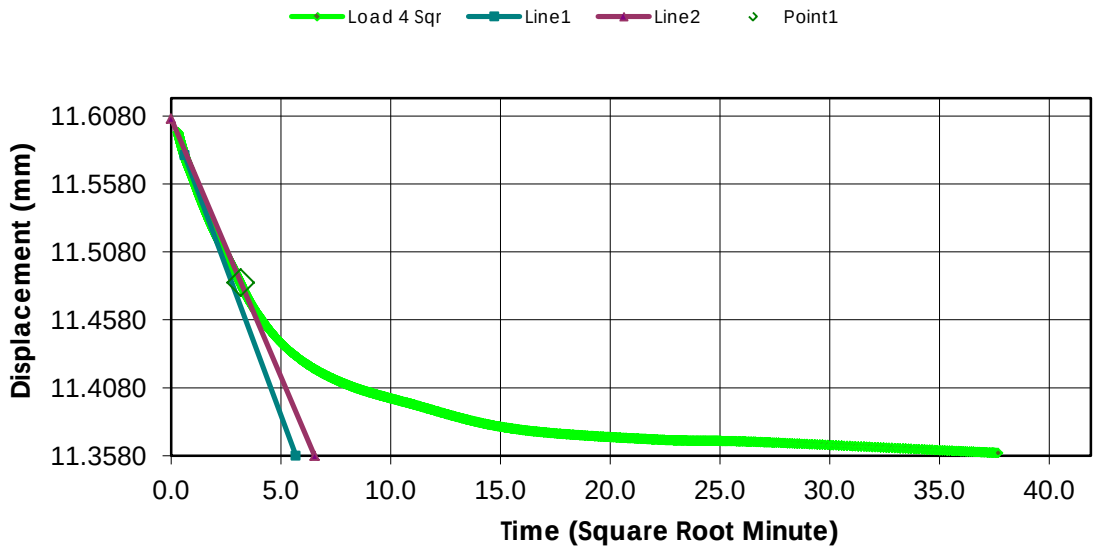
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

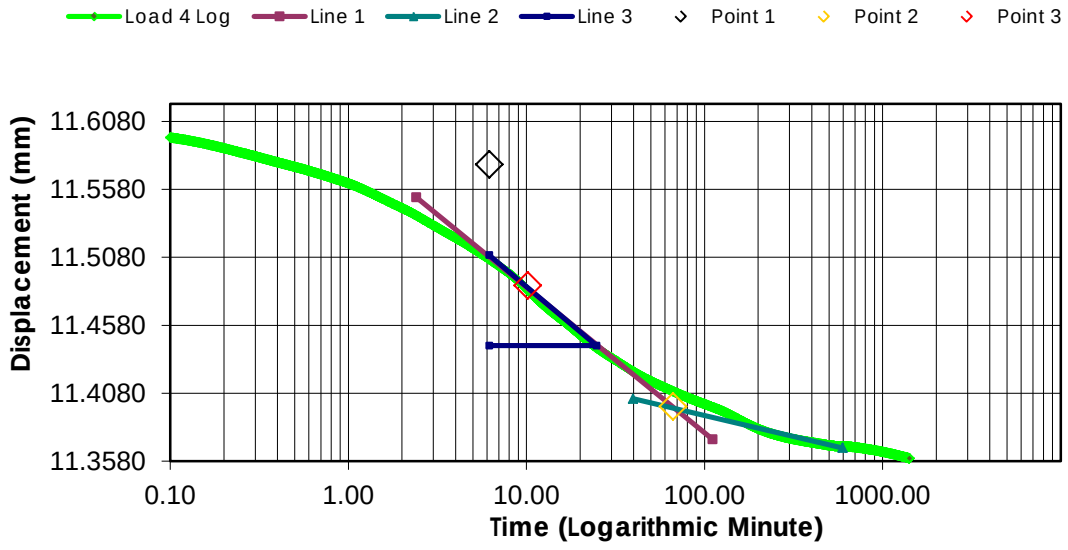
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.6700 | 0.3500 | 1.8519 | 0.6438 |
| 1 | 00:00:06 | 11.5960 | 0.3940 | 2.0847 | 0.6399 |
| 2 | 00:00:16 | 11.5840 | 0.4060 | 2.1481 | 0.6388 |
| 3 | 00:00:31 | 11.5740 | 0.4160 | 2.2011 | 0.6379 |
| 4 | 00:01:01 | 11.5620 | 0.4280 | 2.2646 | 0.6368 |
| 5 | 00:02:01 | 11.5440 | 0.4460 | 2.3598 | 0.6353 |
| 6 | 00:04:01 | 11.5220 | 0.4680 | 2.4762 | 0.6333 |
| 7 | 00:08:01 | 11.4960 | 0.4940 | 2.6138 | 0.6310 |
| 8 | 00:15:02 | 11.4640 | 0.5260 | 2.7831 | 0.6282 |
| 9 | 00:30:03 | 11.4340 | 0.5560 | 2.9418 | 0.6255 |
| 10 | 01:00:06 | 11.4120 | 0.5780 | 3.0582 | 0.6236 |
| 11 | 02:00:11 | 11.3960 | 0.5940 | 3.1429 | 0.6221 |
| 12 | 04:00:22 | 11.3780 | 0.6120 | 3.2381 | 0.6205 |
| 13 | 08:00:43 | 11.3700 | 0.6200 | 3.2804 | 0.6198 |
| 14 | 12:01:04 | 11.3680 | 0.6220 | 3.2910 | 0.6197 |
| 15 | 23:39:19 | 11.3600 | 0.6300 | 3.3333 | 0.6189 |

# Consolidation Test Results
## (Sequence 4) Load 200.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 400.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

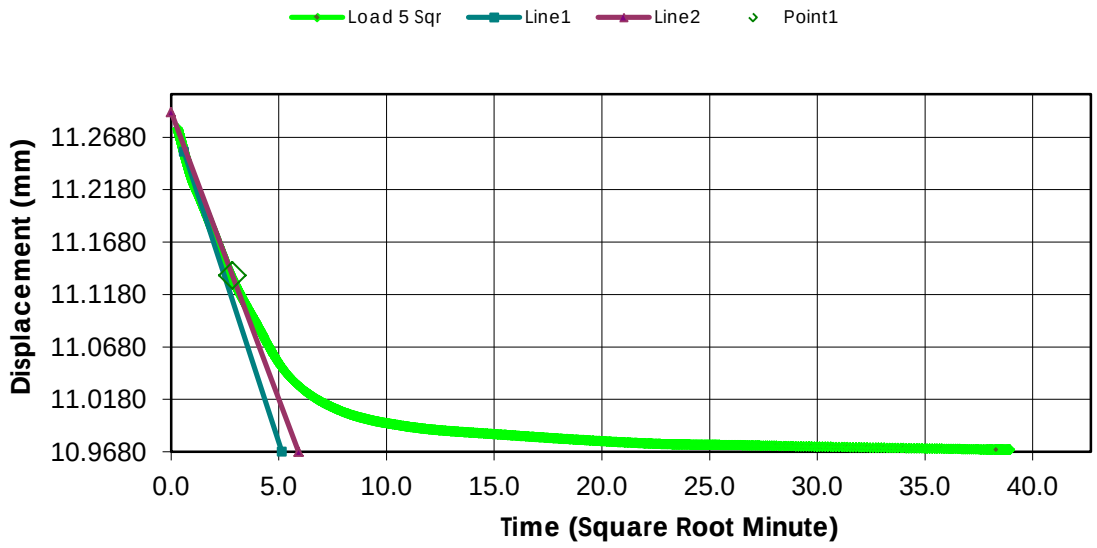
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

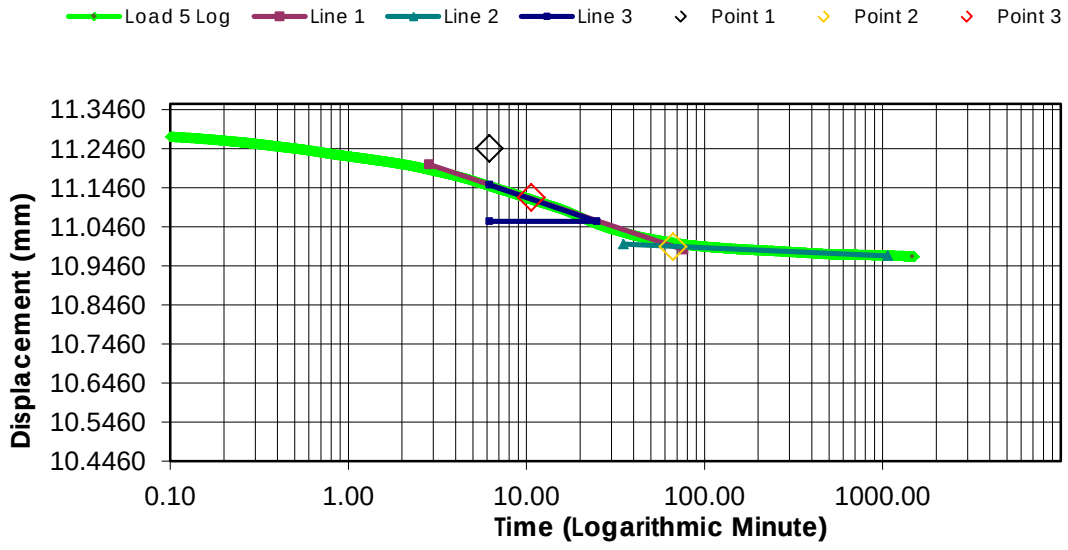
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.3600 | 0.6300 | 3.3333 | 0.6189 |
| 1 | 00:00:06 | 11.2760 | 0.6840 | 3.6190 | 0.6142 |
| 2 | 00:00:15 | 11.2620 | 0.6980 | 3.6931 | 0.6129 |
| 3 | 00:00:30 | 11.2460 | 0.7140 | 3.7778 | 0.6115 |
| 4 | 00:01:00 | 11.2260 | 0.7340 | 3.8836 | 0.6097 |
| 5 | 00:02:00 | 11.2060 | 0.7540 | 3.9894 | 0.6080 |
| 6 | 00:04:00 | 11.1760 | 0.7840 | 4.1482 | 0.6053 |
| 7 | 00:08:01 | 11.1340 | 0.8260 | 4.3704 | 0.6016 |
| 8 | 00:15:01 | 11.0940 | 0.8660 | 4.5820 | 0.5980 |
| 9 | 00:30:03 | 11.0400 | 0.9200 | 4.8677 | 0.5932 |
| 10 | 01:00:05 | 11.0080 | 0.9520 | 5.0370 | 0.5904 |
| 11 | 02:00:11 | 10.9920 | 0.9680 | 5.1217 | 0.5890 |
| 12 | 04:00:21 | 10.9840 | 0.9760 | 5.1640 | 0.5883 |
| 13 | 08:00:43 | 10.9760 | 0.9840 | 5.2064 | 0.5876 |
| 14 | 12:01:04 | 10.9740 | 0.9860 | 5.2169 | 0.5874 |
| 15 | 24:02:04 | 10.9700 | 0.9900 | 5.2381 | 0.5870 |
| 16 | 24:26:44 | 10.9700 | 0.9900 | 5.2381 | 0.5870 |

# Consolidation Test Results
## (Sequence 5) Load 400.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 800.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

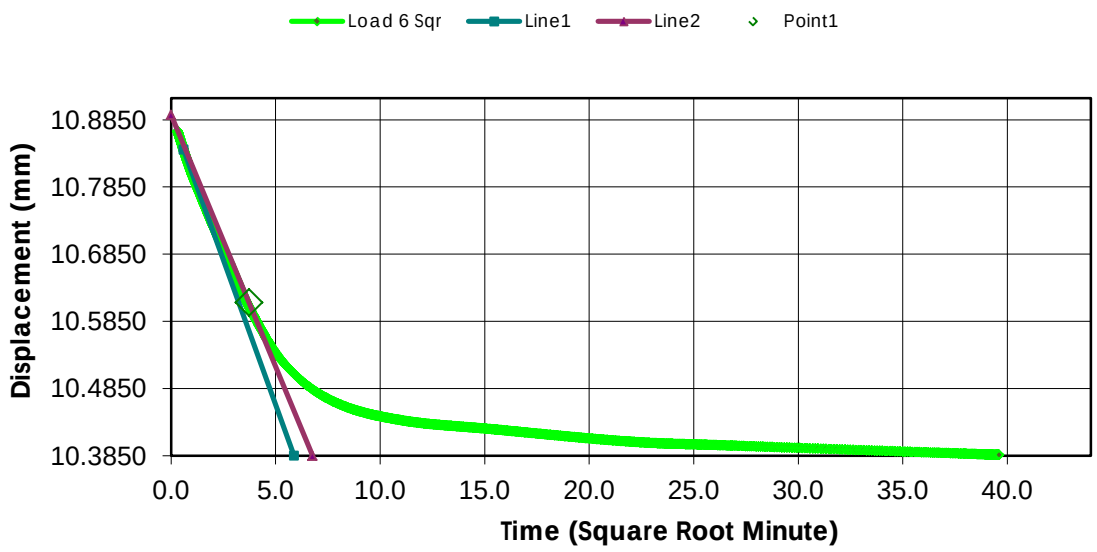
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

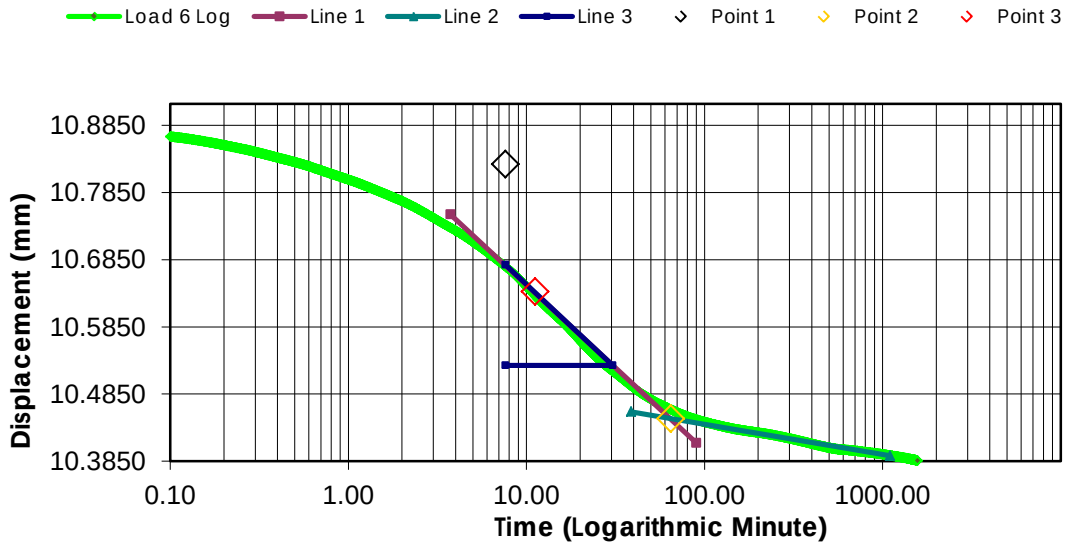
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.9700 | 0.9900 | 5.2381 | 0.5870 |
| 1 | 00:00:06 | 10.8680 | 1.0220 | 5.4074 | 0.5842 |
| 2 | 00:00:15 | 10.8500 | 1.0400 | 5.5026 | 0.5826 |
| 3 | 00:00:30 | 10.8300 | 1.0600 | 5.6085 | 0.5808 |
| 4 | 00:01:00 | 10.8040 | 1.0860 | 5.7460 | 0.5785 |
| 5 | 00:02:00 | 10.7720 | 1.1180 | 5.9153 | 0.5757 |
| 6 | 00:04:00 | 10.7280 | 1.1620 | 6.1481 | 0.5718 |
| 7 | 00:08:00 | 10.6700 | 1.2200 | 6.4550 | 0.5667 |
| 8 | 00:15:01 | 10.5980 | 1.2920 | 6.8360 | 0.5603 |
| 9 | 00:30:02 | 10.5200 | 1.3700 | 7.2487 | 0.5534 |
| 10 | 01:00:05 | 10.4660 | 1.4240 | 7.5344 | 0.5486 |
| 11 | 02:00:10 | 10.4380 | 1.4520 | 7.6825 | 0.5461 |
| 12 | 04:00:21 | 10.4240 | 1.4660 | 7.7566 | 0.5449 |
| 13 | 08:00:42 | 10.4060 | 1.4840 | 7.8519 | 0.5433 |
| 14 | 12:01:04 | 10.4000 | 1.4900 | 7.8836 | 0.5427 |
| 15 | 24:02:08 | 10.3880 | 1.5020 | 7.9471 | 0.5417 |
| 16 | 26:09:20 | 10.3860 | 1.5040 | 7.9577 | 0.5415 |

# Consolidation Test Results
## (Sequence 6) Load 800.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Rebound 200.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

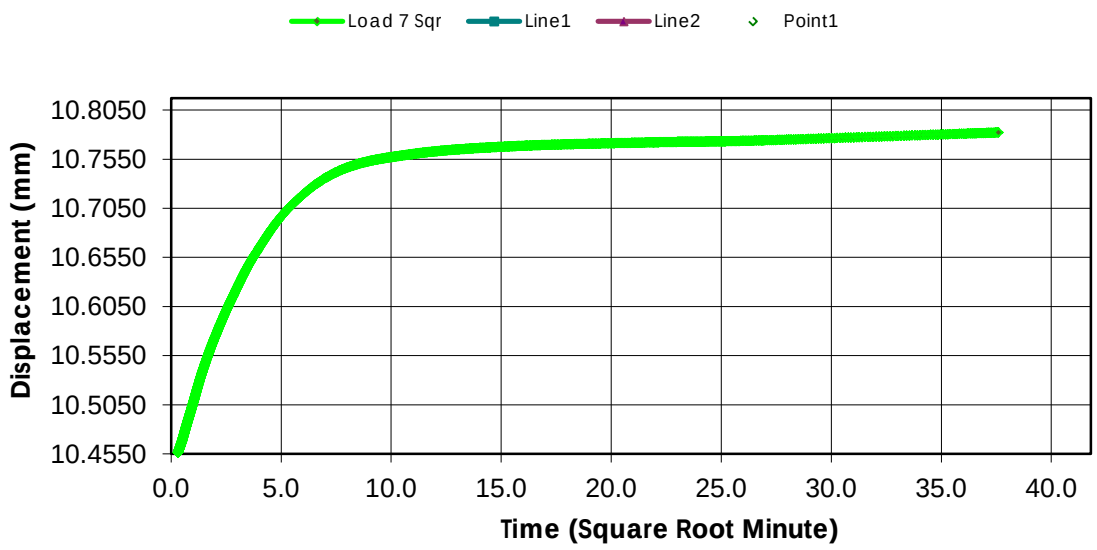
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

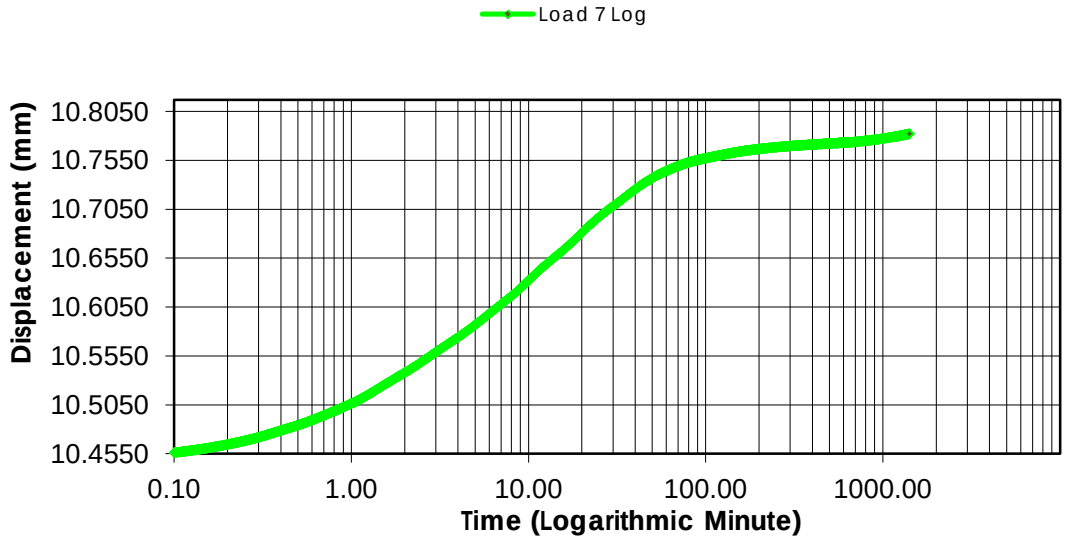
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.3860 | 1.5040 | 7.9577 | 0.5415 |
| 1 | 00:00:06 | 10.4560 | 1.5340 | 8.1164 | 0.5388 |
| 2 | 00:00:15 | 10.4680 | 1.5220 | 8.0529 | 0.5399 |
| 3 | 00:00:30 | 10.4840 | 1.5060 | 7.9683 | 0.5413 |
| 4 | 00:01:00 | 10.5060 | 1.4840 | 7.8519 | 0.5433 |
| 5 | 00:02:01 | 10.5380 | 1.4520 | 7.6825 | 0.5461 |
| 6 | 00:04:01 | 10.5740 | 1.4160 | 7.4921 | 0.5493 |
| 7 | 00:08:01 | 10.6160 | 1.3740 | 7.2698 | 0.5530 |
| 8 | 00:15:02 | 10.6600 | 1.3300 | 7.0370 | 0.5569 |
| 9 | 00:30:03 | 10.7080 | 1.2820 | 6.7831 | 0.5612 |
| 10 | 01:00:06 | 10.7440 | 1.2460 | 6.5926 | 0.5644 |
| 11 | 02:00:11 | 10.7600 | 1.2300 | 6.5079 | 0.5658 |
| 12 | 04:00:21 | 10.7680 | 1.2220 | 6.4656 | 0.5665 |
| 13 | 08:00:43 | 10.7720 | 1.2180 | 6.4444 | 0.5668 |
| 14 | 12:01:04 | 10.7740 | 1.2160 | 6.4339 | 0.5670 |
| 15 | 23:34:20 | 10.7820 | 1.2080 | 6.3915 | 0.5677 |

# Consolidation Test Results
## (Sequence 7) Rebound 200.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Rebound 50.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

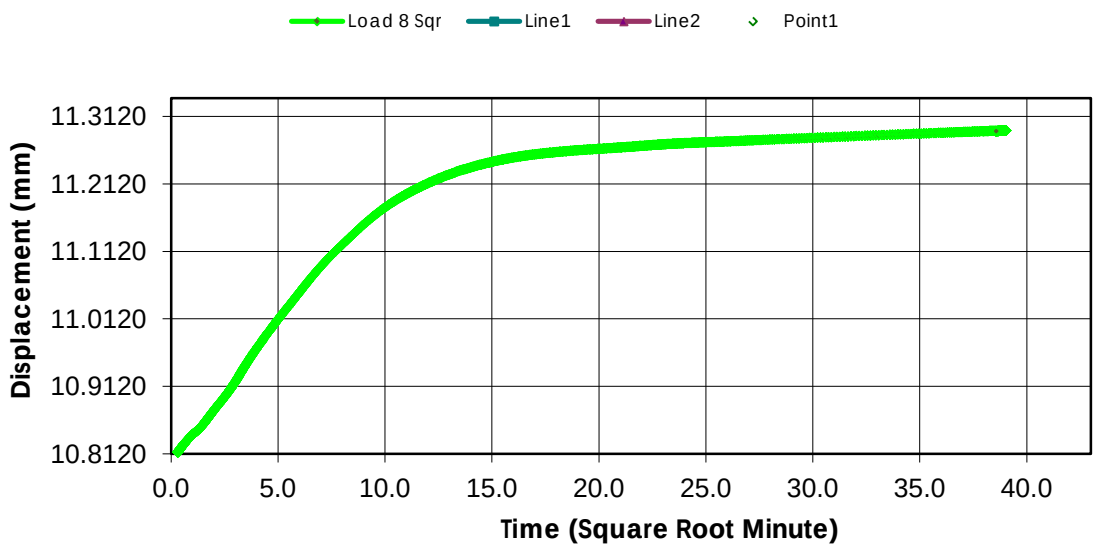
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

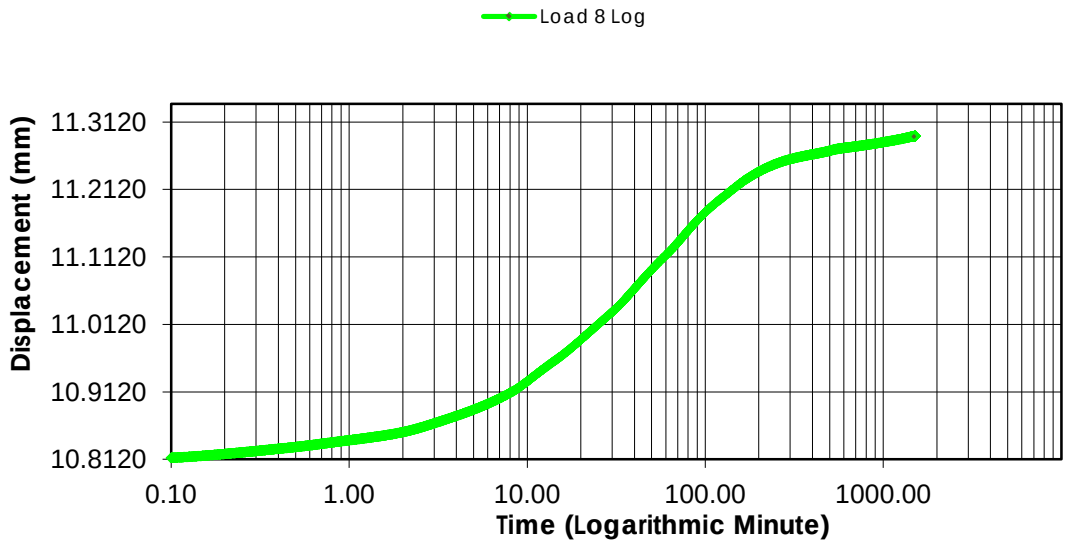
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.7820 | 1.2080 | 6.3915 | 0.5677 |
| 1 | 00:00:06 | 10.8140 | 1.2180 | 6.4444 | 0.5668 |
| 2 | 00:00:15 | 10.8220 | 1.2100 | 6.4021 | 0.5676 |
| 3 | 00:00:30 | 10.8300 | 1.2020 | 6.3598 | 0.5683 |
| 4 | 00:01:00 | 10.8400 | 1.1920 | 6.3069 | 0.5691 |
| 5 | 00:02:00 | 10.8520 | 1.1800 | 6.2434 | 0.5702 |
| 6 | 00:04:00 | 10.8760 | 1.1560 | 6.1164 | 0.5723 |
| 7 | 00:08:00 | 10.9100 | 1.1220 | 5.9365 | 0.5753 |
| 8 | 00:15:01 | 10.9620 | 1.0700 | 5.6614 | 0.5800 |
| 9 | 00:30:02 | 11.0300 | 1.0020 | 5.3016 | 0.5860 |
| 10 | 01:00:05 | 11.1140 | 0.9180 | 4.8571 | 0.5934 |
| 11 | 02:00:10 | 11.1960 | 0.8360 | 4.4233 | 0.6007 |
| 12 | 04:00:21 | 11.2480 | 0.7840 | 4.1481 | 0.6053 |
| 13 | 08:00:42 | 11.2680 | 0.7640 | 4.0423 | 0.6071 |
| 14 | 12:01:04 | 11.2760 | 0.7560 | 4.0000 | 0.6078 |
| 15 | 24:02:08 | 11.2900 | 0.7420 | 3.9259 | 0.6090 |
| 16 | 24:47:39 | 11.2900 | 0.7420 | 3.9259 | 0.6090 |

# Consolidation Test Results
## (Sequence 8) Rebound 50.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 200.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

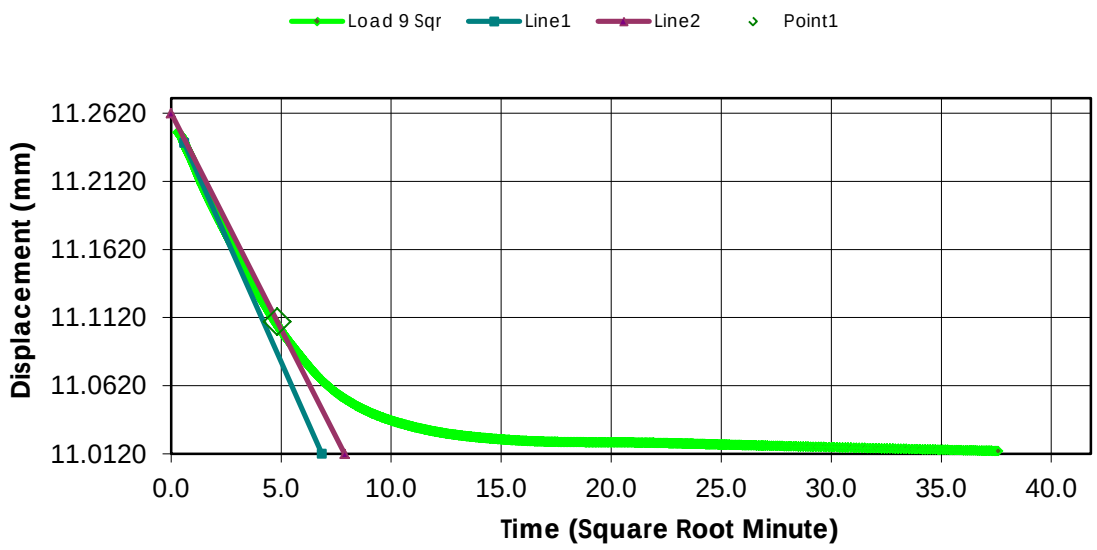
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

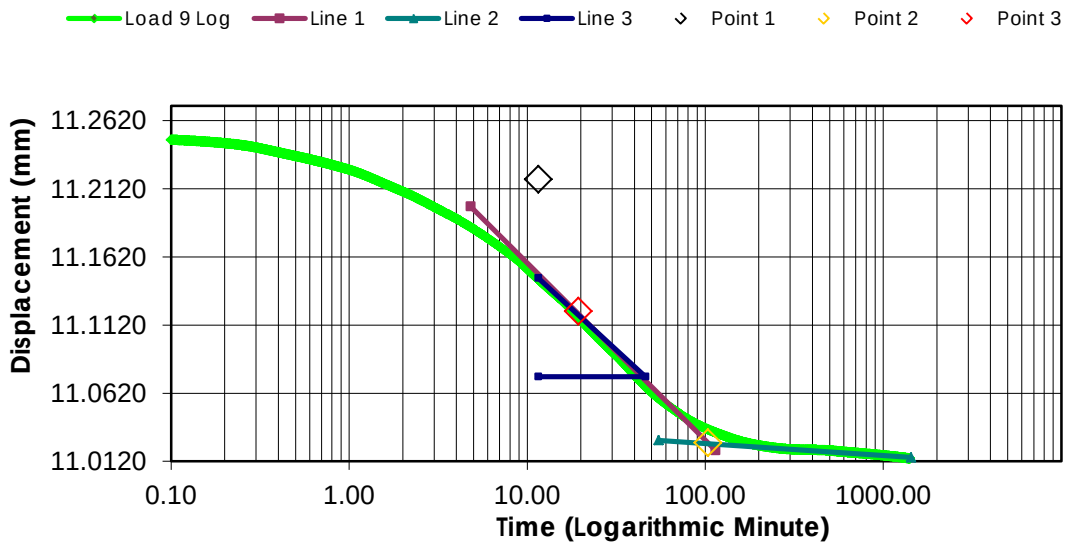
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.2900 | 0.7420 | 3.9259 | 0.6090 |
| 1 | 00:00:06 | 11.2480 | 0.7420 | 3.9259 | 0.6090 |
| 2 | 00:00:15 | 11.2440 | 0.7460 | 3.9471 | 0.6087 |
| 3 | 00:00:30 | 11.2360 | 0.7540 | 3.9894 | 0.6080 |
| 4 | 00:01:00 | 11.2260 | 0.7640 | 4.0423 | 0.6071 |
| 5 | 00:02:00 | 11.2100 | 0.7800 | 4.1270 | 0.6057 |
| 6 | 00:04:00 | 11.1900 | 0.8000 | 4.2328 | 0.6039 |
| 7 | 00:08:00 | 11.1640 | 0.8260 | 4.3704 | 0.6016 |
| 8 | 00:15:01 | 11.1320 | 0.8580 | 4.5397 | 0.5987 |
| 9 | 00:30:02 | 11.0920 | 0.8980 | 4.7513 | 0.5952 |
| 10 | 01:00:05 | 11.0540 | 0.9360 | 4.9524 | 0.5918 |
| 11 | 02:00:10 | 11.0320 | 0.9580 | 5.0688 | 0.5899 |
| 12 | 04:00:21 | 11.0220 | 0.9680 | 5.1217 | 0.5890 |
| 13 | 08:00:43 | 11.0200 | 0.9700 | 5.1323 | 0.5888 |
| 14 | 12:01:06 | 11.0180 | 0.9720 | 5.1429 | 0.5886 |
| 15 | 23:32:57 | 11.0140 | 0.9760 | 5.1640 | 0.5883 |

# Consolidation Test Results
## (Sequence 9) Load 200.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Load 800.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

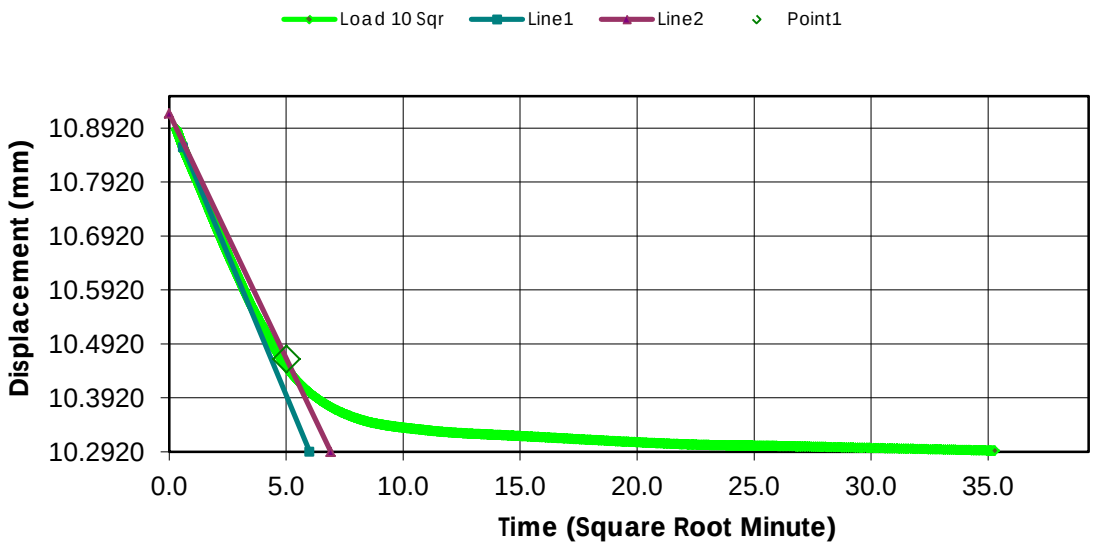
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

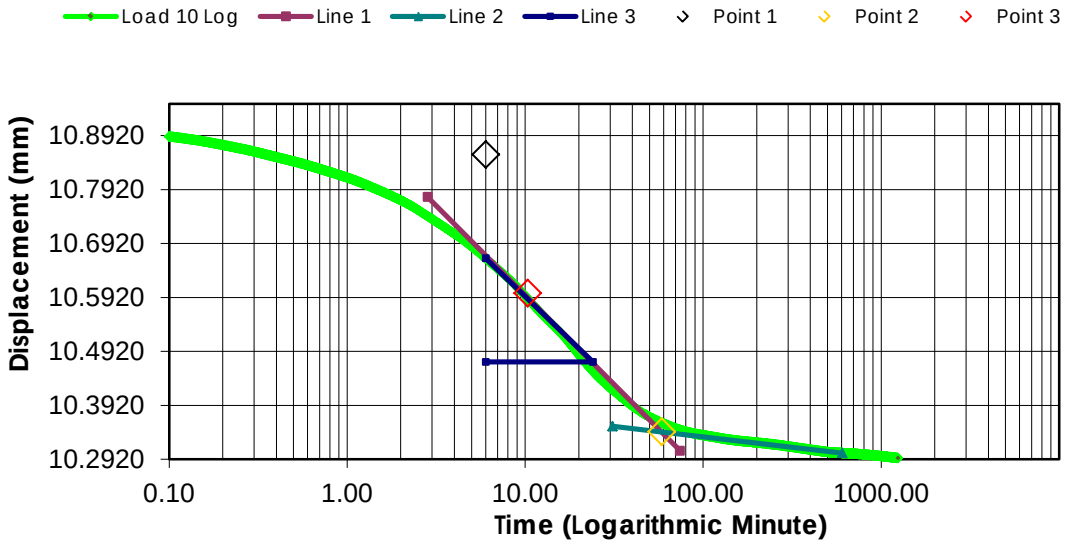
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.0140 | 0.9760 | 5.1640 | 0.5883 |
| 1 | 00:00:06 | 10.8900 | 1.0000 | 5.2910 | 0.5862 |
| 2 | 00:00:15 | 10.8680 | 1.0220 | 5.4074 | 0.5842 |
| 3 | 00:00:30 | 10.8440 | 1.0460 | 5.5344 | 0.5821 |
| 4 | 00:01:00 | 10.8140 | 1.0760 | 5.6931 | 0.5794 |
| 5 | 00:02:00 | 10.7720 | 1.1180 | 5.9153 | 0.5757 |
| 6 | 00:04:00 | 10.7100 | 1.1800 | 6.2434 | 0.5702 |
| 7 | 00:08:00 | 10.6280 | 1.2620 | 6.6772 | 0.5629 |
| 8 | 00:15:01 | 10.5340 | 1.3560 | 7.1746 | 0.5546 |
| 9 | 00:30:02 | 10.4240 | 1.4660 | 7.7566 | 0.5449 |
| 10 | 01:00:05 | 10.3580 | 1.5320 | 8.1058 | 0.5390 |
| 11 | 02:00:11 | 10.3320 | 1.5580 | 8.2434 | 0.5367 |
| 12 | 04:00:22 | 10.3200 | 1.5700 | 8.3069 | 0.5357 |
| 13 | 08:00:44 | 10.3060 | 1.5840 | 8.3810 | 0.5344 |
| 14 | 12:01:06 | 10.3020 | 1.5880 | 8.4021 | 0.5341 |
| 15 | 20:46:20 | 10.2940 | 1.5960 | 8.4444 | 0.5333 |

# Consolidation Test Results
## (Sequence 10) Load 800.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Load 1600.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

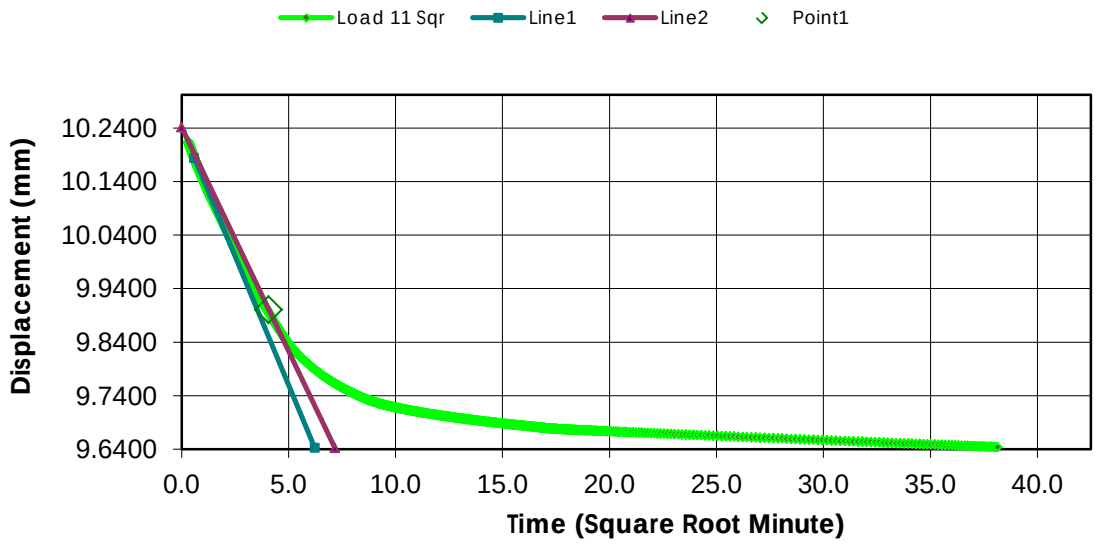
**Sample Number:** D20-ST6
**Boring Number:**
**Depth:** 2.7-3.2m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

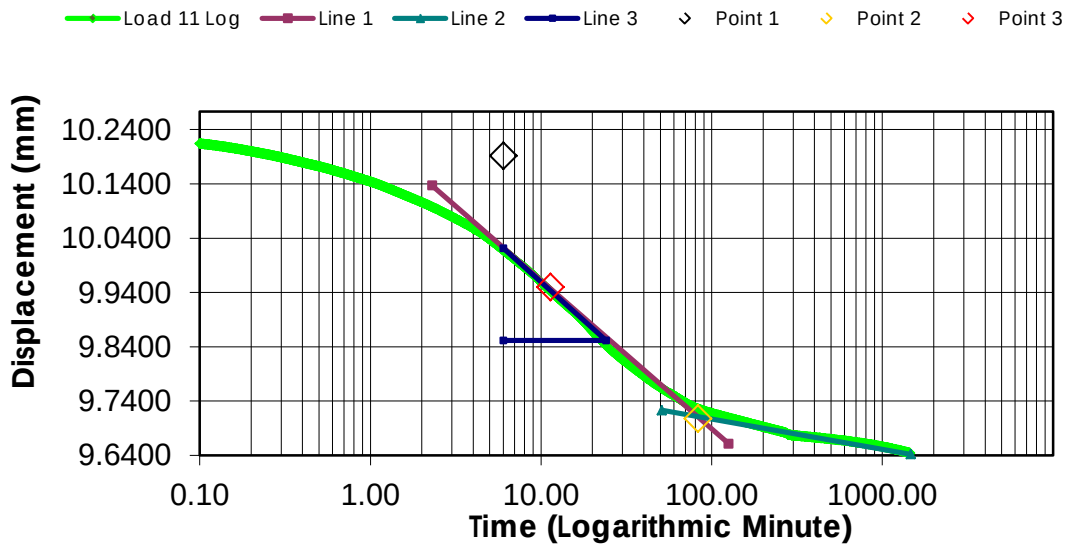
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.2940 | 1.5960 | 8.4444 | 0.5333 |
| 1 | 00:00:06 | 10.2140 | 1.6280 | 8.6138 | 0.5305 |
| 2 | 00:00:15 | 10.1940 | 1.6480 | 8.7196 | 0.5287 |
| 3 | 00:00:30 | 10.1720 | 1.6700 | 8.8360 | 0.5268 |
| 4 | 00:01:00 | 10.1440 | 1.6980 | 8.9841 | 0.5243 |
| 5 | 00:02:00 | 10.1060 | 1.7360 | 9.1852 | 0.5209 |
| 6 | 00:04:00 | 10.0580 | 1.7840 | 9.4392 | 0.5167 |
| 7 | 00:08:00 | 9.9860 | 1.8560 | 9.8201 | 0.5103 |
| 8 | 00:15:15 | 9.9060 | 1.9360 | 10.2434 | 0.5032 |
| 9 | 00:30:00 | 9.8160 | 2.0260 | 10.7196 | 0.4952 |
| 10 | 01:00:00 | 9.7500 | 2.0920 | 11.0688 | 0.4894 |
| 11 | 01:50:00 | 9.7140 | 2.1280 | 11.2593 | 0.4862 |
| 12 | 04:15:00 | 9.6840 | 2.1580 | 11.4180 | 0.4835 |
| 13 | 07:10:00 | 9.6720 | 2.1700 | 11.4815 | 0.4825 |
| 14 | 24:15:00 | 9.6440 | 2.1980 | 11.6296 | 0.4800 |

# Consolidation Test Results
## (Sequence 11) Load 1600.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



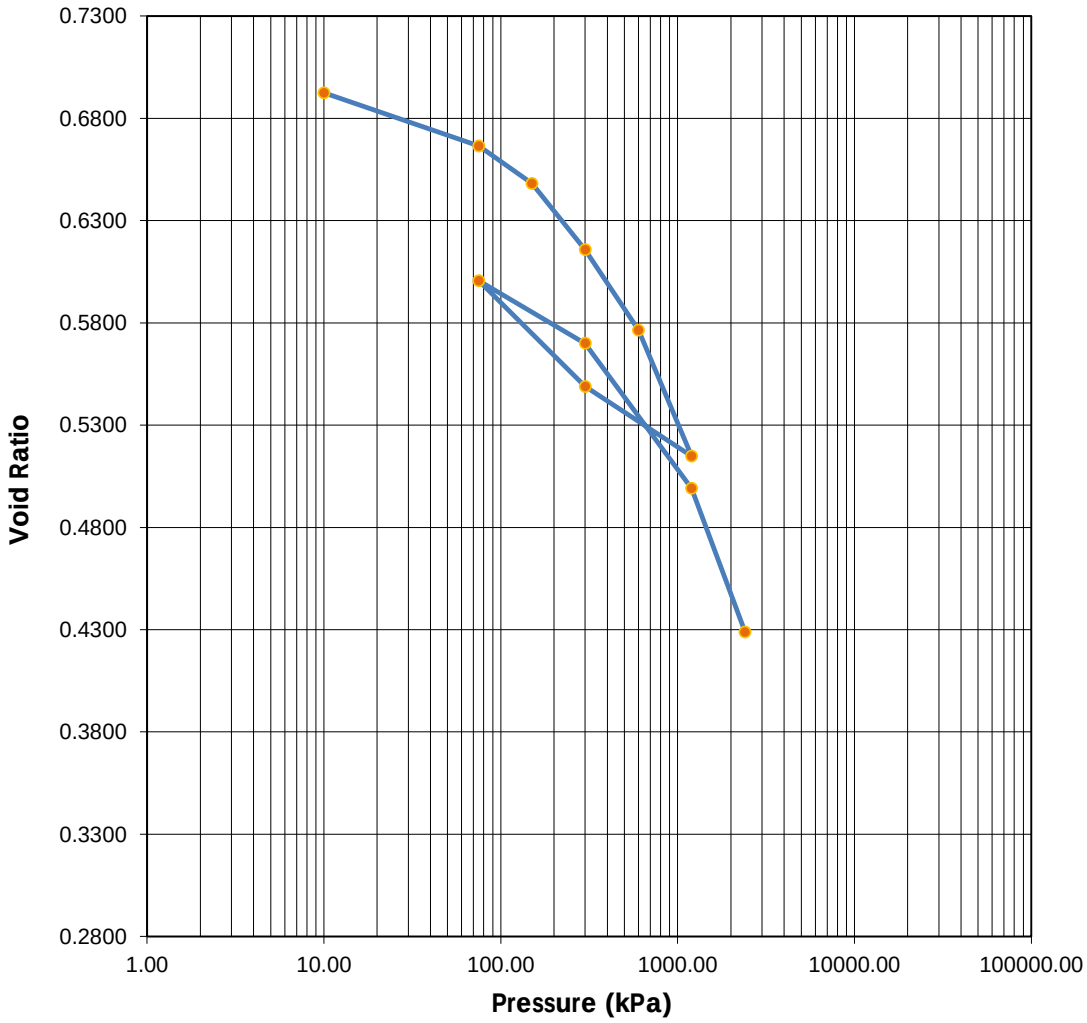
# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

### Test Results

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876



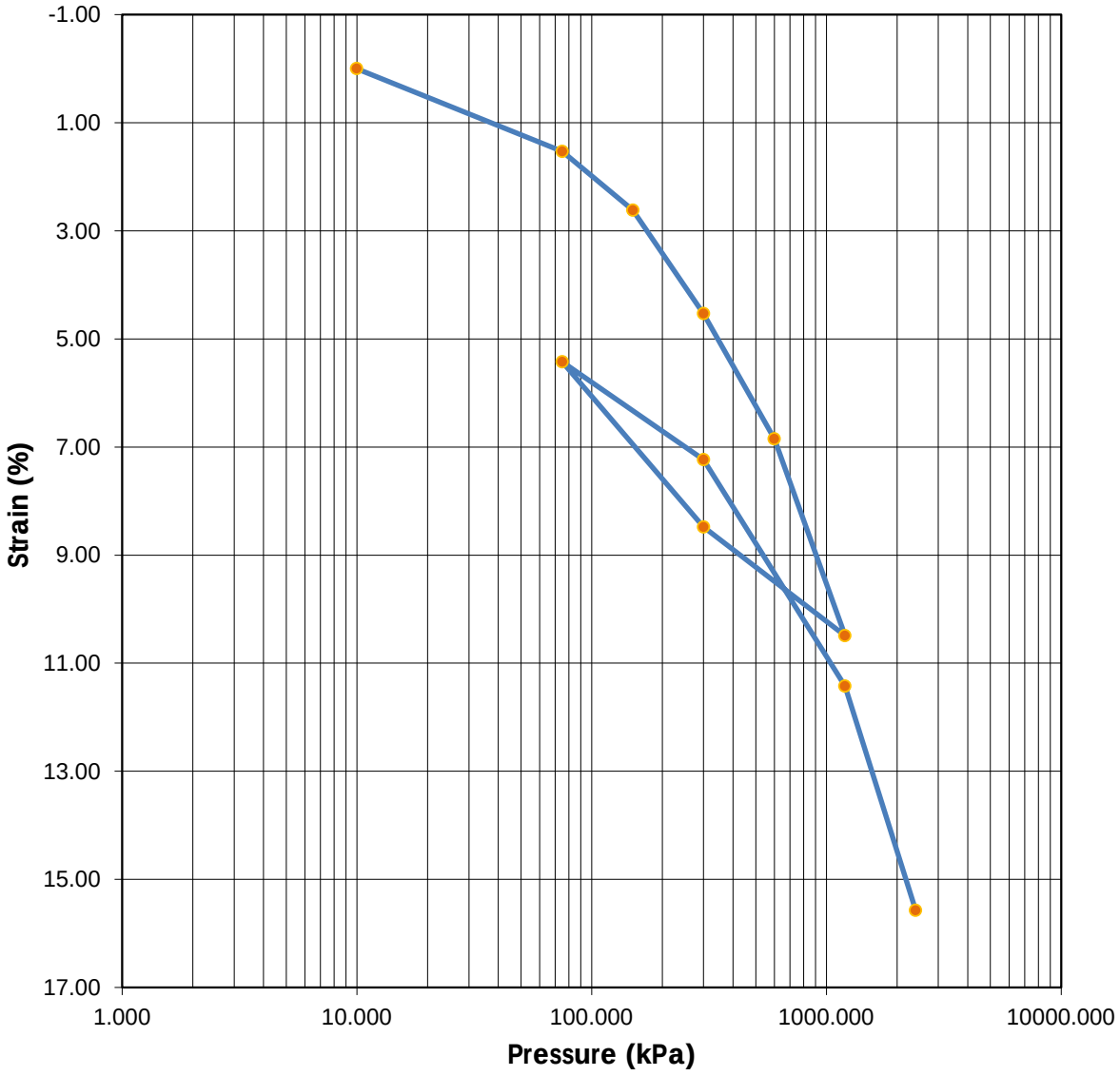

| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Moisture (%):** | 26.9 | 21.5 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.593 | 1.879 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 104.37 | 132.81 | | | | |
| **Void Ratio:** | 0.6924 | 0.4288 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Dark Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 5.4-6.0m | **Remarks:** |
| **Sample Number:** | D20-ST12 | **Boring Number:** - | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | - | | |

**Tested By:** C. Tollifson **Reviewed By:** C. Lamoureux

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results



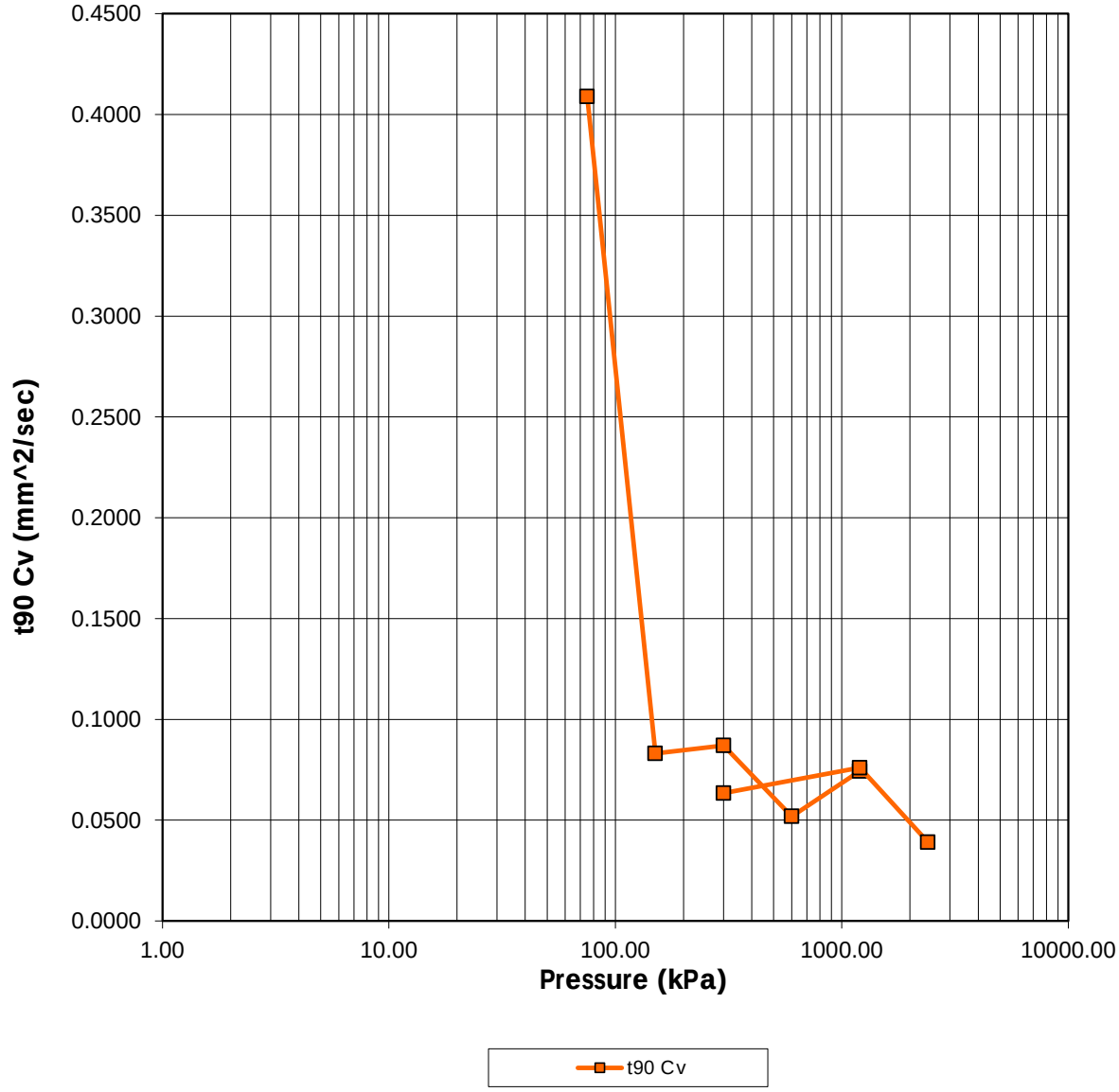

| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 26.9 | 21.5 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.593 | 1.879 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 104.37 | 132.81 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6924 | 0.4288 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Dark Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 5.4-6.0m | **Remarks:** |
| **Sample Number:** | D20-ST12 | **Boring Number:** - | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | - | | |

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 26.9 | 21.5 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.593 | 1.879 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 104.37 | 132.81 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6924 | 0.4288 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Dark Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 5.4-6.0m | **Remarks:** |
| **Sample Number:** | D20-ST12 | **Boring Number:** - | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | - | | |

Stantec Consulting Ltd.
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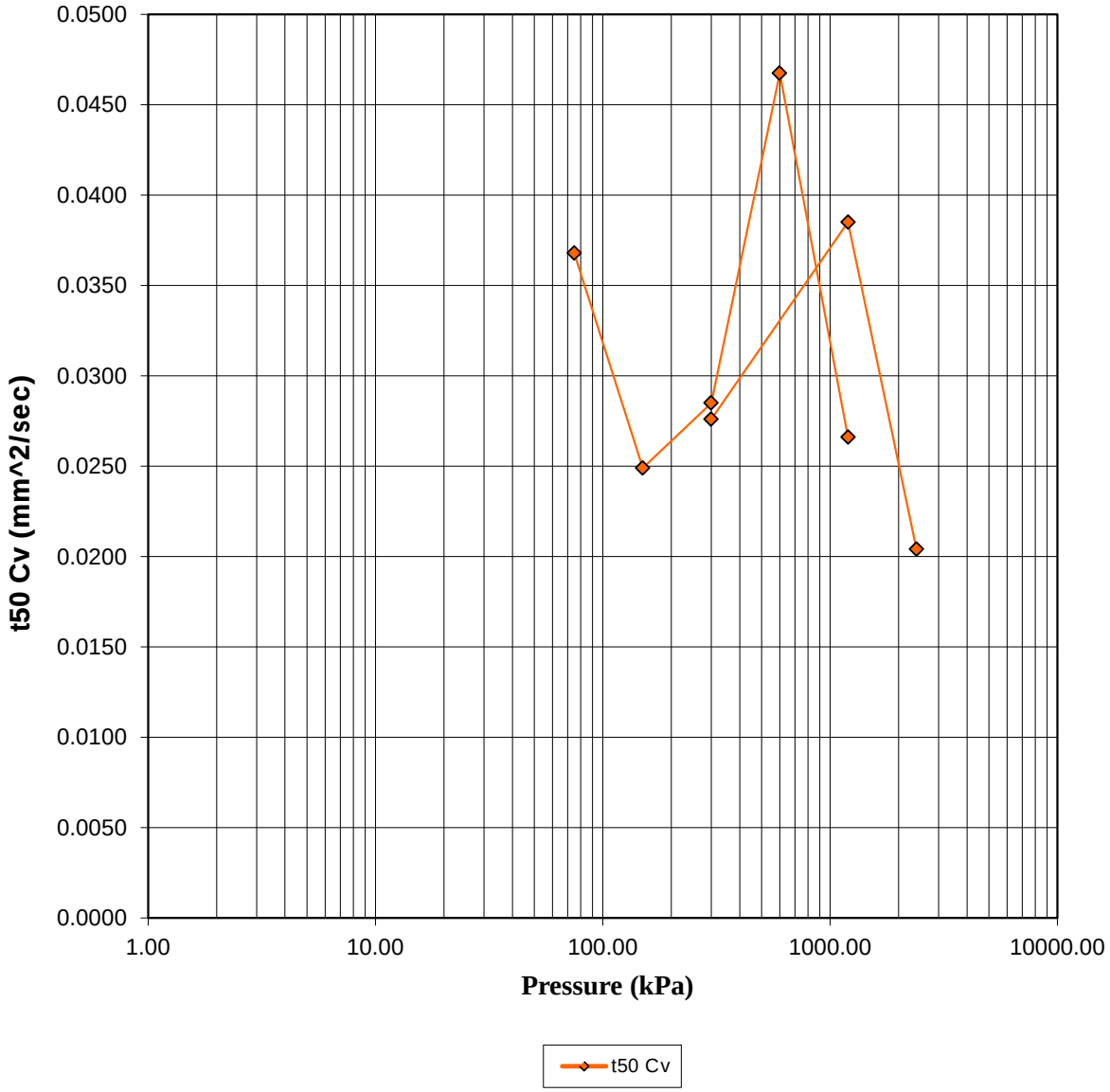
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 26.9 | 21.5 | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Dry Density (g/cm3):** | 1.593 | 1.879 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 104.37 | 132.81 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6924 | 0.4288 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Dark Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 5.4-6.0m | **Remarks:** |
| **Sample Number:** | D20-ST12 | **Boring Number:** - | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | - | | |

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

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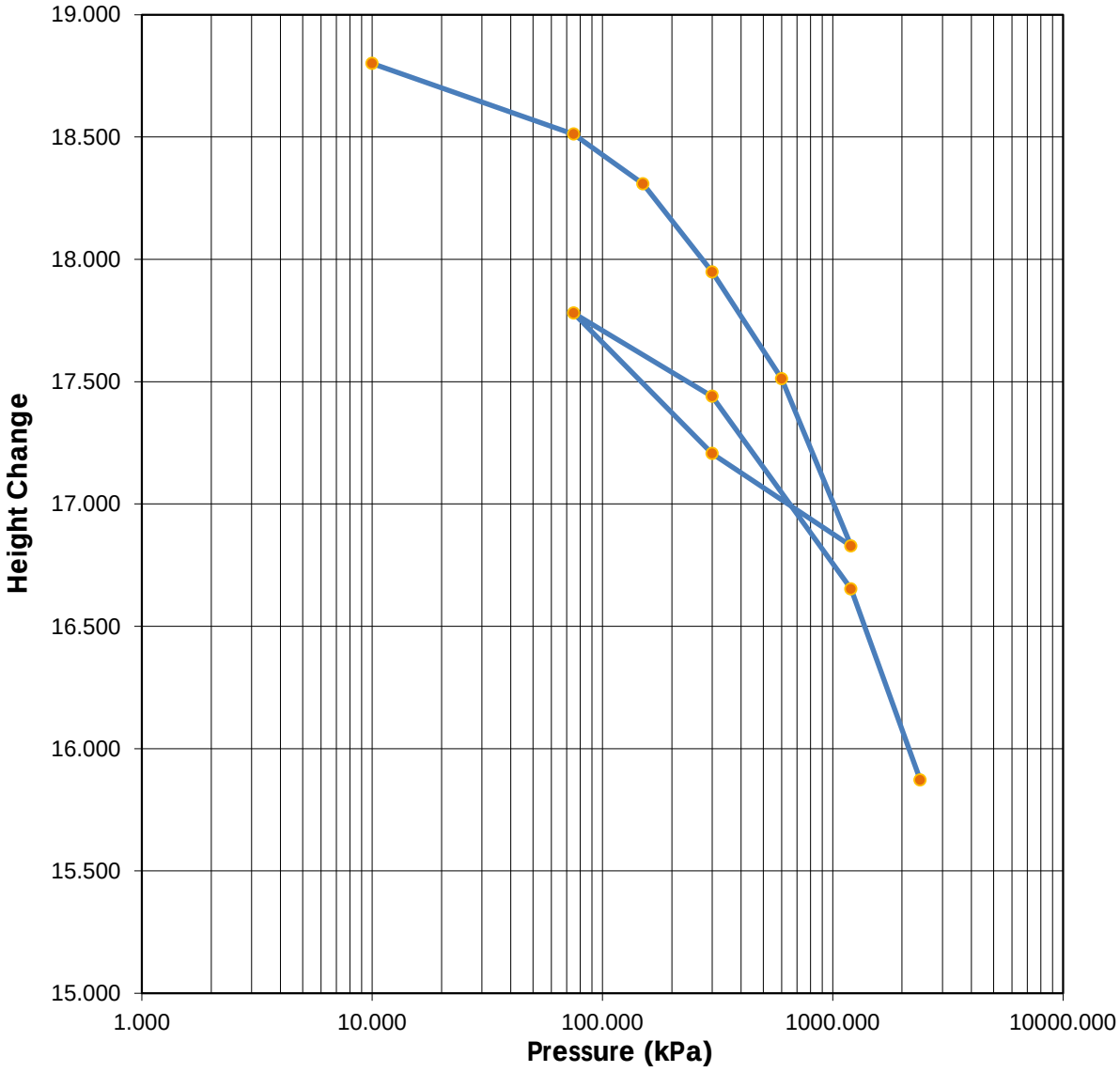
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 12-May-16 |
| **Moisture (%):** | 26.9 | 21.5 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.593 | 1.879 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 104.37 | 132.81 | | | | |
| **Void Ratio:** | 0.6924 | 0.4288 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Dark Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 5.4-6.0m | **Remarks:** |
| **Sample Number:** | D20-ST12 | **Boring Number:** - | |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | - | | |

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230

**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Sample Description:** Dark Brown Clay
**Remarks:**

**Test Number:**
**Test Date:** 12-May-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 18.8000 | 7.6917 | 0.00 | 0.6924 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 10.000 | 0.0000 | 18.8000 | 7.6917 | 0.00 | 0.6924 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 75.000 | 0.2880 | 18.5120 | 7.4037 | 1.53 | 0.6665 | 2.961 | 7.646 | 0.409 | 0.037 |
| 3 | 150.000 | 0.4920 | 18.3080 | 7.1997 | 2.62 | 0.6481 | 14.257 | 11.052 | 0.083 | 0.025 |
| 4 | 300.000 | 0.8520 | 17.9480 | 6.8397 | 4.53 | 0.6157 | 13.080 | 9.280 | 0.087 | 0.028 |
| 5 | 600.000 | 1.2880 | 17.5120 | 6.4037 | 6.85 | 0.5765 | 20.879 | 5.384 | 0.052 | 0.047 |
| 6 | 1200.000 | 1.9720 | 16.8280 | 5.7197 | 10.49 | 0.5149 | 13.449 | 8.738 | 0.074 | 0.027 |
| 7 | 300.000 | 1.5940 | 17.2060 | 6.0977 | 8.48 | 0.5489 | 0.000 | 0.000 | 0.000 | 0.000 |
| 8 | 75.000 | 1.0200 | 17.7800 | 6.6717 | 5.43 | 0.6006 | 0.000 | 0.000 | 0.000 | 0.000 |
| 9 | 300.000 | 1.3600 | 17.4400 | 6.3317 | 7.23 | 0.5700 | 16.960 | 9.047 | 0.063 | 0.028 |
| 10 | 1200.000 | 2.1480 | 16.6520 | 5.5437 | 11.43 | 0.4991 | 12.888 | 5.912 | 0.076 | 0.039 |
| 11 | 2400.000 | 2.9280 | 15.8720 | 4.7637 | 15.57 | 0.4288 | 22.795 | 10.132 | 0.039 | 0.020 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:** -
**Job Number:** - **Test Date:** 12-May-16

**Sample Number:** D20-ST12 **Sample Description:**
**Boring Number:** - Dark Brown Clay
**Depth:** 5.4-6.0m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**

| | | | | | |
|---|---|---|---|---|---|
| **Liquid Limit:** | - | **Initial Void Ratio:** | 0.6924 | **Initial Height (mm):** | 18.8000 |
| **Plastic Limit:** | - | **Plasticity Index (%):** | - | **Initial Diameter (mm):** | 49.9000 |
| **Specific Gravity:** | 2.7000 Assumed | **Weight of Ring (g):** | 61.1200 | | |

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 46.37 | 28.76 |
| Dry Soil + Container (g) | 36.88 | 23.93 |
| Weight of Container (g) | 1.57 | 1.45 |
| Moisture Content (%) | 26.88 | 21.49 |
| Void Ratio | 0.6924 | 0.4288 |
| Saturation (%) | 104.37 | 132.81 |
| Dry Density (g/cm3) | 1.59 | 1.88 |

# Consolidation Test Results
## (Sequence 1) Load 10.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

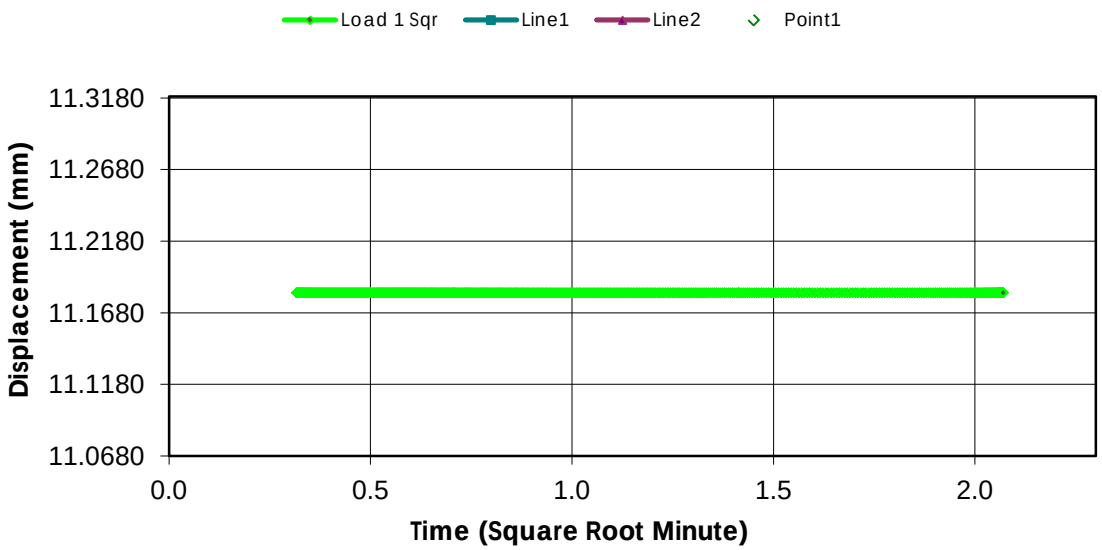
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

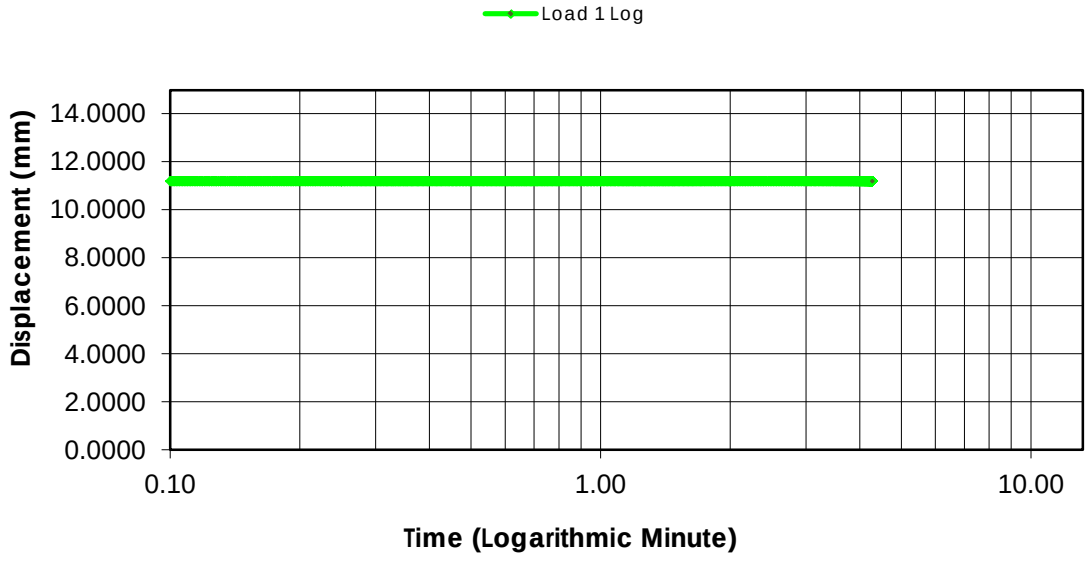
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |
| 1 | 00:00:06 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |
| 2 | 00:00:15 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |
| 3 | 00:00:30 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |
| 4 | 00:01:00 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |
| 5 | 00:02:00 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |
| 6 | 00:04:00 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |
| 7 | 00:04:15 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |
| 8 | 00:04:17 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |

# Consolidation Test Results
## (Sequence 1) Load 10.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 2) Load 75.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

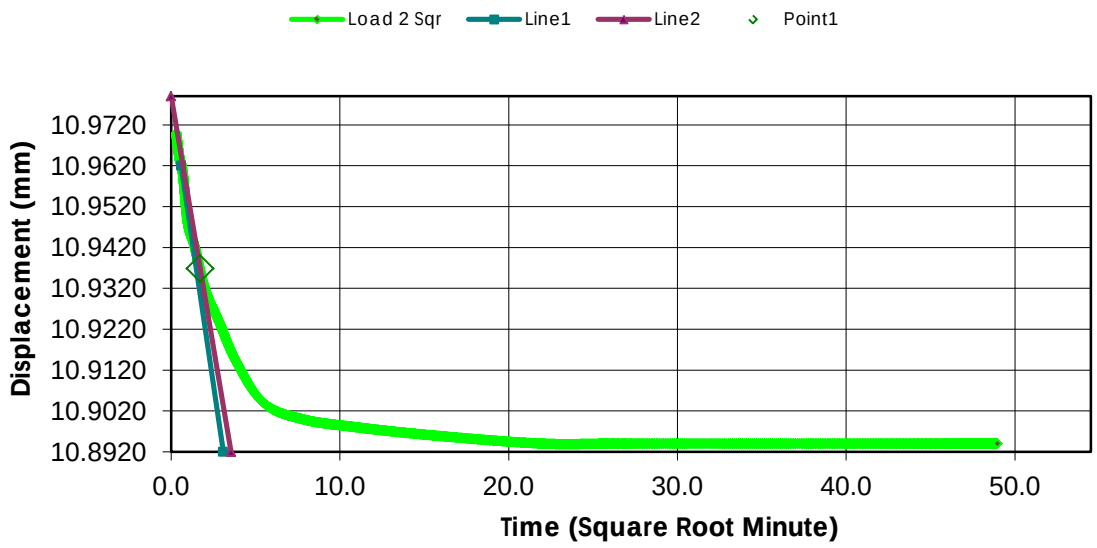
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

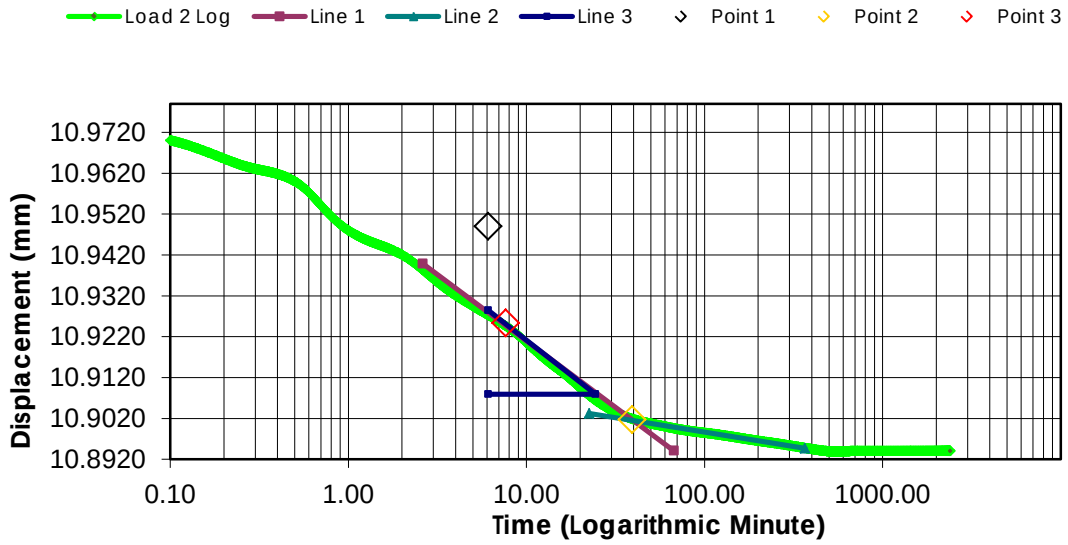
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.1820 | 0.0000 | 0.0000 | 0.6924 |
| 1 | 00:00:06 | 10.9700 | 0.2120 | 1.1277 | 0.6733 |
| 2 | 00:00:15 | 10.9640 | 0.2180 | 1.1596 | 0.6727 |
| 3 | 00:00:30 | 10.9600 | 0.2220 | 1.1809 | 0.6724 |
| 4 | 00:01:00 | 10.9480 | 0.2340 | 1.2447 | 0.6713 |
| 5 | 00:02:00 | 10.9420 | 0.2400 | 1.2766 | 0.6708 |
| 6 | 00:04:01 | 10.9320 | 0.2500 | 1.3298 | 0.6699 |
| 7 | 00:08:01 | 10.9240 | 0.2580 | 1.3723 | 0.6691 |
| 8 | 00:15:02 | 10.9140 | 0.2680 | 1.4255 | 0.6682 |
| 9 | 00:30:03 | 10.9040 | 0.2780 | 1.4787 | 0.6673 |
| 10 | 01:00:06 | 10.9000 | 0.2820 | 1.5000 | 0.6670 |
| 11 | 02:00:11 | 10.8980 | 0.2840 | 1.5106 | 0.6668 |
| 12 | 04:00:21 | 10.8960 | 0.2860 | 1.5213 | 0.6666 |
| 13 | 08:00:41 | 10.8940 | 0.2880 | 1.5319 | 0.6664 |
| 14 | 12:01:02 | 10.8940 | 0.2880 | 1.5319 | 0.6664 |
| 15 | 24:02:05 | 10.8940 | 0.2880 | 1.5319 | 0.6664 |
| 16 | 36:03:09 | 10.8940 | 0.2880 | 1.5319 | 0.6664 |
| 17 | 39:57:17 | 10.8940 | 0.2880 | 1.5319 | 0.6664 |

# Consolidation Test Results
## (Sequence 2) Load 75.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 3) Load 150.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

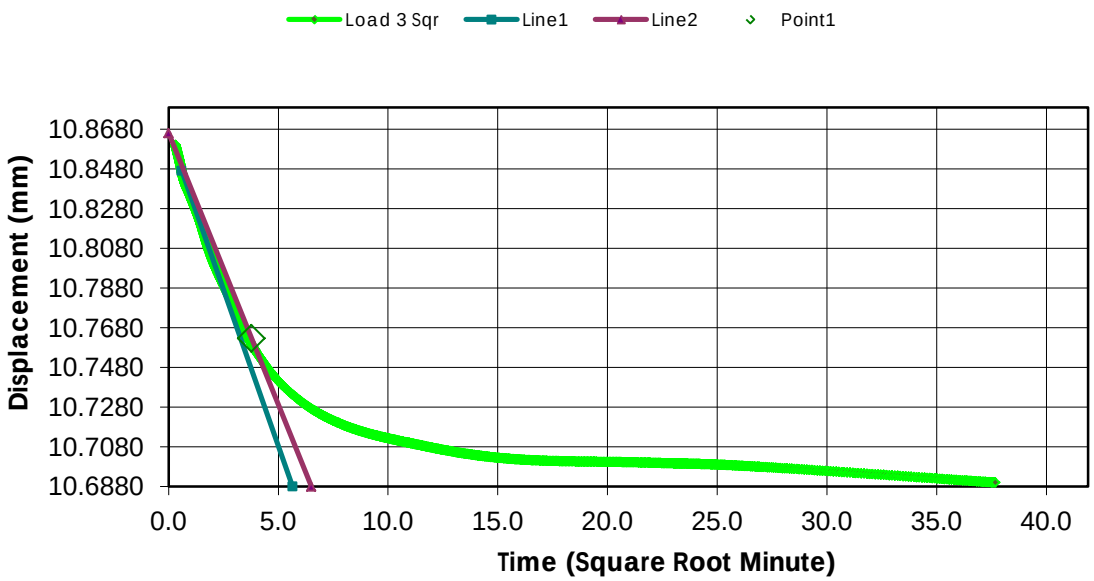
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

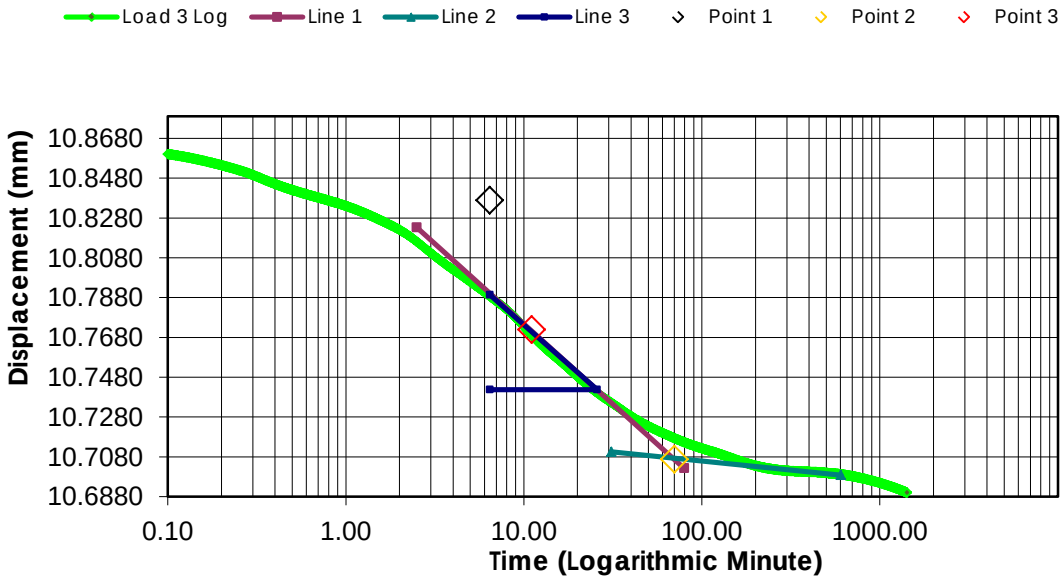
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.8940 | 0.2880 | 1.5319 | 0.6664 |
| 1 | 00:00:06 | 10.8600 | 0.3220 | 1.7128 | 0.6634 |
| 2 | 00:00:15 | 10.8520 | 0.3300 | 1.7553 | 0.6627 |
| 3 | 00:00:30 | 10.8420 | 0.3400 | 1.8085 | 0.6618 |
| 4 | 00:01:00 | 10.8340 | 0.3480 | 1.8511 | 0.6610 |
| 5 | 00:02:00 | 10.8220 | 0.3600 | 1.9149 | 0.6600 |
| 6 | 00:04:00 | 10.8020 | 0.3800 | 2.0213 | 0.6582 |
| 7 | 00:08:00 | 10.7820 | 0.4000 | 2.1277 | 0.6564 |
| 8 | 00:15:01 | 10.7580 | 0.4240 | 2.2553 | 0.6542 |
| 9 | 00:30:02 | 10.7360 | 0.4460 | 2.3723 | 0.6522 |
| 10 | 01:00:05 | 10.7200 | 0.4620 | 2.4574 | 0.6508 |
| 11 | 02:00:10 | 10.7100 | 0.4720 | 2.5106 | 0.6499 |
| 12 | 04:00:21 | 10.7020 | 0.4800 | 2.5532 | 0.6492 |
| 13 | 08:00:42 | 10.7000 | 0.4820 | 2.5638 | 0.6490 |
| 14 | 12:01:04 | 10.6980 | 0.4840 | 2.5745 | 0.6488 |
| 15 | 23:39:54 | 10.6900 | 0.4920 | 2.6170 | 0.6481 |

# Consolidation Test Results
## (Sequence 3) Load 150.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 300.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

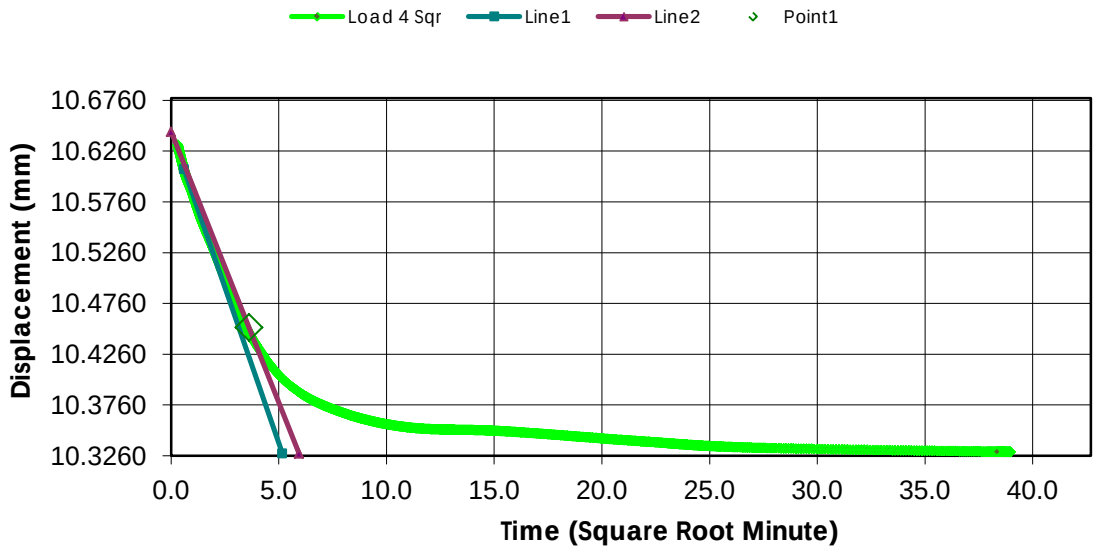
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

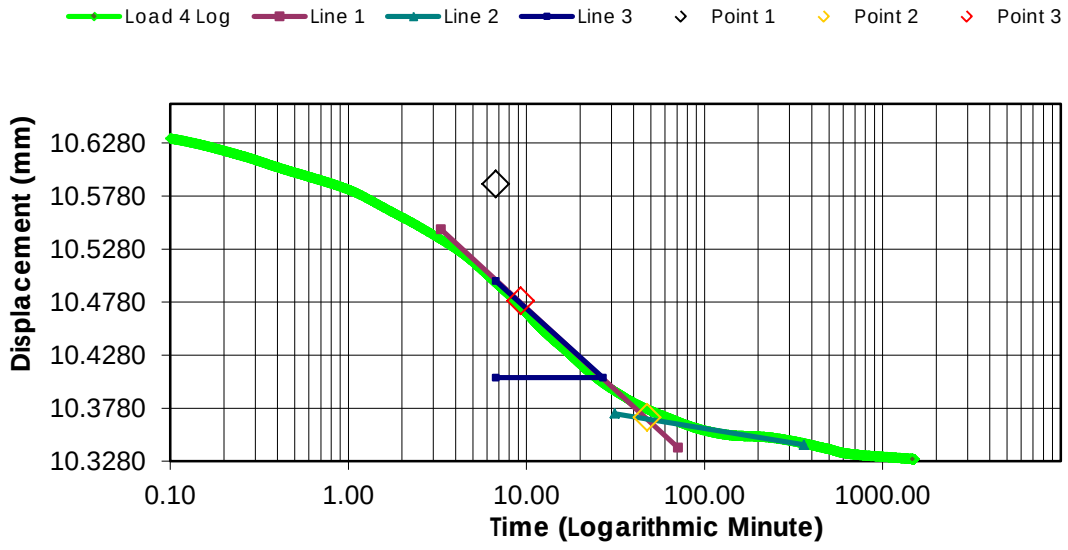
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.6900 | 0.4920 | 2.6170 | 0.6481 |
| 1 | 00:00:06 | 10.6320 | 0.5500 | 2.9255 | 0.6429 |
| 2 | 00:00:15 | 10.6160 | 0.5660 | 3.0106 | 0.6414 |
| 3 | 00:00:30 | 10.6000 | 0.5820 | 3.0957 | 0.6400 |
| 4 | 00:01:00 | 10.5840 | 0.5980 | 3.1809 | 0.6385 |
| 5 | 00:02:00 | 10.5580 | 0.6240 | 3.3192 | 0.6362 |
| 6 | 00:04:00 | 10.5280 | 0.6540 | 3.4787 | 0.6335 |
| 7 | 00:08:00 | 10.4840 | 0.6980 | 3.7128 | 0.6295 |
| 8 | 00:15:01 | 10.4380 | 0.7440 | 3.9575 | 0.6254 |
| 9 | 00:30:02 | 10.3960 | 0.7860 | 4.1809 | 0.6216 |
| 10 | 01:00:05 | 10.3700 | 0.8120 | 4.3191 | 0.6193 |
| 11 | 02:00:10 | 10.3540 | 0.8280 | 4.4043 | 0.6178 |
| 12 | 04:00:21 | 10.3500 | 0.8320 | 4.4255 | 0.6175 |
| 13 | 08:00:42 | 10.3400 | 0.8420 | 4.4787 | 0.6166 |
| 14 | 12:01:03 | 10.3340 | 0.8480 | 4.5106 | 0.6160 |
| 15 | 24:02:04 | 10.3300 | 0.8520 | 4.5319 | 0.6157 |
| 16 | 24:30:09 | 10.3300 | 0.8520 | 4.5319 | 0.6157 |

# Consolidation Test Results
## (Sequence 4) Load 300.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 600.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

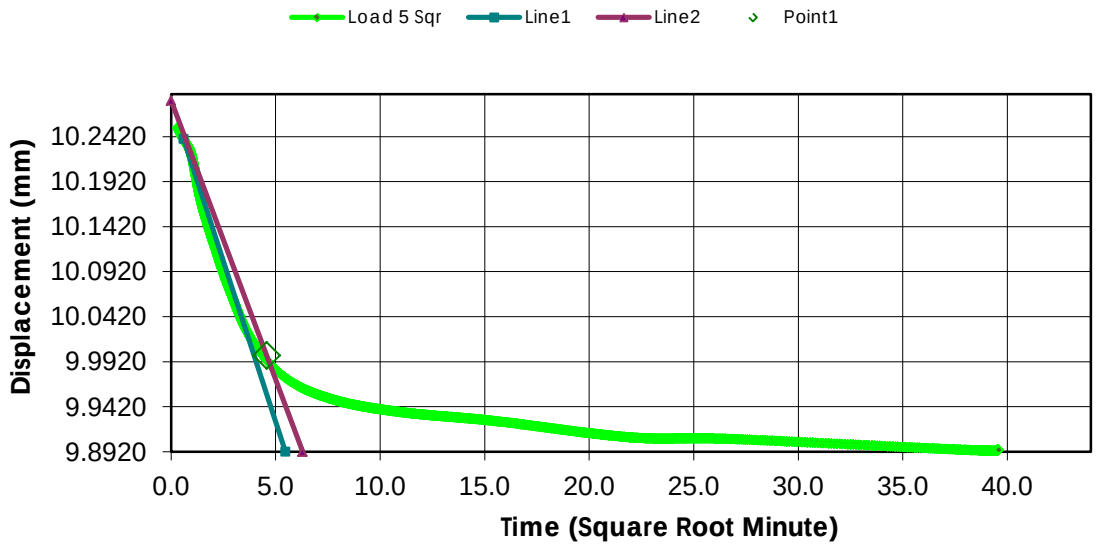
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

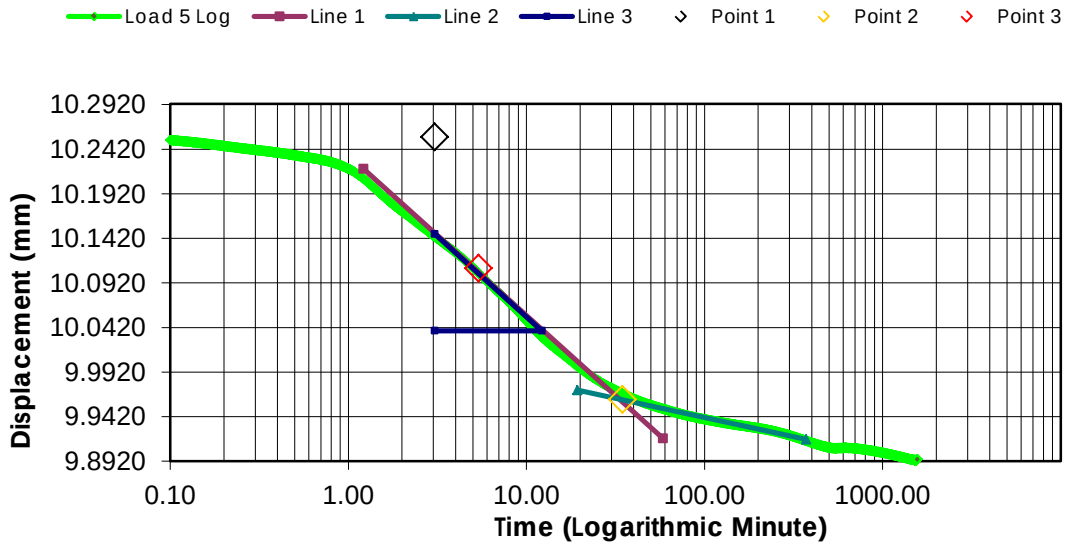
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.3300 | 0.8520 | 4.5319 | 0.6157 |
| 1 | 00:00:06 | 10.2520 | 0.9300 | 4.9468 | 0.6087 |
| 2 | 00:00:15 | 10.2430 | 0.9390 | 4.9947 | 0.6078 |
| 3 | 00:00:30 | 10.2350 | 0.9470 | 5.0372 | 0.6071 |
| 4 | 00:01:00 | 10.2200 | 0.9620 | 5.1170 | 0.6058 |
| 5 | 00:02:00 | 10.1720 | 1.0100 | 5.3723 | 0.6015 |
| 6 | 00:04:00 | 10.1260 | 1.0560 | 5.6170 | 0.5973 |
| 7 | 00:08:00 | 10.0700 | 1.1120 | 5.9149 | 0.5923 |
| 8 | 00:15:01 | 10.0160 | 1.1660 | 6.2021 | 0.5874 |
| 9 | 00:30:02 | 9.9740 | 1.2080 | 6.4255 | 0.5836 |
| 10 | 01:00:05 | 9.9500 | 1.2320 | 6.5532 | 0.5815 |
| 11 | 02:00:10 | 9.9360 | 1.2460 | 6.6277 | 0.5802 |
| 12 | 04:00:21 | 9.9260 | 1.2560 | 6.6809 | 0.5793 |
| 13 | 08:00:42 | 9.9080 | 1.2740 | 6.7766 | 0.5777 |
| 14 | 12:01:04 | 9.9060 | 1.2760 | 6.7872 | 0.5775 |
| 15 | 24:02:08 | 9.8940 | 1.2880 | 6.8511 | 0.5764 |
| 16 | 26:07:19 | 9.8940 | 1.2880 | 6.8511 | 0.5764 |

# Consolidation Test Results
## (Sequence 5) Load 600.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 1200.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

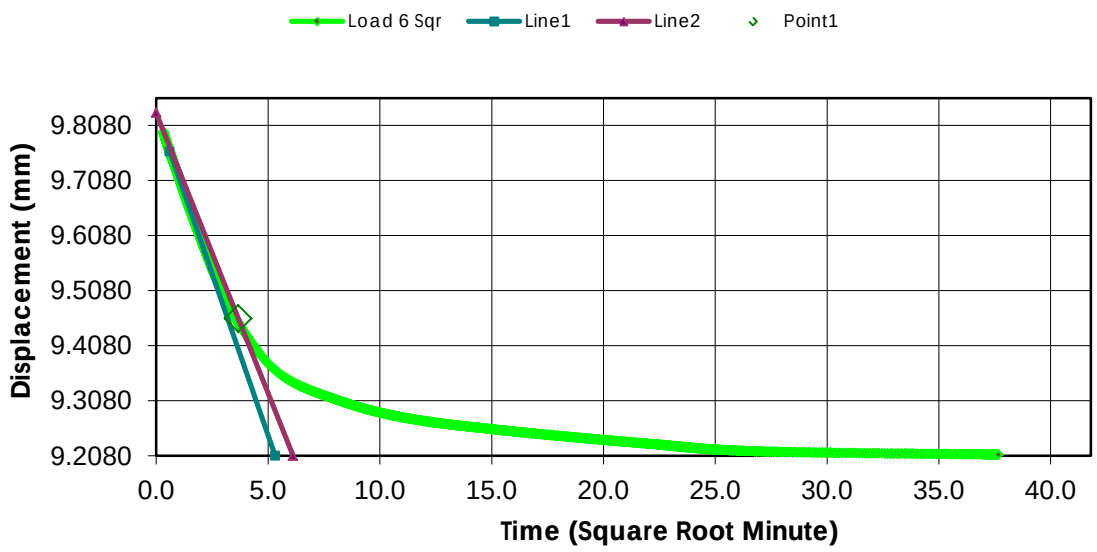
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

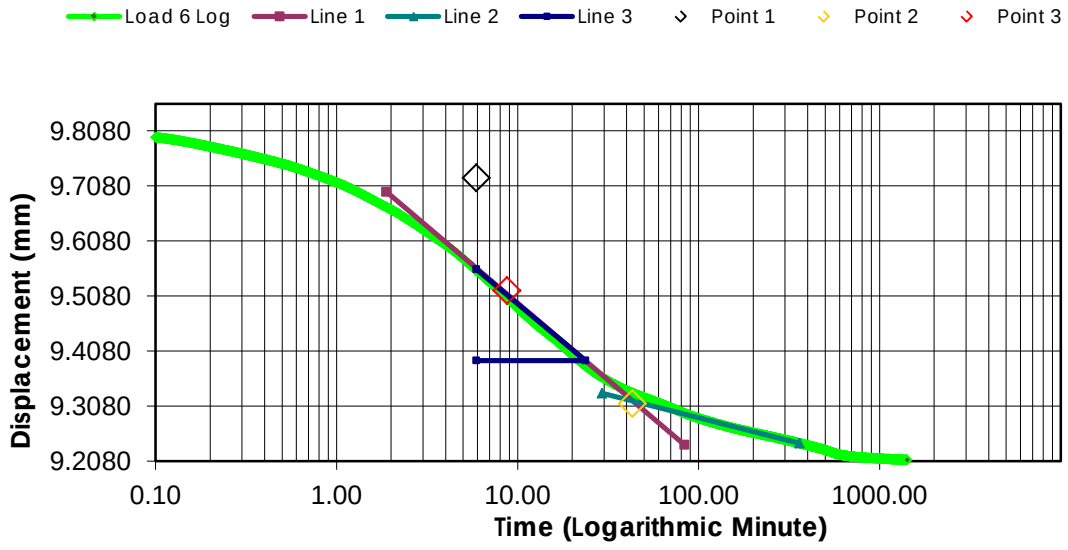
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.8940 | 1.2880 | 6.8511 | 0.5764 |
| 1 | 00:00:06 | 9.7960 | 1.3860 | 7.3723 | 0.5676 |
| 2 | 00:00:15 | 9.7720 | 1.4100 | 7.5000 | 0.5654 |
| 3 | 00:00:30 | 9.7480 | 1.4340 | 7.6277 | 0.5633 |
| 4 | 00:01:00 | 9.7140 | 1.4680 | 7.8085 | 0.5602 |
| 5 | 00:02:01 | 9.6640 | 1.5180 | 8.0745 | 0.5557 |
| 6 | 00:04:01 | 9.6000 | 1.5820 | 8.4149 | 0.5500 |
| 7 | 00:08:01 | 9.5160 | 1.6660 | 8.8617 | 0.5424 |
| 8 | 00:15:02 | 9.4360 | 1.7460 | 9.2872 | 0.5352 |
| 9 | 00:30:03 | 9.3580 | 1.8240 | 9.7021 | 0.5282 |
| 10 | 01:00:06 | 9.3140 | 1.8680 | 9.9362 | 0.5242 |
| 11 | 02:00:11 | 9.2780 | 1.9040 | 10.1277 | 0.5210 |
| 12 | 04:00:21 | 9.2540 | 1.9280 | 10.2553 | 0.5188 |
| 13 | 08:00:43 | 9.2300 | 1.9520 | 10.3830 | 0.5167 |
| 14 | 12:01:04 | 9.2160 | 1.9660 | 10.4574 | 0.5154 |
| 15 | 23:39:09 | 9.2100 | 1.9720 | 10.4894 | 0.5149 |

# Consolidation Test Results
## (Sequence 6) Load 1200.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Rebound 300.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

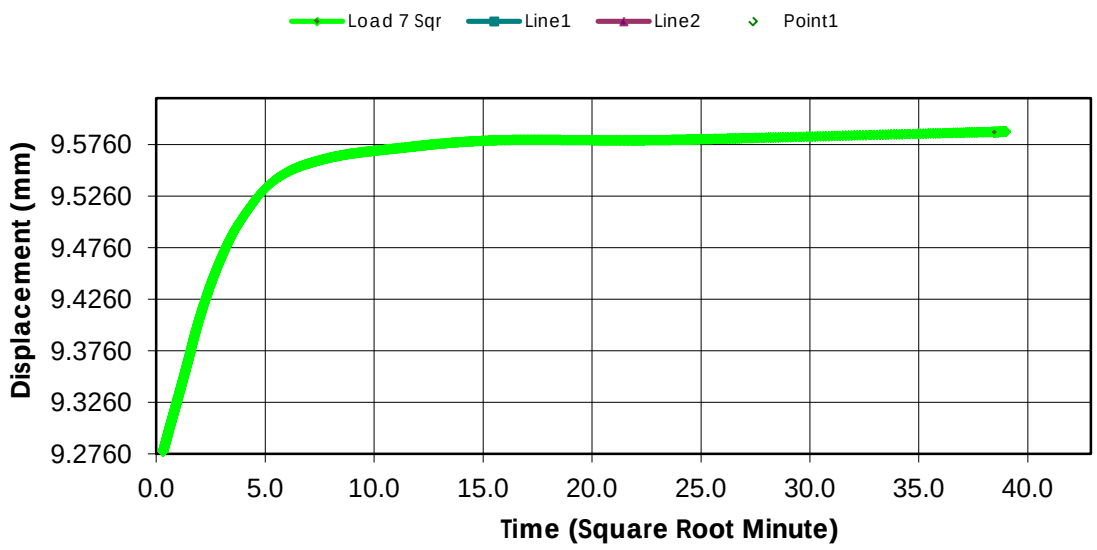
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

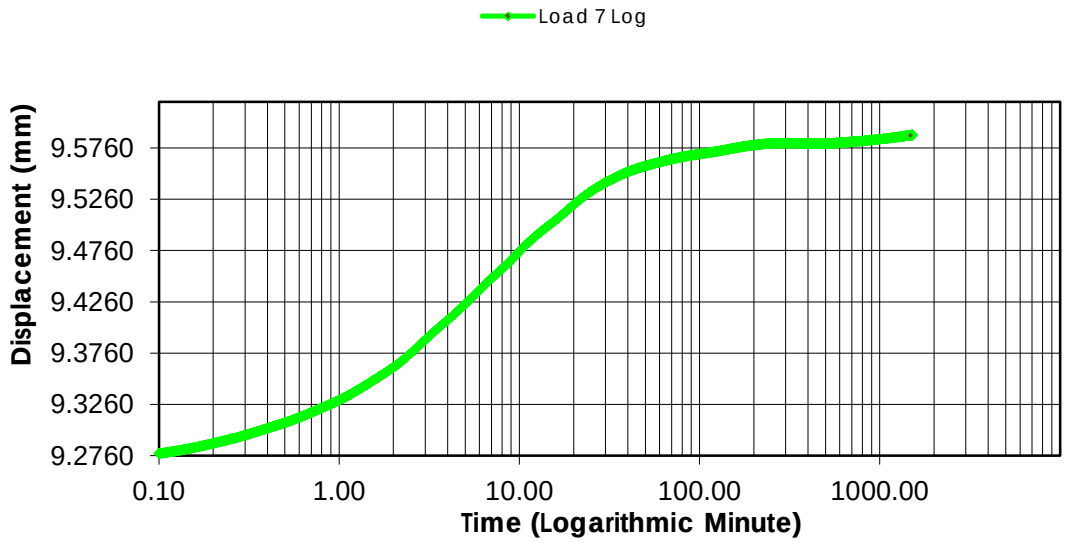
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.2100 | 1.9720 | 10.4894 | 0.5149 |
| 1 | 00:00:06 | 9.2780 | 1.9040 | 10.1277 | 0.5210 |
| 2 | 00:00:15 | 9.2920 | 1.8900 | 10.0532 | 0.5222 |
| 3 | 00:00:30 | 9.3080 | 1.8740 | 9.9681 | 0.5237 |
| 4 | 00:01:00 | 9.3300 | 1.8520 | 9.8511 | 0.5257 |
| 5 | 00:02:00 | 9.3620 | 1.8200 | 9.6809 | 0.5285 |
| 6 | 00:04:00 | 9.4080 | 1.7740 | 9.4362 | 0.5327 |
| 7 | 00:08:01 | 9.4580 | 1.7240 | 9.1702 | 0.5372 |
| 8 | 00:15:01 | 9.5020 | 1.6800 | 8.9362 | 0.5411 |
| 9 | 00:30:03 | 9.5420 | 1.6400 | 8.7234 | 0.5447 |
| 10 | 01:00:05 | 9.5620 | 1.6200 | 8.6170 | 0.5465 |
| 11 | 02:00:11 | 9.5720 | 1.6100 | 8.5638 | 0.5474 |
| 12 | 04:00:21 | 9.5800 | 1.6020 | 8.5213 | 0.5482 |
| 13 | 08:00:43 | 9.5800 | 1.6020 | 8.5213 | 0.5482 |
| 14 | 12:01:04 | 9.5820 | 1.6000 | 8.5106 | 0.5483 |
| 15 | 24:02:08 | 9.5880 | 1.5940 | 8.4787 | 0.5489 |
| 16 | 24:39:49 | 9.5880 | 1.5940 | 8.4787 | 0.5489 |
| 17 | 24:39:53 | 9.5880 | 1.5940 | 8.4787 | 0.5489 |

# Consolidation Test Results
## (Sequence 7) Rebound 300.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Rebound 75.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

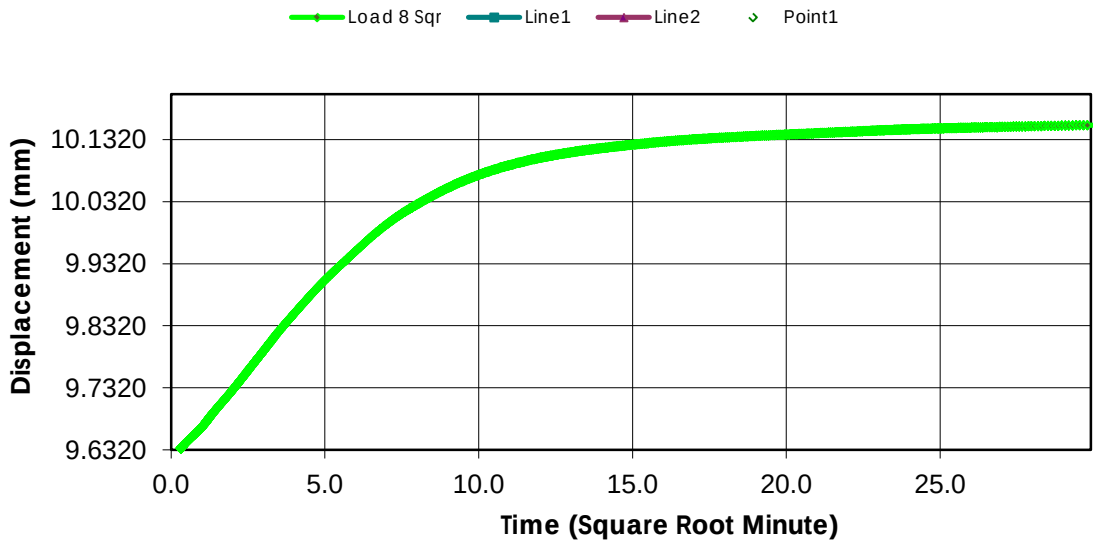
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

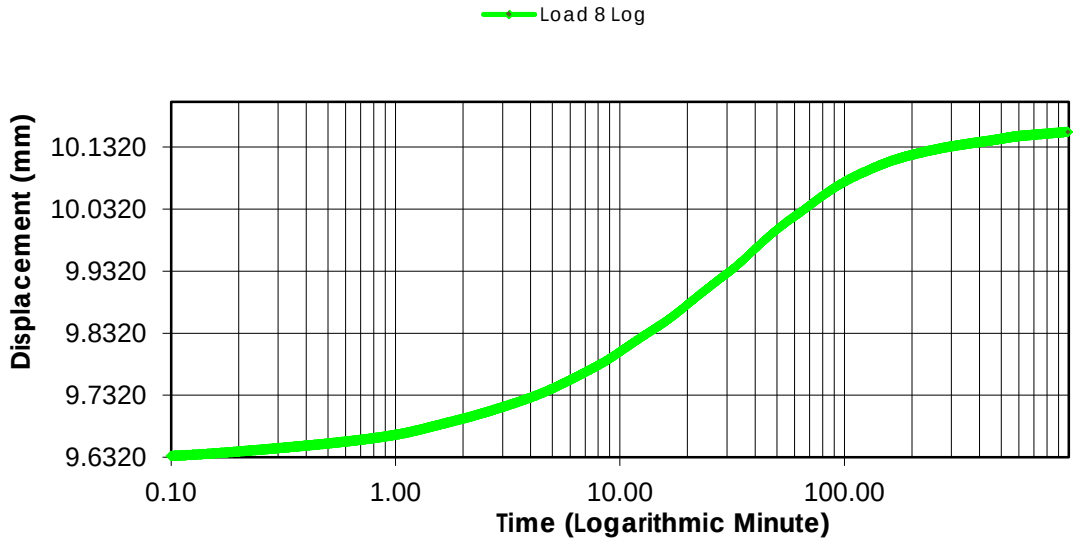
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5880 | 1.5940 | 8.4787 | 0.5489 |
| 1 | 00:00:06 | 9.6340 | 1.5480 | 8.2340 | 0.5530 |
| 2 | 00:00:15 | 9.6440 | 1.5380 | 8.1809 | 0.5539 |
| 3 | 00:00:30 | 9.6540 | 1.5280 | 8.1277 | 0.5548 |
| 4 | 00:01:00 | 9.6680 | 1.5140 | 8.0532 | 0.5561 |
| 5 | 00:02:00 | 9.6940 | 1.4880 | 7.9149 | 0.5584 |
| 6 | 00:04:00 | 9.7280 | 1.4540 | 7.7340 | 0.5615 |
| 7 | 00:08:01 | 9.7800 | 1.4020 | 7.4574 | 0.5662 |
| 8 | 00:15:01 | 9.8440 | 1.3380 | 7.1170 | 0.5719 |
| 9 | 00:30:03 | 9.9280 | 1.2540 | 6.6702 | 0.5795 |
| 10 | 01:00:05 | 10.0200 | 1.1620 | 6.1809 | 0.5878 |
| 11 | 02:00:11 | 10.0900 | 1.0920 | 5.8085 | 0.5941 |
| 12 | 04:00:22 | 10.1260 | 1.0560 | 5.6170 | 0.5973 |
| 13 | 08:00:44 | 10.1440 | 1.0380 | 5.5213 | 0.5989 |
| 14 | 12:01:06 | 10.1520 | 1.0300 | 5.4787 | 0.5997 |
| 15 | 23:33:19 | 10.1620 | 1.0200 | 5.4255 | 0.6006 |

# Consolidation Test Results
## (Sequence 8) Rebound 75.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 300.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

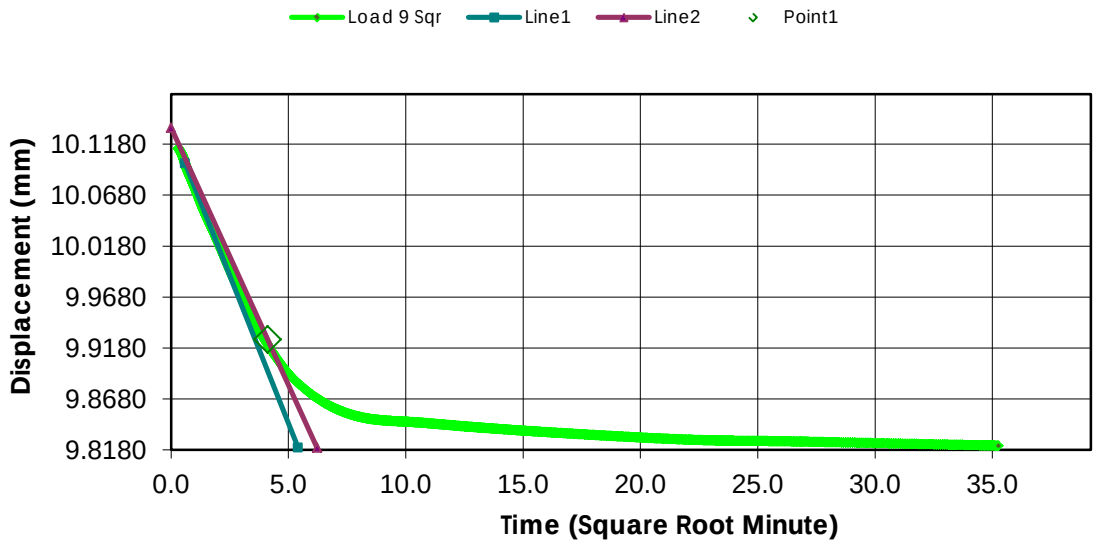
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

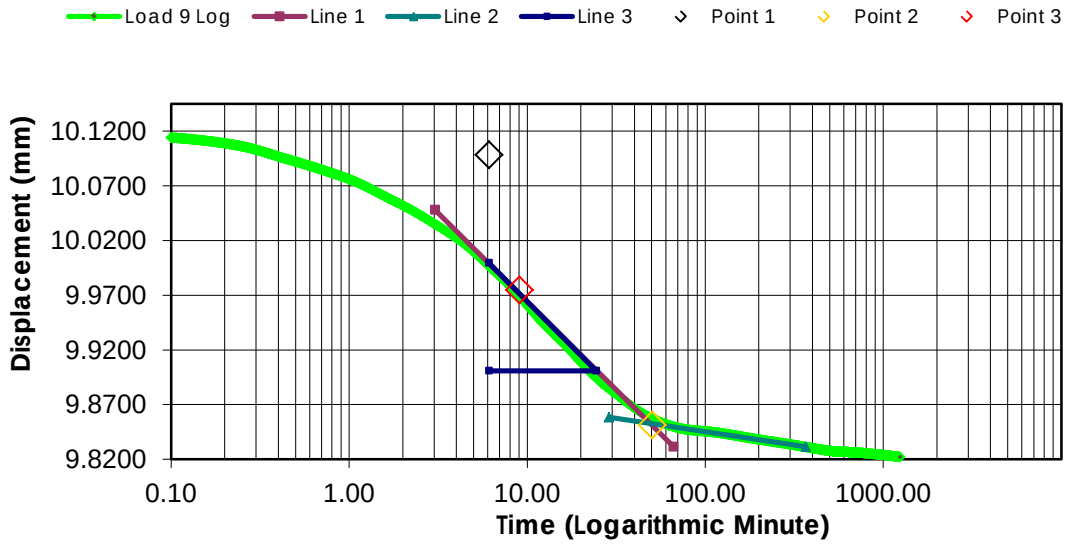
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.1620 | 1.0200 | 5.4255 | 0.6006 |
| 1 | 00:00:06 | 10.1140 | 1.0680 | 5.6809 | 0.5962 |
| 2 | 00:00:15 | 10.1060 | 1.0760 | 5.7234 | 0.5955 |
| 3 | 00:00:30 | 10.0920 | 1.0900 | 5.7979 | 0.5942 |
| 4 | 00:01:00 | 10.0760 | 1.1060 | 5.8830 | 0.5928 |
| 5 | 00:02:00 | 10.0520 | 1.1300 | 6.0106 | 0.5906 |
| 6 | 00:04:01 | 10.0220 | 1.1600 | 6.1702 | 0.5879 |
| 7 | 00:08:01 | 9.9780 | 1.2040 | 6.4043 | 0.5840 |
| 8 | 00:15:02 | 9.9300 | 1.2520 | 6.6596 | 0.5797 |
| 9 | 00:30:03 | 9.8820 | 1.3000 | 6.9149 | 0.5753 |
| 10 | 01:00:06 | 9.8520 | 1.3300 | 7.0745 | 0.5726 |
| 11 | 02:00:11 | 9.8440 | 1.3380 | 7.1170 | 0.5719 |
| 12 | 04:00:22 | 9.8360 | 1.3460 | 7.1596 | 0.5712 |
| 13 | 08:00:45 | 9.8280 | 1.3540 | 7.2021 | 0.5705 |
| 14 | 12:01:07 | 9.8260 | 1.3560 | 7.2128 | 0.5703 |
| 15 | 20:43:32 | 9.8220 | 1.3600 | 7.2340 | 0.5699 |

# Consolidation Test Results
## (Sequence 9) Load 300.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Load 1200.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

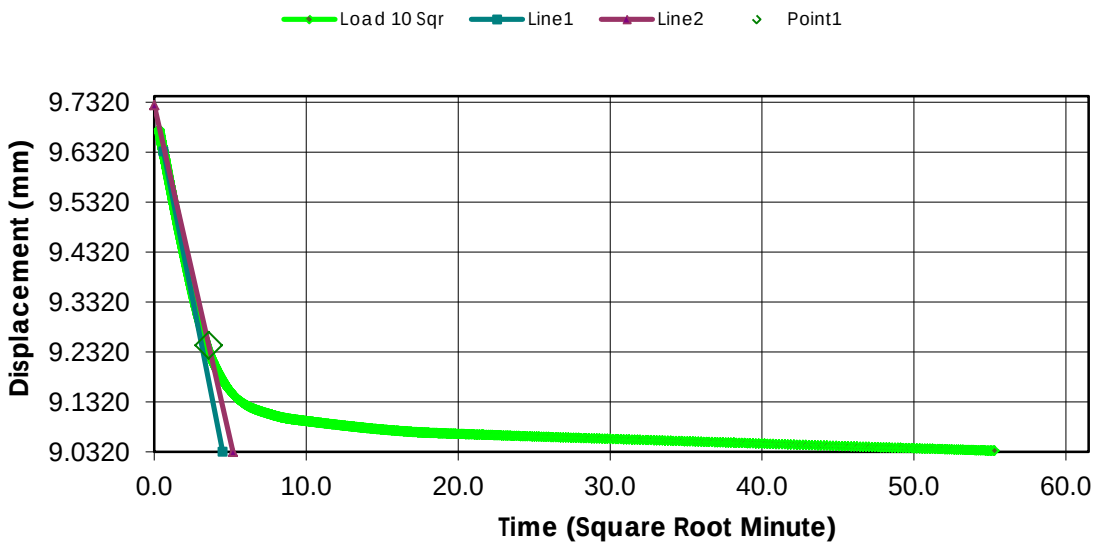
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

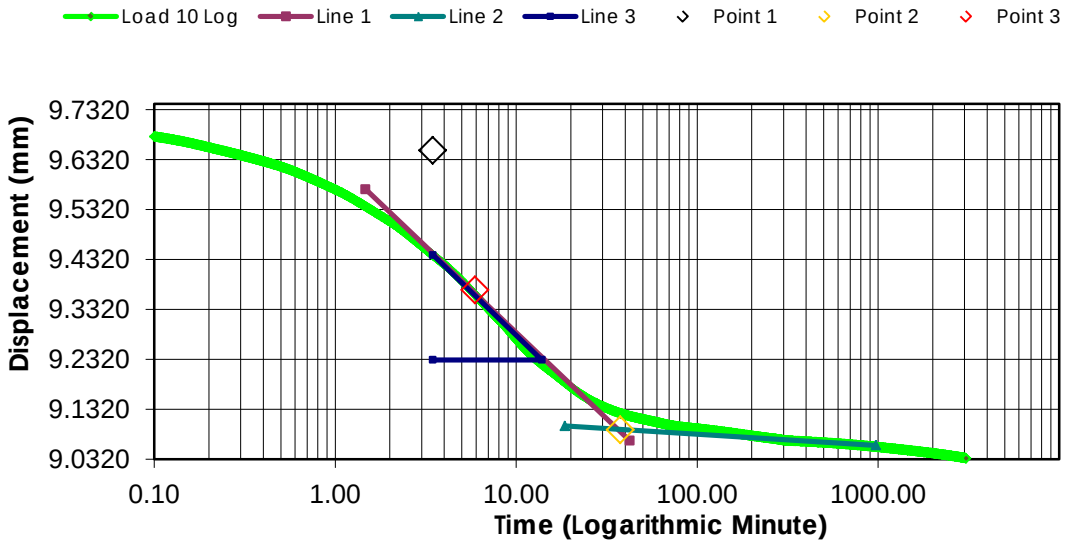
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.8220 | 1.3600 | 7.2340 | 0.5699 |
| 1 | 00:00:06 | 9.6780 | 1.5040 | 8.0000 | 0.5570 |
| 2 | 00:00:15 | 9.6480 | 1.5340 | 8.1596 | 0.5543 |
| 3 | 00:00:30 | 9.6180 | 1.5640 | 8.3192 | 0.5516 |
| 4 | 00:01:00 | 9.5720 | 1.6100 | 8.5638 | 0.5474 |
| 5 | 00:02:00 | 9.5080 | 1.6740 | 8.9043 | 0.5417 |
| 6 | 00:04:00 | 9.4220 | 1.7600 | 9.3617 | 0.5339 |
| 7 | 00:08:15 | 9.3060 | 1.8760 | 9.9787 | 0.5235 |
| 8 | 00:15:00 | 9.2120 | 1.9700 | 10.4787 | 0.5150 |
| 9 | 00:30:00 | 9.1380 | 2.0440 | 10.8723 | 0.5084 |
| 10 | 01:00:00 | 9.1060 | 2.0760 | 11.0426 | 0.5055 |
| 11 | 01:48:00 | 9.0920 | 2.0900 | 11.1170 | 0.5042 |
| 12 | 04:15:00 | 9.0740 | 2.1080 | 11.2128 | 0.5026 |
| 13 | 07:48:00 | 9.0660 | 2.1160 | 11.2553 | 0.5019 |
| 14 | 24:15:00 | 9.0500 | 2.1320 | 11.3404 | 0.5004 |
| 15 | 51:00:00 | 9.0340 | 2.1480 | 11.4255 | 0.4990 |

# Consolidation Test Results
## (Sequence 10) Load 1200.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Load 2400.000 kpa

**Project:** SR1
**Location:** -
**Job Number:** -

**Project Number:** 302.702.230
**Test Date:** 12-May-16
**Test Number:**

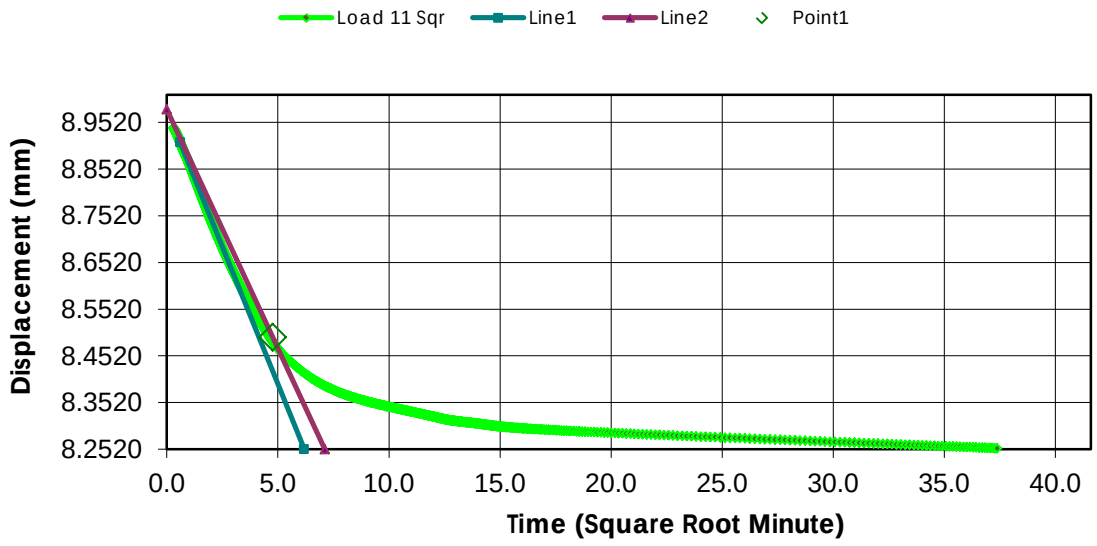
**Sample Number:** D20-ST12
**Boring Number:** -
**Depth:** 5.4-6.0m
**Sample Type:** Undisturbed

**Soil Description:** Dark Brown Clay
**Remarks:**

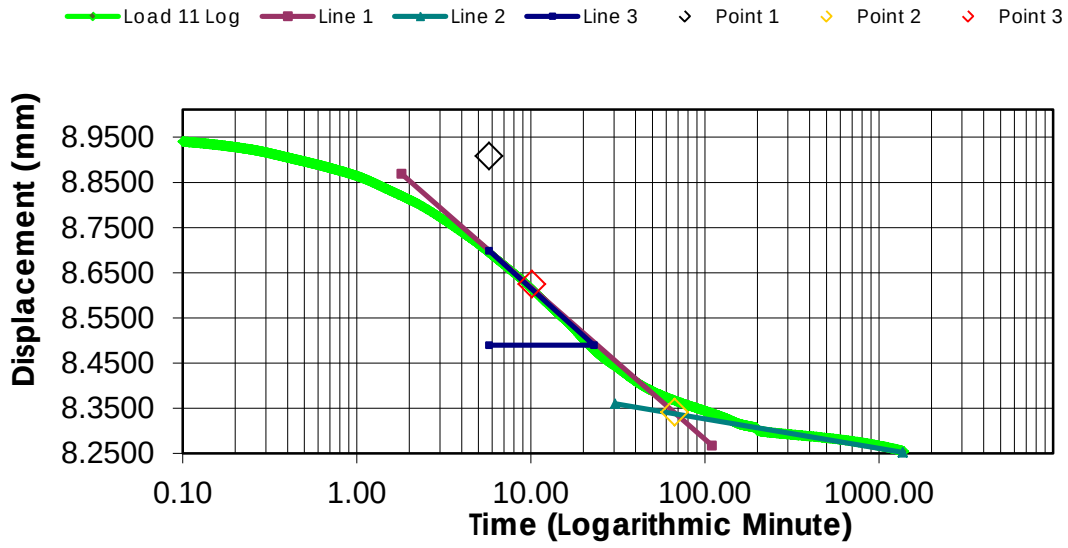
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.0340 | 2.1480 | 11.4255 | 0.4990 |
| 1 | 00:00:06 | 8.9400 | 2.2420 | 11.9255 | 0.4905 |
| 2 | 00:00:15 | 8.9220 | 2.2600 | 12.0213 | 0.4889 |
| 3 | 00:00:30 | 8.8960 | 2.2860 | 12.1596 | 0.4866 |
| 4 | 00:01:00 | 8.8640 | 2.3180 | 12.3298 | 0.4837 |
| 5 | 00:02:00 | 8.8120 | 2.3700 | 12.6064 | 0.4790 |
| 6 | 00:04:25 | 8.7280 | 2.4540 | 13.0532 | 0.4715 |
| 7 | 00:08:25 | 8.6420 | 2.5400 | 13.5106 | 0.4637 |
| 8 | 00:15:45 | 8.5440 | 2.6380 | 14.0319 | 0.4549 |
| 9 | 00:29:00 | 8.4480 | 2.7340 | 14.5426 | 0.4463 |
| 10 | 01:00:00 | 8.3740 | 2.8080 | 14.9362 | 0.4396 |
| 11 | 02:15:00 | 8.3260 | 2.8560 | 15.1915 | 0.4353 |
| 12 | 03:10:00 | 8.3080 | 2.8740 | 15.2872 | 0.4337 |
| 13 | 05:45:00 | 8.2900 | 2.8920 | 15.3830 | 0.4320 |
| 14 | 23:17:00 | 8.2540 | 2.9280 | 15.5745 | 0.4288 |

# Consolidation Test Results
## (Sequence 11) Load 2400.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



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Calgary Laboratory
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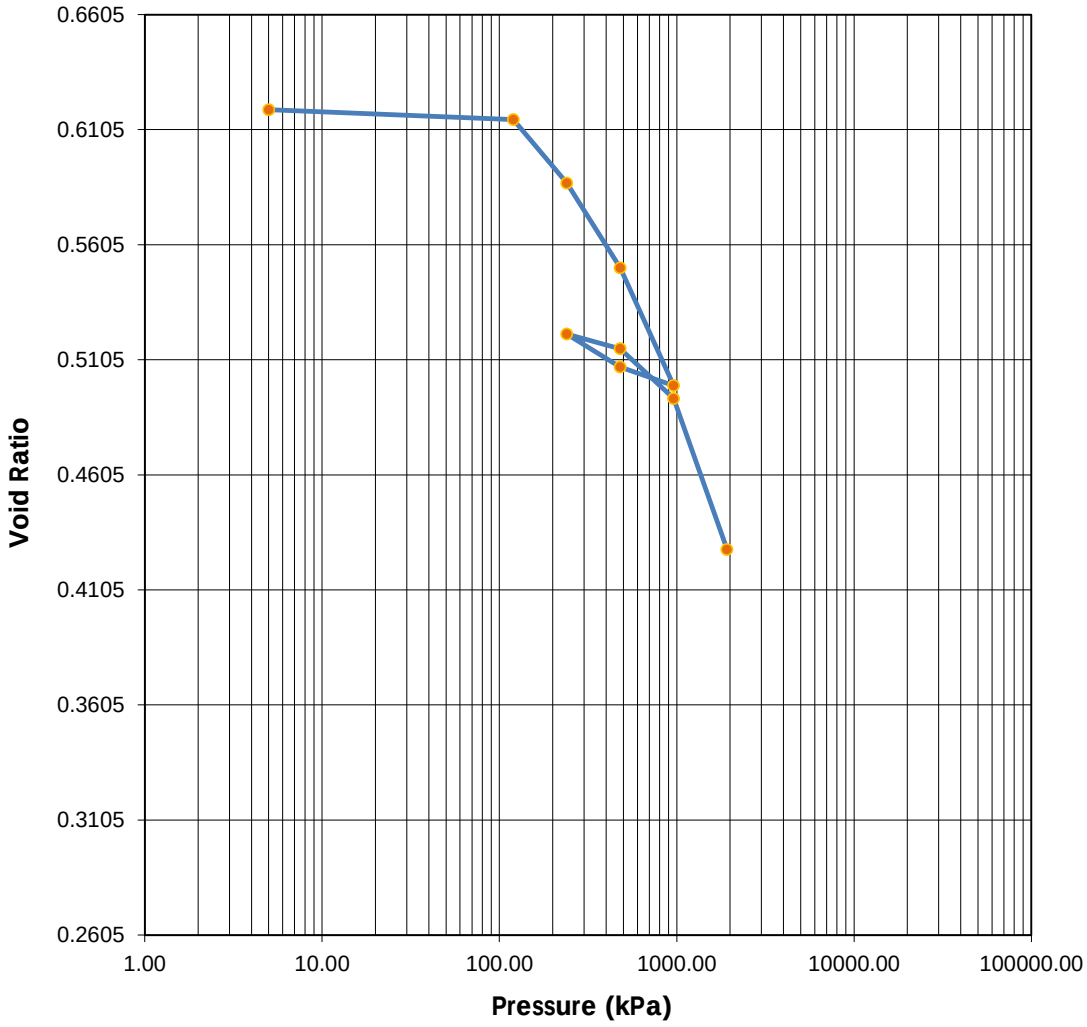
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.0 | 21.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.665 | 1.807 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 104.09 | 119.38 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6202 | 0.4289 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 3.5-3.92m | **Remarks:** |
| **Sample Number:** | D28 ST8 | **Boring Number:** | Loads at 7.5kPa, 15kPa, 30kPa and 60kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

**Tested By:** C. Oost **Reviewed By:** C. Lamoureux

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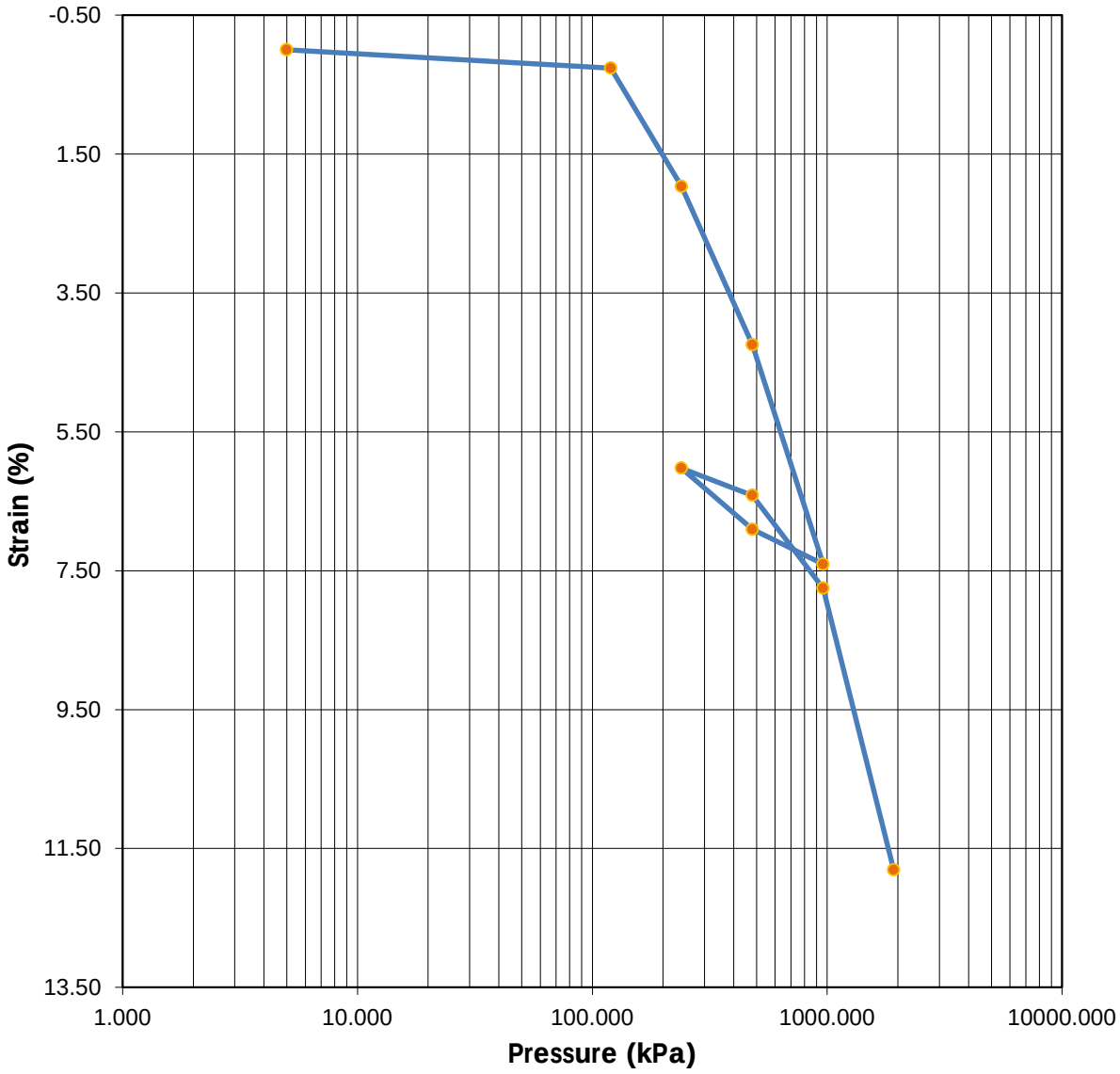
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.0 | 21.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.665 | 1.807 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 104.09 | 119.38 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6202 | 0.4289 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 3.5-3.92m | **Remarks:** |
| **Sample Number:** | D28 ST8 | **Boring Number:** | Loads at 7.5kPa, 15kPa, 30kPa and 60kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

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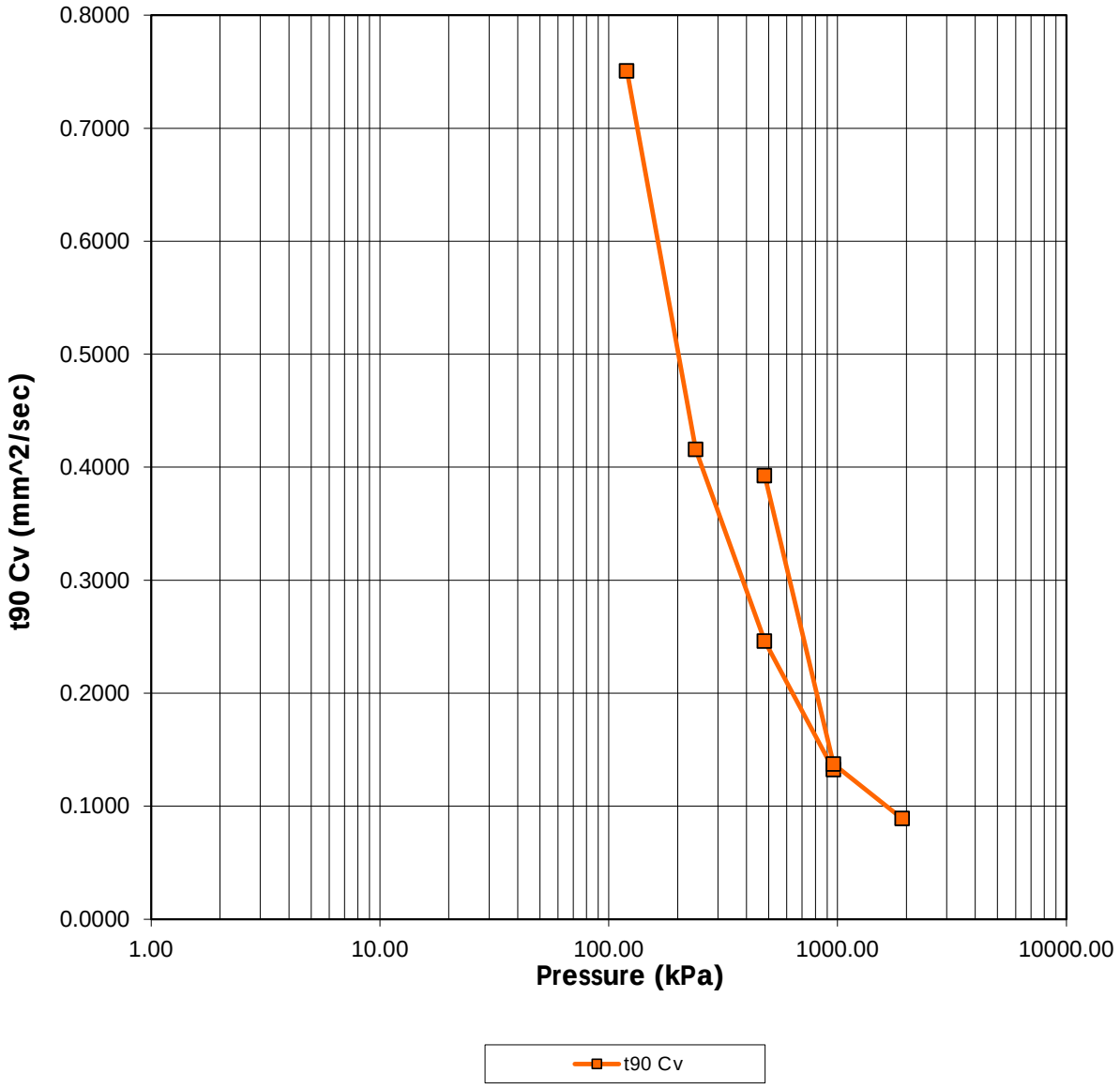
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.0 | 21.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.665 | 1.807 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 104.09 | 119.38 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6202 | 0.4289 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 3.5-3.92m

**Sample Number:** D28 ST8 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads at 7.5kPa, 15kPa, 30kPa and 60kPa omitted due to swelling

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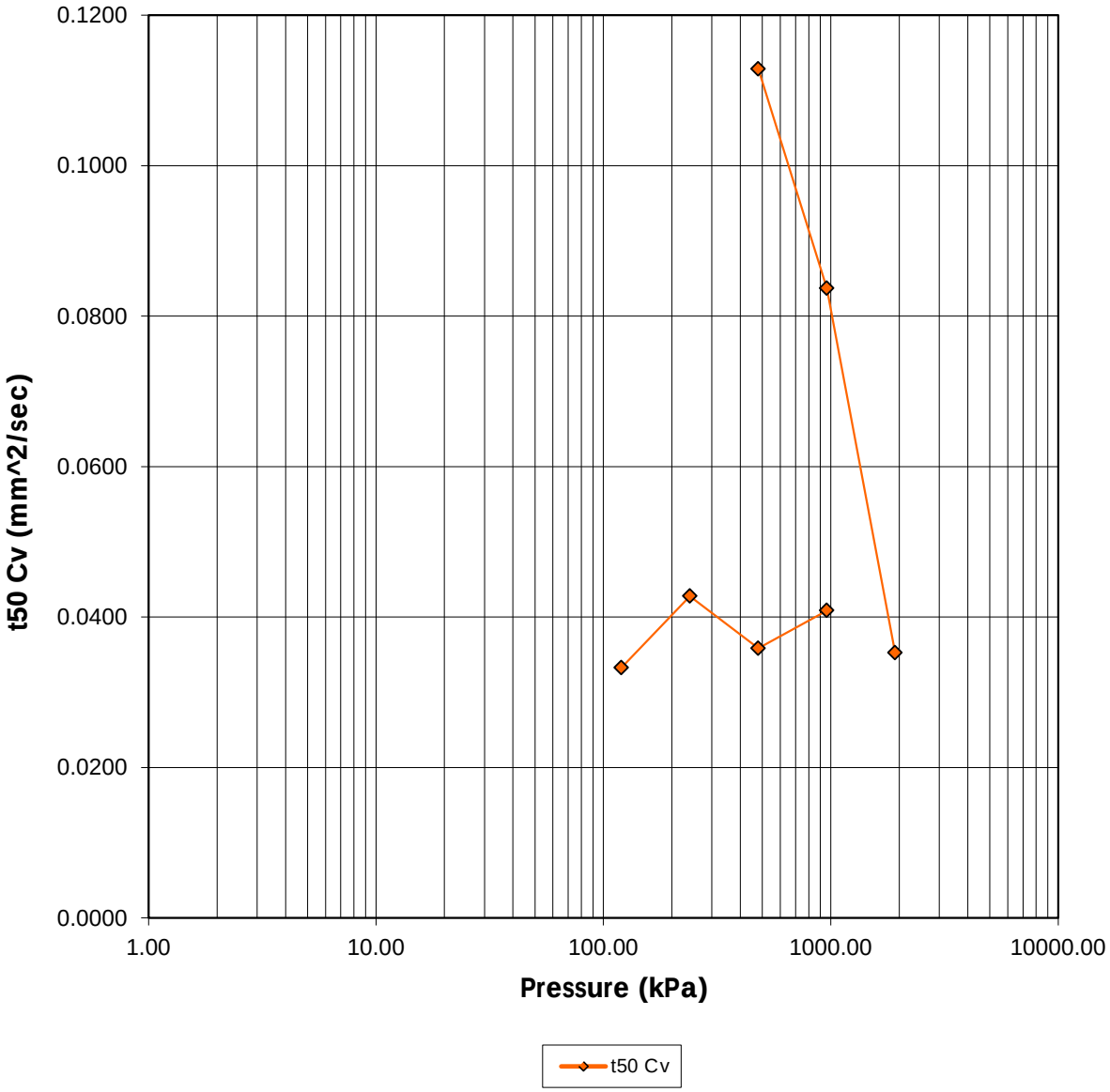
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.0 | 21.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.665 | 1.807 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 104.09 | 119.38 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6202 | 0.4289 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 3.5-3.92m | **Remarks:** |
| **Sample Number:** | D28 ST8 | **Boring Number:** | Loads at 7.5kPa, 15kPa, 30kPa and 60kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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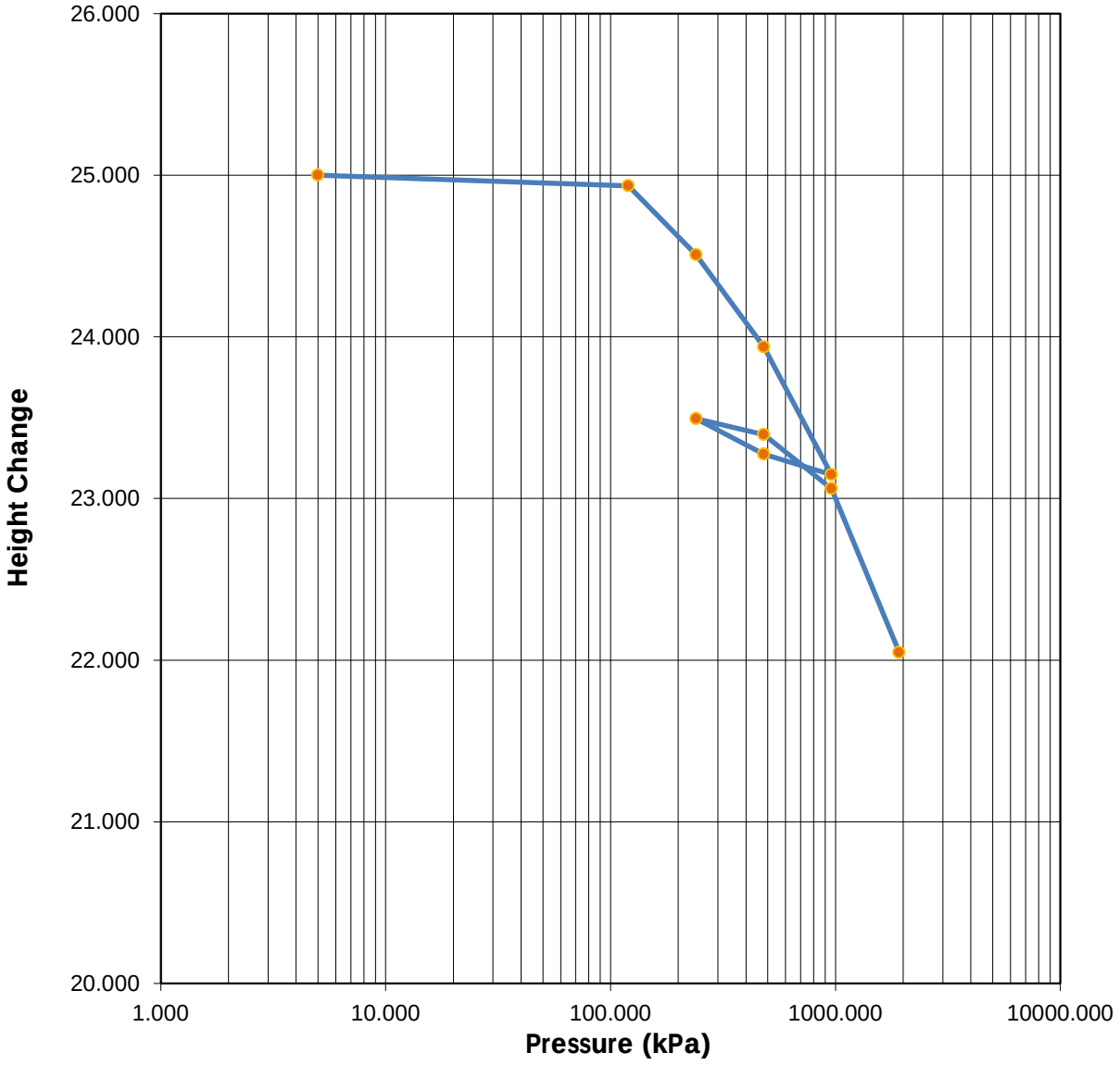
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 24.0 | 21.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.665 | 1.807 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 104.09 | 119.38 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6202 | 0.4289 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 3.5-3.92m | **Remarks:** |
| **Sample Number:** | D28 ST8 | **Boring Number:** | Loads at 7.5kPa, 15kPa, 30kPa and 60kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Sample Description:** Brown Clay
**Remarks:** Loads at 7.5kPa, 15kPa, 30kPa and 60kPa omitted due to swelling

**Test Number:**
**Test Date:** 15-Jul-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.0000 | 9.5599 | 0.00 | 0.6192 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 25.0000 | 9.5599 | 0.00 | 0.6192 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 7.500 | -0.0020 | 25.0020 | 9.5619 | -0.01 | 0.6193 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 15.000 | -0.0020 | 25.0020 | 9.5619 | -0.01 | 0.6193 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 30.000 | -0.0100 | 25.0100 | 9.5699 | -0.04 | 0.6198 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | 60.000 | 0.0300 | 24.9700 | 9.5299 | 0.12 | 0.6172 | 0.000 | 0.000 | 0.000 | 0.000 |
| 6 | 120.000 | 0.0660 | 24.9340 | 9.4939 | 0.26 | 0.6149 | 2.927 | 15.346 | 0.751 | 0.033 |
| 7 | 240.000 | 0.4920 | 24.5080 | 9.0679 | 1.97 | 0.5873 | 5.107 | 11.525 | 0.416 | 0.043 |
| 8 | 480.000 | 1.0620 | 23.9380 | 8.4979 | 4.25 | 0.5504 | 8.230 | 13.120 | 0.246 | 0.036 |
| 9 | 960.000 | 1.8520 | 23.1480 | 7.7079 | 7.41 | 0.4992 | 14.332 | 10.764 | 0.132 | 0.041 |
| 10 | 480.000 | 1.7260 | 23.2740 | 7.8339 | 6.90 | 0.5074 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 240.000 | 1.5060 | 23.4940 | 8.0539 | 6.02 | 0.5216 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 480.000 | 1.6040 | 23.3960 | 7.9559 | 6.42 | 0.5153 | 4.930 | 3.982 | 0.392 | 0.113 |
| 13 | 960.000 | 1.9380 | 23.0620 | 7.6219 | 7.75 | 0.4936 | 13.697 | 5.216 | 0.137 | 0.084 |
| 14 | 1920.000 | 2.9520 | 22.0480 | 6.6079 | 11.81 | 0.4280 | 19.313 | 11.322 | 0.089 | 0.035 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Jul-16

**Sample Number:** D28 ST8 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 3.5-3.92m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** 0.0000 **Initial Void Ratio:** 0.6202 **Initial Height (mm):** 25.0000
**Plastic Limit:** 0.0000 **Plasticity Index (%):** 0.0000 **Initial Diameter (mm):** 50.7000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 89.6900

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 37.29 | 83.23 |
| Dry Soil + Container (g) | 30.38 | 68.59 |
| Weight of Container (g) | 1.56 | 1.63 |
| Moisture Content (%) | 23.98 | 21.86 |
| Void Ratio | 0.6202 | 0.4289 |
| Saturation (%) | 104.09 | 119.38 |
| Dry Density (g/cm3) | 1.66 | 1.81 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

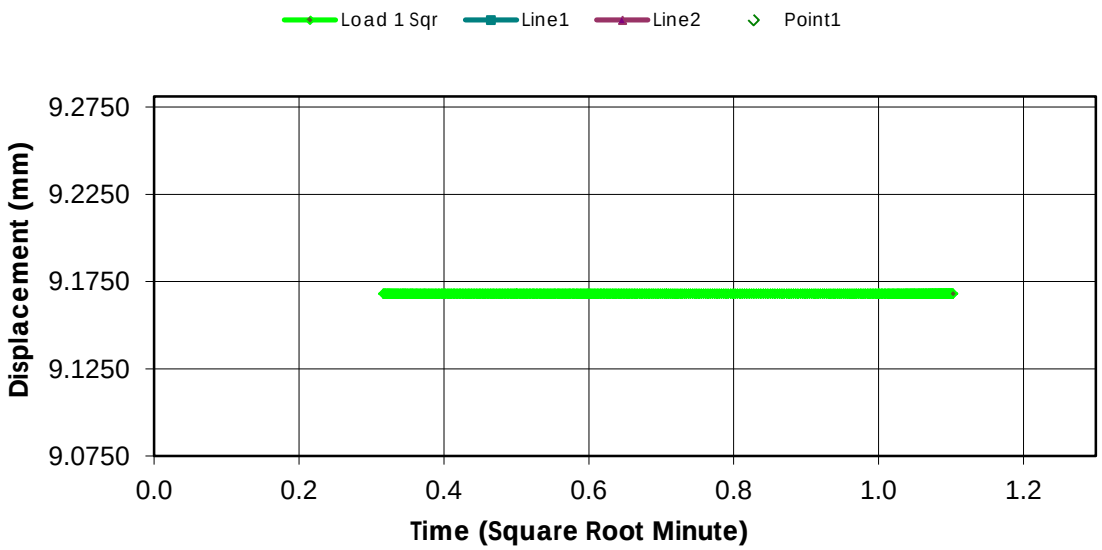
**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

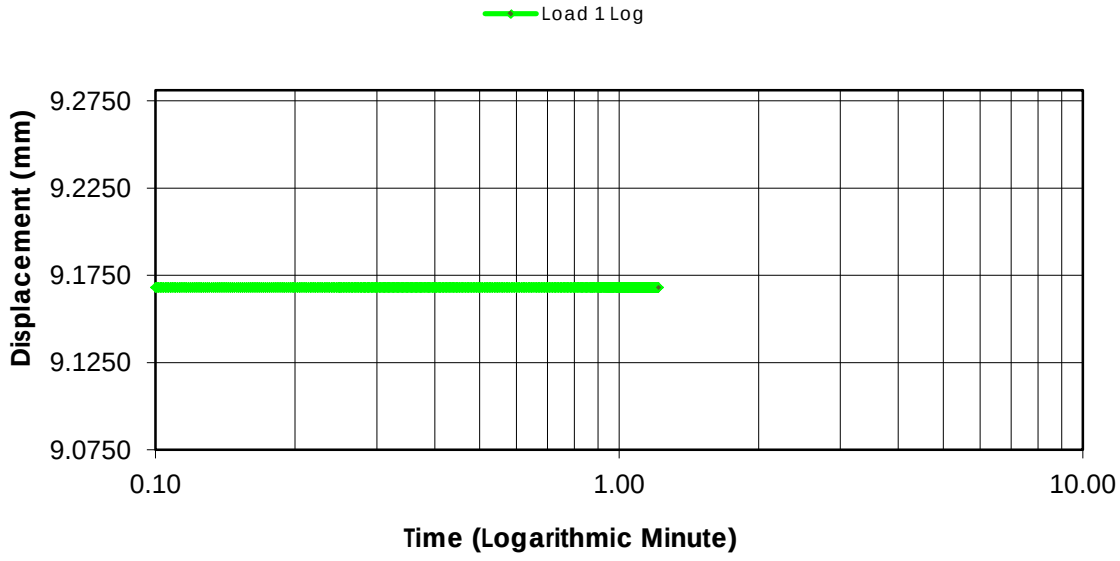
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.1680 | 0.0000 | 0.0000 | 0.6202 |
| 1 | 00:00:06 | 9.1680 | 0.0000 | 0.0000 | 0.6202 |
| 2 | 00:00:15 | 9.1680 | 0.0000 | 0.0000 | 0.6202 |
| 3 | 00:00:30 | 9.1680 | 0.0000 | 0.0000 | 0.6202 |
| 4 | 00:01:00 | 9.1680 | 0.0000 | 0.0000 | 0.6202 |
| 5 | 00:01:13 | 9.1680 | 0.0000 | 0.0000 | 0.6202 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 120.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

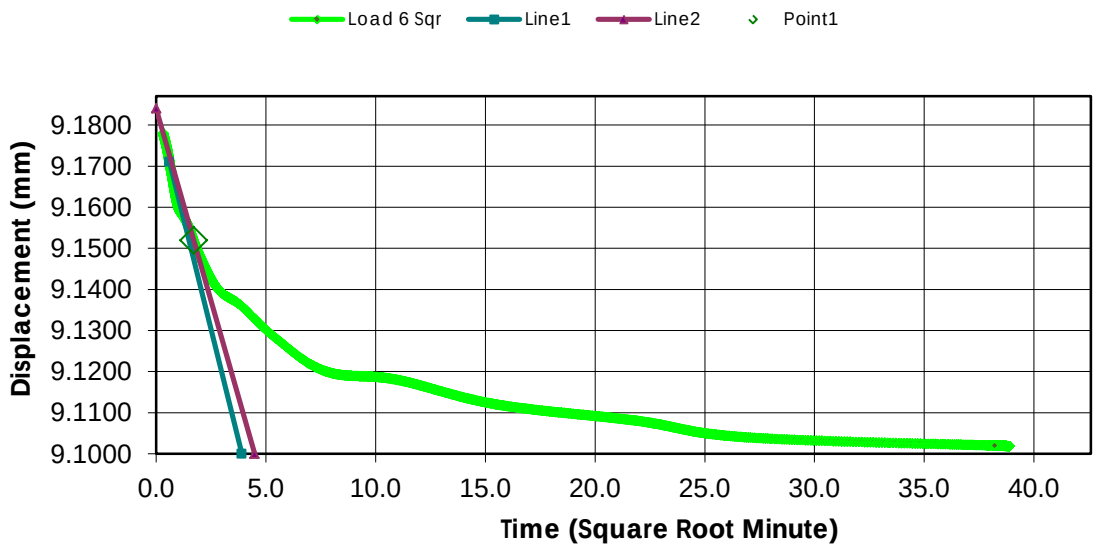
**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

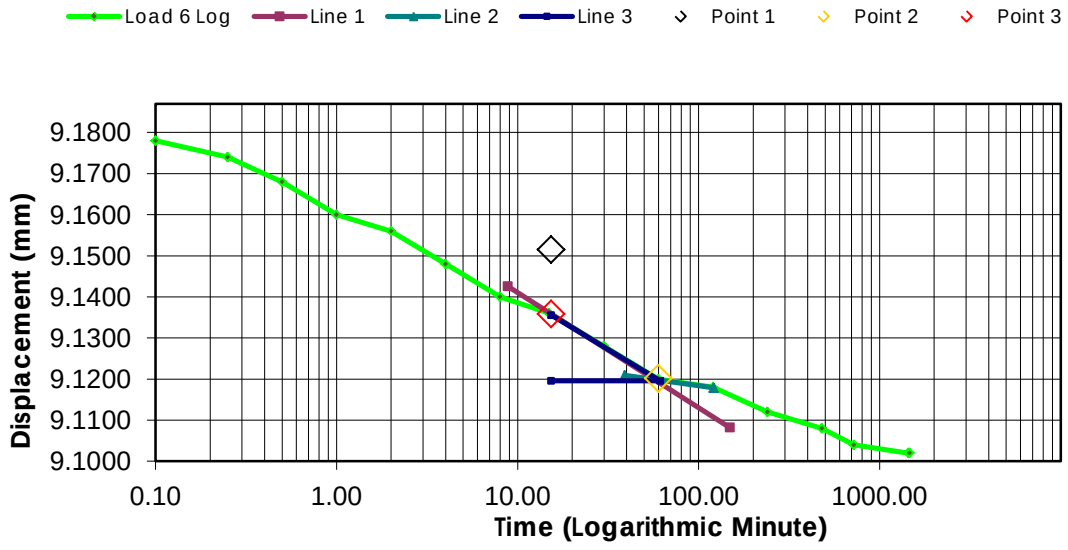
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.1380 | 0.0300 | 0.1200 | 0.6183 |
| 1 | 00:00:06 | 9.1780 | -0.0100 | -0.0400 | 0.6209 |
| 2 | 00:00:15 | 9.1740 | -0.0060 | -0.0240 | 0.6206 |
| 3 | 00:00:30 | 9.1680 | 0.0000 | 0.0000 | 0.6202 |
| 4 | 00:01:00 | 9.1600 | 0.0080 | 0.0320 | 0.6197 |
| 5 | 00:02:00 | 9.1560 | 0.0120 | 0.0480 | 0.6194 |
| 6 | 00:04:00 | 9.1480 | 0.0200 | 0.0800 | 0.6189 |
| 7 | 00:08:00 | 9.1400 | 0.0280 | 0.1120 | 0.6184 |
| 8 | 00:14:59 | 9.1360 | 0.0320 | 0.1280 | 0.6182 |
| 9 | 00:29:59 | 9.1280 | 0.0400 | 0.1600 | 0.6176 |
| 10 | 00:59:58 | 9.1200 | 0.0480 | 0.1920 | 0.6171 |
| 11 | 01:59:57 | 9.1180 | 0.0500 | 0.2000 | 0.6170 |
| 12 | 03:59:54 | 9.1120 | 0.0560 | 0.2240 | 0.6166 |
| 13 | 07:59:48 | 9.1080 | 0.0600 | 0.2400 | 0.6163 |
| 14 | 11:59:42 | 9.1040 | 0.0640 | 0.2560 | 0.6161 |
| 15 | 23:59:24 | 9.1020 | 0.0660 | 0.2640 | 0.6159 |
| 16 | 24:20:23 | 9.1020 | 0.0660 | 0.2640 | 0.6159 |

# Consolidation Test Results
## (Sequence 6) Load 120.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 240.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

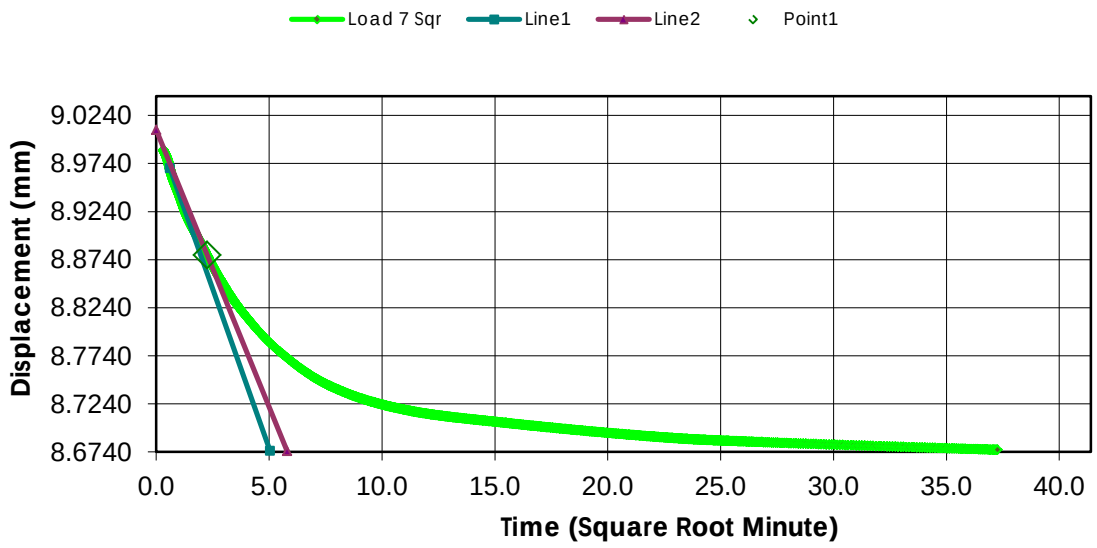
**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

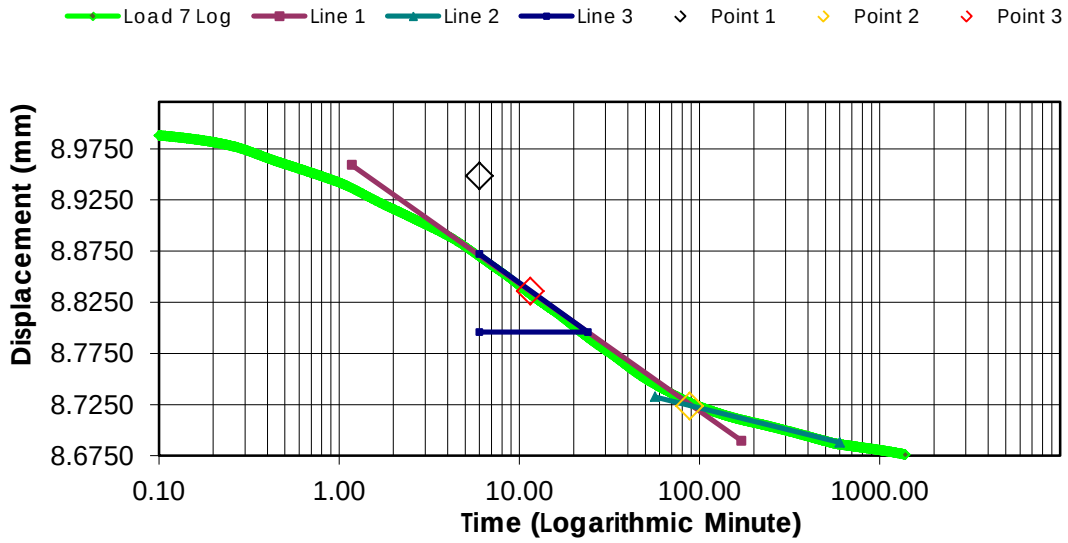
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.1020 | 0.0660 | 0.2640 | 0.6159 |
| 1 | 00:00:06 | 8.9880 | 0.1800 | 0.7200 | 0.6086 |
| 2 | 00:00:15 | 8.9780 | 0.1900 | 0.7600 | 0.6079 |
| 3 | 00:00:30 | 8.9600 | 0.2080 | 0.8320 | 0.6067 |
| 4 | 00:01:00 | 8.9420 | 0.2260 | 0.9040 | 0.6056 |
| 5 | 00:02:00 | 8.9160 | 0.2520 | 1.0080 | 0.6039 |
| 6 | 00:04:00 | 8.8900 | 0.2780 | 1.1120 | 0.6022 |
| 7 | 00:08:00 | 8.8540 | 0.3140 | 1.2560 | 0.5999 |
| 8 | 00:15:00 | 8.8180 | 0.3500 | 1.4000 | 0.5975 |
| 9 | 00:30:00 | 8.7780 | 0.3900 | 1.5600 | 0.5950 |
| 10 | 00:59:59 | 8.7420 | 0.4260 | 1.7040 | 0.5926 |
| 11 | 01:59:58 | 8.7180 | 0.4500 | 1.8000 | 0.5911 |
| 12 | 03:59:55 | 8.7040 | 0.4640 | 1.8560 | 0.5902 |
| 13 | 07:59:49 | 8.6900 | 0.4780 | 1.9120 | 0.5892 |
| 14 | 11:59:44 | 8.6840 | 0.4840 | 1.9360 | 0.5889 |
| 15 | 23:09:04 | 8.6760 | 0.4920 | 1.9680 | 0.5883 |

# Consolidation Test Results
## (Sequence 7) Load 240.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 480.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

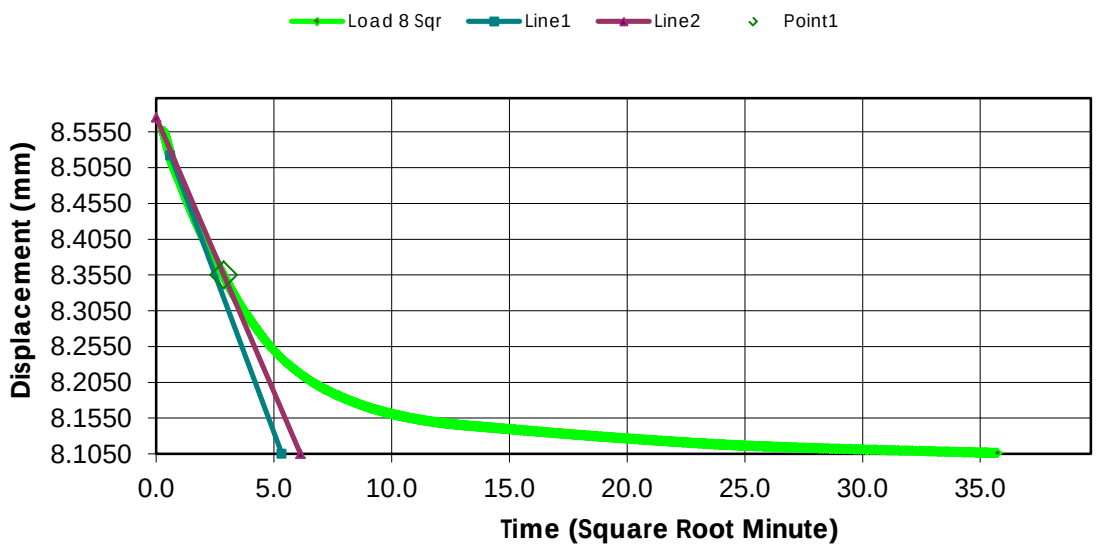
**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

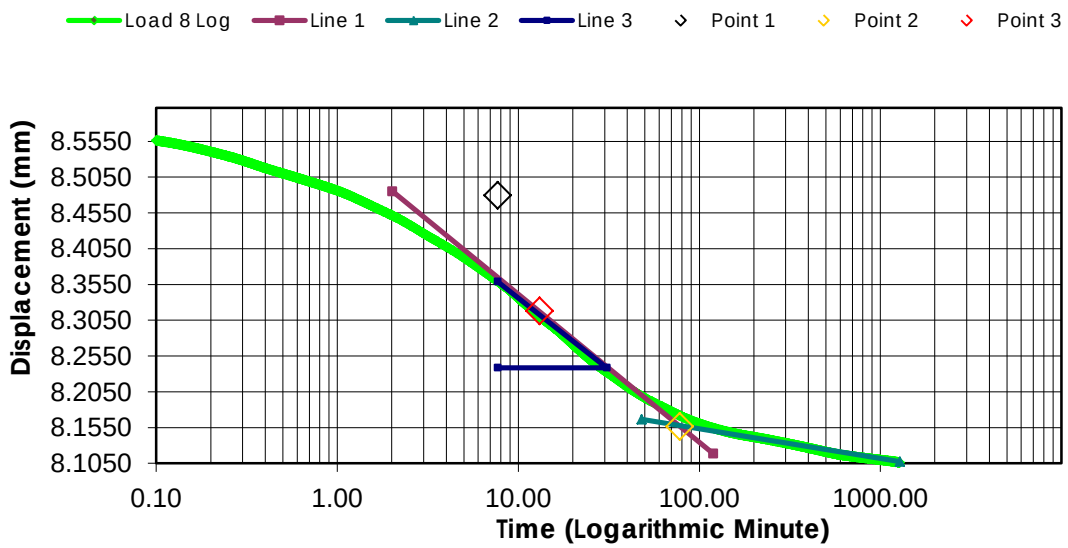
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.6760 | 0.4920 | 1.9680 | 0.5883 |
| 1 | 00:00:06 | 8.5560 | 0.6120 | 2.4480 | 0.5806 |
| 2 | 00:00:15 | 8.5340 | 0.6340 | 2.5360 | 0.5791 |
| 3 | 00:00:30 | 8.5100 | 0.6580 | 2.6320 | 0.5776 |
| 4 | 00:01:00 | 8.4860 | 0.6820 | 2.7280 | 0.5760 |
| 5 | 00:01:59 | 8.4520 | 0.7160 | 2.8640 | 0.5738 |
| 6 | 00:03:59 | 8.4080 | 0.7600 | 3.0400 | 0.5710 |
| 7 | 00:07:59 | 8.3560 | 0.8120 | 3.2480 | 0.5676 |
| 8 | 00:14:59 | 8.2980 | 0.8700 | 3.4800 | 0.5638 |
| 9 | 00:29:59 | 8.2340 | 0.9340 | 3.7360 | 0.5597 |
| 10 | 00:59:58 | 8.1860 | 0.9820 | 3.9280 | 0.5566 |
| 11 | 01:59:57 | 8.1540 | 1.0140 | 4.0560 | 0.5545 |
| 12 | 03:59:54 | 8.1380 | 1.0300 | 4.1200 | 0.5535 |
| 13 | 07:59:48 | 8.1220 | 1.0460 | 4.1840 | 0.5524 |
| 14 | 11:59:43 | 8.1140 | 1.0540 | 4.2160 | 0.5519 |
| 15 | 21:17:18 | 8.1060 | 1.0620 | 4.2480 | 0.5514 |

# Consolidation Test Results
## (Sequence 8) Load 480.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 960.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

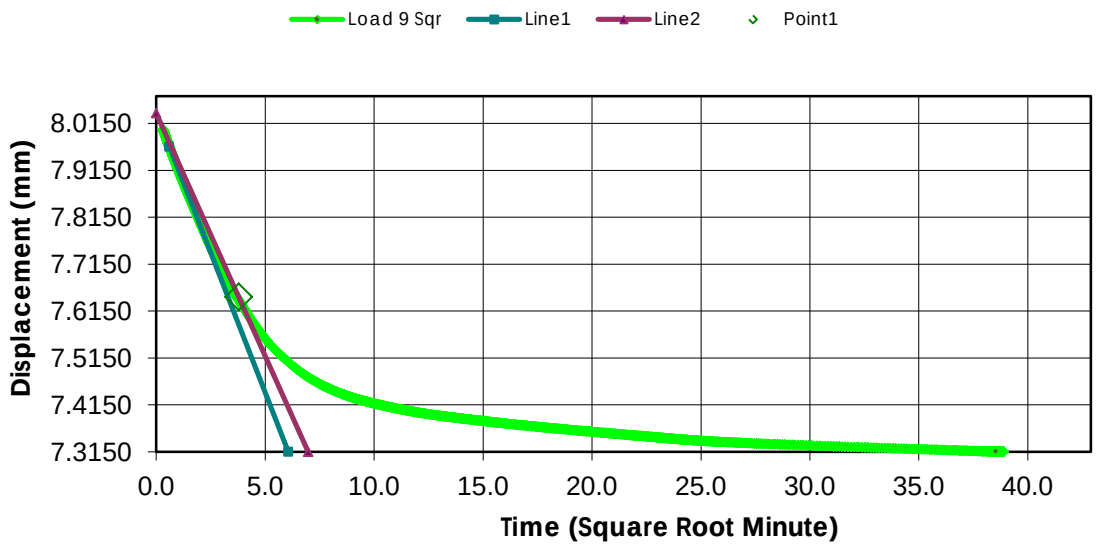
**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

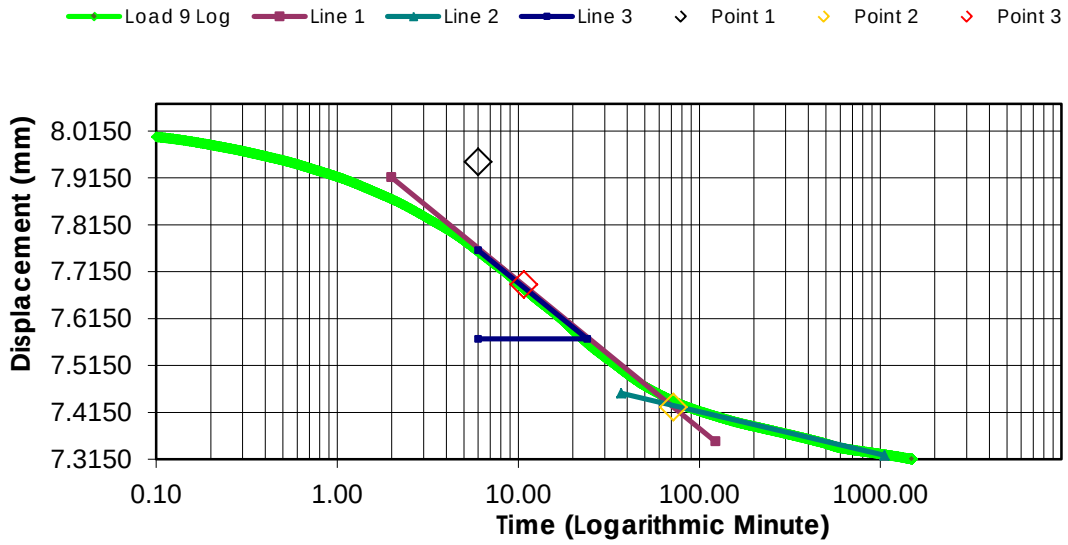
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.1060 | 1.0620 | 4.2480 | 0.5514 |
| 1 | 00:00:06 | 8.0020 | 1.1660 | 4.6640 | 0.5447 |
| 2 | 00:00:15 | 7.9780 | 1.1900 | 4.7600 | 0.5431 |
| 3 | 00:00:30 | 7.9520 | 1.2160 | 4.8640 | 0.5414 |
| 4 | 00:00:59 | 7.9180 | 1.2500 | 5.0000 | 0.5392 |
| 5 | 00:01:59 | 7.8700 | 1.2980 | 5.1920 | 0.5361 |
| 6 | 00:03:59 | 7.8060 | 1.3620 | 5.4480 | 0.5320 |
| 7 | 00:07:59 | 7.7200 | 1.4480 | 5.7920 | 0.5264 |
| 8 | 00:14:59 | 7.6320 | 1.5360 | 6.1440 | 0.5207 |
| 9 | 00:29:59 | 7.5320 | 1.6360 | 6.5440 | 0.5142 |
| 10 | 00:59:58 | 7.4540 | 1.7140 | 6.8560 | 0.5091 |
| 11 | 01:59:57 | 7.4080 | 1.7600 | 7.0400 | 0.5062 |
| 12 | 03:59:54 | 7.3780 | 1.7900 | 7.1600 | 0.5042 |
| 13 | 07:59:49 | 7.3500 | 1.8180 | 7.2720 | 0.5024 |
| 14 | 11:59:43 | 7.3340 | 1.8340 | 7.3360 | 0.5014 |
| 15 | 23:59:26 | 7.3160 | 1.8520 | 7.4080 | 0.5002 |
| 16 | 24:44:44 | 7.3160 | 1.8520 | 7.4080 | 0.5002 |

# Consolidation Test Results
## (Sequence 9) Load 960.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 480.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

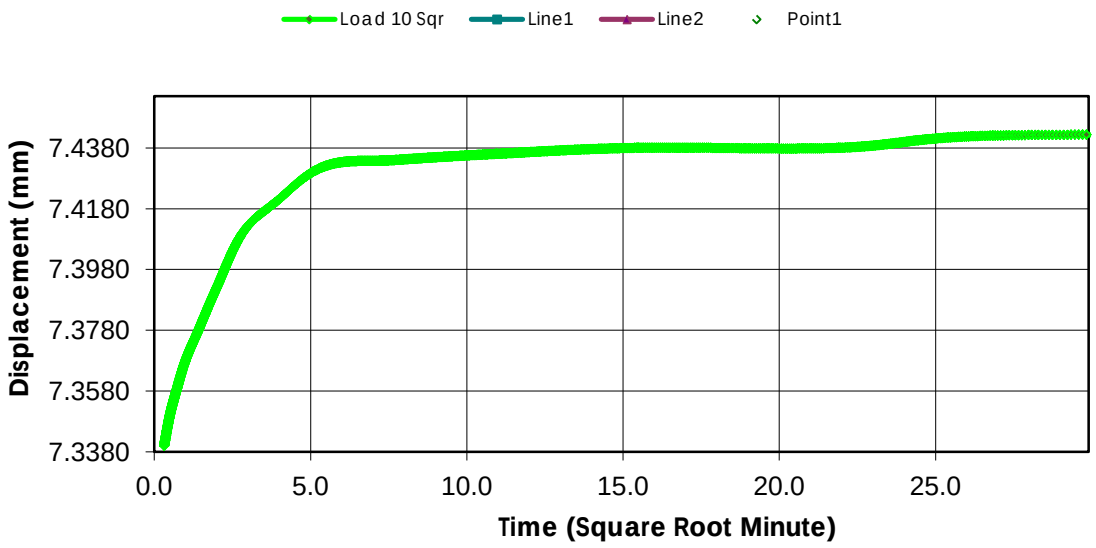
**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

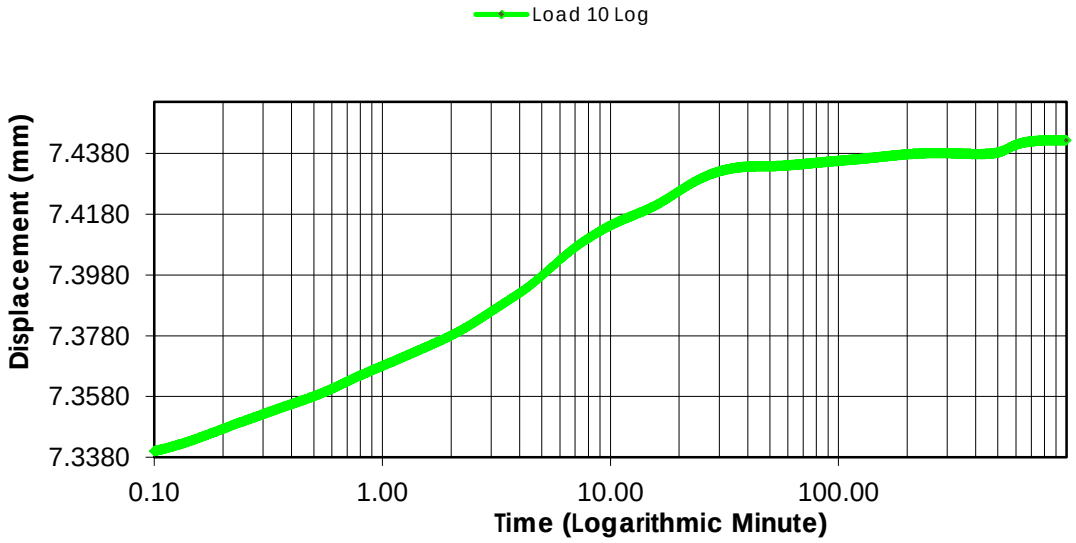
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.3160 | 1.8520 | 7.4080 | 0.5002 |
| 1 | 00:00:06 | 7.3400 | 1.8280 | 7.3120 | 0.5018 |
| 2 | 00:00:15 | 7.3500 | 1.8180 | 7.2720 | 0.5024 |
| 3 | 00:00:30 | 7.3580 | 1.8100 | 7.2400 | 0.5029 |
| 4 | 00:01:00 | 7.3680 | 1.8000 | 7.2000 | 0.5036 |
| 5 | 00:02:00 | 7.3780 | 1.7900 | 7.1600 | 0.5042 |
| 6 | 00:04:00 | 7.3920 | 1.7760 | 7.1040 | 0.5051 |
| 7 | 00:08:00 | 7.4100 | 1.7580 | 7.0320 | 0.5063 |
| 8 | 00:15:00 | 7.4200 | 1.7480 | 6.9920 | 0.5069 |
| 9 | 00:29:59 | 7.4320 | 1.7360 | 6.9440 | 0.5077 |
| 10 | 00:59:59 | 7.4340 | 1.7340 | 6.9360 | 0.5078 |
| 11 | 01:59:57 | 7.4360 | 1.7320 | 6.9280 | 0.5080 |
| 12 | 03:59:54 | 7.4380 | 1.7300 | 6.9200 | 0.5081 |
| 13 | 07:59:49 | 7.4380 | 1.7300 | 6.9200 | 0.5081 |
| 14 | 11:59:43 | 7.4420 | 1.7260 | 6.9040 | 0.5084 |
| 15 | 23:55:57 | 7.4420 | 1.7260 | 6.9040 | 0.5084 |

# Consolidation Test Results
## (Sequence 10) Rebound 480.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 240.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

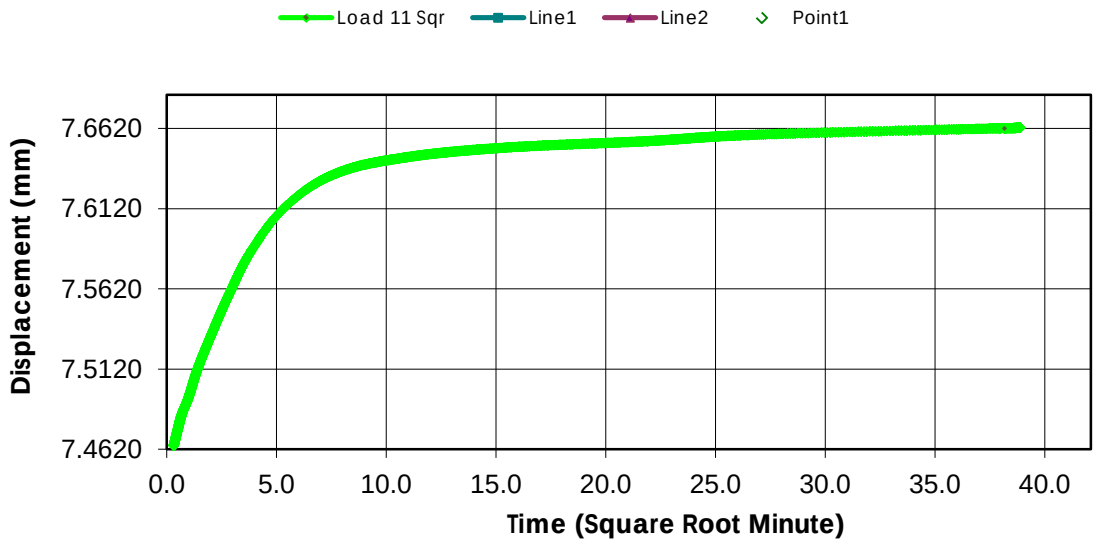
**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

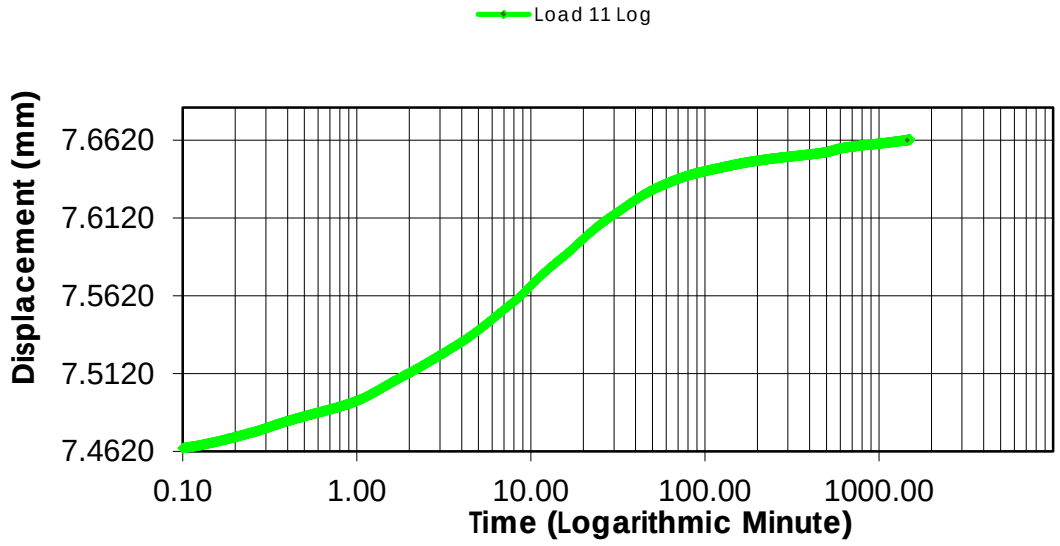
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.4420 | 1.7260 | 6.9040 | 0.5084 |
| 1 | 00:00:06 | 7.4640 | 1.7040 | 6.8160 | 0.5098 |
| 2 | 00:00:15 | 7.4740 | 1.6940 | 6.7760 | 0.5104 |
| 3 | 00:00:29 | 7.4840 | 1.6840 | 6.7360 | 0.5111 |
| 4 | 00:00:59 | 7.4940 | 1.6740 | 6.6960 | 0.5117 |
| 5 | 00:01:59 | 7.5120 | 1.6560 | 6.6240 | 0.5129 |
| 6 | 00:03:59 | 7.5320 | 1.6360 | 6.5440 | 0.5142 |
| 7 | 00:07:59 | 7.5580 | 1.6100 | 6.4400 | 0.5159 |
| 8 | 00:14:59 | 7.5860 | 1.5820 | 6.3280 | 0.5177 |
| 9 | 00:29:59 | 7.6140 | 1.5540 | 6.2160 | 0.5195 |
| 10 | 00:59:58 | 7.6340 | 1.5340 | 6.1360 | 0.5208 |
| 11 | 01:59:57 | 7.6440 | 1.5240 | 6.0960 | 0.5215 |
| 12 | 03:59:54 | 7.6500 | 1.5180 | 6.0720 | 0.5218 |
| 13 | 07:59:48 | 7.6540 | 1.5140 | 6.0560 | 0.5221 |
| 14 | 11:59:43 | 7.6580 | 1.5100 | 6.0400 | 0.5224 |
| 15 | 23:59:26 | 7.6620 | 1.5060 | 6.0240 | 0.5226 |
| 16 | 24:17:11 | 7.6620 | 1.5060 | 6.0240 | 0.5226 |

# Consolidation Test Results
## (Sequence 11) Rebound 240.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 480.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

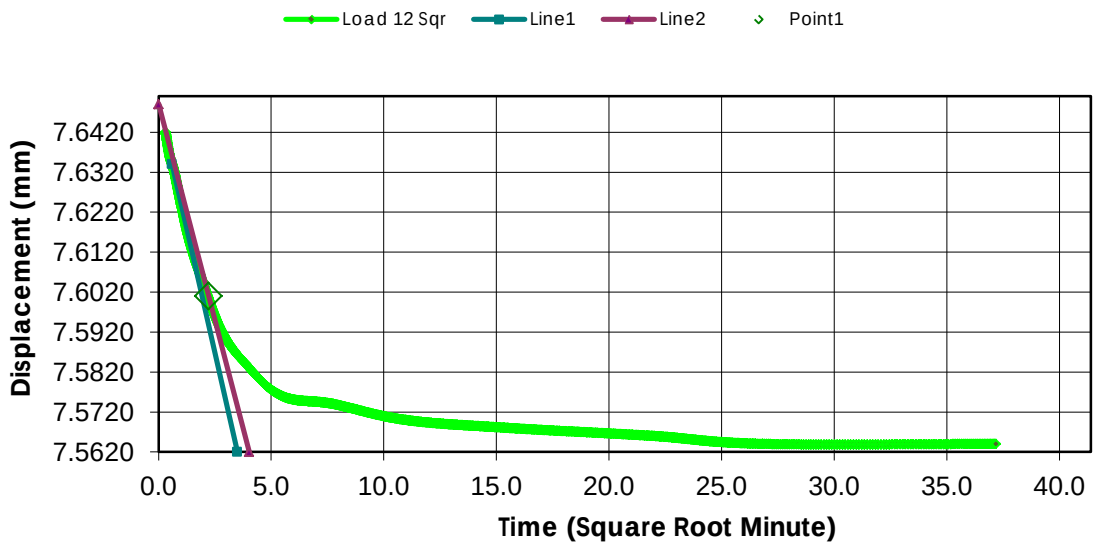
**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

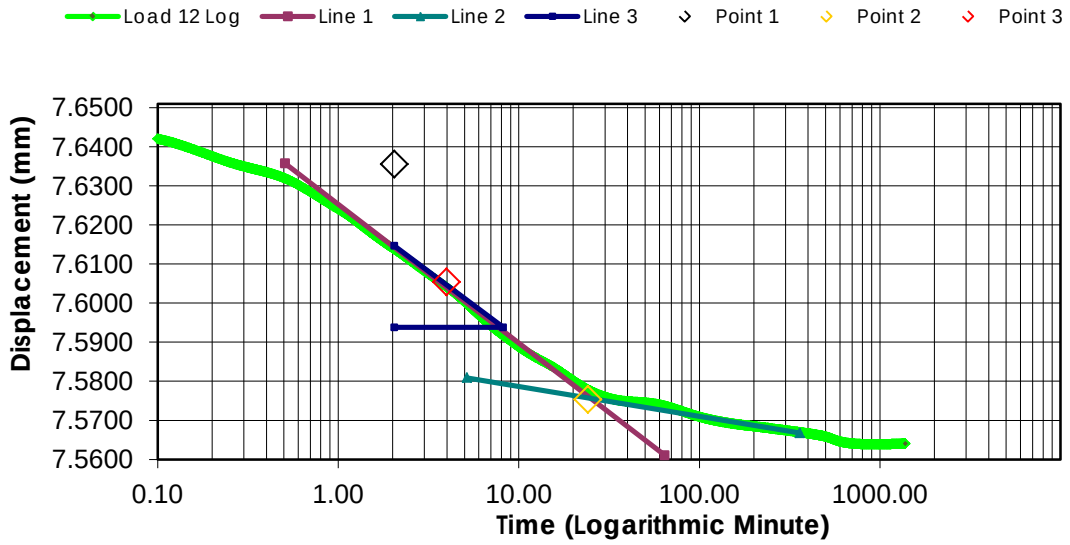
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.6620 | 1.5060 | 6.0240 | 0.5226 |
| 1 | 00:00:06 | 7.6420 | 1.5260 | 6.1040 | 0.5213 |
| 2 | 00:00:15 | 7.6360 | 1.5320 | 6.1280 | 0.5209 |
| 3 | 00:00:30 | 7.6320 | 1.5360 | 6.1440 | 0.5207 |
| 4 | 00:01:00 | 7.6240 | 1.5440 | 6.1760 | 0.5202 |
| 5 | 00:02:00 | 7.6140 | 1.5540 | 6.2160 | 0.5195 |
| 6 | 00:04:00 | 7.6040 | 1.5640 | 6.2560 | 0.5189 |
| 7 | 00:08:00 | 7.5920 | 1.5760 | 6.3040 | 0.5181 |
| 8 | 00:15:00 | 7.5840 | 1.5840 | 6.3360 | 0.5176 |
| 9 | 00:29:59 | 7.5760 | 1.5920 | 6.3680 | 0.5170 |
| 10 | 00:59:59 | 7.5740 | 1.5940 | 6.3760 | 0.5169 |
| 11 | 01:59:57 | 7.5700 | 1.5980 | 6.3920 | 0.5167 |
| 12 | 03:59:54 | 7.5680 | 1.6000 | 6.4000 | 0.5165 |
| 13 | 07:59:48 | 7.5660 | 1.6020 | 6.4080 | 0.5164 |
| 14 | 11:59:43 | 7.5640 | 1.6040 | 6.4160 | 0.5163 |
| 15 | 23:02:24 | 7.5640 | 1.6040 | 6.4160 | 0.5163 |

# Consolidation Test Results
## (Sequence 12) Load 480.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 960.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

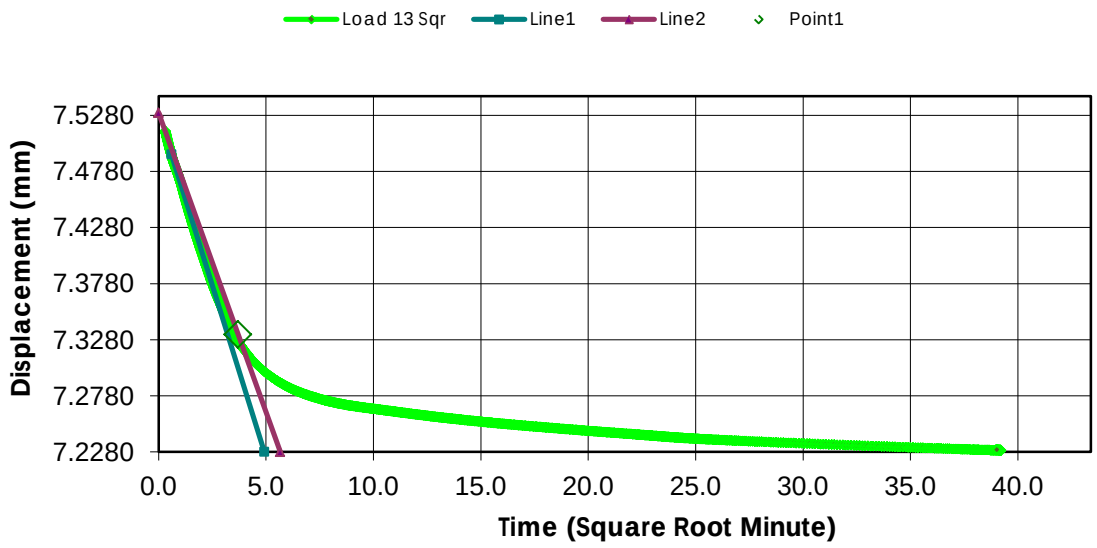
**Sample Number:** D28 ST8
**Boring Number:**
**Depth:** 3.5-3.92m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

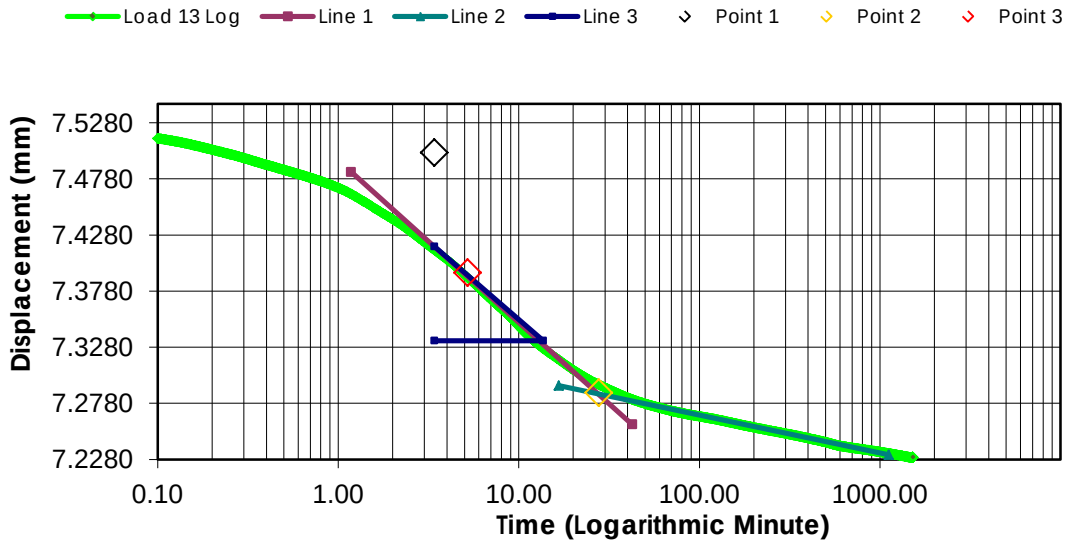
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.5640 | 1.6040 | 6.4160 | 0.5163 |
| 1 | 00:00:06 | 7.5140 | 1.6540 | 6.6160 | 0.5130 |
| 2 | 00:00:15 | 7.5000 | 1.6680 | 6.6720 | 0.5121 |
| 3 | 00:00:30 | 7.4860 | 1.6820 | 6.7280 | 0.5112 |
| 4 | 00:01:00 | 7.4700 | 1.6980 | 6.7920 | 0.5102 |
| 5 | 00:02:00 | 7.4420 | 1.7260 | 6.9040 | 0.5084 |
| 6 | 00:04:00 | 7.4060 | 1.7620 | 7.0480 | 0.5060 |
| 7 | 00:08:00 | 7.3620 | 1.8060 | 7.2240 | 0.5032 |
| 8 | 00:14:59 | 7.3220 | 1.8460 | 7.3840 | 0.5006 |
| 9 | 00:29:59 | 7.2920 | 1.8760 | 7.5040 | 0.4986 |
| 10 | 00:59:58 | 7.2740 | 1.8940 | 7.5760 | 0.4975 |
| 11 | 01:59:57 | 7.2640 | 1.9040 | 7.6160 | 0.4968 |
| 12 | 03:59:53 | 7.2540 | 1.9140 | 7.6560 | 0.4962 |
| 13 | 07:59:48 | 7.2440 | 1.9240 | 7.6960 | 0.4955 |
| 14 | 11:59:42 | 7.2380 | 1.9300 | 7.7200 | 0.4951 |
| 15 | 23:59:25 | 7.2300 | 1.9380 | 7.7520 | 0.4946 |
| 16 | 25:23:17 | 7.2300 | 1.9380 | 7.7520 | 0.4946 |

# Consolidation Test Results
## (Sequence 13) Load 960.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 14) Load 1920.000 kpa

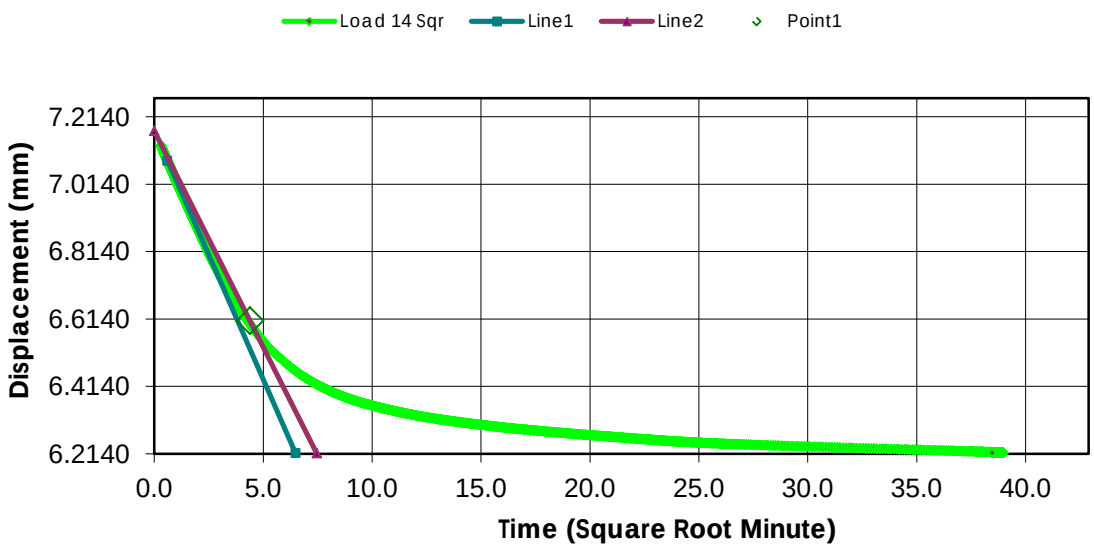
**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Jul-16
**Test Number:**

**Sample Number:** D28 ST8 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 3.5-3.92m **Remarks:**
**Sample Type:** Undisturbed

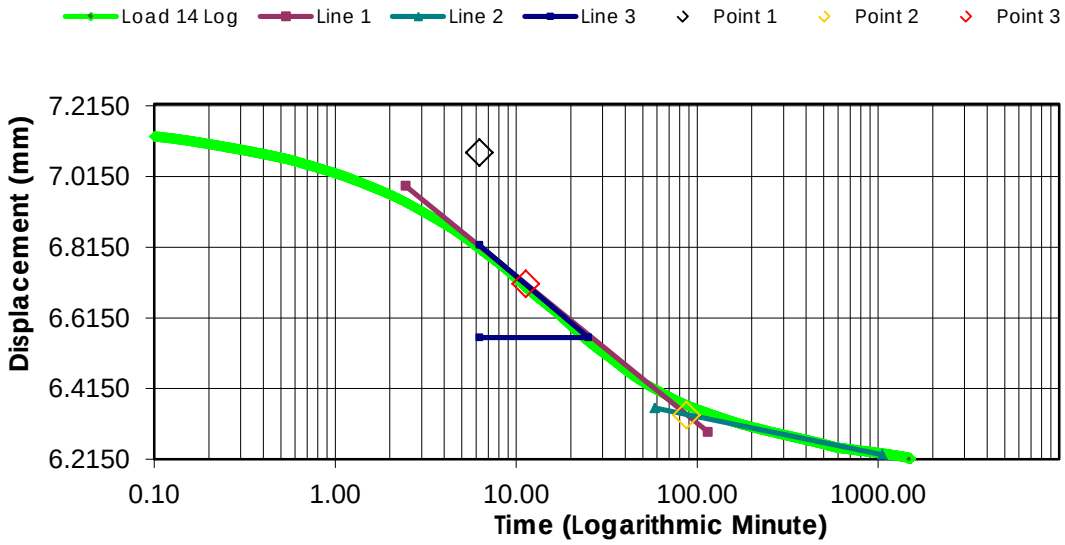
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.2300 | 1.9380 | 7.7520 | 0.4946 |
| 1 | 00:00:06 | 7.1280 | 2.0400 | 8.1600 | 0.4880 |
| 2 | 00:00:15 | 7.0980 | 2.0700 | 8.2800 | 0.4861 |
| 3 | 00:00:30 | 7.0680 | 2.1000 | 8.4000 | 0.4841 |
| 4 | 00:01:00 | 7.0240 | 2.1440 | 8.5760 | 0.4813 |
| 5 | 00:02:00 | 6.9640 | 2.2040 | 8.8160 | 0.4774 |
| 6 | 00:04:00 | 6.8800 | 2.2880 | 9.1520 | 0.4719 |
| 7 | 00:07:59 | 6.7680 | 2.4000 | 9.6000 | 0.4647 |
| 8 | 00:14:59 | 6.6480 | 2.5200 | 10.0800 | 0.4569 |
| 9 | 00:29:59 | 6.5160 | 2.6520 | 10.6080 | 0.4484 |
| 10 | 00:59:58 | 6.4100 | 2.7580 | 11.0320 | 0.4415 |
| 11 | 01:59:57 | 6.3420 | 2.8260 | 11.3040 | 0.4371 |
| 12 | 03:59:54 | 6.2960 | 2.8720 | 11.4880 | 0.4341 |
| 13 | 07:59:48 | 6.2600 | 2.9080 | 11.6320 | 0.4318 |
| 14 | 11:59:43 | 6.2420 | 2.9260 | 11.7040 | 0.4306 |
| 15 | 23:59:24 | 6.2200 | 2.9480 | 11.7920 | 0.4292 |
| 16 | 24:40:06 | 6.2160 | 2.9520 | 11.8080 | 0.4289 |

# Consolidation Test Results
## (Sequence 14) Load 1920.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



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Calgary Laboratory
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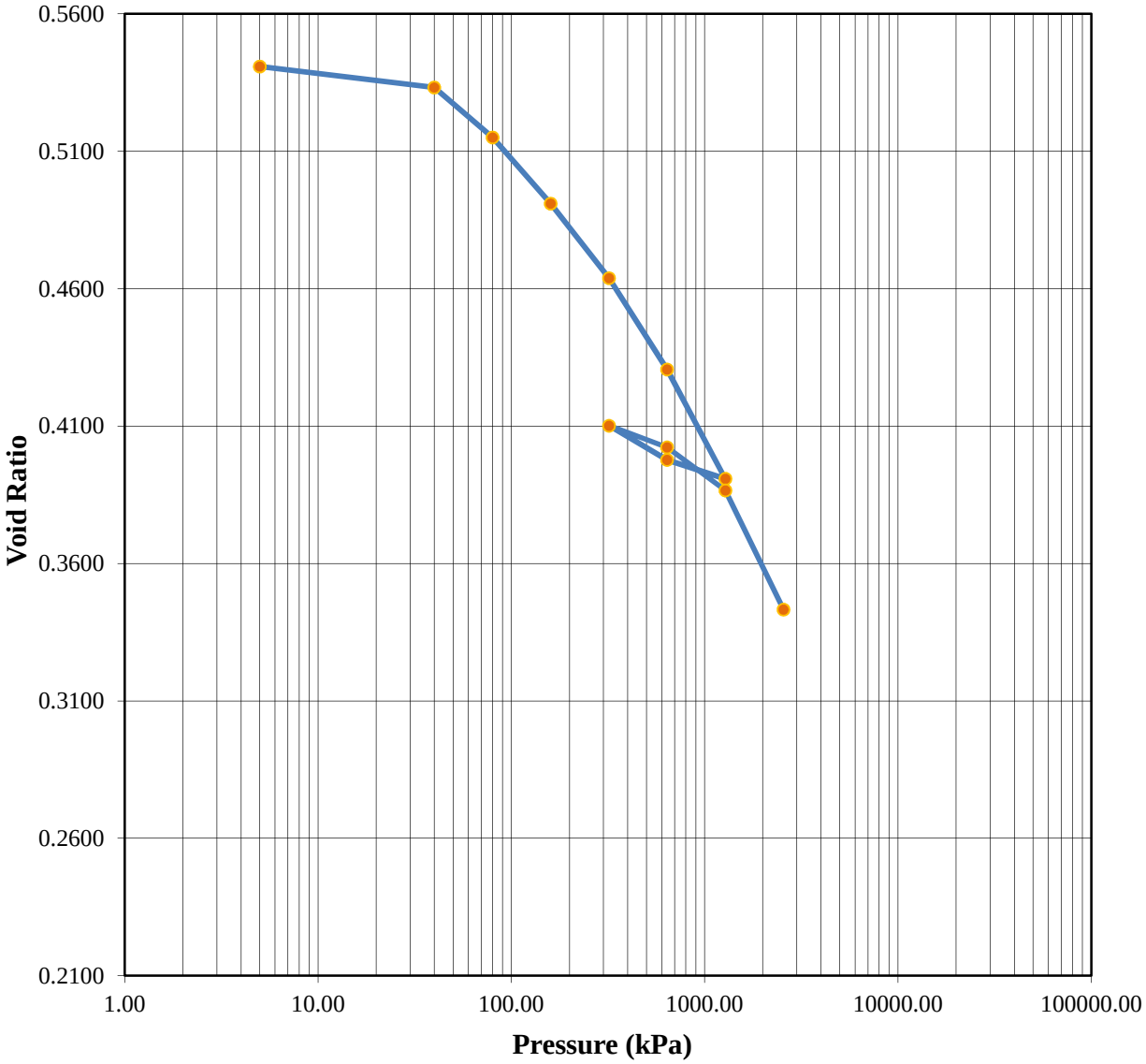
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 19.0 | 16.5 | **Liquid Limits:** | - | **Test Date:** | 12-Sep-16 |
| **Dry Density (g/cm3):** | 1.749 | 1.989 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 94.28 | 124.82 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5407 | 0.3431 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, trace gravel | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 1.70-2.15m | **Remarks:** |
| **Sample Number:** | D30 ST4 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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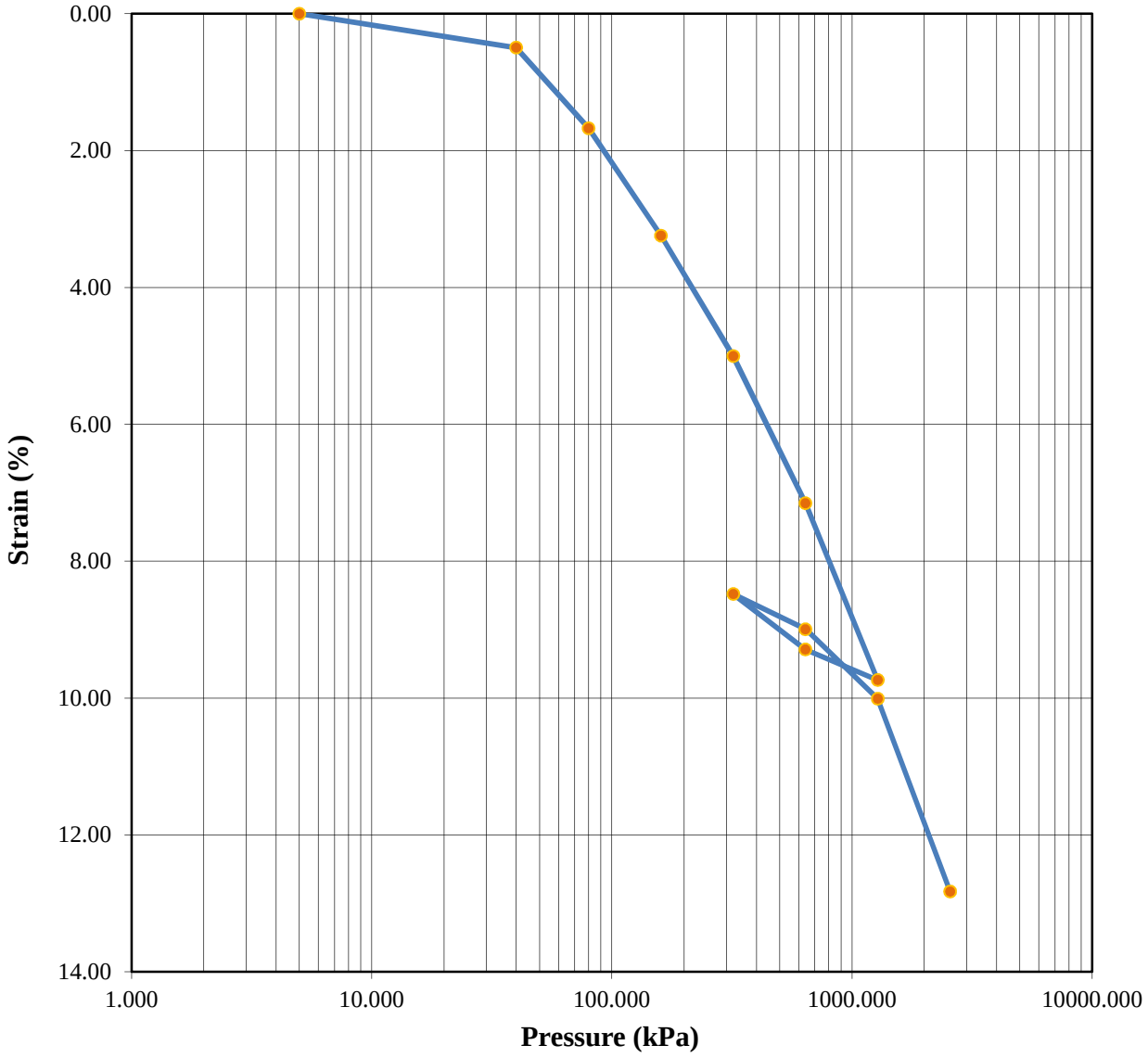
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 19.0 | 16.5 | **Liquid Limits:** | - | **Test Date:** | 12-Sep-16 |
| **Dry Density (g/cm3):** | 1.749 | 1.989 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 94.28 | 124.82 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5407 | 0.3431 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay, trace gravel | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 1.70-2.15m | **Remarks:** |
| **Sample Number:** | D30 ST4 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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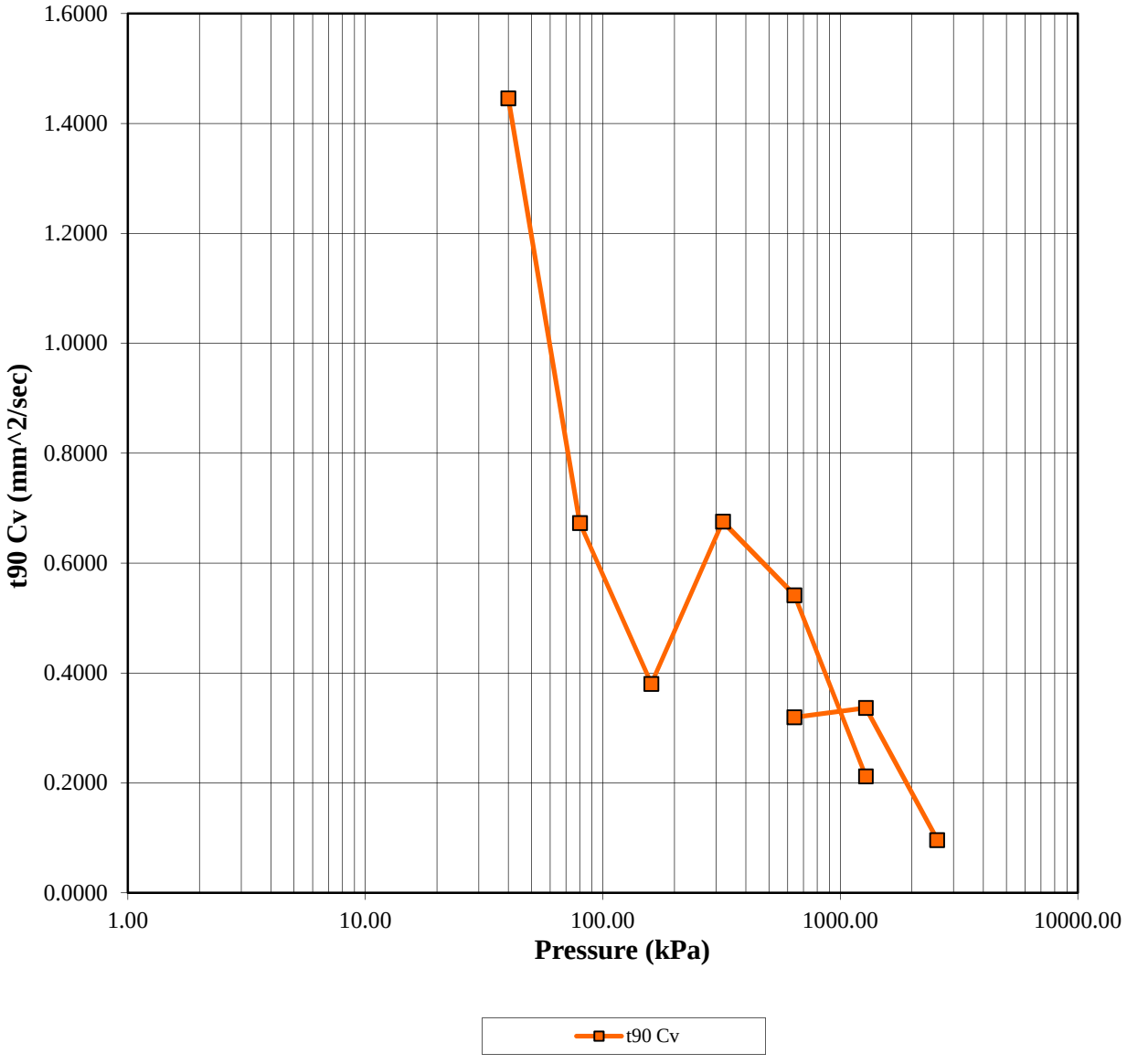
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 19.0 | 16.5 | **Liquid Limits:** | - | **Test Date:** | 12-Sep-16 |
| **Dry Density (g/cm3):** | 1.749 | 1.989 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 94.28 | 124.82 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5407 | 0.3431 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, trace gravel | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 1.70-2.15m | **Remarks:** |
| **Sample Number:** | D30 ST4 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

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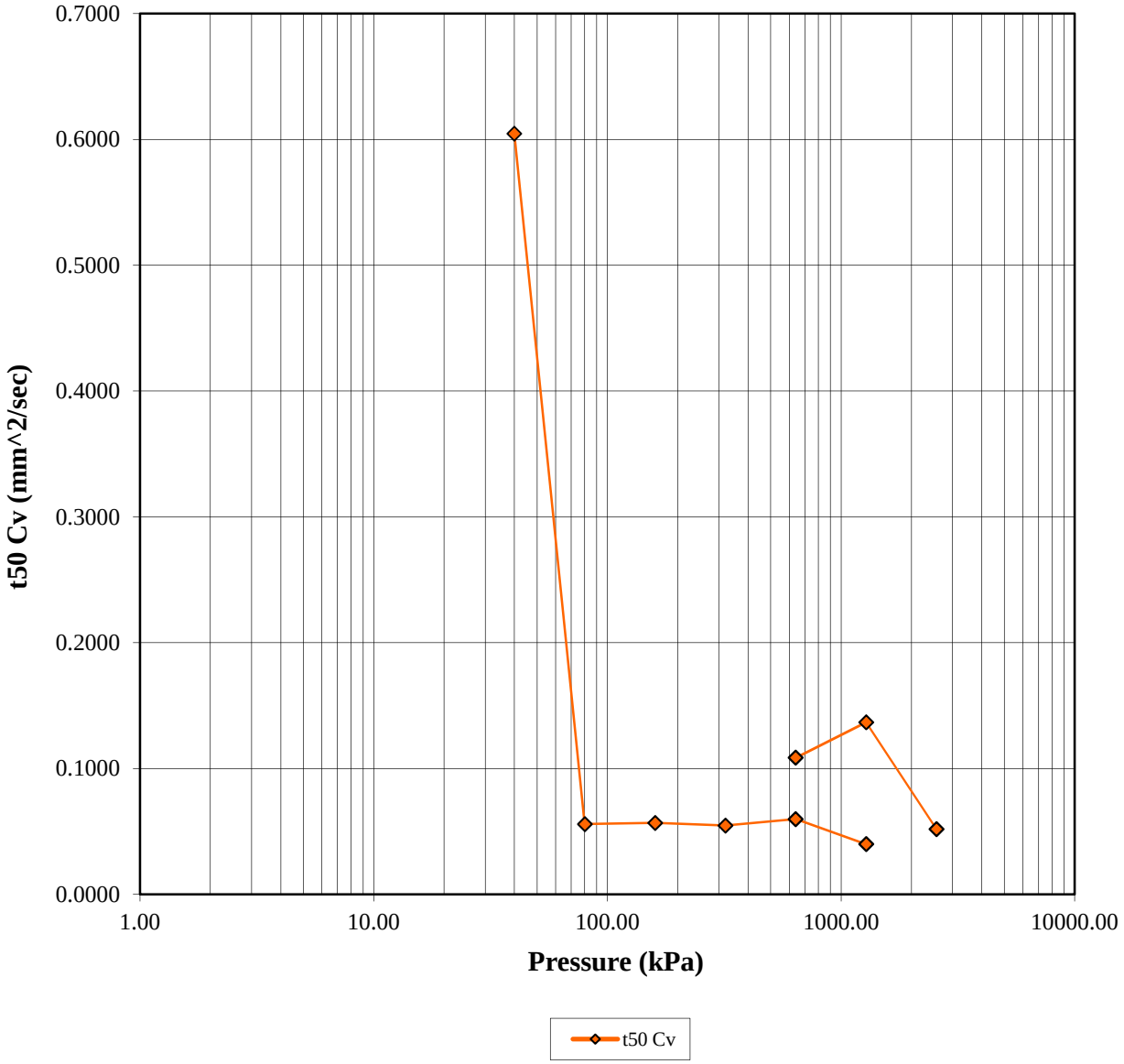


| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 19.0 | 16.5 | **Liquid Limits:** | - | **Test Date:** | 12-Sep-16 |
| **Dry Density (g/cm3):** | 1.749 | 1.989 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 94.28 | 124.82 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5407 | 0.3431 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, trace gravel | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 1.70-2.15m | **Remarks:** |
| **Sample Number:** | D30 ST4 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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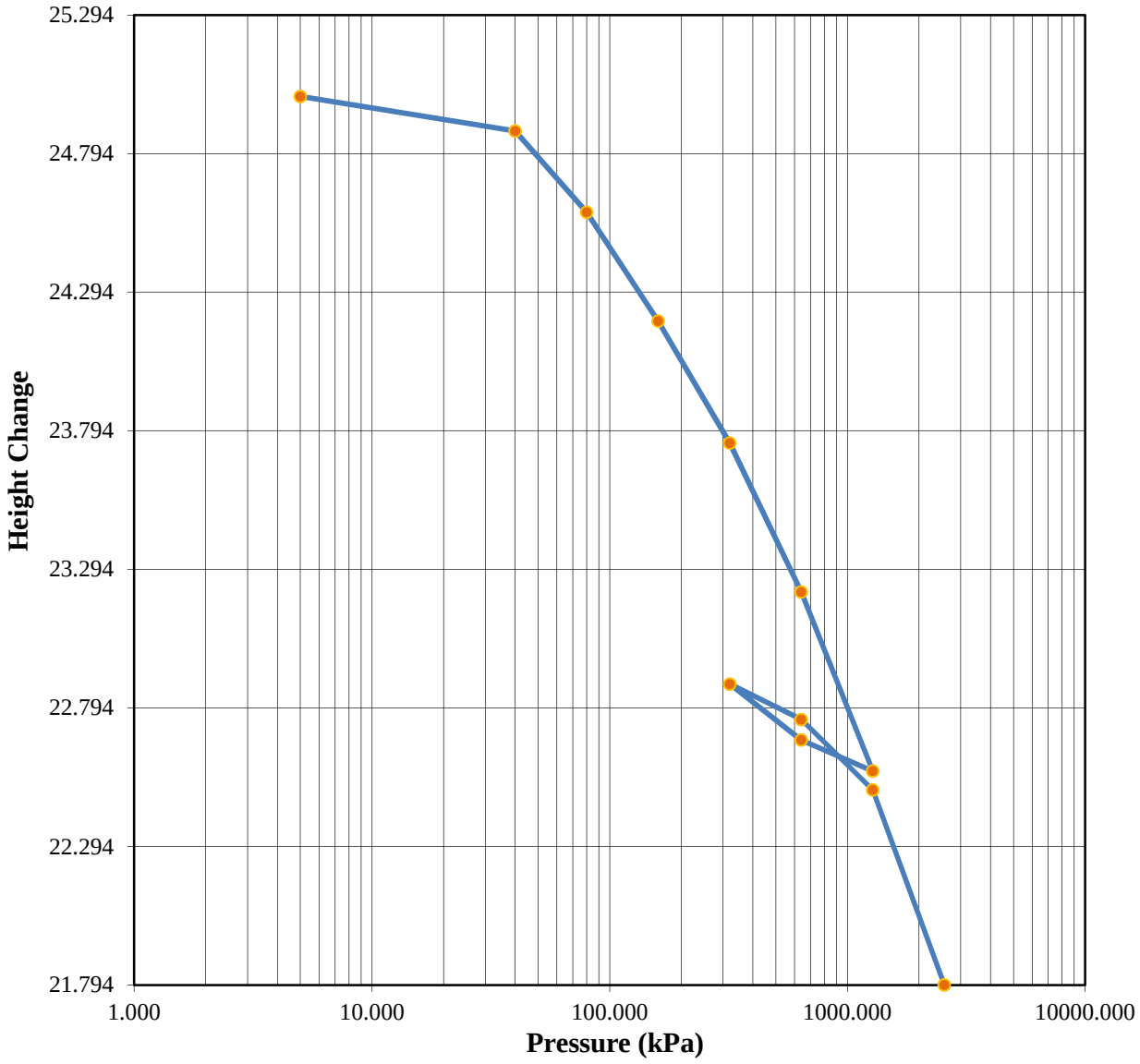
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 19.0 | 16.5 | **Liquid Limits:** | - | **Test Date:** | 12-Sep-16 |
| **Dry Density (g/cm3):** | 1.749 | 1.989 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 94.28 | 124.82 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5407 | 0.3431 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, trace gravel | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 1.70-2.15m | **Remarks:** |
| **Sample Number:** | D30 ST4 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435

### Summary

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:**

**Sample Number:** D30 ST4 **Sample Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:** **Test Number:**
**Sample Type:** Undisturbed Loads at 10kPa and 20kPa omitted due to swelling. **Test Date:** 12-Sep-16

| Index | Load Sequence (kpa) | Cummulative Change in Height (in) | Specimen Height (in) | Height of Void (in) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (ft2/year) | t50 Cv (ft2/year) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.0000 | 8.7750 | 0.00 | 0.5408 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 25.0000 | 8.7750 | 0.00 | 0.5408 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 10.000 | 0.0160 | 24.9840 | 8.7590 | 0.06 | 0.5398 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 20.000 | 0.0260 | 24.9740 | 8.7490 | 0.10 | 0.5392 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 40.000 | 0.1240 | 24.8760 | 8.6510 | 0.50 | 0.5332 | 1.512 | 0.840 | 1.446 | 0.605 |
| 5 | 80.000 | 0.4180 | 24.5820 | 8.3570 | 1.67 | 0.5151 | 3.172 | 8.893 | 0.673 | 0.056 |
| 6 | 160.000 | 0.8100 | 24.1900 | 7.9650 | 3.24 | 0.4909 | 5.435 | 8.459 | 0.380 | 0.057 |
| 7 | 320.000 | 1.2500 | 23.7500 | 7.5250 | 5.00 | 0.4638 | 2.950 | 8.470 | 0.676 | 0.055 |
| 8 | 640.000 | 1.7880 | 23.2120 | 6.9870 | 7.15 | 0.4306 | 3.515 | 7.399 | 0.542 | 0.060 |
| 9 | 1280.000 | 2.4340 | 22.5660 | 6.3410 | 9.74 | 0.3908 | 8.474 | 10.472 | 0.212 | 0.040 |
| 10 | 640.000 | 2.3220 | 22.6780 | 6.4530 | 9.29 | 0.3977 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 320.000 | 2.1200 | 22.8800 | 6.6550 | 8.48 | 0.4102 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 640.000 | 2.2480 | 22.7520 | 6.5270 | 8.99 | 0.4023 | 5.724 | 3.913 | 0.320 | 0.109 |
| 13 | 1280.000 | 2.5020 | 22.4980 | 6.2730 | 10.01 | 0.3866 | 5.316 | 3.039 | 0.336 | 0.137 |
| 14 | 2560.000 | 3.2060 | 21.7940 | 5.5690 | 12.82 | 0.3432 | 17.445 | 7.509 | 0.096 | 0.052 |

**Tested By:** C.Tollifson **Checked By:** C.Lamoureux

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16

**Sample Number:** D30 ST4 **Sample Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** 0.0000 **Initial Void Ratio:** 0.5407 **Initial Height (mm):** 25.0000
**Plastic Limit:** 0.0000 **Plasticity Index (%):** 0.0000 **Initial Diameter (mm):** 63.2000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 111.5100

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 51.51 | 94.78 |
| Dry Soil + Container (g) | 43.56 | 82.48 |
| Weight of Container (g) | 1.67 | 8.11 |
| Moisture Content (%) | 18.98 | 16.54 |
| Void Ratio | 0.5407 | 0.3431 |
| Saturation (%) | 94.28 | 124.82 |
| Dry Density (g/cm3) | 1.75 | 1.99 |

**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

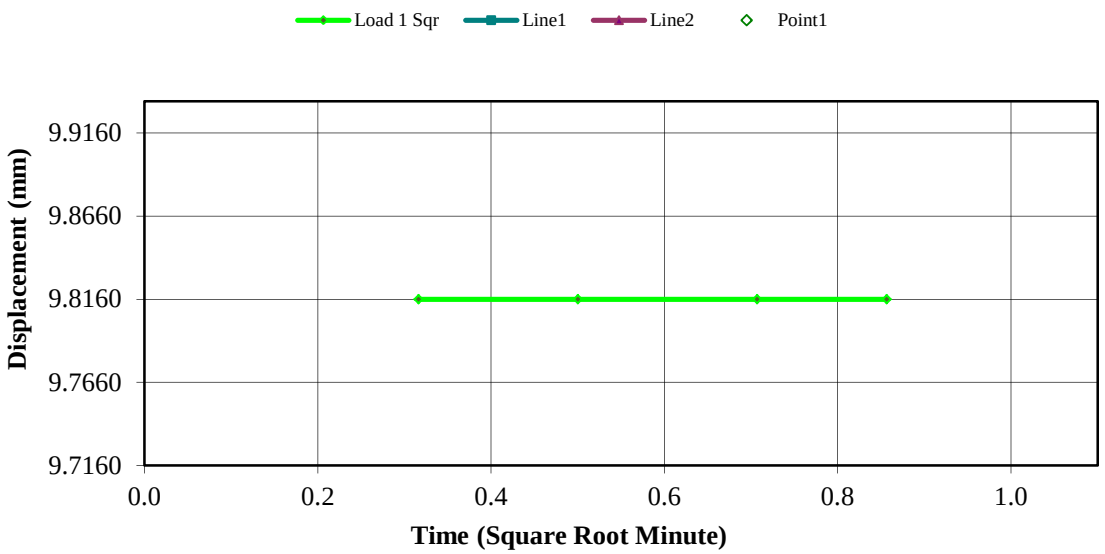
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.8160 | 0.0000 | 0.0000 | 0.5407 |
| 1 | 00:00:06 | 9.8160 | 0.0000 | 0.0000 | 0.5407 |
| 2 | 00:00:15 | 9.8160 | 0.0000 | 0.0000 | 0.5407 |
| 3 | 00:00:30 | 9.8160 | 0.0000 | 0.0000 | 0.5407 |
| 4 | 00:00:44 | 9.8160 | 0.0000 | 0.0000 | 0.5407 |

**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)

# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

**Project:** SR1 **Project Number:** 3.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

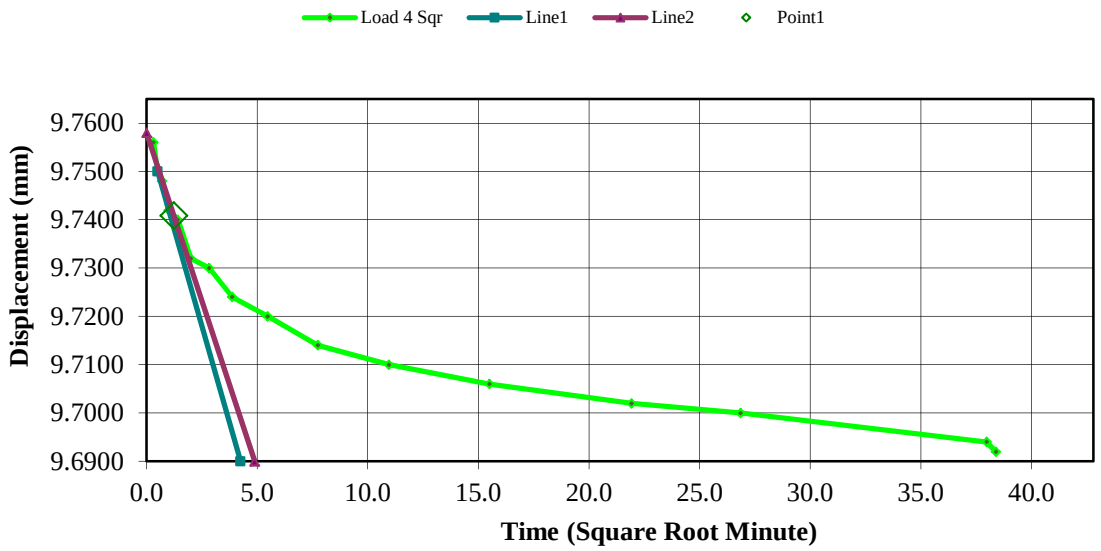
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.7900 | 0.0260 | 0.1040 | 0.5391 |
| 1 | 00:00:06 | 9.7560 | 0.0600 | 0.2400 | 0.5370 |
| 2 | 00:00:15 | 9.7500 | 0.0660 | 0.2640 | 0.5366 |
| 3 | 00:00:30 | 9.7480 | 0.0680 | 0.2720 | 0.5365 |
| 4 | 00:01:00 | 9.7420 | 0.0740 | 0.2960 | 0.5361 |
| 5 | 00:02:00 | 9.7400 | 0.0760 | 0.3040 | 0.5360 |
| 6 | 00:04:00 | 9.7320 | 0.0840 | 0.3360 | 0.5355 |
| 7 | 00:08:00 | 9.7300 | 0.0860 | 0.3440 | 0.5354 |
| 8 | 00:15:01 | 9.7240 | 0.0920 | 0.3680 | 0.5350 |
| 9 | 00:30:02 | 9.7200 | 0.0960 | 0.3840 | 0.5347 |
| 10 | 01:00:04 | 9.7140 | 0.1020 | 0.4080 | 0.5344 |
| 11 | 02:00:08 | 9.7100 | 0.1060 | 0.4240 | 0.5341 |
| 12 | 04:00:17 | 9.7060 | 0.1100 | 0.4400 | 0.5339 |
| 13 | 08:00:34 | 9.7020 | 0.1140 | 0.4560 | 0.5336 |
| 14 | 12:00:52 | 9.7000 | 0.1160 | 0.4640 | 0.5335 |
| 15 | 24:01:48 | 9.6940 | 0.1220 | 0.4880 | 0.5331 |
| 16 | 24:34:01 | 9.6920 | 0.1240 | 0.4960 | 0.5330 |

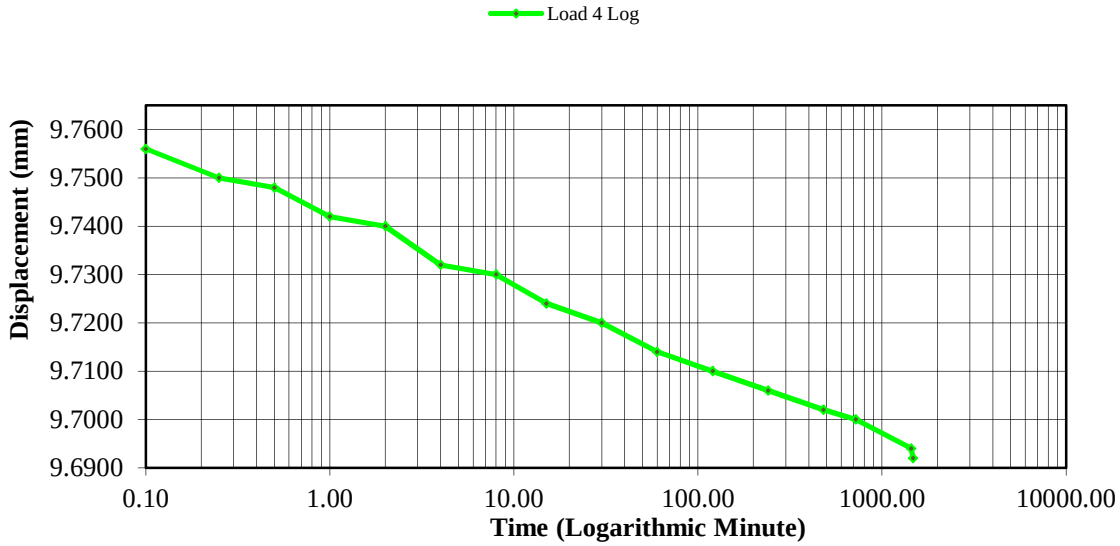
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

**Project:** SR1 **Project Number:** 3.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

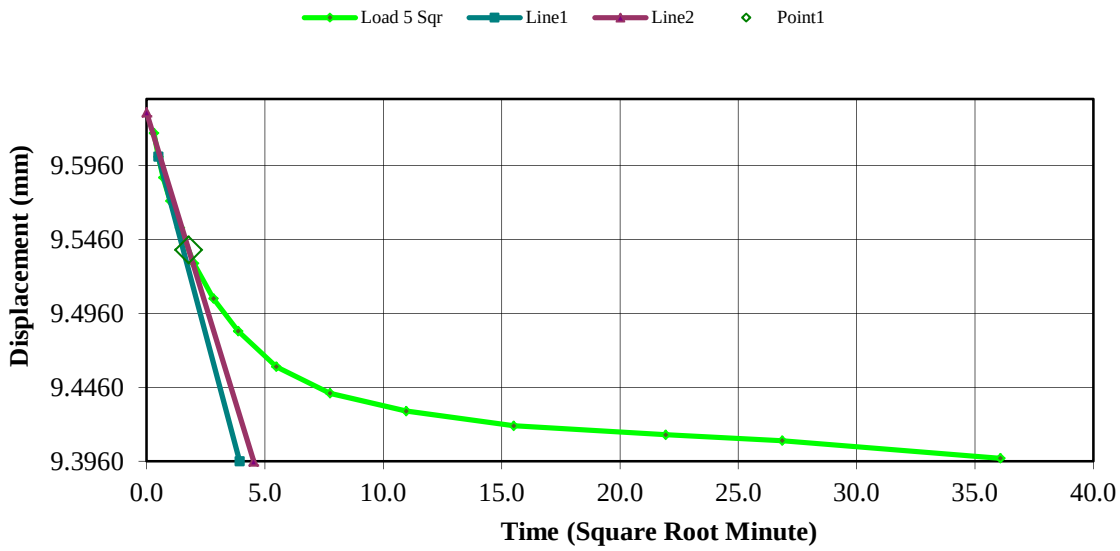
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.6920 | 0.1240 | 0.4960 | 0.5330 |
| 1 | 00:00:06 | 9.6180 | 0.1980 | 0.7920 | 0.5285 |
| 2 | 00:00:15 | 9.6020 | 0.2140 | 0.8560 | 0.5275 |
| 3 | 00:00:30 | 9.5880 | 0.2280 | 0.9120 | 0.5266 |
| 4 | 00:01:00 | 9.5720 | 0.2440 | 0.9760 | 0.5256 |
| 5 | 00:02:00 | 9.5540 | 0.2620 | 1.0480 | 0.5245 |
| 6 | 00:04:01 | 9.5300 | 0.2860 | 1.1440 | 0.5230 |
| 7 | 00:08:01 | 9.5060 | 0.3100 | 1.2400 | 0.5216 |
| 8 | 00:15:02 | 9.4840 | 0.3320 | 1.3280 | 0.5202 |
| 9 | 00:30:03 | 9.4600 | 0.3560 | 1.4240 | 0.5187 |
| 10 | 01:00:06 | 9.4420 | 0.3740 | 1.4960 | 0.5176 |
| 11 | 02:00:13 | 9.4300 | 0.3860 | 1.5440 | 0.5169 |
| 12 | 04:00:25 | 9.4200 | 0.3960 | 1.5840 | 0.5163 |
| 13 | 08:00:50 | 9.4140 | 0.4020 | 1.6080 | 0.5159 |
| 14 | 12:01:14 | 9.4100 | 0.4060 | 1.6240 | 0.5156 |
| 15 | 21:41:18 | 9.3980 | 0.4180 | 1.6720 | 0.5149 |

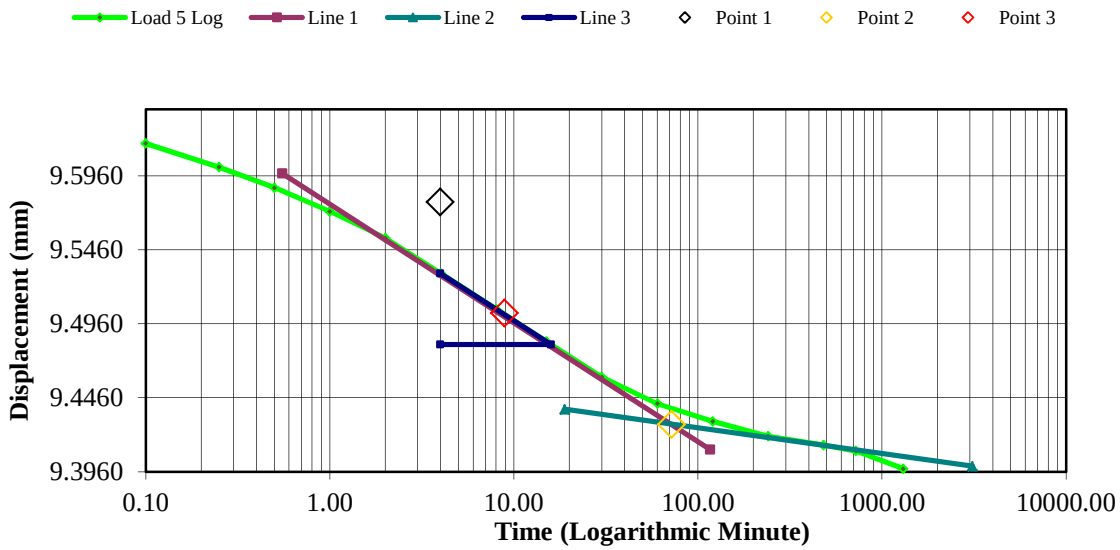
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

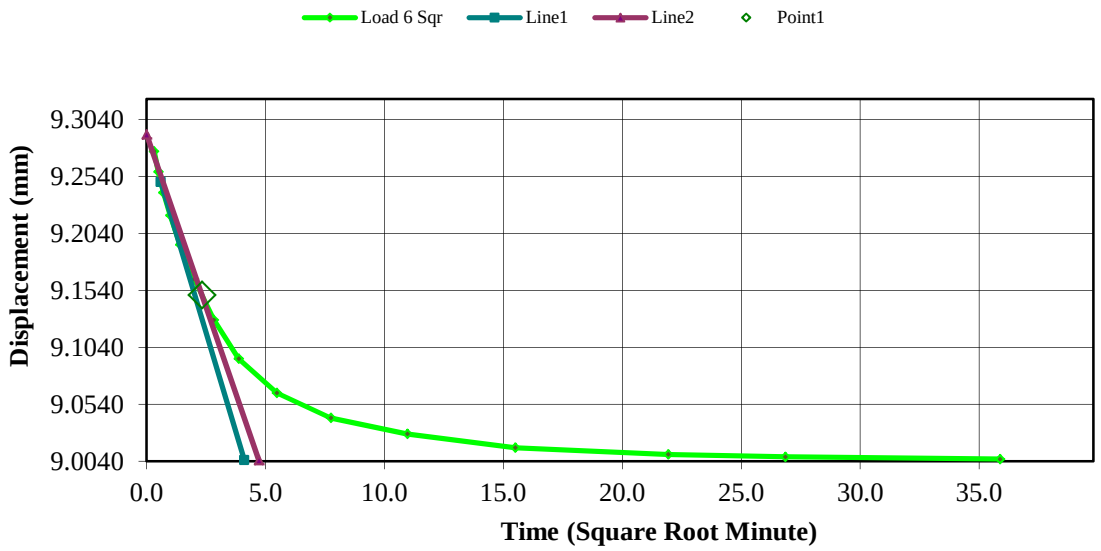
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.3980 | 0.4180 | 1.6720 | 0.5149 |
| 1 | 00:00:06 | 9.2760 | 0.5400 | 2.1600 | 0.5074 |
| 2 | 00:00:15 | 9.2580 | 0.5580 | 2.2320 | 0.5063 |
| 3 | 00:00:30 | 9.2400 | 0.5760 | 2.3040 | 0.5052 |
| 4 | 00:01:00 | 9.2200 | 0.5960 | 2.3840 | 0.5039 |
| 5 | 00:02:00 | 9.1940 | 0.6220 | 2.4880 | 0.5023 |
| 6 | 00:04:00 | 9.1640 | 0.6520 | 2.6080 | 0.5005 |
| 7 | 00:08:01 | 9.1280 | 0.6880 | 2.7520 | 0.4983 |
| 8 | 00:15:01 | 9.0940 | 0.7220 | 2.8880 | 0.4962 |
| 9 | 00:30:03 | 9.0640 | 0.7520 | 3.0080 | 0.4943 |
| 10 | 01:00:06 | 9.0420 | 0.7740 | 3.0960 | 0.4930 |
| 11 | 02:00:12 | 9.0280 | 0.7880 | 3.1520 | 0.4921 |
| 12 | 04:00:25 | 9.0160 | 0.8000 | 3.2000 | 0.4914 |
| 13 | 08:00:50 | 9.0100 | 0.8060 | 3.2240 | 0.4910 |
| 14 | 12:01:14 | 9.0080 | 0.8080 | 3.2320 | 0.4909 |
| 15 | 21:27:06 | 9.0060 | 0.8100 | 3.2400 | 0.4907 |

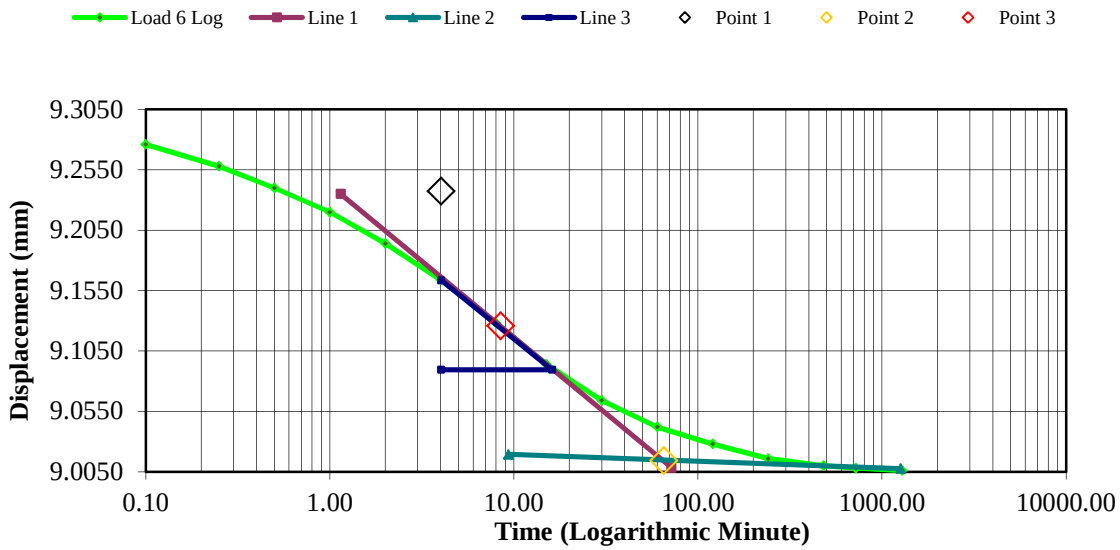
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

**Project:** SR1 **Project Number:** 3.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

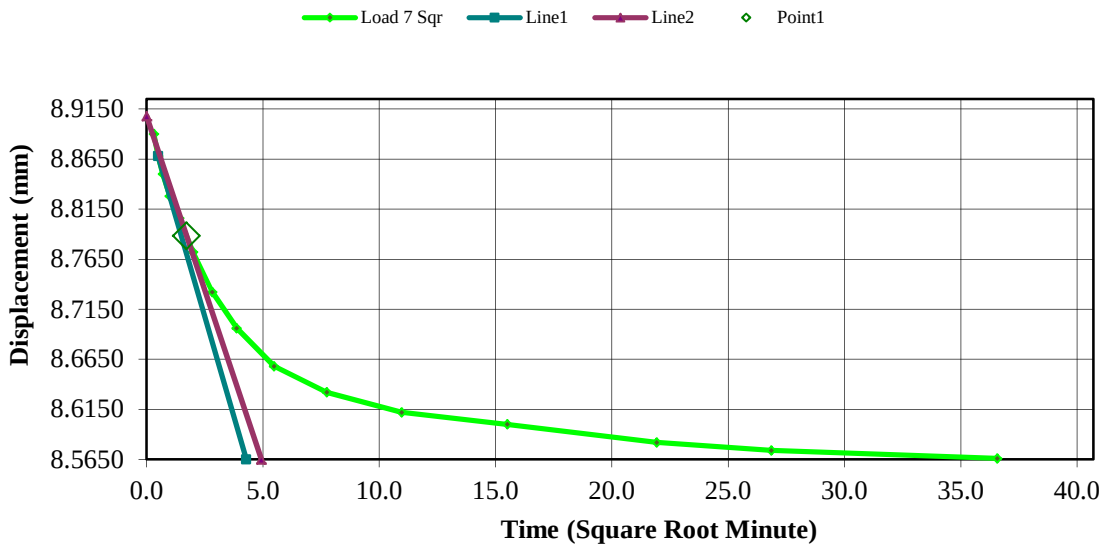
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.0060 | 0.8100 | 3.2400 | 0.4907 |
| 1 | 00:00:06 | 8.8900 | 0.9260 | 3.7040 | 0.4836 |
| 2 | 00:00:15 | 8.8680 | 0.9480 | 3.7920 | 0.4822 |
| 3 | 00:00:30 | 8.8500 | 0.9660 | 3.8640 | 0.4811 |
| 4 | 00:01:00 | 8.8280 | 0.9880 | 3.9520 | 0.4798 |
| 5 | 00:02:00 | 8.8060 | 1.0100 | 4.0400 | 0.4784 |
| 6 | 00:04:01 | 8.7720 | 1.0440 | 4.1760 | 0.4763 |
| 7 | 00:08:01 | 8.7320 | 1.0840 | 4.3360 | 0.4739 |
| 8 | 00:15:02 | 8.6960 | 1.1200 | 4.4800 | 0.4716 |
| 9 | 00:30:03 | 8.6580 | 1.1580 | 4.6320 | 0.4693 |
| 10 | 01:00:06 | 8.6320 | 1.1840 | 4.7360 | 0.4677 |
| 11 | 02:00:12 | 8.6120 | 1.2040 | 4.8160 | 0.4665 |
| 12 | 04:00:25 | 8.6000 | 1.2160 | 4.8640 | 0.4657 |
| 13 | 08:00:50 | 8.5820 | 1.2340 | 4.9360 | 0.4646 |
| 14 | 12:01:08 | 8.5740 | 1.2420 | 4.9680 | 0.4641 |
| 15 | 22:16:44 | 8.5660 | 1.2500 | 5.0000 | 0.4636 |

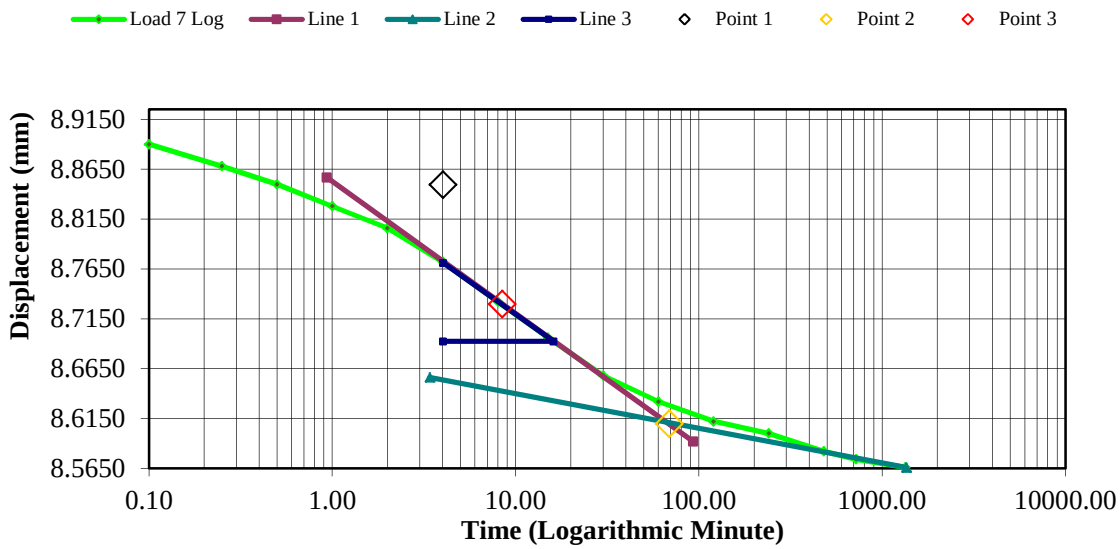
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

**Project:** SR1 **Project Number:** 3.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

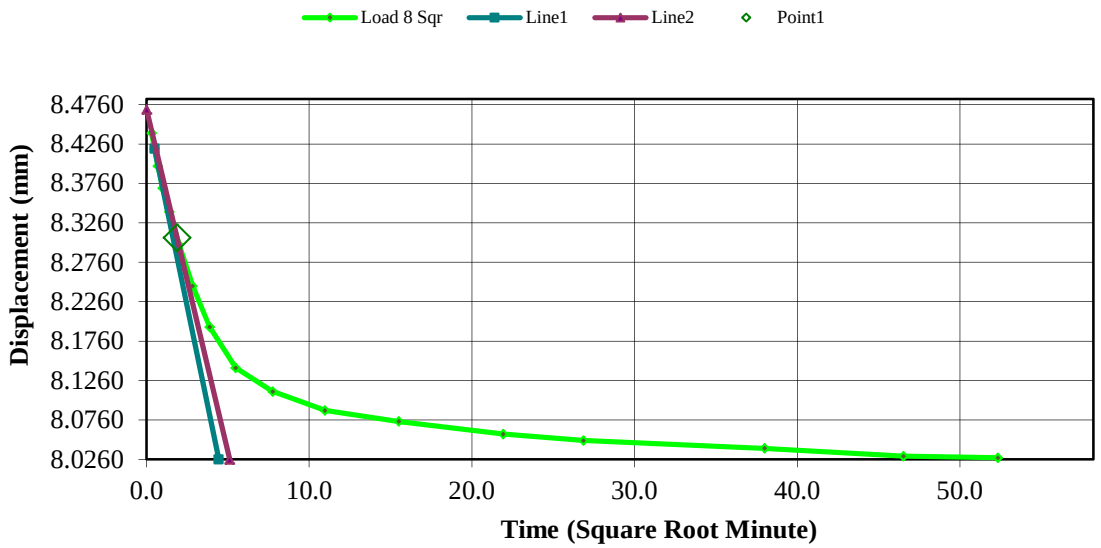
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.5660 | 1.2500 | 5.0000 | 0.4636 |
| 1 | 00:00:06 | 8.4400 | 1.3760 | 5.5040 | 0.4559 |
| 2 | 00:00:15 | 8.4200 | 1.3960 | 5.5840 | 0.4546 |
| 3 | 00:00:30 | 8.3980 | 1.4180 | 5.6720 | 0.4533 |
| 4 | 00:01:00 | 8.3700 | 1.4460 | 5.7840 | 0.4516 |
| 5 | 00:02:00 | 8.3400 | 1.4760 | 5.9040 | 0.4497 |
| 6 | 00:04:00 | 8.2980 | 1.5180 | 6.0720 | 0.4471 |
| 7 | 00:08:01 | 8.2460 | 1.5700 | 6.2800 | 0.4439 |
| 8 | 00:15:02 | 8.1940 | 1.6220 | 6.4880 | 0.4407 |
| 9 | 00:30:03 | 8.1420 | 1.6740 | 6.6960 | 0.4375 |
| 10 | 01:00:06 | 8.1120 | 1.7040 | 6.8160 | 0.4357 |
| 11 | 02:00:11 | 8.0880 | 1.7280 | 6.9120 | 0.4342 |
| 12 | 04:00:24 | 8.0740 | 1.7420 | 6.9680 | 0.4333 |
| 13 | 08:00:48 | 8.0580 | 1.7580 | 7.0320 | 0.4323 |
| 14 | 12:01:13 | 8.0500 | 1.7660 | 7.0640 | 0.4318 |
| 15 | 24:02:27 | 8.0400 | 1.7760 | 7.1040 | 0.4312 |
| 16 | 36:03:41 | 8.0300 | 1.7860 | 7.1440 | 0.4306 |
| 17 | 45:37:12 | 8.0280 | 1.7880 | 7.1520 | 0.4305 |

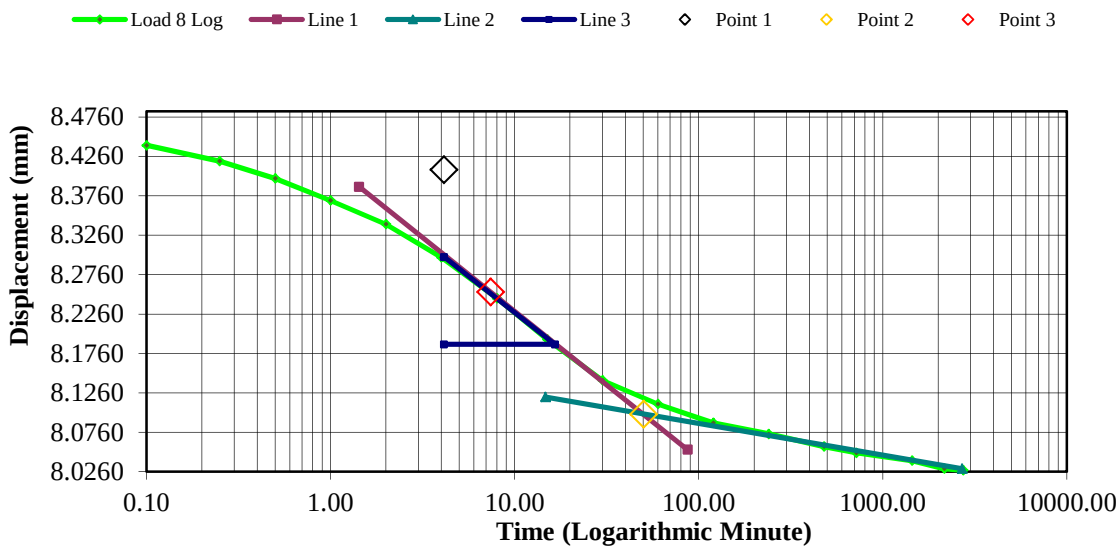
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

**Project:** SR1 **Project Number:** 3.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

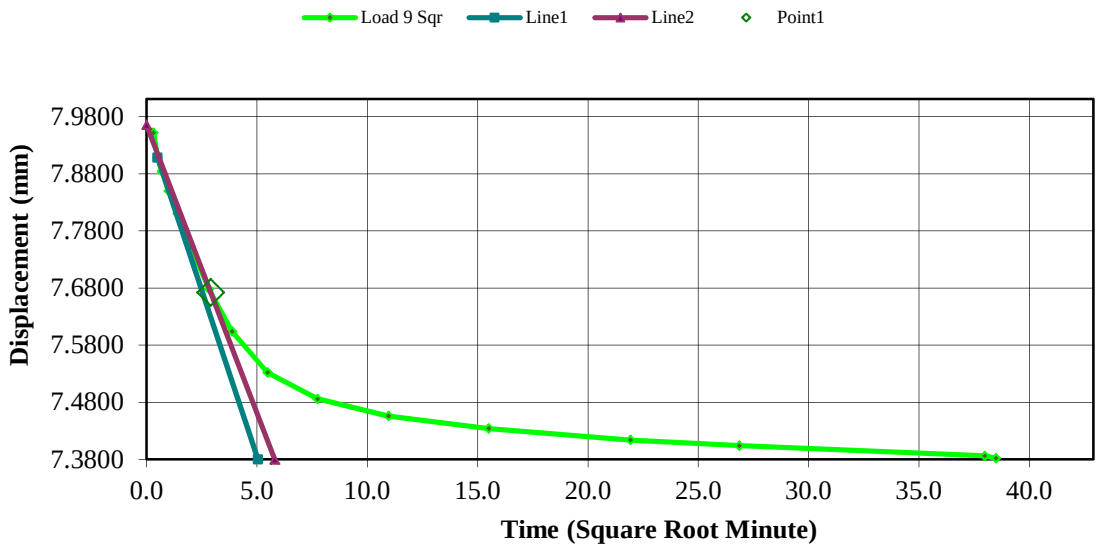
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.0280 | 1.7880 | 7.1520 | 0.4305 |
| 1 | 00:00:06 | 7.9520 | 1.8640 | 7.4560 | 0.4258 |
| 2 | 00:00:15 | 7.9080 | 1.9080 | 7.6320 | 0.4231 |
| 3 | 00:00:30 | 7.8840 | 1.9320 | 7.7280 | 0.4216 |
| 4 | 00:01:00 | 7.8500 | 1.9660 | 7.8640 | 0.4195 |
| 5 | 00:02:00 | 7.8100 | 2.0060 | 8.0240 | 0.4170 |
| 6 | 00:04:01 | 7.7520 | 2.0640 | 8.2560 | 0.4135 |
| 7 | 00:08:01 | 7.6780 | 2.1380 | 8.5520 | 0.4089 |
| 8 | 00:15:02 | 7.6040 | 2.2120 | 8.8480 | 0.4043 |
| 9 | 00:30:03 | 7.5320 | 2.2840 | 9.1360 | 0.3999 |
| 10 | 01:00:06 | 7.4860 | 2.3300 | 9.3200 | 0.3971 |
| 11 | 02:00:11 | 7.4560 | 2.3600 | 9.4400 | 0.3952 |
| 12 | 04:00:23 | 7.4340 | 2.3820 | 9.5280 | 0.3939 |
| 13 | 08:00:48 | 7.4140 | 2.4020 | 9.6080 | 0.3926 |
| 14 | 12:01:13 | 7.4040 | 2.4120 | 9.6480 | 0.3920 |
| 15 | 24:02:27 | 7.3860 | 2.4300 | 9.7200 | 0.3909 |
| 16 | 24:40:40 | 7.3820 | 2.4340 | 9.7360 | 0.3907 |

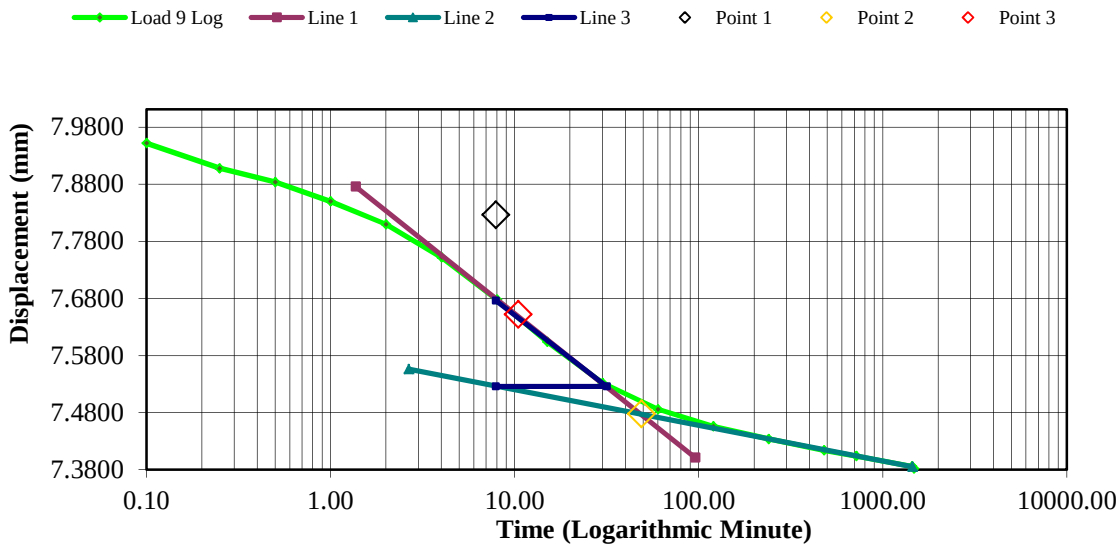
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

**Project:** SR1 **Project Number:** ).302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

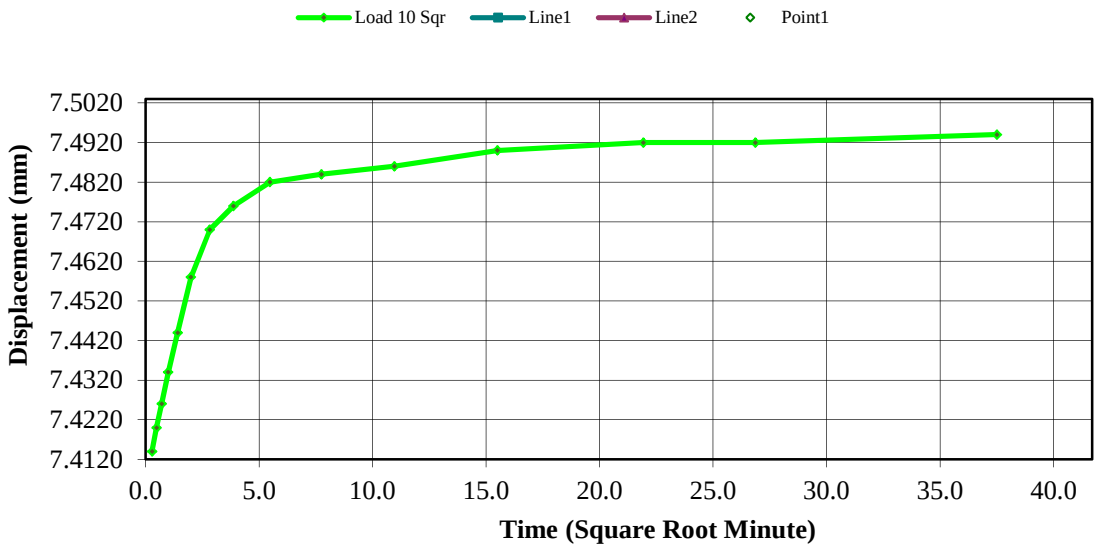
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.3820 | 2.4340 | 9.7360 | 0.3907 |
| 1 | 00:00:05 | 7.4140 | 2.4020 | 9.6080 | 0.3926 |
| 2 | 00:00:14 | 7.4200 | 2.3960 | 9.5840 | 0.3930 |
| 3 | 00:00:30 | 7.4260 | 2.3900 | 9.5600 | 0.3934 |
| 4 | 00:01:00 | 7.4340 | 2.3820 | 9.5280 | 0.3939 |
| 5 | 00:02:00 | 7.4440 | 2.3720 | 9.4880 | 0.3945 |
| 6 | 00:04:00 | 7.4580 | 2.3580 | 9.4320 | 0.3953 |
| 7 | 00:08:00 | 7.4700 | 2.3460 | 9.3840 | 0.3961 |
| 8 | 00:15:01 | 7.4760 | 2.3400 | 9.3600 | 0.3965 |
| 9 | 00:30:03 | 7.4820 | 2.3340 | 9.3360 | 0.3968 |
| 10 | 01:00:06 | 7.4840 | 2.3320 | 9.3280 | 0.3969 |
| 11 | 02:00:12 | 7.4860 | 2.3300 | 9.3200 | 0.3971 |
| 12 | 04:00:24 | 7.4900 | 2.3260 | 9.3040 | 0.3973 |
| 13 | 08:00:49 | 7.4920 | 2.3240 | 9.2960 | 0.3974 |
| 14 | 12:01:14 | 7.4920 | 2.3240 | 9.2960 | 0.3974 |
| 15 | 23:26:18 | 7.4940 | 2.3220 | 9.2880 | 0.3976 |

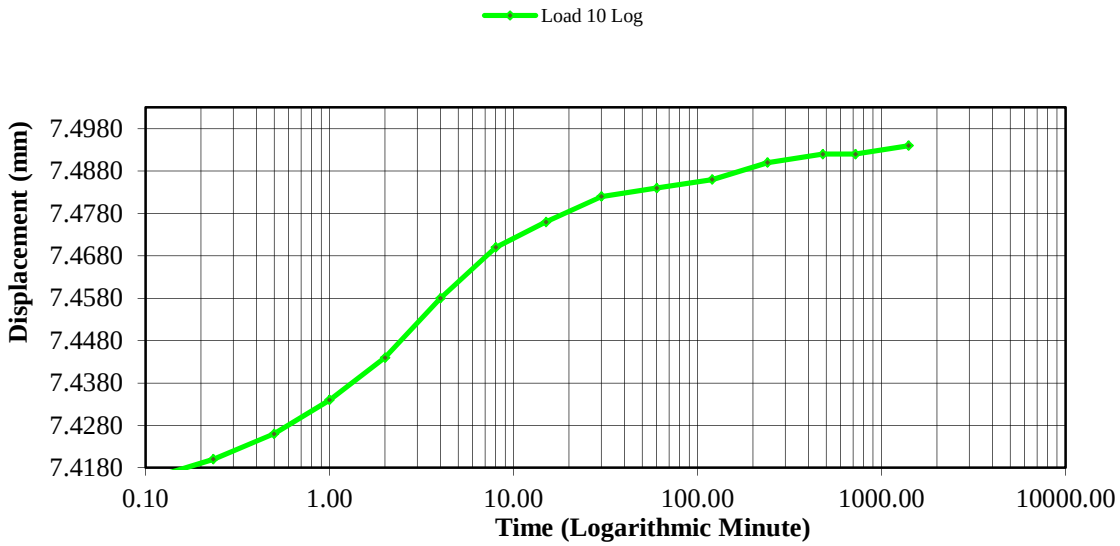
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

**Project:** SR1 **Project Number:** 3.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

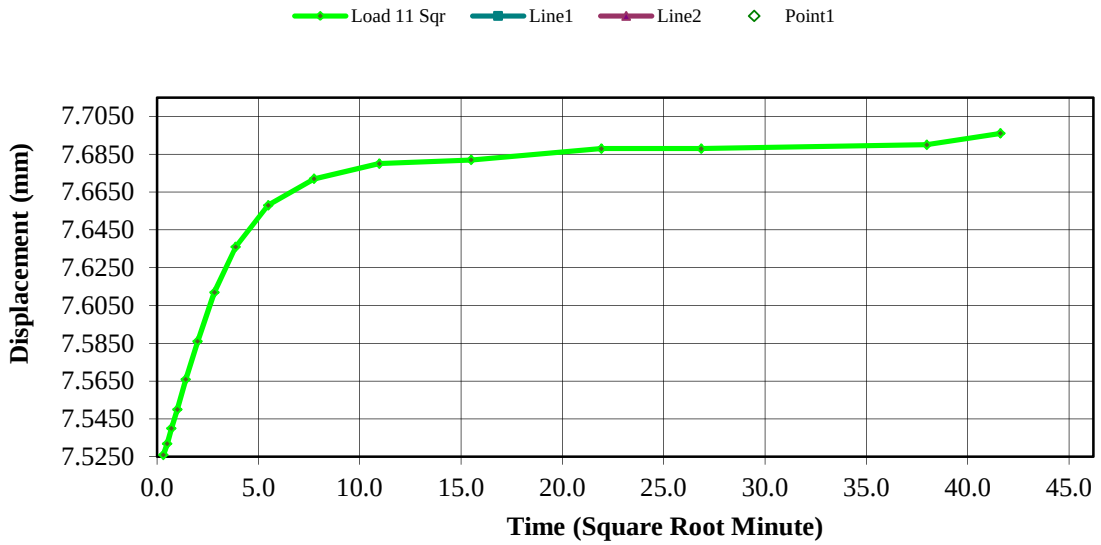
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.4940 | 2.3220 | 9.2880 | 0.3976 |
| 1 | 00:00:06 | 7.5260 | 2.2900 | 9.1600 | 0.3995 |
| 2 | 00:00:15 | 7.5320 | 2.2840 | 9.1360 | 0.3999 |
| 3 | 00:00:30 | 7.5400 | 2.2760 | 9.1040 | 0.4004 |
| 4 | 00:01:00 | 7.5500 | 2.2660 | 9.0640 | 0.4010 |
| 5 | 00:02:00 | 7.5660 | 2.2500 | 9.0000 | 0.4020 |
| 6 | 00:04:01 | 7.5860 | 2.2300 | 8.9200 | 0.4032 |
| 7 | 00:08:01 | 7.6120 | 2.2040 | 8.8160 | 0.4048 |
| 8 | 00:15:02 | 7.6360 | 2.1800 | 8.7200 | 0.4063 |
| 9 | 00:30:03 | 7.6580 | 2.1580 | 8.6320 | 0.4077 |
| 10 | 01:00:06 | 7.6720 | 2.1440 | 8.5760 | 0.4085 |
| 11 | 02:00:13 | 7.6800 | 2.1360 | 8.5440 | 0.4090 |
| 12 | 04:00:25 | 7.6820 | 2.1340 | 8.5360 | 0.4092 |
| 13 | 08:00:50 | 7.6880 | 2.1280 | 8.5120 | 0.4095 |
| 14 | 12:01:14 | 7.6880 | 2.1280 | 8.5120 | 0.4095 |
| 15 | 24:02:29 | 7.6900 | 2.1260 | 8.5040 | 0.4096 |
| 16 | 28:50:59 | 7.6960 | 2.1200 | 8.4800 | 0.4100 |

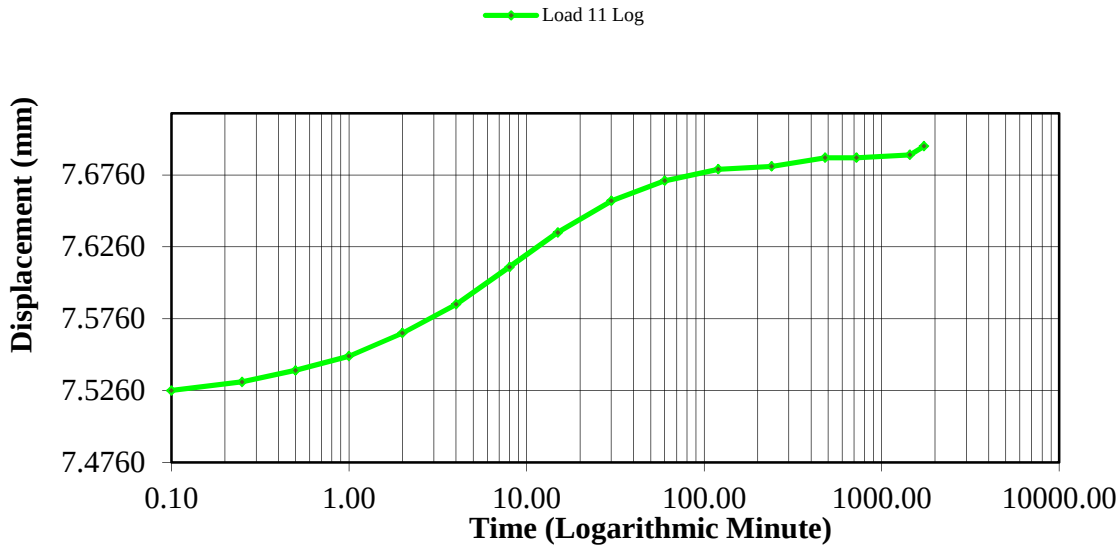
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

**Project:** SR1 **Project Number:** 3.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

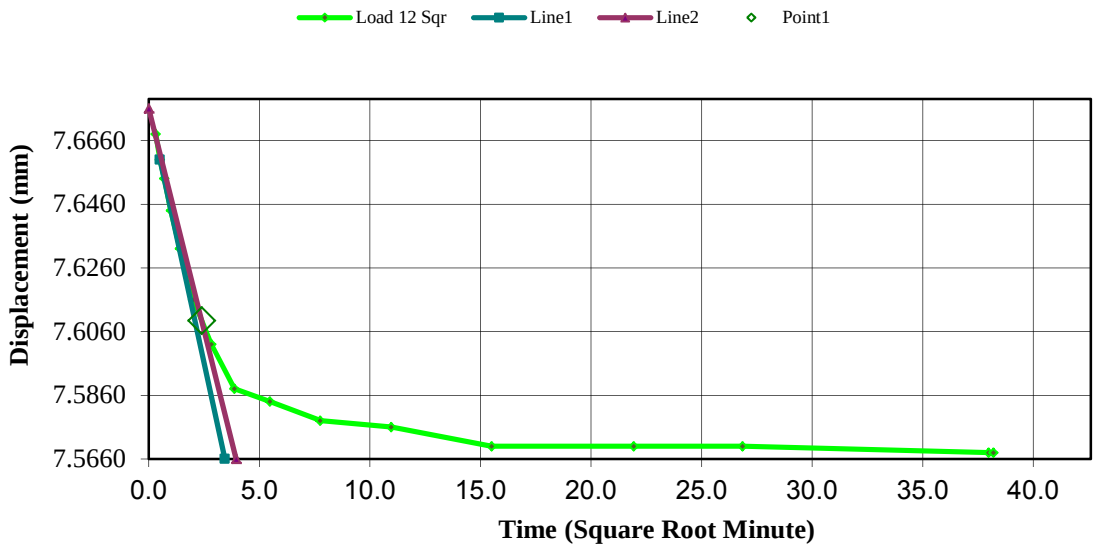
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.6960 | 2.1200 | 8.4800 | 0.4100 |
| 1 | 00:00:06 | 7.6680 | 2.1480 | 8.5920 | 0.4083 |
| 2 | 00:00:15 | 7.6600 | 2.1560 | 8.6240 | 0.4078 |
| 3 | 00:00:30 | 7.6540 | 2.1620 | 8.6480 | 0.4074 |
| 4 | 00:01:00 | 7.6440 | 2.1720 | 8.6880 | 0.4068 |
| 5 | 00:02:00 | 7.6320 | 2.1840 | 8.7360 | 0.4061 |
| 6 | 00:04:01 | 7.6160 | 2.2000 | 8.8000 | 0.4051 |
| 7 | 00:08:01 | 7.6020 | 2.2140 | 8.8560 | 0.4042 |
| 8 | 00:15:02 | 7.5880 | 2.2280 | 8.9120 | 0.4034 |
| 9 | 00:30:03 | 7.5840 | 2.2320 | 8.9280 | 0.4031 |
| 10 | 01:00:06 | 7.5780 | 2.2380 | 8.9520 | 0.4027 |
| 11 | 02:00:11 | 7.5760 | 2.2400 | 8.9600 | 0.4026 |
| 12 | 04:00:21 | 7.5700 | 2.2460 | 8.9840 | 0.4022 |
| 13 | 08:00:46 | 7.5700 | 2.2460 | 8.9840 | 0.4022 |
| 14 | 12:01:11 | 7.5700 | 2.2460 | 8.9840 | 0.4022 |
| 15 | 24:02:25 | 7.5680 | 2.2480 | 8.9920 | 0.4021 |
| 16 | 24:19:13 | 7.5680 | 2.2480 | 8.9920 | 0.4021 |

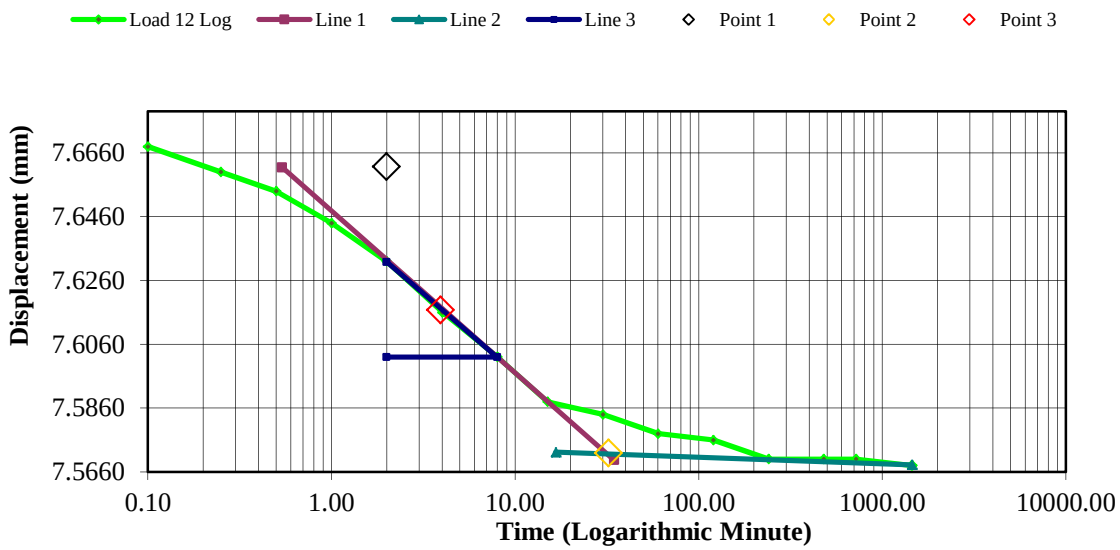
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

**Project:** SR1 **Project Number:** 3.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

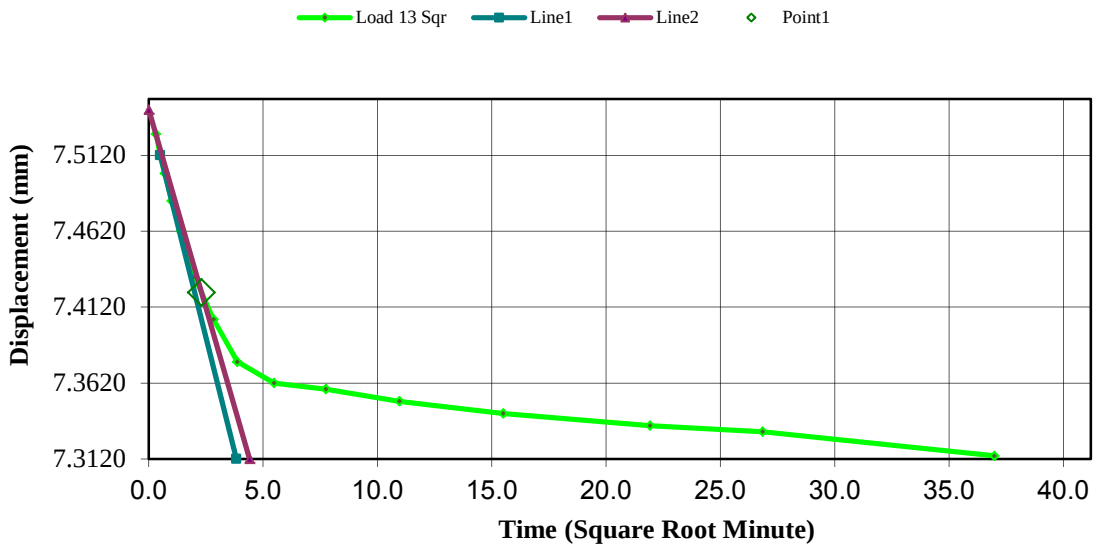
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.5680 | 2.2480 | 8.9920 | 0.4021 |
| 1 | 00:00:06 | 7.5260 | 2.2900 | 9.1600 | 0.3995 |
| 2 | 00:00:15 | 7.5120 | 2.3040 | 9.2160 | 0.3987 |
| 3 | 00:00:30 | 7.5000 | 2.3160 | 9.2640 | 0.3979 |
| 4 | 00:01:00 | 7.4820 | 2.3340 | 9.3360 | 0.3968 |
| 5 | 00:02:00 | 7.4620 | 2.3540 | 9.4160 | 0.3956 |
| 6 | 00:04:00 | 7.4320 | 2.3840 | 9.5360 | 0.3937 |
| 7 | 00:08:01 | 7.4040 | 2.4120 | 9.6480 | 0.3920 |
| 8 | 00:15:01 | 7.3760 | 2.4400 | 9.7600 | 0.3903 |
| 9 | 00:30:03 | 7.3620 | 2.4540 | 9.8160 | 0.3894 |
| 10 | 01:00:06 | 7.3580 | 2.4580 | 9.8320 | 0.3892 |
| 11 | 02:00:12 | 7.3500 | 2.4660 | 9.8640 | 0.3887 |
| 12 | 04:00:24 | 7.3420 | 2.4740 | 9.8960 | 0.3882 |
| 13 | 08:00:49 | 7.3340 | 2.4820 | 9.9280 | 0.3877 |
| 14 | 12:01:11 | 7.3300 | 2.4860 | 9.9440 | 0.3875 |
| 15 | 22:48:00 | 7.3140 | 2.5020 | 10.0080 | 0.3865 |

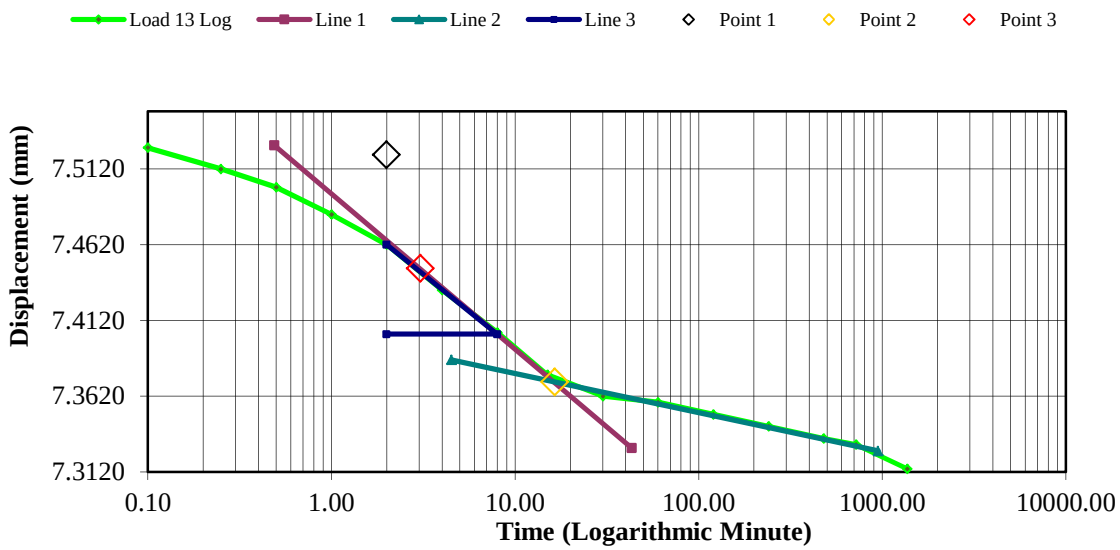
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 12-Sep-16
**Test Number:**

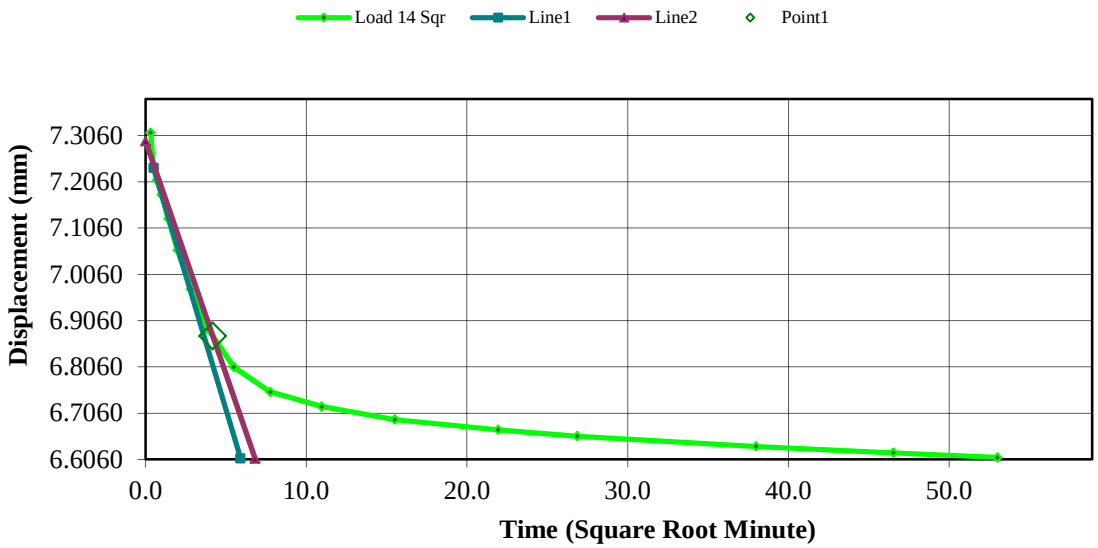
**Sample Number:** D30 ST4 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel
**Depth:** 1.70-2.15m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.3140 | 2.5020 | 10.0080 | 0.3865 |
| 1 | 00:00:06 | 7.3120 | 2.5040 | 10.0160 | 0.3864 |
| 2 | 00:00:15 | 7.2360 | 2.5800 | 10.3200 | 0.3817 |
| 3 | 00:00:30 | 7.2100 | 2.6060 | 10.4240 | 0.3801 |
| 4 | 00:01:00 | 7.1780 | 2.6380 | 10.5520 | 0.3781 |
| 5 | 00:02:00 | 7.1260 | 2.6900 | 10.7600 | 0.3749 |
| 6 | 00:04:00 | 7.0580 | 2.7580 | 11.0320 | 0.3707 |
| 7 | 00:08:01 | 6.9740 | 2.8420 | 11.3680 | 0.3655 |
| 8 | 00:15:02 | 6.8880 | 2.9280 | 11.7120 | 0.3602 |
| 9 | 00:30:03 | 6.8060 | 3.0100 | 12.0400 | 0.3552 |
| 10 | 01:00:06 | 6.7520 | 3.0640 | 12.2560 | 0.3518 |
| 11 | 02:00:12 | 6.7200 | 3.0960 | 12.3840 | 0.3499 |
| 12 | 04:00:25 | 6.6920 | 3.1240 | 12.4960 | 0.3481 |
| 13 | 08:00:49 | 6.6700 | 3.1460 | 12.5840 | 0.3468 |
| 14 | 12:01:14 | 6.6560 | 3.1600 | 12.6400 | 0.3459 |
| 15 | 24:02:27 | 6.6340 | 3.1820 | 12.7280 | 0.3446 |
| 16 | 36:03:41 | 6.6200 | 3.1960 | 12.7840 | 0.3437 |
| 17 | 46:47:34 | 6.6100 | 3.2060 | 12.8240 | 0.3431 |

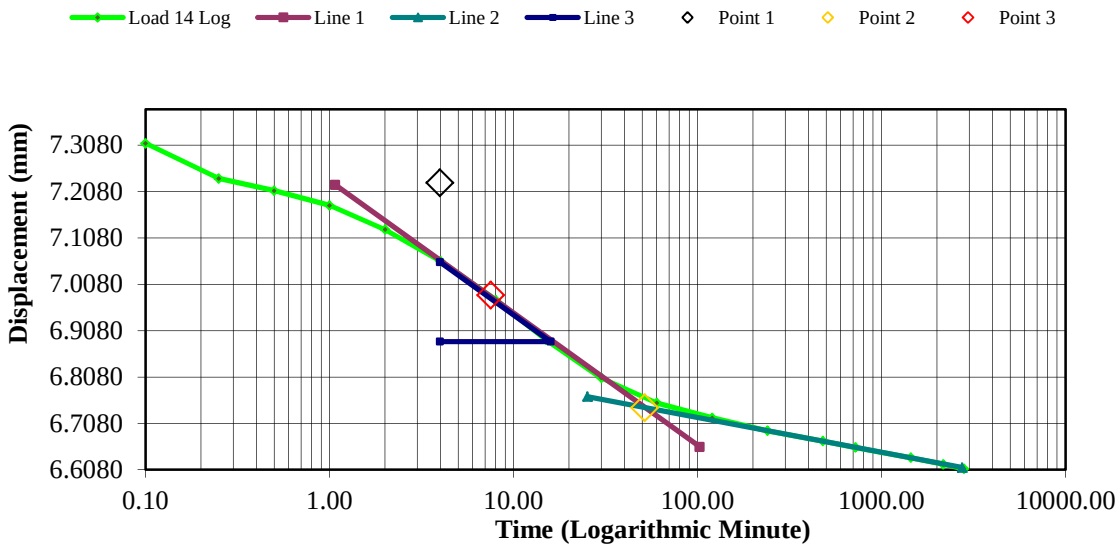
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



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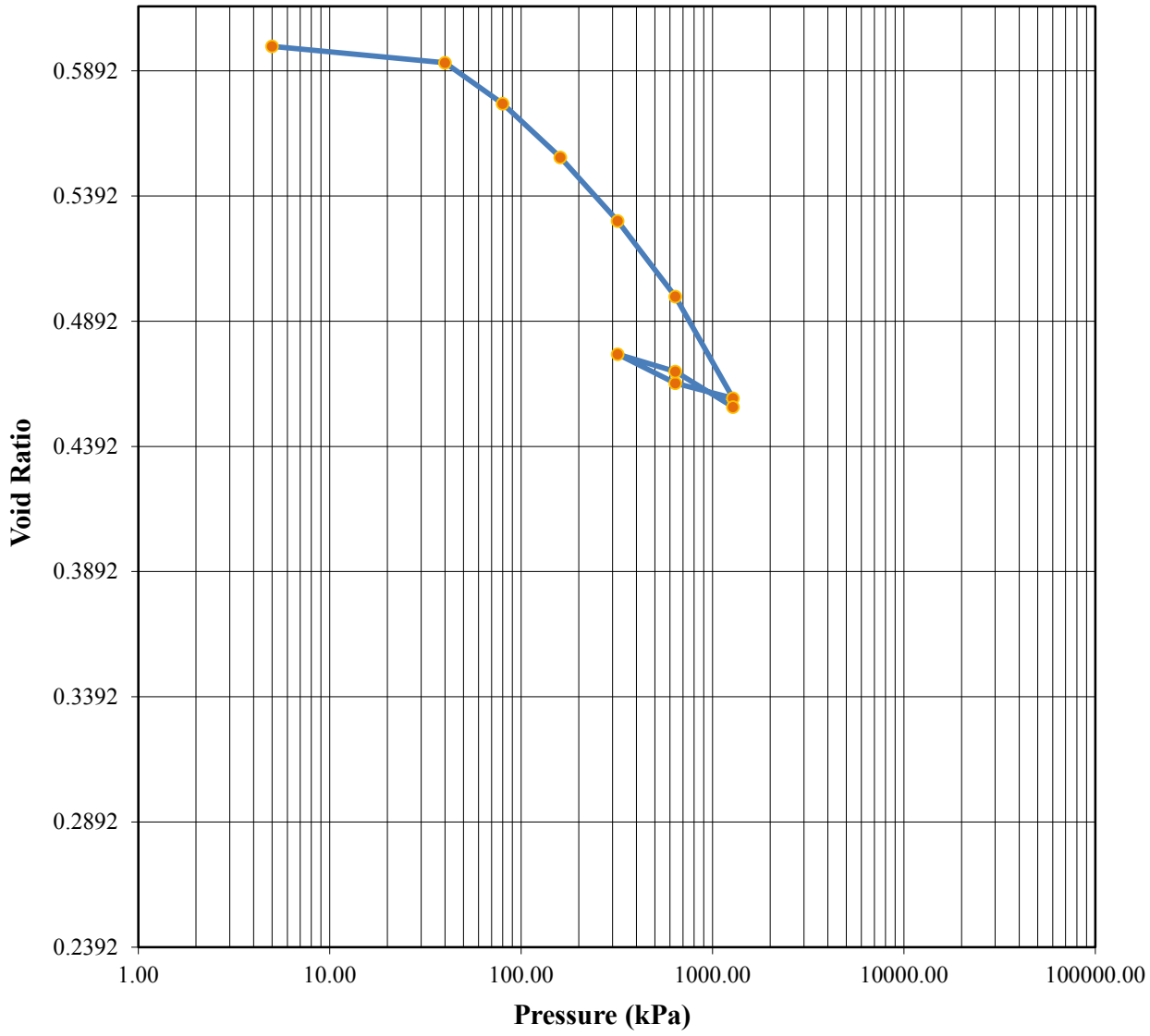
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 15-Sep-16 |
| **Moisture (%):** | 20.3 | 18.3 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.686 | 1.853 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 91.22 | 108.09 | | | | |
| **Void Ratio:** | 0.5981 | 0.4543 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.40-4.85m | **Remarks:** |
| **Sample Number:** | D30 ST10 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling. |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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## One-Dimensional Consolidation Test

## ASTM D2435

### Test Results

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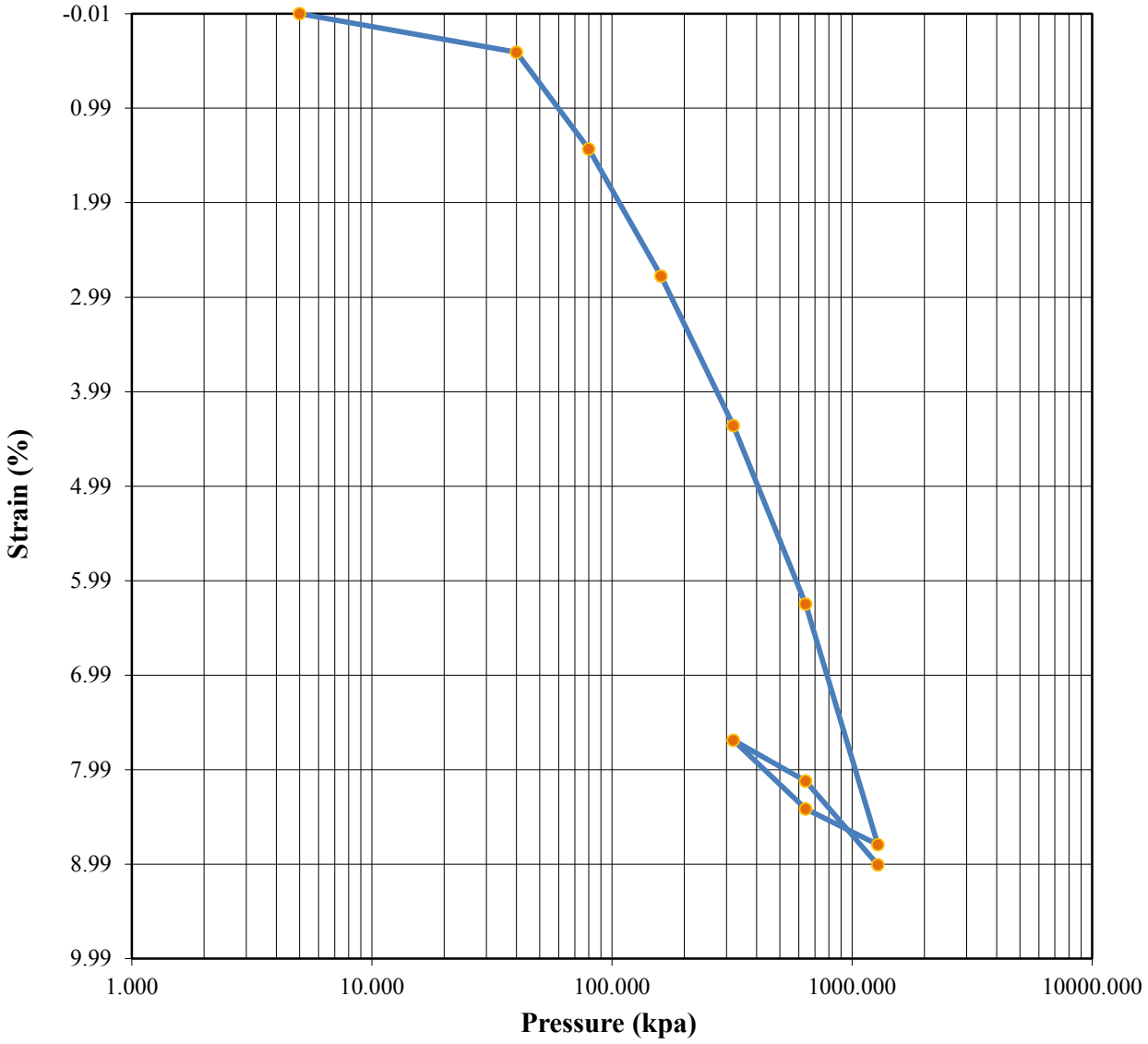


| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 20.3 | 18.3 | **Liquid Limits:** | - | **Test Date:** | 15-Sep-16 |
| **Dry Density (g/cm3):** | 1.686 | 1.853 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 91.22 | 108.09 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5981 | 0.4543 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.40-4.85m | **Remarks:** |
| **Sample Number:** | D30 ST10 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling. |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

### Test Results

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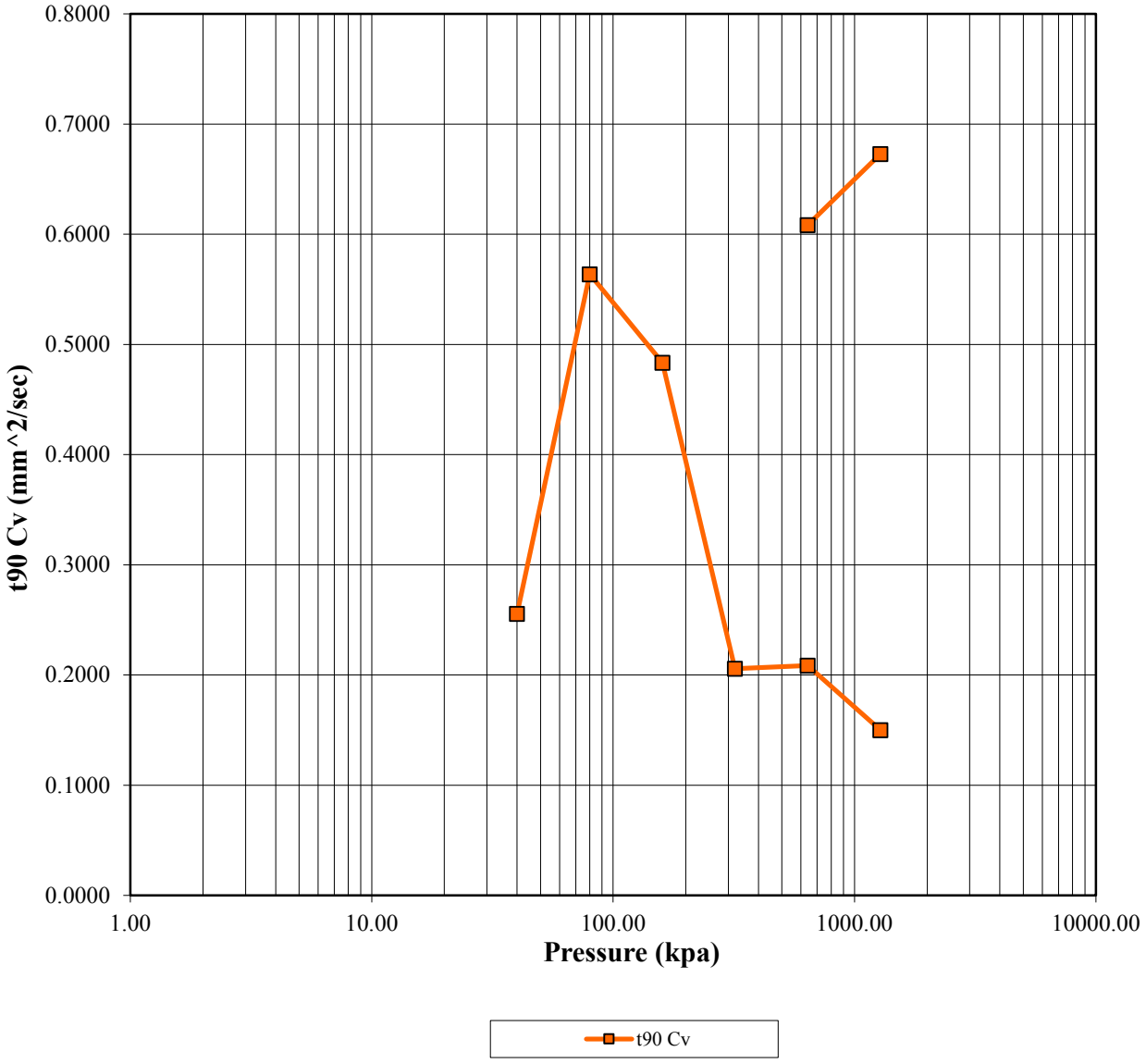


| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 20.3 | 18.3 | **Liquid Limits:** | - | **Test Date:** | 15-Sep-16 |
| **Dry Density (g/cm3):** | 1.686 | 1.853 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 91.22 | 108.09 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5981 | 0.4543 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.40-4.85m | **Remarks:** |
| **Sample Number:** | D30 ST10 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling. |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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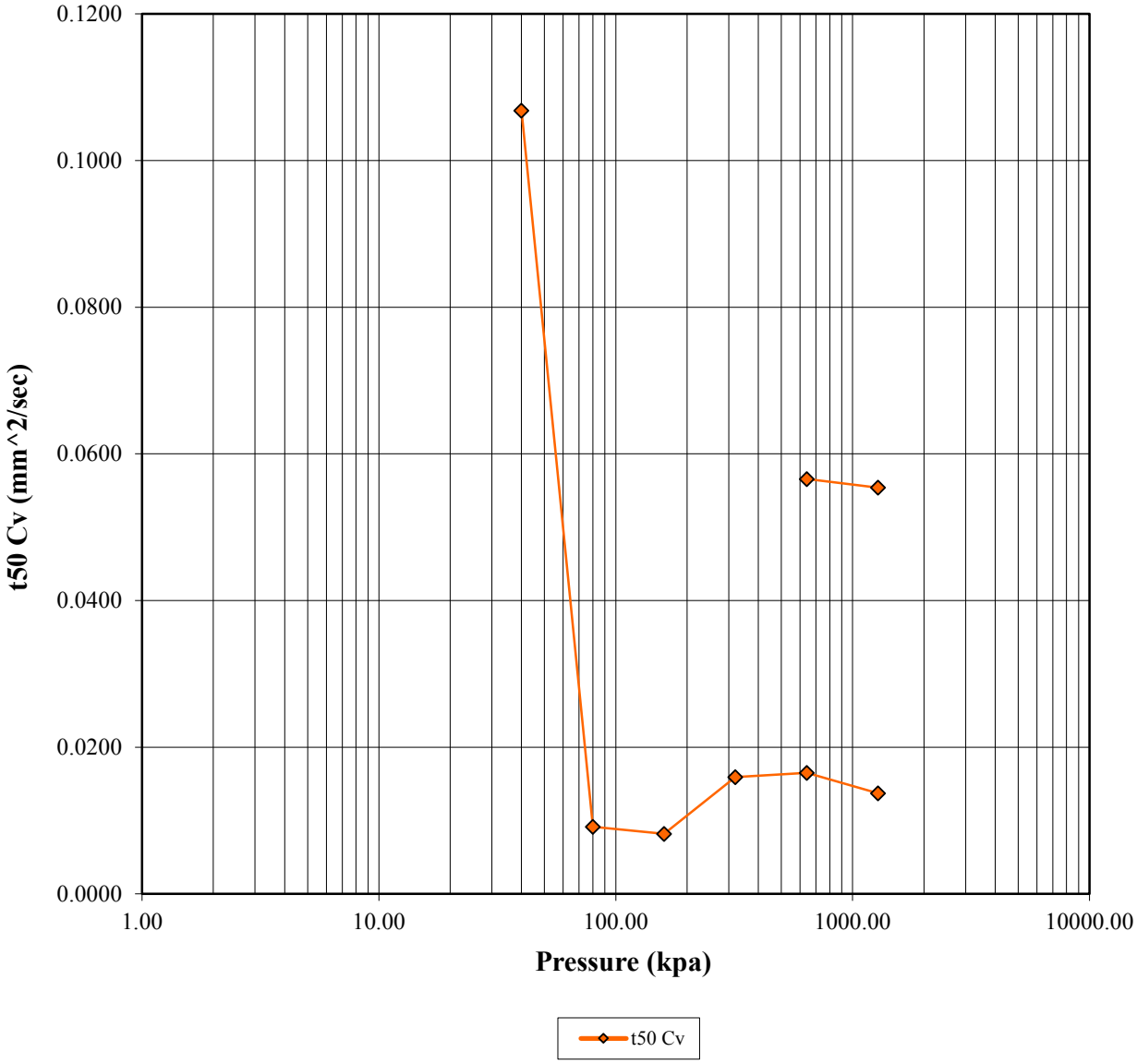
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 20.3 | 18.3 | **Liquid Limits:** | - | **Test Date:** | 15-Sep-16 |
| **Dry Density (g/cm3):** | 1.686 | 1.853 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 91.22 | 108.09 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5981 | 0.4543 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.40-4.85m | **Remarks:** |
| **Sample Number:** | D30 ST10 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling. |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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## One-Dimensional Consolidation Test

## ASTM D2435

### Test Results

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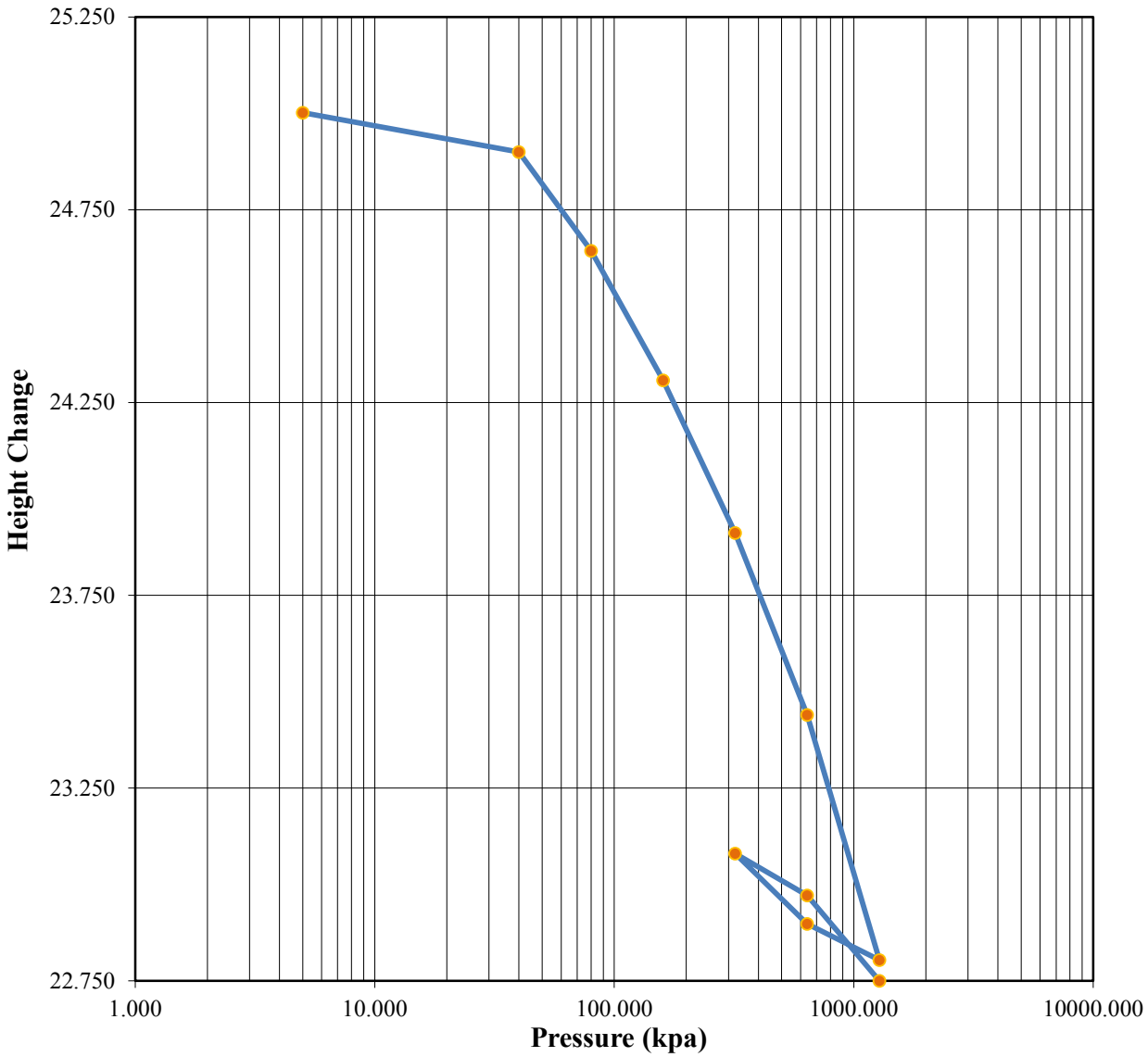


| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 20.3 | 18.3 | **Liquid Limits:** | - | **Test Date:** | 15-Sep-16 |
| **Dry Density (g/cm3):** | 1.686 | 1.853 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 91.22 | 108.09 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5981 | 0.4543 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.40-4.85m | **Remarks:** |
| **Sample Number:** | D30 ST10 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling. |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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# Stantec Consulting Ltd.
## One-Dimensional Consolidation Test
## ASTM D2435
### Summary

**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:**

**Sample Number:** D30 ST10 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:** **Test Number:**
**Sample Type:** Undisturbed **Test Date:** 15-Sep-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.0000 | 9.3638 | 0.00 | 0.5988 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | -0.0020 | 25.0020 | 9.3658 | -0.01 | 0.5990 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 10.000 | 0.0060 | 24.9940 | 9.3578 | 0.02 | 0.5985 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 20.000 | 0.0200 | 24.9800 | 9.3438 | 0.08 | 0.5976 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 40.000 | 0.1000 | 24.9000 | 9.2638 | 0.40 | 0.5925 | 8.577 | 4.765 | 0.255 | 0.107 |
| 5 | 80.000 | 0.3560 | 24.6440 | 9.0078 | 1.42 | 0.5761 | 3.806 | 54.618 | 0.564 | 0.009 |
| 6 | 160.000 | 0.6920 | 24.3080 | 8.6718 | 2.77 | 0.5546 | 4.318 | 59.264 | 0.483 | 0.008 |
| 7 | 320.000 | 1.0880 | 23.9120 | 8.2758 | 4.35 | 0.5293 | 9.821 | 29.456 | 0.206 | 0.016 |
| 8 | 640.000 | 1.5600 | 23.4400 | 7.8038 | 6.24 | 0.4991 | 9.305 | 27.307 | 0.209 | 0.017 |
| 9 | 1280.000 | 2.1960 | 22.8040 | 7.1678 | 8.78 | 0.4584 | 12.244 | 31.135 | 0.150 | 0.014 |
| 10 | 640.000 | 2.1020 | 22.8980 | 7.2618 | 8.41 | 0.4644 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 320.000 | 1.9200 | 23.0800 | 7.4438 | 7.68 | 0.4761 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 640.000 | 2.0280 | 22.9720 | 7.3358 | 8.11 | 0.4692 | 3.065 | 7.656 | 0.608 | 0.057 |
| 13 | 1280.000 | 2.2500 | 22.7500 | 7.1138 | 9.00 | 0.4550 | 2.718 | 7.671 | 0.673 | 0.055 |

**Tested By:** **Checked By:**

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16

**Sample Number:** D30 ST10 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** 0.0000 **Initial Void Ratio:** 0.5981 **Initial Height (mm):** 25.0000
**Plastic Limit:** 0.0000 **Plasticity Index (%):** 0.0000 **Initial Diameter (mm):** 63.6000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 207.6000

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 62.91 | 51.98 |
| Dry Soil + Container (g) | 52.52 | 44.15 |
| Weight of Container (g) | 1.42 | 1.36 |
| Moisture Content (%) | 20.33 | 18.30 |
| Void Ratio | 0.5981 | 0.4543 |
| Saturation (%) | 91.22 | 108.09 |
| Dry Density (g/cm3) | 1.69 | 1.85 |

**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

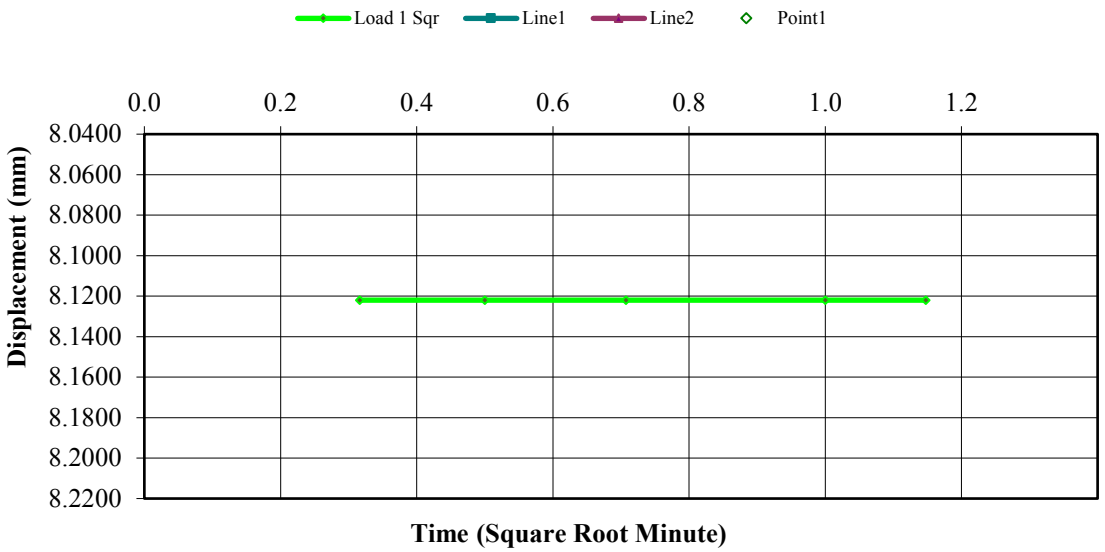
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.1240 | 0.0000 | 0.0000 | 0.5981 |
| 1 | 00:00:06 | 8.1220 | -0.0020 | -0.0080 | 0.5983 |
| 2 | 00:00:15 | 8.1220 | -0.0020 | -0.0080 | 0.5983 |
| 3 | 00:00:30 | 8.1220 | -0.0020 | -0.0080 | 0.5983 |
| 4 | 00:01:00 | 8.1220 | -0.0020 | -0.0080 | 0.5983 |
| 5 | 00:01:19 | 8.1220 | -0.0020 | -0.0080 | 0.5983 |

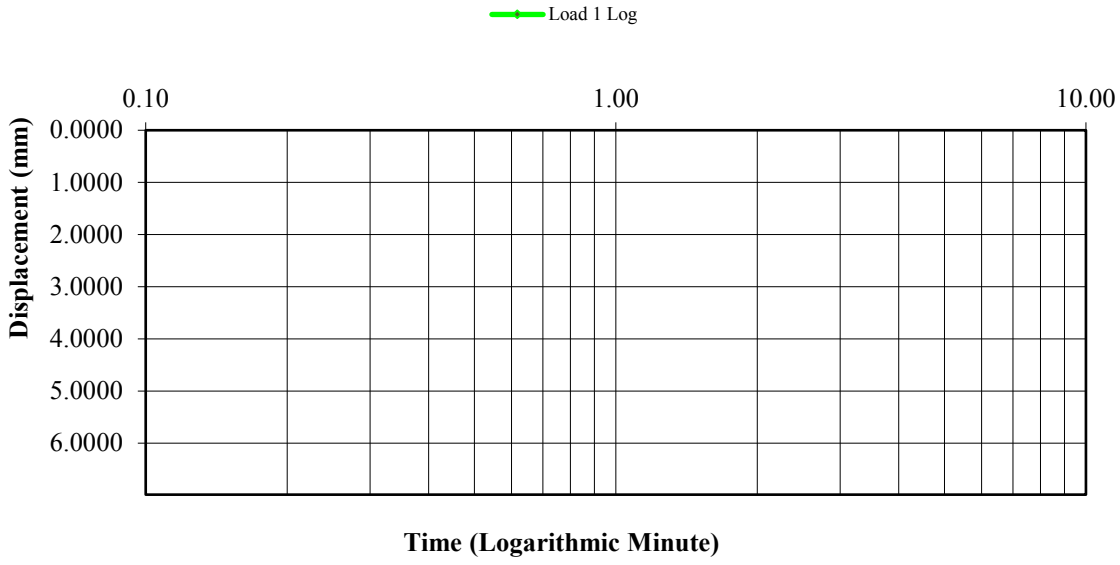
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 2) Load 10.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

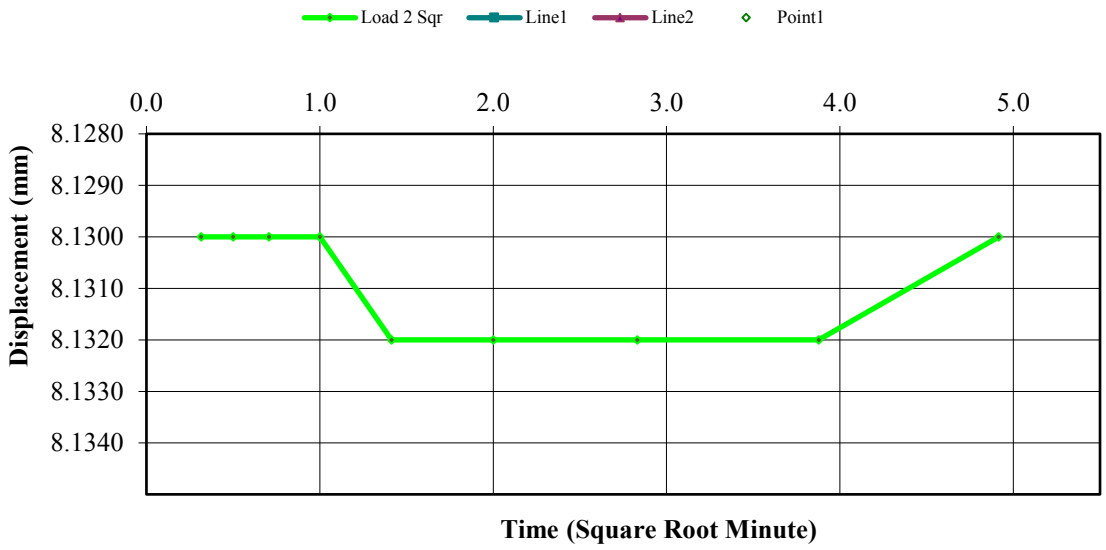
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.1220 | -0.0020 | -0.0080 | 0.5983 |
| 1 | 00:00:06 | 8.1300 | 0.0060 | 0.0240 | 0.5977 |
| 2 | 00:00:15 | 8.1300 | 0.0060 | 0.0240 | 0.5977 |
| 3 | 00:00:30 | 8.1300 | 0.0060 | 0.0240 | 0.5977 |
| 4 | 00:01:00 | 8.1300 | 0.0060 | 0.0240 | 0.5977 |
| 5 | 00:02:00 | 8.1320 | 0.0080 | 0.0320 | 0.5976 |
| 6 | 00:04:00 | 8.1320 | 0.0080 | 0.0320 | 0.5976 |
| 7 | 00:08:01 | 8.1320 | 0.0080 | 0.0320 | 0.5976 |
| 8 | 00:15:02 | 8.1320 | 0.0080 | 0.0320 | 0.5976 |
| 9 | 00:24:10 | 8.1300 | 0.0060 | 0.0240 | 0.5977 |

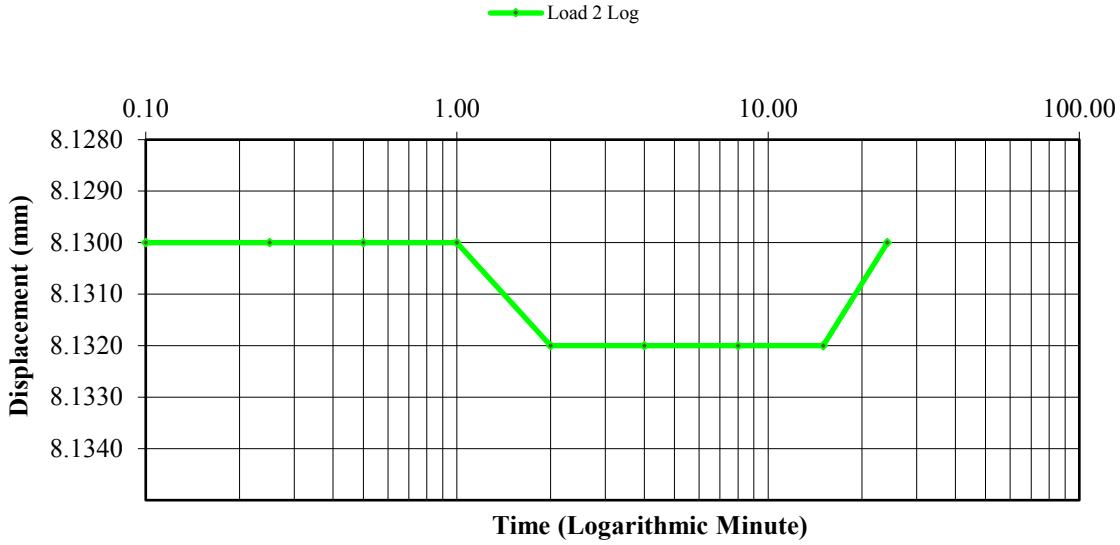
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 2) Load 10.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 3) Load 20.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

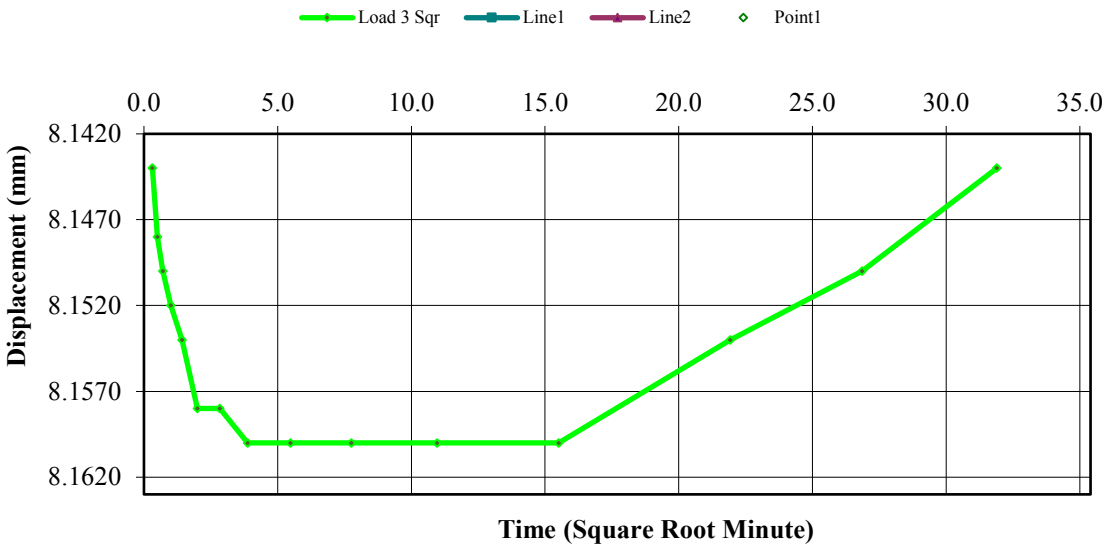
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.1300 | 0.0060 | 0.0240 | 0.5977 |
| 1 | 00:00:06 | 8.1440 | 0.0200 | 0.0800 | 0.5968 |
| 2 | 00:00:15 | 8.1480 | 0.0240 | 0.0960 | 0.5966 |
| 3 | 00:00:30 | 8.1500 | 0.0260 | 0.1040 | 0.5965 |
| 4 | 00:01:00 | 8.1520 | 0.0280 | 0.1120 | 0.5963 |
| 5 | 00:02:01 | 8.1540 | 0.0300 | 0.1200 | 0.5962 |
| 6 | 00:04:01 | 8.1580 | 0.0340 | 0.1360 | 0.5960 |
| 7 | 00:08:01 | 8.1580 | 0.0340 | 0.1360 | 0.5960 |
| 8 | 00:15:02 | 8.1600 | 0.0360 | 0.1440 | 0.5958 |
| 9 | 00:30:03 | 8.1600 | 0.0360 | 0.1440 | 0.5958 |
| 10 | 01:00:07 | 8.1600 | 0.0360 | 0.1440 | 0.5958 |
| 11 | 02:00:13 | 8.1600 | 0.0360 | 0.1440 | 0.5958 |
| 12 | 04:00:25 | 8.1600 | 0.0360 | 0.1440 | 0.5958 |
| 13 | 08:00:50 | 8.1540 | 0.0300 | 0.1200 | 0.5962 |
| 14 | 12:01:15 | 8.1500 | 0.0260 | 0.1040 | 0.5965 |
| 15 | 16:57:23 | 8.1440 | 0.0200 | 0.0800 | 0.5968 |

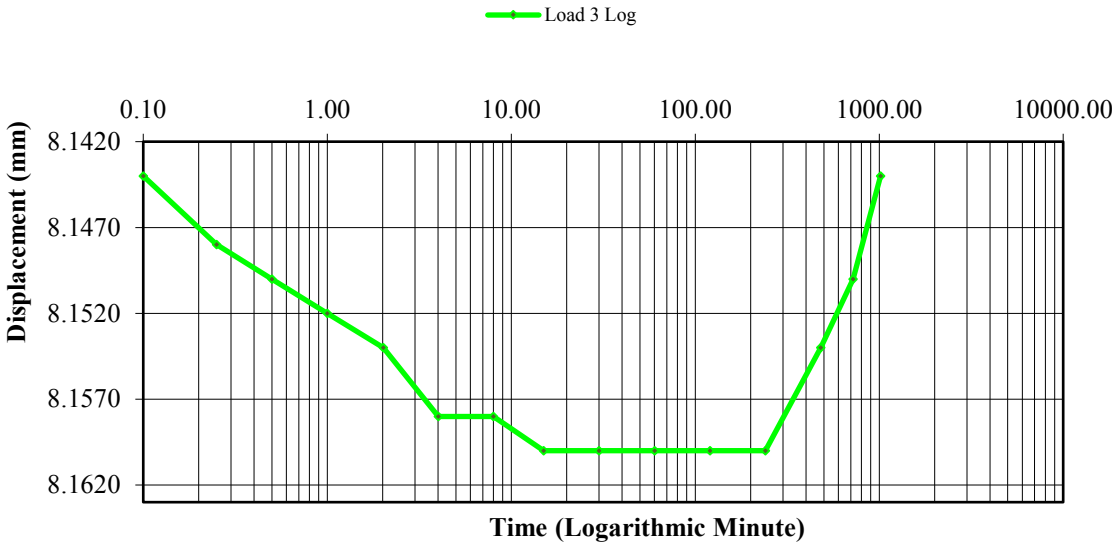
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 3) Load 20.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

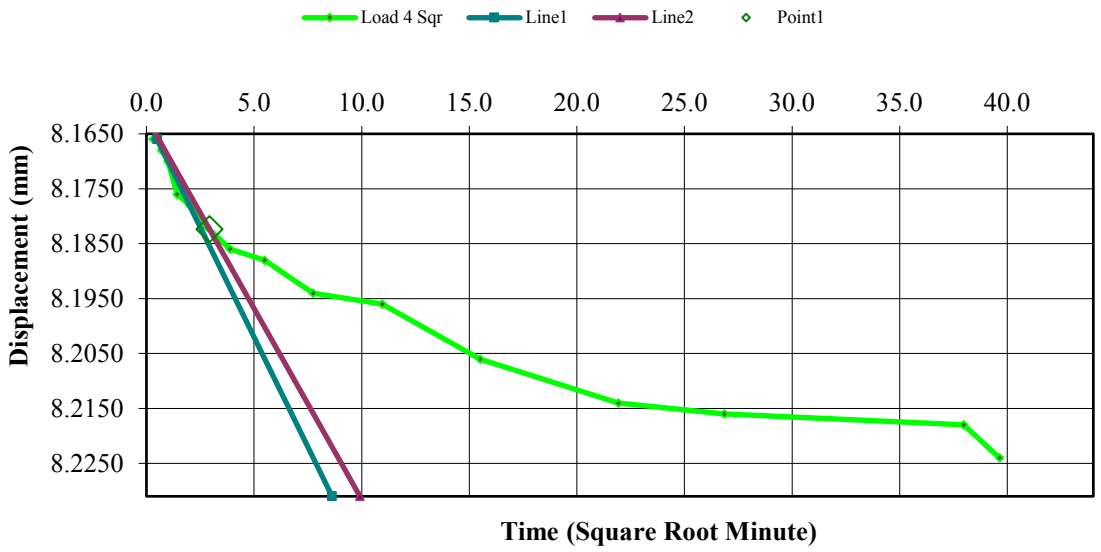
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.1440 | 0.0200 | 0.0800 | 0.5968 |
| 1 | 00:00:06 | 8.1660 | 0.0420 | 0.1680 | 0.5954 |
| 2 | 00:00:15 | 8.1660 | 0.0420 | 0.1680 | 0.5954 |
| 3 | 00:00:30 | 8.1680 | 0.0440 | 0.1760 | 0.5953 |
| 4 | 00:01:00 | 8.1700 | 0.0460 | 0.1840 | 0.5952 |
| 5 | 00:02:01 | 8.1760 | 0.0520 | 0.2080 | 0.5948 |
| 6 | 00:04:01 | 8.1780 | 0.0540 | 0.2160 | 0.5947 |
| 7 | 00:08:01 | 8.1820 | 0.0580 | 0.2320 | 0.5944 |
| 8 | 00:15:02 | 8.1860 | 0.0620 | 0.2480 | 0.5942 |
| 9 | 00:30:03 | 8.1880 | 0.0640 | 0.2560 | 0.5940 |
| 10 | 01:00:07 | 8.1940 | 0.0700 | 0.2800 | 0.5937 |
| 11 | 02:00:13 | 8.1960 | 0.0720 | 0.2880 | 0.5935 |
| 12 | 04:00:25 | 8.2060 | 0.0820 | 0.3280 | 0.5929 |
| 13 | 08:00:50 | 8.2140 | 0.0900 | 0.3600 | 0.5924 |
| 14 | 12:01:15 | 8.2160 | 0.0920 | 0.3680 | 0.5922 |
| 15 | 24:02:13 | 8.2180 | 0.0940 | 0.3760 | 0.5921 |
| 16 | 26:11:13 | 8.2240 | 0.1000 | 0.4000 | 0.5917 |

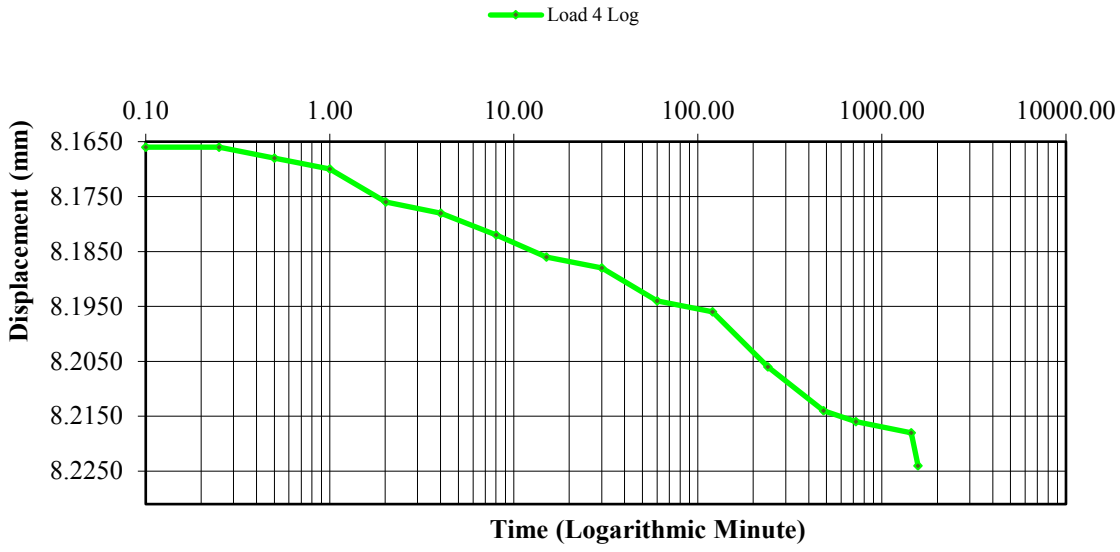
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

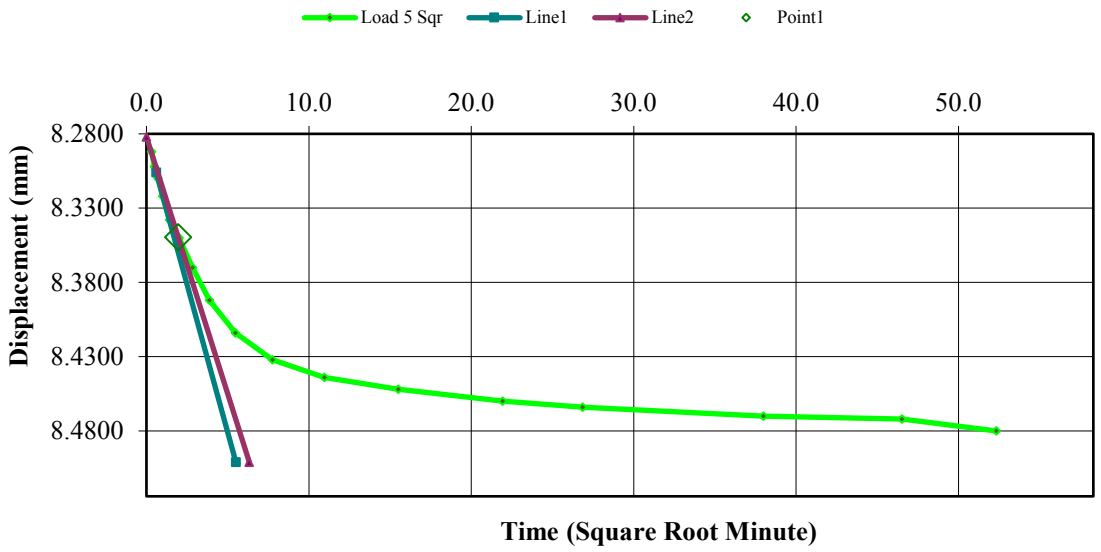
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.2240 | 0.1000 | 0.4000 | 0.5917 |
| 1 | 00:00:06 | 8.2920 | 0.1680 | 0.6720 | 0.5874 |
| 2 | 00:00:15 | 8.3020 | 0.1780 | 0.7120 | 0.5867 |
| 3 | 00:00:30 | 8.3100 | 0.1860 | 0.7440 | 0.5862 |
| 4 | 00:01:00 | 8.3220 | 0.1980 | 0.7920 | 0.5855 |
| 5 | 00:02:00 | 8.3380 | 0.2140 | 0.8560 | 0.5844 |
| 6 | 00:04:01 | 8.3500 | 0.2260 | 0.9040 | 0.5837 |
| 7 | 00:08:01 | 8.3700 | 0.2460 | 0.9840 | 0.5824 |
| 8 | 00:15:02 | 8.3920 | 0.2680 | 1.0720 | 0.5810 |
| 9 | 00:30:03 | 8.4140 | 0.2900 | 1.1600 | 0.5796 |
| 10 | 01:00:06 | 8.4320 | 0.3080 | 1.2320 | 0.5784 |
| 11 | 02:00:11 | 8.4440 | 0.3200 | 1.2800 | 0.5777 |
| 12 | 04:00:24 | 8.4520 | 0.3280 | 1.3120 | 0.5772 |
| 13 | 08:00:48 | 8.4600 | 0.3360 | 1.3440 | 0.5766 |
| 14 | 12:01:13 | 8.4640 | 0.3400 | 1.3600 | 0.5764 |
| 15 | 24:02:27 | 8.4700 | 0.3460 | 1.3840 | 0.5760 |
| 16 | 36:03:41 | 8.4720 | 0.3480 | 1.3920 | 0.5759 |
| 17 | 45:38:12 | 8.4800 | 0.3560 | 1.4240 | 0.5754 |

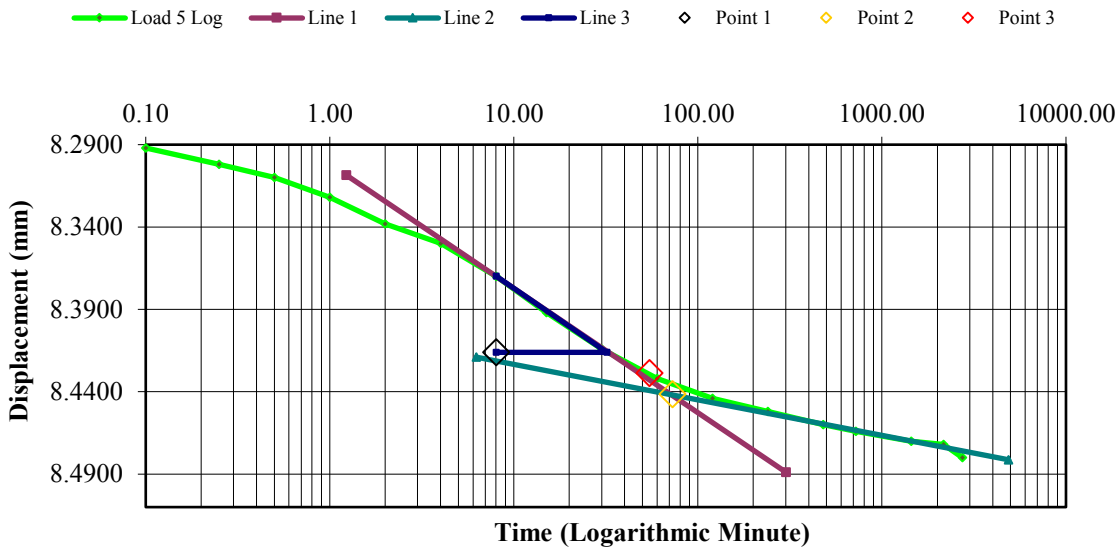
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

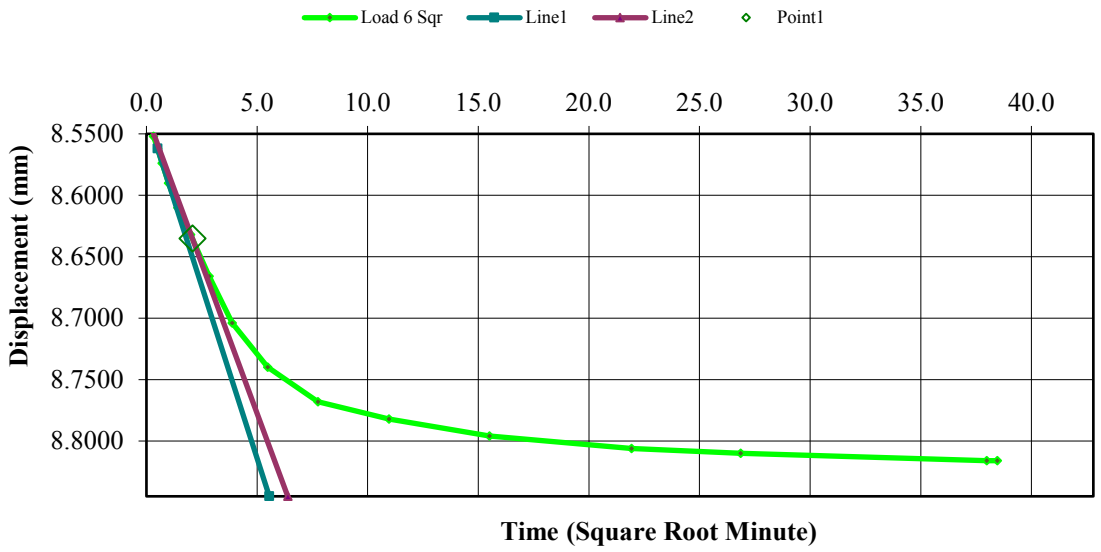
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.4800 | 0.3560 | 1.4240 | 0.5754 |
| 1 | 00:00:06 | 8.5520 | 0.4280 | 1.7120 | 0.5708 |
| 2 | 00:00:15 | 8.5620 | 0.4380 | 1.7520 | 0.5701 |
| 3 | 00:00:30 | 8.5740 | 0.4500 | 1.8000 | 0.5694 |
| 4 | 00:01:00 | 8.5900 | 0.4660 | 1.8640 | 0.5683 |
| 5 | 00:02:00 | 8.6100 | 0.4860 | 1.9440 | 0.5671 |
| 6 | 00:04:00 | 8.6320 | 0.5080 | 2.0320 | 0.5657 |
| 7 | 00:08:01 | 8.6660 | 0.5420 | 2.1680 | 0.5635 |
| 8 | 00:15:01 | 8.7040 | 0.5800 | 2.3200 | 0.5611 |
| 9 | 00:30:03 | 8.7400 | 0.6160 | 2.4640 | 0.5588 |
| 10 | 01:00:05 | 8.7680 | 0.6440 | 2.5760 | 0.5570 |
| 11 | 02:00:11 | 8.7820 | 0.6580 | 2.6320 | 0.5561 |
| 12 | 04:00:23 | 8.7960 | 0.6720 | 2.6880 | 0.5552 |
| 13 | 08:00:48 | 8.8060 | 0.6820 | 2.7280 | 0.5545 |
| 14 | 12:01:13 | 8.8100 | 0.6860 | 2.7440 | 0.5543 |
| 15 | 24:02:26 | 8.8160 | 0.6920 | 2.7680 | 0.5539 |
| 16 | 24:38:57 | 8.8160 | 0.6920 | 2.7680 | 0.5539 |

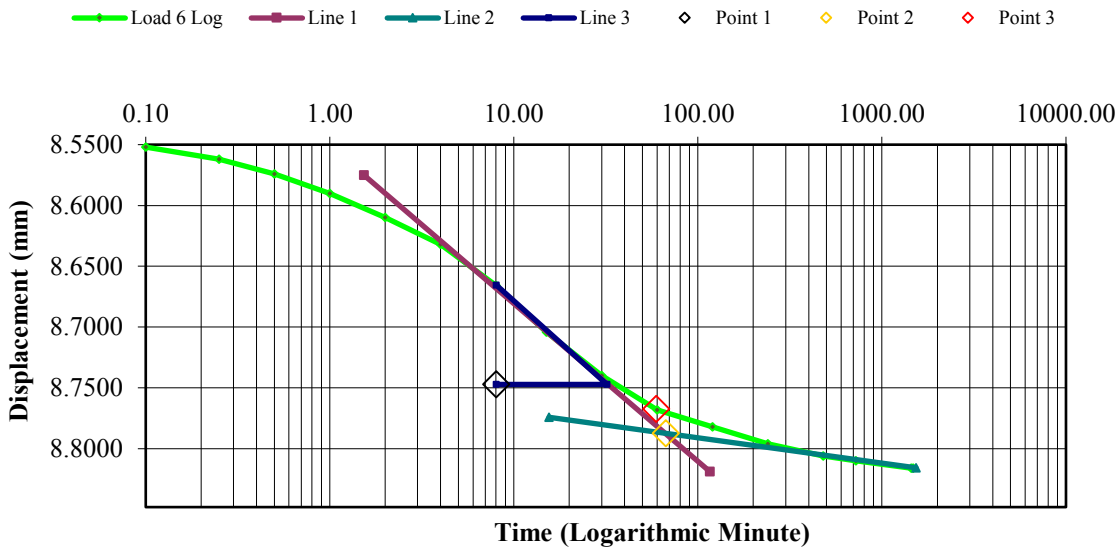
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

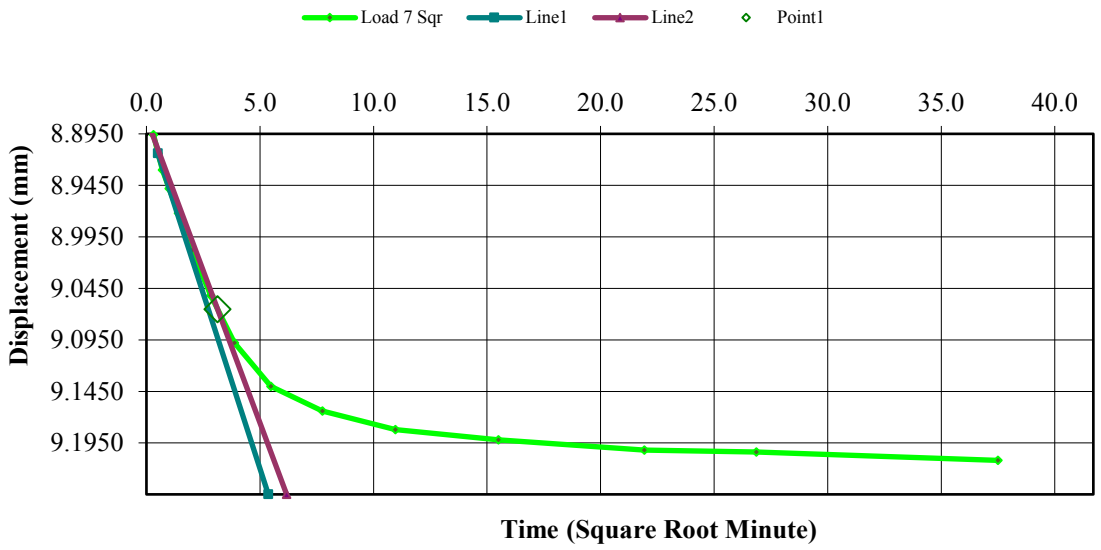
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.8160 | 0.6920 | 2.7680 | 0.5539 |
| 1 | 00:00:06 | 8.8960 | 0.7720 | 3.0880 | 0.5488 |
| 2 | 00:00:15 | 8.9140 | 0.7900 | 3.1600 | 0.5476 |
| 3 | 00:00:30 | 8.9300 | 0.8060 | 3.2240 | 0.5466 |
| 4 | 00:01:00 | 8.9480 | 0.8240 | 3.2960 | 0.5455 |
| 5 | 00:02:00 | 8.9720 | 0.8480 | 3.3920 | 0.5439 |
| 6 | 00:04:00 | 9.0080 | 0.8840 | 3.5360 | 0.5416 |
| 7 | 00:08:01 | 9.0520 | 0.9280 | 3.7120 | 0.5388 |
| 8 | 00:15:02 | 9.0980 | 0.9740 | 3.8960 | 0.5359 |
| 9 | 00:30:03 | 9.1400 | 1.0160 | 4.0640 | 0.5332 |
| 10 | 01:00:06 | 9.1640 | 1.0400 | 4.1600 | 0.5316 |
| 11 | 02:00:12 | 9.1820 | 1.0580 | 4.2320 | 0.5305 |
| 12 | 04:00:25 | 9.1920 | 1.0680 | 4.2720 | 0.5299 |
| 13 | 08:00:50 | 9.2020 | 1.0780 | 4.3120 | 0.5292 |
| 14 | 12:01:14 | 9.2040 | 1.0800 | 4.3200 | 0.5291 |
| 15 | 23:26:30 | 9.2120 | 1.0880 | 4.3520 | 0.5286 |

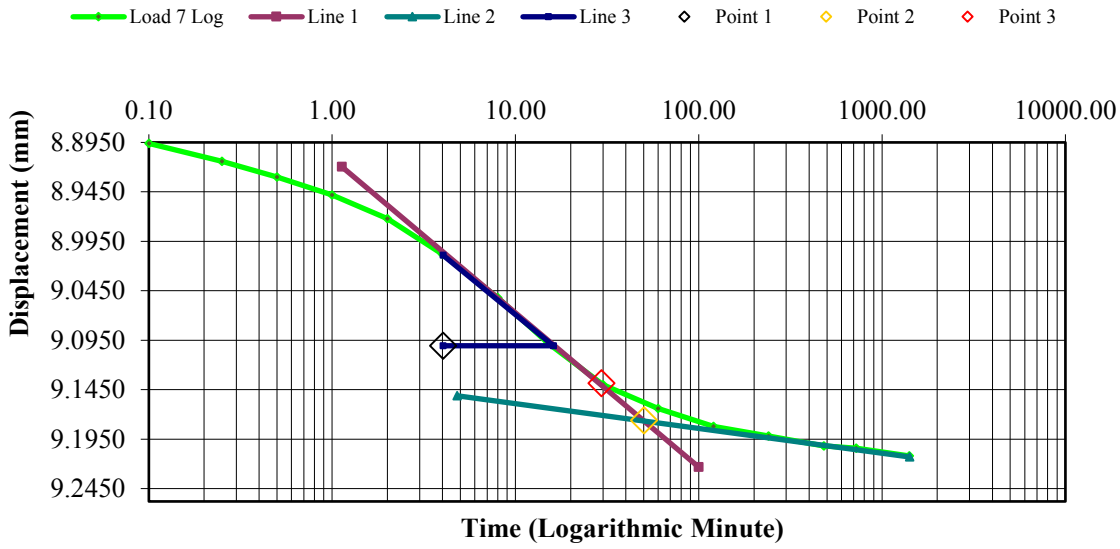
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

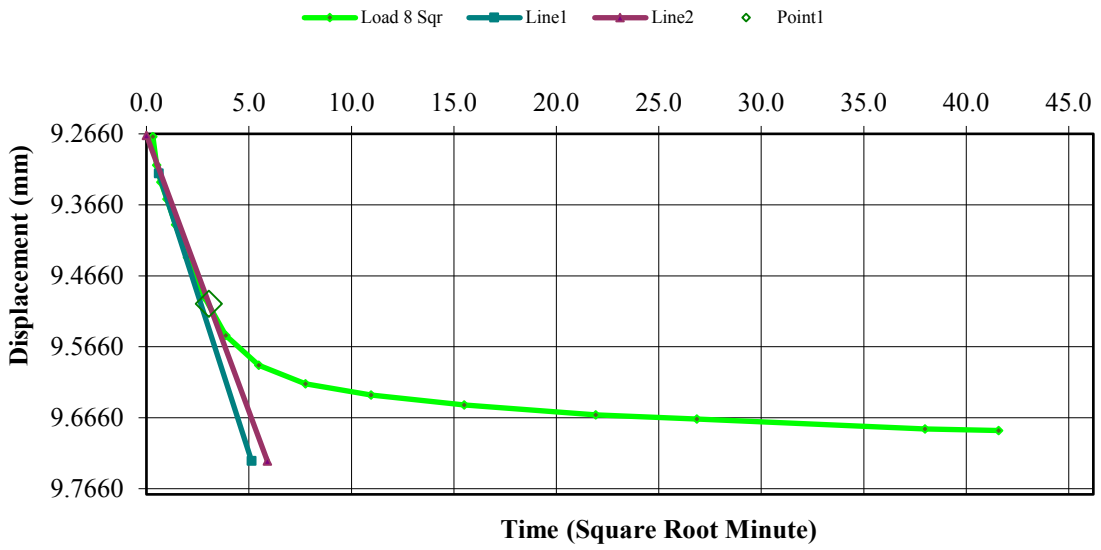
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.2120 | 1.0880 | 4.3520 | 0.5286 |
| 1 | 00:00:06 | 9.2700 | 1.1460 | 4.5840 | 0.5249 |
| 2 | 00:00:15 | 9.3100 | 1.1860 | 4.7440 | 0.5223 |
| 3 | 00:00:30 | 9.3340 | 1.2100 | 4.8400 | 0.5208 |
| 4 | 00:01:00 | 9.3580 | 1.2340 | 4.9360 | 0.5192 |
| 5 | 00:02:00 | 9.3940 | 1.2700 | 5.0800 | 0.5169 |
| 6 | 00:04:00 | 9.4400 | 1.3160 | 5.2640 | 0.5140 |
| 7 | 00:08:00 | 9.4960 | 1.3720 | 5.4880 | 0.5104 |
| 8 | 00:15:01 | 9.5500 | 1.4260 | 5.7040 | 0.5070 |
| 9 | 00:30:03 | 9.5920 | 1.4680 | 5.8720 | 0.5043 |
| 10 | 01:00:06 | 9.6180 | 1.4940 | 5.9760 | 0.5026 |
| 11 | 02:00:12 | 9.6340 | 1.5100 | 6.0400 | 0.5016 |
| 12 | 04:00:24 | 9.6480 | 1.5240 | 6.0960 | 0.5007 |
| 13 | 08:00:49 | 9.6620 | 1.5380 | 6.1520 | 0.4998 |
| 14 | 12:01:13 | 9.6680 | 1.5440 | 6.1760 | 0.4994 |
| 15 | 24:02:28 | 9.6820 | 1.5580 | 6.2320 | 0.4985 |
| 16 | 28:48:27 | 9.6840 | 1.5600 | 6.2400 | 0.4984 |

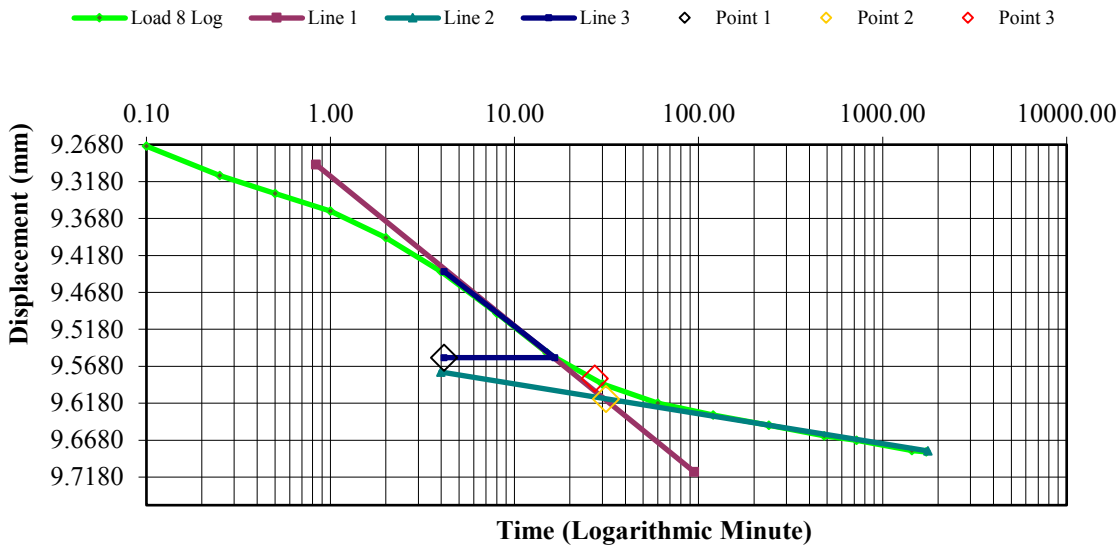
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

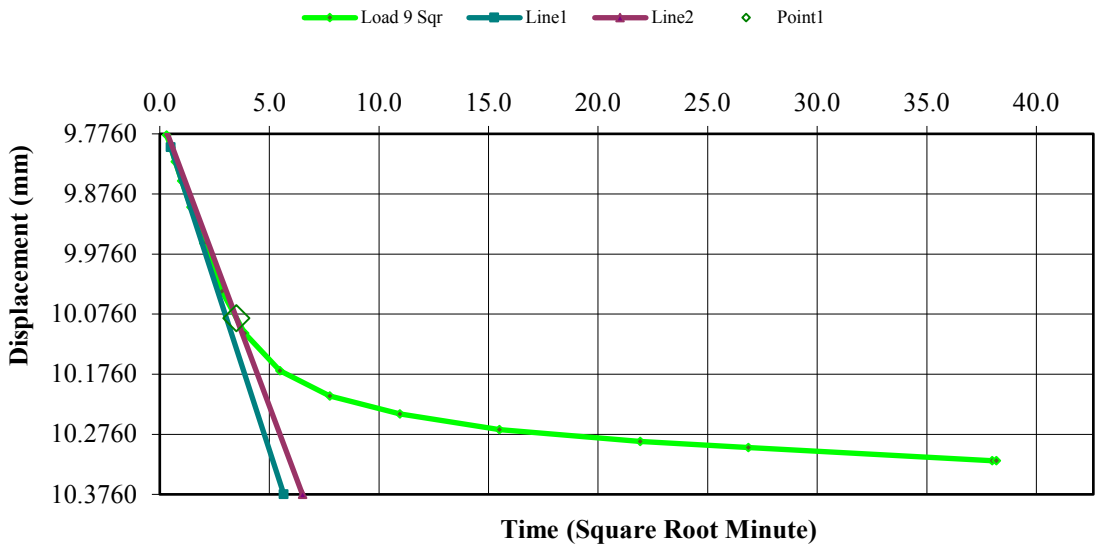
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.6840 | 1.5600 | 6.2400 | 0.4984 |
| 1 | 00:00:06 | 9.7780 | 1.6540 | 6.6160 | 0.4924 |
| 2 | 00:00:15 | 9.7980 | 1.6740 | 6.6960 | 0.4911 |
| 3 | 00:00:30 | 9.8220 | 1.6980 | 6.7920 | 0.4896 |
| 4 | 00:01:00 | 9.8540 | 1.7300 | 6.9200 | 0.4875 |
| 5 | 00:02:00 | 9.8980 | 1.7740 | 7.0960 | 0.4847 |
| 6 | 00:04:00 | 9.9580 | 1.8340 | 7.3360 | 0.4809 |
| 7 | 00:08:01 | 10.0380 | 1.9140 | 7.6560 | 0.4758 |
| 8 | 00:15:01 | 10.1080 | 1.9840 | 7.9360 | 0.4713 |
| 9 | 00:30:02 | 10.1700 | 2.0460 | 8.1840 | 0.4673 |
| 10 | 01:00:05 | 10.2120 | 2.0880 | 8.3520 | 0.4647 |
| 11 | 02:00:10 | 10.2420 | 2.1180 | 8.4720 | 0.4627 |
| 12 | 04:00:21 | 10.2680 | 2.1440 | 8.5760 | 0.4611 |
| 13 | 08:00:46 | 10.2880 | 2.1640 | 8.6560 | 0.4598 |
| 14 | 12:01:11 | 10.2980 | 2.1740 | 8.6960 | 0.4592 |
| 15 | 24:02:24 | 10.3200 | 2.1960 | 8.7840 | 0.4577 |
| 16 | 24:17:34 | 10.3200 | 2.1960 | 8.7840 | 0.4577 |

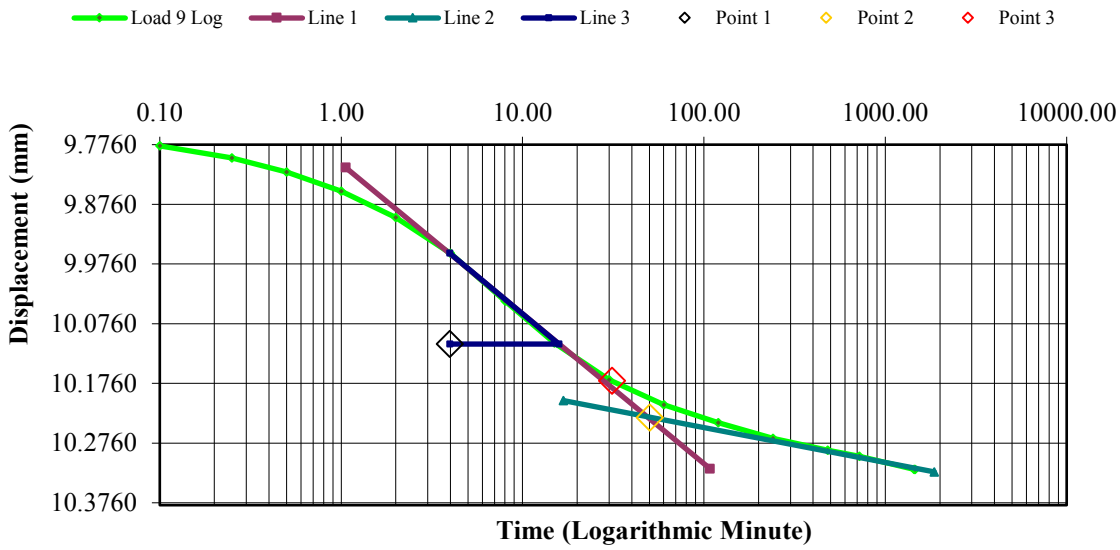
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

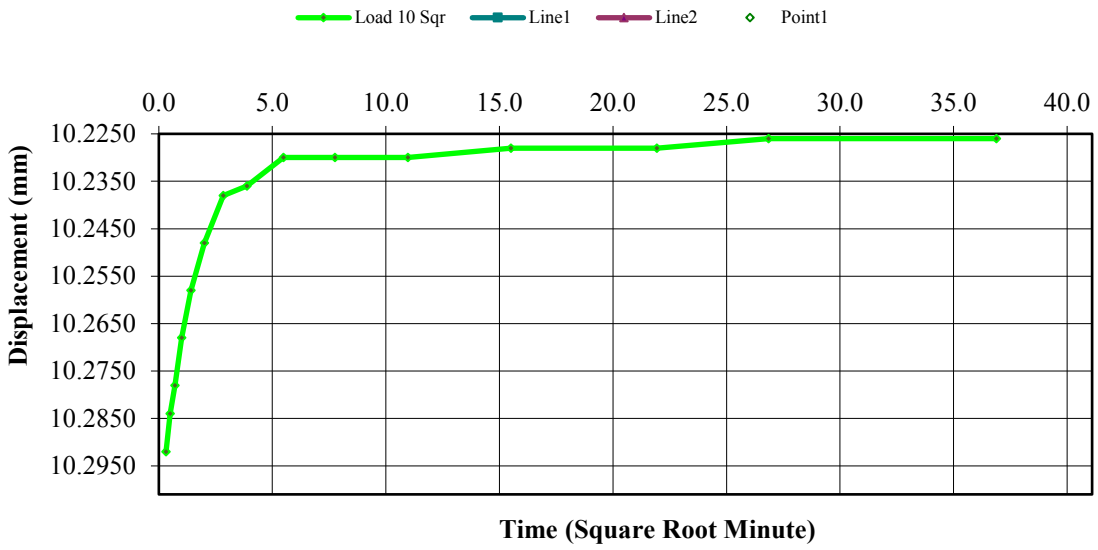
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.3200 | 2.1960 | 8.7840 | 0.4577 |
| 1 | 00:00:06 | 10.2920 | 2.1680 | 8.6720 | 0.4595 |
| 2 | 00:00:15 | 10.2840 | 2.1600 | 8.6400 | 0.4600 |
| 3 | 00:00:30 | 10.2780 | 2.1540 | 8.6160 | 0.4604 |
| 4 | 00:01:00 | 10.2680 | 2.1440 | 8.5760 | 0.4611 |
| 5 | 00:02:00 | 10.2580 | 2.1340 | 8.5360 | 0.4617 |
| 6 | 00:04:00 | 10.2480 | 2.1240 | 8.4960 | 0.4624 |
| 7 | 00:08:01 | 10.2380 | 2.1140 | 8.4560 | 0.4630 |
| 8 | 00:15:01 | 10.2360 | 2.1120 | 8.4480 | 0.4631 |
| 9 | 00:30:03 | 10.2300 | 2.1060 | 8.4240 | 0.4635 |
| 10 | 01:00:06 | 10.2300 | 2.1060 | 8.4240 | 0.4635 |
| 11 | 02:00:12 | 10.2300 | 2.1060 | 8.4240 | 0.4635 |
| 12 | 04:00:24 | 10.2280 | 2.1040 | 8.4160 | 0.4636 |
| 13 | 08:00:49 | 10.2280 | 2.1040 | 8.4160 | 0.4636 |
| 14 | 12:01:10 | 10.2260 | 2.1020 | 8.4080 | 0.4638 |
| 15 | 22:41:02 | 10.2260 | 2.1020 | 8.4080 | 0.4638 |

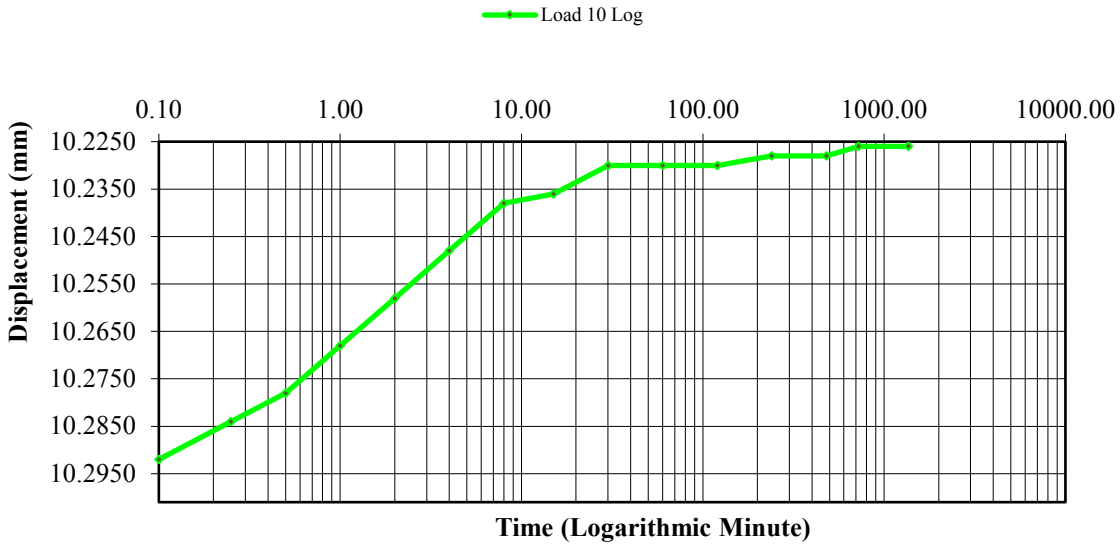
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

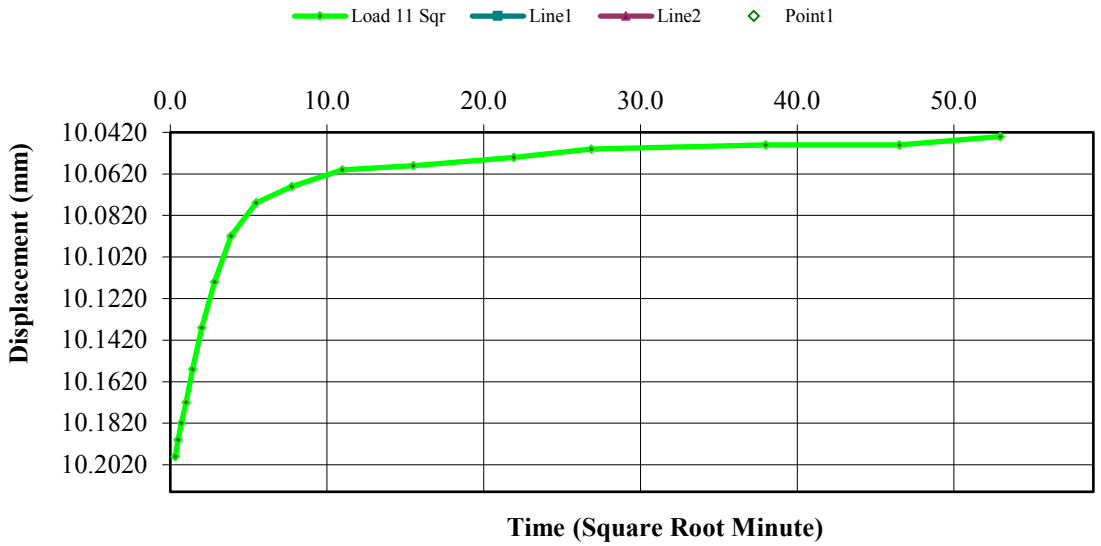
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.2260 | 2.1020 | 8.4080 | 0.4638 |
| 1 | 00:00:06 | 10.1980 | 2.0740 | 8.2960 | 0.4655 |
| 2 | 00:00:15 | 10.1900 | 2.0660 | 8.2640 | 0.4661 |
| 3 | 00:00:30 | 10.1820 | 2.0580 | 8.2320 | 0.4666 |
| 4 | 00:01:00 | 10.1720 | 2.0480 | 8.1920 | 0.4672 |
| 5 | 00:02:00 | 10.1560 | 2.0320 | 8.1280 | 0.4682 |
| 6 | 00:04:01 | 10.1360 | 2.0120 | 8.0480 | 0.4695 |
| 7 | 00:08:01 | 10.1140 | 1.9900 | 7.9600 | 0.4709 |
| 8 | 00:15:02 | 10.0920 | 1.9680 | 7.8720 | 0.4723 |
| 9 | 00:30:03 | 10.0760 | 1.9520 | 7.8080 | 0.4733 |
| 10 | 01:00:06 | 10.0680 | 1.9440 | 7.7760 | 0.4739 |
| 11 | 02:00:12 | 10.0600 | 1.9360 | 7.7440 | 0.4744 |
| 12 | 04:00:25 | 10.0580 | 1.9340 | 7.7360 | 0.4745 |
| 13 | 08:00:49 | 10.0540 | 1.9300 | 7.7200 | 0.4748 |
| 14 | 12:01:14 | 10.0500 | 1.9260 | 7.7040 | 0.4750 |
| 15 | 24:02:27 | 10.0480 | 1.9240 | 7.6960 | 0.4751 |
| 16 | 36:03:41 | 10.0480 | 1.9240 | 7.6960 | 0.4751 |
| 17 | 46:45:12 | 10.0440 | 1.9200 | 7.6800 | 0.4754 |

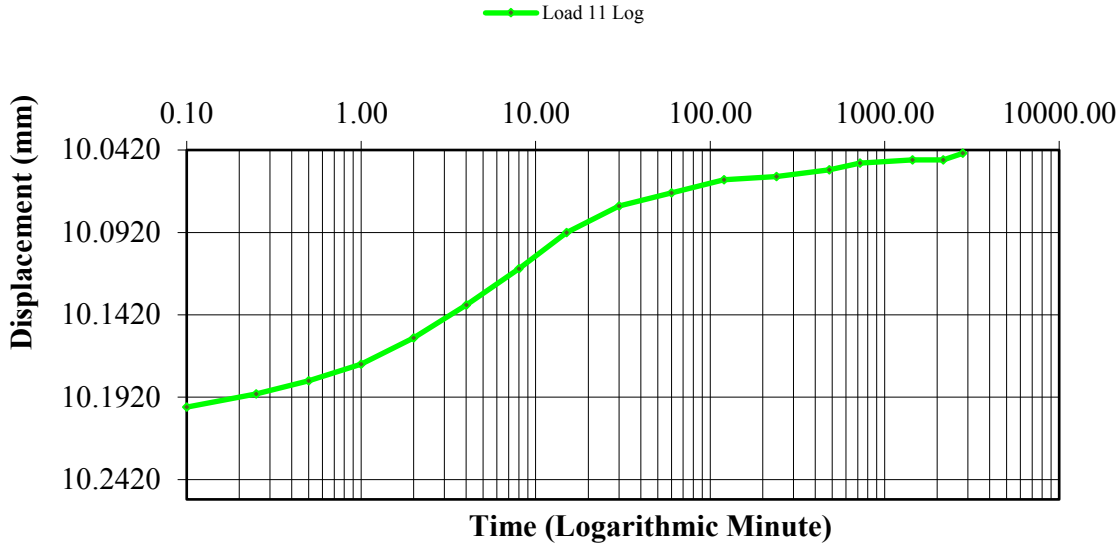
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

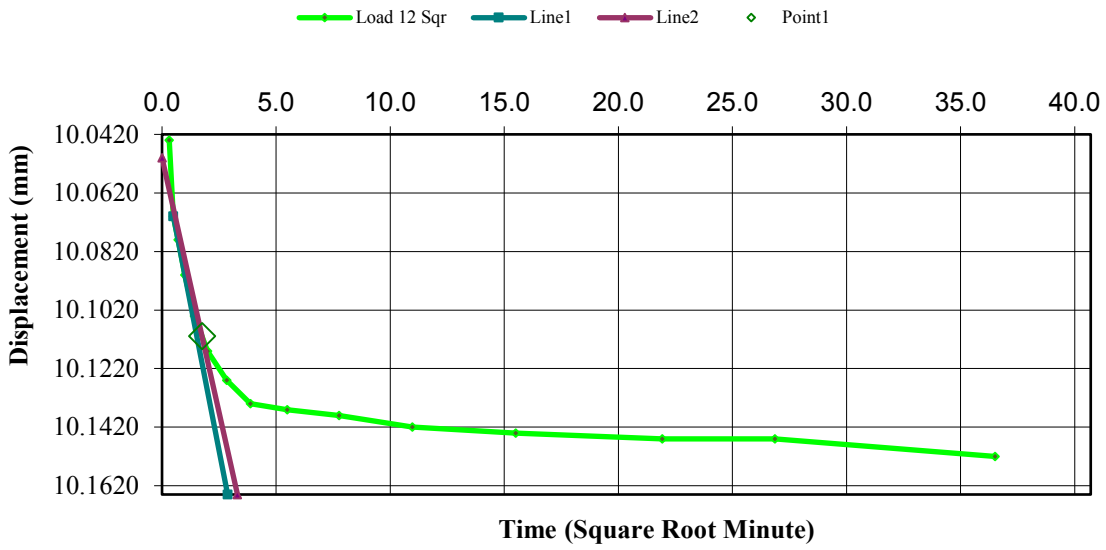
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.0440 | 1.9200 | 7.6800 | 0.4754 |
| 1 | 00:00:06 | 10.0440 | 1.9200 | 7.6800 | 0.4754 |
| 2 | 00:00:15 | 10.0700 | 1.9460 | 7.7840 | 0.4737 |
| 3 | 00:00:30 | 10.0780 | 1.9540 | 7.8160 | 0.4732 |
| 4 | 00:01:00 | 10.0900 | 1.9660 | 7.8640 | 0.4725 |
| 5 | 00:02:00 | 10.1040 | 1.9800 | 7.9200 | 0.4716 |
| 6 | 00:04:00 | 10.1160 | 1.9920 | 7.9680 | 0.4708 |
| 7 | 00:08:01 | 10.1260 | 2.0020 | 8.0080 | 0.4701 |
| 8 | 00:15:01 | 10.1340 | 2.0100 | 8.0400 | 0.4696 |
| 9 | 00:30:03 | 10.1360 | 2.0120 | 8.0480 | 0.4695 |
| 10 | 01:00:06 | 10.1380 | 2.0140 | 8.0560 | 0.4694 |
| 11 | 02:00:12 | 10.1420 | 2.0180 | 8.0720 | 0.4691 |
| 12 | 04:00:25 | 10.1440 | 2.0200 | 8.0800 | 0.4690 |
| 13 | 08:00:49 | 10.1460 | 2.0220 | 8.0880 | 0.4689 |
| 14 | 12:01:14 | 10.1460 | 2.0220 | 8.0880 | 0.4689 |
| 15 | 22:12:22 | 10.1520 | 2.0280 | 8.1120 | 0.4685 |

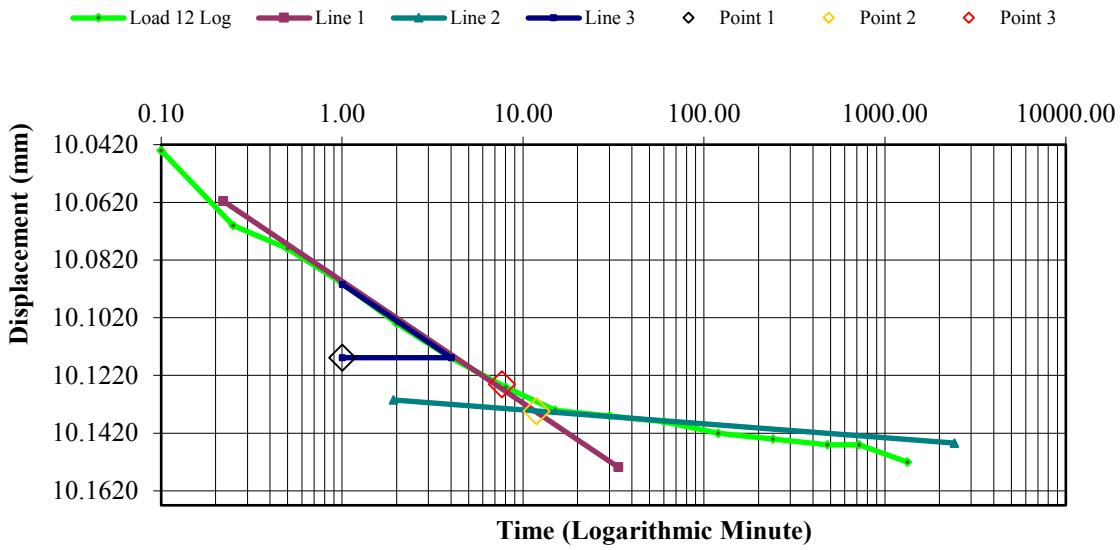
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Sep-16
**Test Number:**

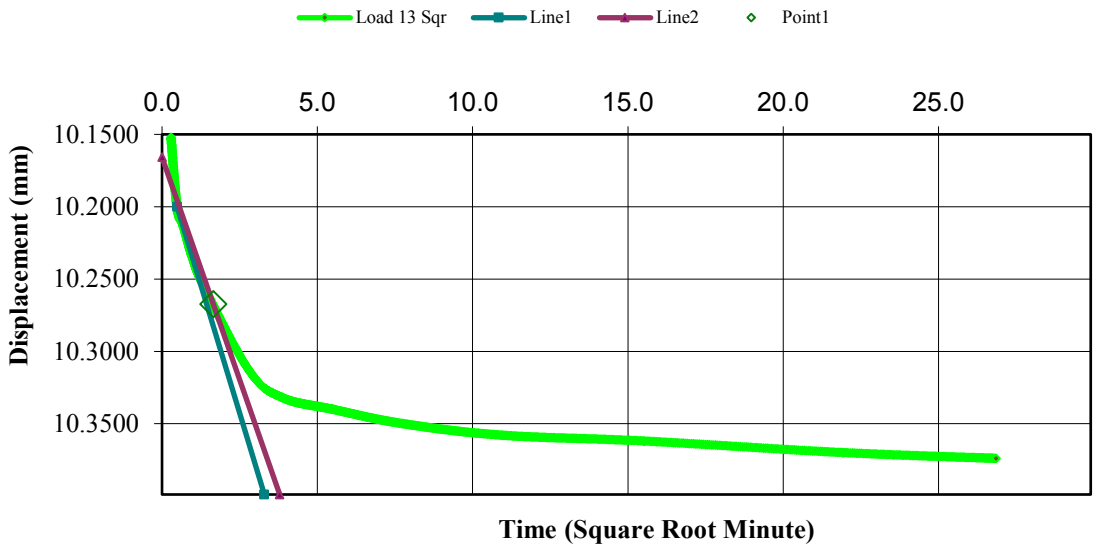
**Sample Number:** D30 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.1520 | 2.0280 | 8.1120 | 0.4685 |
| 1 | 00:00:05 | 10.1520 | 2.0280 | 8.1120 | 0.4685 |
| 2 | 00:00:14 | 10.2000 | 2.0760 | 8.3040 | 0.4654 |
| 3 | 00:00:29 | 10.2140 | 2.0900 | 8.3600 | 0.4645 |
| 4 | 00:00:59 | 10.2360 | 2.1120 | 8.4480 | 0.4631 |
| 5 | 00:02:00 | 10.2580 | 2.1340 | 8.5360 | 0.4617 |
| 7 | 00:08:00 | 10.3140 | 2.1900 | 8.7600 | 0.4581 |
| 8 | 00:15:01 | 10.3320 | 2.2080 | 8.8320 | 0.4570 |
| 9 | 00:30:02 | 10.3400 | 2.2160 | 8.8640 | 0.4565 |
| 10 | 01:00:06 | 10.3500 | 2.2260 | 8.9040 | 0.4558 |
| 11 | 02:00:12 | 10.3580 | 2.2340 | 8.9360 | 0.4553 |
| 12 | 04:00:24 | 10.3620 | 2.2380 | 8.9520 | 0.4551 |
| 13 | 08:00:49 | 10.3700 | 2.2460 | 8.9840 | 0.4546 |
| 14 | 12:01:14 | 10.3740 | 2.2500 | 9.0000 | 0.4543 |

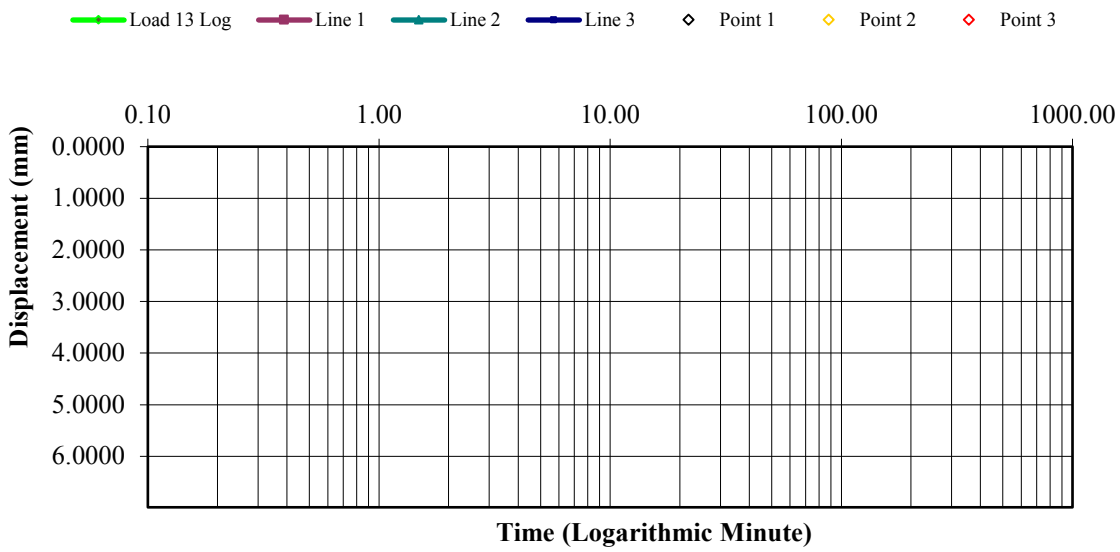
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



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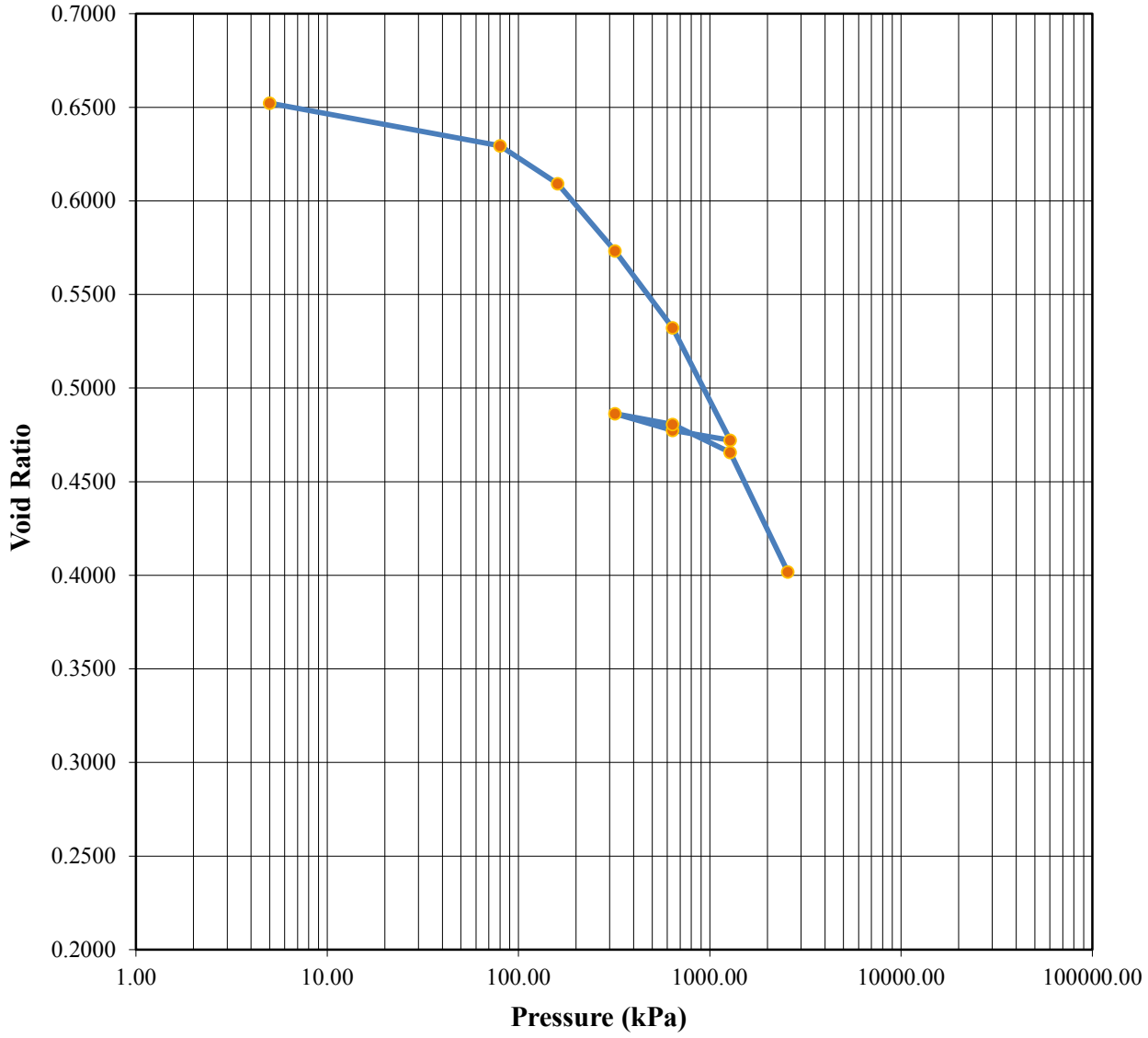
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 23.4 | 18.1 | **Liquid Limits:** | - | **Test Date:** | 14-Sep-16 |
| **Dry Density (g/cm3):** | 1.631 | 1.919 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.44 | 120.39 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6533 | 0.4026 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.50-4.95m | **Remarks:** |
| **Sample Number:** | D36 ST10 | **Boring Number:** | Loads at 10kPa, 20kPa, and 40kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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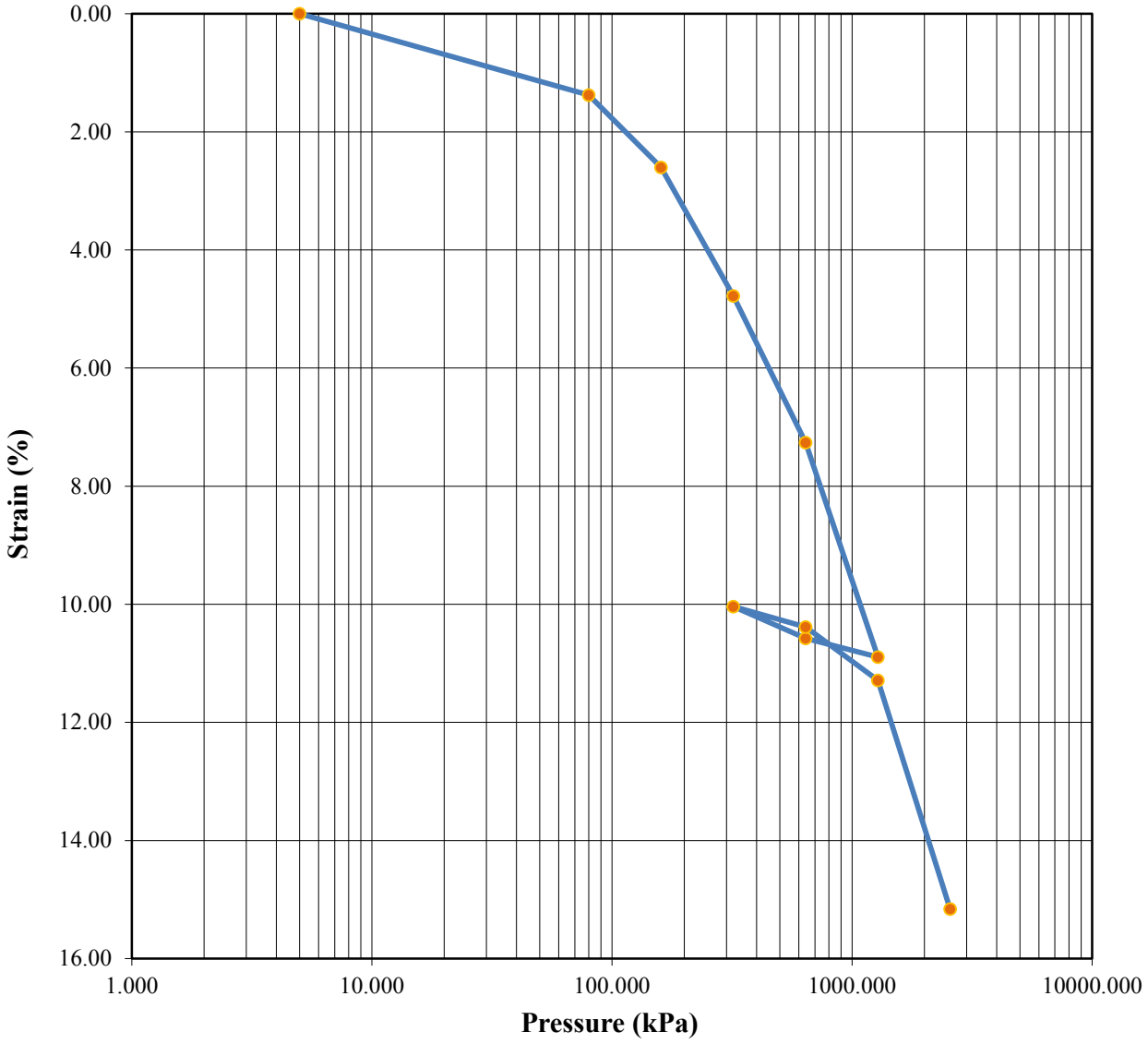
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 23.4 | 18.1 | **Liquid Limits:** | - | **Test Date:** | 14-Sep-16 |
| **Dry Density (g/cm3):** | 1.631 | 1.919 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.44 | 120.39 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6533 | 0.4026 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.50-4.95m | **Remarks:** |
| **Sample Number:** | D36 ST10 | **Boring Number:** | Loads at 10kPa, 20kPa, and 40kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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## One-Dimensional Consolidation Test
## ASTM D2435
### Test Results

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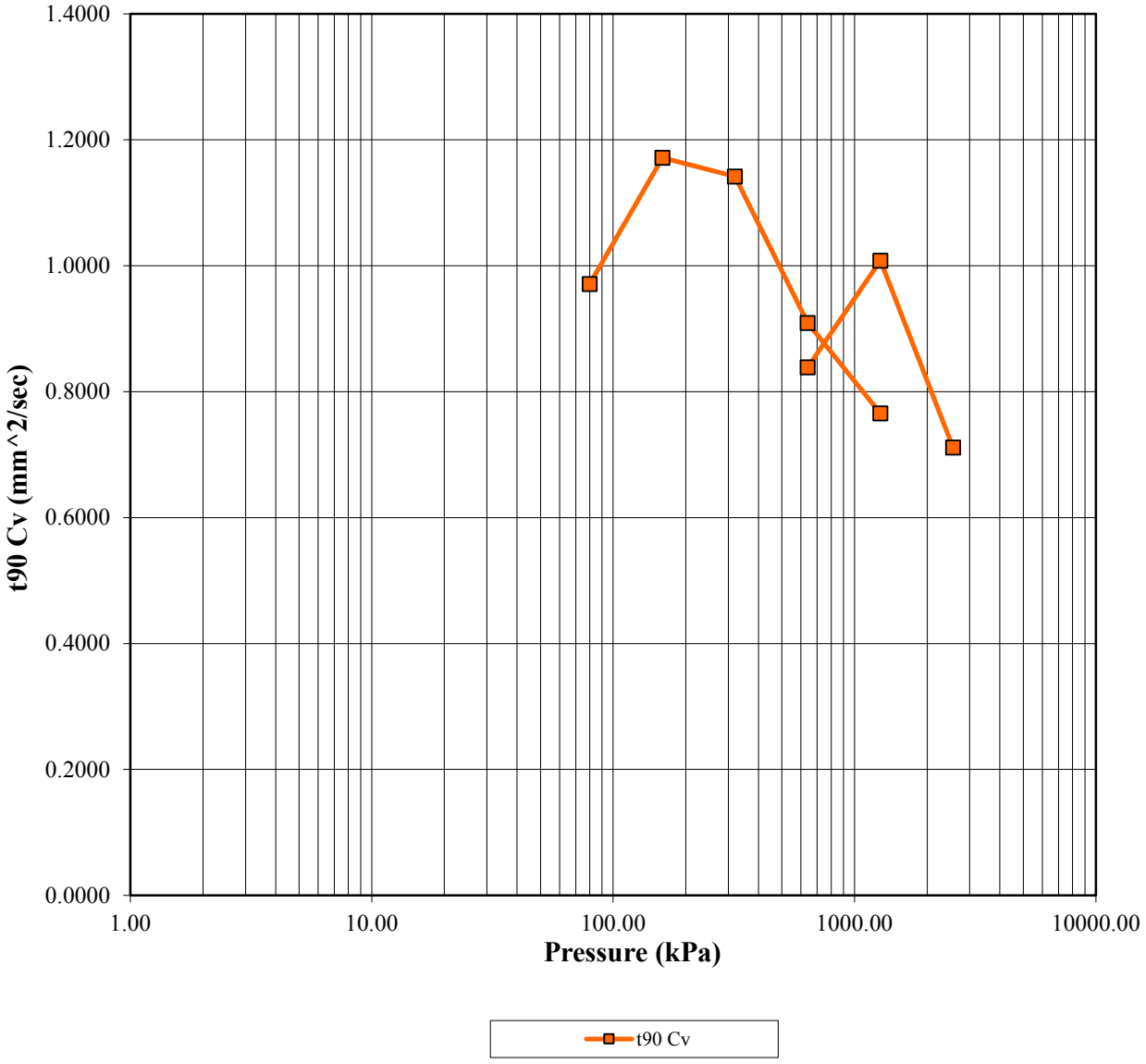


| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 23.4 | 18.1 | **Liquid Limits:** | - | **Test Date:** | 14-Sep-16 |
| **Dry Density (g/cm3):** | 1.631 | 1.919 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.44 | 120.39 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6533 | 0.4026 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.50-4.95m | **Remarks:** |
| **Sample Number:** | D36 ST10 | **Boring Number:** | Loads at 10kPa, 20kPa, and 40kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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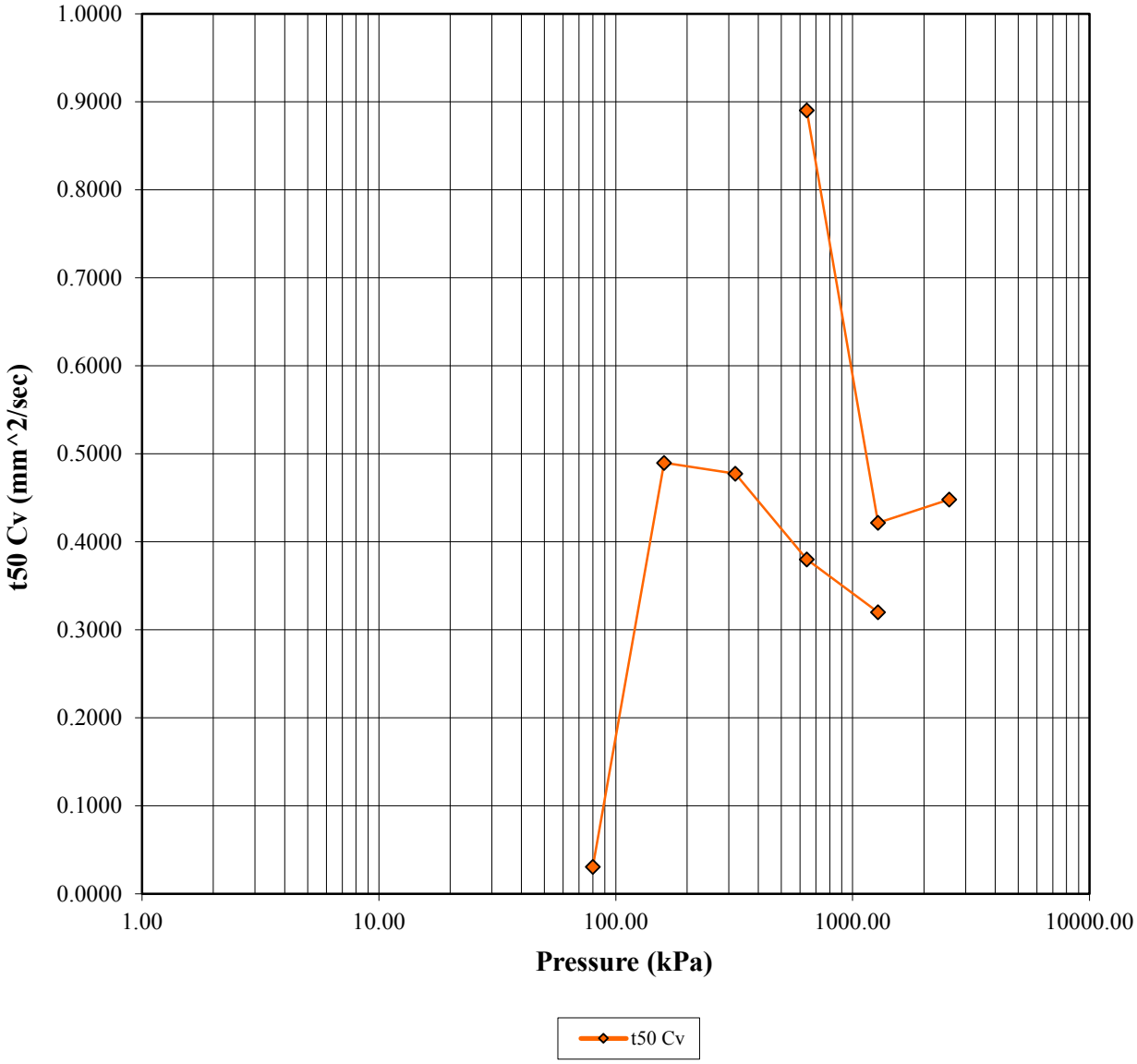
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 23.4 | 18.1 | **Liquid Limits:** | - | **Test Date:** | 14-Sep-16 |
| **Dry Density (g/cm3):** | 1.631 | 1.919 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.44 | 120.39 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6533 | 0.4026 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.50-4.95m | **Remarks:** |
| **Sample Number:** | D36 ST10 | **Boring Number:** | Loads at 10kPa, 20kPa, and 40kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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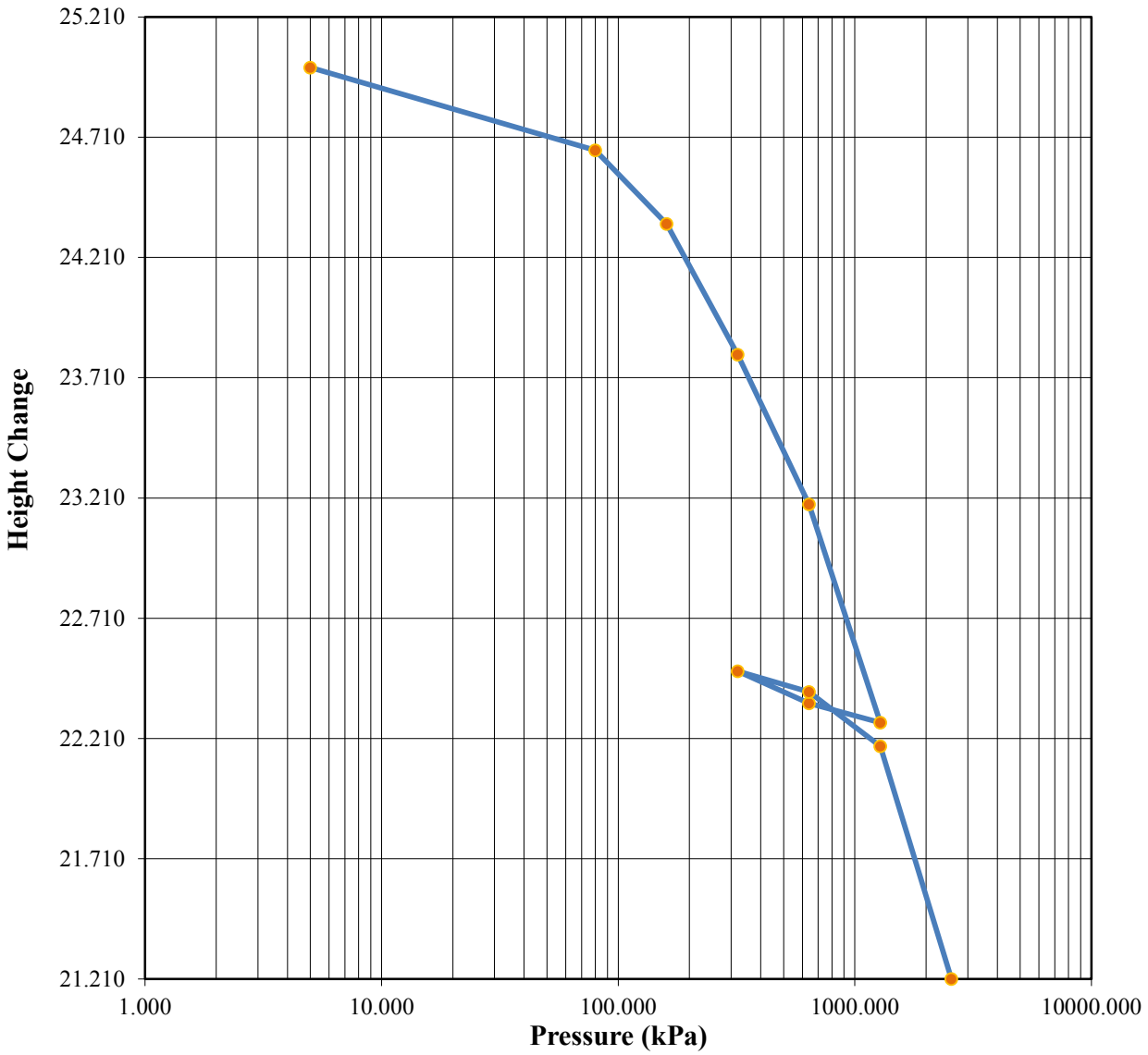
# One-Dimensional Consolidation Test
## ASTM D2435
### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 23.4 | 18.1 | **Liquid Limits:** | - | **Test Date:** | 14-Sep-16 |
| **Dry Density (g/cm3):** | 1.631 | 1.919 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 96.44 | 120.39 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6533 | 0.4026 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.50-4.95m | **Remarks:** |
| **Sample Number:** | D36 ST10 | **Boring Number:** | Loads at 10kPa, 20kPa, and 40kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

### Summary

**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:**

**Sample Number:** D36 ST10 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:** **Test Number:**
**Sample Type:** Undisturbed **Test Date:** 14-Sep-16

| Index | Load Sequence (mm) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.0000 | 9.8686 | 0.00 | 0.6522 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 25.0000 | 9.8686 | 0.00 | 0.6522 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 10.000 | 0.0060 | 24.9940 | 9.8626 | 0.02 | 0.6518 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 20.000 | 0.0360 | 24.9640 | 9.8326 | 0.14 | 0.6498 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 40.000 | 0.1340 | 24.8660 | 9.7346 | 0.54 | 0.6433 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | 80.000 | 0.3440 | 24.6560 | 9.5246 | 1.38 | 0.6295 | 2.212 | 16.196 | 0.971 | 0.031 |
| 6 | 160.000 | 0.6500 | 24.3500 | 9.2186 | 2.60 | 0.6092 | 1.788 | 0.994 | 1.171 | 0.490 |
| 7 | 320.000 | 1.1940 | 23.8060 | 8.6746 | 4.78 | 0.5733 | 1.754 | 0.974 | 1.142 | 0.478 |
| 8 | 640.000 | 1.8160 | 23.1840 | 8.0526 | 7.26 | 0.5322 | 2.089 | 1.606 | 0.909 | 0.380 |
| 9 | 1280.000 | 2.7240 | 22.2760 | 7.1446 | 10.90 | 0.4722 | 2.291 | 1.273 | 0.765 | 0.320 |
| 10 | 640.000 | 2.6440 | 22.3560 | 7.2246 | 10.58 | 0.4775 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 320.000 | 2.5100 | 22.4900 | 7.3586 | 10.04 | 0.4863 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 640.000 | 2.5960 | 22.4040 | 7.2726 | 10.38 | 0.4806 | 2.114 | 0.463 | 0.839 | 0.891 |
| 13 | 1280.000 | 2.8220 | 22.1780 | 7.0466 | 11.29 | 0.4657 | 1.724 | 0.957 | 1.008 | 0.422 |
| 14 | 2560.000 | 3.7900 | 21.2100 | 6.0786 | 15.16 | 0.4017 | 2.235 | 0.824 | 0.711 | 0.448 |

**Tested By:** **Checked By:**

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16

**Sample Number:** D36 ST10 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** 0.0000 **Initial Void Ratio:** 0.6533 **Initial Height (mm):** 25.0000
**Plastic Limit:** 0.0000 **Plasticity Index (%):** 0.0000 **Initial Diameter (mm):** 50.7000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 89.7400

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 45.75 | 34.20 |
| Dry Soil + Container (g) | 37.30 | 29.15 |
| Weight of Container (g) | 1.19 | 1.33 |
| Moisture Content (%) | 23.40 | 18.15 |
| Void Ratio | 0.6533 | 0.4026 |
| Saturation (%) | 96.44 | 120.39 |
| Dry Density (g/cm3) | 1.63 | 1.92 |

**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

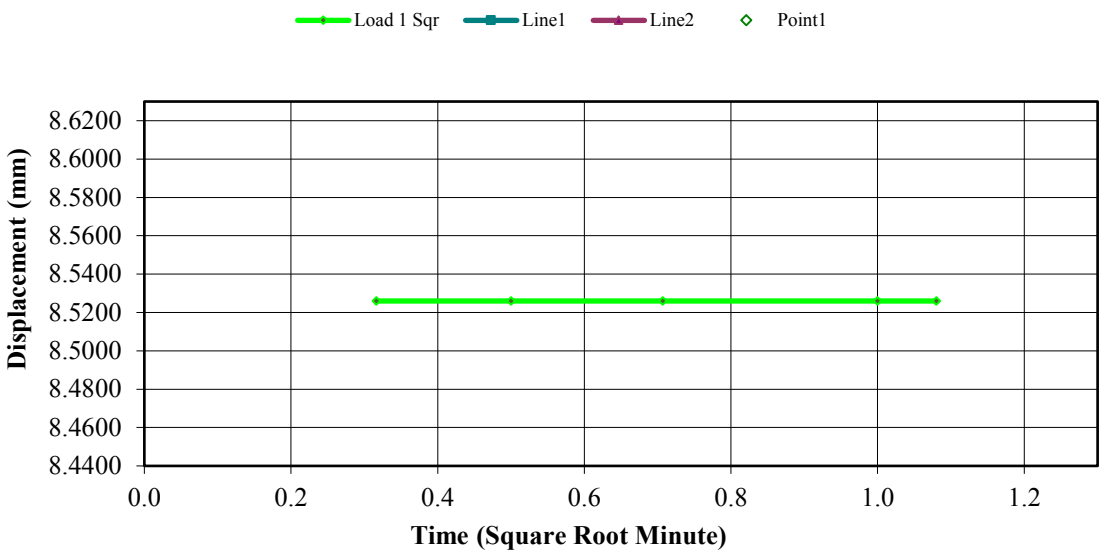
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.5260 | 0.0000 | 0.0000 | 0.6533 |
| 1 | 00:00:06 | 8.5260 | 0.0000 | 0.0000 | 0.6533 |
| 2 | 00:00:15 | 8.5260 | 0.0000 | 0.0000 | 0.6533 |
| 3 | 00:00:30 | 8.5260 | 0.0000 | 0.0000 | 0.6533 |
| 4 | 00:01:00 | 8.5260 | 0.0000 | 0.0000 | 0.6533 |
| 5 | 00:01:10 | 8.5260 | 0.0000 | 0.0000 | 0.6533 |

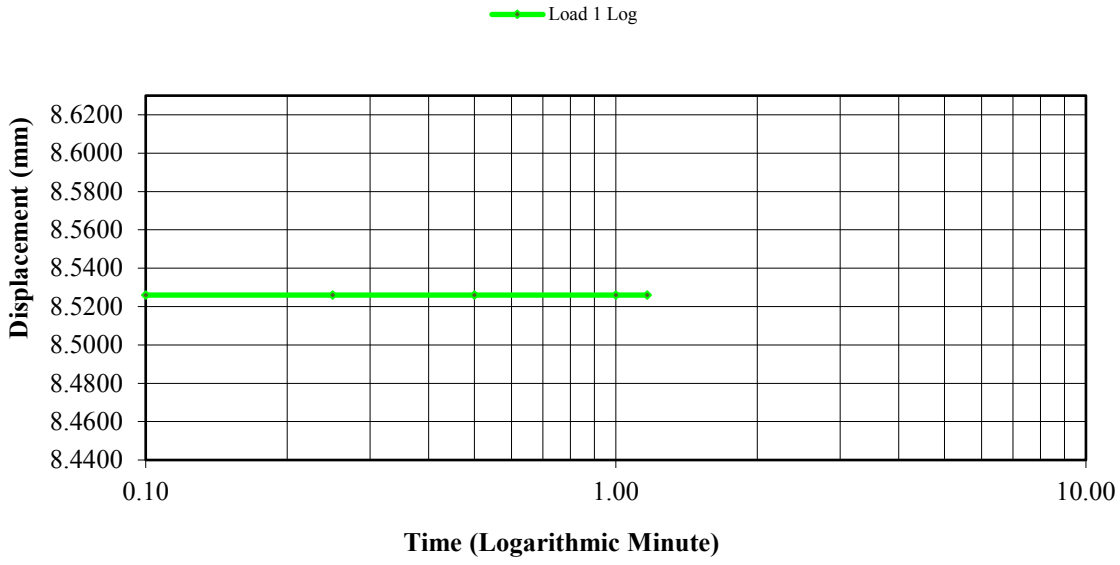
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 2) Load 10.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

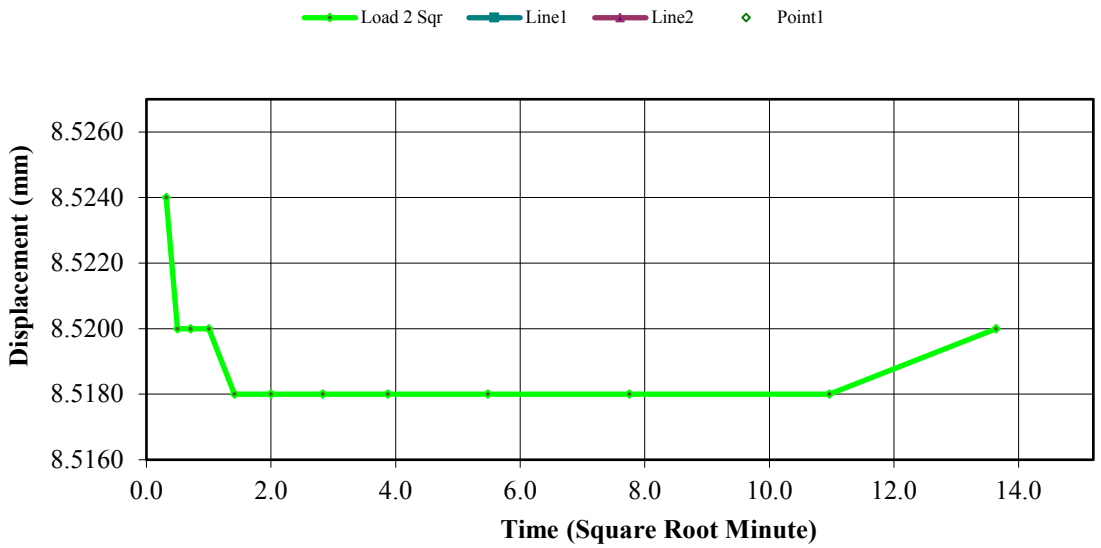
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.5260 | 0.0000 | 0.0000 | 0.6533 |
| 1 | 00:00:06 | 8.5240 | 0.0020 | 0.0080 | 0.6532 |
| 2 | 00:00:15 | 8.5200 | 0.0060 | 0.0240 | 0.6529 |
| 3 | 00:00:30 | 8.5200 | 0.0060 | 0.0240 | 0.6529 |
| 4 | 00:01:00 | 8.5200 | 0.0060 | 0.0240 | 0.6529 |
| 5 | 00:02:00 | 8.5180 | 0.0080 | 0.0320 | 0.6528 |
| 6 | 00:04:00 | 8.5180 | 0.0080 | 0.0320 | 0.6528 |
| 7 | 00:08:00 | 8.5180 | 0.0080 | 0.0320 | 0.6528 |
| 8 | 00:15:01 | 8.5180 | 0.0080 | 0.0320 | 0.6528 |
| 9 | 00:30:02 | 8.5180 | 0.0080 | 0.0320 | 0.6528 |
| 10 | 01:00:05 | 8.5180 | 0.0080 | 0.0320 | 0.6528 |
| 11 | 02:00:10 | 8.5180 | 0.0080 | 0.0320 | 0.6528 |
| 12 | 03:06:03 | 8.5200 | 0.0060 | 0.0240 | 0.6529 |

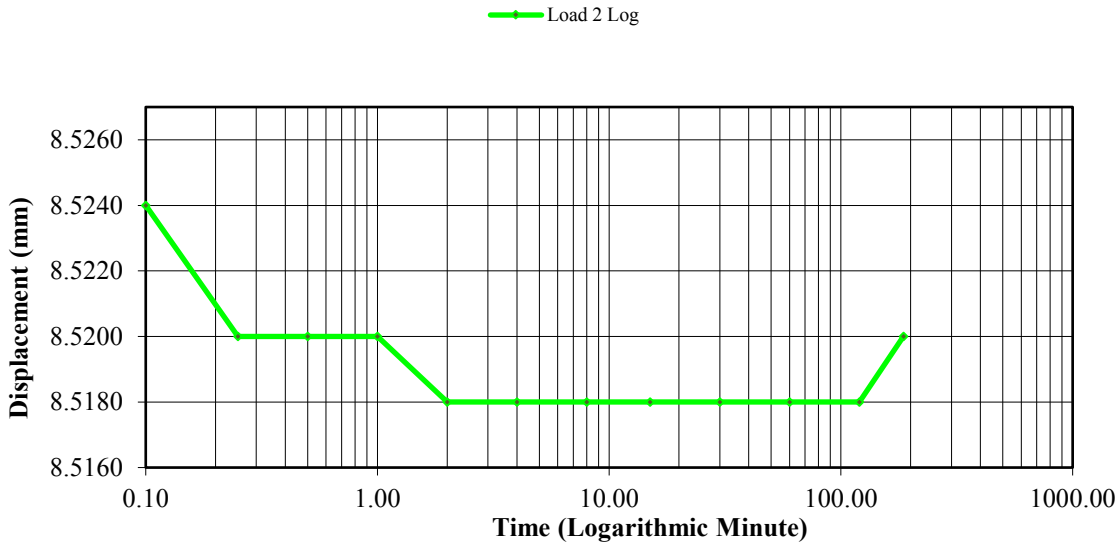
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 2) Load 10.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 3) Load 20.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

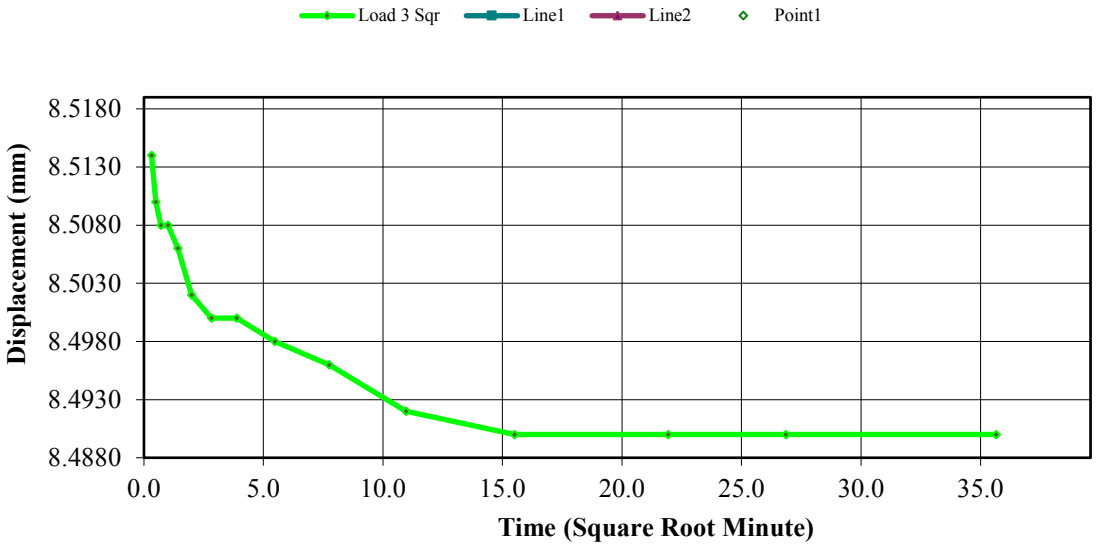
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.5200 | 0.0060 | 0.0240 | 0.6529 |
| 1 | 00:00:06 | 8.5140 | 0.0120 | 0.0480 | 0.6525 |
| 2 | 00:00:15 | 8.5100 | 0.0160 | 0.0640 | 0.6522 |
| 3 | 00:00:30 | 8.5080 | 0.0180 | 0.0720 | 0.6521 |
| 4 | 00:01:00 | 8.5080 | 0.0180 | 0.0720 | 0.6521 |
| 5 | 00:02:00 | 8.5060 | 0.0200 | 0.0800 | 0.6520 |
| 6 | 00:04:00 | 8.5020 | 0.0240 | 0.0960 | 0.6517 |
| 7 | 00:08:01 | 8.5000 | 0.0260 | 0.1040 | 0.6516 |
| 8 | 00:15:02 | 8.5000 | 0.0260 | 0.1040 | 0.6516 |
| 9 | 00:30:03 | 8.4980 | 0.0280 | 0.1120 | 0.6514 |
| 10 | 01:00:06 | 8.4960 | 0.0300 | 0.1200 | 0.6513 |
| 11 | 02:00:12 | 8.4920 | 0.0340 | 0.1360 | 0.6510 |
| 12 | 04:00:23 | 8.4900 | 0.0360 | 0.1440 | 0.6509 |
| 13 | 08:00:47 | 8.4900 | 0.0360 | 0.1440 | 0.6509 |
| 14 | 12:01:10 | 8.4900 | 0.0360 | 0.1440 | 0.6509 |
| 15 | 21:11:07 | 8.4900 | 0.0360 | 0.1440 | 0.6509 |

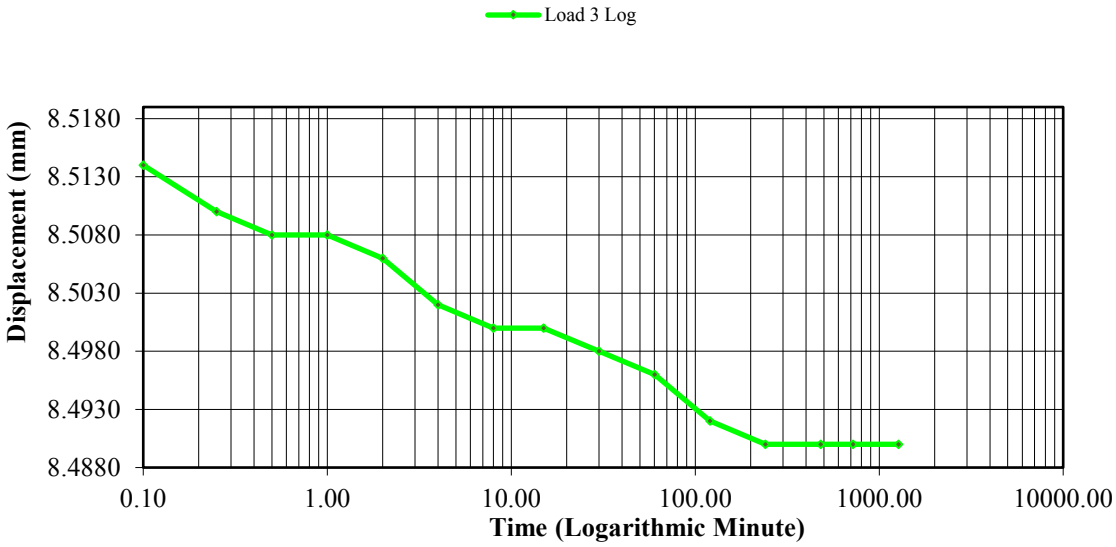
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 3) Load 20.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

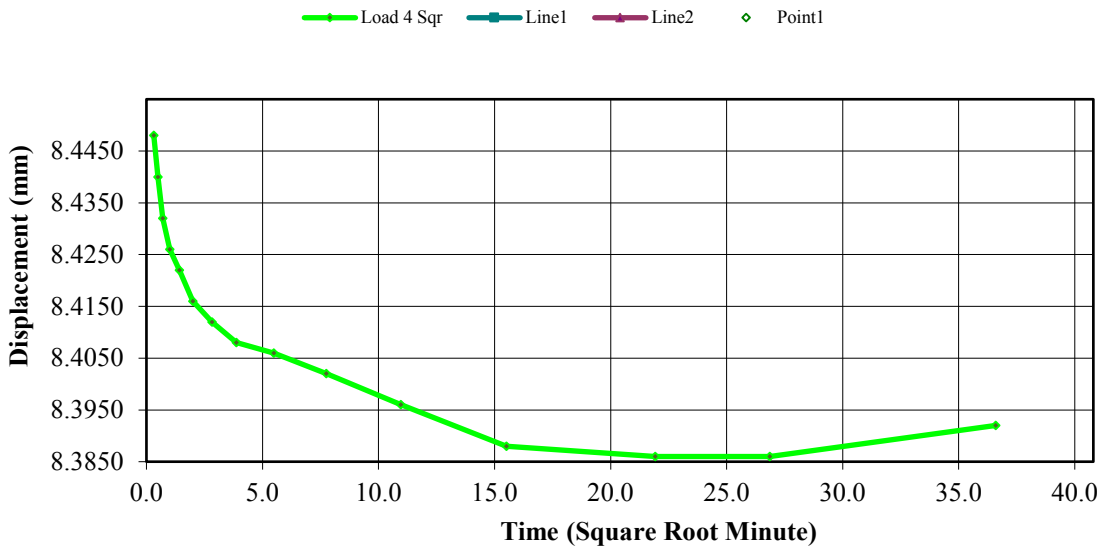
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.4900 | 0.0360 | 0.1440 | 0.6509 |
| 1 | 00:00:06 | 8.4480 | 0.0780 | 0.3120 | 0.6481 |
| 2 | 00:00:15 | 8.4400 | 0.0860 | 0.3440 | 0.6476 |
| 3 | 00:00:30 | 8.4320 | 0.0940 | 0.3760 | 0.6471 |
| 4 | 00:01:00 | 8.4260 | 0.1000 | 0.4000 | 0.6467 |
| 5 | 00:02:00 | 8.4220 | 0.1040 | 0.4160 | 0.6464 |
| 6 | 00:04:00 | 8.4160 | 0.1100 | 0.4400 | 0.6460 |
| 7 | 00:08:01 | 8.4120 | 0.1140 | 0.4560 | 0.6457 |
| 8 | 00:15:02 | 8.4080 | 0.1180 | 0.4720 | 0.6455 |
| 9 | 00:30:03 | 8.4060 | 0.1200 | 0.4800 | 0.6454 |
| 10 | 01:00:06 | 8.4020 | 0.1240 | 0.4960 | 0.6451 |
| 11 | 02:00:12 | 8.3960 | 0.1300 | 0.5200 | 0.6447 |
| 12 | 04:00:24 | 8.3880 | 0.1380 | 0.5520 | 0.6442 |
| 13 | 08:00:48 | 8.3860 | 0.1400 | 0.5600 | 0.6440 |
| 14 | 12:01:11 | 8.3860 | 0.1400 | 0.5600 | 0.6440 |
| 15 | 22:19:17 | 8.3920 | 0.1340 | 0.5360 | 0.6444 |

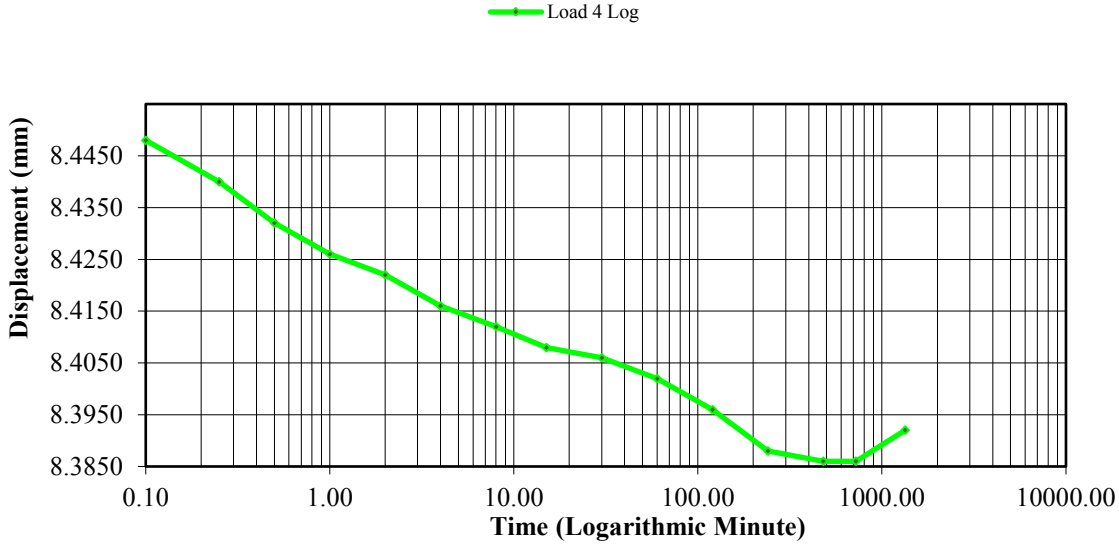
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

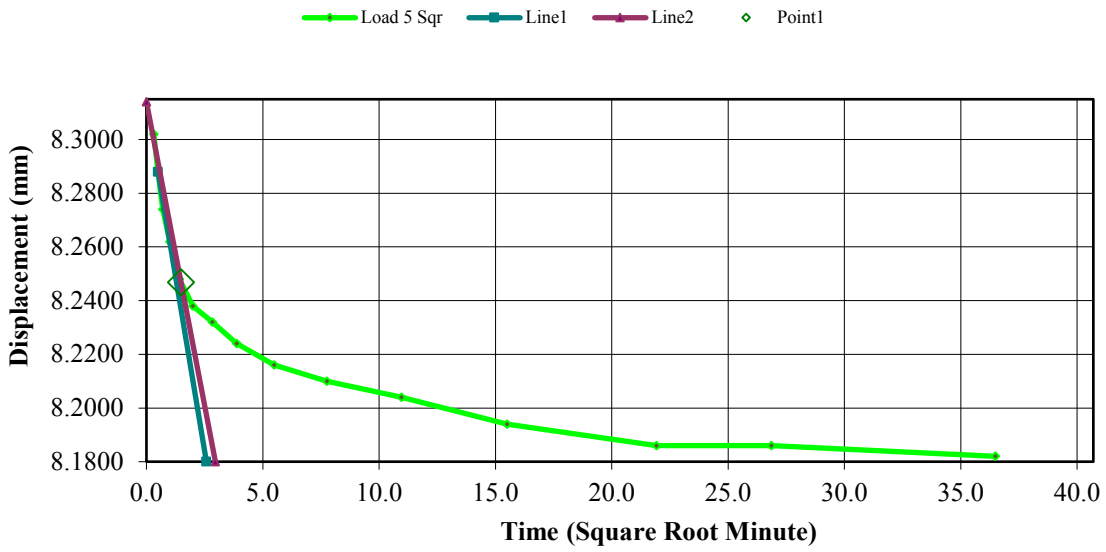
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.3920 | 0.1340 | 0.5360 | 0.6444 |
| 1 | 00:00:06 | 8.3020 | 0.2240 | 0.8960 | 0.6385 |
| 2 | 00:00:15 | 8.2880 | 0.2380 | 0.9520 | 0.6375 |
| 3 | 00:00:30 | 8.2740 | 0.2520 | 1.0080 | 0.6366 |
| 4 | 00:01:00 | 8.2620 | 0.2640 | 1.0560 | 0.6358 |
| 5 | 00:02:00 | 8.2480 | 0.2780 | 1.1120 | 0.6349 |
| 6 | 00:04:00 | 8.2380 | 0.2880 | 1.1520 | 0.6342 |
| 7 | 00:08:01 | 8.2320 | 0.2940 | 1.1760 | 0.6338 |
| 8 | 00:15:01 | 8.2240 | 0.3020 | 1.2080 | 0.6333 |
| 9 | 00:30:03 | 8.2160 | 0.3100 | 1.2400 | 0.6328 |
| 10 | 01:00:06 | 8.2100 | 0.3160 | 1.2640 | 0.6324 |
| 11 | 02:00:12 | 8.2040 | 0.3220 | 1.2880 | 0.6320 |
| 12 | 04:00:24 | 8.1940 | 0.3320 | 1.3280 | 0.6313 |
| 13 | 08:00:48 | 8.1860 | 0.3400 | 1.3600 | 0.6308 |
| 14 | 12:01:12 | 8.1860 | 0.3400 | 1.3600 | 0.6308 |
| 15 | 22:11:32 | 8.1820 | 0.3440 | 1.3760 | 0.6305 |

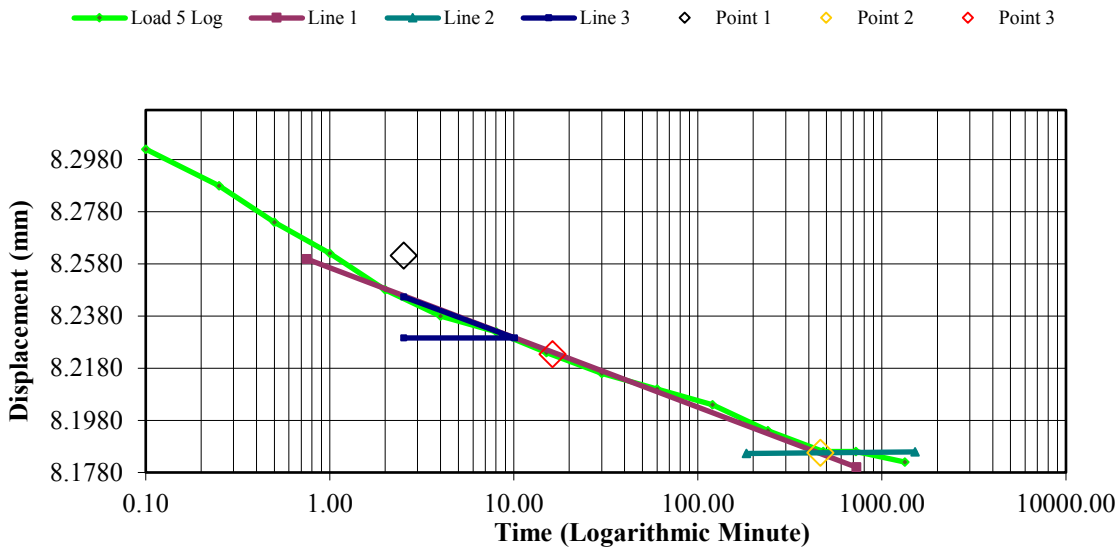
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

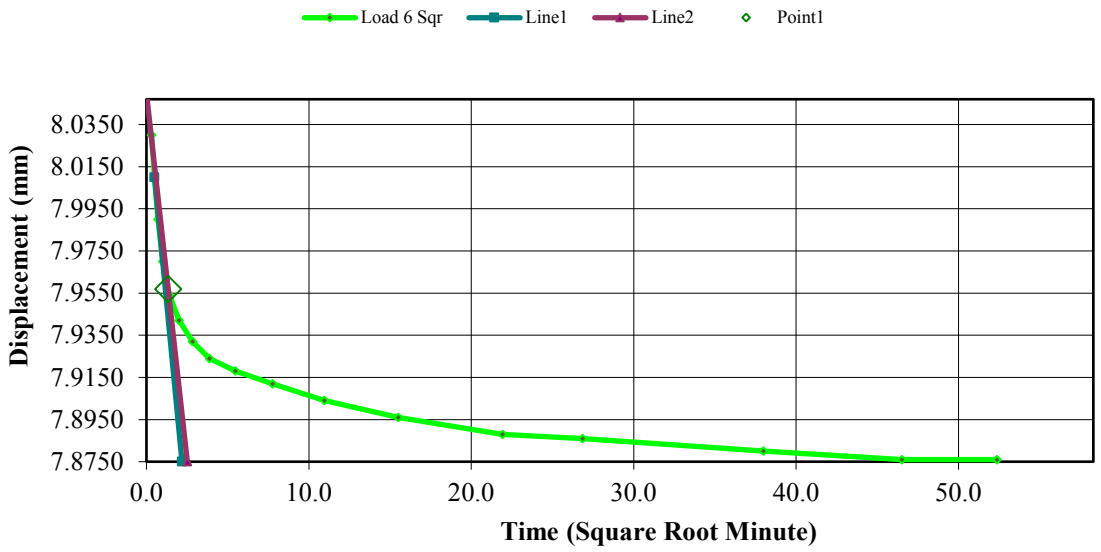
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.1820 | 0.3440 | 1.3760 | 0.6305 |
| 1 | 00:00:06 | 8.0300 | 0.4960 | 1.9840 | 0.6205 |
| 2 | 00:00:15 | 8.0100 | 0.5160 | 2.0640 | 0.6192 |
| 3 | 00:00:30 | 7.9900 | 0.5360 | 2.1440 | 0.6178 |
| 4 | 00:01:00 | 7.9700 | 0.5560 | 2.2240 | 0.6165 |
| 5 | 00:02:00 | 7.9540 | 0.5720 | 2.2880 | 0.6155 |
| 6 | 00:04:00 | 7.9420 | 0.5840 | 2.3360 | 0.6147 |
| 7 | 00:08:01 | 7.9320 | 0.5940 | 2.3760 | 0.6140 |
| 8 | 00:15:01 | 7.9240 | 0.6020 | 2.4080 | 0.6135 |
| 9 | 00:30:03 | 7.9180 | 0.6080 | 2.4320 | 0.6131 |
| 10 | 01:00:06 | 7.9120 | 0.6140 | 2.4560 | 0.6127 |
| 11 | 02:00:12 | 7.9040 | 0.6220 | 2.4880 | 0.6122 |
| 12 | 04:00:24 | 7.8960 | 0.6300 | 2.5200 | 0.6116 |
| 13 | 08:00:48 | 7.8880 | 0.6380 | 2.5520 | 0.6111 |
| 14 | 12:01:12 | 7.8860 | 0.6400 | 2.5600 | 0.6110 |
| 15 | 24:02:24 | 7.8800 | 0.6460 | 2.5840 | 0.6106 |
| 16 | 36:03:36 | 7.8760 | 0.6500 | 2.6000 | 0.6103 |
| 17 | 45:42:56 | 7.8760 | 0.6500 | 2.6000 | 0.6103 |

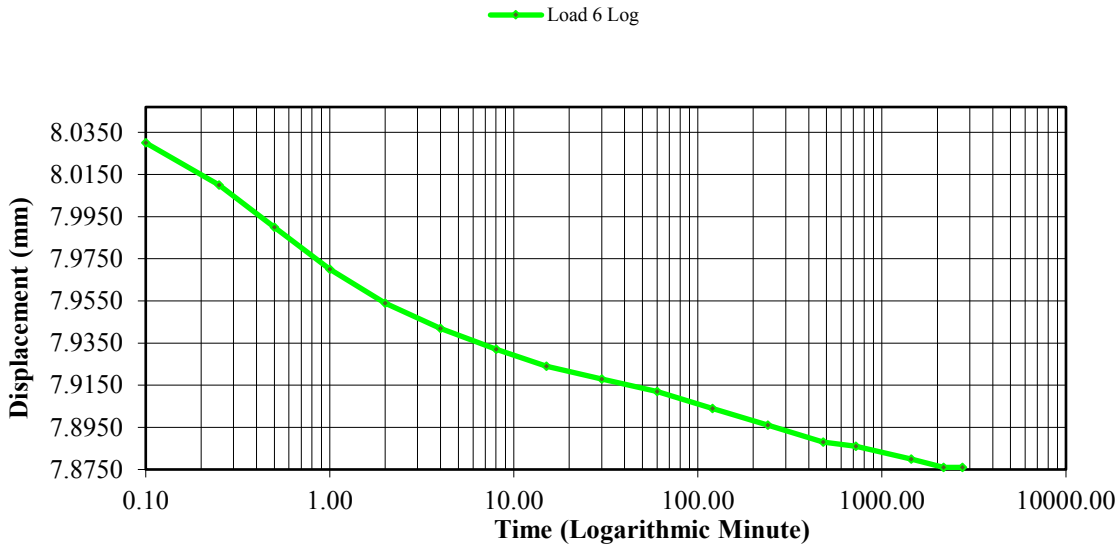
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

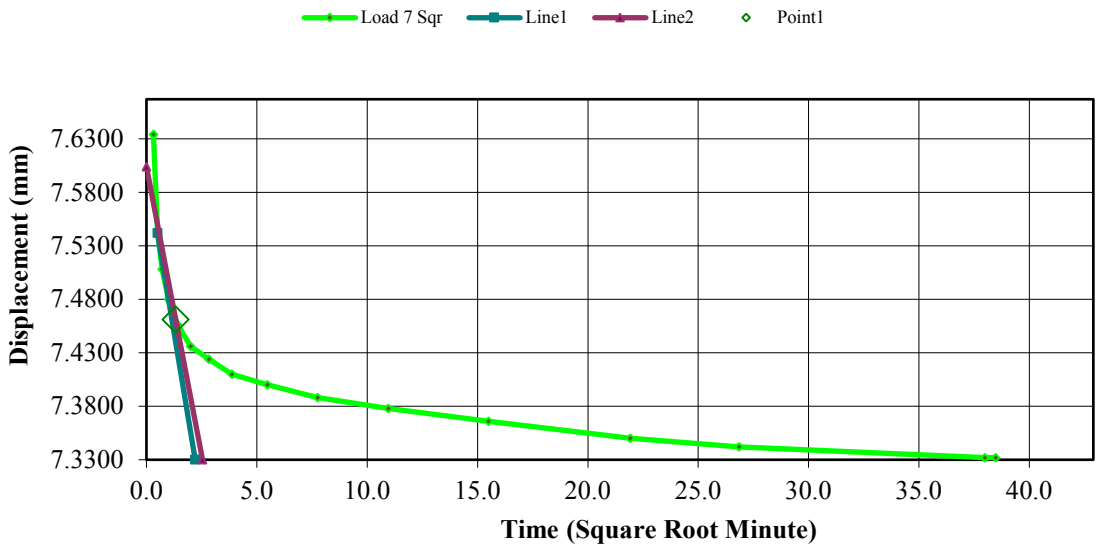
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.8760 | 0.6500 | 2.6000 | 0.6103 |
| 1 | 00:00:06 | 7.6340 | 0.8920 | 3.5680 | 0.5943 |
| 2 | 00:00:15 | 7.5420 | 0.9840 | 3.9360 | 0.5882 |
| 3 | 00:00:30 | 7.5080 | 1.0180 | 4.0720 | 0.5860 |
| 4 | 00:01:00 | 7.4800 | 1.0460 | 4.1840 | 0.5841 |
| 5 | 00:02:00 | 7.4560 | 1.0700 | 4.2800 | 0.5825 |
| 6 | 00:04:00 | 7.4360 | 1.0900 | 4.3600 | 0.5812 |
| 7 | 00:08:01 | 7.4240 | 1.1020 | 4.4080 | 0.5804 |
| 8 | 00:15:01 | 7.4100 | 1.1160 | 4.4640 | 0.5795 |
| 9 | 00:30:02 | 7.4000 | 1.1260 | 4.5040 | 0.5788 |
| 10 | 01:00:05 | 7.3880 | 1.1380 | 4.5520 | 0.5780 |
| 11 | 02:00:10 | 7.3780 | 1.1480 | 4.5920 | 0.5774 |
| 12 | 04:00:22 | 7.3660 | 1.1600 | 4.6400 | 0.5766 |
| 13 | 08:00:46 | 7.3500 | 1.1760 | 4.7040 | 0.5755 |
| 14 | 12:01:09 | 7.3420 | 1.1840 | 4.7360 | 0.5750 |
| 15 | 24:02:20 | 7.3320 | 1.1940 | 4.7760 | 0.5743 |
| 16 | 24:40:15 | 7.3320 | 1.1940 | 4.7760 | 0.5743 |

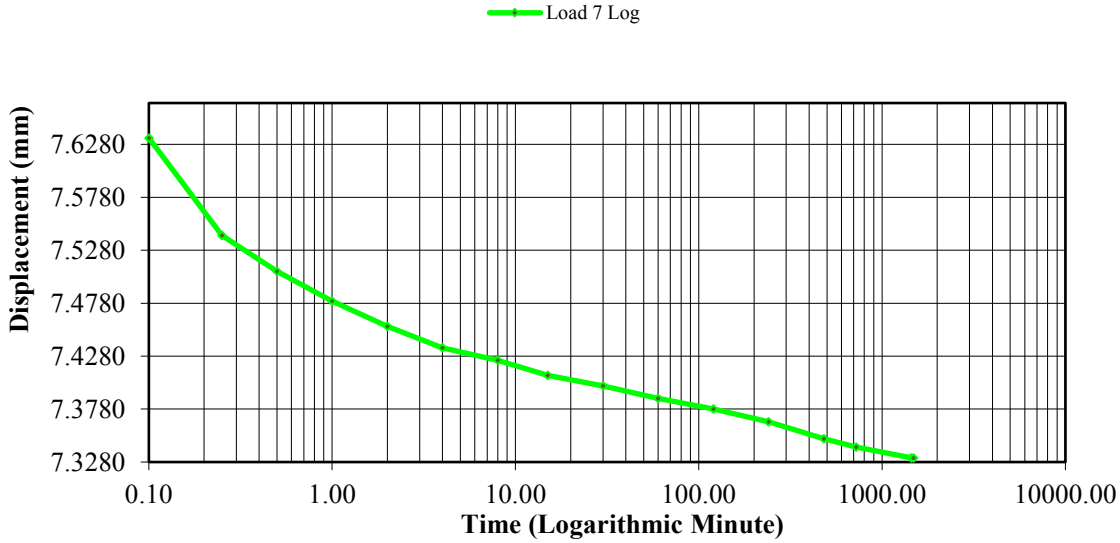
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

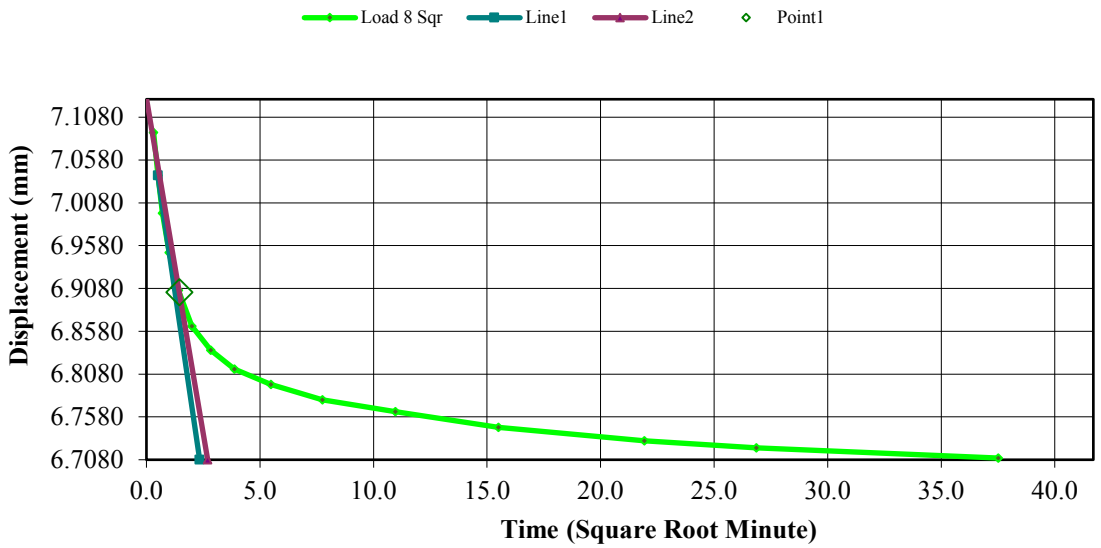
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.3320 | 1.1940 | 4.7760 | 0.5743 |
| 1 | 00:00:06 | 7.0900 | 1.4360 | 5.7440 | 0.5583 |
| 2 | 00:00:15 | 7.0400 | 1.4860 | 5.9440 | 0.5550 |
| 3 | 00:00:30 | 6.9960 | 1.5300 | 6.1200 | 0.5521 |
| 4 | 00:01:00 | 6.9500 | 1.5760 | 6.3040 | 0.5491 |
| 5 | 00:02:00 | 6.9060 | 1.6200 | 6.4800 | 0.5462 |
| 6 | 00:04:00 | 6.8640 | 1.6620 | 6.6480 | 0.5434 |
| 7 | 00:08:01 | 6.8360 | 1.6900 | 6.7600 | 0.5415 |
| 8 | 00:15:02 | 6.8140 | 1.7120 | 6.8480 | 0.5401 |
| 9 | 00:30:03 | 6.7960 | 1.7300 | 6.9200 | 0.5389 |
| 10 | 01:00:06 | 6.7780 | 1.7480 | 6.9920 | 0.5377 |
| 11 | 02:00:12 | 6.7640 | 1.7620 | 7.0480 | 0.5368 |
| 12 | 04:00:24 | 6.7460 | 1.7800 | 7.1200 | 0.5356 |
| 13 | 08:00:48 | 6.7300 | 1.7960 | 7.1840 | 0.5345 |
| 14 | 12:01:12 | 6.7220 | 1.8040 | 7.2160 | 0.5340 |
| 15 | 23:26:46 | 6.7100 | 1.8160 | 7.2640 | 0.5332 |

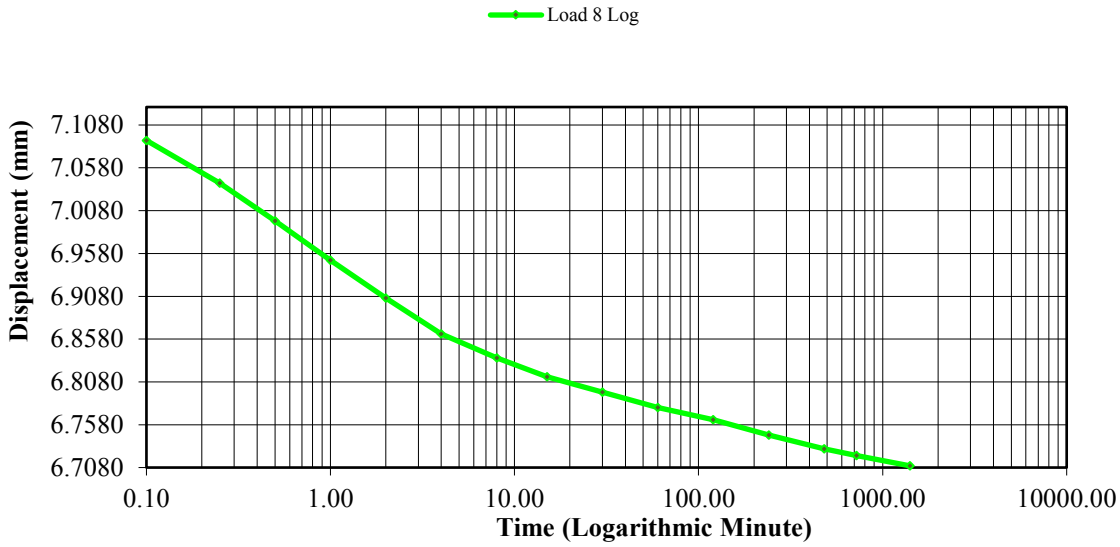
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

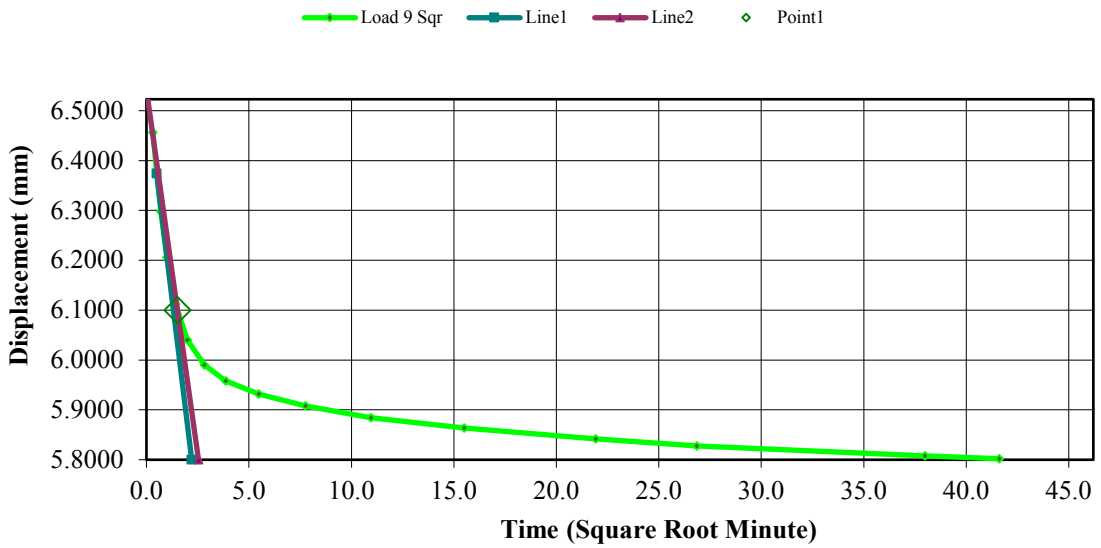
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 6.7100 | 1.8160 | 7.2640 | 0.5332 |
| 1 | 00:00:06 | 6.4560 | 2.0700 | 8.2800 | 0.5164 |
| 2 | 00:00:15 | 6.3740 | 2.1520 | 8.6080 | 0.5110 |
| 3 | 00:00:30 | 6.2980 | 2.2280 | 8.9120 | 0.5059 |
| 4 | 00:01:00 | 6.2060 | 2.3200 | 9.2800 | 0.4999 |
| 5 | 00:02:00 | 6.1120 | 2.4140 | 9.6560 | 0.4936 |
| 6 | 00:04:00 | 6.0400 | 2.4860 | 9.9440 | 0.4889 |
| 7 | 00:08:00 | 5.9900 | 2.5360 | 10.1440 | 0.4856 |
| 8 | 00:15:01 | 5.9580 | 2.5680 | 10.2720 | 0.4835 |
| 9 | 00:30:03 | 5.9320 | 2.5940 | 10.3760 | 0.4817 |
| 10 | 01:00:06 | 5.9080 | 2.6180 | 10.4720 | 0.4802 |
| 11 | 02:00:11 | 5.8840 | 2.6420 | 10.5680 | 0.4786 |
| 12 | 04:00:23 | 5.8640 | 2.6620 | 10.6480 | 0.4772 |
| 13 | 08:00:47 | 5.8420 | 2.6840 | 10.7360 | 0.4758 |
| 14 | 12:01:11 | 5.8280 | 2.6980 | 10.7920 | 0.4749 |
| 15 | 24:02:24 | 5.8080 | 2.7180 | 10.8720 | 0.4735 |
| 16 | 28:51:08 | 5.8020 | 2.7240 | 10.8960 | 0.4731 |

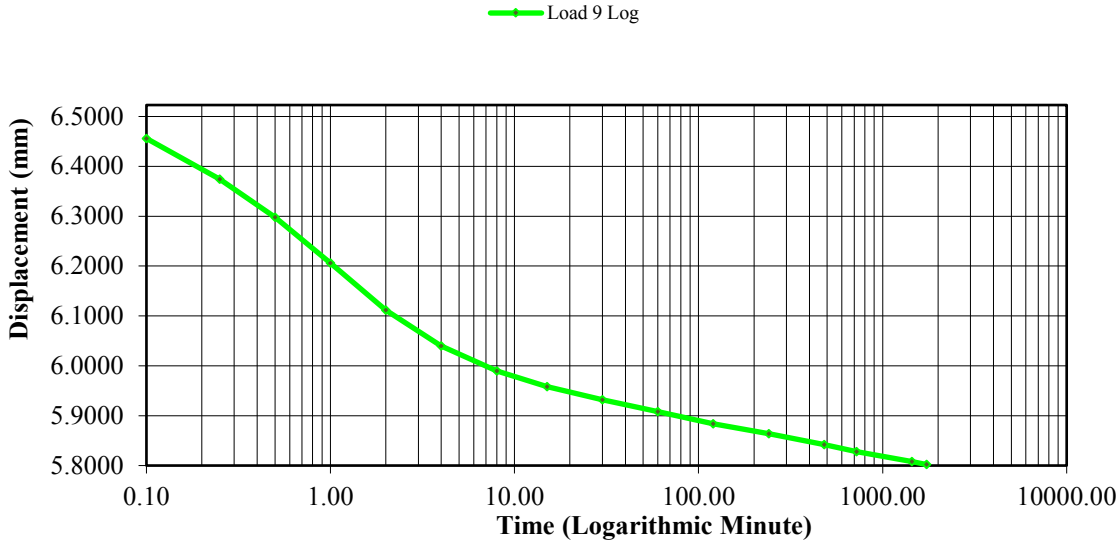
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

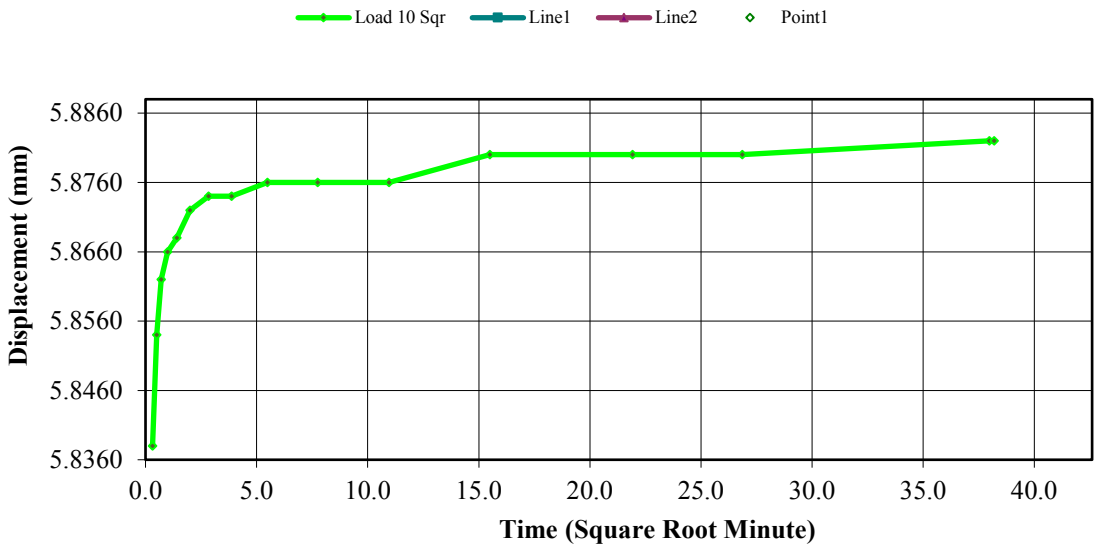
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 5.8020 | 2.7240 | 10.8960 | 0.4731 |
| 1 | 00:00:06 | 5.8380 | 2.6880 | 10.7520 | 0.4755 |
| 2 | 00:00:15 | 5.8540 | 2.6720 | 10.6880 | 0.4766 |
| 3 | 00:00:30 | 5.8620 | 2.6640 | 10.6560 | 0.4771 |
| 4 | 00:01:00 | 5.8660 | 2.6600 | 10.6400 | 0.4774 |
| 5 | 00:02:00 | 5.8680 | 2.6580 | 10.6320 | 0.4775 |
| 6 | 00:04:01 | 5.8720 | 2.6540 | 10.6160 | 0.4778 |
| 7 | 00:08:01 | 5.8740 | 2.6520 | 10.6080 | 0.4779 |
| 8 | 00:15:01 | 5.8740 | 2.6520 | 10.6080 | 0.4779 |
| 9 | 00:30:03 | 5.8760 | 2.6500 | 10.6000 | 0.4780 |
| 10 | 01:00:05 | 5.8760 | 2.6500 | 10.6000 | 0.4780 |
| 11 | 02:00:10 | 5.8760 | 2.6500 | 10.6000 | 0.4780 |
| 12 | 04:00:20 | 5.8800 | 2.6460 | 10.5840 | 0.4783 |
| 13 | 08:00:44 | 5.8800 | 2.6460 | 10.5840 | 0.4783 |
| 14 | 12:01:08 | 5.8800 | 2.6460 | 10.5840 | 0.4783 |
| 15 | 24:02:18 | 5.8820 | 2.6440 | 10.5760 | 0.4784 |
| 16 | 24:19:03 | 5.8820 | 2.6440 | 10.5760 | 0.4784 |

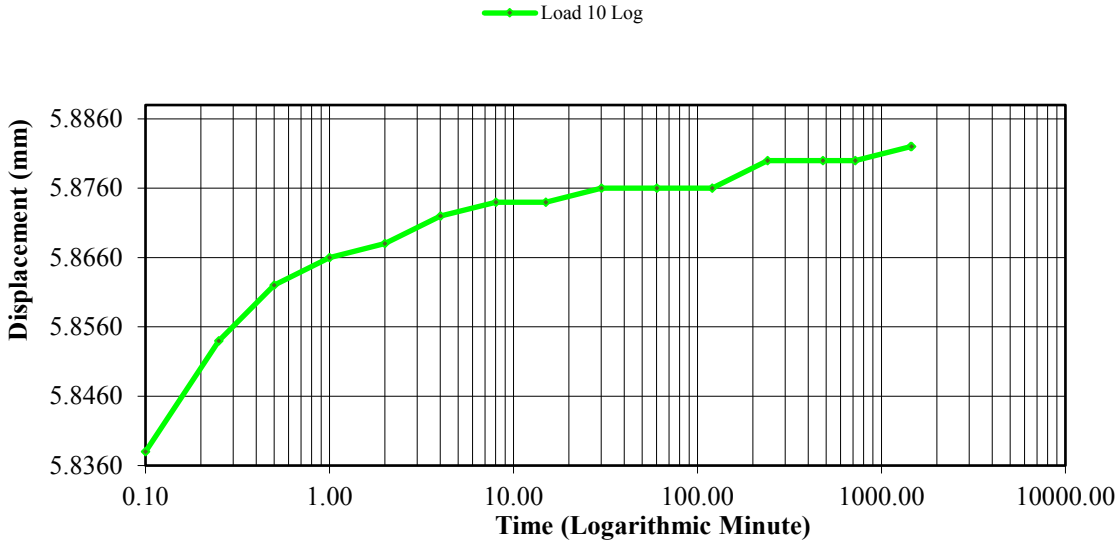
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

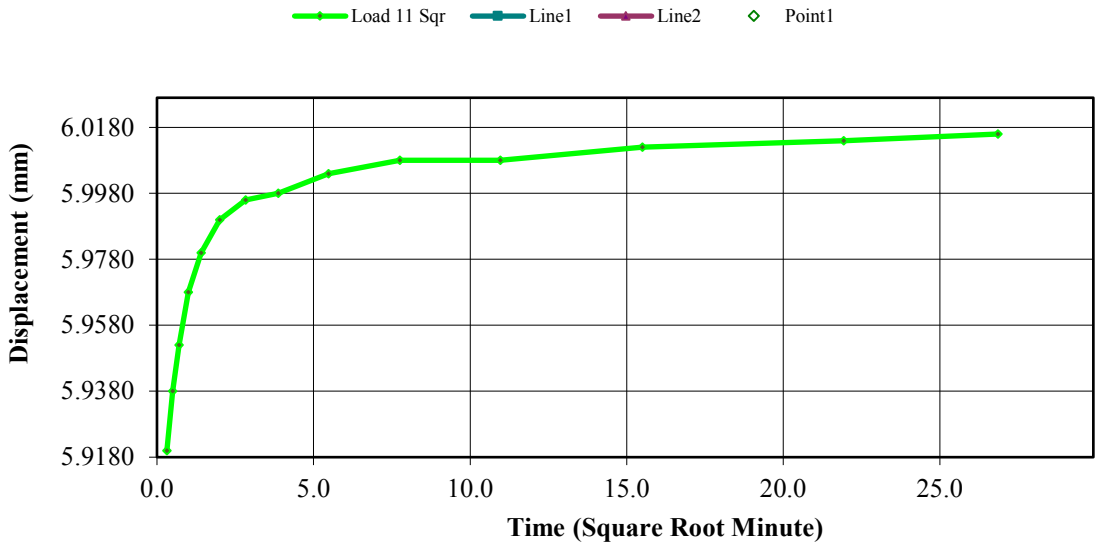
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 5.8820 | 2.6440 | 10.5760 | 0.4784 |
| 1 | 00:00:06 | 5.9200 | 2.6060 | 10.4240 | 0.4809 |
| 2 | 00:00:15 | 5.9380 | 2.5880 | 10.3520 | 0.4821 |
| 3 | 00:00:30 | 5.9520 | 2.5740 | 10.2960 | 0.4831 |
| 4 | 00:01:00 | 5.9680 | 2.5580 | 10.2320 | 0.4841 |
| 5 | 00:02:00 | 5.9800 | 2.5460 | 10.1840 | 0.4849 |
| 6 | 00:04:00 | 5.9900 | 2.5360 | 10.1440 | 0.4856 |
| 7 | 00:08:00 | 5.9960 | 2.5300 | 10.1200 | 0.4860 |
| 8 | 00:15:01 | 5.9980 | 2.5280 | 10.1120 | 0.4861 |
| 9 | 00:30:03 | 6.0040 | 2.5220 | 10.0880 | 0.4865 |
| 10 | 01:00:06 | 6.0080 | 2.5180 | 10.0720 | 0.4868 |
| 11 | 02:00:12 | 6.0080 | 2.5180 | 10.0720 | 0.4868 |
| 12 | 04:00:24 | 6.0120 | 2.5140 | 10.0560 | 0.4870 |
| 13 | 08:00:48 | 6.0140 | 2.5120 | 10.0480 | 0.4872 |
| 14 | 12:01:12 | 6.0160 | 2.5100 | 10.0400 | 0.4873 |

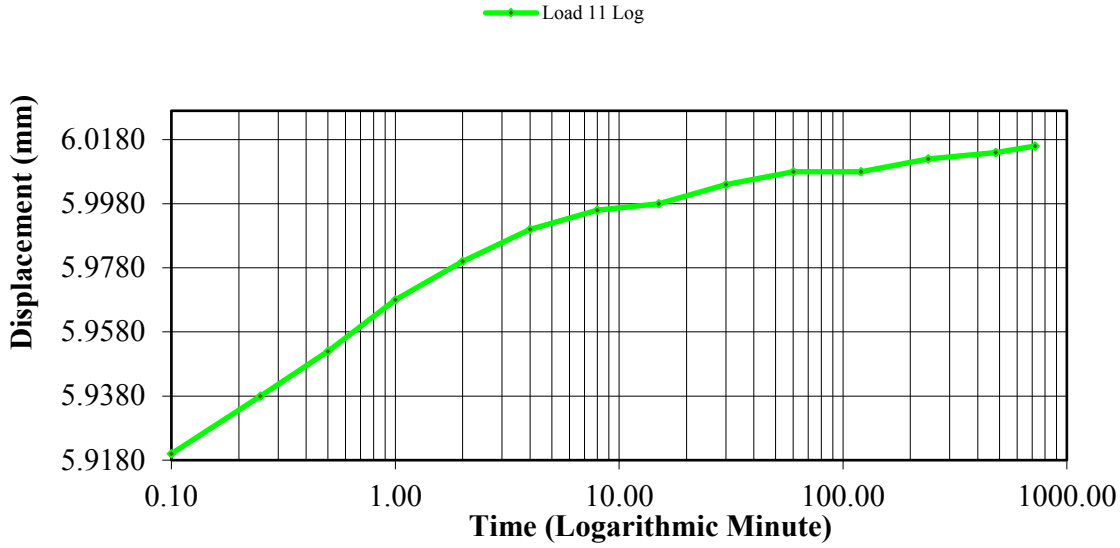
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

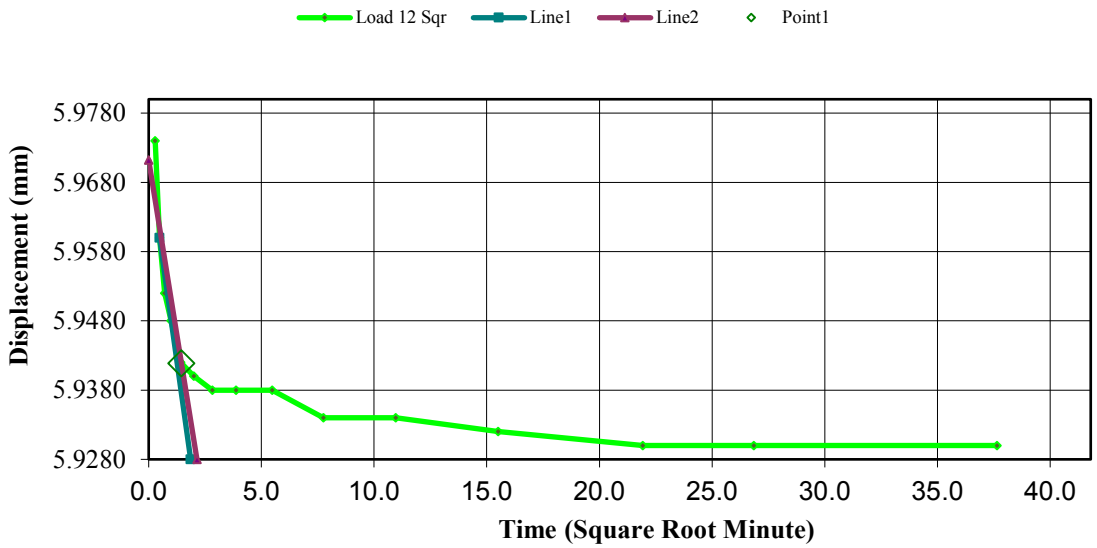
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 6.0160 | 2.5100 | 10.0400 | 0.4873 |
| 1 | 00:00:05 | 5.9740 | 2.5520 | 10.2080 | 0.4845 |
| 2 | 00:00:14 | 5.9600 | 2.5660 | 10.2640 | 0.4836 |
| 3 | 00:00:30 | 5.9520 | 2.5740 | 10.2960 | 0.4831 |
| 4 | 00:01:00 | 5.9480 | 2.5780 | 10.3120 | 0.4828 |
| 5 | 00:02:00 | 5.9420 | 2.5840 | 10.3360 | 0.4824 |
| 6 | 00:04:00 | 5.9400 | 2.5860 | 10.3440 | 0.4823 |
| 7 | 00:08:00 | 5.9380 | 2.5880 | 10.3520 | 0.4821 |
| 8 | 00:15:01 | 5.9380 | 2.5880 | 10.3520 | 0.4821 |
| 9 | 00:30:02 | 5.9380 | 2.5880 | 10.3520 | 0.4821 |
| 10 | 01:00:05 | 5.9340 | 2.5920 | 10.3680 | 0.4819 |
| 11 | 02:00:12 | 5.9340 | 2.5920 | 10.3680 | 0.4819 |
| 12 | 04:00:24 | 5.9320 | 2.5940 | 10.3760 | 0.4817 |
| 13 | 08:00:47 | 5.9300 | 2.5960 | 10.3840 | 0.4816 |
| 14 | 12:01:12 | 5.9300 | 2.5960 | 10.3840 | 0.4816 |
| 15 | 23:36:31 | 5.9300 | 2.5960 | 10.3840 | 0.4816 |

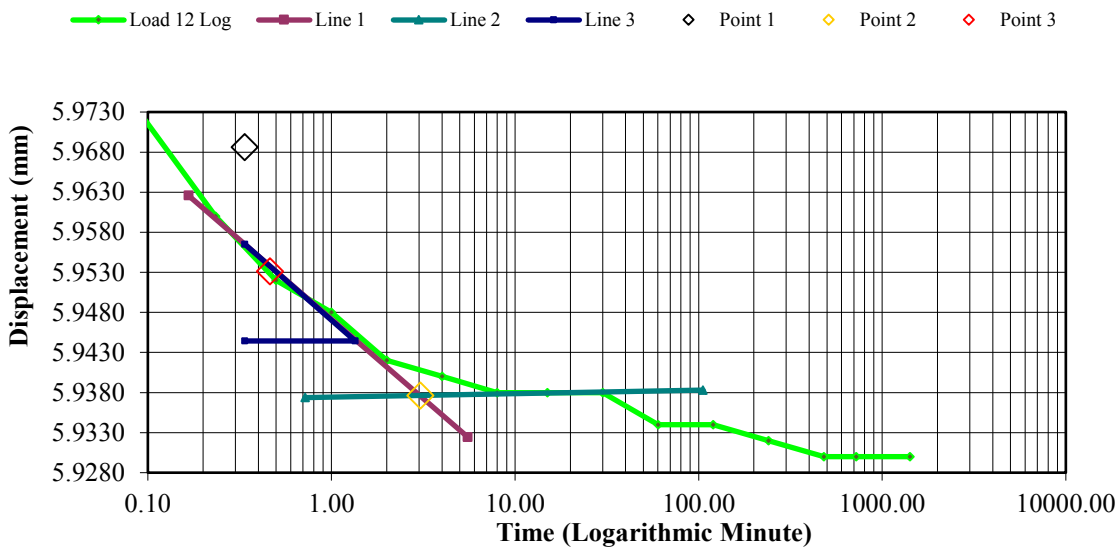
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

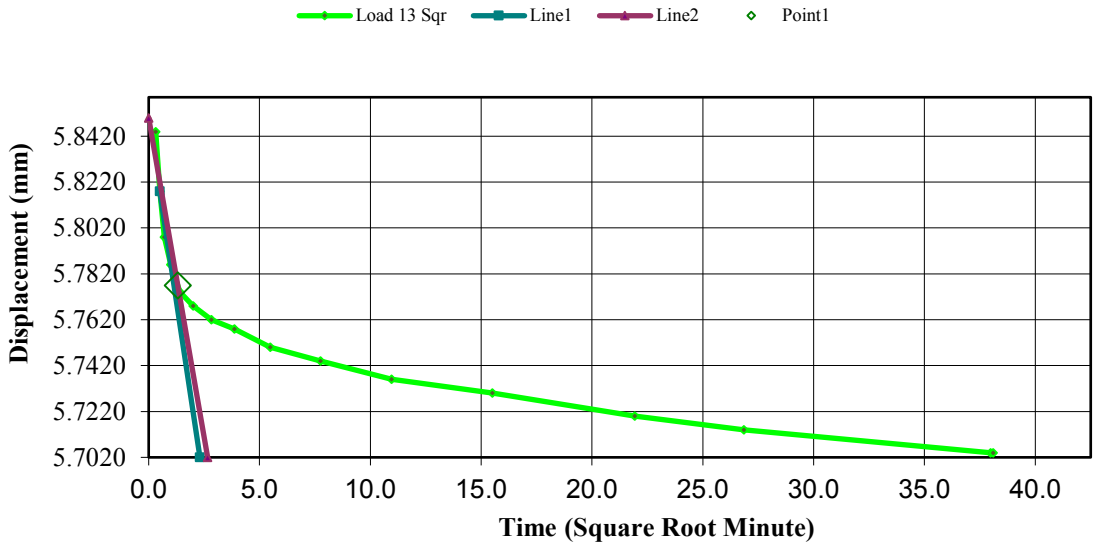
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 5.9300 | 2.5960 | 10.3840 | 0.4816 |
| 1 | 00:00:06 | 5.8440 | 2.6820 | 10.7280 | 0.4759 |
| 2 | 00:00:15 | 5.8180 | 2.7080 | 10.8320 | 0.4742 |
| 3 | 00:00:30 | 5.7980 | 2.7280 | 10.9120 | 0.4729 |
| 4 | 00:01:00 | 5.7860 | 2.7400 | 10.9600 | 0.4721 |
| 5 | 00:02:00 | 5.7740 | 2.7520 | 11.0080 | 0.4713 |
| 6 | 00:04:00 | 5.7680 | 2.7580 | 11.0320 | 0.4709 |
| 7 | 00:08:01 | 5.7620 | 2.7640 | 11.0560 | 0.4705 |
| 8 | 00:15:01 | 5.7580 | 2.7680 | 11.0720 | 0.4702 |
| 9 | 00:30:03 | 5.7500 | 2.7760 | 11.1040 | 0.4697 |
| 10 | 01:00:06 | 5.7440 | 2.7820 | 11.1280 | 0.4693 |
| 11 | 02:00:12 | 5.7360 | 2.7900 | 11.1600 | 0.4688 |
| 12 | 04:00:24 | 5.7300 | 2.7960 | 11.1840 | 0.4684 |
| 13 | 08:00:48 | 5.7200 | 2.8060 | 11.2240 | 0.4677 |
| 14 | 12:01:12 | 5.7140 | 2.8120 | 11.2480 | 0.4673 |
| 15 | 24:02:22 | 5.7040 | 2.8220 | 11.2880 | 0.4667 |
| 16 | 24:11:41 | 5.7040 | 2.8220 | 11.2880 | 0.4667 |

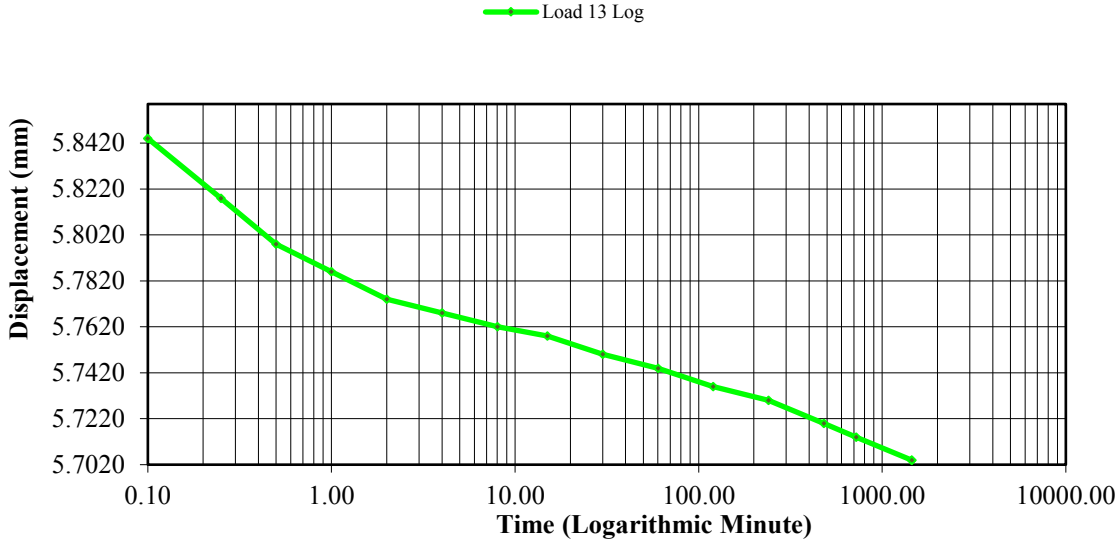
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

**Project:** SR1 **Project Number:** 5.302.702.230
**Location:**
**Job Number:** **Test Date:** 14-Sep-16
**Test Number:**

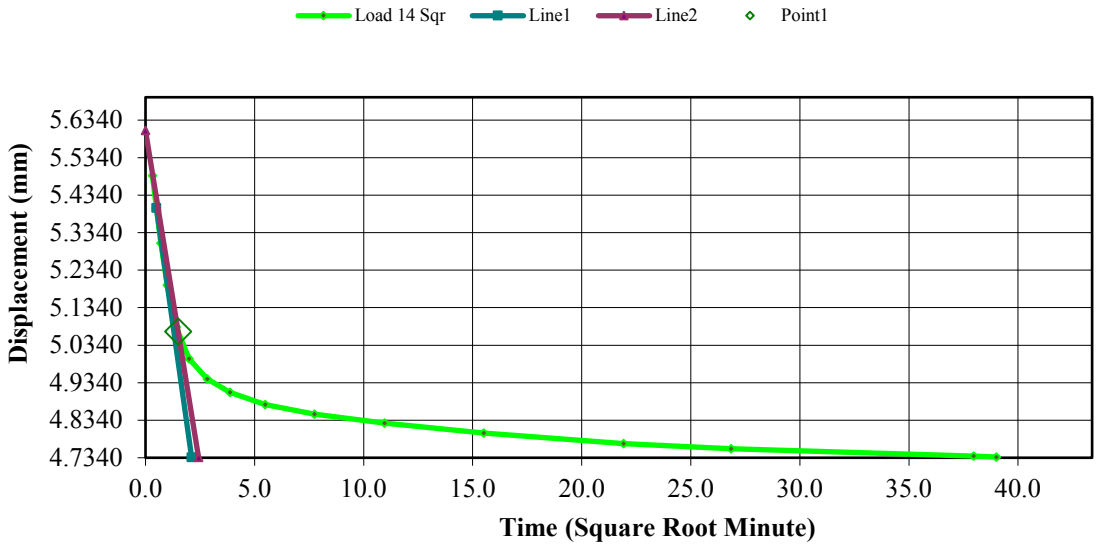
**Sample Number:** D36 ST10 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 4.50-4.95m **Remarks:**
**Sample Type:** Undisturbed

| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 5.7040 | 2.8220 | 11.2880 | 0.4667 |
| 1 | 00:00:06 | 5.4860 | 3.0400 | 12.1600 | 0.4522 |
| 2 | 00:00:15 | 5.4000 | 3.1260 | 12.5040 | 0.4466 |
| 3 | 00:00:30 | 5.3060 | 3.2200 | 12.8800 | 0.4403 |
| 4 | 00:01:00 | 5.1940 | 3.3320 | 13.3280 | 0.4329 |
| 5 | 00:02:00 | 5.0820 | 3.4440 | 13.7760 | 0.4255 |
| 6 | 00:04:00 | 4.9980 | 3.5280 | 14.1120 | 0.4200 |
| 7 | 00:08:00 | 4.9440 | 3.5820 | 14.3280 | 0.4164 |
| 8 | 00:15:01 | 4.9080 | 3.6180 | 14.4720 | 0.4140 |
| 9 | 00:30:02 | 4.8760 | 3.6500 | 14.6000 | 0.4119 |
| 10 | 01:00:04 | 4.8500 | 3.6760 | 14.7040 | 0.4102 |
| 11 | 02:00:08 | 4.8260 | 3.7000 | 14.8000 | 0.4086 |
| 12 | 04:00:19 | 4.8000 | 3.7260 | 14.9040 | 0.4069 |
| 13 | 08:00:43 | 4.7720 | 3.7540 | 15.0160 | 0.4050 |
| 14 | 12:01:06 | 4.7580 | 3.7680 | 15.0720 | 0.4041 |
| 15 | 24:02:17 | 4.7380 | 3.7880 | 15.1520 | 0.4028 |
| 16 | 25:21:48 | 4.7360 | 3.7900 | 15.1600 | 0.4026 |

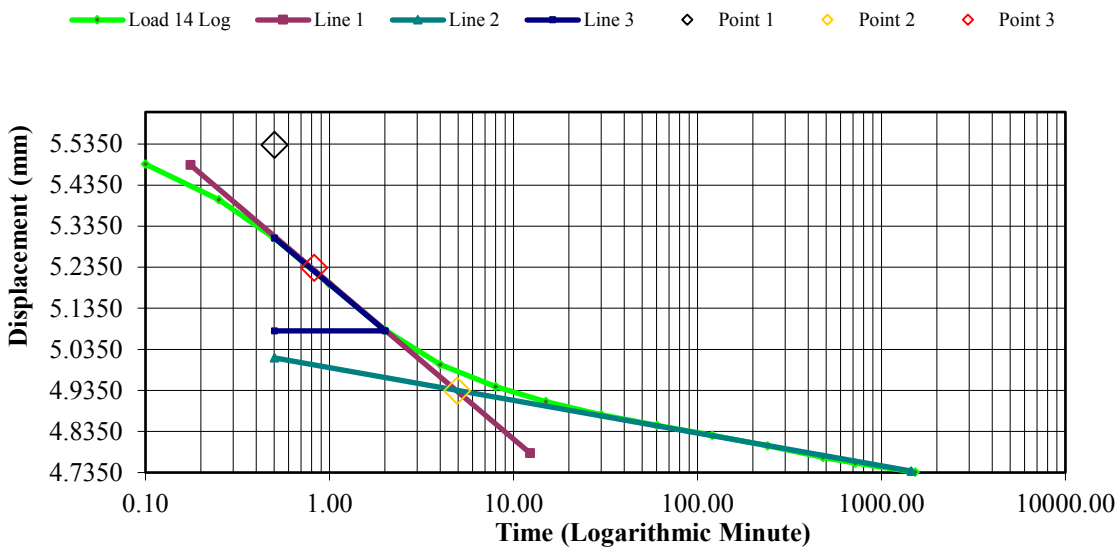
**Tested By:** **Checked By:**

# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



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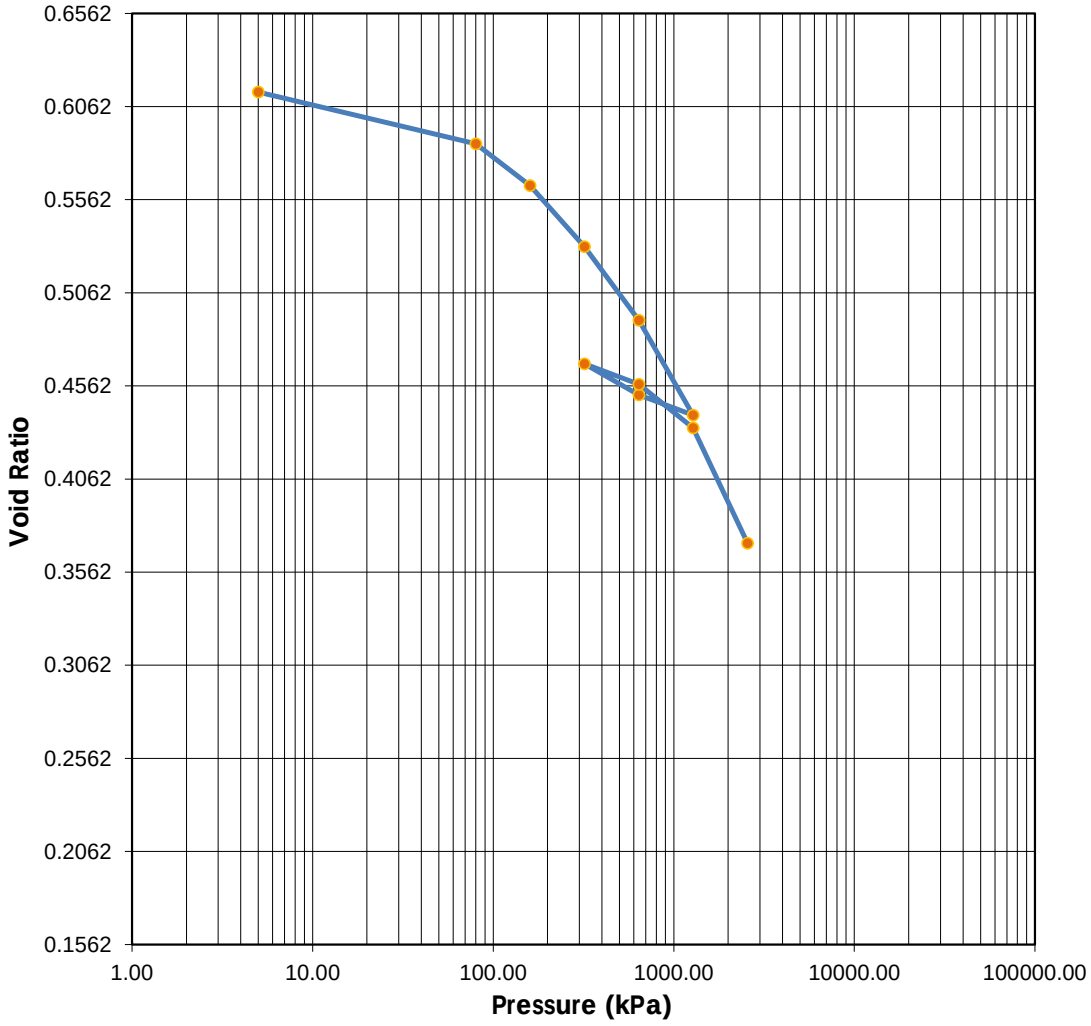
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 11-Oct-16 |
| **Moisture (%):** | 18.8 | 18.0 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.670 | 1.928 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 82.38 | 100.00 | | | | |
| **Void Ratio:** | 0.6140 | 0.3718 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.70-3.15m

**Sample Number:** D51 ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads at 10kPa, 20kPa and 40kPa omitted due to swelling.

**Tested By:** C. Woods **Reviewed By:**

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435

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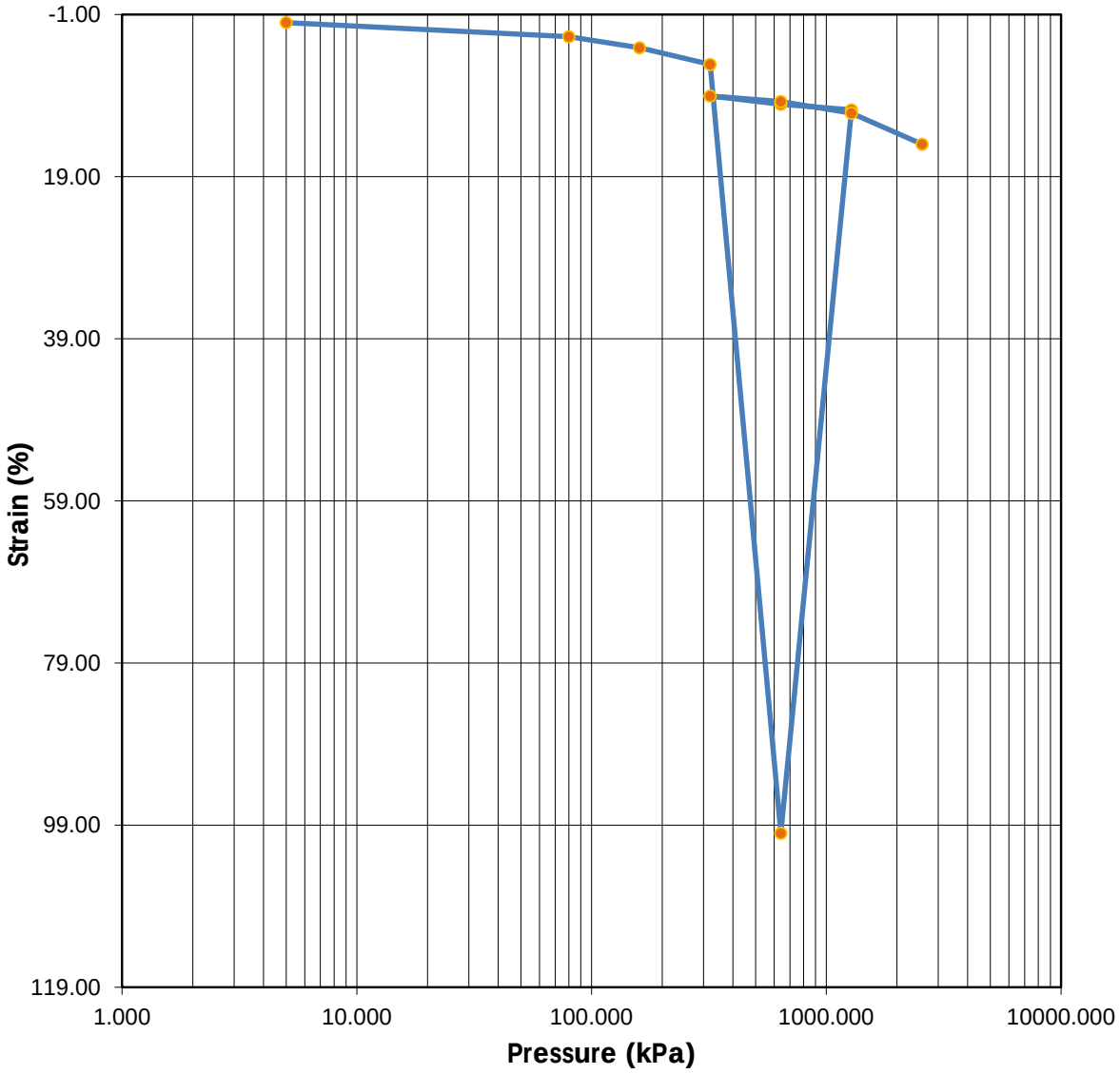
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

### Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 18.8 | 18.0 | **Liquid Limits:** | - | **Test Date:** | 11-Oct-16 |
| **Dry Density (g/cm3):** | 1.670 | 1.928 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 82.38 | 100.00 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6140 | 0.3718 | **Specific Gravity:** | 2.700 | Assumed | |

**Sample Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.70-3.15m

**Sample Number:** D51 ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads at 10kPa, 20kPa and 40kPa omitted due to swelling.

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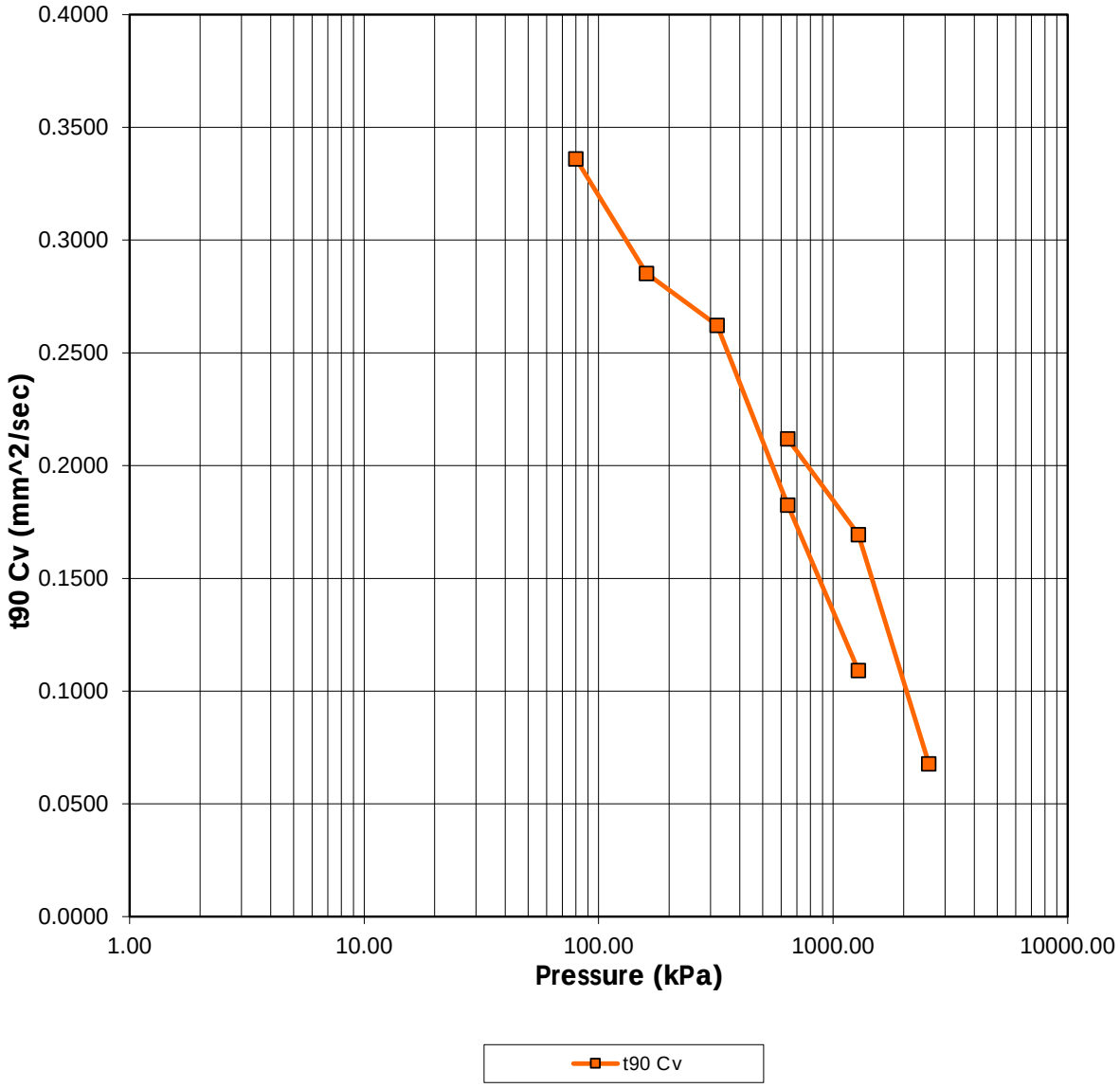
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 18.8 | 18.0 | **Liquid Limits:** | - | **Test Date:** | 11-Oct-16 |
| **Dry Density (g/cm3):** | 1.670 | 1.928 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 82.38 | 100.00 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6140 | 0.3718 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.70-3.15m

**Sample Number:** D51 ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads at 10kPa, 20kPa and 40kPa omitted due to swelling.

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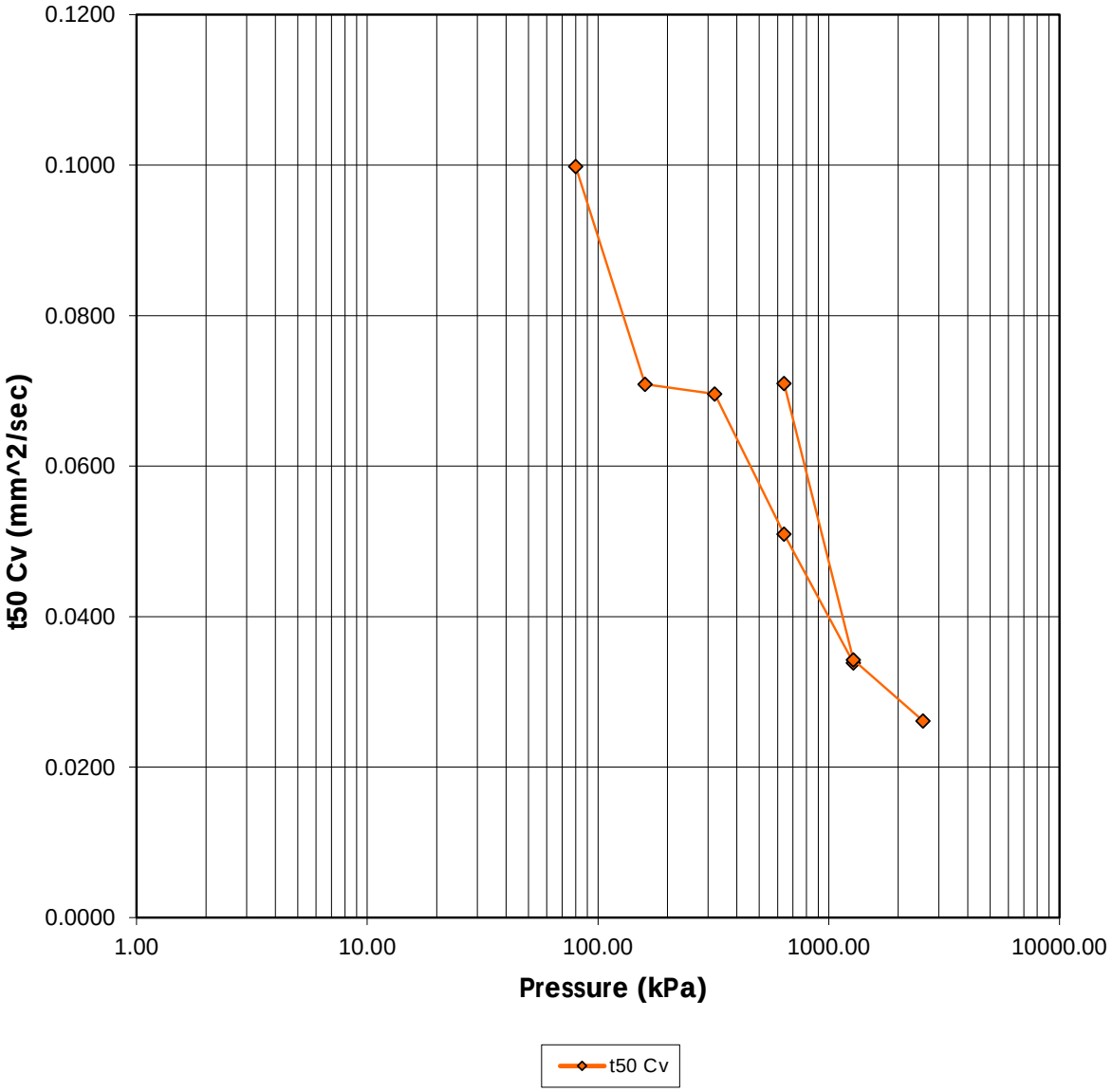
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 18.8 | 18.0 | **Liquid Limits:** | - | **Test Date:** | 11-Oct-16 |
| **Dry Density (g/cm3):** | 1.670 | 1.928 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 82.38 | 100.00 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6140 | 0.3718 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.70-3.15m

**Sample Number:** D51 ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads at 10kPa, 20kPa and 40kPa omitted due to swelling.

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

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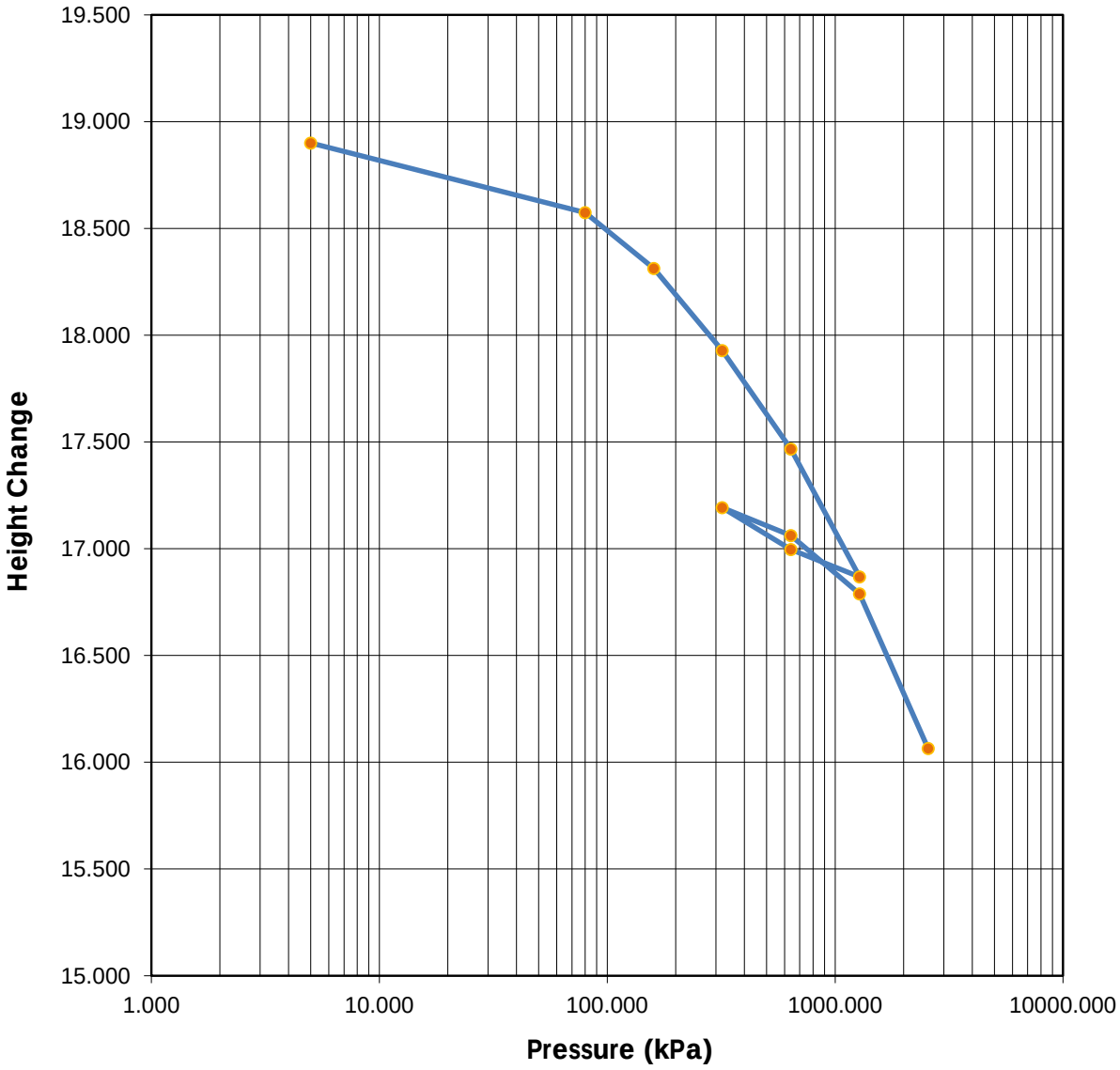
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 11-Oct-16 |
| **Moisture (%):** | 18.8 | 18.0 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.670 | 1.928 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 82.38 | 100.00 | | | | |
| **Void Ratio:** | 0.6140 | 0.3718 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.70-3.15m

**Sample Number:** D51 ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads at 10kPa, 20kPa and 40kPa omitted due to swelling.

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D51 ST6
**Boring Number:**
**Depth:** 2.70-3.15m
**Sample Type:** Undisturbed

**Sample Description:** Brown Clay
**Remarks:**

**Test Number:**
**Test Date:** 11-Oct-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 18.9000 | 7.1898 | 0.00 | 0.6140 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 18.9000 | 7.1898 | 0.00 | 0.6140 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 10.000 | 0.0220 | 18.8780 | 7.1678 | 0.12 | 0.6121 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 20.000 | 0.0840 | 18.8160 | 7.1058 | 0.44 | 0.6068 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 40.000 | 0.1760 | 18.7240 | 7.0138 | 0.93 | 0.5990 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | 80.000 | 0.3260 | 18.5740 | 6.8638 | 1.72 | 0.5861 | 3.627 | 2.837 | 0.336 | 0.100 |
| 6 | 160.000 | 0.5880 | 18.3120 | 6.6018 | 3.11 | 0.5638 | 4.155 | 3.884 | 0.285 | 0.071 |
| 7 | 320.000 | 0.9720 | 17.9280 | 6.2178 | 5.14 | 0.5310 | 4.331 | 3.791 | 0.262 | 0.070 |
| 8 | 640.000 | 1.4340 | 17.4660 | 5.7558 | 100.00 | 0.4915 | 5.907 | 4.912 | 0.182 | 0.051 |
| 9 | 1280.000 | 2.0320 | 16.8680 | 5.1578 | 10.75 | 0.4405 | 9.206 | 6.900 | 0.109 | 0.034 |
| 10 | 640.000 | 1.9040 | 16.9960 | 5.2858 | 10.07 | 0.4514 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 320.000 | 1.7080 | 17.1920 | 5.4818 | 9.04 | 0.4681 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 640.000 | 1.8380 | 17.0620 | 5.3518 | 9.72 | 0.4570 | 4.854 | 3.366 | 0.212 | 0.071 |
| 13 | 1280.000 | 2.1120 | 16.7880 | 5.0778 | 11.17 | 0.4336 | 5.880 | 6.754 | 0.169 | 0.034 |
| 14 | 2560.000 | 2.8360 | 16.0640 | 4.3538 | 15.01 | 0.3718 | 13.460 | 8.099 | 0.068 | 0.026 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 11-Oct-16

**Sample Number:** D51 ST6 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 2.70-3.15m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** - **Initial Void Ratio:** 0.6140 **Initial Height (mm):** 18.9
**Plastic Limit:** - **Plasticity Index (%):** - **Initial Diameter (mm):** 49.9
**Specific Gravity:** 2.70 Assumed **Weight of Ring (g):** 61.5300

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 42.93 | 66.98 |
| Dry Soil + Container (g) | 36.36 | 57.37 |
| Weight of Container (g) | 1.45 | 3.95 |
| Moisture Content (%) | 18.82 | 17.99 |
| Void Ratio | 0.6140 | 0.3718 |
| Saturation (%) | 82.38 | 100.00 |
| Dry Density (g/cm3) | 1.67 | 1.93 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 11-Oct-16
**Test Number:**

**Sample Number:** D51 ST6
**Boring Number:**
**Depth:** 2.70-3.15m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

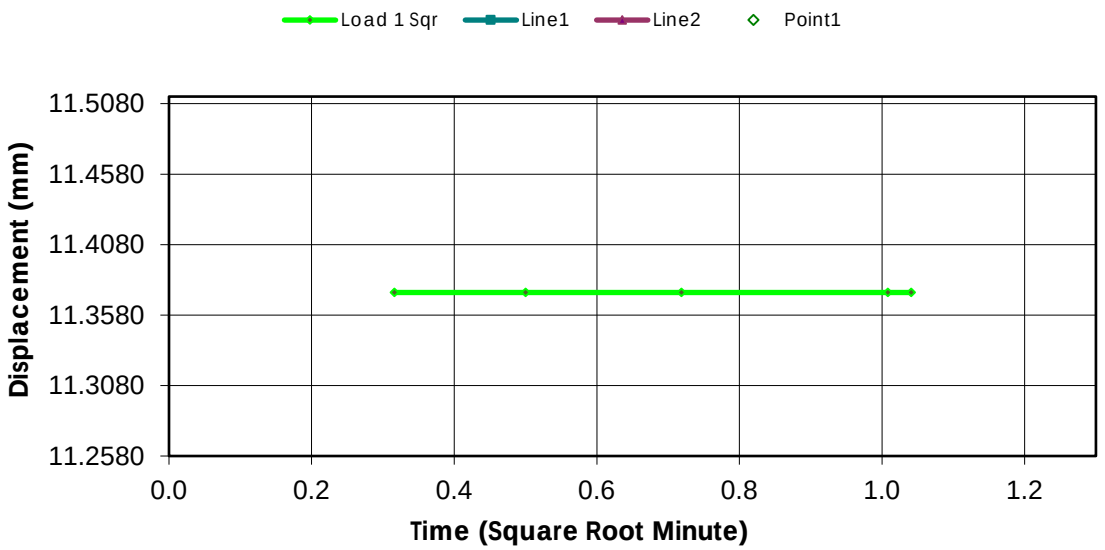
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.3740 | 0.0000 | 0.0000 | 0.6140 |
| 1 | 00:00:06 | 11.3740 | 0.0000 | 0.0000 | 0.6140 |
| 2 | 00:00:15 | 11.3740 | 0.0000 | 0.0000 | 0.6140 |
| 3 | 00:00:31 | 11.3740 | 0.0000 | 0.0000 | 0.6140 |
| 4 | 00:01:01 | 11.3740 | 0.0000 | 0.0000 | 0.6140 |
| 5 | 00:01:05 | 11.3740 | 0.0000 | 0.0000 | 0.6140 |

#####

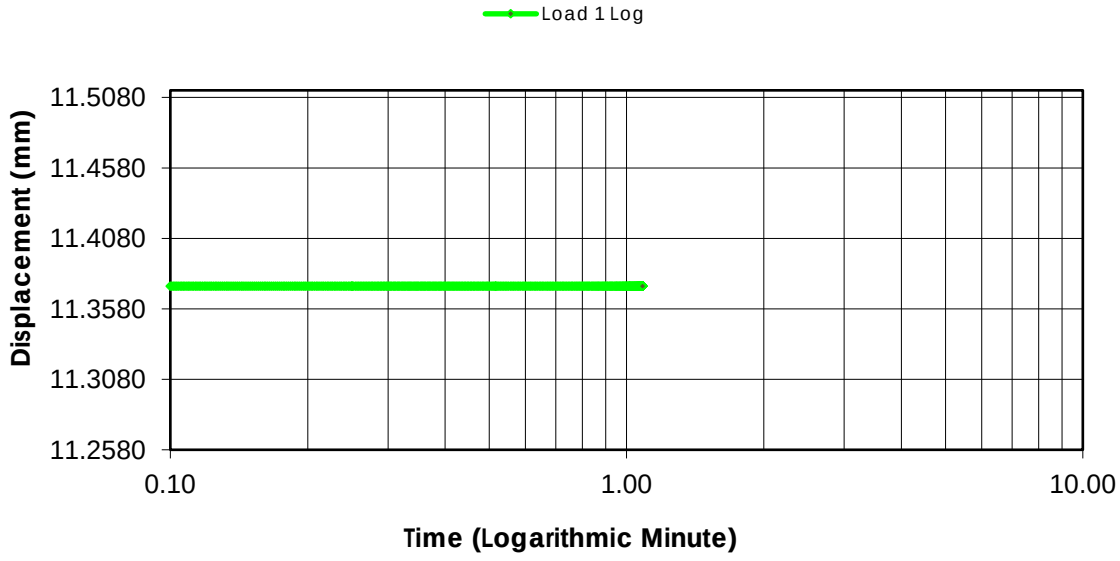
100.0000

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 11-Oct-16
**Test Number:**

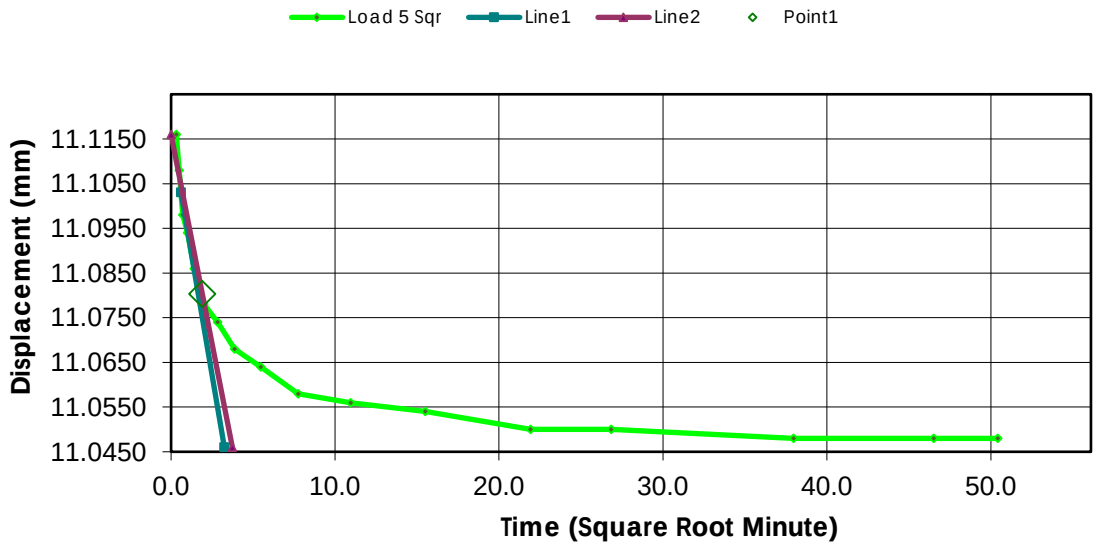
**Sample Number:** D51 ST6
**Boring Number:**
**Depth:** 2.70-3.15m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

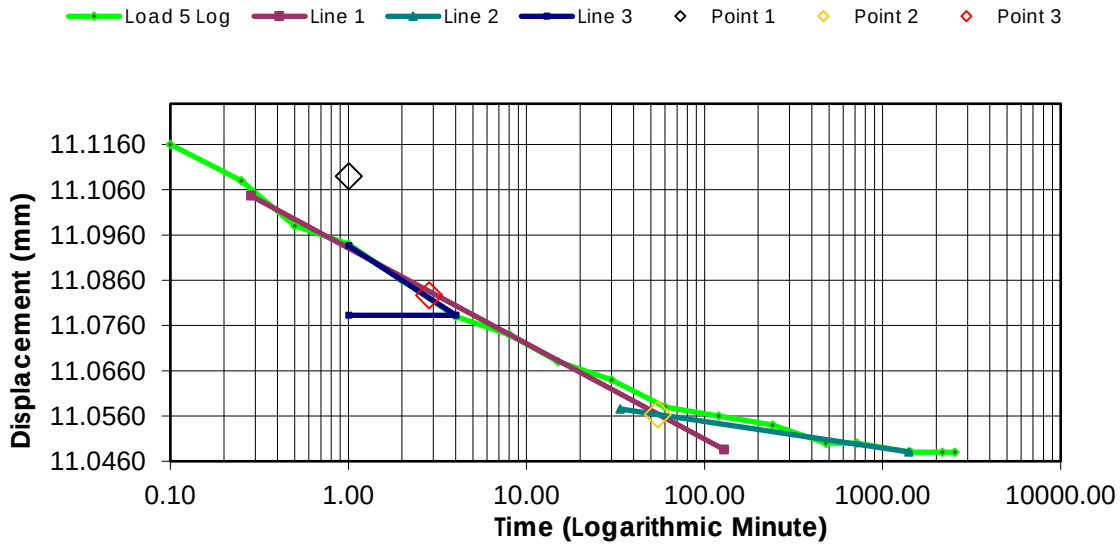
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.1980 | 0.1760 | 0.9312 | 0.5990 |
| 1 | 00:00:06 | 11.1160 | 0.2580 | 1.3651 | 0.5920 |
| 2 | 00:00:15 | 11.1080 | 0.2660 | 1.4074 | 0.5913 |
| 3 | 00:00:30 | 11.0980 | 0.2760 | 1.4603 | 0.5904 |
| 4 | 00:01:00 | 11.0940 | 0.2800 | 1.4815 | 0.5901 |
| 5 | 00:02:00 | 11.0860 | 0.2880 | 1.5238 | 0.5894 |
| 6 | 00:04:00 | 11.0780 | 0.2960 | 1.5661 | 0.5887 |
| 7 | 00:08:01 | 11.0740 | 0.3000 | 1.5873 | 0.5884 |
| 8 | 00:15:01 | 11.0680 | 0.3060 | 1.6190 | 0.5879 |
| 9 | 00:30:02 | 11.0640 | 0.3100 | 1.6402 | 0.5875 |
| 10 | 01:00:05 | 11.0580 | 0.3160 | 1.6720 | 0.5870 |
| 11 | 02:00:09 | 11.0560 | 0.3180 | 1.6825 | 0.5868 |
| 12 | 04:00:18 | 11.0540 | 0.3200 | 1.6931 | 0.5867 |
| 13 | 08:00:37 | 11.0500 | 0.3240 | 1.7143 | 0.5863 |
| 14 | 12:00:55 | 11.0500 | 0.3240 | 1.7143 | 0.5863 |
| 15 | 24:01:51 | 11.0480 | 0.3260 | 1.7249 | 0.5862 |
| 16 | 36:02:46 | 11.0480 | 0.3260 | 1.7249 | 0.5862 |
| 17 | 42:22:26 | 11.0480 | 0.3260 | 1.7249 | 0.5862 |

# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 11-Oct-16
**Test Number:**

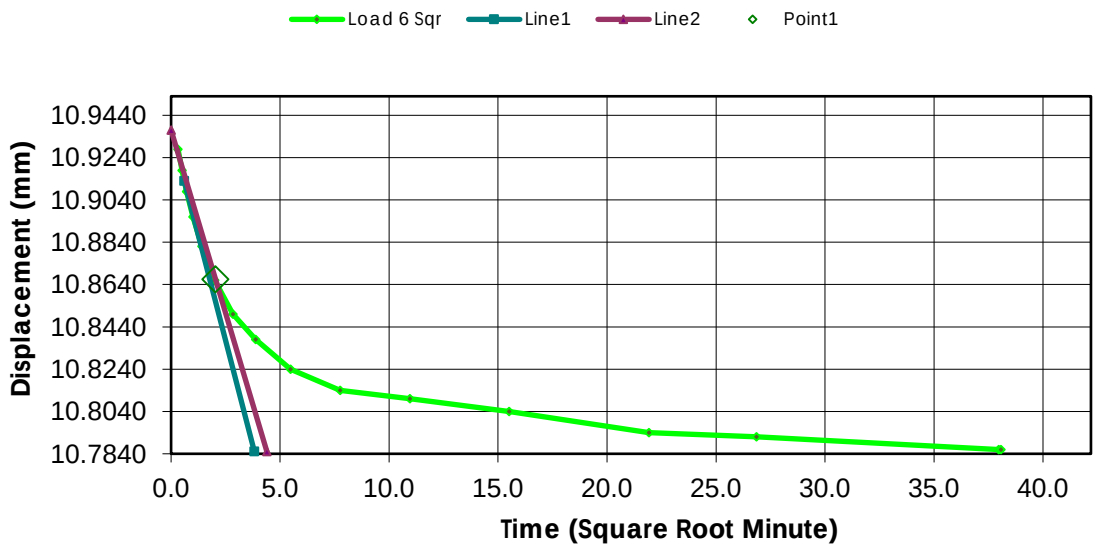
**Sample Number:** D51 ST6
**Boring Number:**
**Depth:** 2.70-3.15m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

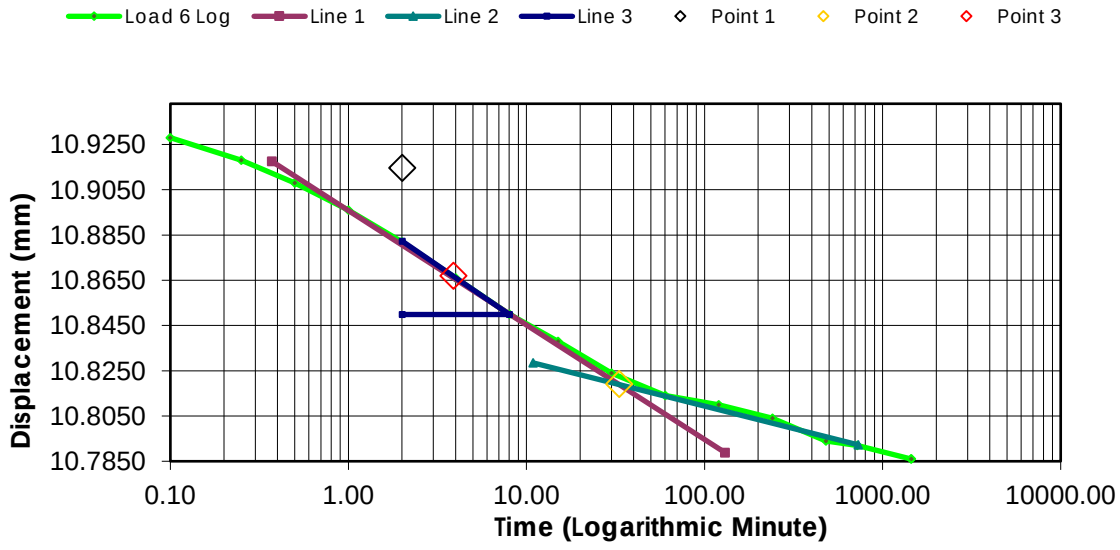
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.0480 | 0.3260 | 1.7249 | 0.5862 |
| 1 | 00:00:06 | 10.9280 | 0.4460 | 2.3598 | 0.5759 |
| 2 | 00:00:15 | 10.9180 | 0.4560 | 2.4127 | 0.5750 |
| 3 | 00:00:30 | 10.9080 | 0.4660 | 2.4656 | 0.5742 |
| 4 | 00:01:00 | 10.8960 | 0.4780 | 2.5291 | 0.5732 |
| 5 | 00:02:00 | 10.8820 | 0.4920 | 2.6032 | 0.5720 |
| 6 | 00:04:00 | 10.8660 | 0.5080 | 2.6878 | 0.5706 |
| 7 | 00:08:01 | 10.8500 | 0.5240 | 2.7725 | 0.5692 |
| 8 | 00:15:01 | 10.8380 | 0.5360 | 2.8360 | 0.5682 |
| 9 | 00:30:02 | 10.8240 | 0.5500 | 2.9101 | 0.5670 |
| 10 | 01:00:05 | 10.8140 | 0.5600 | 2.9630 | 0.5662 |
| 11 | 02:00:09 | 10.8100 | 0.5640 | 2.9841 | 0.5658 |
| 12 | 04:00:19 | 10.8040 | 0.5700 | 3.0159 | 0.5653 |
| 13 | 08:00:37 | 10.7940 | 0.5800 | 3.0688 | 0.5645 |
| 14 | 12:00:55 | 10.7920 | 0.5820 | 3.0794 | 0.5643 |
| 15 | 24:01:51 | 10.7860 | 0.5880 | 3.1111 | 0.5638 |
| 16 | 24:08:54 | 10.7860 | 0.5880 | 3.1111 | 0.5638 |

# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

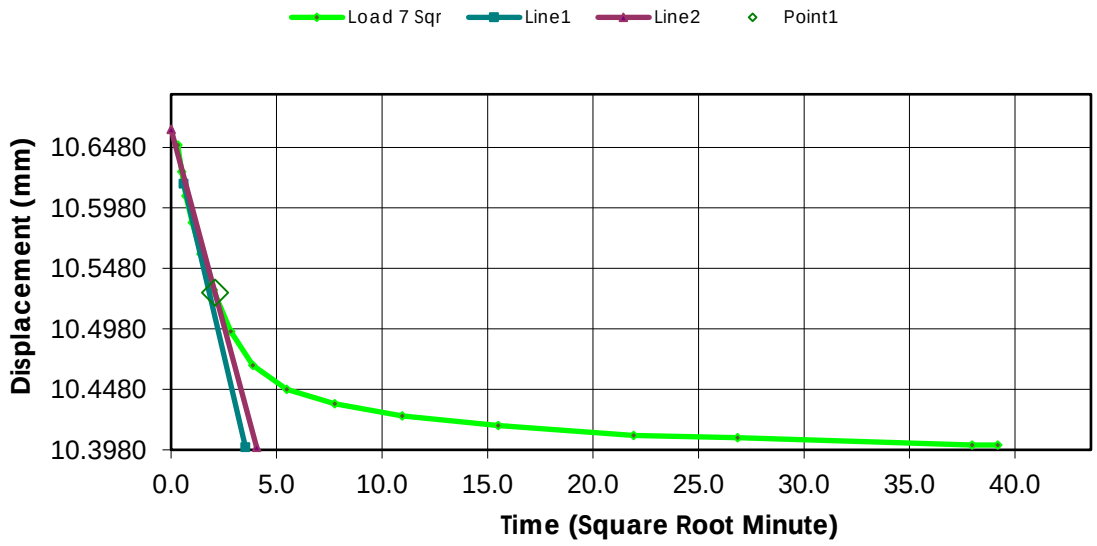
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 11-Oct-16
**Test Number:**

**Sample Number:** D51 ST6 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 2.70-3.15m **Remarks:**
**Sample Type:** Undisturbed

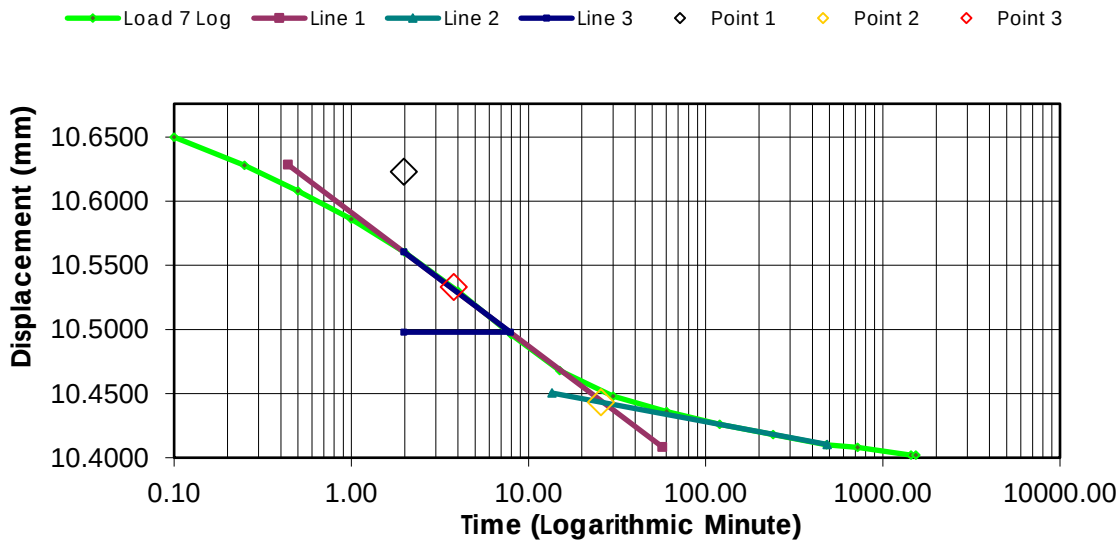
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.7860 | 0.5880 | 3.1111 | 0.5638 |
| 1 | 00:00:06 | 10.6500 | 0.7240 | 3.8307 | 0.5522 |
| 2 | 00:00:15 | 10.6280 | 0.7460 | 3.9471 | 0.5503 |
| 3 | 00:00:30 | 10.6080 | 0.7660 | 4.0529 | 0.5486 |
| 4 | 00:01:00 | 10.5860 | 0.7880 | 4.1693 | 0.5467 |
| 5 | 00:02:00 | 10.5600 | 0.8140 | 4.3069 | 0.5445 |
| 6 | 00:04:00 | 10.5300 | 0.8440 | 4.4656 | 0.5419 |
| 7 | 00:08:00 | 10.4960 | 0.8780 | 4.6455 | 0.5390 |
| 8 | 00:15:01 | 10.4680 | 0.9060 | 4.7936 | 0.5366 |
| 9 | 00:30:02 | 10.4480 | 0.9260 | 4.8995 | 0.5349 |
| 10 | 01:00:04 | 10.4360 | 0.9380 | 4.9630 | 0.5339 |
| 11 | 02:00:09 | 10.4260 | 0.9480 | 5.0159 | 0.5330 |
| 12 | 04:00:18 | 10.4180 | 0.9560 | 5.0582 | 0.5324 |
| 13 | 08:00:37 | 10.4100 | 0.9640 | 5.1005 | 0.5317 |
| 14 | 12:00:55 | 10.4080 | 0.9660 | 5.1111 | 0.5315 |
| 15 | 24:01:50 | 10.4020 | 0.9720 | 5.1429 | 0.5310 |
| 16 | 25:35:05 | 10.4020 | 0.9720 | 5.1429 | 0.5310 |

# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 11-Oct-16
**Test Number:**

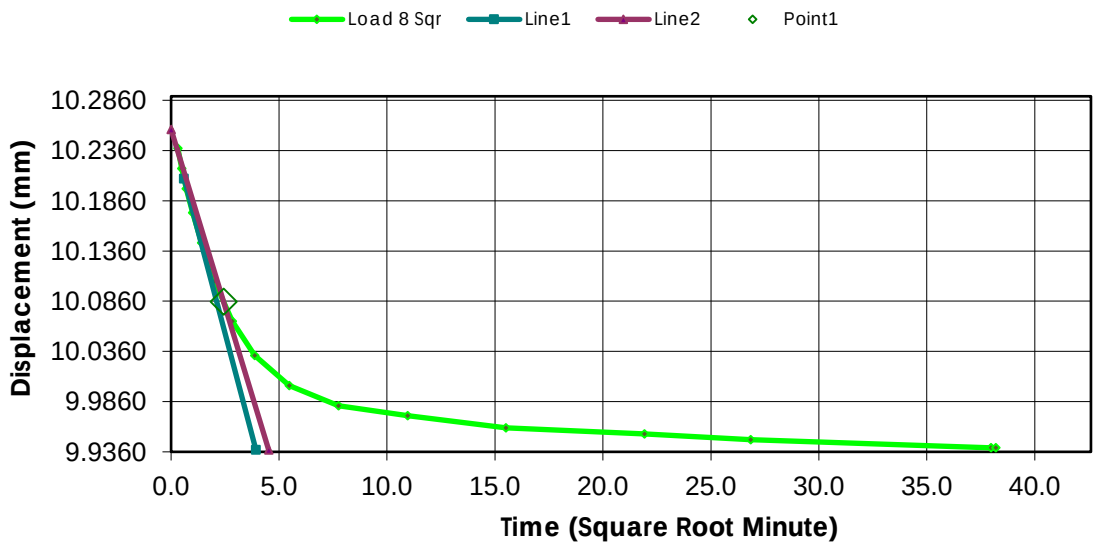
**Sample Number:** D51 ST6
**Boring Number:**
**Depth:** 2.70-3.15m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

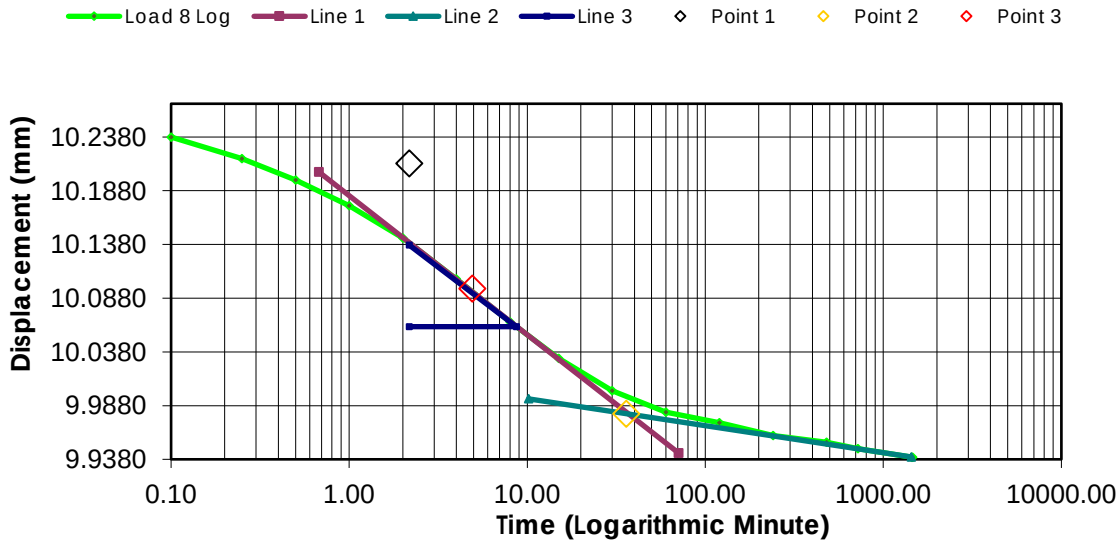
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.4020 | 0.9720 | 5.1429 | 0.5310 |
| 1 | 00:00:06 | 10.2380 | 1.1360 | 6.0106 | 0.5170 |
| 2 | 00:00:15 | 10.2180 | 1.1560 | 6.1164 | 0.5153 |
| 3 | 00:00:30 | 10.1980 | 1.1760 | 6.2222 | 0.5136 |
| 4 | 00:01:00 | 10.1740 | 1.2000 | 6.3492 | 0.5115 |
| 5 | 00:02:00 | 10.1440 | 1.2300 | 6.5079 | 0.5090 |
| 6 | 00:04:00 | 10.1060 | 1.2680 | 6.7090 | 0.5057 |
| 7 | 00:08:01 | 10.0660 | 1.3080 | 6.9206 | 0.5023 |
| 8 | 00:15:01 | 10.0320 | 1.3420 | 7.1005 | 0.4994 |
| 9 | 00:30:02 | 10.0020 | 1.3720 | 7.2593 | 0.4968 |
| 10 | 01:00:05 | 9.9820 | 1.3920 | 7.3651 | 0.4951 |
| 11 | 02:00:09 | 9.9720 | 1.4020 | 7.4180 | 0.4943 |
| 12 | 04:00:19 | 9.9600 | 1.4140 | 7.4815 | 0.4932 |
| 13 | 08:00:37 | 9.9540 | 1.4200 | 7.5132 | 0.4927 |
| 14 | 12:00:55 | 9.9480 | 1.4260 | 7.5450 | 0.4922 |
| 15 | 24:01:51 | 9.9400 | 1.4340 | 7.5873 | 0.4915 |
| 16 | 24:19:27 | 9.9400 | 1.4340 | 7.5873 | 0.4915 |

# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 11-Oct-16
**Test Number:**

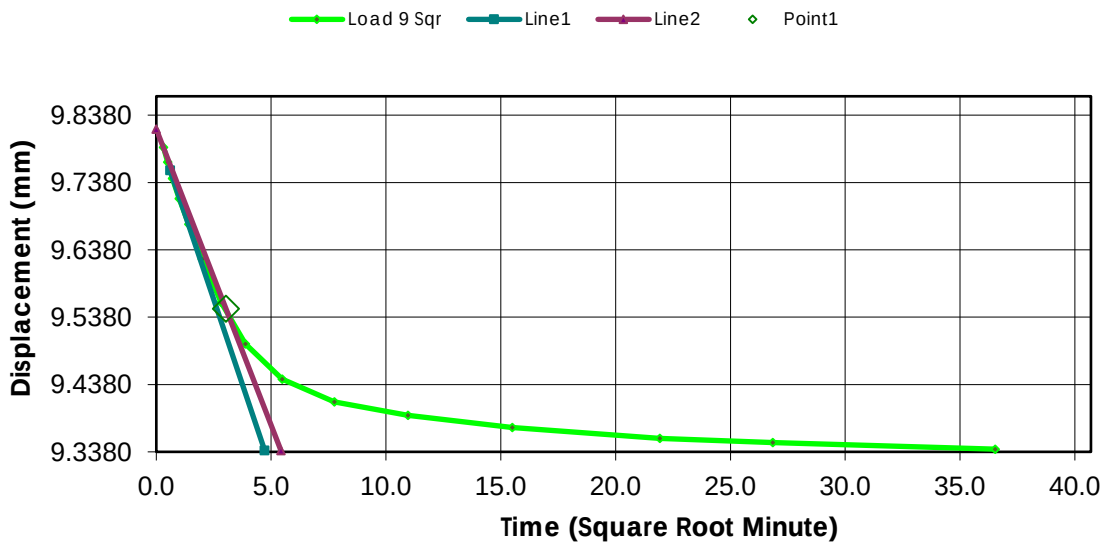
**Sample Number:** D51 ST6
**Boring Number:**
**Depth:** 2.70-3.15m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

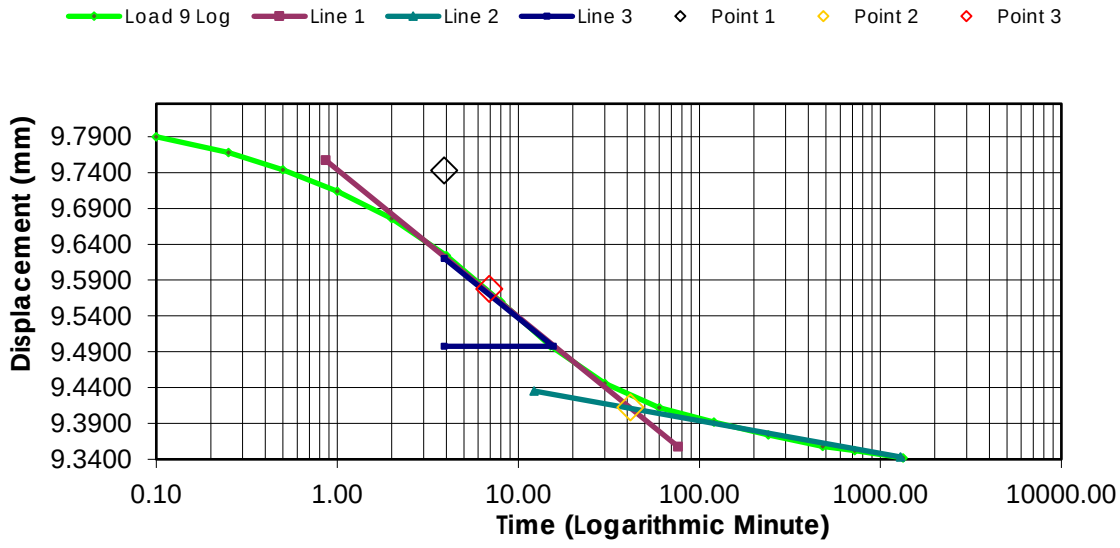
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.9400 | 1.4340 | 7.5873 | 0.4915 |
| 1 | 00:00:06 | 9.7900 | 1.5840 | 8.3810 | 0.4787 |
| 2 | 00:00:15 | 9.7680 | 1.6060 | 8.4974 | 0.4768 |
| 3 | 00:00:30 | 9.7440 | 1.6300 | 8.6243 | 0.4748 |
| 4 | 00:01:00 | 9.7140 | 1.6600 | 8.7831 | 0.4722 |
| 5 | 00:02:00 | 9.6760 | 1.6980 | 8.9841 | 0.4690 |
| 6 | 00:04:00 | 9.6240 | 1.7500 | 9.2593 | 0.4645 |
| 7 | 00:08:00 | 9.5600 | 1.8140 | 9.5979 | 0.4591 |
| 8 | 00:15:01 | 9.4980 | 1.8760 | 9.9259 | 0.4538 |
| 9 | 00:30:02 | 9.4460 | 1.9280 | 10.2011 | 0.4493 |
| 10 | 01:00:04 | 9.4120 | 1.9620 | 10.3809 | 0.4464 |
| 11 | 02:00:09 | 9.3920 | 1.9820 | 10.4868 | 0.4447 |
| 12 | 04:00:18 | 9.3740 | 2.0000 | 10.5820 | 0.4432 |
| 13 | 08:00:37 | 9.3580 | 2.0160 | 10.6667 | 0.4418 |
| 14 | 12:00:55 | 9.3520 | 2.0220 | 10.6984 | 0.4413 |
| 15 | 22:14:45 | 9.3420 | 2.0320 | 10.7513 | 0.4405 |

# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

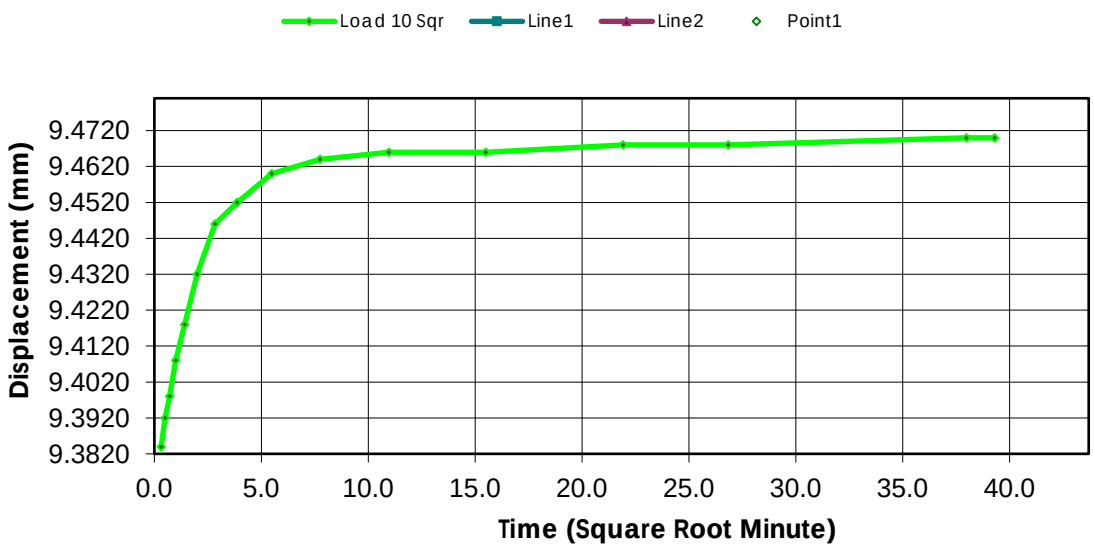
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 11-Oct-16
**Test Number:**

**Sample Number:** D51 ST6 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 2.70-3.15m **Remarks:**
**Sample Type:** Undisturbed

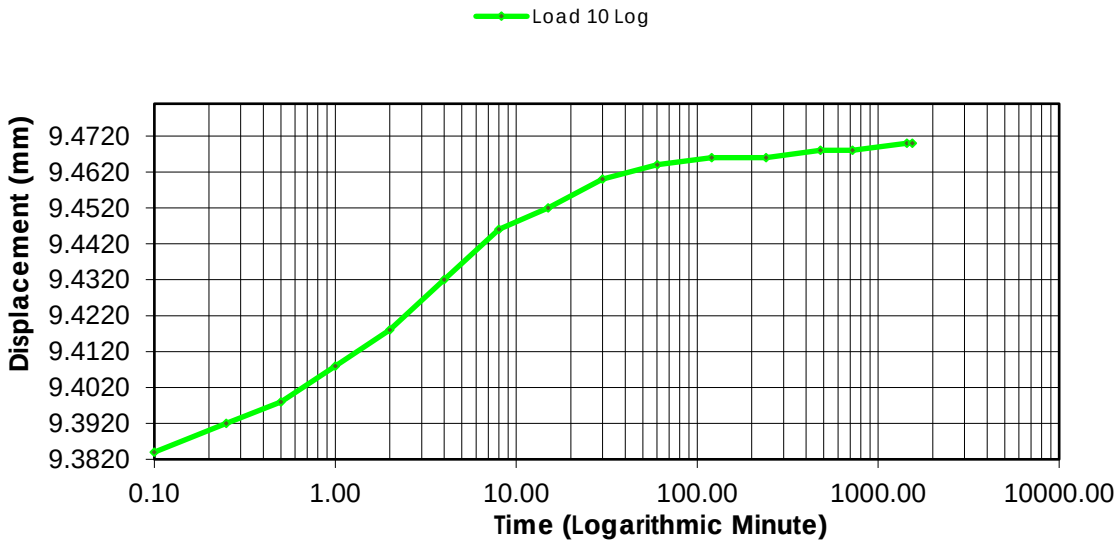
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.3420 | 2.0320 | 10.7513 | 0.4405 |
| 1 | 00:00:06 | 9.3840 | 1.9900 | 10.5291 | 0.4441 |
| 2 | 00:00:15 | 9.3920 | 1.9820 | 10.4868 | 0.4447 |
| 3 | 00:00:30 | 9.3980 | 1.9760 | 10.4550 | 0.4452 |
| 4 | 00:01:00 | 9.4080 | 1.9660 | 10.4021 | 0.4461 |
| 5 | 00:02:00 | 9.4180 | 1.9560 | 10.3492 | 0.4470 |
| 6 | 00:04:00 | 9.4320 | 1.9420 | 10.2751 | 0.4481 |
| 7 | 00:08:01 | 9.4460 | 1.9280 | 10.2011 | 0.4493 |
| 8 | 00:15:01 | 9.4520 | 1.9220 | 10.1693 | 0.4499 |
| 9 | 00:30:02 | 9.4600 | 1.9140 | 10.1270 | 0.4505 |
| 10 | 01:00:05 | 9.4640 | 1.9100 | 10.1058 | 0.4509 |
| 11 | 02:00:09 | 9.4660 | 1.9080 | 10.0952 | 0.4511 |
| 12 | 04:00:19 | 9.4660 | 1.9080 | 10.0952 | 0.4511 |
| 13 | 08:00:37 | 9.4680 | 1.9060 | 10.0847 | 0.4512 |
| 14 | 12:00:59 | 9.4680 | 1.9060 | 10.0847 | 0.4512 |
| 15 | 24:02:07 | 9.4700 | 1.9040 | 10.0741 | 0.4514 |
| 16 | 25:44:10 | 9.4700 | 1.9040 | 10.0741 | 0.4514 |

# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

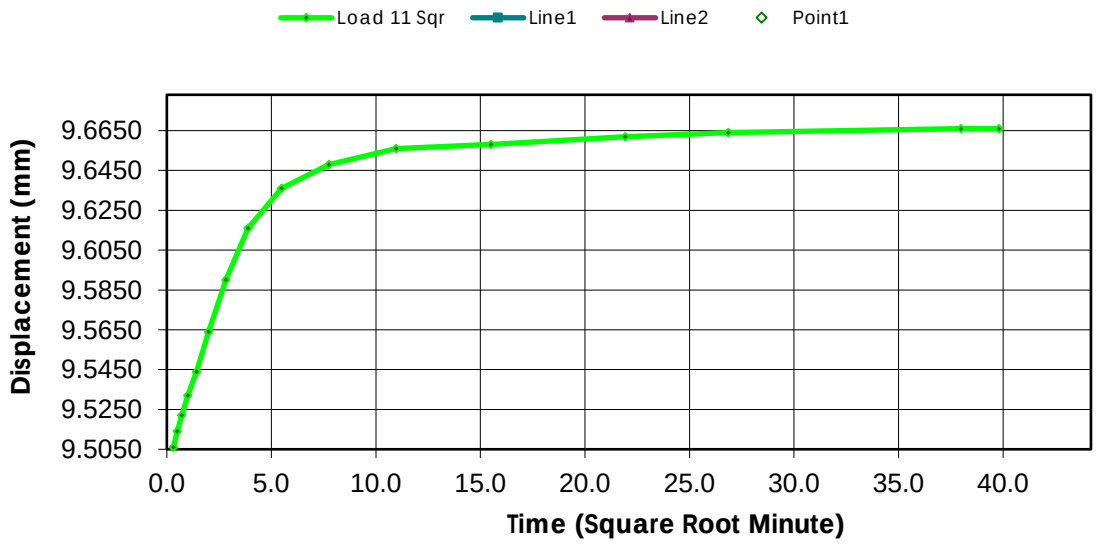
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 11-Oct-16
**Test Number:**

**Sample Number:** D51 ST6 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 2.70-3.15m **Remarks:**
**Sample Type:** Undisturbed

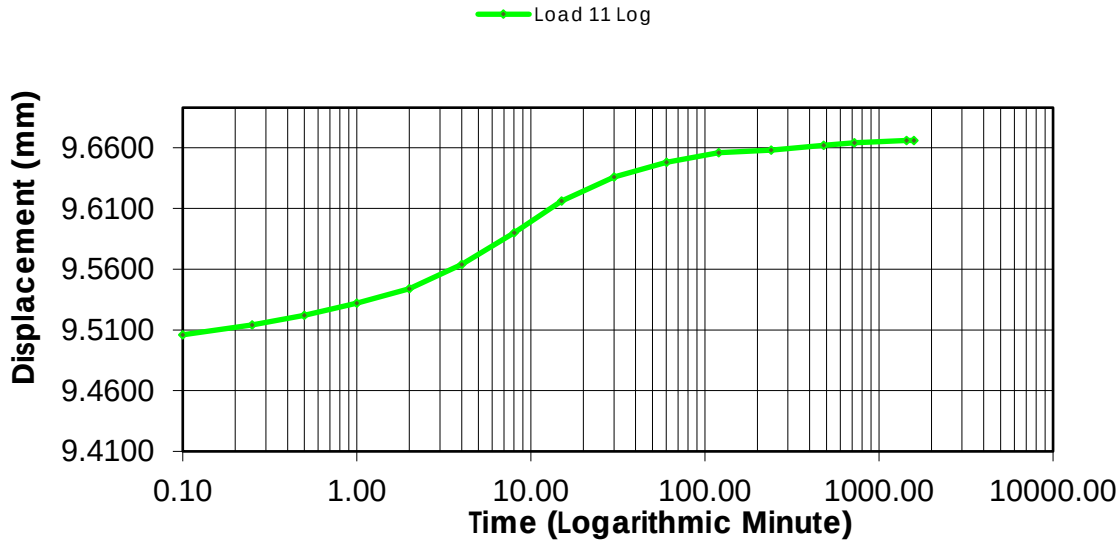
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.4700 | 1.9040 | 10.0741 | 0.4514 |
| 1 | 00:00:06 | 9.5060 | 1.8680 | 9.8836 | 0.4545 |
| 2 | 00:00:15 | 9.5140 | 1.8600 | 9.8413 | 0.4552 |
| 3 | 00:00:30 | 9.5220 | 1.8520 | 9.7989 | 0.4558 |
| 4 | 00:01:00 | 9.5320 | 1.8420 | 9.7460 | 0.4567 |
| 5 | 00:02:00 | 9.5440 | 1.8300 | 9.6825 | 0.4577 |
| 6 | 00:04:00 | 9.5640 | 1.8100 | 9.5767 | 0.4594 |
| 7 | 00:08:01 | 9.5900 | 1.7840 | 9.4392 | 0.4616 |
| 8 | 00:15:02 | 9.6160 | 1.7580 | 9.3016 | 0.4639 |
| 9 | 00:30:03 | 9.6360 | 1.7380 | 9.1958 | 0.4656 |
| 10 | 01:00:06 | 9.6480 | 1.7260 | 9.1323 | 0.4666 |
| 11 | 02:00:12 | 9.6560 | 1.7180 | 9.0899 | 0.4673 |
| 12 | 04:00:24 | 9.6580 | 1.7160 | 9.0794 | 0.4674 |
| 13 | 08:00:49 | 9.6620 | 1.7120 | 9.0582 | 0.4678 |
| 14 | 12:01:13 | 9.6640 | 1.7100 | 9.0476 | 0.4680 |
| 15 | 24:02:27 | 9.6660 | 1.7080 | 9.0370 | 0.4681 |
| 16 | 26:24:05 | 9.6660 | 1.7080 | 9.0370 | 0.4681 |

# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 11-Oct-16
**Test Number:**

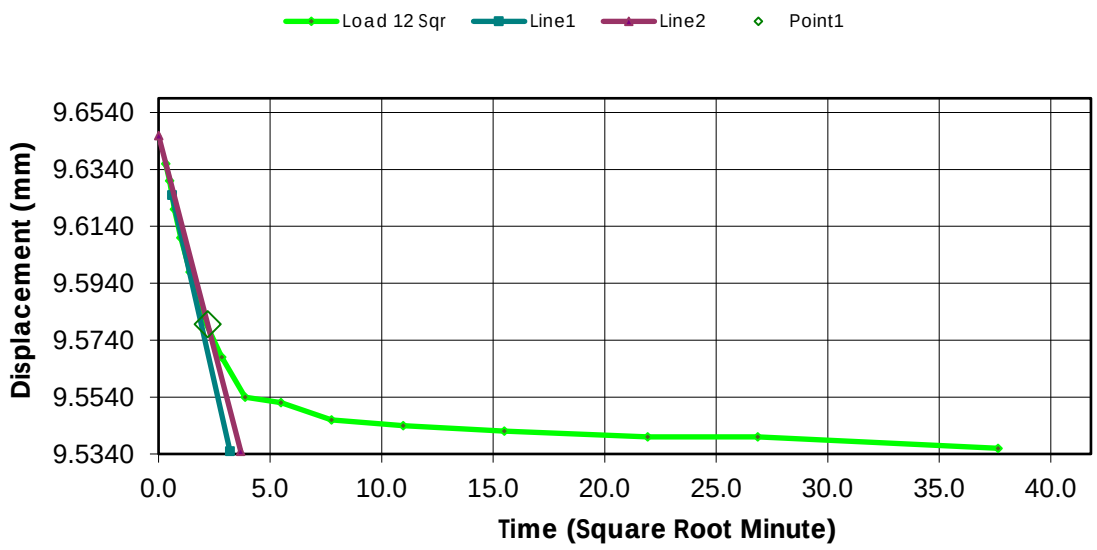
**Sample Number:** D51 ST6
**Boring Number:**
**Depth:** 2.70-3.15m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

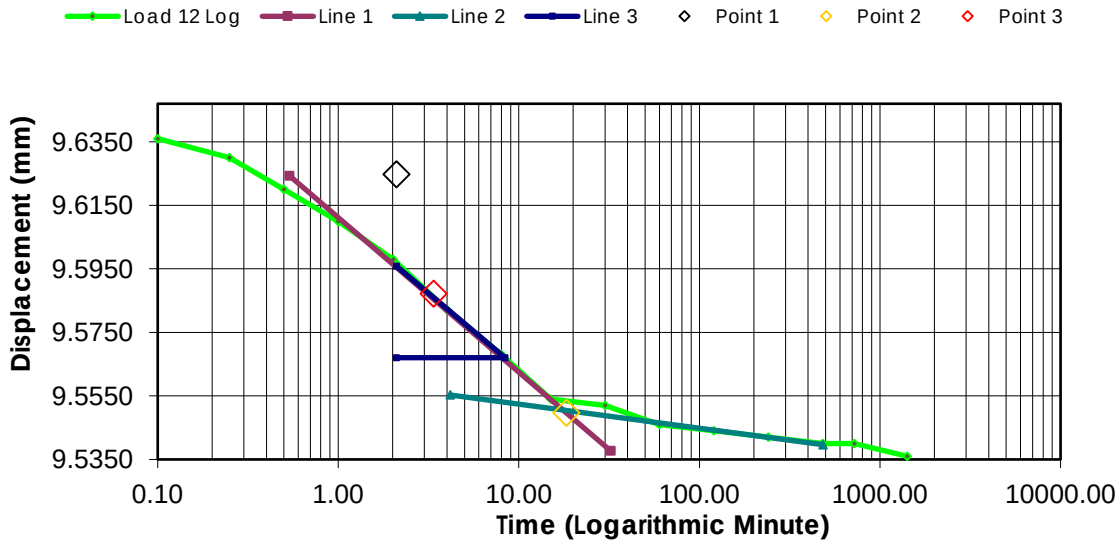
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.6660 | 1.7080 | 9.0370 | 0.4681 |
| 1 | 00:00:06 | 9.6360 | 1.7380 | 9.1958 | 0.4656 |
| 2 | 00:00:15 | 9.6300 | 1.7440 | 9.2275 | 0.4651 |
| 3 | 00:00:30 | 9.6200 | 1.7540 | 9.2804 | 0.4642 |
| 4 | 00:01:00 | 9.6100 | 1.7640 | 9.3333 | 0.4634 |
| 5 | 00:02:01 | 9.5980 | 1.7760 | 9.3968 | 0.4623 |
| 6 | 00:04:01 | 9.5820 | 1.7920 | 9.4815 | 0.4610 |
| 7 | 00:08:01 | 9.5680 | 1.8060 | 9.5556 | 0.4598 |
| 8 | 00:15:02 | 9.5540 | 1.8200 | 9.6296 | 0.4586 |
| 9 | 00:30:03 | 9.5520 | 1.8220 | 9.6402 | 0.4584 |
| 10 | 01:00:06 | 9.5460 | 1.8280 | 9.6720 | 0.4579 |
| 11 | 02:00:12 | 9.5440 | 1.8300 | 9.6825 | 0.4577 |
| 12 | 04:00:25 | 9.5420 | 1.8320 | 9.6931 | 0.4575 |
| 13 | 08:00:49 | 9.5400 | 1.8340 | 9.7037 | 0.4574 |
| 14 | 12:01:14 | 9.5400 | 1.8340 | 9.7037 | 0.4574 |
| 15 | 23:36:06 | 9.5360 | 1.8380 | 9.7249 | 0.4570 |

# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 11-Oct-16
**Test Number:**

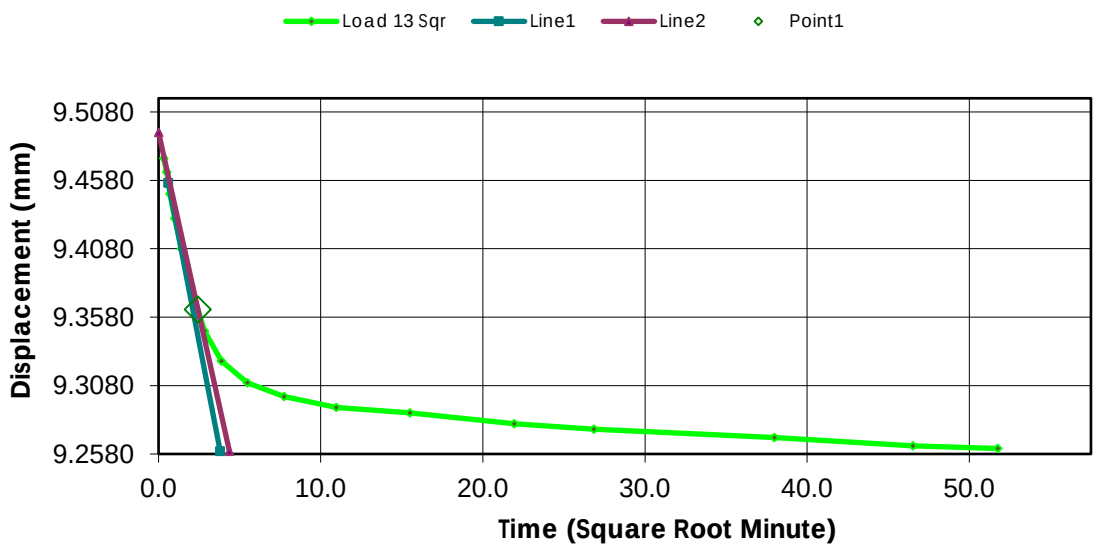
**Sample Number:** D51 ST6
**Boring Number:**
**Depth:** 2.70-3.15m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

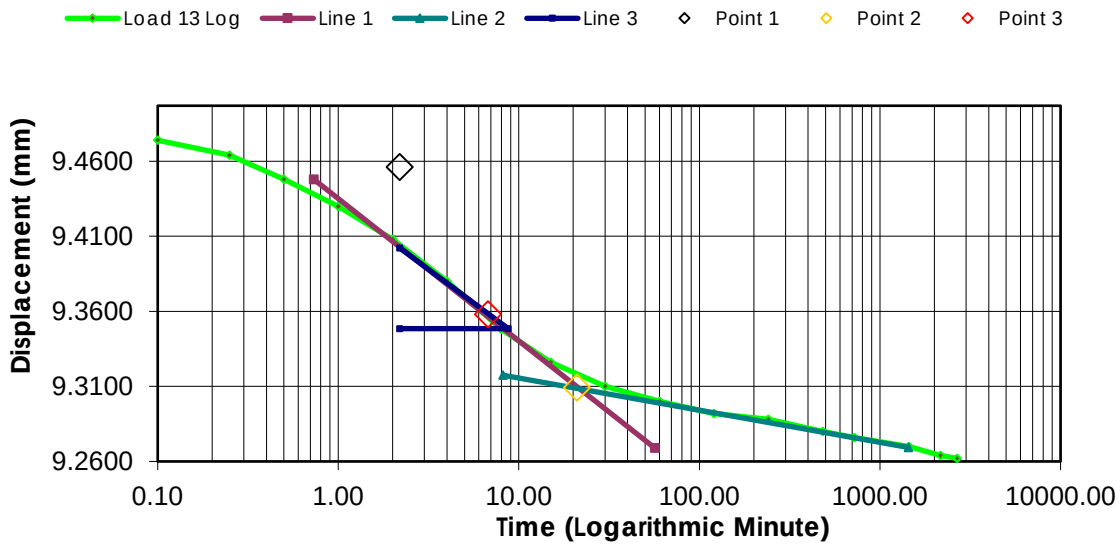
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5360 | 1.8380 | 9.7249 | 0.4570 |
| 1 | 00:00:06 | 9.4740 | 1.9000 | 10.0529 | 0.4517 |
| 2 | 00:00:15 | 9.4640 | 1.9100 | 10.1058 | 0.4509 |
| 3 | 00:00:30 | 9.4480 | 1.9260 | 10.1905 | 0.4495 |
| 4 | 00:01:00 | 9.4300 | 1.9440 | 10.2857 | 0.4480 |
| 5 | 00:02:00 | 9.4080 | 1.9660 | 10.4021 | 0.4461 |
| 6 | 00:04:00 | 9.3800 | 1.9940 | 10.5503 | 0.4437 |
| 7 | 00:08:01 | 9.3480 | 2.0260 | 10.7196 | 0.4410 |
| 8 | 00:15:01 | 9.3260 | 2.0480 | 10.8360 | 0.4391 |
| 9 | 00:30:03 | 9.3100 | 2.0640 | 10.9206 | 0.4377 |
| 10 | 01:00:06 | 9.3000 | 2.0740 | 10.9735 | 0.4369 |
| 11 | 02:00:12 | 9.2920 | 2.0820 | 11.0159 | 0.4362 |
| 12 | 04:00:24 | 9.2880 | 2.0860 | 11.0370 | 0.4359 |
| 13 | 08:00:49 | 9.2800 | 2.0940 | 11.0794 | 0.4352 |
| 14 | 12:01:13 | 9.2760 | 2.0980 | 11.1005 | 0.4348 |
| 15 | 24:02:27 | 9.2700 | 2.1040 | 11.1323 | 0.4343 |
| 16 | 36:03:36 | 9.2640 | 2.1100 | 11.1640 | 0.4338 |
| 17 | 44:39:07 | 9.2620 | 2.1120 | 11.1746 | 0.4336 |

# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

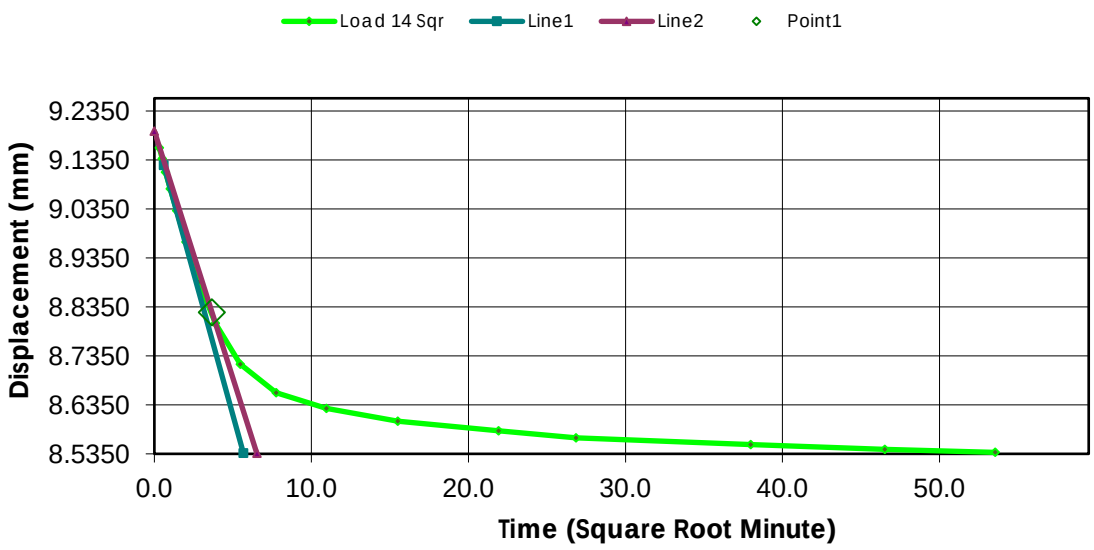
**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:** **Test Date:** 11-Oct-16
**Test Number:**

**Sample Number:** D51 ST6 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 2.70-3.15m **Remarks:**
**Sample Type:** Undisturbed

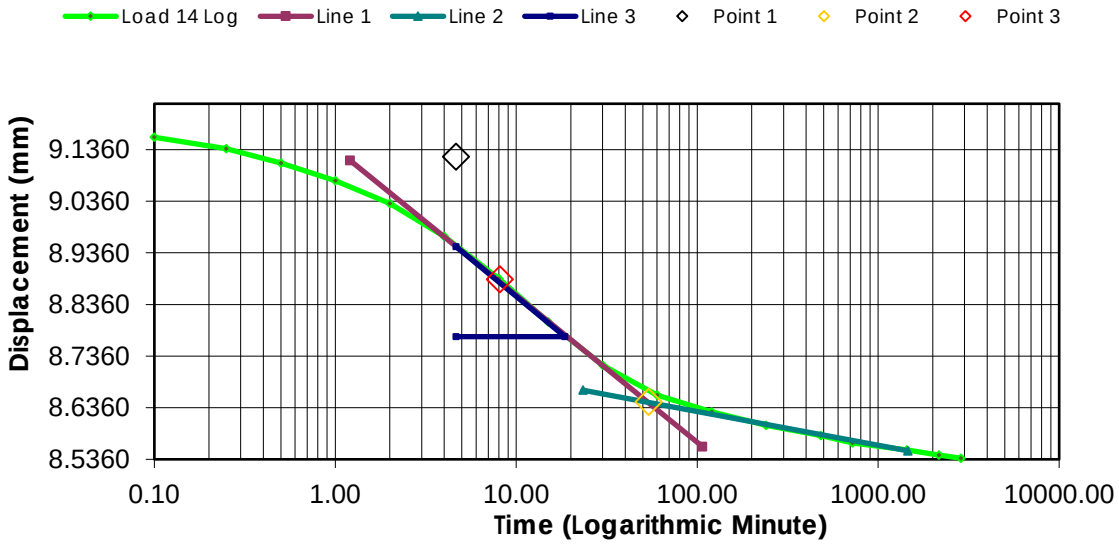
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.2620 | 2.1120 | 11.1746 | 0.4336 |
| 1 | 00:00:06 | 9.1600 | 2.2140 | 11.7143 | 0.4249 |
| 2 | 00:00:15 | 9.1380 | 2.2360 | 11.8307 | 0.4230 |
| 3 | 00:00:30 | 9.1100 | 2.2640 | 11.9788 | 0.4207 |
| 4 | 00:01:00 | 9.0760 | 2.2980 | 12.1587 | 0.4177 |
| 5 | 00:02:00 | 9.0320 | 2.3420 | 12.3915 | 0.4140 |
| 6 | 00:04:00 | 8.9680 | 2.4060 | 12.7302 | 0.4085 |
| 7 | 00:08:01 | 8.8860 | 2.4880 | 13.1640 | 0.4015 |
| 8 | 00:15:01 | 8.8020 | 2.5720 | 13.6085 | 0.3944 |
| 9 | 00:30:03 | 8.7180 | 2.6560 | 14.0529 | 0.3872 |
| 10 | 01:00:06 | 8.6600 | 2.7140 | 14.3598 | 0.3822 |
| 11 | 02:00:12 | 8.6280 | 2.7460 | 14.5291 | 0.3795 |
| 12 | 04:00:24 | 8.6020 | 2.7720 | 14.6667 | 0.3773 |
| 13 | 08:00:48 | 8.5820 | 2.7920 | 14.7725 | 0.3756 |
| 14 | 12:01:13 | 8.5680 | 2.8060 | 14.8466 | 0.3744 |
| 15 | 24:02:22 | 8.5540 | 2.8200 | 14.9206 | 0.3732 |
| 16 | 36:03:36 | 8.5440 | 2.8300 | 14.9735 | 0.3723 |
| 17 | 47:46:59 | 8.5380 | 2.8360 | 15.0053 | 0.3718 |

# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



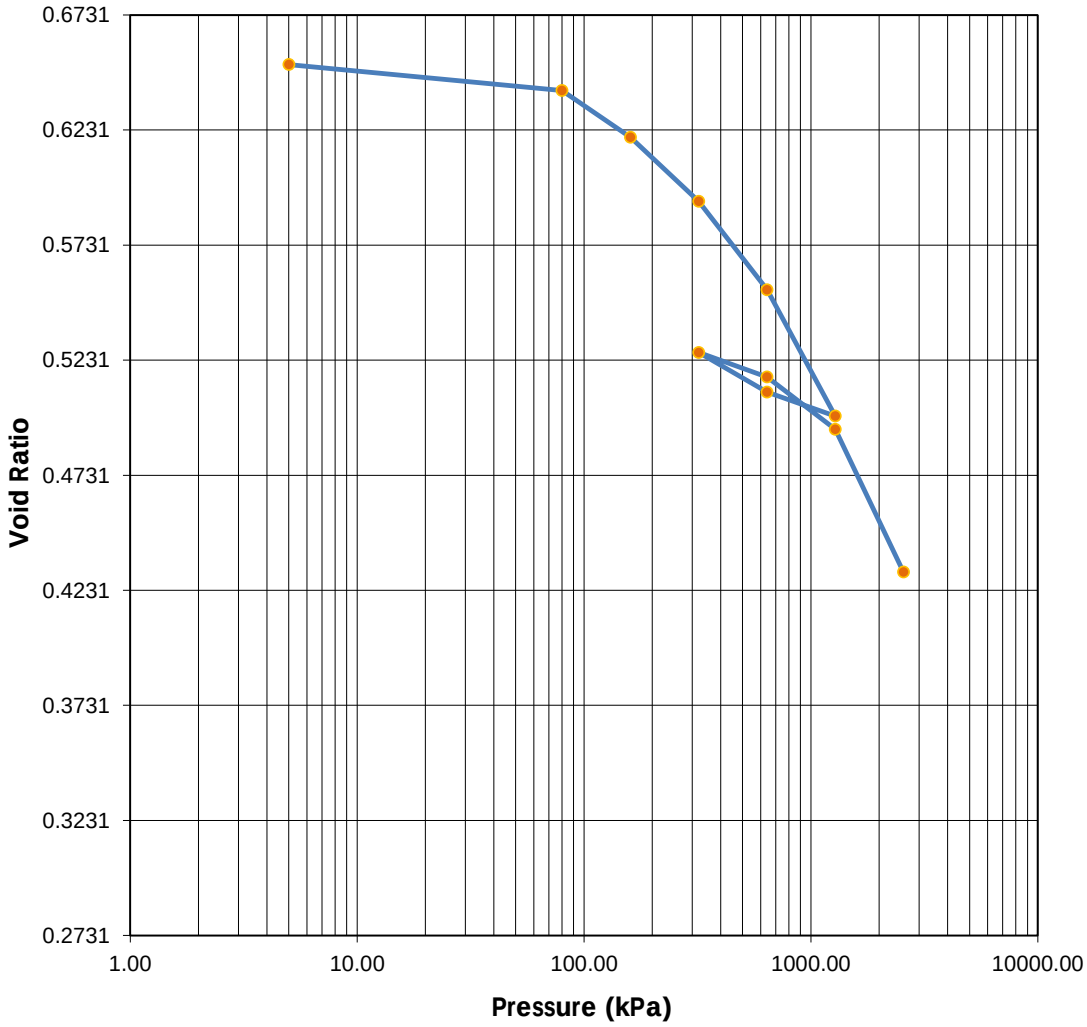
# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

### Test Results

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 21.9 | 19.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.632 | 1.837 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 90.46 | 114.67 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6503 | 0.4299 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay

**Project Number:** 110773396.302.702.230 **Depth:** 2.40-2.89m

**Sample Number:** D59 ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Loads at 10kPa, 20kPa and 40kpa omitted due to swelling

**Tested By:** C. Oost **Reviewed By:** C. Lamoureux

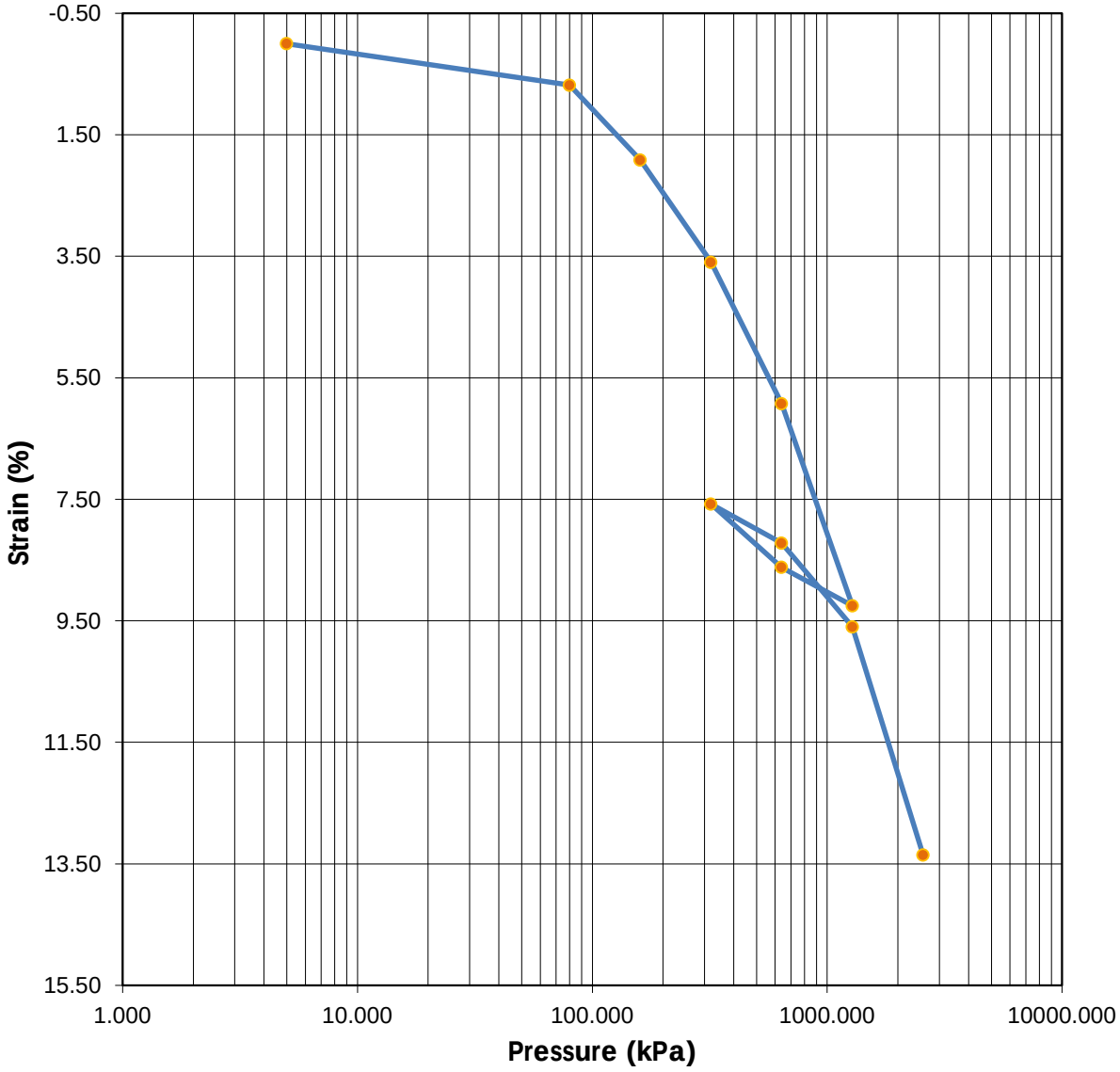
# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 21.9 | 19.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.632 | 1.837 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 90.46 | 114.67 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6503 | 0.4299 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 2.40-2.89m | **Remarks:** |
| **Sample Number:** | D59 ST6 | **Boring Number:** | Loads at 10kPa, 20kPa and 40kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

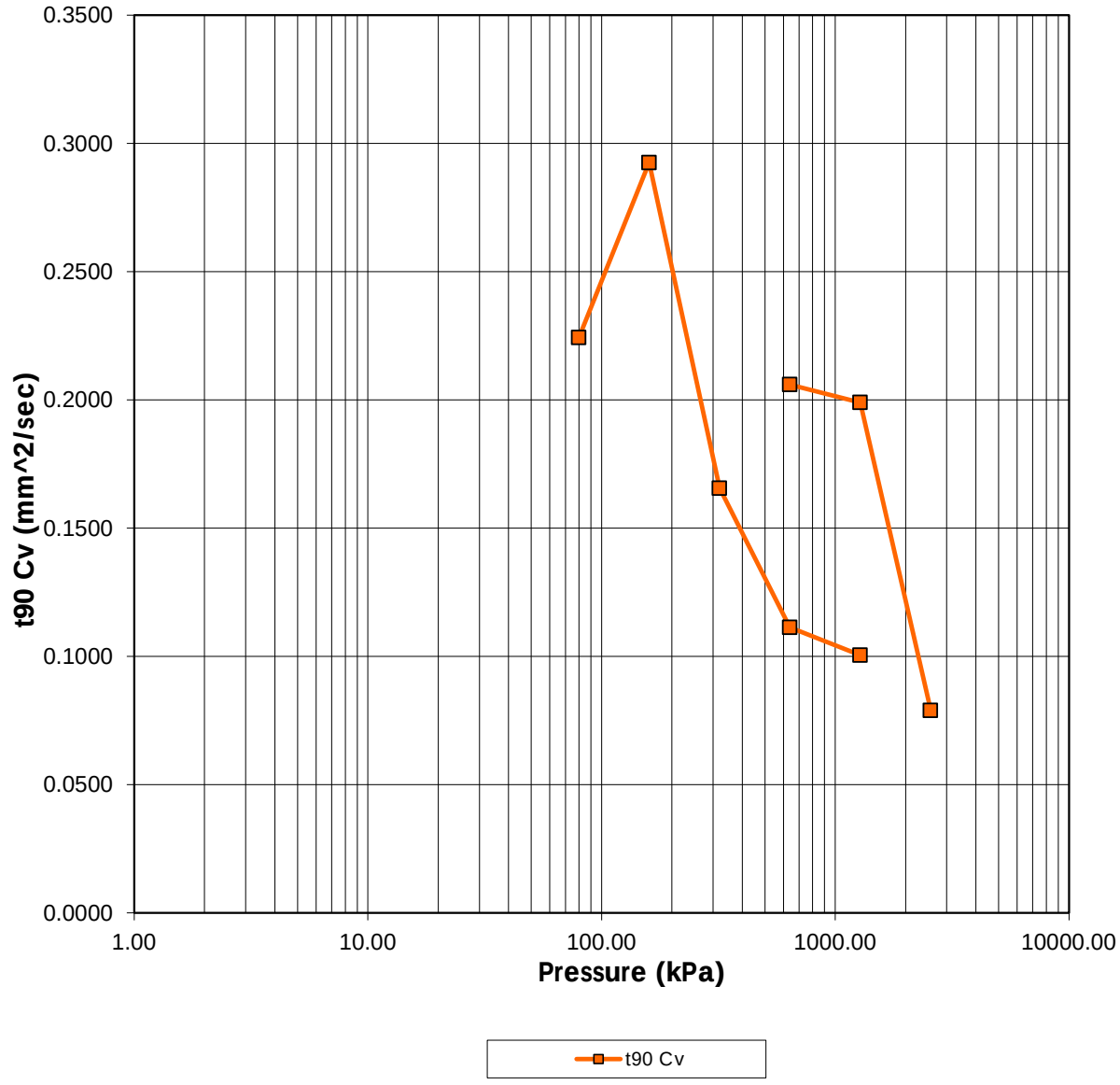
# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

## Test Results

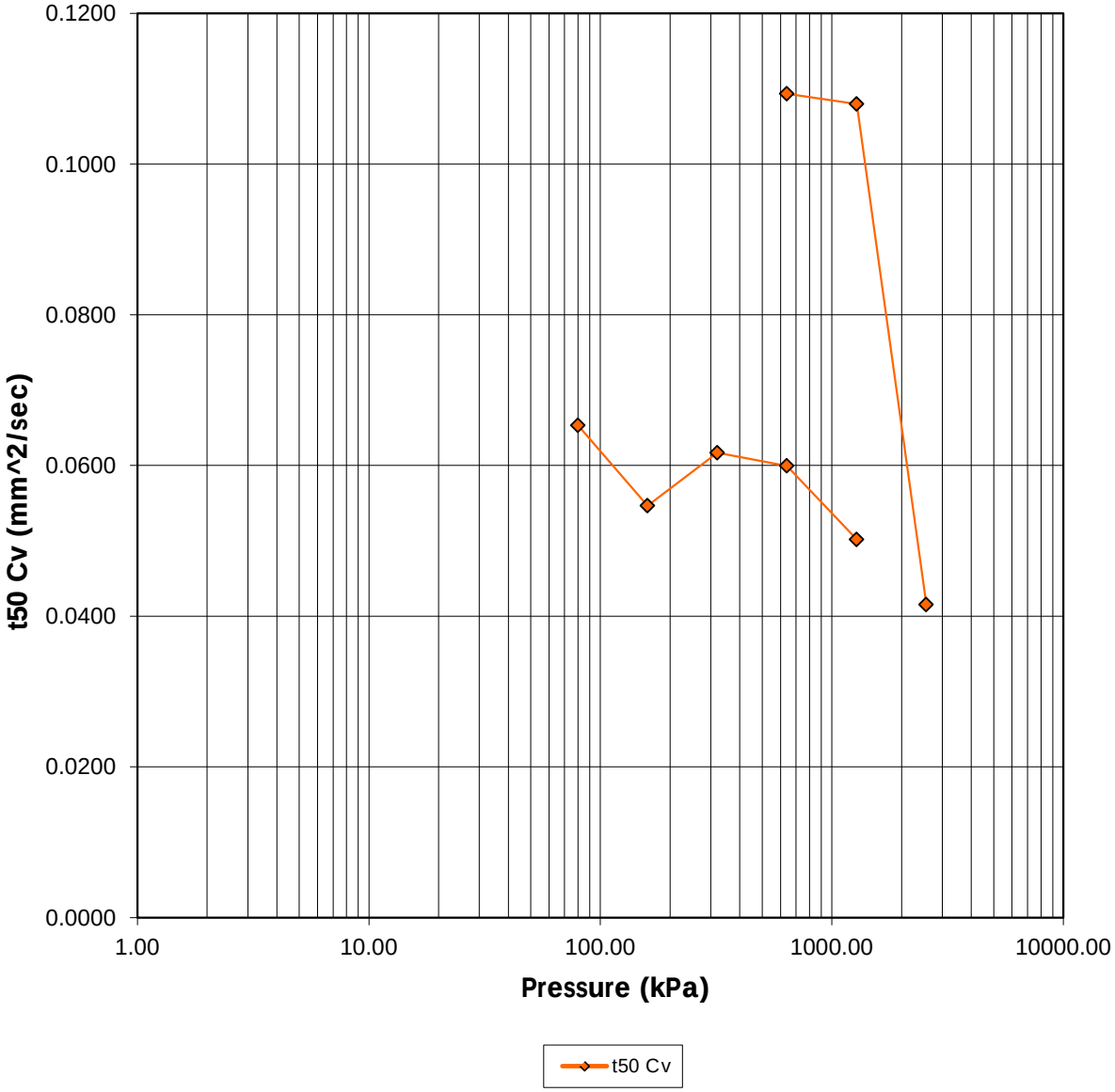



| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 21.9 | 19.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.632 | 1.837 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 90.46 | 114.67 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6503 | 0.4299 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 2.40-2.89m | **Remarks:** |
| **Sample Number:** | D59 ST6 | **Boring Number:** | Loads at 10kPa, 20kPa and 40kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

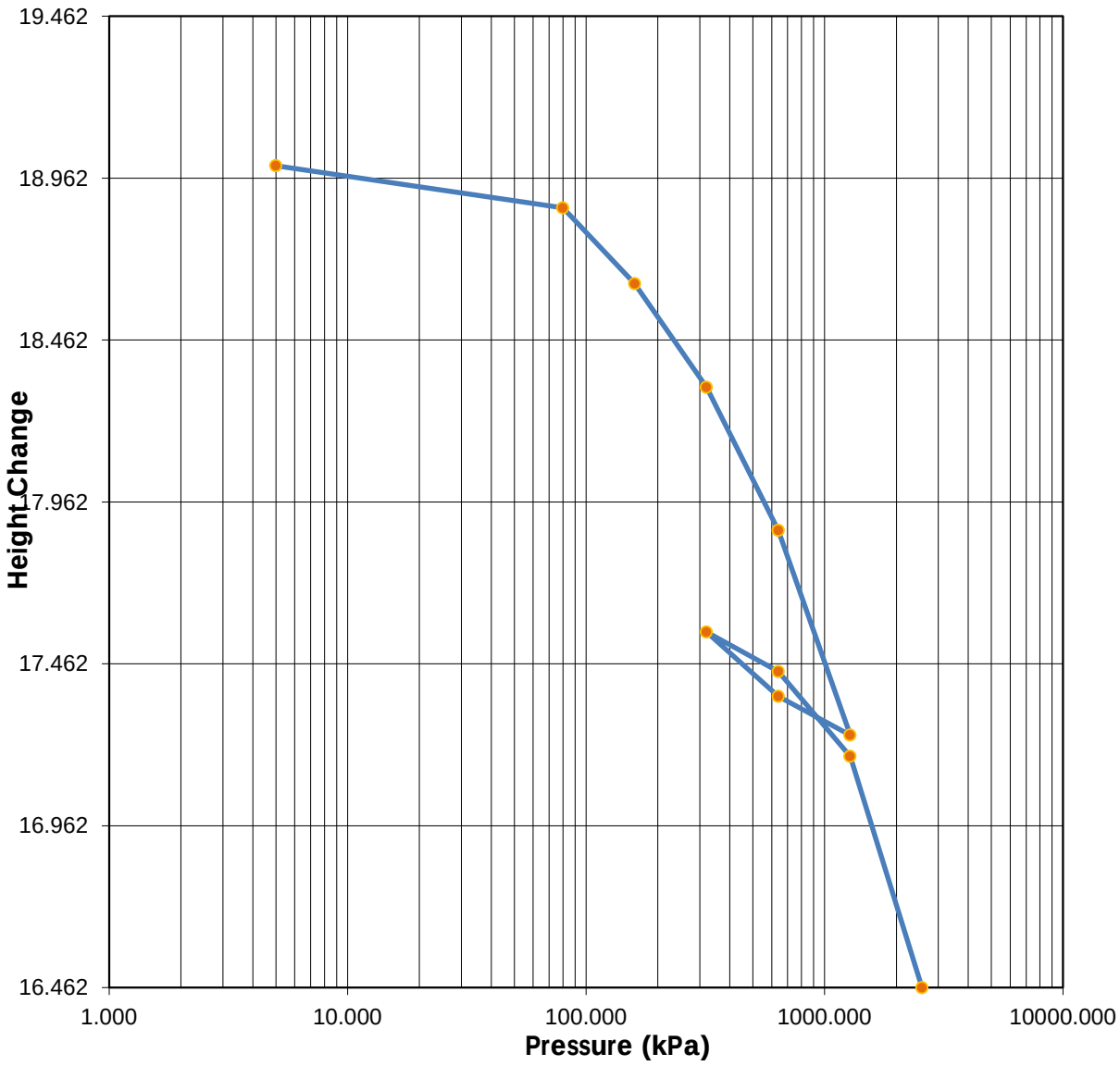



| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 21.9 | 19.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.632 | 1.837 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 90.46 | 114.67 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6503 | 0.4299 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 2.40-2.89m | **Remarks:** |
| **Sample Number:** | D59 ST6 | **Boring Number:** | Loads at 10kPa, 20kPa and 40kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 21.9 | 19.9 | **Liquid Limits:** | - | **Test Date:** | 15-Jul-16 |
| **Dry Density (g/cm3):** | 1.632 | 1.837 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 90.46 | 114.67 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6503 | 0.4299 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 2.40-2.89m | **Remarks:** |
| **Sample Number:** | D59 ST6 | **Boring Number:** | Loads at 10kPa, 20kPa and 40kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Sample Description:** Brown Clay
**Remarks:** Loads at 10kPa, 20kPa, and 40kPa omitted due to swelling

**Test Number:**
**Test Date:** 15-Jul-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 19.0000 | 7.4959 | 0.00 | 0.6516 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 19.0000 | 7.4959 | 0.00 | 0.6516 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 10.000 | 0.0120 | 18.9880 | 7.4839 | 0.06 | 0.6505 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 20.000 | 0.0000 | 19.0000 | 7.4959 | 0.00 | 0.6516 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 40.000 | 0.0220 | 18.9780 | 7.4739 | 0.12 | 0.6497 | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | 80.000 | 0.1300 | 18.8700 | 7.3659 | 0.68 | 0.6403 | 5.608 | 4.476 | 0.224 | 0.065 |
| 6 | 160.000 | 0.3640 | 18.6360 | 7.1319 | 1.92 | 0.6199 | 4.196 | 5.214 | 0.292 | 0.055 |
| 7 | 320.000 | 0.6840 | 18.3160 | 6.8119 | 3.60 | 0.5921 | 7.160 | 4.465 | 0.166 | 0.062 |
| 8 | 640.000 | 1.1260 | 17.8740 | 6.3699 | 5.93 | 0.5537 | 10.144 | 4.375 | 0.111 | 0.060 |
| 9 | 1280.000 | 1.7580 | 17.2420 | 5.7379 | 9.25 | 0.4988 | 10.458 | 4.864 | 0.100 | 0.050 |
| 10 | 640.000 | 1.6380 | 17.3620 | 5.8579 | 8.62 | 0.5092 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 320.000 | 1.4400 | 17.5600 | 6.0559 | 7.58 | 0.5264 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 640.000 | 1.5620 | 17.4380 | 5.9339 | 8.22 | 0.5158 | 5.217 | 2.283 | 0.206 | 0.109 |
| 13 | 1280.000 | 1.8240 | 17.1760 | 5.6719 | 9.60 | 0.4930 | 5.239 | 2.243 | 0.199 | 0.108 |
| 14 | 2560.000 | 2.5380 | 16.4620 | 4.9579 | 13.36 | 0.4310 | 12.136 | 5.354 | 0.079 | 0.042 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Jul-16

**Sample Number:** D59 ST6 **Sample Description:**
**Boring Number:** Brown Clay
**Depth:** 2.40-2.89m **Remarks:** Loads at 10kPa, 20kPa, and 40kPa
**Sample Type:** Undisturbed omitted due to swelling

**Test Number:**
**Liquid Limit:** - **Initial Void Ratio:** 0.6503 **Initial Height (mm):** 19.0000
**Plastic Limit:** - **Plasticity Index (%):** - **Initial Diameter (mm):** 50.0000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 61.1300

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 44.46 | 61.14 |
| Dry Soil + Container (g) | 36.72 | 51.30 |
| Weight of Container (g) | 1.42 | 1.95 |
| Moisture Content (%) | 21.93 | 19.94 |
| Void Ratio | 0.6503 | 0.4299 |
| Saturation (%) | 90.46 | 114.67 |
| Dry Density (g/cm3) | 1.63 | 1.84 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

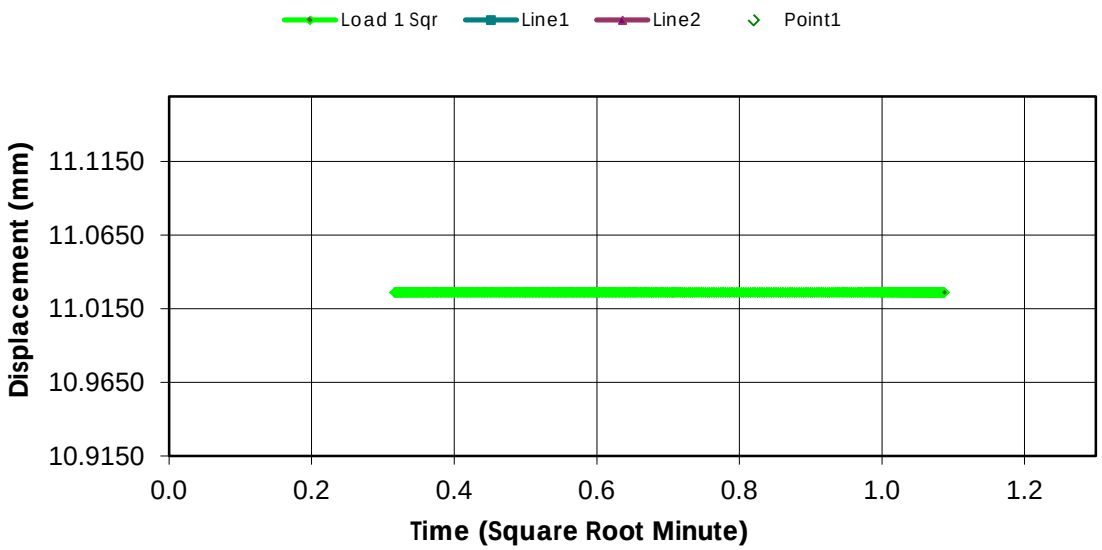
**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

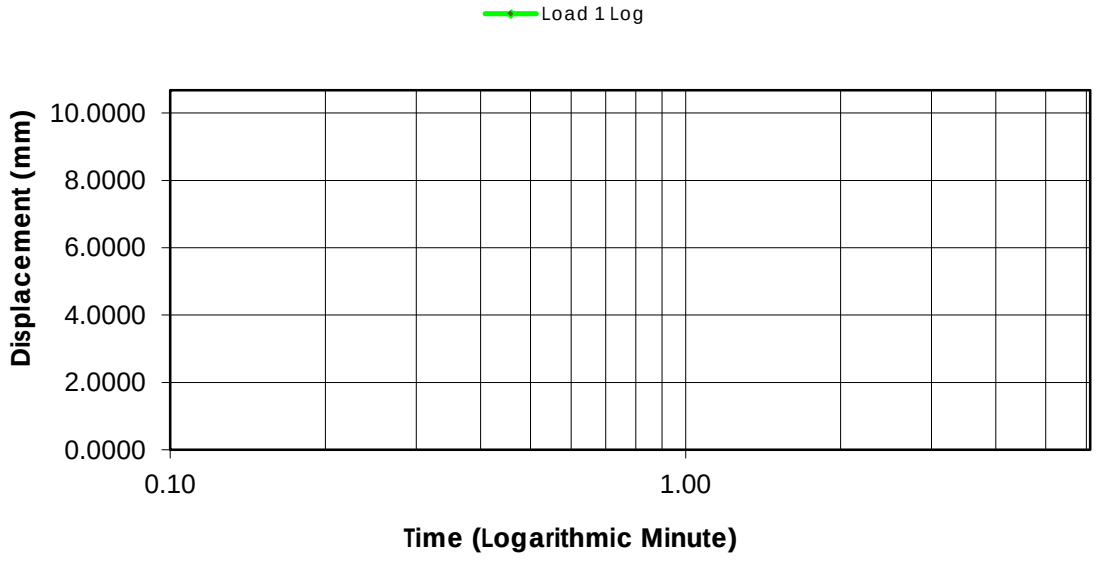
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.0260 | 0.0000 | 0.0000 | 0.6503 |
| 1 | 00:00:06 | 11.0260 | 0.0000 | 0.0000 | 0.6503 |
| 2 | 00:00:15 | 11.0260 | 0.0000 | 0.0000 | 0.6503 |
| 3 | 00:00:30 | 11.0260 | 0.0000 | 0.0000 | 0.6503 |
| 4 | 00:01:00 | 11.0260 | 0.0000 | 0.0000 | 0.6503 |
| 5 | 00:01:11 | 11.0260 | 0.0000 | 0.0000 | 0.6503 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

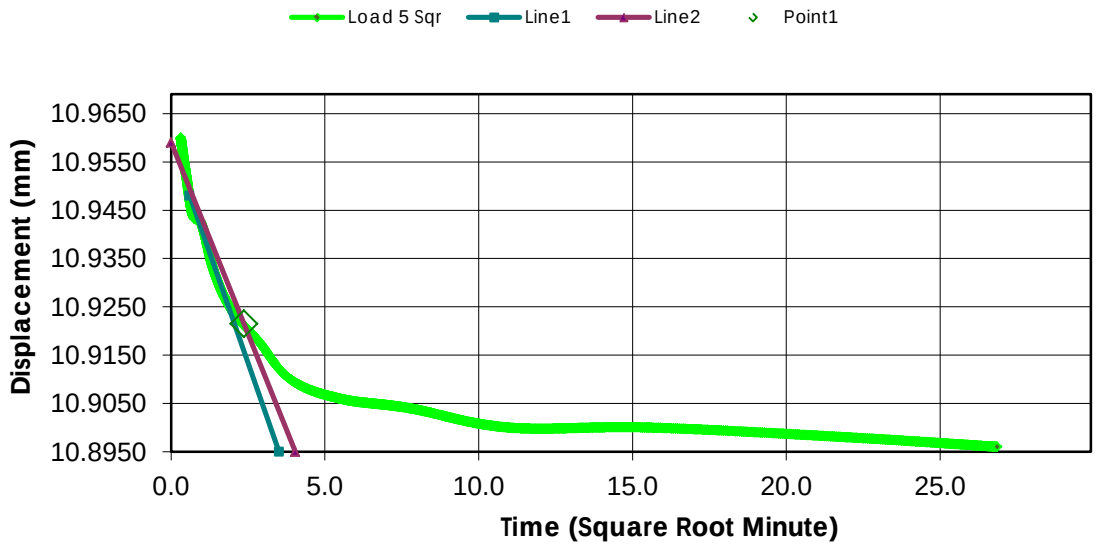
**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

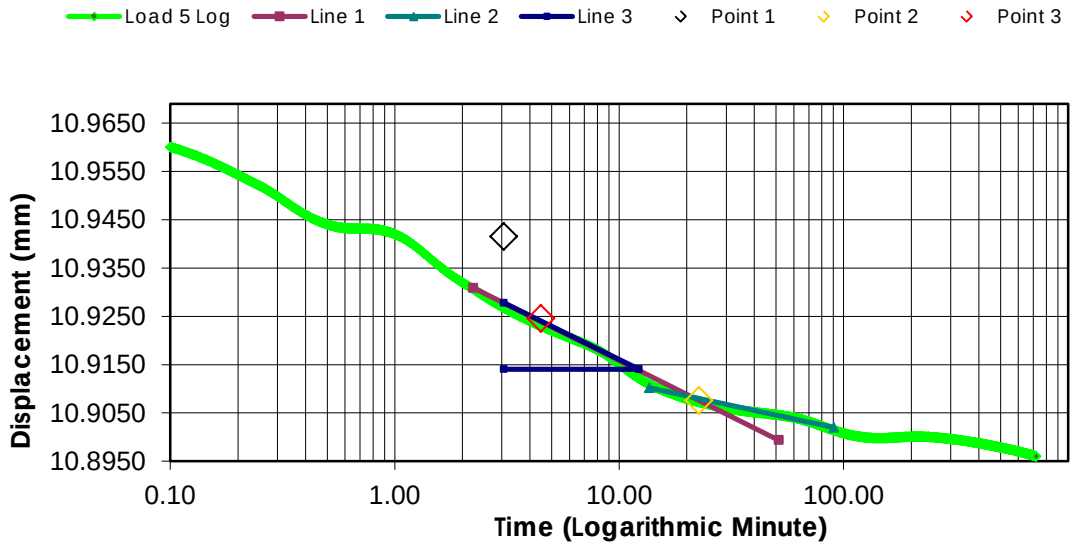
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 11.0040 | 0.0220 | 0.1158 | 0.6484 |
| 1 | 00:00:06 | 10.9600 | 0.0660 | 0.3474 | 0.6446 |
| 2 | 00:00:15 | 10.9520 | 0.0740 | 0.3895 | 0.6439 |
| 3 | 00:00:30 | 10.9440 | 0.0820 | 0.4316 | 0.6432 |
| 4 | 00:01:00 | 10.9420 | 0.0840 | 0.4421 | 0.6430 |
| 5 | 00:02:00 | 10.9320 | 0.0940 | 0.4947 | 0.6422 |
| 6 | 00:04:00 | 10.9240 | 0.1020 | 0.5368 | 0.6415 |
| 7 | 00:08:01 | 10.9180 | 0.1080 | 0.5684 | 0.6410 |
| 8 | 00:15:01 | 10.9100 | 0.1160 | 0.6105 | 0.6403 |
| 9 | 00:30:03 | 10.9060 | 0.1200 | 0.6316 | 0.6399 |
| 10 | 01:00:05 | 10.9040 | 0.1220 | 0.6421 | 0.6397 |
| 11 | 02:00:11 | 10.9000 | 0.1260 | 0.6632 | 0.6394 |
| 12 | 04:00:21 | 10.9000 | 0.1260 | 0.6632 | 0.6394 |
| 13 | 08:00:43 | 10.8980 | 0.1280 | 0.6737 | 0.6392 |
| 14 | 12:01:04 | 10.8960 | 0.1300 | 0.6842 | 0.6391 |

# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

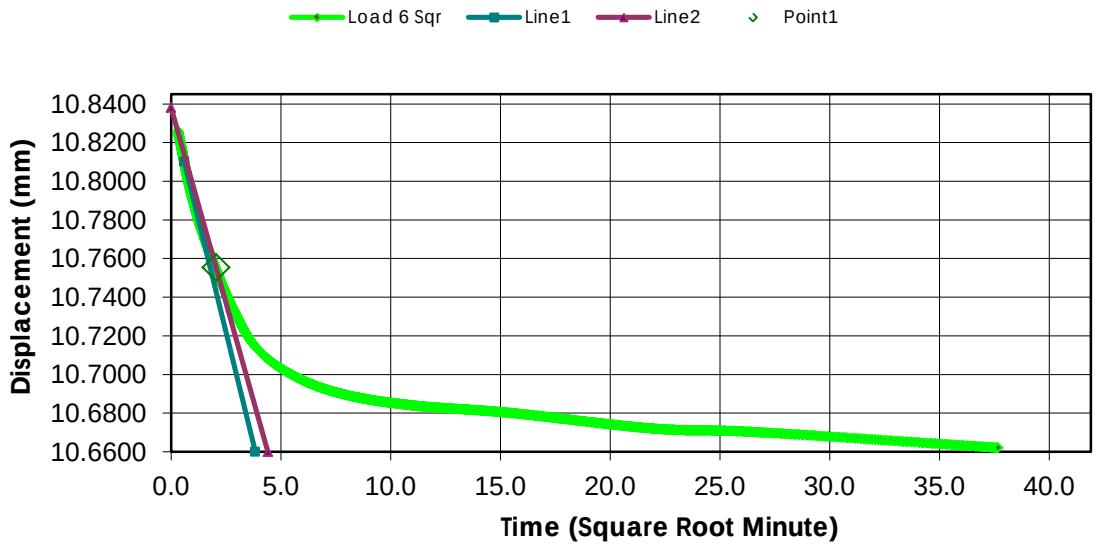
**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

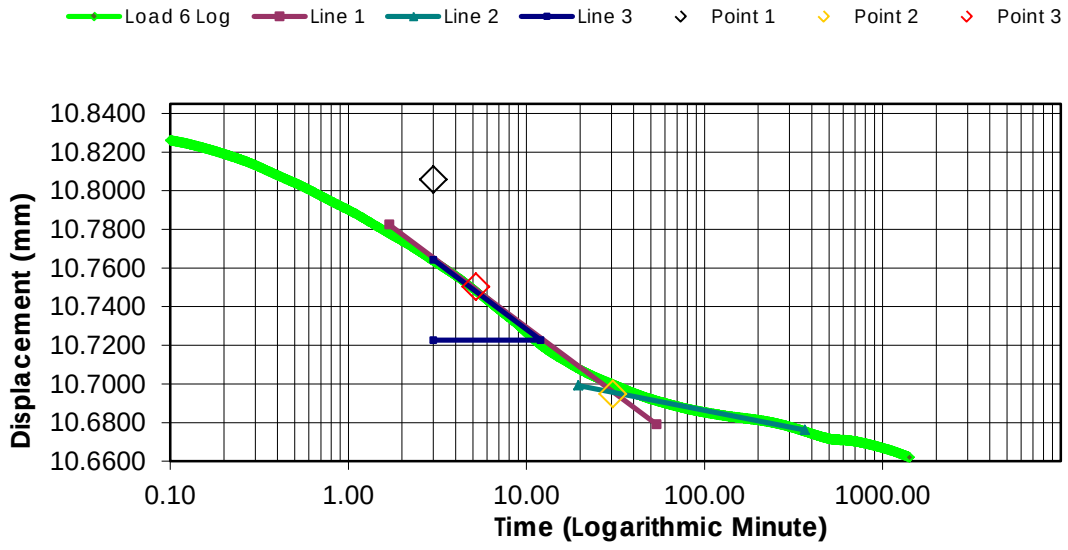
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.8960 | 0.1300 | 0.6842 | 0.6391 |
| 1 | 00:00:06 | 10.8260 | 0.2000 | 1.0526 | 0.6330 |
| 2 | 00:00:15 | 10.8160 | 0.2100 | 1.1053 | 0.6321 |
| 3 | 00:00:30 | 10.8040 | 0.2220 | 1.1684 | 0.6311 |
| 4 | 00:01:00 | 10.7900 | 0.2360 | 1.2421 | 0.6298 |
| 5 | 00:02:00 | 10.7740 | 0.2520 | 1.3263 | 0.6285 |
| 6 | 00:04:00 | 10.7560 | 0.2700 | 1.4211 | 0.6269 |
| 7 | 00:08:01 | 10.7340 | 0.2920 | 1.5368 | 0.6250 |
| 8 | 00:15:01 | 10.7140 | 0.3120 | 1.6421 | 0.6232 |
| 9 | 00:30:02 | 10.7000 | 0.3260 | 1.7158 | 0.6220 |
| 10 | 01:00:05 | 10.6900 | 0.3360 | 1.7684 | 0.6212 |
| 11 | 02:00:10 | 10.6840 | 0.3420 | 1.8000 | 0.6206 |
| 12 | 04:00:19 | 10.6800 | 0.3460 | 1.8211 | 0.6203 |
| 13 | 08:00:38 | 10.6720 | 0.3540 | 1.8632 | 0.6196 |
| 14 | 12:00:57 | 10.6700 | 0.3560 | 1.8737 | 0.6194 |
| 15 | 23:40:03 | 10.6620 | 0.3640 | 1.9158 | 0.6187 |

# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

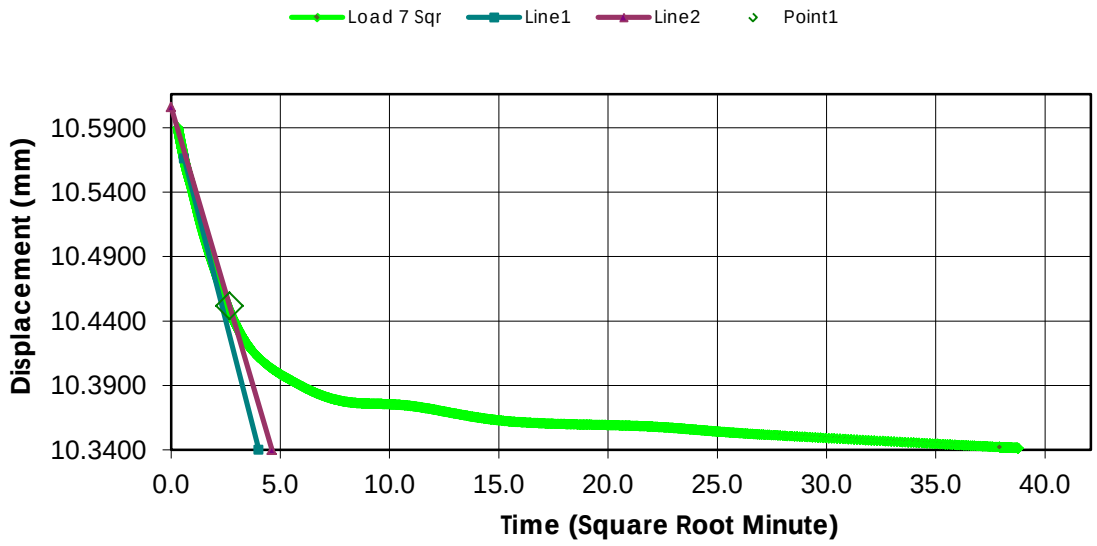
**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

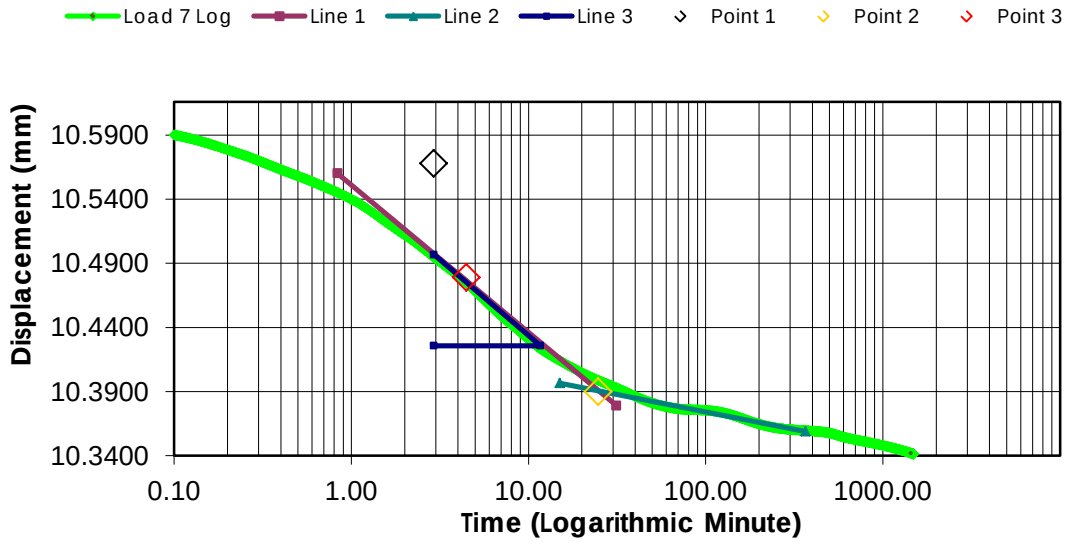
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.6620 | 0.3640 | 1.9158 | 0.6187 |
| 1 | 00:00:06 | 10.5900 | 0.4360 | 2.2947 | 0.6125 |
| 2 | 00:00:15 | 10.5740 | 0.4520 | 2.3789 | 0.6111 |
| 3 | 00:00:30 | 10.5580 | 0.4680 | 2.4632 | 0.6097 |
| 4 | 00:01:00 | 10.5400 | 0.4860 | 2.5579 | 0.6081 |
| 5 | 00:02:00 | 10.5120 | 0.5140 | 2.7053 | 0.6057 |
| 6 | 00:04:00 | 10.4800 | 0.5460 | 2.8737 | 0.6029 |
| 7 | 00:08:00 | 10.4420 | 0.5840 | 3.0737 | 0.5996 |
| 8 | 00:15:01 | 10.4140 | 0.6120 | 3.2211 | 0.5972 |
| 9 | 00:30:02 | 10.3940 | 0.6320 | 3.3263 | 0.5954 |
| 10 | 01:00:04 | 10.3780 | 0.6480 | 3.4105 | 0.5941 |
| 11 | 02:00:08 | 10.3740 | 0.6520 | 3.4316 | 0.5937 |
| 12 | 04:00:16 | 10.3620 | 0.6640 | 3.4947 | 0.5927 |
| 13 | 08:00:33 | 10.3580 | 0.6680 | 3.5158 | 0.5923 |
| 14 | 12:00:49 | 10.3520 | 0.6740 | 3.5474 | 0.5918 |
| 15 | 23:58:03 | 10.3420 | 0.6840 | 3.6000 | 0.5909 |
| 16 | 23:58:03 | 10.3420 | 0.6840 | 3.6000 | 0.5909 |

# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

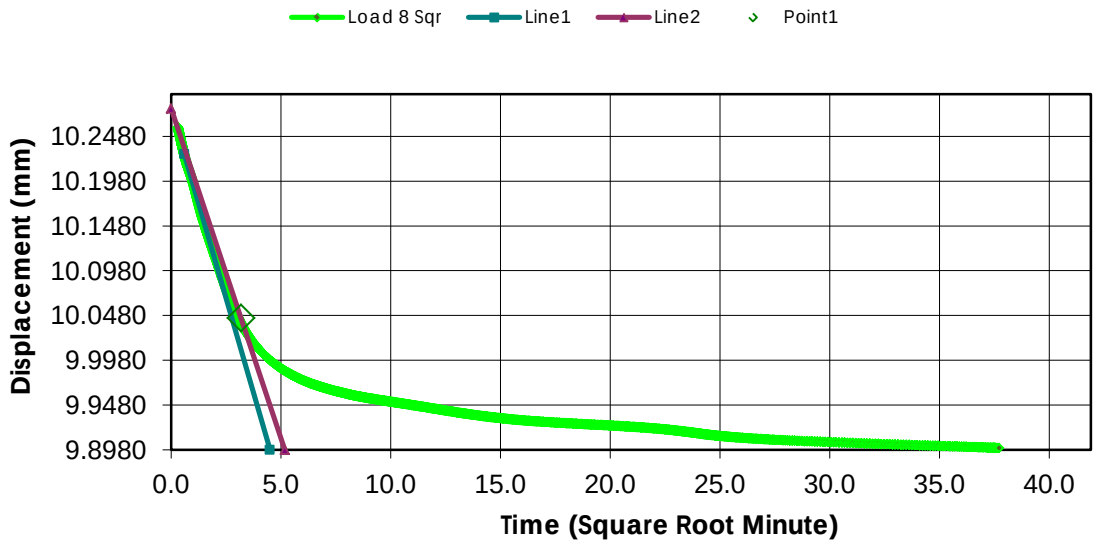
**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

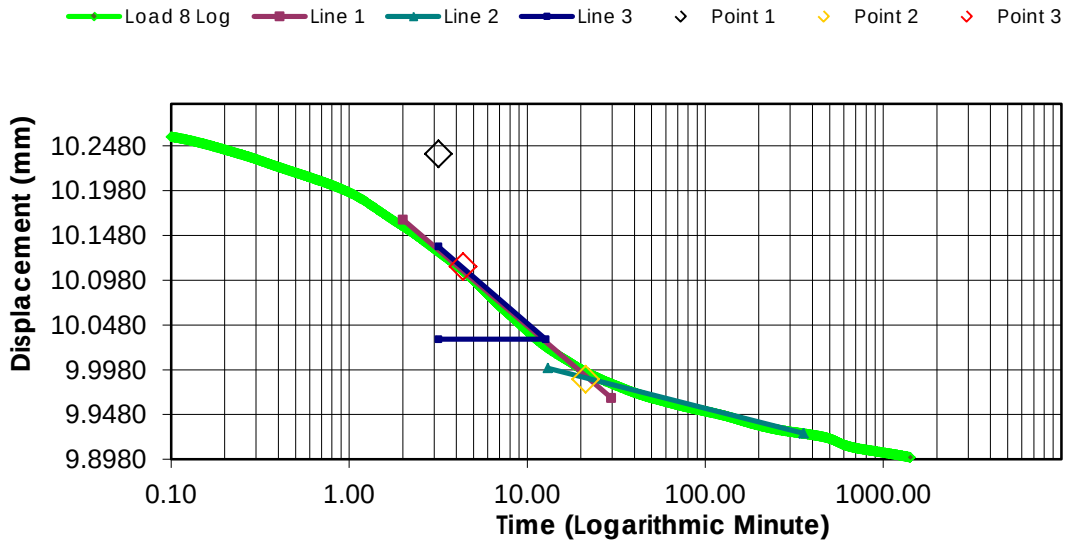
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 10.3420 | 0.6840 | 3.6000 | 0.5909 |
| 1 | 00:00:06 | 10.2580 | 0.7680 | 4.0421 | 0.5836 |
| 2 | 00:00:15 | 10.2380 | 0.7880 | 4.1474 | 0.5819 |
| 3 | 00:00:30 | 10.2180 | 0.8080 | 4.2526 | 0.5802 |
| 4 | 00:01:00 | 10.1960 | 0.8300 | 4.3684 | 0.5783 |
| 5 | 00:02:00 | 10.1580 | 0.8680 | 4.5684 | 0.5749 |
| 6 | 00:04:00 | 10.1140 | 0.9120 | 4.8000 | 0.5711 |
| 7 | 00:08:01 | 10.0580 | 0.9680 | 5.0947 | 0.5663 |
| 8 | 00:15:01 | 10.0140 | 1.0120 | 5.3263 | 0.5624 |
| 9 | 00:30:02 | 9.9820 | 1.0440 | 5.4947 | 0.5597 |
| 10 | 01:00:05 | 9.9620 | 1.0640 | 5.6000 | 0.5579 |
| 11 | 02:00:10 | 9.9480 | 1.0780 | 5.6737 | 0.5567 |
| 12 | 04:00:19 | 9.9320 | 1.0940 | 5.7579 | 0.5553 |
| 13 | 08:00:38 | 9.9220 | 1.1040 | 5.8105 | 0.5545 |
| 14 | 12:00:57 | 9.9100 | 1.1160 | 5.8737 | 0.5534 |
| 15 | 23:42:30 | 9.9000 | 1.1260 | 5.9263 | 0.5525 |

# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

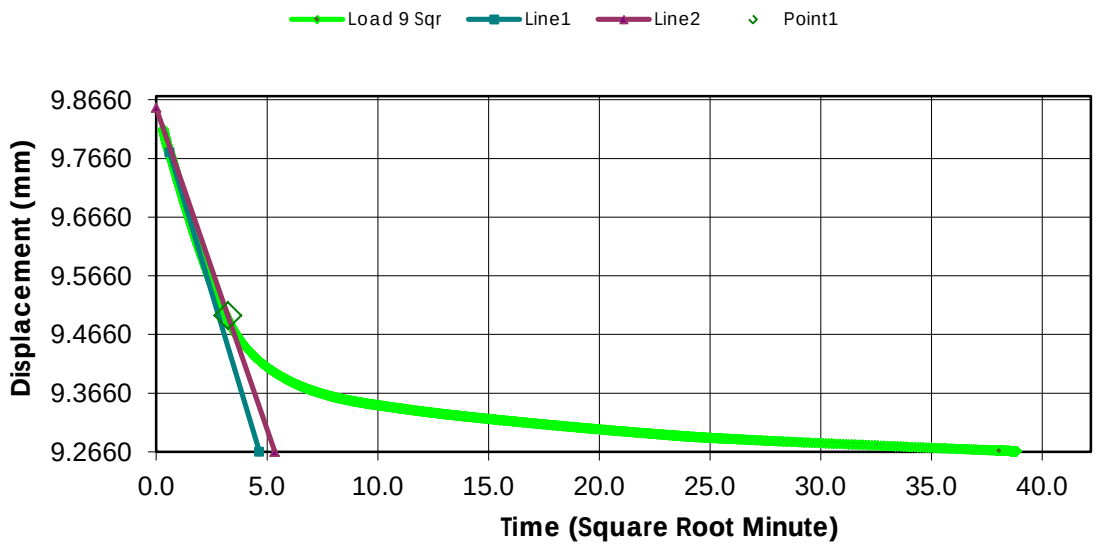
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Jul-16
**Test Number:**

**Sample Number:** D59 ST6 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 2.40-2.89m **Remarks:**
**Sample Type:** Undisturbed

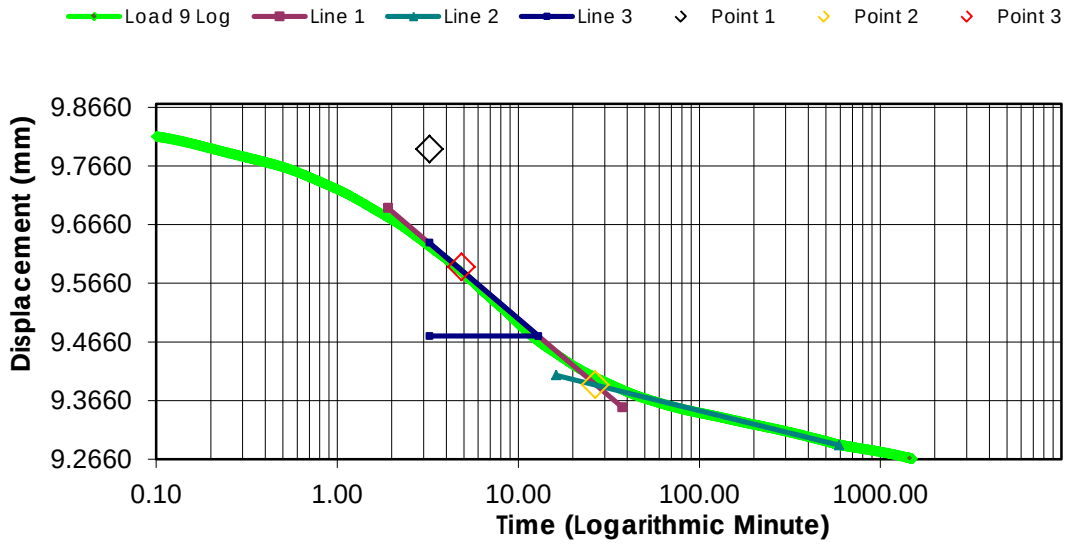
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.9000 | 1.1260 | 5.9263 | 0.5525 |
| 1 | 00:00:06 | 9.8160 | 1.2100 | 6.3684 | 0.5452 |
| 2 | 00:00:15 | 9.7880 | 1.2380 | 6.5158 | 0.5428 |
| 3 | 00:00:30 | 9.7640 | 1.2620 | 6.6421 | 0.5407 |
| 4 | 00:01:00 | 9.7260 | 1.3000 | 6.8421 | 0.5374 |
| 5 | 00:02:00 | 9.6740 | 1.3520 | 7.1158 | 0.5329 |
| 6 | 00:04:01 | 9.6060 | 1.4200 | 7.4737 | 0.5270 |
| 7 | 00:08:01 | 9.5240 | 1.5020 | 7.9053 | 0.5199 |
| 8 | 00:15:02 | 9.4520 | 1.5740 | 8.2842 | 0.5136 |
| 9 | 00:30:03 | 9.3980 | 1.6280 | 8.5684 | 0.5089 |
| 10 | 01:00:05 | 9.3620 | 1.6640 | 8.7579 | 0.5058 |
| 11 | 02:00:10 | 9.3400 | 1.6860 | 8.8737 | 0.5039 |
| 12 | 04:00:16 | 9.3200 | 1.7060 | 8.9790 | 0.5022 |
| 13 | 08:00:24 | 9.2980 | 1.7280 | 9.0947 | 0.5003 |
| 14 | 12:00:32 | 9.2860 | 1.7400 | 9.1579 | 0.4992 |
| 15 | 24:00:57 | 9.2680 | 1.7580 | 9.2526 | 0.4976 |
| 16 | 24:07:22 | 9.2680 | 1.7580 | 9.2526 | 0.4976 |

# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

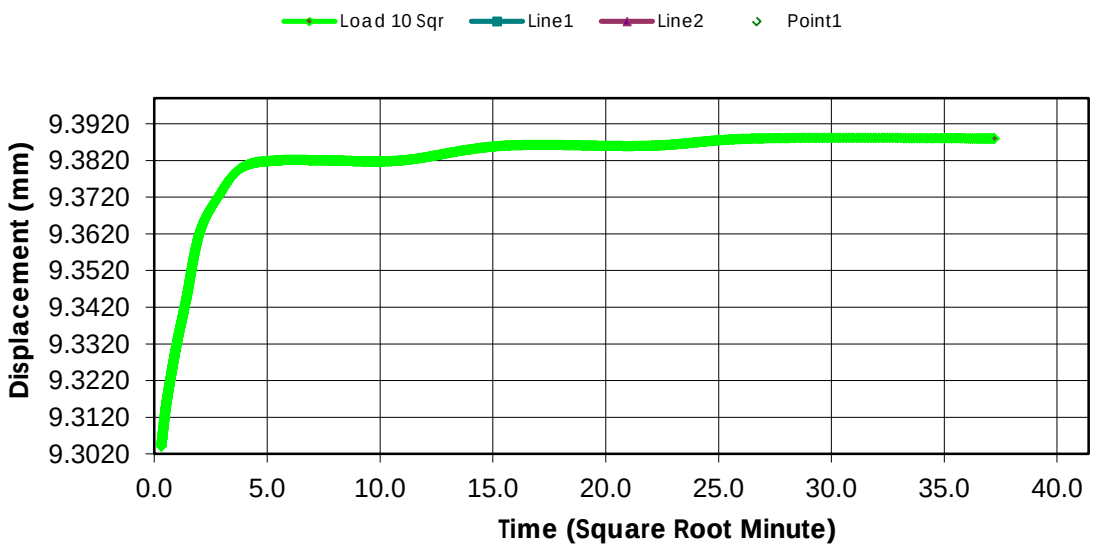
**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

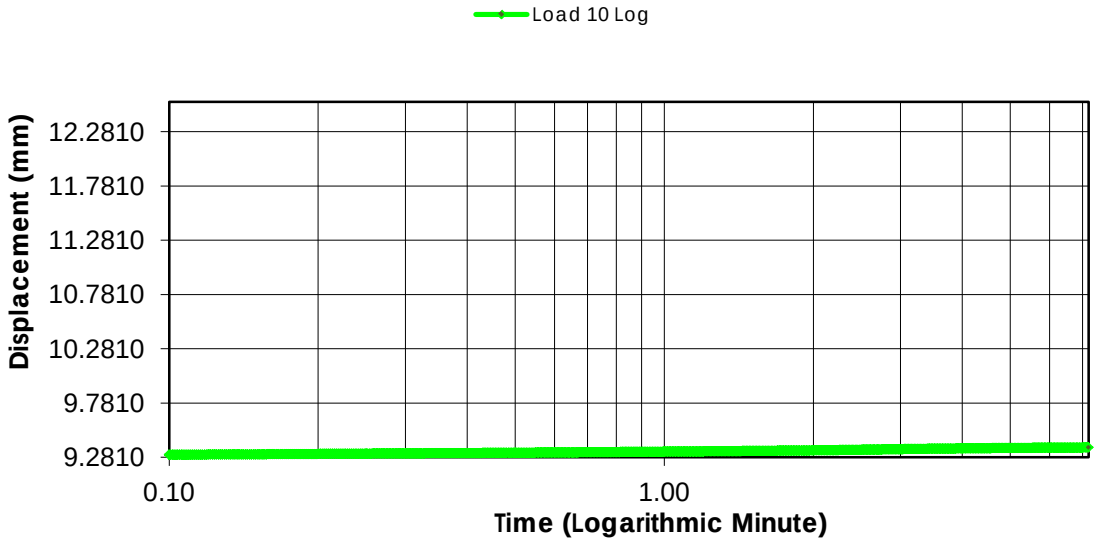
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.2680 | 1.7580 | 9.2526 | 0.4976 |
| 1 | 00:00:06 | 9.3040 | 1.7220 | 9.0632 | 0.5008 |
| 2 | 00:00:15 | 9.3140 | 1.7120 | 9.0105 | 0.5016 |
| 3 | 00:00:30 | 9.3220 | 1.7040 | 8.9684 | 0.5023 |
| 4 | 00:01:00 | 9.3320 | 1.6940 | 8.9158 | 0.5032 |
| 5 | 00:02:00 | 9.3440 | 1.6820 | 8.8526 | 0.5042 |
| 6 | 00:04:00 | 9.3620 | 1.6640 | 8.7579 | 0.5058 |
| 7 | 00:08:00 | 9.3720 | 1.6540 | 8.7053 | 0.5067 |
| 8 | 00:15:00 | 9.3800 | 1.6460 | 8.6632 | 0.5074 |
| 9 | 00:30:01 | 9.3820 | 1.6440 | 8.6526 | 0.5075 |
| 10 | 01:00:02 | 9.3820 | 1.6440 | 8.6526 | 0.5075 |
| 11 | 02:00:04 | 9.3820 | 1.6440 | 8.6526 | 0.5075 |
| 12 | 04:00:08 | 9.3860 | 1.6400 | 8.6316 | 0.5079 |
| 13 | 08:00:16 | 9.3860 | 1.6400 | 8.6316 | 0.5079 |
| 14 | 12:00:24 | 9.3880 | 1.6380 | 8.6211 | 0.5081 |
| 15 | 23:06:46 | 9.3880 | 1.6380 | 8.6211 | 0.5081 |

# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

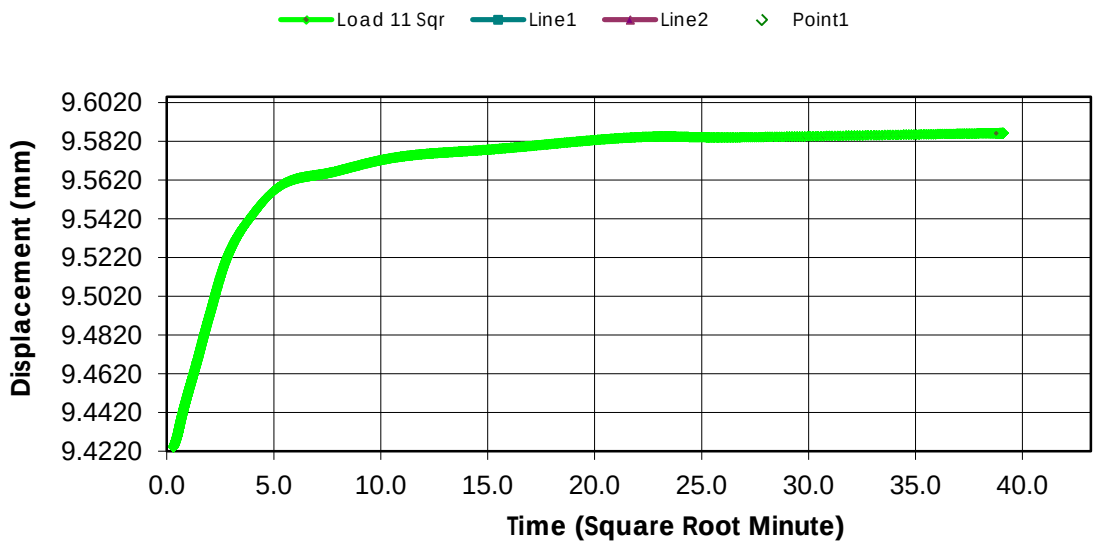
**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

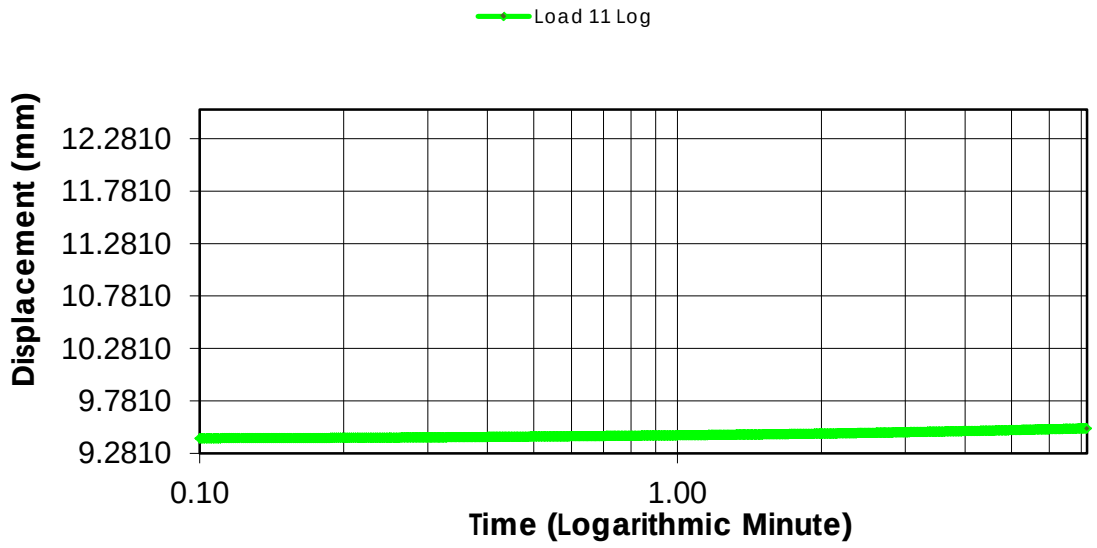
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.3880 | 1.6380 | 8.6211 | 0.5081 |
| 1 | 00:00:06 | 9.4240 | 1.6020 | 8.4316 | 0.5112 |
| 2 | 00:00:15 | 9.4300 | 1.5960 | 8.4000 | 0.5117 |
| 3 | 00:00:30 | 9.4400 | 1.5860 | 8.3474 | 0.5126 |
| 4 | 00:01:00 | 9.4520 | 1.5740 | 8.2842 | 0.5136 |
| 5 | 00:02:00 | 9.4680 | 1.5580 | 8.2000 | 0.5150 |
| 6 | 00:04:00 | 9.4920 | 1.5340 | 8.0737 | 0.5171 |
| 7 | 00:08:00 | 9.5220 | 1.5040 | 7.9158 | 0.5197 |
| 8 | 00:15:01 | 9.5420 | 1.4840 | 7.8105 | 0.5214 |
| 9 | 00:30:01 | 9.5600 | 1.4660 | 7.7158 | 0.5230 |
| 10 | 01:00:02 | 9.5660 | 1.4600 | 7.6842 | 0.5235 |
| 11 | 02:00:04 | 9.5740 | 1.4520 | 7.6421 | 0.5242 |
| 12 | 04:00:08 | 9.5780 | 1.4480 | 7.6211 | 0.5246 |
| 13 | 08:00:17 | 9.5840 | 1.4420 | 7.5895 | 0.5251 |
| 14 | 12:00:25 | 9.5840 | 1.4420 | 7.5895 | 0.5251 |
| 15 | 24:00:50 | 9.5860 | 1.4400 | 7.5789 | 0.5253 |
| 16 | 25:03:45 | 9.5860 | 1.4400 | 7.5789 | 0.5253 |

# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

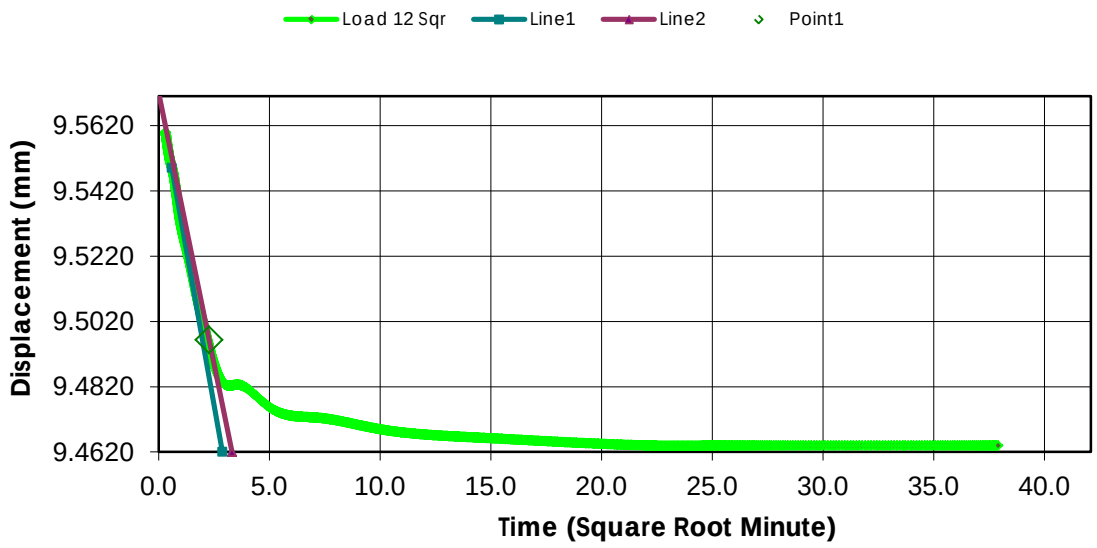
**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

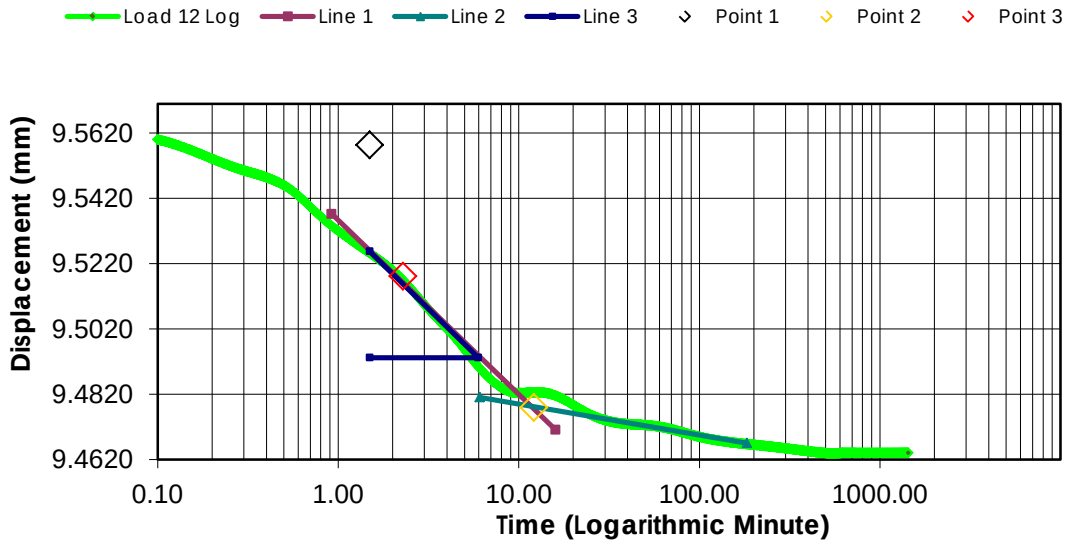
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5860 | 1.4400 | 7.5789 | 0.5253 |
| 1 | 00:00:06 | 9.5600 | 1.4660 | 7.7158 | 0.5230 |
| 2 | 00:00:15 | 9.5520 | 1.4740 | 7.7579 | 0.5223 |
| 3 | 00:00:30 | 9.5460 | 1.4800 | 7.7895 | 0.5218 |
| 4 | 00:01:00 | 9.5320 | 1.4940 | 7.8632 | 0.5206 |
| 5 | 00:02:00 | 9.5200 | 1.5060 | 7.9263 | 0.5195 |
| 6 | 00:04:00 | 9.5020 | 1.5240 | 8.0211 | 0.5180 |
| 7 | 00:08:00 | 9.4840 | 1.5420 | 8.1158 | 0.5164 |
| 8 | 00:15:01 | 9.4820 | 1.5440 | 8.1263 | 0.5162 |
| 9 | 00:30:01 | 9.4740 | 1.5520 | 8.1684 | 0.5155 |
| 10 | 01:00:02 | 9.4720 | 1.5540 | 8.1789 | 0.5154 |
| 11 | 02:00:04 | 9.4680 | 1.5580 | 8.2000 | 0.5150 |
| 12 | 04:00:08 | 9.4660 | 1.5600 | 8.2105 | 0.5148 |
| 13 | 08:00:17 | 9.4640 | 1.5620 | 8.2211 | 0.5147 |
| 14 | 12:00:25 | 9.4640 | 1.5620 | 8.2211 | 0.5147 |
| 15 | 23:57:00 | 9.4640 | 1.5620 | 8.2211 | 0.5147 |

# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 15-Jul-16
**Test Number:**

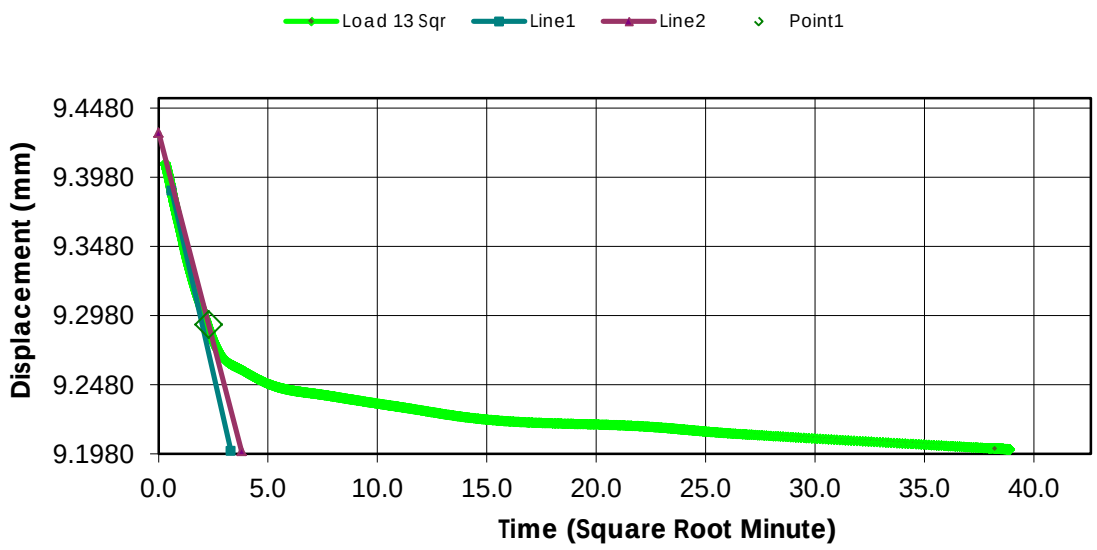
**Sample Number:** D59 ST6
**Boring Number:**
**Depth:** 2.40-2.89m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay
**Remarks:**

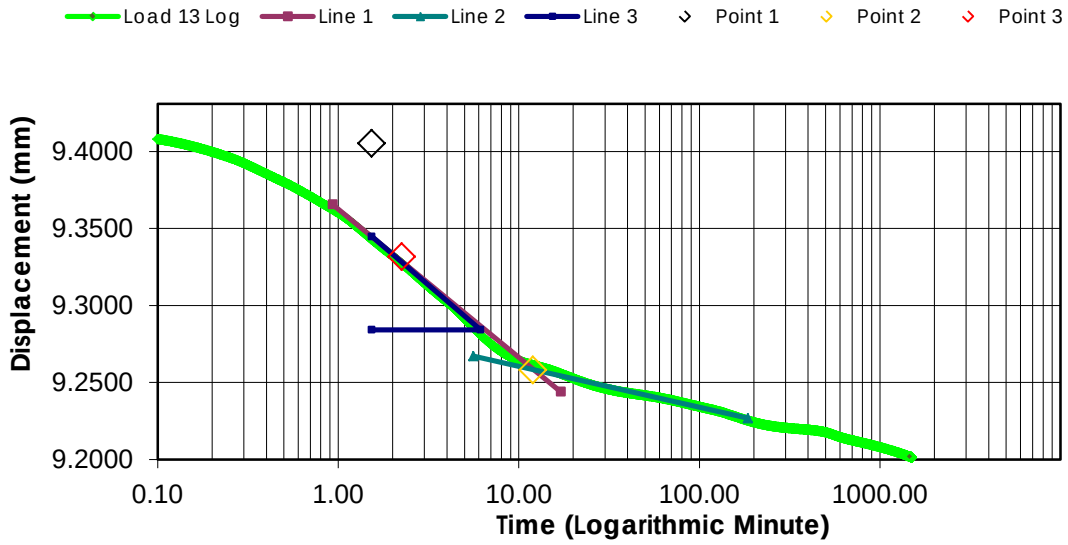
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.4640 | 1.5620 | 8.2211 | 0.5147 |
| 1 | 00:00:06 | 9.4080 | 1.6180 | 8.5158 | 0.5098 |
| 2 | 00:00:15 | 9.3960 | 1.6300 | 8.5789 | 0.5088 |
| 3 | 00:00:30 | 9.3800 | 1.6460 | 8.6632 | 0.5074 |
| 4 | 00:01:00 | 9.3600 | 1.6660 | 8.7684 | 0.5056 |
| 5 | 00:02:00 | 9.3320 | 1.6940 | 8.9158 | 0.5032 |
| 6 | 00:04:00 | 9.3020 | 1.7240 | 9.0737 | 0.5006 |
| 7 | 00:08:00 | 9.2700 | 1.7560 | 9.2421 | 0.4978 |
| 8 | 00:15:00 | 9.2580 | 1.7680 | 9.3053 | 0.4968 |
| 9 | 00:30:01 | 9.2460 | 1.7800 | 9.3684 | 0.4957 |
| 10 | 01:00:02 | 9.2400 | 1.7860 | 9.4000 | 0.4952 |
| 11 | 02:00:04 | 9.2320 | 1.7940 | 9.4421 | 0.4945 |
| 12 | 04:00:08 | 9.2220 | 1.8040 | 9.4947 | 0.4936 |
| 13 | 08:00:17 | 9.2180 | 1.8080 | 9.5158 | 0.4933 |
| 14 | 12:00:25 | 9.2120 | 1.8140 | 9.5474 | 0.4928 |
| 15 | 24:00:50 | 9.2020 | 1.8240 | 9.6000 | 0.4919 |
| 16 | 24:19:42 | 9.2020 | 1.8240 | 9.6000 | 0.4919 |

# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

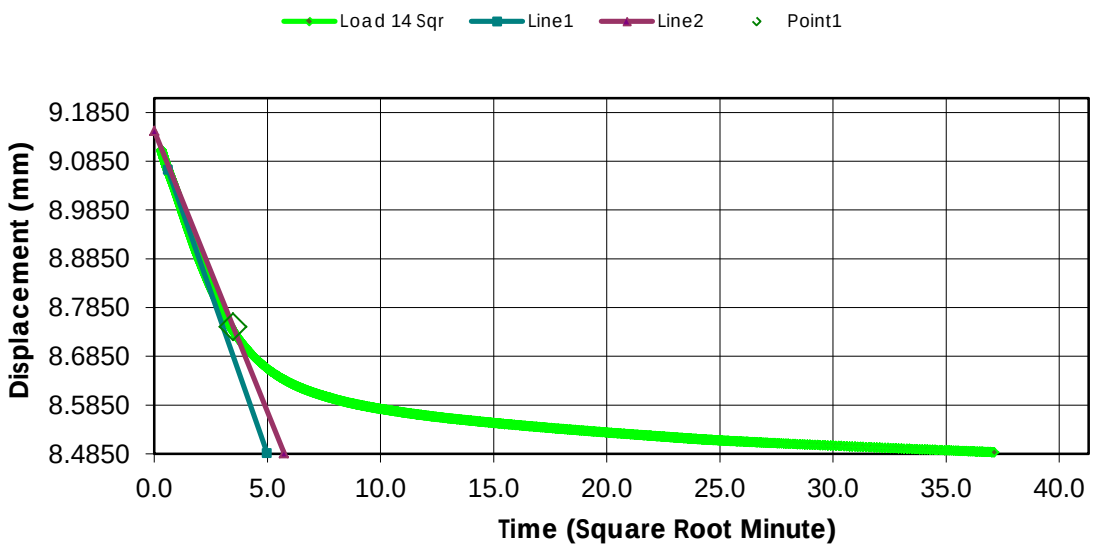
**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:** **Test Date:** 15-Jul-16
**Test Number:**

**Sample Number:** D59 ST6 **Soil Description:**
**Boring Number:** Brown Clay
**Depth:** 2.40-2.89m **Remarks:**
**Sample Type:** Undisturbed

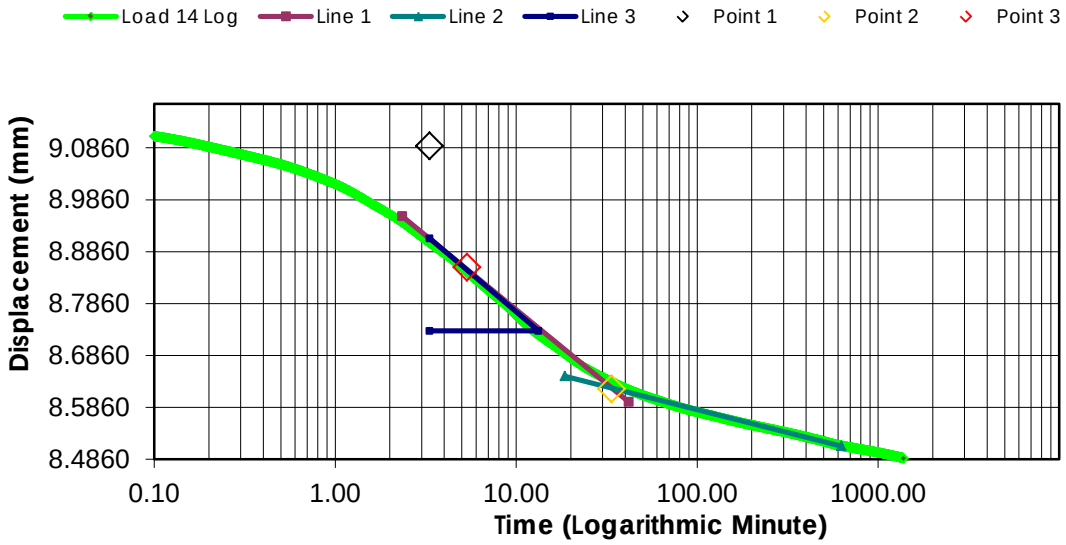
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.2020 | 1.8240 | 9.6000 | 0.4919 |
| 1 | 00:00:06 | 9.1080 | 1.9180 | 10.0947 | 0.4837 |
| 2 | 00:00:15 | 9.0800 | 1.9460 | 10.2421 | 0.4813 |
| 3 | 00:00:30 | 9.0540 | 1.9720 | 10.3789 | 0.4791 |
| 4 | 00:01:00 | 9.0160 | 2.0100 | 10.5789 | 0.4758 |
| 5 | 00:02:00 | 8.9580 | 2.0680 | 10.8842 | 0.4707 |
| 6 | 00:04:00 | 8.8820 | 2.1440 | 11.2842 | 0.4641 |
| 7 | 00:08:00 | 8.7940 | 2.2320 | 11.7474 | 0.4565 |
| 8 | 00:15:00 | 8.7120 | 2.3140 | 12.1789 | 0.4494 |
| 9 | 00:30:01 | 8.6440 | 2.3820 | 12.5368 | 0.4434 |
| 10 | 01:00:02 | 8.6000 | 2.4260 | 12.7684 | 0.4396 |
| 11 | 02:00:04 | 8.5700 | 2.4560 | 12.9263 | 0.4370 |
| 12 | 04:00:08 | 8.5460 | 2.4800 | 13.0526 | 0.4349 |
| 13 | 08:00:16 | 8.5220 | 2.5040 | 13.1789 | 0.4328 |
| 14 | 12:00:25 | 8.5080 | 2.5180 | 13.2526 | 0.4316 |
| 15 | 22:58:36 | 8.4880 | 2.5380 | 13.3579 | 0.4299 |

# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



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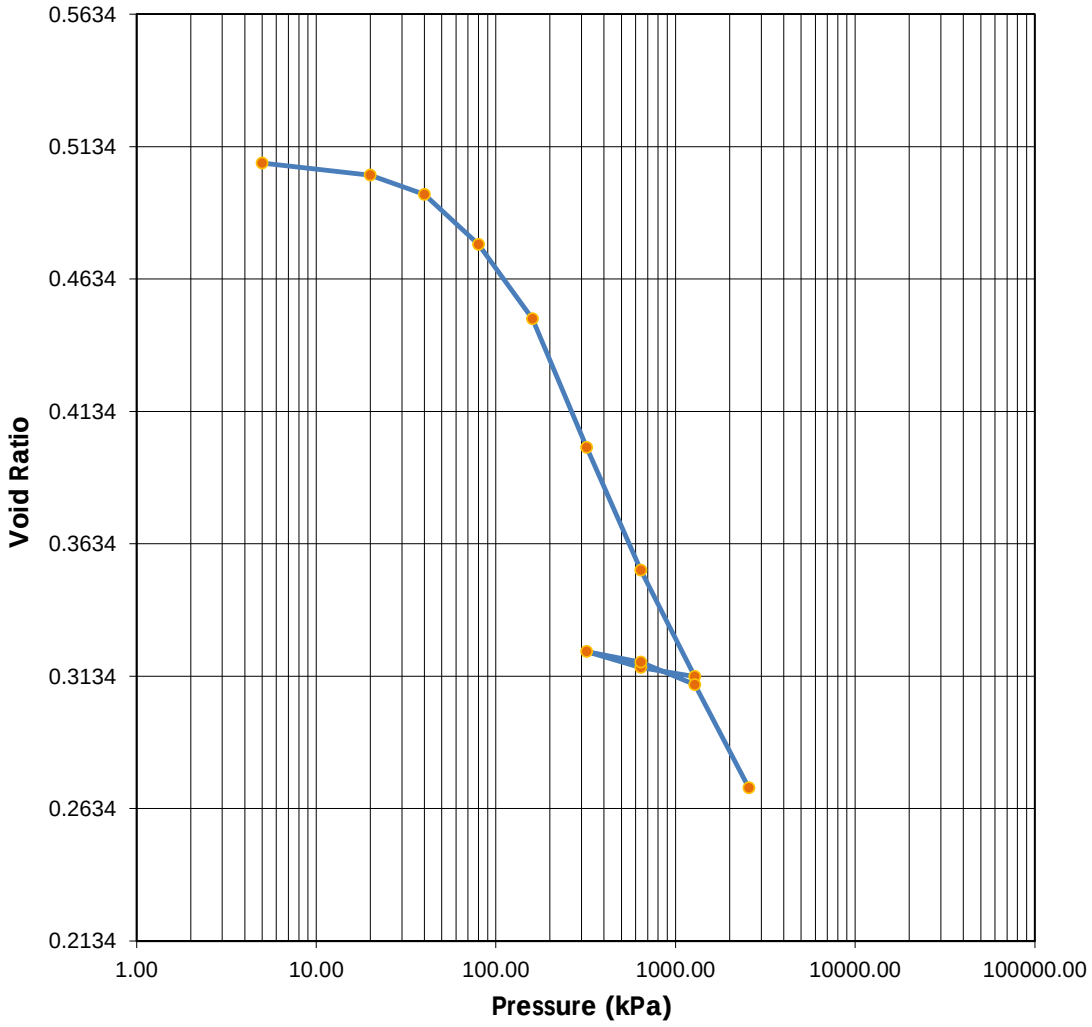
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 30-Aug-16 |
| **Moisture (%):** | 15.5 | 11.9 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.788 | 2.133 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 82.29 | 120.47 | | | | |
| **Void Ratio:** | 0.5082 | 0.2721 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay, some gravel, trace sand

**Project Number:** 110773396.302.702.230 **Depth:** 4.60-5.05m
**Sample Number:** D62 ST6 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportation
**Location:**

**Remarks:**
Load at 10kPa omitted due to swelling

**Tested By:** C. Oost **Reviewed By:**

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

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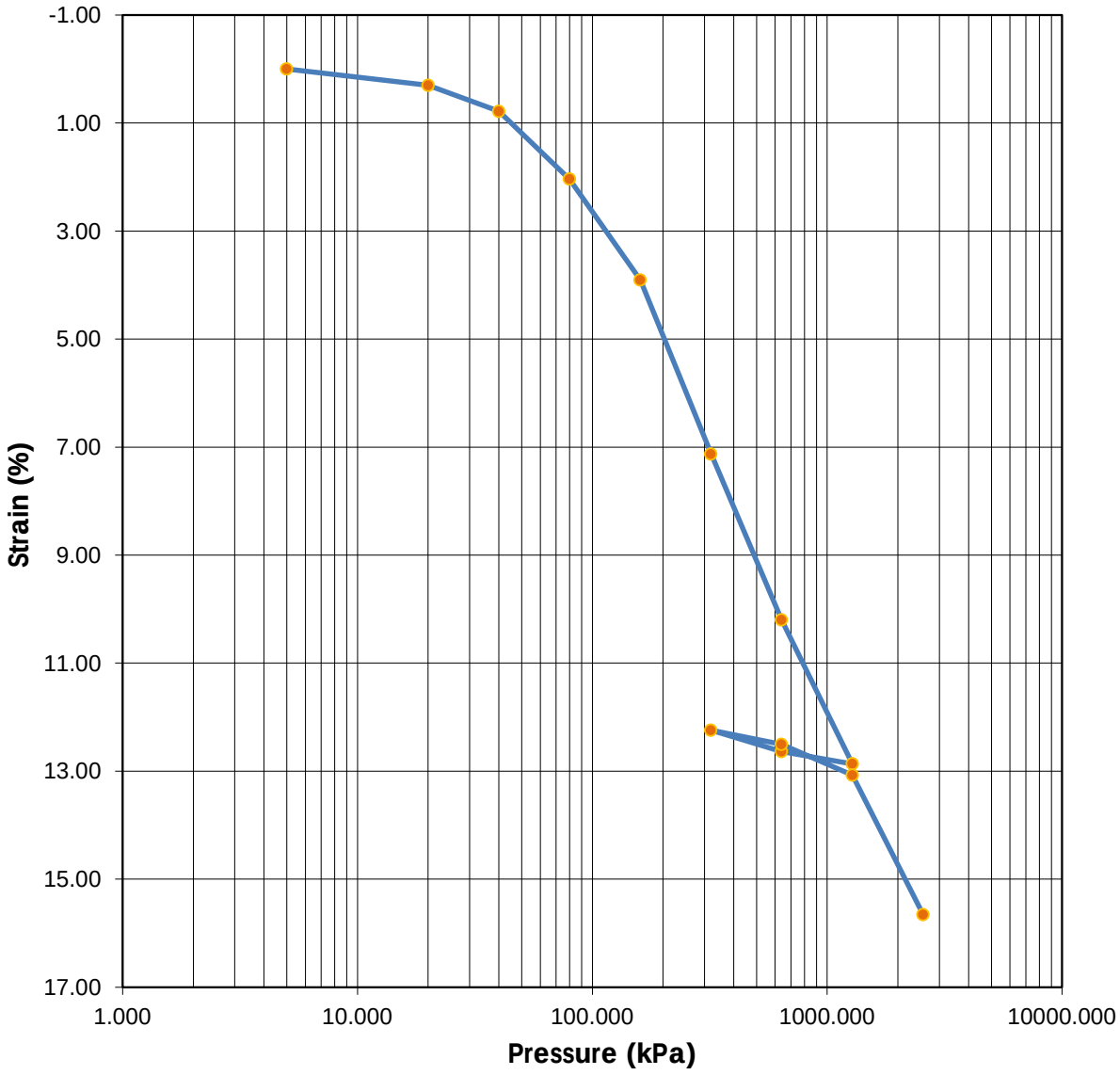
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| | | | **Liquid Limits:** | - | **Test Date:** | 30-Aug-16 |
| **Moisture (%):** | 15.5 | 11.9 | **Plastic Limits:** | - | | |
| **Dry Density (g/cm3):** | 1.788 | 2.133 | **Plasticity Index (%):** | - | | |
| **Saturation (%):** | 82.29 | 120.47 | | | | |
| **Void Ratio:** | 0.5082 | 0.2721 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Sample Description:** | Brown Clay, some gravel, trace sand | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.60-5.05m | **Remarks:** |
| **Sample Number:** | D62 ST6 | **Boring Number:** | Load at 10kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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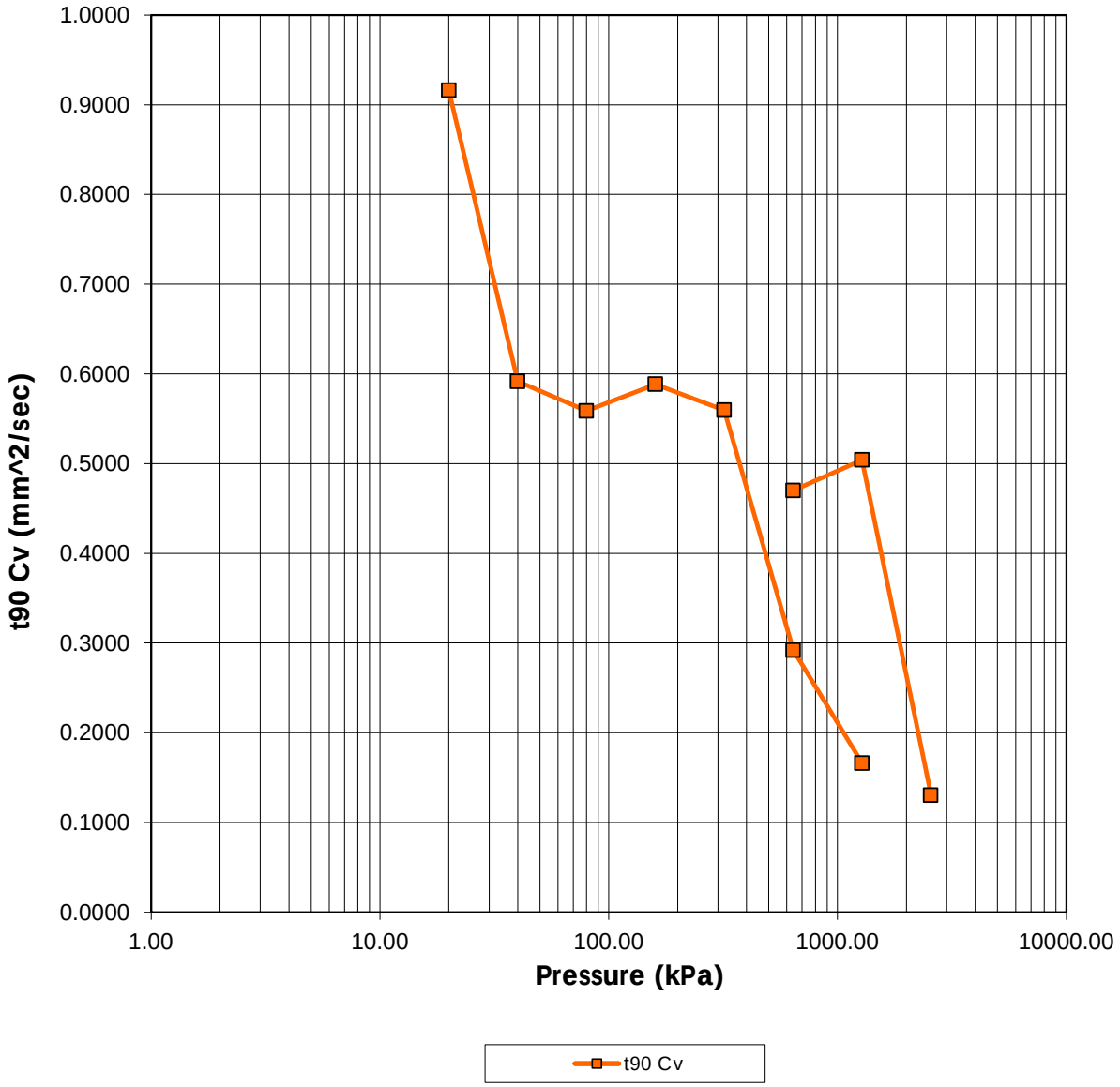
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 15.5 | 11.9 | **Liquid Limits:** | - | **Test Date:** | 30-Aug-16 |
| **Dry Density (g/cm3):** | 1.788 | 2.133 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 82.29 | 120.47 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5082 | 0.2721 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay, some gravel, trace sand

**Project Number:** 110773396.302.702.230 **Depth:** 4.60-5.05m

**Sample Number:** D62 ST6 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:**
Load at 10kPa omitted due to swelling

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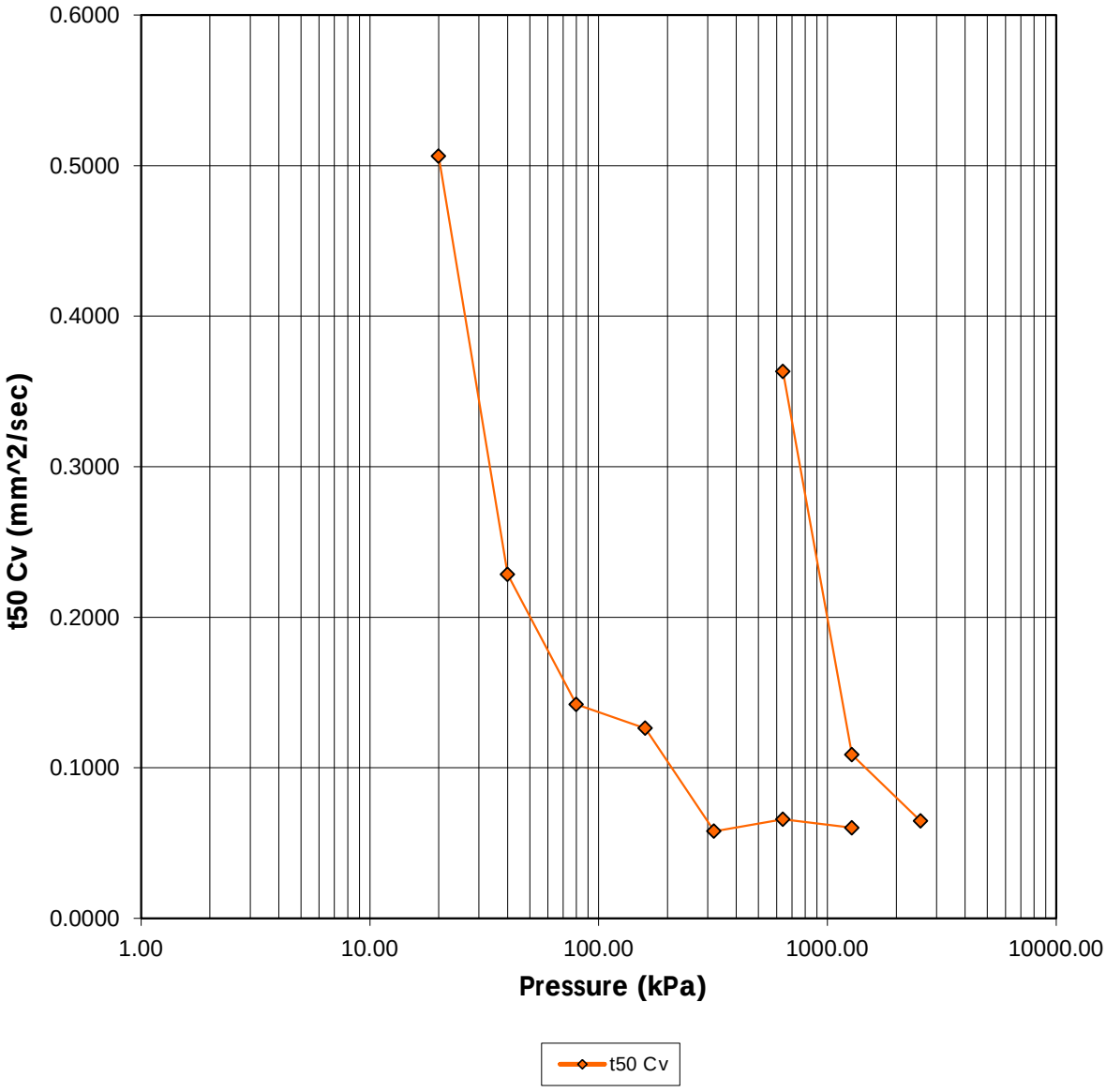
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 15.5 | 11.9 | **Liquid Limits:** | - | **Test Date:** | 30-Aug-16 |
| **Dry Density (g/cm3):** | 1.788 | 2.133 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 82.29 | 120.47 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5082 | 0.2721 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, some gravel, trace sand | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.60-5.05m | **Remarks:** |
| **Sample Number:** | D62 ST6 | **Boring Number:** | Load at 10kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

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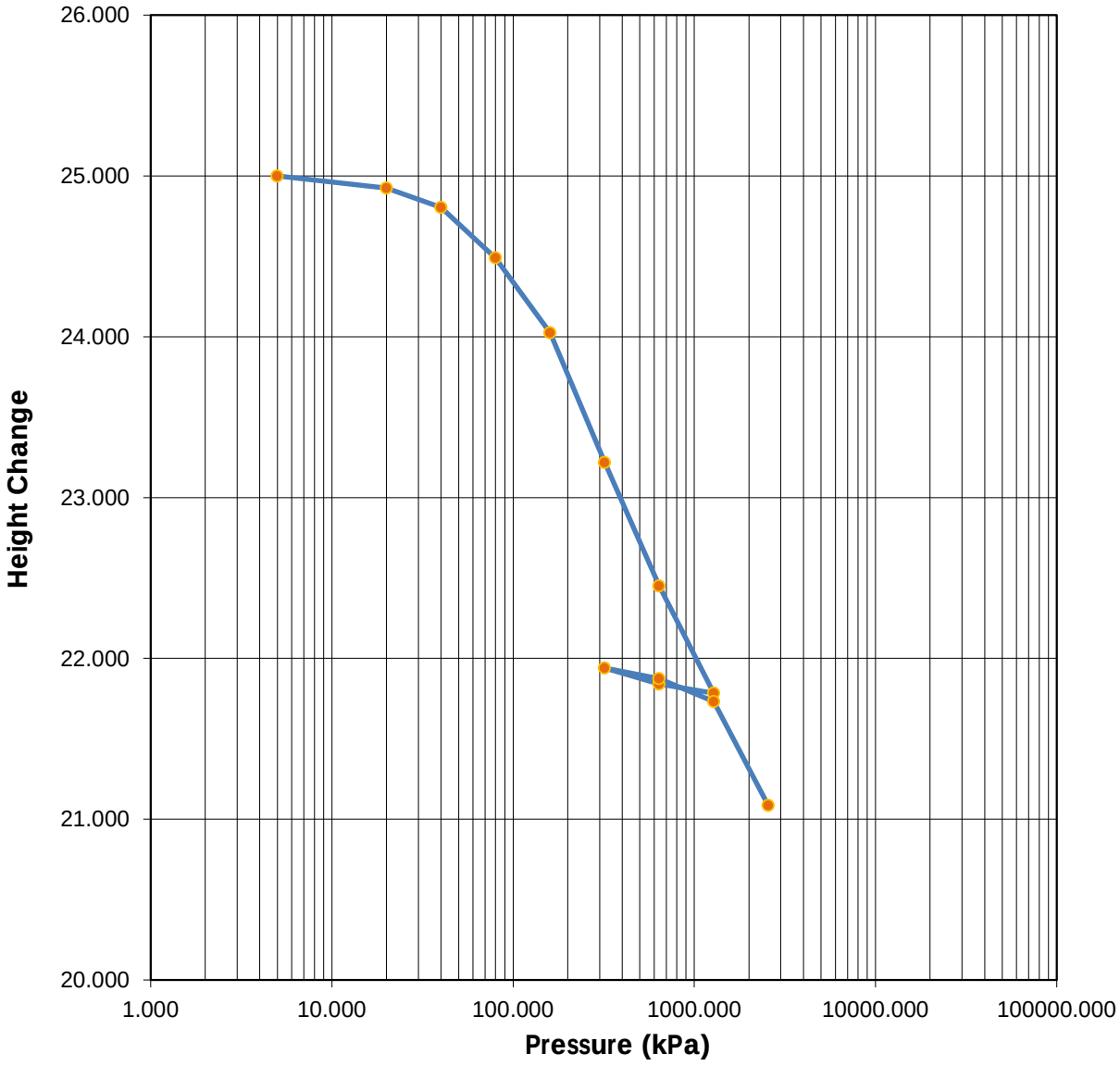
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 15.5 | 11.9 | **Liquid Limits:** | - | **Test Date:** | 30-Aug-16 |
| **Dry Density (g/cm3):** | 1.788 | 2.133 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 82.29 | 120.47 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.5082 | 0.2721 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, some gravel, trace sand | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.60-5.05m | **Remarks:** |
| **Sample Number:** | D62 ST6 | **Boring Number:** | Load at 10kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D62 ST6
**Boring Number:**
**Depth:** 4.60-5.05m
**Sample Type:** Undisturbed

**Sample Description:**
Brown Clay, some gravel, trace sand
**Remarks:** Load at 10kPa omitted due to swelling

**Test Number:**
**Test Date:** 30-Aug-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.0000 | 8.4130 | 0.00 | 0.5072 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 25.0000 | 8.4130 | 0.00 | 0.5072 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 10.000 | 0.0420 | 24.9580 | 8.3710 | 0.17 | 0.5047 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 20.000 | 0.0760 | 24.9240 | 8.3370 | 0.30 | 0.5026 | 2.396 | 1.007 | 0.916 | 0.506 |
| 4 | 40.000 | 0.1960 | 24.8040 | 8.2170 | 0.78 | 0.4954 | 3.674 | 2.210 | 0.592 | 0.228 |
| 5 | 80.000 | 0.5100 | 24.4900 | 7.9030 | 2.04 | 0.4765 | 3.793 | 3.464 | 0.559 | 0.142 |
| 6 | 160.000 | 0.9760 | 24.0240 | 7.4370 | 3.90 | 0.4484 | 3.466 | 3.752 | 0.588 | 0.126 |
| 7 | 320.000 | 1.7820 | 23.2180 | 6.6310 | 7.13 | 0.3998 | 3.403 | 7.653 | 0.560 | 0.058 |
| 8 | 640.000 | 2.5500 | 22.4500 | 5.8630 | 10.20 | 0.3535 | 6.100 | 6.289 | 0.292 | 0.066 |
| 9 | 1280.000 | 3.2160 | 21.7840 | 5.1970 | 12.86 | 0.3133 | 10.089 | 6.477 | 0.166 | 0.060 |
| 10 | 640.000 | 3.1600 | 21.8400 | 5.2530 | 12.64 | 0.3167 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 320.000 | 3.0600 | 21.9400 | 5.3530 | 12.24 | 0.3227 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 640.000 | 3.1260 | 21.8740 | 5.2870 | 12.50 | 0.3187 | 3.597 | 1.081 | 0.470 | 0.363 |
| 13 | 1280.000 | 3.2680 | 21.7320 | 5.1450 | 13.07 | 0.3102 | 3.310 | 3.565 | 0.504 | 0.109 |
| 14 | 2560.000 | 3.9140 | 21.0860 | 4.4990 | 15.66 | 0.2712 | 12.046 | 5.647 | 0.130 | 0.065 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16

**Sample Number:** D62 ST6 **Sample Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** - **Initial Void Ratio:** 0.5082 **Initial Height (mm):** 25.0000
**Plastic Limit:** - **Plasticity Index (%):** - **Initial Diameter (mm):** 50.7000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 89.6900

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 58.65 | 83.08 |
| Dry Soil + Container (g) | 50.97 | 74.72 |
| Weight of Container (g) | 1.55 | 4.26 |
| Moisture Content (%) | 15.54 | 11.86 |
| Void Ratio | 0.5082 | 0.2721 |
| Saturation (%) | 82.29 | 120.47 |
| Dry Density (g/cm3) | 1.788 | 2.133 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

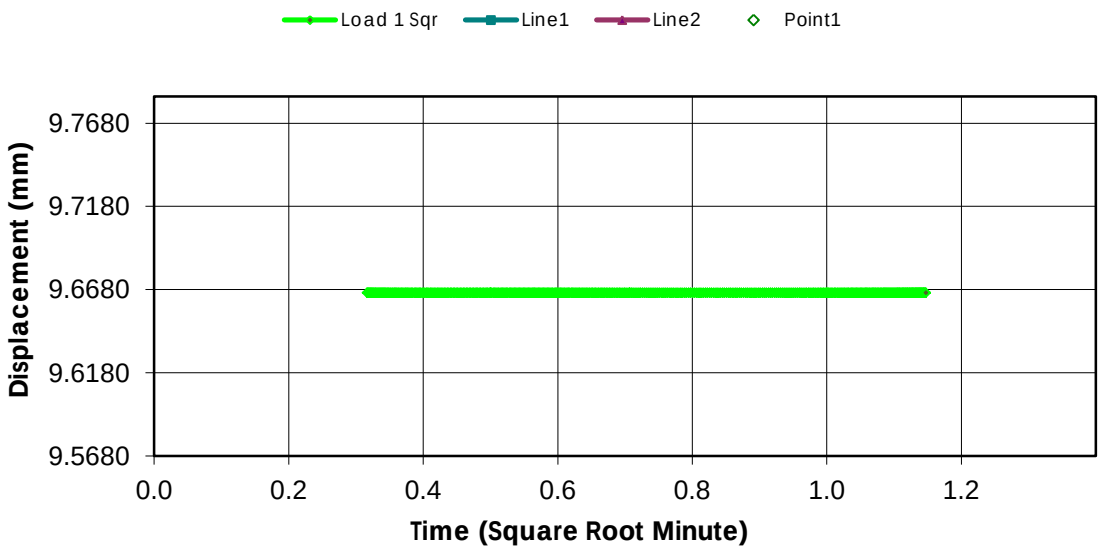
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

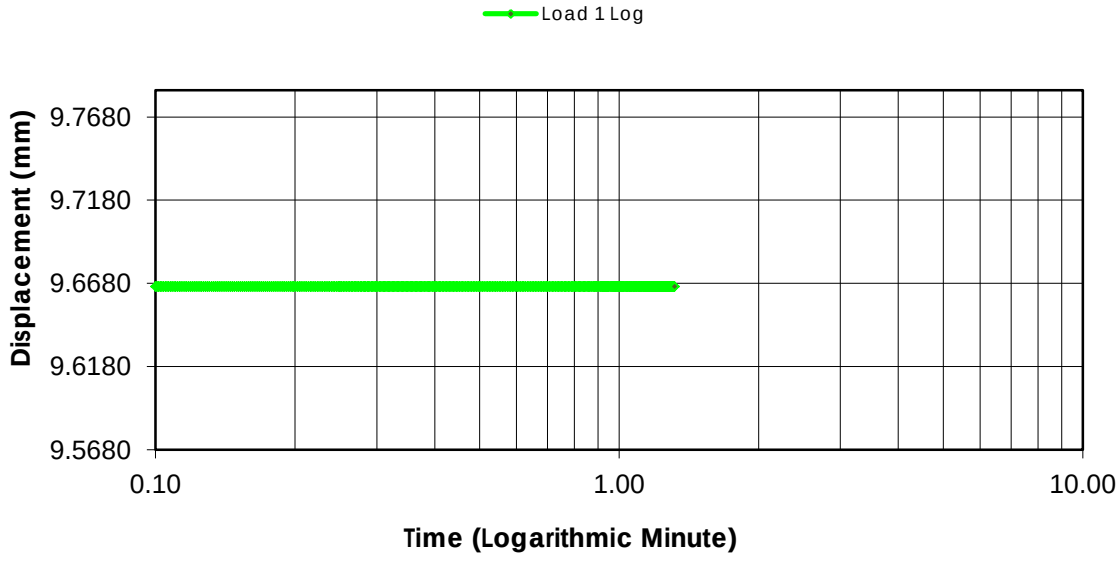
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.6660 | 0.0000 | 0.0000 | 0.5082 |
| 1 | 00:00:06 | 9.6660 | 0.0000 | 0.0000 | 0.5082 |
| 2 | 00:00:15 | 9.6660 | 0.0000 | 0.0000 | 0.5082 |
| 3 | 00:00:30 | 9.6660 | 0.0000 | 0.0000 | 0.5082 |
| 4 | 00:01:00 | 9.6660 | 0.0000 | 0.0000 | 0.5082 |
| 5 | 00:01:19 | 9.6660 | 0.0000 | 0.0000 | 0.5082 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 3) Load 20.000 kpa

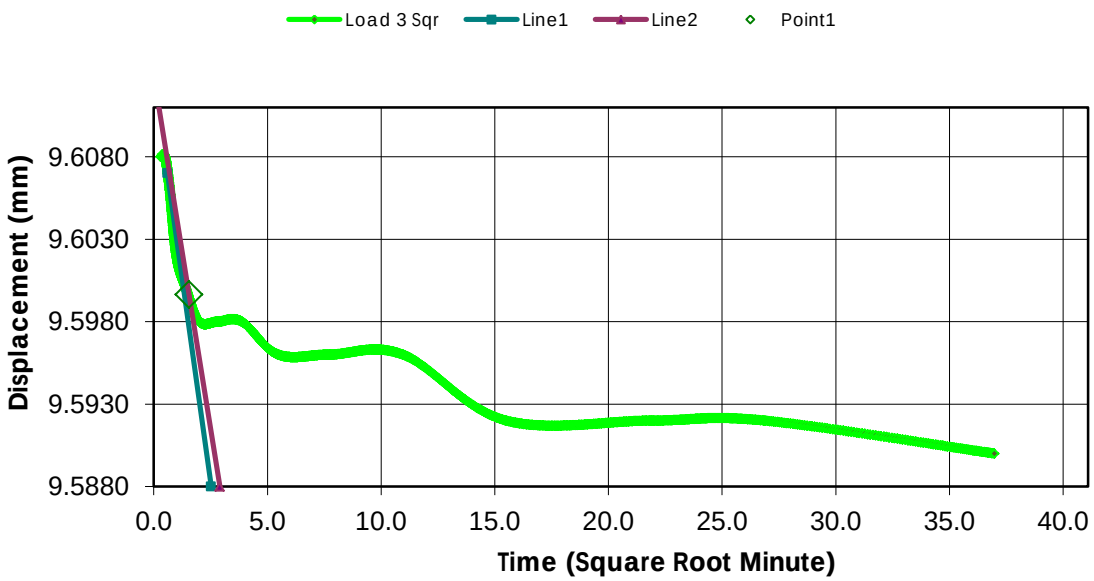
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

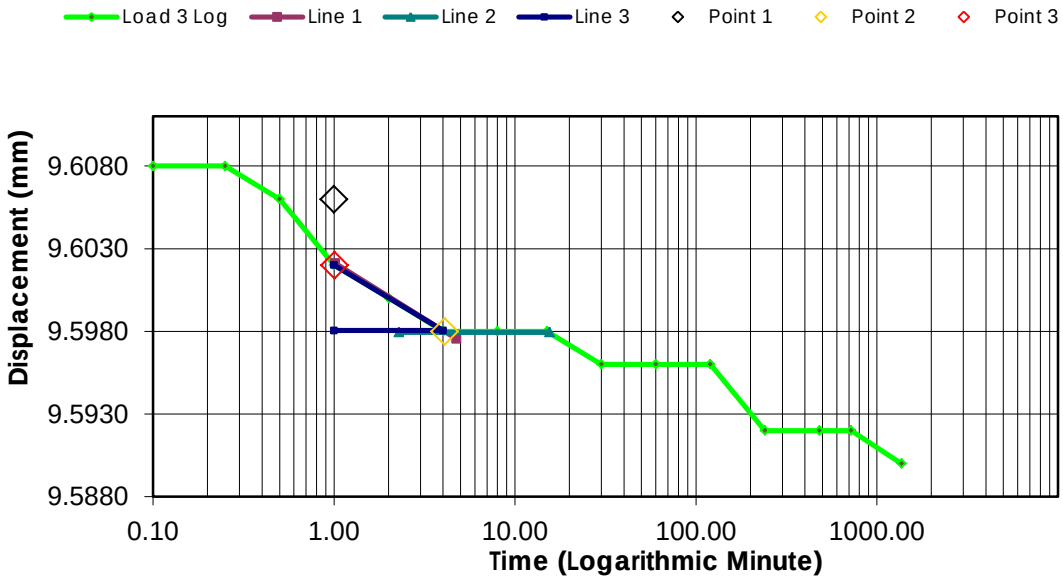
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.6240 | 0.0420 | 0.1680 | 0.5057 |
| 1 | 00:00:06 | 9.6080 | 0.0580 | 0.2320 | 0.5047 |
| 2 | 00:00:15 | 9.6080 | 0.0580 | 0.2320 | 0.5047 |
| 3 | 00:00:30 | 9.6060 | 0.0600 | 0.2400 | 0.5046 |
| 4 | 00:01:00 | 9.6020 | 0.0640 | 0.2560 | 0.5043 |
| 5 | 00:02:01 | 9.6000 | 0.0660 | 0.2640 | 0.5042 |
| 6 | 00:04:01 | 9.5980 | 0.0680 | 0.2720 | 0.5041 |
| 7 | 00:08:01 | 9.5980 | 0.0680 | 0.2720 | 0.5041 |
| 8 | 00:15:02 | 9.5980 | 0.0680 | 0.2720 | 0.5041 |
| 9 | 00:30:03 | 9.5960 | 0.0700 | 0.2800 | 0.5040 |
| 10 | 01:00:05 | 9.5960 | 0.0700 | 0.2800 | 0.5040 |
| 11 | 02:00:10 | 9.5960 | 0.0700 | 0.2800 | 0.5040 |
| 12 | 04:00:20 | 9.5920 | 0.0740 | 0.2960 | 0.5037 |
| 13 | 08:00:40 | 9.5920 | 0.0740 | 0.2960 | 0.5037 |
| 14 | 12:01:00 | 9.5920 | 0.0740 | 0.2960 | 0.5037 |
| 15 | 22:47:10 | 9.5900 | 0.0760 | 0.3040 | 0.5036 |

# Consolidation Test Results
## (Sequence 3) Load 20.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

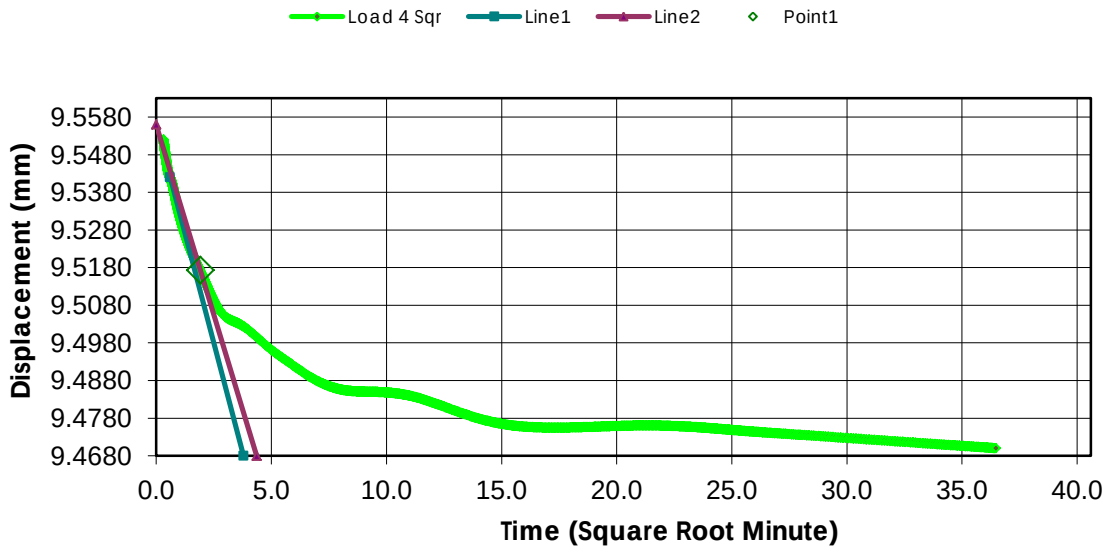
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

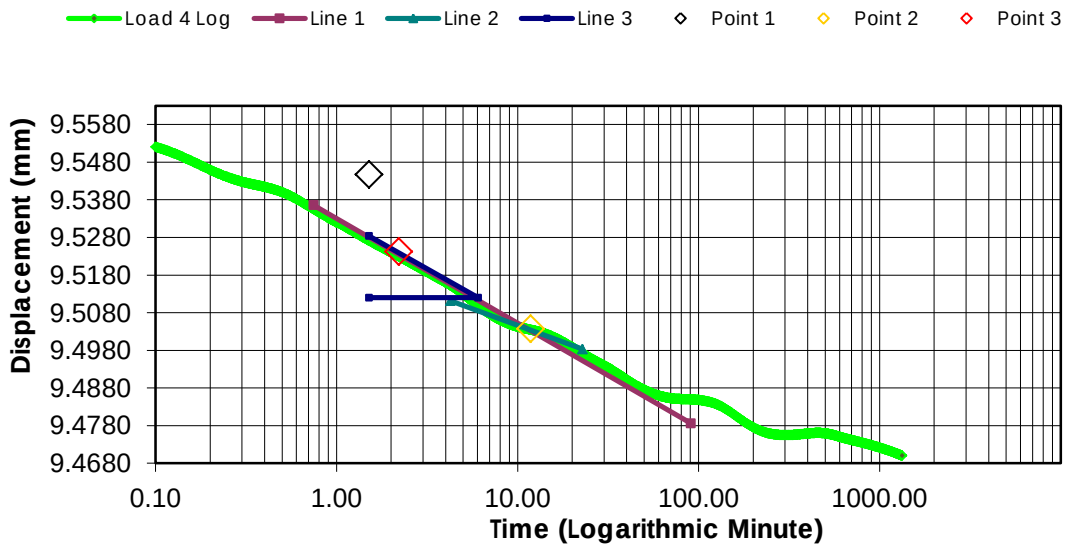
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5900 | 0.0760 | 0.3040 | 0.5036 |
| 1 | 00:00:06 | 9.5520 | 0.1140 | 0.4560 | 0.5013 |
| 2 | 00:00:15 | 9.5440 | 0.1220 | 0.4880 | 0.5008 |
| 3 | 00:00:30 | 9.5400 | 0.1260 | 0.5040 | 0.5006 |
| 4 | 00:01:00 | 9.5320 | 0.1340 | 0.5360 | 0.5001 |
| 5 | 00:02:00 | 9.5240 | 0.1420 | 0.5680 | 0.4996 |
| 6 | 00:04:00 | 9.5160 | 0.1500 | 0.6000 | 0.4992 |
| 7 | 00:08:01 | 9.5060 | 0.1600 | 0.6400 | 0.4985 |
| 8 | 00:15:01 | 9.5020 | 0.1640 | 0.6560 | 0.4983 |
| 9 | 00:30:03 | 9.4940 | 0.1720 | 0.6880 | 0.4978 |
| 10 | 01:00:05 | 9.4860 | 0.1800 | 0.7200 | 0.4973 |
| 11 | 02:00:10 | 9.4840 | 0.1820 | 0.7280 | 0.4972 |
| 12 | 04:00:20 | 9.4760 | 0.1900 | 0.7600 | 0.4967 |
| 13 | 08:00:40 | 9.4760 | 0.1900 | 0.7600 | 0.4967 |
| 14 | 12:00:59 | 9.4740 | 0.1920 | 0.7680 | 0.4966 |
| 15 | 22:10:01 | 9.4700 | 0.1960 | 0.7840 | 0.4964 |

# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

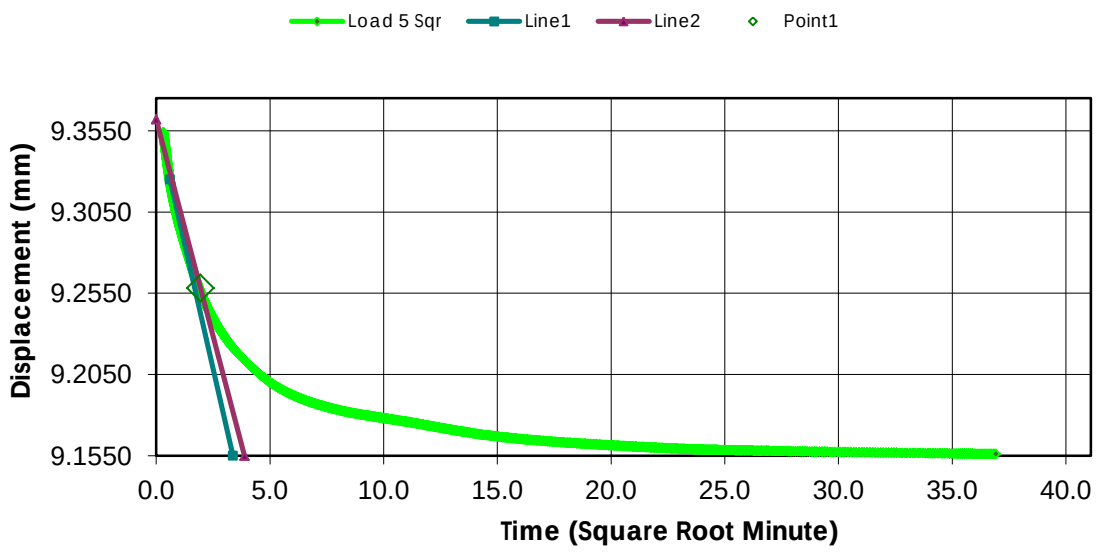
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

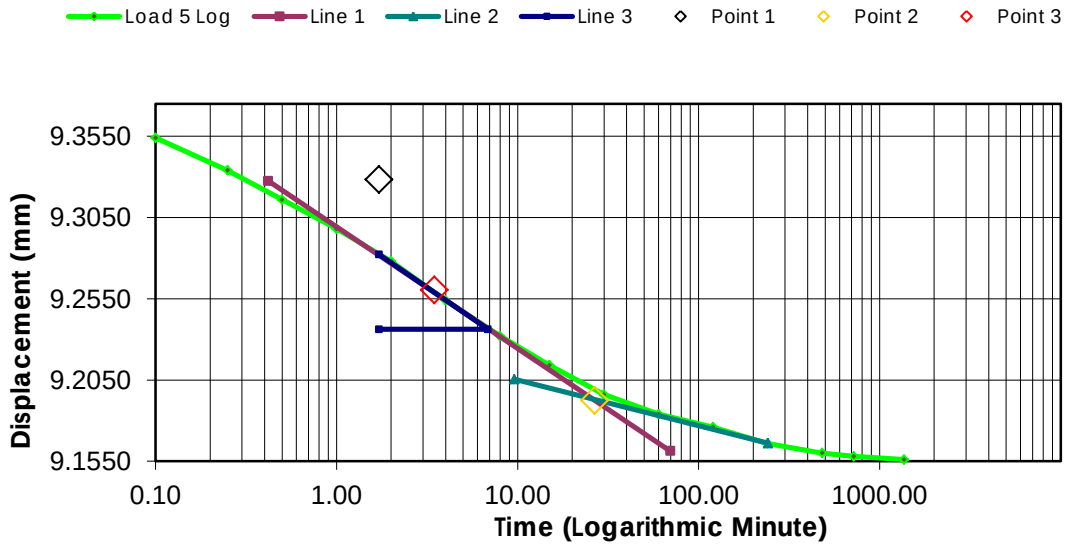
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.4700 | 0.1960 | 0.7840 | 0.4964 |
| 1 | 00:00:06 | 9.3540 | 0.3120 | 1.2480 | 0.4894 |
| 2 | 00:00:15 | 9.3340 | 0.3320 | 1.3280 | 0.4882 |
| 3 | 00:00:30 | 9.3160 | 0.3500 | 1.4000 | 0.4871 |
| 4 | 00:01:00 | 9.2980 | 0.3680 | 1.4720 | 0.4860 |
| 5 | 00:02:00 | 9.2780 | 0.3880 | 1.5520 | 0.4848 |
| 6 | 00:04:00 | 9.2540 | 0.4120 | 1.6480 | 0.4833 |
| 7 | 00:08:00 | 9.2320 | 0.4340 | 1.7360 | 0.4820 |
| 8 | 00:15:01 | 9.2140 | 0.4520 | 1.8080 | 0.4809 |
| 9 | 00:30:02 | 9.1960 | 0.4700 | 1.8800 | 0.4798 |
| 10 | 01:00:04 | 9.1840 | 0.4820 | 1.9280 | 0.4791 |
| 11 | 02:00:09 | 9.1760 | 0.4900 | 1.9600 | 0.4786 |
| 12 | 04:00:19 | 9.1660 | 0.5000 | 2.0000 | 0.4780 |
| 13 | 08:00:39 | 9.1600 | 0.5060 | 2.0240 | 0.4777 |
| 14 | 12:00:59 | 9.1580 | 0.5080 | 2.0320 | 0.4776 |
| 15 | 22:43:52 | 9.1560 | 0.5100 | 2.0400 | 0.4774 |

# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

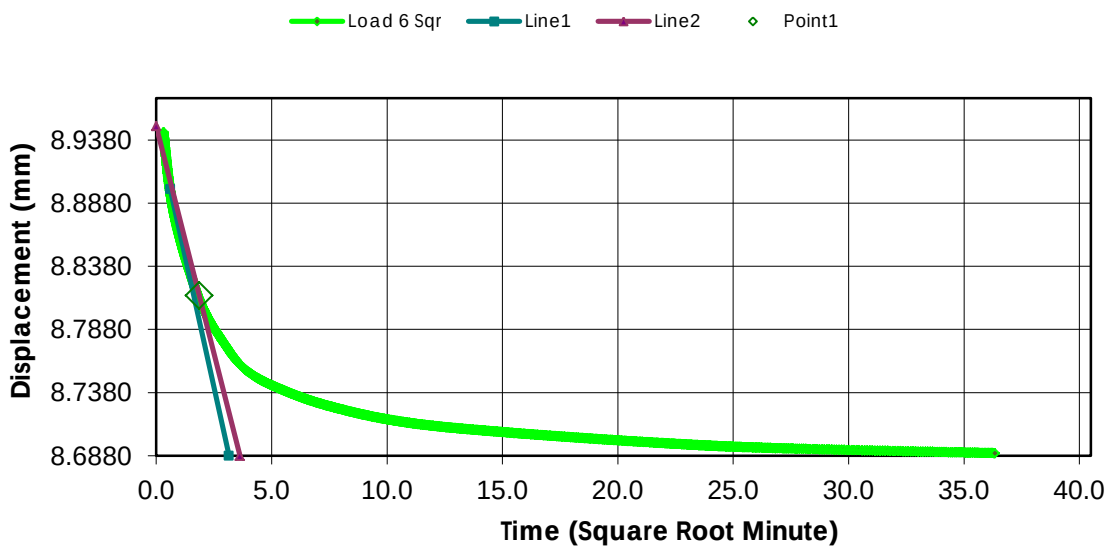
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

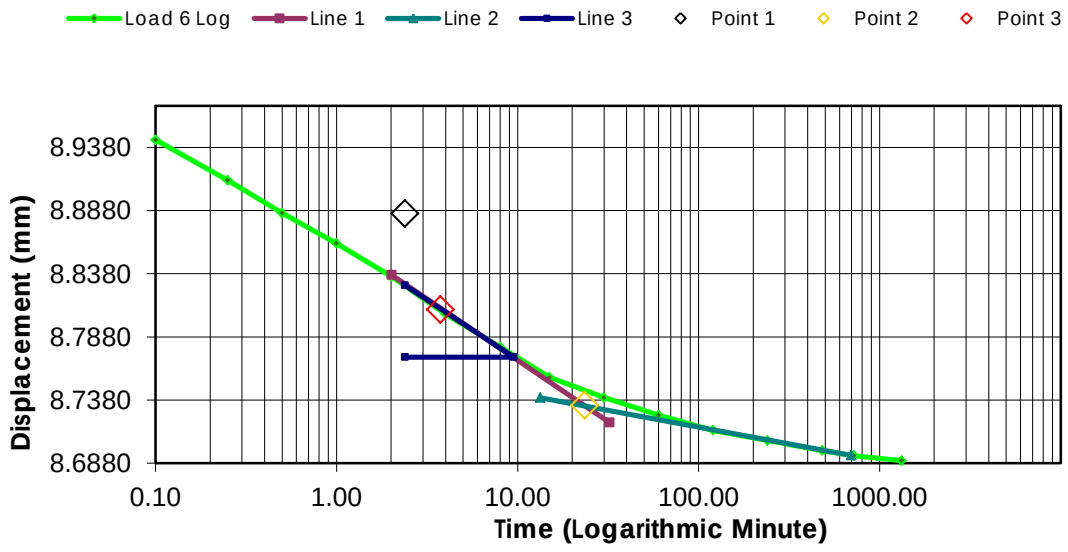
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.1560 | 0.5100 | 2.0400 | 0.4774 |
| 1 | 00:00:06 | 8.9440 | 0.7220 | 2.8880 | 0.4646 |
| 2 | 00:00:15 | 8.9120 | 0.7540 | 3.0160 | 0.4627 |
| 3 | 00:00:30 | 8.8860 | 0.7800 | 3.1200 | 0.4611 |
| 4 | 00:01:00 | 8.8620 | 0.8040 | 3.2160 | 0.4597 |
| 5 | 00:02:00 | 8.8360 | 0.8300 | 3.3200 | 0.4581 |
| 6 | 00:04:00 | 8.8060 | 0.8600 | 3.4400 | 0.4563 |
| 7 | 00:08:01 | 8.7800 | 0.8860 | 3.5440 | 0.4548 |
| 8 | 00:15:01 | 8.7560 | 0.9100 | 3.6400 | 0.4533 |
| 9 | 00:30:03 | 8.7400 | 0.9260 | 3.7040 | 0.4523 |
| 10 | 01:00:05 | 8.7260 | 0.9400 | 3.7600 | 0.4515 |
| 11 | 02:00:10 | 8.7140 | 0.9520 | 3.8080 | 0.4508 |
| 12 | 04:00:20 | 8.7060 | 0.9600 | 3.8400 | 0.4503 |
| 13 | 08:00:39 | 8.6980 | 0.9680 | 3.8720 | 0.4498 |
| 14 | 12:00:59 | 8.6940 | 0.9720 | 3.8880 | 0.4496 |
| 15 | 22:01:12 | 8.6900 | 0.9760 | 3.9040 | 0.4493 |

# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

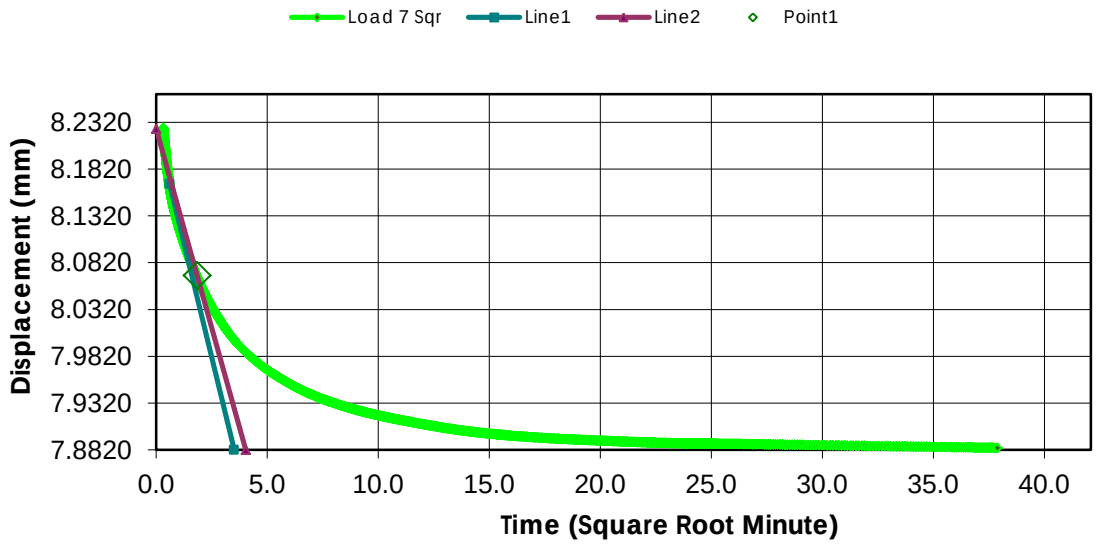
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

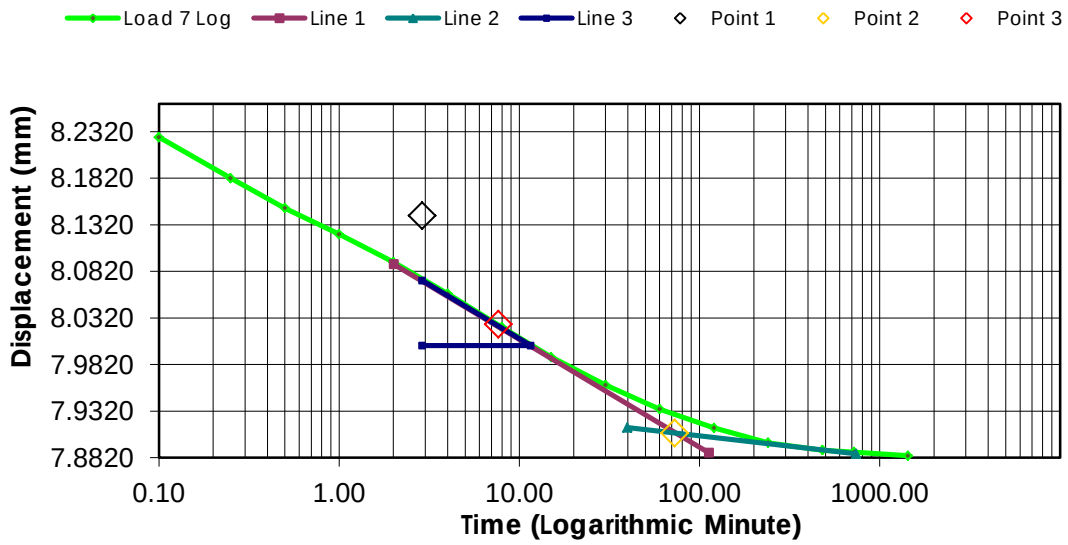
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.6900 | 0.9760 | 3.9040 | 0.4493 |
| 1 | 00:00:06 | 8.2260 | 1.4400 | 5.7600 | 0.4213 |
| 2 | 00:00:15 | 8.1820 | 1.4840 | 5.9360 | 0.4187 |
| 3 | 00:00:30 | 8.1500 | 1.5160 | 6.0640 | 0.4167 |
| 4 | 00:01:00 | 8.1220 | 1.5440 | 6.1760 | 0.4151 |
| 5 | 00:02:00 | 8.0920 | 1.5740 | 6.2960 | 0.4132 |
| 6 | 00:04:00 | 8.0580 | 1.6080 | 6.4320 | 0.4112 |
| 7 | 00:08:00 | 8.0220 | 1.6440 | 6.5760 | 0.4090 |
| 8 | 00:15:01 | 7.9900 | 1.6760 | 6.7040 | 0.4071 |
| 9 | 00:30:02 | 7.9600 | 1.7060 | 6.8240 | 0.4053 |
| 10 | 01:00:04 | 7.9340 | 1.7320 | 6.9280 | 0.4037 |
| 11 | 02:00:09 | 7.9140 | 1.7520 | 7.0080 | 0.4025 |
| 12 | 04:00:19 | 7.8980 | 1.7680 | 7.0720 | 0.4015 |
| 13 | 08:00:38 | 7.8900 | 1.7760 | 7.1040 | 0.4011 |
| 14 | 12:00:58 | 7.8880 | 1.7780 | 7.1120 | 0.4009 |
| 15 | 23:56:00 | 7.8840 | 1.7820 | 7.1280 | 0.4007 |

# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

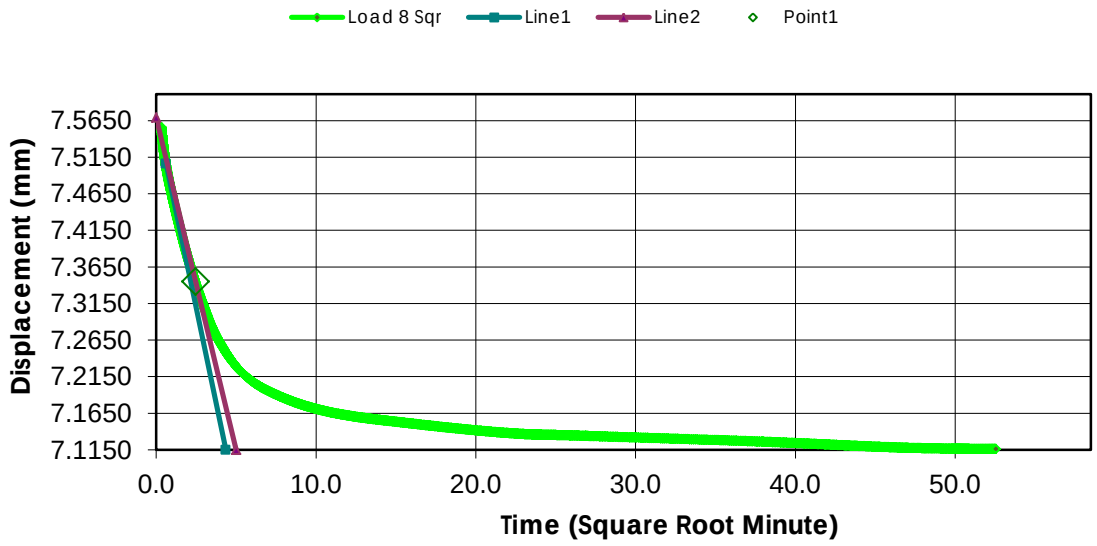
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

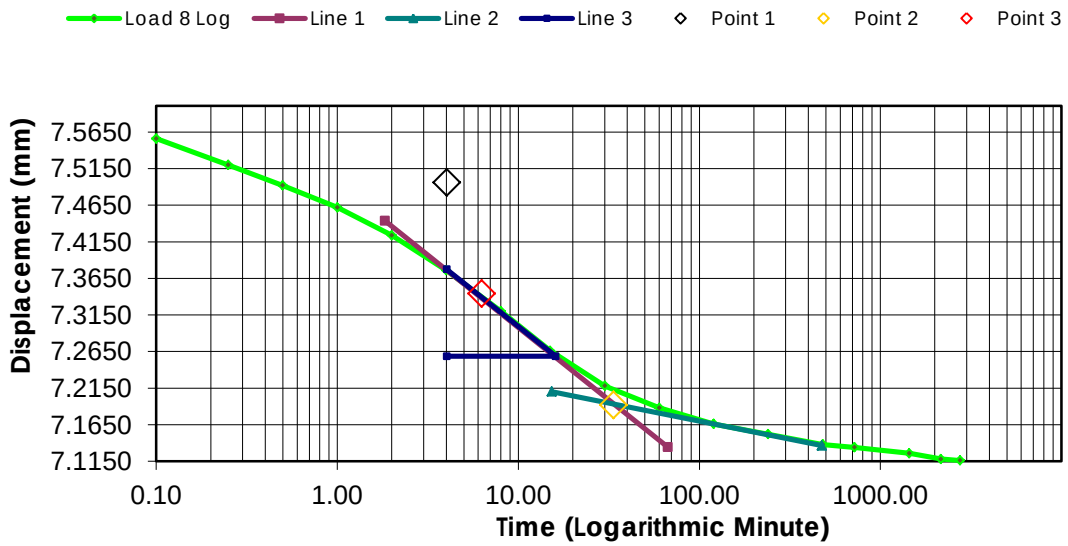
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.8840 | 1.7820 | 7.1280 | 0.4007 |
| 1 | 00:00:06 | 7.5560 | 2.1100 | 8.4400 | 0.3809 |
| 2 | 00:00:15 | 7.5200 | 2.1460 | 8.5840 | 0.3787 |
| 3 | 00:00:30 | 7.4920 | 2.1740 | 8.6960 | 0.3770 |
| 4 | 00:01:00 | 7.4620 | 2.2040 | 8.8160 | 0.3752 |
| 5 | 00:02:00 | 7.4240 | 2.2420 | 8.9680 | 0.3729 |
| 6 | 00:04:00 | 7.3760 | 2.2900 | 9.1600 | 0.3700 |
| 7 | 00:08:01 | 7.3200 | 2.3460 | 9.3840 | 0.3667 |
| 8 | 00:15:01 | 7.2660 | 2.4000 | 9.6000 | 0.3634 |
| 9 | 00:30:02 | 7.2180 | 2.4480 | 9.7920 | 0.3605 |
| 10 | 01:00:05 | 7.1880 | 2.4780 | 9.9120 | 0.3587 |
| 11 | 02:00:10 | 7.1660 | 2.5000 | 10.0000 | 0.3574 |
| 12 | 04:00:20 | 7.1520 | 2.5140 | 10.0560 | 0.3565 |
| 13 | 08:00:39 | 7.1380 | 2.5280 | 10.1120 | 0.3557 |
| 14 | 12:00:59 | 7.1340 | 2.5320 | 10.1280 | 0.3555 |
| 15 | 24:01:58 | 7.1260 | 2.5400 | 10.1600 | 0.3550 |
| 16 | 36:02:57 | 7.1180 | 2.5480 | 10.1920 | 0.3545 |
| 17 | 46:01:23 | 7.1160 | 2.5500 | 10.2000 | 0.3544 |

# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

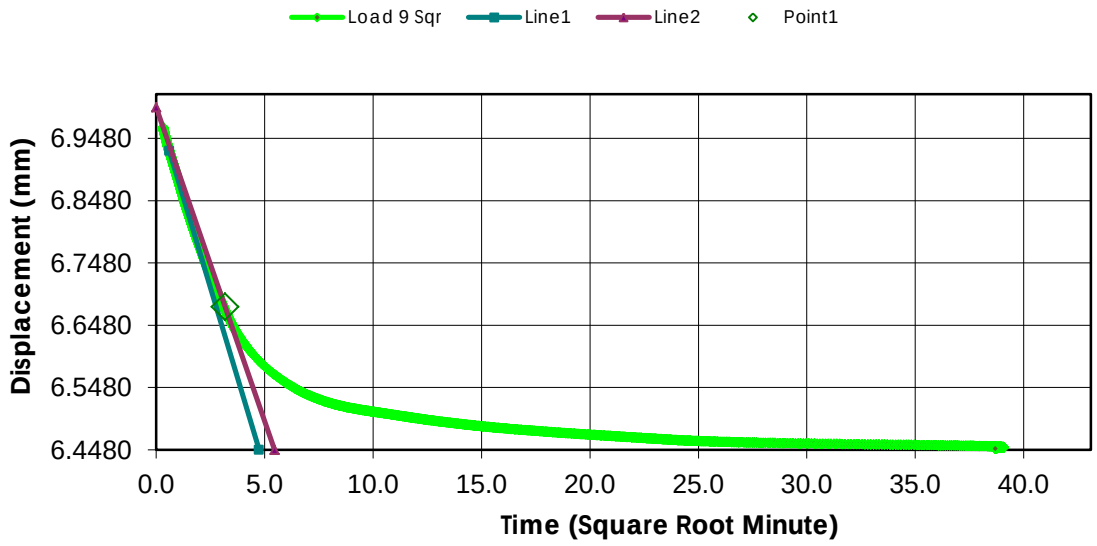
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

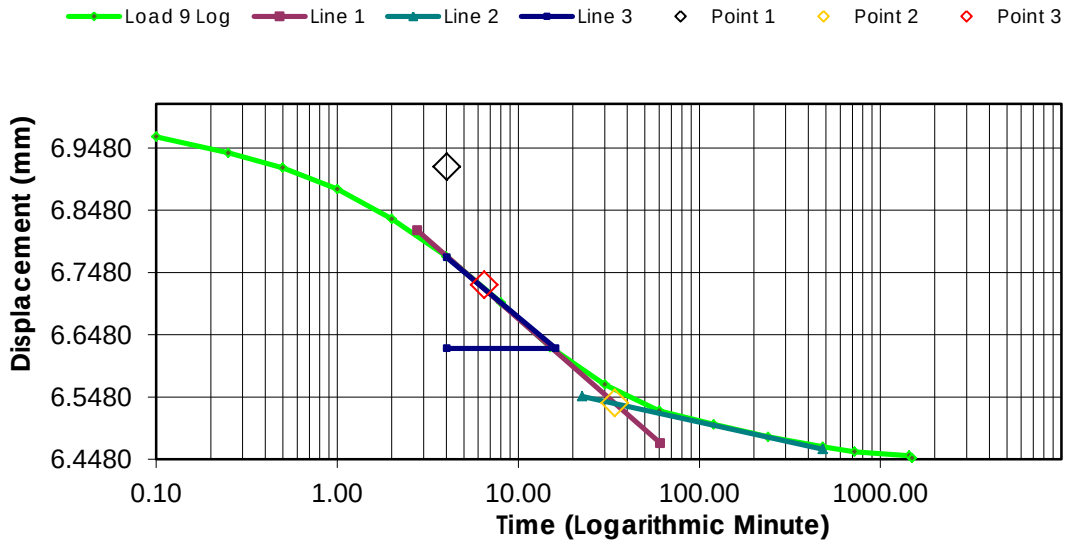
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.1160 | 2.5500 | 10.2000 | 0.3544 |
| 1 | 00:00:06 | 6.9660 | 2.7000 | 10.8000 | 0.3453 |
| 2 | 00:00:15 | 6.9400 | 2.7260 | 10.9040 | 0.3437 |
| 3 | 00:00:30 | 6.9160 | 2.7500 | 11.0000 | 0.3423 |
| 4 | 00:01:00 | 6.8820 | 2.7840 | 11.1360 | 0.3402 |
| 5 | 00:02:00 | 6.8340 | 2.8320 | 11.3280 | 0.3374 |
| 6 | 00:04:00 | 6.7740 | 2.8920 | 11.5680 | 0.3337 |
| 7 | 00:08:00 | 6.7000 | 2.9660 | 11.8640 | 0.3293 |
| 8 | 00:15:01 | 6.6280 | 3.0380 | 12.1520 | 0.3249 |
| 9 | 00:30:02 | 6.5680 | 3.0980 | 12.3920 | 0.3213 |
| 10 | 01:00:05 | 6.5260 | 3.1400 | 12.5600 | 0.3188 |
| 11 | 02:00:09 | 6.5040 | 3.1620 | 12.6480 | 0.3174 |
| 12 | 04:00:19 | 6.4840 | 3.1820 | 12.7280 | 0.3162 |
| 13 | 08:00:39 | 6.4680 | 3.1980 | 12.7920 | 0.3153 |
| 14 | 12:00:59 | 6.4600 | 3.2060 | 12.8240 | 0.3148 |
| 15 | 24:01:58 | 6.4540 | 3.2120 | 12.8480 | 0.3144 |
| 16 | 24:56:55 | 6.4500 | 3.2160 | 12.8640 | 0.3142 |

# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

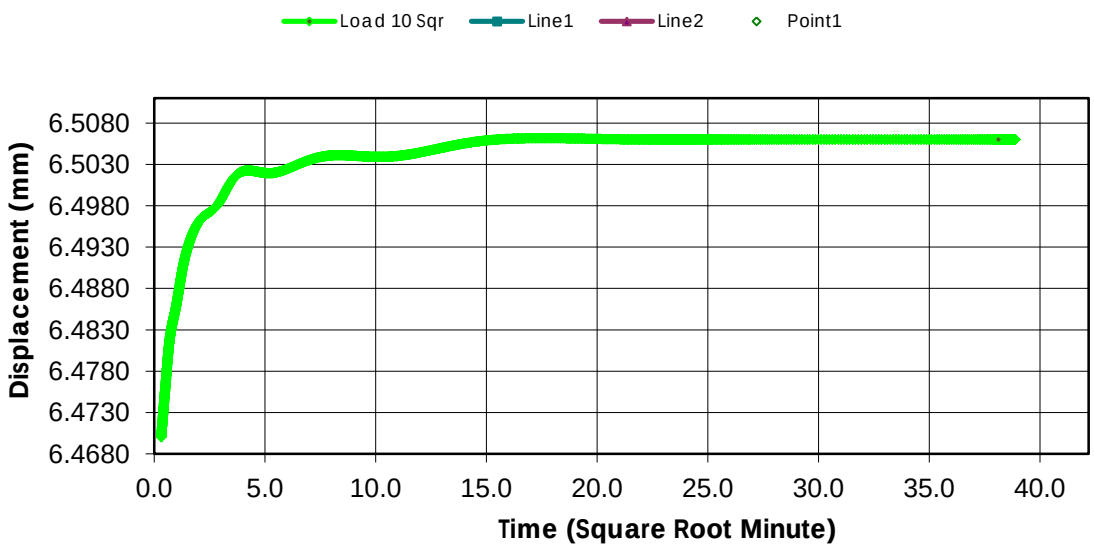
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

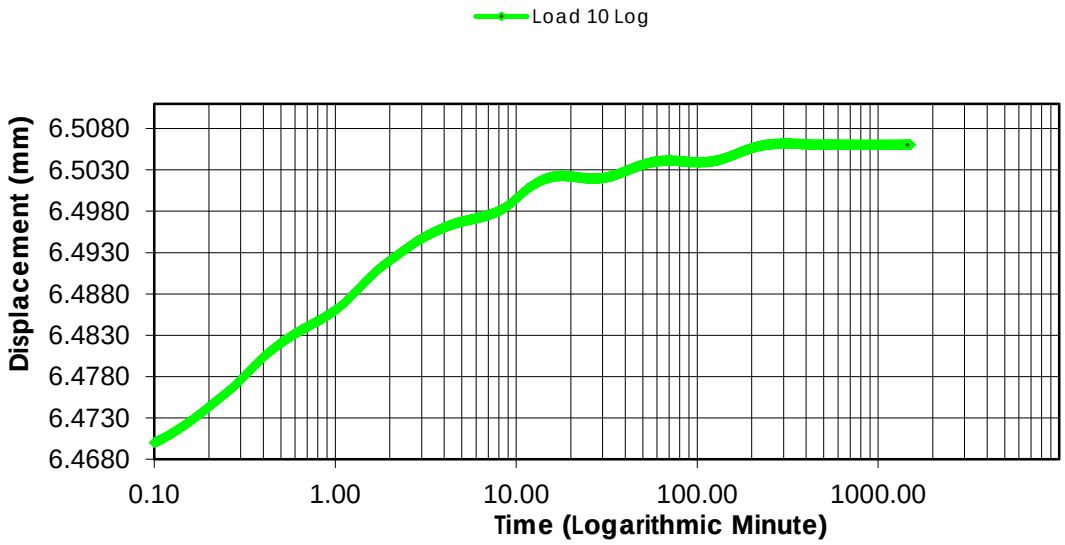
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 6.4500 | 3.2160 | 12.8640 | 0.3142 |
| 1 | 00:00:06 | 6.4700 | 3.1960 | 12.7840 | 0.3154 |
| 2 | 00:00:15 | 6.4760 | 3.1900 | 12.7600 | 0.3158 |
| 3 | 00:00:30 | 6.4820 | 3.1840 | 12.7360 | 0.3161 |
| 4 | 00:01:00 | 6.4860 | 3.1800 | 12.7200 | 0.3164 |
| 5 | 00:02:00 | 6.4920 | 3.1740 | 12.6960 | 0.3167 |
| 6 | 00:04:00 | 6.4960 | 3.1700 | 12.6800 | 0.3170 |
| 7 | 00:08:01 | 6.4980 | 3.1680 | 12.6720 | 0.3171 |
| 8 | 00:15:01 | 6.5020 | 3.1640 | 12.6560 | 0.3173 |
| 9 | 00:30:02 | 6.5020 | 3.1640 | 12.6560 | 0.3173 |
| 10 | 01:00:05 | 6.5040 | 3.1620 | 12.6480 | 0.3174 |
| 11 | 02:00:10 | 6.5040 | 3.1620 | 12.6480 | 0.3174 |
| 12 | 04:00:20 | 6.5060 | 3.1600 | 12.6400 | 0.3176 |
| 13 | 08:00:40 | 6.5060 | 3.1600 | 12.6400 | 0.3176 |
| 14 | 12:00:59 | 6.5060 | 3.1600 | 12.6400 | 0.3176 |
| 15 | 24:01:59 | 6.5060 | 3.1600 | 12.6400 | 0.3176 |
| 16 | 24:14:08 | 6.5060 | 3.1600 | 12.6400 | 0.3176 |

# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

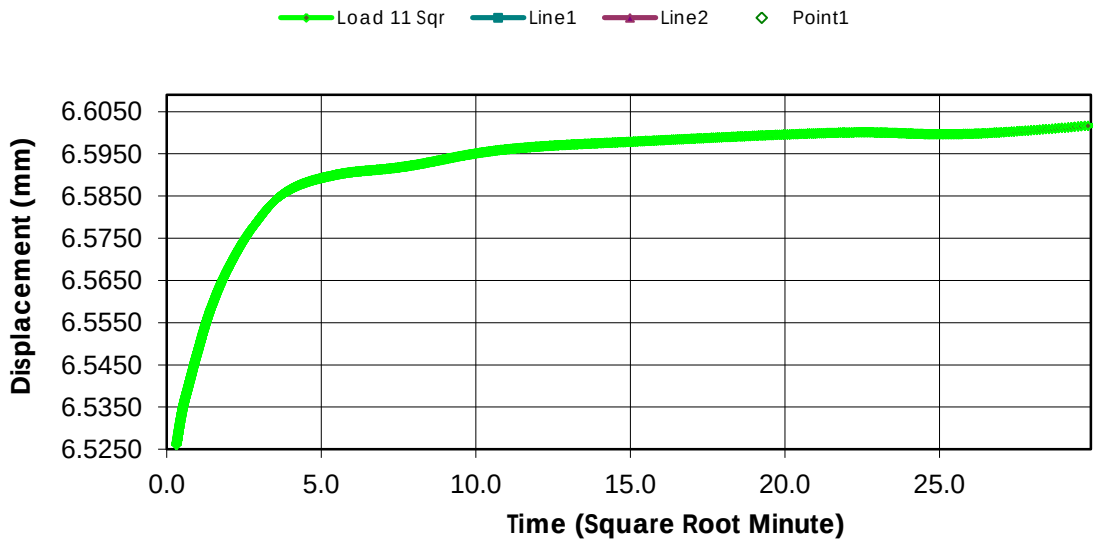
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

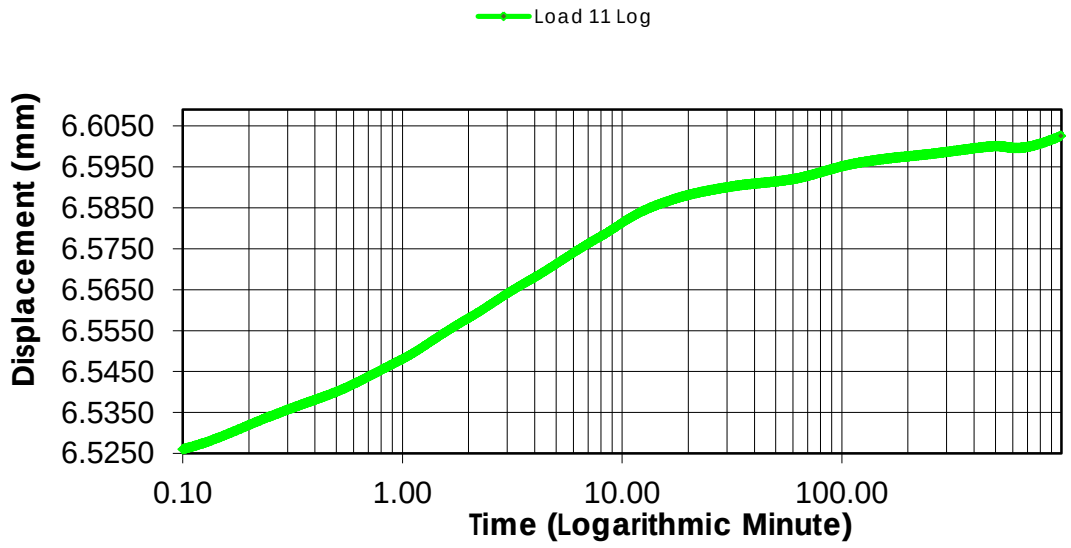
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 6.5060 | 3.1600 | 12.6400 | 0.3176 |
| 1 | 00:00:06 | 6.5260 | 3.1400 | 12.5600 | 0.3188 |
| 2 | 00:00:15 | 6.5340 | 3.1320 | 12.5280 | 0.3193 |
| 3 | 00:00:30 | 6.5400 | 3.1260 | 12.5040 | 0.3196 |
| 4 | 00:01:00 | 6.5480 | 3.1180 | 12.4720 | 0.3201 |
| 5 | 00:02:00 | 6.5580 | 3.1080 | 12.4320 | 0.3207 |
| 6 | 00:04:00 | 6.5680 | 3.0980 | 12.3920 | 0.3213 |
| 7 | 00:08:00 | 6.5780 | 3.0880 | 12.3520 | 0.3219 |
| 8 | 00:15:01 | 6.5860 | 3.0800 | 12.3200 | 0.3224 |
| 9 | 00:30:02 | 6.5900 | 3.0760 | 12.3040 | 0.3226 |
| 10 | 01:00:05 | 6.5920 | 3.0740 | 12.2960 | 0.3228 |
| 11 | 02:00:09 | 6.5960 | 3.0700 | 12.2800 | 0.3230 |
| 12 | 04:00:19 | 6.5980 | 3.0680 | 12.2720 | 0.3231 |
| 13 | 08:00:39 | 6.6000 | 3.0660 | 12.2640 | 0.3232 |
| 14 | 12:00:59 | 6.6000 | 3.0660 | 12.2640 | 0.3232 |
| 15 | 22:01:32 | 6.6060 | 3.0600 | 12.2400 | 0.3236 |

# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

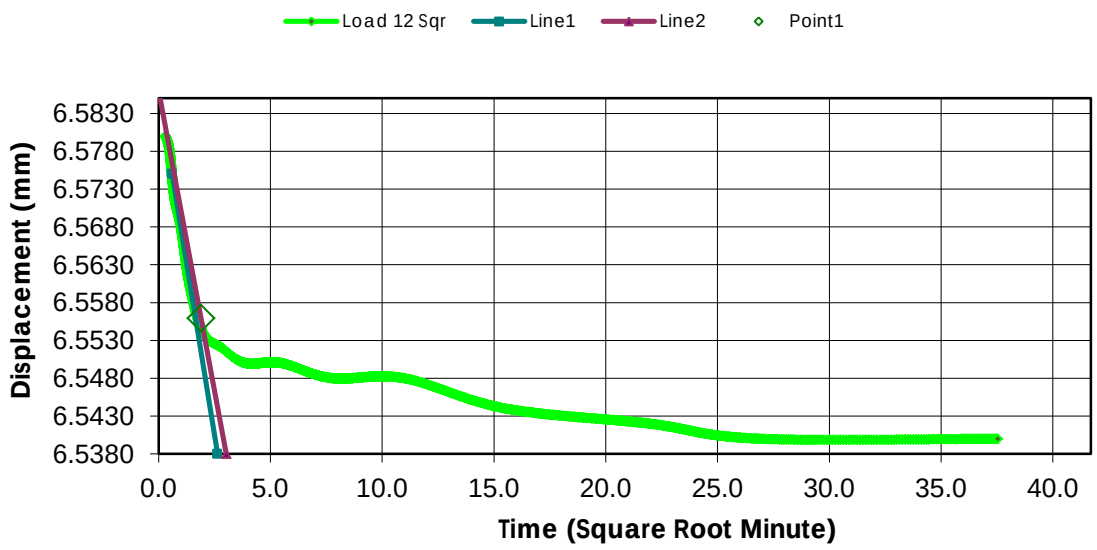
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

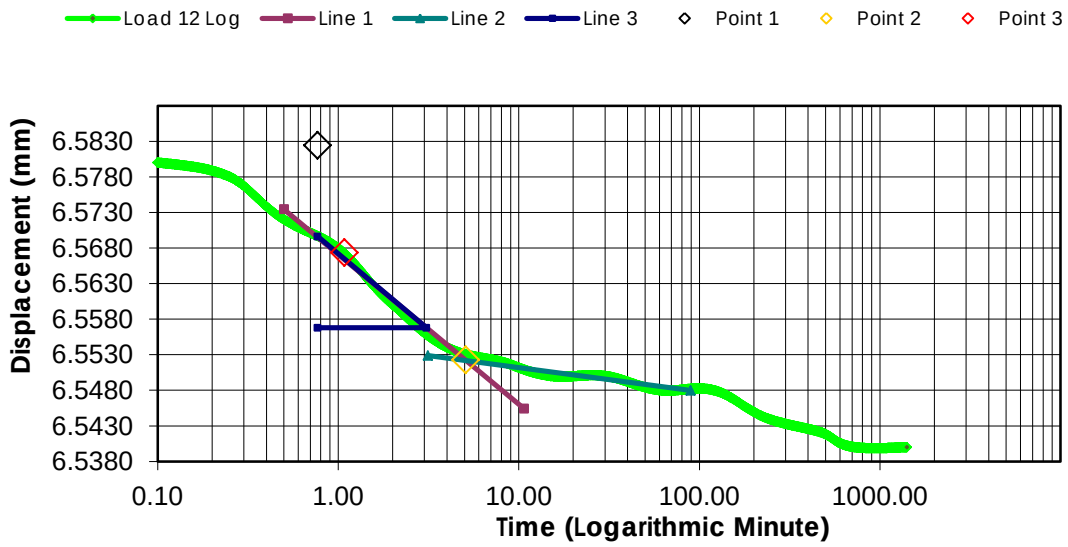
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 6.6060 | 3.0600 | 12.2400 | 0.3236 |
| 1 | 00:00:06 | 6.5800 | 3.0860 | 12.3440 | 0.3220 |
| 2 | 00:00:15 | 6.5780 | 3.0880 | 12.3520 | 0.3219 |
| 3 | 00:00:30 | 6.5720 | 3.0940 | 12.3760 | 0.3215 |
| 4 | 00:01:00 | 6.5680 | 3.0980 | 12.3920 | 0.3213 |
| 5 | 00:02:00 | 6.5600 | 3.1060 | 12.4240 | 0.3208 |
| 6 | 00:04:01 | 6.5540 | 3.1120 | 12.4480 | 0.3205 |
| 7 | 00:08:01 | 6.5520 | 3.1140 | 12.4560 | 0.3203 |
| 8 | 00:15:02 | 6.5500 | 3.1160 | 12.4640 | 0.3202 |
| 9 | 00:30:03 | 6.5500 | 3.1160 | 12.4640 | 0.3202 |
| 10 | 01:00:05 | 6.5480 | 3.1180 | 12.4720 | 0.3201 |
| 11 | 02:00:10 | 6.5480 | 3.1180 | 12.4720 | 0.3201 |
| 12 | 04:00:20 | 6.5440 | 3.1220 | 12.4880 | 0.3199 |
| 13 | 08:00:40 | 6.5420 | 3.1240 | 12.4960 | 0.3197 |
| 14 | 12:00:59 | 6.5400 | 3.1260 | 12.5040 | 0.3196 |
| 15 | 23:29:17 | 6.5400 | 3.1260 | 12.5040 | 0.3196 |

# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

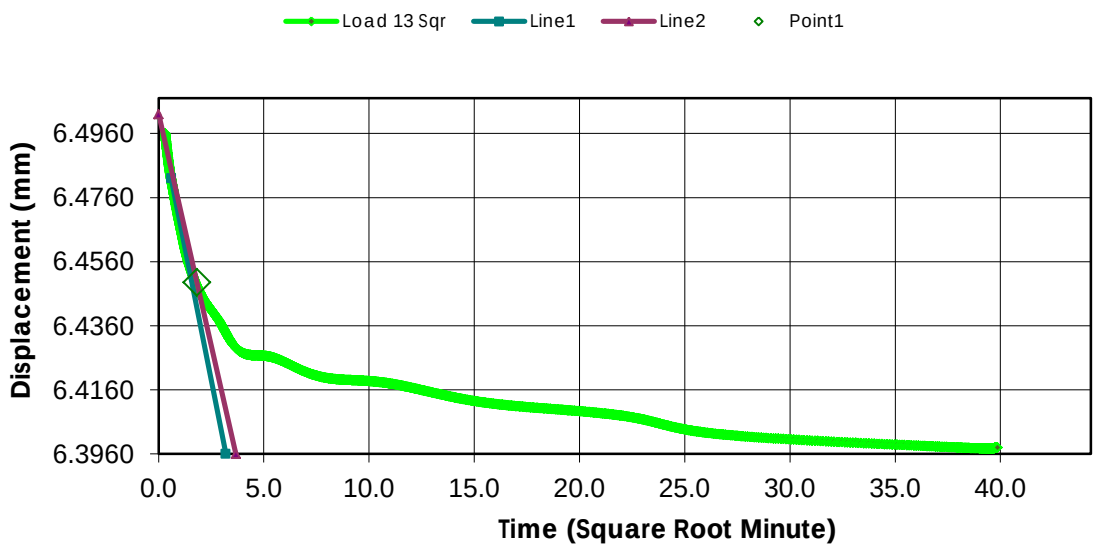
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

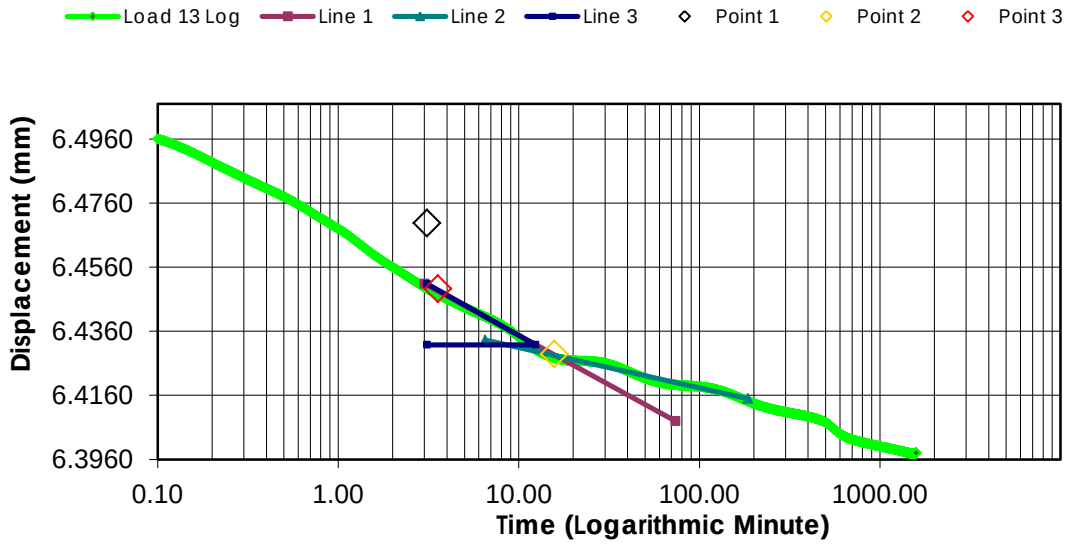
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 6.5400 | 3.1260 | 12.5040 | 0.3196 |
| 1 | 00:00:06 | 6.4960 | 3.1700 | 12.6800 | 0.3170 |
| 2 | 00:00:15 | 6.4860 | 3.1800 | 12.7200 | 0.3164 |
| 3 | 00:00:30 | 6.4780 | 3.1880 | 12.7520 | 0.3159 |
| 4 | 00:01:00 | 6.4680 | 3.1980 | 12.7920 | 0.3153 |
| 5 | 00:02:00 | 6.4560 | 3.2100 | 12.8400 | 0.3145 |
| 6 | 00:04:00 | 6.4460 | 3.2200 | 12.8800 | 0.3139 |
| 7 | 00:08:01 | 6.4380 | 3.2280 | 12.9120 | 0.3135 |
| 8 | 00:15:01 | 6.4280 | 3.2380 | 12.9520 | 0.3129 |
| 9 | 00:30:02 | 6.4260 | 3.2400 | 12.9600 | 0.3127 |
| 10 | 01:00:05 | 6.4200 | 3.2460 | 12.9840 | 0.3124 |
| 11 | 02:00:10 | 6.4180 | 3.2480 | 12.9920 | 0.3123 |
| 12 | 04:00:20 | 6.4120 | 3.2540 | 13.0160 | 0.3119 |
| 13 | 08:00:39 | 6.4080 | 3.2580 | 13.0320 | 0.3117 |
| 14 | 12:00:59 | 6.4020 | 3.2640 | 13.0560 | 0.3113 |
| 15 | 24:01:58 | 6.3980 | 3.2680 | 13.0720 | 0.3110 |
| 16 | 26:28:44 | 6.3980 | 3.2680 | 13.0720 | 0.3110 |

# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

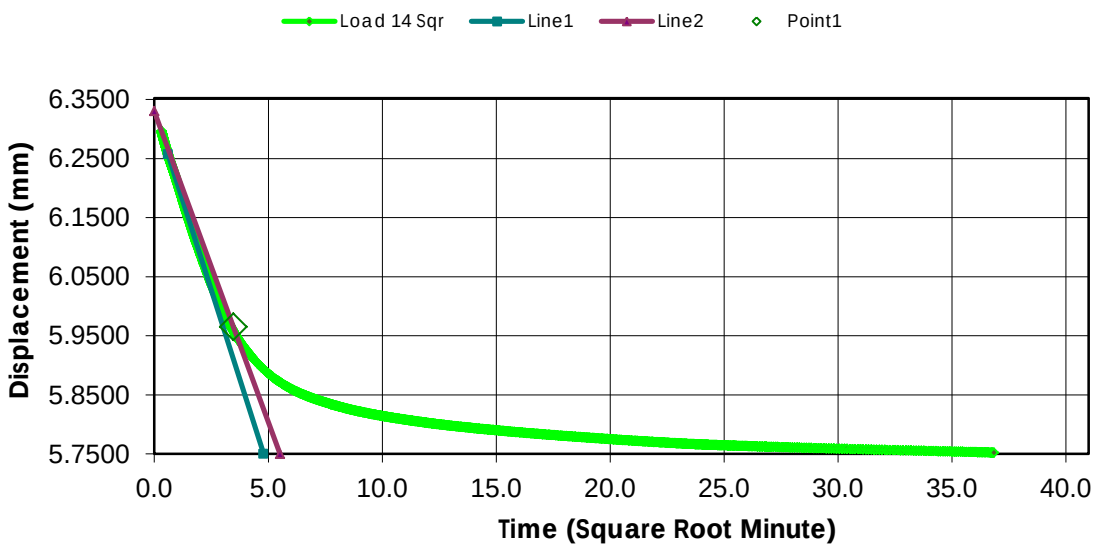
**Project:** SR1 **Project Number:** .302.702.230
**Location:**
**Job Number:** **Test Date:** 30-Aug-16
**Test Number:**

**Sample Number:** D62 ST6 **Soil Description:**
**Boring Number:** Brown Clay, some gravel, trace sand
**Depth:** 4.60-5.05m **Remarks:**
**Sample Type:** Undisturbed

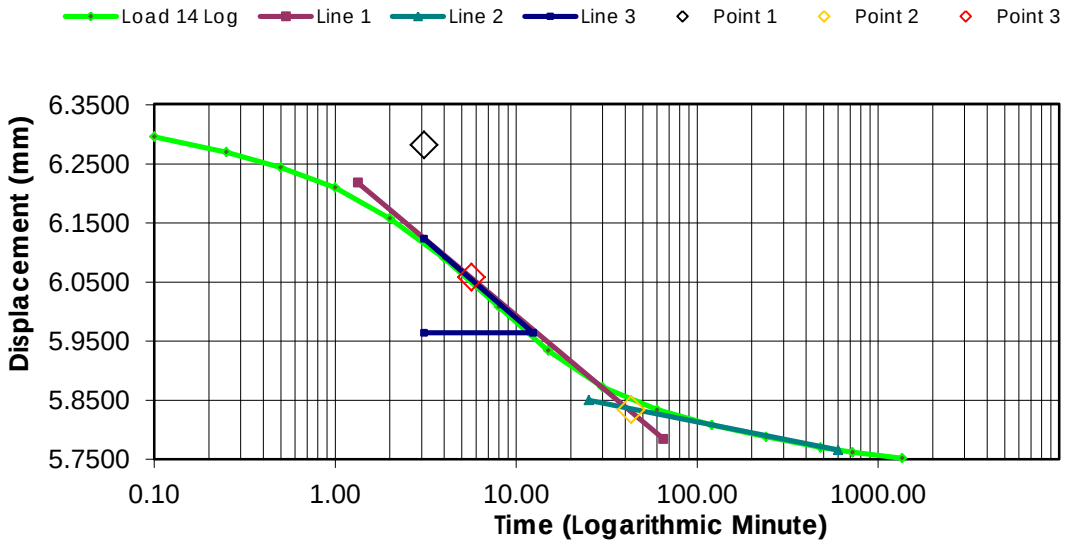
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 6.3980 | 3.2680 | 13.0720 | 0.3110 |
| 1 | 00:00:06 | 6.2960 | 3.3700 | 13.4800 | 0.3049 |
| 2 | 00:00:15 | 6.2700 | 3.3960 | 13.5840 | 0.3033 |
| 3 | 00:00:30 | 6.2440 | 3.4220 | 13.6880 | 0.3018 |
| 4 | 00:01:00 | 6.2100 | 3.4560 | 13.8240 | 0.2997 |
| 5 | 00:02:00 | 6.1580 | 3.5080 | 14.0320 | 0.2966 |
| 6 | 00:04:01 | 6.0900 | 3.5760 | 14.3040 | 0.2925 |
| 7 | 00:08:01 | 6.0080 | 3.6580 | 14.6320 | 0.2875 |
| 8 | 00:15:01 | 5.9340 | 3.7320 | 14.9280 | 0.2831 |
| 9 | 00:30:03 | 5.8720 | 3.7940 | 15.1760 | 0.2793 |
| 10 | 01:00:05 | 5.8340 | 3.8320 | 15.3280 | 0.2770 |
| 11 | 02:00:10 | 5.8080 | 3.8580 | 15.4320 | 0.2755 |
| 12 | 04:00:19 | 5.7880 | 3.8780 | 15.5120 | 0.2742 |
| 13 | 08:00:39 | 5.7700 | 3.8960 | 15.5840 | 0.2732 |
| 14 | 12:00:59 | 5.7620 | 3.9040 | 15.6160 | 0.2727 |
| 15 | 22:37:17 | 5.7520 | 3.9140 | 15.6560 | 0.2721 |

# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



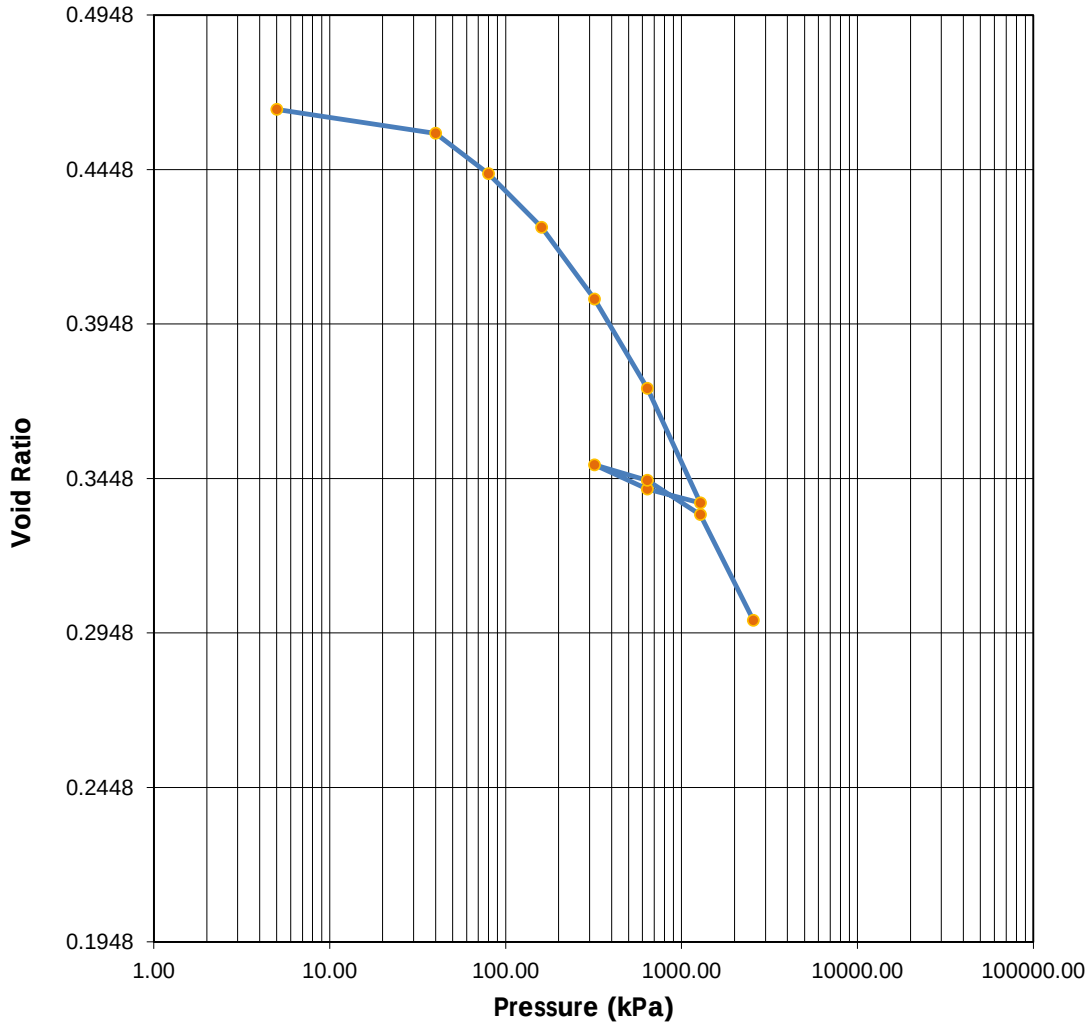
# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

### Test Results

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 14.5 | 13.8 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.841 | 2.025 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 83.66 | 111.85 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.4637 | 0.2982 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay, trace gravel, trace sand

**Project Number:** 110773396.302.702.230 **Depth:** 4.40-4.85m

**Sample Number:** D68 ST10 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

**Location:**

**Remarks:** Loads at 10kPa and 20kPa omitted due to swelling

**Tested By:** C. Oost **Reviewed By:**

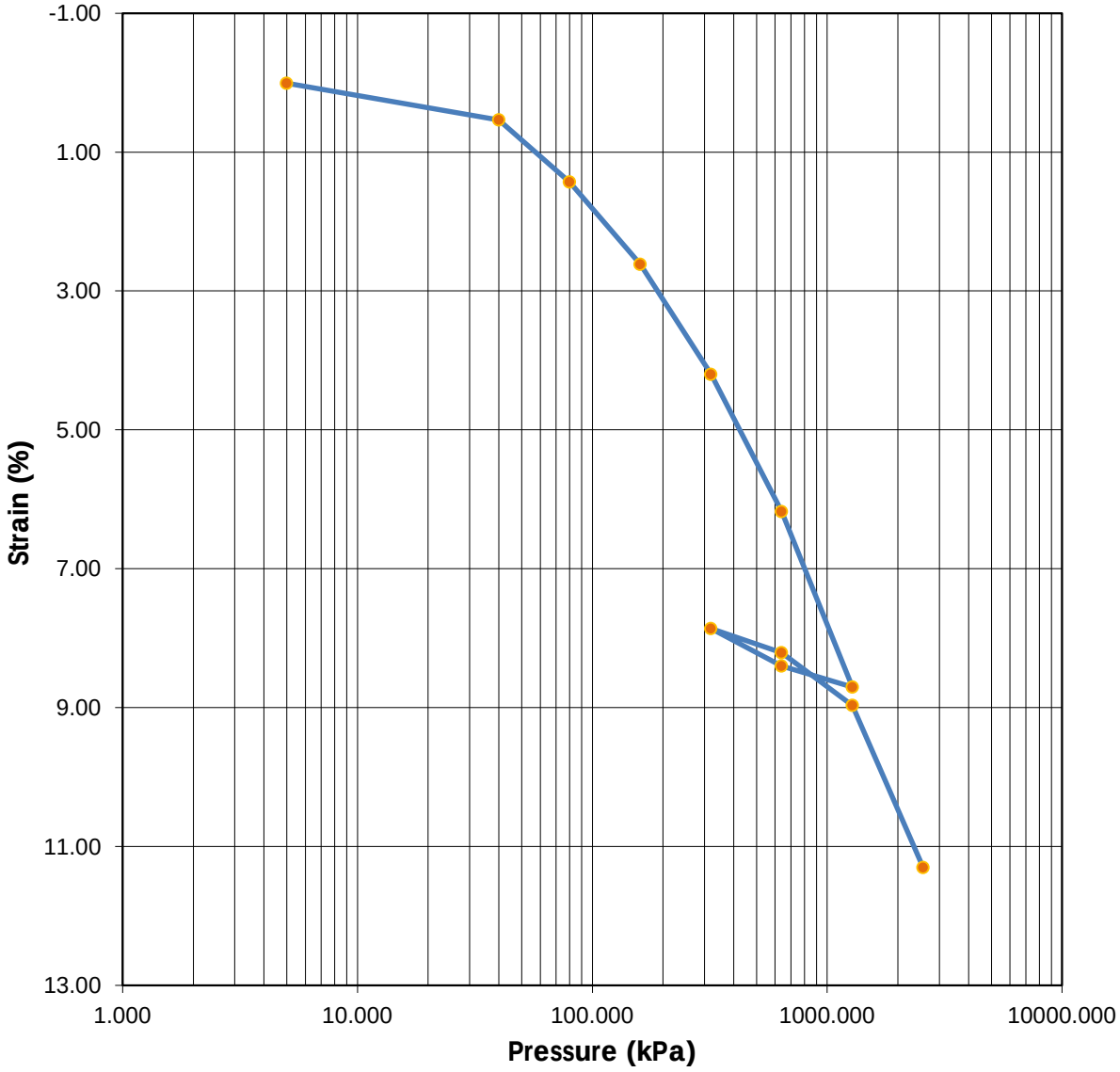
# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test

## ASTM D2435

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 14.5 | 13.8 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.841 | 2.025 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 83.66 | 111.85 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.4637 | 0.2982 | **Specific Gravity:** | 2.700 | Assumed | |

**Sample Description:** Brown Clay, trace gravel, trace sand

**Project Number:** 110773396.302.702.230 **Depth:** 4.40-4.85m

**Sample Number:** D68 ST10 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportation

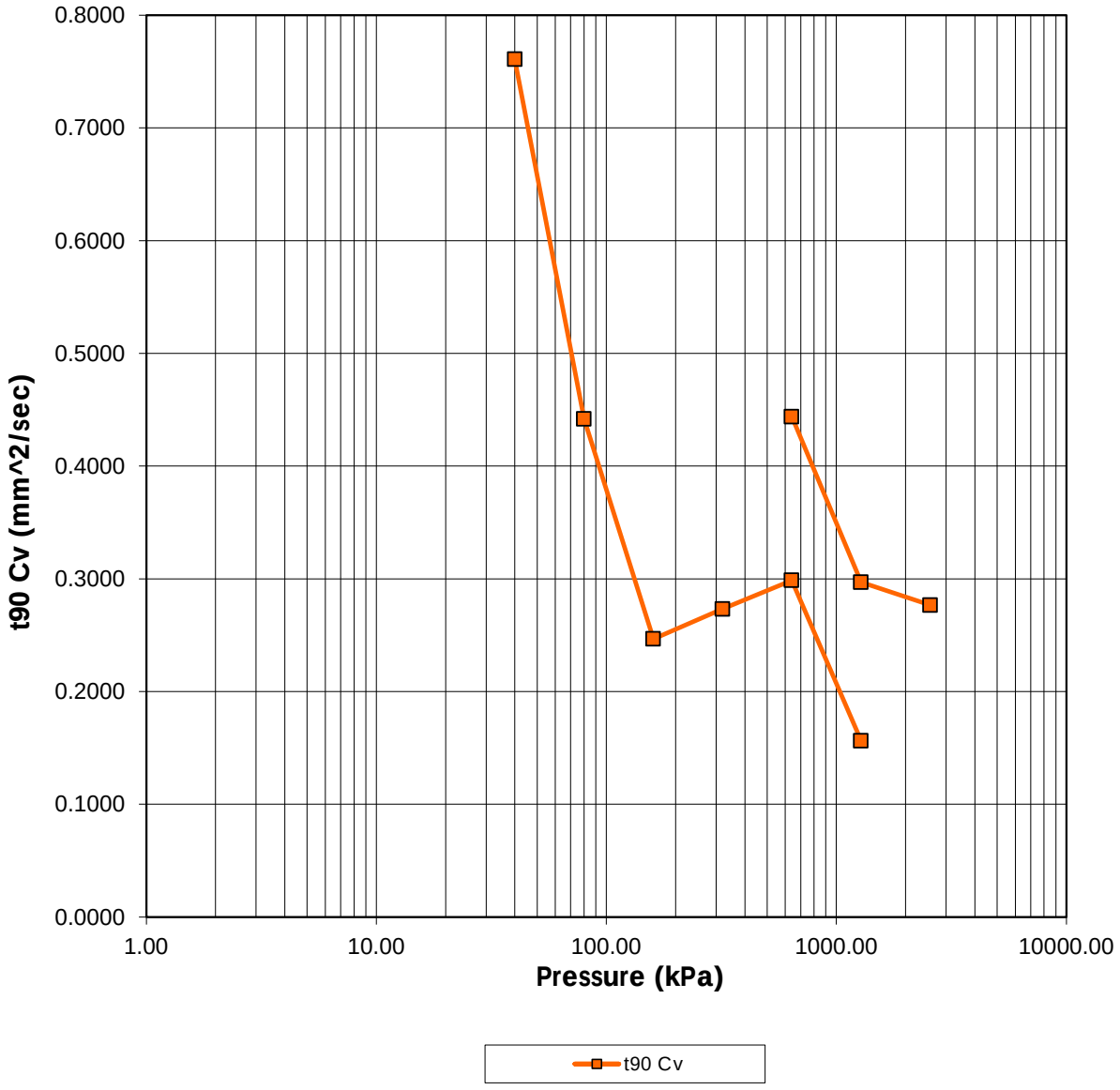
**Location:**

**Remarks:**
Loads at 10kPa and 20kPa omitted due to swelling

# Stantec Consulting Ltd.

## One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

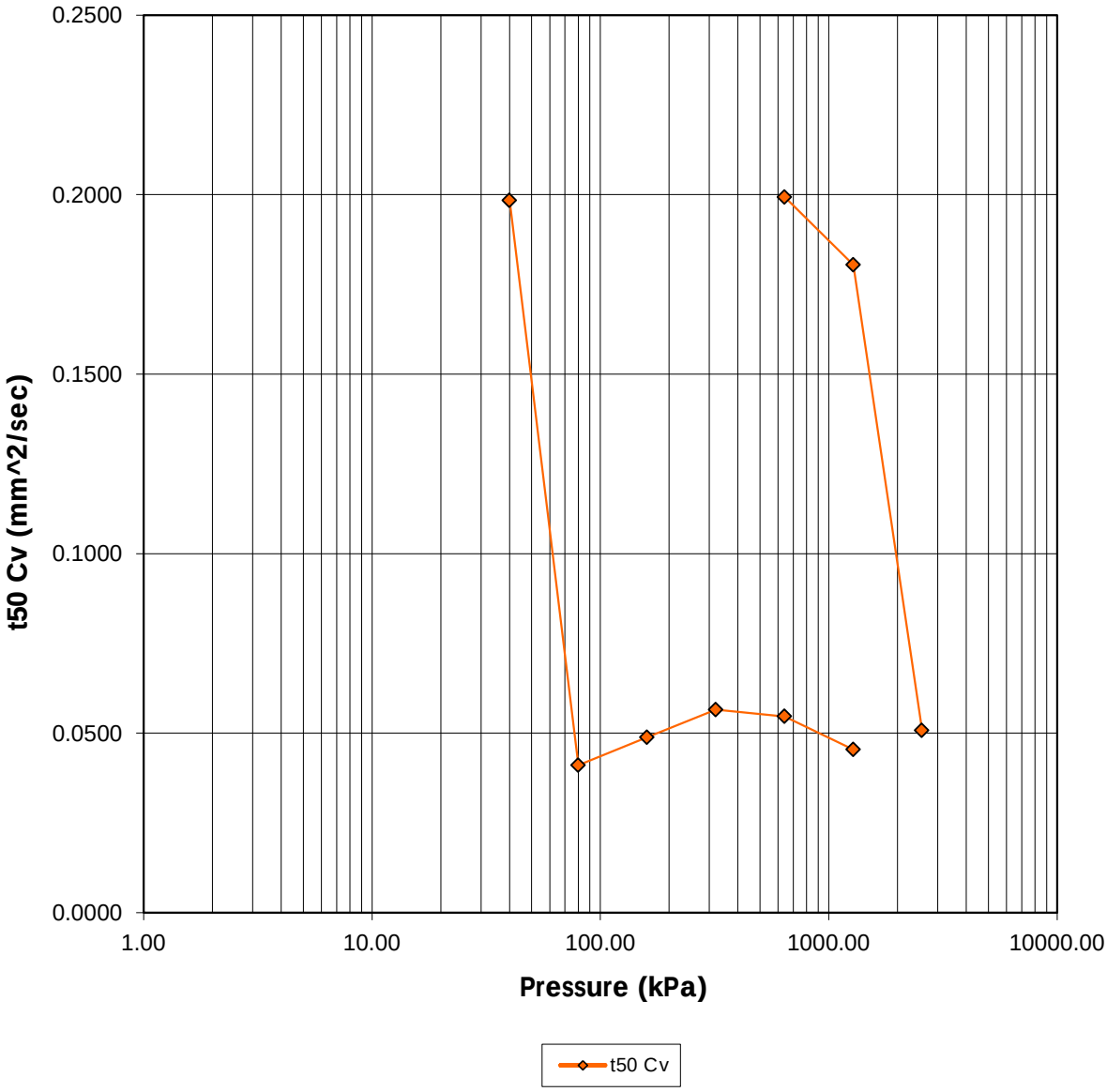



| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 14.5 | 13.8 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.841 | 2.025 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 83.66 | 111.85 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.4637 | 0.2982 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, trace gravel, trace sand | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.40-4.85m | **Remarks:** |
| **Sample Number:** | D68 ST10 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results

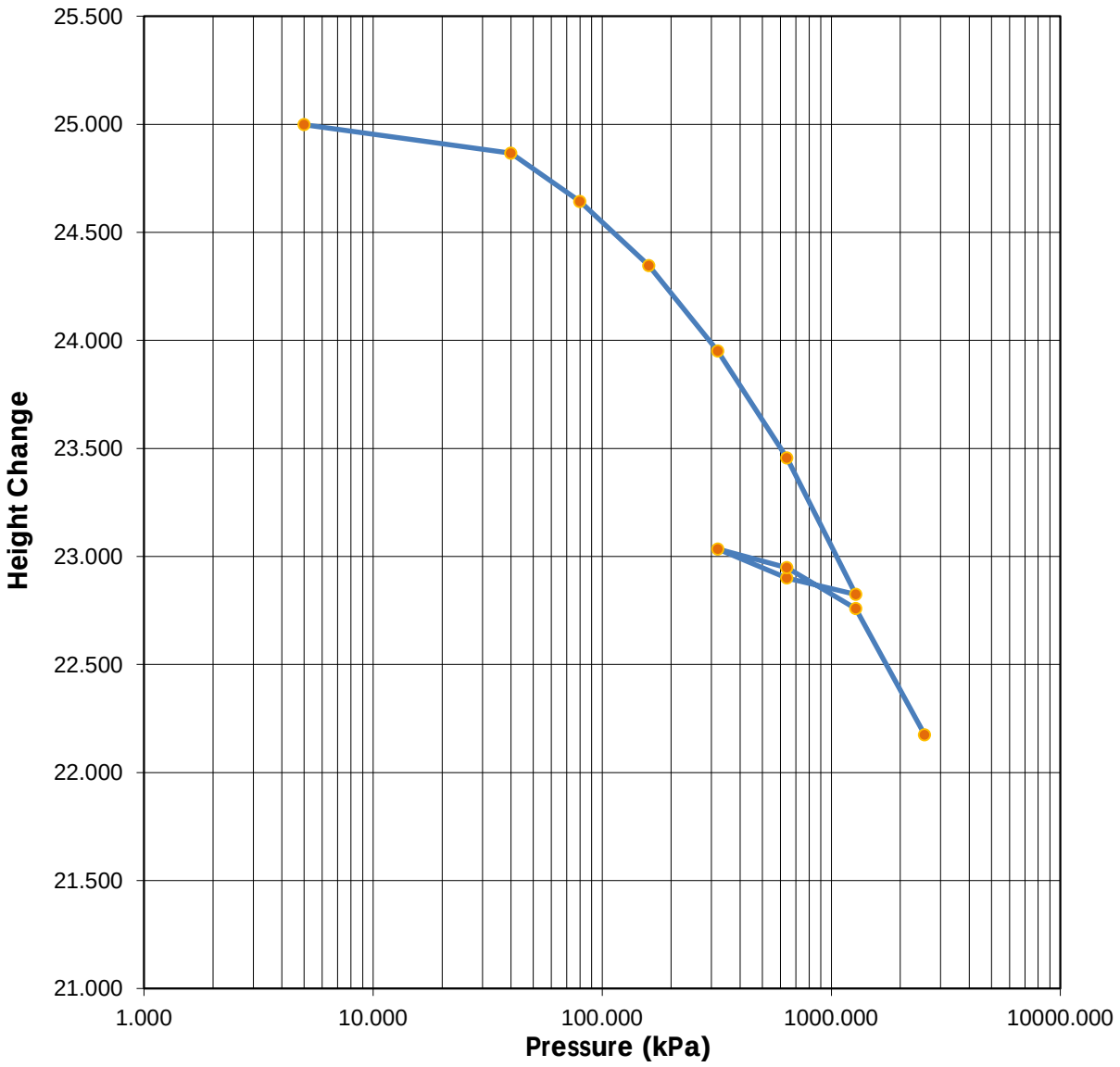



| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 14.47 | 13.82 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.84 | 2.02 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 83.66 | 111.85 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.4637 | 0.2982 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, trace gravel, trace sand | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.40-4.85m | **Remarks:** |
| **Sample Number:** | D68 ST10 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

Stantec Consulting Ltd.
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 14.5 | 13.8 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.841 | 2.025 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 83.66 | 111.85 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.4637 | 0.2982 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, trace gravel, trace sand | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 4.40-4.85m | **Remarks:** |
| **Sample Number:** | D68 ST10 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportation | | |
| **Location:** | | | |

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D68 ST10
**Boring Number:**
**Depth:** 4.40-4.85m
**Sample Type:** Undisturbed

**Sample Description:**
Brown Clay, trace gravel, trace sand
**Remarks:** Loads at 10kPa and 20kPa omitted due to swelling

**Test Number:**
**Test Date:** 31-Aug-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.0000 | 7.9277 | 0.00 | 0.4644 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0020 | 24.9980 | 7.9257 | 0.01 | 0.4642 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 10.000 | 0.0040 | 24.9960 | 7.9237 | 0.02 | 0.4641 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 20.000 | 0.0400 | 24.9600 | 7.8877 | 0.16 | 0.4620 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 40.000 | 0.1340 | 24.8660 | 7.7937 | 0.54 | 0.4565 | 2.871 | 2.558 | 0.761 | 0.198 |
| 5 | 80.000 | 0.3580 | 24.6420 | 7.5697 | 1.43 | 0.4434 | 4.855 | 12.124 | 0.442 | 0.041 |
| 6 | 160.000 | 0.6540 | 24.3460 | 7.2737 | 2.62 | 0.4260 | 8.488 | 9.965 | 0.247 | 0.049 |
| 7 | 320.000 | 1.0500 | 23.9500 | 6.8777 | 4.20 | 0.4029 | 7.418 | 8.329 | 0.273 | 0.057 |
| 8 | 640.000 | 1.5440 | 23.4560 | 6.3837 | 6.18 | 0.3739 | 6.510 | 8.261 | 0.299 | 0.055 |
| 9 | 1280.000 | 2.1760 | 22.8240 | 5.7517 | 8.70 | 0.3369 | 11.771 | 9.414 | 0.156 | 0.045 |
| 10 | 640.000 | 2.1000 | 22.9000 | 5.8277 | 8.40 | 0.3414 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 320.000 | 1.9660 | 23.0340 | 5.9617 | 7.86 | 0.3492 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 640.000 | 2.0520 | 22.9480 | 5.8757 | 8.21 | 0.3442 | 4.192 | 2.169 | 0.444 | 0.199 |
| 13 | 1280.000 | 2.2420 | 22.7580 | 5.6857 | 8.97 | 0.3330 | 6.164 | 2.356 | 0.297 | 0.180 |
| 14 | 2560.000 | 2.8260 | 22.1740 | 5.1017 | 11.30 | 0.2988 | 6.279 | 7.950 | 0.277 | 0.051 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16

**Sample Number:** D68 ST10 **Sample Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**
**Liquid Limit:** - **Initial Void Ratio:** 0.4637 **Initial Height (mm):** 25.0000
**Plastic Limit:** - **Plasticity Index (%):** - **Initial Diameter (mm):** 63.6000
**Specific Gravity:** 2.7000 Assumed **Weight of Ring (g):** 111.5200

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 41.15 | 93.42 |
| Dry Soil + Container (g) | 36.14 | 82.58 |
| Weight of Container (g) | 1.51 | 4.12 |
| Moisture Content (%) | 14.47 | 13.82 |
| Void Ratio | 0.4637 | 0.2982 |
| Saturation (%) | 83.66 | 111.85 |
| Dry Density (g/cm3) | 1.841 | 2.025 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

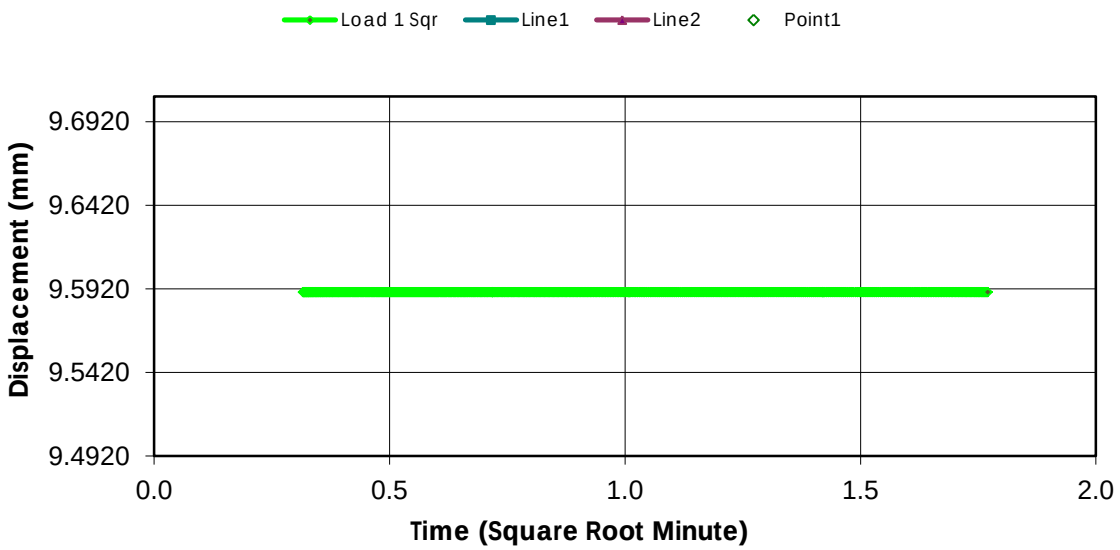
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

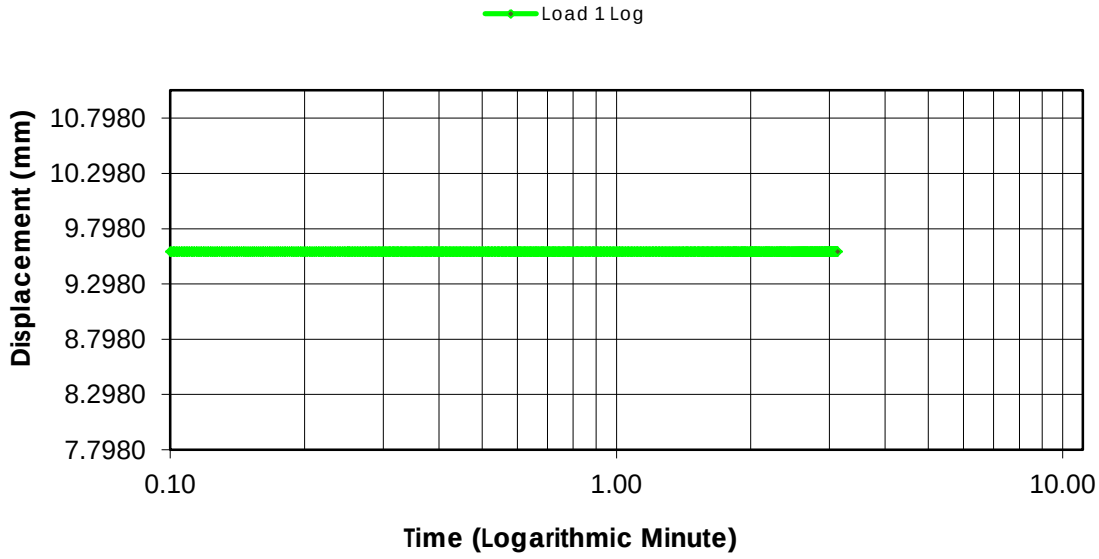
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5920 | 0.0000 | 0.0000 | 0.4637 |
| 1 | 00:00:06 | 9.5900 | 0.0020 | 0.0080 | 0.4635 |
| 2 | 00:00:15 | 9.5900 | 0.0020 | 0.0080 | 0.4635 |
| 3 | 00:00:31 | 9.5900 | 0.0020 | 0.0080 | 0.4635 |
| 4 | 00:01:01 | 9.5900 | 0.0020 | 0.0080 | 0.4635 |
| 5 | 00:02:01 | 9.5900 | 0.0020 | 0.0080 | 0.4635 |
| 6 | 00:03:08 | 9.5900 | 0.0020 | 0.0080 | 0.4635 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

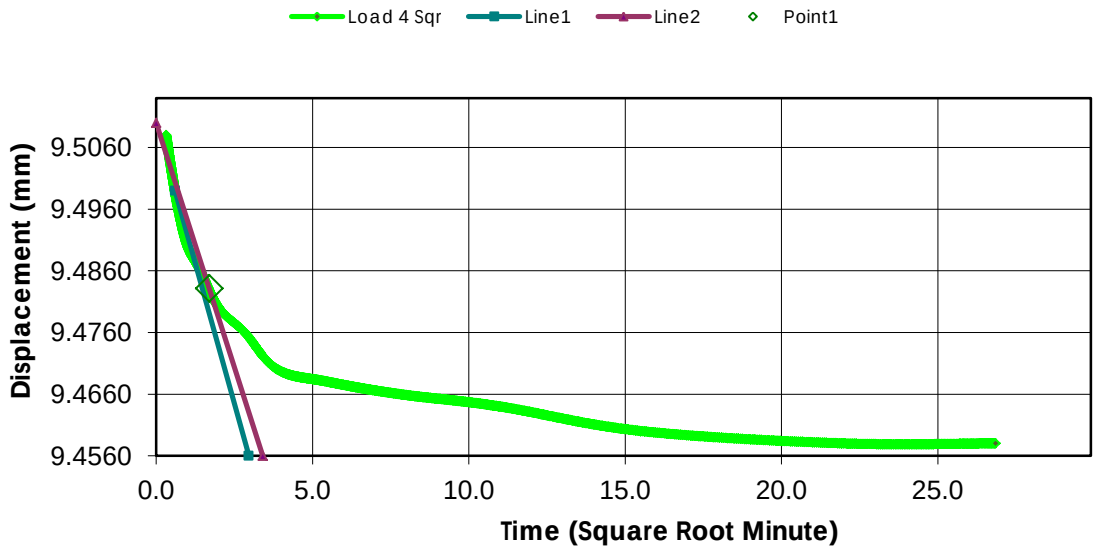
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

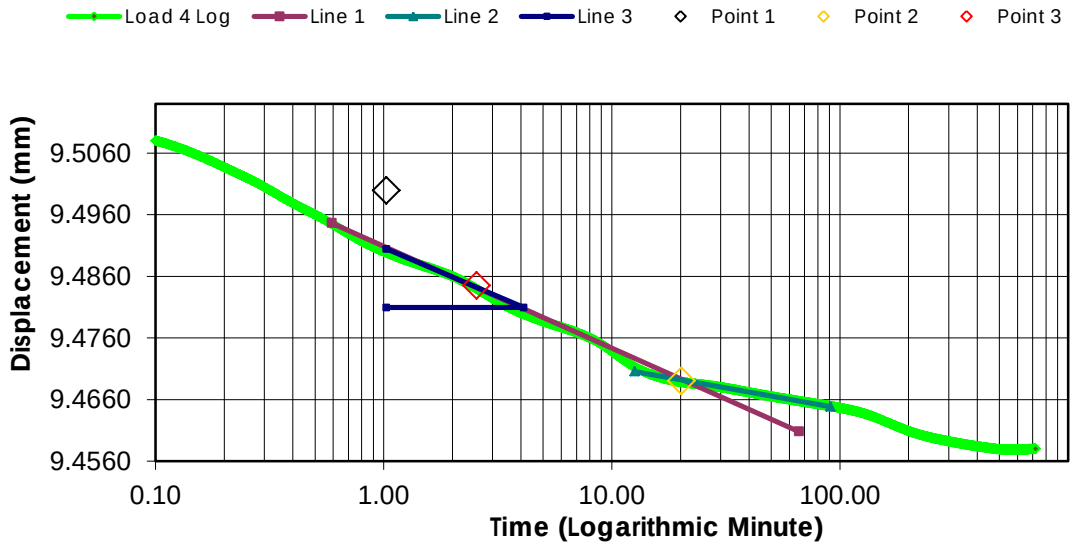
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5520 | 0.0400 | 0.1600 | 0.4613 |
| 1 | 00:00:06 | 9.5080 | 0.0840 | 0.3360 | 0.4587 |
| 2 | 00:00:15 | 9.5020 | 0.0900 | 0.3600 | 0.4584 |
| 3 | 00:00:30 | 9.4960 | 0.0960 | 0.3840 | 0.4580 |
| 4 | 00:01:00 | 9.4900 | 0.1020 | 0.4080 | 0.4577 |
| 5 | 00:02:00 | 9.4860 | 0.1060 | 0.4240 | 0.4575 |
| 6 | 00:04:01 | 9.4800 | 0.1120 | 0.4480 | 0.4571 |
| 7 | 00:08:01 | 9.4760 | 0.1160 | 0.4640 | 0.4569 |
| 8 | 00:15:02 | 9.4700 | 0.1220 | 0.4880 | 0.4565 |
| 9 | 00:30:03 | 9.4680 | 0.1240 | 0.4960 | 0.4564 |
| 10 | 01:00:06 | 9.4660 | 0.1260 | 0.5040 | 0.4563 |
| 11 | 02:00:11 | 9.4640 | 0.1280 | 0.5120 | 0.4562 |
| 12 | 04:00:22 | 9.4600 | 0.1320 | 0.5280 | 0.4559 |
| 13 | 08:00:43 | 9.4580 | 0.1340 | 0.5360 | 0.4558 |
| 14 | 12:01:04 | 9.4580 | 0.1340 | 0.5360 | 0.4558 |

# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

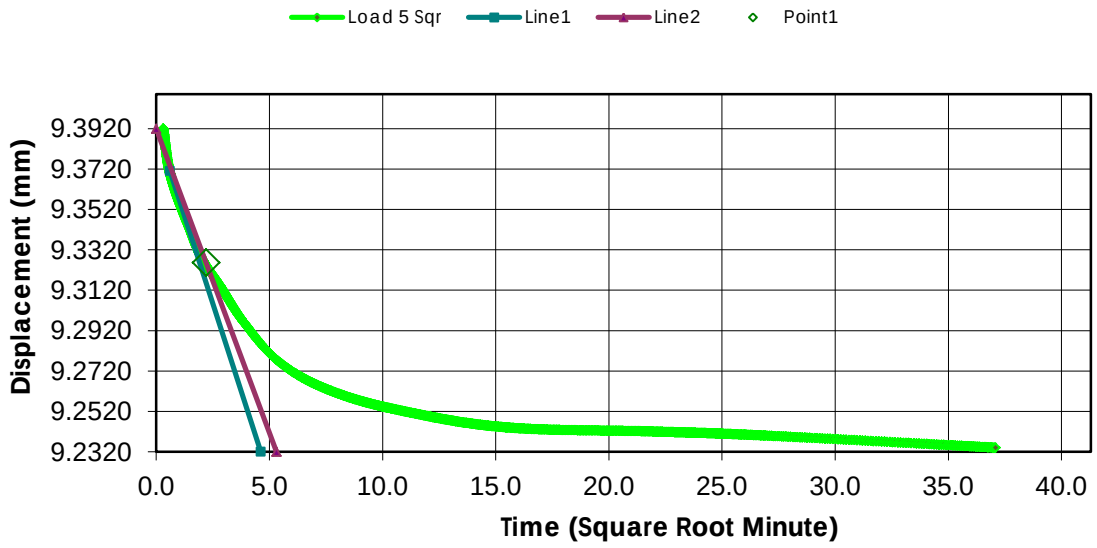
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

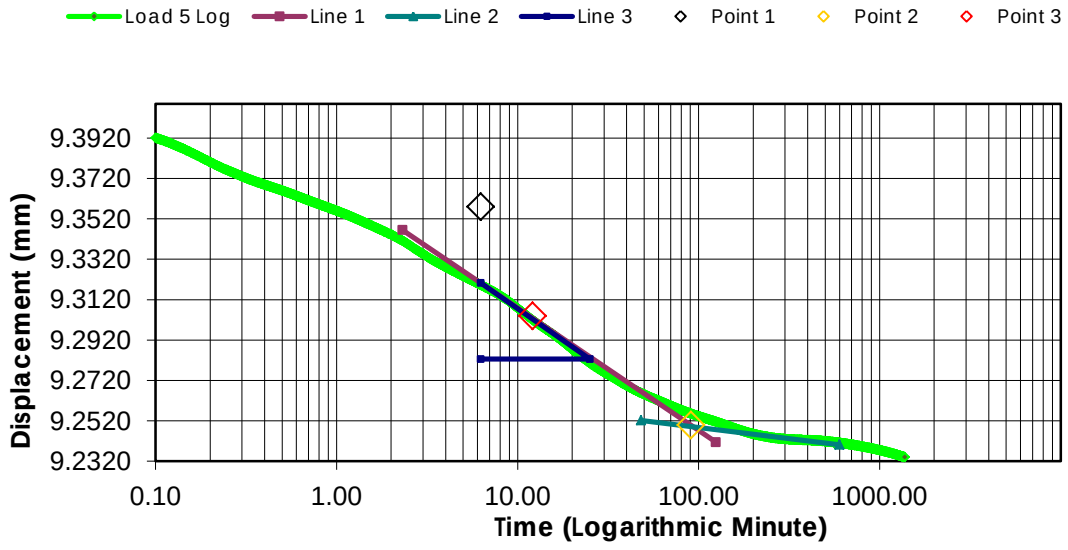
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.4580 | 0.1340 | 0.5360 | 0.4558 |
| 1 | 00:00:06 | 9.3920 | 0.2000 | 0.8000 | 0.4519 |
| 2 | 00:00:15 | 9.3760 | 0.2160 | 0.8640 | 0.4510 |
| 3 | 00:00:30 | 9.3660 | 0.2260 | 0.9040 | 0.4504 |
| 4 | 00:01:00 | 9.3560 | 0.2360 | 0.9440 | 0.4498 |
| 5 | 00:02:01 | 9.3440 | 0.2480 | 0.9920 | 0.4491 |
| 6 | 00:04:01 | 9.3280 | 0.2640 | 1.0560 | 0.4482 |
| 7 | 00:08:01 | 9.3140 | 0.2780 | 1.1120 | 0.4474 |
| 8 | 00:15:02 | 9.2960 | 0.2960 | 1.1840 | 0.4463 |
| 9 | 00:30:03 | 9.2760 | 0.3160 | 1.2640 | 0.4452 |
| 10 | 01:00:06 | 9.2620 | 0.3300 | 1.3200 | 0.4443 |
| 11 | 02:00:11 | 9.2520 | 0.3400 | 1.3600 | 0.4438 |
| 12 | 04:00:22 | 9.2440 | 0.3480 | 1.3920 | 0.4433 |
| 13 | 08:00:43 | 9.2420 | 0.3500 | 1.4000 | 0.4432 |
| 14 | 12:01:05 | 9.2400 | 0.3520 | 1.4080 | 0.4430 |
| 15 | 22:56:00 | 9.2340 | 0.3580 | 1.4320 | 0.4427 |

# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

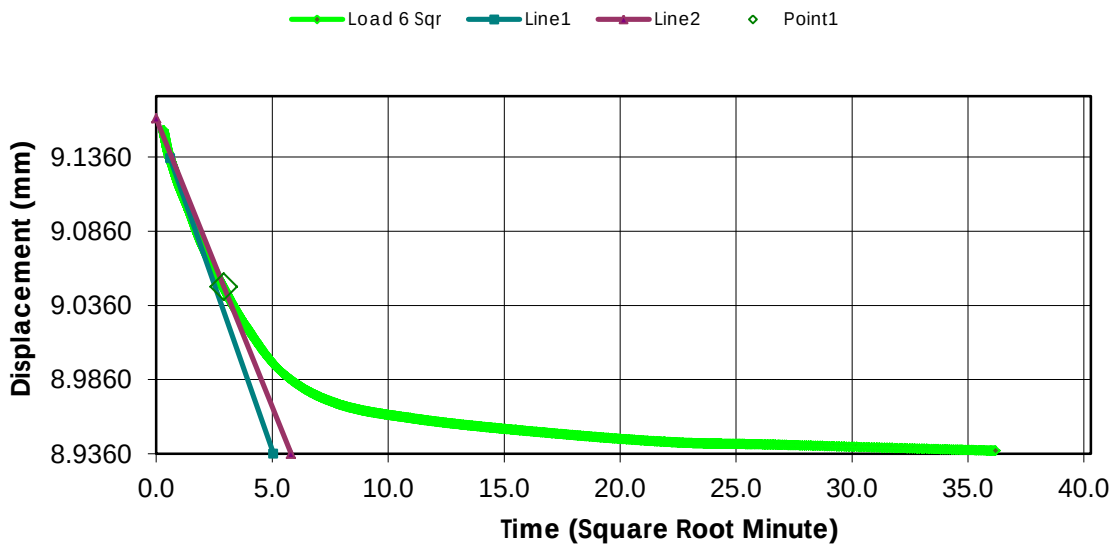
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

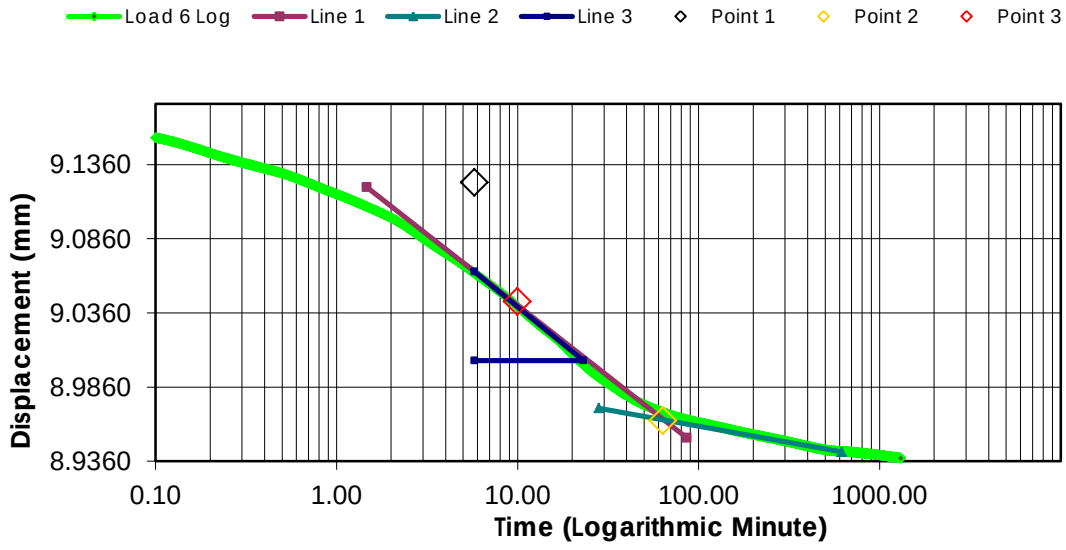
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.2340 | 0.3580 | 1.4320 | 0.4427 |
| 1 | 00:00:06 | 9.1540 | 0.4380 | 1.7520 | 0.4380 |
| 2 | 00:00:15 | 9.1400 | 0.4520 | 1.8080 | 0.4372 |
| 3 | 00:00:30 | 9.1300 | 0.4620 | 1.8480 | 0.4366 |
| 4 | 00:01:00 | 9.1160 | 0.4760 | 1.9040 | 0.4358 |
| 5 | 00:02:00 | 9.1000 | 0.4920 | 1.9680 | 0.4349 |
| 6 | 00:04:00 | 9.0760 | 0.5160 | 2.0640 | 0.4334 |
| 7 | 00:08:01 | 9.0500 | 0.5420 | 2.1680 | 0.4319 |
| 8 | 00:15:01 | 9.0220 | 0.5700 | 2.2800 | 0.4303 |
| 9 | 00:30:03 | 8.9900 | 0.6020 | 2.4080 | 0.4284 |
| 10 | 01:00:05 | 8.9700 | 0.6220 | 2.4880 | 0.4272 |
| 11 | 02:00:11 | 8.9600 | 0.6320 | 2.5280 | 0.4267 |
| 12 | 04:00:21 | 8.9520 | 0.6400 | 2.5600 | 0.4262 |
| 13 | 08:00:43 | 8.9440 | 0.6480 | 2.5920 | 0.4257 |
| 14 | 12:01:04 | 8.9420 | 0.6500 | 2.6000 | 0.4256 |
| 15 | 21:49:29 | 8.9380 | 0.6540 | 2.6160 | 0.4254 |

# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

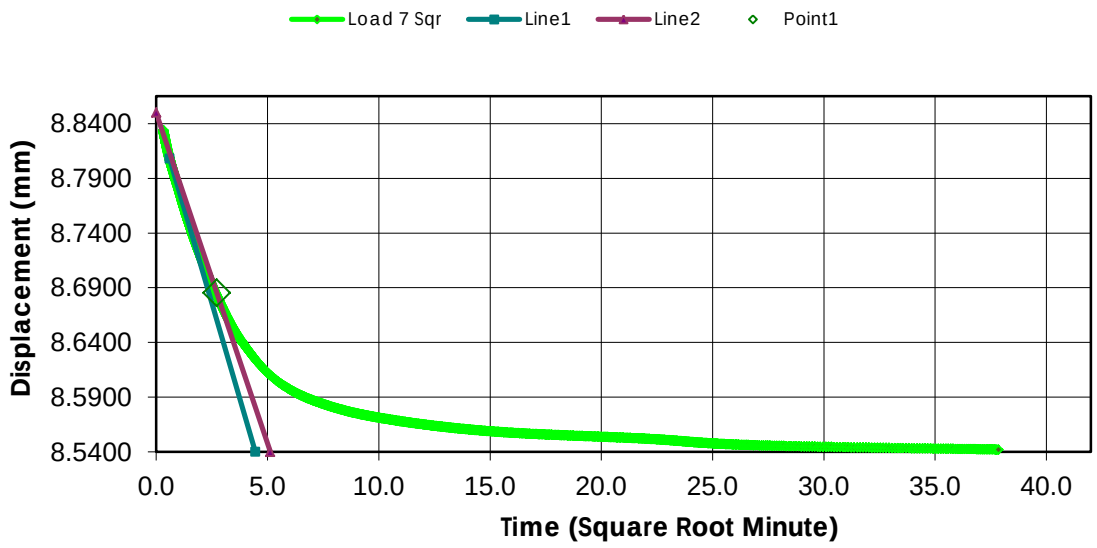
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

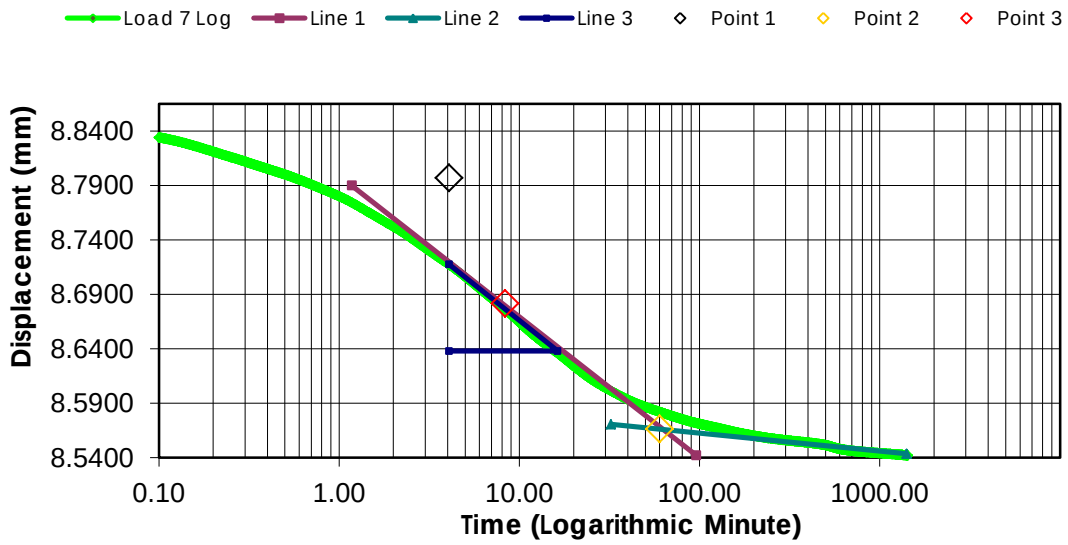
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.9380 | 0.6540 | 2.6160 | 0.4254 |
| 1 | 00:00:06 | 8.8340 | 0.7580 | 3.0320 | 0.4193 |
| 2 | 00:00:15 | 8.8160 | 0.7760 | 3.1040 | 0.4182 |
| 3 | 00:00:30 | 8.8000 | 0.7920 | 3.1680 | 0.4173 |
| 4 | 00:01:00 | 8.7800 | 0.8120 | 3.2480 | 0.4161 |
| 5 | 00:02:00 | 8.7520 | 0.8400 | 3.3600 | 0.4145 |
| 6 | 00:04:00 | 8.7180 | 0.8740 | 3.4960 | 0.4125 |
| 7 | 00:08:01 | 8.6780 | 0.9140 | 3.6560 | 0.4101 |
| 8 | 00:15:01 | 8.6400 | 0.9520 | 3.8080 | 0.4079 |
| 9 | 00:30:03 | 8.6040 | 0.9880 | 3.9520 | 0.4058 |
| 10 | 01:00:05 | 8.5820 | 1.0100 | 4.0400 | 0.4045 |
| 11 | 02:00:11 | 8.5680 | 1.0240 | 4.0960 | 0.4037 |
| 12 | 04:00:20 | 8.5580 | 1.0340 | 4.1360 | 0.4031 |
| 13 | 08:00:41 | 8.5520 | 1.0400 | 4.1600 | 0.4028 |
| 14 | 12:01:02 | 8.5460 | 1.0460 | 4.1840 | 0.4024 |
| 15 | 23:51:59 | 8.5420 | 1.0500 | 4.2000 | 0.4022 |

# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

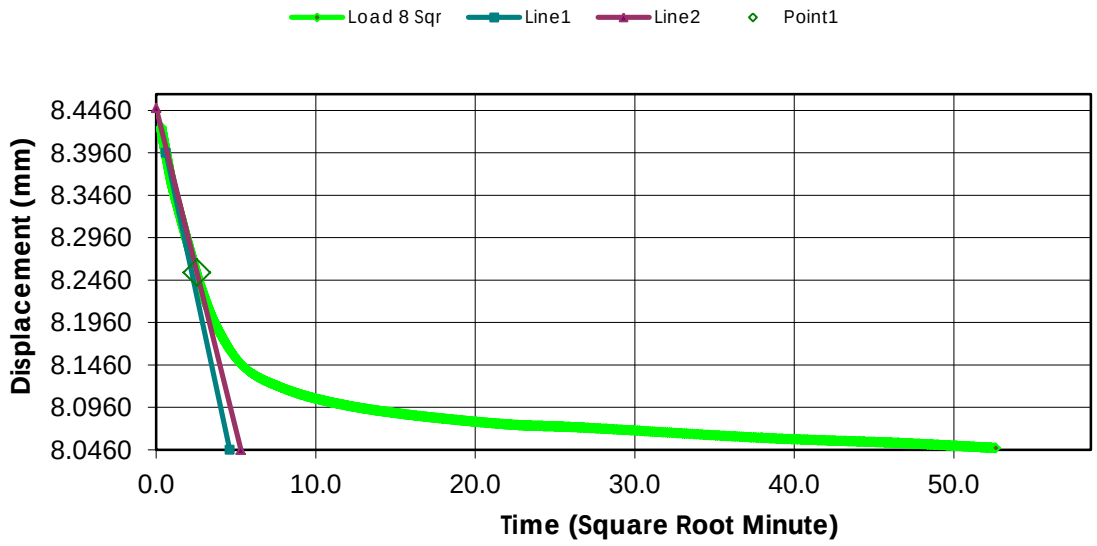
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

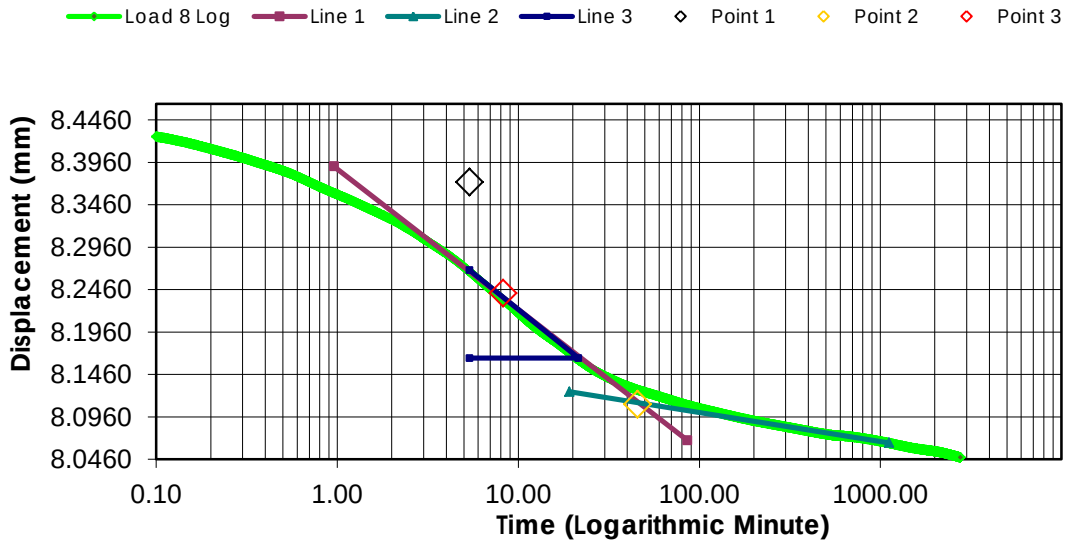
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.5420 | 1.0500 | 4.2000 | 0.4022 |
| 1 | 00:00:06 | 8.4260 | 1.1660 | 4.6640 | 0.3954 |
| 2 | 00:00:15 | 8.4060 | 1.1860 | 4.7440 | 0.3942 |
| 3 | 00:00:30 | 8.3860 | 1.2060 | 4.8240 | 0.3931 |
| 4 | 00:01:00 | 8.3580 | 1.2340 | 4.9360 | 0.3914 |
| 5 | 00:02:01 | 8.3280 | 1.2640 | 5.0560 | 0.3897 |
| 6 | 00:04:01 | 8.2880 | 1.3040 | 5.2160 | 0.3873 |
| 7 | 00:08:01 | 8.2360 | 1.3560 | 5.4240 | 0.3843 |
| 8 | 00:15:02 | 8.1880 | 1.4040 | 5.6160 | 0.3815 |
| 9 | 00:30:03 | 8.1440 | 1.4480 | 5.7920 | 0.3789 |
| 10 | 01:00:06 | 8.1200 | 1.4720 | 5.8880 | 0.3775 |
| 11 | 02:00:11 | 8.1020 | 1.4900 | 5.9600 | 0.3764 |
| 12 | 04:00:22 | 8.0880 | 1.5040 | 6.0160 | 0.3756 |
| 13 | 08:00:43 | 8.0760 | 1.5160 | 6.0640 | 0.3749 |
| 14 | 12:01:04 | 8.0720 | 1.5200 | 6.0800 | 0.3747 |
| 15 | 24:02:08 | 8.0600 | 1.5320 | 6.1280 | 0.3740 |
| 16 | 36:03:13 | 8.0540 | 1.5380 | 6.1520 | 0.3736 |
| 17 | 46:11:09 | 8.0480 | 1.5440 | 6.1760 | 0.3733 |

# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

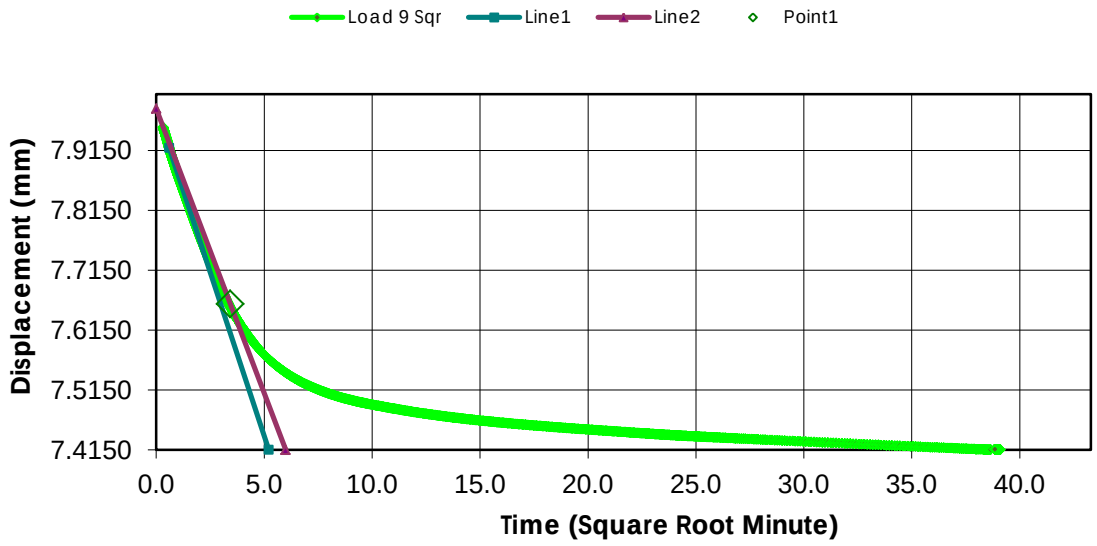
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

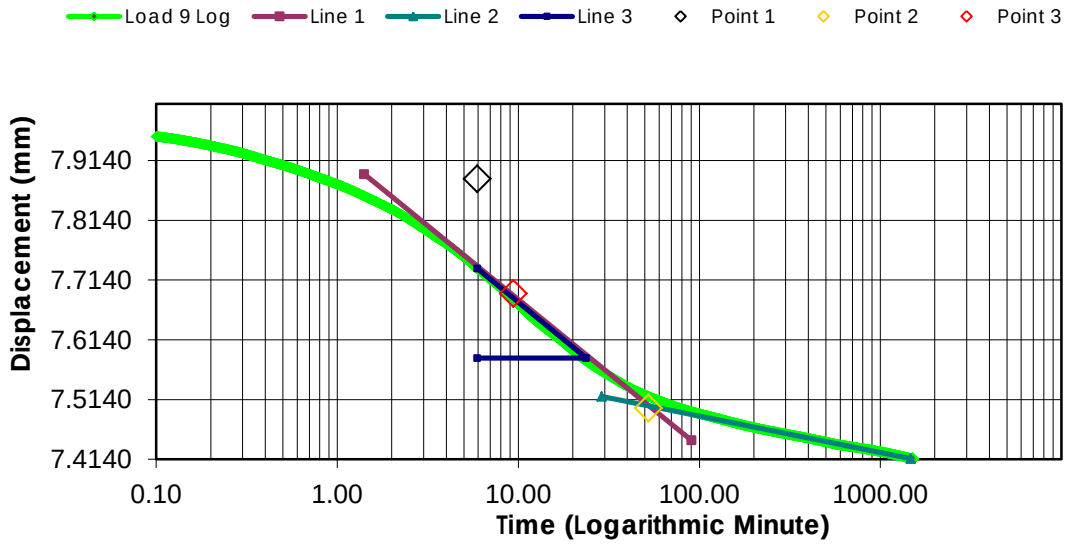
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.0480 | 1.5440 | 6.1760 | 0.3733 |
| 1 | 00:00:06 | 7.9540 | 1.6380 | 6.5520 | 0.3678 |
| 2 | 00:00:15 | 7.9320 | 1.6600 | 6.6400 | 0.3665 |
| 3 | 00:00:30 | 7.9060 | 1.6860 | 6.7440 | 0.3649 |
| 4 | 00:01:00 | 7.8740 | 1.7180 | 6.8720 | 0.3631 |
| 5 | 00:02:00 | 7.8320 | 1.7600 | 7.0400 | 0.3606 |
| 6 | 00:04:00 | 7.7740 | 1.8180 | 7.2720 | 0.3572 |
| 7 | 00:08:00 | 7.7000 | 1.8920 | 7.5680 | 0.3529 |
| 8 | 00:15:01 | 7.6260 | 1.9660 | 7.8640 | 0.3486 |
| 9 | 00:30:02 | 7.5580 | 2.0340 | 8.1360 | 0.3446 |
| 10 | 01:00:05 | 7.5120 | 2.0800 | 8.3200 | 0.3419 |
| 11 | 02:00:10 | 7.4840 | 2.1080 | 8.4320 | 0.3402 |
| 12 | 04:00:21 | 7.4620 | 2.1300 | 8.5200 | 0.3390 |
| 13 | 08:00:42 | 7.4440 | 2.1480 | 8.5920 | 0.3379 |
| 14 | 12:01:04 | 7.4340 | 2.1580 | 8.6320 | 0.3373 |
| 15 | 24:02:08 | 7.4160 | 2.1760 | 8.7040 | 0.3363 |
| 16 | 25:10:16 | 7.4160 | 2.1760 | 8.7040 | 0.3363 |

# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

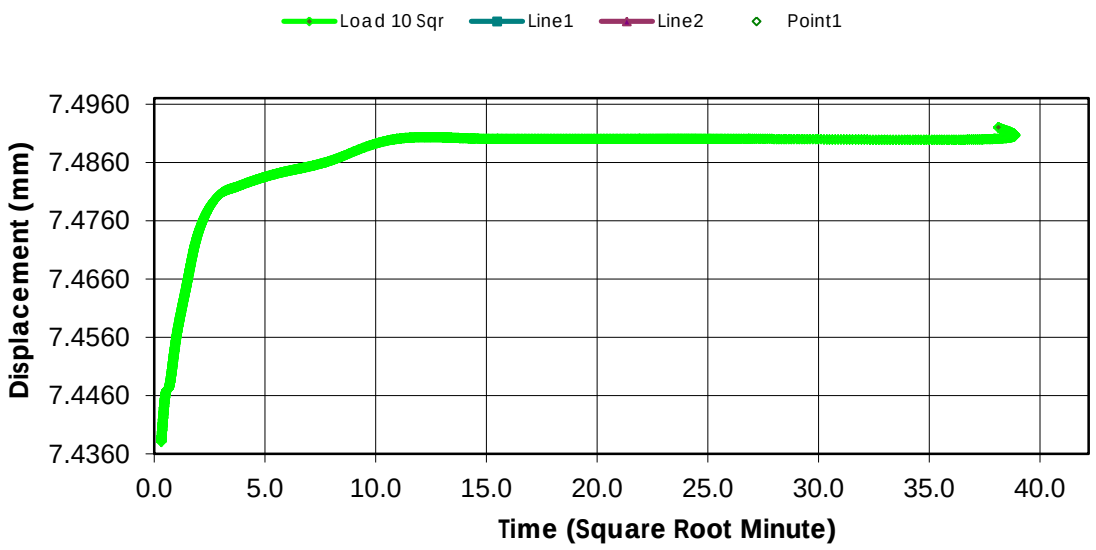
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

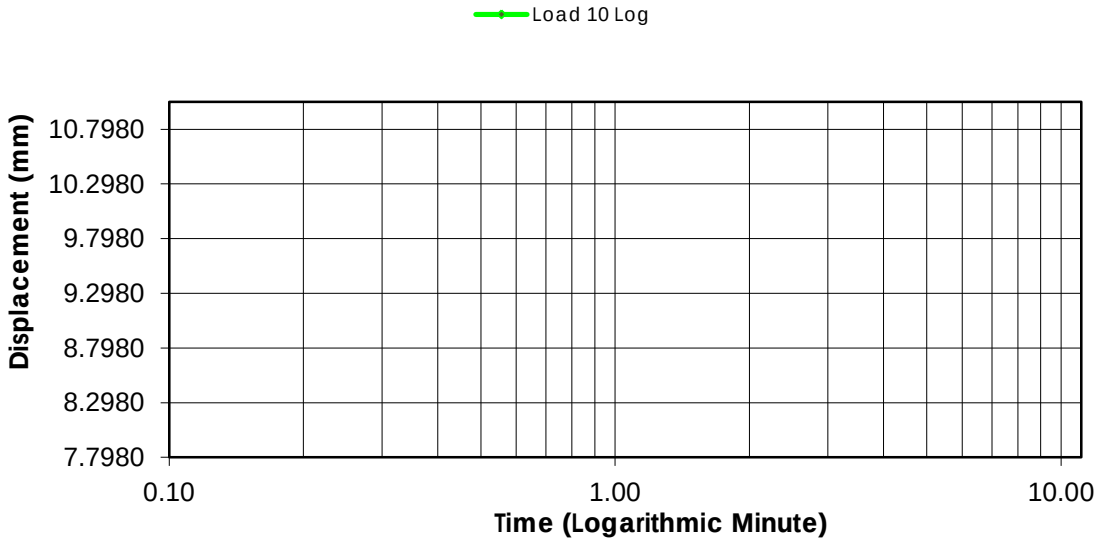
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.4160 | 2.1760 | 8.7040 | 0.3363 |
| 1 | 00:00:06 | 7.4380 | 2.1540 | 8.6160 | 0.3375 |
| 2 | 00:00:15 | 7.4460 | 2.1460 | 8.5840 | 0.3380 |
| 3 | 00:00:30 | 7.4480 | 2.1440 | 8.5760 | 0.3381 |
| 4 | 00:01:00 | 7.4560 | 2.1360 | 8.5440 | 0.3386 |
| 5 | 00:02:00 | 7.4640 | 2.1280 | 8.5120 | 0.3391 |
| 6 | 00:04:00 | 7.4740 | 2.1180 | 8.4720 | 0.3397 |
| 7 | 00:08:00 | 7.4800 | 2.1120 | 8.4480 | 0.3400 |
| 8 | 00:15:01 | 7.4820 | 2.1100 | 8.4400 | 0.3401 |
| 9 | 00:30:02 | 7.4840 | 2.1080 | 8.4320 | 0.3402 |
| 10 | 01:00:05 | 7.4860 | 2.1060 | 8.4240 | 0.3404 |
| 11 | 02:00:10 | 7.4900 | 2.1020 | 8.4080 | 0.3406 |
| 12 | 04:00:21 | 7.4900 | 2.1020 | 8.4080 | 0.3406 |
| 13 | 08:00:42 | 7.4900 | 2.1020 | 8.4080 | 0.3406 |
| 14 | 12:01:03 | 7.4900 | 2.1020 | 8.4080 | 0.3406 |
| 15 | 24:02:07 | 7.4900 | 2.1020 | 8.4080 | 0.3406 |
| 16 | 24:13:35 | 7.4920 | 2.1000 | 8.4000 | 0.3407 |

# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

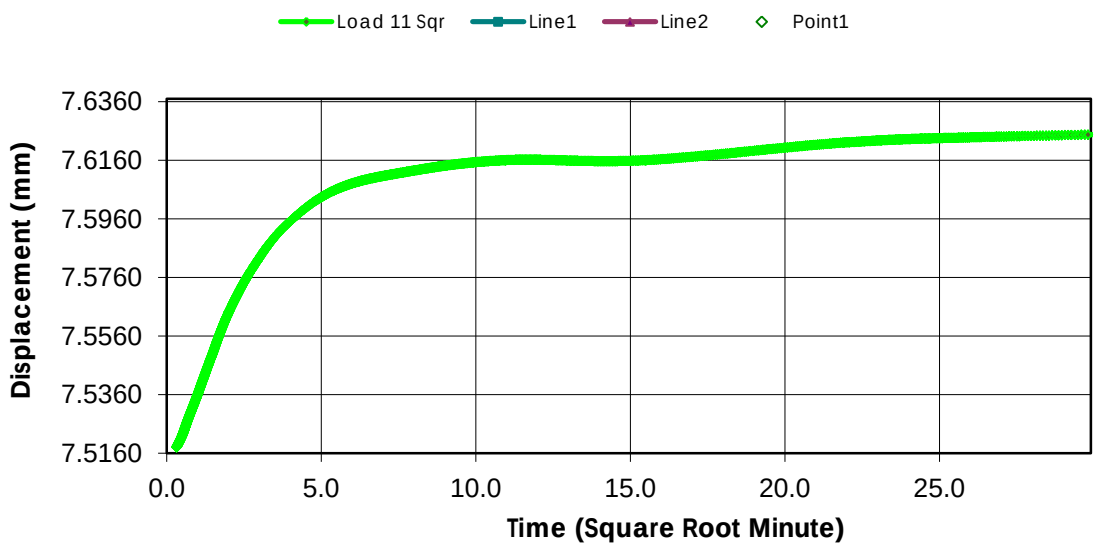
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

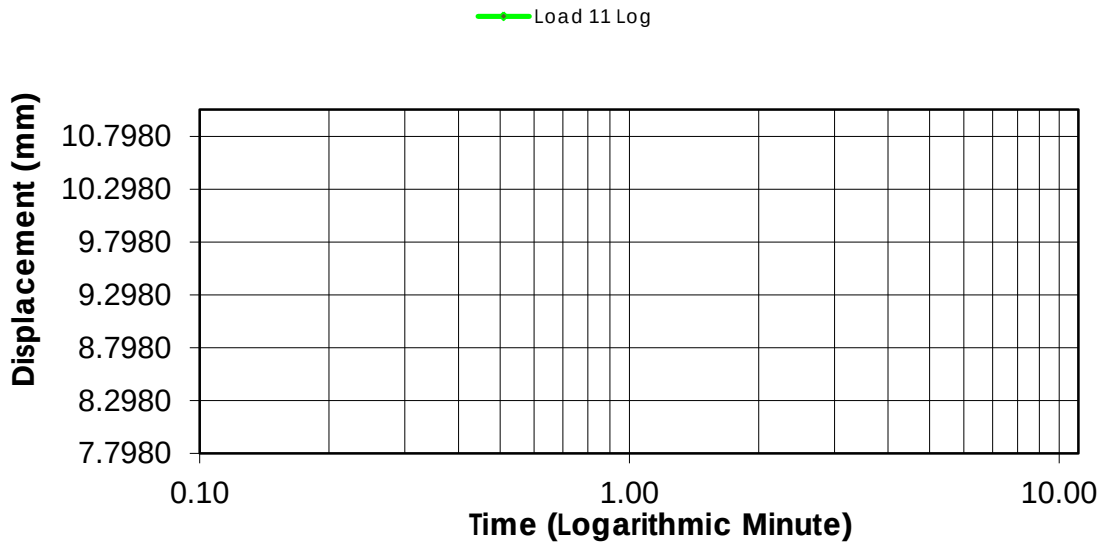
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.4920 | 2.1000 | 8.4000 | 0.3407 |
| 1 | 00:00:06 | 7.5180 | 2.0740 | 8.2960 | 0.3422 |
| 2 | 00:00:15 | 7.5220 | 2.0700 | 8.2800 | 0.3425 |
| 3 | 00:00:30 | 7.5280 | 2.0640 | 8.2560 | 0.3428 |
| 4 | 00:01:00 | 7.5360 | 2.0560 | 8.2240 | 0.3433 |
| 5 | 00:02:00 | 7.5480 | 2.0440 | 8.1760 | 0.3440 |
| 6 | 00:04:01 | 7.5640 | 2.0280 | 8.1120 | 0.3449 |
| 7 | 00:08:01 | 7.5800 | 2.0120 | 8.0480 | 0.3459 |
| 8 | 00:15:02 | 7.5940 | 1.9980 | 7.9920 | 0.3467 |
| 9 | 00:30:03 | 7.6060 | 1.9860 | 7.9440 | 0.3474 |
| 10 | 01:00:06 | 7.6120 | 1.9800 | 7.9200 | 0.3477 |
| 11 | 02:00:11 | 7.6160 | 1.9760 | 7.9040 | 0.3480 |
| 12 | 04:00:21 | 7.6160 | 1.9760 | 7.9040 | 0.3480 |
| 13 | 08:00:43 | 7.6220 | 1.9700 | 7.8800 | 0.3483 |
| 14 | 12:01:04 | 7.6240 | 1.9680 | 7.8720 | 0.3484 |
| 15 | 22:01:52 | 7.6260 | 1.9660 | 7.8640 | 0.3486 |

# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

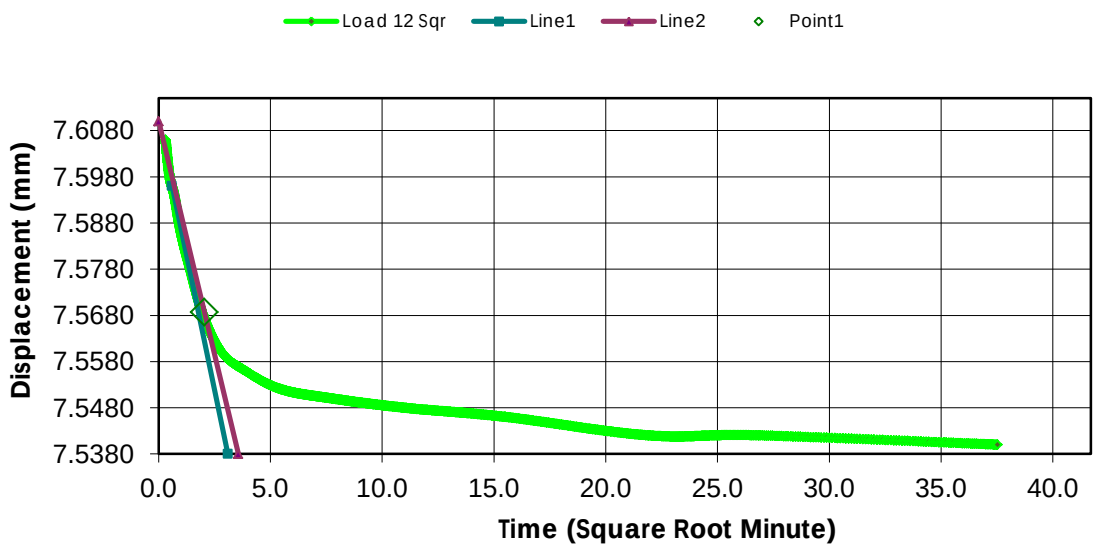
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

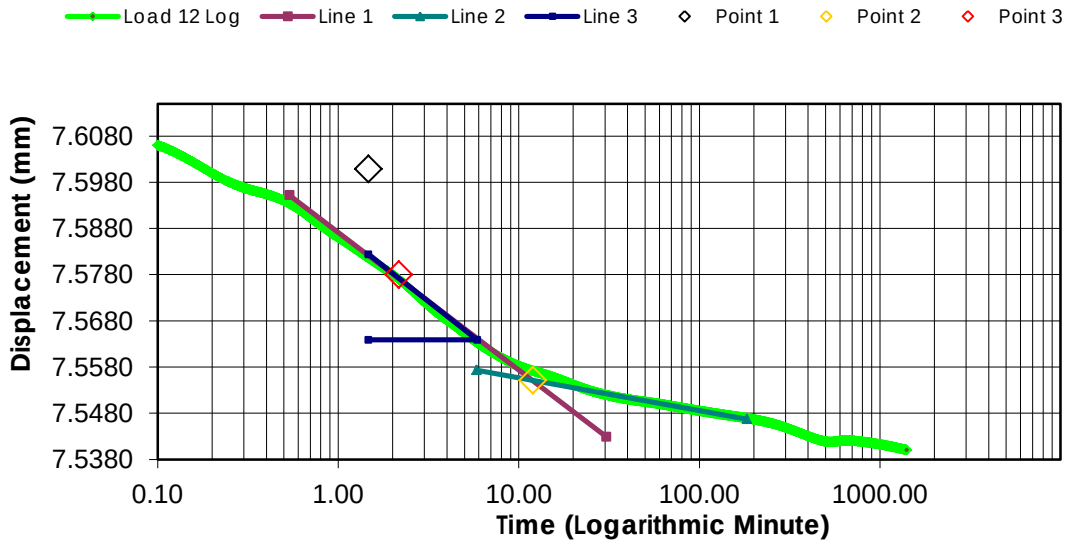
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.6260 | 1.9660 | 7.8640 | 0.3486 |
| 1 | 00:00:06 | 7.6060 | 1.9860 | 7.9440 | 0.3474 |
| 2 | 00:00:15 | 7.5980 | 1.9940 | 7.9760 | 0.3469 |
| 3 | 00:00:30 | 7.5940 | 1.9980 | 7.9920 | 0.3467 |
| 4 | 00:01:00 | 7.5860 | 2.0060 | 8.0240 | 0.3462 |
| 5 | 00:02:00 | 7.5780 | 2.0140 | 8.0560 | 0.3457 |
| 6 | 00:04:01 | 7.5680 | 2.0240 | 8.0960 | 0.3452 |
| 7 | 00:08:01 | 7.5600 | 2.0320 | 8.1280 | 0.3447 |
| 8 | 00:15:02 | 7.5560 | 2.0360 | 8.1440 | 0.3445 |
| 9 | 00:30:03 | 7.5520 | 2.0400 | 8.1600 | 0.3442 |
| 10 | 01:00:06 | 7.5500 | 2.0420 | 8.1680 | 0.3441 |
| 11 | 02:00:11 | 7.5480 | 2.0440 | 8.1760 | 0.3440 |
| 12 | 04:00:20 | 7.5460 | 2.0460 | 8.1840 | 0.3439 |
| 13 | 08:00:32 | 7.5420 | 2.0500 | 8.2000 | 0.3436 |
| 14 | 12:00:54 | 7.5420 | 2.0500 | 8.2000 | 0.3436 |
| 15 | 23:27:57 | 7.5400 | 2.0520 | 8.2080 | 0.3435 |

# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

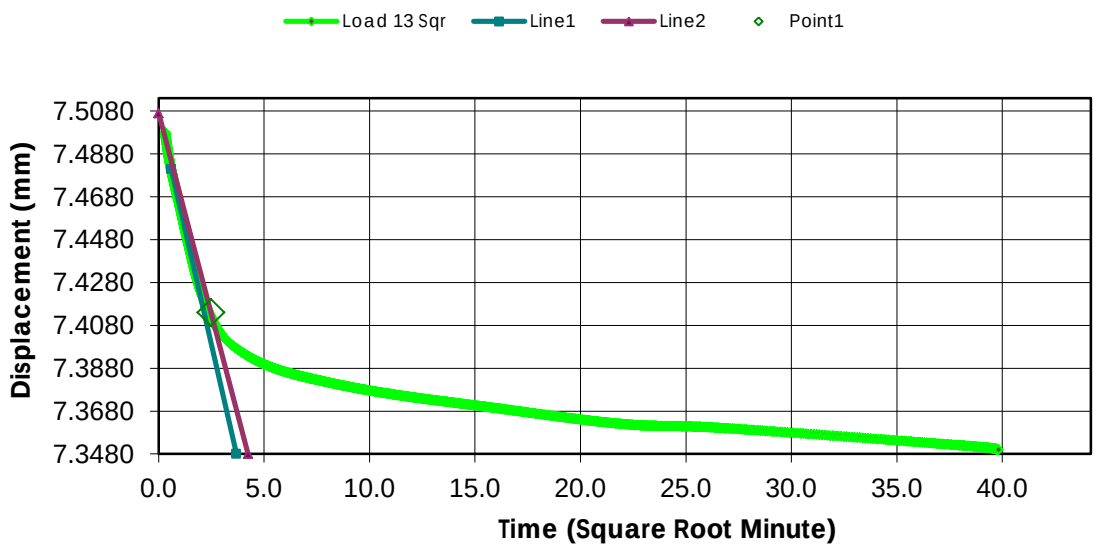
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

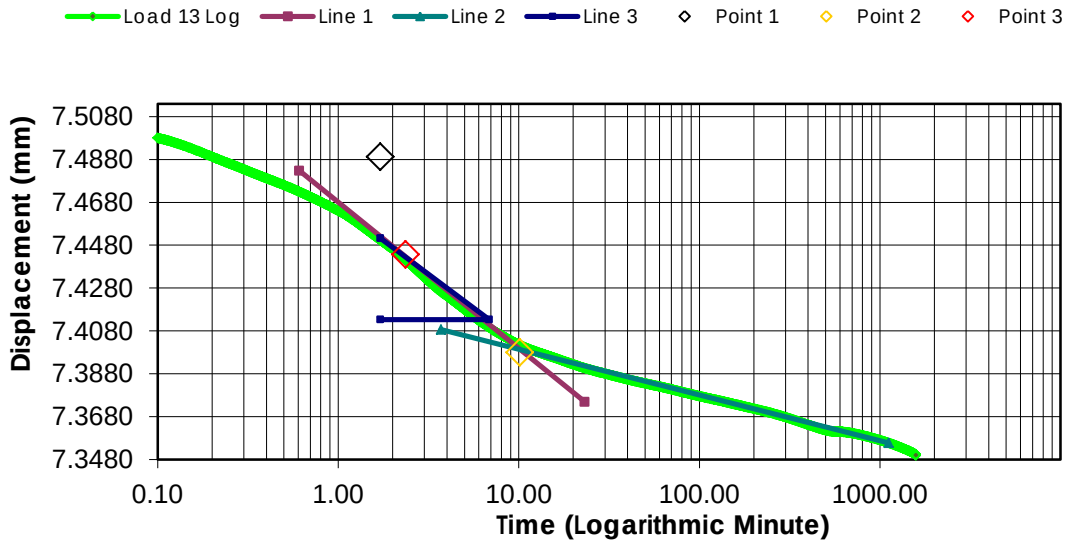
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.5400 | 2.0520 | 8.2080 | 0.3435 |
| 1 | 00:00:06 | 7.4980 | 2.0940 | 8.3760 | 0.3411 |
| 2 | 00:00:15 | 7.4860 | 2.1060 | 8.4240 | 0.3404 |
| 3 | 00:00:30 | 7.4760 | 2.1160 | 8.4640 | 0.3398 |
| 4 | 00:01:00 | 7.4640 | 2.1280 | 8.5120 | 0.3391 |
| 5 | 00:02:00 | 7.4460 | 2.1460 | 8.5840 | 0.3380 |
| 6 | 00:04:00 | 7.4240 | 2.1680 | 8.6720 | 0.3367 |
| 7 | 00:08:01 | 7.4060 | 2.1860 | 8.7440 | 0.3357 |
| 8 | 00:15:01 | 7.3960 | 2.1960 | 8.7840 | 0.3351 |
| 9 | 00:30:02 | 7.3880 | 2.2040 | 8.8160 | 0.3346 |
| 10 | 01:00:05 | 7.3820 | 2.2100 | 8.8400 | 0.3343 |
| 11 | 02:00:10 | 7.3760 | 2.2160 | 8.8640 | 0.3339 |
| 12 | 04:00:21 | 7.3700 | 2.2220 | 8.8880 | 0.3336 |
| 13 | 08:00:42 | 7.3620 | 2.2300 | 8.9200 | 0.3331 |
| 14 | 12:01:03 | 7.3600 | 2.2320 | 8.9280 | 0.3330 |
| 15 | 24:02:07 | 7.3520 | 2.2400 | 8.9600 | 0.3325 |
| 16 | 26:25:30 | 7.3500 | 2.2420 | 8.9680 | 0.3324 |

# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

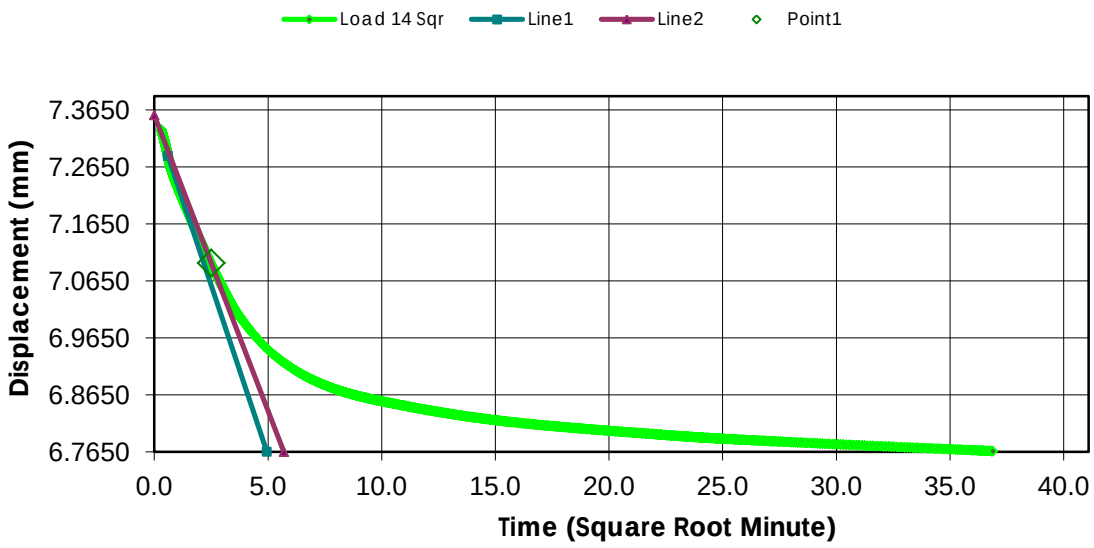
**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16
**Test Number:**

**Sample Number:** D68 ST10 **Soil Description:**
**Boring Number:** Brown Clay, trace gravel, trace sand
**Depth:** 4.40-4.85m **Remarks:**
**Sample Type:** Undisturbed

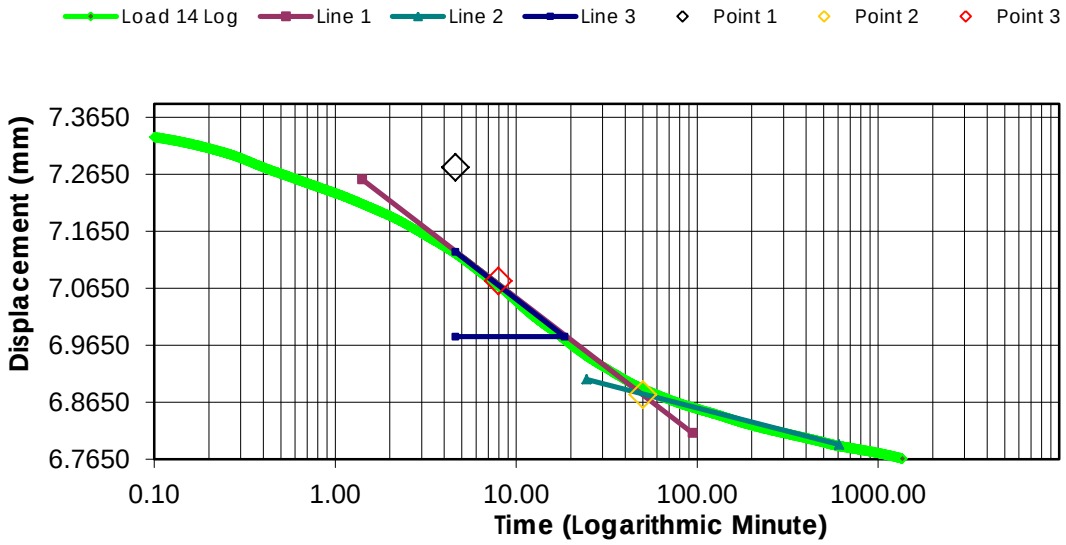
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.3500 | 2.2420 | 8.9680 | 0.3324 |
| 1 | 00:00:06 | 7.3300 | 2.2620 | 9.0480 | 0.3312 |
| 2 | 00:00:15 | 7.3020 | 2.2900 | 9.1600 | 0.3296 |
| 3 | 00:00:30 | 7.2660 | 2.3260 | 9.3040 | 0.3275 |
| 4 | 00:01:00 | 7.2320 | 2.3600 | 9.4400 | 0.3255 |
| 5 | 00:02:00 | 7.1920 | 2.4000 | 9.6000 | 0.3231 |
| 6 | 00:04:00 | 7.1380 | 2.4540 | 9.8160 | 0.3200 |
| 7 | 00:08:00 | 7.0680 | 2.5240 | 10.0960 | 0.3159 |
| 8 | 00:15:01 | 6.9960 | 2.5960 | 10.3840 | 0.3117 |
| 9 | 00:30:02 | 6.9280 | 2.6640 | 10.6560 | 0.3077 |
| 10 | 01:00:05 | 6.8780 | 2.7140 | 10.8560 | 0.3048 |
| 11 | 02:00:10 | 6.8460 | 2.7460 | 10.9840 | 0.3029 |
| 12 | 04:00:21 | 6.8180 | 2.7740 | 11.0960 | 0.3012 |
| 13 | 08:00:42 | 6.7960 | 2.7960 | 11.1840 | 0.3000 |
| 14 | 12:01:03 | 6.7840 | 2.8080 | 11.2320 | 0.2993 |
| 15 | 22:41:15 | 6.7660 | 2.8260 | 11.3040 | 0.2982 |

# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



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Calgary Laboratory
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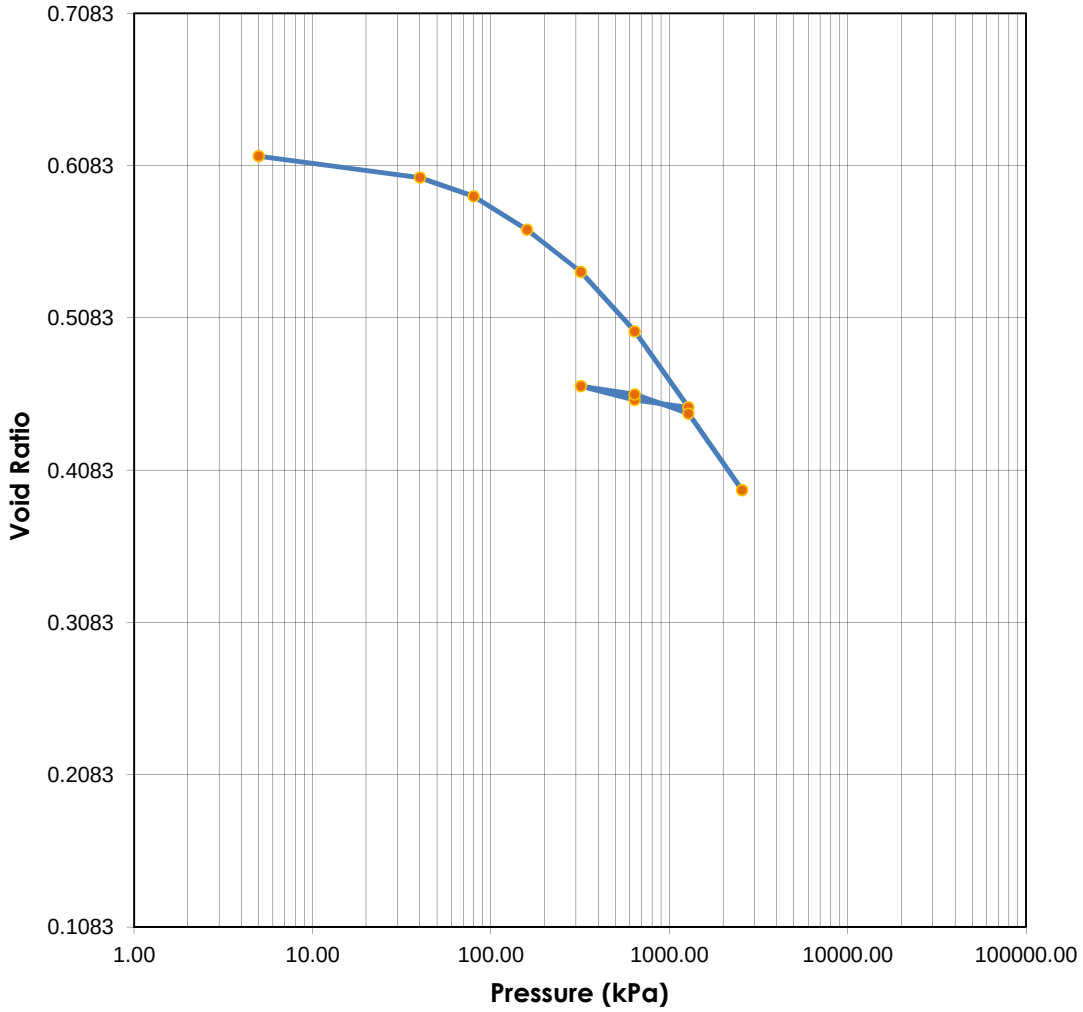
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 20.5 | 14.8 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.669 | 1.962 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 89.44 | 106.29 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6137 | 0.3945 | **Specific Gravity:** | 2.700 | Assumed | |

| | | | |
|---|---|---|---|
| **Soil Description:** | Brown Clay, Trace Gravel | | |
| **Project Number:** | 110773396.302.702.230 | **Depth:** 7.6-8.1m | **Remarks:** |
| **Sample Number:** | D68 ST15 | **Boring Number:** | Loads at 10kPa and 20kPa omitted due to swelling |
| **Project:** | SR1 | | |
| **Client:** | Alberta Transportaiton | | |
| **Location:** | | | |

**Tested By:** C. Oost **Reviewed By:**

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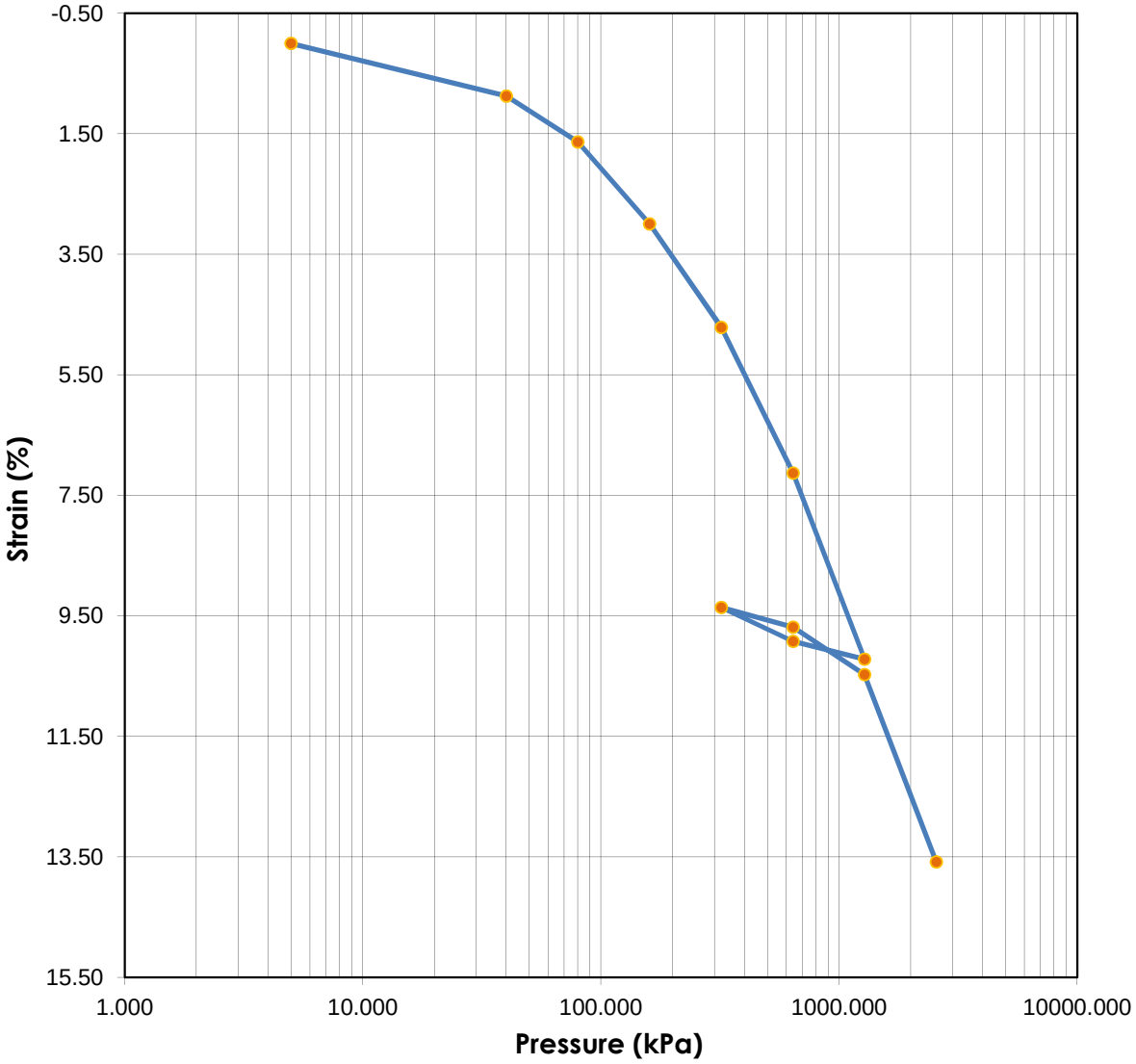
Calgary Laboratory
10830 - 46th Street SE
Calgary, Alberta T2C 1G4
Tel: (403) 253-7876

# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 20.5 | 14.8 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.669 | 1.962 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 89.44 | 106.29 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6137 | 0.3945 | **Specific Gravity:** | 2.700 | Assumed | |

**Sample Description:** Brown Clay, Trace Gravel

**Project Number:** 110773396.302.702.230 **Depth:** 7.6-8.1m
**Sample Number:** D68 ST15 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportaiton
**Location:**

**Remarks:**
Loads at 10kPa and 20kPa omitted due to swelling

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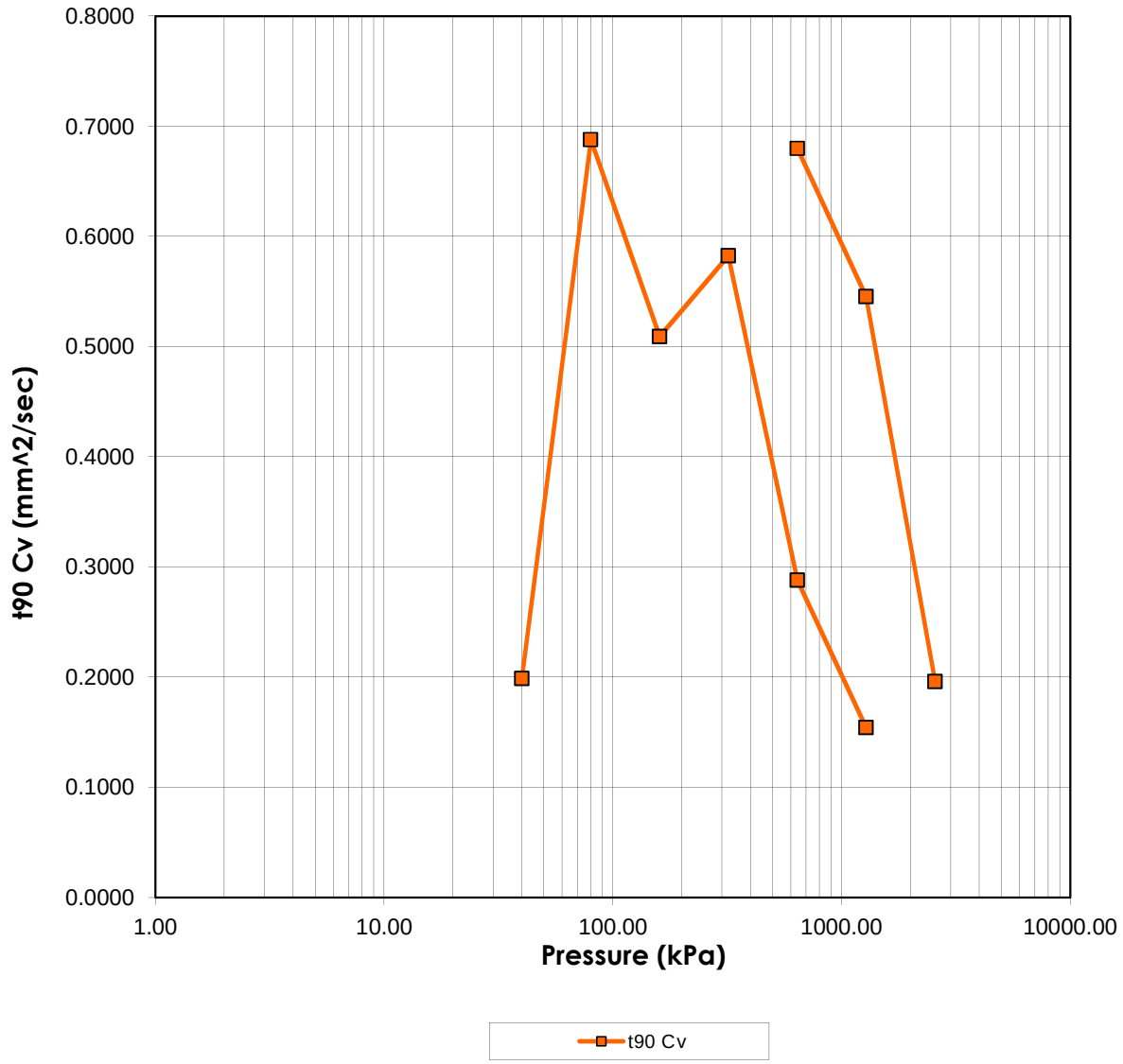
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 20.5 | 14.8 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.669 | 1.962 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 89.44 | 106.29 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6137 | 0.3945 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay, Trace Gravel

**Project Number:** 110773396.302.702.230 **Depth:** 7.6-8.1m
**Sample Number:** D68 ST15 **Boring Number:**

**Project:** SR1
**Client:** Alberta Transportaiton
**Location:**

**Remarks:**
Loads at 10kPa and 20kPa omitted due to swelling

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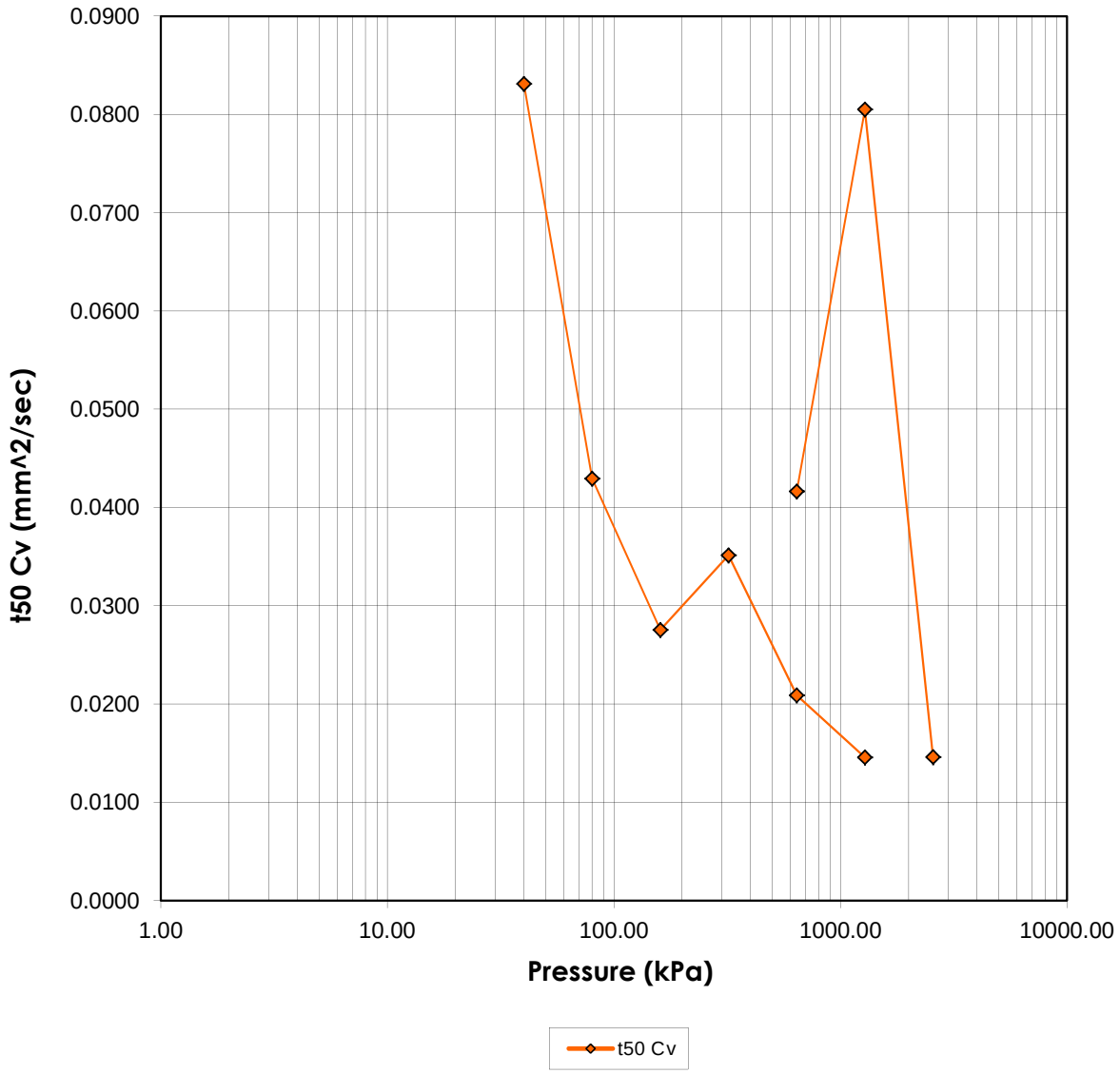
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 20.5 | 14.8 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.669 | 1.962 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 89.44 | 106.29 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6137 | 0.3945 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay, Trace Gravel

**Project Number:** 110773396.302.702.230 **Depth:** 7.6-8.1m

**Sample Number:** D68 ST15 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportaiton

**Location:**

**Remarks:**
Loads at 10kPa and 20kPa omitted due to swelling

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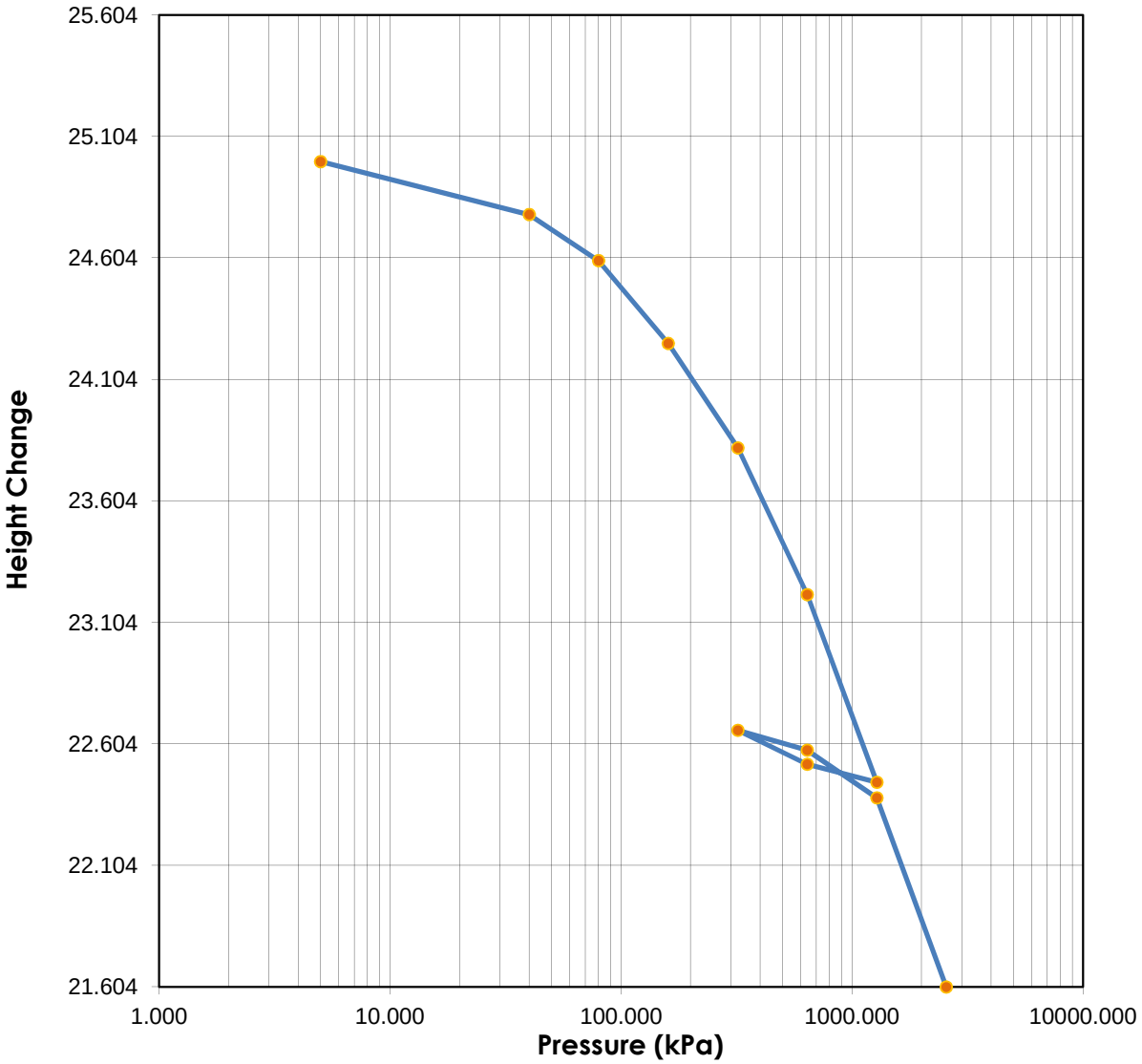
# One-Dimensional Consolidation Test
## ASTM D2435
## Test Results




| | Before | After | | | | |
|---|---|---|---|---|---|---|
| **Moisture (%):** | 20.5 | 14.8 | **Liquid Limits:** | - | **Test Date:** | 31-Aug-16 |
| **Dry Density (g/cm3):** | 1.669 | 1.962 | **Plastic Limits:** | - | | |
| **Saturation (%):** | 89.44 | 106.29 | **Plasticity Index (%):** | - | | |
| **Void Ratio:** | 0.6137 | 0.3945 | **Specific Gravity:** | 2.700 | Assumed | |

**Soil Description:** Brown Clay, Trace Gravel

**Project Number:** 110773396.302.702.230 **Depth:** 7.6-8.1m

**Sample Number:** D68 ST15 **Boring Number:**

**Project:** SR1

**Client:** Alberta Transportaiton

**Location:**

**Remarks:**
Loads at 10kPa and 20kPa omitted due to swelling

# Consolidation Test Results
## Summary

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230

**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Sample Description:**
Brown Clay, Trace Gravel
**Remarks:** Loads at 10kPa and 20kPa omitted due to swelling

**Test Number:**
**Test Date:** 31-Aug-16

| Index | Load Sequence (kPa) | Cummulative Change in Height (mm) | Specimen Height (mm) | Height of Void (mm) | Vertical Strain (%) | Void Ratio | t90 Fitting Time (min) | t50 Fitting Time (min) | t90 Cv (mm2/sec) | t50 Cv (mm2/sec) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.000 | 0.0000 | 25.0000 | 9.5151 | 0.00 | 0.6145 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1 | 5.000 | 0.0000 | 25.0000 | 9.5151 | 0.00 | 0.6145 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2 | 10.000 | 0.0020 | 24.9980 | 9.5131 | 0.01 | 0.6143 | 0.000 | 0.000 | 0.000 | 0.000 |
| 3 | 20.000 | 0.0940 | 24.9060 | 9.4211 | 0.38 | 0.6084 | 0.000 | 0.000 | 0.000 | 0.000 |
| 4 | 40.000 | 0.2180 | 24.7820 | 9.2971 | 0.87 | 0.6004 | 10.918 | * 6.0657 | 0.199 | 0.083 |
| 5 | 80.000 | 0.4080 | 24.5920 | 9.1071 | 1.63 | 0.5881 | 3.107 | 11.562 | 0.688 | 0.043 |
| 6 | 160.000 | 0.7480 | 24.2520 | 8.7671 | 2.99 | 0.5662 | 4.081 | 17.514 | 0.509 | 0.028 |
| 7 | 320.000 | 1.1780 | 23.8220 | 8.3371 | 4.71 | 0.5384 | 3.443 | 13.260 | 0.582 | 0.035 |
| 8 | 640.000 | 1.7820 | 23.2180 | 7.7331 | 7.13 | 0.4994 | 6.614 | 21.169 | 0.288 | 0.021 |
| 9 | 1280.000 | 2.5540 | 22.4460 | 6.9611 | 10.22 | 0.4495 | 11.533 | 28.401 | 0.154 | 0.015 |
| 10 | 640.000 | 2.4800 | 22.5200 | 7.0351 | 9.92 | 0.4543 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | 320.000 | 2.3400 | 22.6600 | 7.1751 | 9.36 | 0.4634 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 640.000 | 2.4220 | 22.5780 | 7.0931 | 9.69 | 0.4581 | 2.649 | 10.046 | 0.680 | 0.042 |
| 13 | 1280.000 | 2.6180 | 22.3820 | 6.8971 | 10.47 | 0.4454 | 3.246 | 5.107 | 0.545 | 0.081 |
| 14 | 2560.000 | 3.3960 | 21.6040 | 6.1191 | 13.58 | 0.3952 | 8.409 | 26.233 | 0.196 | 0.015 |

Predicted value indicated with *

# Consolidation Test
## Consolidation Specimen Information

**Project:** SR1 **Project Number:** 302.702.230
**Location:**
**Job Number:** **Test Date:** 31-Aug-16

**Sample Number:** D68 ST15 **Sample Description:**
**Boring Number:** Brown Clay, Trace Gravel
**Depth:** 7.6-8.1m **Remarks:**
**Sample Type:** Undisturbed

**Test Number:**

| | | | | | |
|---|---|---|---|---|---|
| **Liquid Limit:** | - | **Initial Void Ratio:** | 0.6137 | **Initial Height (mm):** | 25.0000 |
| **Plastic Limit:** | - | **Plasticity Index (%):** | - | **Initial Diameter (mm):** | 63.6000 |
| **Specific Gravity:** | 2.7000 Assumed | **Weight of Ring (g):** | 207.7000 | | |

| Parameters | Initial Specimen | Final Specimen |
|---|---|---|
| Moist Weight + Container (g) | 63.28 | 84.25 |
| Dry Soil + Container (g) | 52.74 | 73.94 |
| Weight of Container (g) | 1.21 | 4.26 |
| Moisture Content (%) | 20.45 | 14.80 |
| Void Ratio | 0.6137 | 0.3945 |
| Saturation (%) | 89.44 | 106.29 |
| Dry Density (g/cm3) | 1.669 | 1.962 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

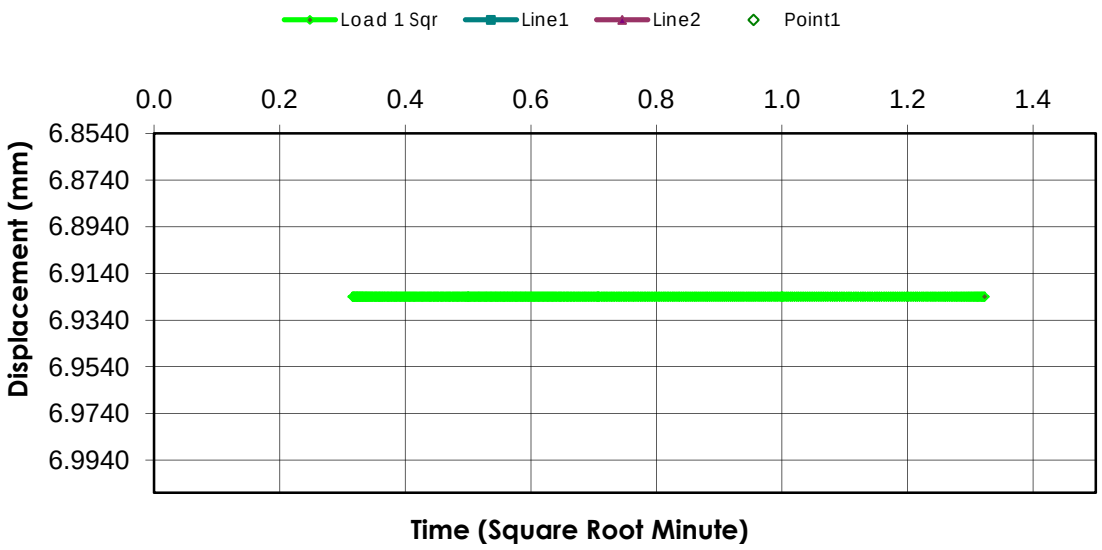
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

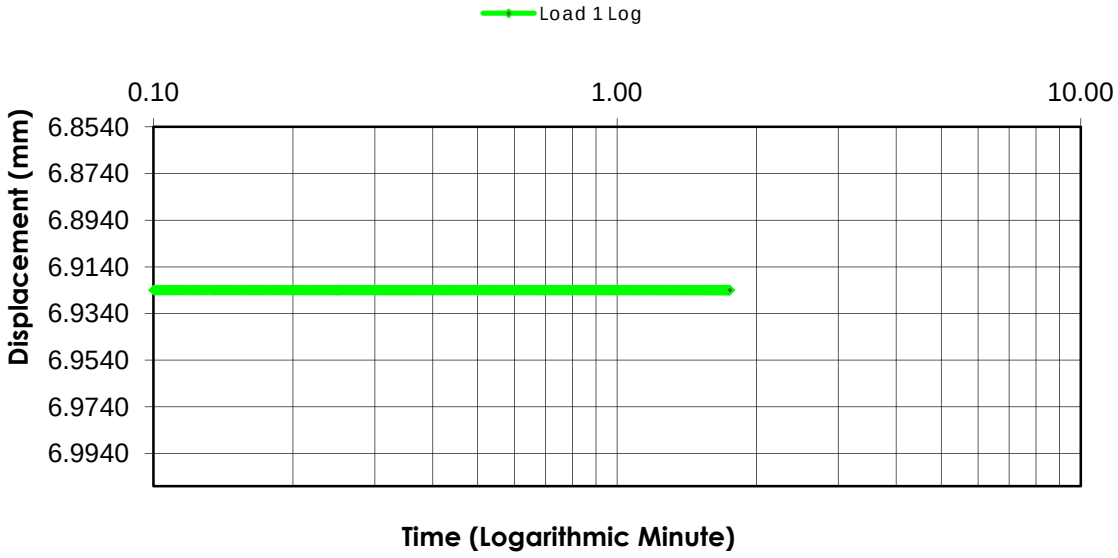
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 6.9240 | 0.0000 | 0.0000 | 0.6137 |
| 1 | 00:00:06 | 6.9240 | 0.0000 | 0.0000 | 0.6137 |
| 2 | 00:00:15 | 6.9240 | 0.0000 | 0.0000 | 0.6137 |
| 3 | 00:00:30 | 6.9240 | 0.0000 | 0.0000 | 0.6137 |
| 4 | 00:01:00 | 6.9240 | 0.0000 | 0.0000 | 0.6137 |
| 5 | 00:01:45 | 6.9240 | 0.0000 | 0.0000 | 0.6137 |

# Consolidation Test Results
## (Sequence 1) Load 5.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

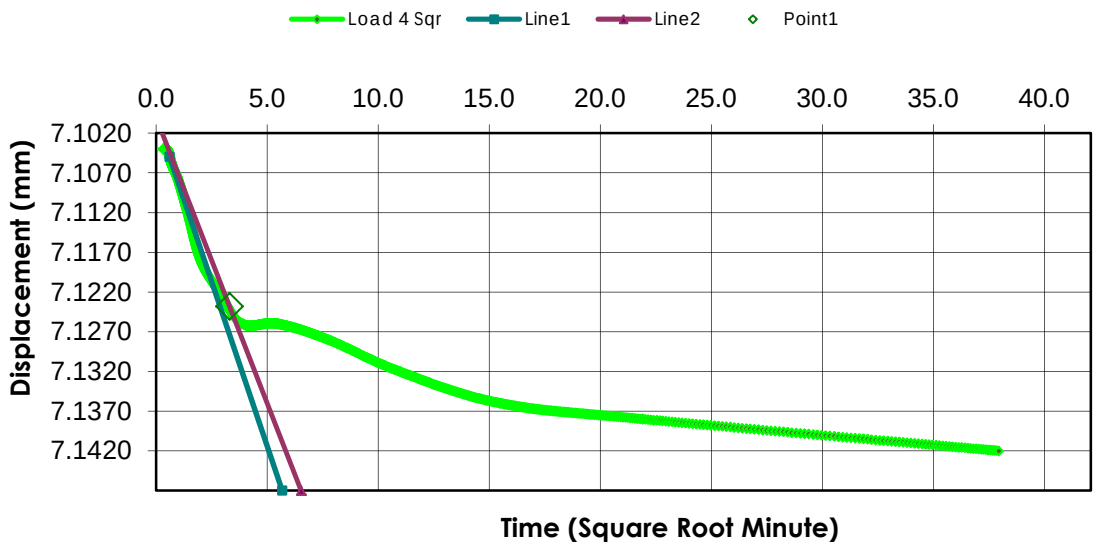
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

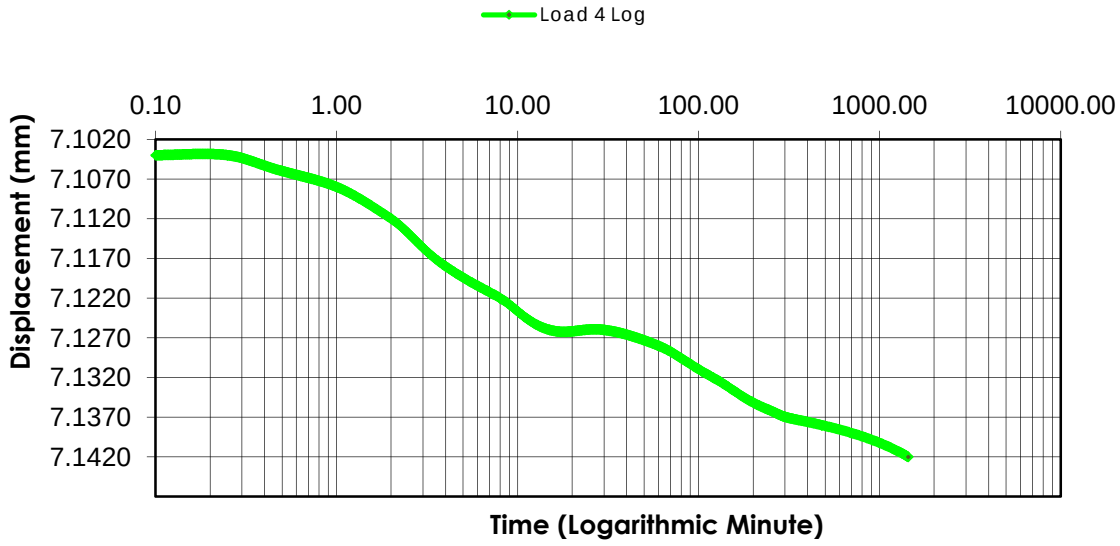
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.0180 | 0.0940 | 0.3760 | 0.6076 |
| 1 | 00:00:06 | 7.1040 | 0.1800 | 0.7200 | 0.6021 |
| 2 | 00:00:15 | 7.1040 | 0.1800 | 0.7200 | 0.6021 |
| 3 | 00:00:30 | 7.1060 | 0.1820 | 0.7280 | 0.6019 |
| 4 | 00:01:00 | 7.1080 | 0.1840 | 0.7360 | 0.6018 |
| 5 | 00:02:00 | 7.1120 | 0.1880 | 0.7520 | 0.6015 |
| 6 | 00:04:00 | 7.1180 | 0.1940 | 0.7760 | 0.6012 |
| 7 | 00:08:00 | 7.1220 | 0.1980 | 0.7920 | 0.6009 |
| 8 | 00:15:00 | 7.1260 | 0.2020 | 0.8080 | 0.6006 |
| 9 | 00:30:00 | 7.1260 | 0.2020 | 0.8080 | 0.6006 |
| 10 | 01:00:00 | 7.1280 | 0.2040 | 0.8160 | 0.6005 |
| 11 | 02:00:00 | 7.1320 | 0.2080 | 0.8320 | 0.6003 |
| 12 | 04:00:00 | 7.1360 | 0.2120 | 0.8480 | 0.6000 |
| 13 | 08:00:00 | 7.1380 | 0.2140 | 0.8560 | 0.5999 |
| 14 | 24:00:00 | 7.1420 | 0.2180 | 0.8720 | 0.5996 |

# Consolidation Test Results
## (Sequence 4) Load 40.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

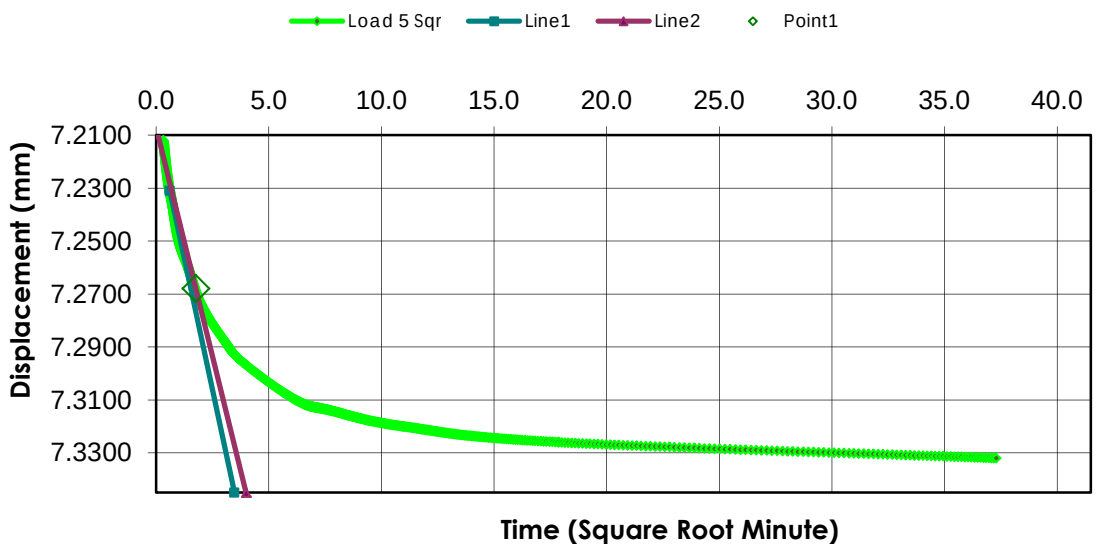
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

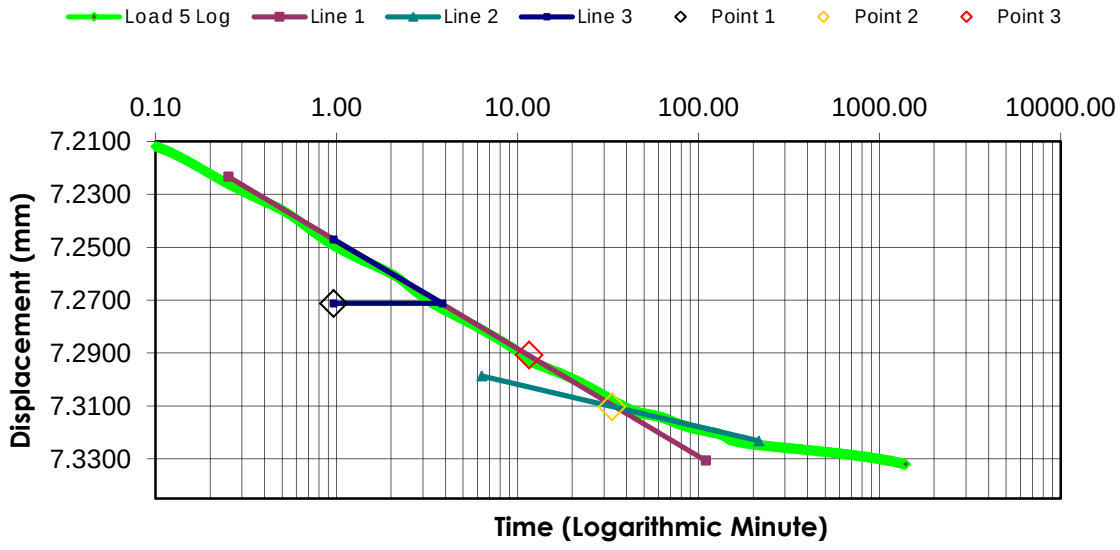
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.1420 | 0.2180 | 0.8720 | 0.5996 |
| 1 | 00:00:06 | 7.2120 | 0.2880 | 1.1520 | 0.5951 |
| 2 | 00:00:15 | 7.2260 | 0.3020 | 1.2080 | 0.5942 |
| 3 | 00:00:30 | 7.2360 | 0.3120 | 1.2480 | 0.5935 |
| 4 | 00:01:00 | 7.2500 | 0.3260 | 1.3040 | 0.5926 |
| 5 | 00:02:00 | 7.2600 | 0.3360 | 1.3440 | 0.5920 |
| 6 | 00:04:00 | 7.2740 | 0.3500 | 1.4000 | 0.5911 |
| 7 | 00:09:20 | 7.2880 | 0.3640 | 1.4560 | 0.5902 |
| 8 | 00:15:00 | 7.2960 | 0.3720 | 1.4880 | 0.5897 |
| 9 | 00:38:20 | 7.3100 | 0.3860 | 1.5440 | 0.5888 |
| 10 | 01:00:00 | 7.3140 | 0.3900 | 1.5600 | 0.5885 |
| 11 | 02:00:00 | 7.3200 | 0.3960 | 1.5840 | 0.5881 |
| 12 | 05:19:00 | 7.3260 | 0.4020 | 1.6080 | 0.5877 |
| 13 | 23:11:00 | 7.3320 | 0.4080 | 1.6320 | 0.5873 |

# Consolidation Test Results
## (Sequence 5) Load 80.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

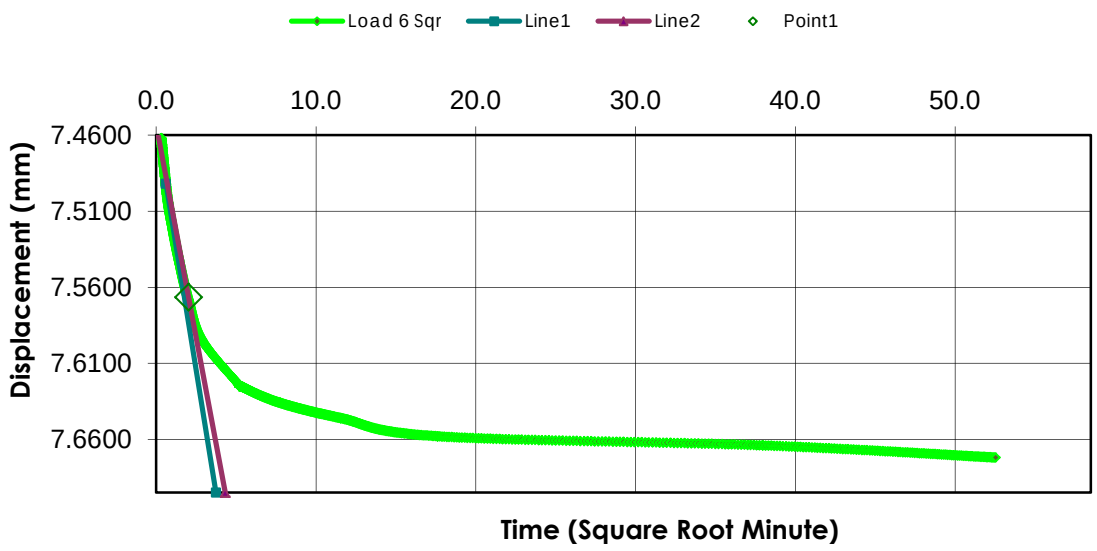
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

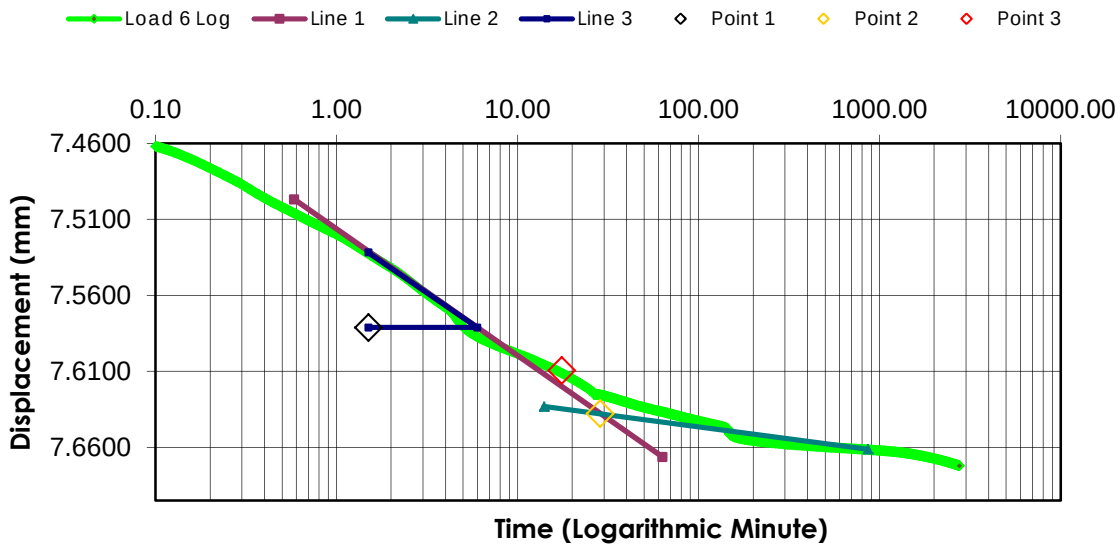
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.3320 | 0.4080 | 1.6320 | 0.5873 |
| 1 | 00:00:06 | 7.4620 | 0.5380 | 2.1520 | 0.5790 |
| 2 | 00:00:15 | 7.4820 | 0.5580 | 2.2320 | 0.5777 |
| 3 | 00:00:30 | 7.5020 | 0.5780 | 2.3120 | 0.5764 |
| 4 | 00:01:00 | 7.5200 | 0.5960 | 2.3840 | 0.5752 |
| 5 | 00:02:00 | 7.5420 | 0.6180 | 2.4720 | 0.5738 |
| 6 | 00:04:00 | 7.5680 | 0.6440 | 2.5760 | 0.5721 |
| 7 | 00:08:00 | 7.5940 | 0.6700 | 2.6800 | 0.5704 |
| 8 | 00:25:00 | 7.6220 | 0.6980 | 2.7920 | 0.5686 |
| 9 | 00:30:00 | 7.6260 | 0.7020 | 2.8080 | 0.5684 |
| 10 | 01:00:00 | 7.6360 | 0.7120 | 2.8480 | 0.5677 |
| 11 | 02:13:00 | 7.6460 | 0.7220 | 2.8880 | 0.5671 |
| 12 | 05:10:00 | 7.6580 | 0.7340 | 2.9360 | 0.5663 |
| 13 | 24:00:00 | 7.6640 | 0.7400 | 2.9600 | 0.5659 |
| 14 | 46:00:00 | 7.6720 | 0.7480 | 2.9920 | 0.5654 |

# Consolidation Test Results
## (Sequence 6) Load 160.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

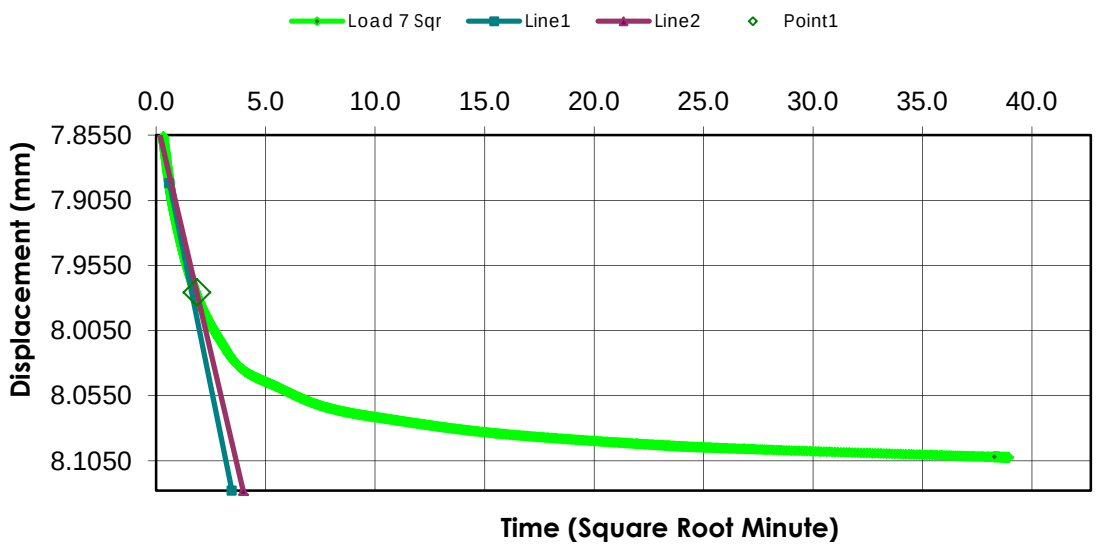
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

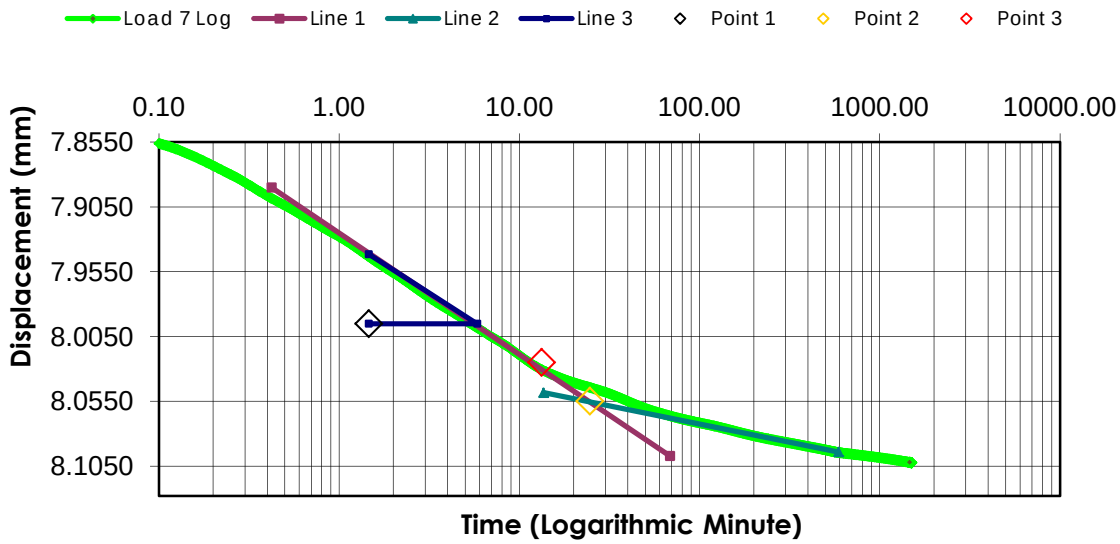
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 7.6720 | 0.7480 | 2.9920 | 0.5654 |
| 1 | 00:00:06 | 7.8560 | 0.9320 | 3.7280 | 0.5535 |
| 2 | 00:00:15 | 7.8800 | 0.9560 | 3.8240 | 0.5520 |
| 3 | 00:00:30 | 7.9040 | 0.9800 | 3.9200 | 0.5504 |
| 4 | 00:01:00 | 7.9280 | 1.0040 | 4.0160 | 0.5489 |
| 5 | 00:02:00 | 7.9560 | 1.0320 | 4.1280 | 0.5471 |
| 6 | 00:04:00 | 7.9840 | 1.0600 | 4.2400 | 0.5453 |
| 7 | 00:08:00 | 8.0100 | 1.0860 | 4.3440 | 0.5436 |
| 8 | 00:15:01 | 8.0340 | 1.1100 | 4.4400 | 0.5420 |
| 9 | 00:30:02 | 8.0480 | 1.1240 | 4.4960 | 0.5411 |
| 10 | 01:00:05 | 8.0640 | 1.1400 | 4.5600 | 0.5401 |
| 11 | 02:00:10 | 8.0740 | 1.1500 | 4.6000 | 0.5394 |
| 12 | 04:00:21 | 8.0840 | 1.1600 | 4.6400 | 0.5388 |
| 13 | 08:00:42 | 8.0920 | 1.1680 | 4.6720 | 0.5383 |
| 14 | 12:01:04 | 8.0960 | 1.1720 | 4.6880 | 0.5380 |
| 15 | 24:02:08 | 8.1020 | 1.1780 | 4.7120 | 0.5376 |
| 16 | 24:25:45 | 8.1020 | 1.1780 | 4.7120 | 0.5376 |

# Consolidation Test Results
## (Sequence 7) Load 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

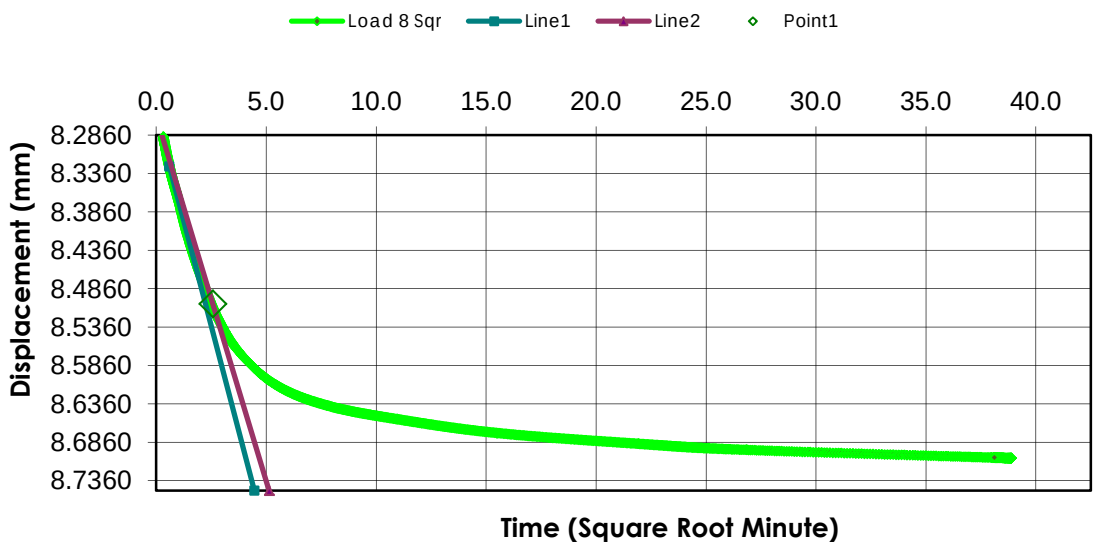
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

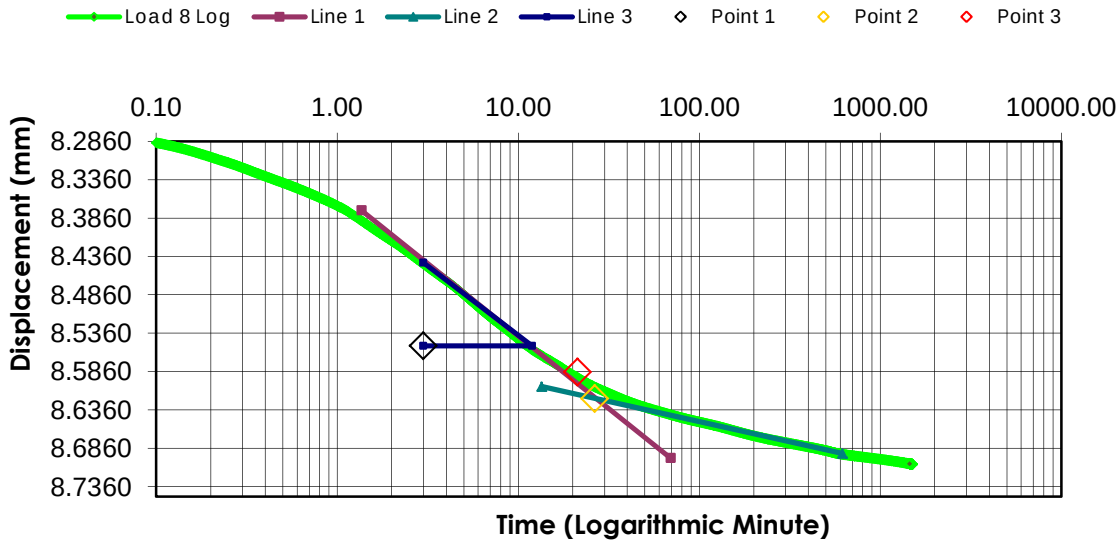
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.1020 | 1.1780 | 4.7120 | 0.5376 |
| 1 | 00:00:06 | 8.2880 | 1.3640 | 5.4560 | 0.5256 |
| 2 | 00:00:15 | 8.3140 | 1.3900 | 5.5600 | 0.5240 |
| 3 | 00:00:30 | 8.3400 | 1.4160 | 5.6640 | 0.5223 |
| 4 | 00:01:00 | 8.3700 | 1.4460 | 5.7840 | 0.5203 |
| 5 | 00:02:00 | 8.4160 | 1.4920 | 5.9680 | 0.5174 |
| 6 | 00:04:01 | 8.4680 | 1.5440 | 6.1760 | 0.5140 |
| 7 | 00:08:01 | 8.5260 | 1.6020 | 6.4080 | 0.5103 |
| 8 | 00:15:02 | 8.5720 | 1.6480 | 6.5920 | 0.5073 |
| 9 | 00:30:03 | 8.6120 | 1.6880 | 6.7520 | 0.5047 |
| 10 | 01:00:06 | 8.6380 | 1.7140 | 6.8560 | 0.5030 |
| 11 | 02:00:11 | 8.6560 | 1.7320 | 6.9280 | 0.5019 |
| 12 | 04:00:22 | 8.6740 | 1.7500 | 7.0000 | 0.5007 |
| 13 | 08:00:43 | 8.6880 | 1.7640 | 7.0560 | 0.4998 |
| 14 | 12:01:04 | 8.6960 | 1.7720 | 7.0880 | 0.4993 |
| 15 | 24:02:08 | 8.7060 | 1.7820 | 7.1280 | 0.4987 |
| 16 | 24:12:26 | 8.7060 | 1.7820 | 7.1280 | 0.4987 |
| 17 | 24:12:28 | 8.7060 | 1.7820 | 7.1280 | 0.4987 |

# Consolidation Test Results
## (Sequence 8) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

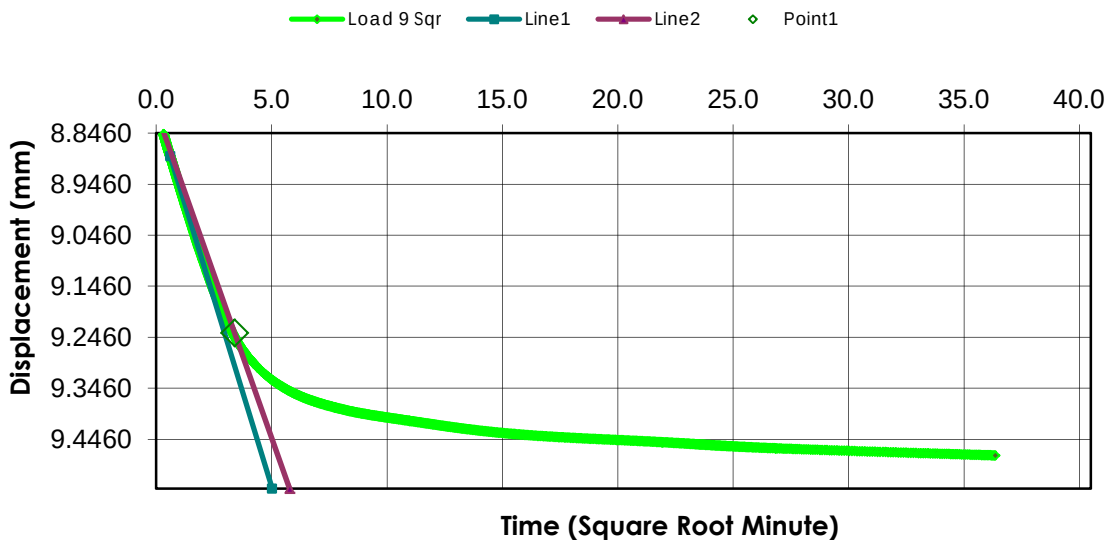
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

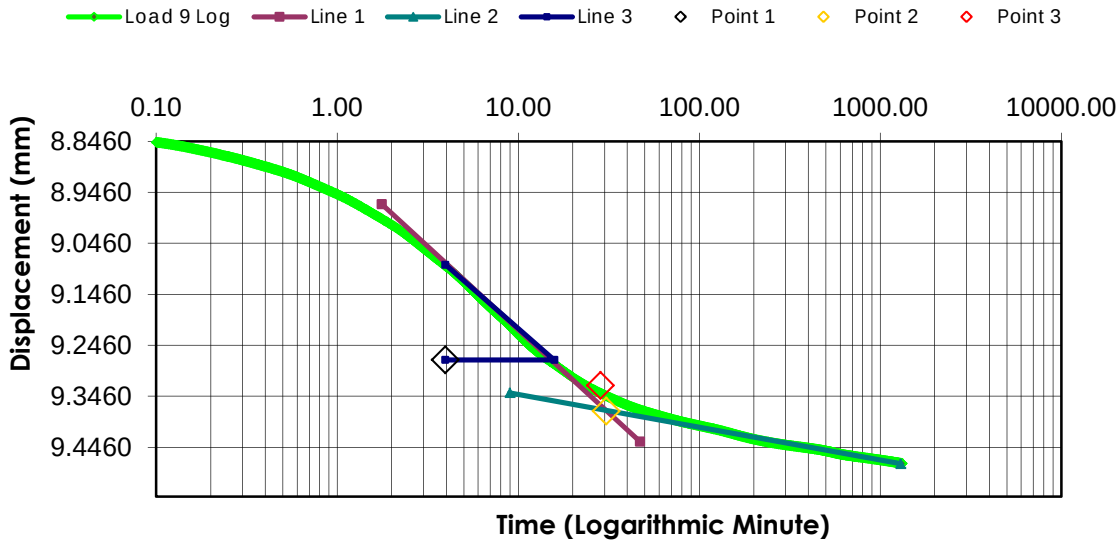
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 8.7060 | 1.7820 | 7.1280 | 0.4987 |
| 1 | 00:00:06 | 8.8480 | 1.9240 | 7.6960 | 0.4895 |
| 2 | 00:00:15 | 8.8760 | 1.9520 | 7.8080 | 0.4877 |
| 3 | 00:00:30 | 8.9060 | 1.9820 | 7.9280 | 0.4857 |
| 4 | 00:01:00 | 8.9500 | 2.0260 | 8.1040 | 0.4829 |
| 5 | 00:02:00 | 9.0100 | 2.0860 | 8.3440 | 0.4790 |
| 6 | 00:04:00 | 9.0920 | 2.1680 | 8.6720 | 0.4737 |
| 7 | 00:08:01 | 9.1920 | 2.2680 | 9.0720 | 0.4673 |
| 8 | 00:15:01 | 9.2780 | 2.3540 | 9.4160 | 0.4617 |
| 9 | 00:30:03 | 9.3440 | 2.4200 | 9.6800 | 0.4575 |
| 10 | 01:00:05 | 9.3840 | 2.4600 | 9.8400 | 0.4549 |
| 11 | 02:00:10 | 9.4100 | 2.4860 | 9.9440 | 0.4532 |
| 12 | 04:00:21 | 9.4360 | 2.5120 | 10.0480 | 0.4515 |
| 13 | 08:00:42 | 9.4520 | 2.5280 | 10.1120 | 0.4505 |
| 14 | 12:01:03 | 9.4640 | 2.5400 | 10.1600 | 0.4497 |
| 15 | 22:02:13 | 9.4780 | 2.5540 | 10.2160 | 0.4488 |

# Consolidation Test Results
## (Sequence 9) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

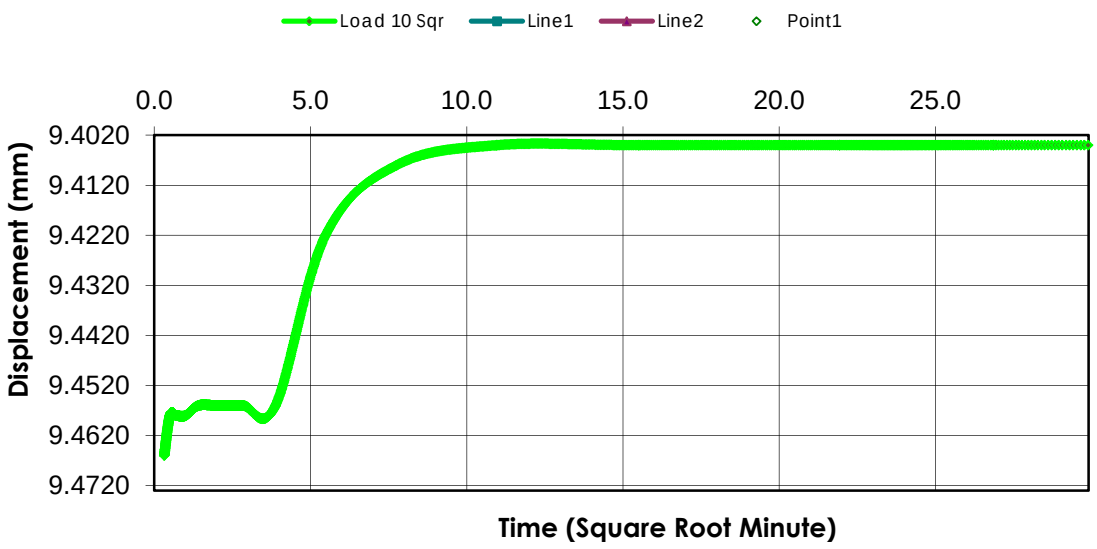
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

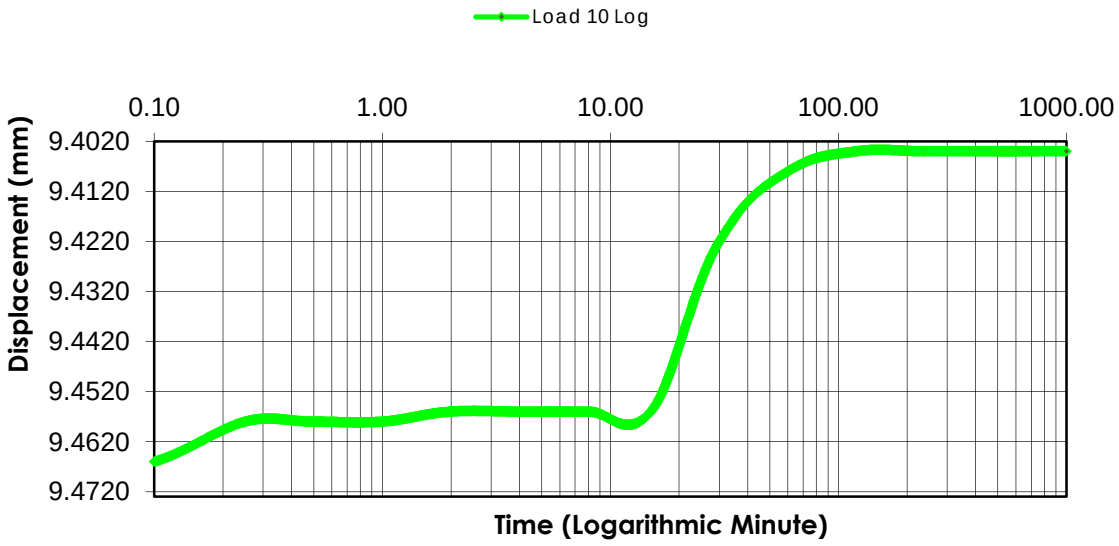
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.4780 | 2.5540 | 10.2160 | 0.4488 |
| 1 | 00:00:06 | 9.4660 | 2.5420 | 10.1680 | 0.4496 |
| 2 | 00:00:15 | 9.4580 | 2.5340 | 10.1360 | 0.4501 |
| 3 | 00:00:30 | 9.4580 | 2.5340 | 10.1360 | 0.4501 |
| 4 | 00:01:00 | 9.4580 | 2.5340 | 10.1360 | 0.4501 |
| 5 | 00:02:00 | 9.4560 | 2.5320 | 10.1280 | 0.4502 |
| 6 | 00:04:01 | 9.4560 | 2.5320 | 10.1280 | 0.4502 |
| 7 | 00:08:01 | 9.4560 | 2.5320 | 10.1280 | 0.4502 |
| 8 | 00:15:02 | 9.4560 | 2.5320 | 10.1280 | 0.4502 |
| 9 | 00:30:03 | 9.4220 | 2.4980 | 9.9920 | 0.4524 |
| 10 | 01:00:06 | 9.4080 | 2.4840 | 9.9360 | 0.4533 |
| 11 | 02:00:11 | 9.4040 | 2.4800 | 9.9200 | 0.4536 |
| 12 | 04:00:20 | 9.4040 | 2.4800 | 9.9200 | 0.4536 |
| 13 | 08:00:32 | 9.4040 | 2.4800 | 9.9200 | 0.4536 |
| 14 | 12:00:54 | 9.4040 | 2.4800 | 9.9200 | 0.4536 |
| 15 | 23:27:32 | 9.4040 | 2.4800 | 9.9200 | 0.4536 |

# Consolidation Test Results
## (Sequence 10) Rebound 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

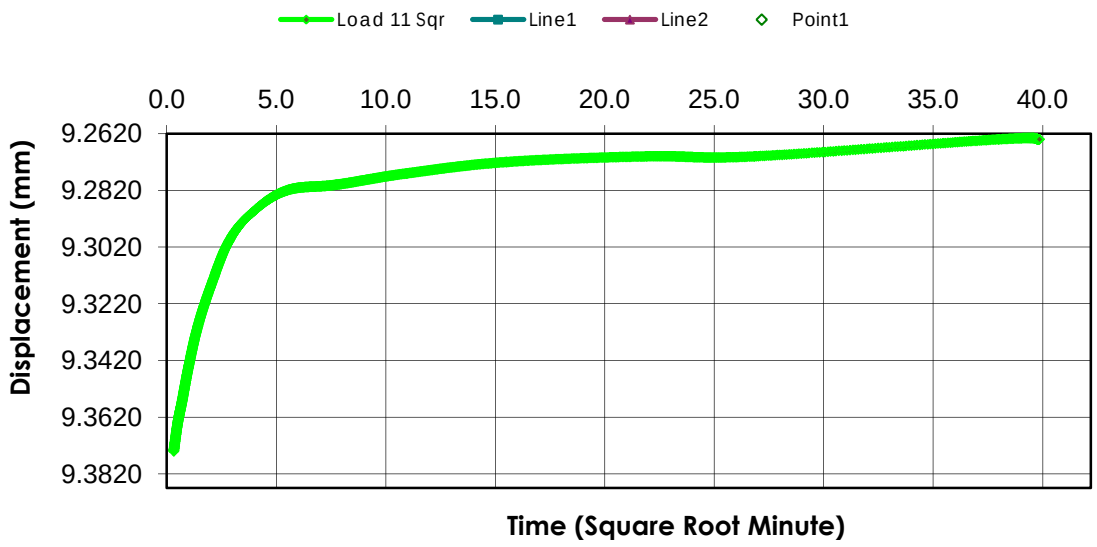
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

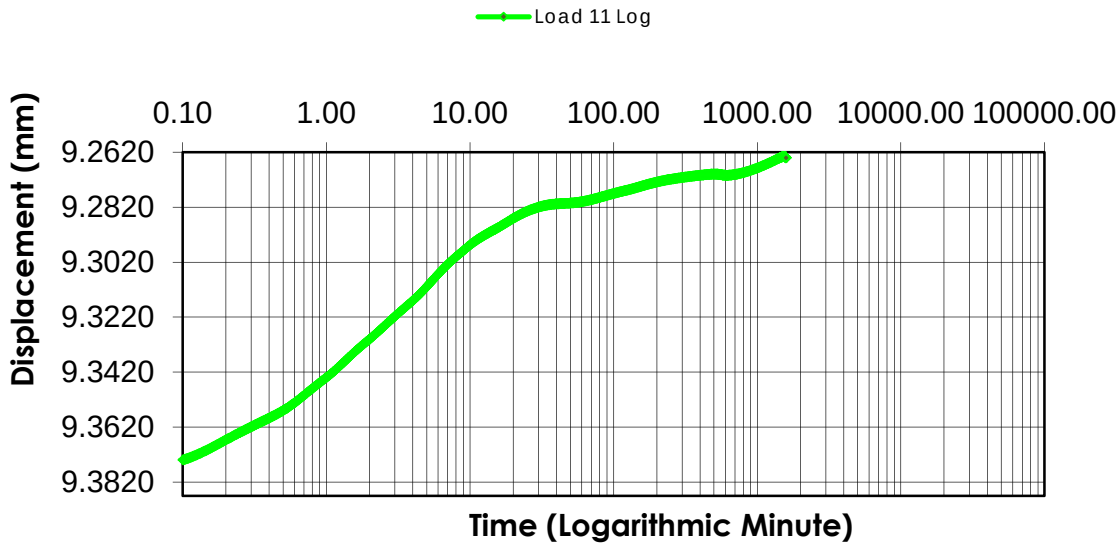
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.4040 | 2.4800 | 9.9200 | 0.4536 |
| 1 | 00:00:06 | 9.3740 | 2.4500 | 9.8000 | 0.4555 |
| 2 | 00:00:15 | 9.3640 | 2.4400 | 9.7600 | 0.4562 |
| 3 | 00:00:30 | 9.3560 | 2.4320 | 9.7280 | 0.4567 |
| 4 | 00:01:00 | 9.3440 | 2.4200 | 9.6800 | 0.4575 |
| 5 | 00:02:00 | 9.3300 | 2.4060 | 9.6240 | 0.4584 |
| 6 | 00:04:00 | 9.3160 | 2.3920 | 9.5680 | 0.4593 |
| 7 | 00:08:01 | 9.3000 | 2.3760 | 9.5040 | 0.4603 |
| 8 | 00:15:01 | 9.2900 | 2.3660 | 9.4640 | 0.4610 |
| 9 | 00:30:02 | 9.2820 | 2.3580 | 9.4320 | 0.4615 |
| 10 | 01:00:05 | 9.2800 | 2.3560 | 9.4240 | 0.4616 |
| 11 | 02:00:10 | 9.2760 | 2.3520 | 9.4080 | 0.4619 |
| 12 | 04:00:21 | 9.2720 | 2.3480 | 9.3920 | 0.4621 |
| 13 | 08:00:42 | 9.2700 | 2.3460 | 9.3840 | 0.4622 |
| 14 | 12:01:03 | 9.2700 | 2.3460 | 9.3840 | 0.4622 |
| 15 | 24:02:07 | 9.2640 | 2.3400 | 9.3600 | 0.4626 |
| 16 | 26:28:26 | 9.2640 | 2.3400 | 9.3600 | 0.4626 |

# Consolidation Test Results
## (Sequence 11) Rebound 320.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

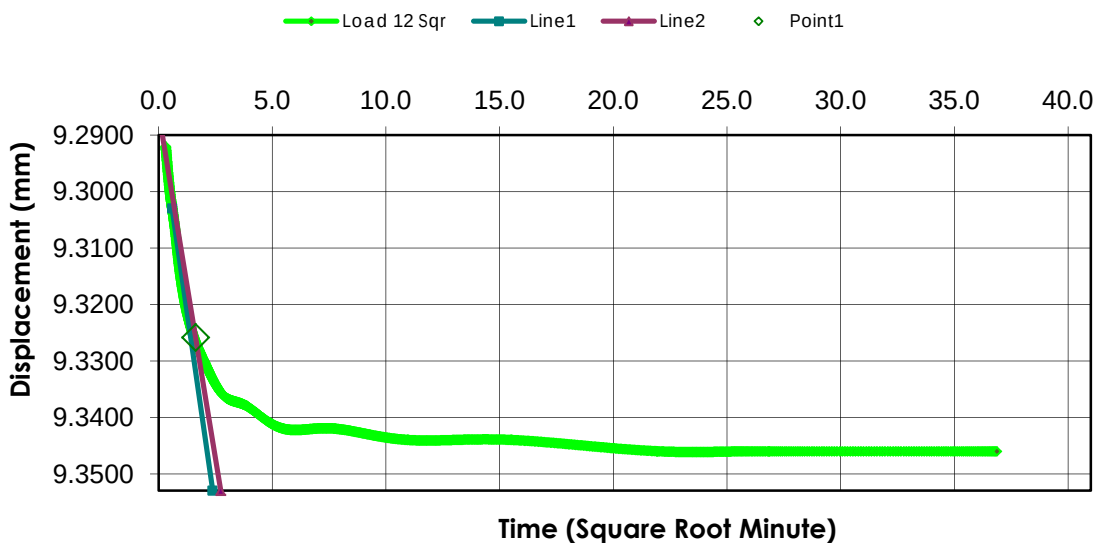
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

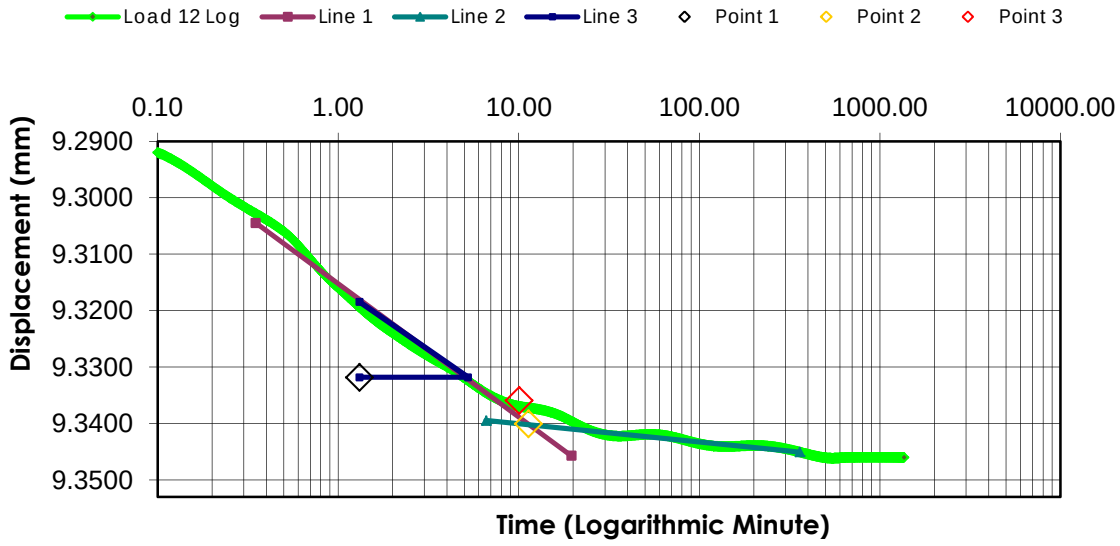
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.2640 | 2.3400 | 9.3600 | 0.4626 |
| 1 | 00:00:06 | 9.2920 | 2.3680 | 9.4720 | 0.4608 |
| 2 | 00:00:15 | 9.3000 | 2.3760 | 9.5040 | 0.4603 |
| 3 | 00:00:30 | 9.3060 | 2.3820 | 9.5280 | 0.4599 |
| 4 | 00:01:00 | 9.3160 | 2.3920 | 9.5680 | 0.4593 |
| 5 | 00:02:00 | 9.3240 | 2.4000 | 9.6000 | 0.4588 |
| 6 | 00:04:01 | 9.3300 | 2.4060 | 9.6240 | 0.4584 |
| 7 | 00:08:01 | 9.3360 | 2.4120 | 9.6480 | 0.4580 |
| 8 | 00:15:02 | 9.3380 | 2.4140 | 9.6560 | 0.4579 |
| 9 | 00:30:03 | 9.3420 | 2.4180 | 9.6720 | 0.4576 |
| 10 | 01:00:06 | 9.3420 | 2.4180 | 9.6720 | 0.4576 |
| 11 | 02:00:11 | 9.3440 | 2.4200 | 9.6800 | 0.4575 |
| 12 | 04:00:22 | 9.3440 | 2.4200 | 9.6800 | 0.4575 |
| 13 | 08:00:43 | 9.3460 | 2.4220 | 9.6880 | 0.4573 |
| 14 | 12:01:04 | 9.3460 | 2.4220 | 9.6880 | 0.4573 |
| 15 | 22:39:21 | 9.3460 | 2.4220 | 9.6880 | 0.4573 |

# Consolidation Test Results
## (Sequence 12) Load 640.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** 302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

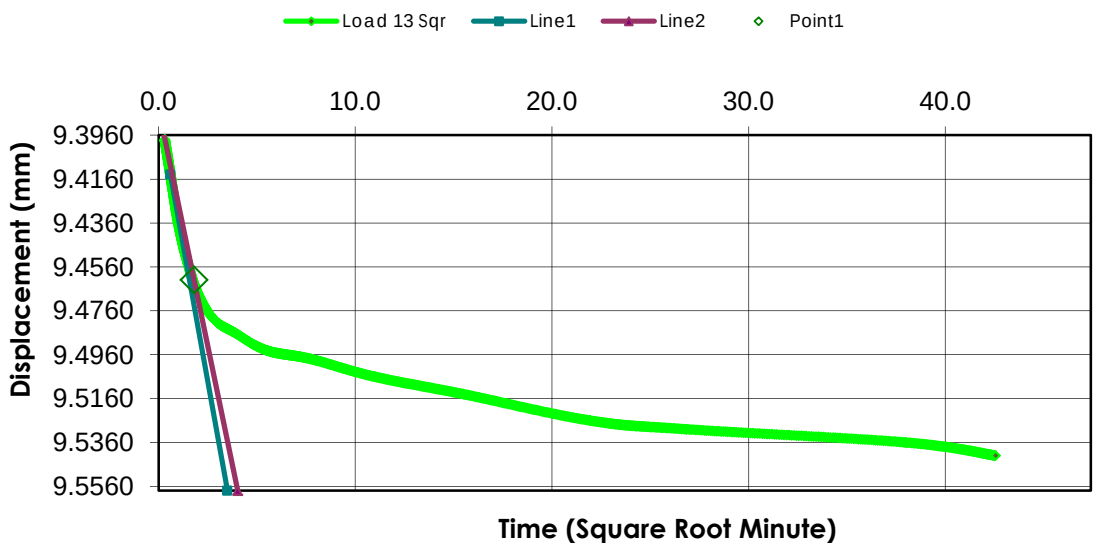
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

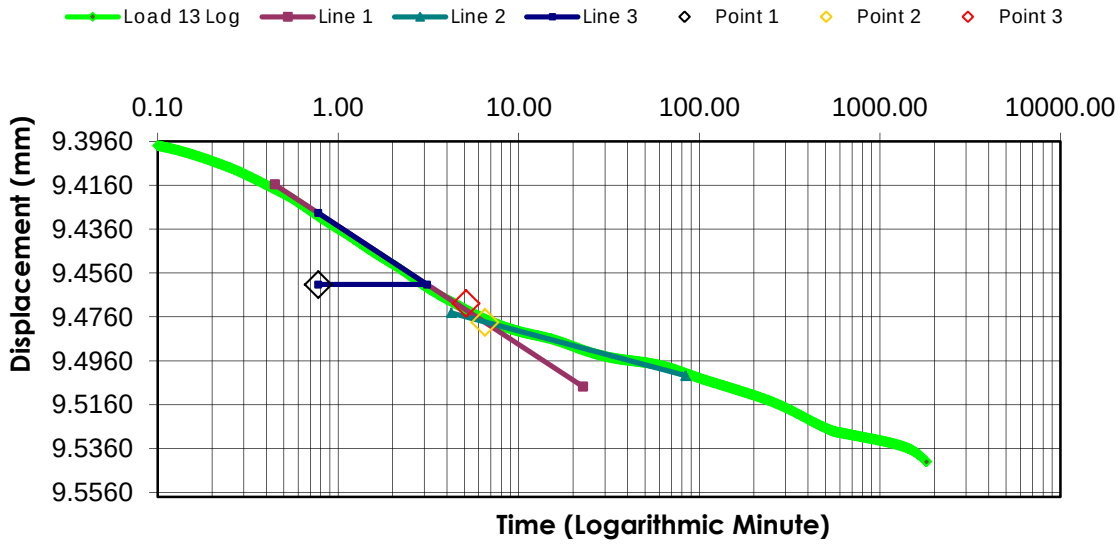
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.3460 | 2.4220 | 9.6880 | 0.4573 |
| 1 | 00:00:06 | 9.3980 | 2.4740 | 9.8960 | 0.4540 |
| 2 | 00:00:15 | 9.4080 | 2.4840 | 9.9360 | 0.4533 |
| 3 | 00:00:30 | 9.4200 | 2.4960 | 9.9840 | 0.4526 |
| 4 | 00:01:00 | 9.4360 | 2.5120 | 10.0480 | 0.4515 |
| 5 | 00:02:00 | 9.4520 | 2.5280 | 10.1120 | 0.4505 |
| 6 | 00:04:00 | 9.4680 | 2.5440 | 10.1760 | 0.4495 |
| 7 | 00:08:00 | 9.4800 | 2.5560 | 10.2240 | 0.4487 |
| 8 | 00:15:01 | 9.4860 | 2.5620 | 10.2480 | 0.4483 |
| 9 | 00:30:02 | 9.4940 | 2.5700 | 10.2800 | 0.4478 |
| 10 | 01:00:04 | 9.4980 | 2.5740 | 10.2960 | 0.4475 |
| 11 | 02:00:08 | 9.5060 | 2.5820 | 10.3280 | 0.4470 |
| 12 | 04:00:17 | 9.5140 | 2.5900 | 10.3600 | 0.4465 |
| 13 | 08:00:35 | 9.5260 | 2.6020 | 10.4080 | 0.4457 |
| 14 | 12:00:52 | 9.5300 | 2.6060 | 10.4240 | 0.4455 |
| 15 | 24:01:44 | 9.5360 | 2.6120 | 10.4480 | 0.4451 |
| 16 | 30:10:54 | 9.5420 | 2.6180 | 10.4720 | 0.4447 |

# Consolidation Test Results
## (Sequence 13) Load 1280.000 kpa

### Consolidation Graph (Squareroot Time)




### Consolidation Graph (Logarithmic Time)



# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

**Project:** SR1
**Location:**
**Job Number:**

**Project Number:** .302.702.230
**Test Date:** 31-Aug-16
**Test Number:**

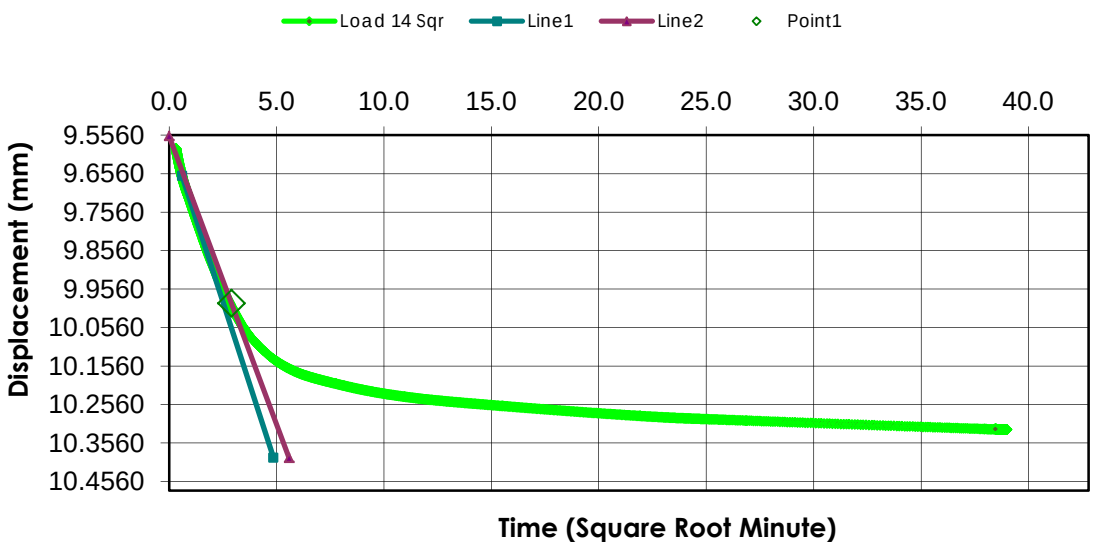
**Sample Number:** D68 ST15
**Boring Number:**
**Depth:** 7.6-8.1m
**Sample Type:** Undisturbed

**Soil Description:** Brown Clay, Trace Gravel
**Remarks:**

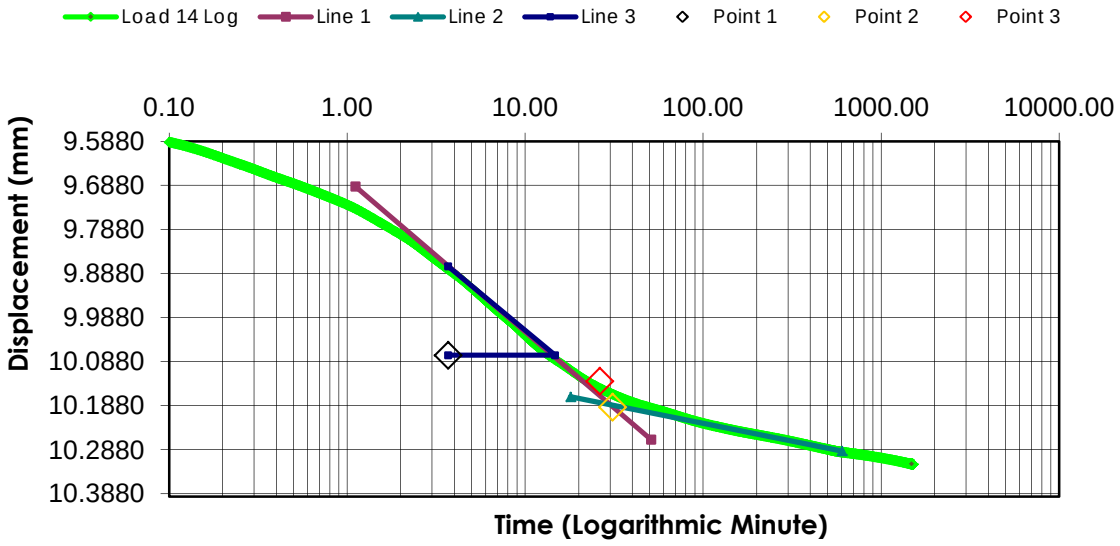
| Index | Time | Displacement (mm) | Settlement (mm) | Axial Strain (%) | Void Ratio |
|---|---|---|---|---|---|
| 0 | 00:00:00 | 9.5420 | 2.6180 | 10.4720 | 0.4447 |
| 1 | 00:00:06 | 9.5900 | 2.6660 | 10.6640 | 0.4416 |
| 2 | 00:00:15 | 9.6400 | 2.7160 | 10.8640 | 0.4384 |
| 3 | 00:00:30 | 9.6840 | 2.7600 | 11.0400 | 0.4355 |
| 4 | 00:01:00 | 9.7320 | 2.8080 | 11.2320 | 0.4324 |
| 5 | 00:02:00 | 9.8000 | 2.8760 | 11.5040 | 0.4280 |
| 6 | 00:04:01 | 9.8900 | 2.9660 | 11.8640 | 0.4222 |
| 7 | 00:08:01 | 9.9940 | 3.0700 | 12.2800 | 0.4155 |
| 8 | 00:15:01 | 10.0860 | 3.1620 | 12.6480 | 0.4096 |
| 9 | 00:30:02 | 10.1600 | 3.2360 | 12.9440 | 0.4048 |
| 10 | 01:00:05 | 10.2020 | 3.2780 | 13.1120 | 0.4021 |
| 11 | 02:00:09 | 10.2360 | 3.3120 | 13.2480 | 0.3999 |
| 12 | 04:00:18 | 10.2600 | 3.3360 | 13.3440 | 0.3983 |
| 13 | 08:00:35 | 10.2860 | 3.3620 | 13.4480 | 0.3967 |
| 14 | 12:00:52 | 10.2980 | 3.3740 | 13.4960 | 0.3959 |
| 15 | 24:01:48 | 10.3200 | 3.3960 | 13.5840 | 0.3945 |
| 16 | 24:38:49 | 10.3200 | 3.3960 | 13.5840 | 0.3945 |

# Consolidation Test Results
## (Sequence 14) Load 2560.000 kpa

### Consolidation Graph (Squareroot Time)



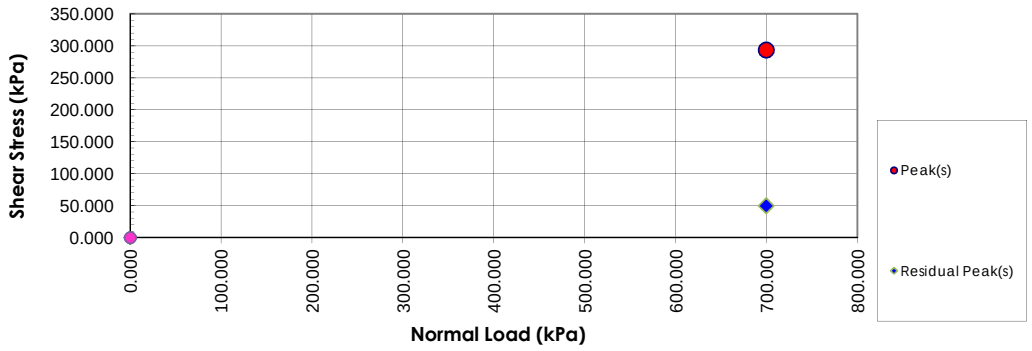

### Consolidation Graph (Logarithmic Time)

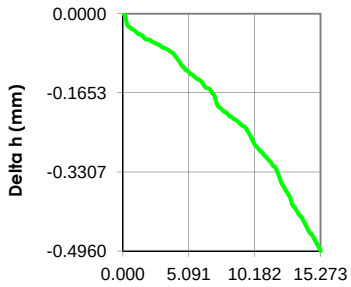


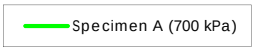
# Stantec Consulting Ltd.

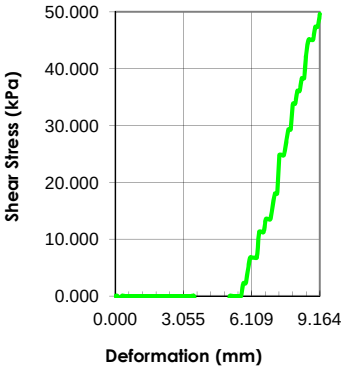
## Direct Shear Test

Stantec




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 12.8 | | | |
| Density (g/cm3) | 1.832 | | | |
| Void Ratio | 0.474 | | | |
| Saturation (%) | 72.82 | | | |
| Diameter (mm) | 60.0 | | | |
| Height (mm) | 25.4 | | | |
| | | | | |

| Final | A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 10.8 | | | |
| Density (g/cm3) | 1.83 | | | |
| Void Ratio | 0.473 | | | |
| Saturation (%) | 100.00 | | | |
| Diameter (mm) | 60.0 | | | |
| Height (mm) | 21.752 | | | |
| Normal Stress (kPa) | 700.0 | | | |
| Peak Stress (kPa) | 293.1 | | | |
| Residual Stress (kPa) | 49.6 | | | |
| Strain (%) | 15.273 | | | |
| Rate (mm/min) | 0.008 | | | |
| | | | | |

| Project Date | |
|---|---|
| Date | 06-May-16 |

| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 10773396.302.702.230 |
| **Boring Number** | - |
| **Sample Number:** | D10-RC24 |
| **Depth:** | - |
| **Sample Type:** | Undisturbed |
| **Description:** | Grey Clay |
| **Test Type:** | Direct Shear |
| **Remarks:** | - |

Reviewed By: C.Lamoureux

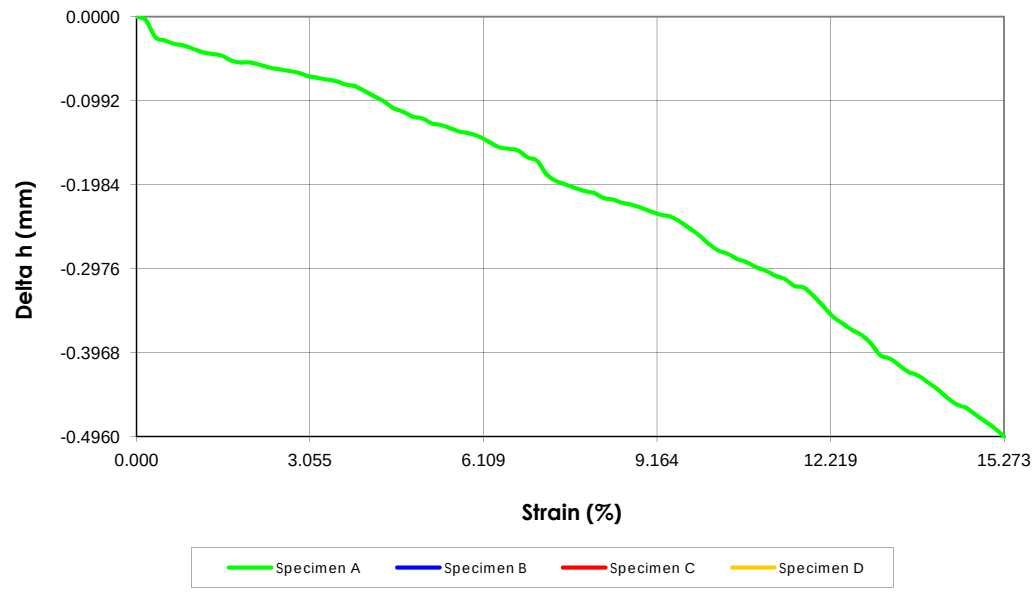
Date: 6-May-16

Tested By: C.Tollifson

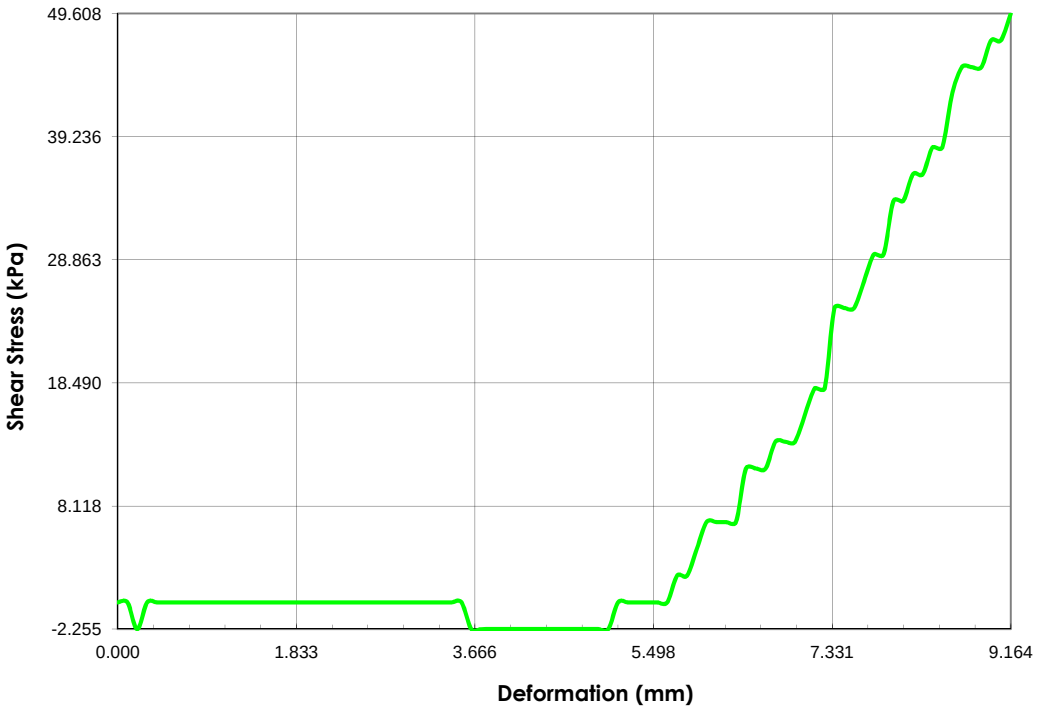
**Stantec Consulting Ltd.**
**Direct Shear Test**

Stantec

## Delta h




## Stress-Deformation



**Stantec Consulting Ltd.**
**Direct Shear Test**

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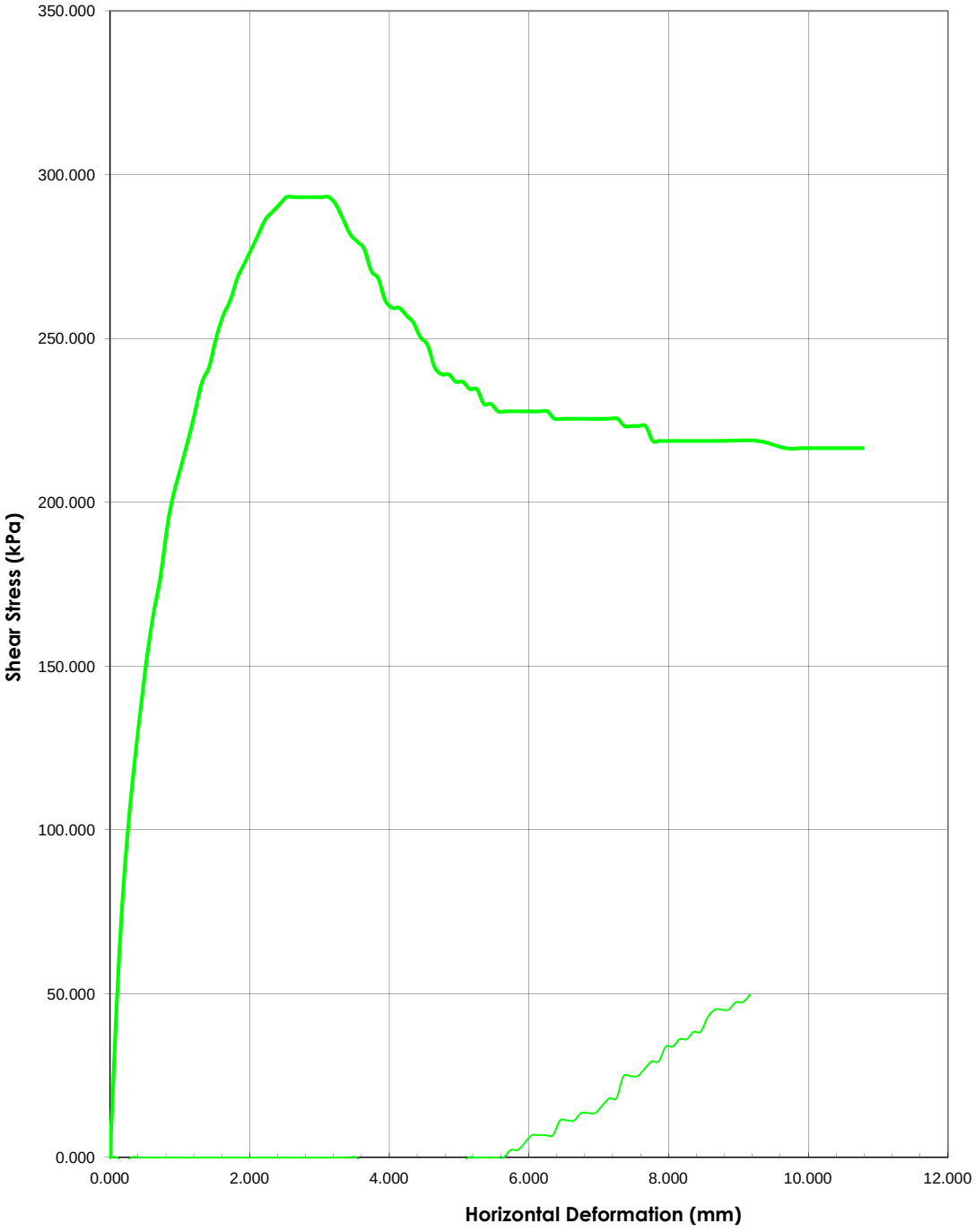
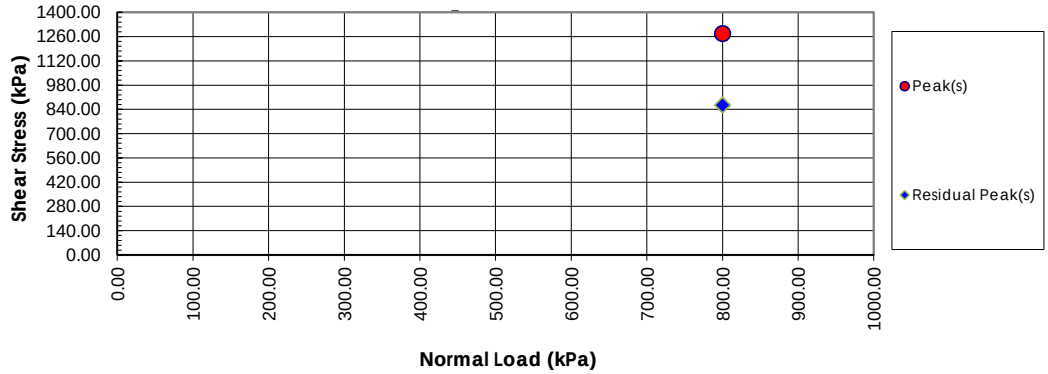
## Specimen A Stress-Deformation

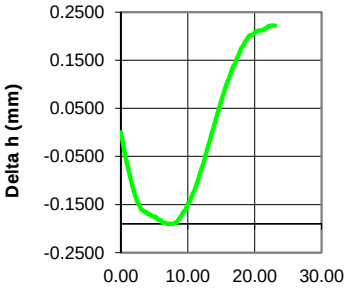


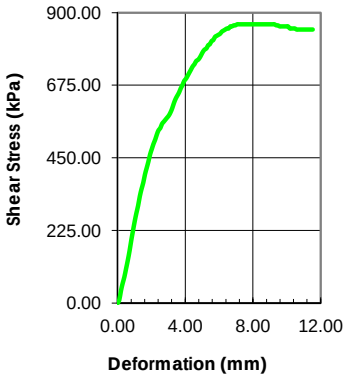
## Stantec Consulting Ltd.

### Direct Shear Test

Stantec




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 5.0 | | | |
| Density (g/cm3) | 1.916 | | | |
| Void Ratio | 0.409 | | | |
| Saturation (%) | 32.68 | | | |
| Diameter (mm) | 50.000 | | | |
| Height (mm) | 38.500 | | | |
| | | | | |

| Final | A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 3.2 | | | |
| Density (g/cm3) | 1.935 | | | |
| Void Ratio | 0.396 | | | |
| Saturation (%) | 26.38 | | | |
| Diameter (mm) | 50.000 | | | |
| Height (mm) | 36.574 | | | |
| Normal Stress (kPa) | 800.0 | | | |
| Peak Stress (kPa) | 1276.1 | | | |
| Residual Stress (kPa) | 863.7 | | | |
| Strain (%) | 23.068 | | | |
| Rate (mm/min) | 0.008 | | | |
| | | | | |

| Project Date | |
|---|---|
| Date | 3-Aug-16 |

| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number** | - |
| **Sample Number:** | D46 RC23 |
| **Depth:** | 15.23-15.25m |
| **Sample Type:** | Undisturbed |
| **Description:** | Grey Mudstone |
| **Test Type:** | Direct Shear |
| **Remarks:** | |

Reviewed By: C. Lamoureux

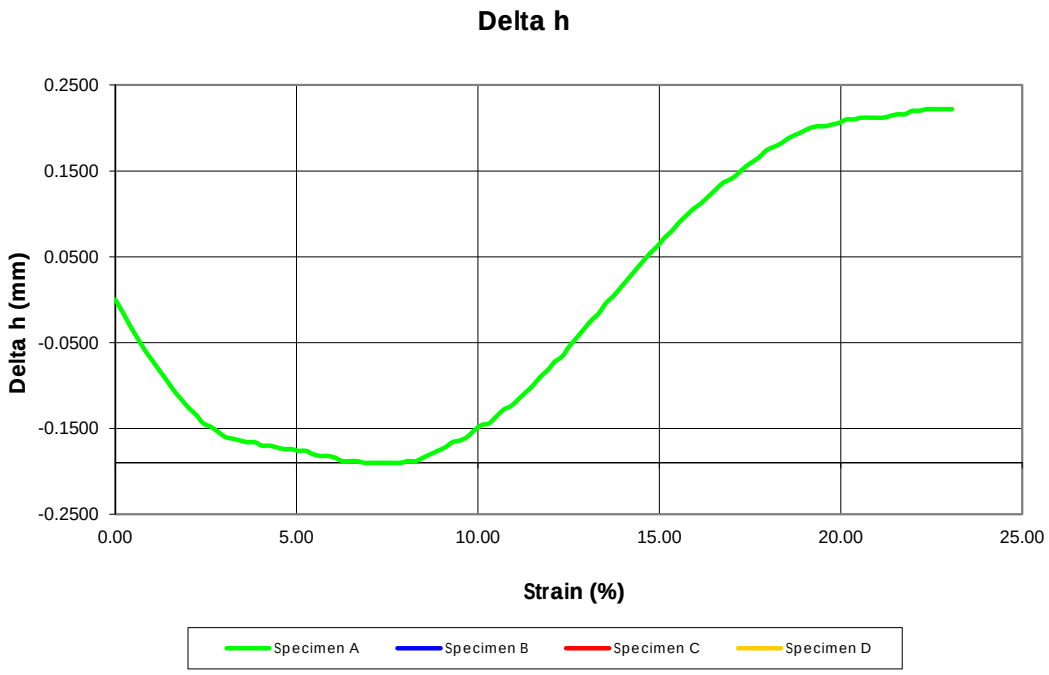
Date: 3-Aug-16

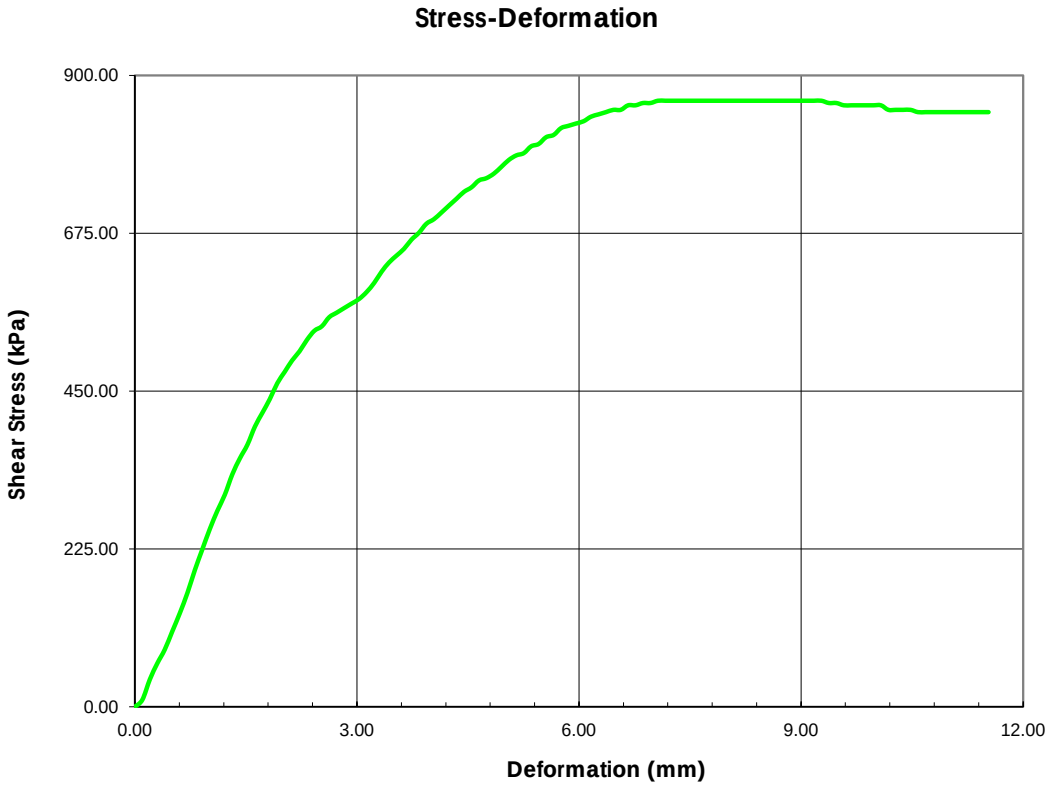
Tested By: C. Oost

**Stantec Consulting Ltd.**

**Direct Shear Test**

Stantec

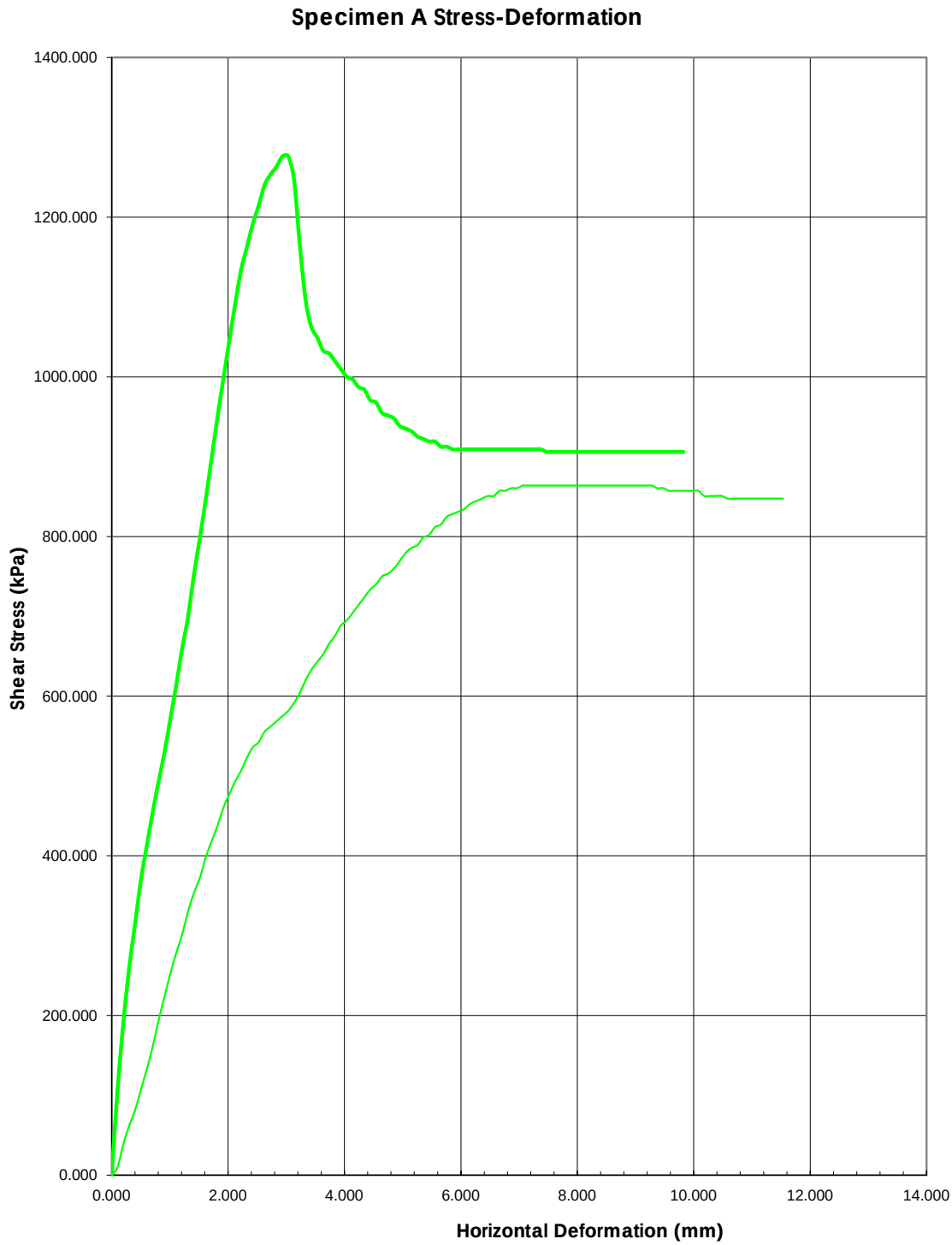


**Stantec Consulting Ltd.**

**Direct Shear Test**

Stantec



| Specimen A Consolidation<br>Direct Shear Test | Stantec Consulting Ltd. |
|---|---|

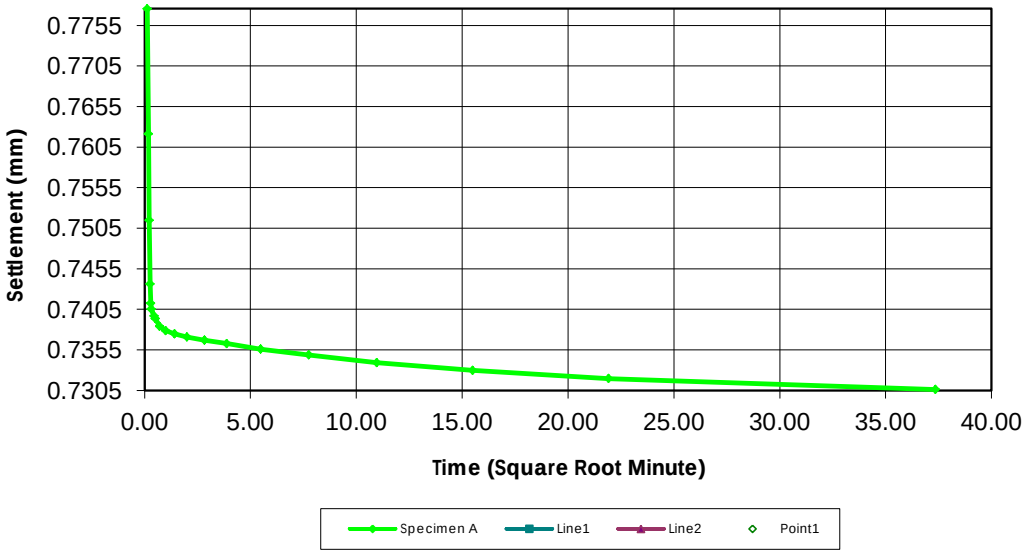
File Location
lab_110773396_dsh_d46rc23a.HSD

**Last Consolidation Sequence**

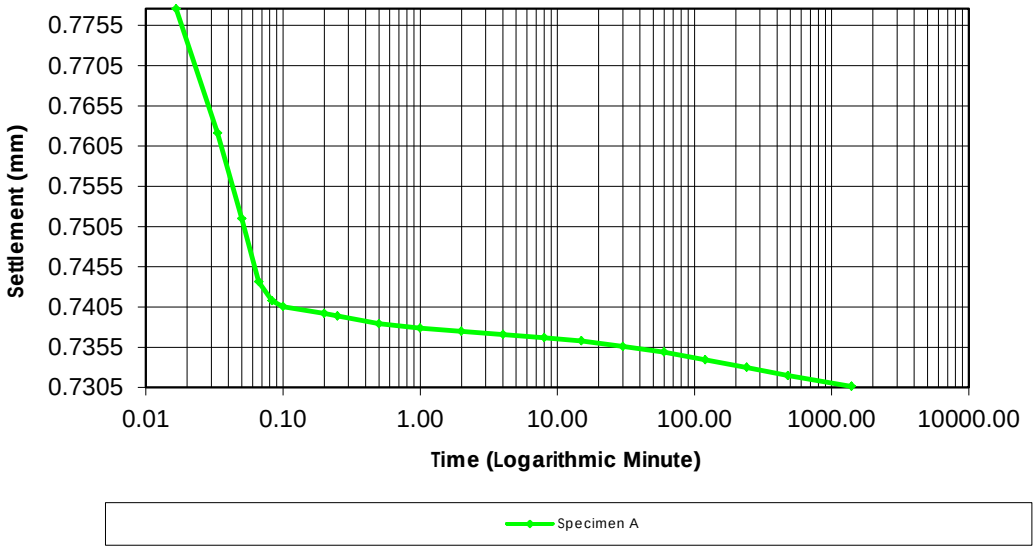
| Reading Number | Time | Disp. (mm) | Settlement (mm) | Void Ratio |
|---|---|---|---|---|
| 0.0 | 00:00:00 | 0.8065 | 0.0000 | 0.4094 |
| 1.0 | 00:00:01 | 0.7776 | 0.0289 | 0.3789 |
| 2.0 | 00:00:02 | 0.7621 | 0.0443 | 0.3646 |
| 3.0 | 00:00:03 | 0.7515 | 0.0550 | 0.3547 |
| 4.0 | 00:00:04 | 0.7436 | 0.0628 | 0.3474 |
| 5.0 | 00:00:05 | 0.7413 | 0.0652 | 0.3453 |
| 6.0 | 00:00:06 | 0.7406 | 0.0659 | 0.3446 |
| 7.0 | 00:00:12 | 0.7397 | 0.0668 | 0.3438 |
| 8.0 | 00:00:15 | 0.7394 | 0.0671 | 0.3435 |
| 9.0 | 00:00:30 | 0.7384 | 0.0680 | 0.3426 |
| 10.0 | 00:01:00 | 0.7379 | 0.0686 | 0.3421 |
| 11.0 | 00:02:00 | 0.7375 | 0.0690 | 0.3417 |
| 12.0 | 00:04:01 | 0.7371 | 0.0694 | 0.3414 |
| 13.0 | 00:08:01 | 0.7367 | 0.0698 | 0.3410 |
| 14.0 | 00:15:01 | 0.7363 | 0.0702 | 0.3407 |
| 15.0 | 00:30:02 | 0.7356 | 0.0709 | 0.3400 |
| 16.0 | 01:00:04 | 0.7349 | 0.0716 | 0.3393 |
| 17.0 | 02:00:08 | 0.7339 | 0.0725 | 0.3385 |
| 18.0 | 04:00:16 | 0.7330 | 0.0735 | 0.3376 |
| 19.0 | 08:00:32 | 0.7320 | 0.0745 | 0.3366 |
| 20.0 | 23:15:57 | 0.7306 | 0.0758 | 0.3354 |

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)



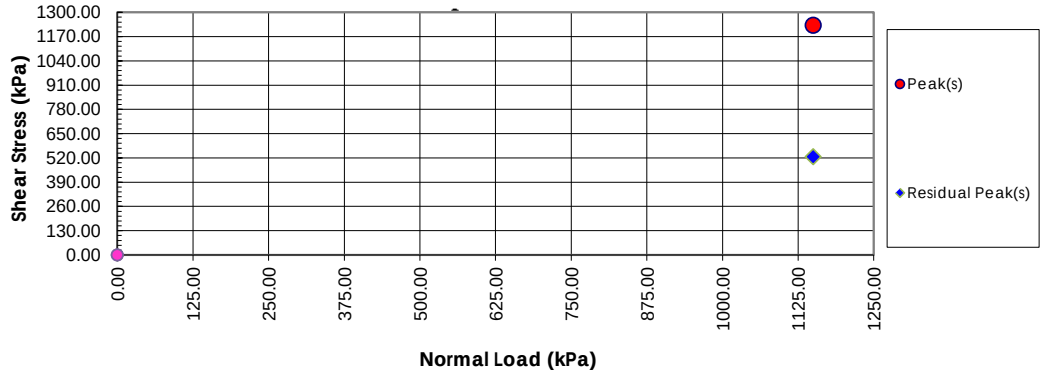

## Consolidation Graph (Logarithmic Time)

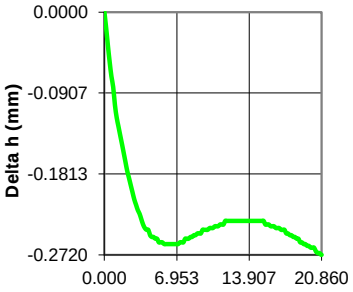


## Stantec Consulting Ltd.

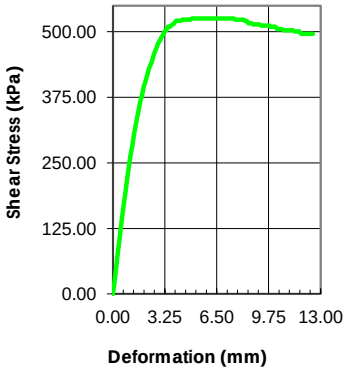
### Direct Shear Test

Stantec




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 6.11 | | | |
| Density (g/cm3) | 2.34 | | | |
| Void Ratio | 0.152 | | | |
| Saturation (%) | 100.00 | | | |
| Diameter (mm) | 50.000 | | | |
| Height (mm) | 28.720 | | | |
| | | | | |




| Final | A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 5.95 | | | |
| Density (g/cm3) | 2.34 | | | |
| Void Ratio | 0.151 | | | |
| Saturation (%) | 100.00 | | | |
| Diameter (mm) | 50.000 | | | |
| Height (mm) | 26.388 | | | |
| Normal Stress (kPa) | 1150.0 | | | |
| Peak Stress (kPa) | 1230.6 | | | |
| Residual Stress (kPa) | 525.4 | | | |
| Strain (%) | 20.860 | | | |
| Rate (mm/min) | 0.008 | | | |
| | | | | |

| Project Date | |
|---|---|
| Date | 29-Jul-16 |

| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number** | - |
| **Sample Number:** | D46 RC23 |
| **Depth:** | 15.47-15.49m |
| **Sample Type:** | Undisturbed |
| **Description:** | Grey Mudstone |
| **Test Type:** | Direct Shear |
| **Remarks:** | |

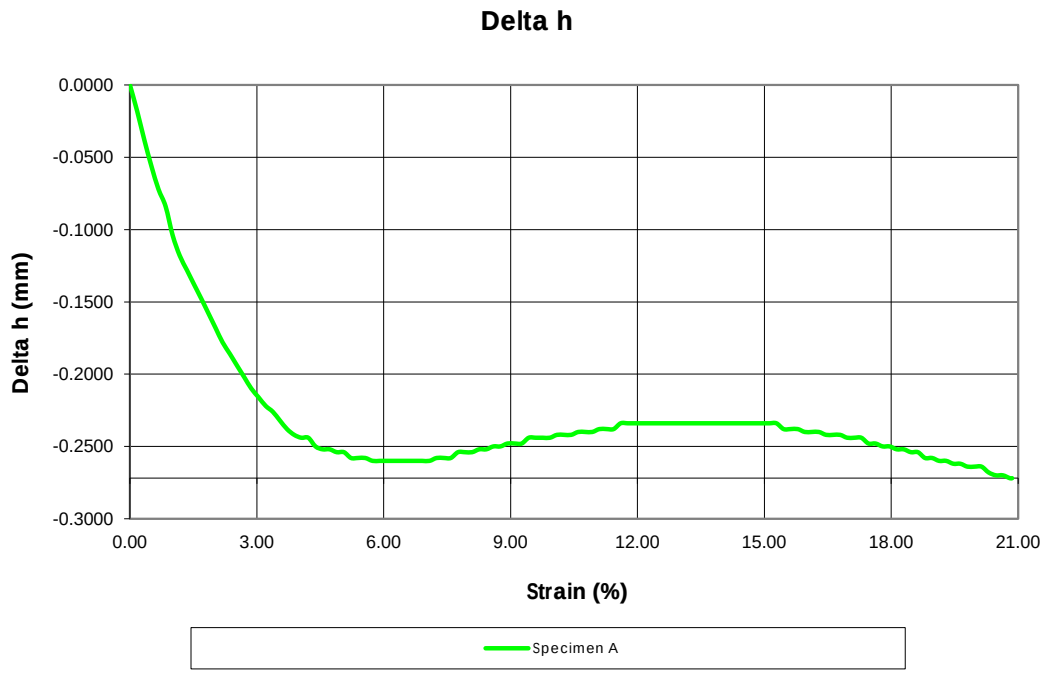
Reviewed By: C. Lamoureux

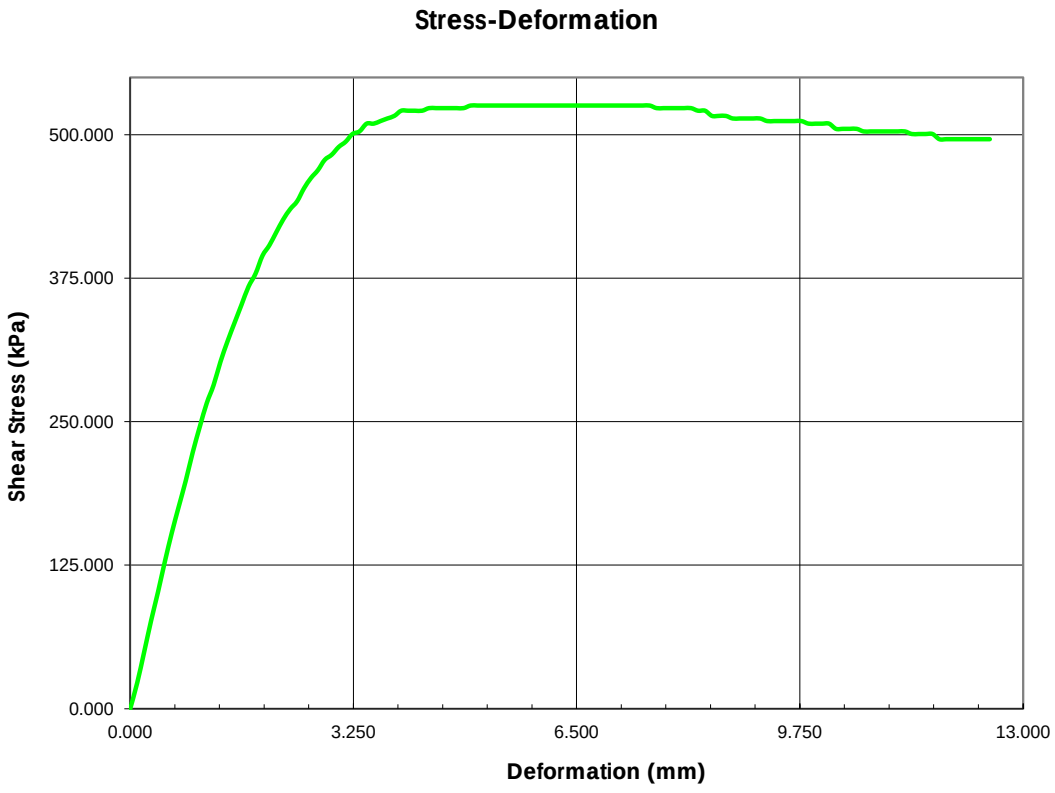
Date: 29-Jul-16

Tested By: C. Oost

**Stantec Consulting Ltd.**

**Direct Shear Test**

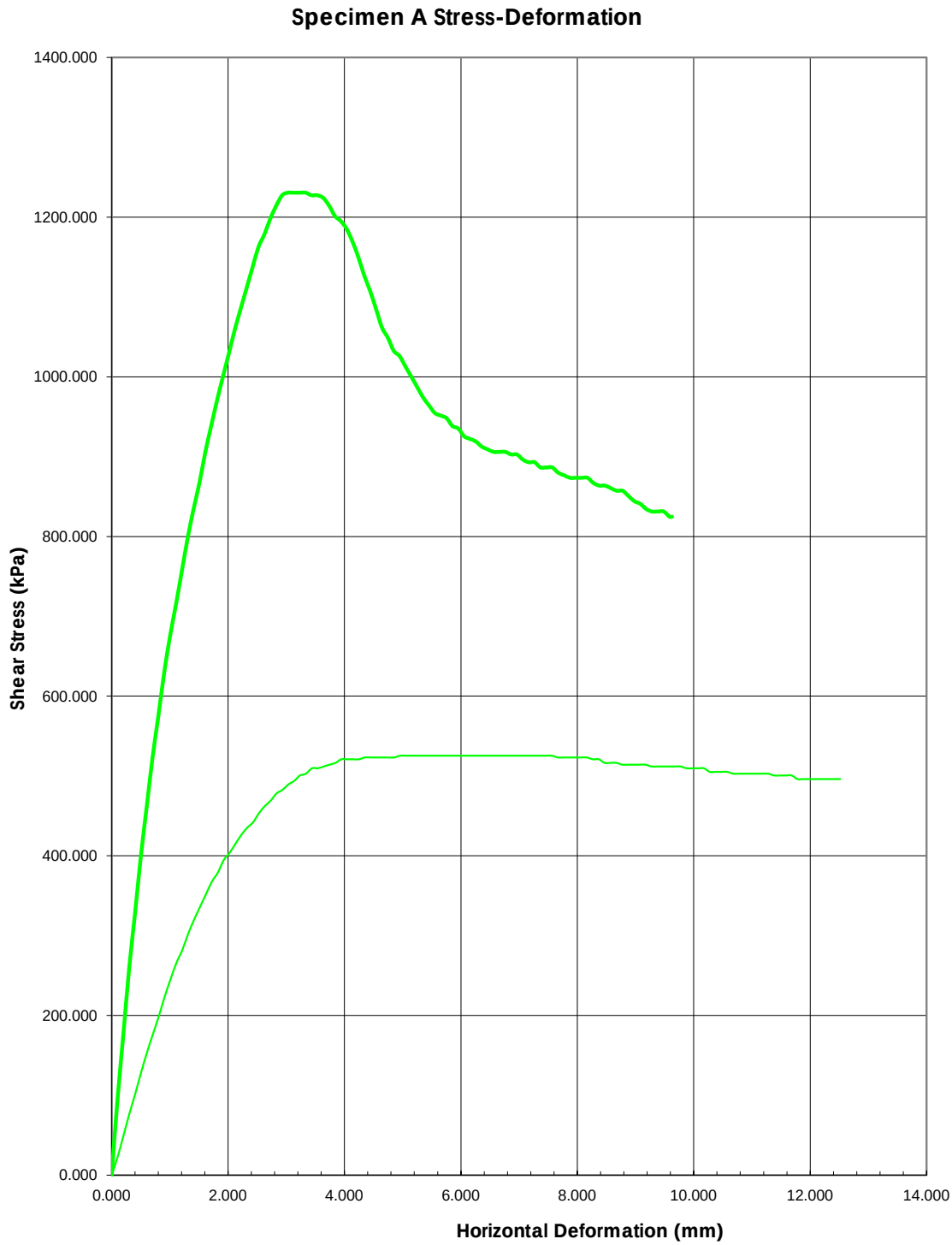


**Stantec Consulting Ltd.**

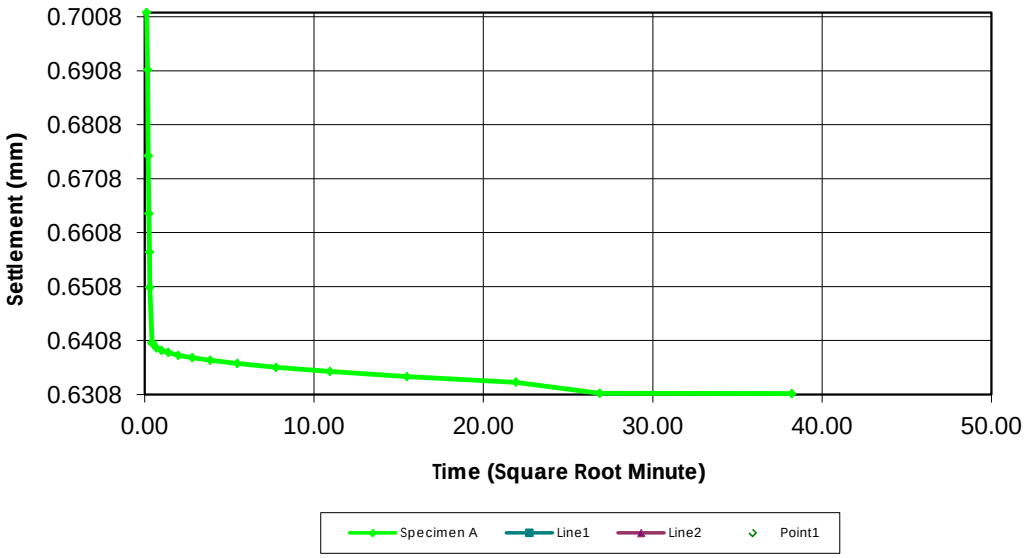
**Direct Shear Test**

Stantec

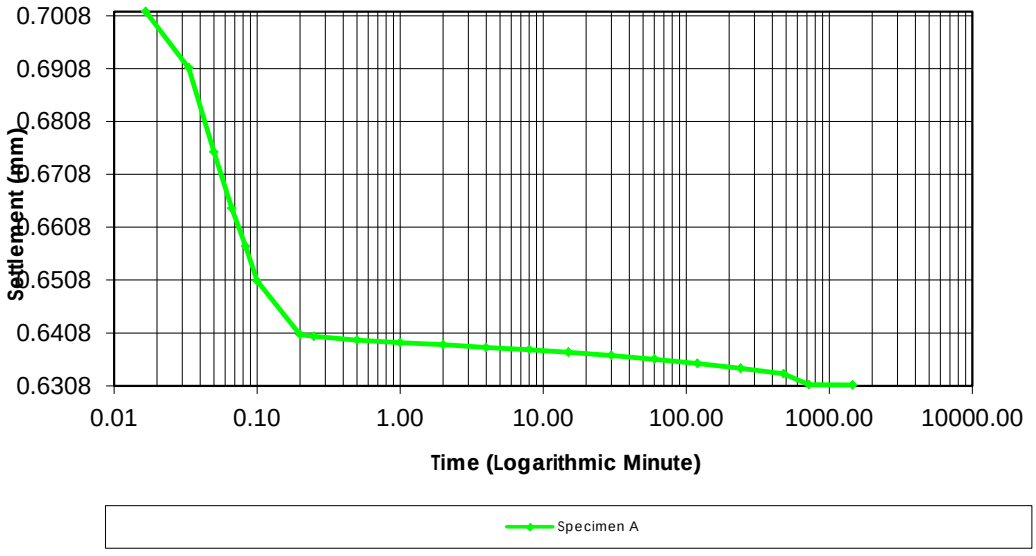


# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)



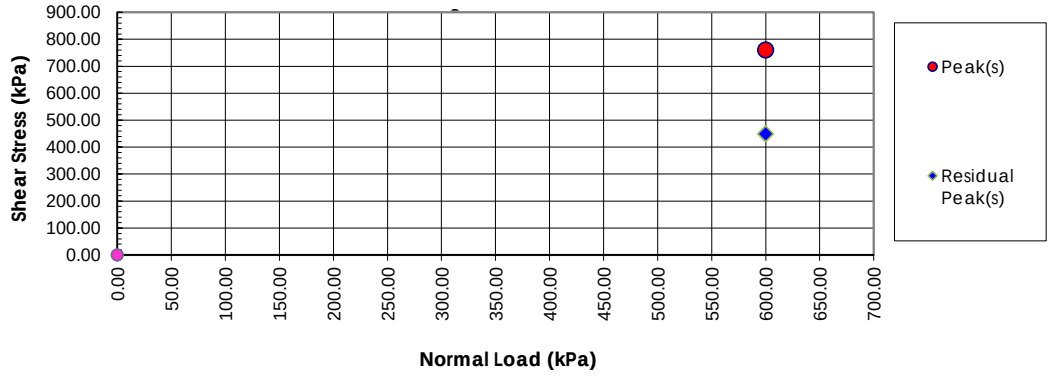

## Consolidation Graph (Logarithmic Time)

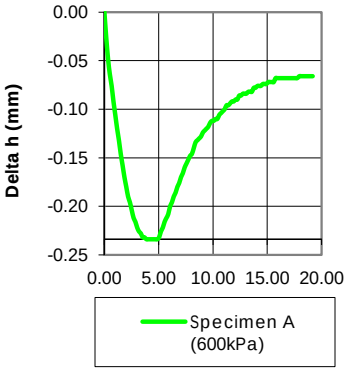


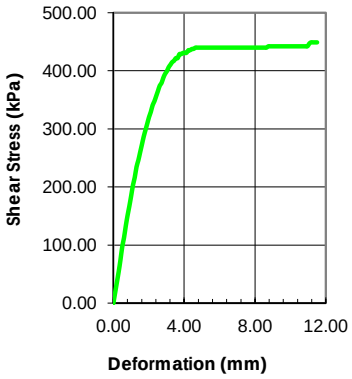
## Stantec Consulting Ltd.

### Direct Shear Test

Stantec




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 7.7 | | | |
| Density (g/cm3) | 1.672 | | | |
| Void Ratio | 0.615 | | | |
| Saturation (%) | 33.93 | | | |
| Diameter (mm) | 60.000 | | | |
| Height (mm) | 28.200 | | | |
| | | | | |

| Final | A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 4.0 | | | |
| Density (g/cm3) | 1.692 | | | |
| Void Ratio | 0.596 | | | |
| Saturation (%) | 20.57 | | | |
| Diameter (mm) | 60.000 | | | |
| Height (mm) | 26.954 | | | |
| Normal Stress (kPa) | 600.0 | | | |
| Peak Stress (kPa) | 759.9 | | | |
| Residual Stress (kPa) | 448.7 | | | |
| Strain (%) | 19.177 | | | |
| Rate (mm/min) | 0.008 | | | |
| | | | | |

| Project Date | |
|---|---|
| Date | 18-Aug-16 |

| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number** | - |
| **Sample Number:** | D60 RC33 |
| **Depth:** | 20.10-20.16m |
| **Sample Type:** | Undisturbed |
| **Description:** | Grey Mudstone |
| **Test Type:** | Direct Shear |
| **Remarks:** | |

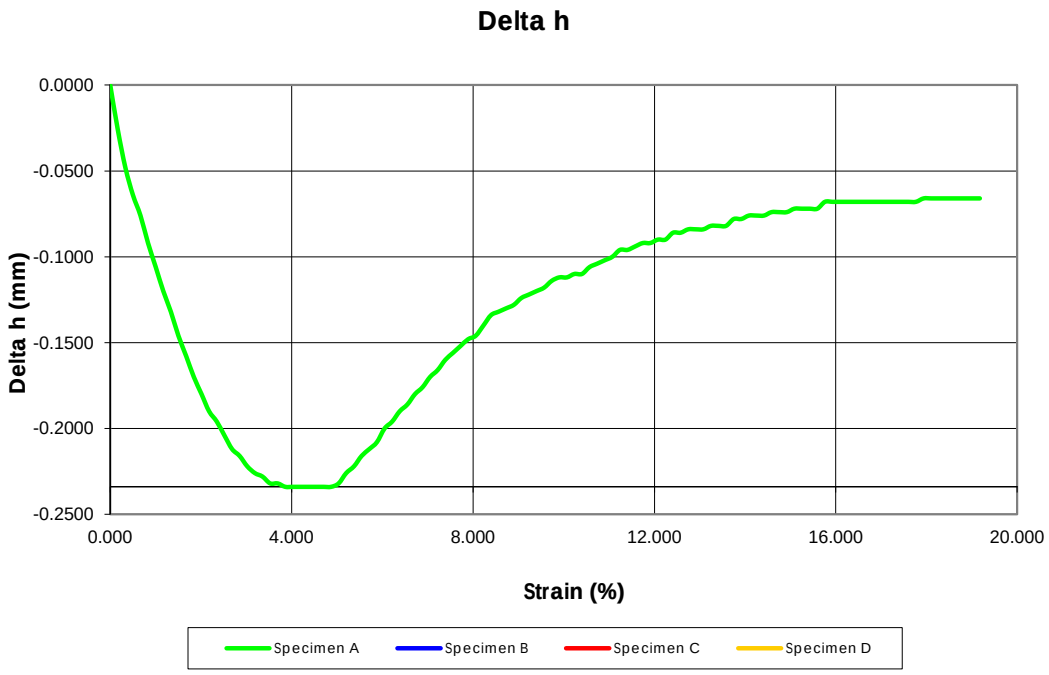
Reviewed By: C. Lamoureux

Date: 18-Aug-16

Tested By: C. Oost

**Stantec Consulting Ltd.**

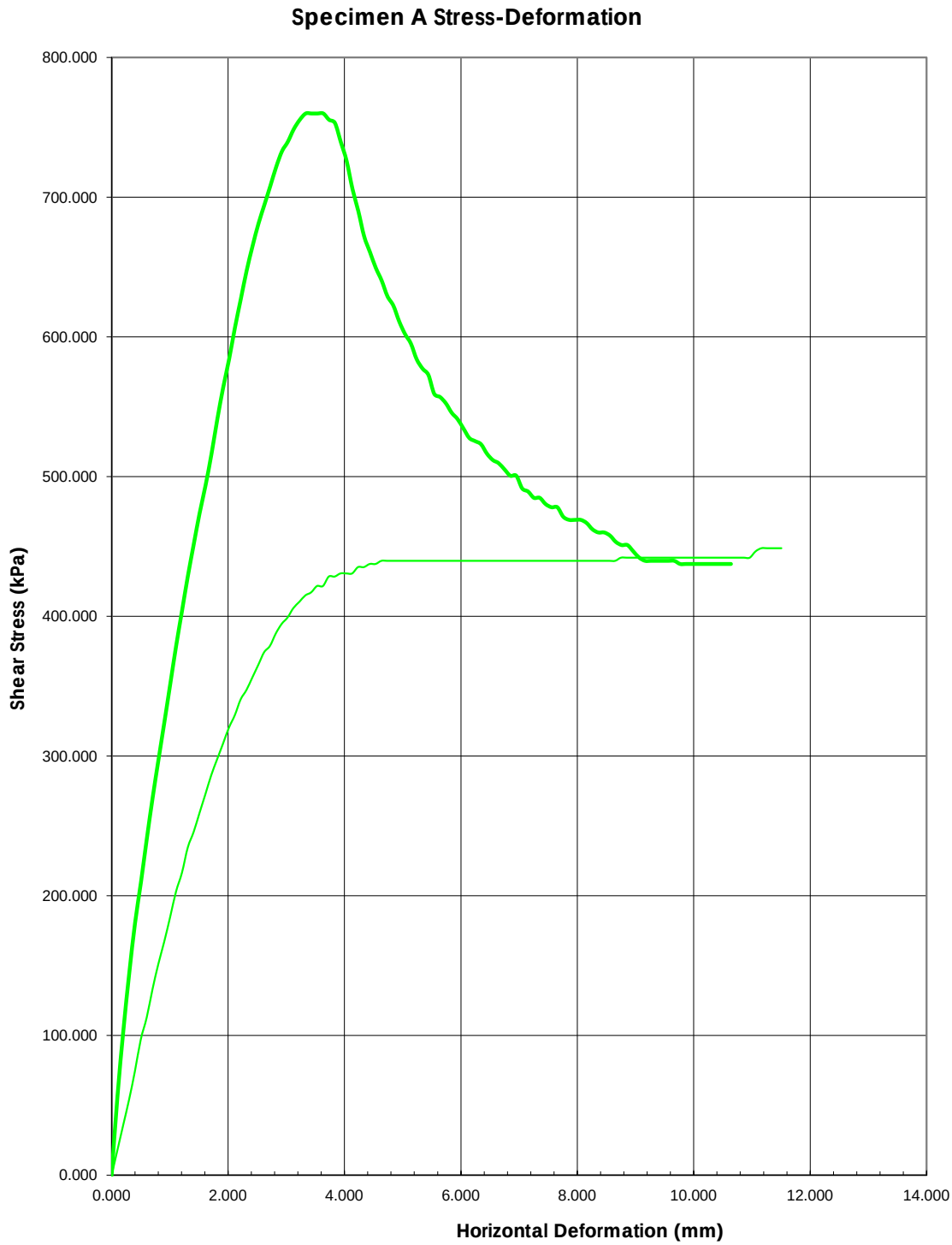
**Direct Shear Test**




**Stantec Consulting Ltd.**

**Direct Shear Test**

Stantec



| Specimen Information<br>Direct Shear Test | Stantec Consulting Ltd. |
|---|---|

**Project Information**

Project: SR1
Location:
Project Number: 110773396.302.702.230
Client: Alberta Transportation
Sample Location:
Sample Number: D60 RC33
Boring Number:

Tested By:
Reduced By:
Checked By:

| Sample Description/Remarks | |
|---|---|
| Specimen A Description | Grey Mudstone |
| Remarks | |
| Specimen B Description | |
| Remarks | |
| Specimen C Description | |
| Remarks | |
| Specimen D Description | |
| Remarks | |

**Moisture Density Data**

| | Specimen A | | Specimen B | | Specimen C | | Specimen D | |
|---|---|---|---|---|---|---|---|---|
| | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| Height (mm) | 28.200 | 26.954 | | | | | | |
| Diameter (mm) | 60.000 | 60.000 | | | | | | |
| Total Wet Weight of Ring & Soil (g) | 2043.30 | 2040.00 | | | | | | |
| Weight of Ring (g) | 1899.70 | 1899.70 | | | | | | |
| Wet Weight of Soil (g) | 143.60 | 140.30 | | | | | | |
| Wt of Wet Soil & Dish (g) | - | 142.63 | | | | | | |
| Wt of Dry Soil & Dish (g) | - | 137.29 | | | | | | |
| Wt. Of Dish (g) | - | 3.86 | | | | | | |

**Consolidation Calculations**

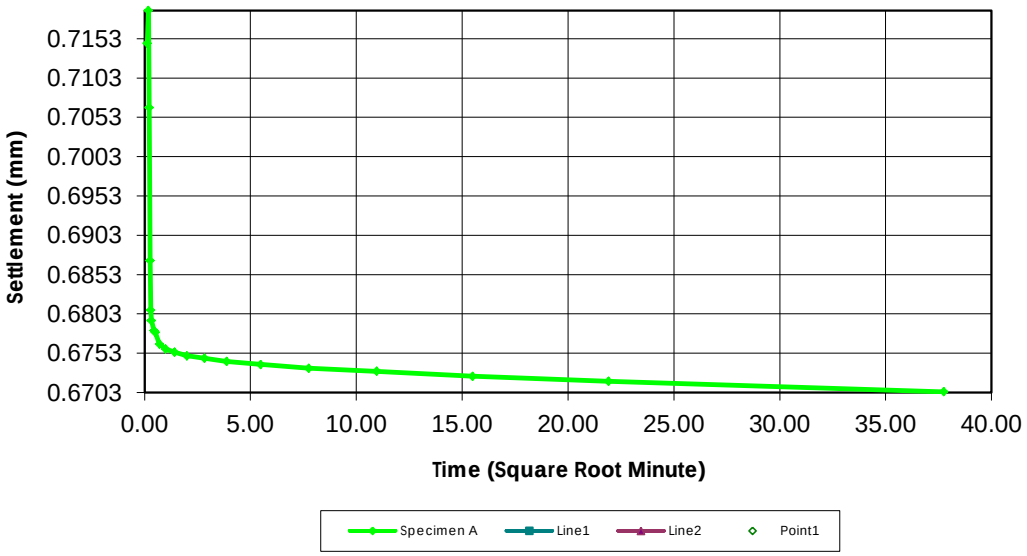
| | Specimen A | Specimen B | Specimen C | Specimen D |
|---|---|---|---|---|
| Initial Ref. Height (mm) | 18.274 | | | |
| Final Ref. Height (mm) | 17.028 | | | |
| Height after Consol (mm) | 26.954 | | | |

**Calculations**

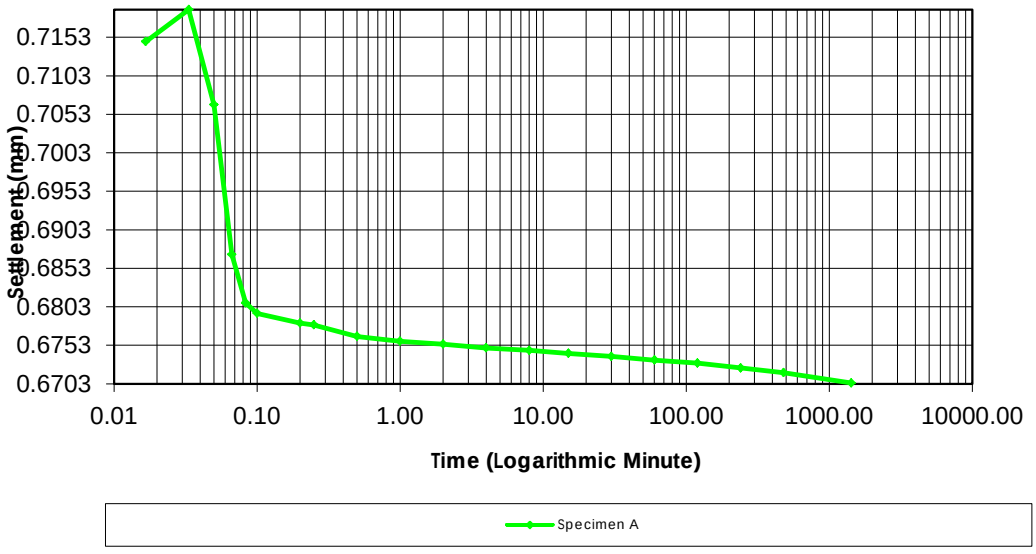
| | Specimen A | | Specimen B | | Specimen C | | Specimen D | |
|---|---|---|---|---|---|---|---|---|
| | Initial | Final | Initial | Final | Initial | Final | Initial | Final |
| Specific Gravity | 2.700 | 2.700 | | | | | | |
| Area (cm2) | 28.274 | 28.274 | | | | | | |
| Volume (cm3) | 79.7 | 79.7 | | | | | | |
| Moisture Content (%) | 7.726 | 4.002 | | | | | | |
| Wet Density (g/cm3) | 1.801 | 1.760 | | | | | | |
| Dry Density (g/cm3) | 1.672 | 1.692 | | | | | | |
| Saturation (%) | 33.933 | 20.569 | | | | | | |
| Void Ratio | 0.615 | 0.596 | | | | | | |
| Porosity (%) | 38.083 | 34.441 | | | | | | |

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)



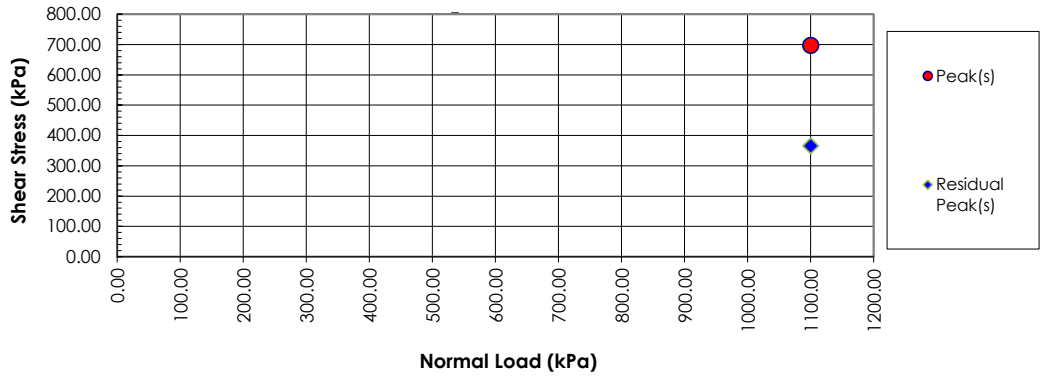

## Consolidation Graph (Logarithmic Time)

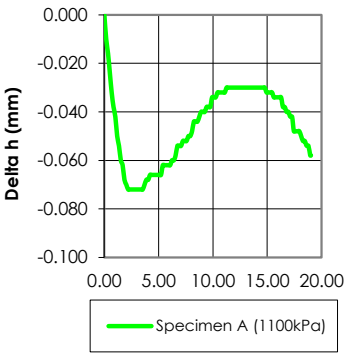


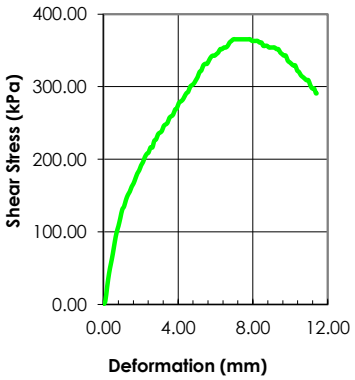
## Stantec Consulting Ltd.

### Direct Shear Test

Stantec




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 5.90 | | | |
| Density (g/cm3) | 1.911 | | | |
| Void Ratio | 0.413 | | | |
| Saturation (%) | 38.55 | | | |
| Diameter (mm) | 60.000 | | | |
| Height (mm) | 26.500 | | | |
| | | | | |

| Final | A | B | C | D |
|---|---|---|---|---|
| Moisture (%) | 4.94 | | | |
| Density (g/cm3) | 1.911 | | | |
| Void Ratio | 0.413 | | | |
| Saturation (%) | 81.19 | | | |
| Diameter (mm) | 60.000 | | | |
| Height (mm) | 21.844 | | | |
| Normal Stress (kPa) | 1100.0 | | | |
| Peak Stress (kPa) | 696.8 | | | |
| Residual Stress (kPa) | 365.3 | | | |
| Strain (%) | 19.020 | | | |
| Rate (mm/min) | 0.008 | | | |
| | | | | |

| Project Date | |
|---|---|
| Date | 22-Aug-16 |

| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number** | - |
| **Sample Number:** | D60 RC35 |
| **Depth:** | 23.39-23.53m |
| **Sample Type:** | Undisturbed |
| **Description:** | Grey Mudstone |
| **Test Type:** | Direct Shear |
| **Remarks:** | |

Reviewed By: C. Lamoureux

Date: 22-Aug-16

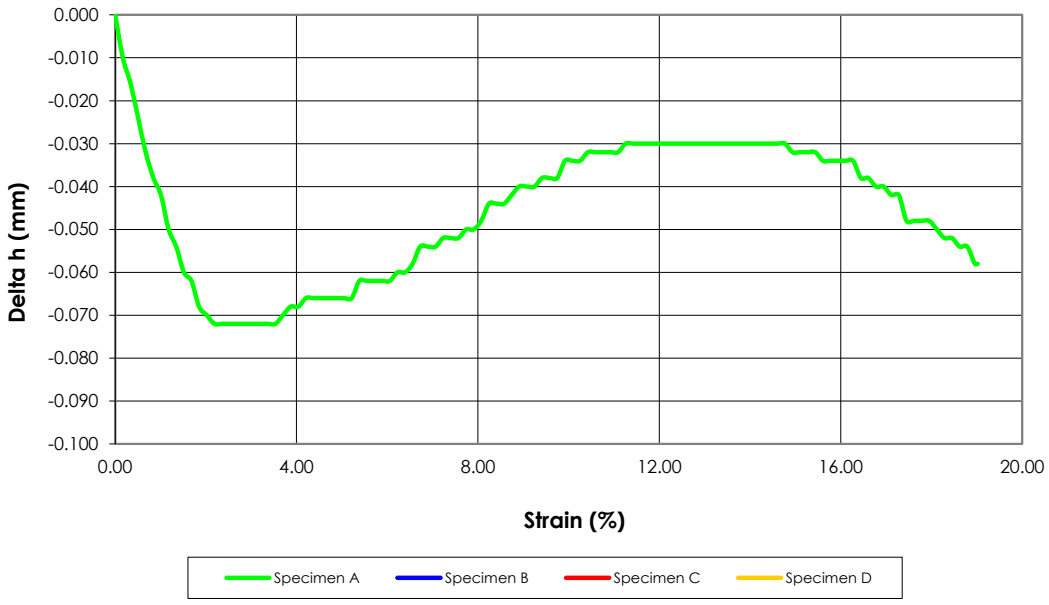
Tested By: C. Oost

**Stantec Consulting Ltd.**

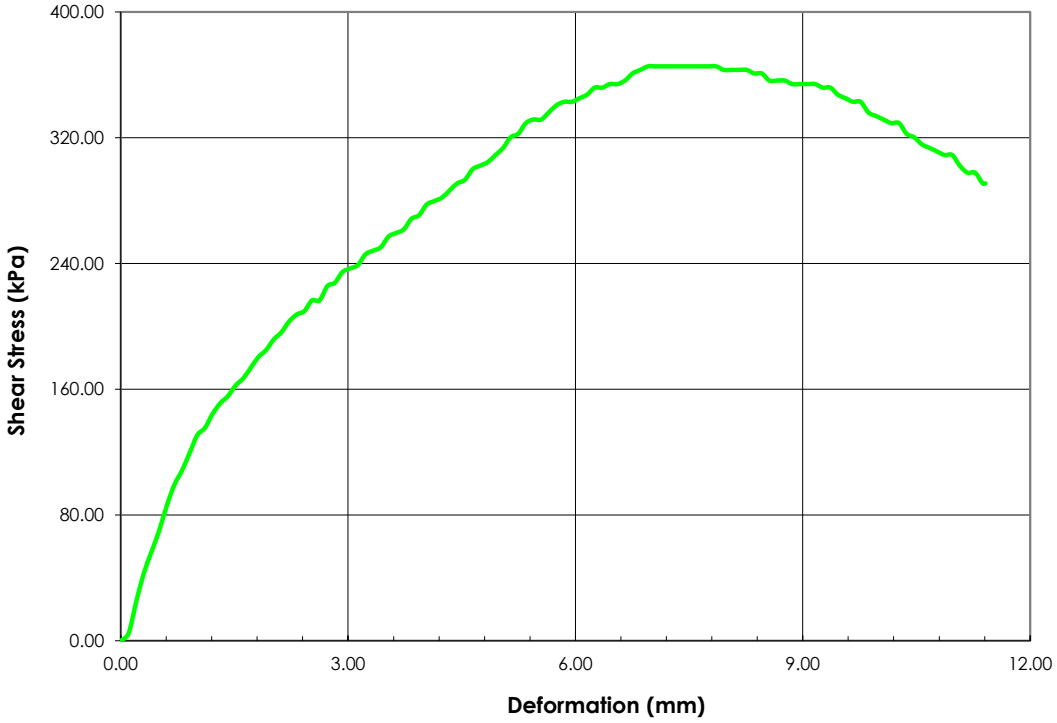
**Direct Shear Test**

Stantec

## Delta h



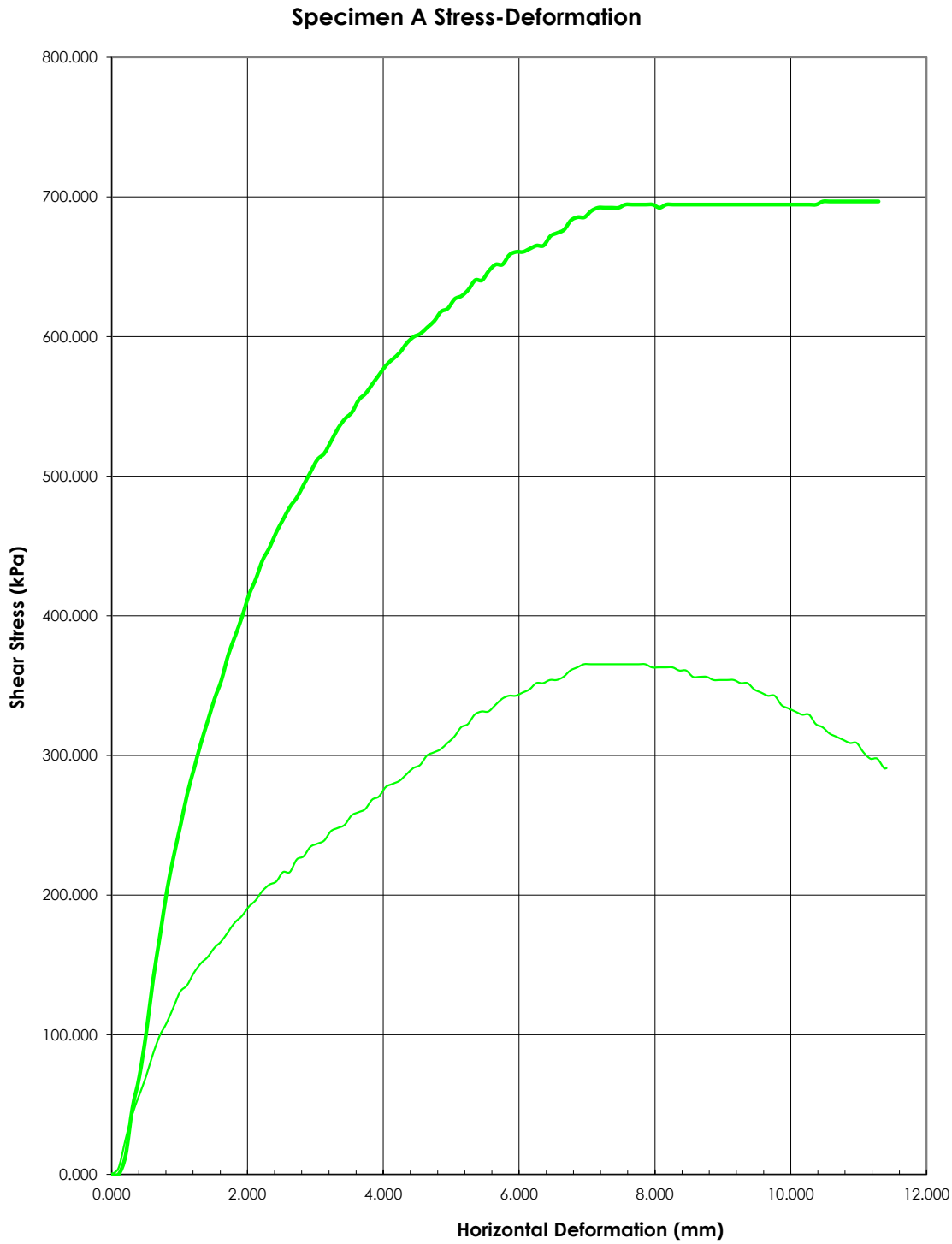

## Stress-Deformation



**Stantec Consulting Ltd.**

**Direct Shear Test**

Stantec



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

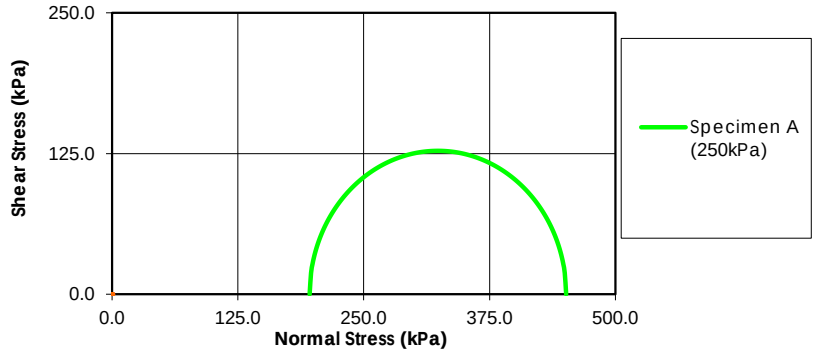
Stantec

Reviewed By C. Lamoureux

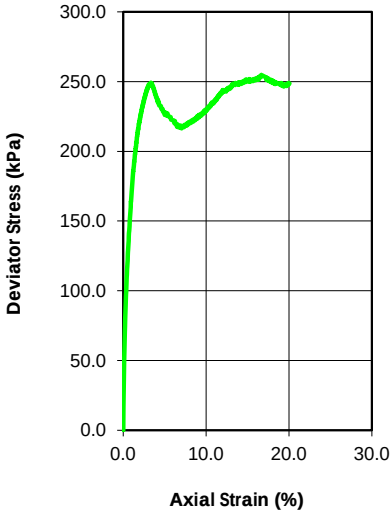
Date: 6-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 18.2 | | | |
| Dry Density (g/cm3) | 1.659 | | | |
| Saturation (%) | 78.24 | | | |
| Void Ratio | 0.627 | | | |
| Diameter (mm) | 72.800 | | | |
| Height (mm) | 145.000 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 15.2 | | | |
| Dry Density (g/cm3) | 1.640 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.646 | | | |
| Effective Stress (kPa) | 247.6 | | | |
| Back Press. (kPa) | 132.4 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

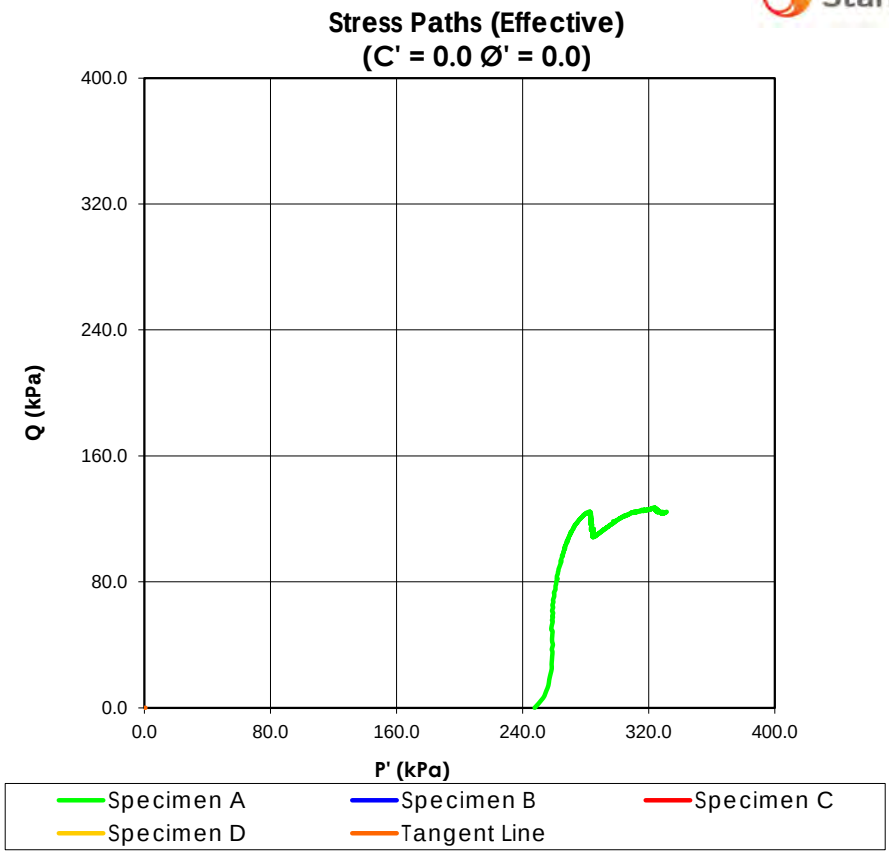
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 451.07 | | | |
| σ'3 at Failure (kPa) | 196.28 | | | |
| | | | | |
| | | | | |

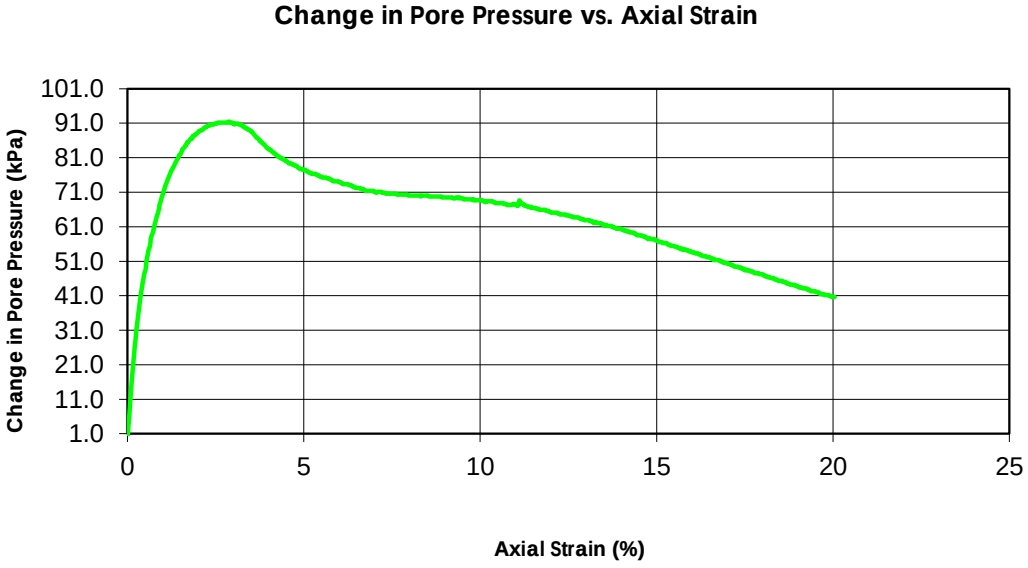
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D3 ST4 |
| **Depth:** | 1.8-2.25m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Silty Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

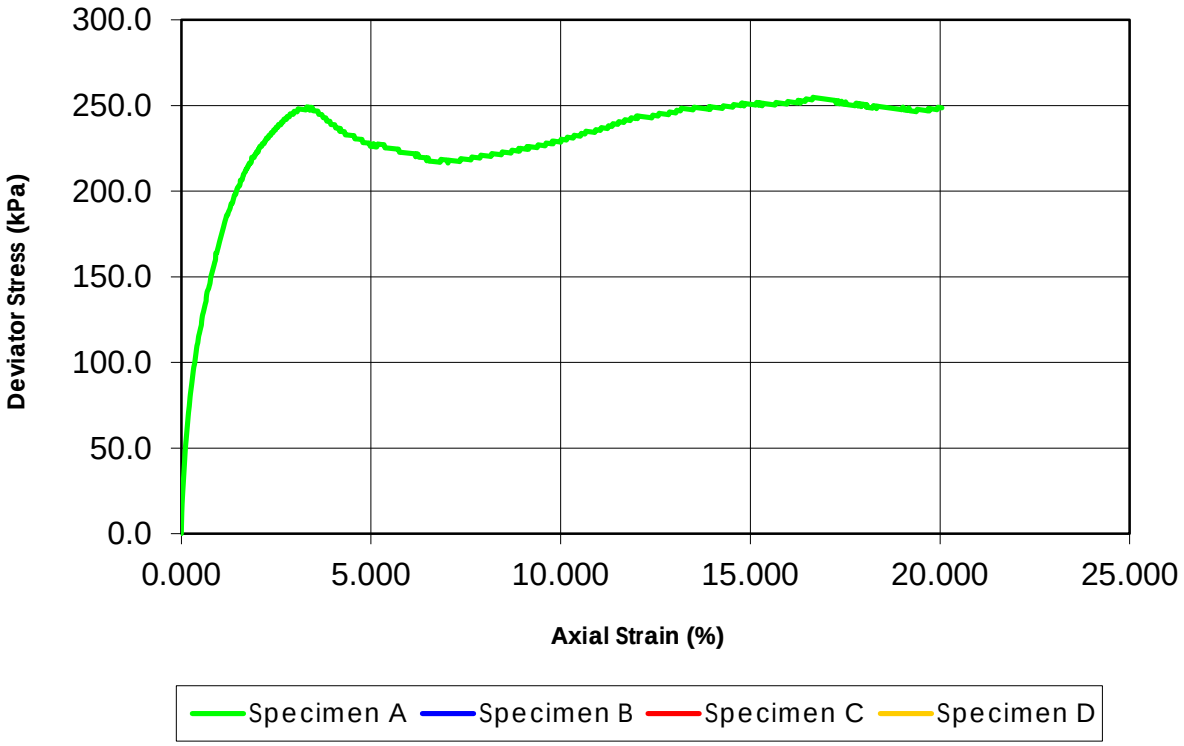
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

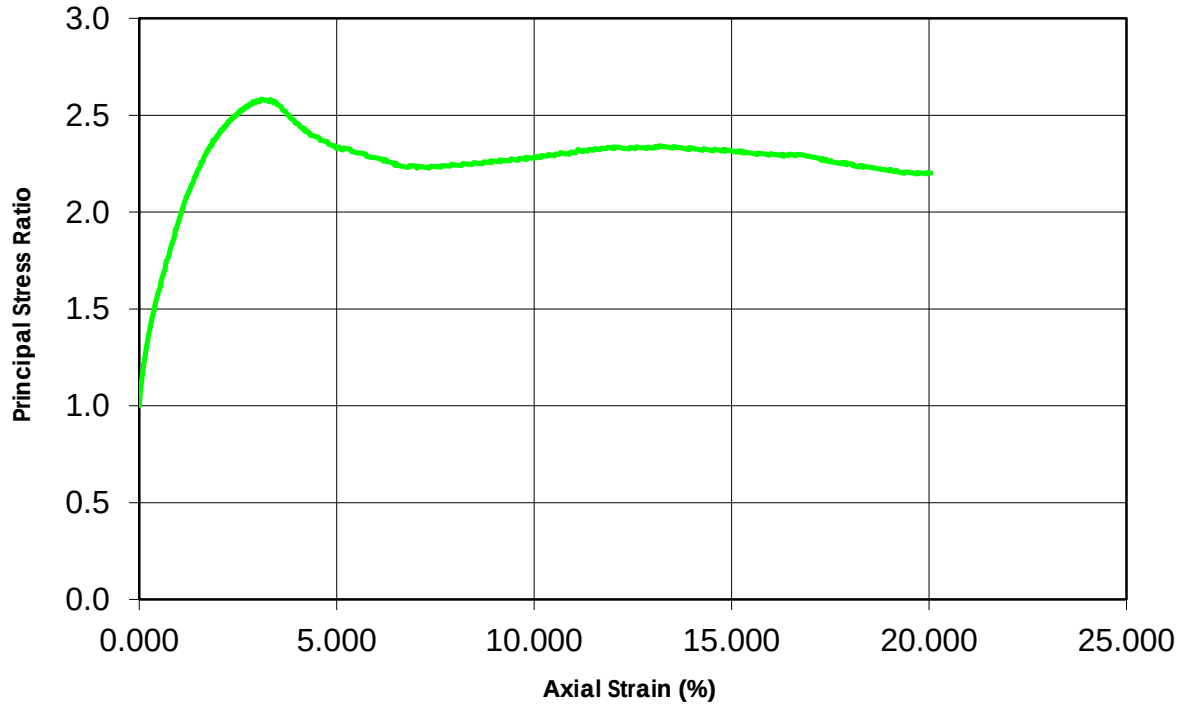


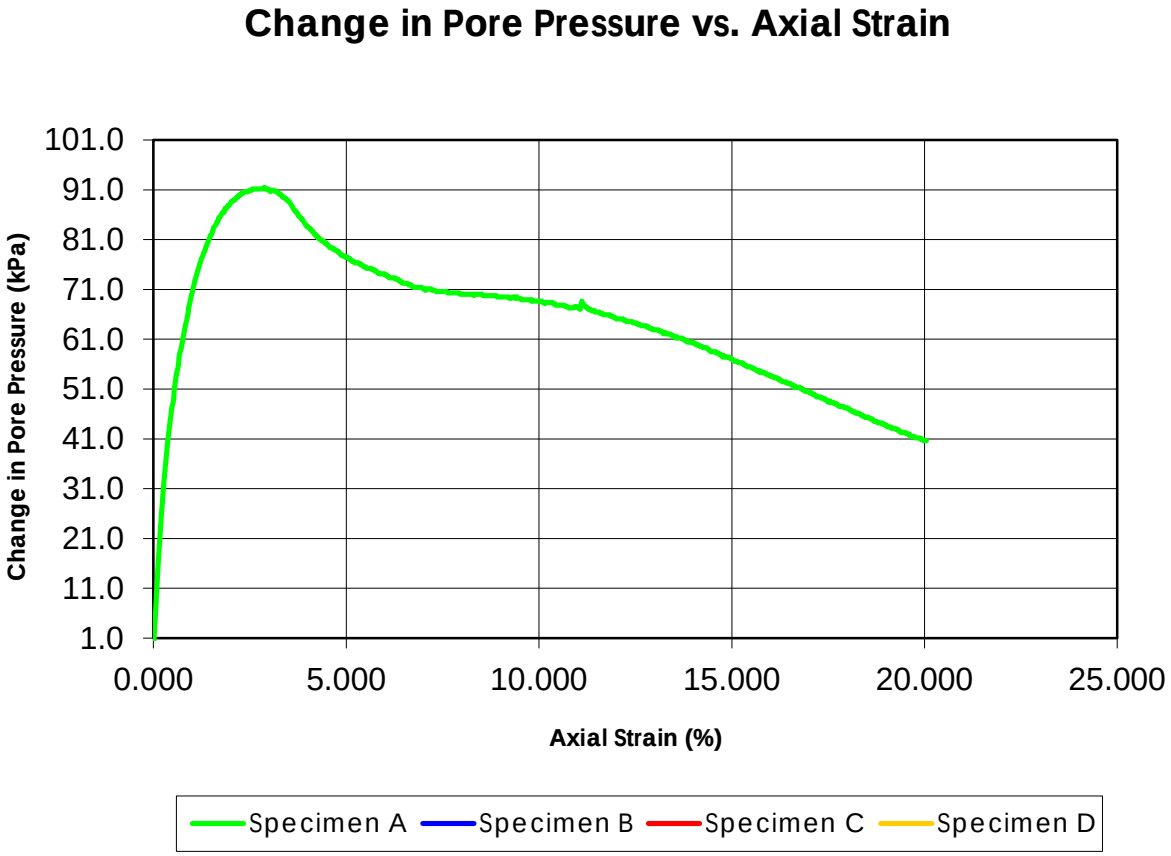



## Deviator Stress vs. Axial Strain



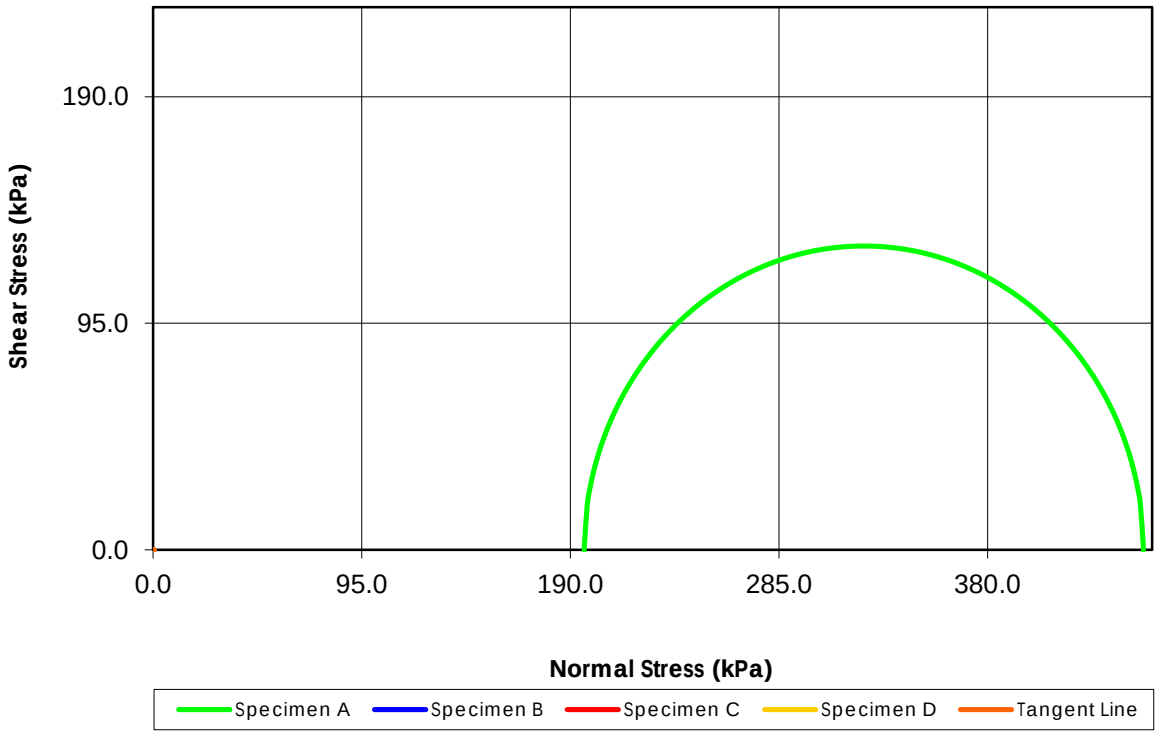

## Principal Stress Ratio vs. Axial Strain



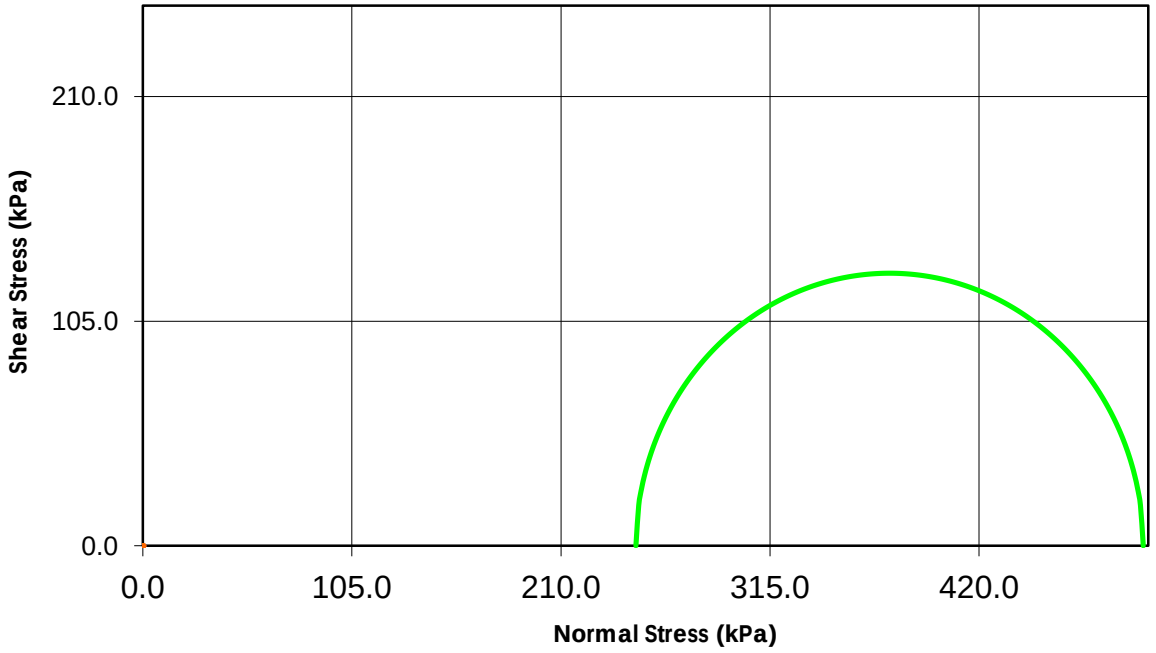

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
101.0
91.0
81.0
71.0
61.0
51.0
41.0
31.0
21.0
11.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

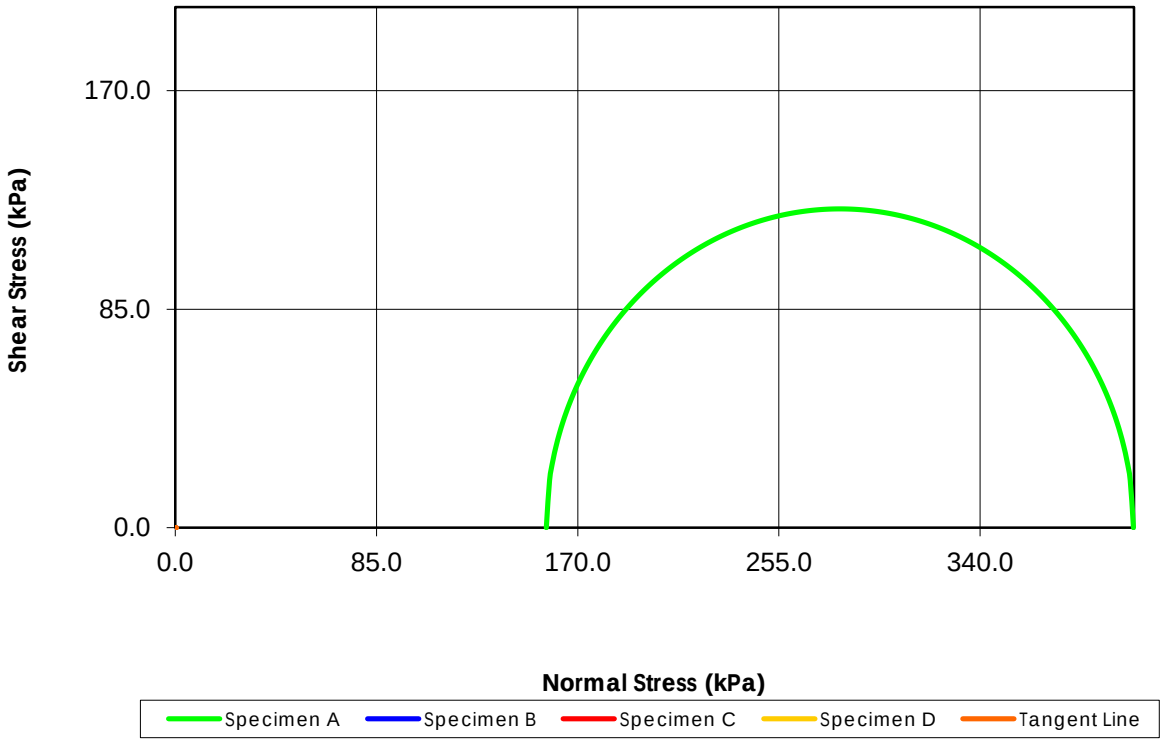



### Total Stress
### (C = 0.0 Ø = 0.0)

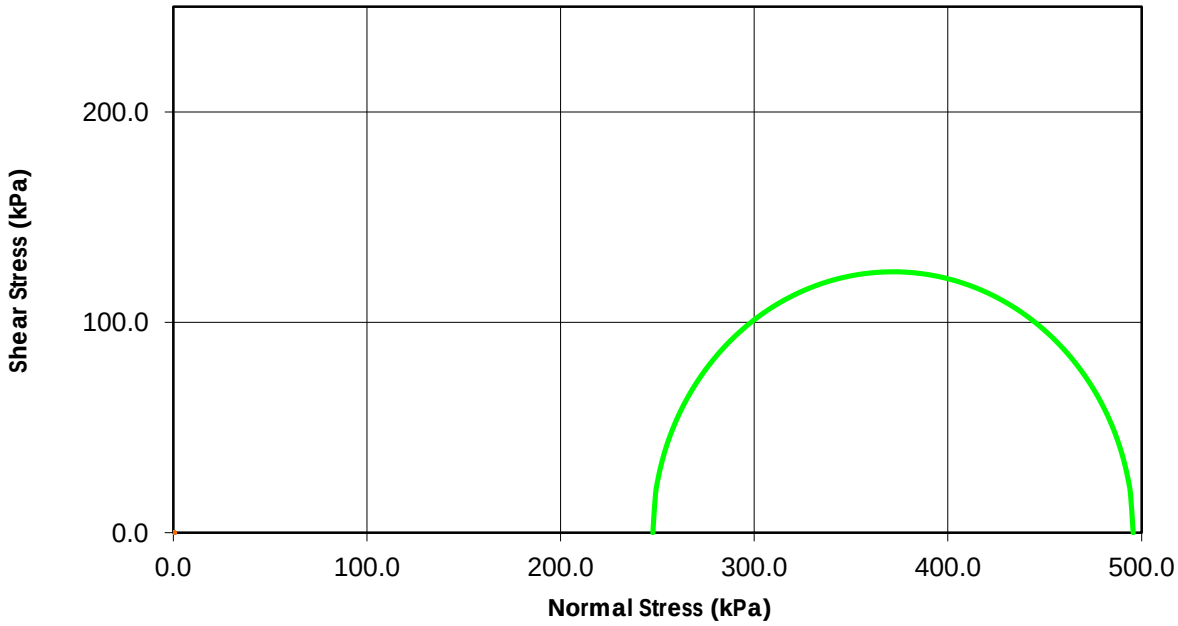


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

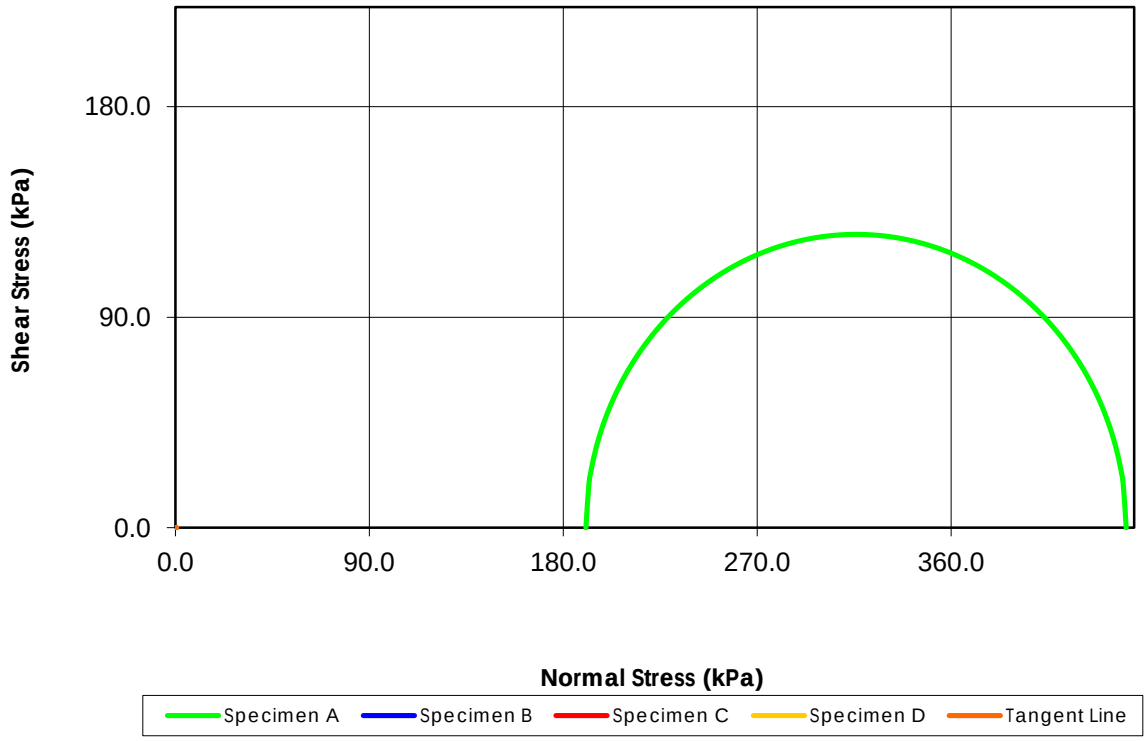



## Total Stress
## (C = 0.0 Ø = 0.0)

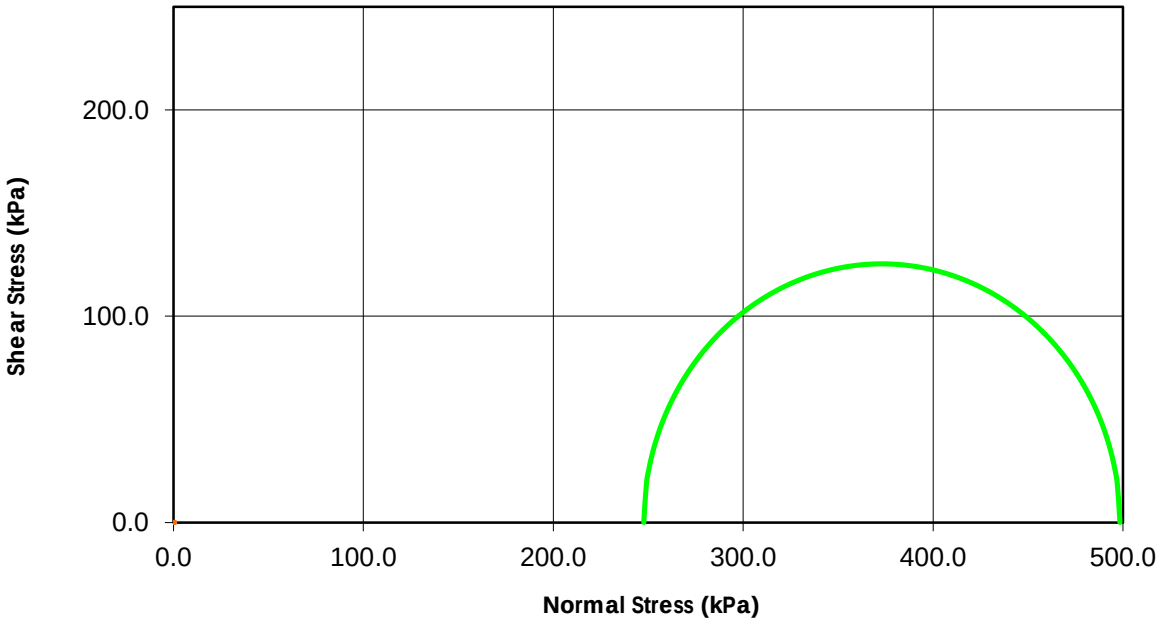


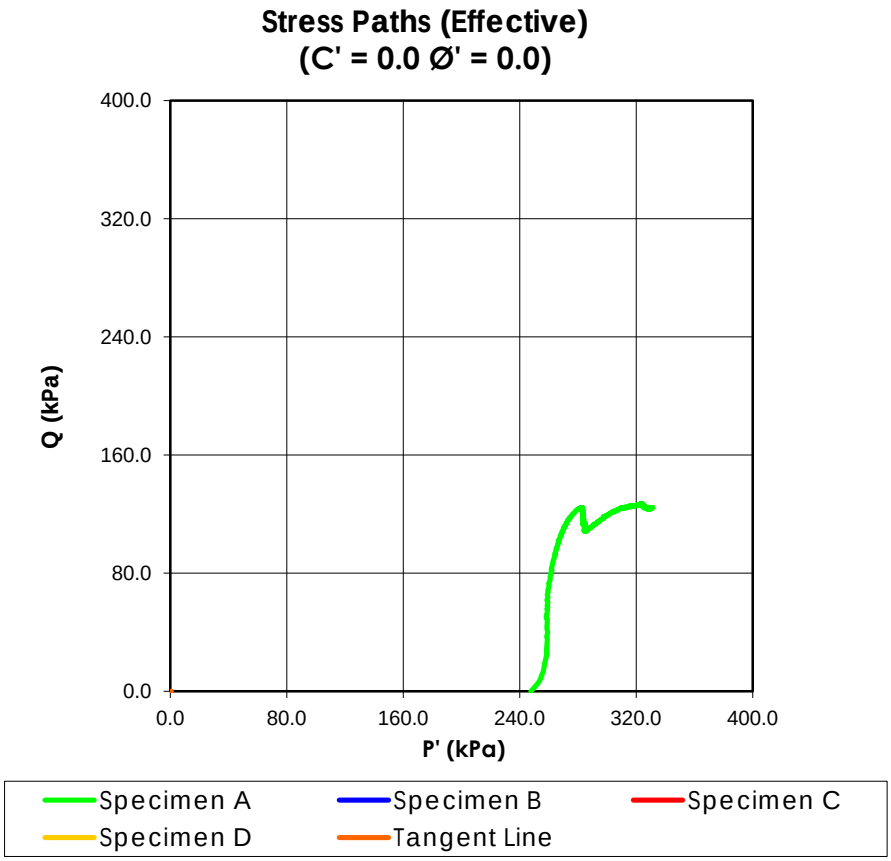
# Mohr Stress Circles at 15% Axial Strain Criterion

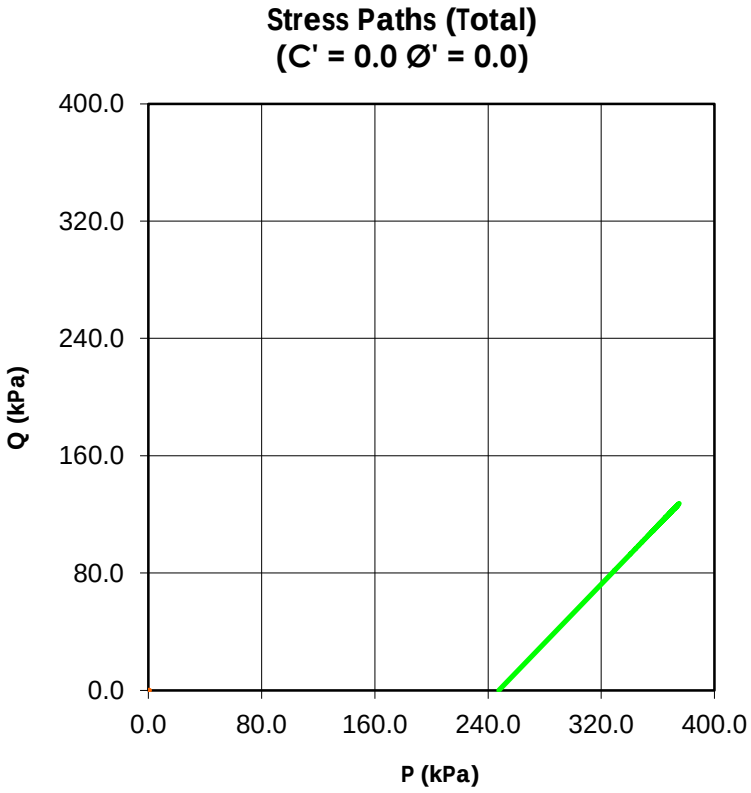
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

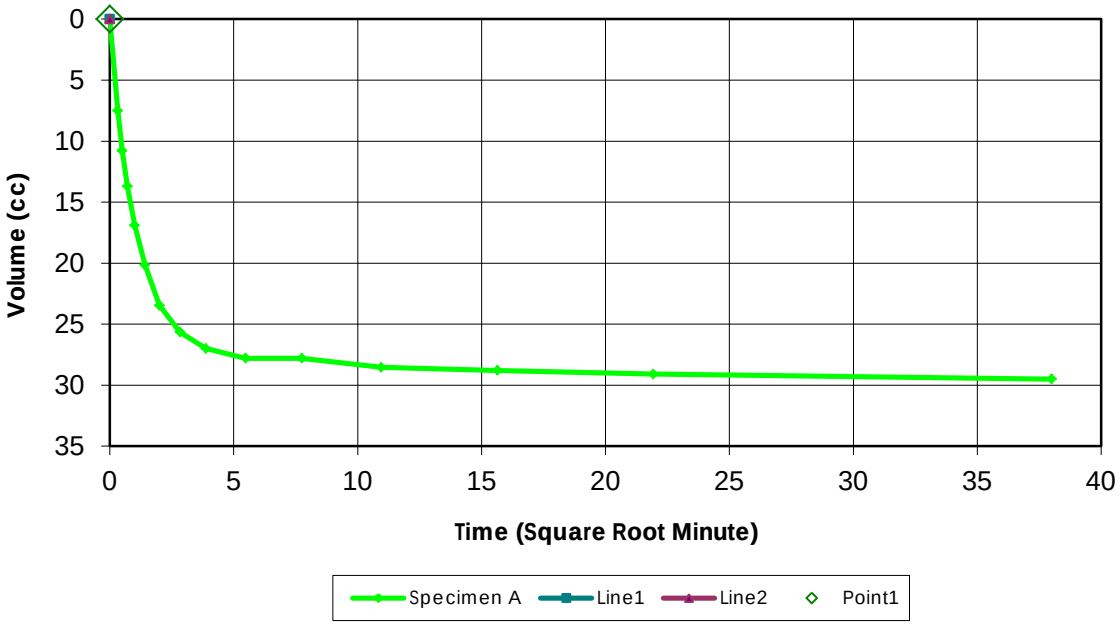



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

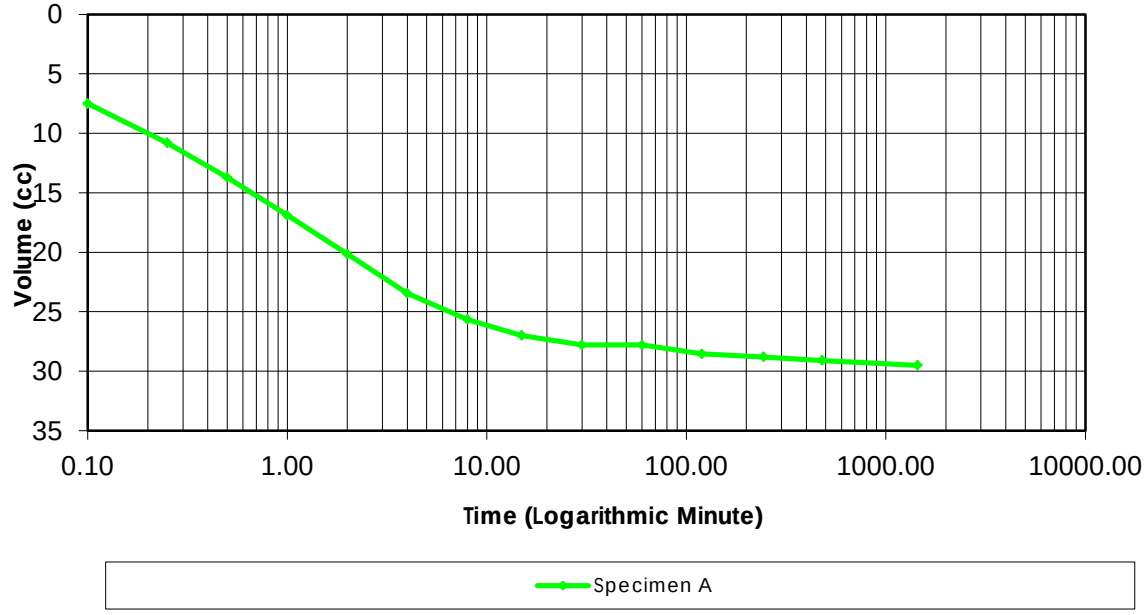

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 0.78 |
| 3 | 150.0 | 130.0 | 0.0 | 70.0 | |
| 4 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 5 | 220.0 | 130.0 | 70.0 | 0.0 | 0.95 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 1.8-2.25m

| | |
|---|---|
| Cell Pressure (kPa) | 380 |
| Back Pressure (kPa) | 130 |
| Effective Pressure (kPa) | 250 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.8 |
| Initial Sample Height (mm) | 145 |
| Initial Sample Area (cm2) | 41.63 |
| Initial Volume (cm3) | 603.6 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 47.20 | N/A |
| 00:00:06 | 39.70 | 7.500 |
| 00:00:15 | 36.40 | 10.800 |
| 00:00:30 | 33.50 | 13.700 |
| 00:01:00 | 30.30 | 16.900 |
| 00:02:00 | 27.05 | 20.150 |
| 00:04:00 | 23.75 | 23.450 |
| 00:08:00 | 21.55 | 25.650 |
| 00:15:00 | 20.20 | 27.000 |
| 00:30:00 | 19.40 | 27.800 |
| 01:00:00 | 19.40 | 27.800 |
| 02:00:00 | 18.65 | 28.550 |
| 04:04:30 | 18.40 | 28.800 |
| 08:01:00 | 18.10 | 29.100 |
| 24:04:00 | 17.70 | 29.500 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

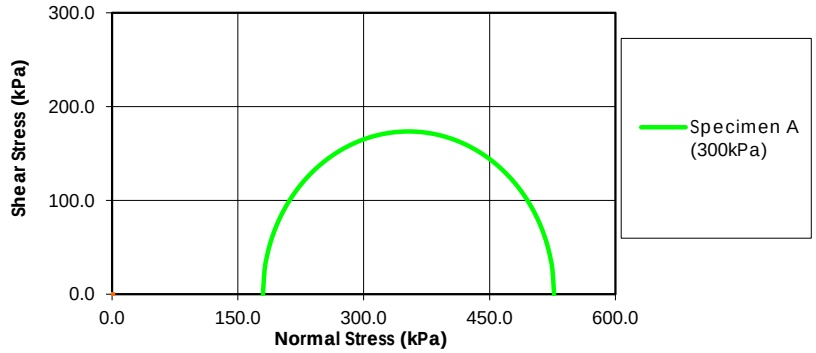
Stantec

Reviewed By C. Lamoureux

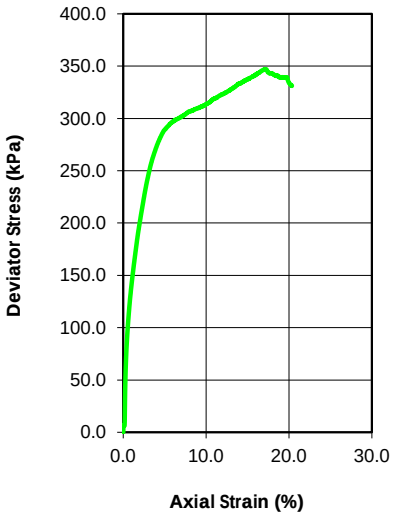
Date: 6-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 10.7 | | | |
| Dry Density (g/cm3) | 1.988 | | | |
| Saturation (%) | 80.57 | | | |
| Void Ratio | 0.358 | | | |
| Diameter (mm) | 71.500 | | | |
| Height (mm) | 171.300 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 6.8 | | | |
| Dry Density (g/cm3) | 2.054 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.315 | | | |
| Effective Stress (kPa) | 290.2 | | | |
| Back Press. (kPa) | 139.8 | | | |
| Rate of Strain | 0.024 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 526.88 | | | |
| σ'3 at Failure (kPa) | 179.88 | | | |
| | | | | |
| | | | | |

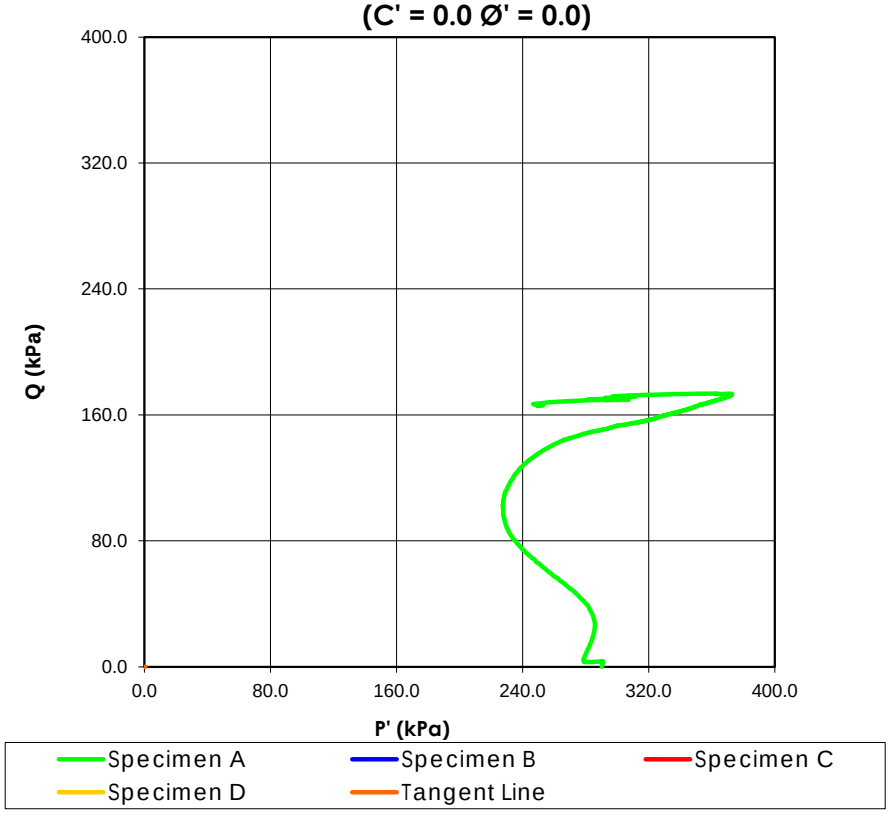
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D3 ST6 |
| **Depth:** | 2.7-3.15m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Silty Clay with sand and Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

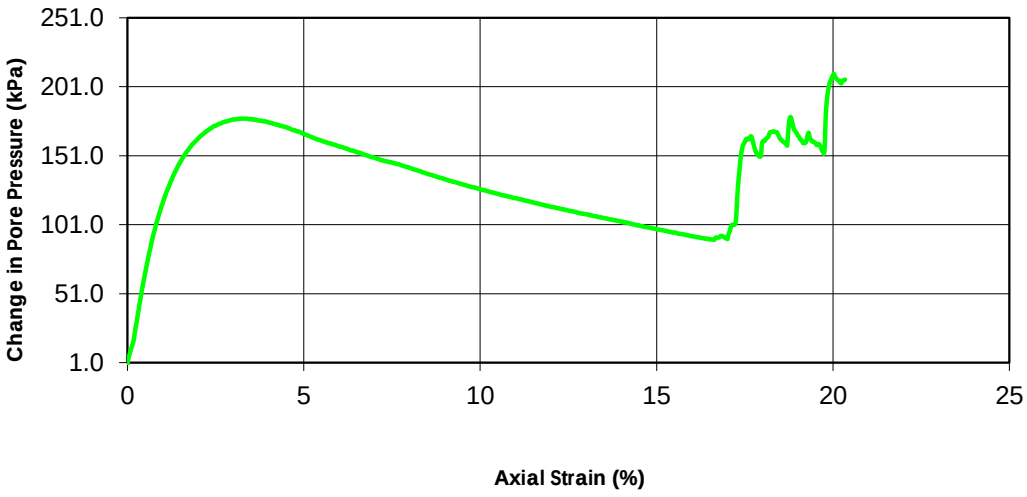
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

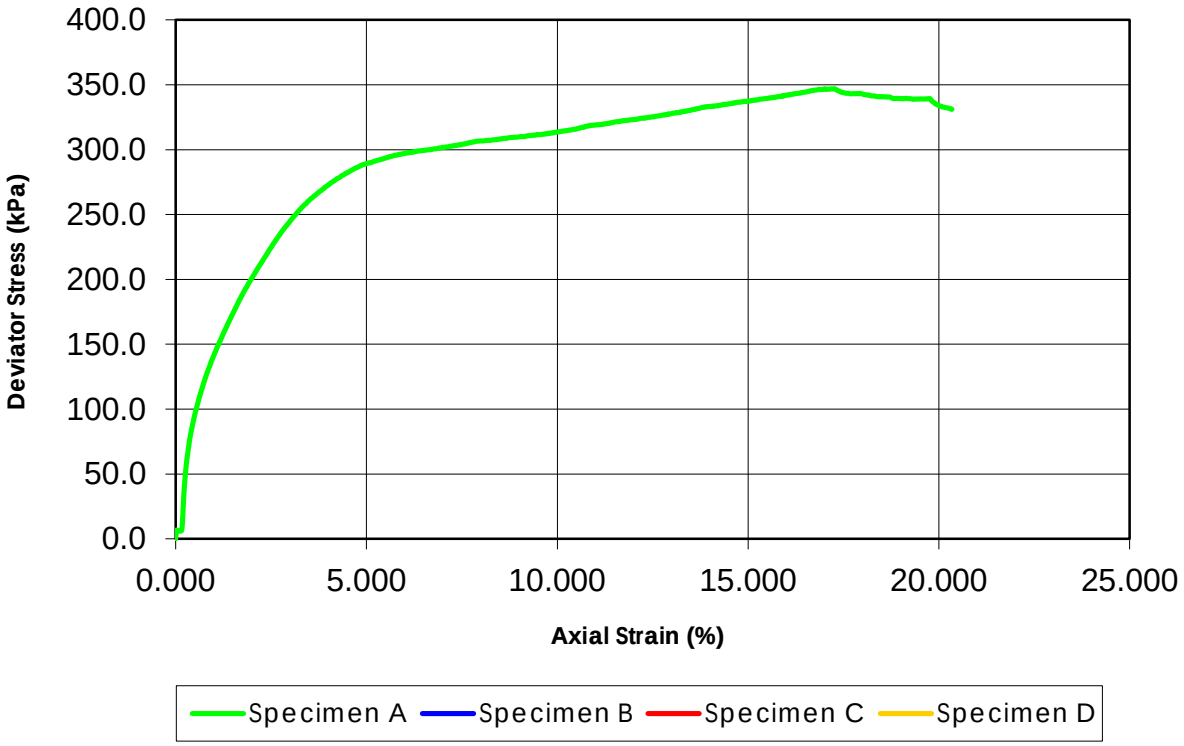
**Stress Paths (Effective)**
**(C' = 0.0 Ø' = 0.0)**



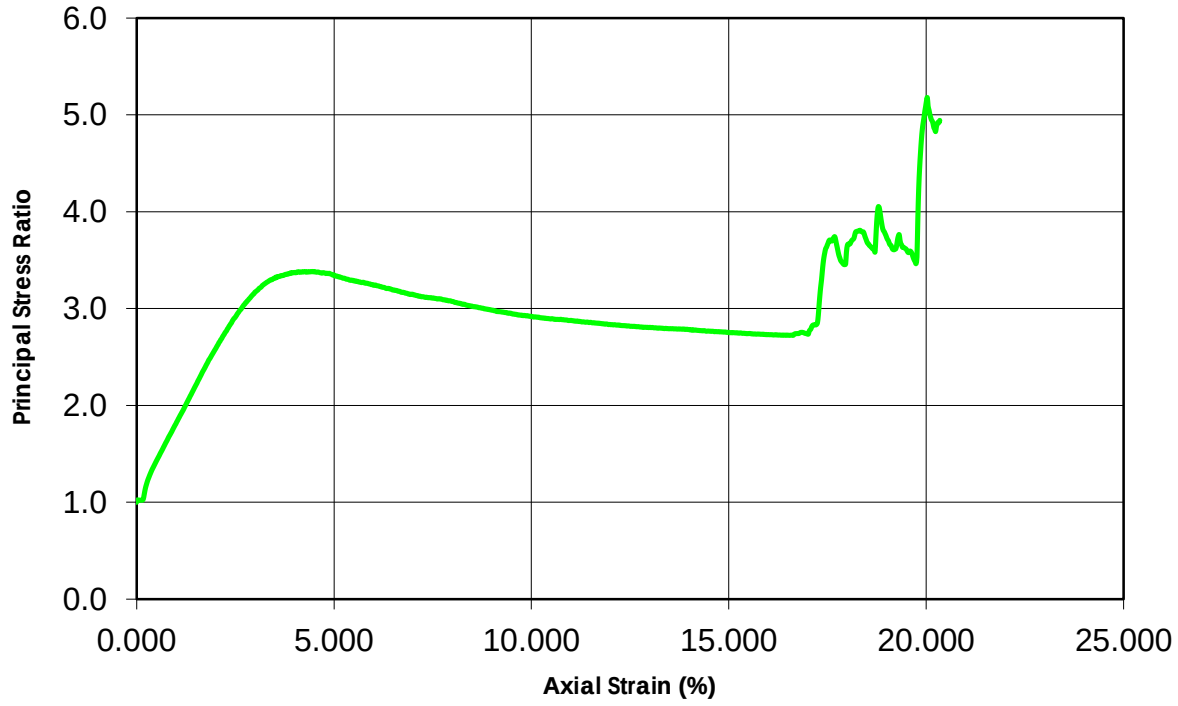

**Change in Pore Pressure vs. Axial Strain**

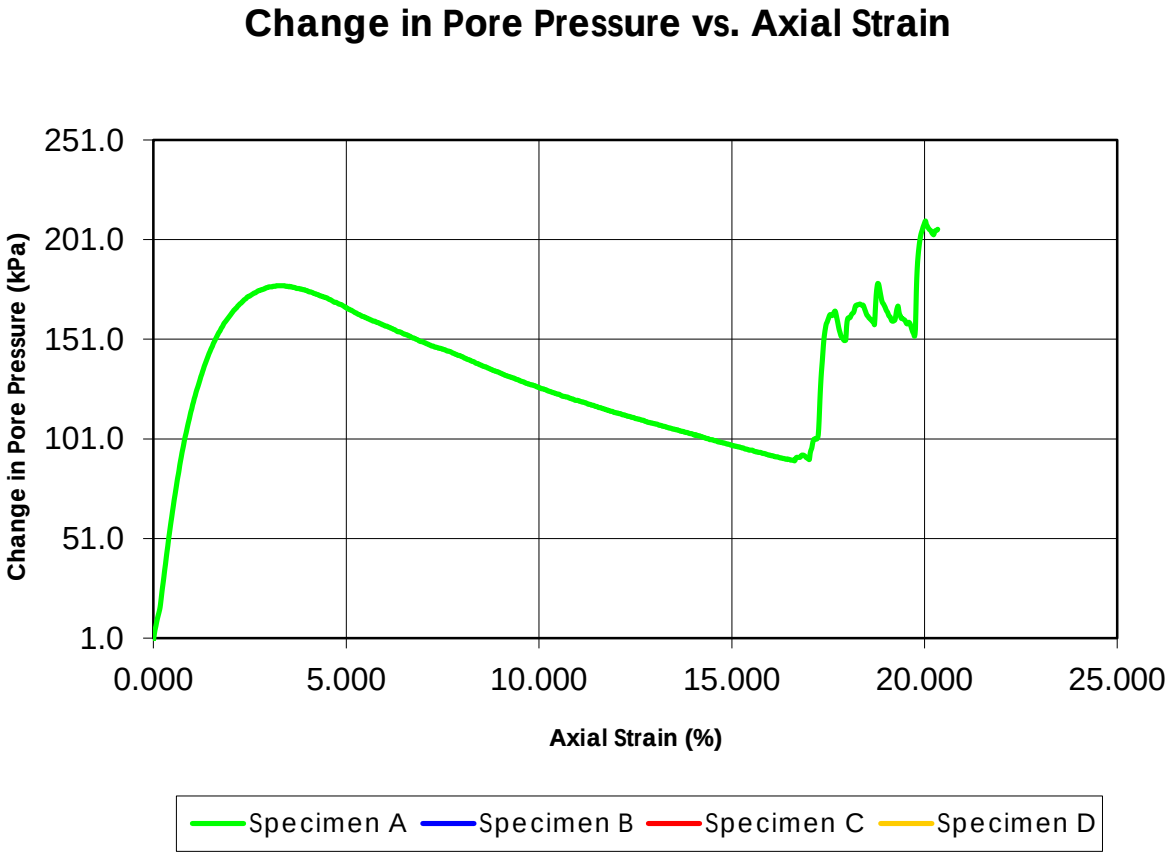


## Deviator Stress vs. Axial Strain



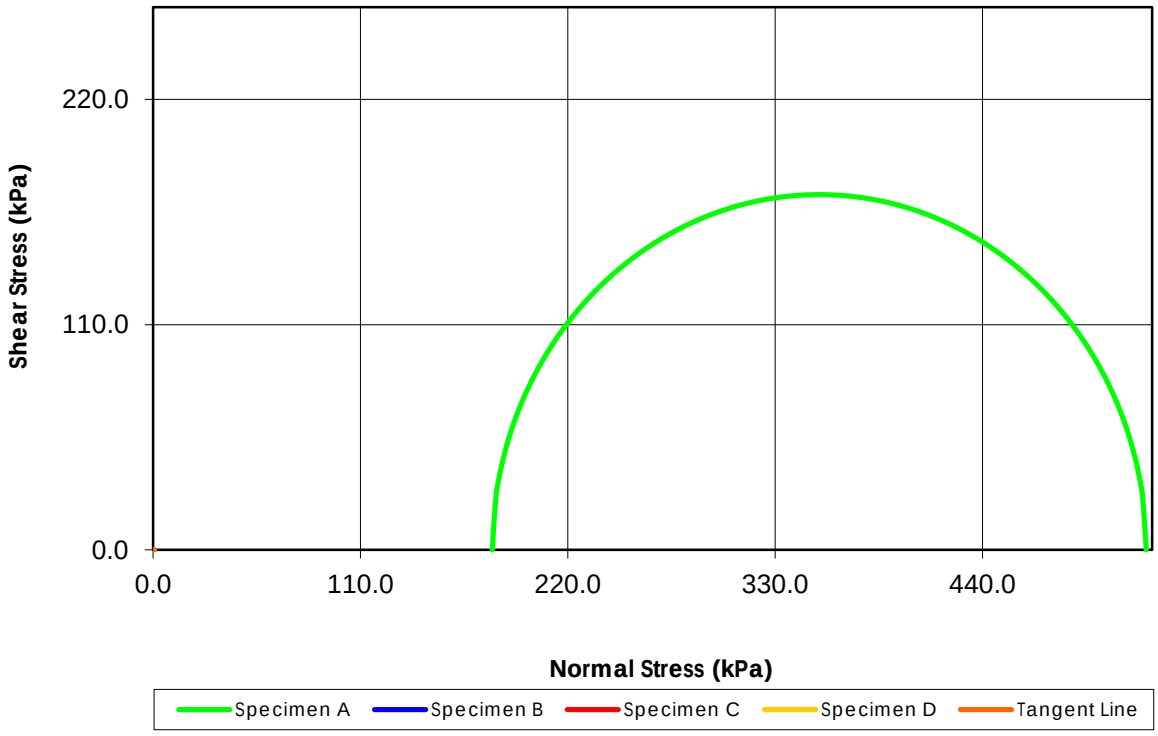

## Principal Stress Ratio vs. Axial Strain



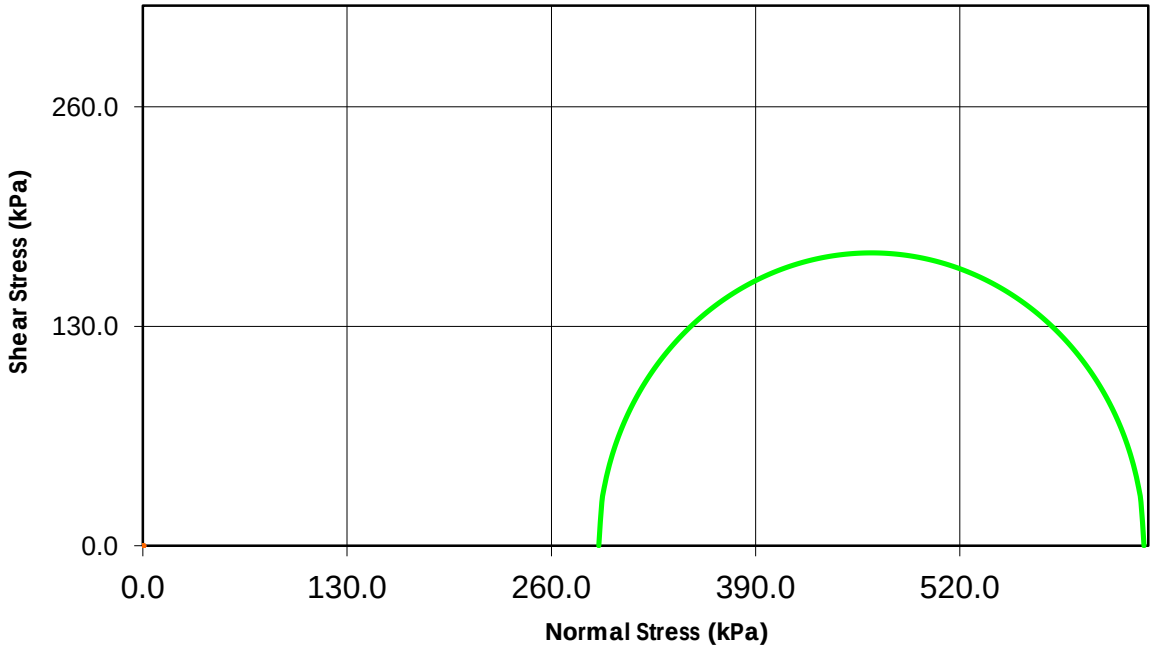

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

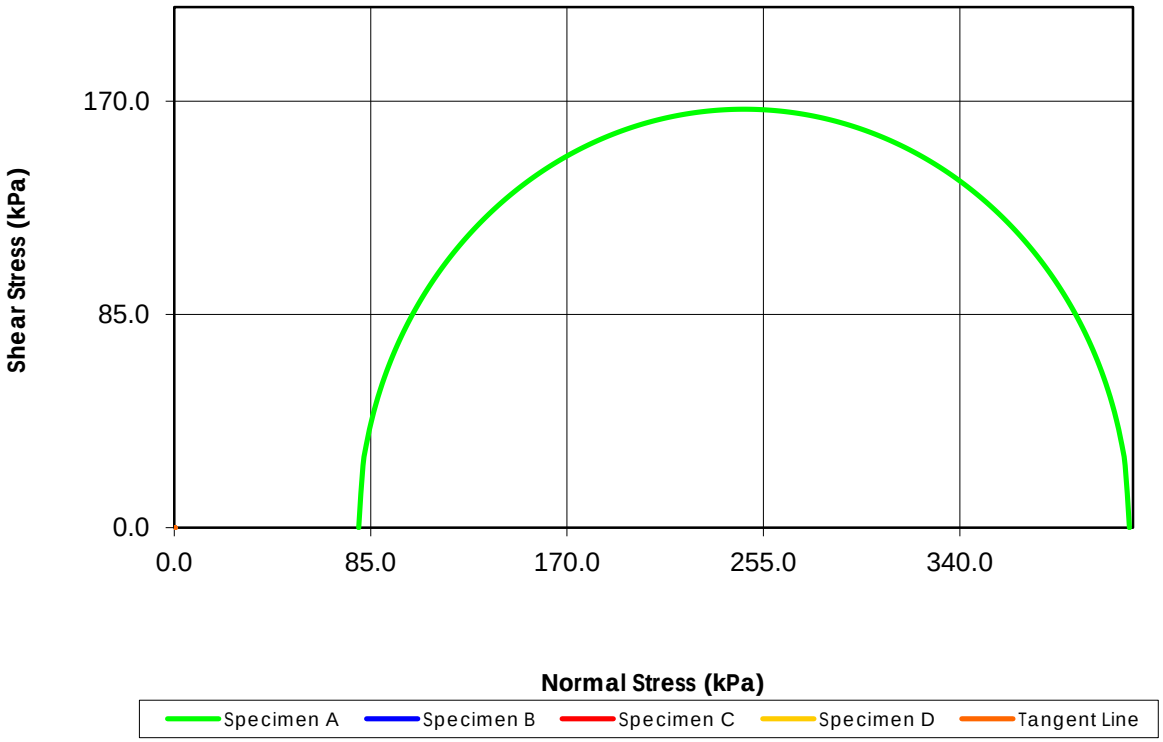



### Total Stress
### (C = 0.0 Ø = 0.0)

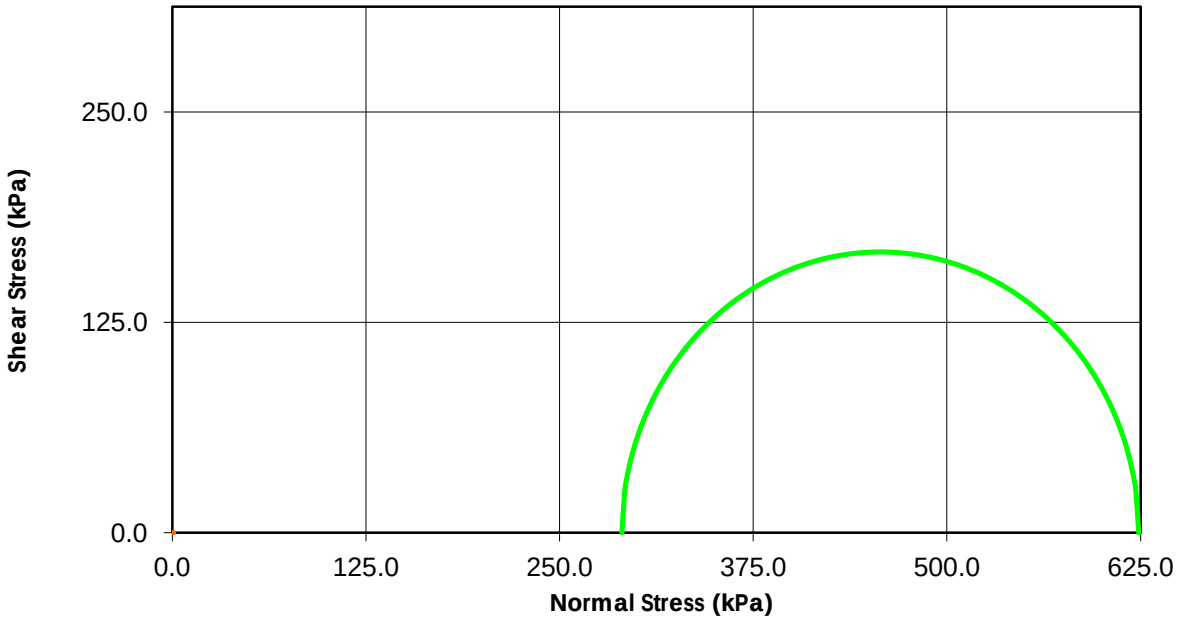


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

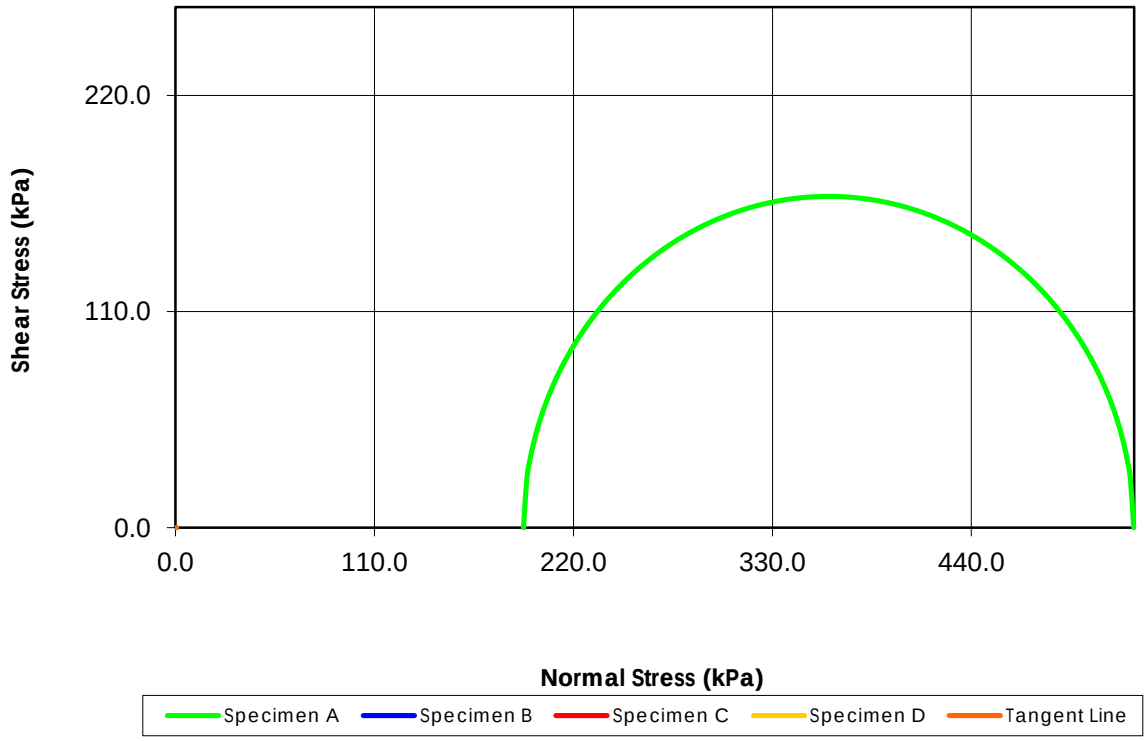



## Total Stress
## (C = 0.0 Ø = 0.0)

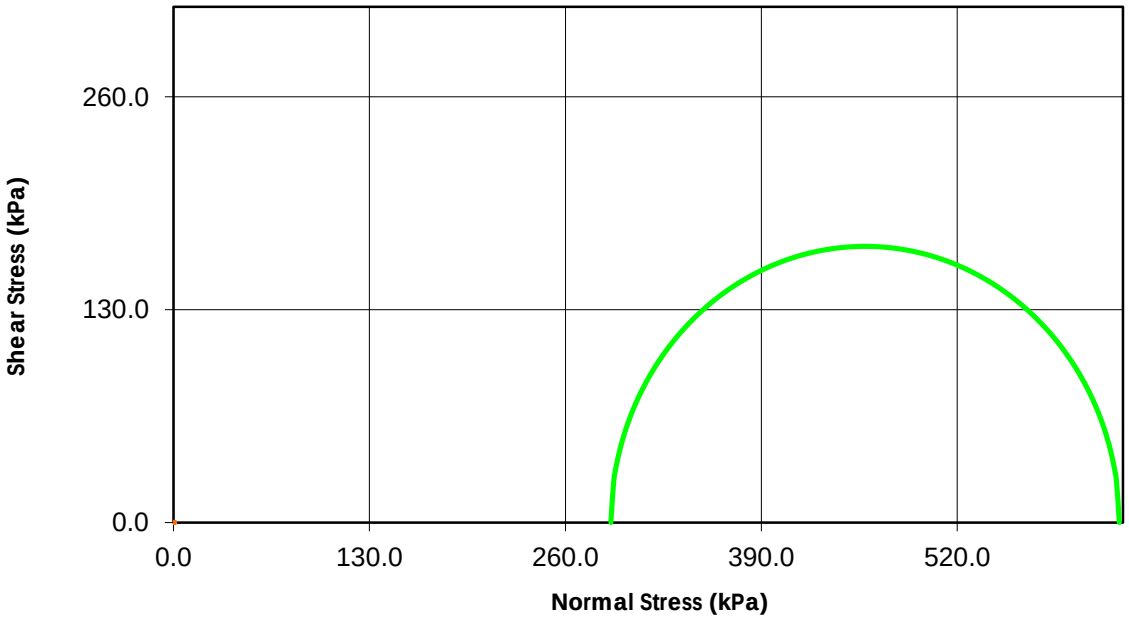


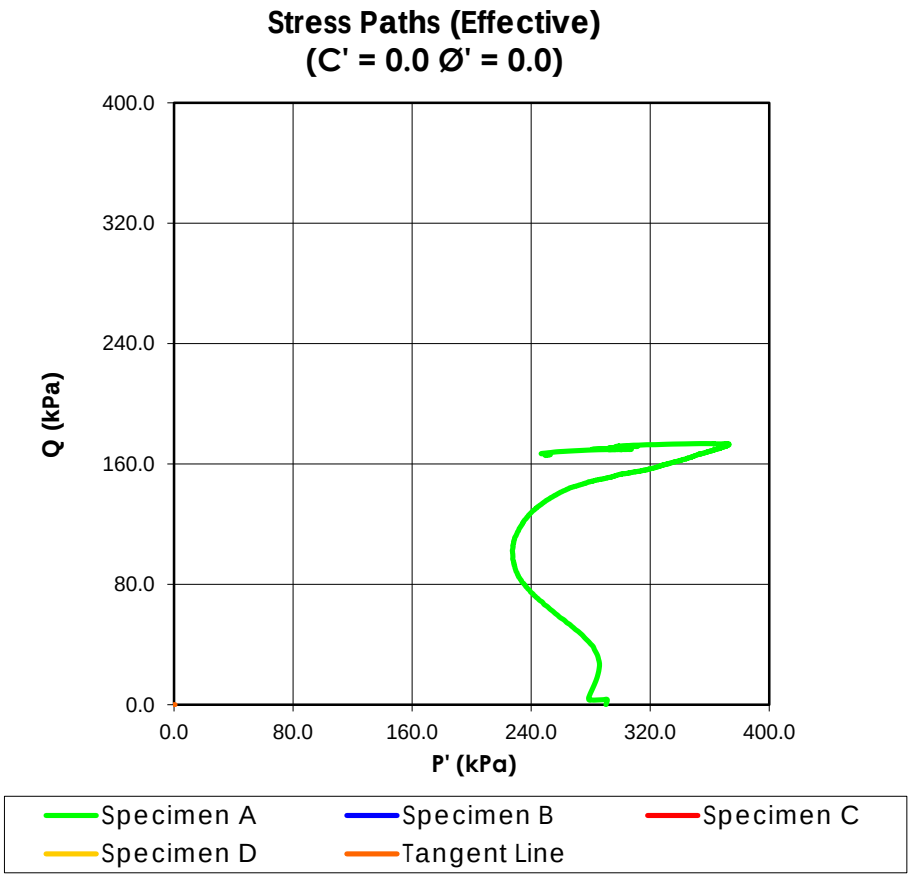
# Mohr Stress Circles at 15% Axial Strain Criterion

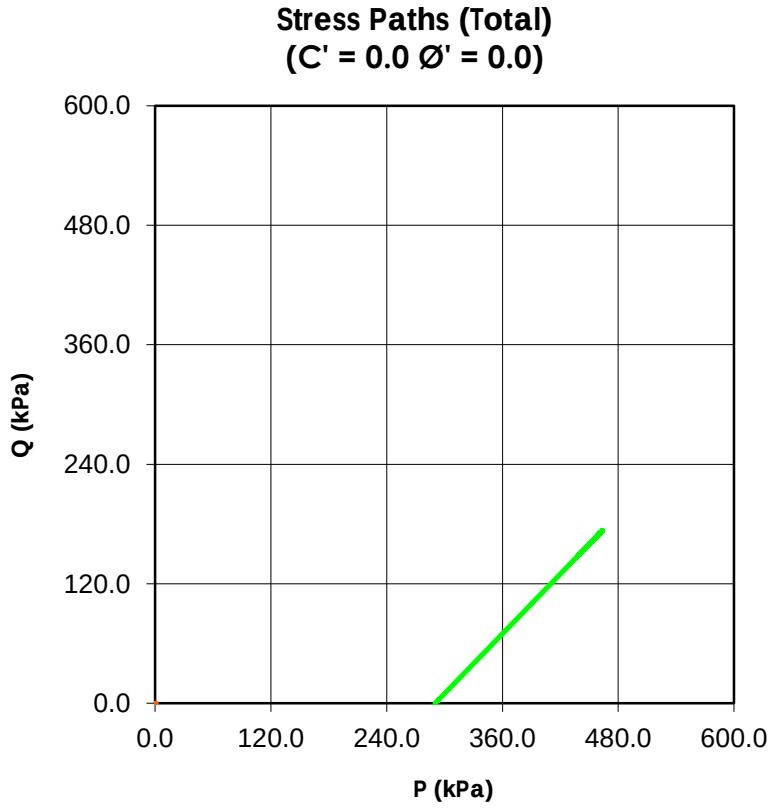
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

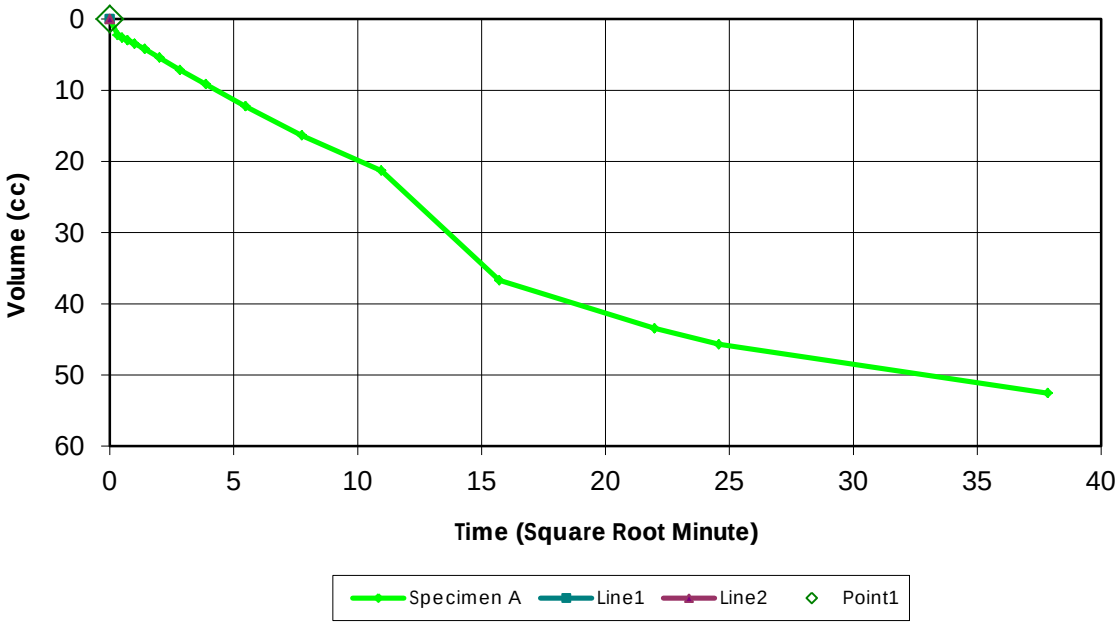



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

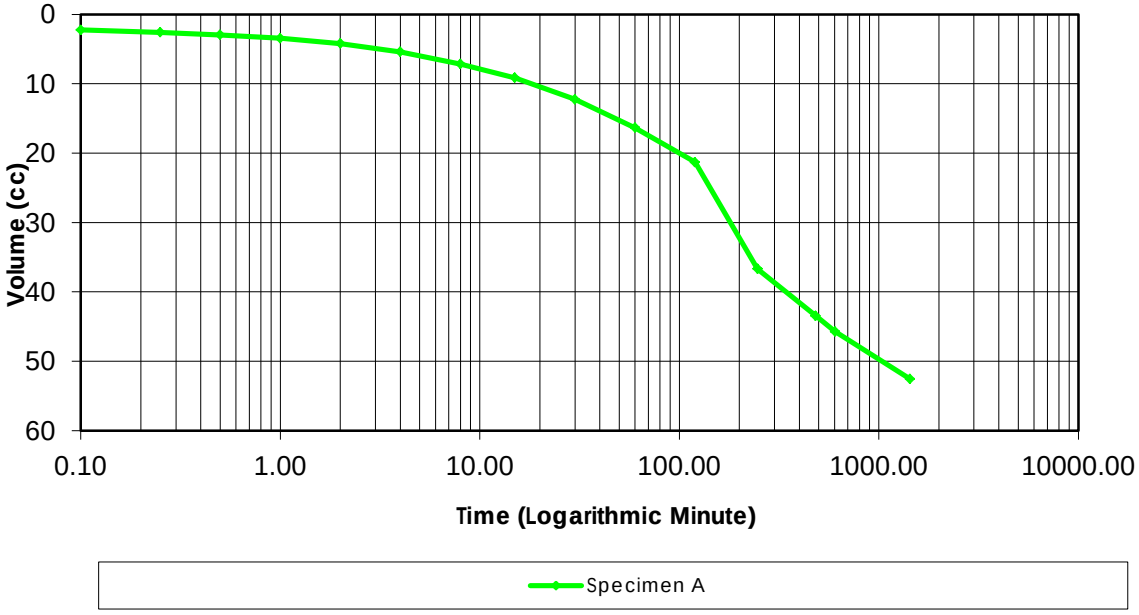

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.97

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 0.70 |
| 3 | 150.0 | 130.0 | 0.0 | 70.0 | |
| 4 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 5 | 220.0 | 130.0 | 70.0 | 0.0 | 0.97 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 2.7-3.15m

| | |
|---|---|
| Cell Pressure (kPa) | 430 |
| Back Pressure (kPa) | 130 |
| Effective Pressure (kPa) | 300 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71.5 |
| Initial Sample Height (mm) | 171.3 |
| Initial Sample Area (cm2) | 40.15 |
| Initial Volume (cm3) | 687.8 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 43.85 | N/A |
| 00:00:06 | 41.60 | 2.250 |
| 00:00:15 | 41.25 | 2.600 |
| 00:00:30 | 40.90 | 2.950 |
| 00:01:00 | 40.40 | 3.450 |
| 00:02:00 | 39.65 | 4.200 |
| 00:04:00 | 38.45 | 5.400 |
| 00:08:00 | 36.70 | 7.150 |
| 00:15:00 | 34.70 | 9.150 |
| 00:30:00 | 31.60 | 12.250 |
| 01:00:00 | 27.50 | 16.350 |
| 02:00:00 | 22.55 | 21.300 |
| 04:07:00 | 7.15 | 36.700 |
| 08:03:00 | 0.40 | 43.450 |
| 10:04:00 | -1.85 | 45.700 |
| 23:53:00 | -8.70 | 52.550 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

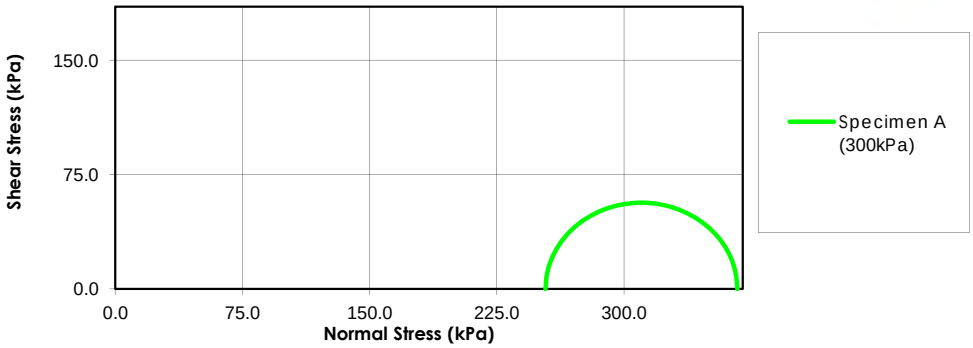
Stantec

Reviewed By C.Lamoureux

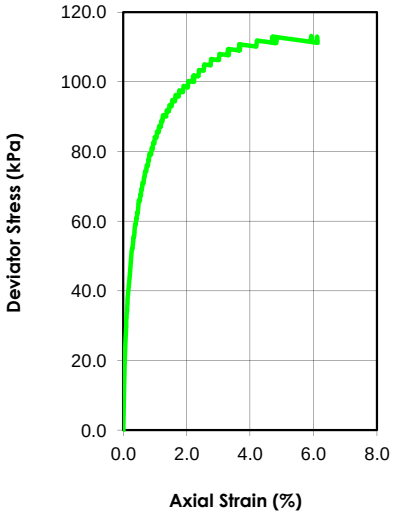
Date: 5-May-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.1 | | | |
| Dry Density (g/cm3) | 1.610 | | | |
| Saturation (%) | 100.12 | | | |
| Void Ratio | 0.674 | | | |
| Diameter (mm) | 72.2 | | | |
| Height (mm) | 154.4 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.99 | | | |
| Water Content (%) | 22.5 | | | |
| Dry Density (g/cm3) | 1.623 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.663 | | | |
| Effective Stress (kPa) | 275.7 | | | |
| Back Press. (kPa) | 204.3 | | | |
| Rate of Strain | 0.017 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 366.86 | | | |
| σ'3 at Failure (kPa) | 253.72 | | | |
| | | | | |
| | | | | |

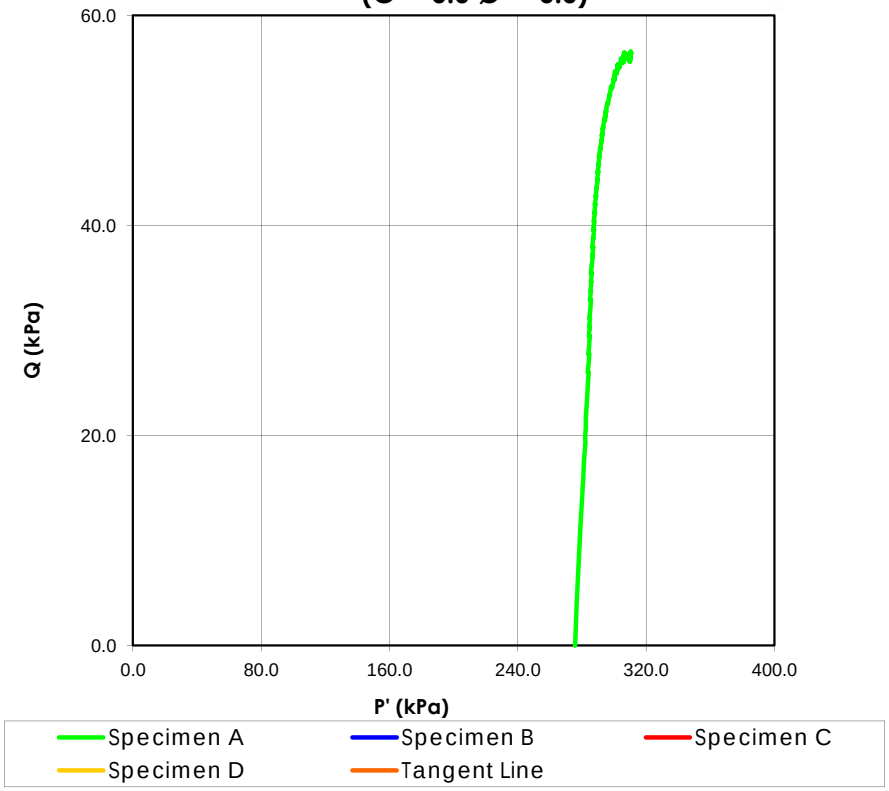
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 10773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D10-ST8 |
| **Depth:** | 3.0-3.5m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

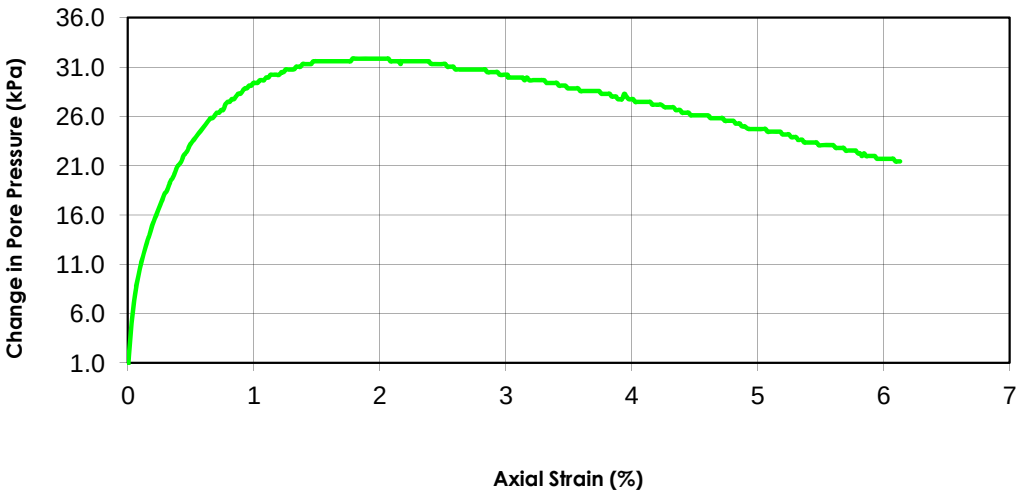
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

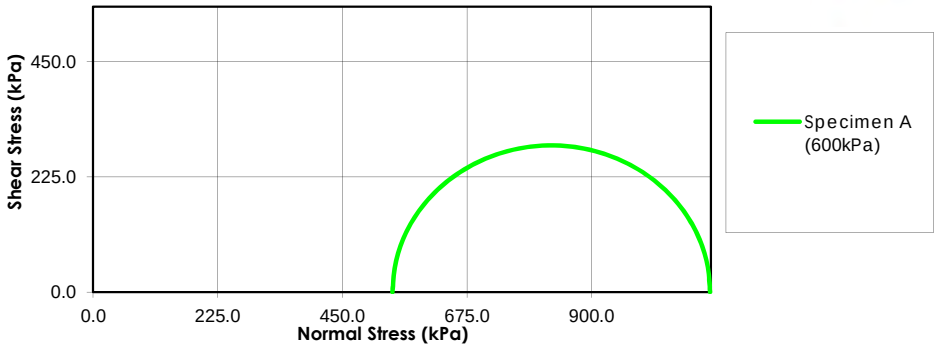
Stantec

Reviewed By C.Lamoureux

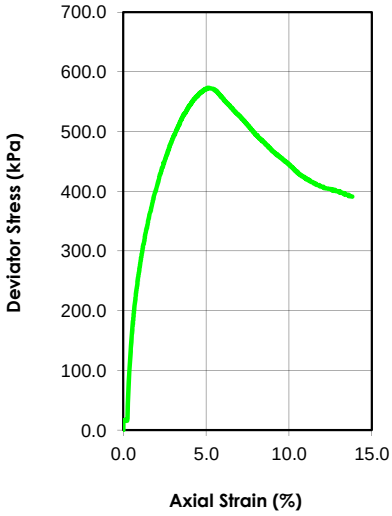
Date: 5-May-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 20.7 | | | |
| Dry Density (g/cm3) | 1.724 | | | |
| Saturation (%) | 98.92 | | | |
| Void Ratio | 0.563 | | | |
| Diameter (mm) | 72.1 | | | |
| Height (mm) | 154.9 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 16.4 | | | |
| Dry Density (g/cm3) | 1.755 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.538 | | | |
| Effective Stress (kPa) | 599.0 | | | |
| Back Press. (kPa) | 61.0 | | | |
| Rate of Strain | 0.017 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 1113.69 | | | |
| σ'3 at Failure (kPa) | 540.54 | | | |
| | | | | |
| | | | | |

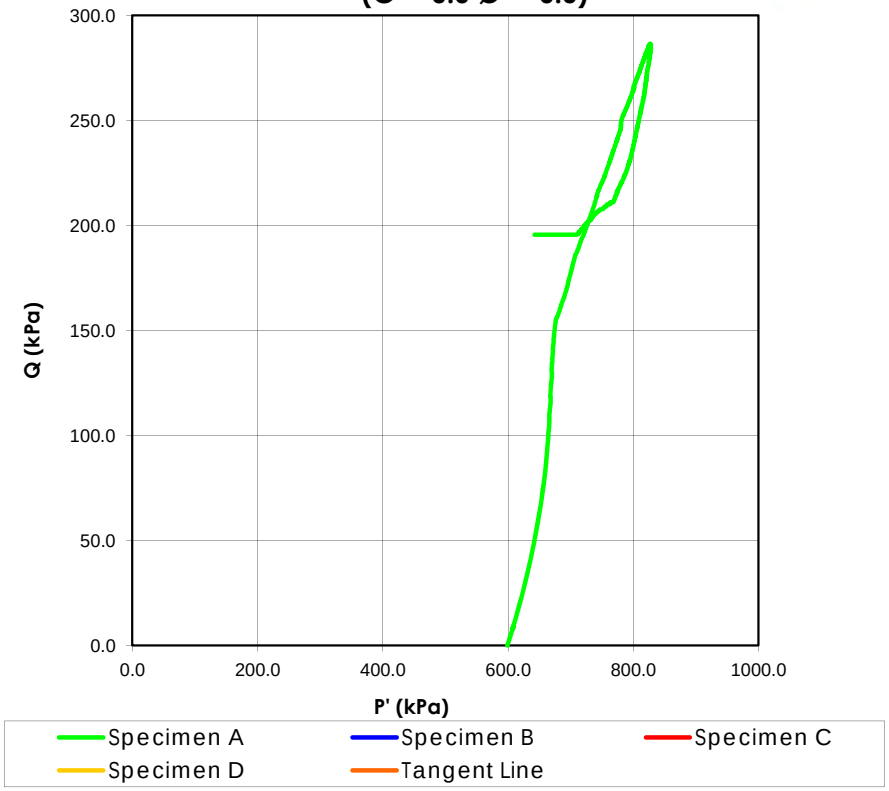
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D10-ST8 Bottom |
| **Depth:** | 3.0-3.5m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

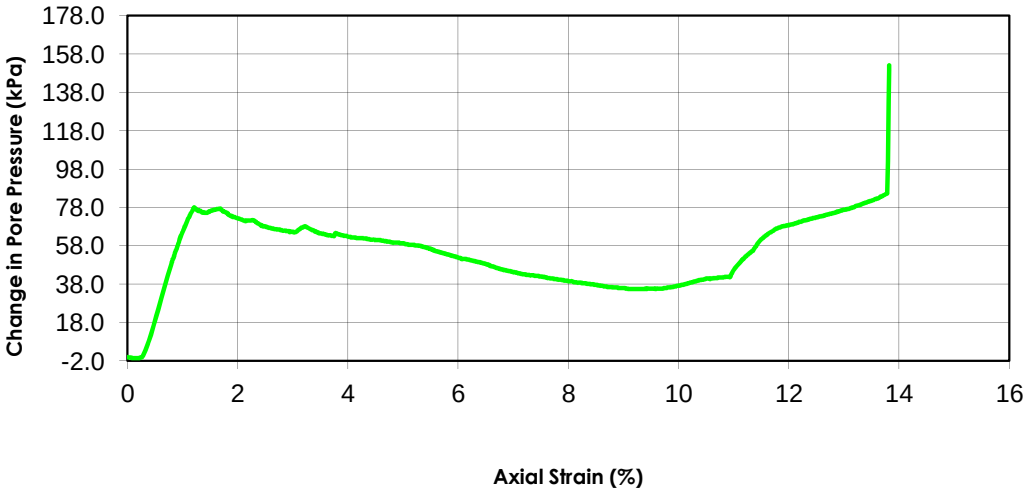
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

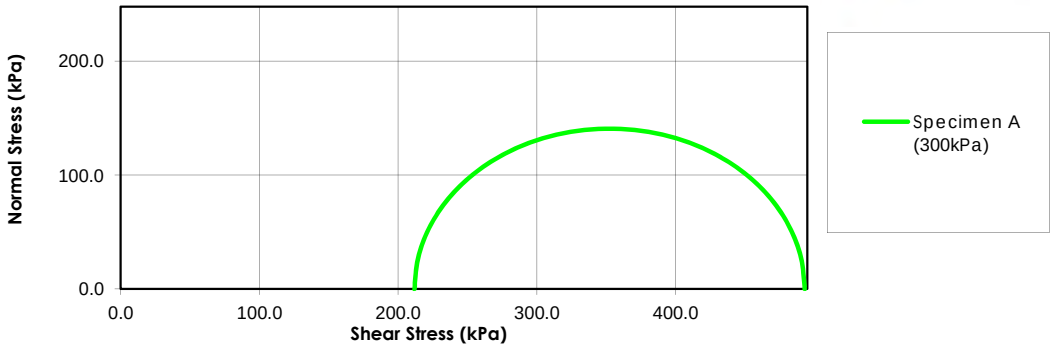
Stantec

Reviewed By C.Lamoureux

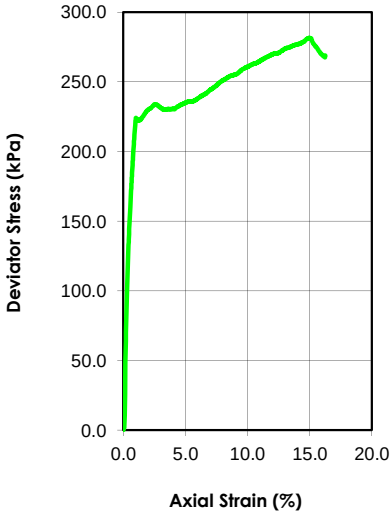
Date: 26-Apr-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 26.6 | | | |
| Dry Density (g/cm3) | 1.580 | | | |
| Saturation (%) | 101.42 | | | |
| Void Ratio | 0.706 | | | |
| Diameter (mm) | 72.8 | | | |
| Height (mm) | 149.8 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | 0 | | | |
| Plastic Limit | 0 | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 1.00 | | | |
| Water Content (%) | 24.6 | | | |
| Dry Density (g/cm3) | 1.563 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.728 | | | |
| Effective Stress (kPa) | 286.0 | | | |
| Back Press. (kPa) | 264.0 | | | |
| Rate of Strain | 0.018 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 493.16 | | | |
| σ'3 at Failure (kPa) | 211.78 | | | |
| | | | | |
| | | | | |

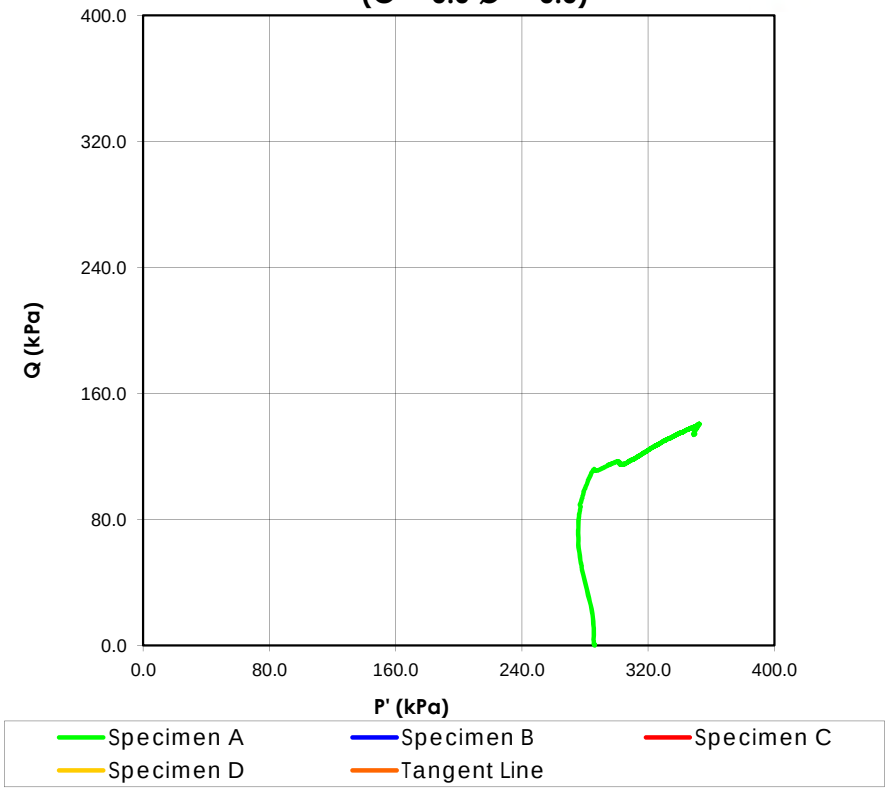
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D11-ST8 |
| **Depth:** | 4.3-4.8 m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

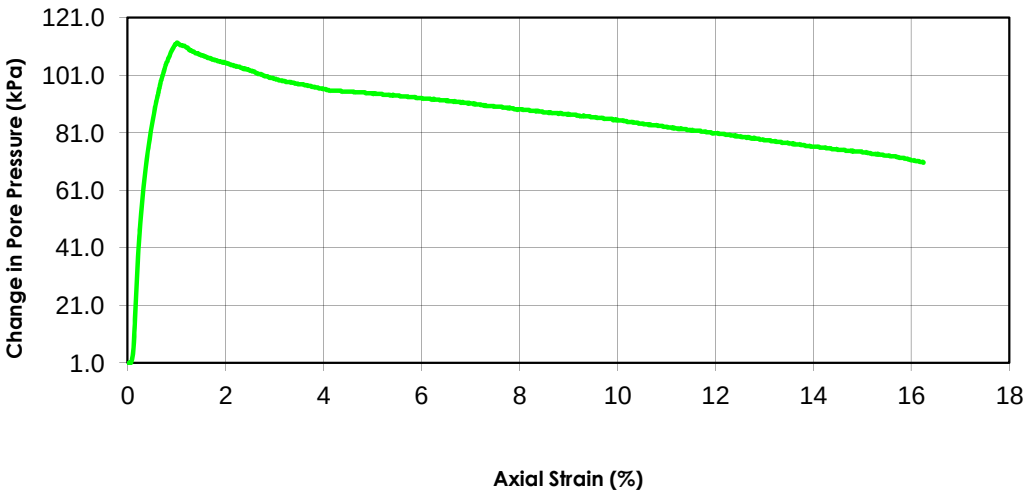
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

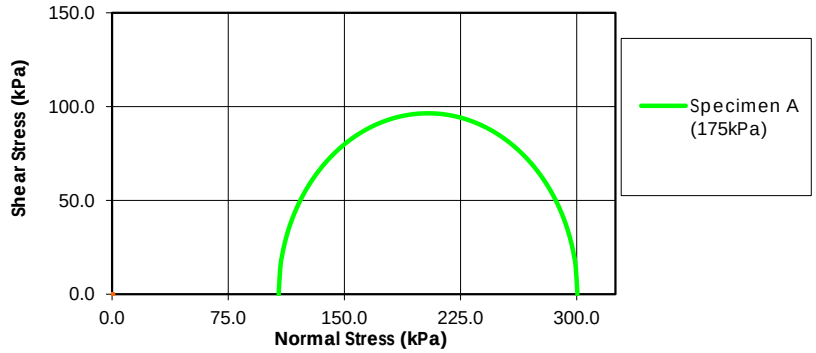
Stantec

Reviewed By C. Lamoureux

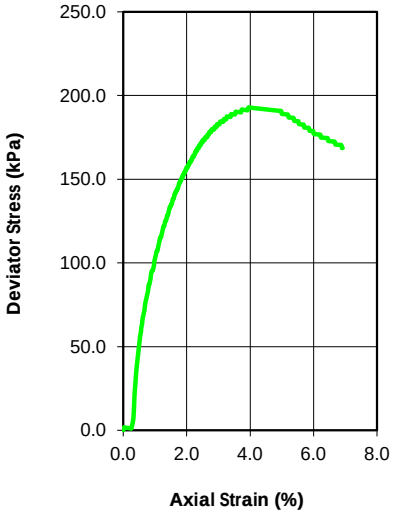
Date: 13-May-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 18.6 | | | |
| Dry Density (g/cm3) | 1.688 | | | |
| Saturation (%) | 81.17 | | | |
| Void Ratio | 0.626 | | | |
| Diameter (mm) | 72.3 | | | |
| Height (mm) | 156.9 | | | |
| Specific Gravity | 2.75 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 16.6 | | | |
| Dry Density (g/cm3) | 1.523 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.806 | | | |
| Effective Stress (kPa) | 179.3 | | | |
| Back Press. (kPa) | 345.7 | | | |
| Rate of Strain | 0.02 | | | |

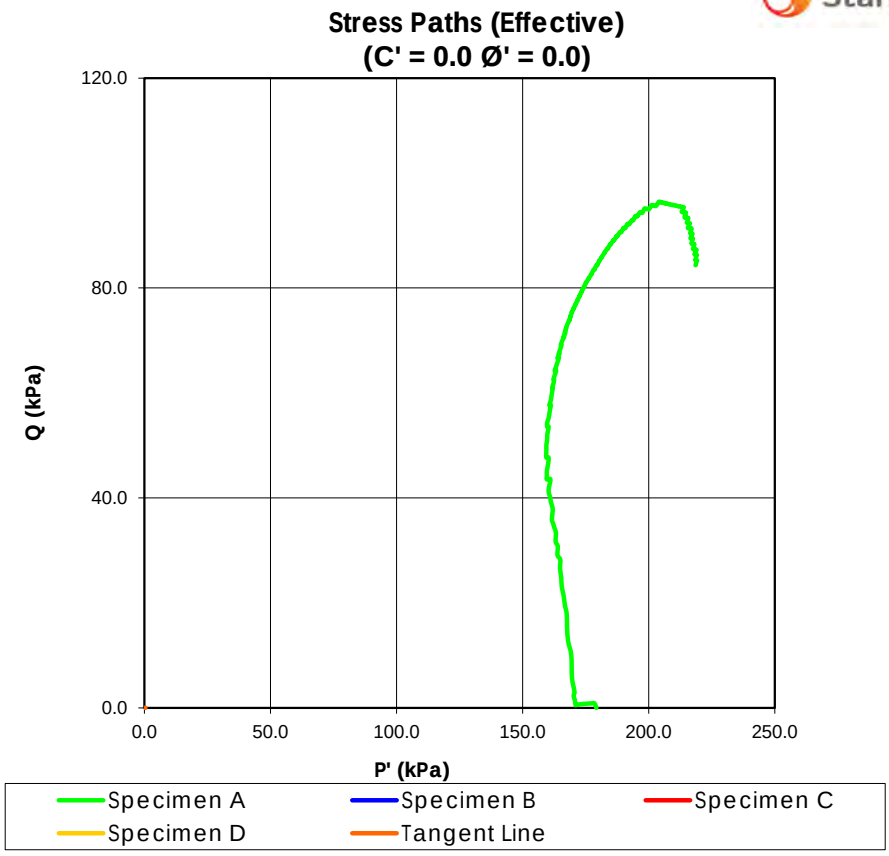
| Maximium Deviator Stress Criterion | | After Shear | A | B | C | D |
|---|---|---|---|---|---|---|
| C (kPa) | 0.0 | σ'1 at Failure (kPa) | 300.46 | | | |
| C' (kPa) | 0.0 | σ'3 at Failure (kPa) | 107.58 | | | |
| Ø (deg) | 0.0 | | | | | |
| Ø' (deg) | 0.0 | | | | | |

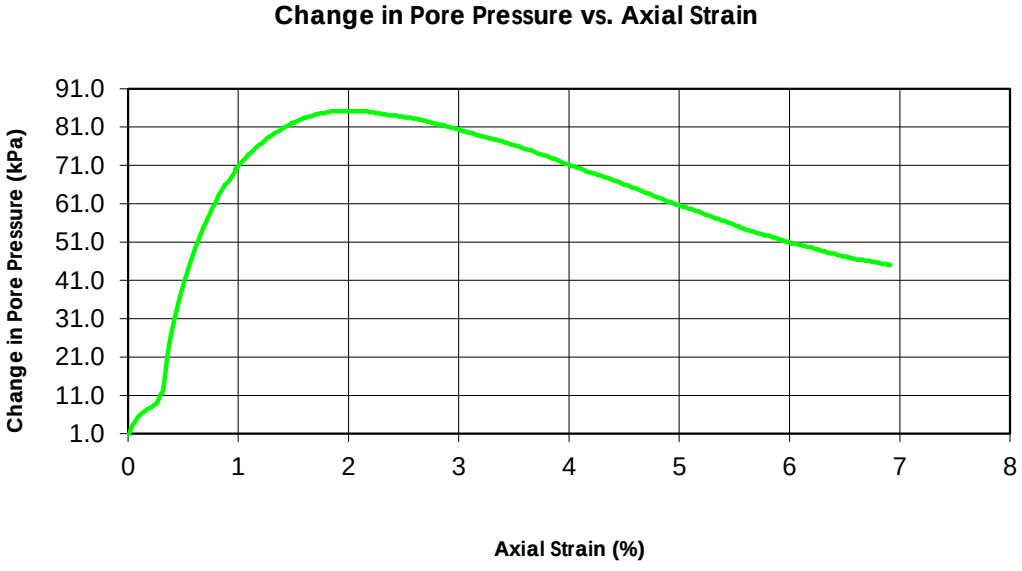
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D12-ST8 Top |
| **Depth:** | 3.6-4.1m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

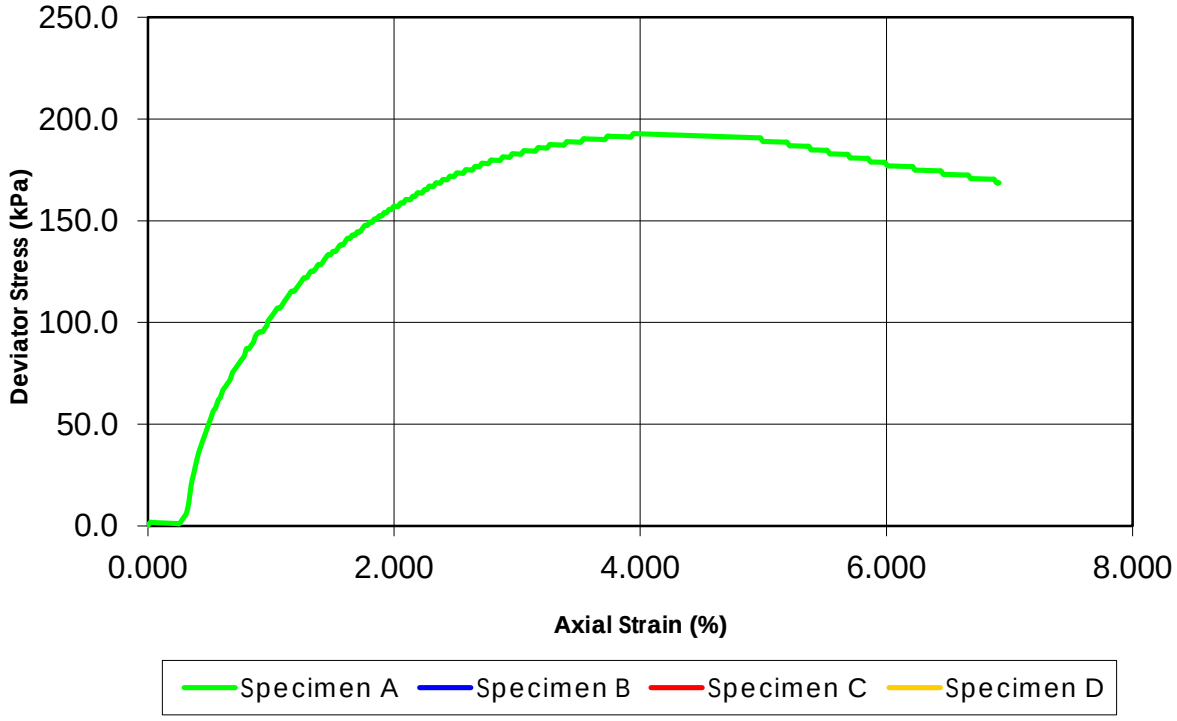
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

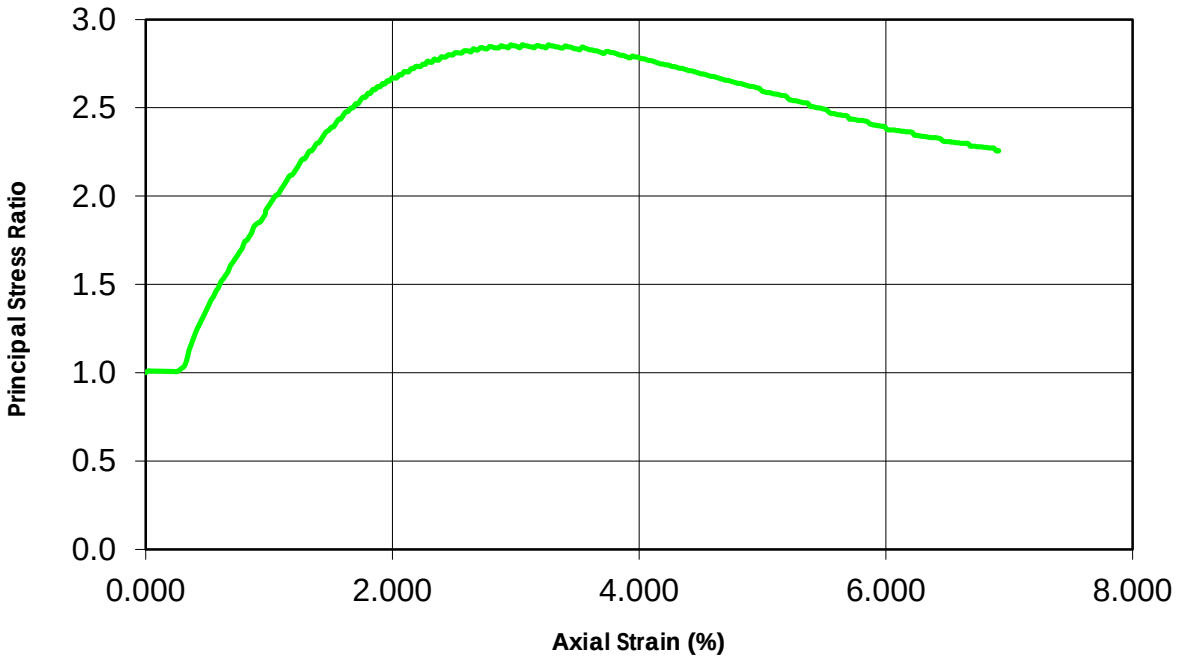


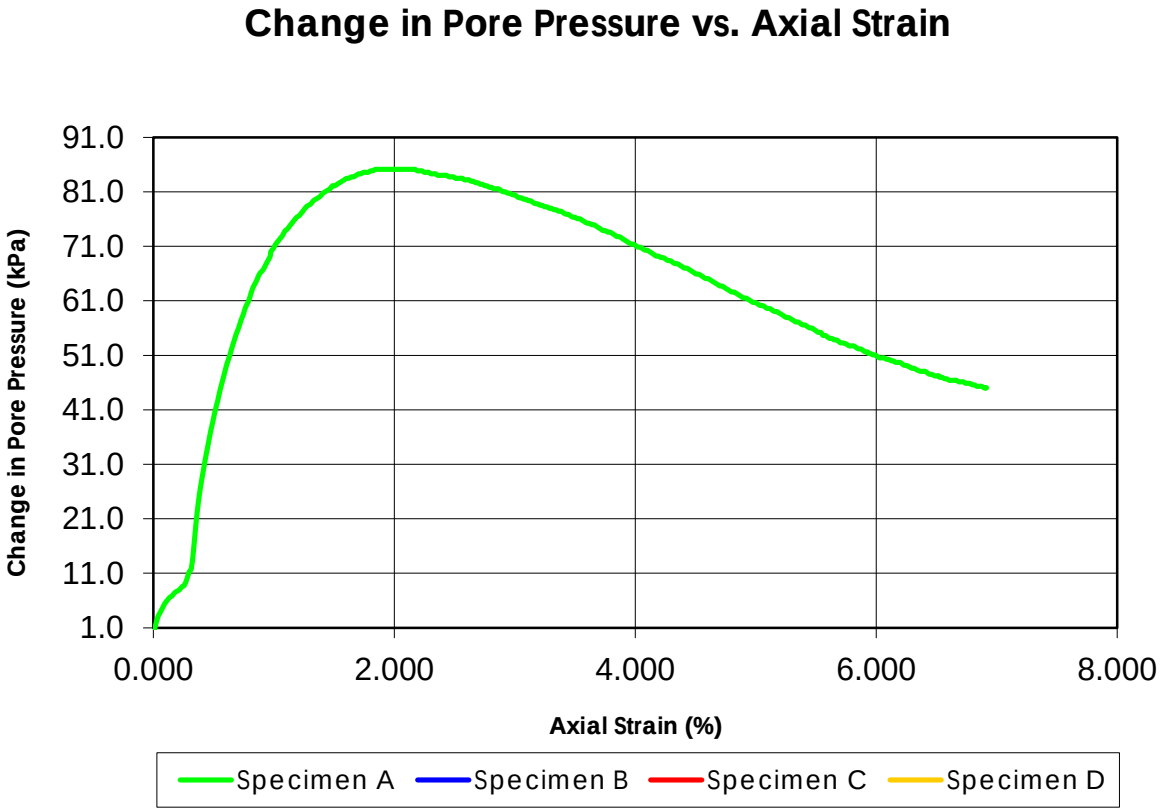



## Deviator Stress vs. Axial Strain



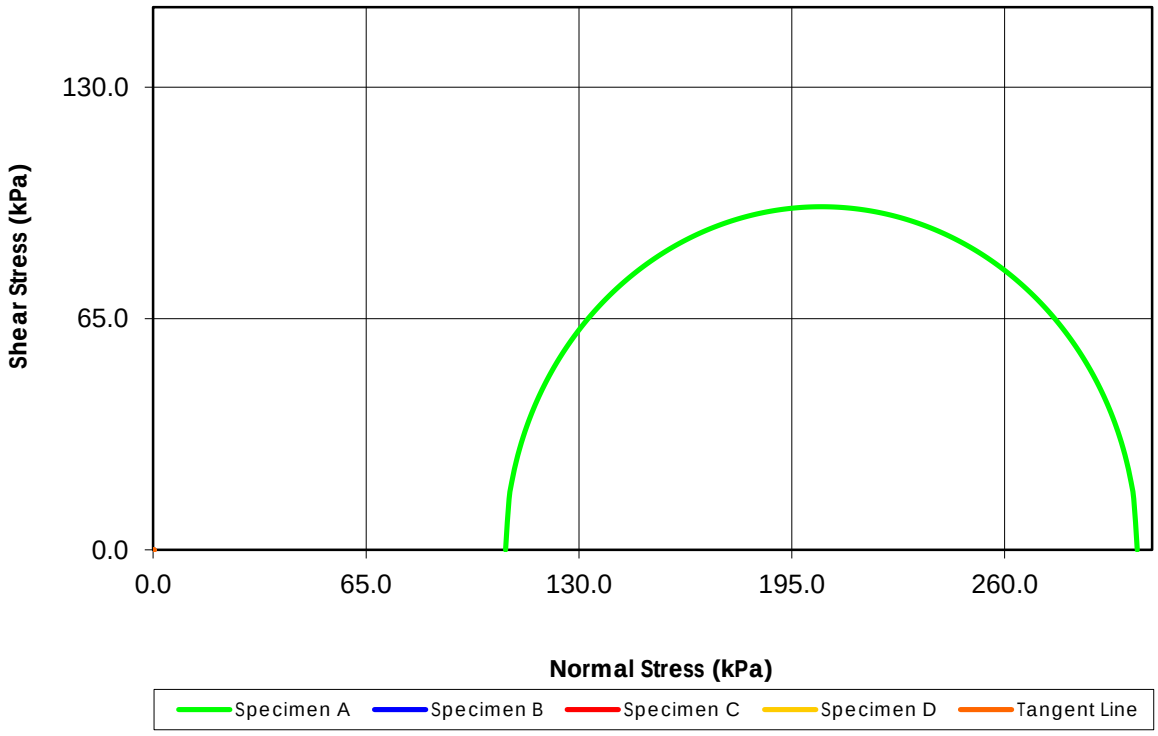

## Principal Stress Ratio vs. Axial Strain



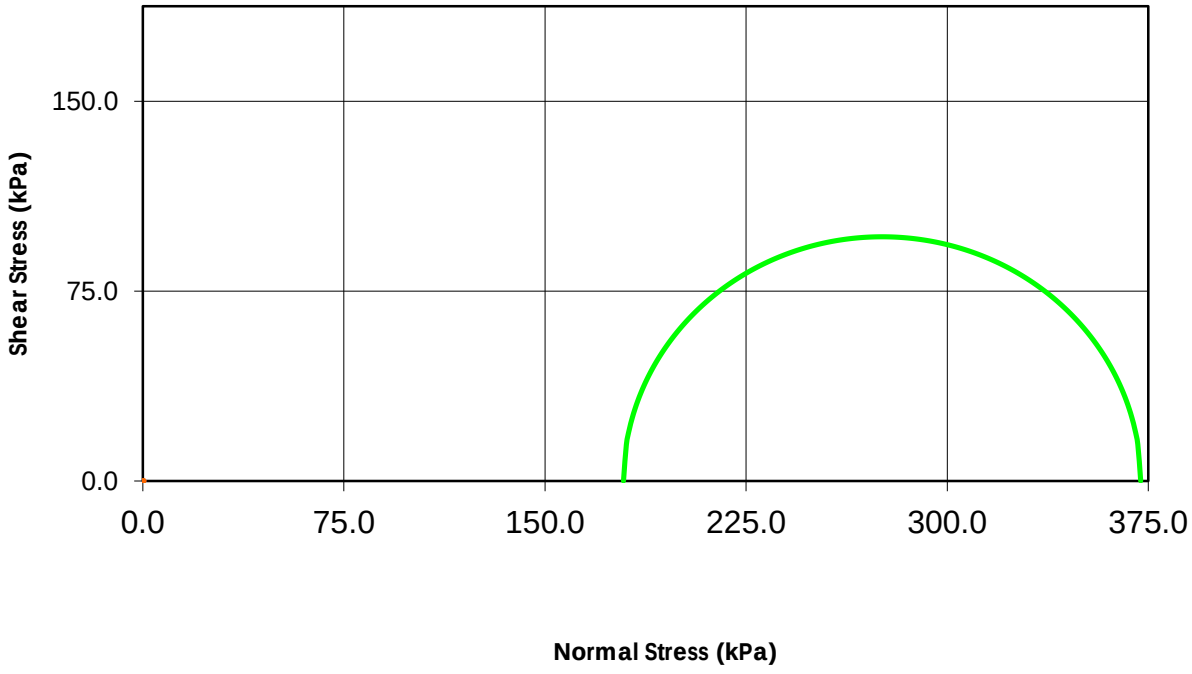

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
91.0
81.0
71.0
61.0
51.0
41.0
31.0
21.0
11.0
1.0
0.000
2.000
4.000
6.000
8.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

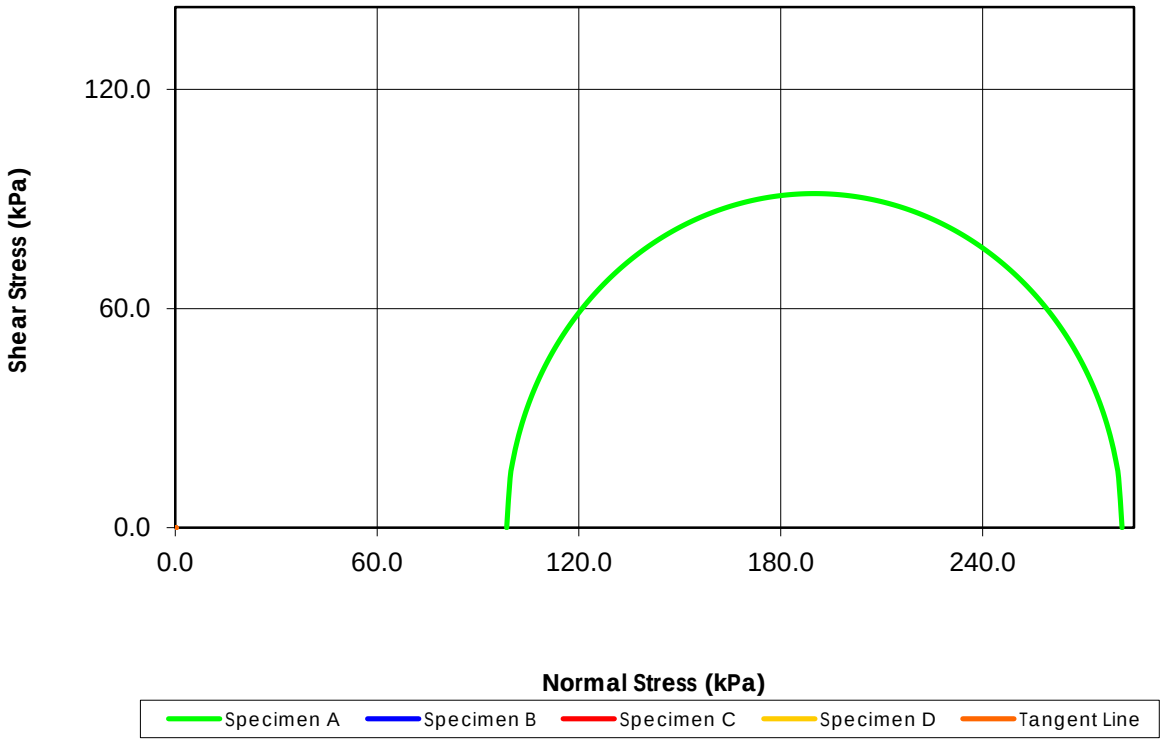



### Total Stress
### (C = 0.0 Ø = 0.0)

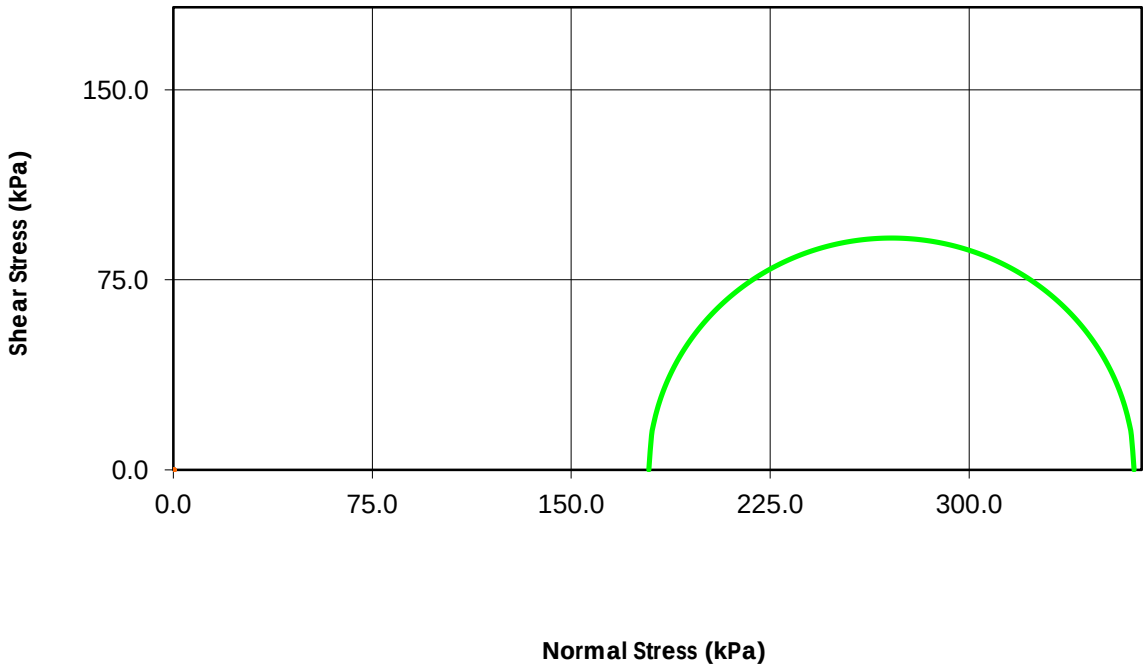


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

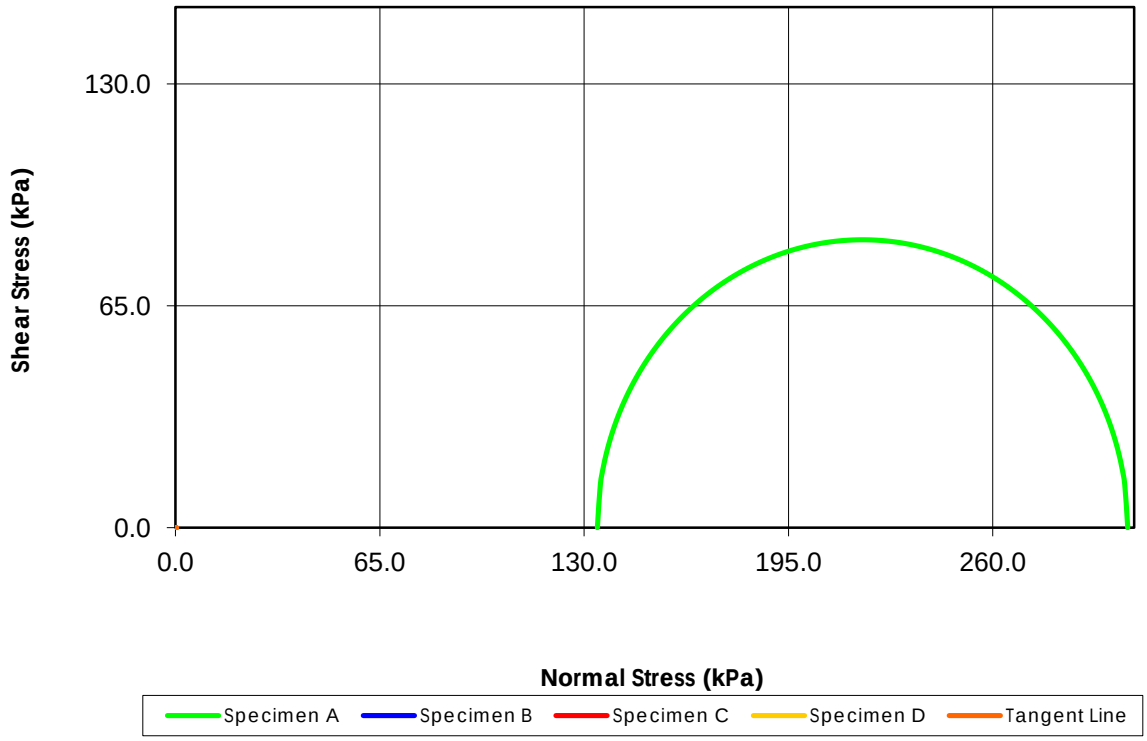



## Total Stress
## (C = 0.0 Ø = 0.0)

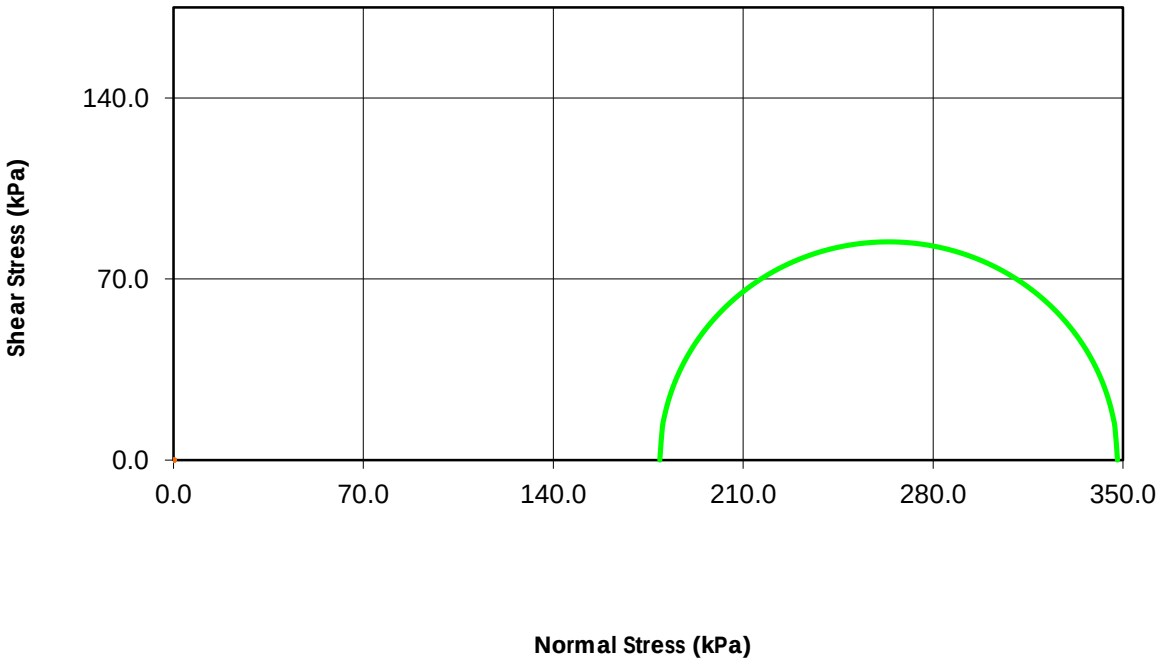


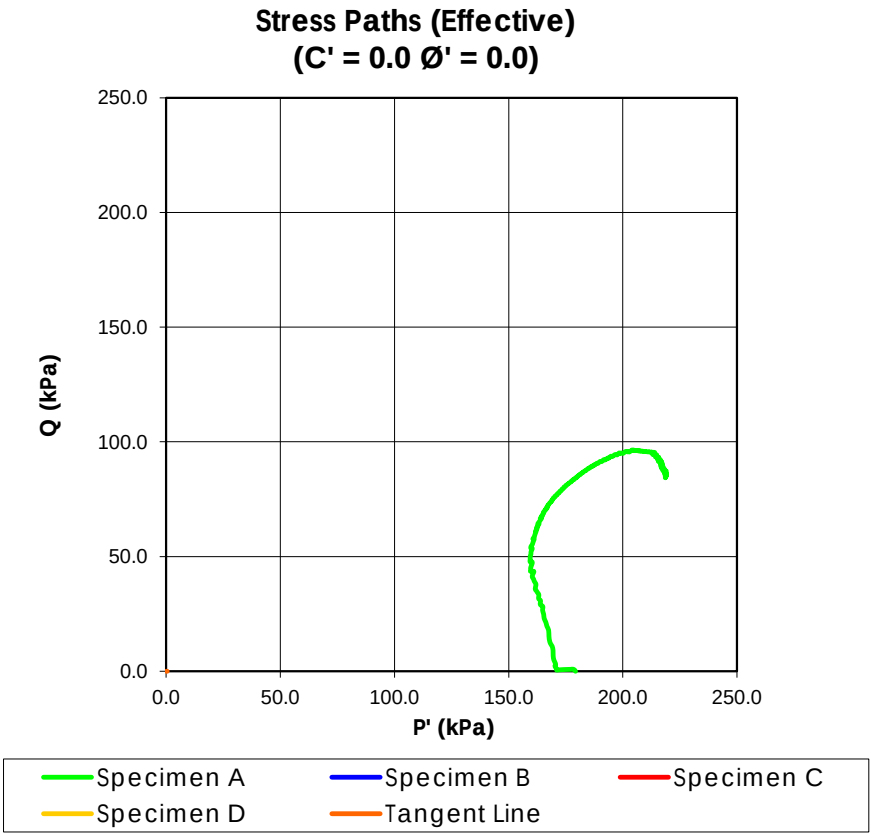
# Mohr Stress Circles at 15% Axial Strain Criterion

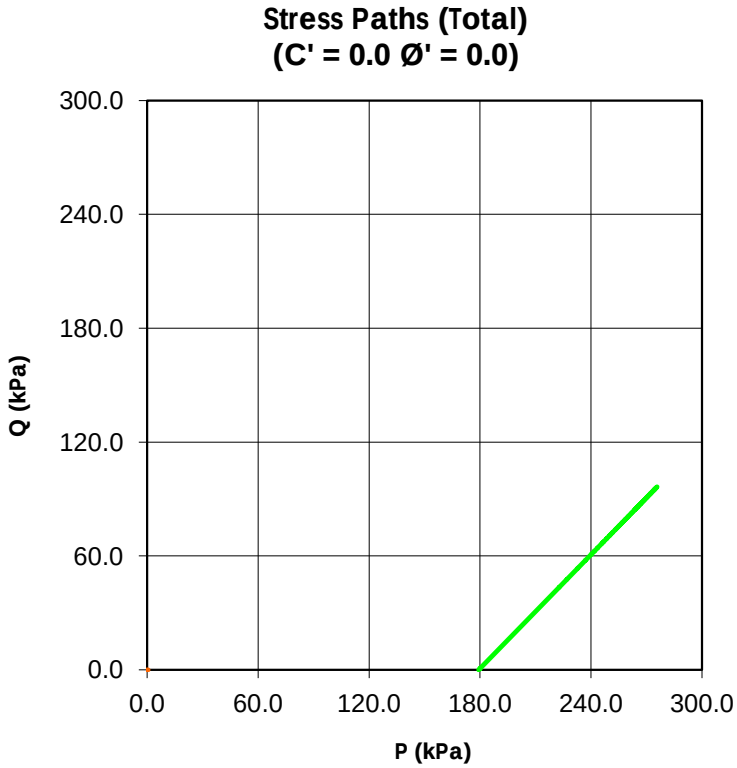
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

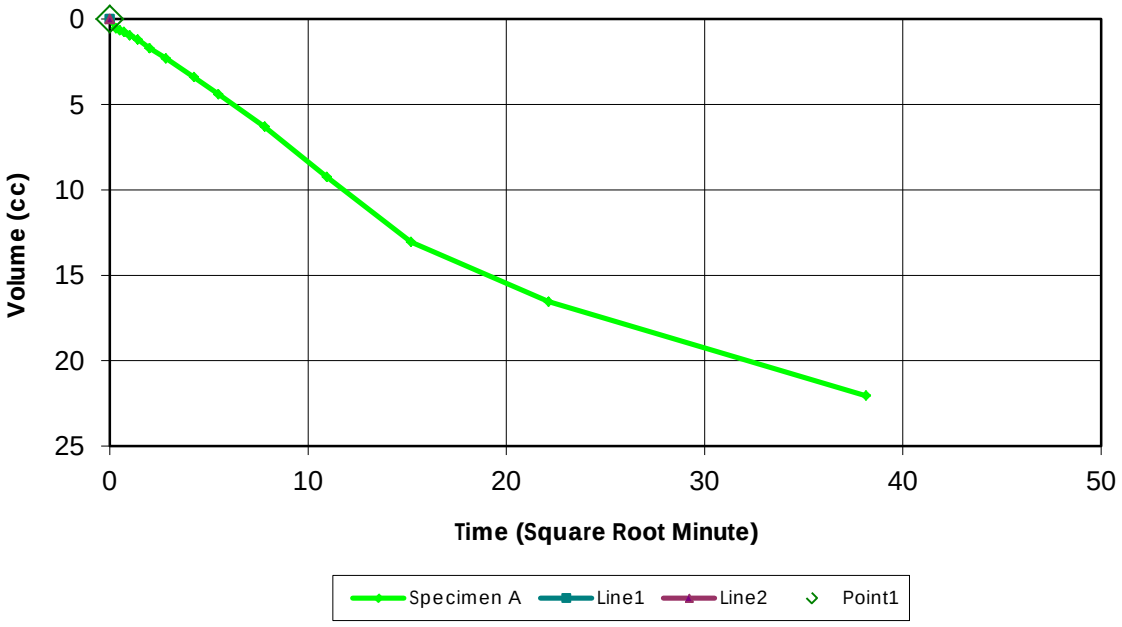



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
250.0
200.0
150.0
100.0
50.0
0.0
Q (kPa)
0.0
50.0
100.0
150.0
200.0
250.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

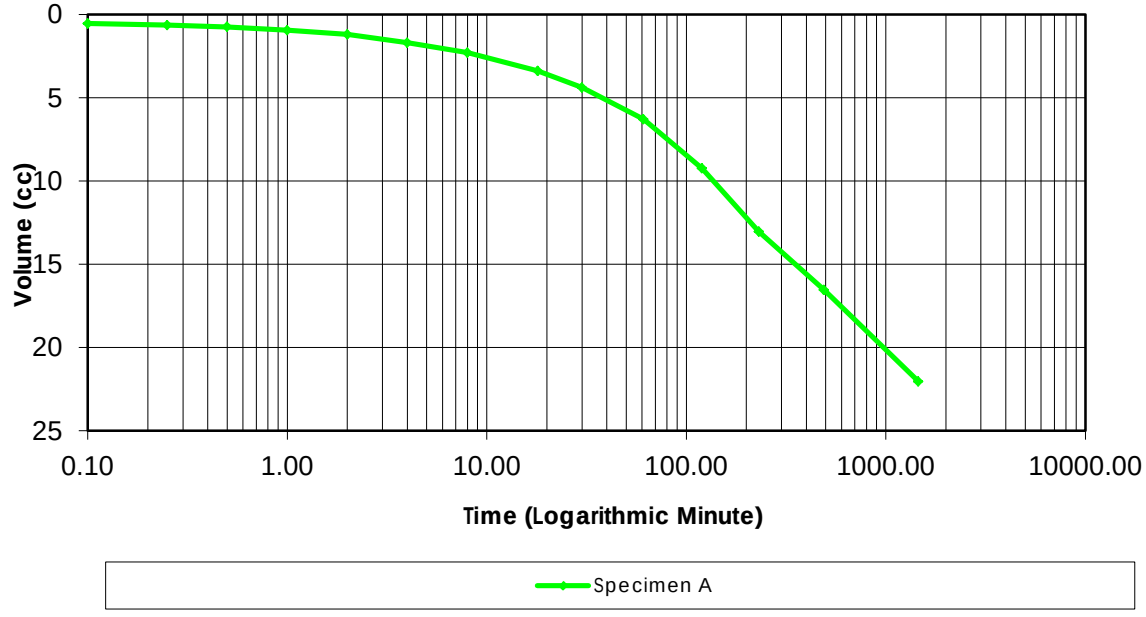

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 70.0 | 50.0 | N/A | N/A | N/A |
| 1 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 2 | 120.0 | 50.0 | 50.0 | 0.0 | 0.32 |
| 3 | 120.0 | 100.0 | 0.0 | 50.0 | |
| 4 | 120.0 | 100.0 | 0.0 | 0.0 | |
| 5 | 170.0 | 100.0 | 50.0 | 0.0 | 0.44 |
| 6 | 170.0 | 150.0 | 0.0 | 50.0 | |
| 7 | 170.0 | 150.0 | 0.0 | 0.0 | |
| 8 | 220.0 | 150.0 | 50.0 | 0.0 | 0.77 |
| 9 | 220.0 | 200.0 | 0.0 | 50.0 | |
| 10 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 11 | 270.0 | 200.0 | 50.0 | 0.0 | 0.91 |
| 12 | 270.0 | 250.0 | 0.0 | 50.0 | |
| 13 | 270.0 | 250.0 | 0.0 | 0.0 | |
| 14 | 320.0 | 250.0 | 50.0 | 0.0 | 0.91 |
| 15 | 320.0 | 300.0 | 0.0 | 50.0 | |
| 16 | 320.0 | 300.0 | 0.0 | 0.0 | |
| 17 | 370.0 | 300.0 | 50.0 | 0.0 | 0.96 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.6-4.1m

| | |
|---|---|
| Cell Pressure (kPa) | 525 |
| Back Pressure (kPa) | 350 |
| Effective Pressure (kPa) | 175 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.3 |
| Initial Sample Height (mm) | 156.9 |
| Initial Sample Area (cm2) | 41.06 |
| Initial Volume (cm3) | 644.2 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 32.55 | N/A |
| 00:00:06 | 32.00 | 0.550 |
| 00:00:15 | 31.90 | 0.650 |
| 00:00:30 | 31.80 | 0.750 |
| 00:01:00 | 31.60 | 0.950 |
| 00:02:00 | 31.35 | 1.200 |
| 00:04:00 | 30.85 | 1.700 |
| 00:08:00 | 30.25 | 2.300 |
| 00:18:00 | 29.15 | 3.400 |
| 00:30:00 | 28.15 | 4.400 |
| 01:01:00 | 26.25 | 6.300 |
| 02:00:00 | 23.30 | 9.250 |
| 03:50:50 | 19.50 | 13.050 |
| 08:10:00 | 16.00 | 16.550 |
| 24:15:00 | 10.50 | 22.050 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

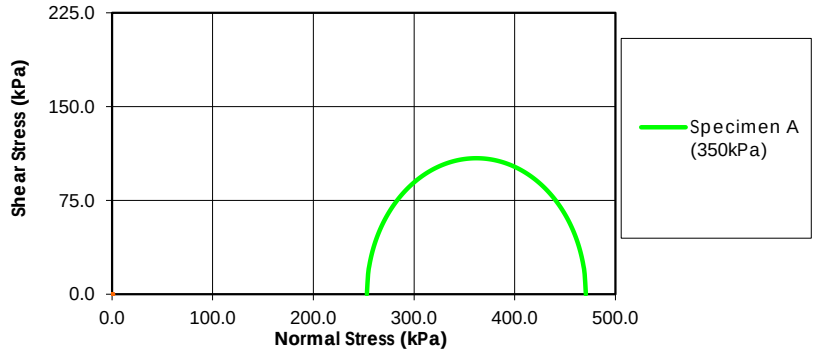
Stantec

Reviewed By: C. Lamoureux

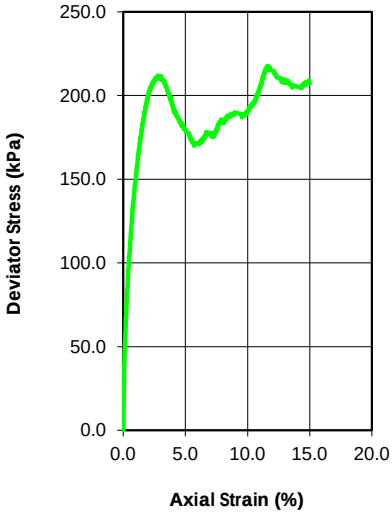
Date: 13-May-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 28.4 | | | |
| Dry Density (g/cm3) | 1.541 | | | |
| Saturation (%) | 99.39 | | | |
| Void Ratio | 0.781 | | | |
| Diameter (mm) | 72.8 | | | |
| Height (mm) | 158.8 | | | |
| Specific Gravity | 2.75 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 24.3 | | | |
| Dry Density (g/cm3) | 1.644 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.672 | | | |
| Effective Stress (kPa) | 336.6 | | | |
| Back Press. (kPa) | 213.4 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

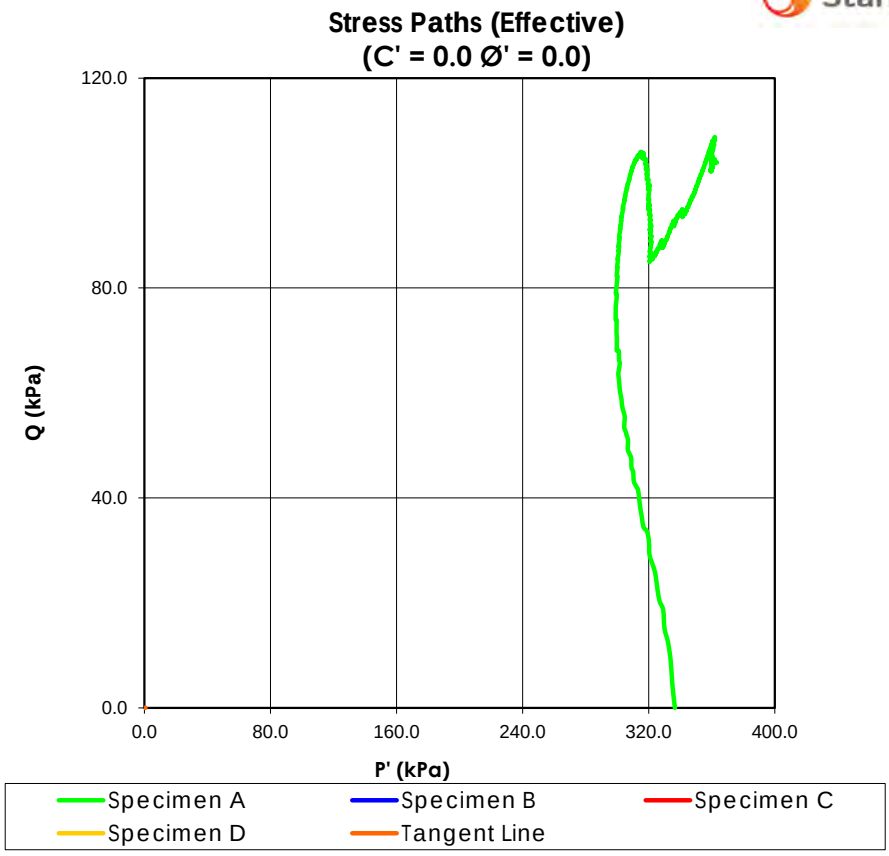
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 470.63 | | | |
| σ'3 at Failure (kPa) | 253.14 | | | |
| | | | | |
| | | | | |

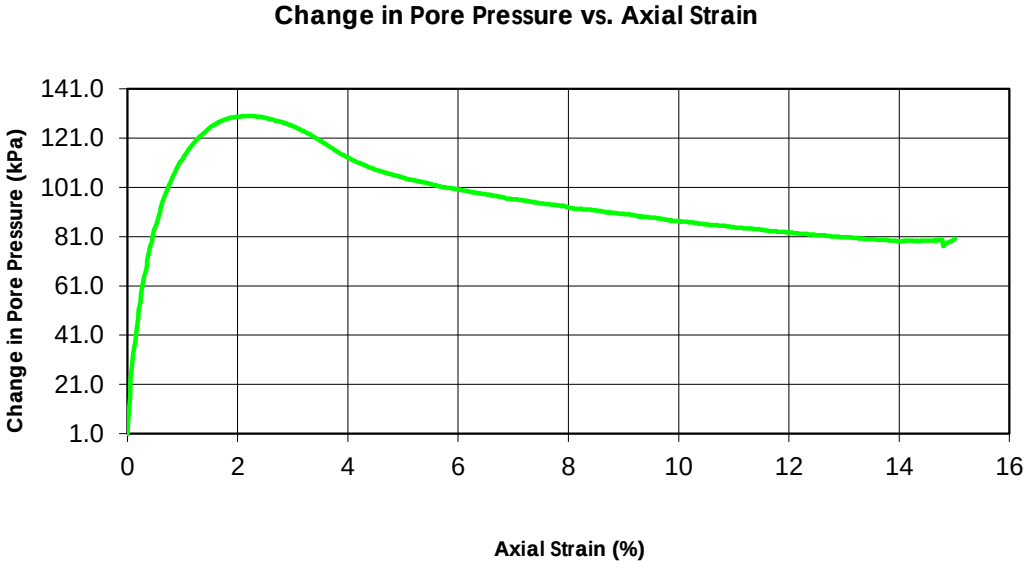
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D12-ST8 Bottom |
| **Depth:** | 3.6-4.1m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

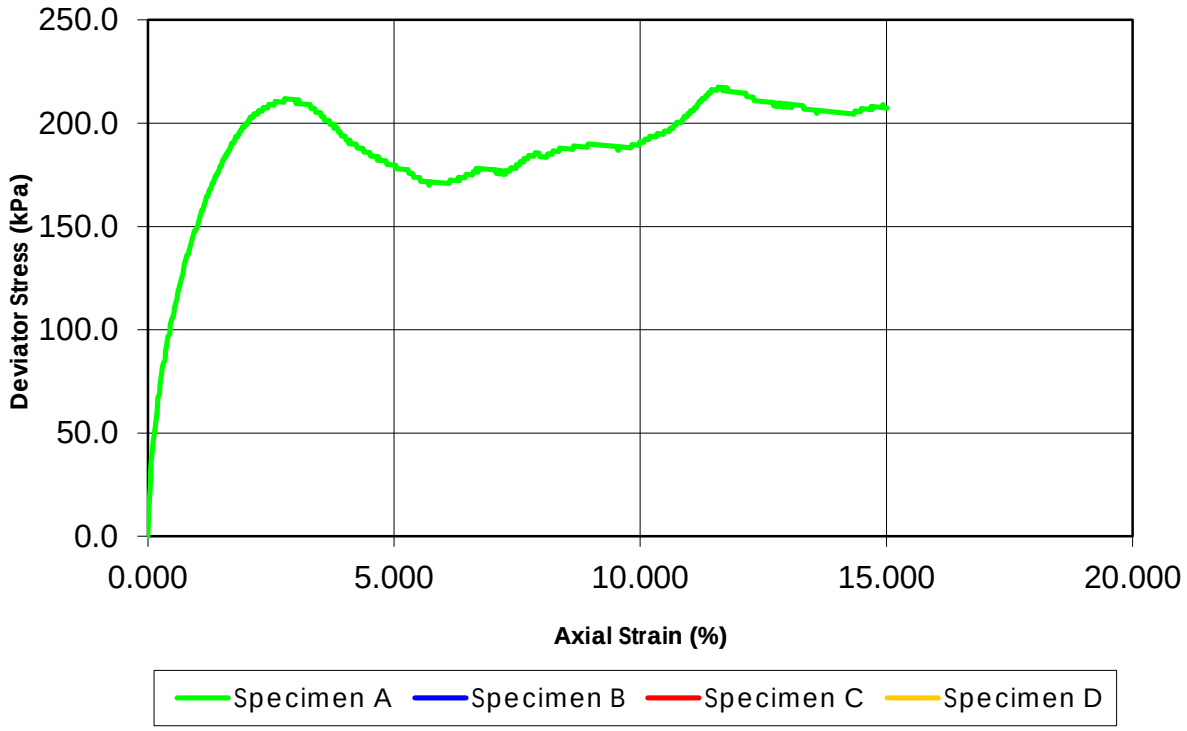
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

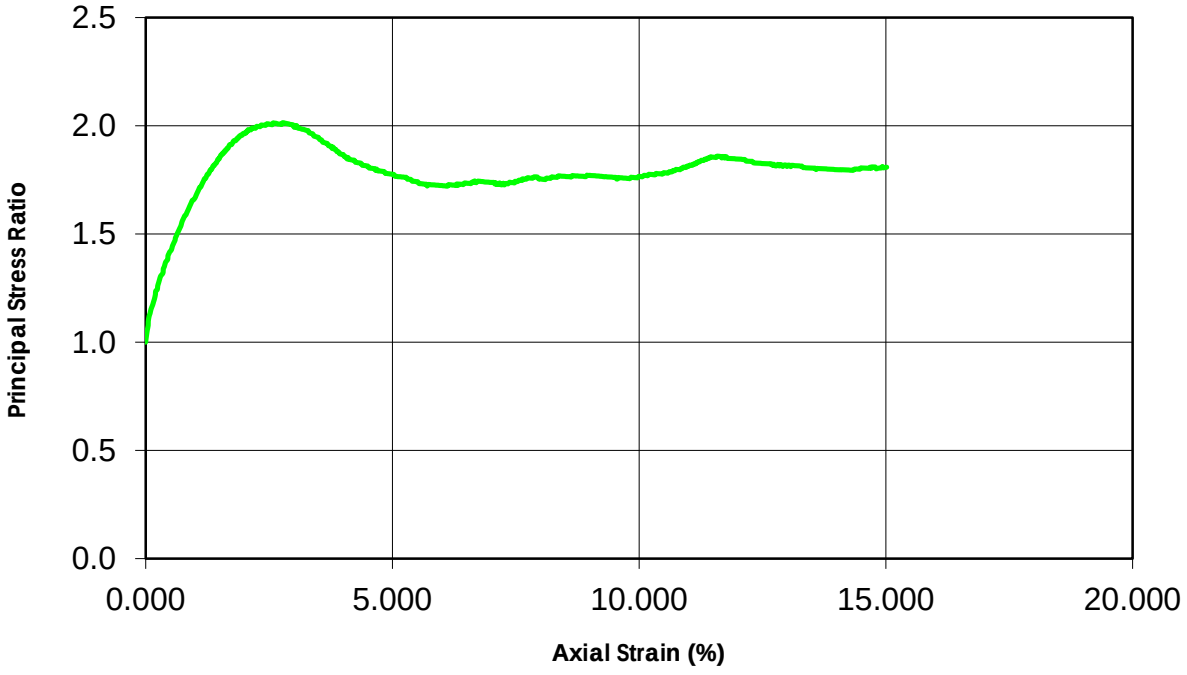


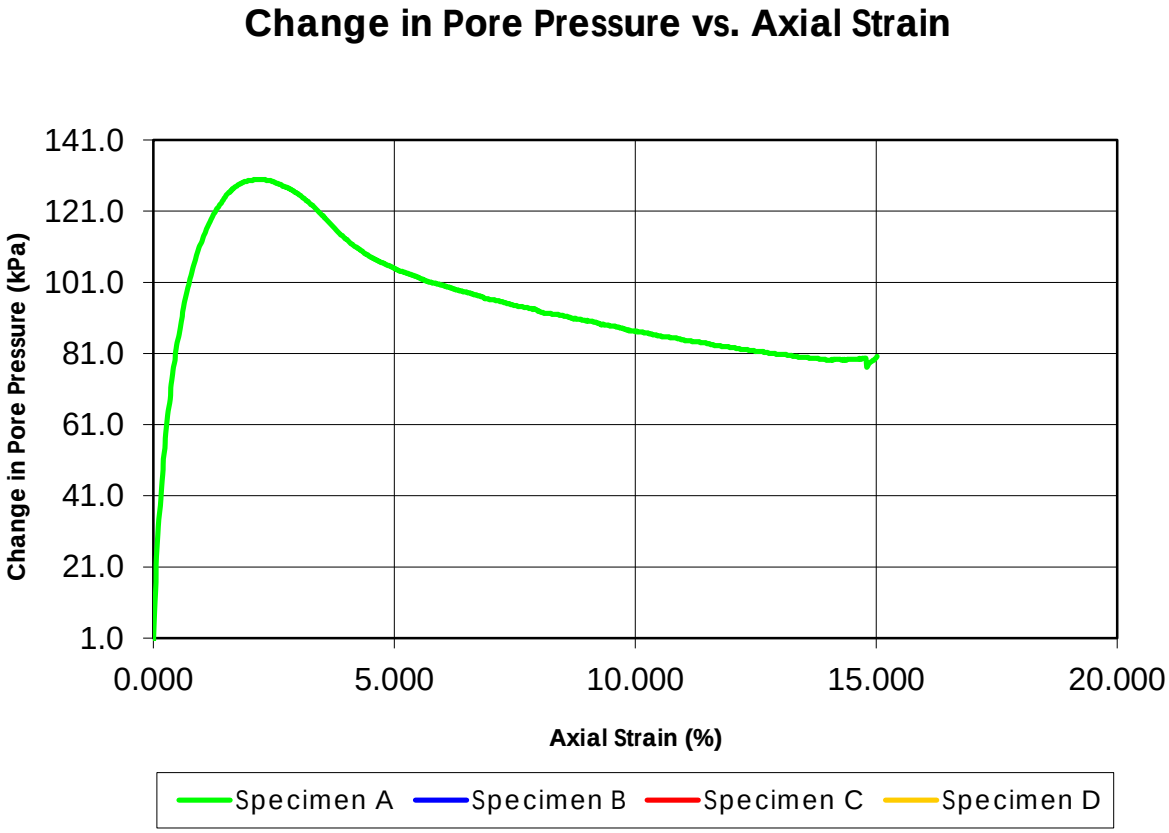



## Deviator Stress vs. Axial Strain



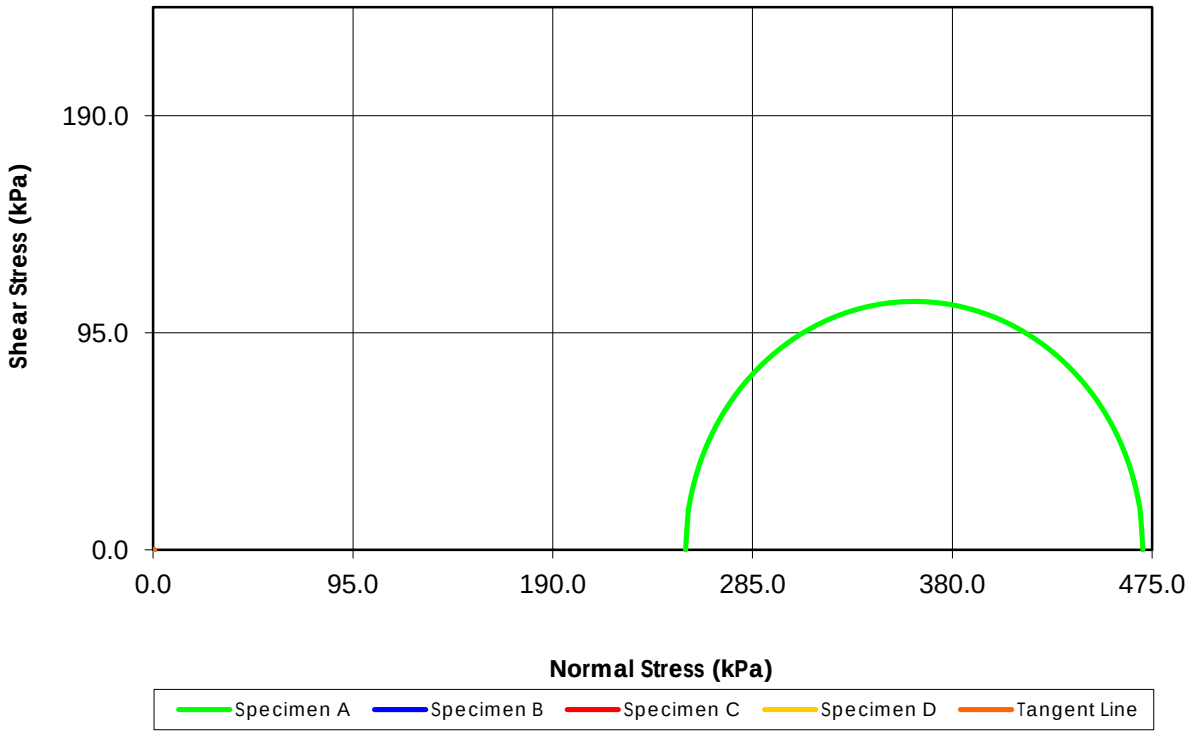

## Principal Stress Ratio vs. Axial Strain



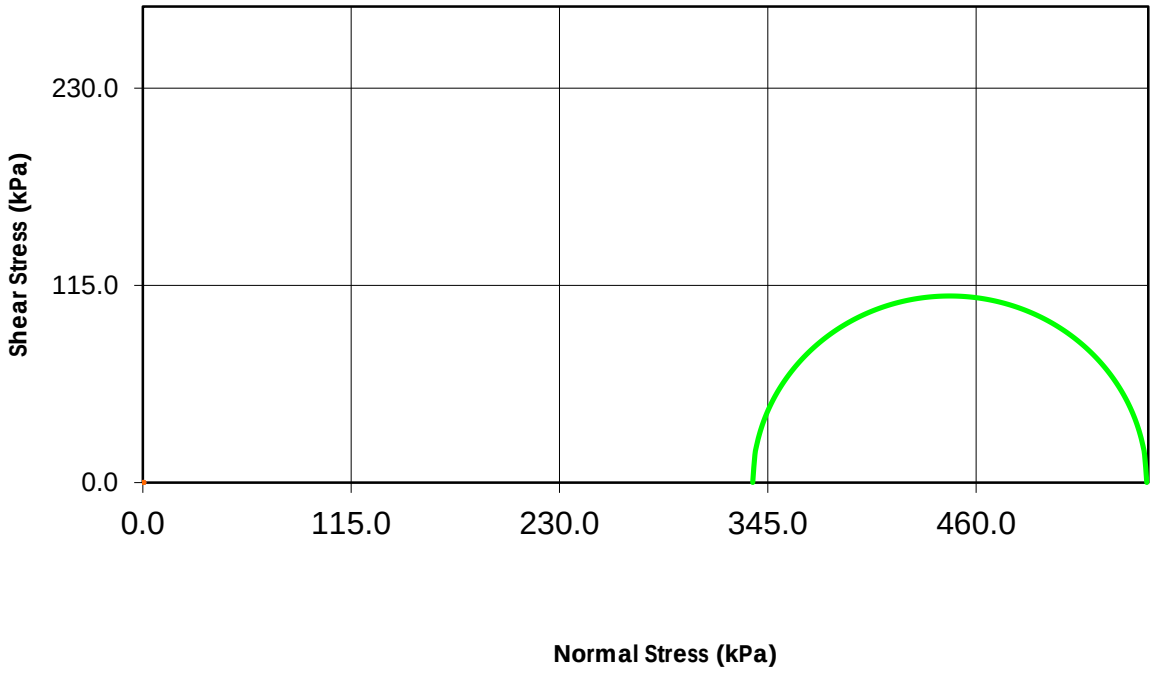

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
0.000
5.000
10.000
15.000
20.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

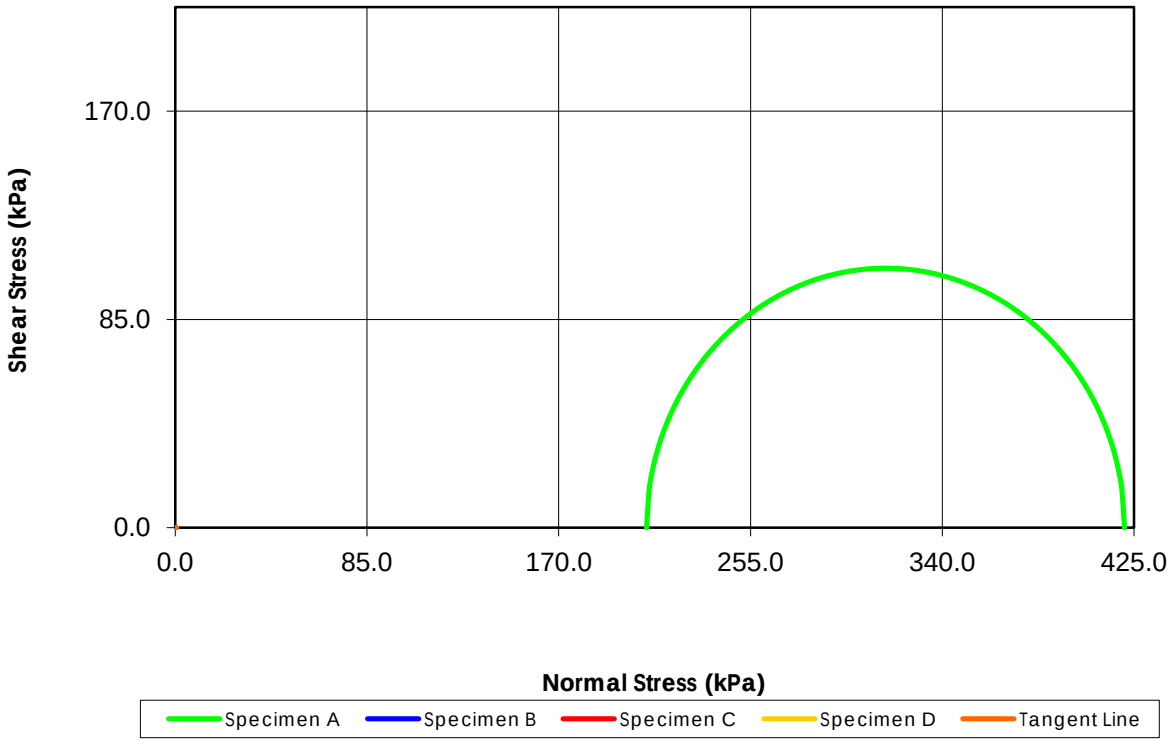



### Total Stress
### (C = 0.0 Ø = 0.0)

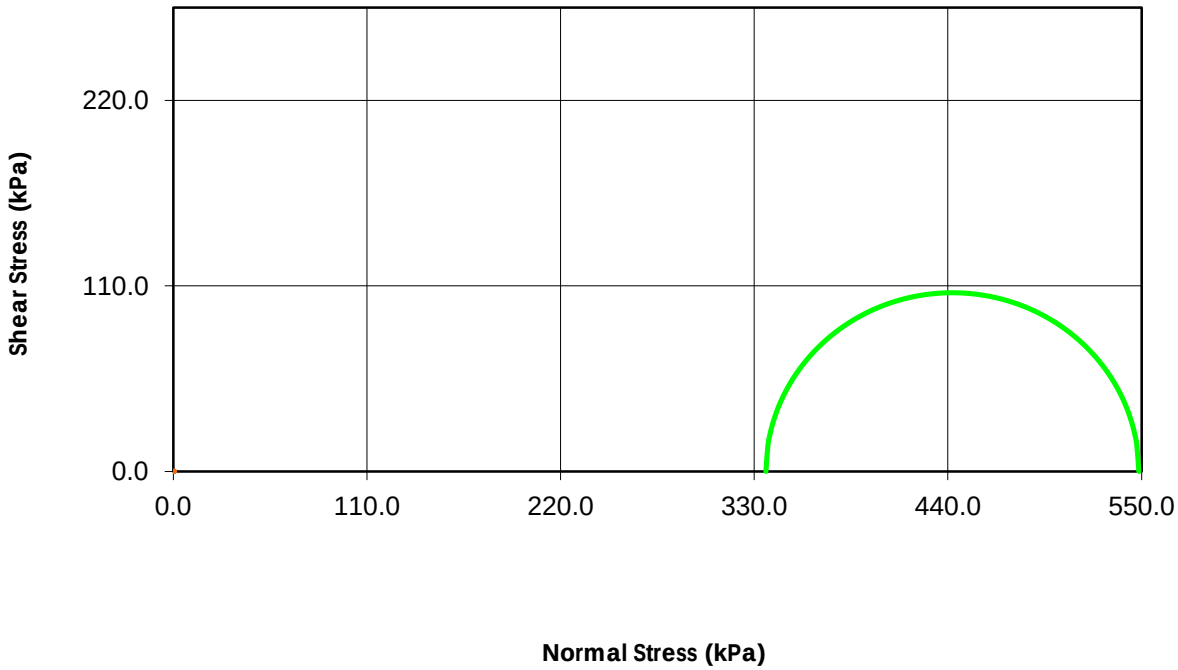


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

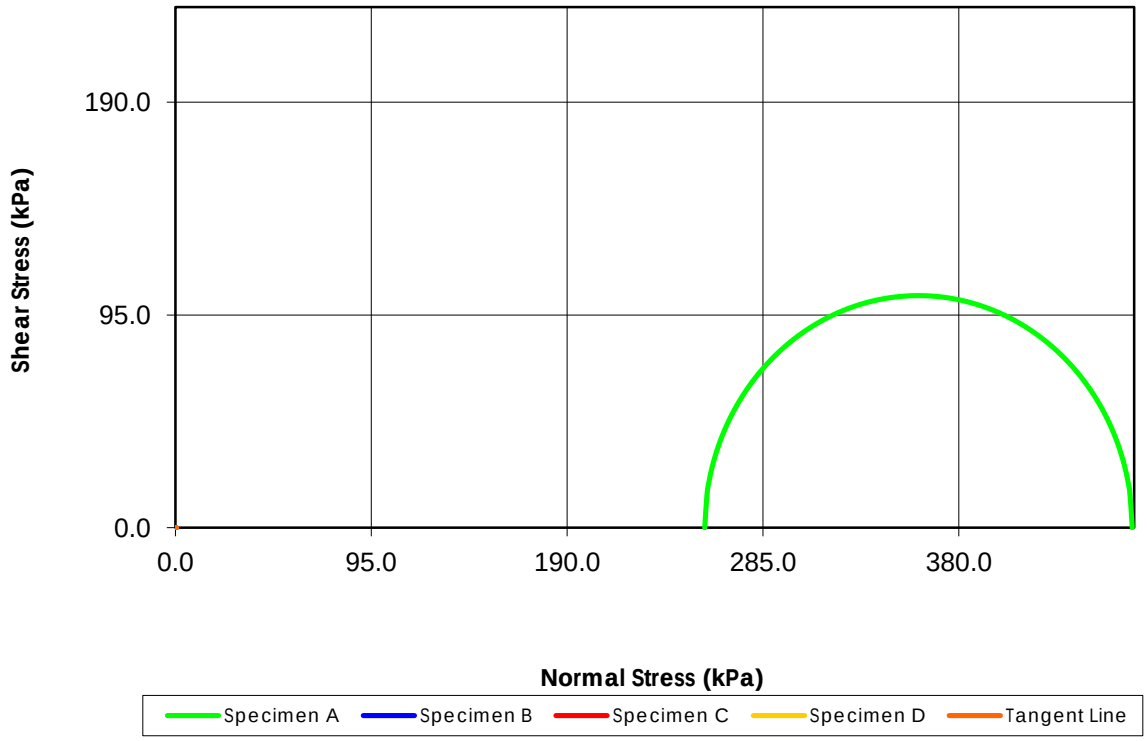



## Total Stress
## (C = 0.0 Ø = 0.0)

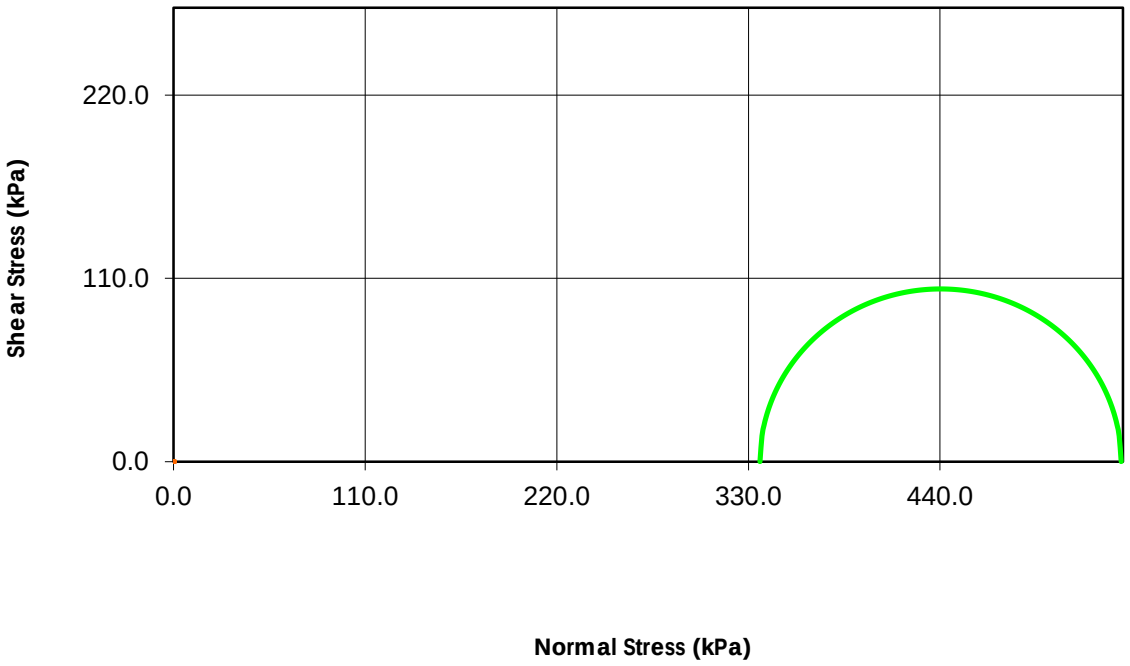


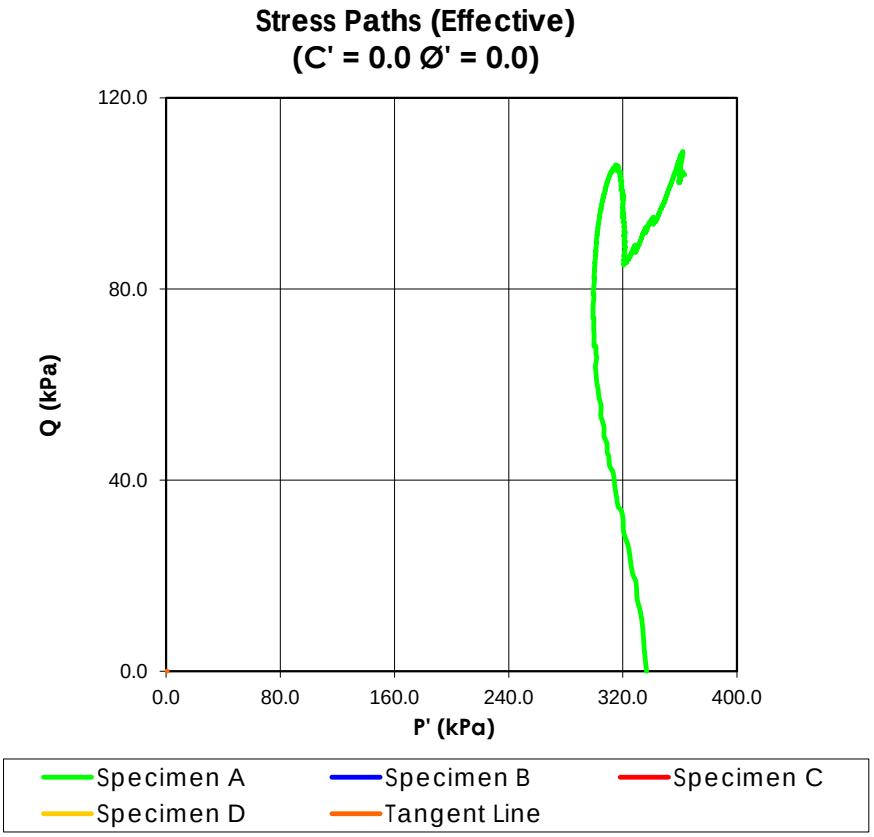
# Mohr Stress Circles at 15% Axial Strain Criterion

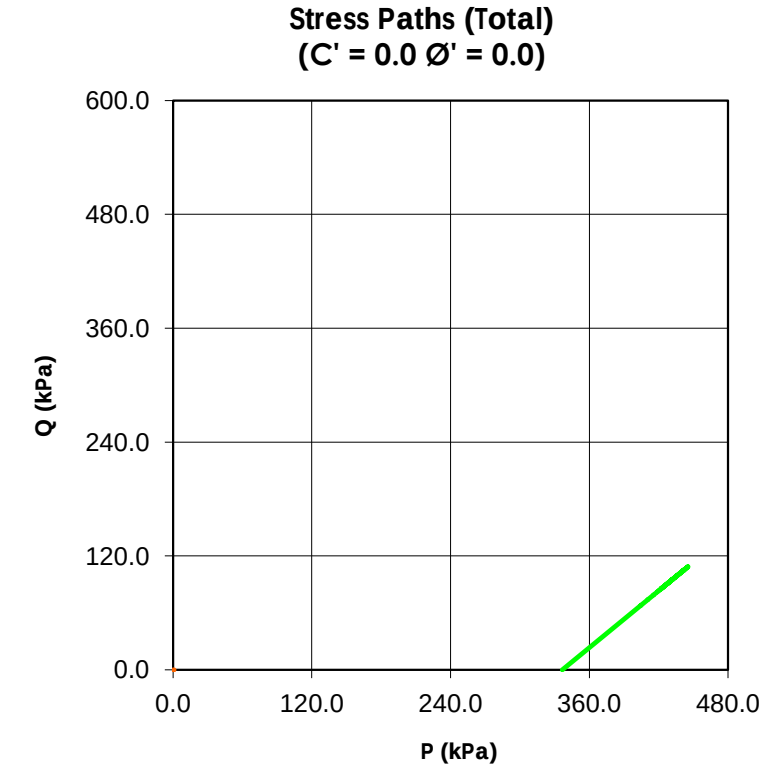
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

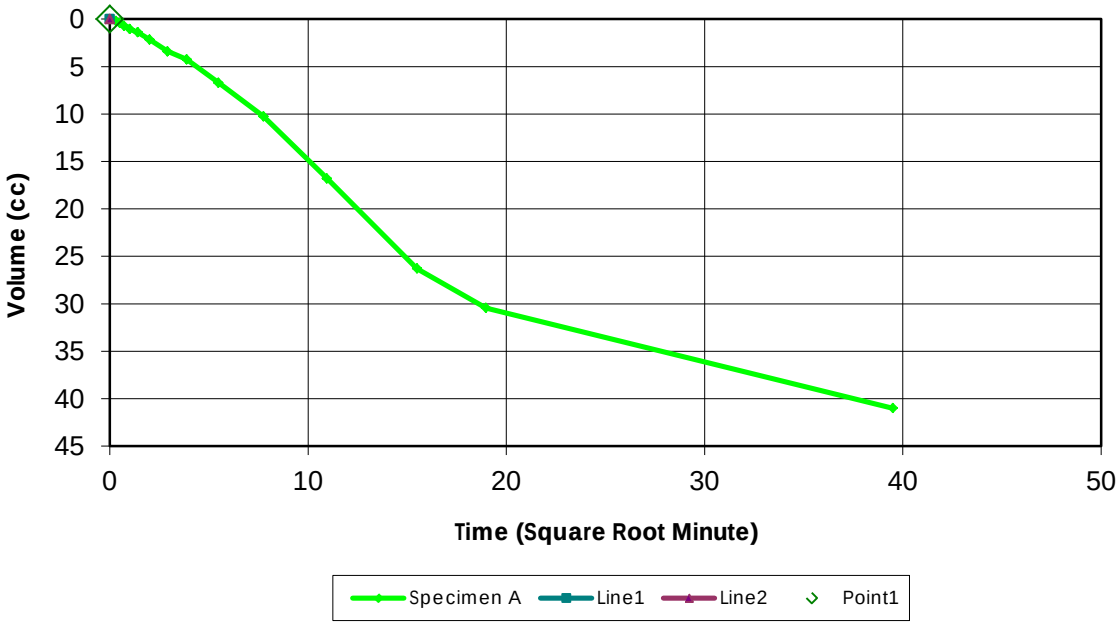



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
120.0
80.0
40.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

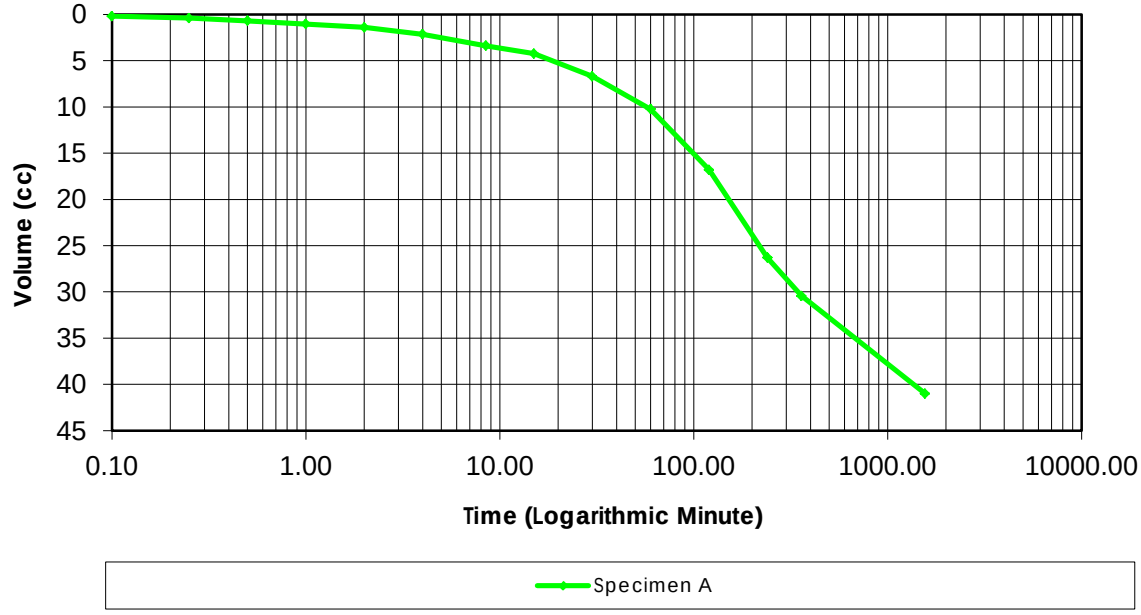

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.962

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 70.0 | 50.0 | N/A | N/A | N/A |
| 1 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 2 | 120.0 | 50.0 | 50.0 | 0.0 | 0.35 |
| 3 | 120.0 | 100.0 | 0.0 | 50.0 | |
| 4 | 120.0 | 100.0 | 0.0 | 0.0 | |
| 5 | 170.0 | 100.0 | 50.0 | 0.0 | 0.26 |
| 6 | 170.0 | 150.0 | 0.0 | 50.0 | |
| 7 | 170.0 | 150.0 | 0.0 | 0.0 | |
| 8 | 200.0 | 150.0 | 30.0 | 0.0 | 0.49 |
| 9 | 200.0 | 180.0 | 0.0 | 30.0 | |
| 10 | 200.0 | 180.0 | 0.0 | 0.0 | |
| 11 | 220.0 | 180.0 | 20.0 | 0.0 | 0.60 |
| 12 | 220.0 | 200.0 | 0.0 | 20.0 | |
| 13 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 14 | 270.0 | 200.0 | 50.0 | 0.0 | 0.96 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.6-4.1m

| | |
|---|---|
| Cell Pressure (kPa) | 550 |
| Back Pressure (kPa) | 200 |
| Effective Pressure (kPa) | 350 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.8 |
| Initial Sample Height (mm) | 158.8 |
| Initial Sample Area (cm2) | 41.63 |
| Initial Volume (cm3) | 661 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.30 | N/A |
| 00:00:06 | 44.10 | 0.200 |
| 00:00:15 | 43.90 | 0.400 |
| 00:00:30 | 43.60 | 0.700 |
| 00:01:00 | 43.25 | 1.050 |
| 00:02:00 | 42.90 | 1.400 |
| 00:04:00 | 42.15 | 2.150 |
| 00:08:30 | 40.90 | 3.400 |
| 00:15:00 | 40.05 | 4.250 |
| 00:30:00 | 37.60 | 6.700 |
| 01:00:00 | 34.05 | 10.250 |
| 02:00:00 | 27.50 | 16.800 |
| 04:00:00 | 18.00 | 26.300 |
| 06:00:00 | 13.85 | 30.450 |
| 26:00:00 | 3.30 | 41.000 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

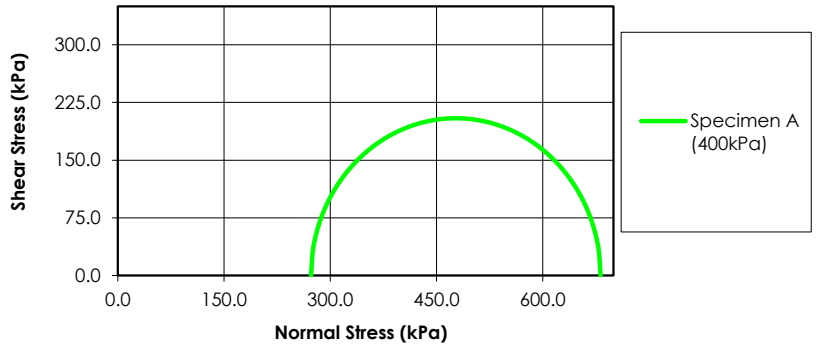
Stantec

Reviewed By C. Lamoureux

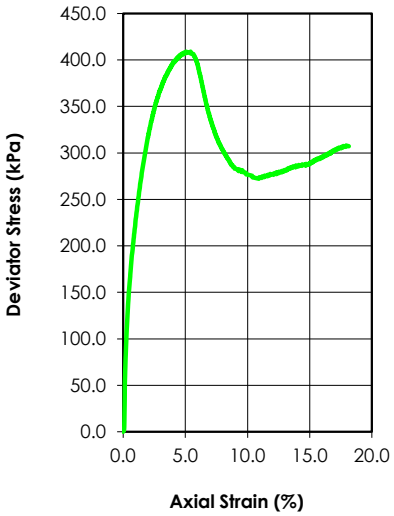
Date: 10-Jun-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 26.2 | | | |
| Dry Density (g/cm3) | 1.589 | | | |
| Saturation (%) | 101.19 | | | |
| Void Ratio | 0.700 | | | |
| Diameter (mm) | 72.90 | | | |
| Height (mm) | 143.60 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 22.3 | | | |
| Dry Density (g/cm3) | 1.631 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.656 | | | |
| Effective Stress (kPa) | 395.9 | | | |
| Back Press. (kPa) | 124.1 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

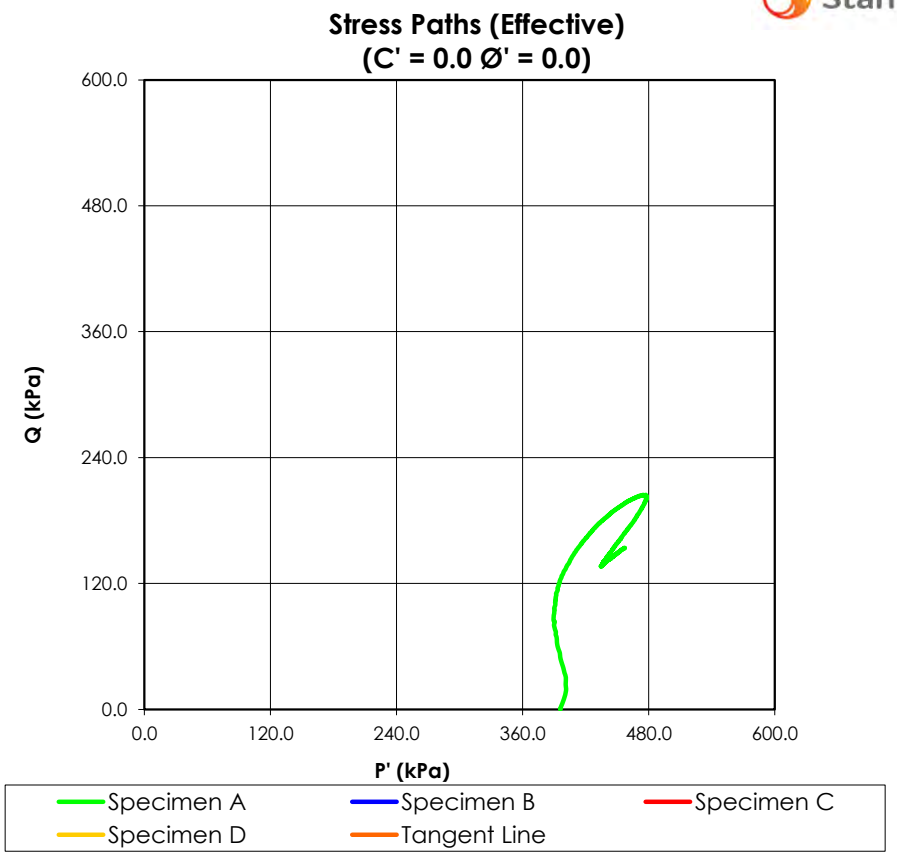
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 681.86 | | | |
| σ'3 at Failure (kPa) | 272.84 | | | |
| | | | | |
| | | | | |

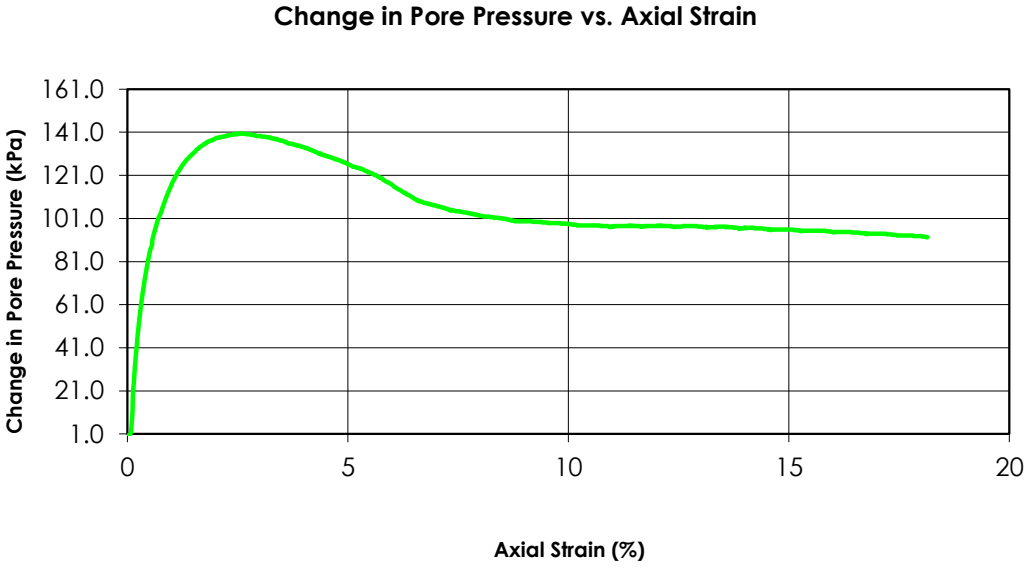
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D13 ST7 |
| **Depth:** | 3.0-3.6m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

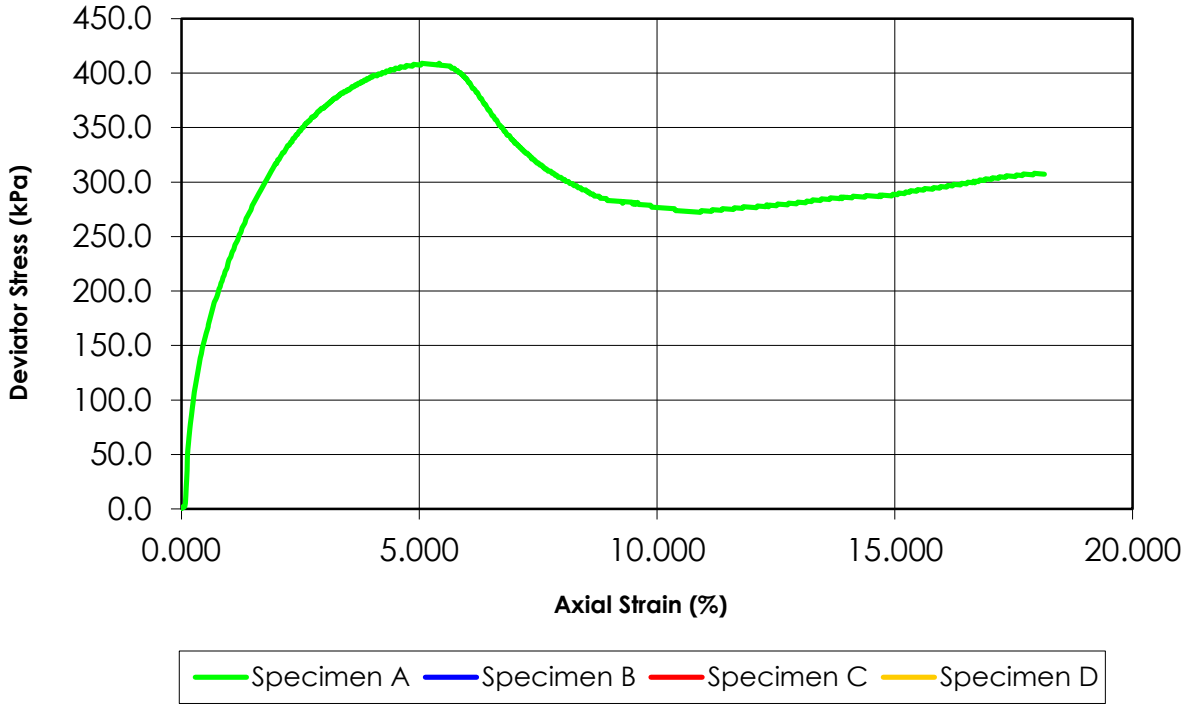
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

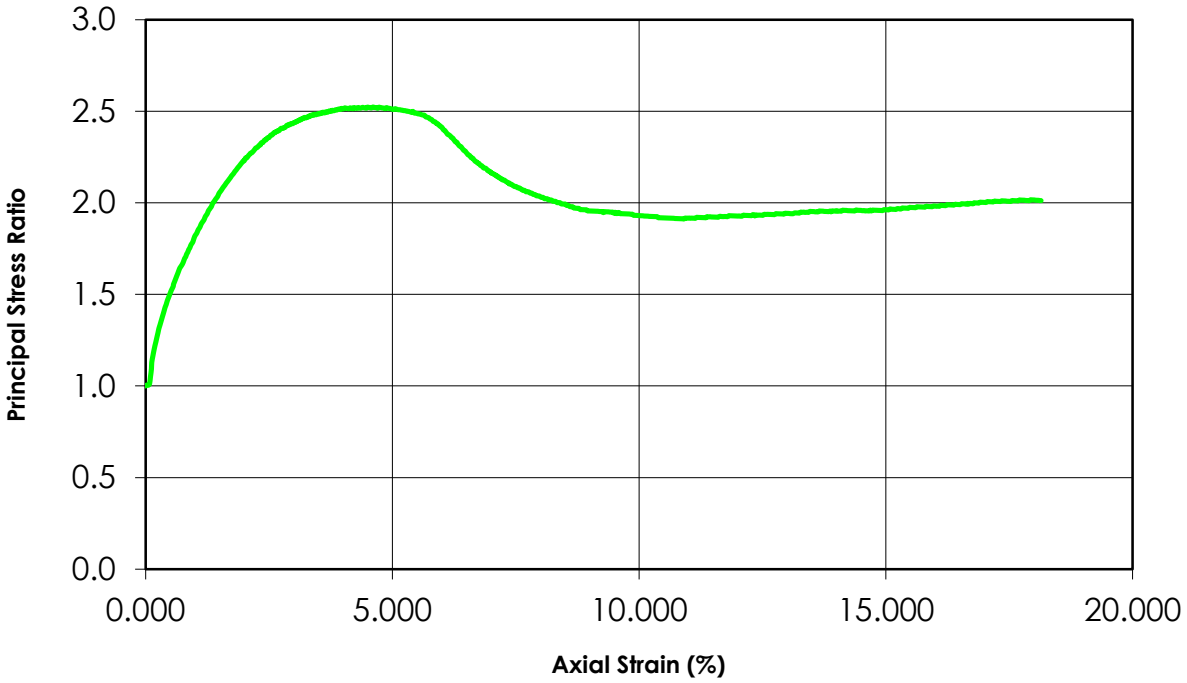


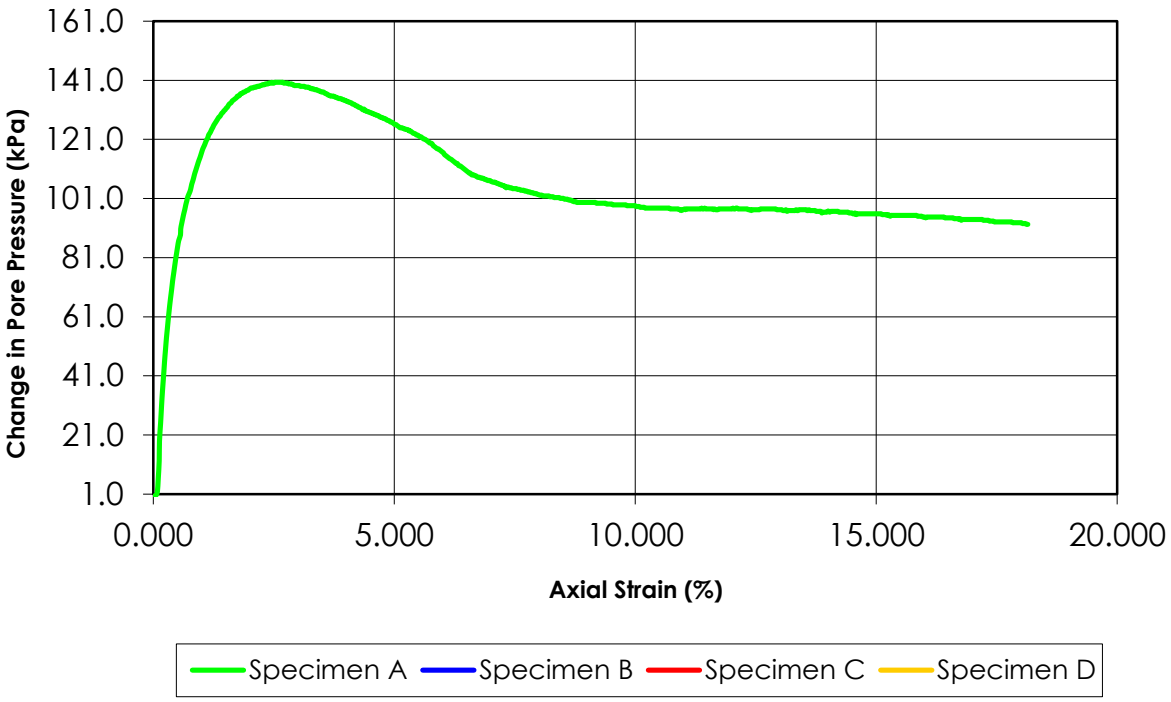
## Deviator Stress vs. Axial Strain




## Principal Stress Ratio vs. Axial Strain

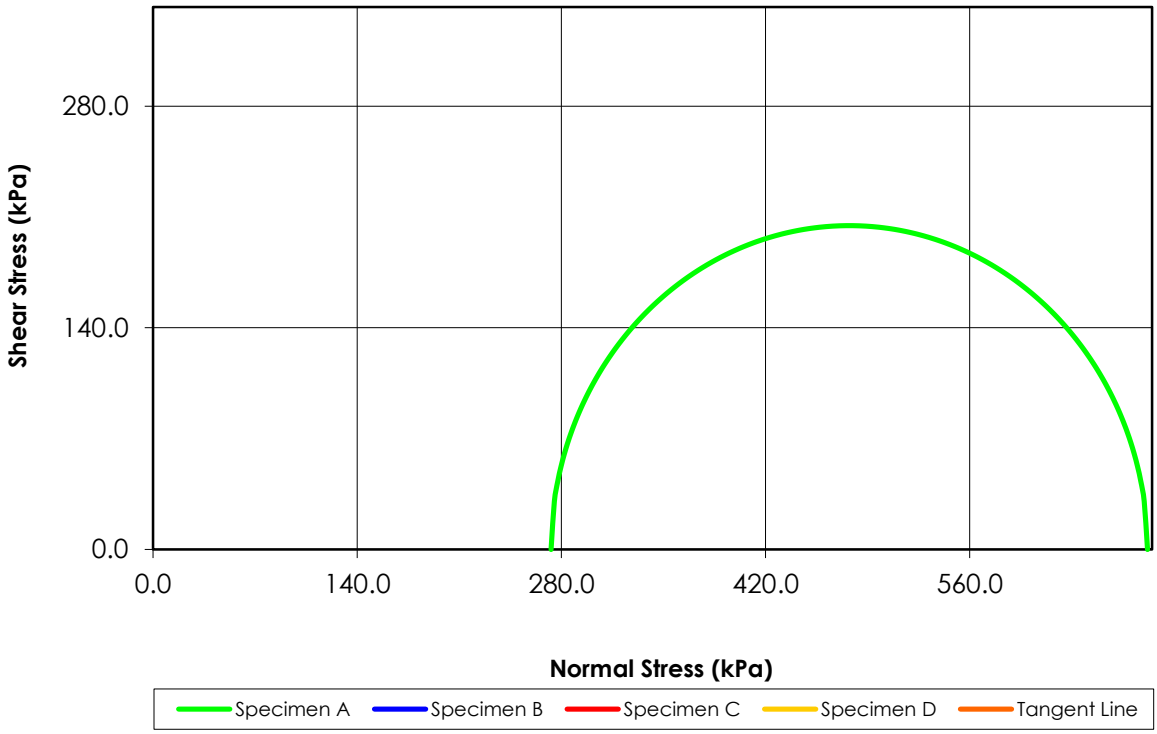


## Change in Pore Pressure vs. Axial Strain

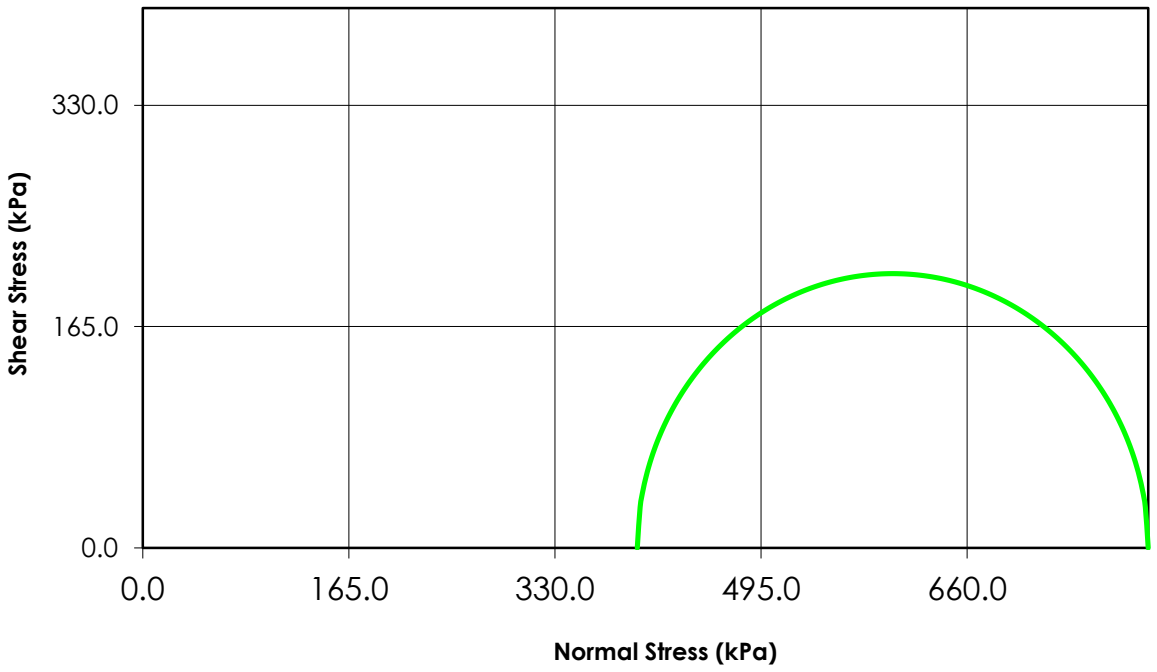


## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

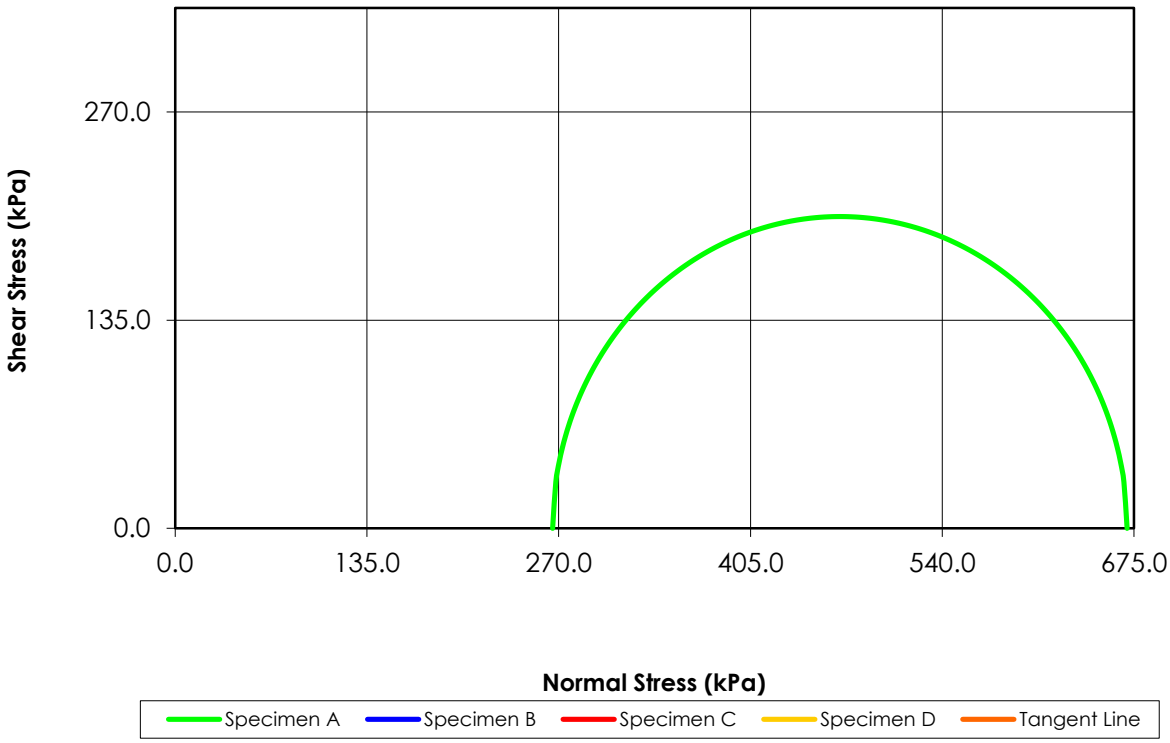



### Total Stress
### (C = 0.0 Ø = 0.0)

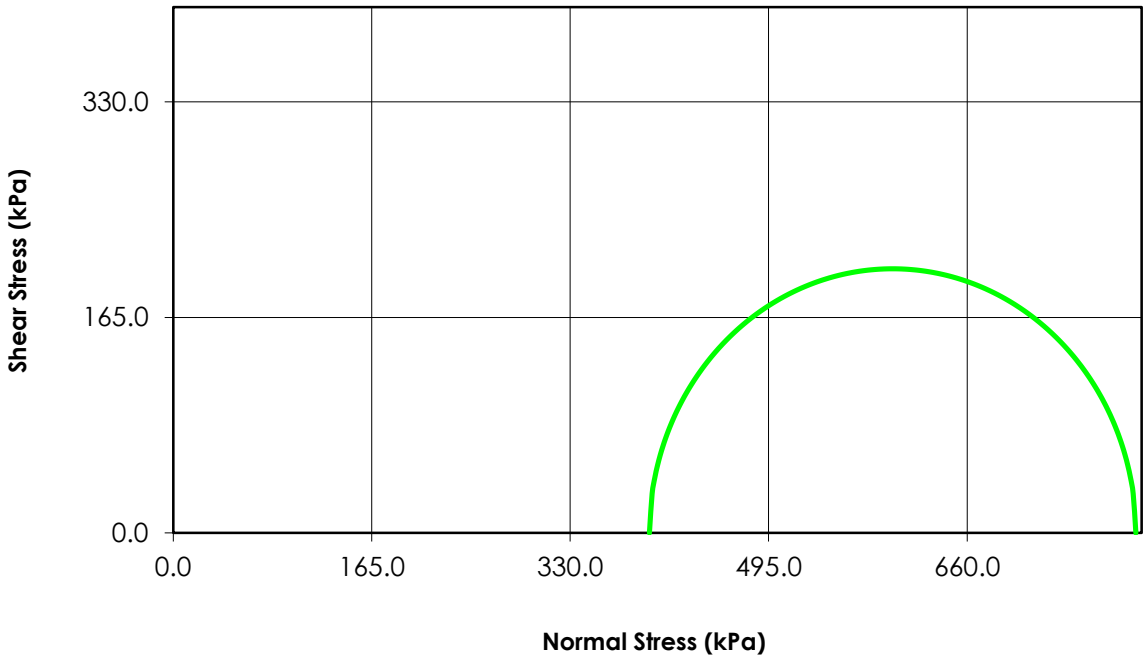


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

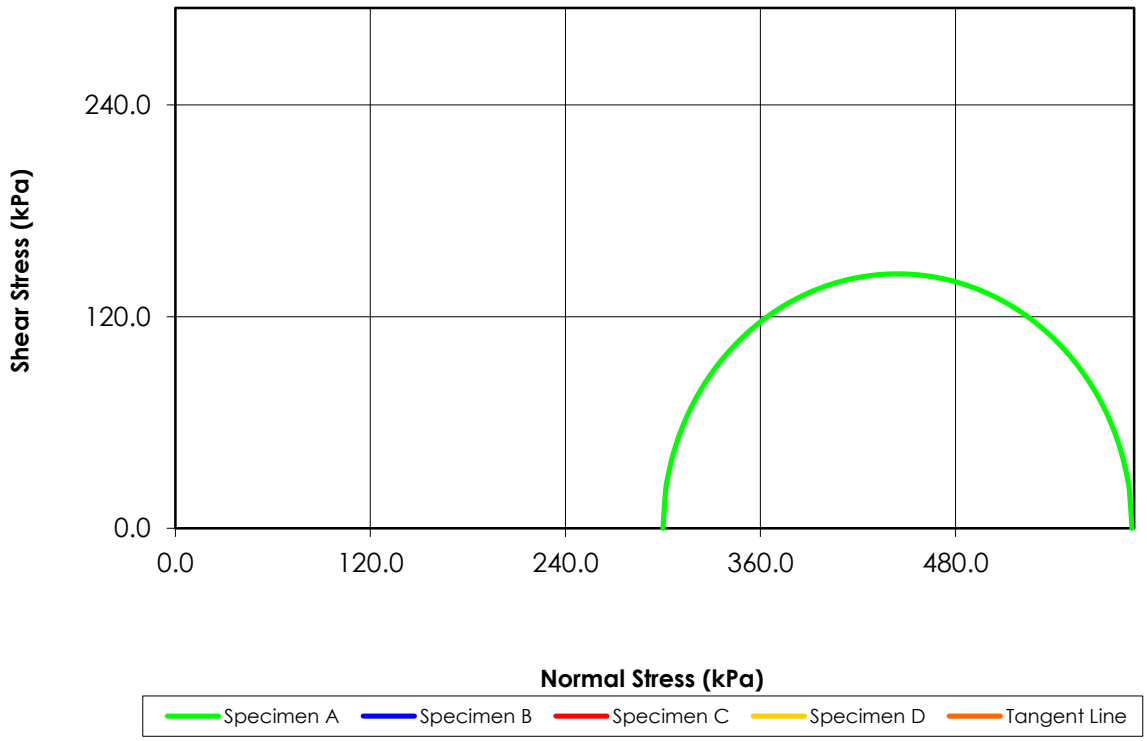



## Total Stress
## (C = 0.0 Ø = 0.0)

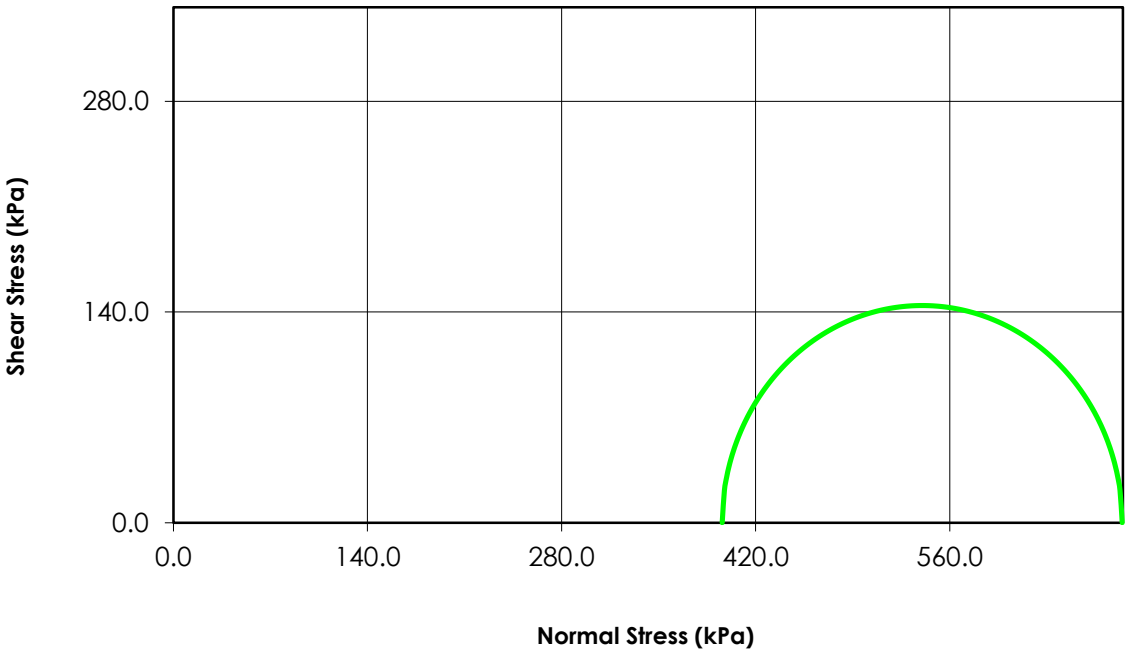


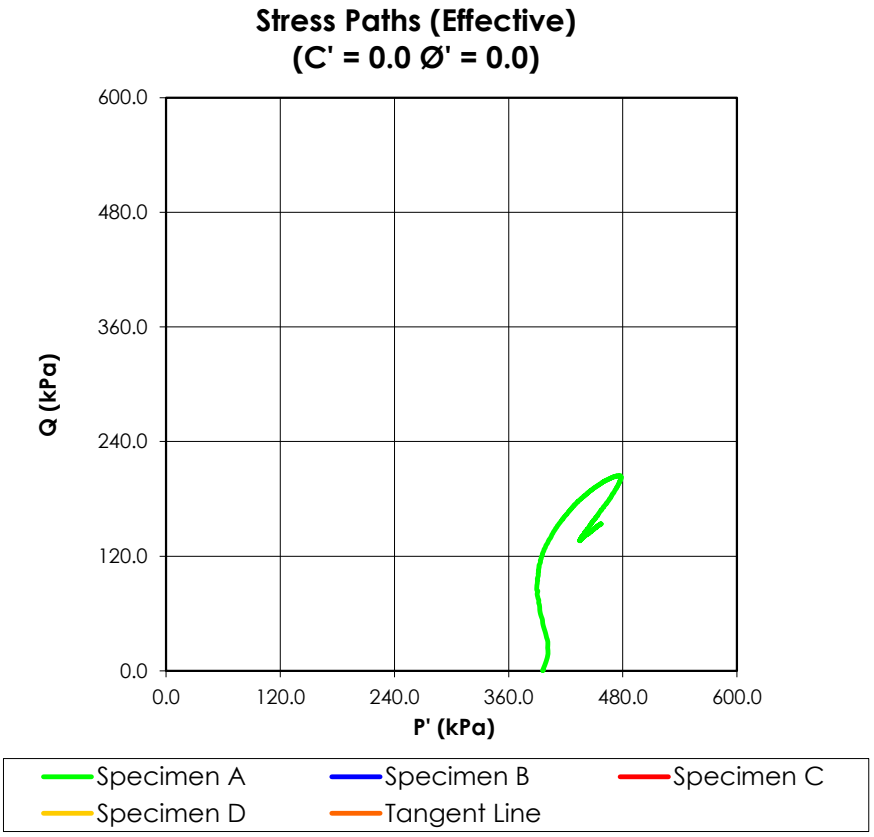
## Mohr Stress Circles at 15% Axial Strain Criterion

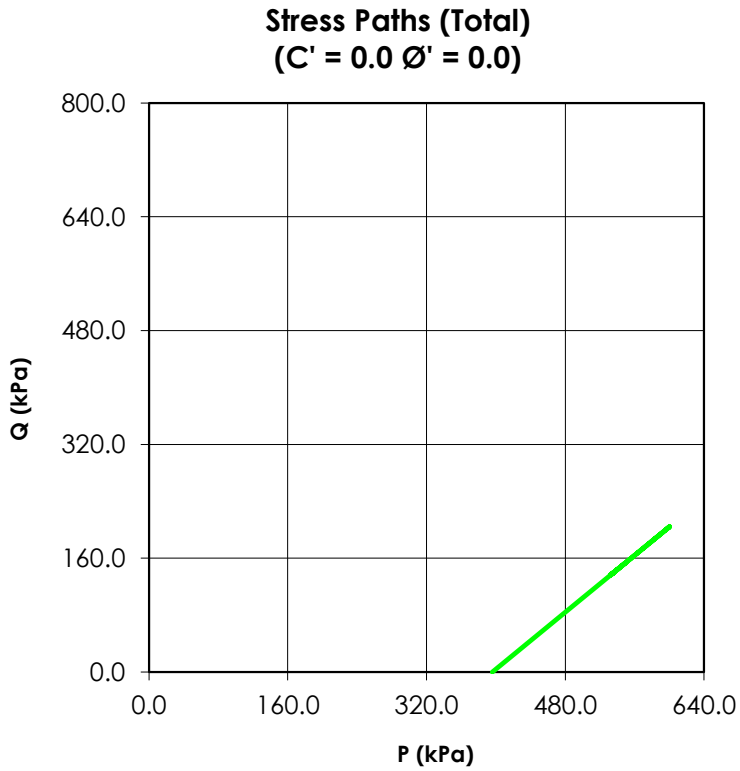
### Effective Stress
### (C' = 0.0 Ø' = 0.0)




### Total Stress
### (C = 0.0 Ø = 0.0)

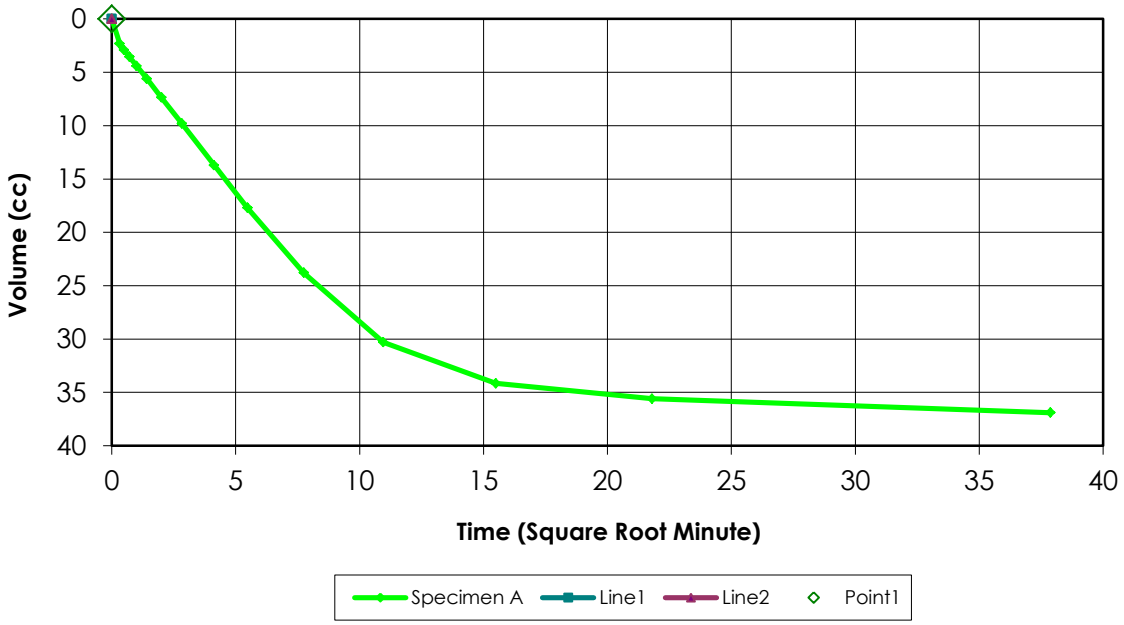



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

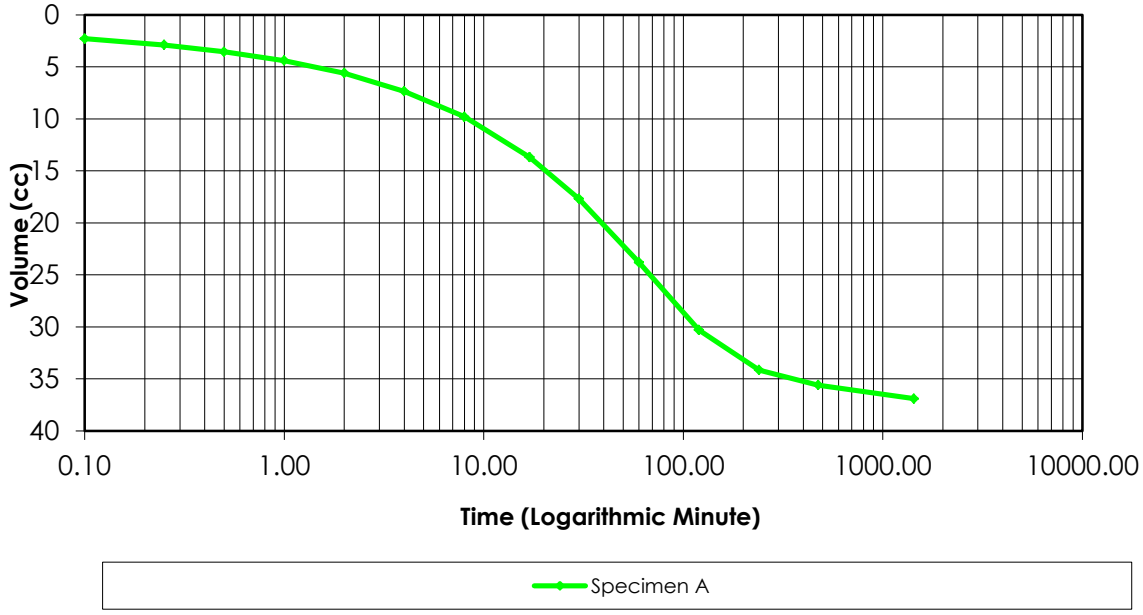

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 40.0 | 20.0 | N/A | N/A | N/A |
| 1 | 40.0 | 20.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 20.0 | 40.0 | 0.0 | 0.21 |
| 3 | 80.0 | 60.0 | 0.0 | 40.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 60.0 | 20.0 | 0.0 | 0.44 |
| 6 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 7 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 8 | 120.0 | 80.0 | 20.0 | 0.0 | 0.58 |
| 9 | 120.0 | 100.0 | 0.0 | 20.0 | |
| 10 | 120.0 | 100.0 | 0.0 | 0.0 | |
| 11 | 140.0 | 100.0 | 20.0 | 0.0 | 0.84 |
| 12 | 140.0 | 120.0 | 0.0 | 20.0 | |
| 13 | 140.0 | 120.0 | 0.0 | 0.0 | |
| 14 | 150.0 | 120.0 | 10.0 | 0.0 | 0.96 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.0-3.6m

| | |
|---|---|
| Cell Pressure (kPa) | 520 |
| Back Pressure (kPa) | 120 |
| Effective Pressure (kPa) | 400 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.9 |
| Initial Sample Height (mm) | 143.6 |
| Initial Sample Area (cm2) | 41.74 |
| Initial Volume (cm3) | 599.4 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 37.25 | N/A |
| 00:00:06 | 34.95 | 2.300 |
| 00:00:15 | 34.35 | 2.900 |
| 00:00:30 | 33.70 | 3.550 |
| 00:01:00 | 32.85 | 4.400 |
| 00:02:00 | 31.65 | 5.600 |
| 00:04:00 | 29.90 | 7.350 |
| 00:08:00 | 27.45 | 9.800 |
| 00:17:00 | 23.55 | 13.700 |
| 00:30:00 | 19.55 | 17.700 |
| 01:00:00 | 13.45 | 23.800 |
| 02:00:00 | 6.95 | 30.300 |
| 04:00:00 | 3.10 | 34.150 |
| 07:55:00 | 1.65 | 35.600 |
| 23:55:00 | 0.35 | 36.900 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

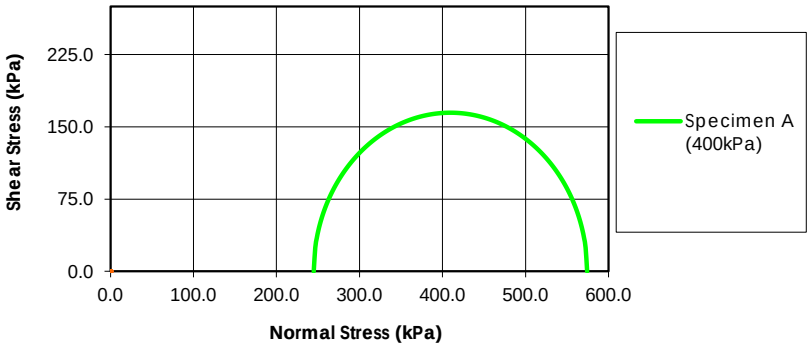
Stantec

Reviewed By C. Lamoureux

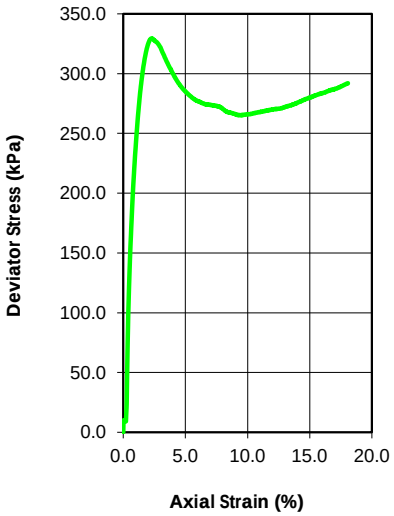
Date: 10-Jun-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 30.0 | | | |
| Dry Density (g/cm3) | 1.5 | | | |
| Saturation (%) | 108.19 | | | |
| Void Ratio | 0.750 | | | |
| Diameter (mm) | 72.80 | | | |
| Height (mm) | 148.20 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 27.4 | | | |
| Dry Density (g/cm3) | 1.58 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.713 | | | |
| Effective Stress (kPa) | 396.3 | | | |
| Back Press. (kPa) | 123.7 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

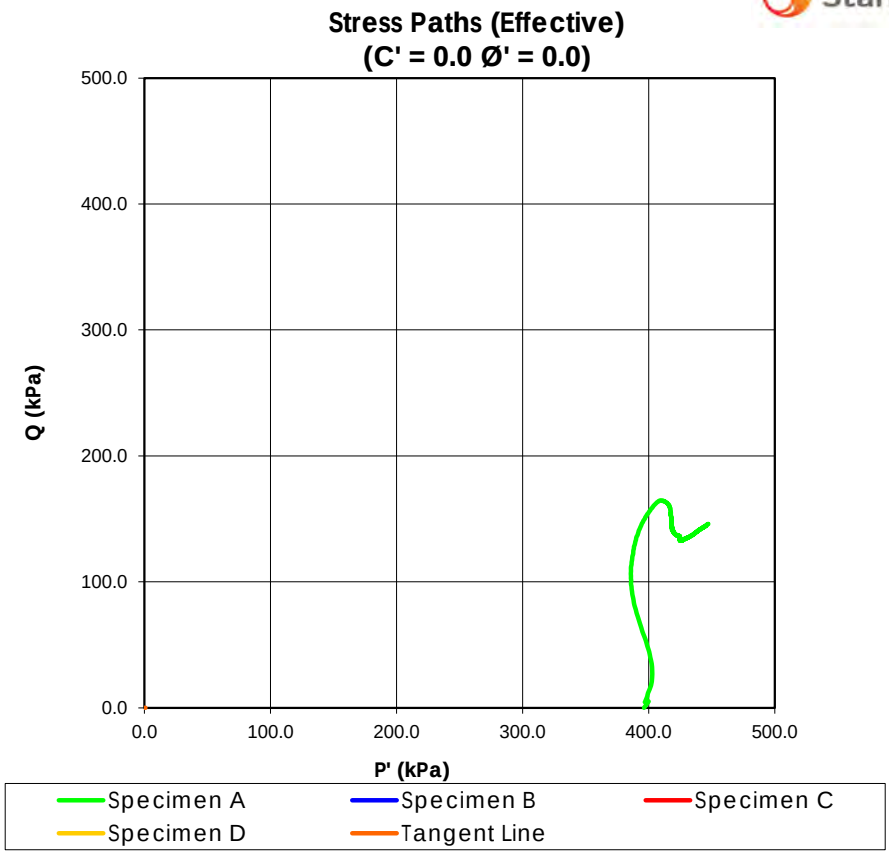
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 574.25 | | | |
| σ'3 at Failure (kPa) | 244.87 | | | |
| | | | | |
| | | | | |

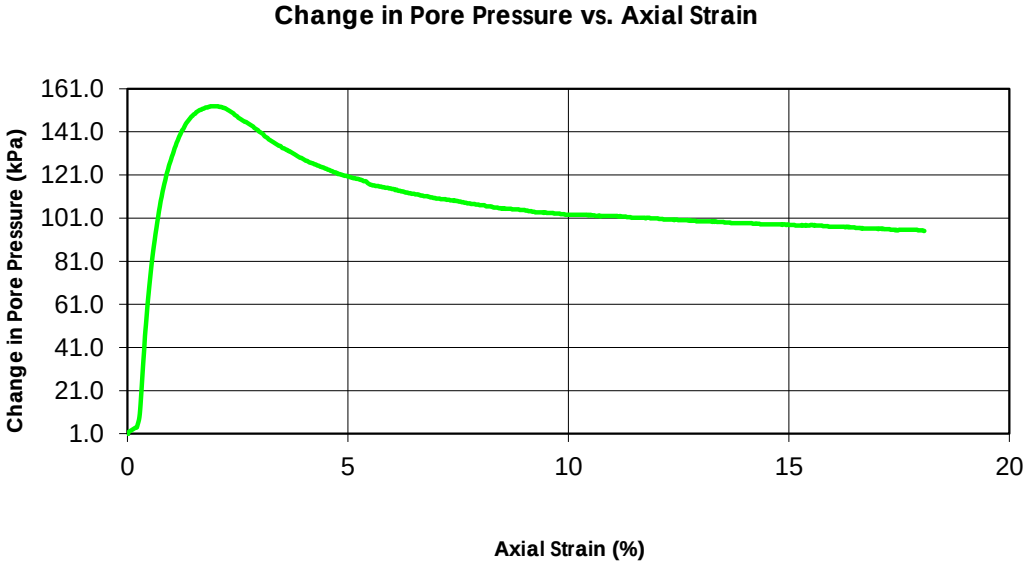
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D13 ST14 |
| **Depth:** | 6.1-6.7m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

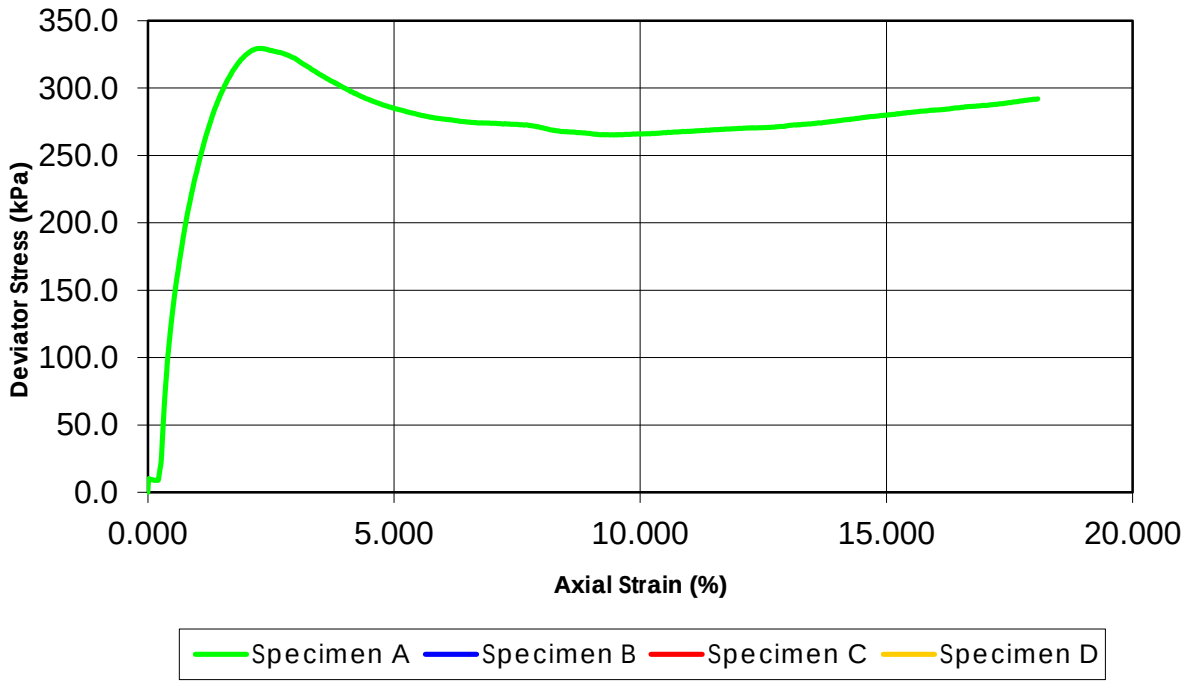
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

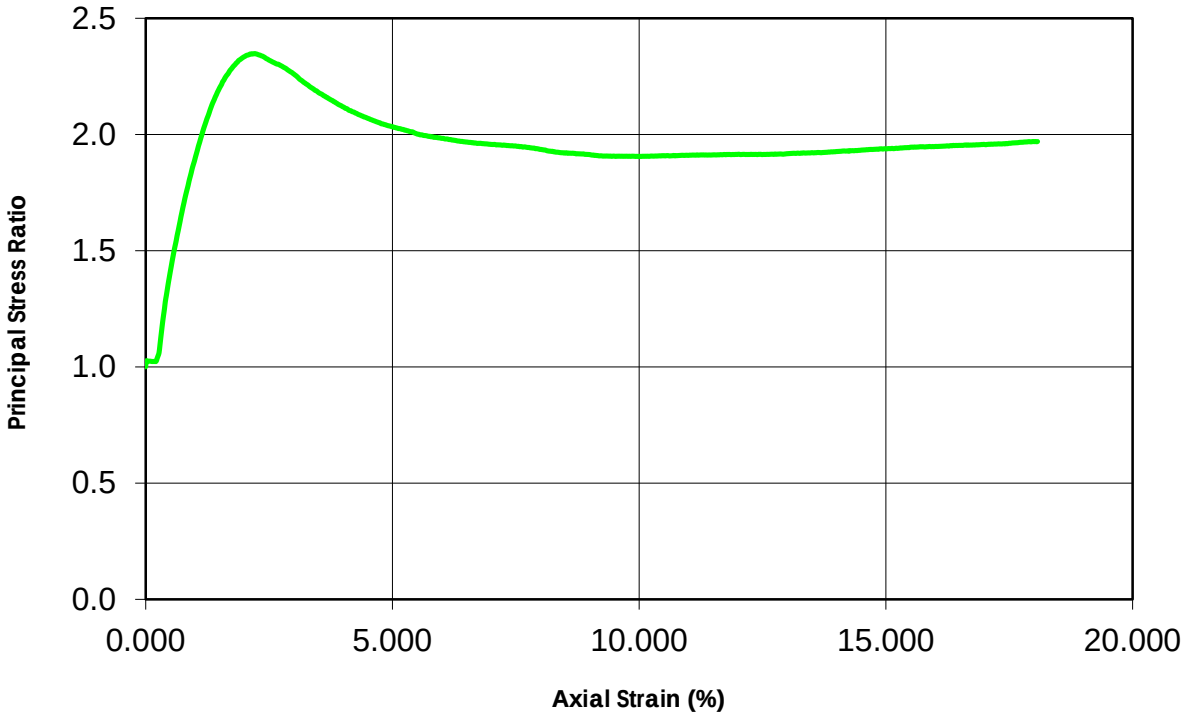


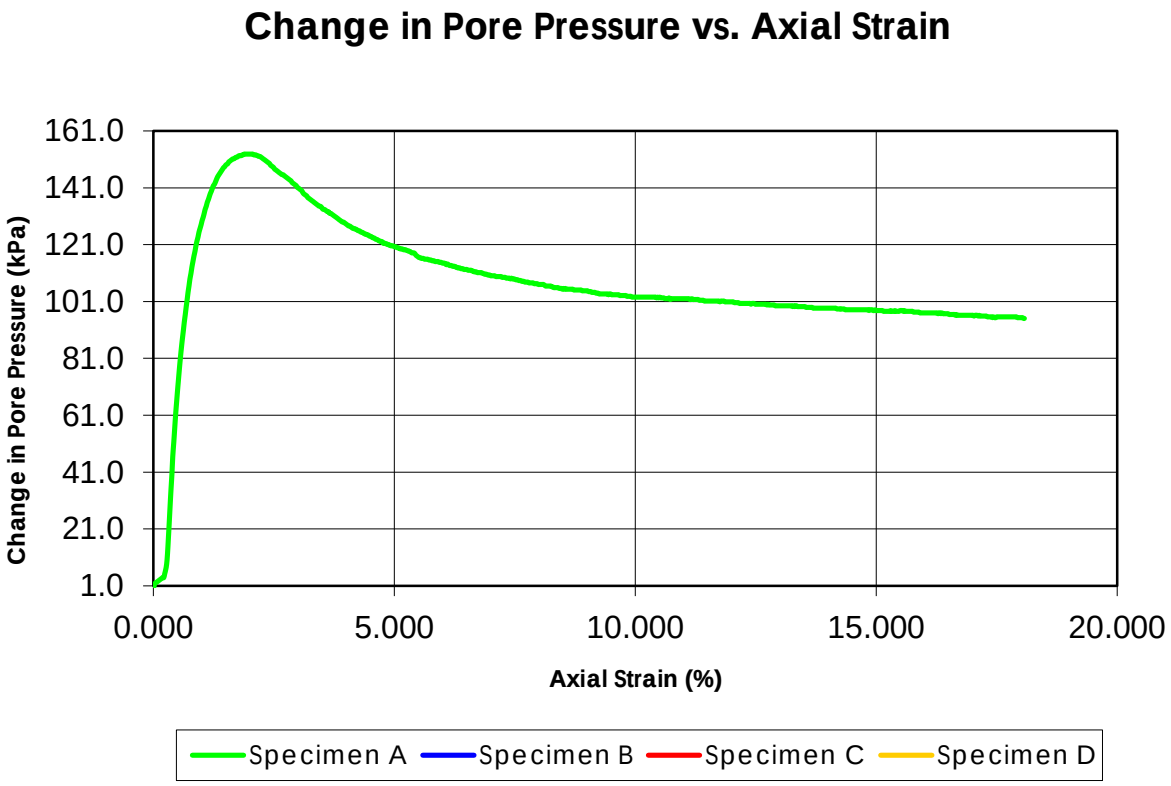



## Deviator Stress vs. Axial Strain



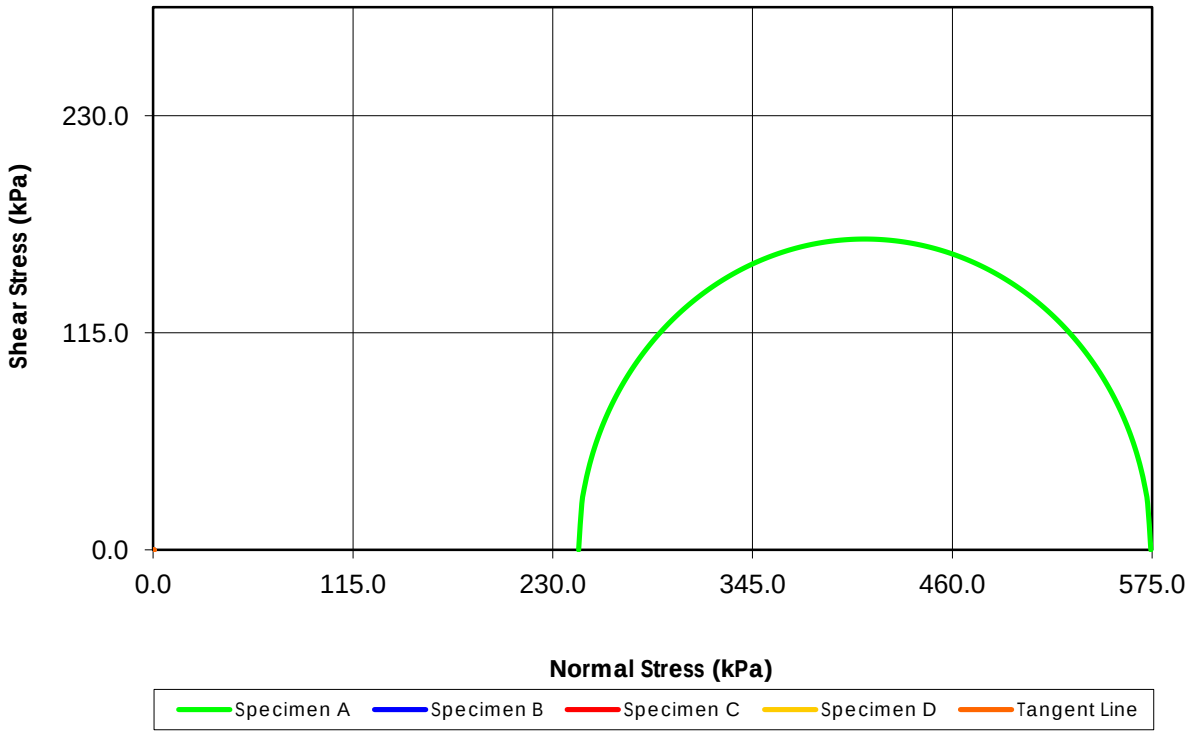

## Principal Stress Ratio vs. Axial Strain



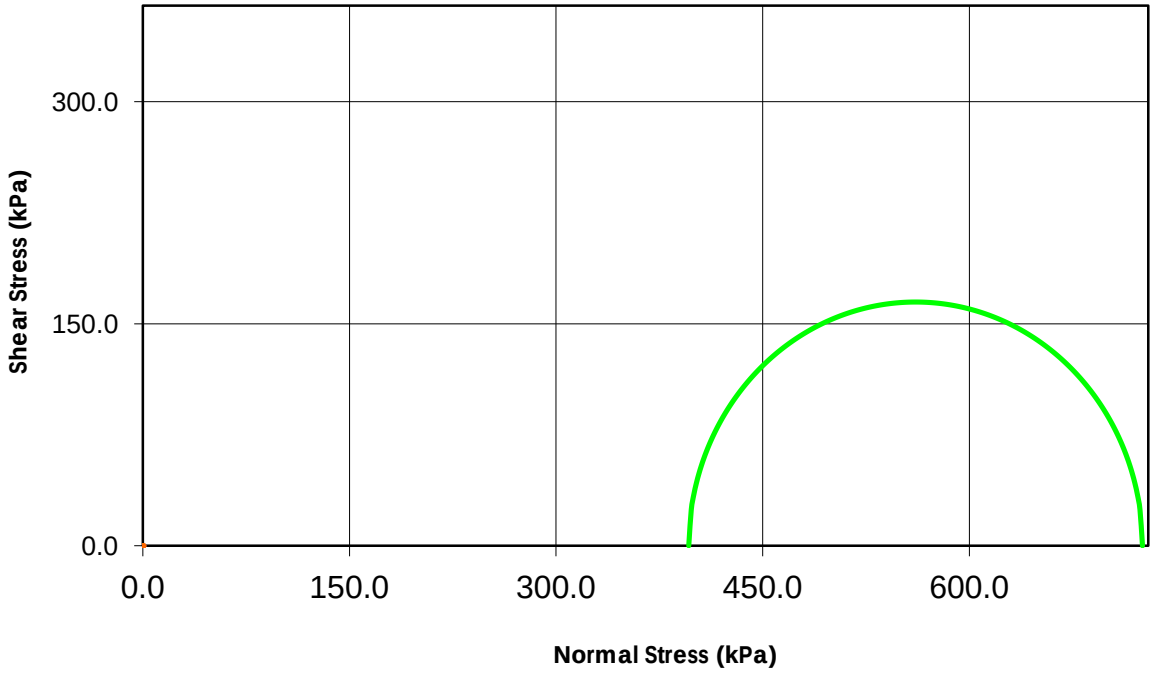

Change in Pore Pressure vs. Axial Strain
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

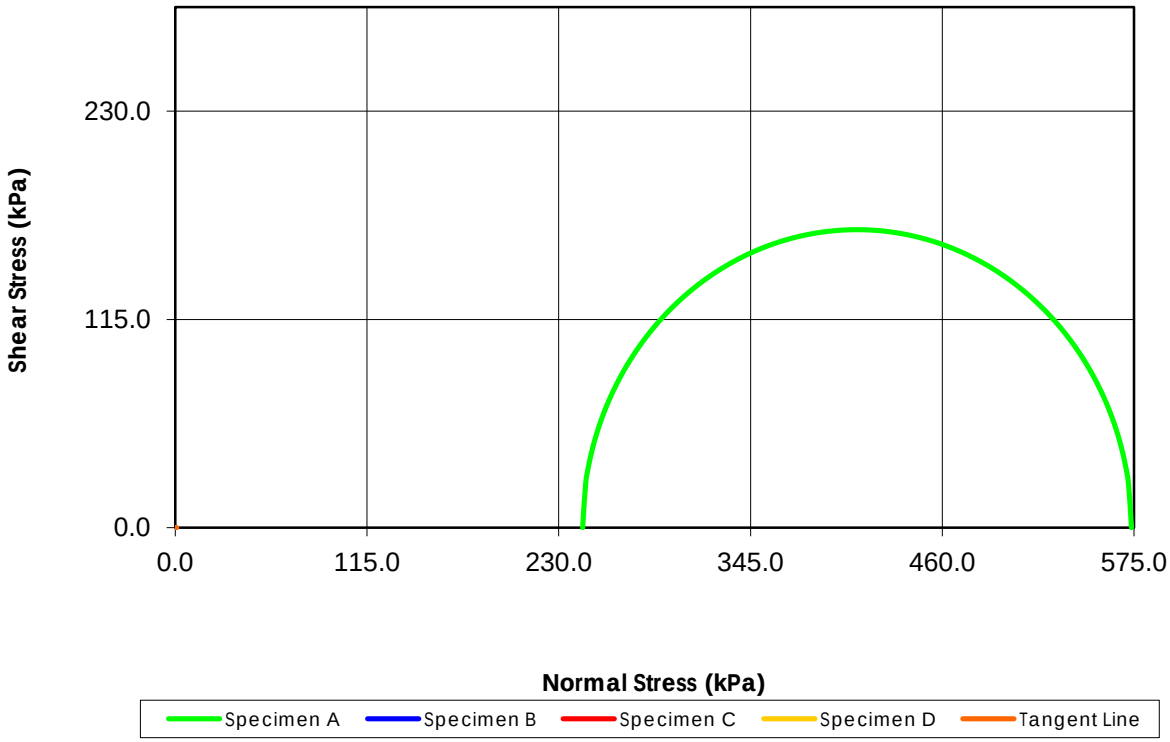



### Total Stress
### (C = 0.0 Ø = 0.0)

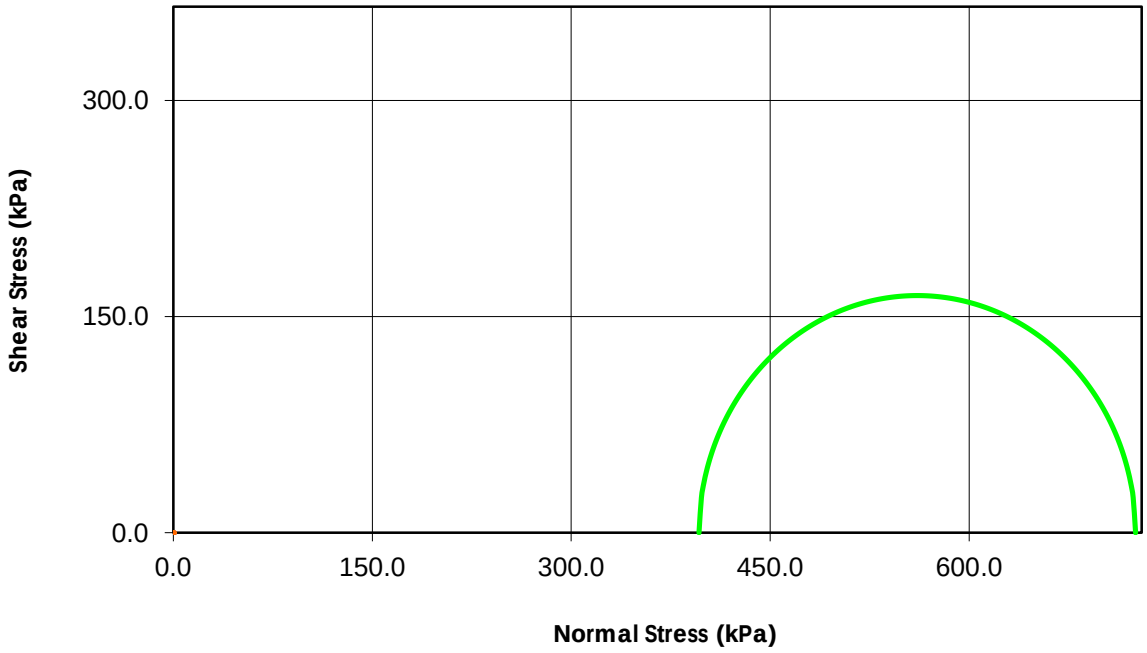


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

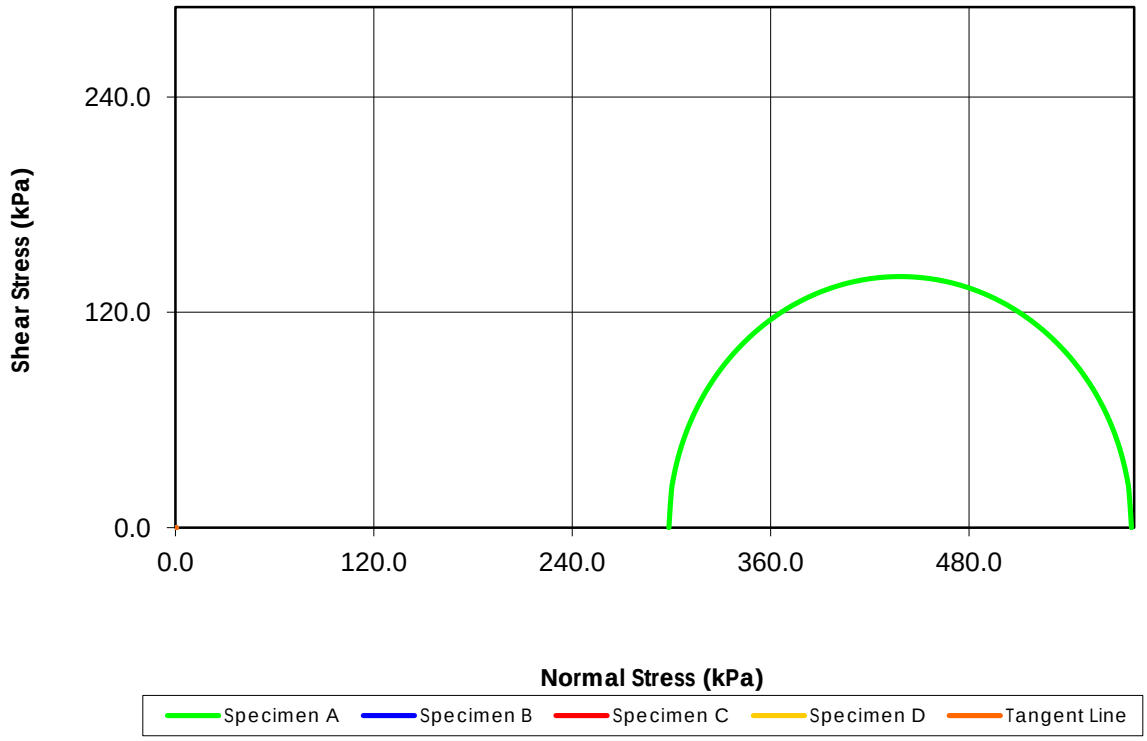



## Total Stress
## (C = 0.0 Ø = 0.0)

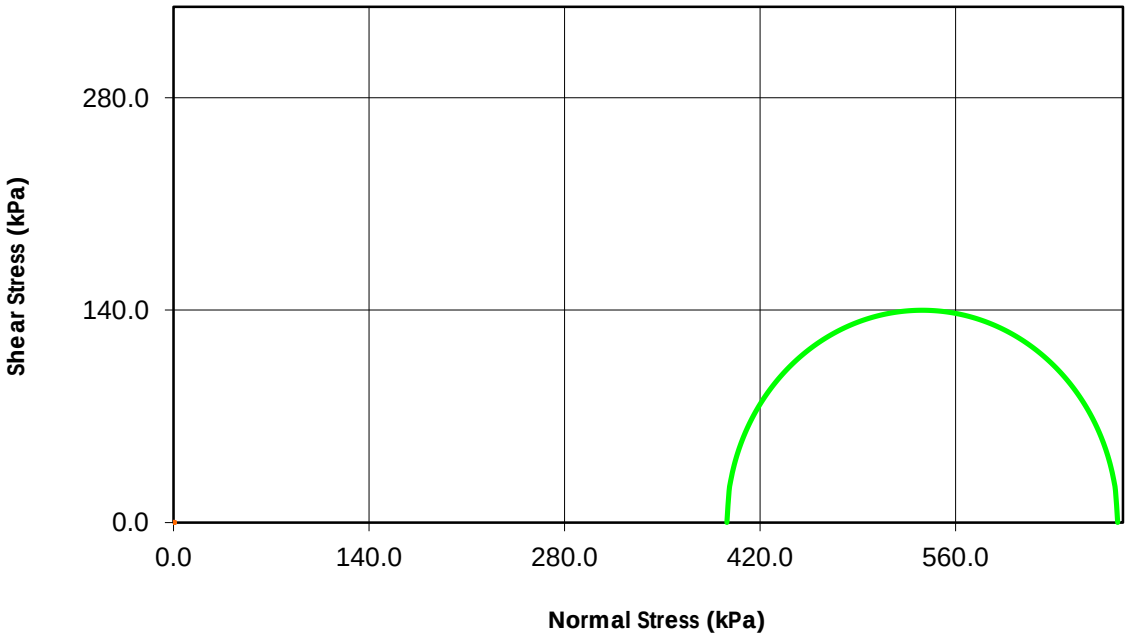


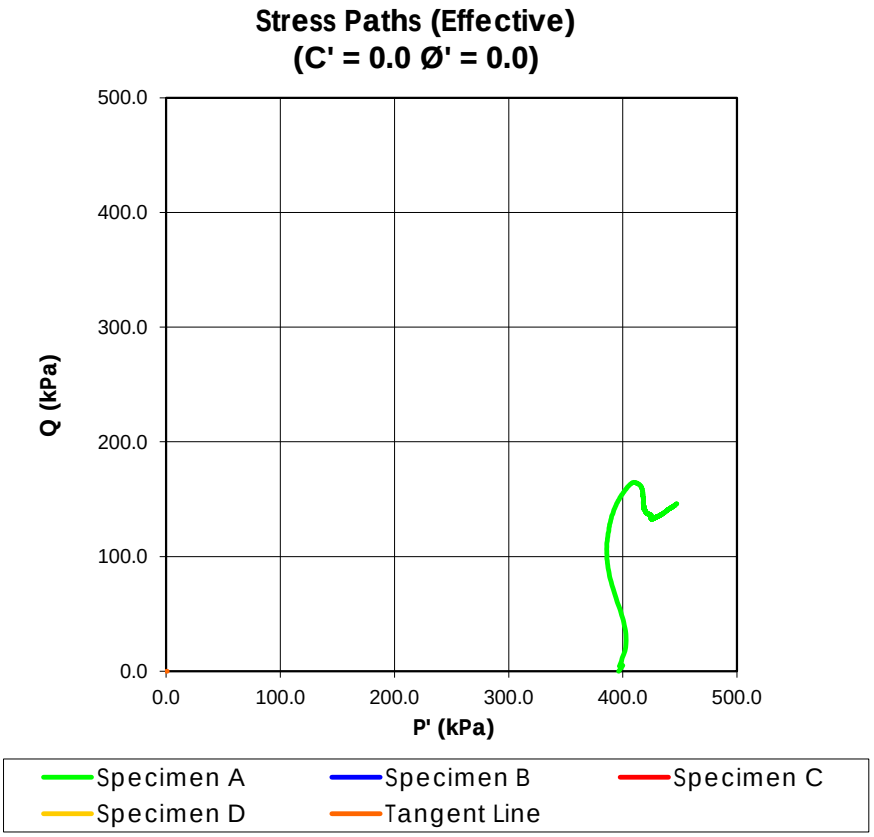
# Mohr Stress Circles at 15% Axial Strain Criterion

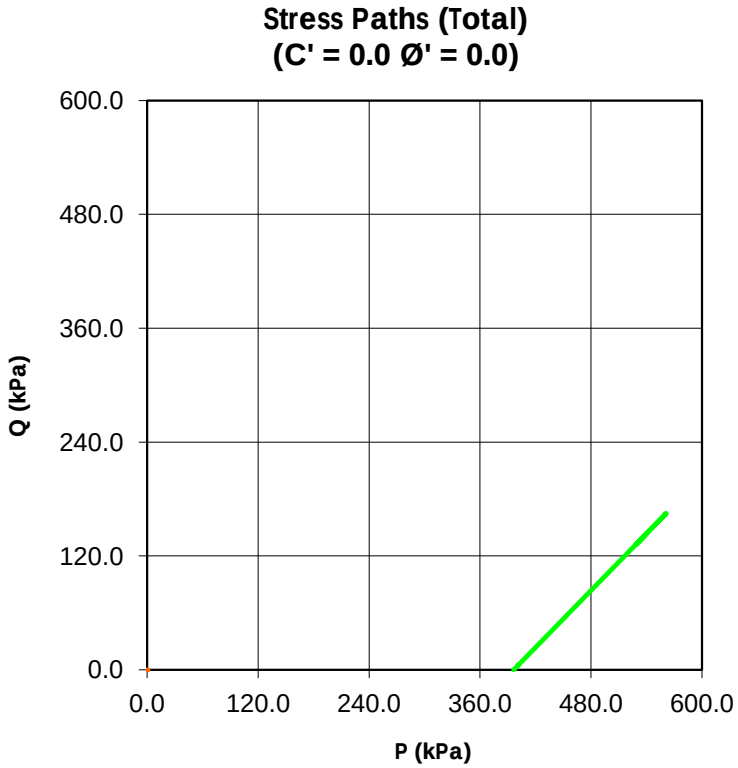
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

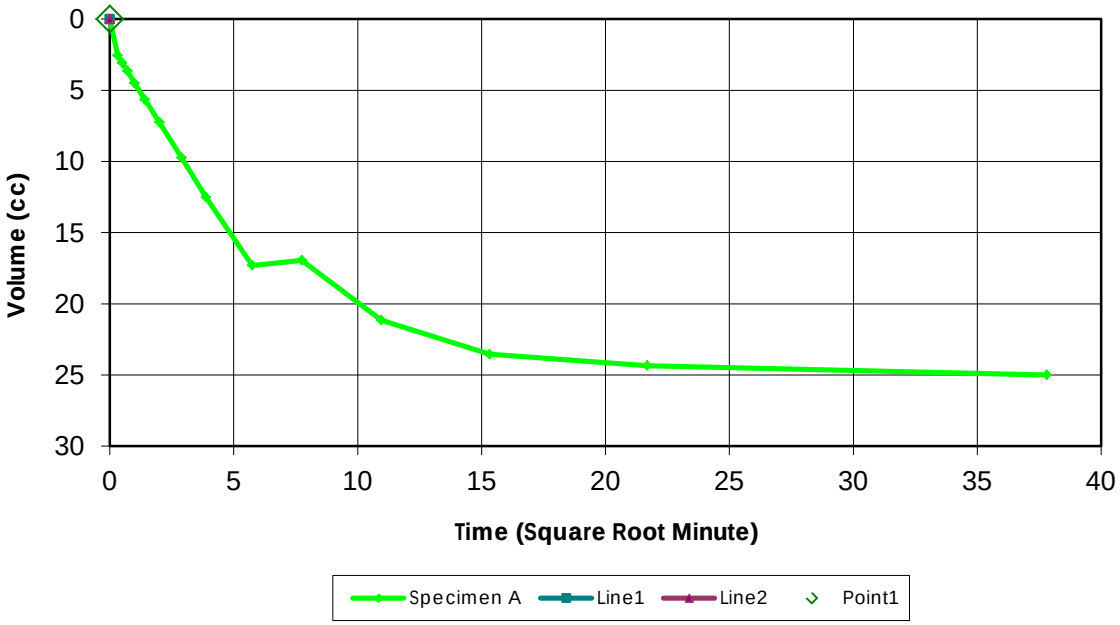



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
500.0
400.0
300.0
200.0
100.0
0.0
Q (kPa)
0.0
100.0
200.0
300.0
400.0
500.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

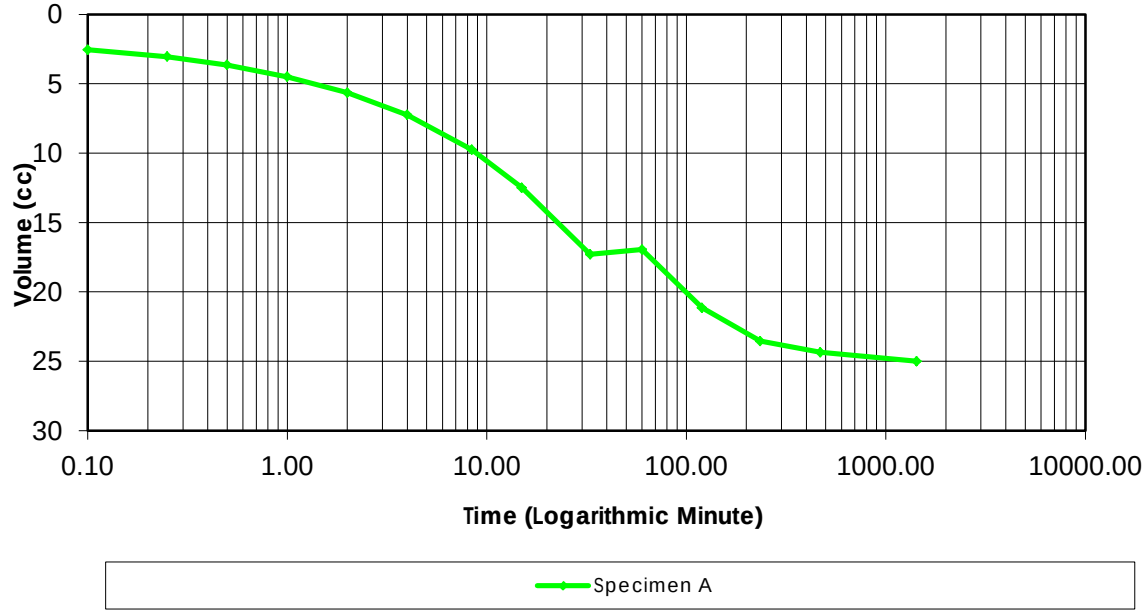

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 40.0 | 20.0 | N/A | N/A | N/A |
| 1 | 40.0 | 20.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 20.0 | 40.0 | 0.0 | 0.27 |
| 3 | 80.0 | 60.0 | 0.0 | 40.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 60.0 | 20.0 | 0.0 | 0.81 |
| 6 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 7 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 8 | 120.0 | 80.0 | 20.0 | 0.0 | 0.86 |
| 9 | 120.0 | 100.0 | 0.0 | 20.0 | |
| 10 | 120.0 | 100.0 | 0.0 | 0.0 | |
| 11 | 140.0 | 100.0 | 20.0 | 0.0 | 0.86 |
| 12 | 140.0 | 120.0 | 0.0 | 20.0 | |
| 13 | 140.0 | 120.0 | 0.0 | 0.0 | |
| 14 | 160.0 | 120.0 | 20.0 | 0.0 | 0.96 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 6.1-6.7m

| | |
|---|---|
| Cell Pressure (kPa) | 520 |
| Back Pressure (kPa) | 120 |
| Effective Pressure (kPa) | 400 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.8 |
| Initial Sample Height (mm) | 148.2 |
| Initial Sample Area (cm2) | 41.63 |
| Initial Volume (cm3) | 616.9 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 48.20 | N/A |
| 00:00:06 | 45.65 | 2.550 |
| 00:00:15 | 45.15 | 3.050 |
| 00:00:30 | 44.55 | 3.650 |
| 00:01:00 | 43.70 | 4.500 |
| 00:02:00 | 42.55 | 5.650 |
| 00:04:00 | 40.95 | 7.250 |
| 00:08:25 | 38.45 | 9.750 |
| 00:15:00 | 35.70 | 12.500 |
| 00:33:00 | 30.90 | 17.300 |
| 01:00:00 | 31.25 | 16.950 |
| 02:00:00 | 27.05 | 21.150 |
| 03:55:00 | 24.65 | 23.550 |
| 07:50:00 | 23.85 | 24.350 |
| 23:50:00 | 23.20 | 25.000 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

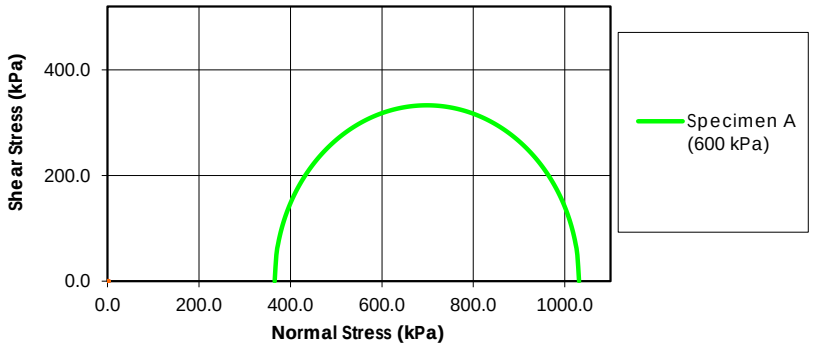
Stantec

Reviewed By C. Lamoureux

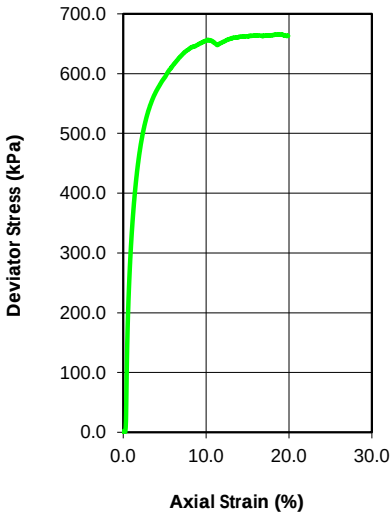
Date: 10-Jun-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.9 | | | |
| Dry Density (g/cm3) | 1.937 | | | |
| Saturation (%) | 102.49 | | | |
| Void Ratio | 0.394 | | | |
| Diameter (mm) | 72.300 | | | |
| Height (mm) | 174.700 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 12.6 | | | |
| Dry Density (g/cm3) | 2.049 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.318 | | | |
| Effective Stress (kPa) | 592.2 | | | |
| Back Press. (kPa) | 67.8 | | | |
| Rate of Strain | 0.024 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

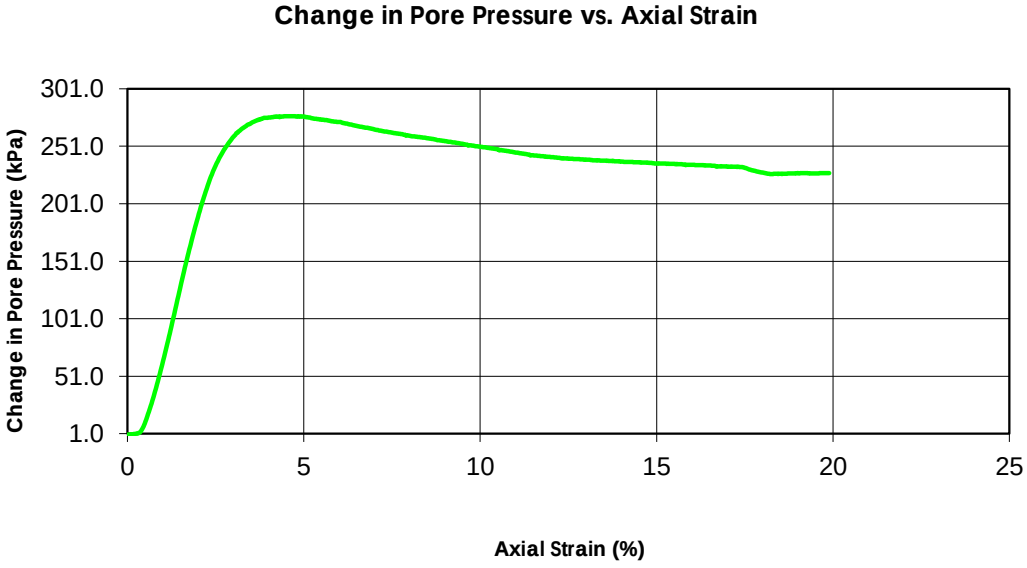
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 1031.19 | | | |
| σ'3 at Failure (kPa) | 365.42 | | | |
| | | | | |
| | | | | |

| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D13 ST21 |
| **Depth:** | 9.1-9.7m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, Some Gravel, Tr. Sand |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

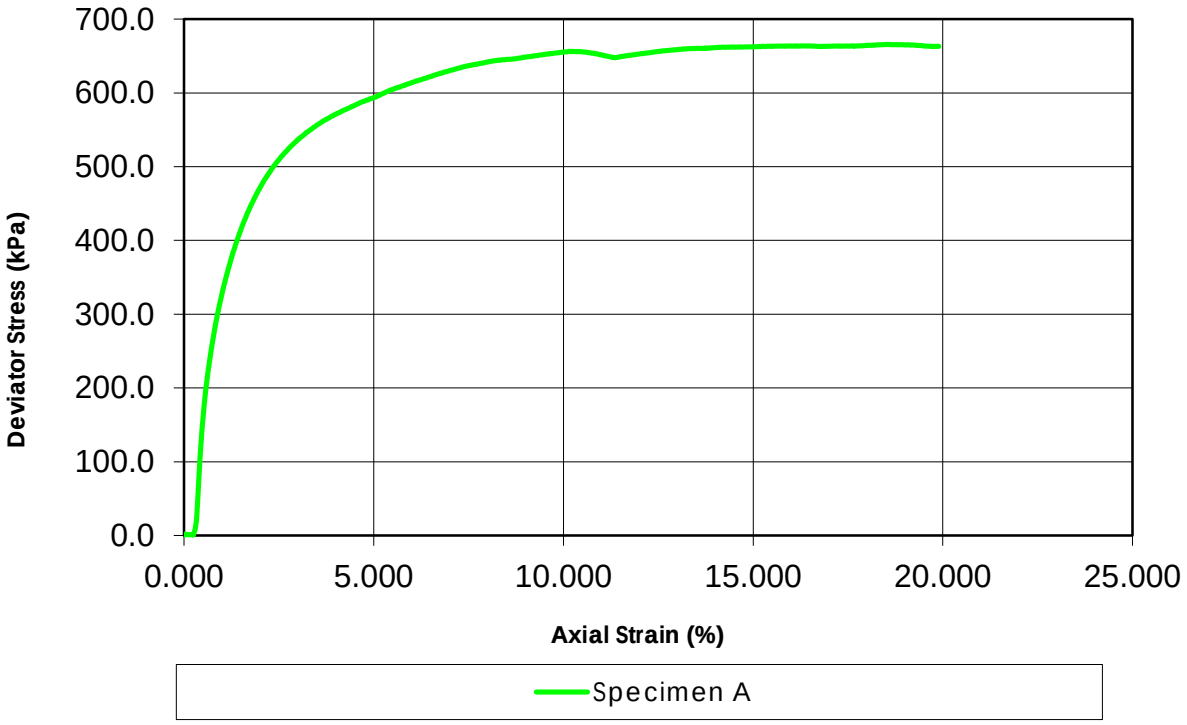
**Stantec Consulting Ltd.**

**Consolidated Undrained Triaxial Test (ASTM D4767)**

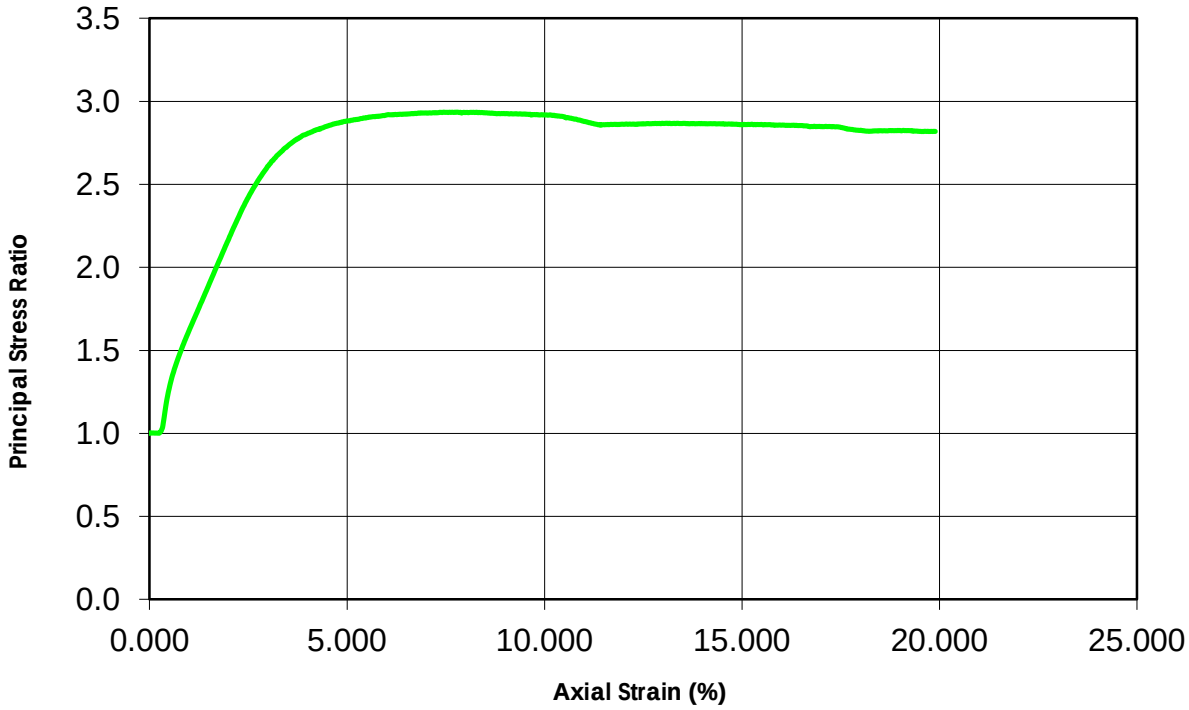
Stantec

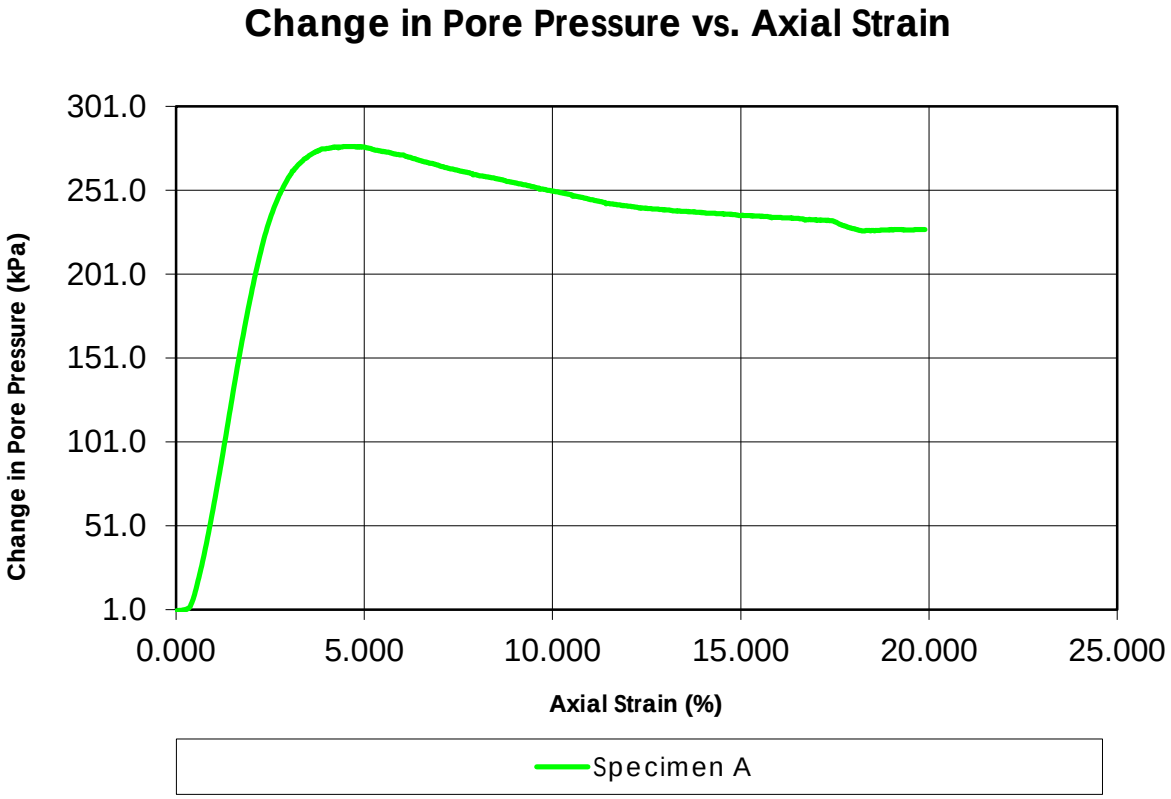



## Deviator Stress vs. Axial Strain



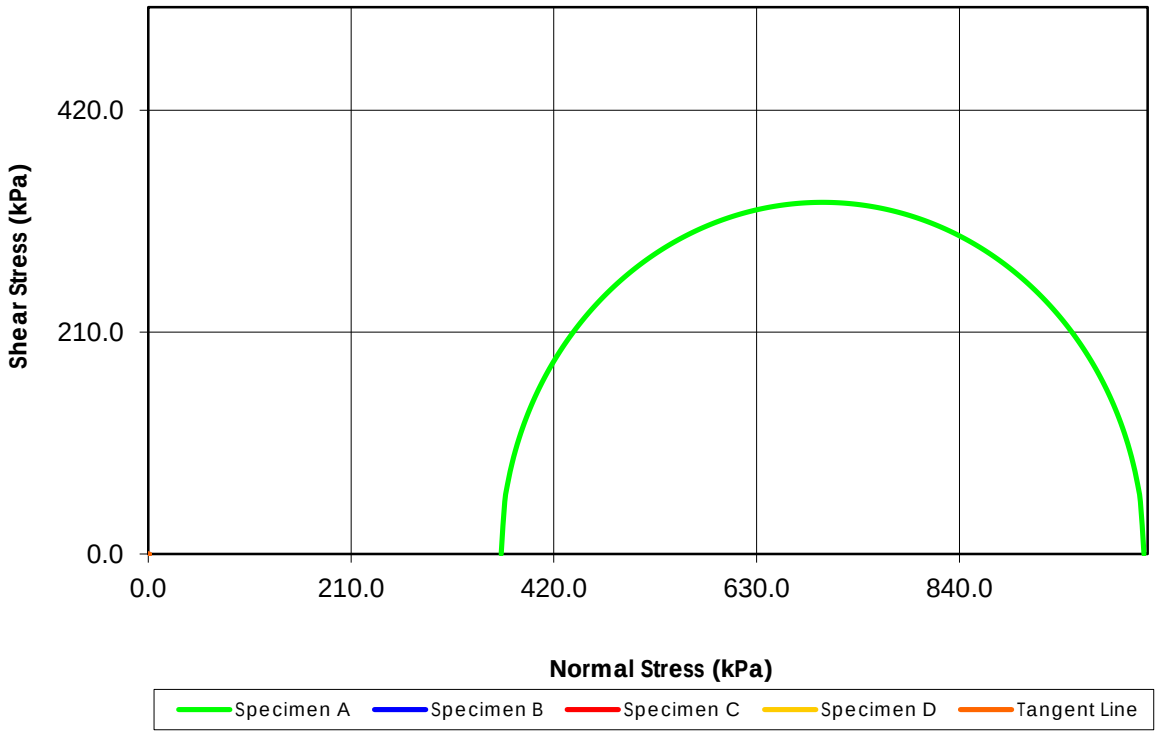

## Principal Stress Ratio vs. Axial Strain



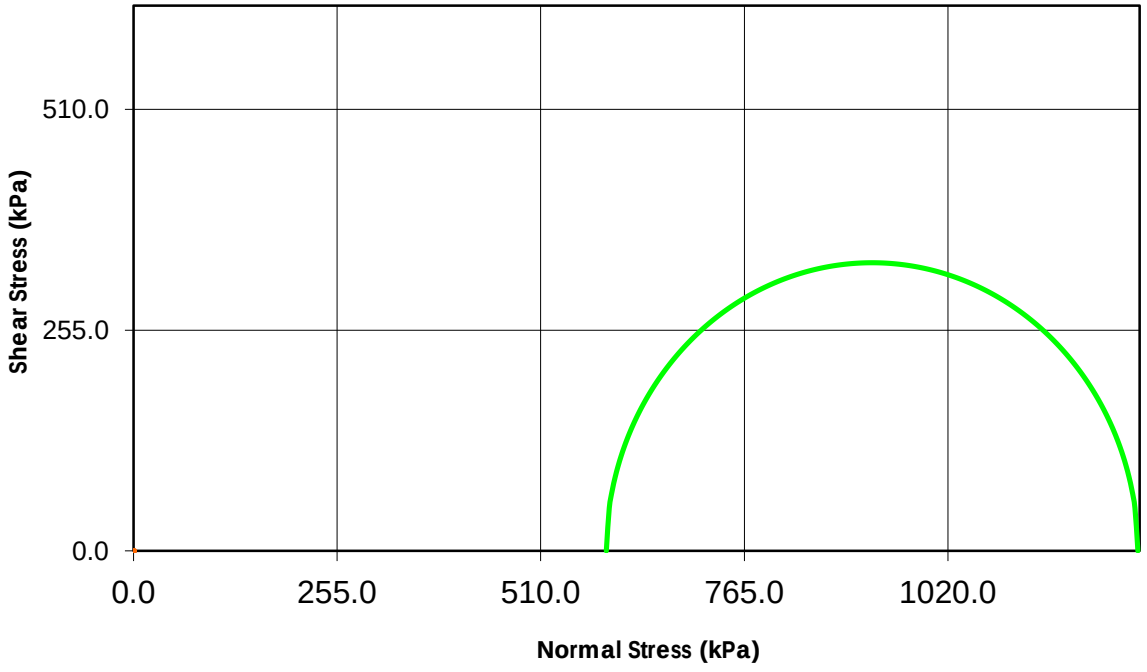

Change in Pore Pressure vs. Axial Strain
301.0
251.0
201.0
151.0
101.0
51.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

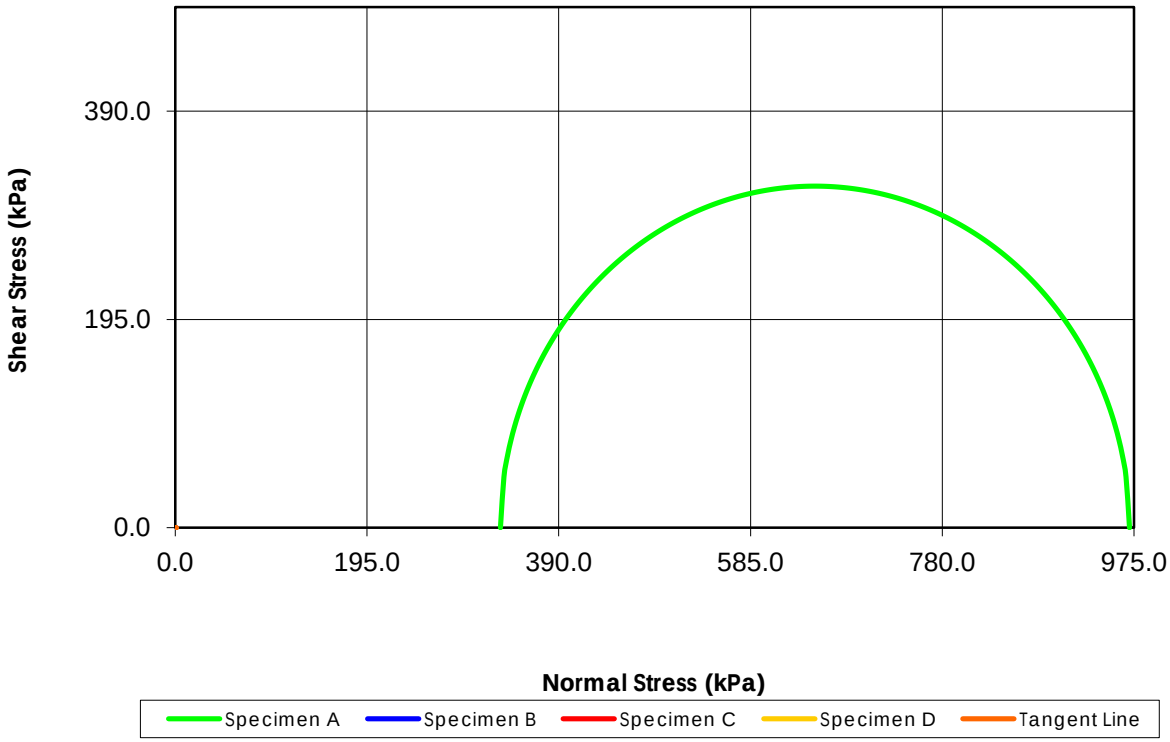



### Total Stress
### (C = 0.0 Ø = 0.0)

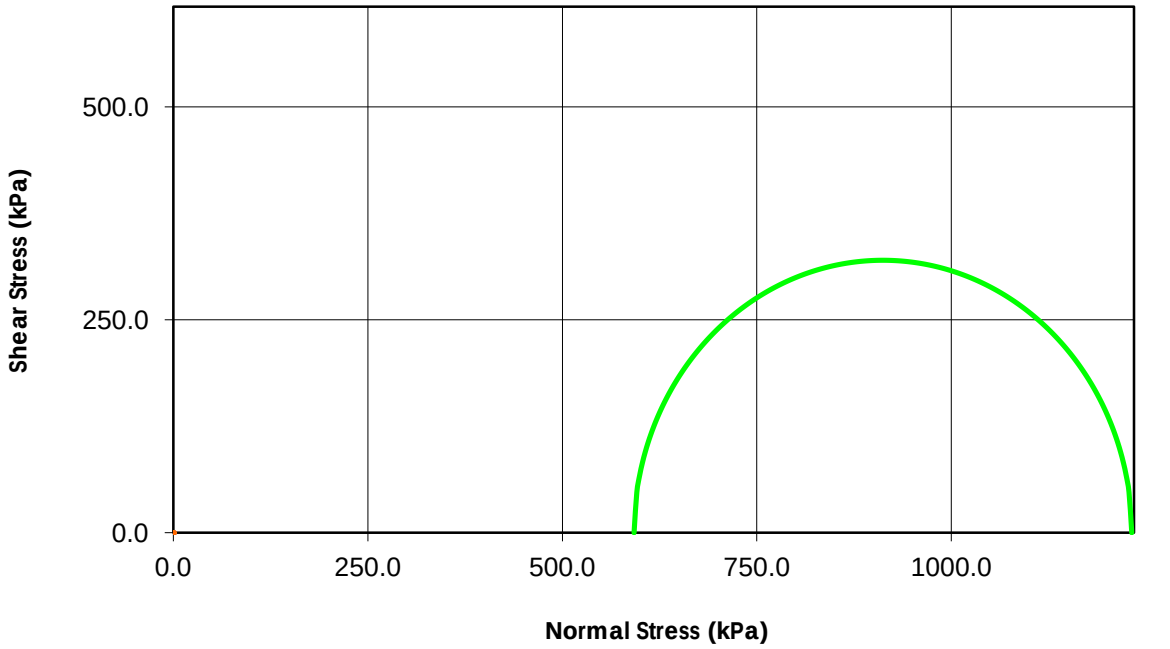


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

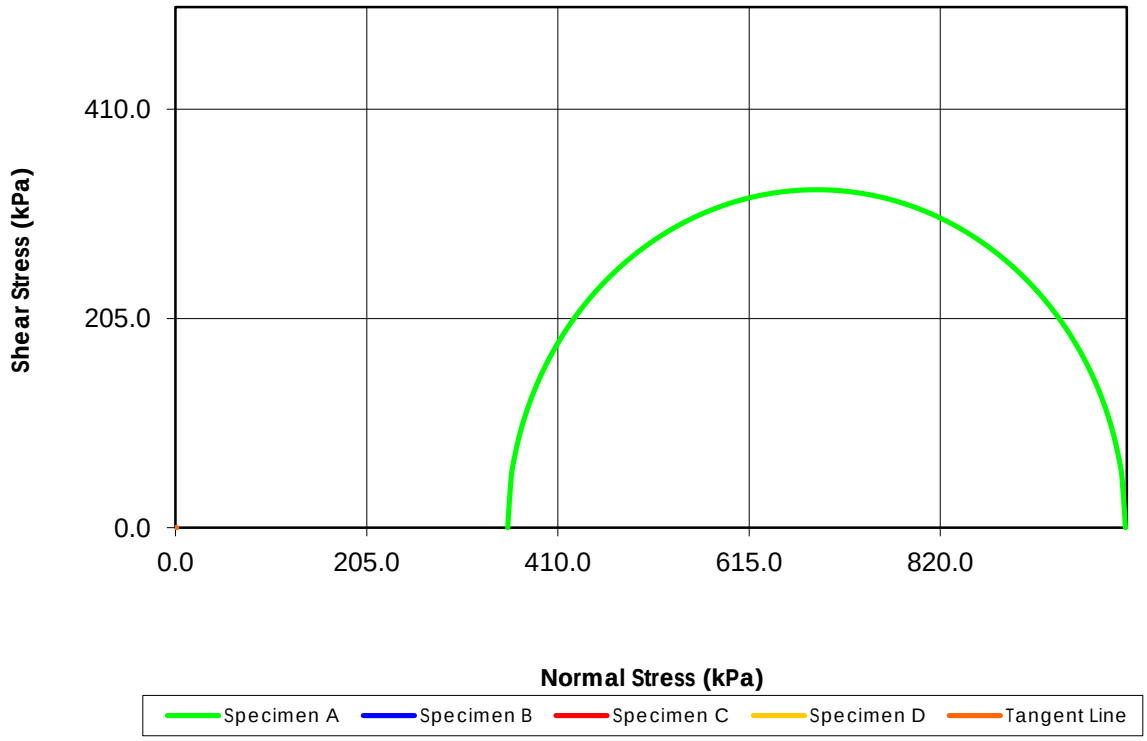



## Total Stress
## (C = 0.0 Ø = 0.0)

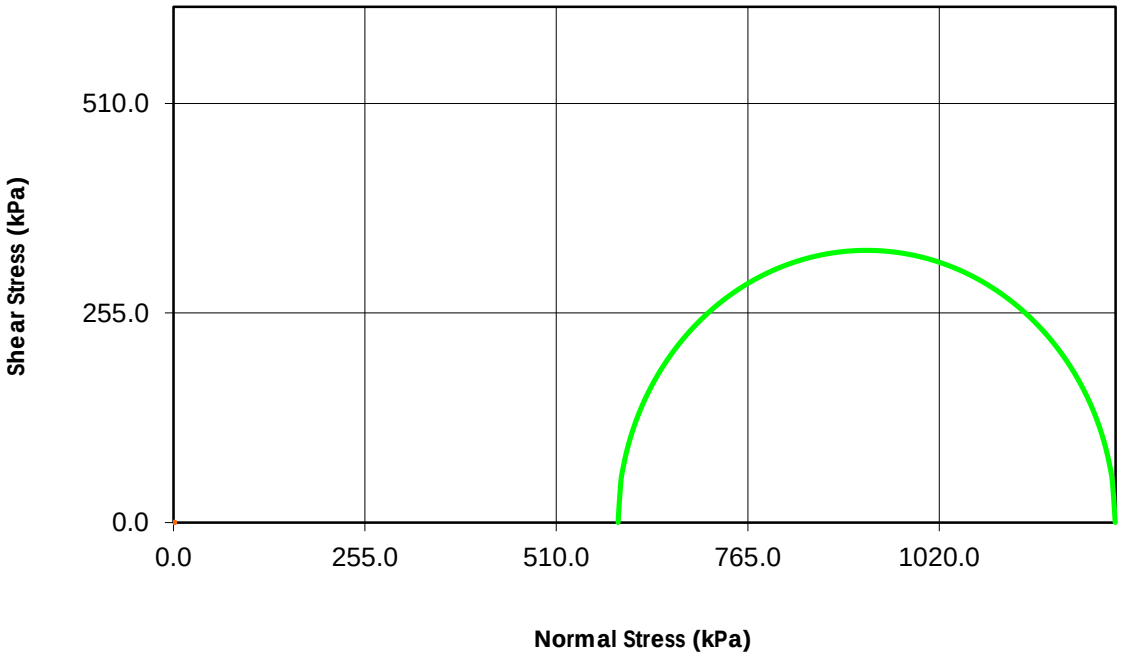


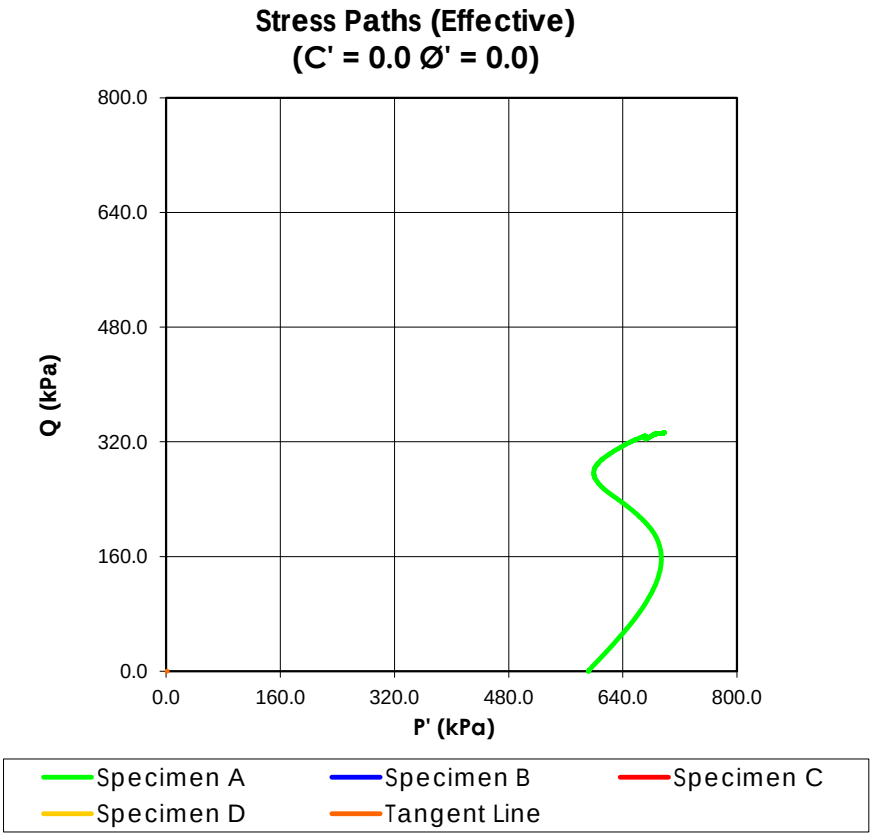
# Mohr Stress Circles at 15% Axial Strain Criterion

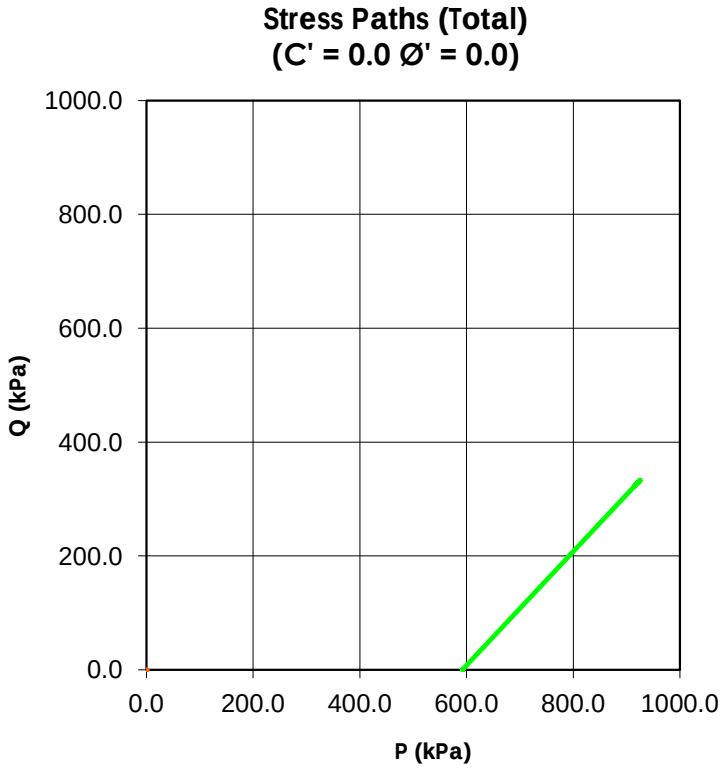
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

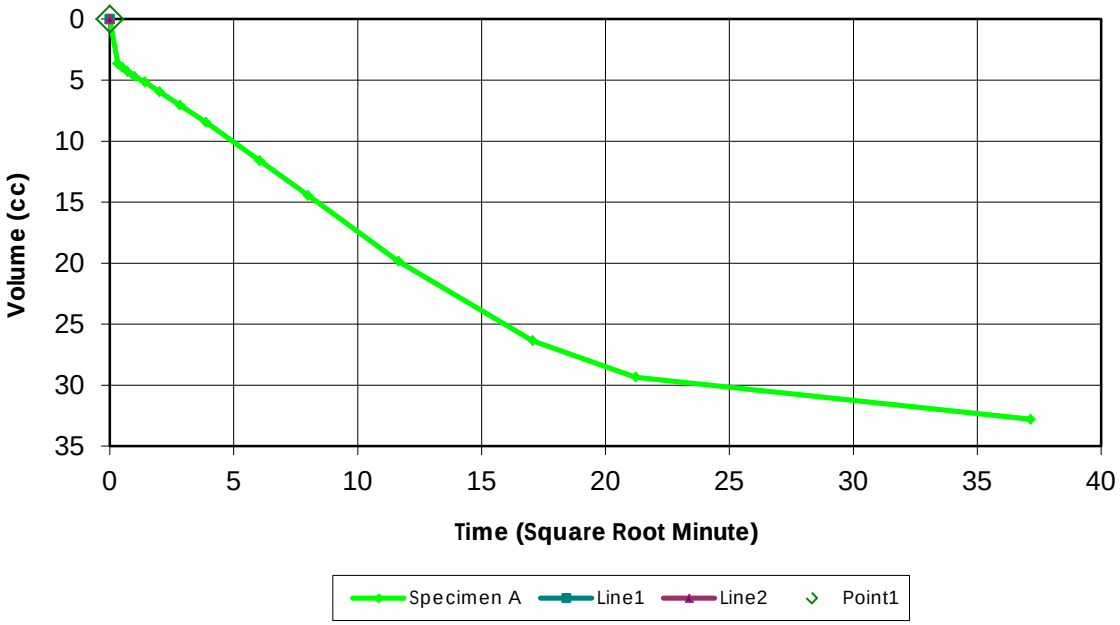



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

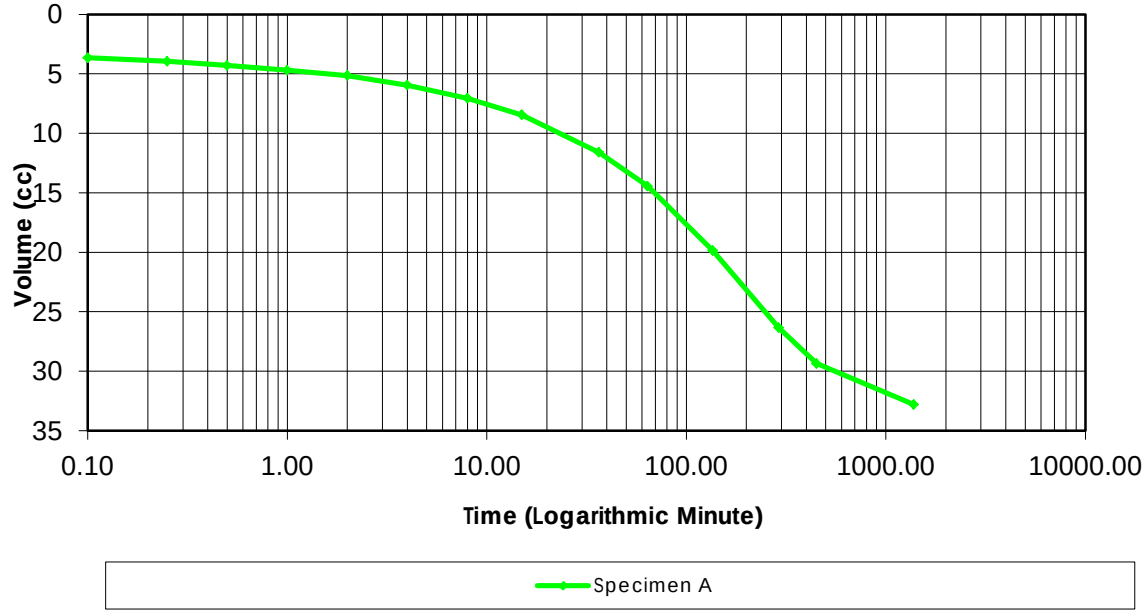

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 40.0 | 20.0 | N/A | N/A | N/A |
| 1 | 40.0 | 20.0 | 0.0 | 0.0 | |
| 2 | 50.0 | 20.0 | 10.0 | 0.0 | 2.00 |
| 3 | 50.0 | 30.0 | 0.0 | 10.0 | |
| 4 | 50.0 | 30.0 | 0.0 | 0.0 | |
| 5 | 60.0 | 30.0 | 10.0 | 0.0 | 28.00 |
| 6 | 60.0 | 40.0 | 0.0 | 10.0 | |
| 7 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 8 | 70.0 | 40.0 | 10.0 | 0.0 | 38.00 |
| 9 | 70.0 | 50.0 | 0.0 | 10.0 | |
| 10 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 11 | 75.0 | 50.0 | 5.0 | 0.0 | 82.00 |
| 12 | 75.0 | 55.0 | 0.0 | 5.0 | |
| 13 | 75.0 | 55.0 | 0.0 | 0.0 | |
| 14 | 80.0 | 55.0 | 5.0 | 0.0 | 96.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 9.1-9.7m

| | |
|---|---|
| Cell Pressure (kPa) | 660 |
| Back Pressure (kPa) | 60 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.3 |
| Initial Sample Height (mm) | 174.7 |
| Initial Sample Area (cm2) | 41.06 |
| Initial Volume (cm3) | 717.2 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 42.10 | N/A |
| 00:00:06 | 38.45 | 3.650 |
| 00:00:15 | 38.15 | 3.950 |
| 00:00:30 | 37.80 | 4.300 |
| 00:01:00 | 37.40 | 4.700 |
| 00:02:00 | 36.95 | 5.150 |
| 00:04:00 | 36.15 | 5.950 |
| 00:08:00 | 35.05 | 7.050 |
| 00:15:00 | 33.65 | 8.450 |
| 00:36:30 | 30.50 | 11.600 |
| 01:04:00 | 27.65 | 14.450 |
| 02:15:40 | 22.25 | 19.850 |
| 04:51:00 | 15.75 | 26.350 |
| 07:30:00 | 12.75 | 29.350 |
| 23:00:00 | 9.30 | 32.800 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

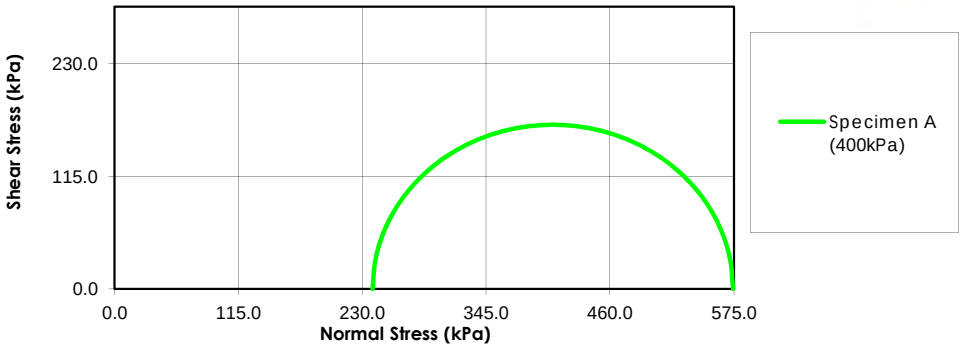
Stantec

Reviewed By C.Lamoureux

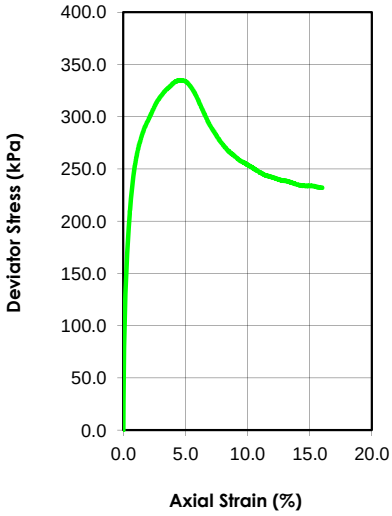
Date: 5-May-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 26.0 | | | |
| Dry Density (g/cm3) | 1.612 | | | |
| Saturation (%) | 104.22 | | | |
| Void Ratio | 0.671 | | | |
| Diameter (mm) | 72.1 | | | |
| Height (mm) | 157.7 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 23.3 | | | |
| Dry Density (g/cm3) | 1.60 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.683 | | | |
| Effective Stress (kPa) | 391.8 | | | |
| Back Press. (kPa) | 258.2 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 574.27 | | | |
| σ'3 at Failure (kPa) | 239.53 | | | |
| | | | | |
| | | | | |

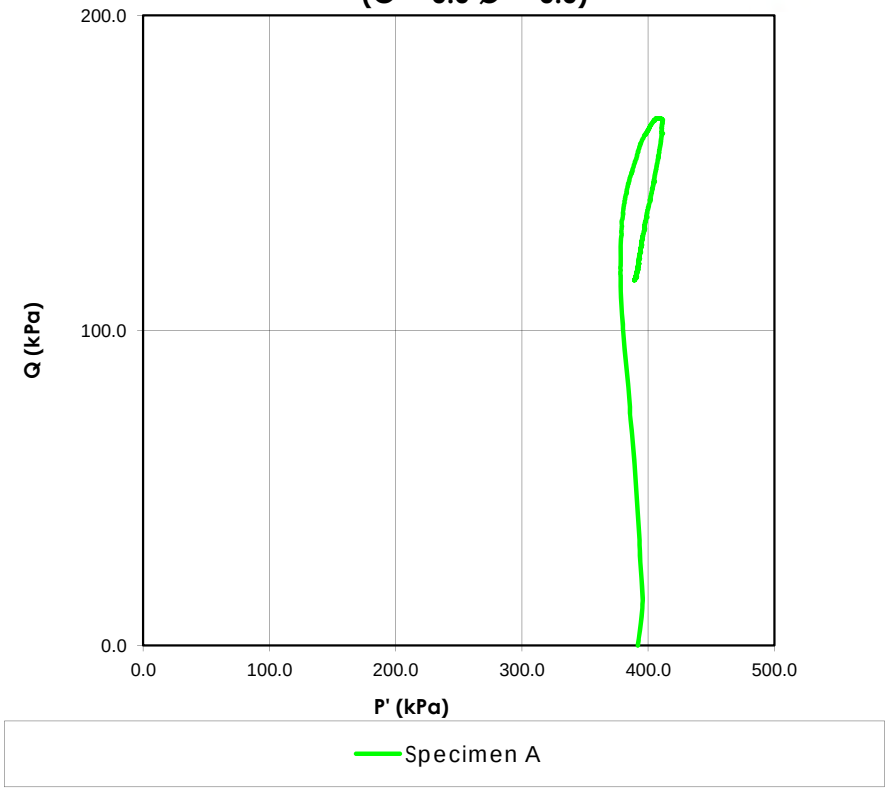
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 10773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D16-ST5 Bottom |
| **Depth:** | 4.5-5.0m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

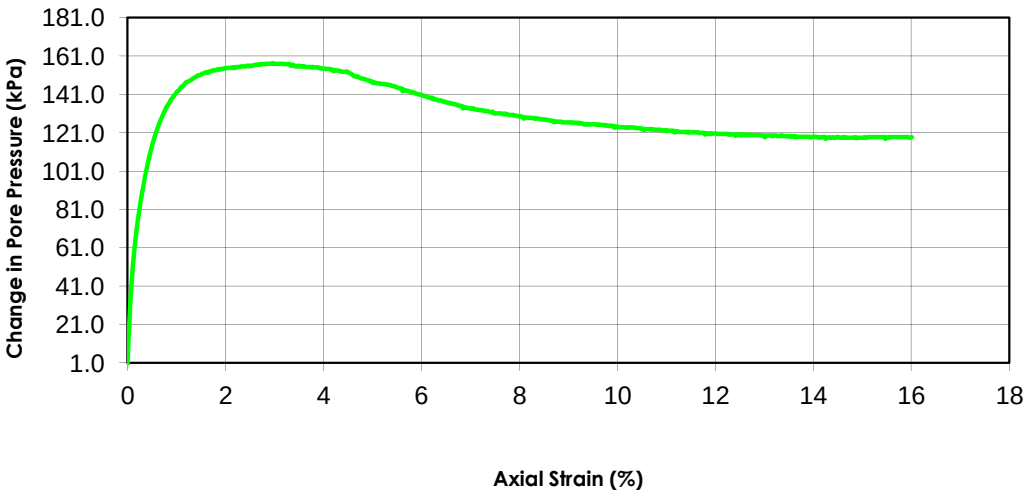
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

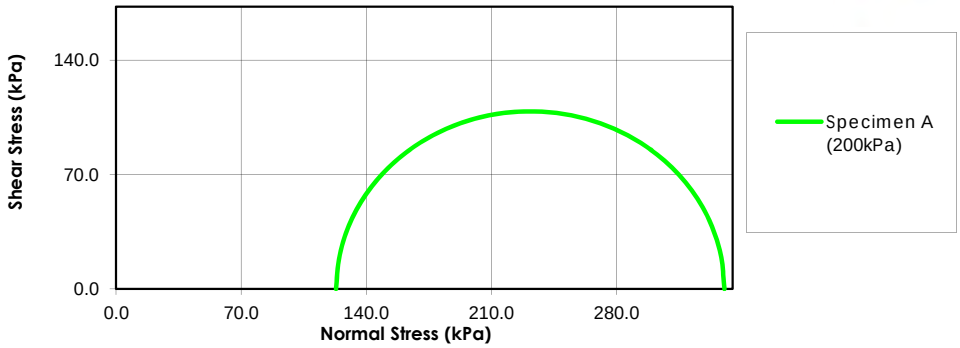
Stantec

Reviewed By C.Lamoureux

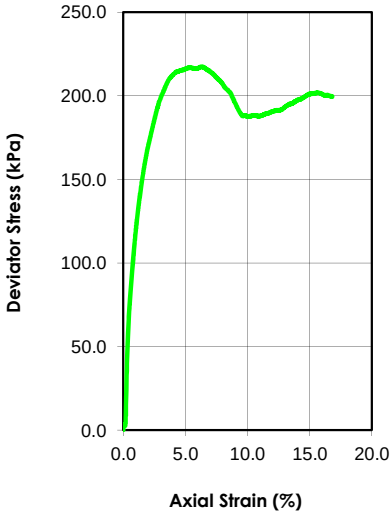
Date: 5-May-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.4 | | | |
| Dry Density (g/cm3) | 1.554 | | | |
| Saturation (%) | 100.40 | | | |
| Void Ratio | 0.734 | | | |
| Diameter (mm) | 73.1 | | | |
| Height (mm) | 149.2 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 24.7 | | | |
| Dry Density (g/cm3) | 1.592 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.696 | | | |
| Effective Stress (kPa) | 192.4 | | | |
| Back Press. (kPa) | 187.6 | | | |
| Rate of Strain | 0.017 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 340.44 | | | |
| σ'3 at Failure (kPa) | 123.21 | | | |
| | | | | |
| | | | | |

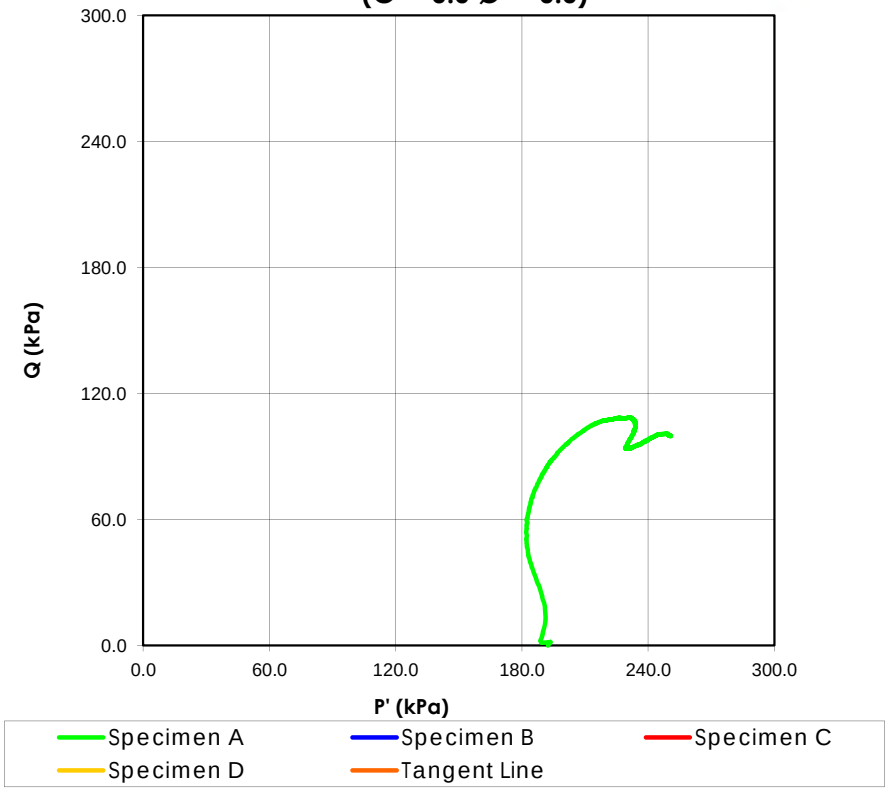
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D16-ST5 Top |
| **Depth:** | 4.6-5.0m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

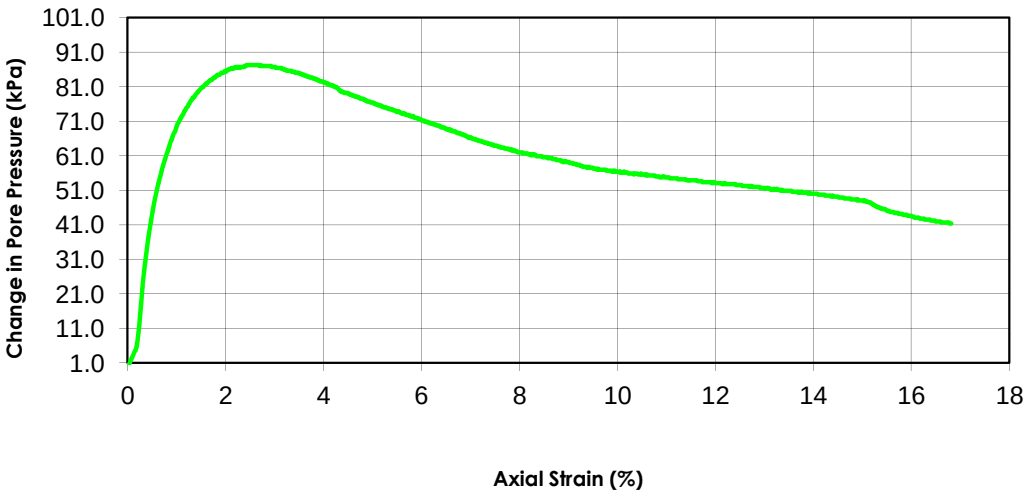
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

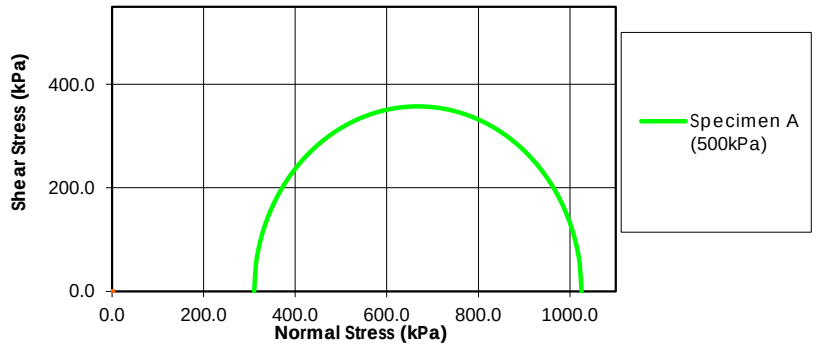
Stantec

Reviewed By C. Lamoureux

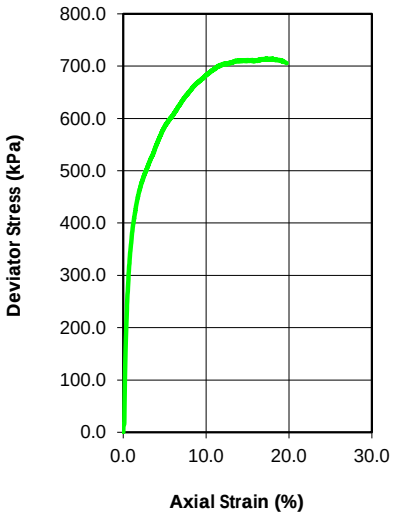
Date: 10-Jun-16

Tested By:

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.0 | | | |
| Dry Density (g/cm3) | 1.773 | | | |
| Saturation (%) | 129.22 | | | |
| Void Ratio | 0.523 | | | |
| Diameter (mm) | 72.60 | | | |
| Height (mm) | 152.40 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 21.5 | | | |
| Dry Density (g/cm3) | 2.033 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.328 | | | |
| Effective Stress (kPa) | 490.9 | | | |
| Back Press. (kPa) | 79.1 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

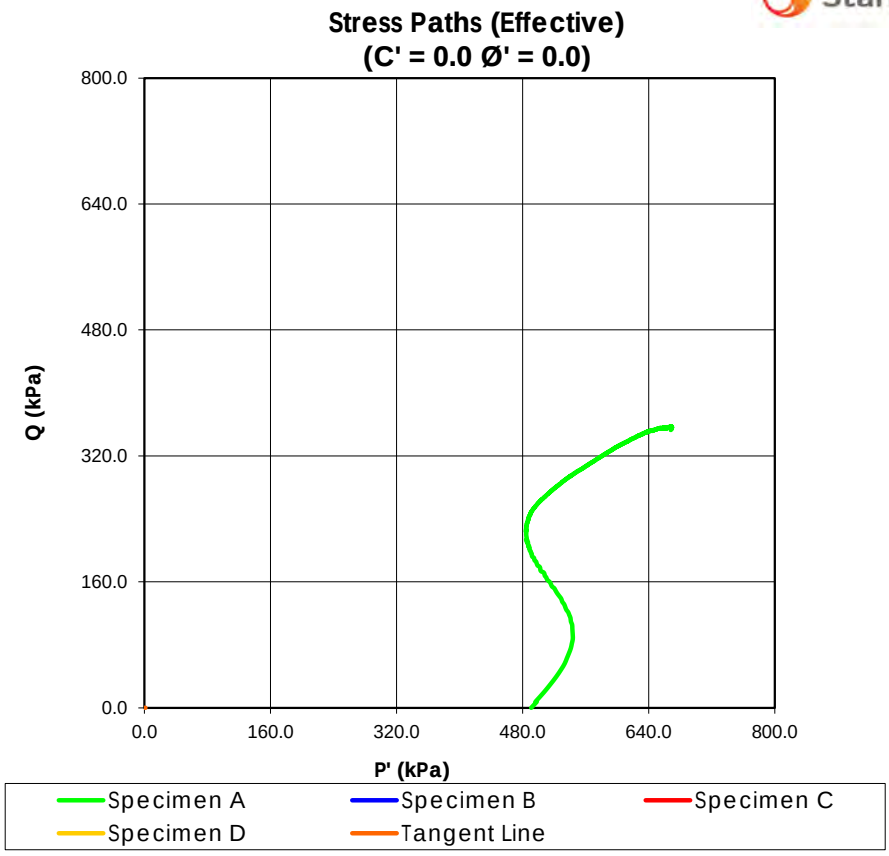
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 1025.36 | | | |
| σ'3 at Failure (kPa) | 310.49 | | | |
| | | | | |
| | | | | |

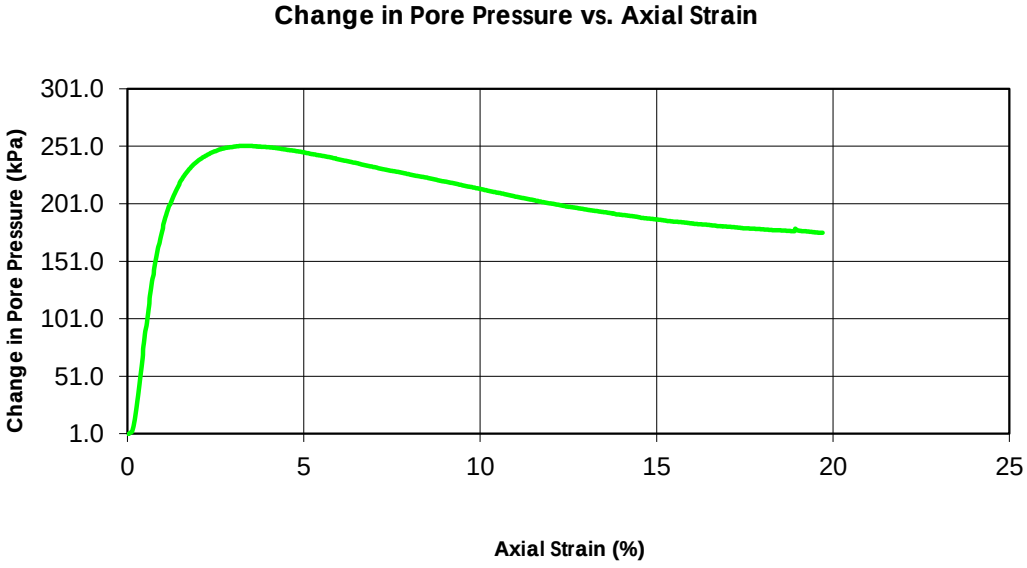
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D17 ST20 |
| **Depth:** | 10.7-11.15m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, Tr. Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

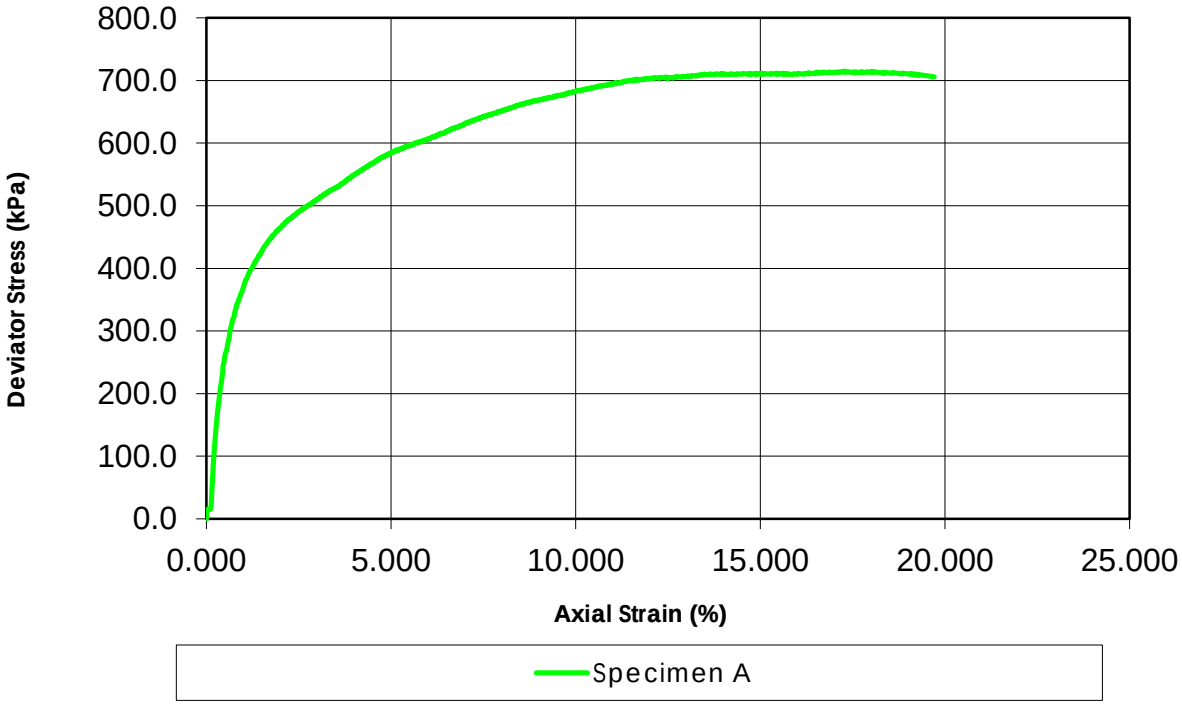
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

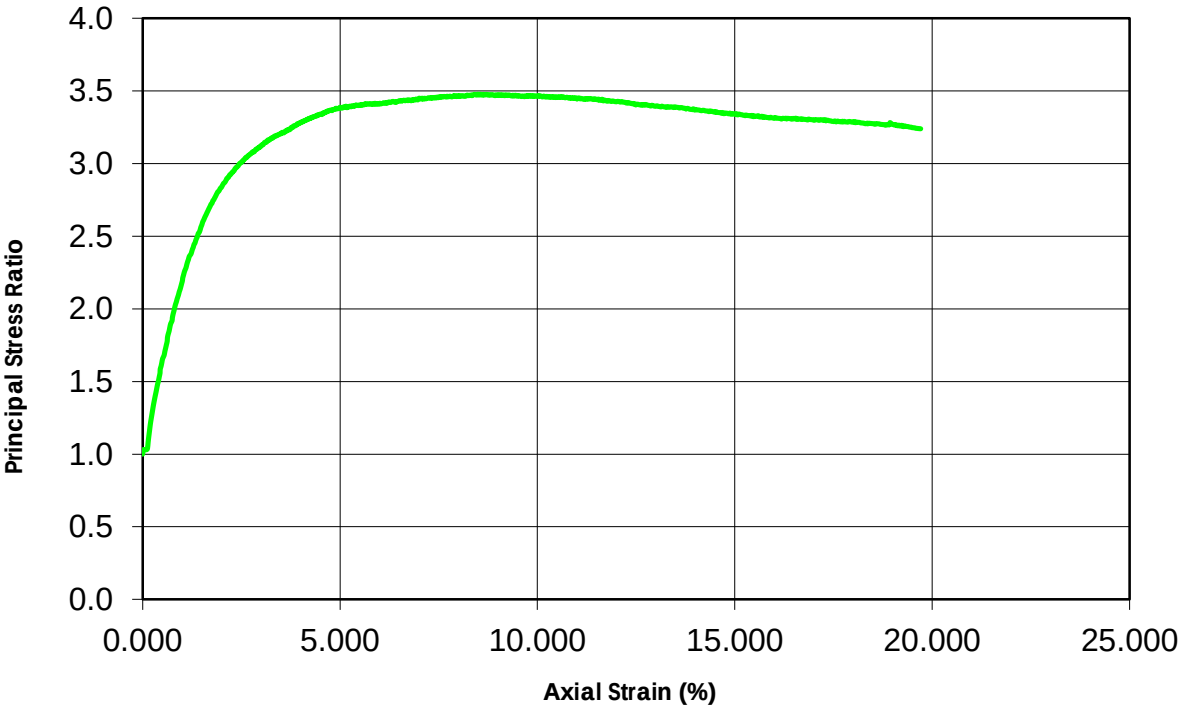


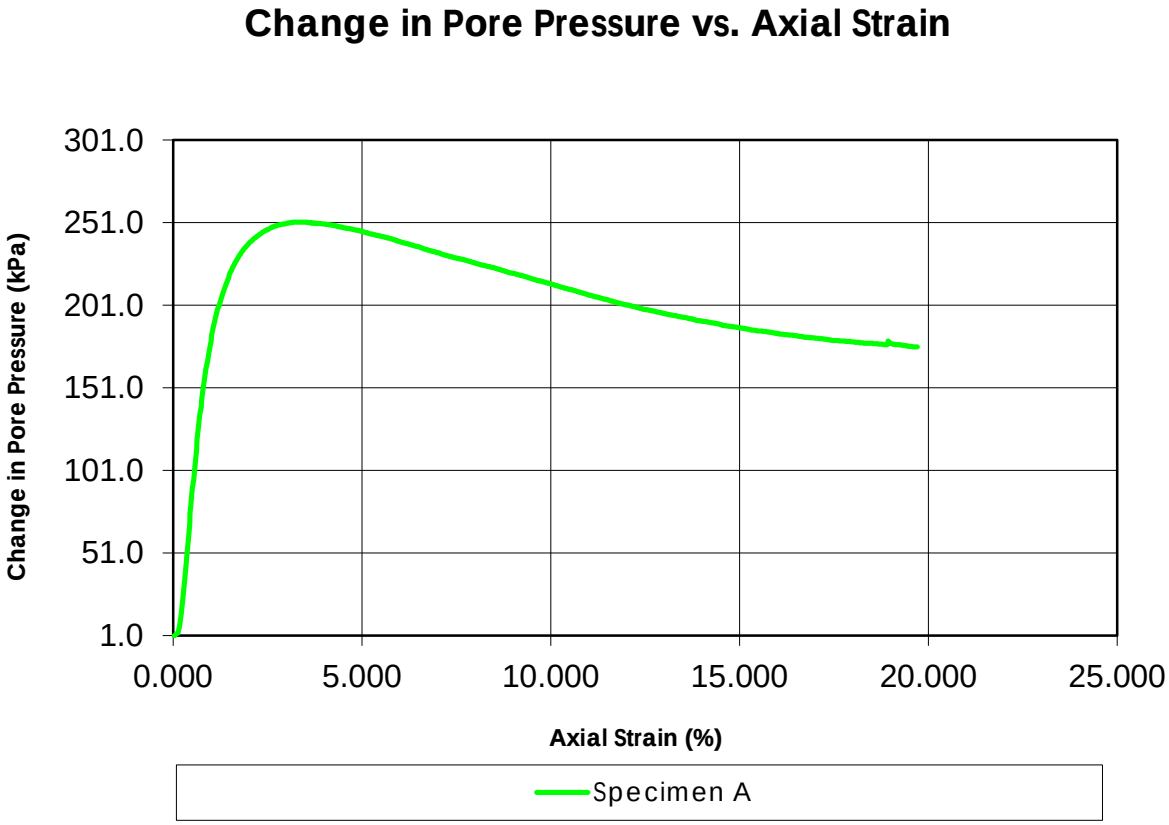



## Deviator Stress vs. Axial Strain



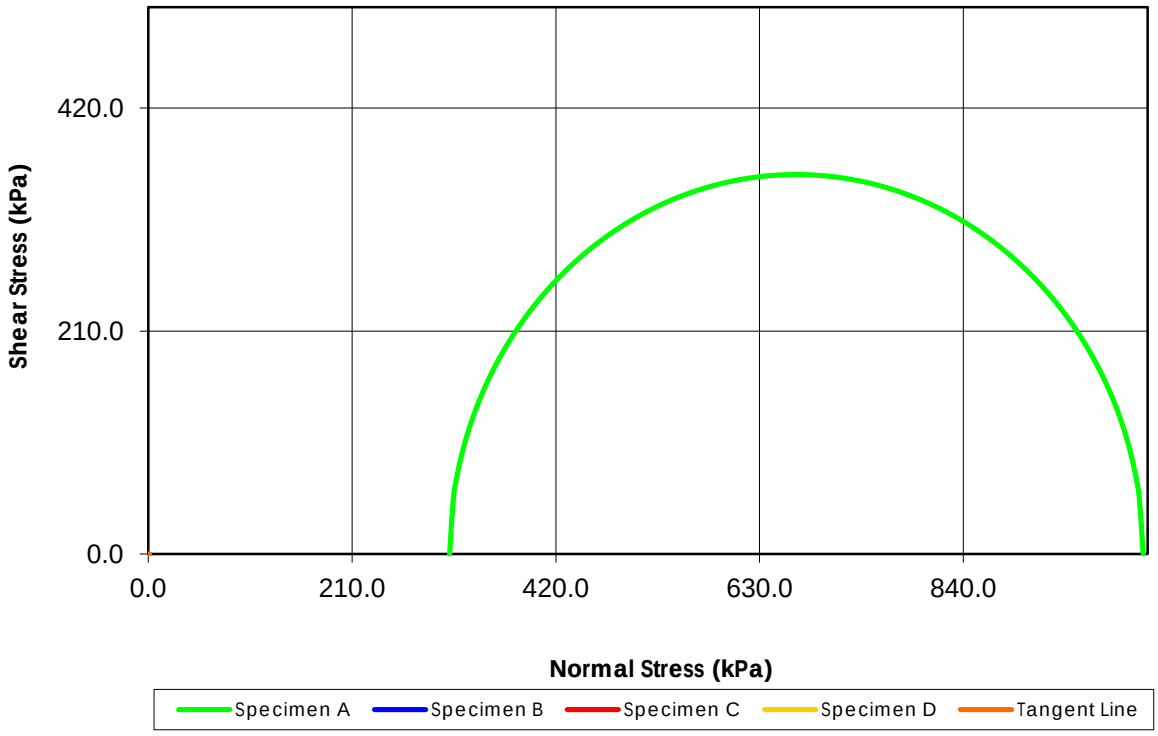

## Principal Stress Ratio vs. Axial Strain



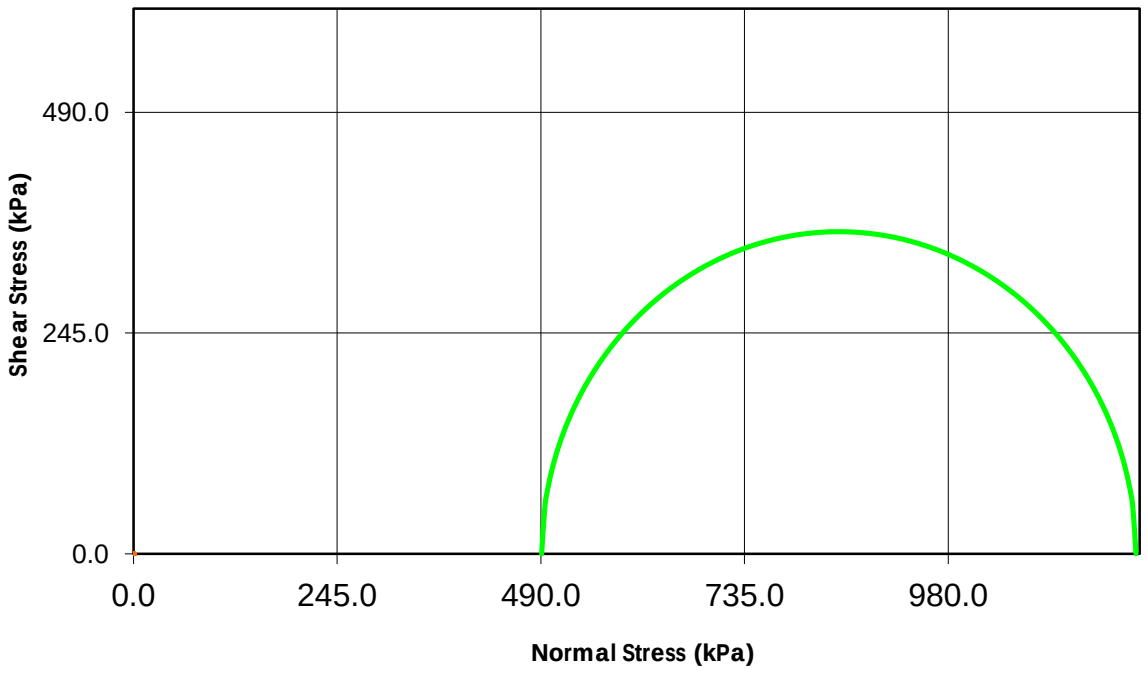

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
301.0
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

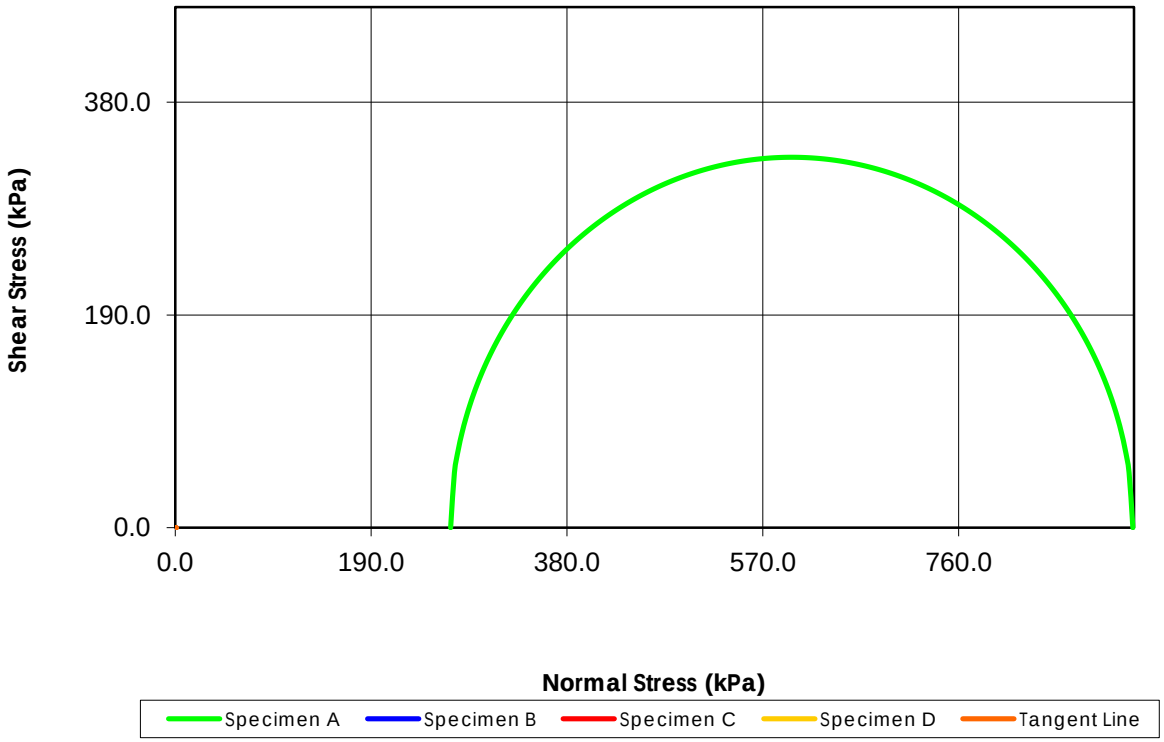



### Total Stress
### (C = 0.0 Ø = 0.0)

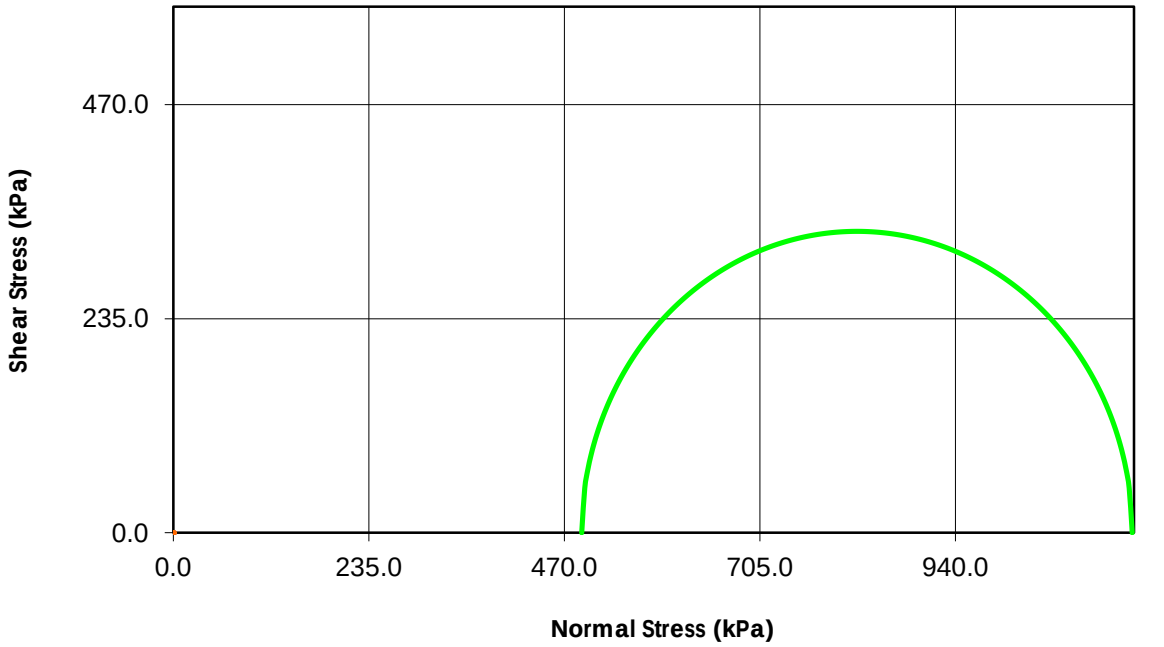


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

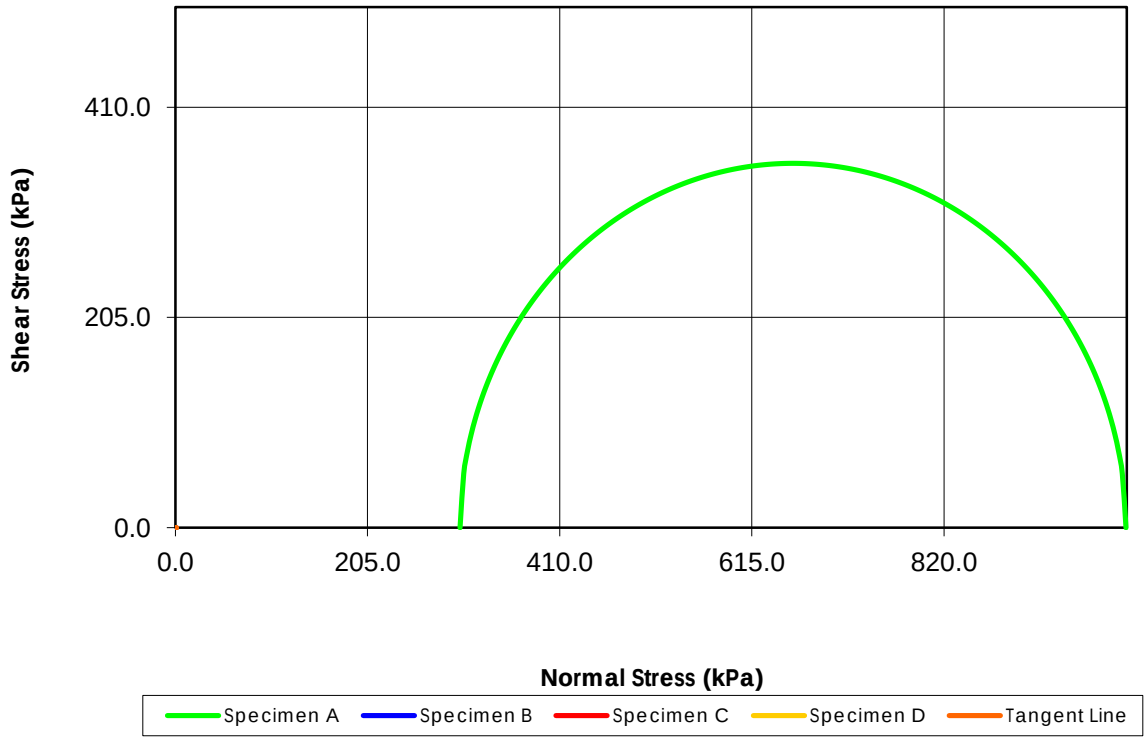



## Total Stress
## (C = 0.0 Ø = 0.0)

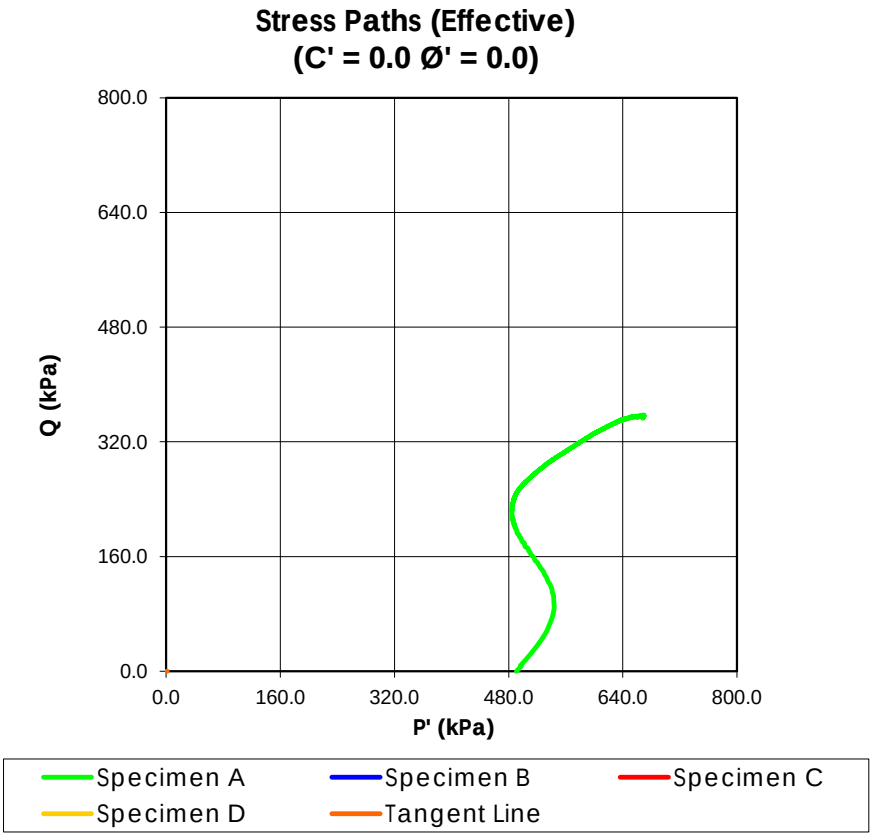


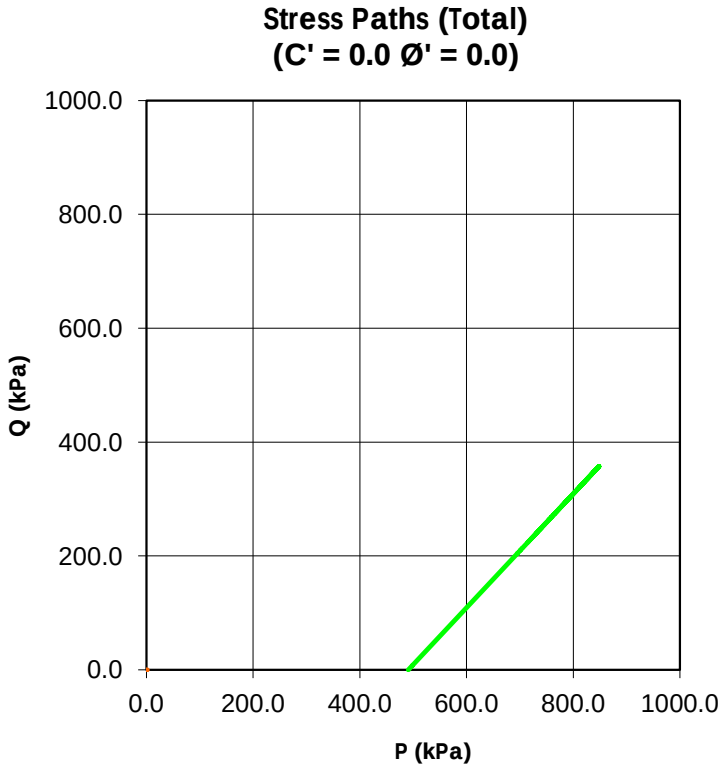
# Mohr Stress Circles at 15% Axial Strain Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)



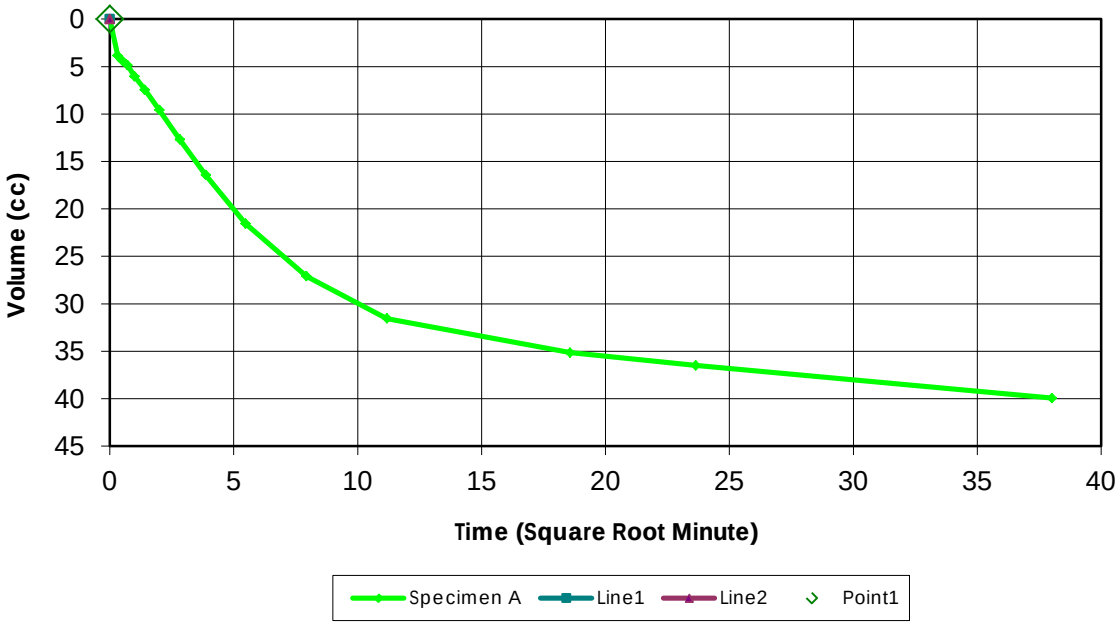

## Total Stress
## (C = 0.0 Ø = 0.0)


Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

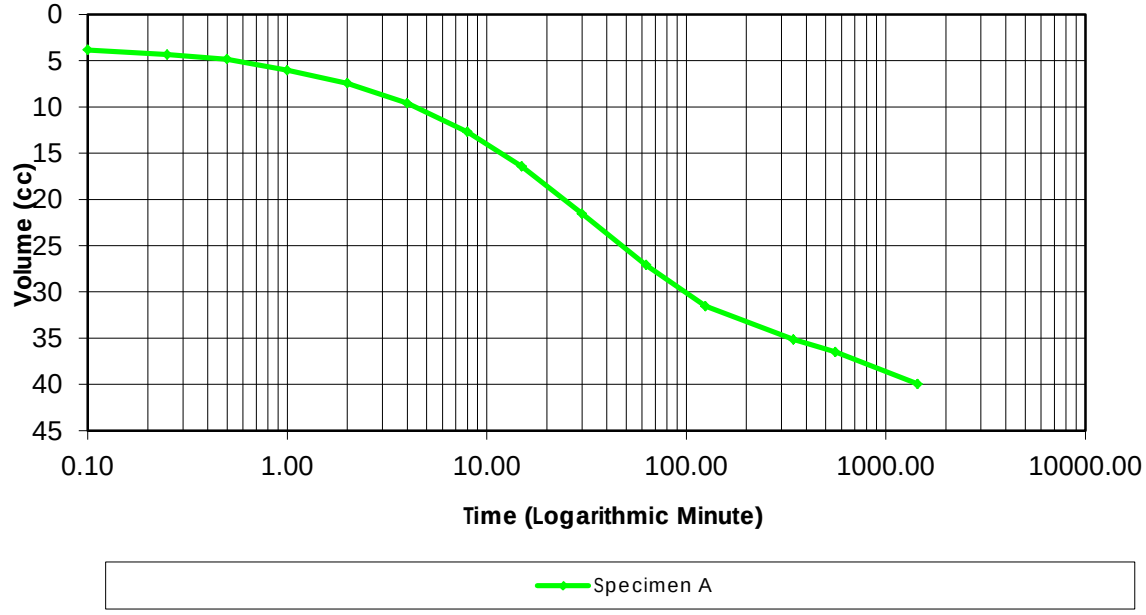

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 40.0 | 20.0 | N/A | N/A | N/A |
| 1 | 40.0 | 20.0 | 0.0 | 0.0 | |
| 2 | 50.0 | 20.0 | 10.0 | 0.0 | 0.16 |
| 3 | 50.0 | 30.0 | 0.0 | 10.0 | |
| 4 | 50.0 | 30.0 | 0.0 | 0.0 | |
| 5 | 60.0 | 30.0 | 10.0 | 0.0 | 0.31 |
| 6 | 60.0 | 40.0 | 0.0 | 10.0 | |
| 7 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 8 | 70.0 | 40.0 | 10.0 | 0.0 | 0.35 |
| 9 | 70.0 | 50.0 | 0.0 | 10.0 | |
| 10 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 11 | 80.0 | 50.0 | 10.0 | 0.0 | 0.75 |
| 12 | 80.0 | 60.0 | 0.0 | 10.0 | |
| 13 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 14 | 90.0 | 60.0 | 10.0 | 0.0 | 0.95 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 10.7-11.15m

| | |
|---|---|
| Cell Pressure (kPa) | 570 |
| Back Pressure (kPa) | 70 |
| Effective Pressure (kPa) | 500 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.6 |
| Initial Sample Height (mm) | 152.4 |
| Initial Sample Area (cm2) | 41.4 |
| Initial Volume (cm3) | 630.9 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 43.35 | N/A |
| 00:00:06 | 39.50 | 3.850 |
| 00:00:15 | 39.00 | 4.350 |
| 00:00:30 | 38.50 | 4.850 |
| 00:01:00 | 37.30 | 6.050 |
| 00:02:00 | 35.90 | 7.450 |
| 00:04:00 | 33.75 | 9.600 |
| 00:08:00 | 30.65 | 12.700 |
| 00:15:00 | 26.90 | 16.450 |
| 00:30:00 | 21.80 | 21.550 |
| 01:03:00 | 16.25 | 27.100 |
| 02:05:00 | 11.80 | 31.550 |
| 05:45:00 | 8.20 | 35.150 |
| 09:19:00 | 6.85 | 36.500 |
| 24:05:00 | 3.40 | 39.950 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

Specimen A (400kPa)

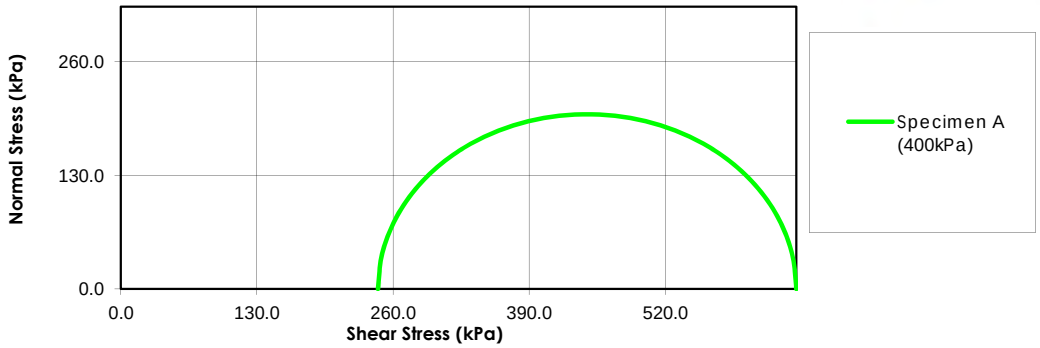
Stantec

Reviewed By C.Lamouruex

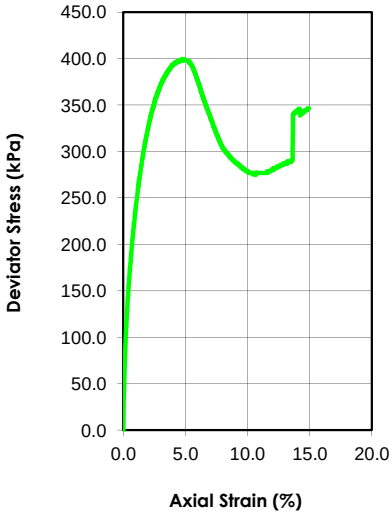
Date: 26-Apr-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.9 | | | |
| Dry Density (g/cm3) | 1.613 | | | |
| Saturation (%) | 103.55 | | | |
| Void Ratio | 0.671 | | | |
| Diameter (mm) | 72.6 | | | |
| Height (mm) | 146.0 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | 0 | | | |
| Plastic Limit | 0 | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 22.7 | | | |
| Dry Density (g/cm3) | 1.672 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.615 | | | |
| Effective Stress (kPa) | 401.8 | | | |
| Back Press. (kPa) | 228.2 | | | |
| Rate of Strain | 0.015 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 644.98 | | | |
| σ'3 at Failure (kPa) | 245.54 | | | |
| | | | | |
| | | | | |

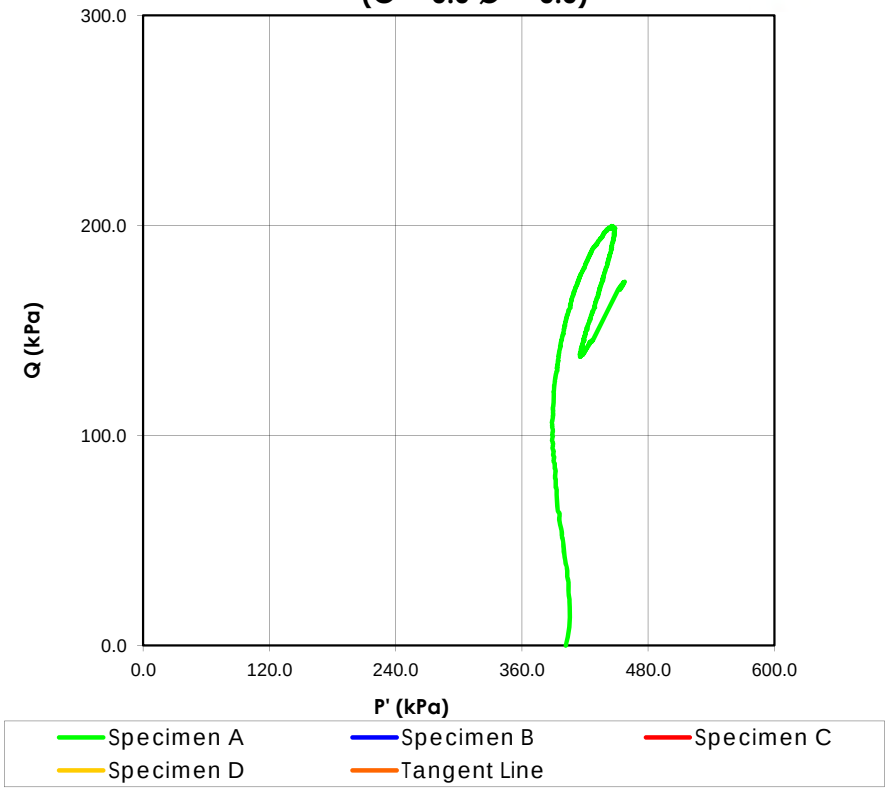
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D19-ST6 |
| **Depth:** | 3.0-3.5m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

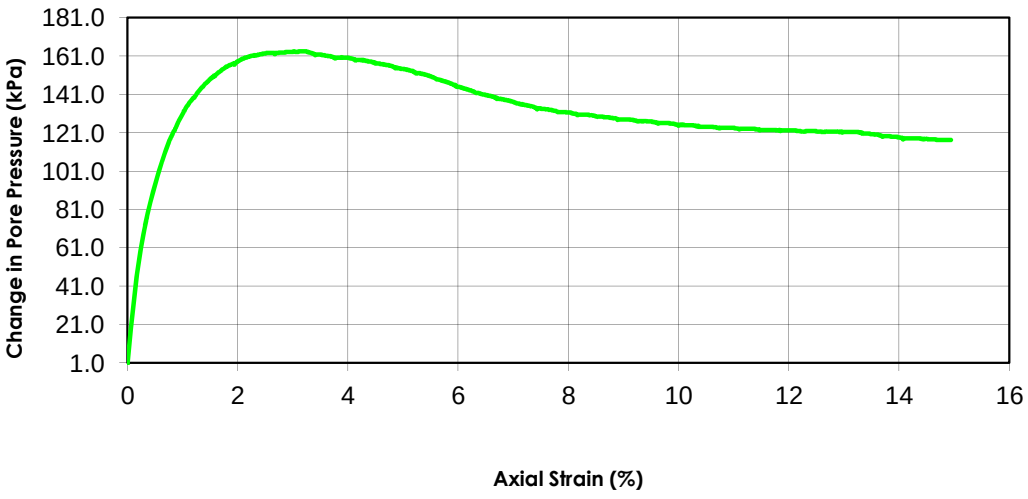
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



# Stantec Consulting Ltd.

## Consolidated Undrained Triaxial Test (ASTM D4767)

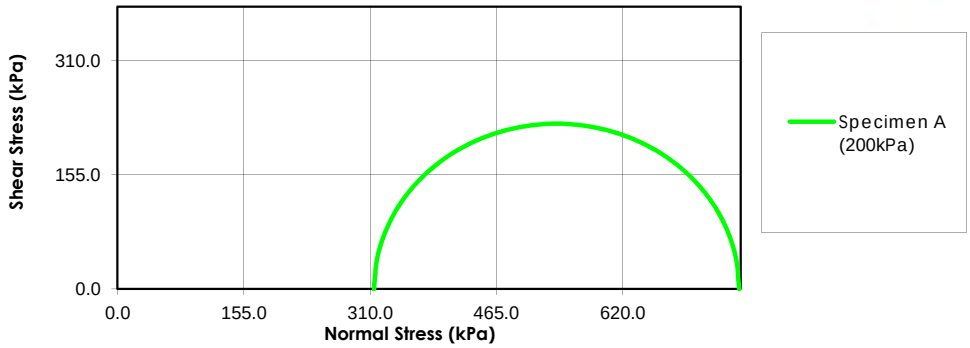
Stantec

Reviewed By C.Lamoureux

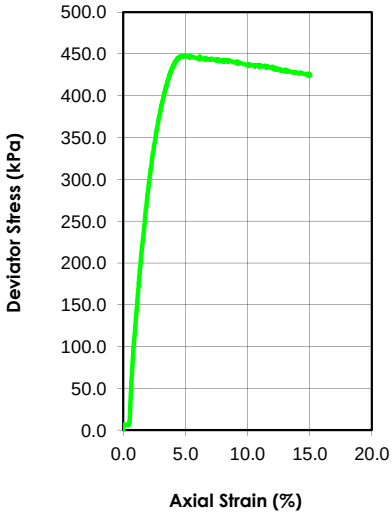
Date: 5-May-16

Tested By: C.Tollifson

### Effective Stress at Maximum Deviator Stress Criterion




### Deviator Stress Vs. Axial Strain




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 23.9 | | | |
| Dry Density (g/cm3) | 1.654 | | | |
| Saturation (%) | 102.07 | | | |
| Void Ratio | 0.629 | | | |
| Diameter (mm) | 72.8 | | | |
| Height (mm) | 145.7 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 21.9 | | | |
| Dry Density (g/cm3) | 1.67 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.619 | | | |
| Effective Stress (kPa) | 292.1 | | | |
| Back Press. (kPa) | 137.9 | | | |
| Rate of Strain | 0.017 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 763.01 | | | |
| σ'3 at Failure (kPa) | 314.94 | | | |
| | | | | |
| | | | | |

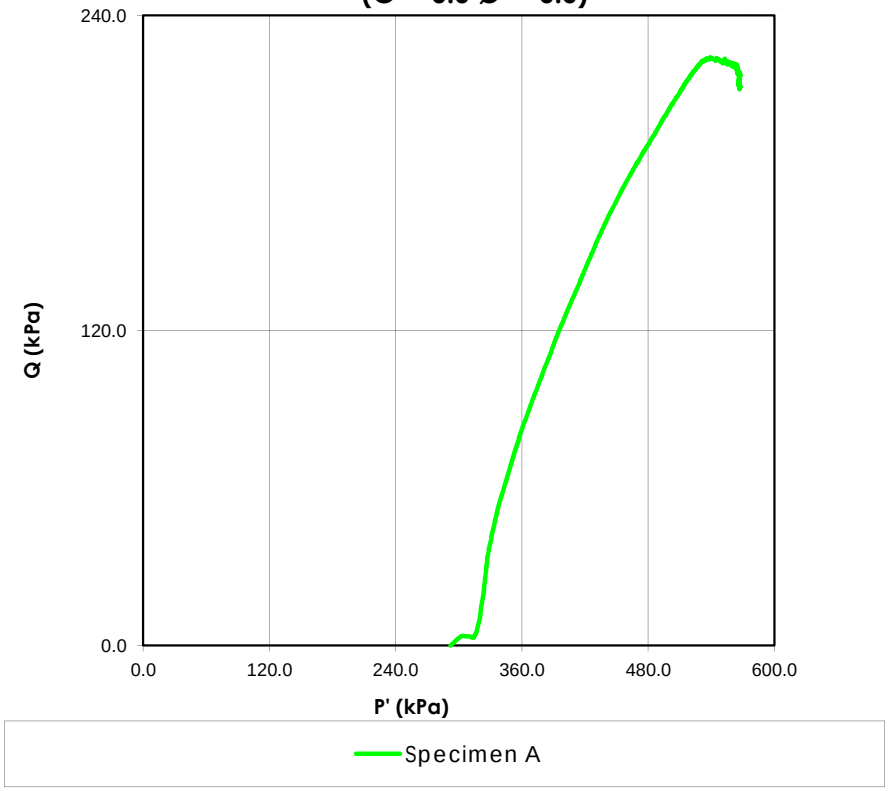
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D19-ST12 |
| **Depth:** | 6.1-6.6m |
| **Sample Type:** | Undisturbed |
| **Description:** | Dark Brown Clay, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

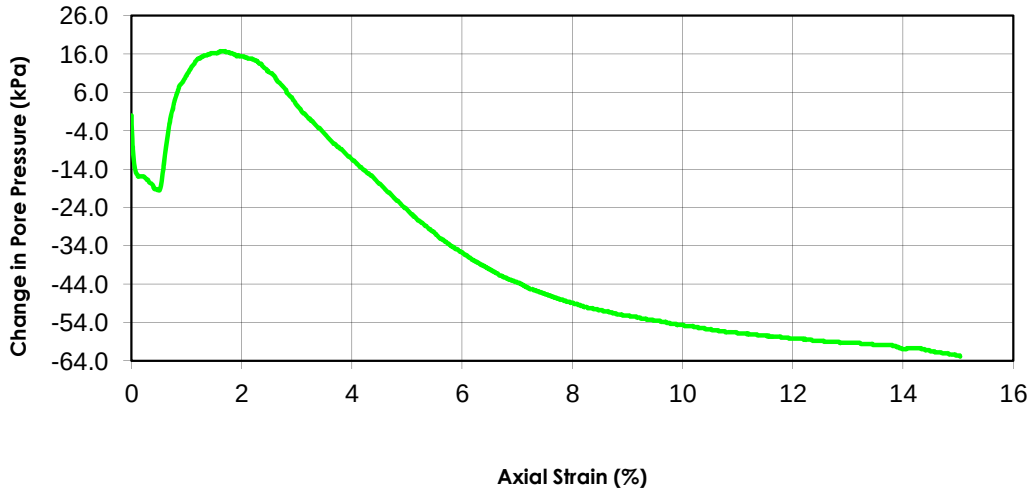
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

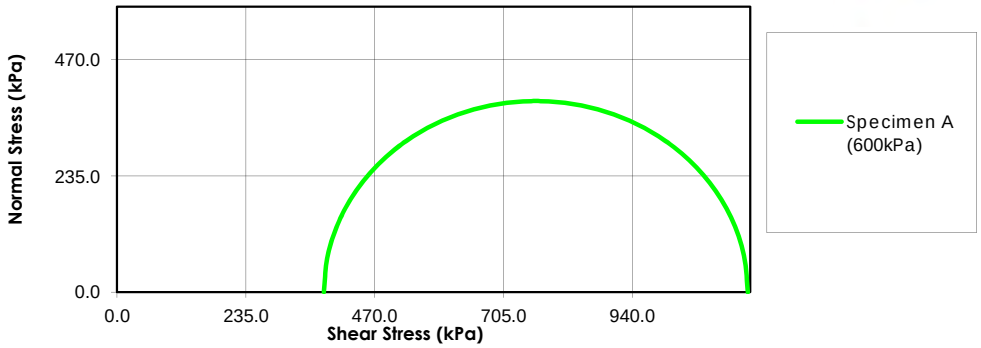
Stantec

Reviewed By C.Lamoureux

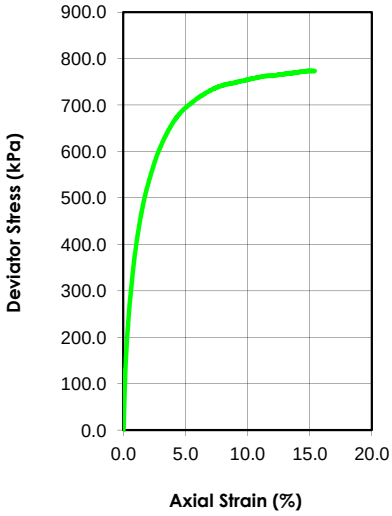
Date: 28-Apr-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.6 | | | |
| Dry Density (g/cm3) | 1.942 | | | |
| Saturation (%) | 100.92 | | | |
| Void Ratio | 0.388 | | | |
| Diameter (mm) | 72.7 | | | |
| Height (mm) | 154.0 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 12.1 | | | |
| Dry Density (g/cm3) | 2.051 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.316 | | | |
| Effective Stress (kPa) | 589.7 | | | |
| Back Press. (kPa) | 90.3 | | | |
| Rate of Strain | 0.016 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 1150.78 | | | |
| σ'3 at Failure (kPa) | 377.36 | | | |
| | | | | |
| | | | | |

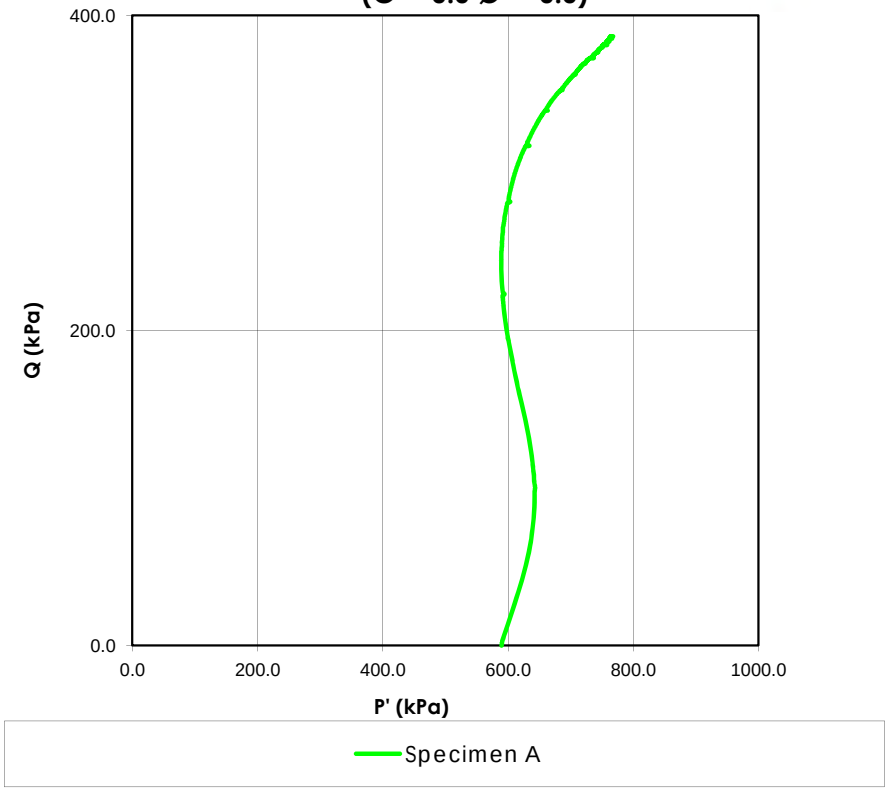
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D19-ST21 |
| **Depth:** | 9.9-10.3m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown/Grey Clay Some Sand and Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

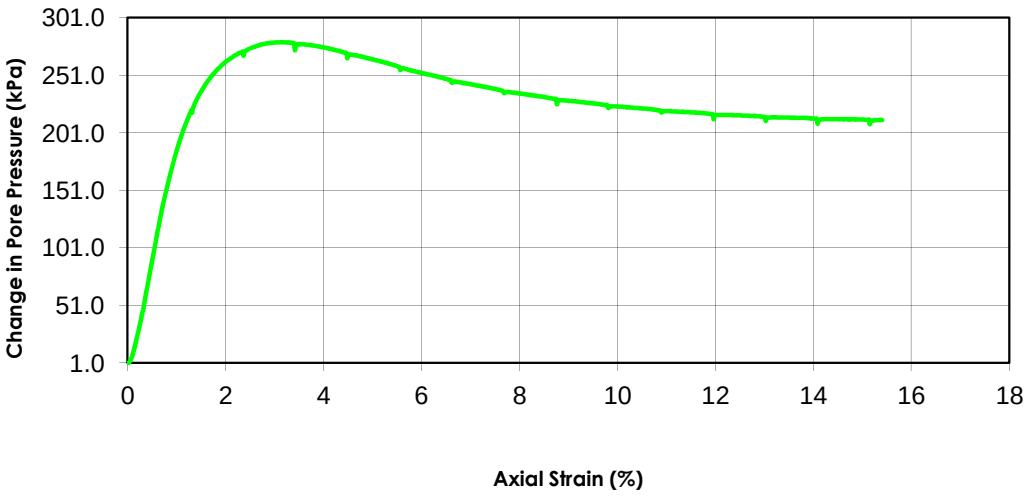
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



# Stantec Consulting Ltd.

## Consolidated Undrained Triaxial Test (ASTM D4767)

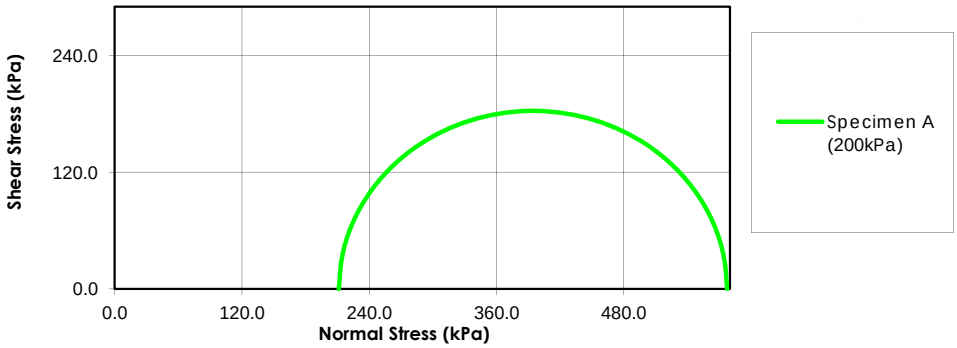
Stantec

Reviewed By C.Lamoureux

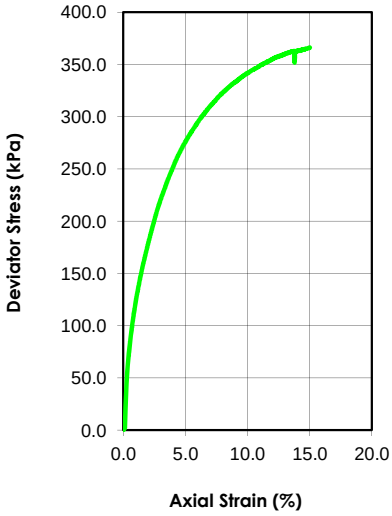
Date: 5-May-16

Tested By: C.Tollifson

### Effective Stress at Maximum Deviator Stress Criterion




### Deviator Stress Vs. Axial Strain




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.3 | | | |
| Dry Density (g/cm3) | 1.964 | | | |
| Saturation (%) | 102.88 | | | |
| Void Ratio | 0.372 | | | |
| Diameter (mm) | 72.2 | | | |
| Height (mm) | 151.0 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 12.0 | | | |
| Dry Density (g/cm3) | 1.99 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.359 | | | |
| Effective Stress (kPa) | 193.2 | | | |
| Back Press. (kPa) | 236.8 | | | |
| Rate of Strain | 0.017 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

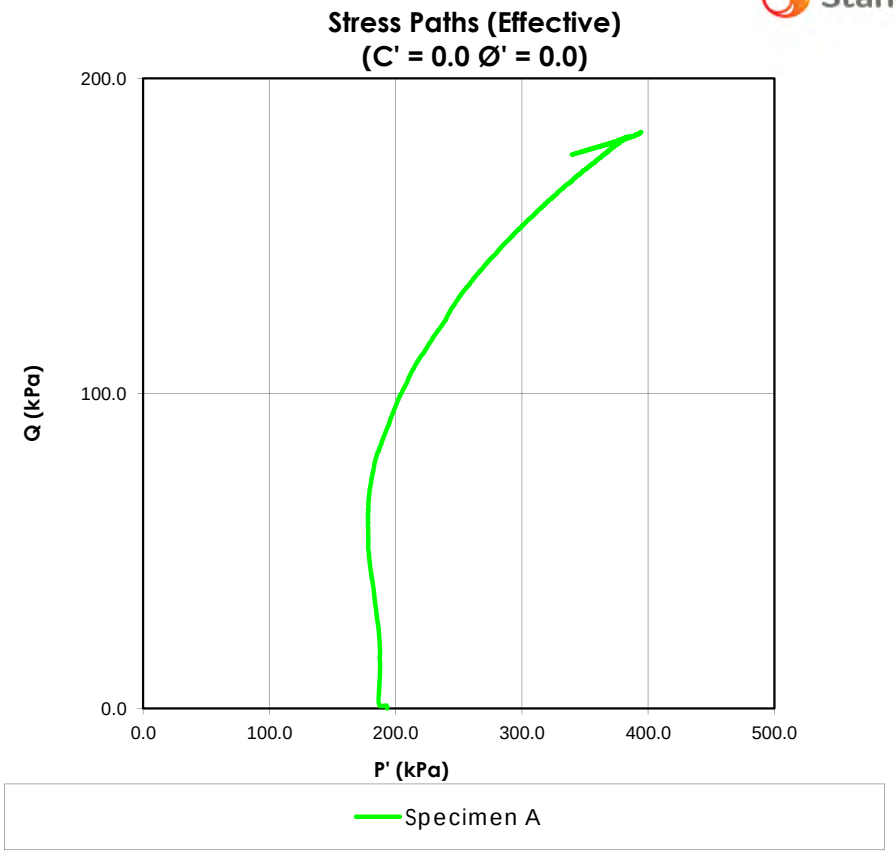
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 577.31 | | | |
| σ'3 at Failure (kPa) | 211.29 | | | |
| | | | | |
| | | | | |

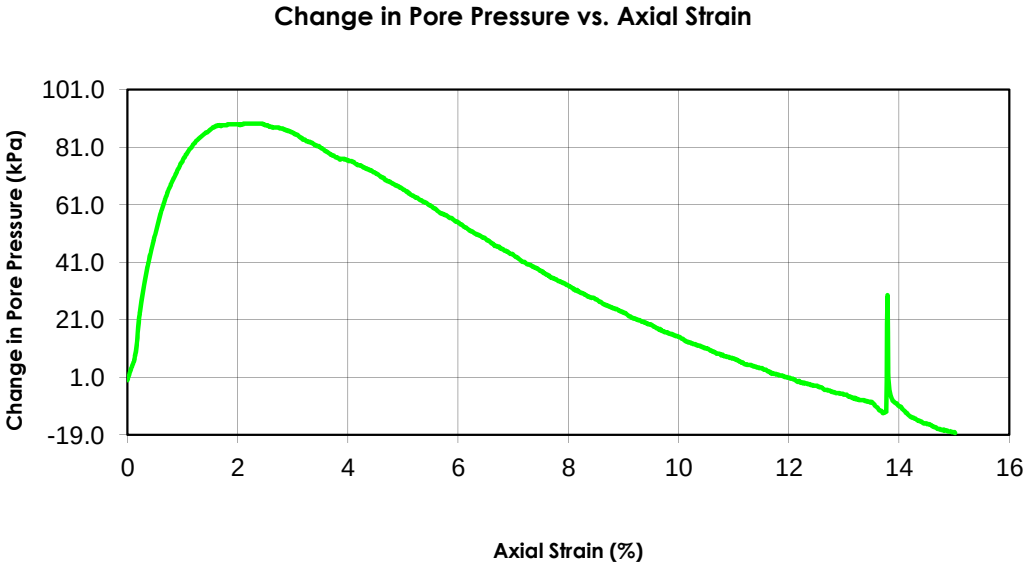
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D19-ST28 |
| **Depth:** | 12.2-12.7m |
| **Sample Type:** | Undisturbed |
| **Description:** | Grey Gravelly Clay, Some Sand |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

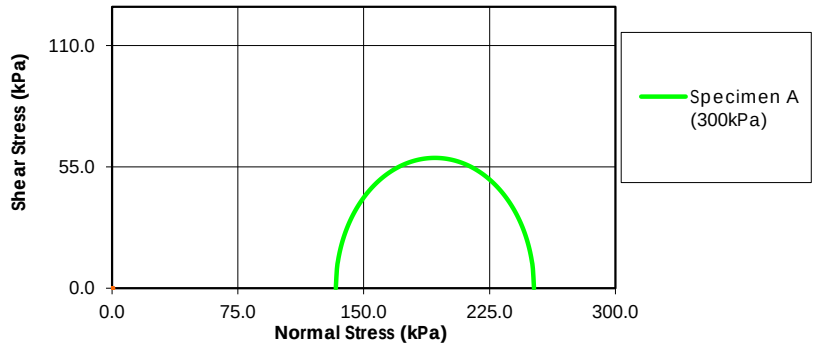
Stantec

Reviewed By: C. Lamoureux

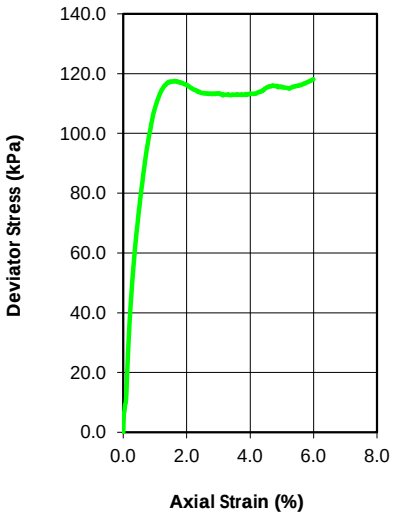
Date: 13-May-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 40.0 | | | |
| Dry Density (g/cm3) | 1.321 | | | |
| Saturation (%) | 102.74 | | | |
| Void Ratio | 1.055 | | | |
| Diameter (mm) | 72.8 | | | |
| Height (mm) | 150.4 | | | |
| Specific Gravity | 2.72 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 37.6 | | | |
| Dry Density (g/cm3) | 1.327 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 1.049 | | | |
| Effective Stress (kPa) | 245.9 | | | |
| Back Press. (kPa) | 404.1 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

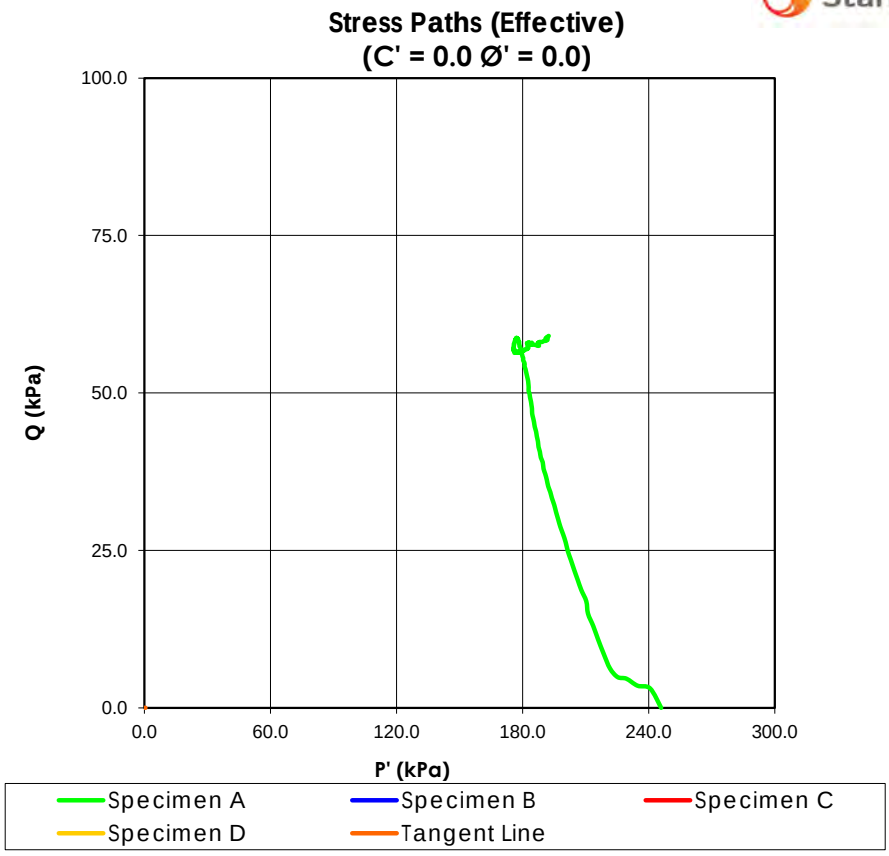
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 251.47 | | | |
| σ'3 at Failure (kPa) | 133.37 | | | |
| | | | | |
| | | | | |

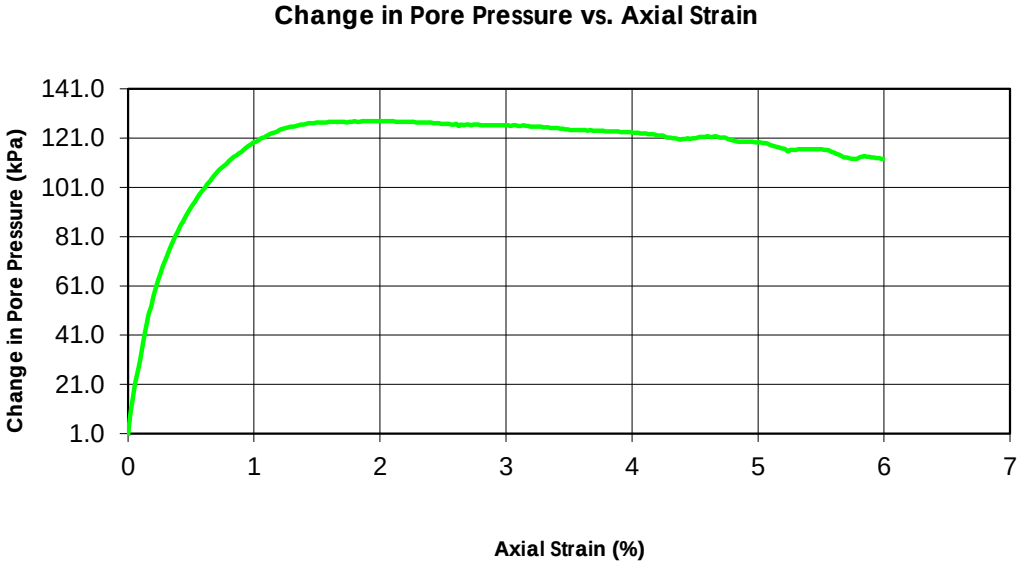
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D20-ST8 Top |
| **Depth:** | 3.6-4.1m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

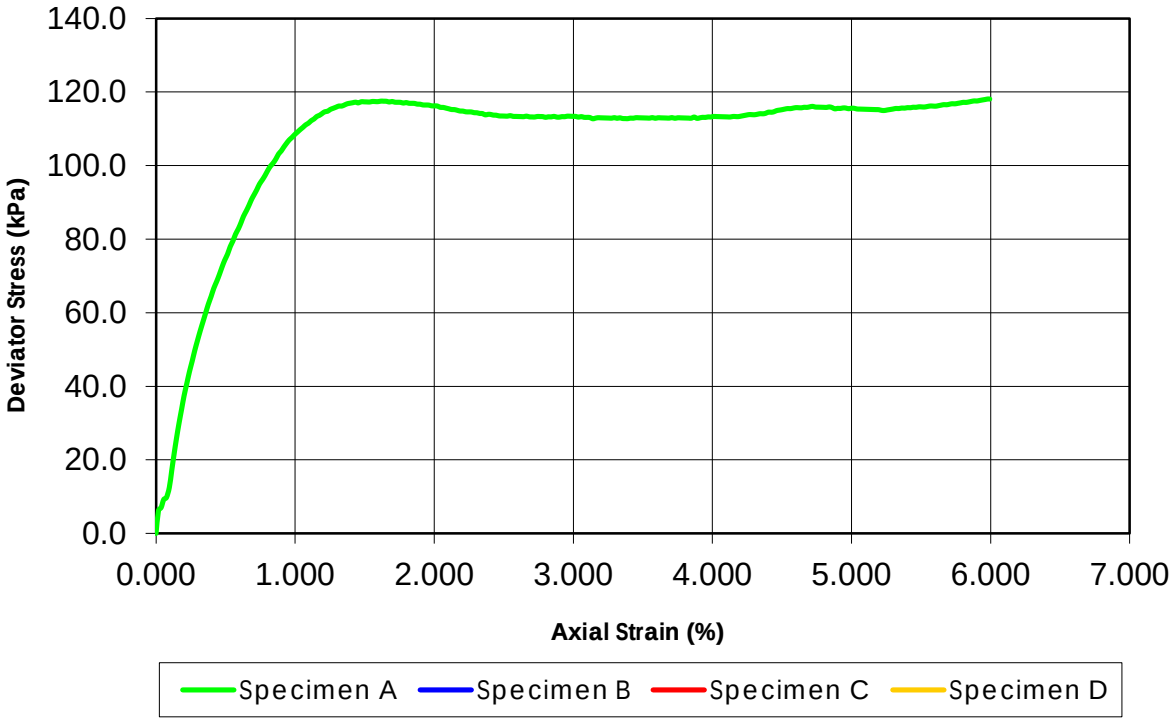
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

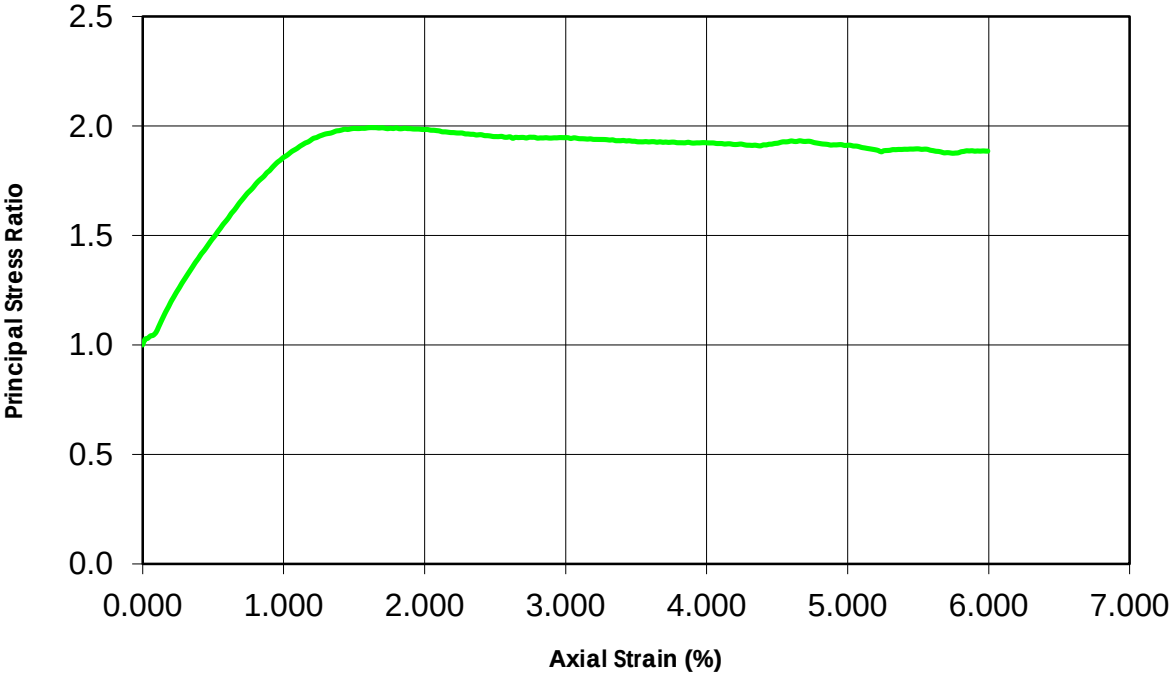


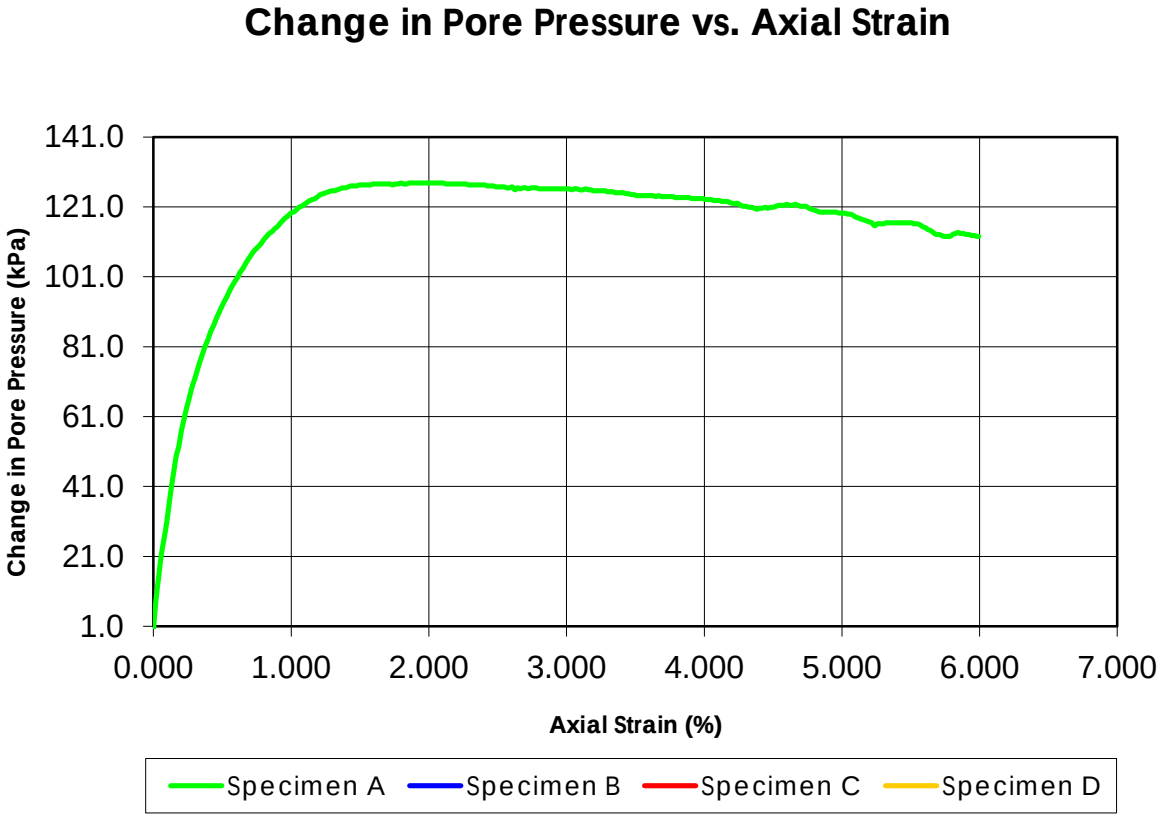



## Deviator Stress vs. Axial Strain



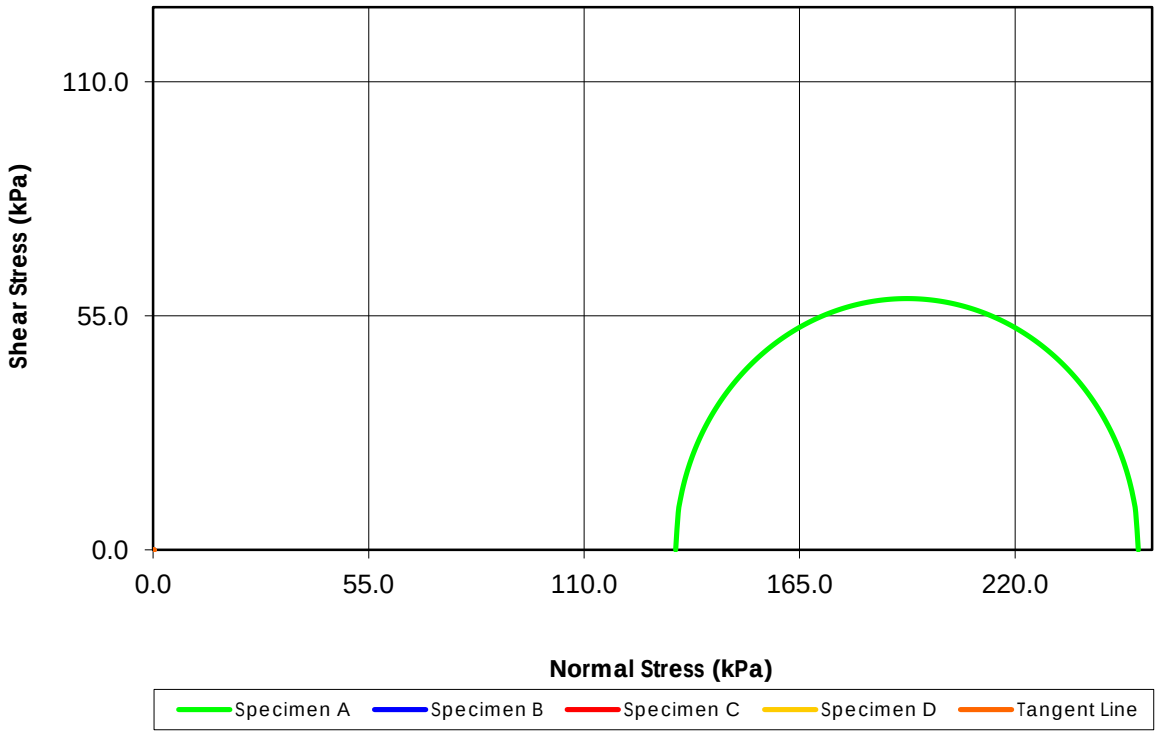

## Principal Stress Ratio vs. Axial Strain



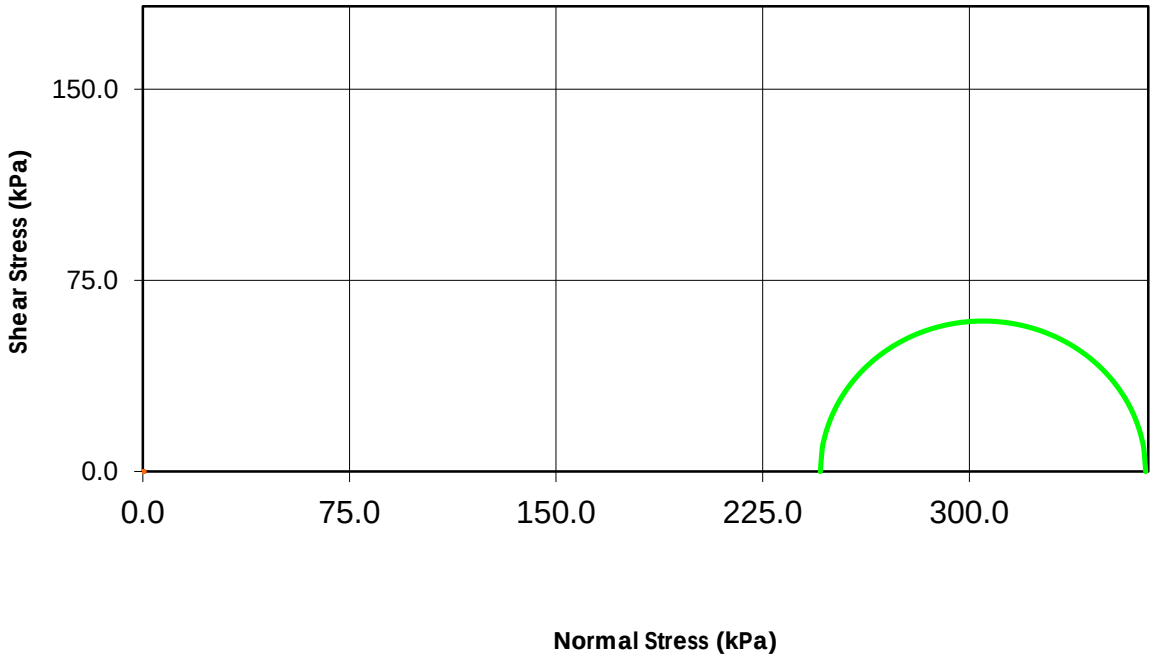

Change in Pore Pressure vs. Axial Strain
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
Change in Pore Pressure (kPa)
0.000
1.000
2.000
3.000
4.000
5.000
6.000
7.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

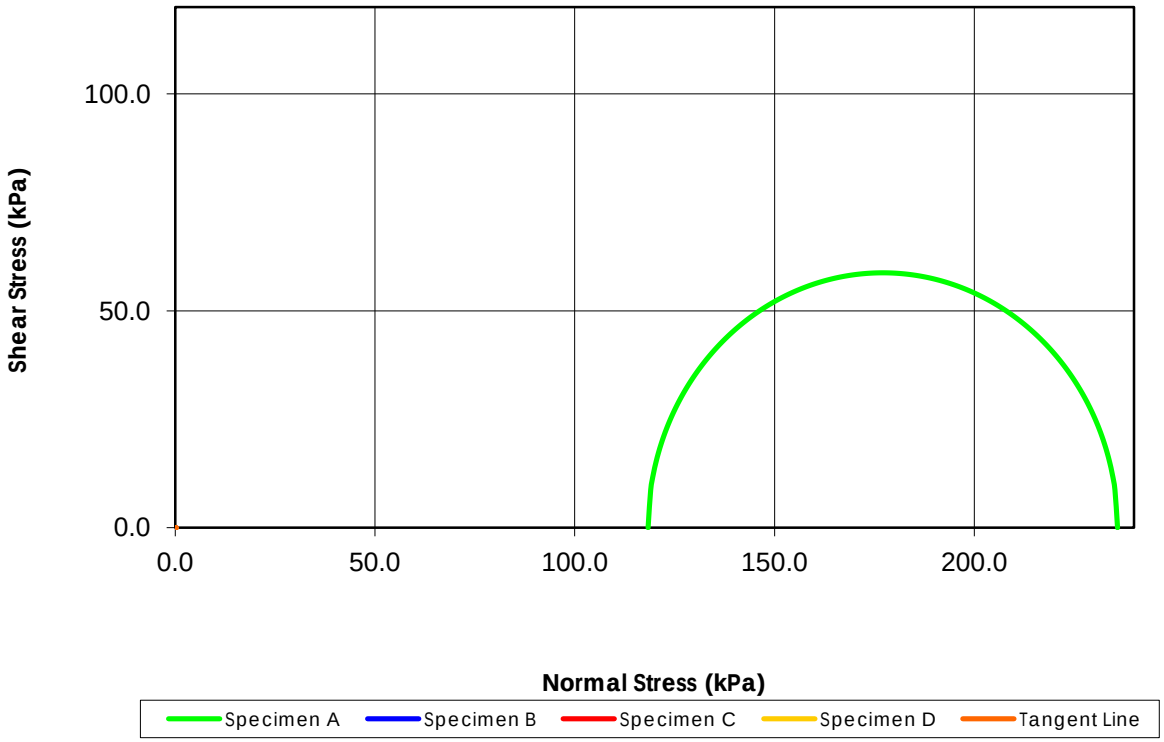



### Total Stress
### (C = 0.0 Ø = 0.0)

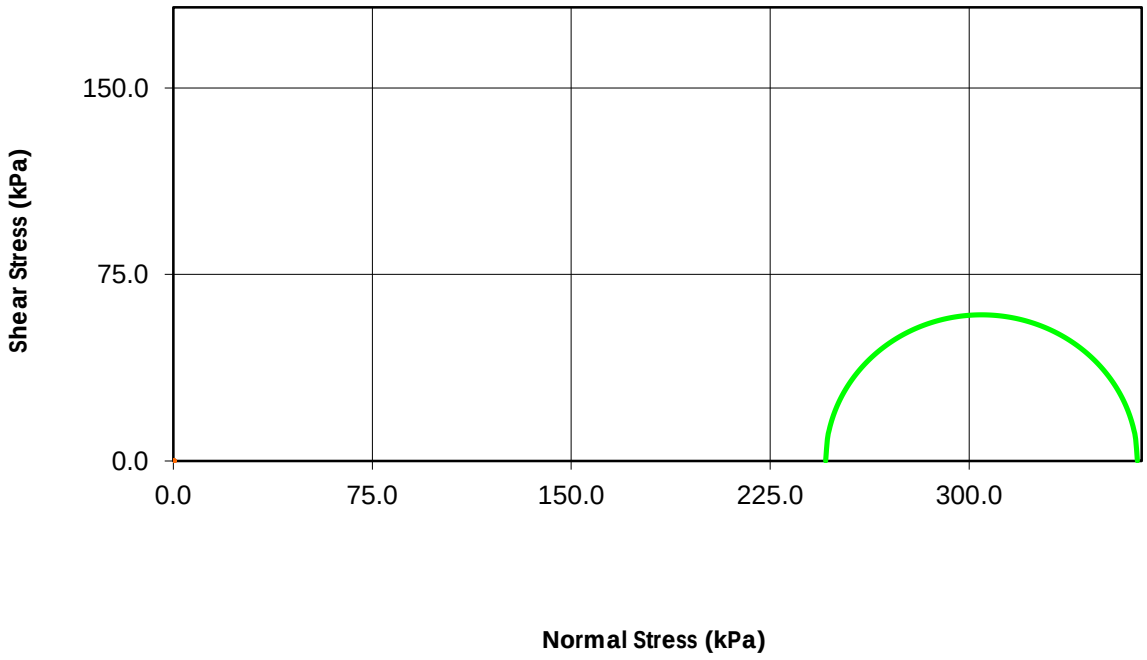


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

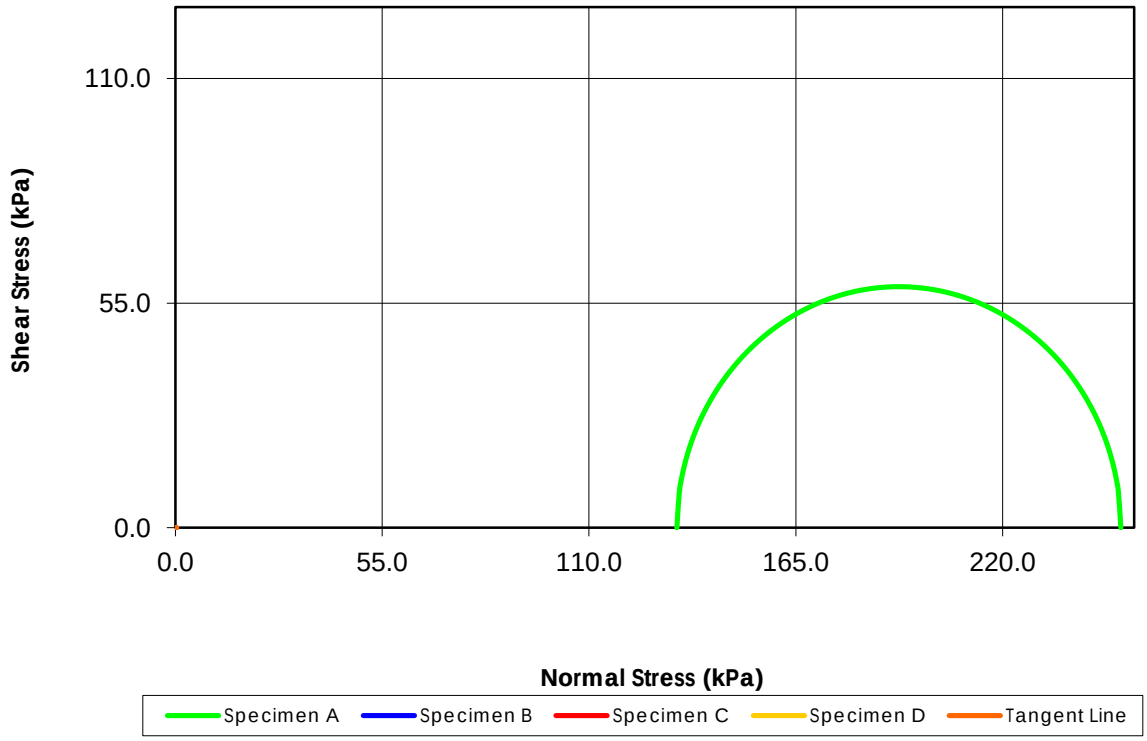



## Total Stress
## (C = 0.0 Ø = 0.0)

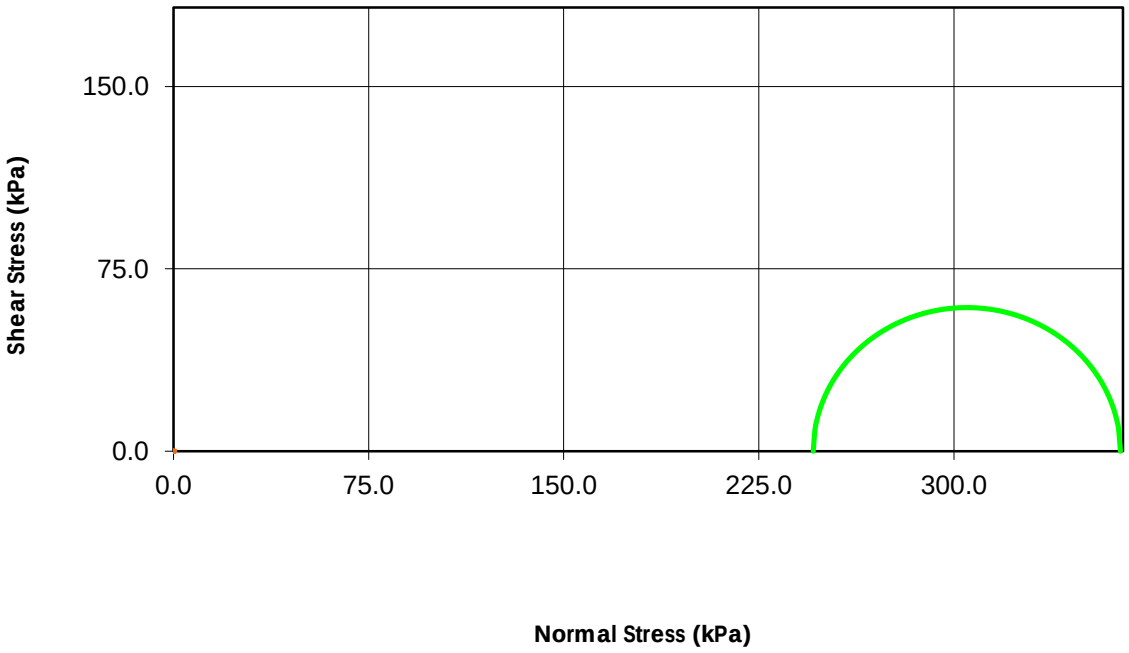


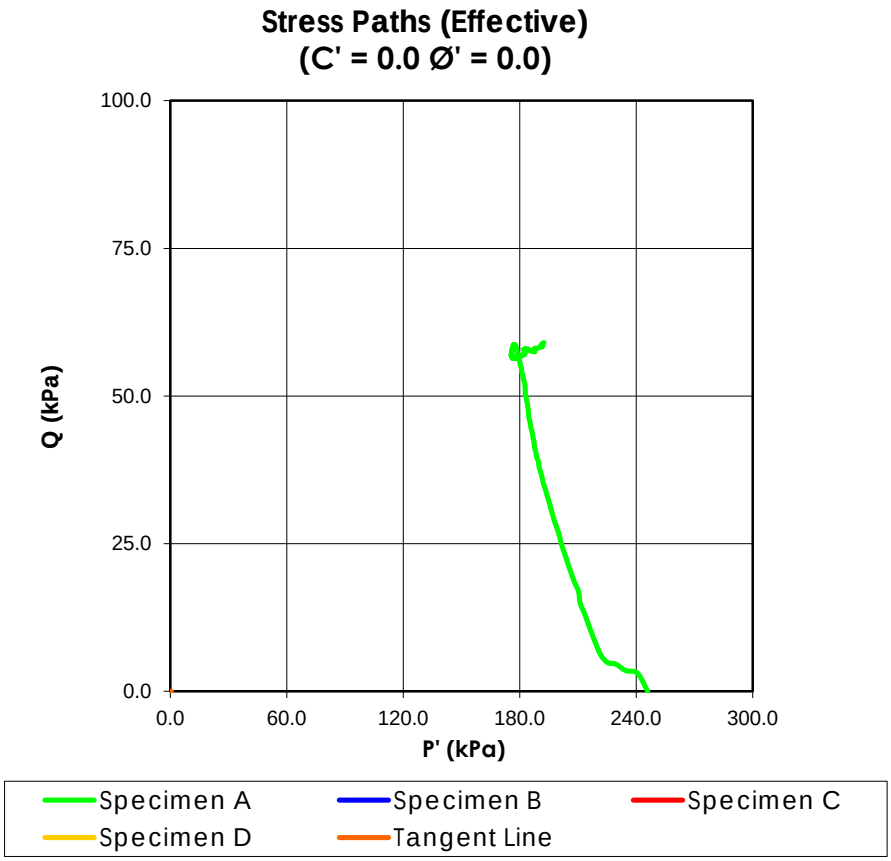
# Mohr Stress Circles at 15% Axial Strain Criterion

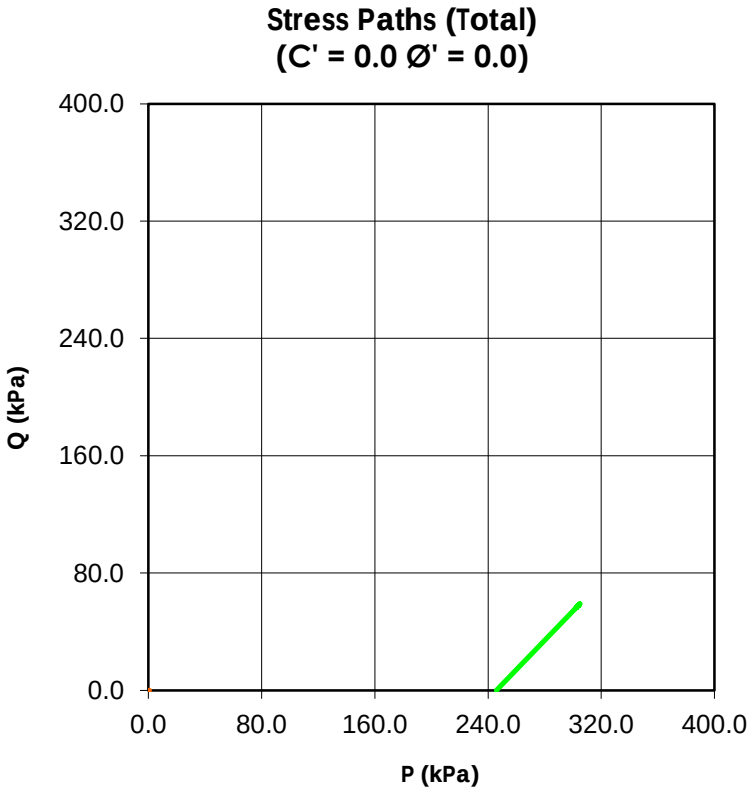
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

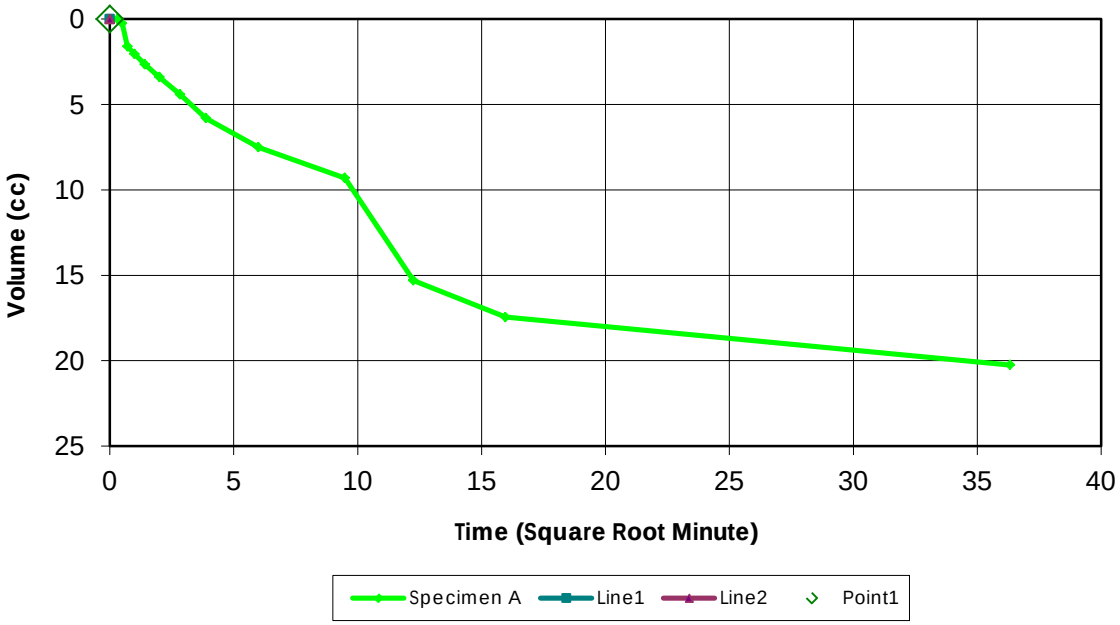



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
100.0
75.0
50.0
25.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

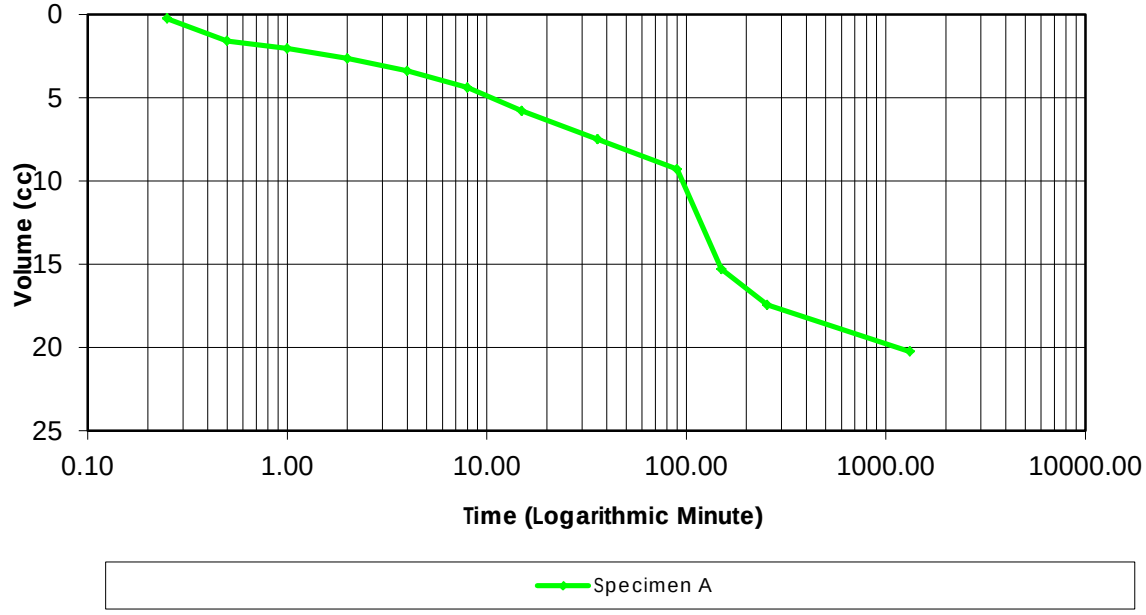

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 70.0 | 50.0 | N/A | N/A | N/A |
| 1 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 2 | 120.0 | 50.0 | 50.0 | 0.0 | 0.33 |
| 3 | 120.0 | 100.0 | 0.0 | 50.0 | |
| 4 | 120.0 | 100.0 | 0.0 | 0.0 | |
| 5 | 170.0 | 100.0 | 50.0 | 0.0 | 0.54 |
| 6 | 170.0 | 150.0 | 0.0 | 50.0 | |
| 7 | 170.0 | 150.0 | 0.0 | 0.0 | |
| 8 | 220.0 | 150.0 | 50.0 | 0.0 | 0.67 |
| 9 | 220.0 | 200.0 | 0.0 | 50.0 | |
| 10 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 11 | 270.0 | 200.0 | 50.0 | 0.0 | 0.79 |
| 12 | 270.0 | 250.0 | 0.0 | 50.0 | |
| 13 | 270.0 | 250.0 | 0.0 | 0.0 | |
| 14 | 320.0 | 250.0 | 50.0 | 0.0 | 0.84 |
| 15 | 320.0 | 300.0 | 0.0 | 50.0 | |
| 16 | 320.0 | 300.0 | 0.0 | 0.0 | |
| 17 | 370.0 | 300.0 | 50.0 | 0.0 | 0.96 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.6-4.1m

| | |
|---|---|
| Cell Pressure (kPa) | 650 |
| Back Pressure (kPa) | 350 |
| Effective Pressure (kPa) | 300 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.8 |
| Initial Sample Height (mm) | 150.4 |
| Initial Sample Area (cm2) | 41.63 |
| Initial Volume (cm3) | 626 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:06 | 35.05 | N/A |
| 00:00:15 | 34.80 | 0.250 |
| 00:00:30 | 33.45 | 1.600 |
| 00:01:00 | 33.00 | 2.050 |
| 00:02:00 | 32.40 | 2.650 |
| 00:04:00 | 31.65 | 3.400 |
| 00:08:00 | 30.65 | 4.400 |
| 00:15:00 | 29.25 | 5.800 |
| 00:36:00 | 27.55 | 7.500 |
| 01:30:00 | 25.75 | 9.300 |
| 02:30:00 | 19.75 | 15.300 |
| 04:15:00 | 17.60 | 17.450 |
| 22:00:00 | 14.80 | 20.250 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

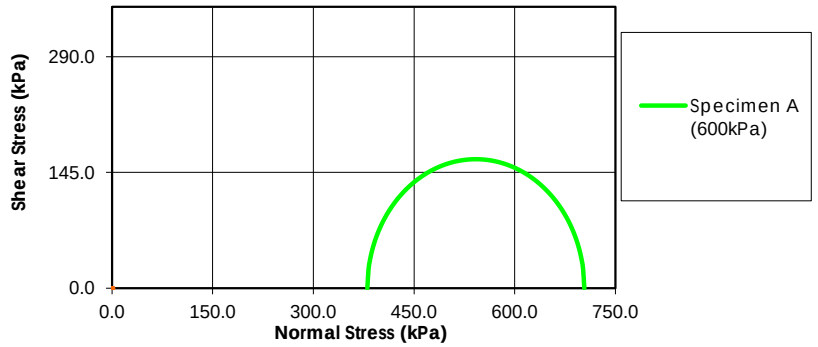
Stantec

Reviewed By: C. Lamoureux

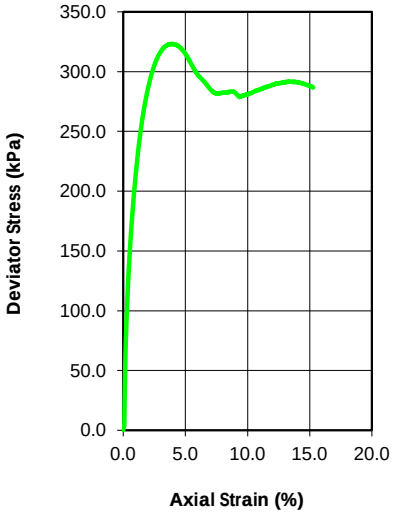
Date: 13-May-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 34.1 | | | |
| Dry Density (g/cm3) | 1.431 | | | |
| Saturation (%) | 101.84 | | | |
| Void Ratio | 0.917 | | | |
| Diameter (mm) | 72.4 | | | |
| Height (mm) | 152.0 | | | |
| Specific Gravity | 2.75 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.99 | | | |
| Water Content (%) | 30.5 | | | |
| Dry Density (g/cm3) | 1.471 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.870 | | | |
| Effective Stress (kPa) | 592.5 | | | |
| Back Press. (kPa) | 87.5 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

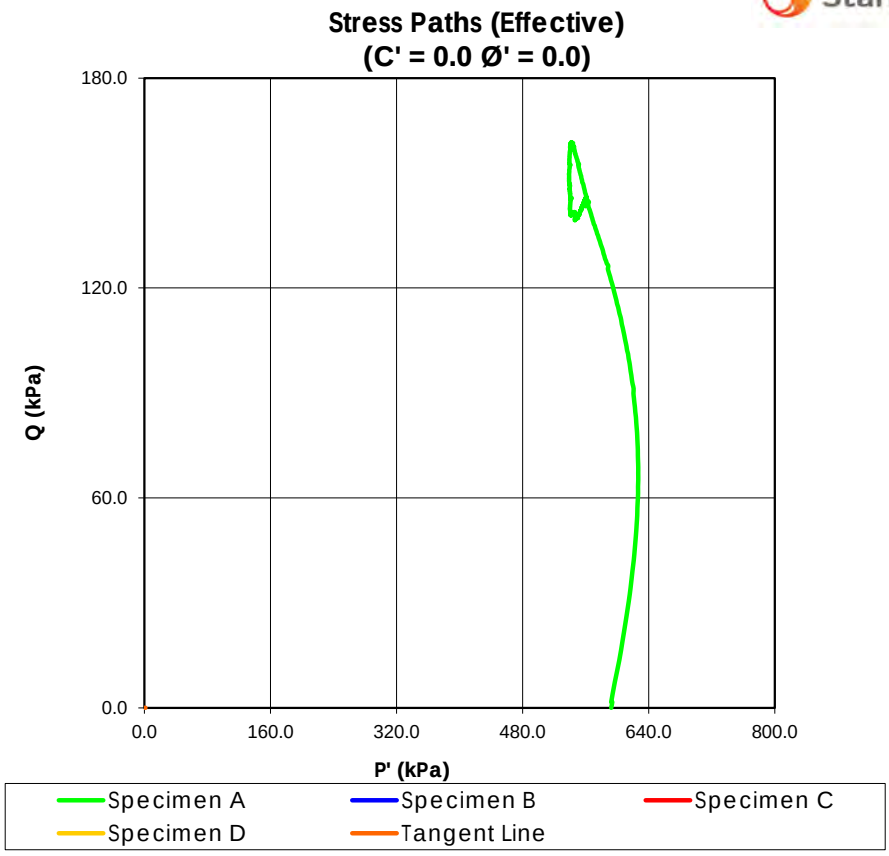
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 703.63 | | | |
| σ'3 at Failure (kPa) | 380.41 | | | |
| | | | | |
| | | | | |

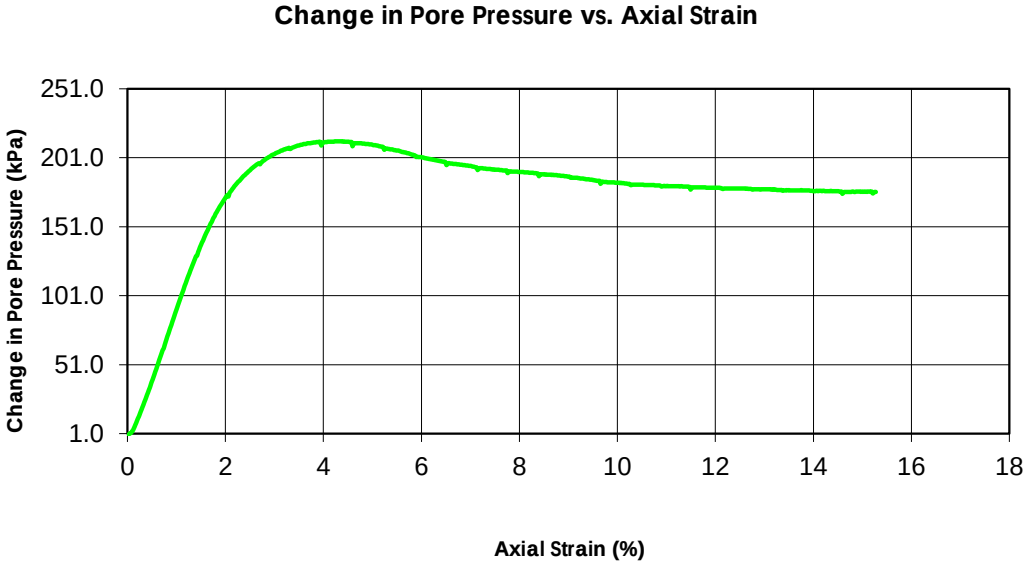
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D20-ST8 Bottom |
| **Depth:** | 3.6-4.1m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

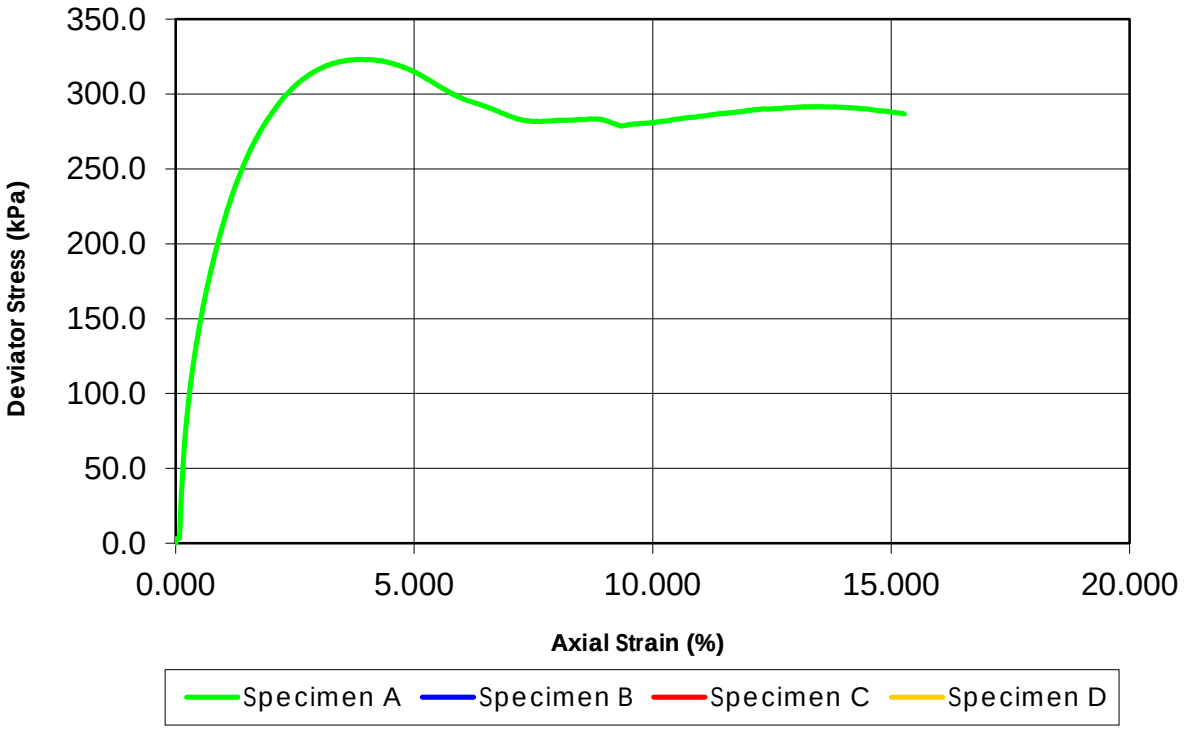
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

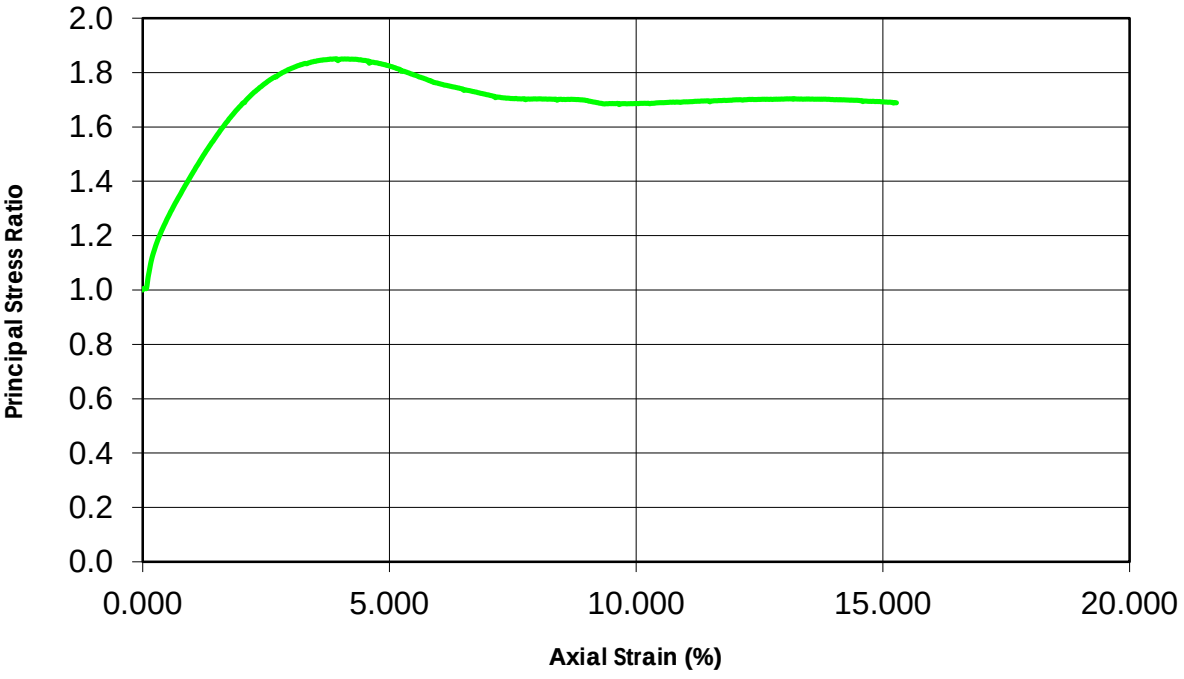


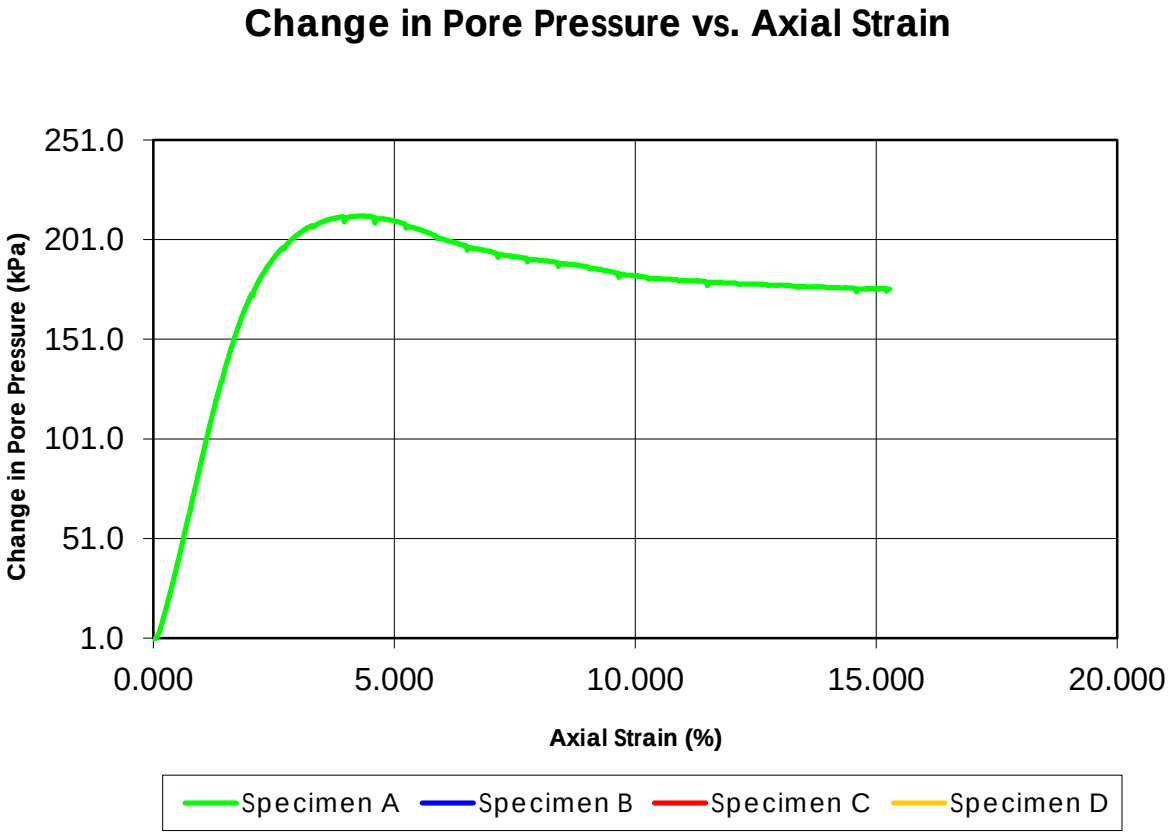



## Deviator Stress vs. Axial Strain



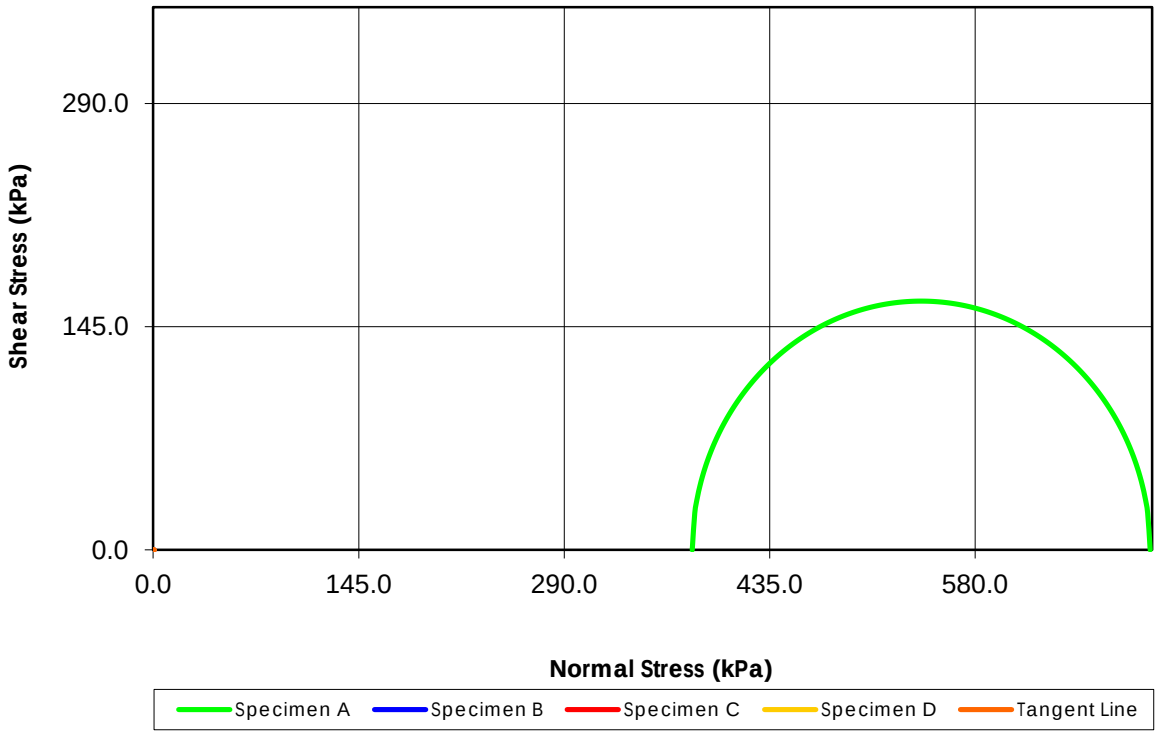

## Principal Stress Ratio vs. Axial Strain



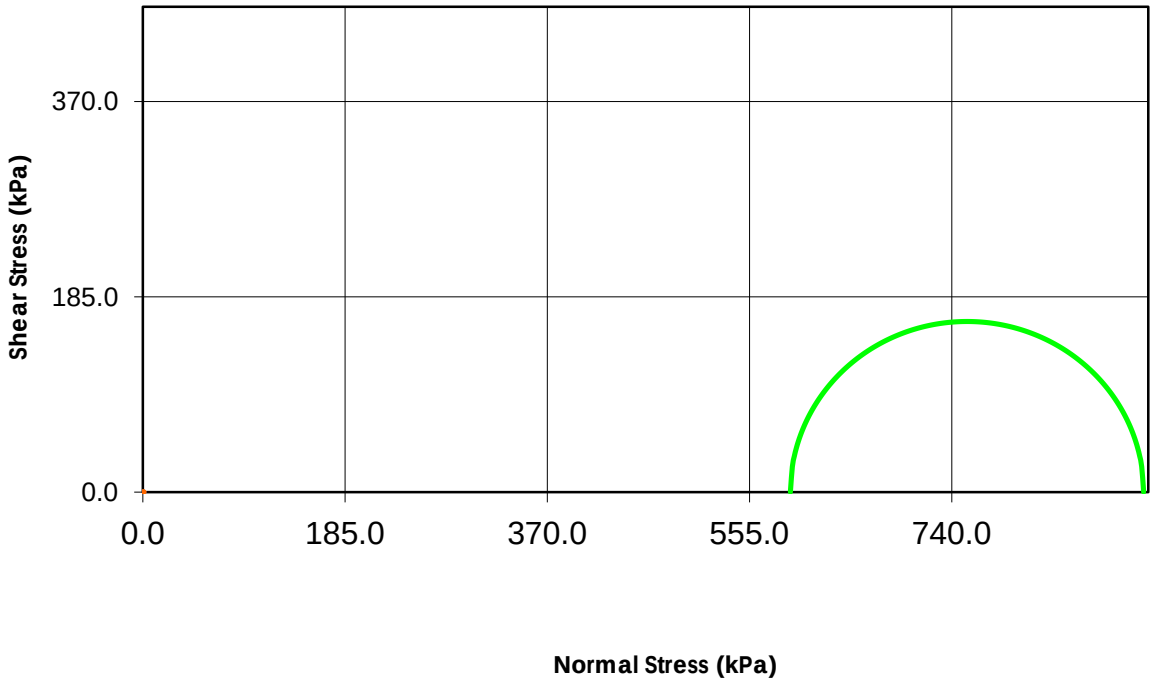

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

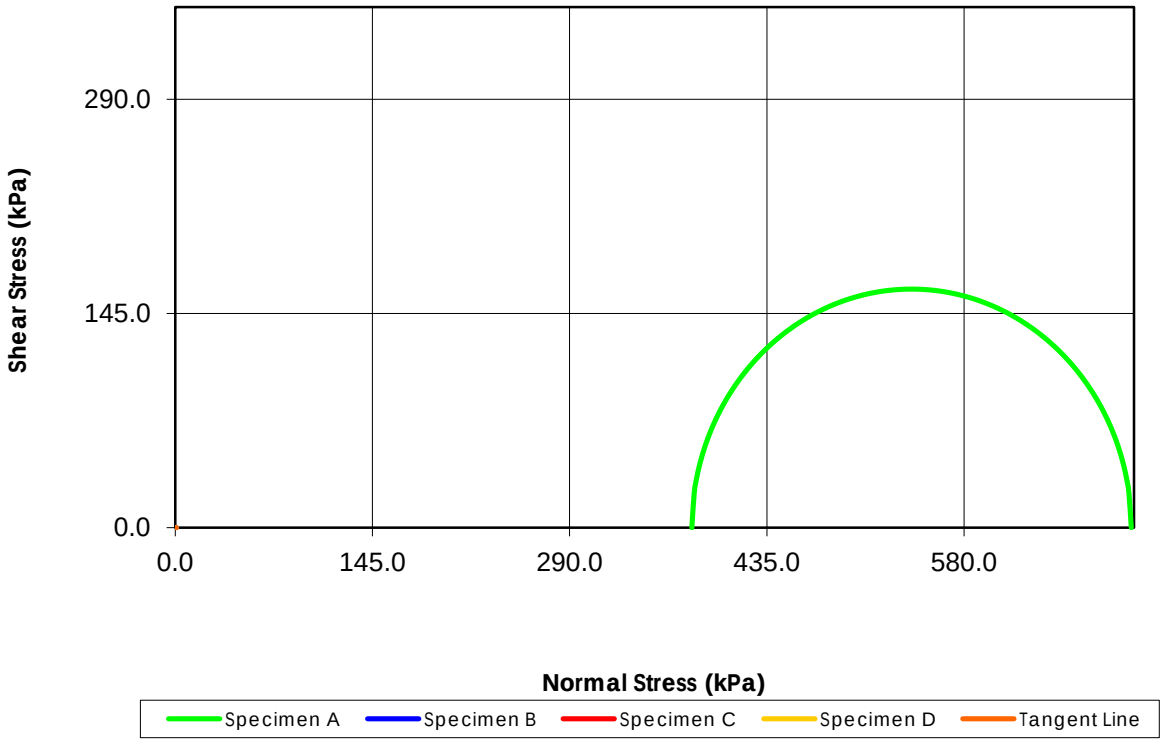



### Total Stress
### (C = 0.0 Ø = 0.0)

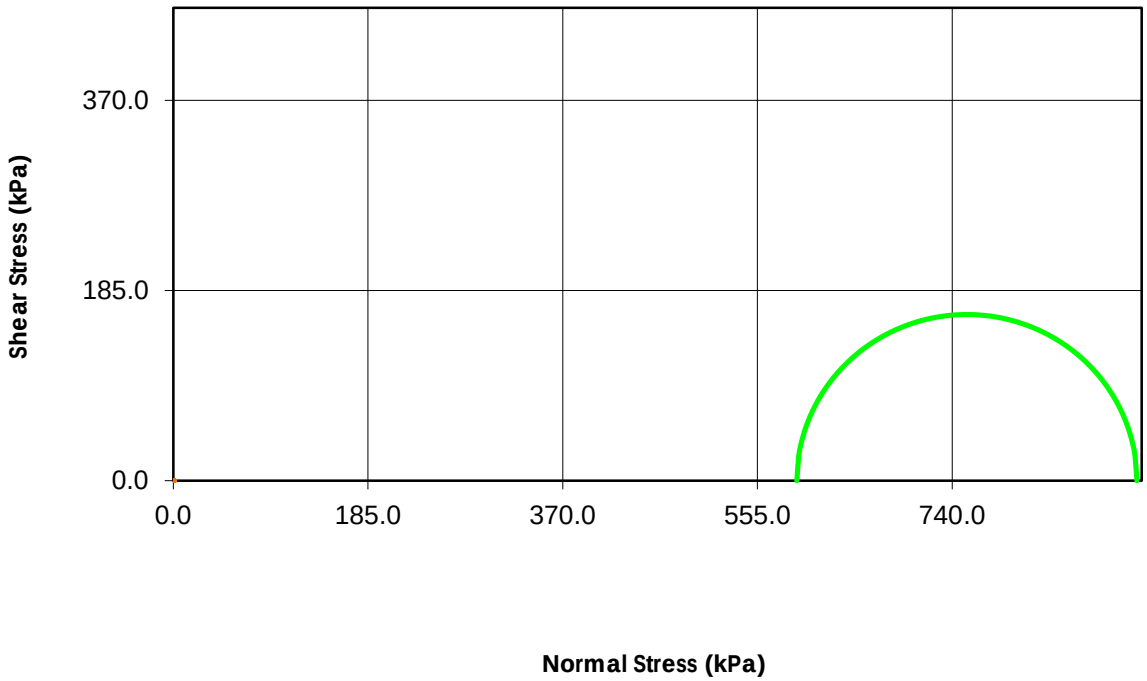


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

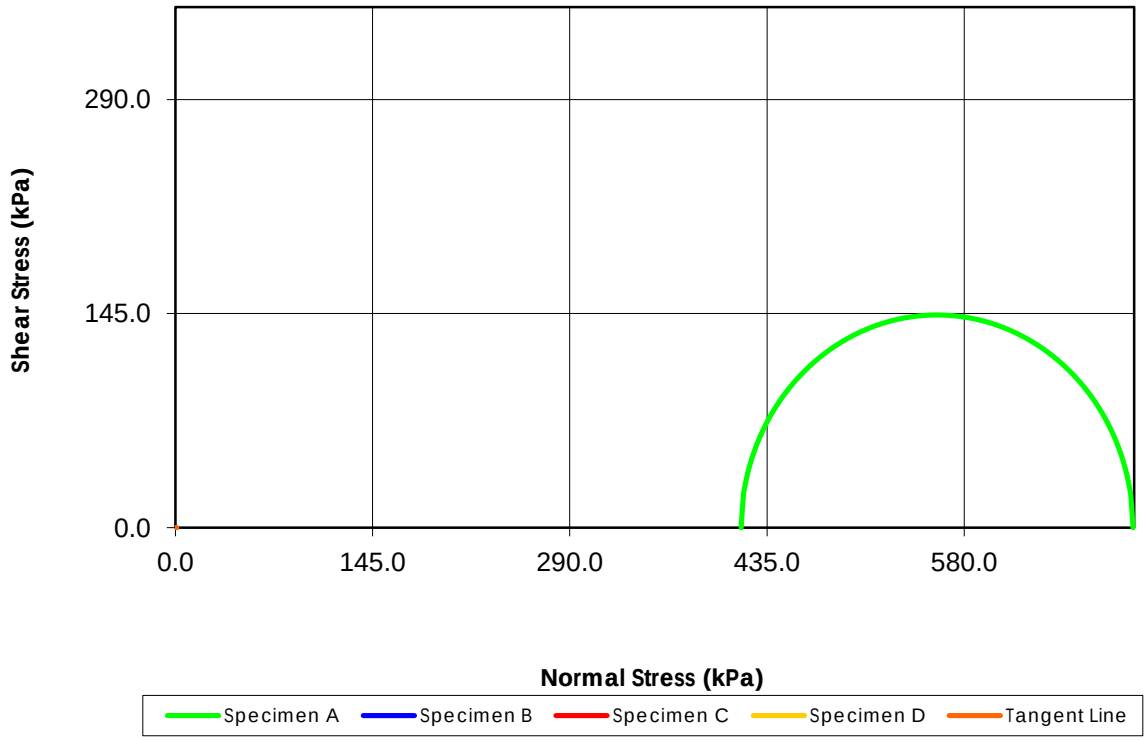



## Total Stress
## (C = 0.0 Ø = 0.0)

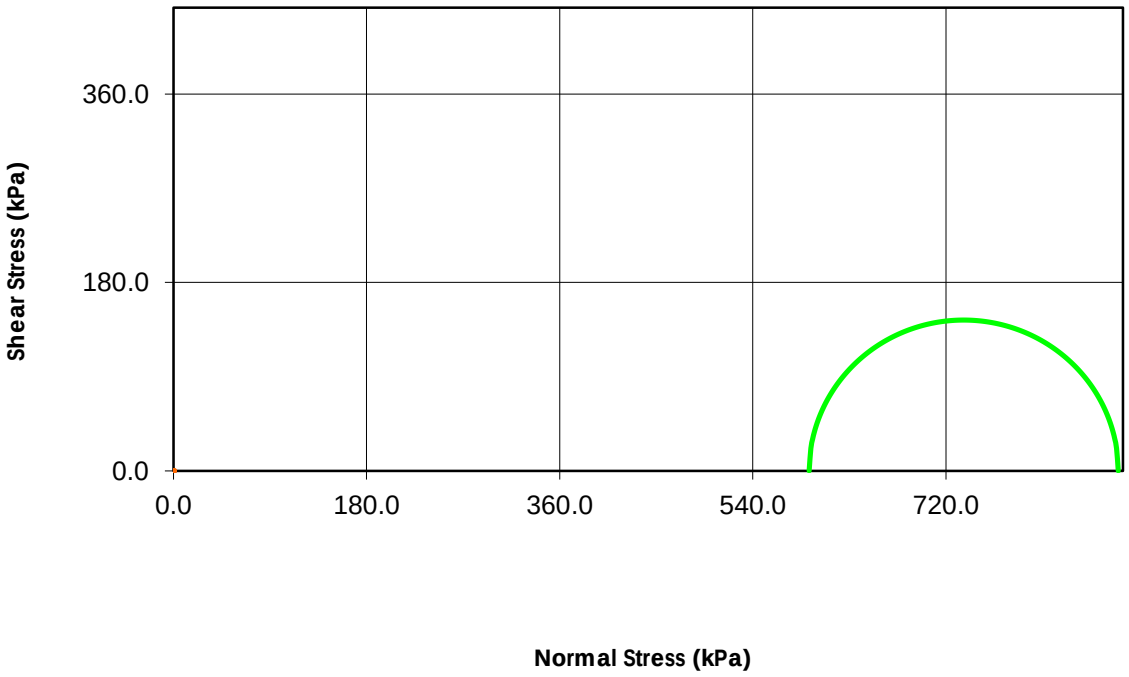


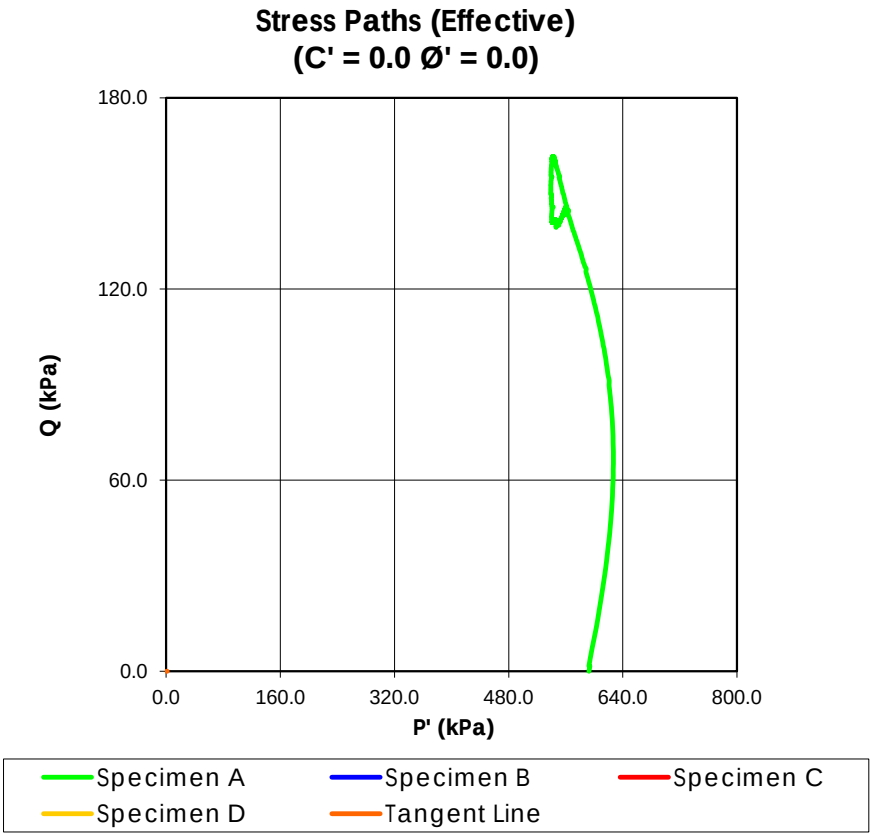
# Mohr Stress Circles at 15% Axial Strain Criterion

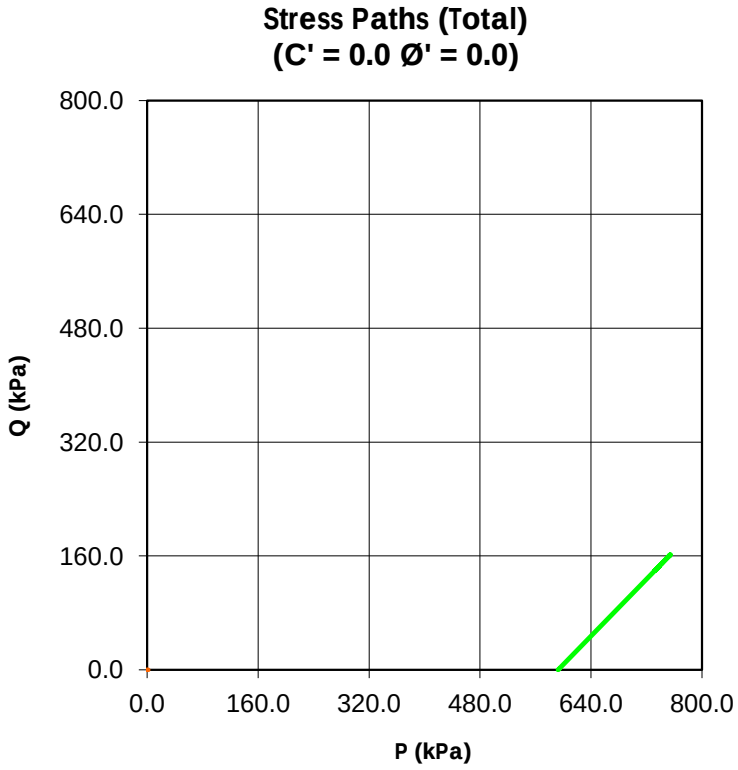
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

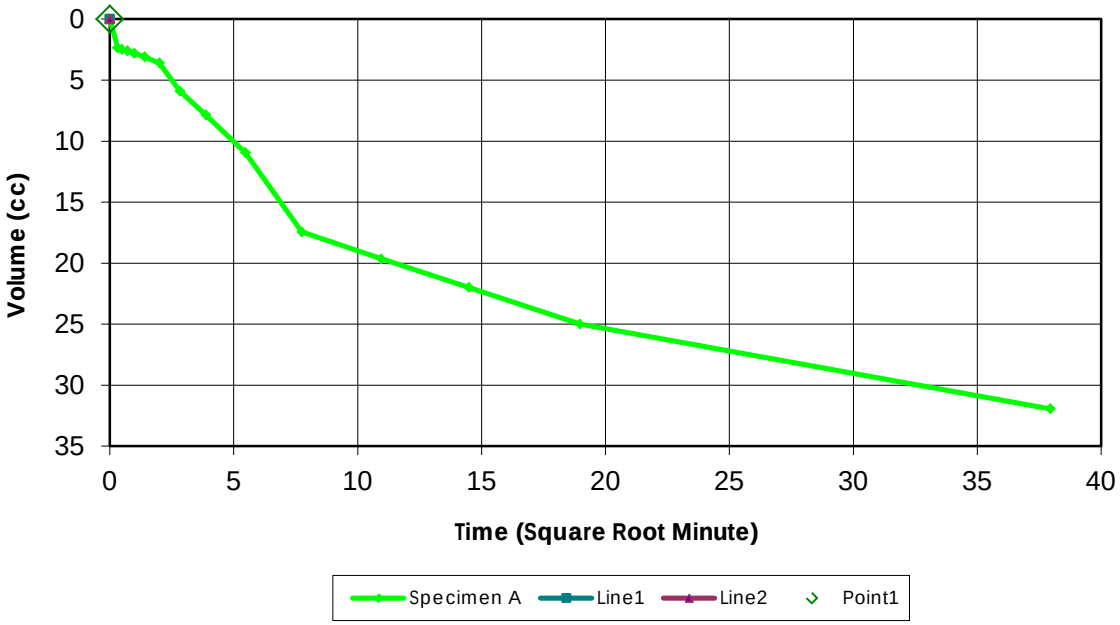



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
180.0
120.0
60.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

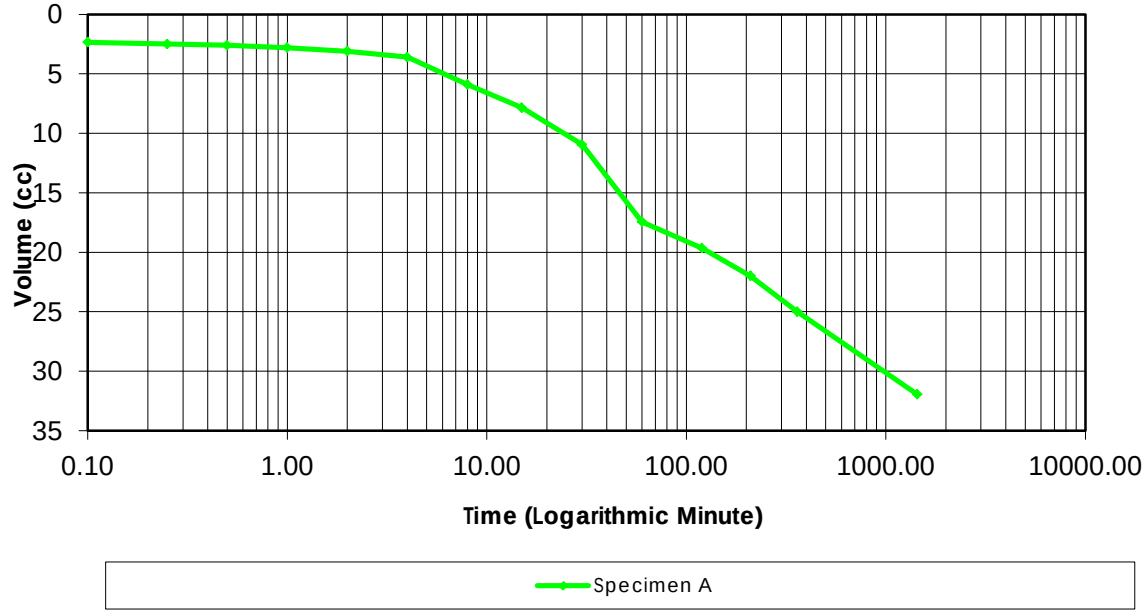

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.99

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 70.0 | 50.0 | N/A | N/A | N/A |
| 1 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 50.0 | 10.0 | 0.0 | 0.82 |
| 3 | 80.0 | 60.0 | 0.0 | 10.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 90.0 | 60.0 | 10.0 | 0.0 | 0.98 |
| 6 | 90.0 | 70.0 | 0.0 | 10.0 | |
| 7 | 90.0 | 70.0 | 0.0 | 0.0 | |
| 8 | 100.0 | 70.0 | 10.0 | 0.0 | 0.99 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.6-4.1m

| | |
|---|---|
| Cell Pressure (kPa) | 680 |
| Back Pressure (kPa) | 80 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 152 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 625.8 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 30.95 | N/A |
| 00:00:06 | 28.60 | 2.350 |
| 00:00:15 | 28.45 | 2.500 |
| 00:00:30 | 28.35 | 2.600 |
| 00:01:00 | 28.15 | 2.800 |
| 00:02:00 | 27.85 | 3.100 |
| 00:04:00 | 27.35 | 3.600 |
| 00:08:00 | 25.05 | 5.900 |
| 00:15:00 | 23.10 | 7.850 |
| 00:30:00 | 20.00 | 10.950 |
| 01:00:00 | 13.50 | 17.450 |
| 02:00:00 | 11.30 | 19.650 |
| 03:30:00 | 8.95 | 22.000 |
| 06:00:00 | 5.95 | 25.000 |
| 24:00:00 | -1.00 | 31.950 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

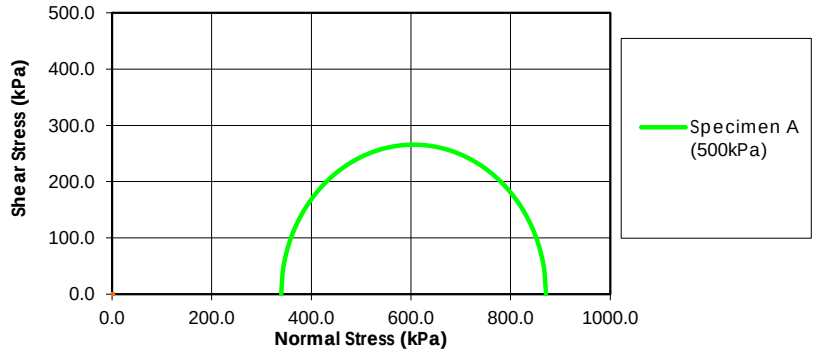
Stantec

Reviewed By C. Lamoureux

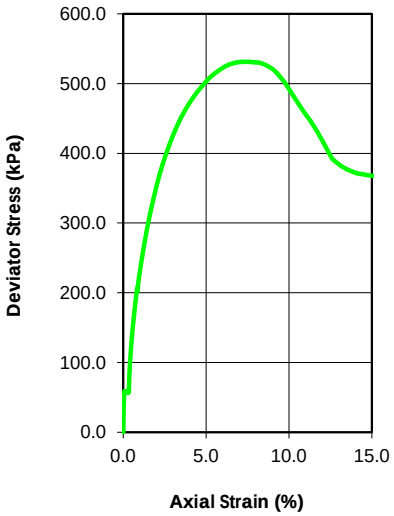
Date: 6-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 24.8 | | | |
| Dry Density (g/cm3) | 1.623 | | | |
| Saturation (%) | 100.89 | | | |
| Void Ratio | 0.663 | | | |
| Diameter (mm) | 72.600 | | | |
| Height (mm) | 163.400 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 20.8 | | | |
| Dry Density (g/cm3) | 1.829 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.476 | | | |
| Effective Stress (kPa) | 489.4 | | | |
| Back Press. (kPa) | 110.6 | | | |
| Rate of Strain | 0.023 | | | |

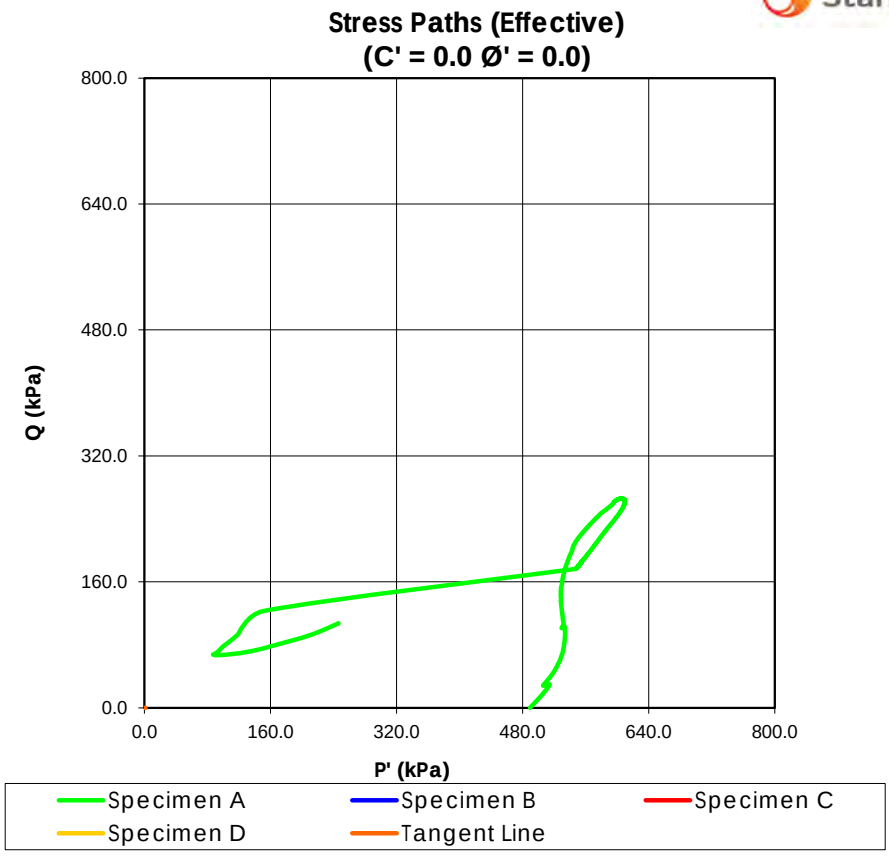
| Maximium Deviator Stress Criterion | | After Shear | A | B | C | D |
|---|---|---|---|---|---|---|
| C (kPa) | 0.0 | σ'1 at Failure (kPa) | 870.95 | | | |
| C' (kPa) | 0.0 | σ'3 at Failure (kPa) | 339.60 | | | |
| Ø (deg) | 0.0 | | | | | |
| Ø' (deg) | 0.0 | | | | | |

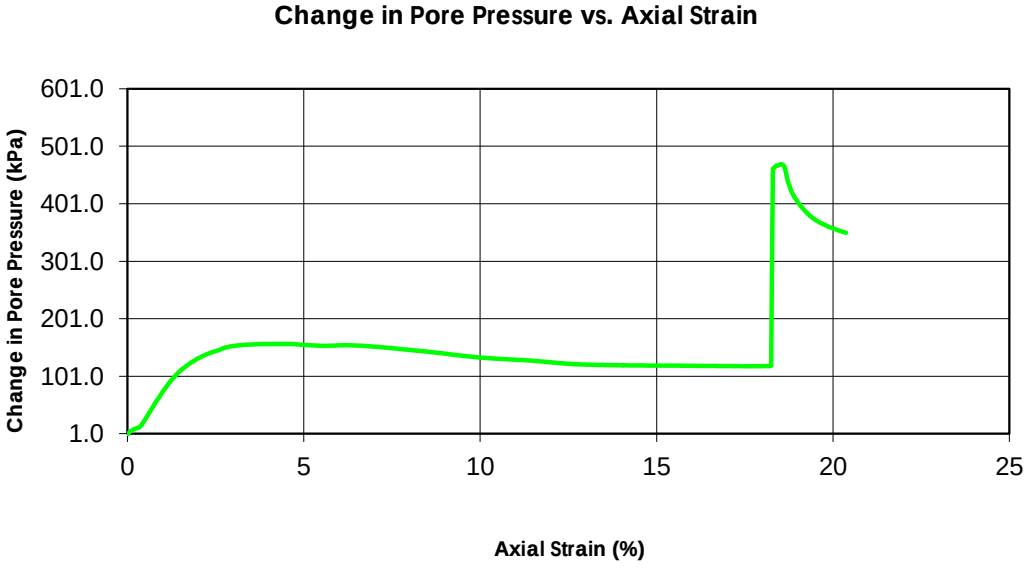
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D27 ST4 |
| **Depth:** | 1.70-2.03m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

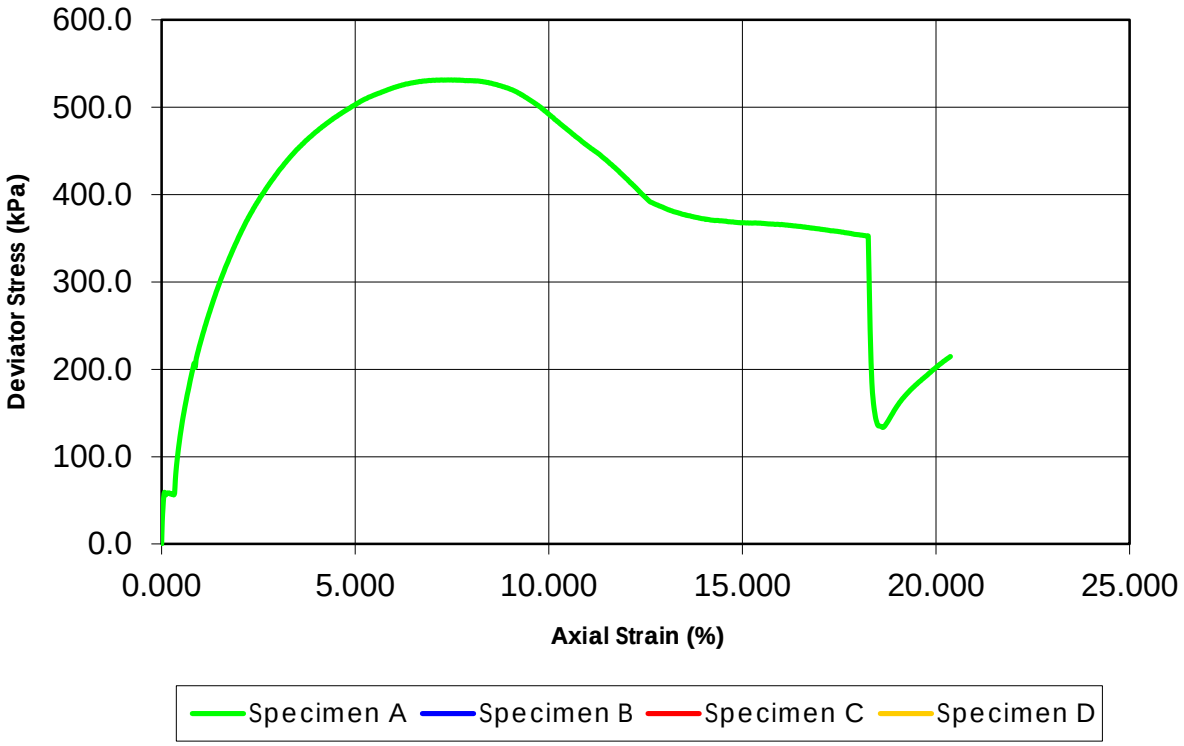
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

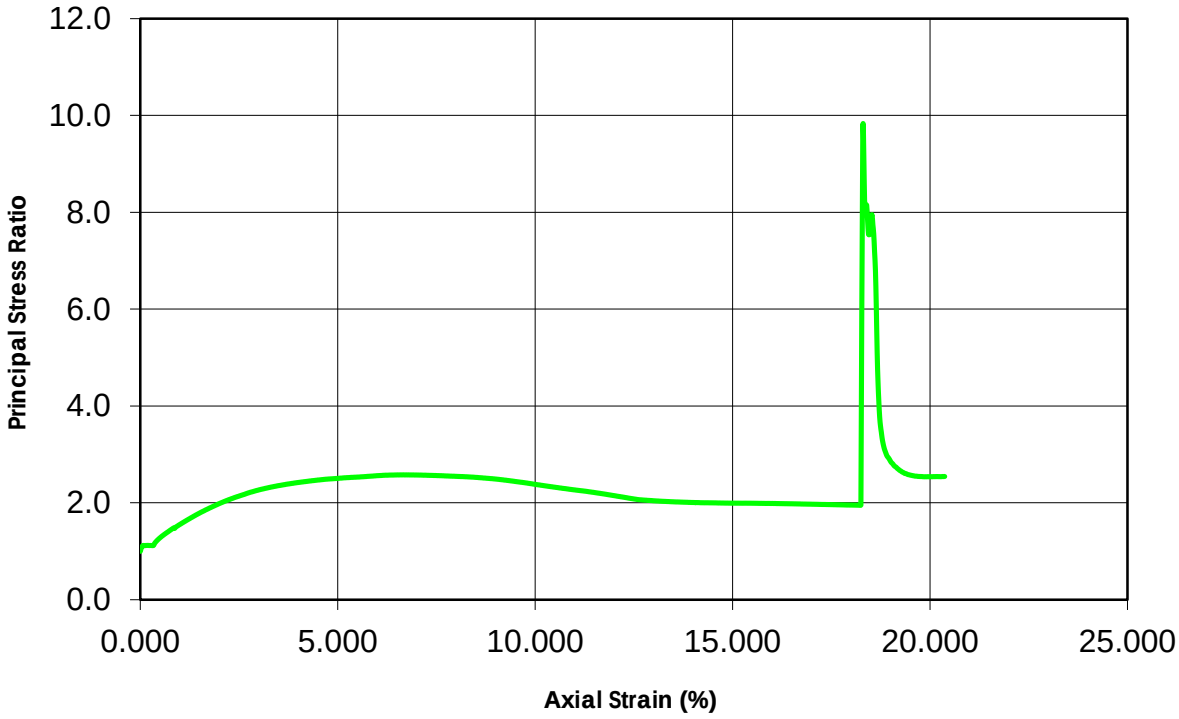


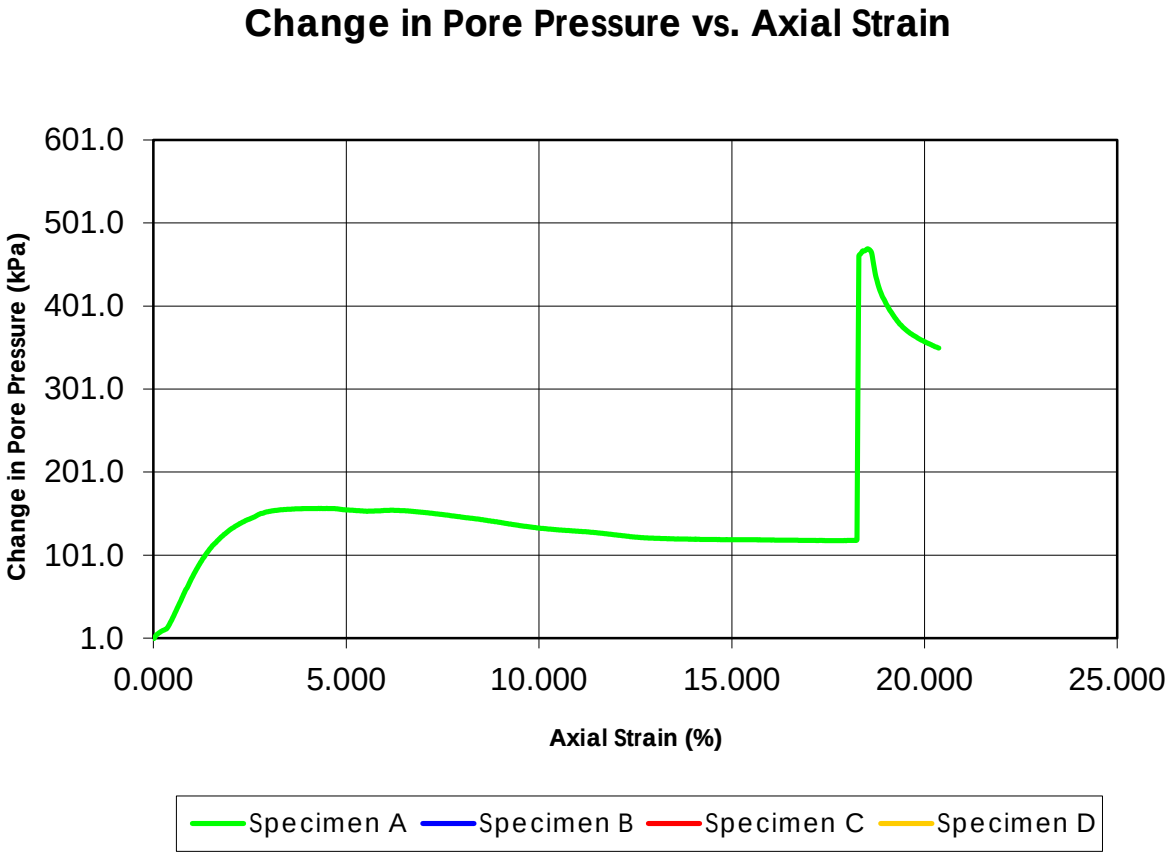



## Deviator Stress vs. Axial Strain



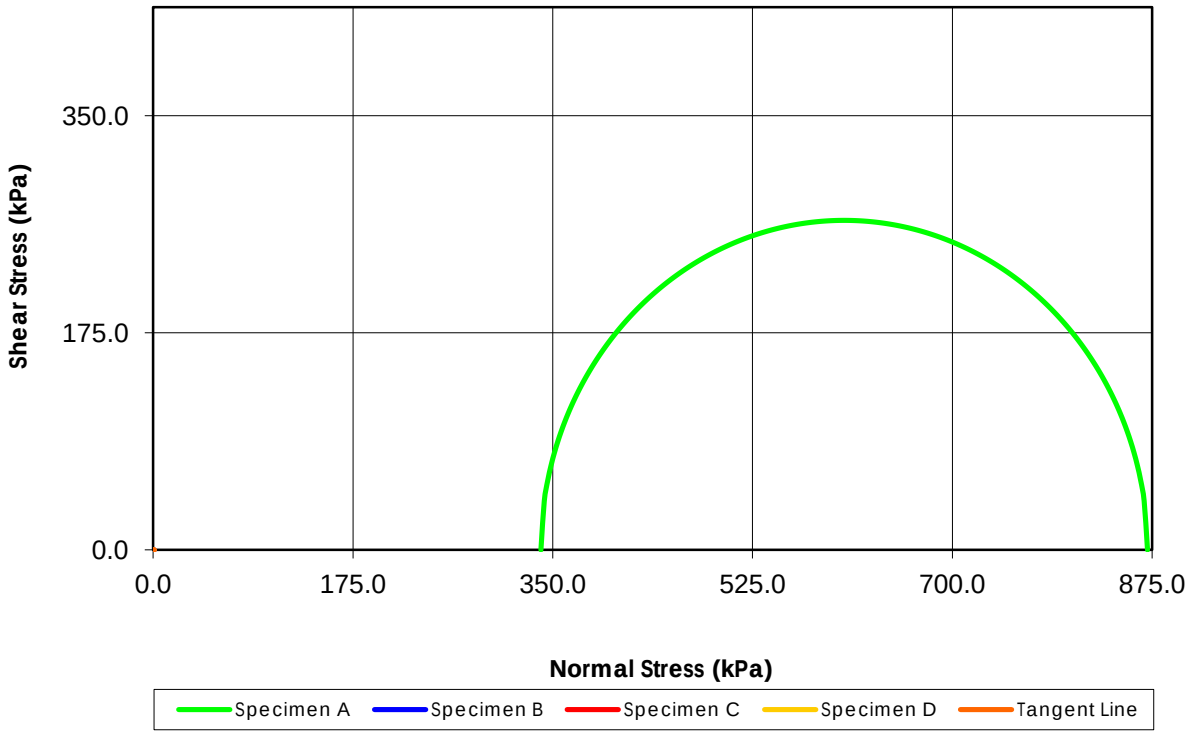

## Principal Stress Ratio vs. Axial Strain



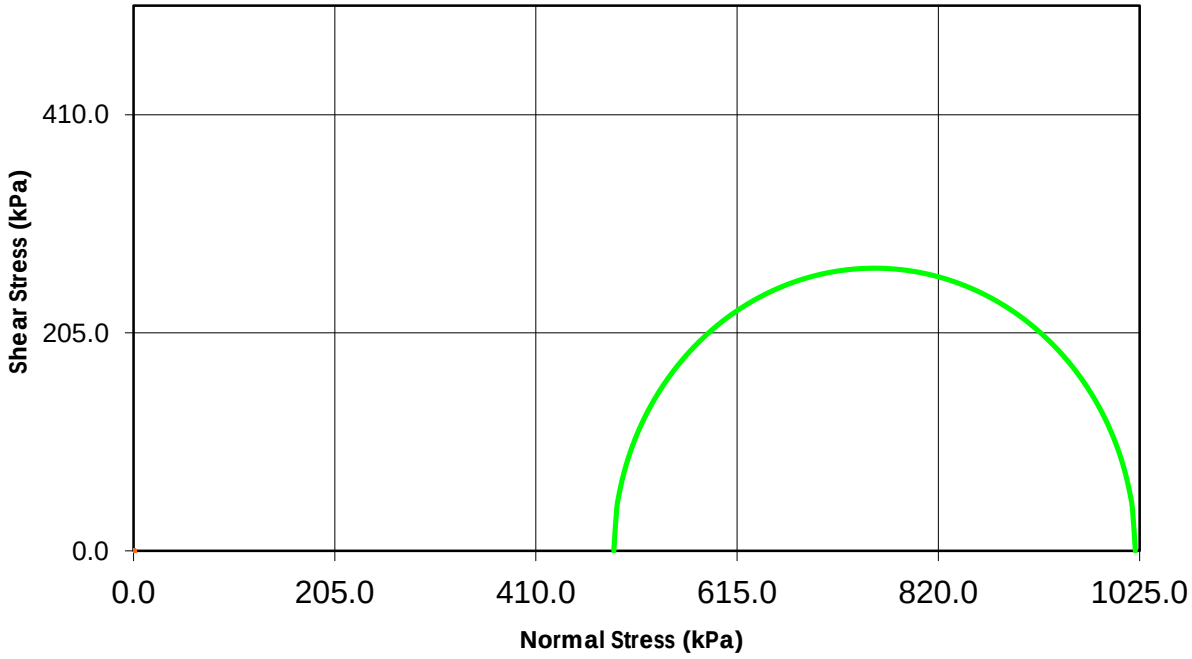

Change in Pore Pressure vs. Axial Strain
601.0
501.0
401.0
301.0
201.0
101.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

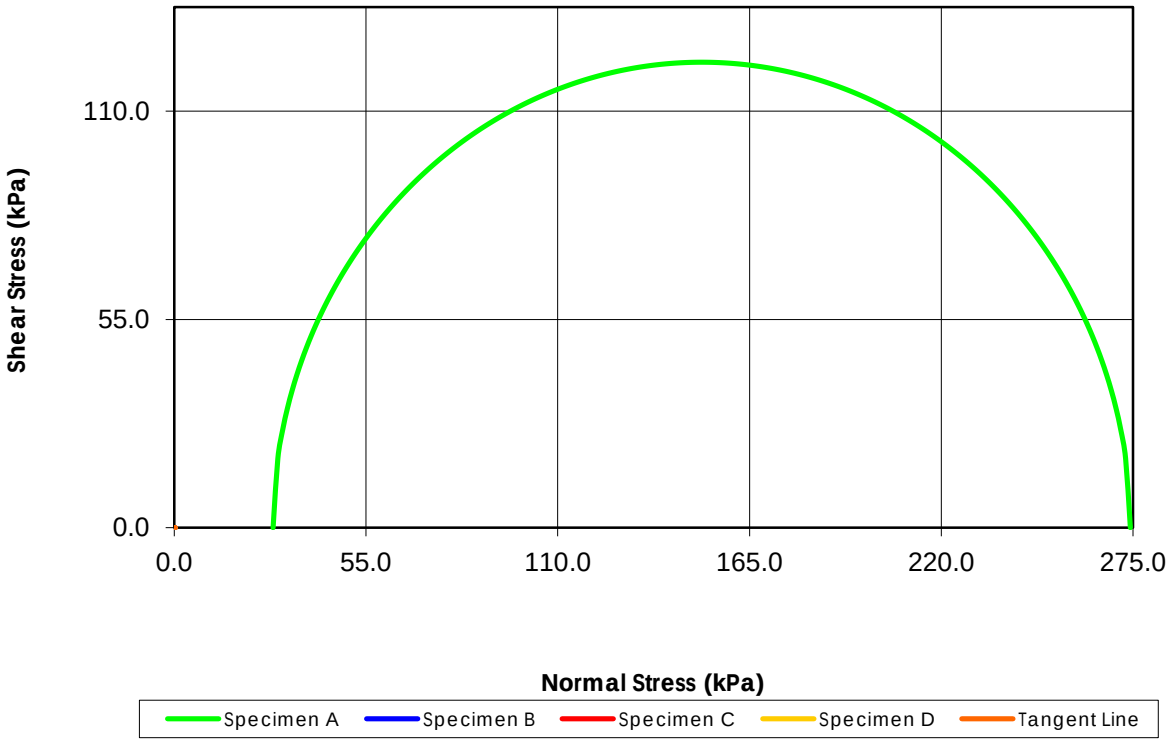



### Total Stress
### (C = 0.0 Ø = 0.0)

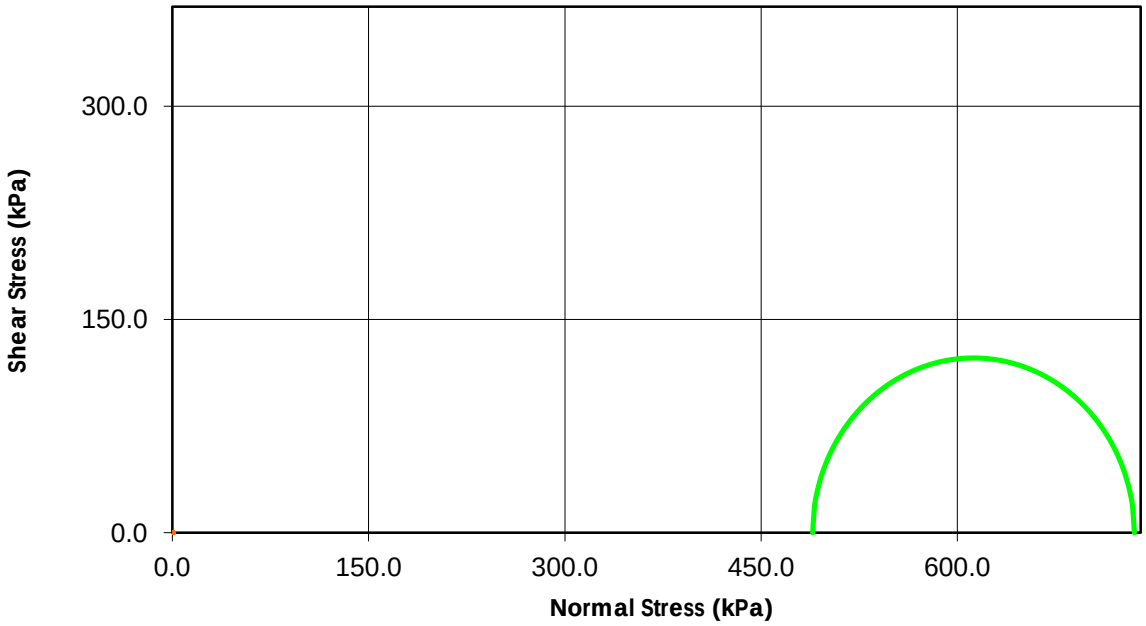


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

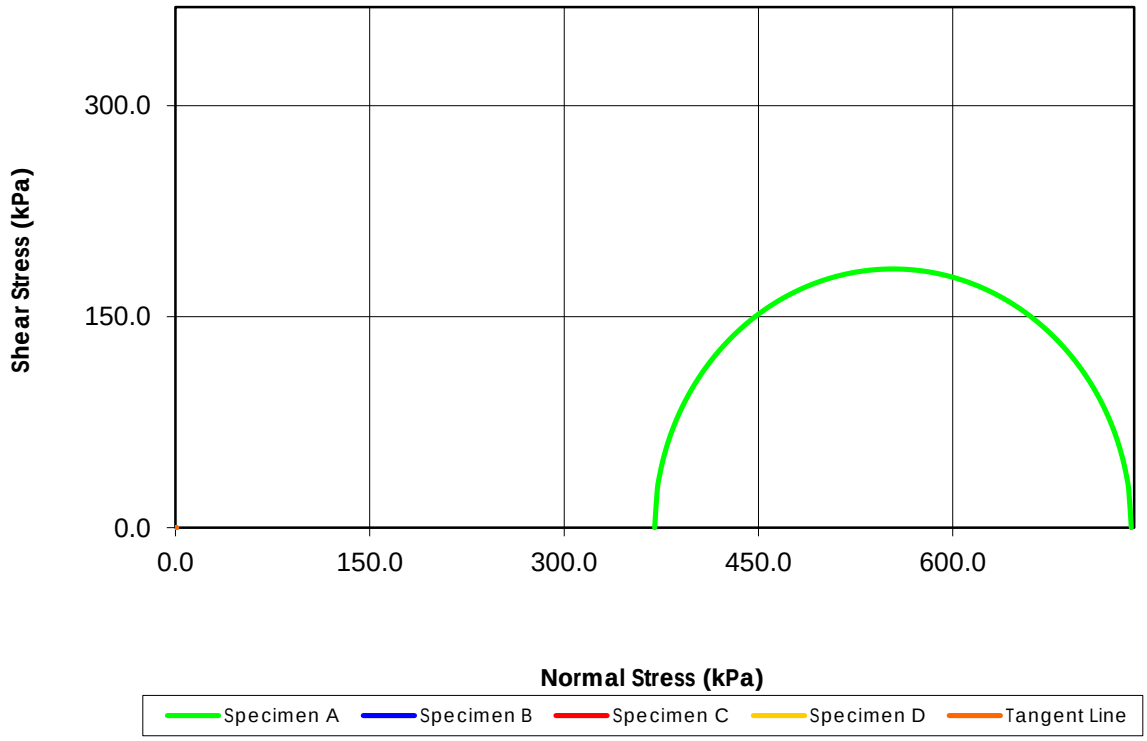



## Total Stress
## (C = 0.0 Ø = 0.0)

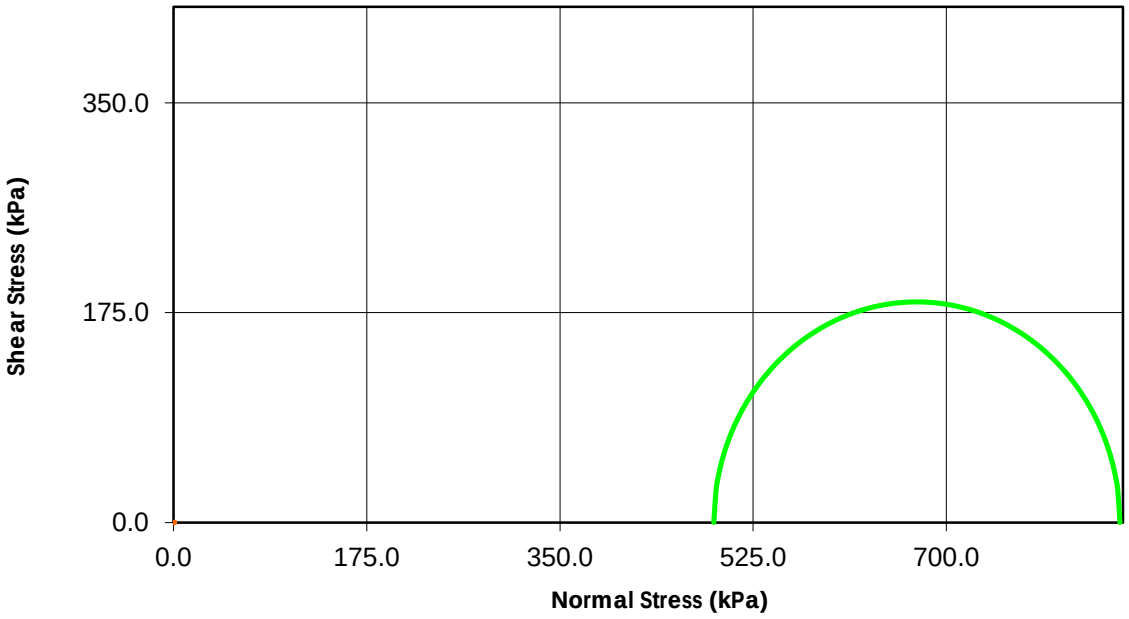


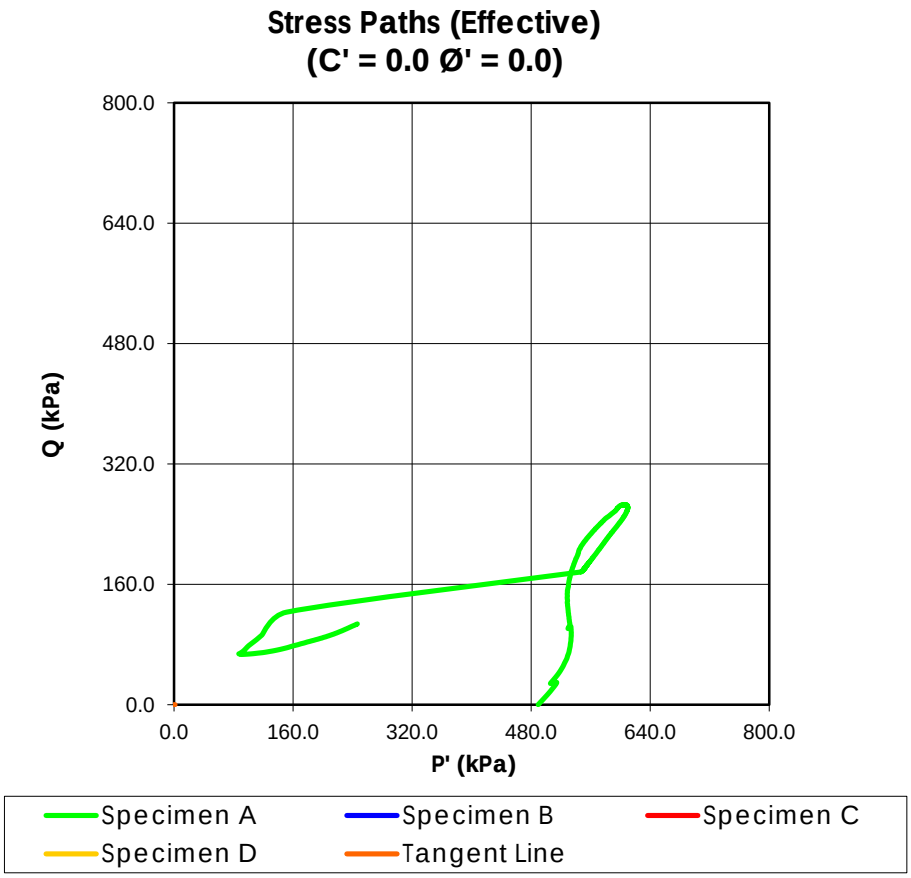
# Mohr Stress Circles at 15% Axial Strain Criterion

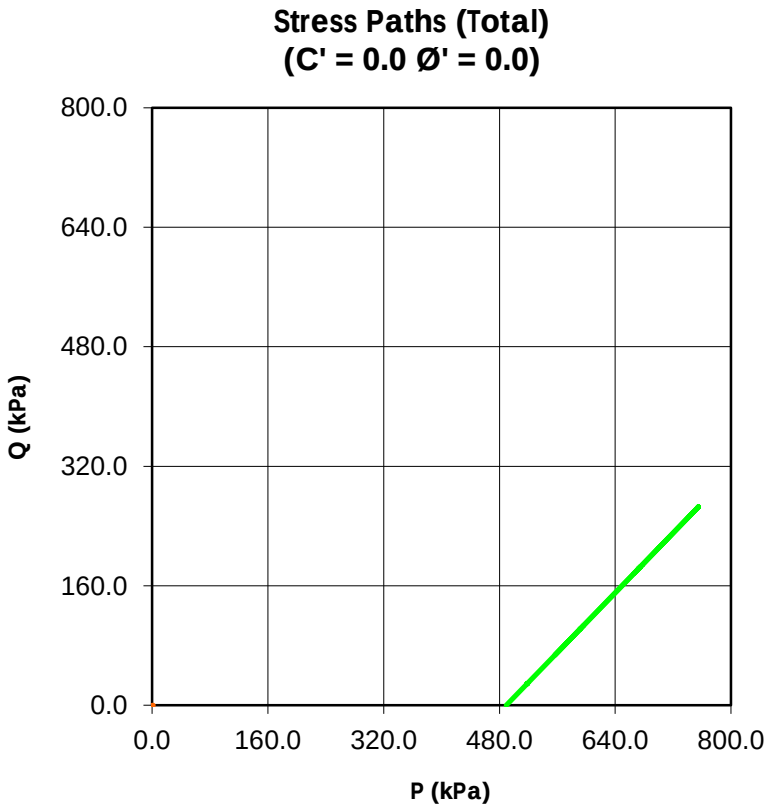
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

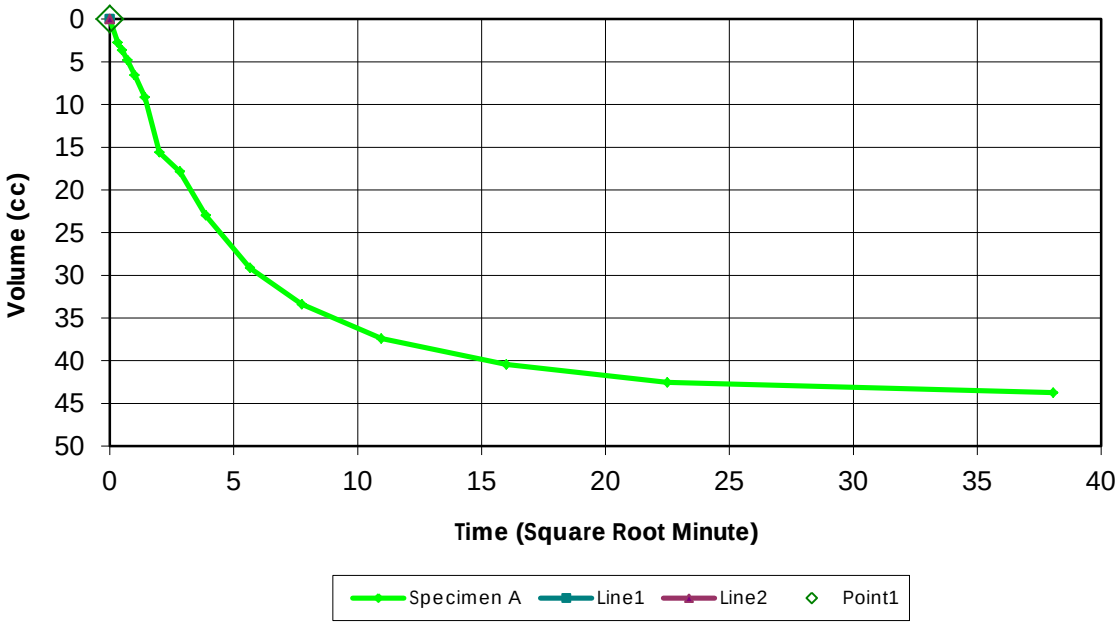



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

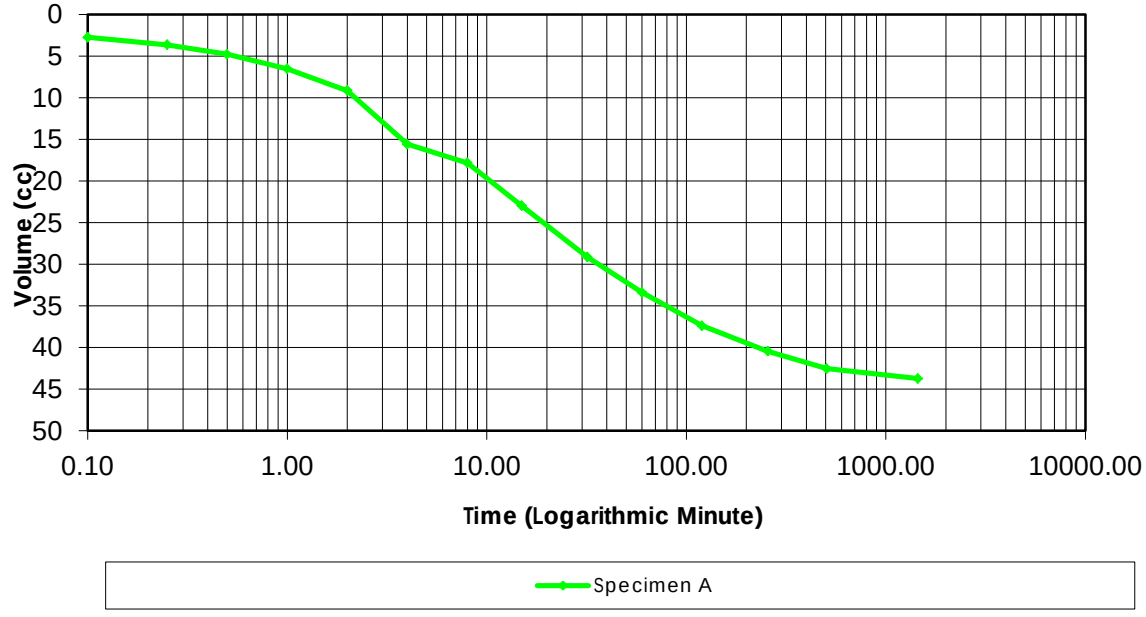

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 25.00 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 60.0 | 20.0 | 0.0 | 50.00 |
| 6 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 7 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 8 | 120.0 | 80.0 | 20.0 | 0.0 | 95.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 1.70-2.03m

| | |
|---|---|
| Cell Pressure (kPa) | 600 |
| Back Pressure (kPa) | 100 |
| Effective Pressure (kPa) | 500 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.6 |
| Initial Sample Height (mm) | 163.4 |
| Initial Sample Area (cm2) | 41.4 |
| Initial Volume (cm3) | 676.4 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.15 | N/A |
| 00:00:06 | 41.40 | 2.750 |
| 00:00:15 | 40.50 | 3.650 |
| 00:00:30 | 39.35 | 4.800 |
| 00:01:00 | 37.60 | 6.550 |
| 00:02:00 | 35.00 | 9.150 |
| 00:04:00 | 28.55 | 15.600 |
| 00:08:00 | 26.30 | 17.850 |
| 00:15:00 | 21.15 | 23.000 |
| 00:32:00 | 15.00 | 29.150 |
| 01:00:00 | 10.75 | 33.400 |
| 02:00:00 | 6.75 | 37.400 |
| 04:16:00 | 3.70 | 40.450 |
| 08:26:00 | 1.60 | 42.550 |
| 24:09:00 | 0.40 | 43.750 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

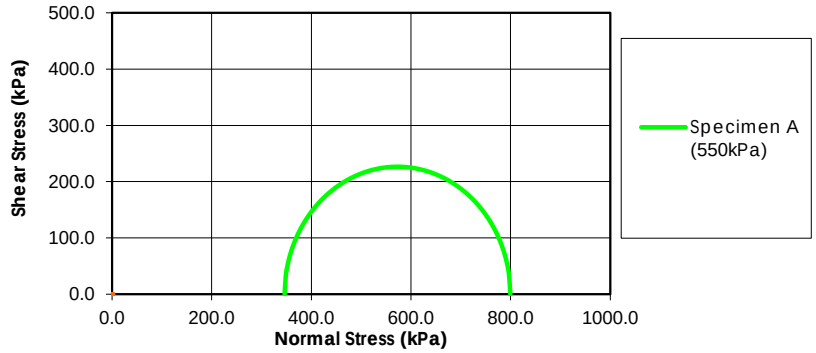
Stantec

Reviewed By C. Lamoureux

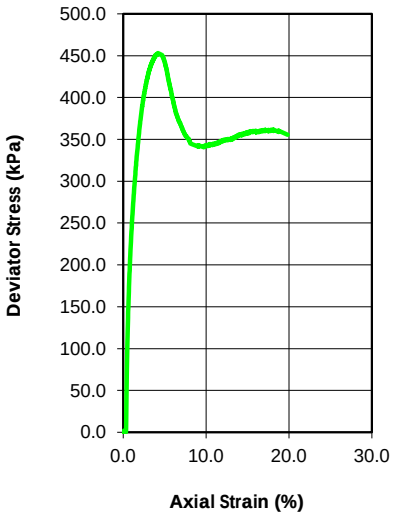
Date: 6-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 23.0 | | | |
| Dry Density (g/cm3) | 1.658 | | | |
| Saturation (%) | 98.84 | | | |
| Void Ratio | 0.629 | | | |
| Diameter (mm) | 72.600 | | | |
| Height (mm) | 152.900 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 18.2 | | | |
| Dry Density (g/cm3) | 1.781 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.516 | | | |
| Effective Stress (kPa) | 549.0 | | | |
| Back Press. (kPa) | 81.0 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

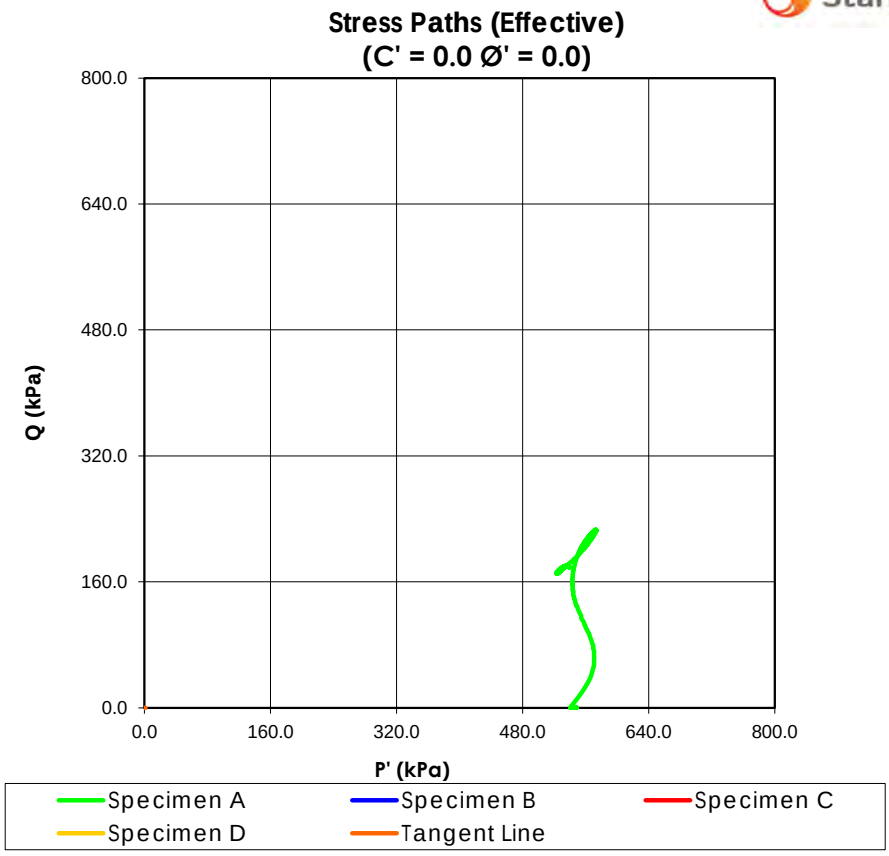
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 799.42 | | | |
| σ'3 at Failure (kPa) | 346.32 | | | |
| | | | | |
| | | | | |

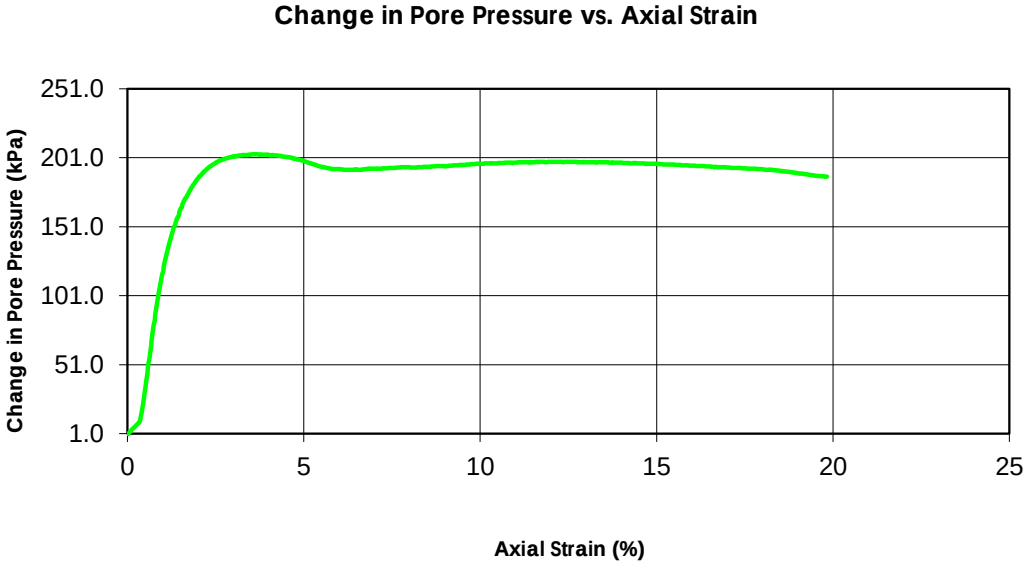
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D27 ST8 |
| **Depth:** | 3.50-3.94m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

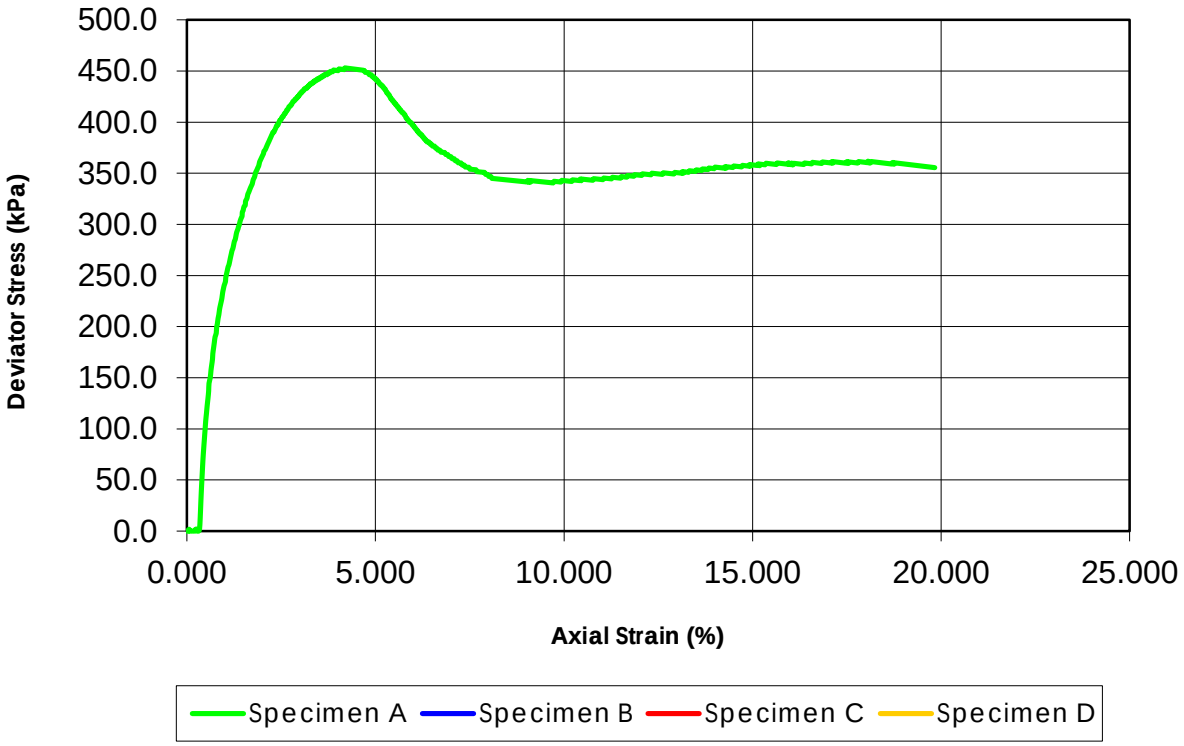
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

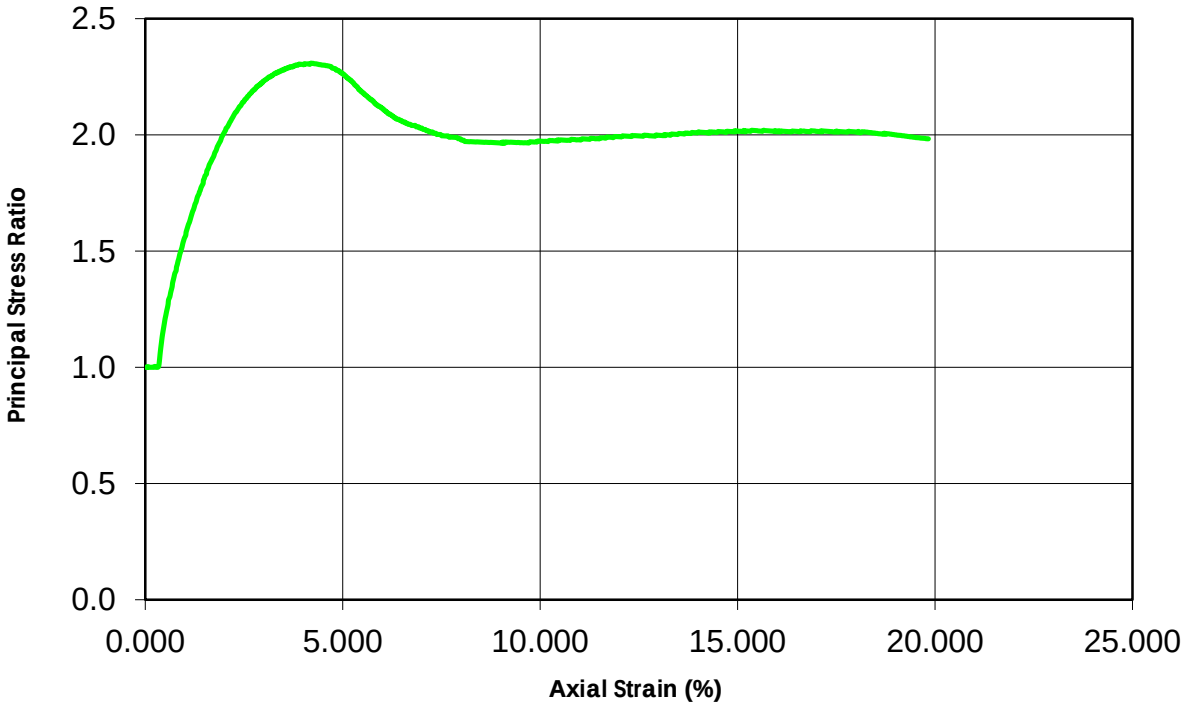


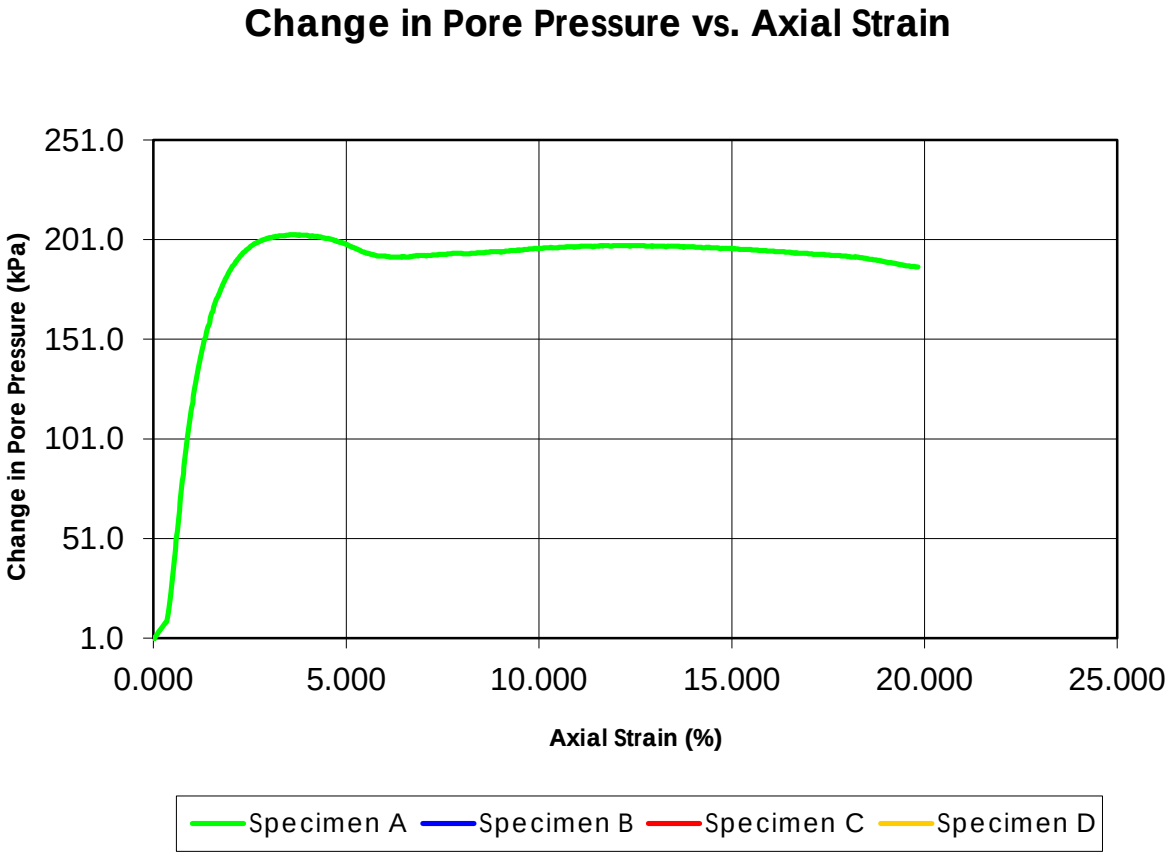



## Deviator Stress vs. Axial Strain



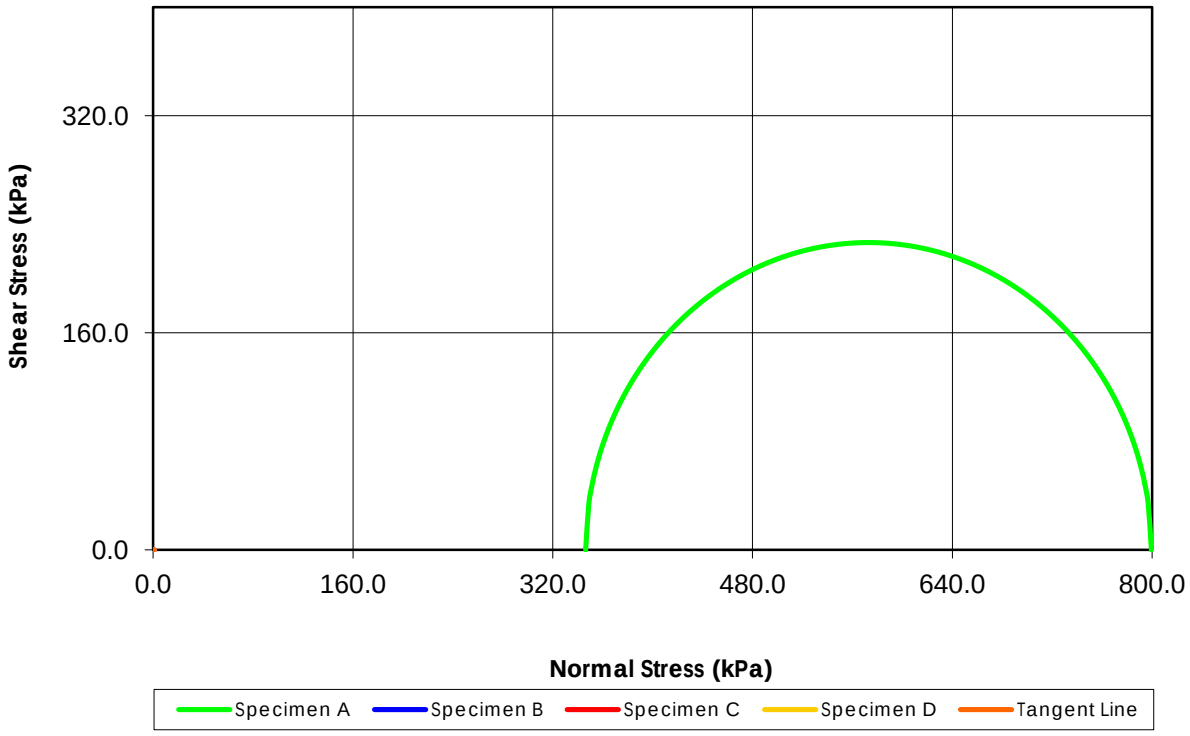

## Principal Stress Ratio vs. Axial Strain



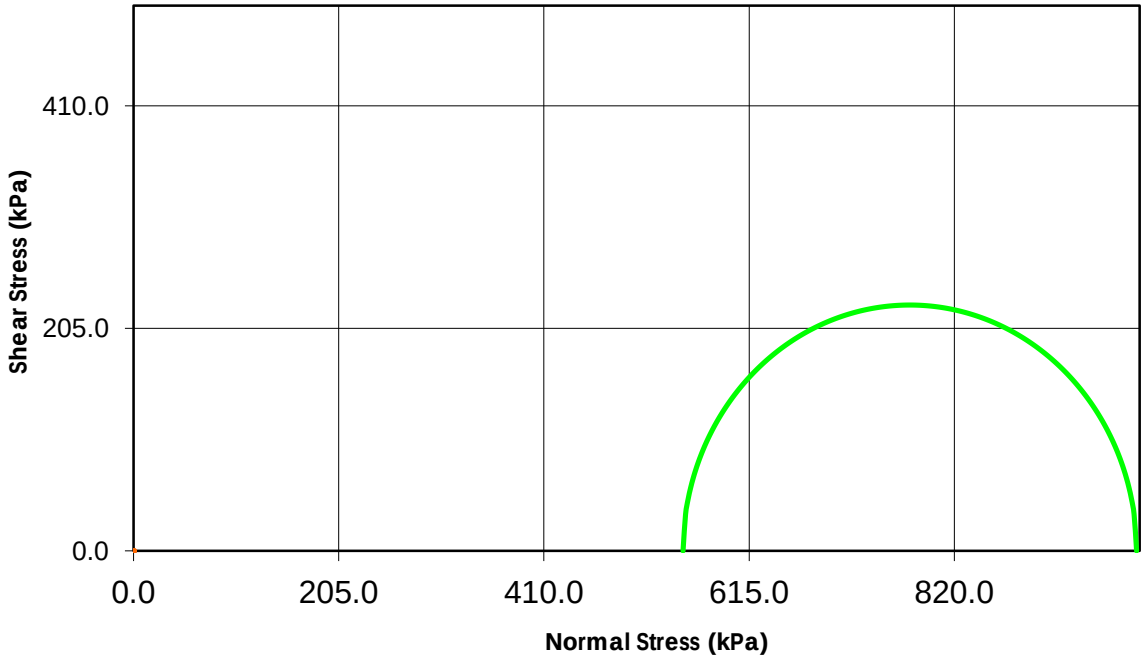

Change in Pore Pressure vs. Axial Strain
251.0
201.0
151.0
101.0
51.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

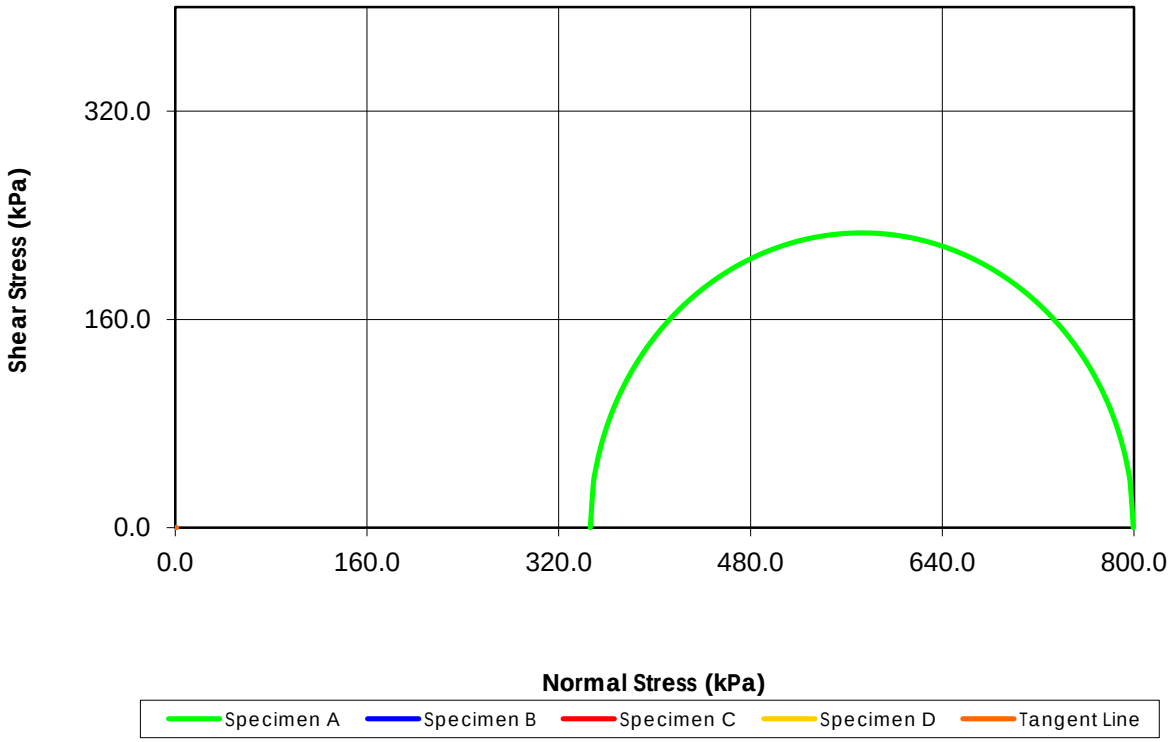



### Total Stress
### (C = 0.0 Ø = 0.0)

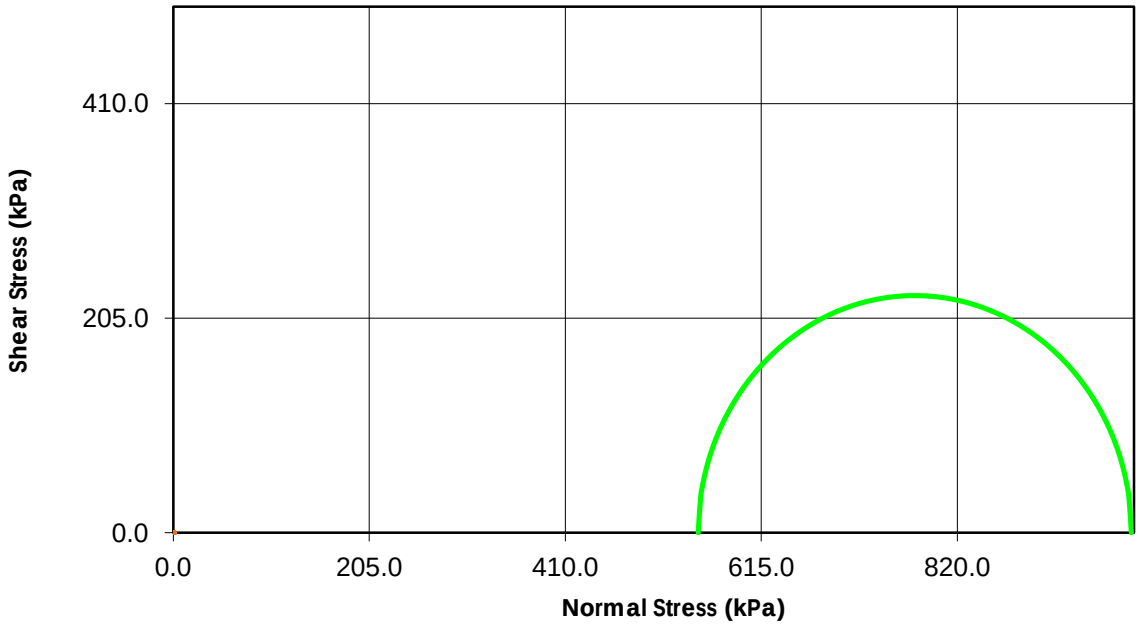


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

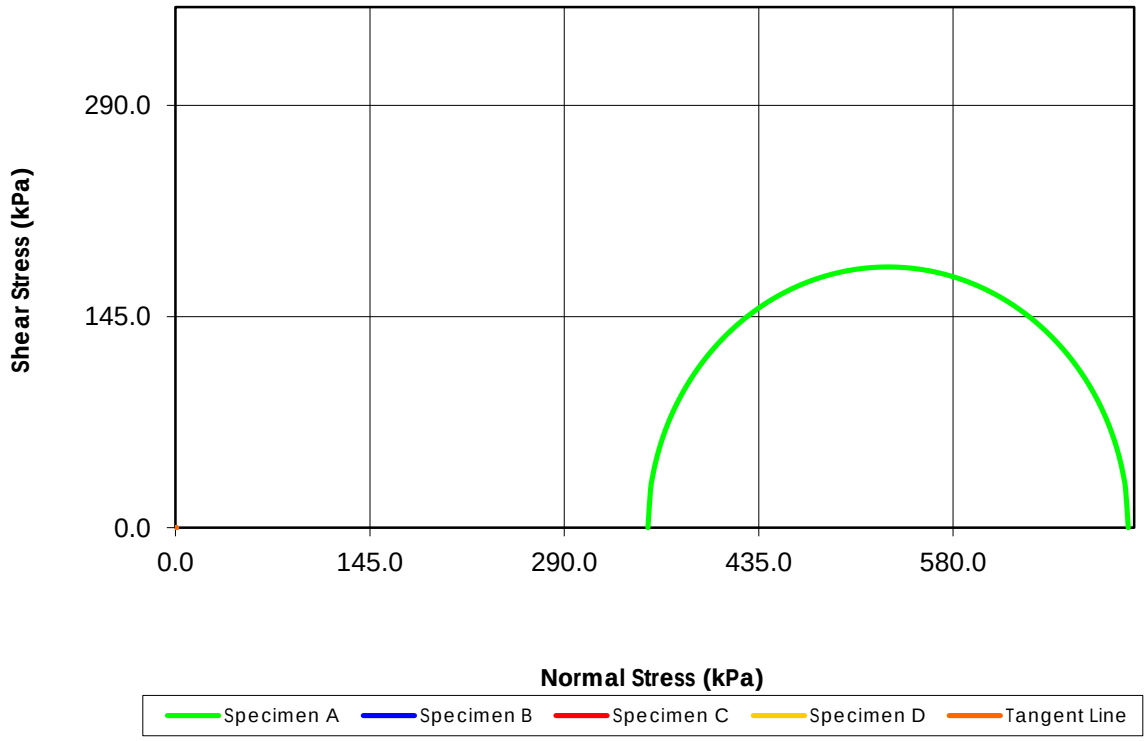



## Total Stress
## (C = 0.0 Ø = 0.0)

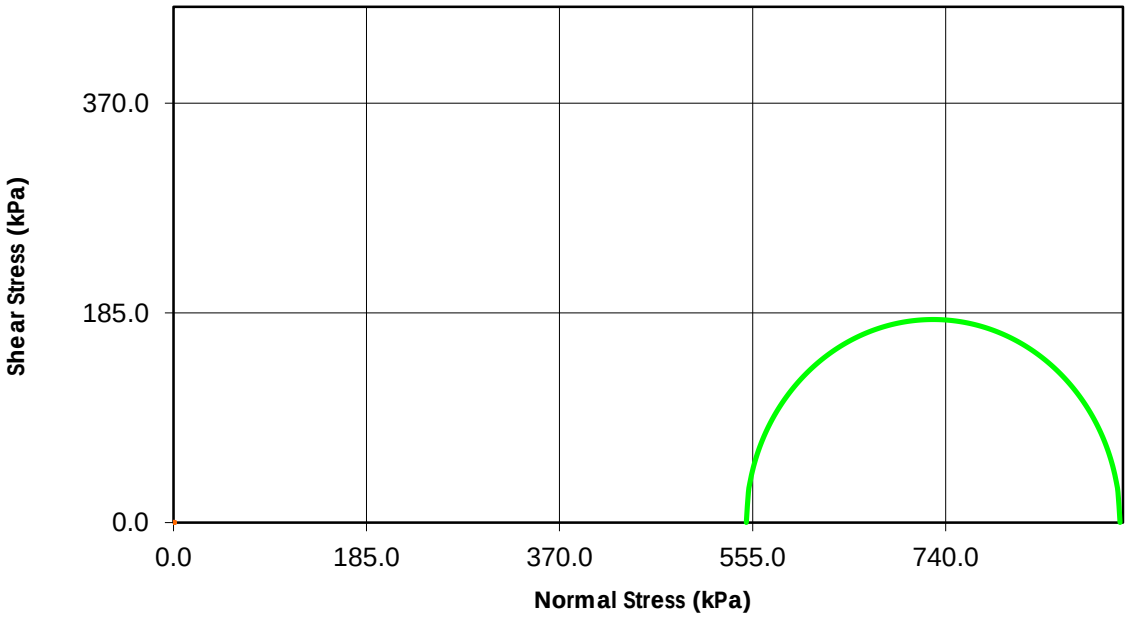


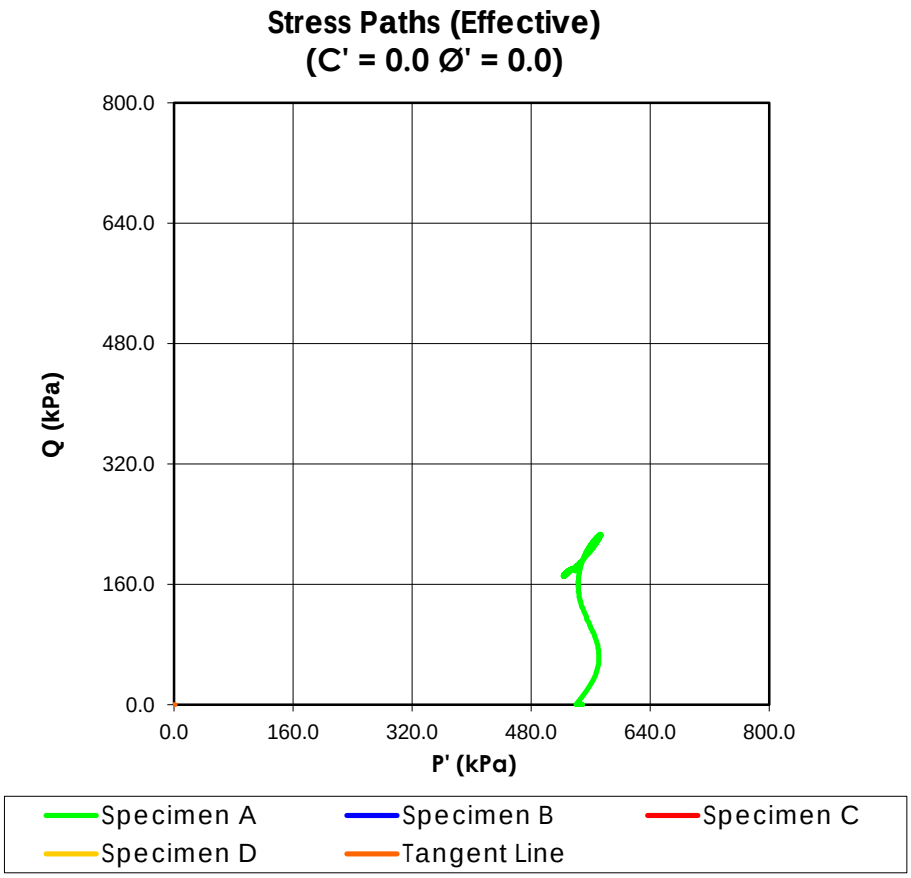
# Mohr Stress Circles at 15% Axial Strain Criterion

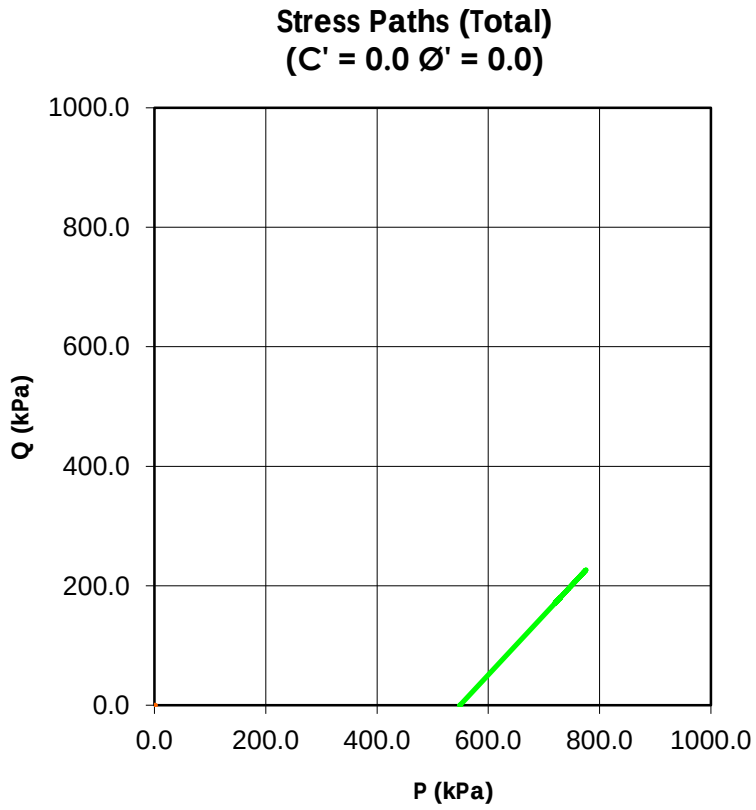
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

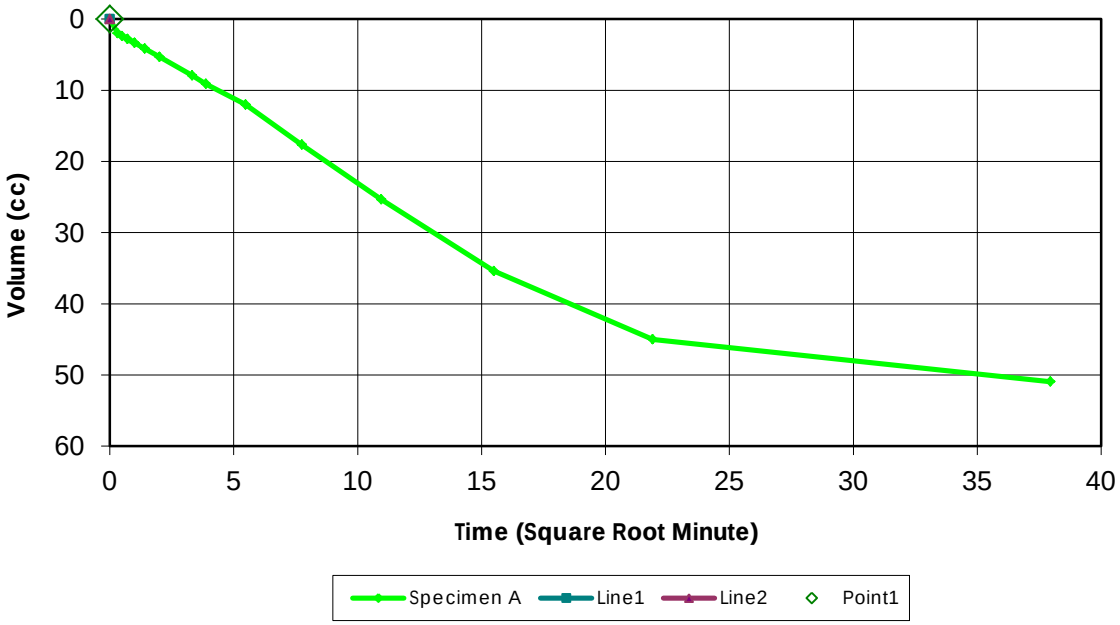



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

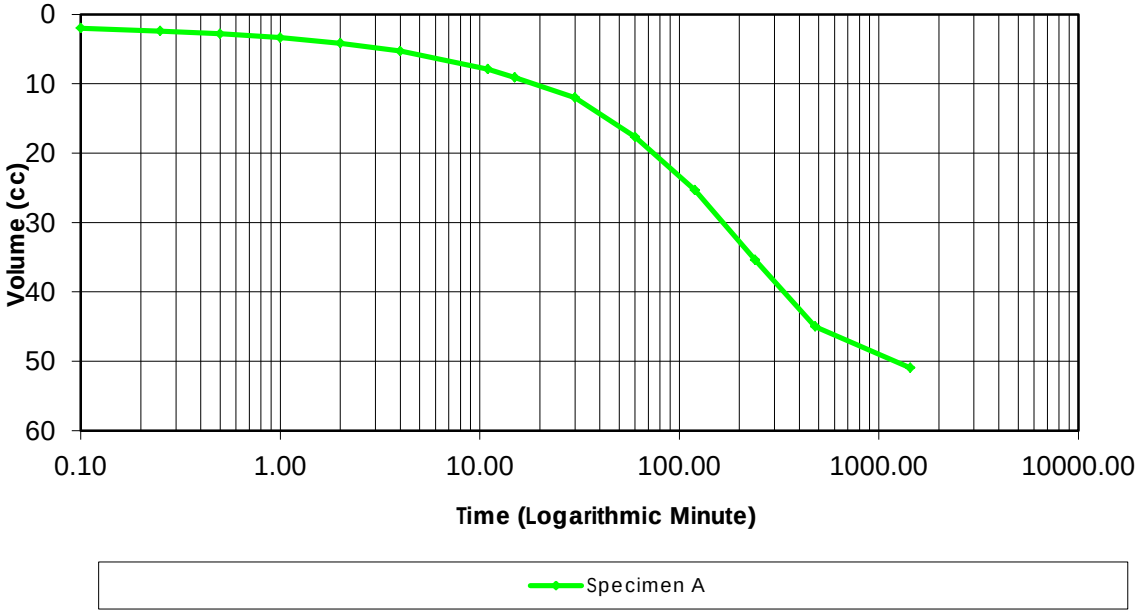

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.97

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 51.00 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 80.0 | 20.0 | 20.0 | 73.00 |
| 6 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 7 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 8 | 120.0 | 80.0 | 20.0 | 0.0 | 97.00 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.50-3.94m

| | |
|---|---|
| Cell Pressure (kPa) | 630 |
| Back Pressure (kPa) | 80 |
| Effective Pressure (kPa) | 550 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.6 |
| Initial Sample Height (mm) | 152.9 |
| Initial Sample Area (cm2) | 41.4 |
| Initial Volume (cm3) | 633 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 46.00 | N/A |
| 00:00:06 | 44.00 | 2.000 |
| 00:00:15 | 43.60 | 2.400 |
| 00:00:30 | 43.20 | 2.800 |
| 00:01:00 | 42.65 | 3.350 |
| 00:02:00 | 41.85 | 4.150 |
| 00:04:00 | 40.70 | 5.300 |
| 00:11:00 | 38.10 | 7.900 |
| 00:15:00 | 36.90 | 9.100 |
| 00:30:00 | 34.00 | 12.000 |
| 01:00:00 | 28.35 | 17.650 |
| 02:00:00 | 20.65 | 25.350 |
| 04:00:00 | 10.60 | 35.400 |
| 08:00:00 | 1.00 | 45.000 |
| 24:00:00 | -4.95 | 50.950 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

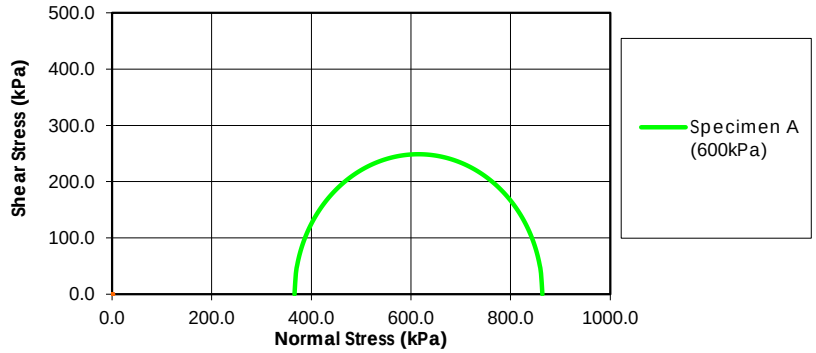
Stantec

Reviewed By C. Lamoureux

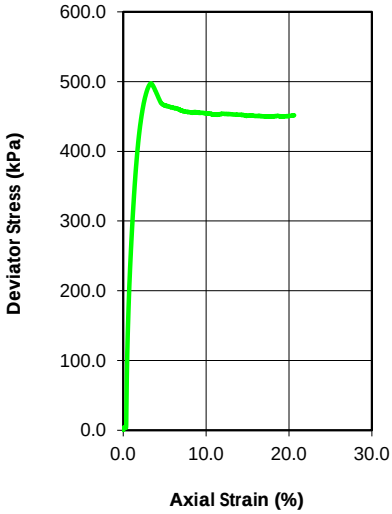
Date: 10-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 24.6 | | | |
| Dry Density (g/cm3) | 1.625 | | | |
| Saturation (%) | 100.59 | | | |
| Void Ratio | 0.658 | | | |
| Diameter (mm) | 72.600 | | | |
| Height (mm) | 155.000 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 20.7 | | | |
| Dry Density (g/cm3) | 1.756 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.538 | | | |
| Effective Stress (kPa) | 589.4 | | | |
| Back Press. (kPa) | 70.6 | | | |
| Rate of Strain | 0.022 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

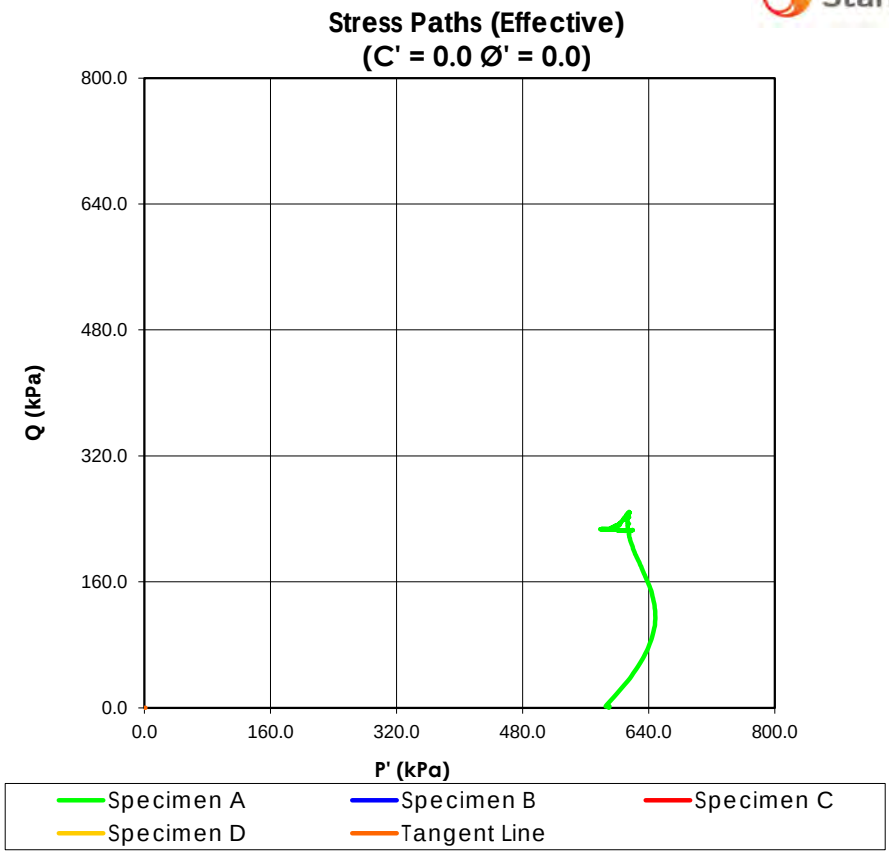
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 863.73 | | | |
| σ'3 at Failure (kPa) | 366.25 | | | |
| | | | | |
| | | | | |

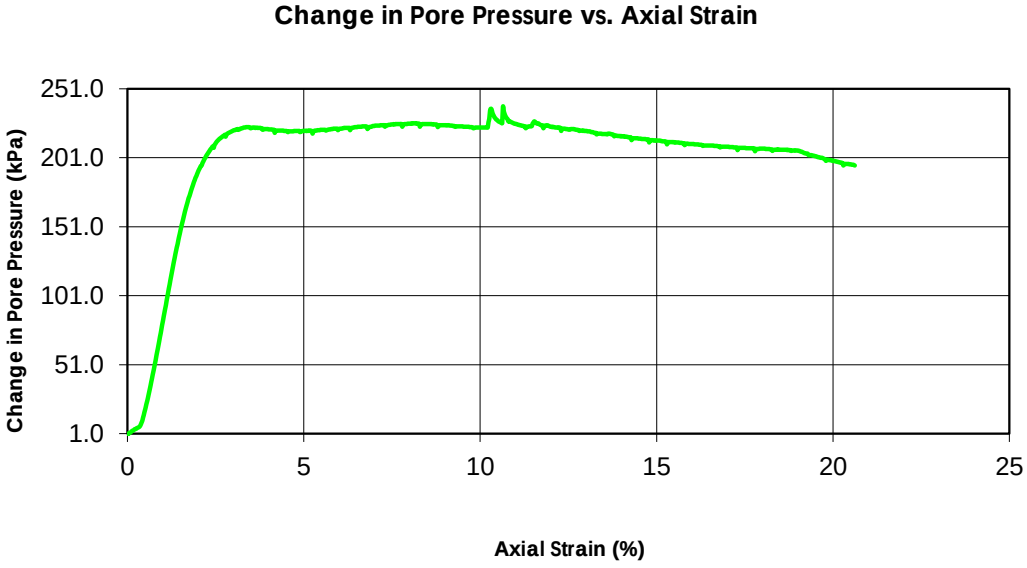
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D27 ST10 |
| **Depth:** | 4.40-4.71m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

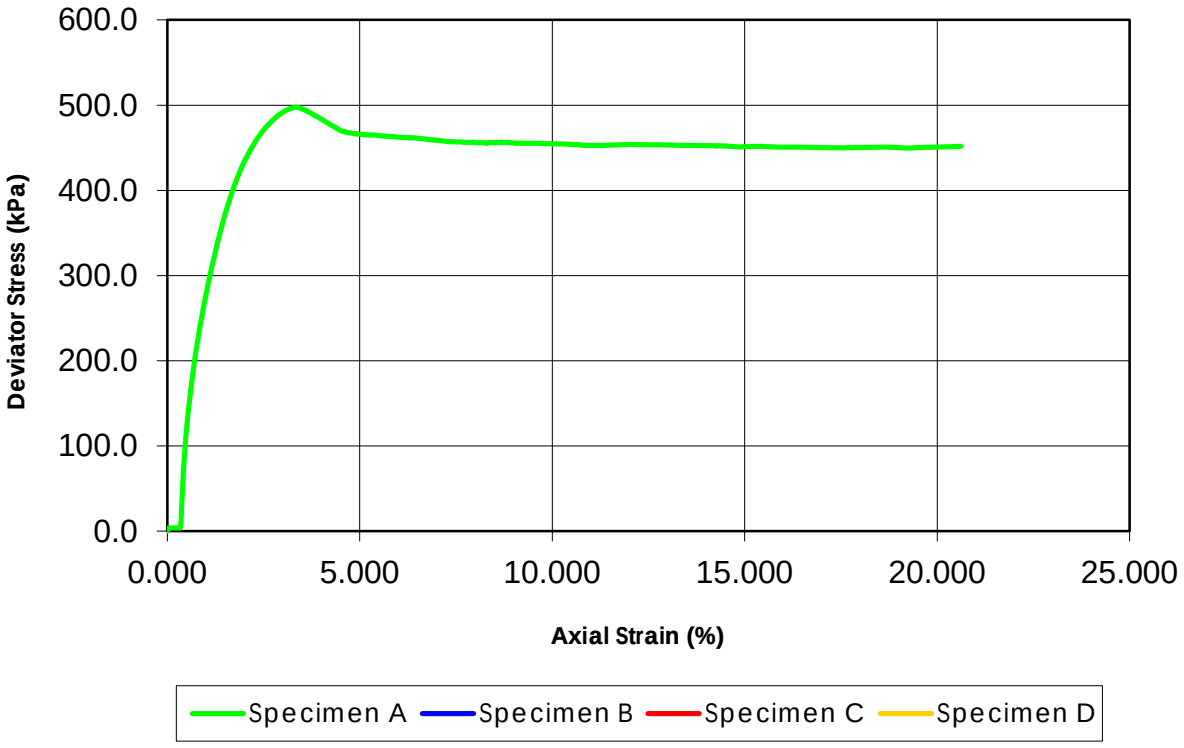
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

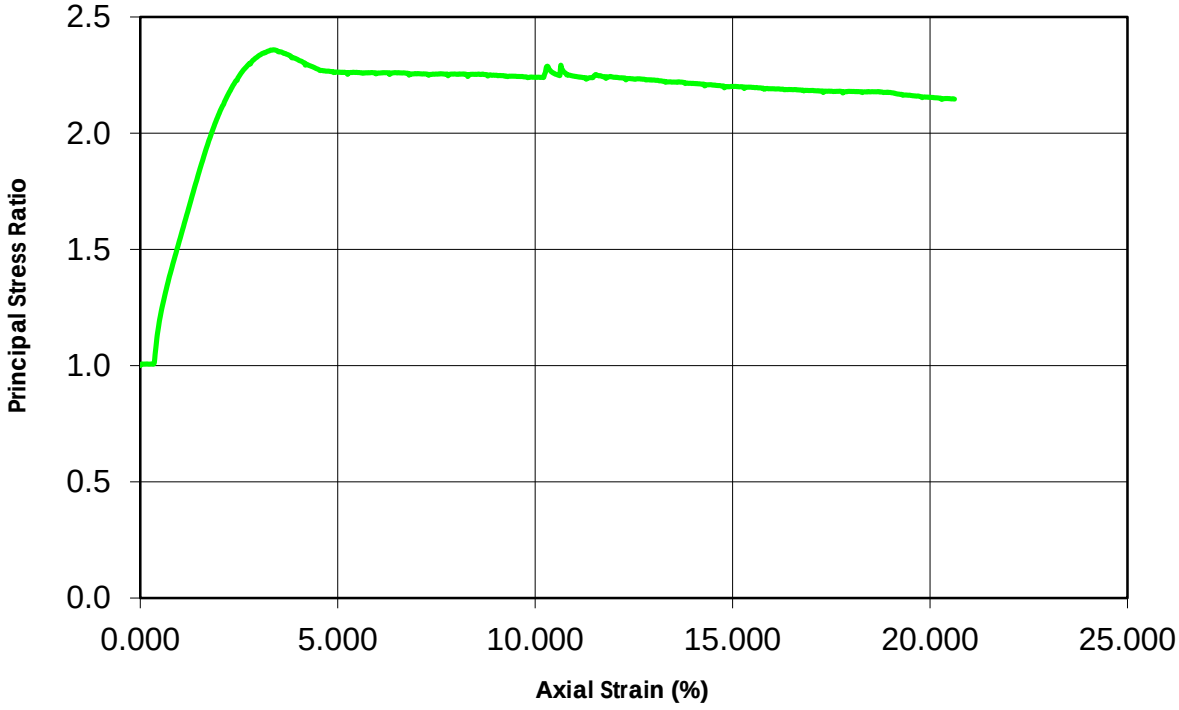


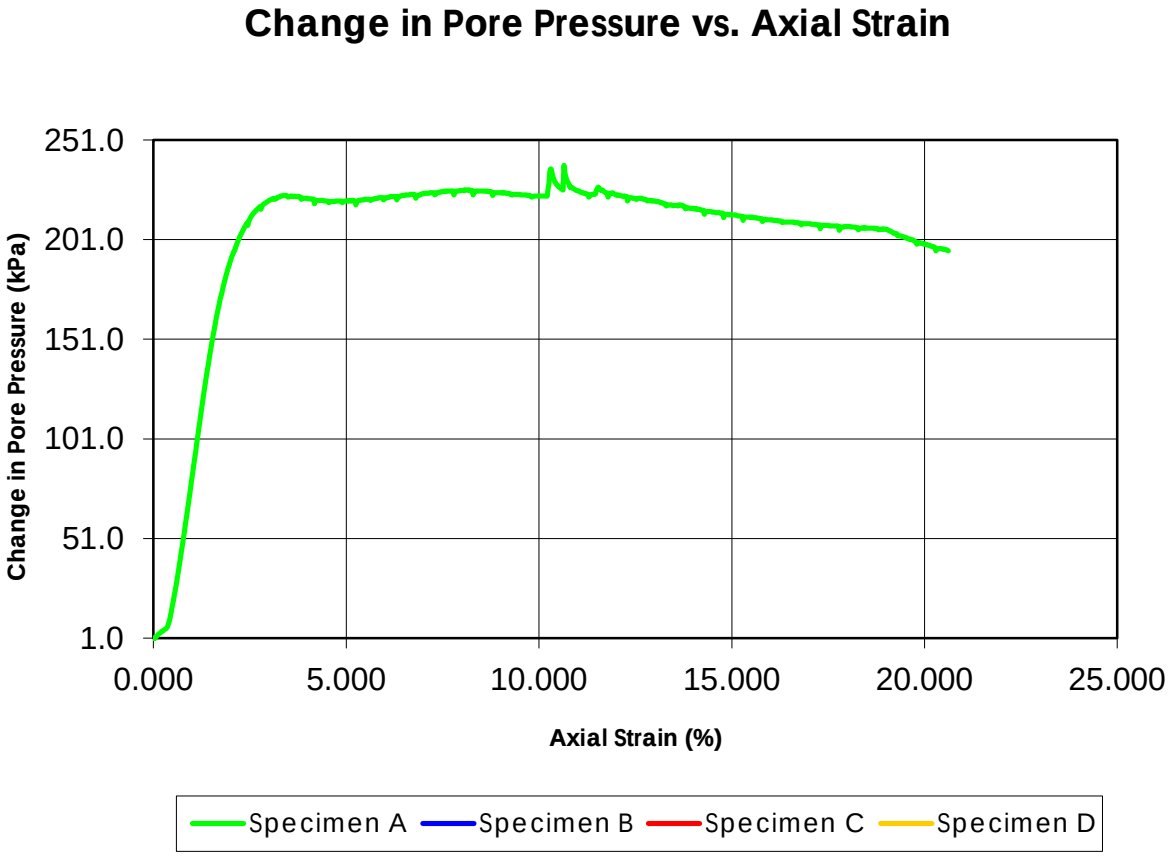



## Deviator Stress vs. Axial Strain



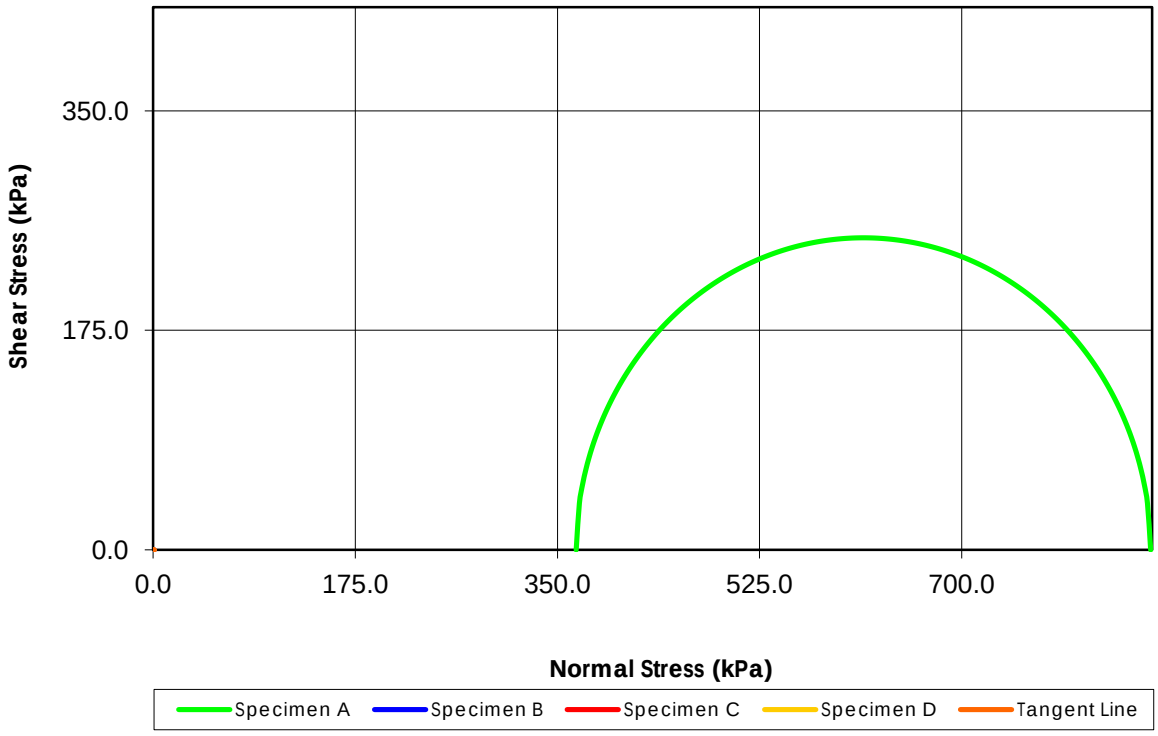

## Principal Stress Ratio vs. Axial Strain



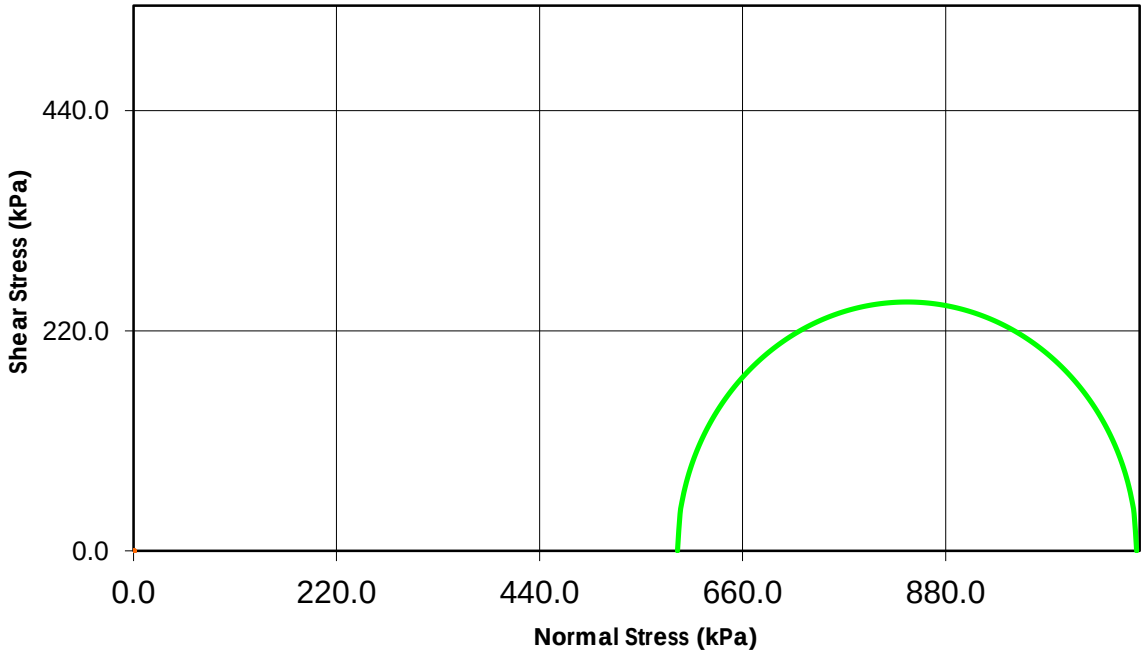

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

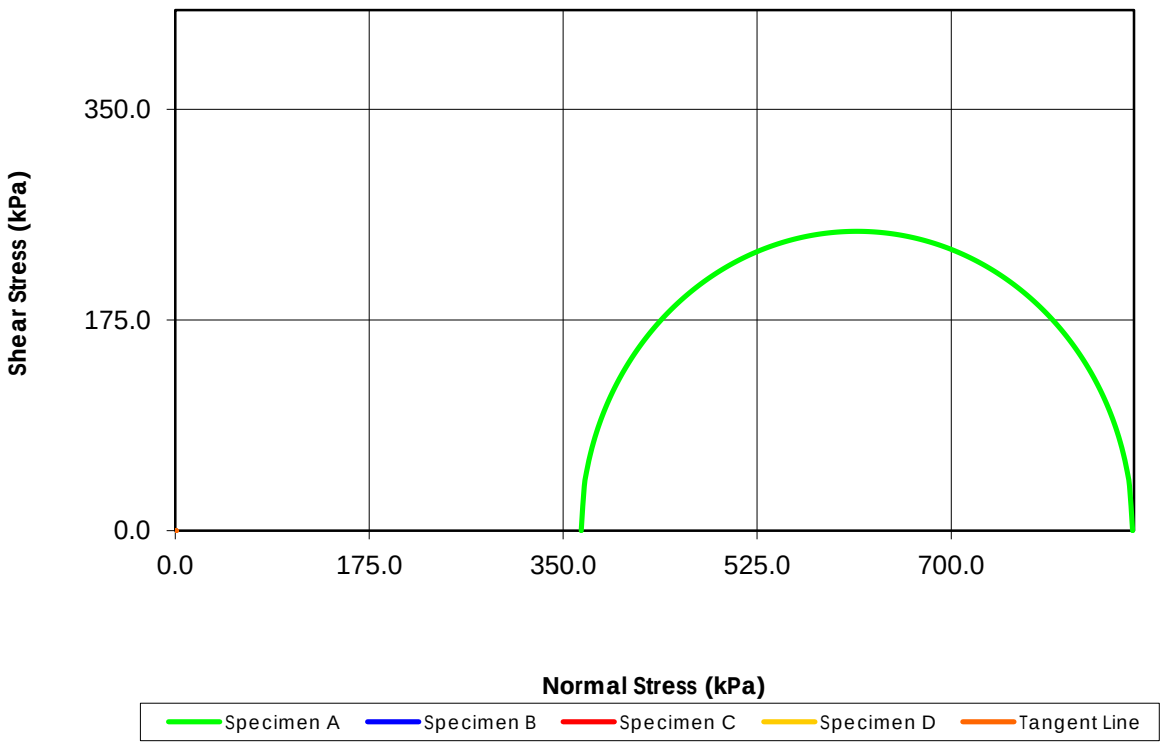



### Total Stress
### (C = 0.0 Ø = 0.0)

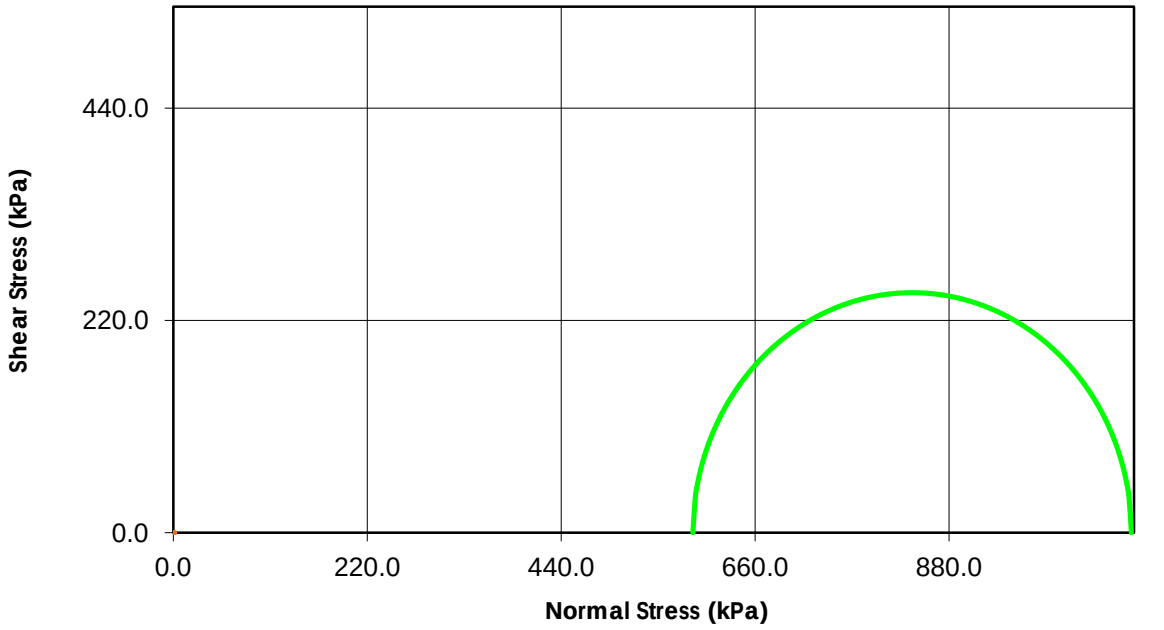


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

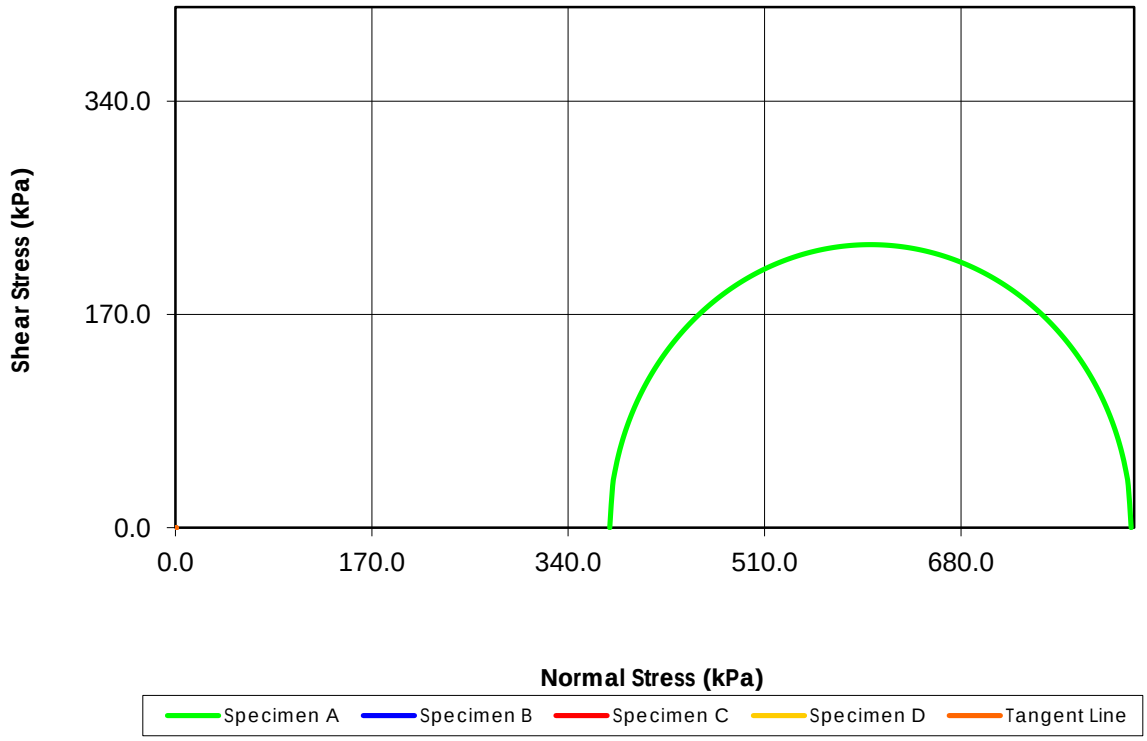



## Total Stress
## (C = 0.0 Ø = 0.0)

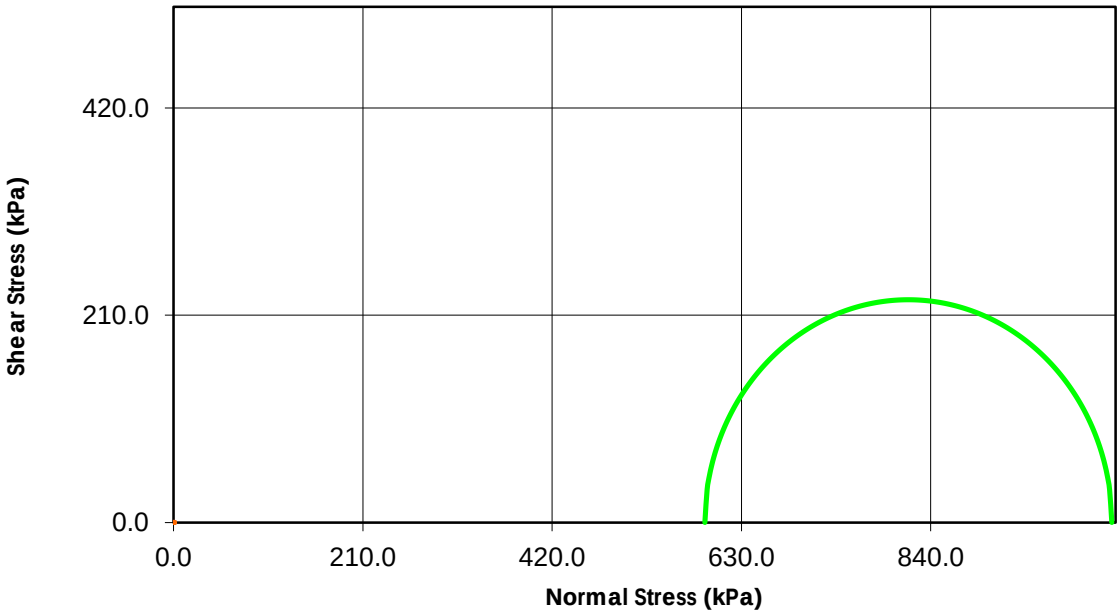


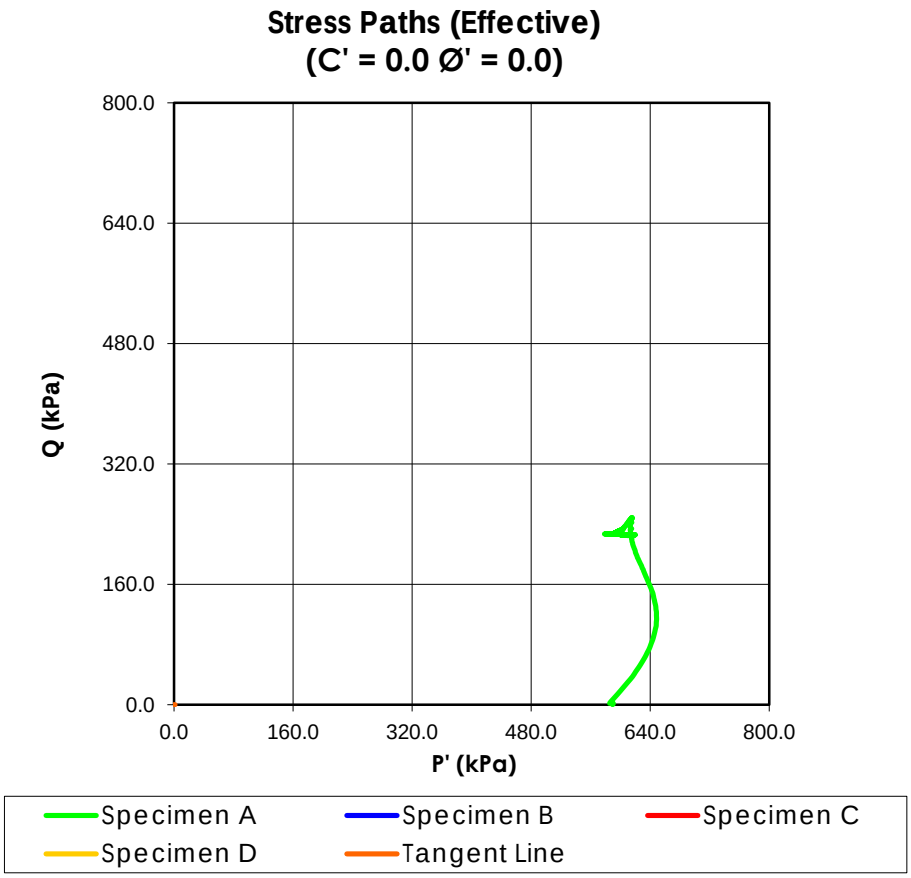
# Mohr Stress Circles at 15% Axial Strain Criterion

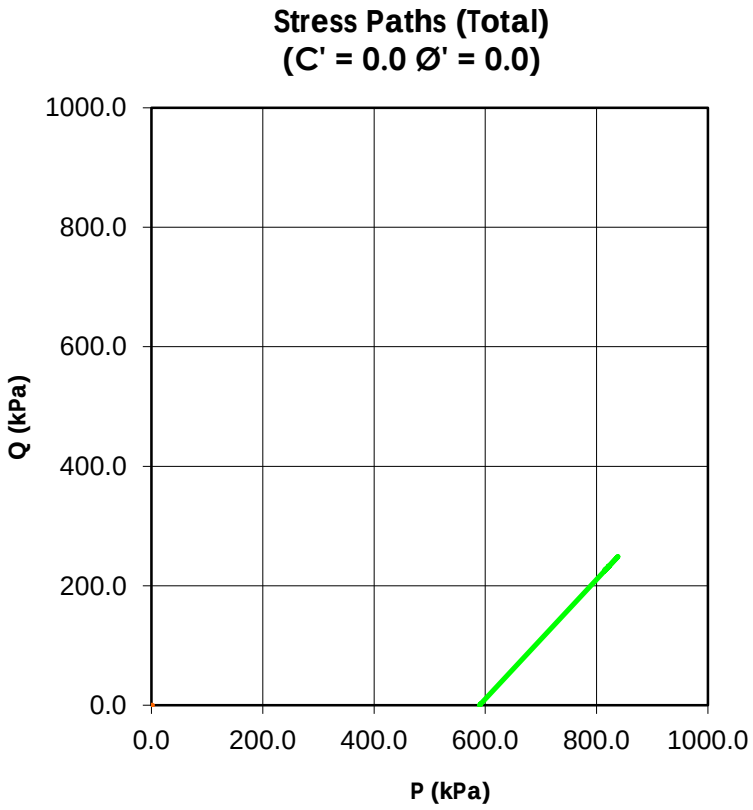
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

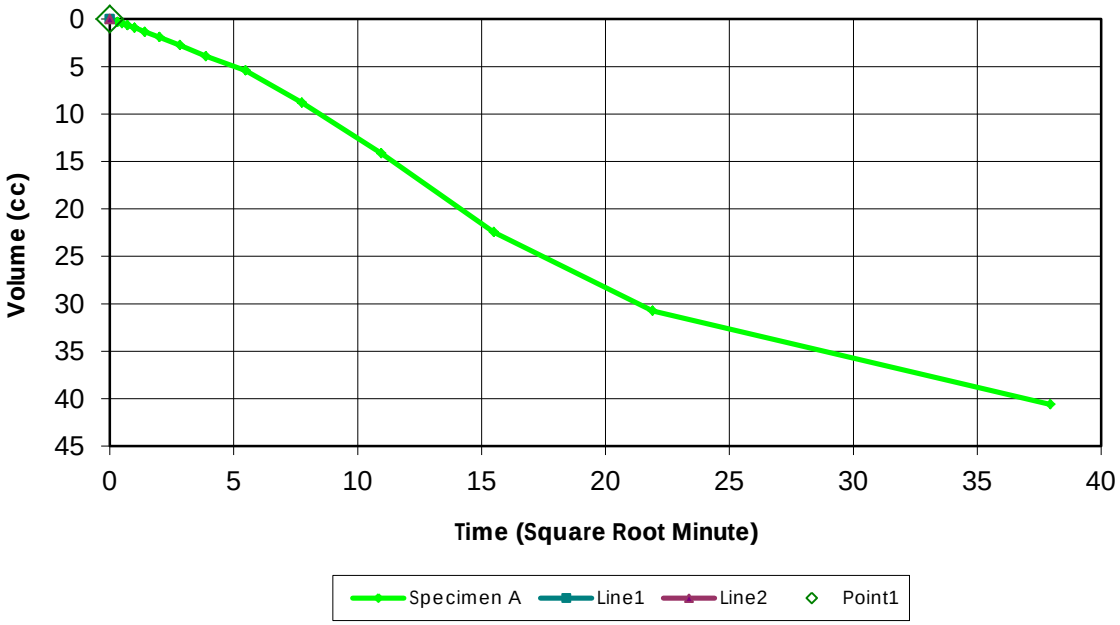



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

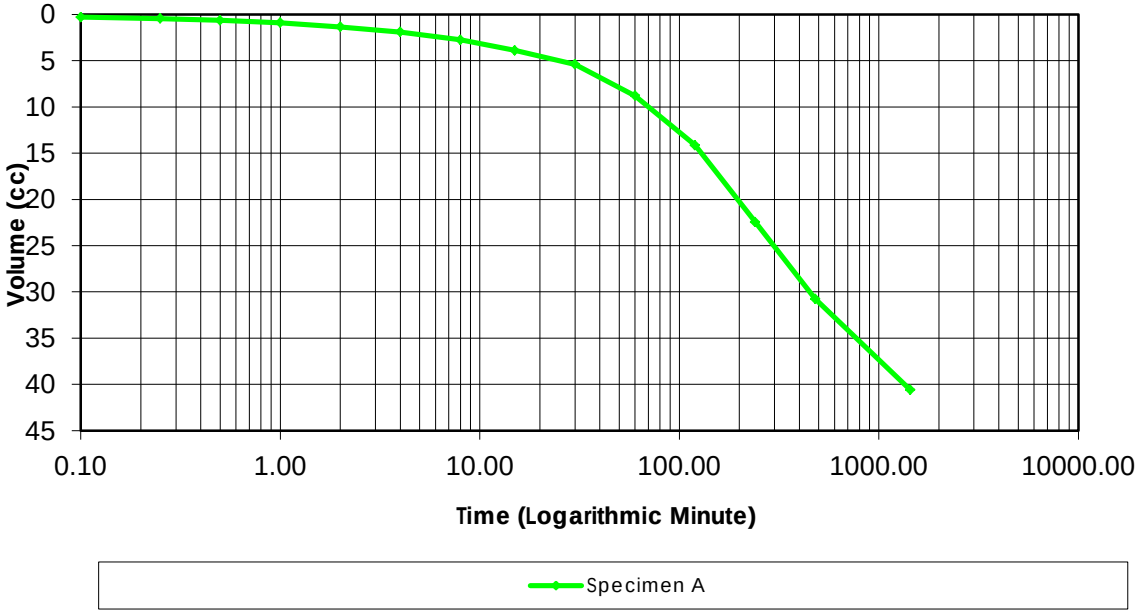

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 0.88 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 60.0 | 20.0 | 0.0 | 0.95 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 4.40-4.71m

| | |
|---|---|
| Cell Pressure (kPa) | 660 |
| Back Pressure (kPa) | 60 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.6 |
| Initial Sample Height (mm) | 155 |
| Initial Sample Area (cm2) | 41.4 |
| Initial Volume (cm3) | 641.6 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 46.95 | N/A |
| 00:00:06 | 46.65 | 0.300 |
| 00:00:15 | 46.50 | 0.450 |
| 00:00:30 | 46.30 | 0.650 |
| 00:01:00 | 46.05 | 0.900 |
| 00:02:00 | 45.60 | 1.350 |
| 00:04:00 | 45.05 | 1.900 |
| 00:08:00 | 44.20 | 2.750 |
| 00:15:00 | 43.05 | 3.900 |
| 00:30:00 | 41.55 | 5.400 |
| 01:00:00 | 38.15 | 8.800 |
| 02:00:00 | 32.80 | 14.150 |
| 04:00:00 | 24.50 | 22.450 |
| 08:00:00 | 16.20 | 30.750 |
| 24:00:00 | 6.35 | 40.600 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

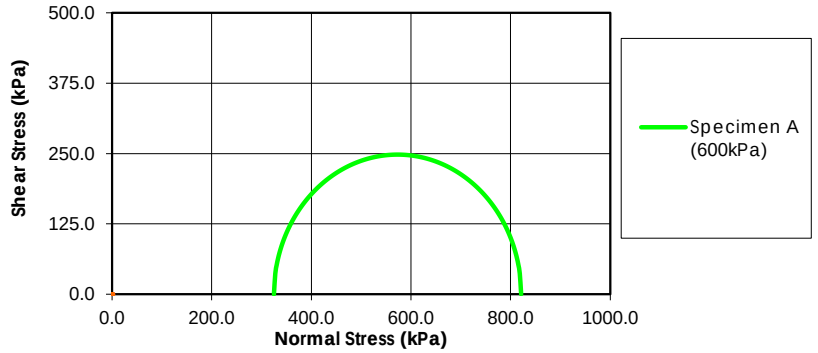
Stantec

Reviewed By C. Lamoureux

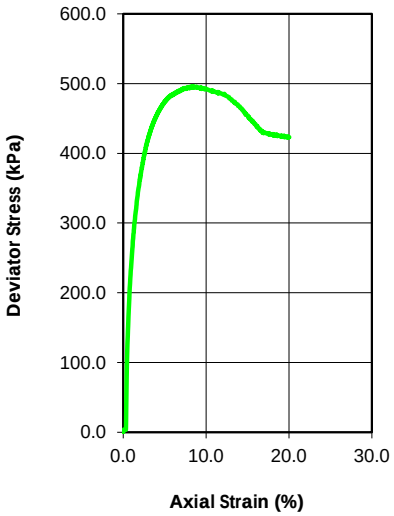
Date: 10-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.1 | | | |
| Dry Density (g/cm3) | 1.589 | | | |
| Saturation (%) | 97.11 | | | |
| Void Ratio | 0.699 | | | |
| Diameter (mm) | 73.100 | | | |
| Height (mm) | 154.800 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 20.9 | | | |
| Dry Density (g/cm3) | 1.704 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.584 | | | |
| Effective Stress (kPa) | 598.8 | | | |
| Back Press. (kPa) | 61.2 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

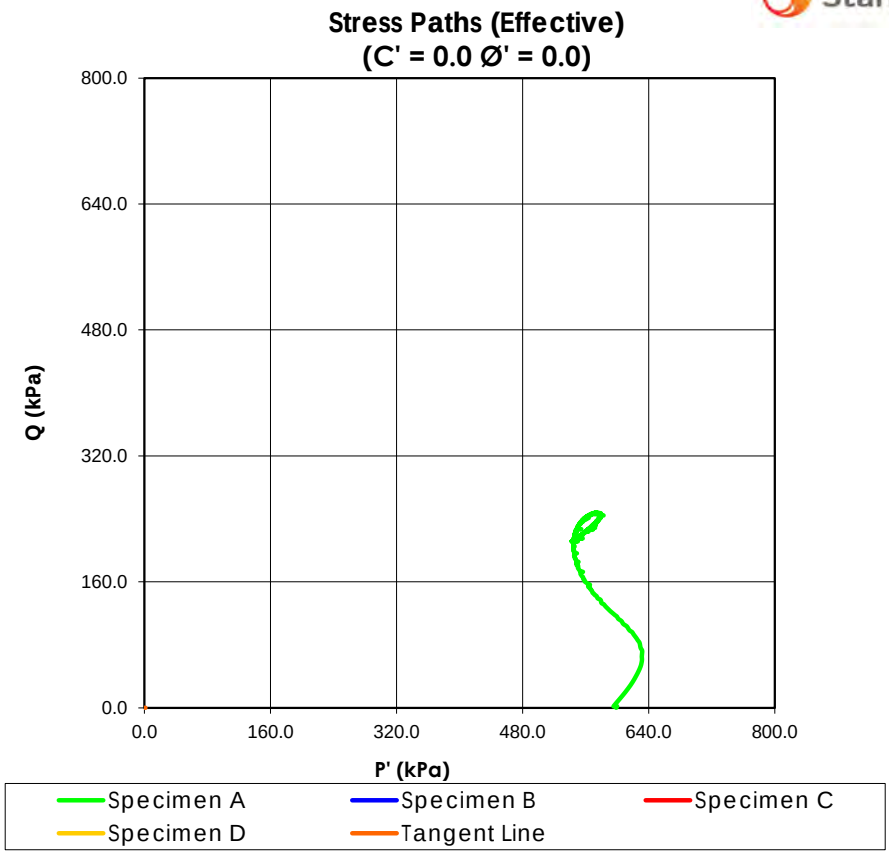
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 821.10 | | | |
| σ'3 at Failure (kPa) | 324.97 | | | |
| | | | | |
| | | | | |

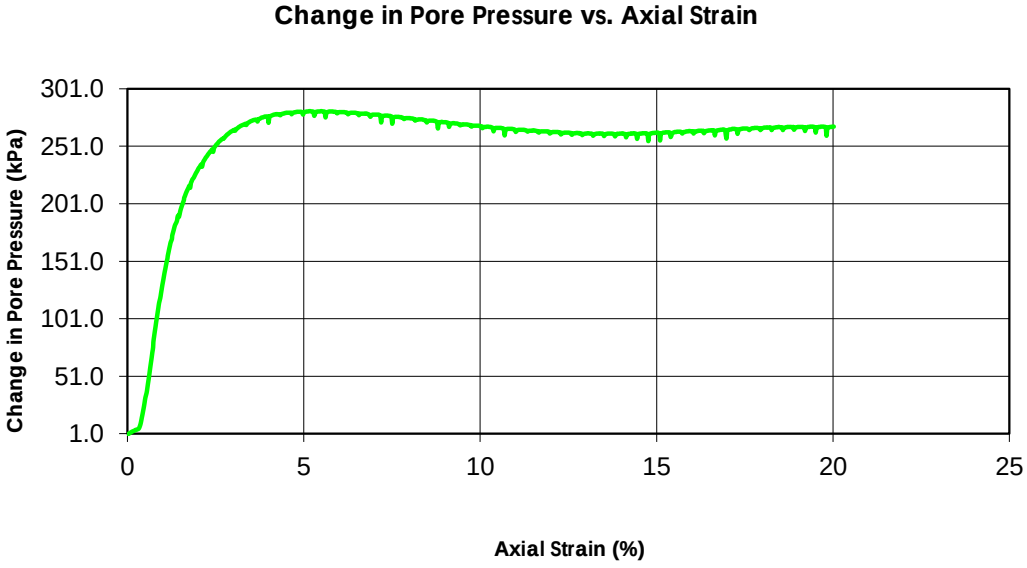
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 10773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D27 ST17 |
| **Depth:** | 9.10-9.56m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

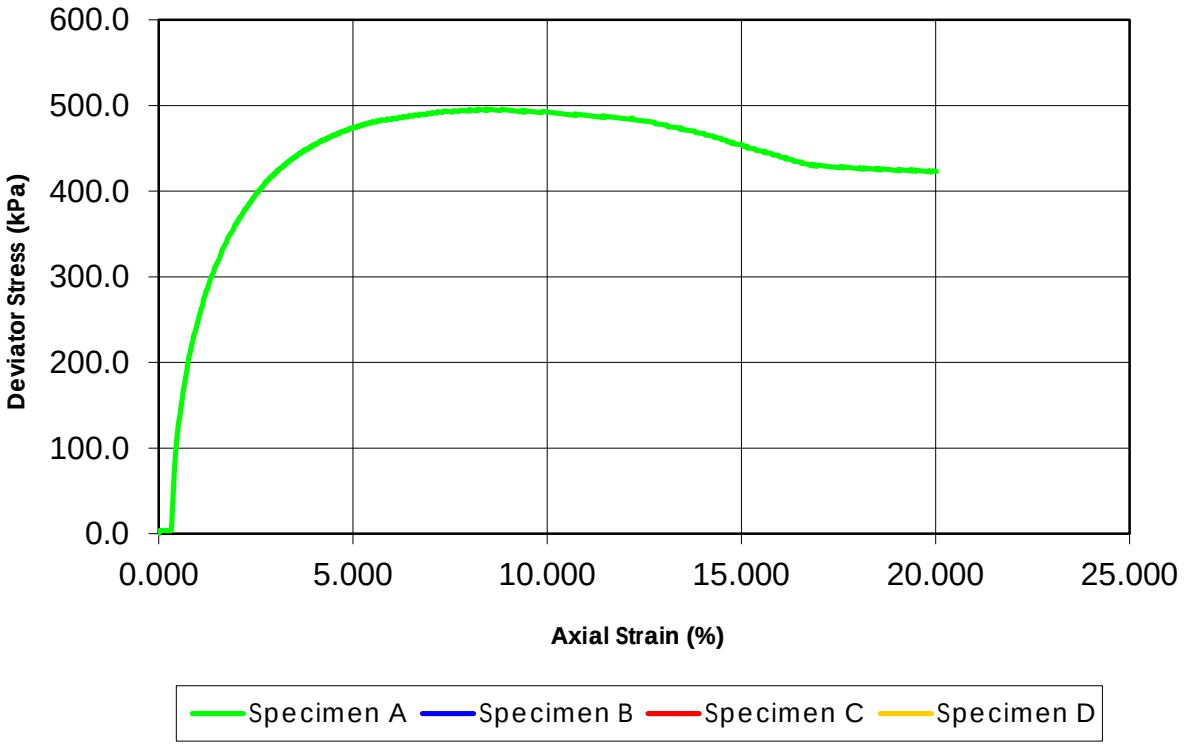
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

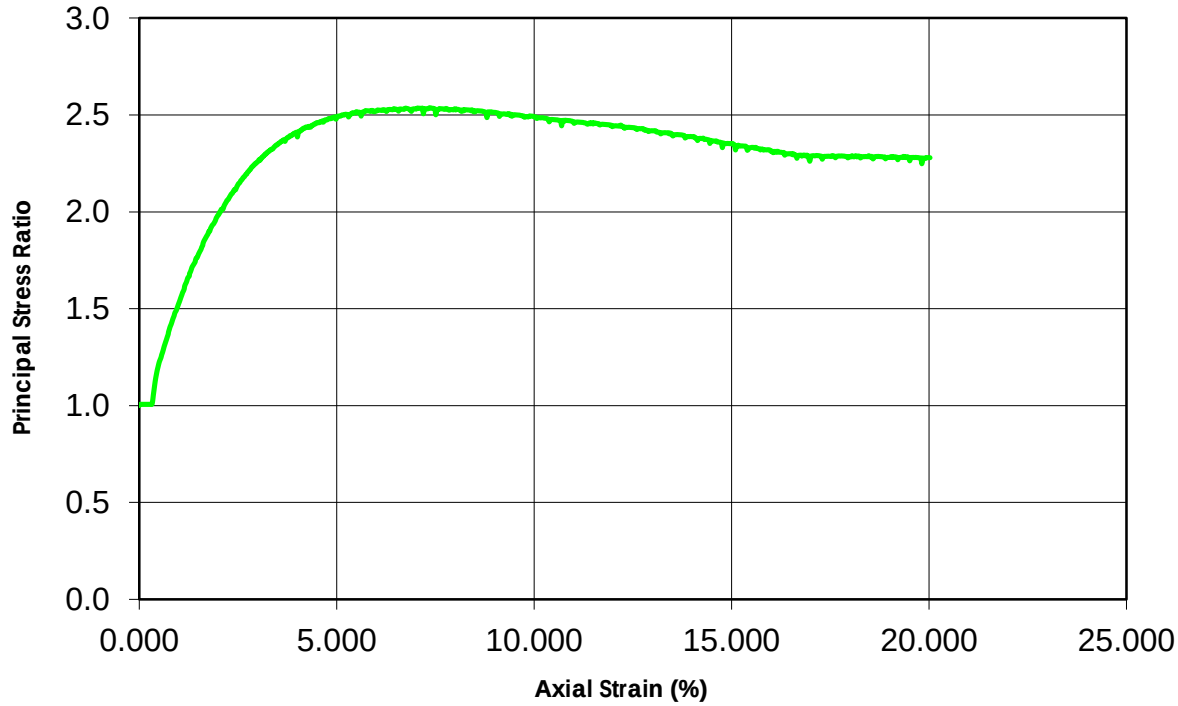


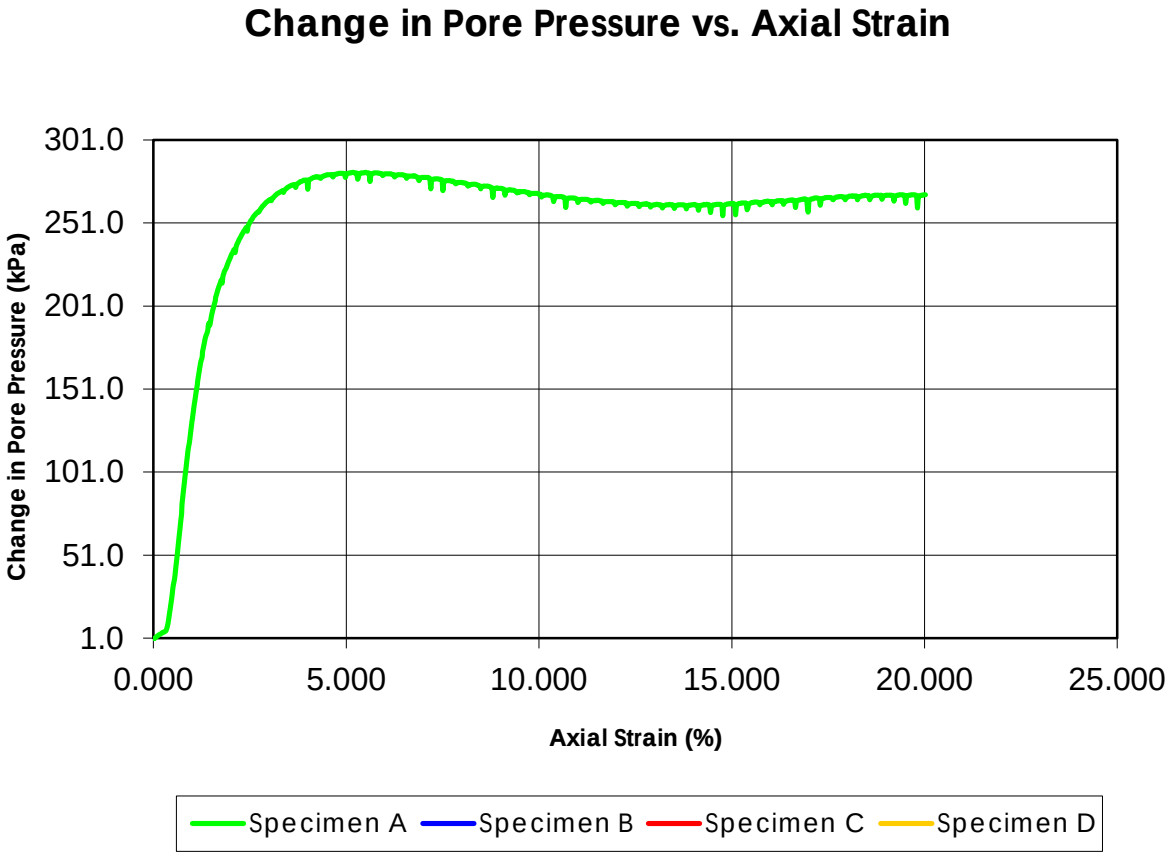



## Deviator Stress vs. Axial Strain



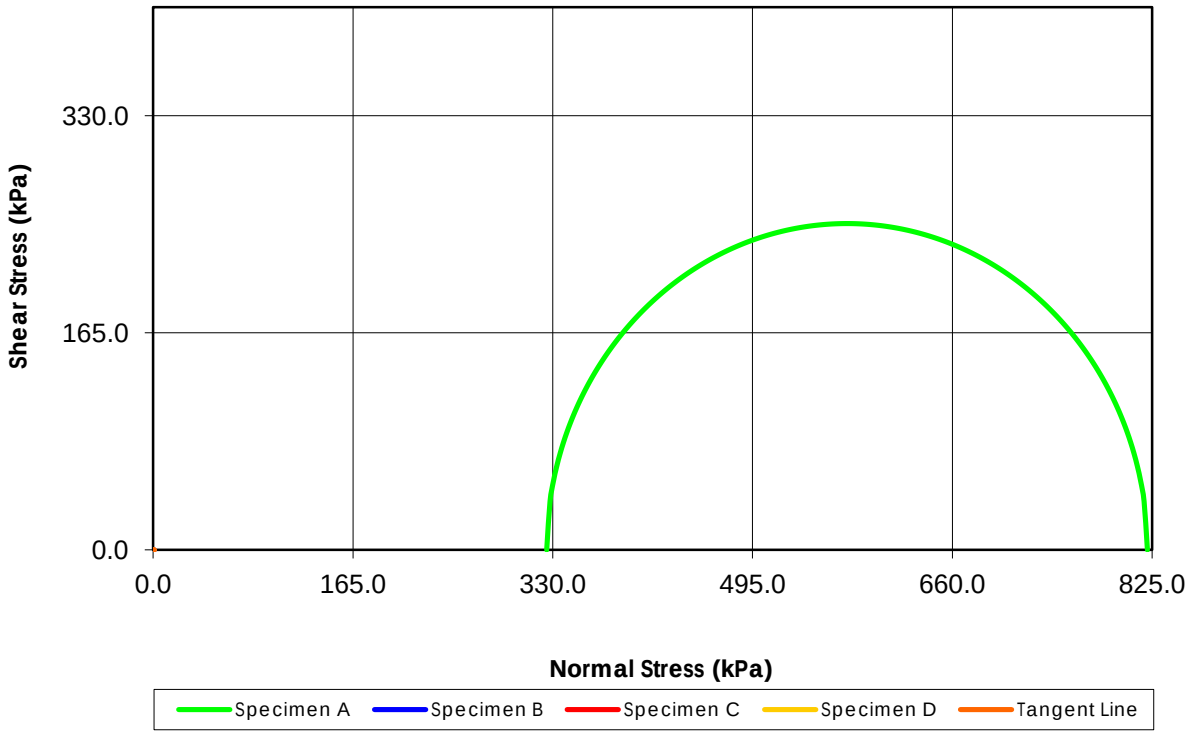

## Principal Stress Ratio vs. Axial Strain



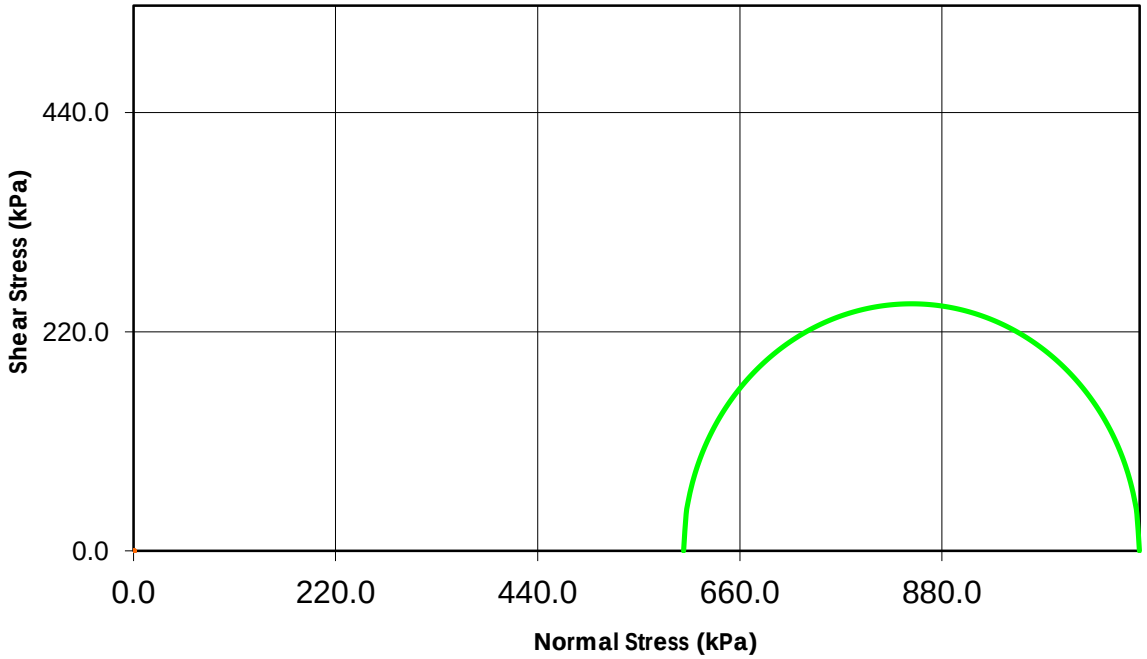

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
301.0
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

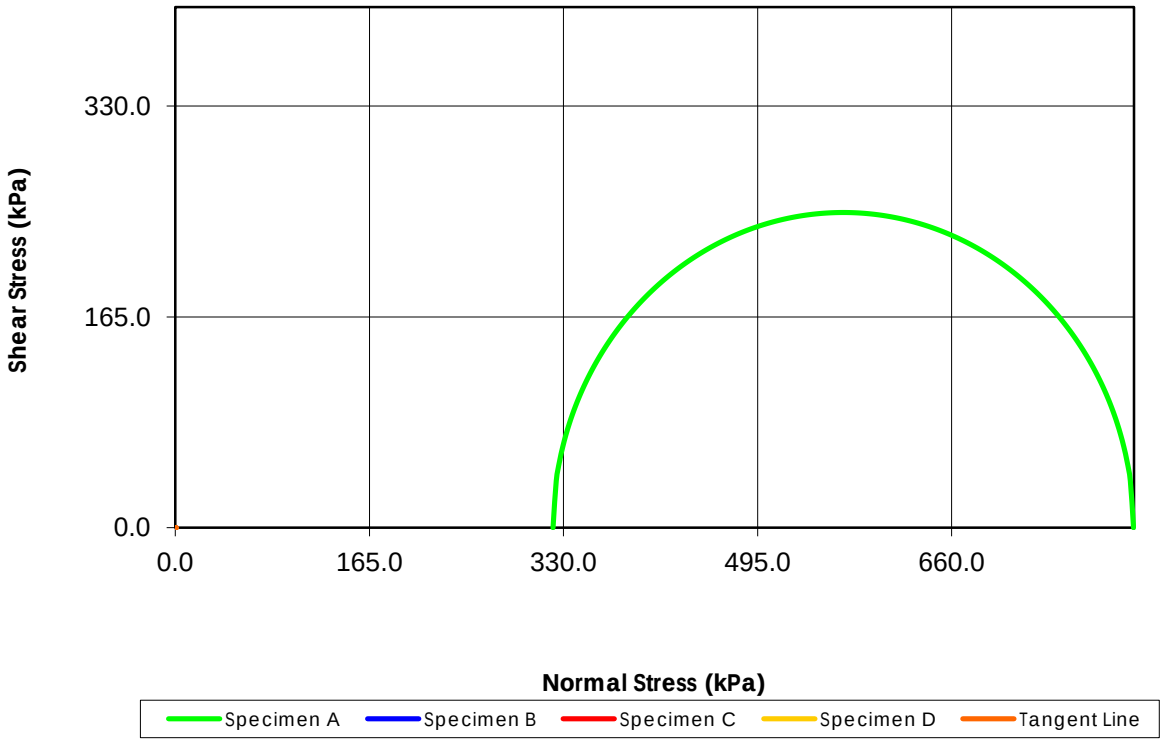



### Total Stress
### (C = 0.0 Ø = 0.0)

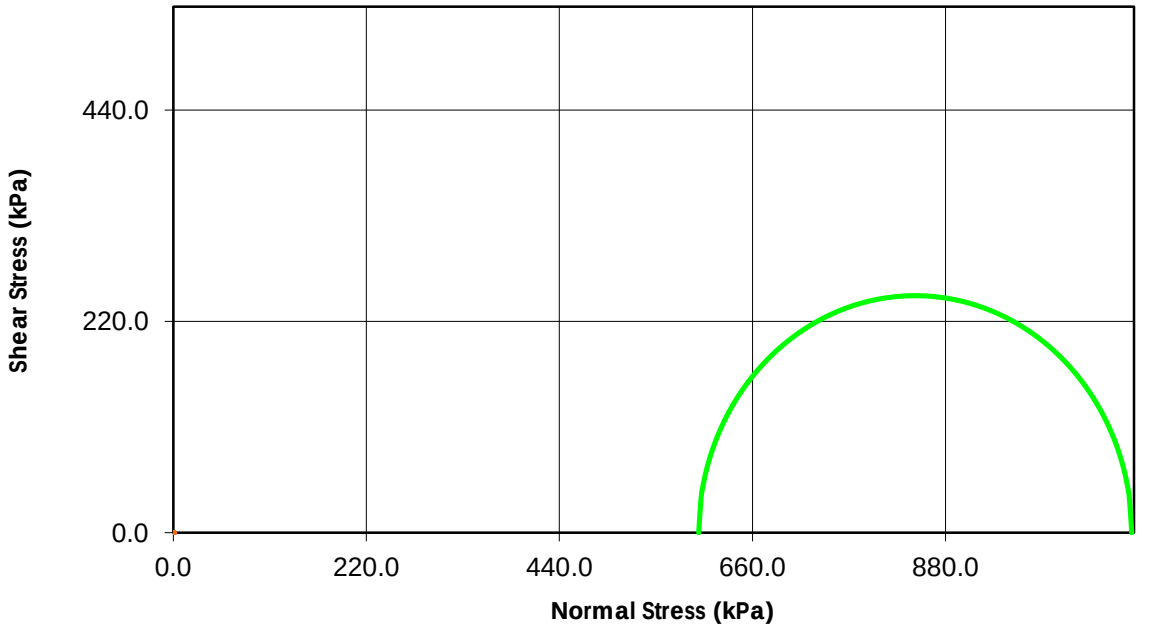


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

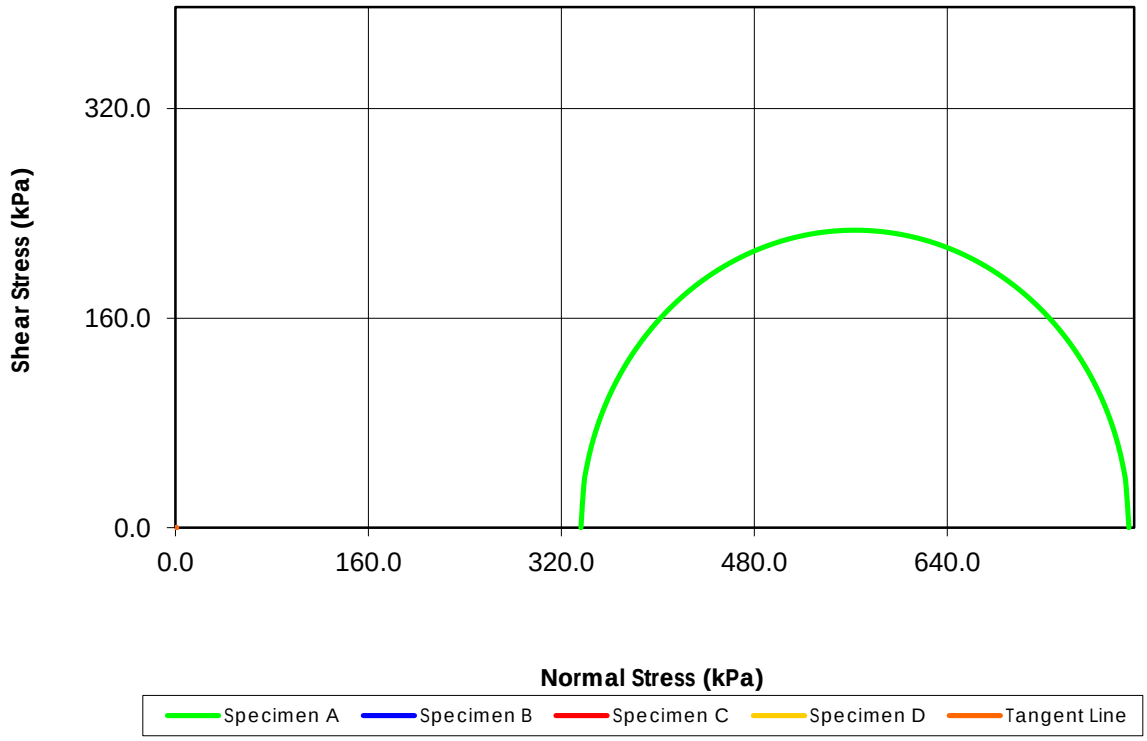



## Total Stress
## (C = 0.0 Ø = 0.0)

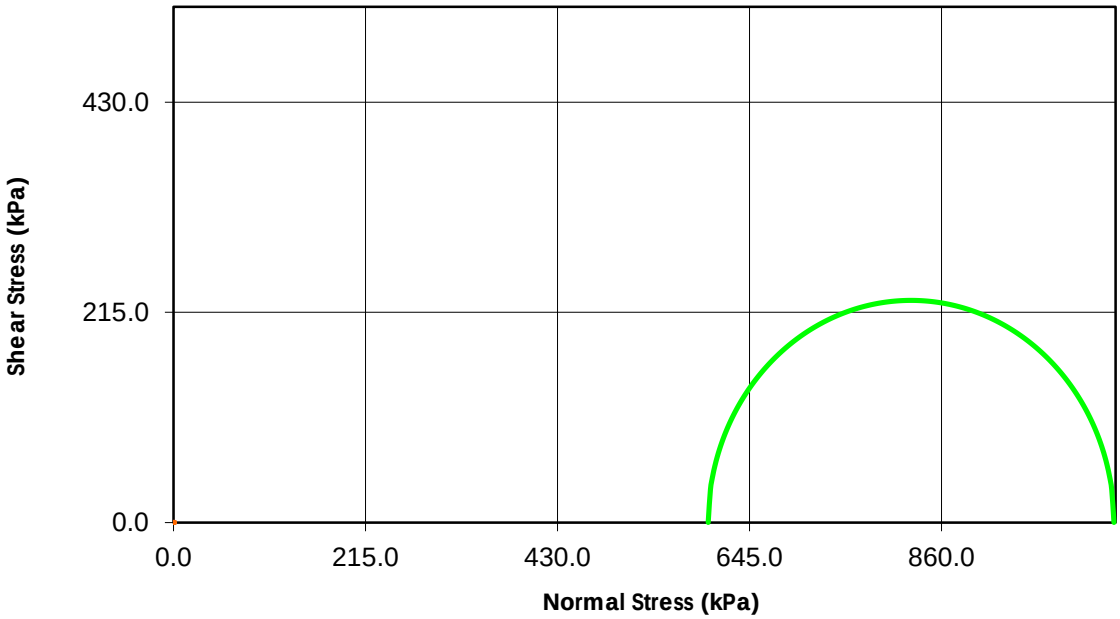


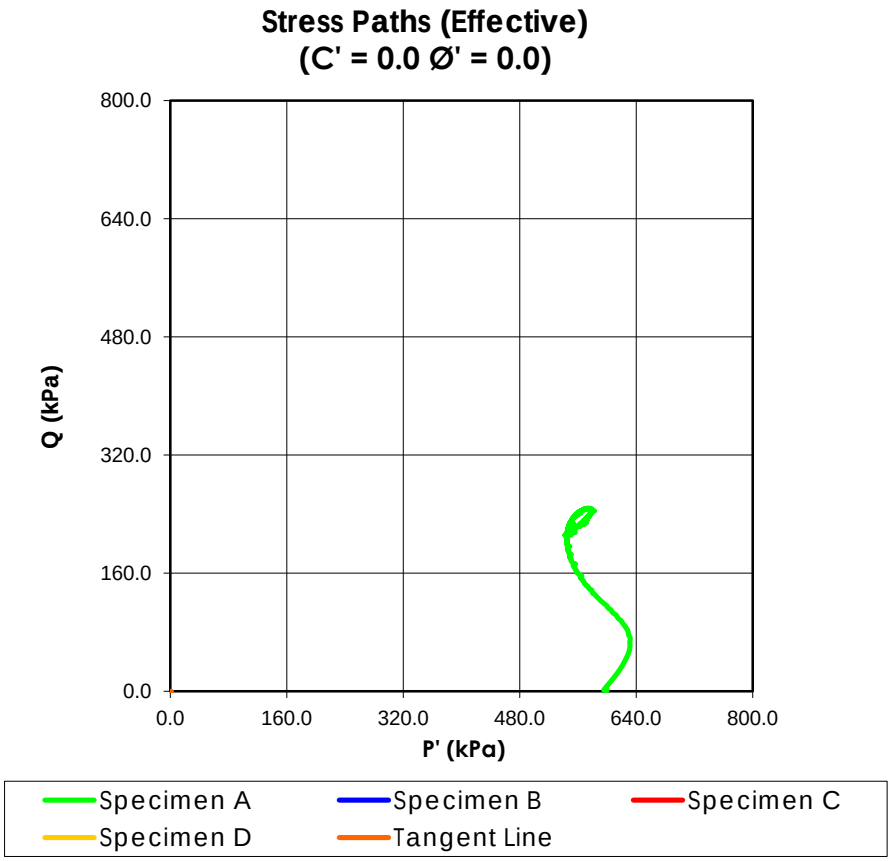
# Mohr Stress Circles at 15% Axial Strain Criterion

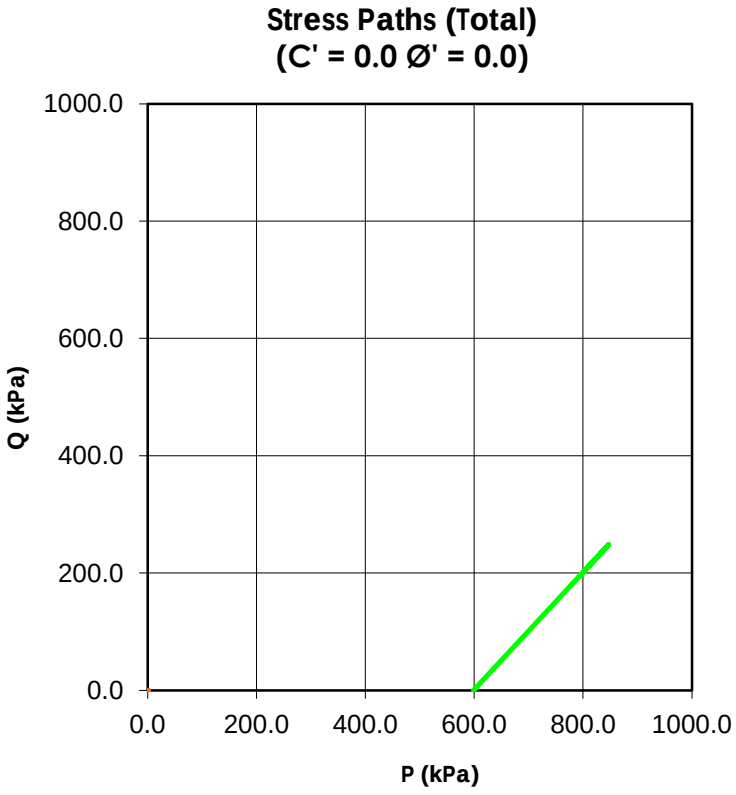
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

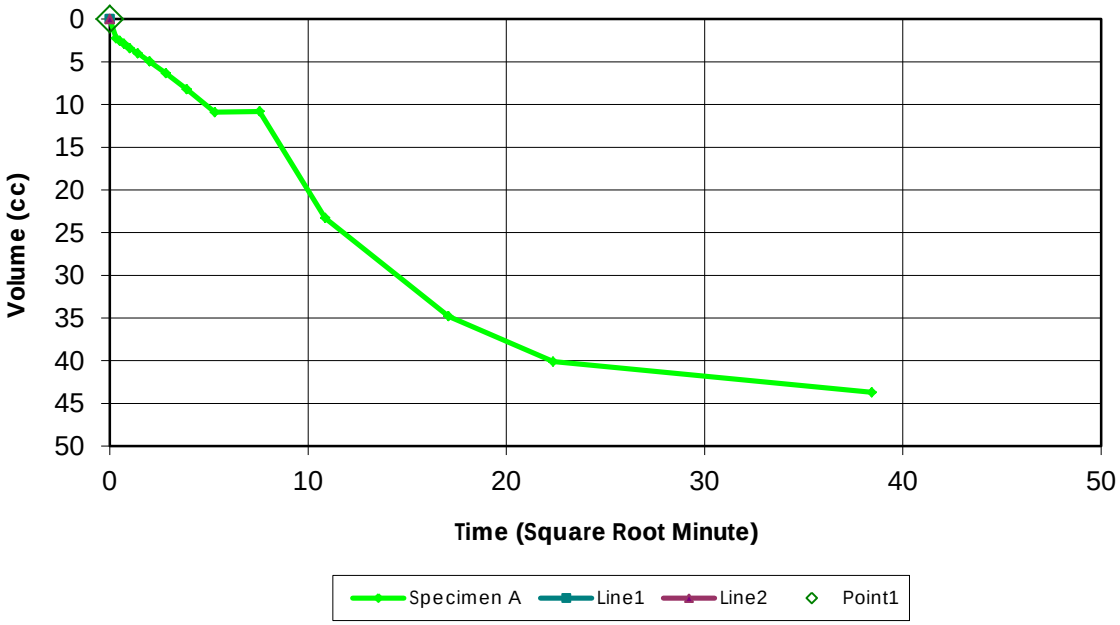



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

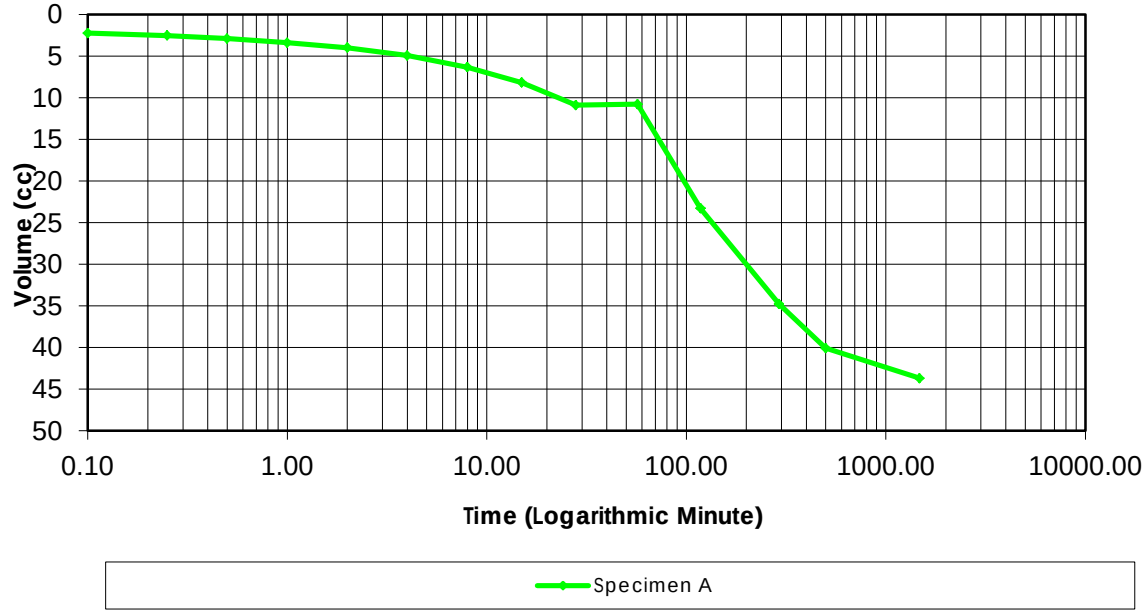

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 10773396.302.70

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.97

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 80.00 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 60.0 | 20.0 | 0.0 | 97.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 10773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 9.10-9.56m

| | |
|---|---|
| Cell Pressure (kPa) | 660 |
| Back Pressure (kPa) | 60 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 73.1 |
| Initial Sample Height (mm) | 154.8 |
| Initial Sample Area (cm2) | 41.97 |
| Initial Volume (cm3) | 649.7 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 46.30 | N/A |
| 00:00:06 | 44.05 | 2.250 |
| 00:00:15 | 43.75 | 2.550 |
| 00:00:30 | 43.40 | 2.900 |
| 00:01:00 | 42.90 | 3.400 |
| 00:02:00 | 42.30 | 4.000 |
| 00:04:00 | 41.35 | 4.950 |
| 00:08:00 | 39.95 | 6.350 |
| 00:15:00 | 38.10 | 8.200 |
| 00:28:00 | 35.40 | 10.900 |
| 00:57:00 | 35.50 | 10.800 |
| 01:58:00 | 23.00 | 23.300 |
| 04:52:00 | 11.50 | 34.800 |
| 08:20:00 | 6.20 | 40.100 |
| 24:37:00 | 2.60 | 43.700 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

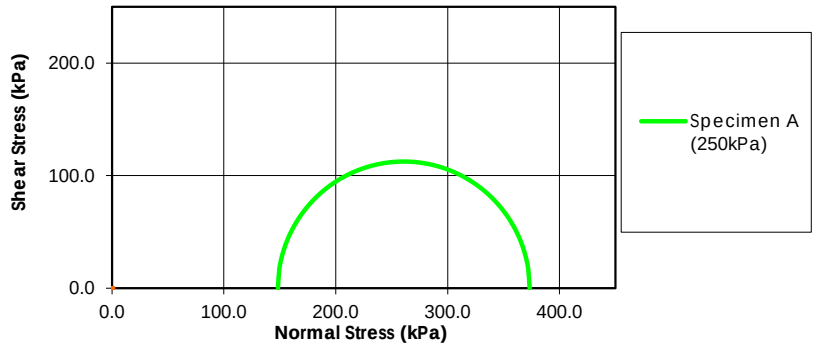
Stantec

Reviewed By C. Lamoureux

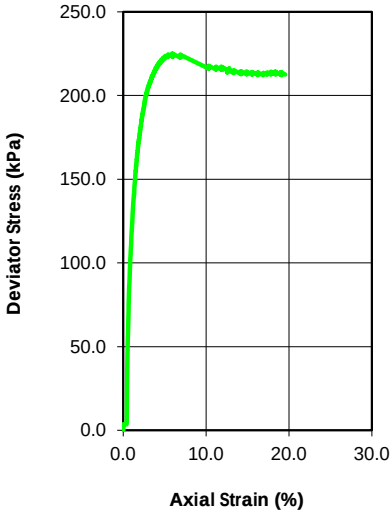
Date: 25-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 24.7 | | | |
| Dry Density (g/cm3) | 1.654 | | | |
| Saturation (%) | 105.46 | | | |
| Void Ratio | 0.633 | | | |
| Diameter (mm) | 73.000 | | | |
| Height (mm) | 154.400 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 21.7 | | | |
| Dry Density (g/cm3) | 1.723 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.567 | | | |
| Effective Stress (kPa) | 243.0 | | | |
| Back Press. (kPa) | 117.0 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

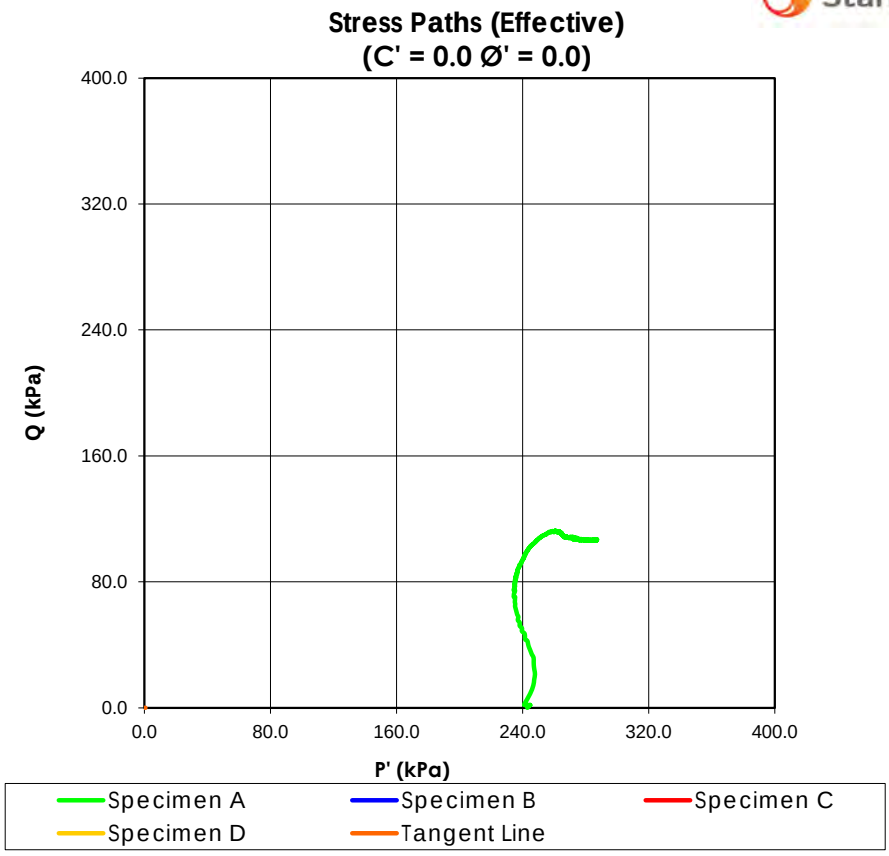
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 373.33 | | | |
| σ'3 at Failure (kPa) | 148.27 | | | |
| | | | | |
| | | | | |

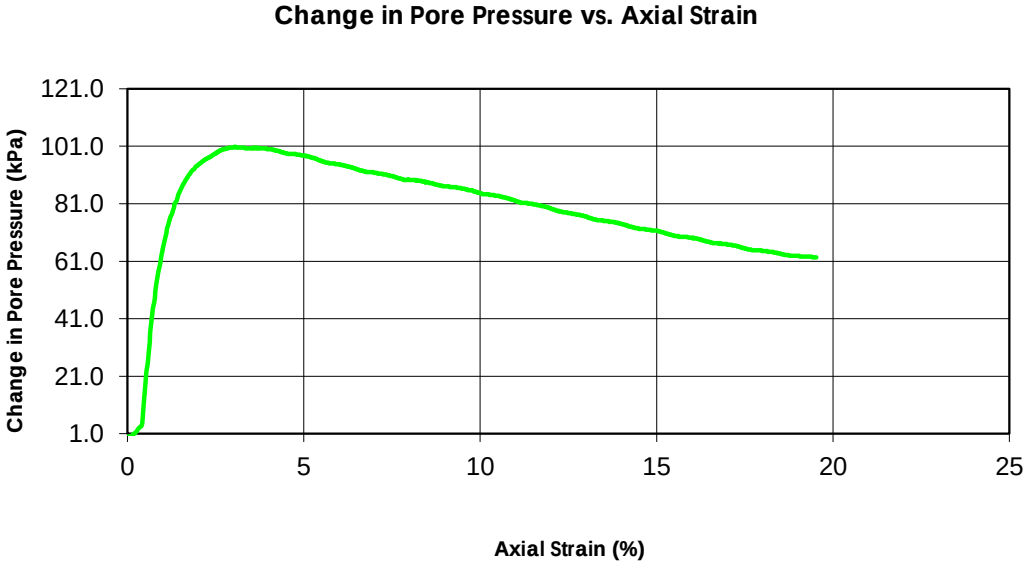
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D28 ST4 |
| **Depth:** | 1.7-2.2m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

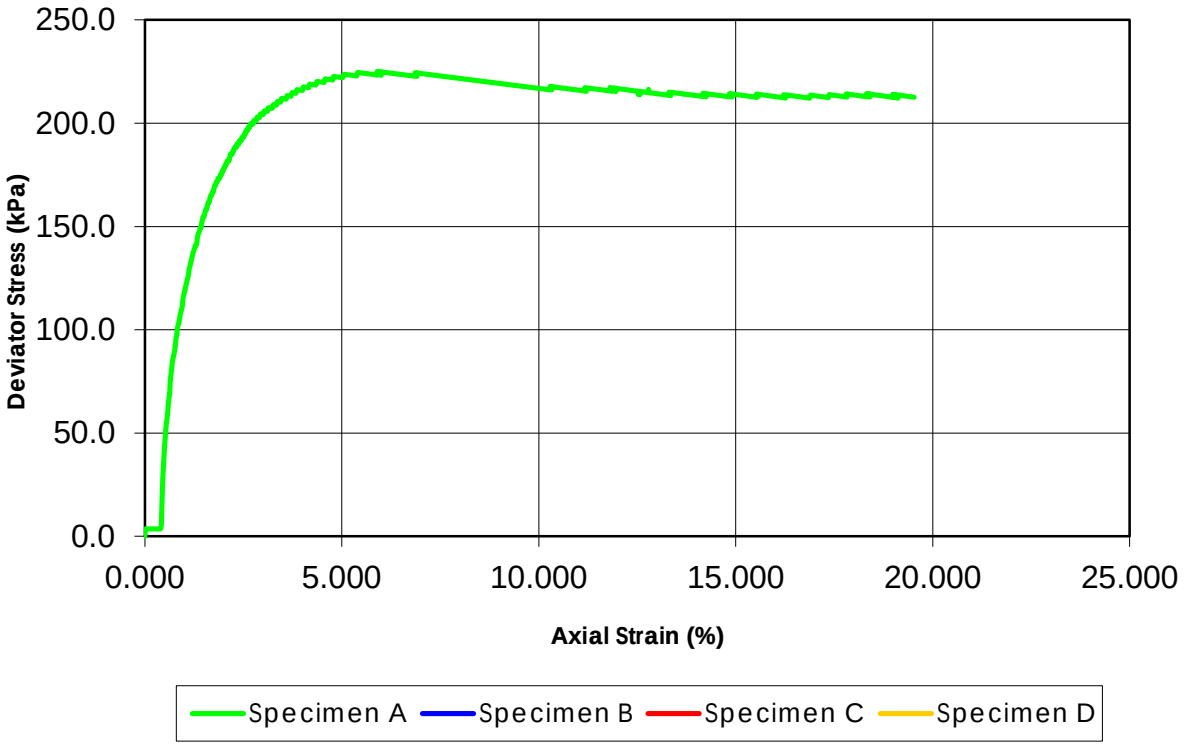
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

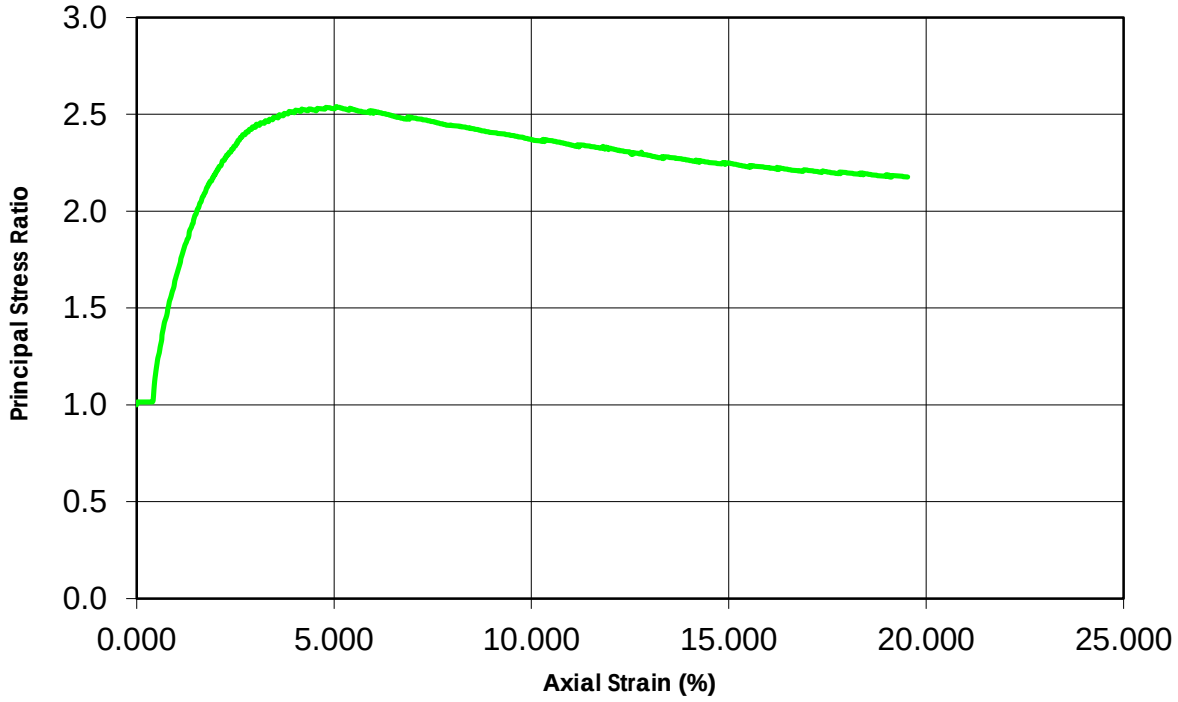


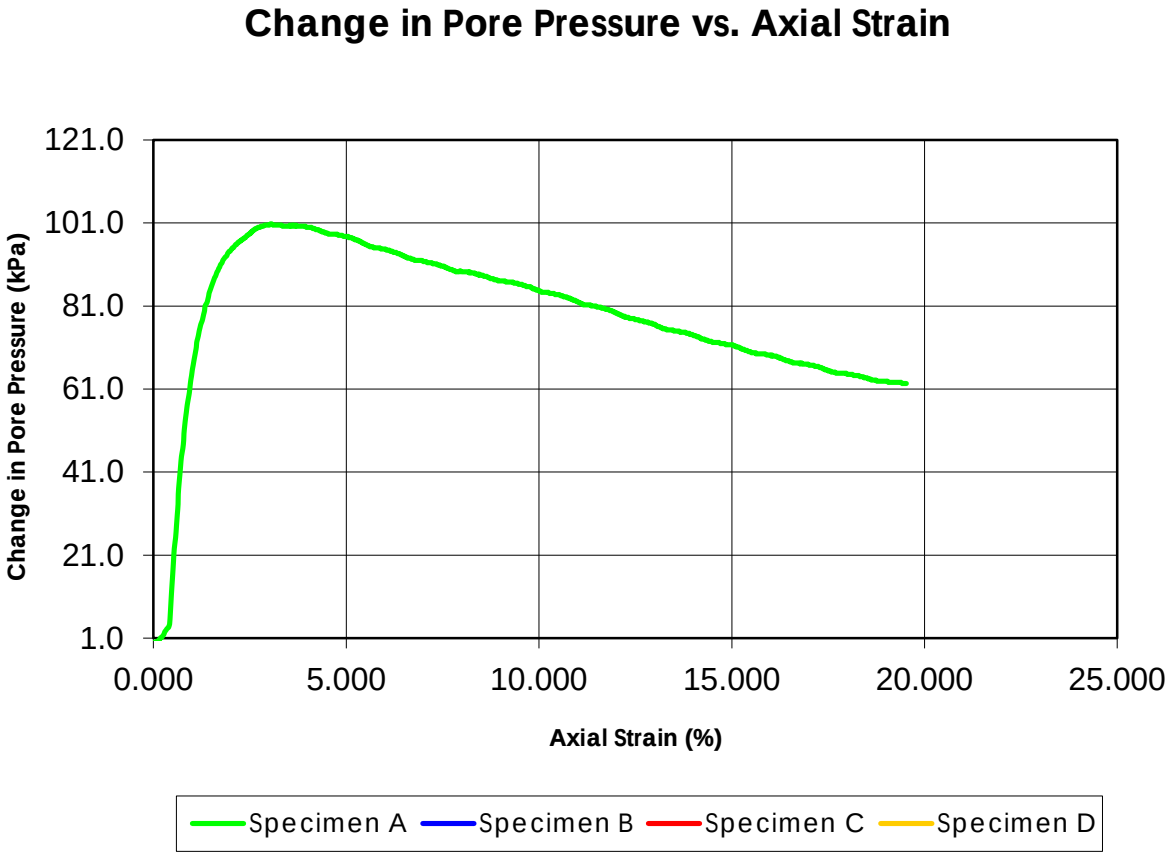



## Deviator Stress vs. Axial Strain



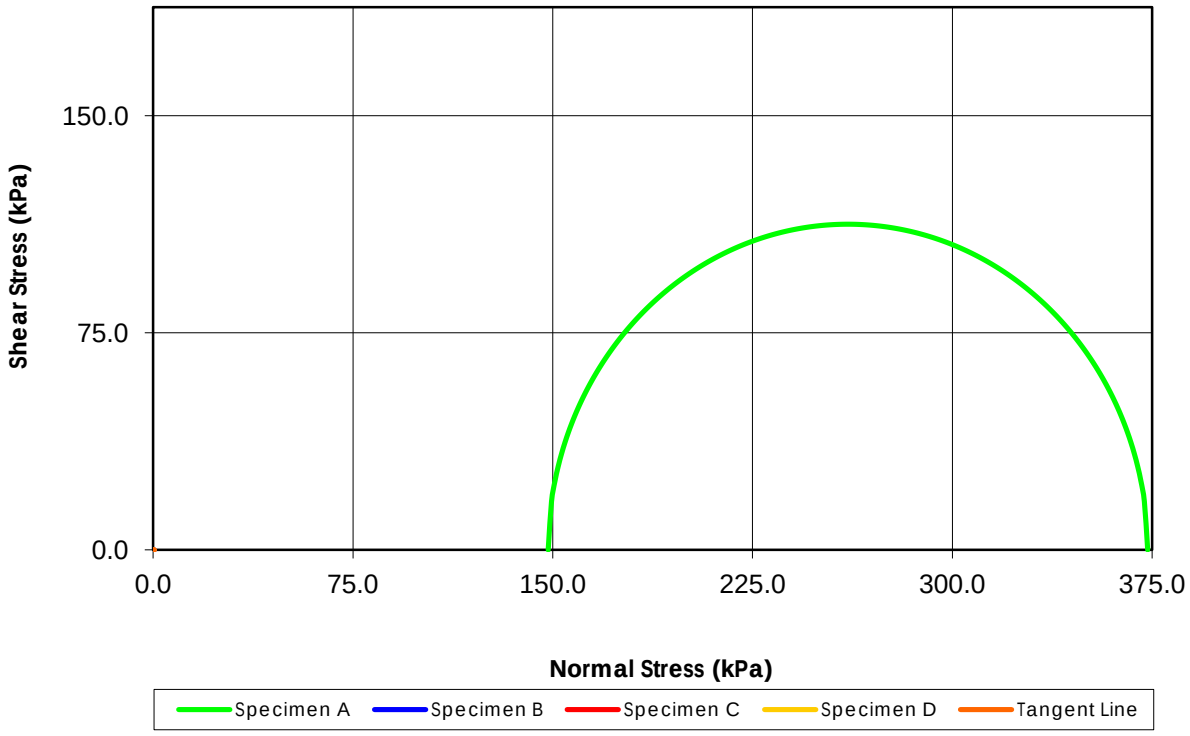

## Principal Stress Ratio vs. Axial Strain



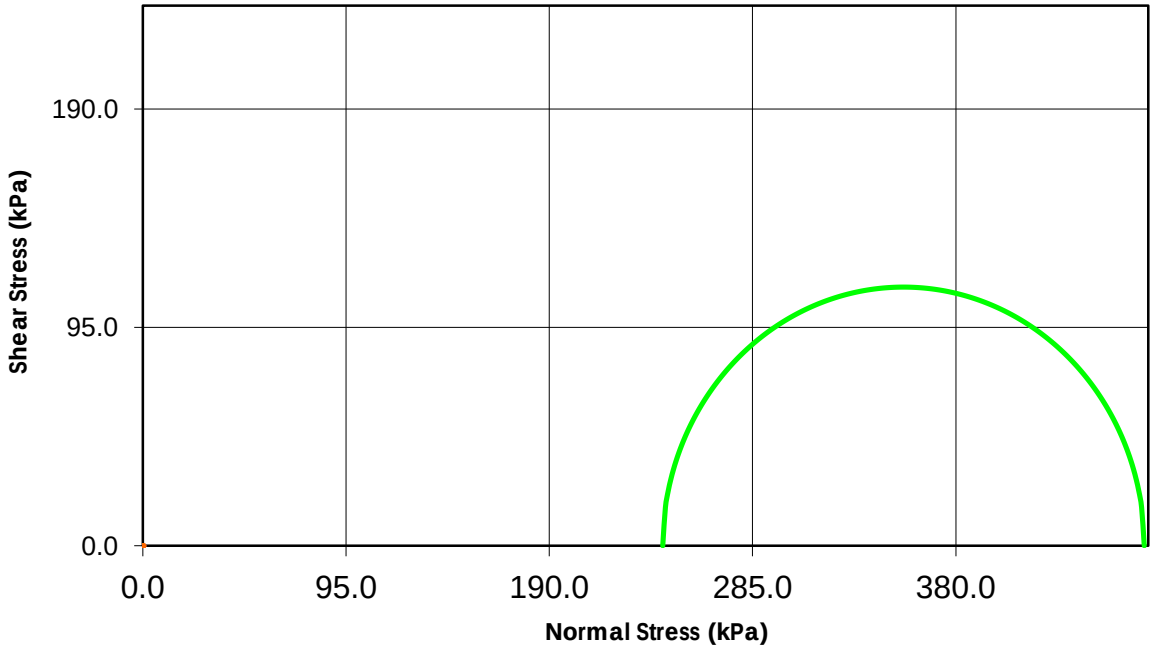

Change in Pore Pressure vs. Axial Strain
121.0
101.0
81.0
61.0
41.0
21.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

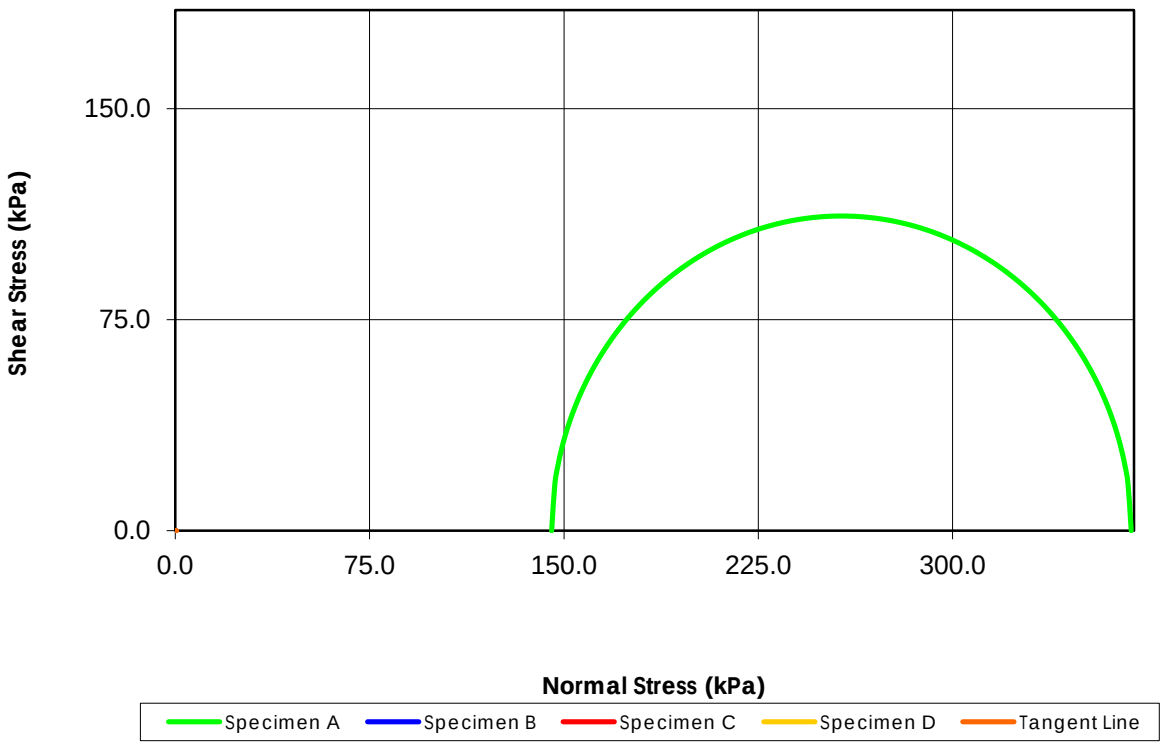



### Total Stress
### (C = 0.0 Ø = 0.0)

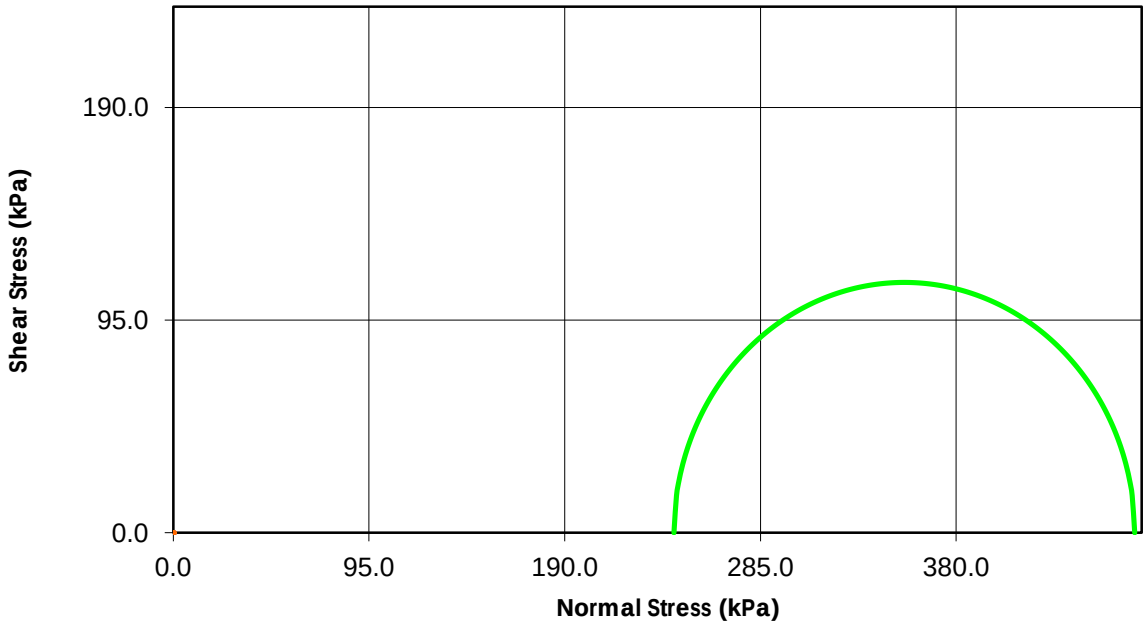


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

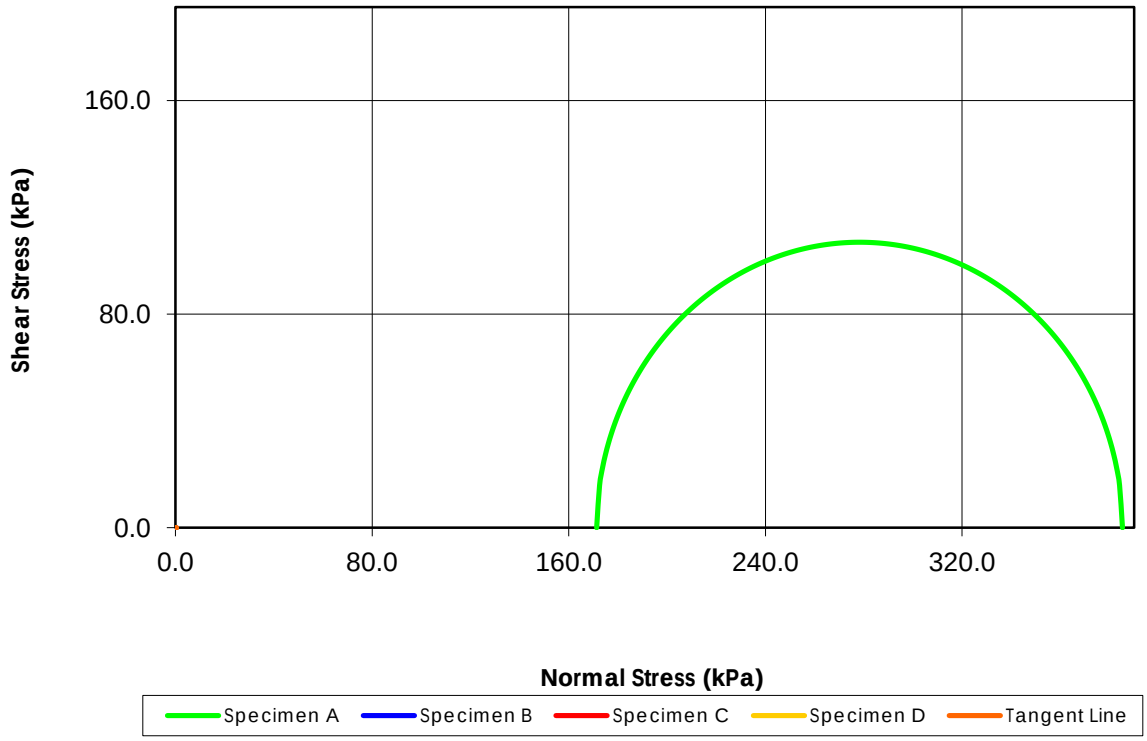



## Total Stress
## (C = 0.0 Ø = 0.0)

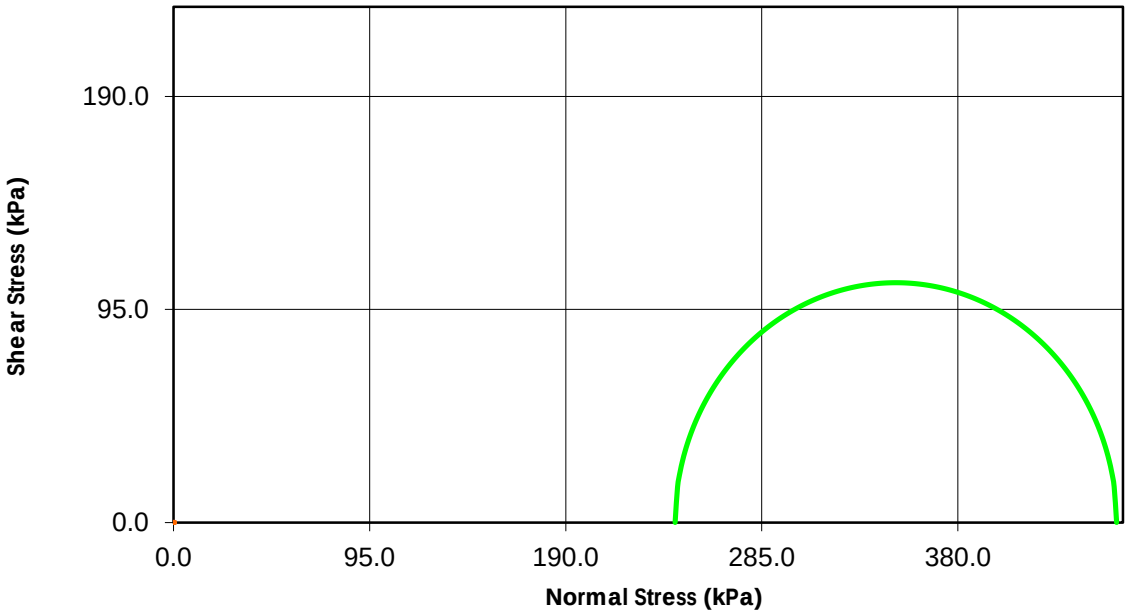


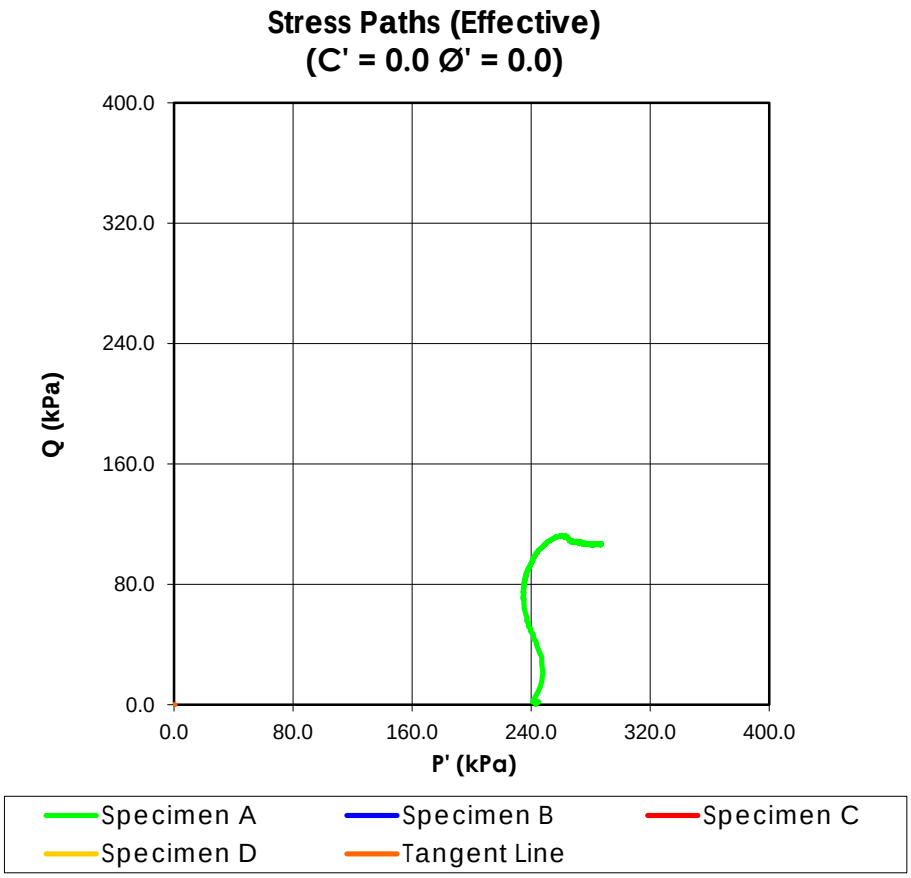
# Mohr Stress Circles at 15% Axial Strain Criterion

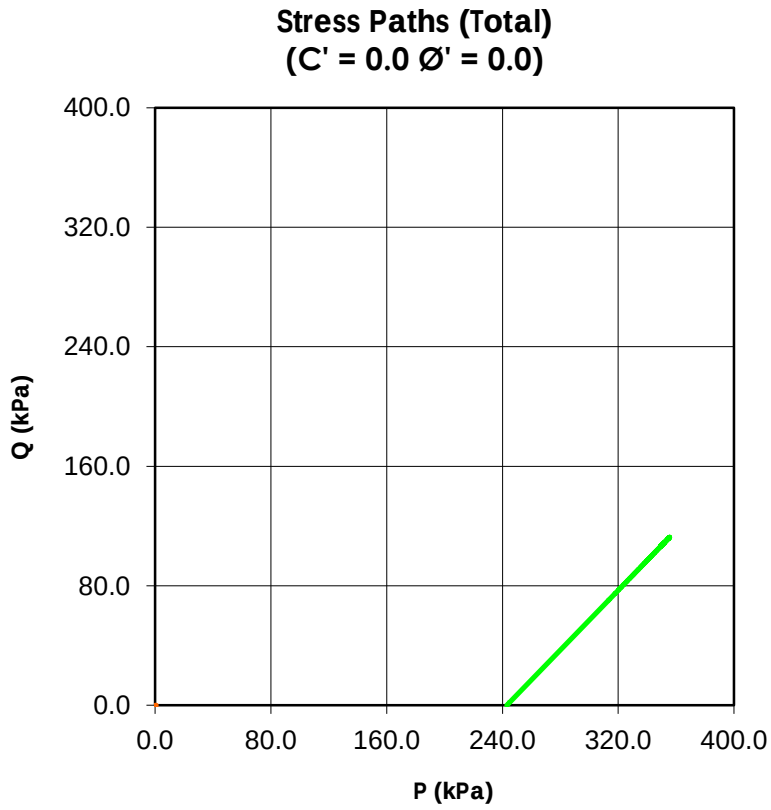
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

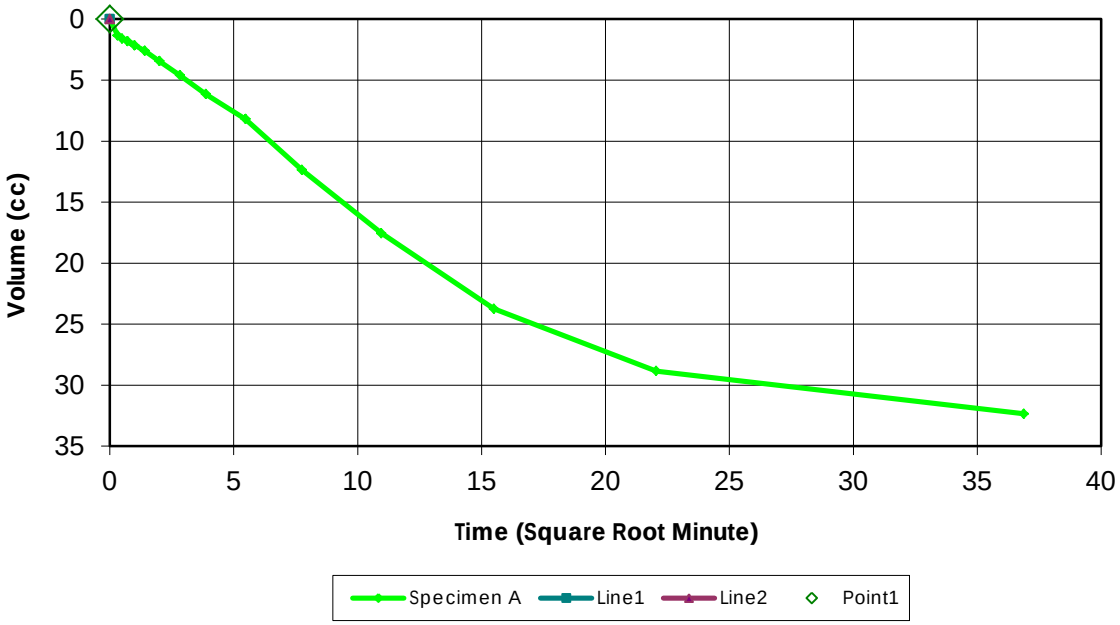



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

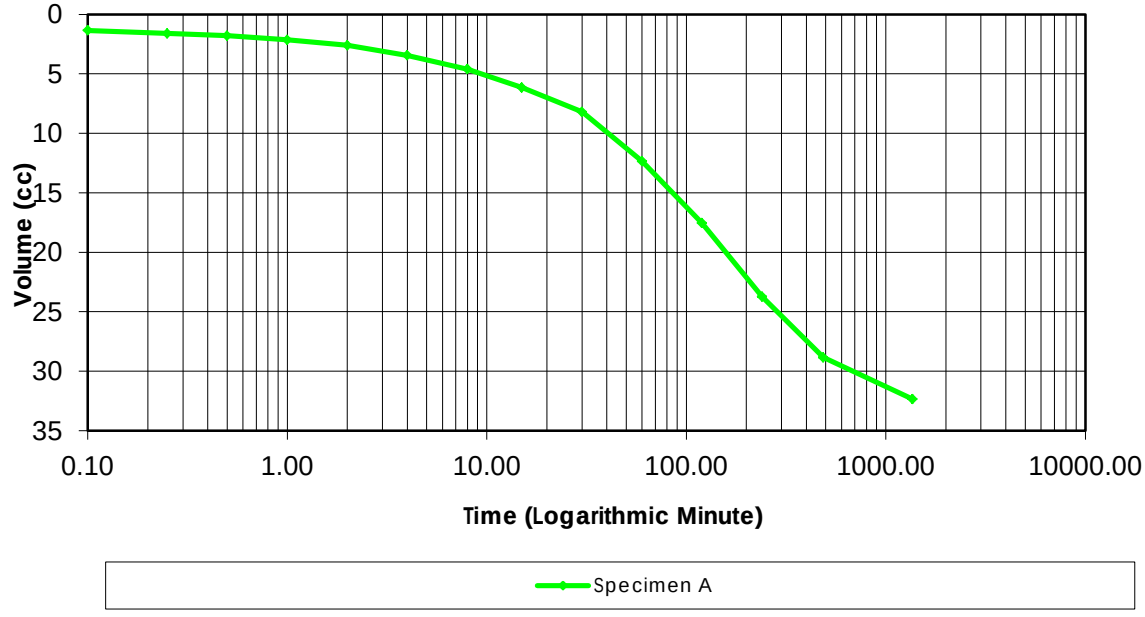

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 130.0 | 40.0 | 70.0 | 0.0 | 38.00 |
| 3 | 130.0 | 110.0 | 0.0 | 70.0 | |
| 4 | 130.0 | 110.0 | 0.0 | 0.0 | |
| 5 | 200.0 | 110.0 | 70.0 | 0.0 | 96.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 1.7-2.2m

| | |
|---|---|
| Cell Pressure (kPa) | 360 |
| Back Pressure (kPa) | 110 |
| Effective Pressure (kPa) | 250 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 73 |
| Initial Sample Height (mm) | 154.4 |
| Initial Sample Area (cm2) | 41.85 |
| Initial Volume (cm3) | 646.2 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 43.05 | N/A |
| 00:00:06 | 41.70 | 1.350 |
| 00:00:15 | 41.45 | 1.600 |
| 00:00:30 | 41.25 | 1.800 |
| 00:01:00 | 40.90 | 2.150 |
| 00:02:00 | 40.45 | 2.600 |
| 00:04:00 | 39.60 | 3.450 |
| 00:08:00 | 38.45 | 4.600 |
| 00:15:00 | 36.90 | 6.150 |
| 00:30:00 | 34.85 | 8.200 |
| 01:00:00 | 30.70 | 12.350 |
| 02:00:00 | 25.50 | 17.550 |
| 04:00:00 | 19.30 | 23.750 |
| 08:06:00 | 14.20 | 28.850 |
| 22:40:00 | 10.70 | 32.350 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

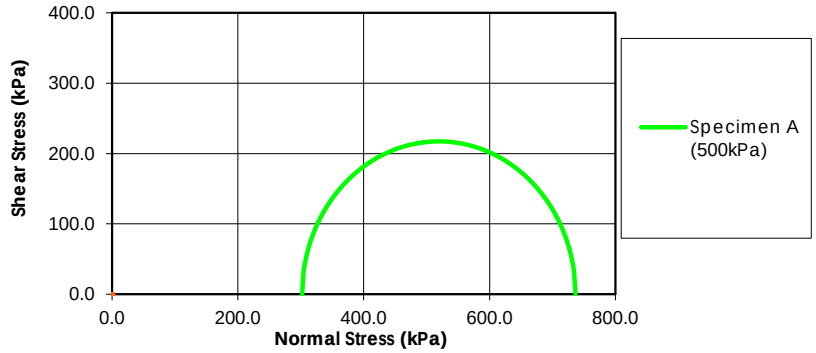
Stantec

Reviewed By C. Lamoureux

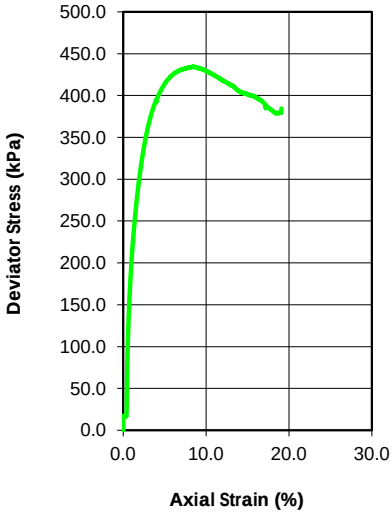
Date: 25-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.7 | | | |
| Dry Density (g/cm3) | 1.609 | | | |
| Saturation (%) | 102.22 | | | |
| Void Ratio | 0.678 | | | |
| Diameter (mm) | 72.600 | | | |
| Height (mm) | 154.400 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 21.0 | | | |
| Dry Density (g/cm3) | 1.666 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.621 | | | |
| Effective Stress (kPa) | 495.8 | | | |
| Back Press. (kPa) | 74.2 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

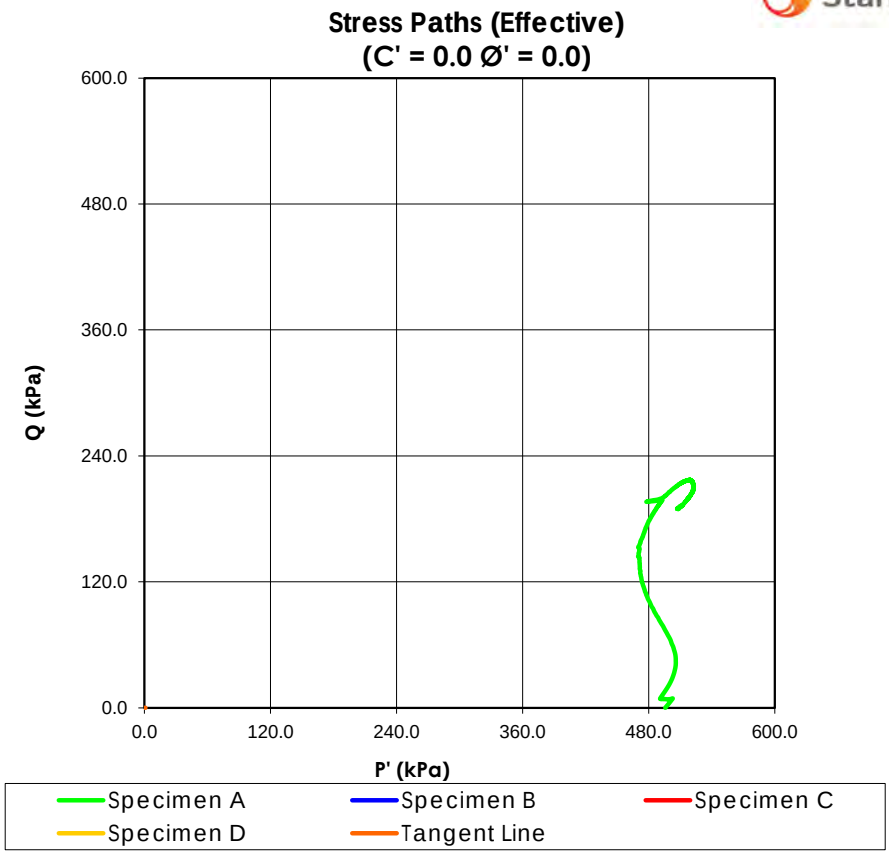
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 736.54 | | | |
| σ'3 at Failure (kPa) | 302.10 | | | |
| | | | | |
| | | | | |

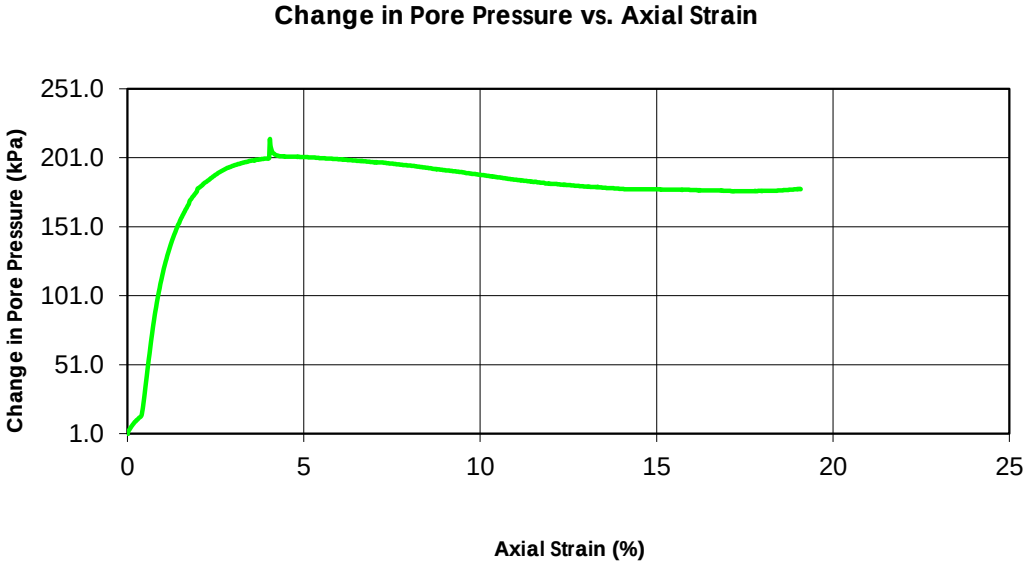
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D28 ST10 |
| **Depth:** | 4.40-4.87m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

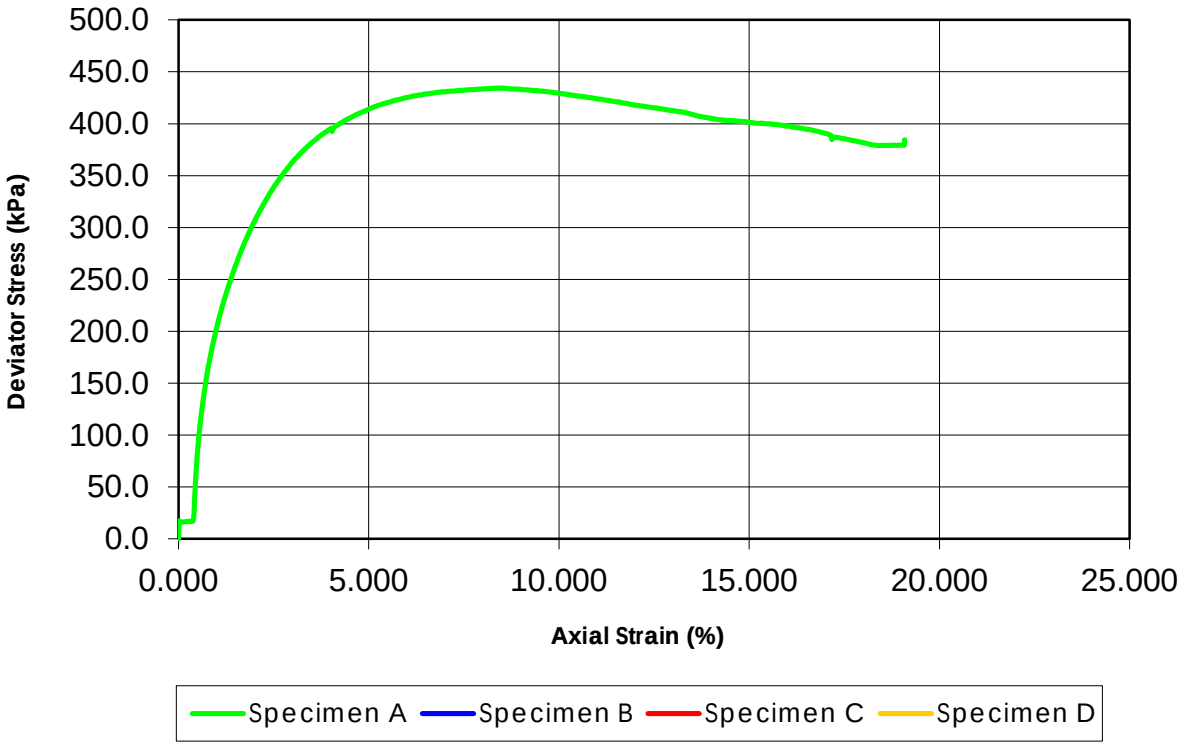
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

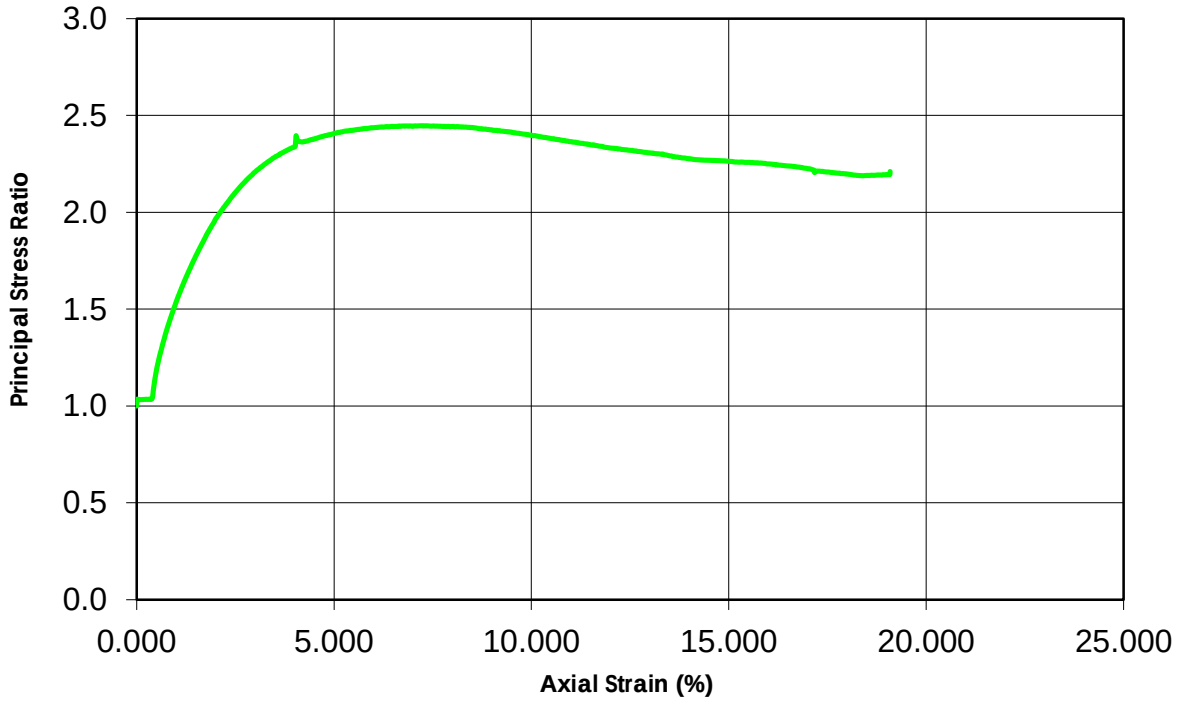


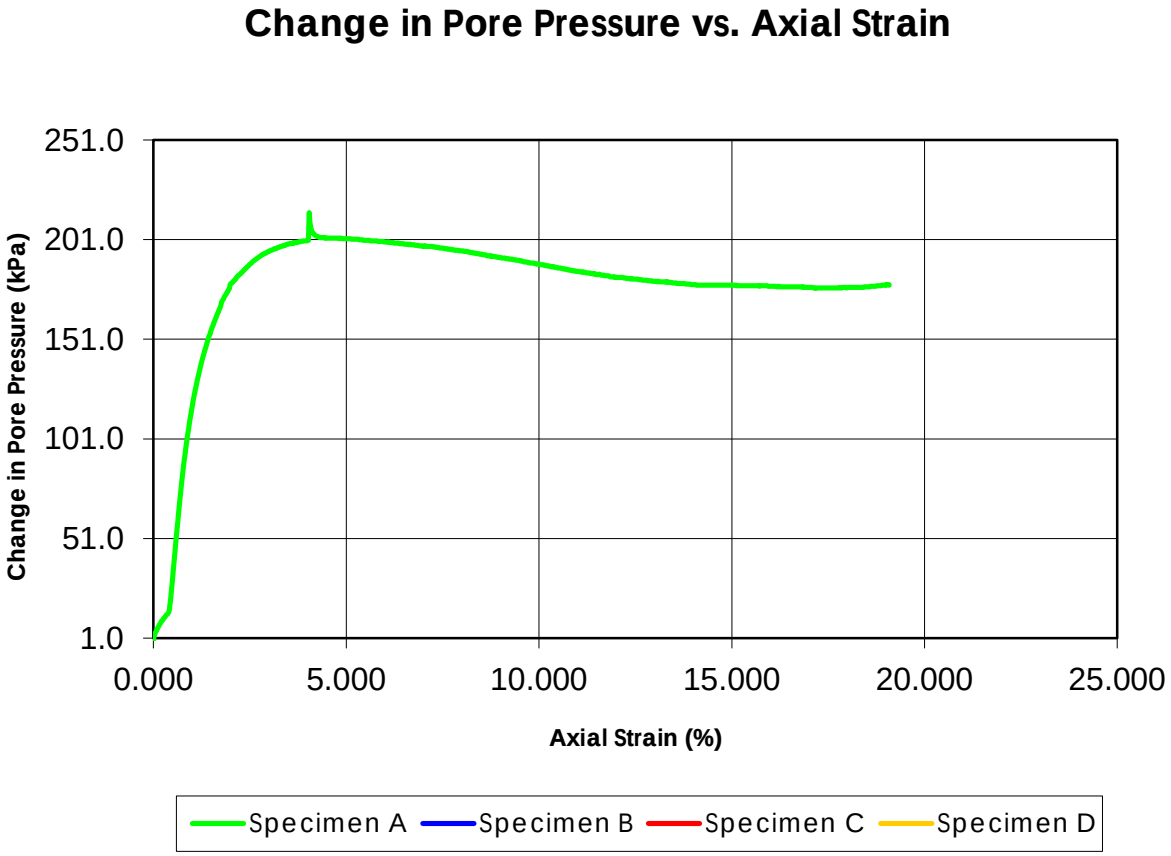



## Deviator Stress vs. Axial Strain



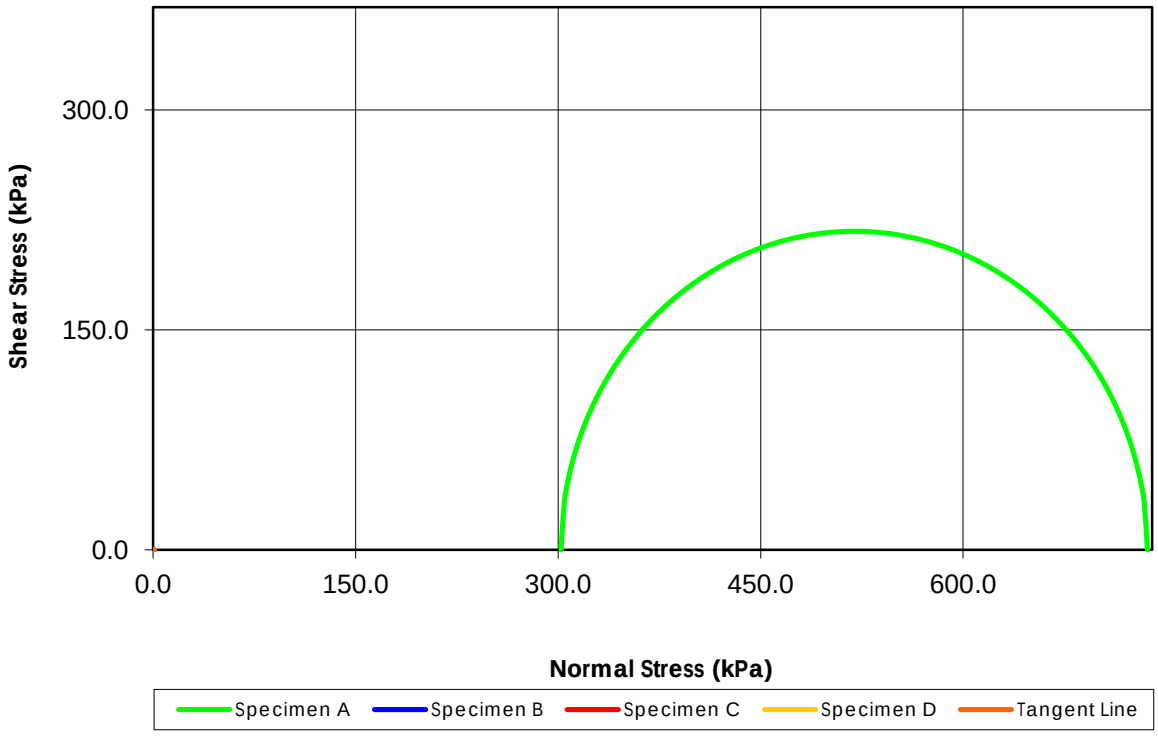

## Principal Stress Ratio vs. Axial Strain



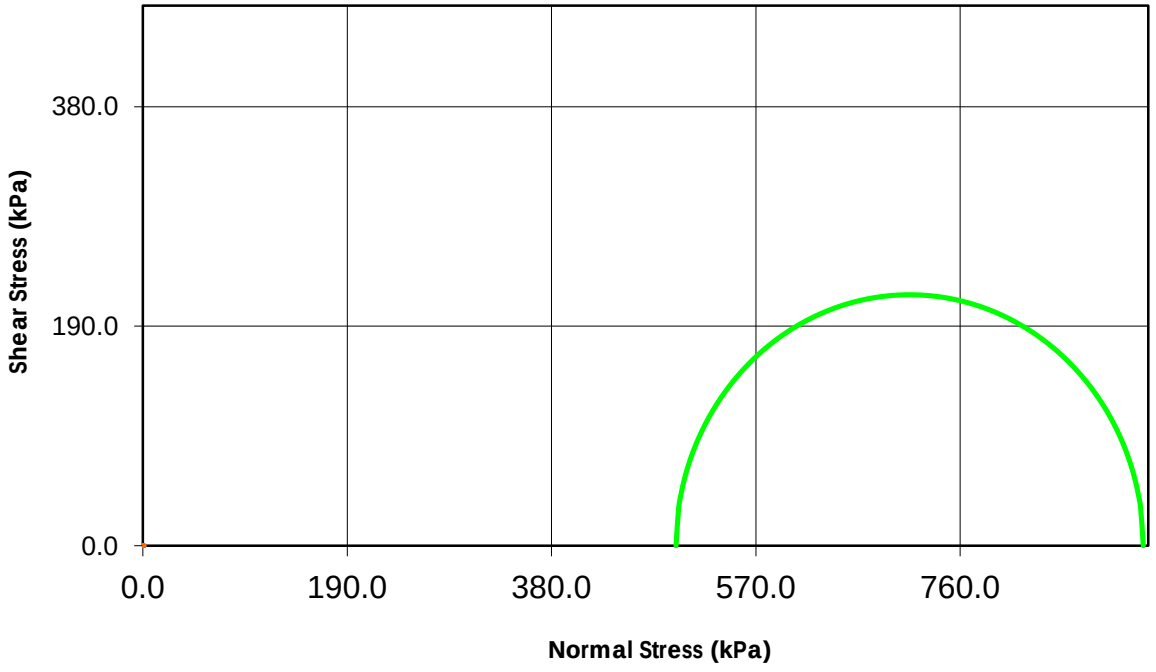

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

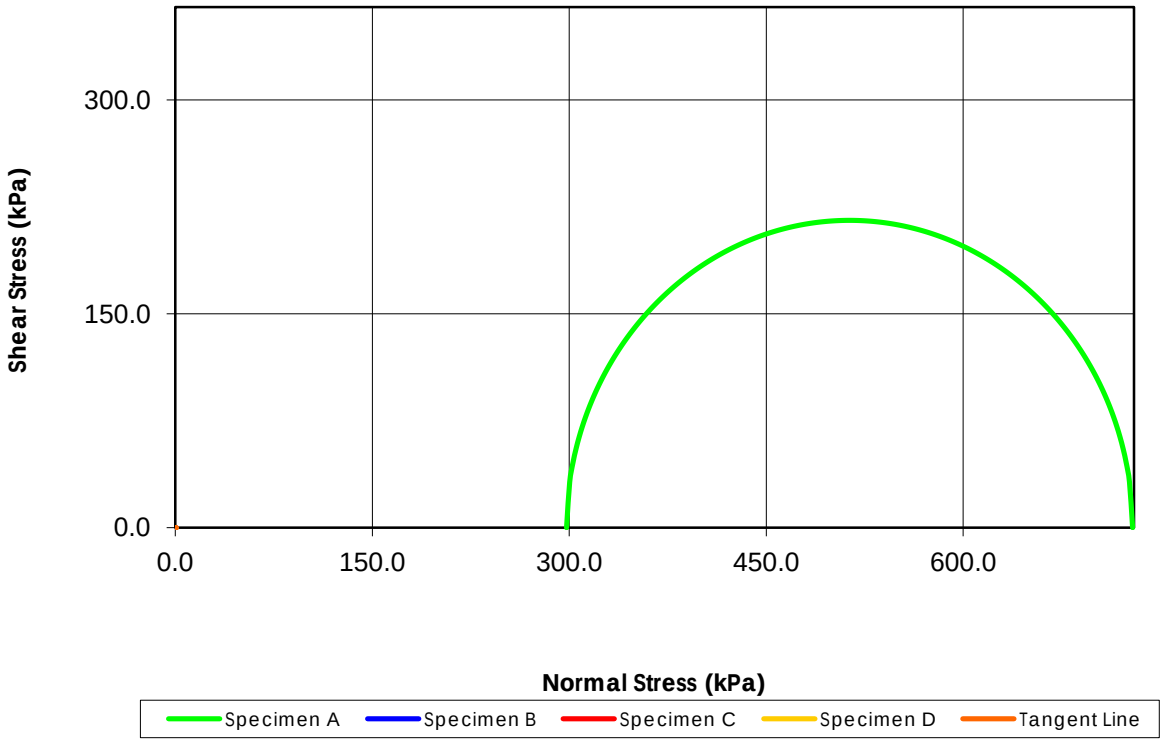



### Total Stress
### (C = 0.0 Ø = 0.0)

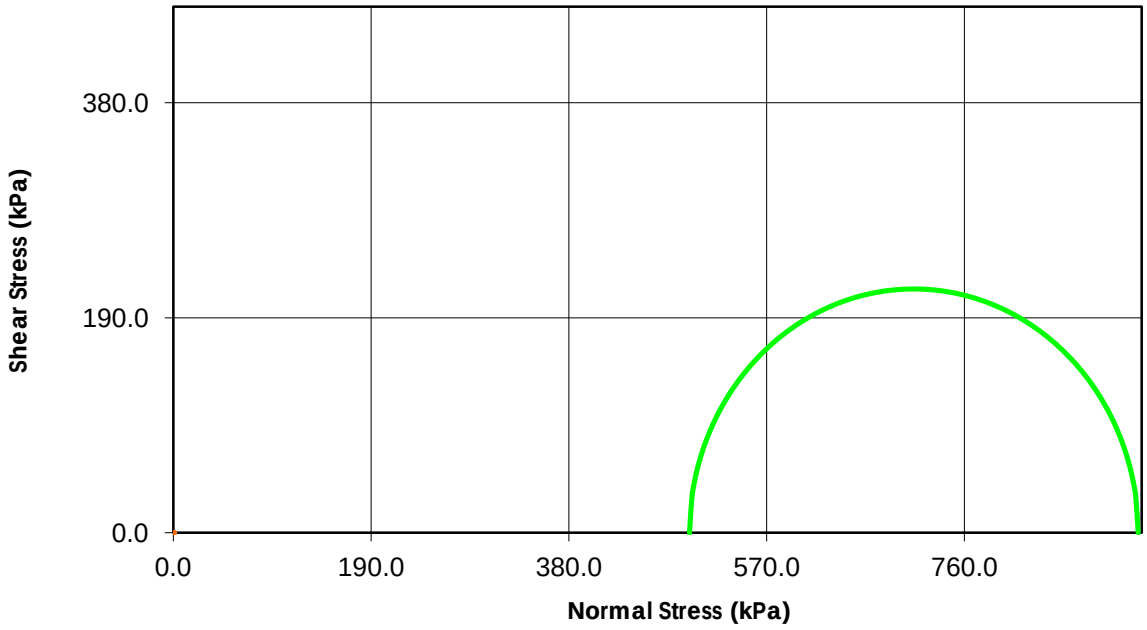


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

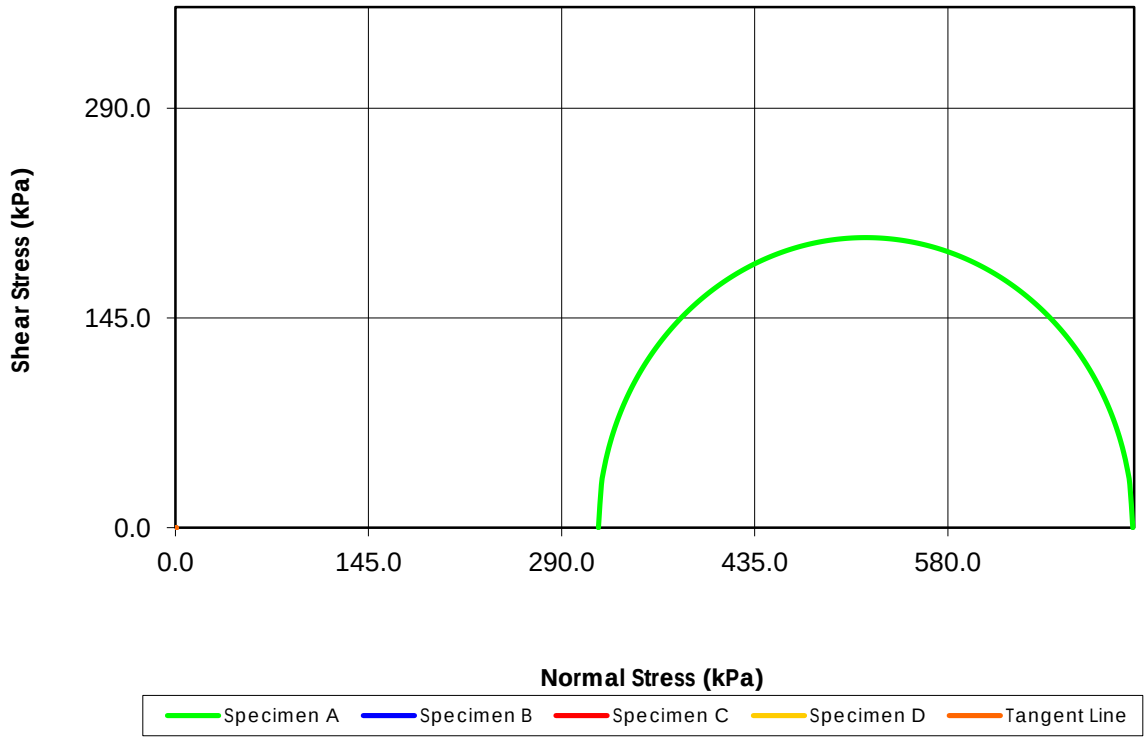



## Total Stress
## (C = 0.0 Ø = 0.0)

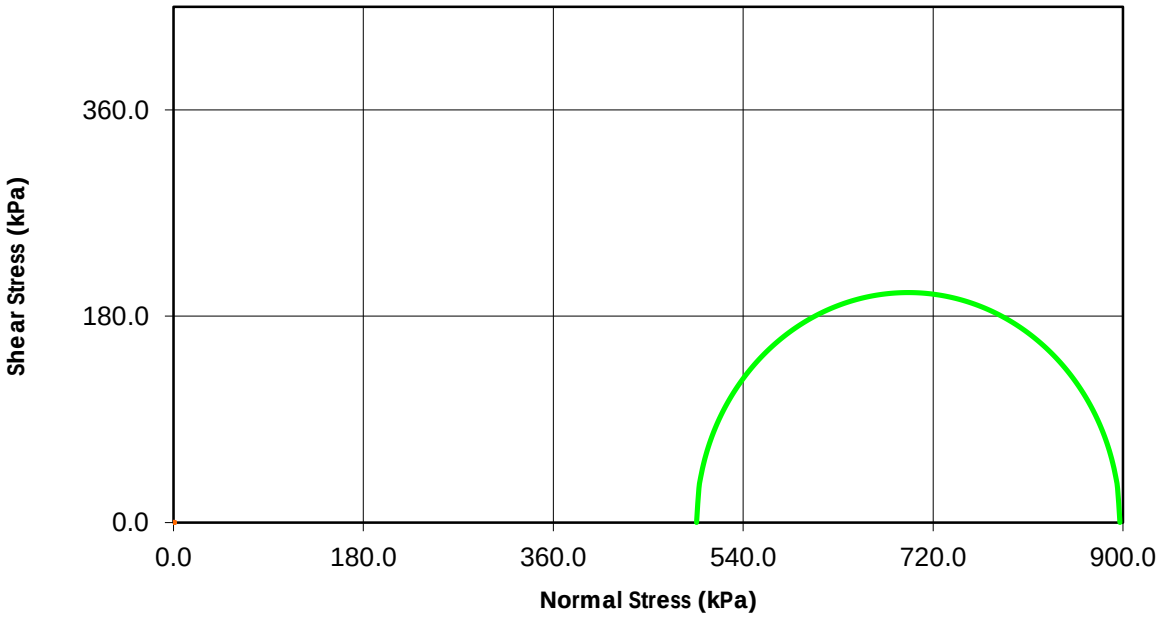


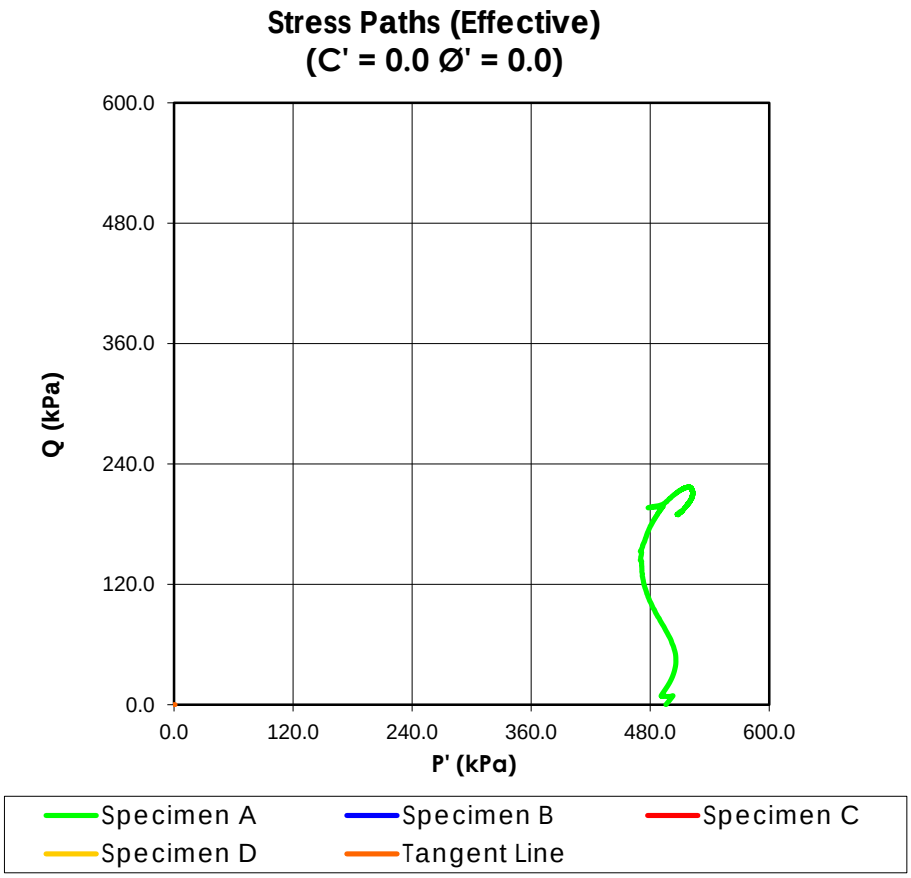
# Mohr Stress Circles at 15% Axial Strain Criterion

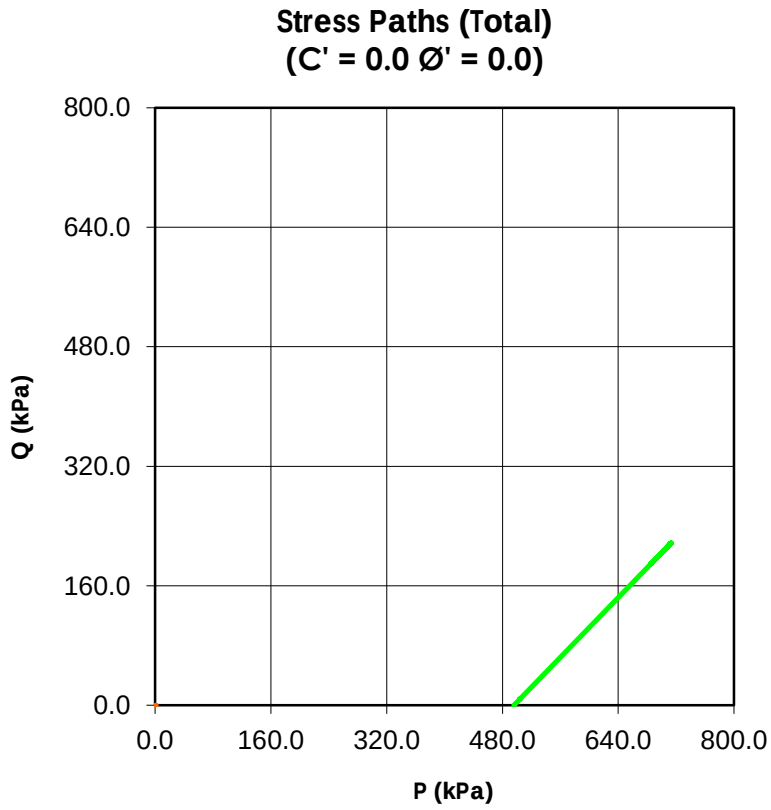
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

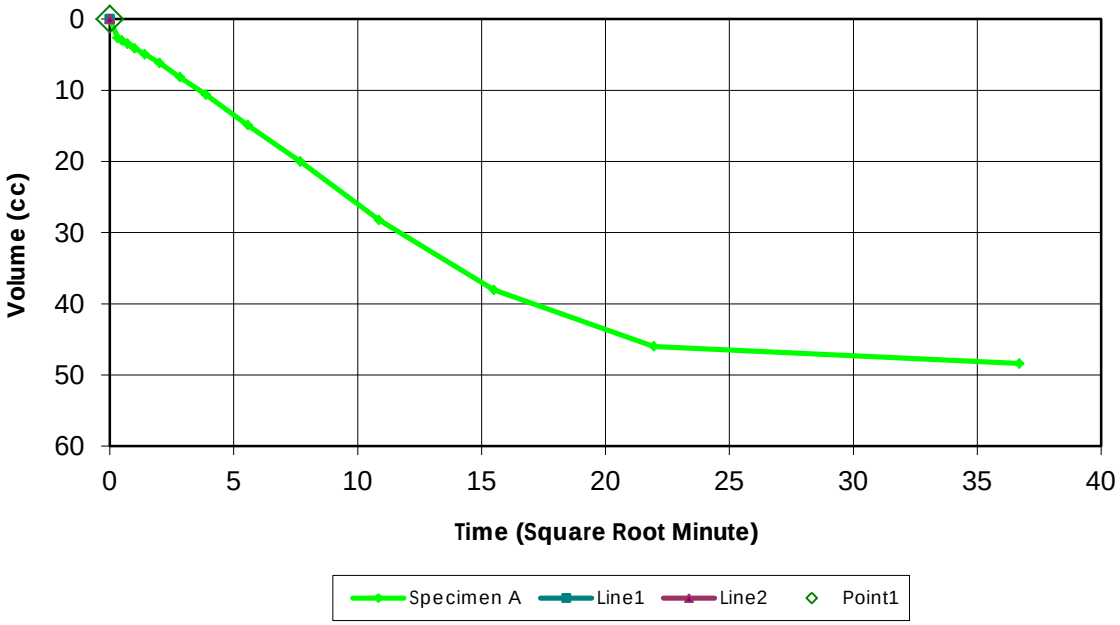



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

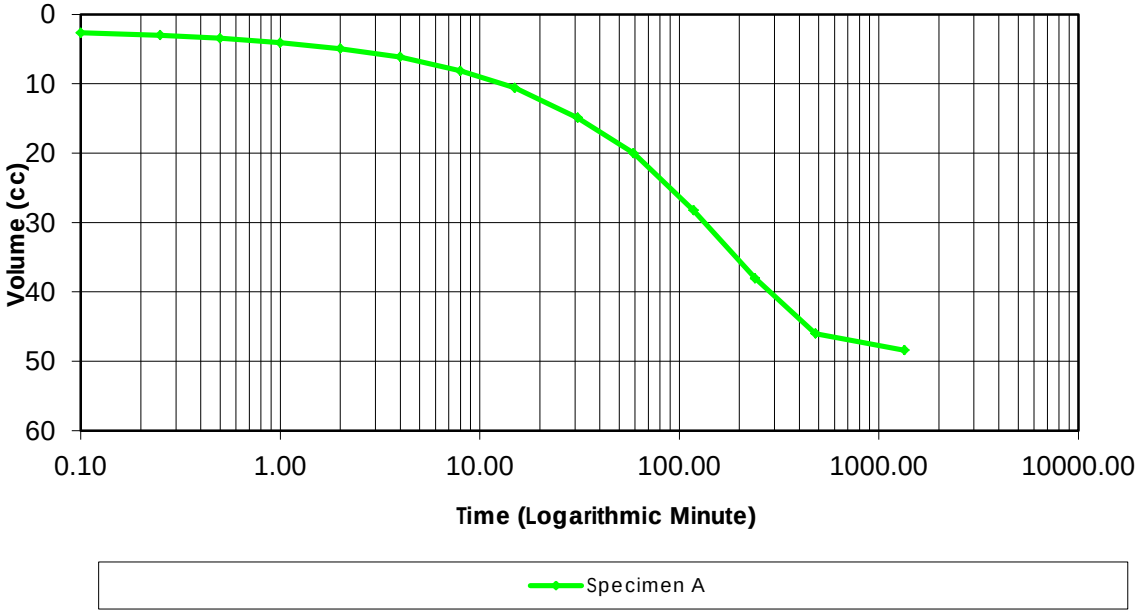

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 1E+15

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 63.00 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 90.0 | 60.0 | 10.0 | 0.0 | 70.00 |
| 6 | 90.0 | 70.0 | 0.0 | 10.0 | |
| 7 | 90.0 | 70.0 | 0.0 | 0.0 | |
| 8 | 120.0 | 70.0 | 30.0 | 0.0 | 95.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 4.40-4.87m

| | |
|---|---|
| Cell Pressure (kPa) | 570 |
| Back Pressure (kPa) | 70 |
| Effective Pressure (kPa) | 500 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.6 |
| Initial Sample Height (mm) | 154.4 |
| Initial Sample Area (cm2) | 41.4 |
| Initial Volume (cm3) | 639.2 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.50 | N/A |
| 00:00:06 | 41.85 | 2.650 |
| 00:00:15 | 41.50 | 3.000 |
| 00:00:30 | 41.05 | 3.450 |
| 00:01:00 | 40.40 | 4.100 |
| 00:02:00 | 39.55 | 4.950 |
| 00:04:00 | 38.35 | 6.150 |
| 00:08:00 | 36.35 | 8.150 |
| 00:15:00 | 33.90 | 10.600 |
| 00:31:00 | 29.60 | 14.900 |
| 00:59:00 | 24.50 | 20.000 |
| 01:58:00 | 16.25 | 28.250 |
| 04:00:00 | 6.45 | 38.050 |
| 08:02:00 | -1.50 | 46.000 |
| 22:27:00 | -3.90 | 48.400 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

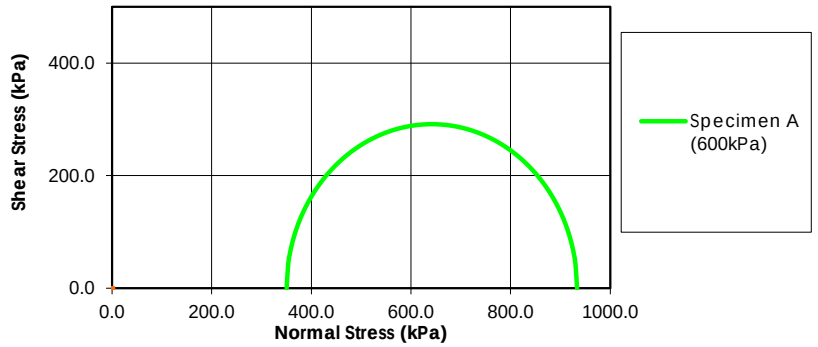
Stantec

Reviewed By C. Lamoureux

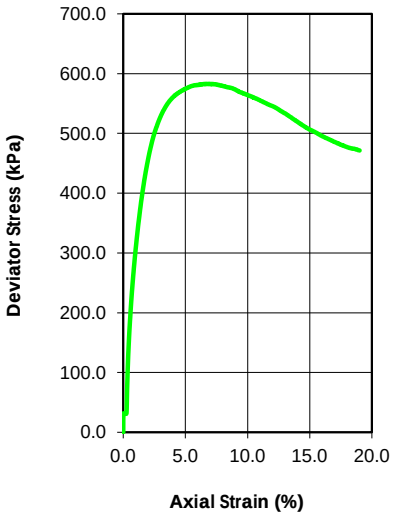
Date: 25-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 24.0 | | | |
| Dry Density (g/cm3) | 1.663 | | | |
| Saturation (%) | 103.90 | | | |
| Void Ratio | 0.624 | | | |
| Diameter (mm) | 72.100 | | | |
| Height (mm) | 156.200 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 20.0 | | | |
| Dry Density (g/cm3) | 1.759 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.535 | | | |
| Effective Stress (kPa) | 601.9 | | | |
| Back Press. (kPa) | 48.1 | | | |
| Rate of Strain | 0.022 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

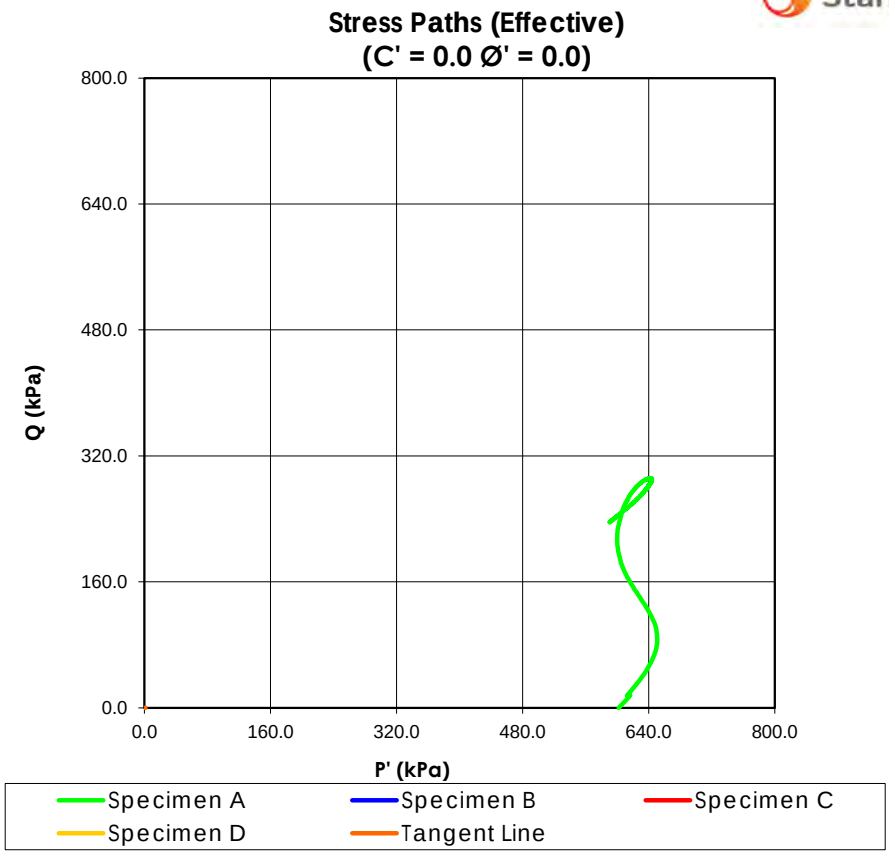
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 933.32 | | | |
| σ'3 at Failure (kPa) | 350.41 | | | |
| | | | | |
| | | | | |

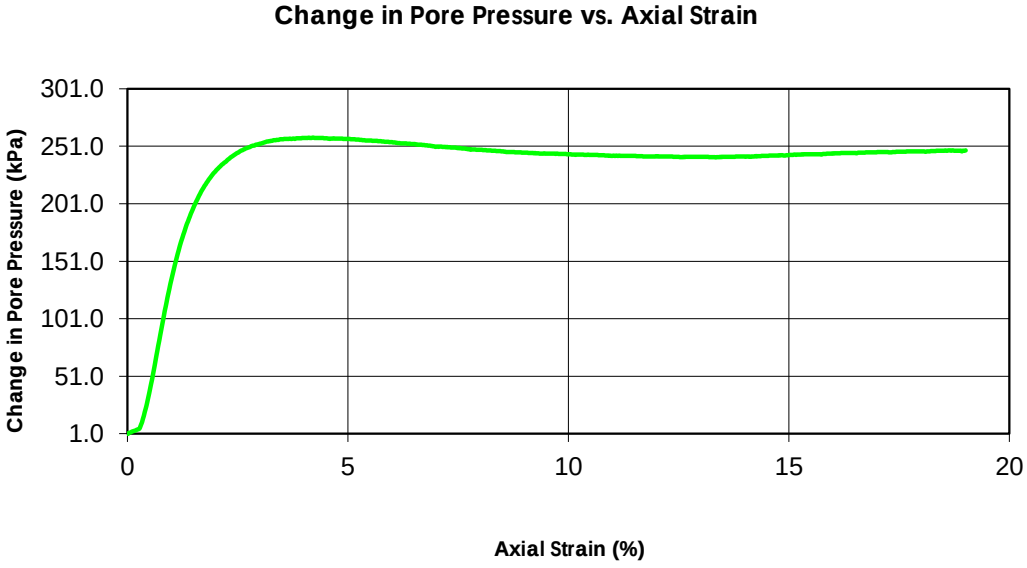
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D28 ST15 |
| **Depth:** | 9.1-9.63 |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

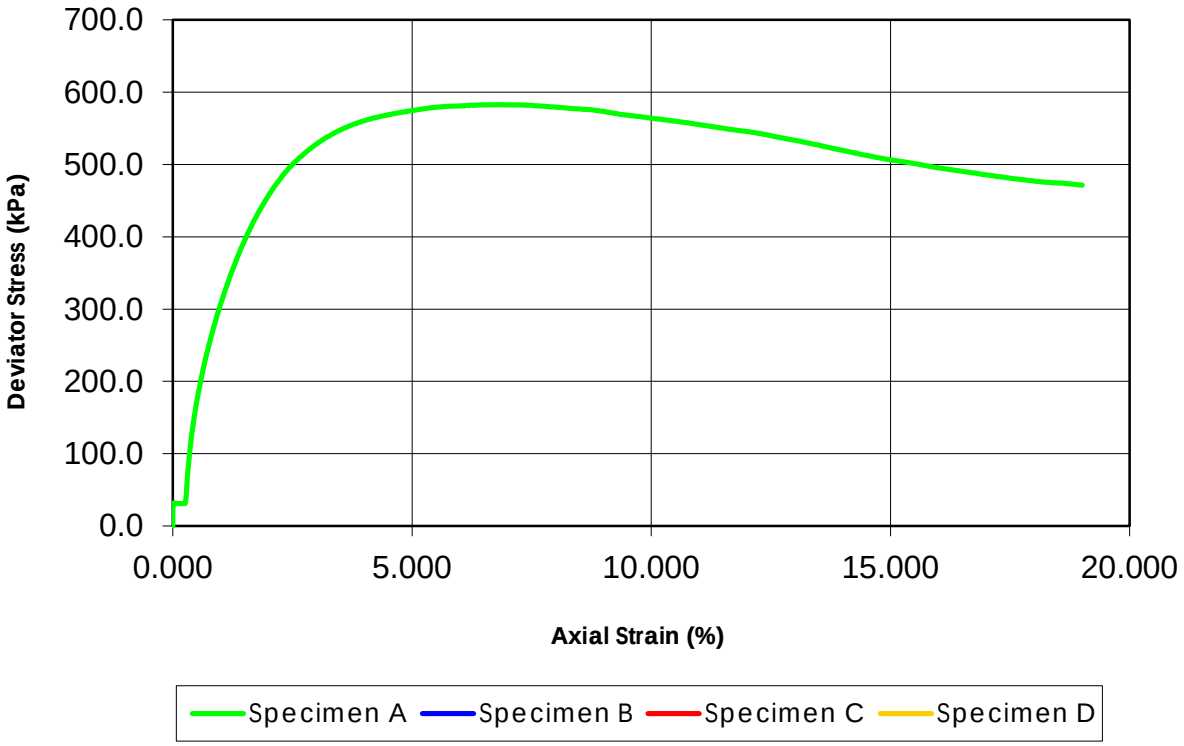
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

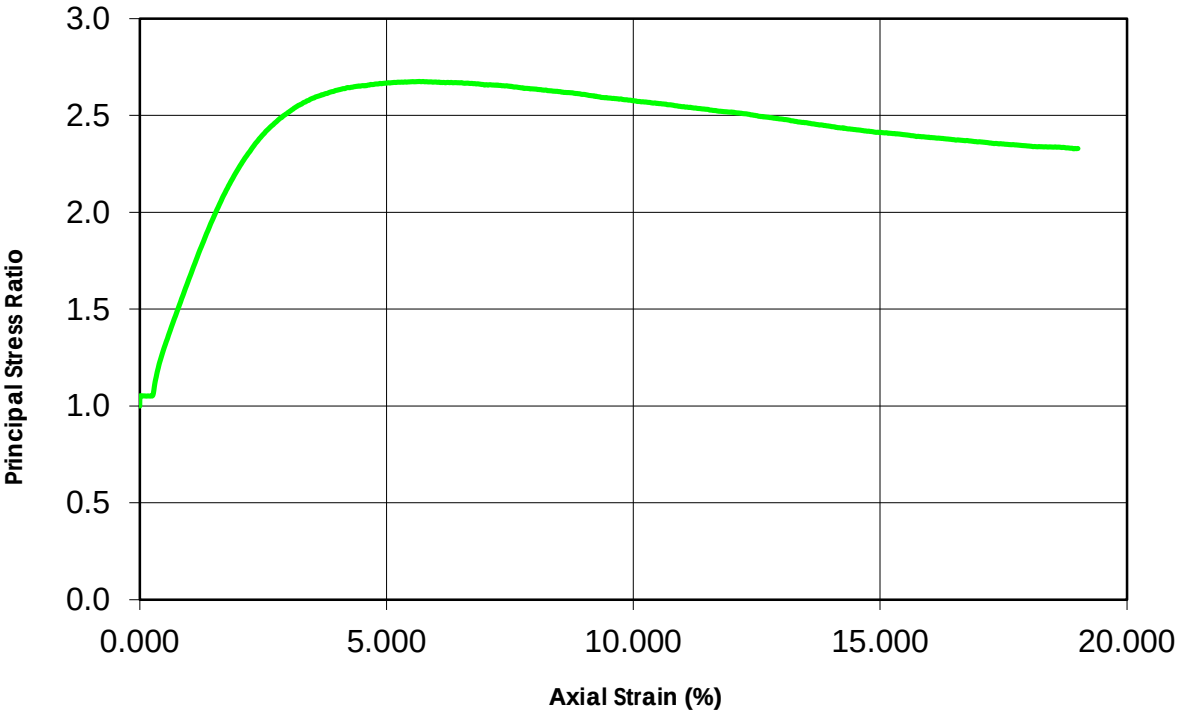


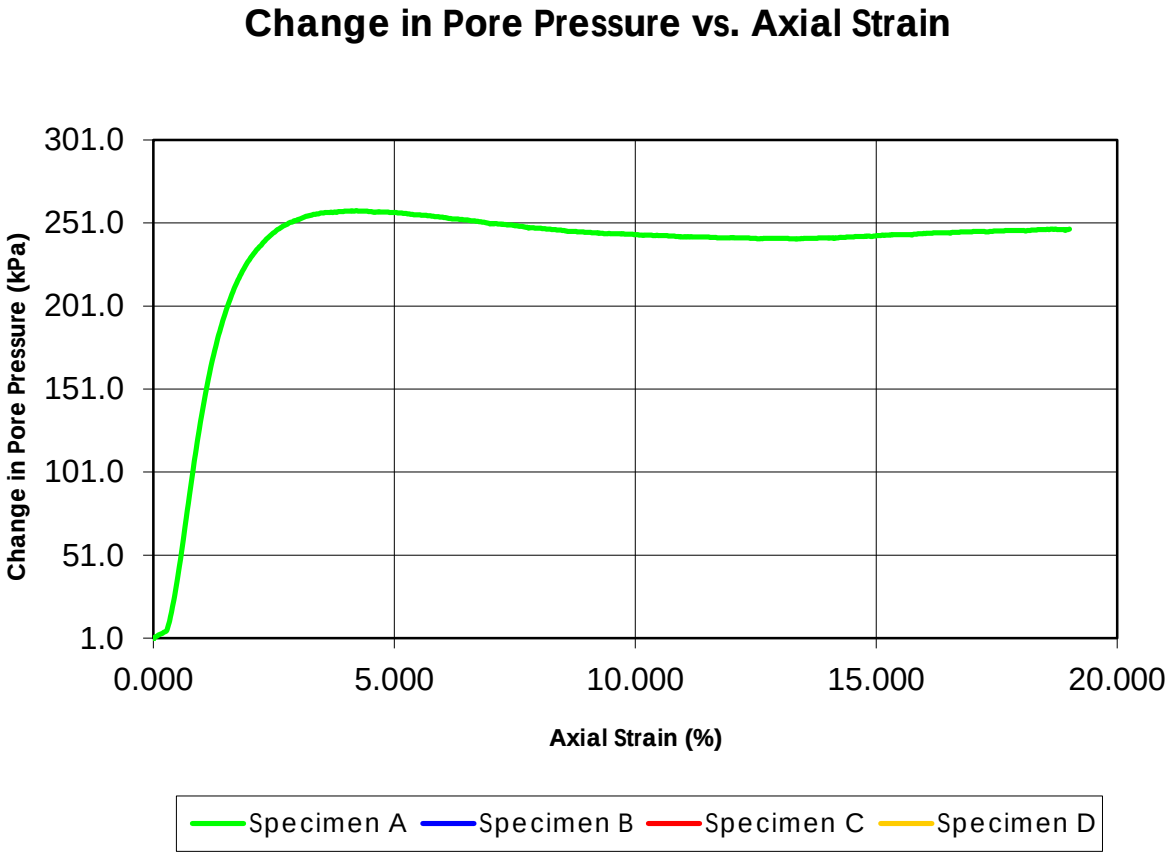



## Deviator Stress vs. Axial Strain



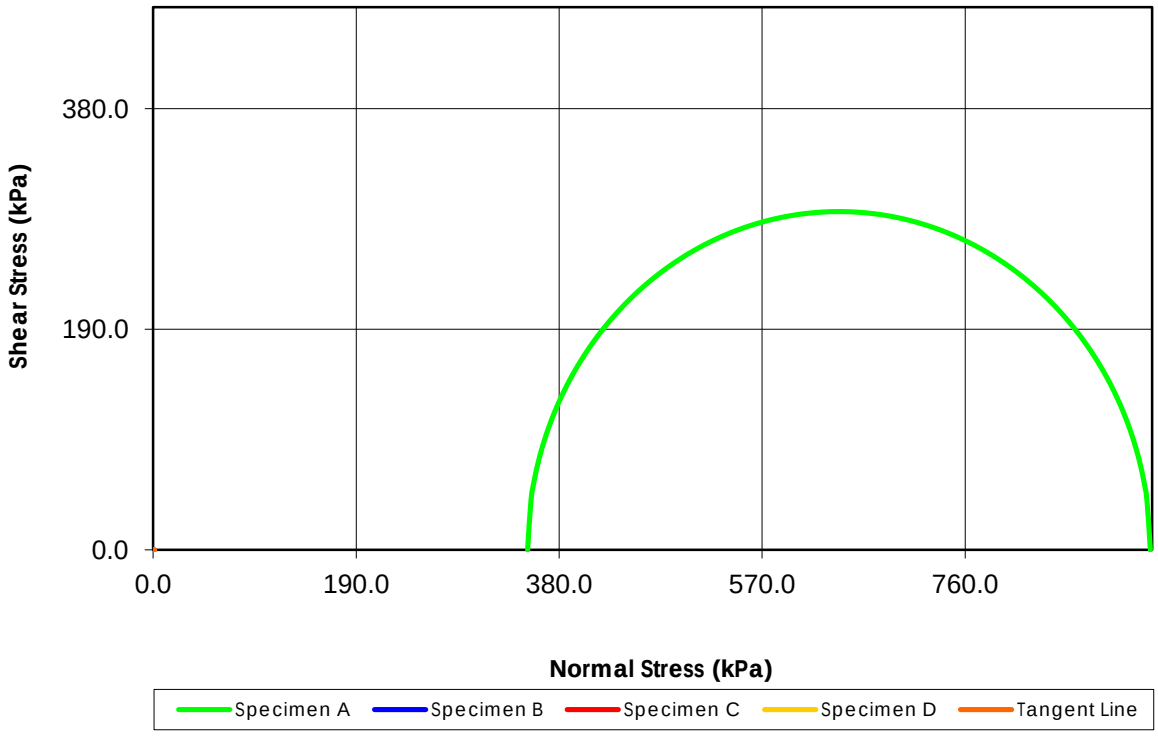

## Principal Stress Ratio vs. Axial Strain



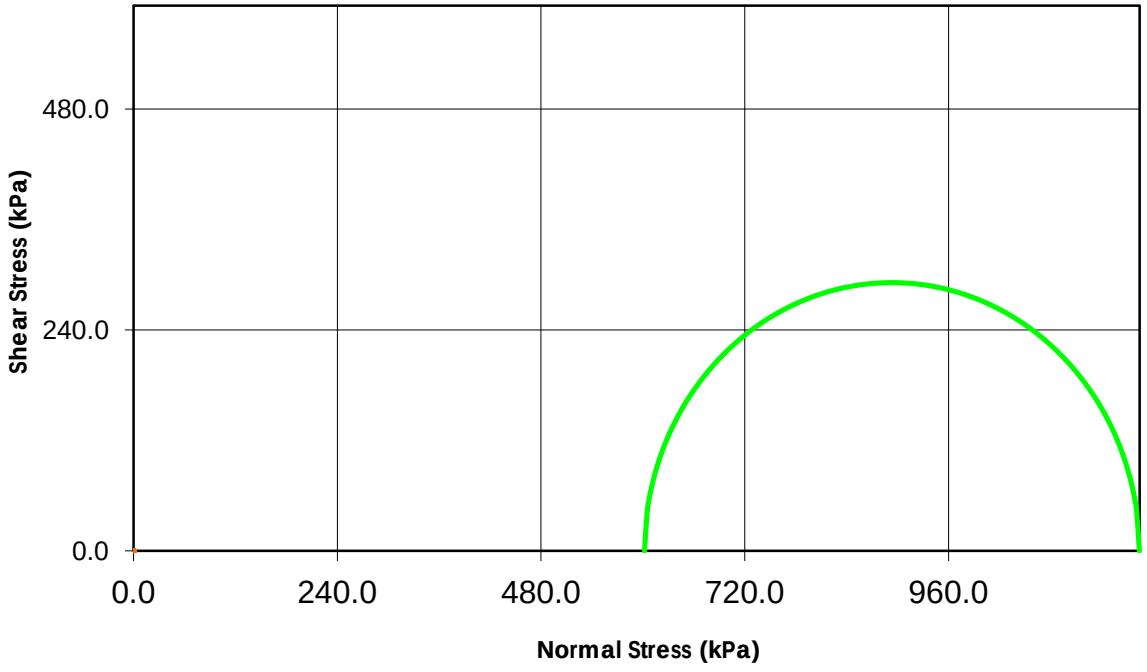

Change in Pore Pressure vs. Axial Strain
301.0
251.0
201.0
151.0
101.0
51.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

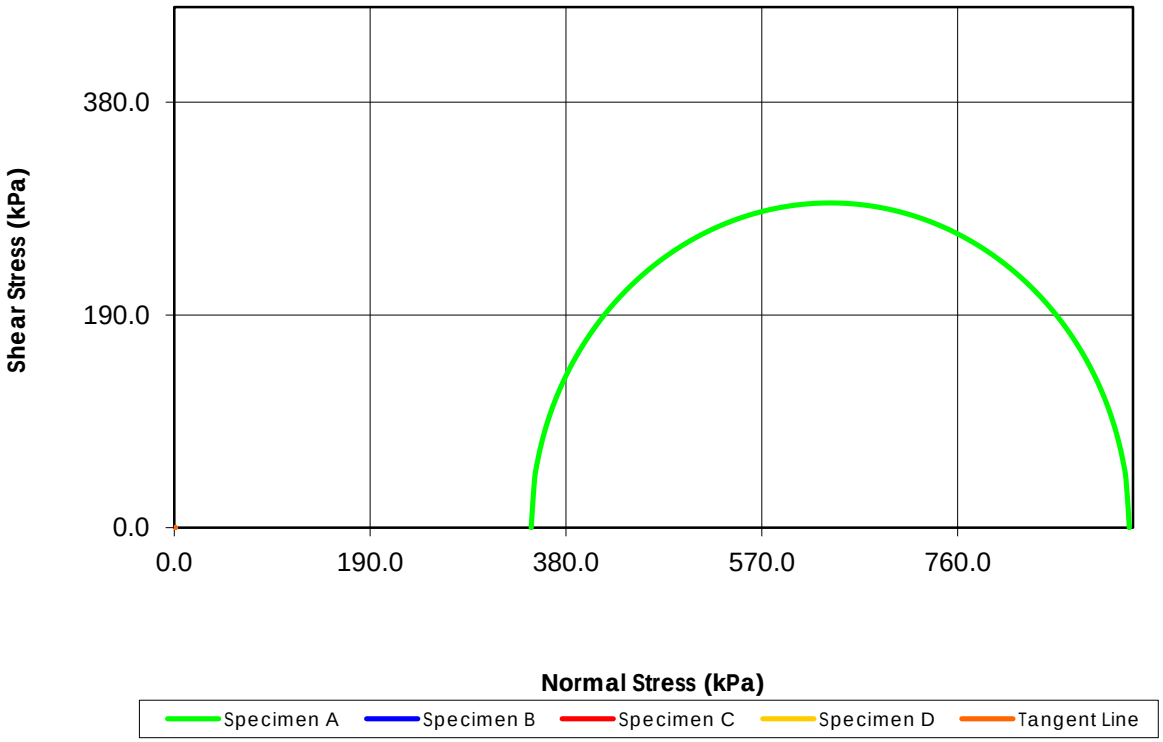



### Total Stress
### (C = 0.0 Ø = 0.0)

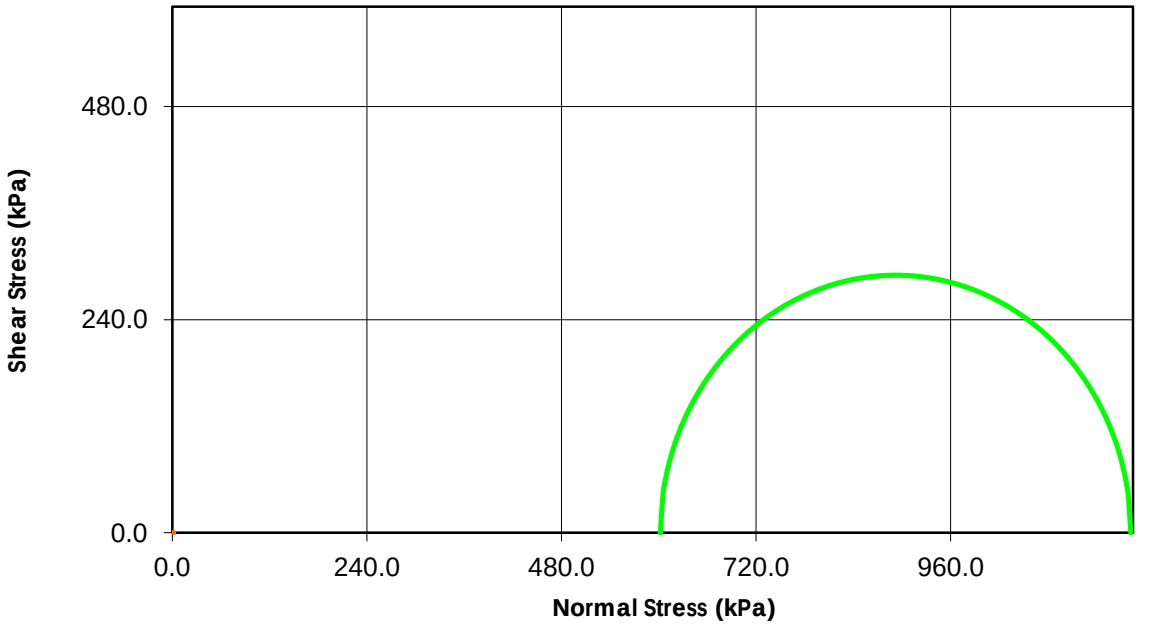


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

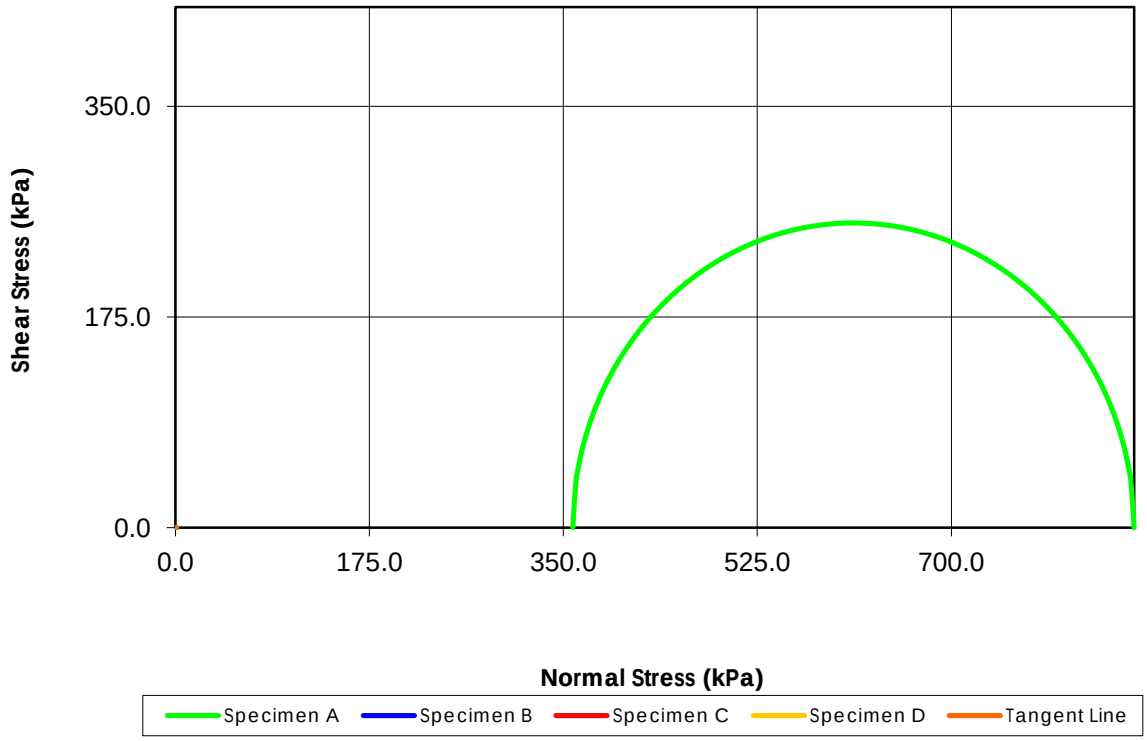



## Total Stress
## (C = 0.0 Ø = 0.0)

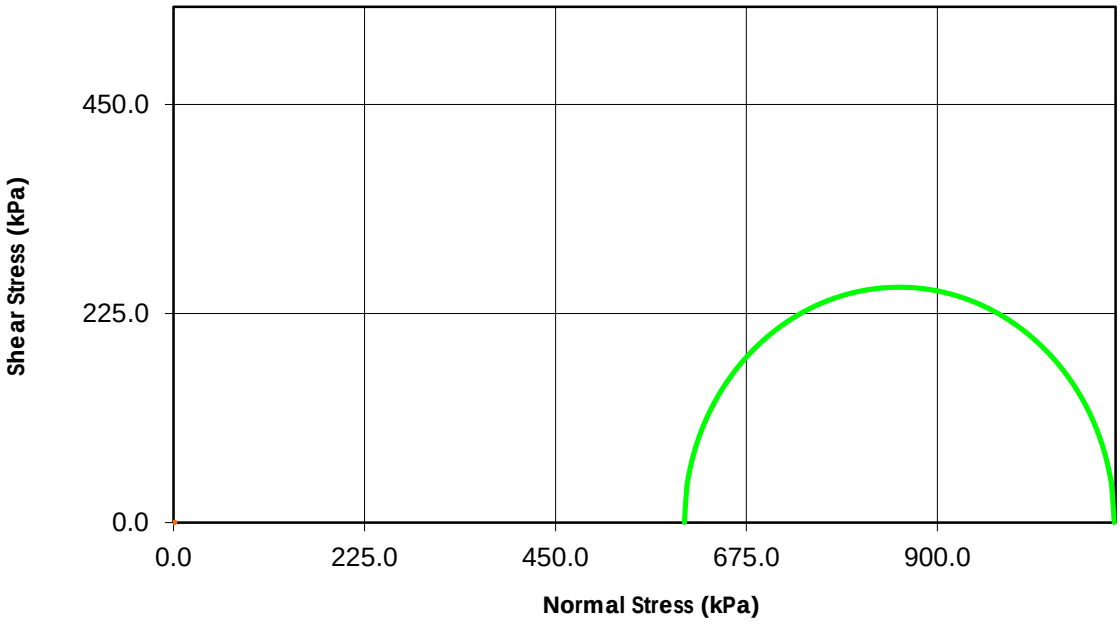


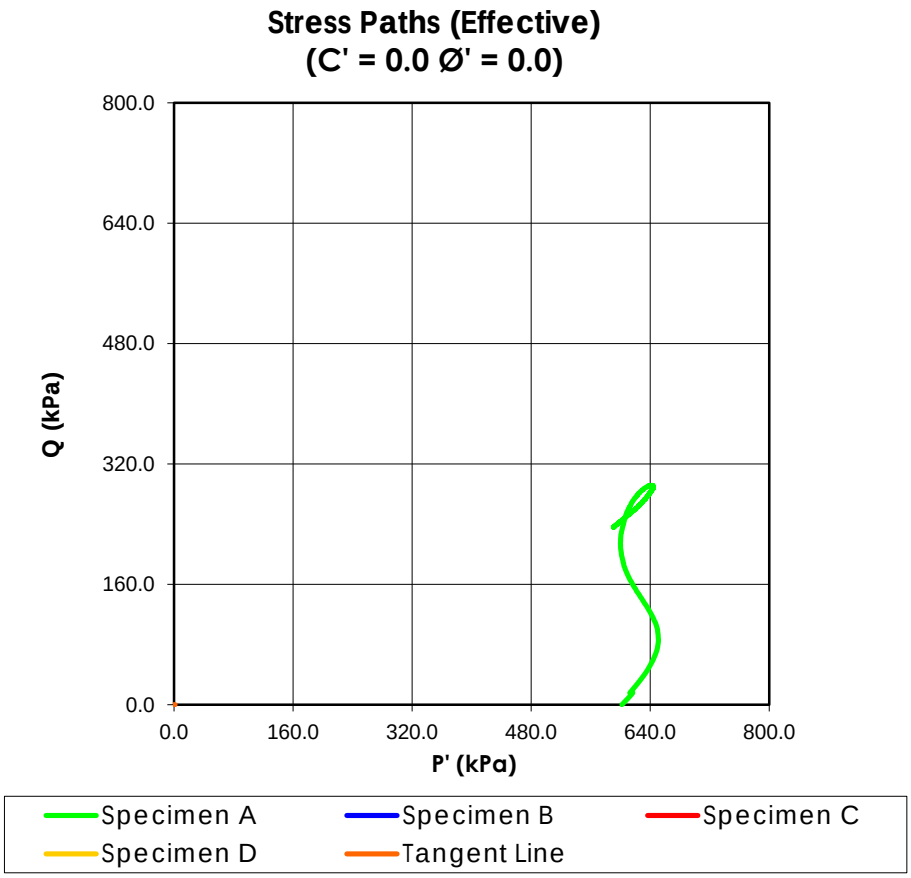
# Mohr Stress Circles at 15% Axial Strain Criterion

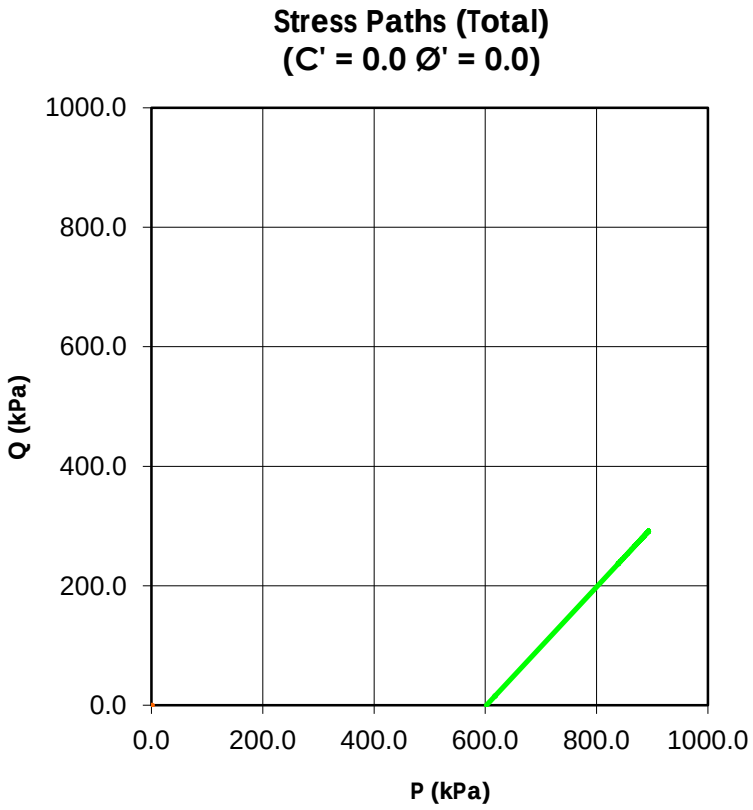
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

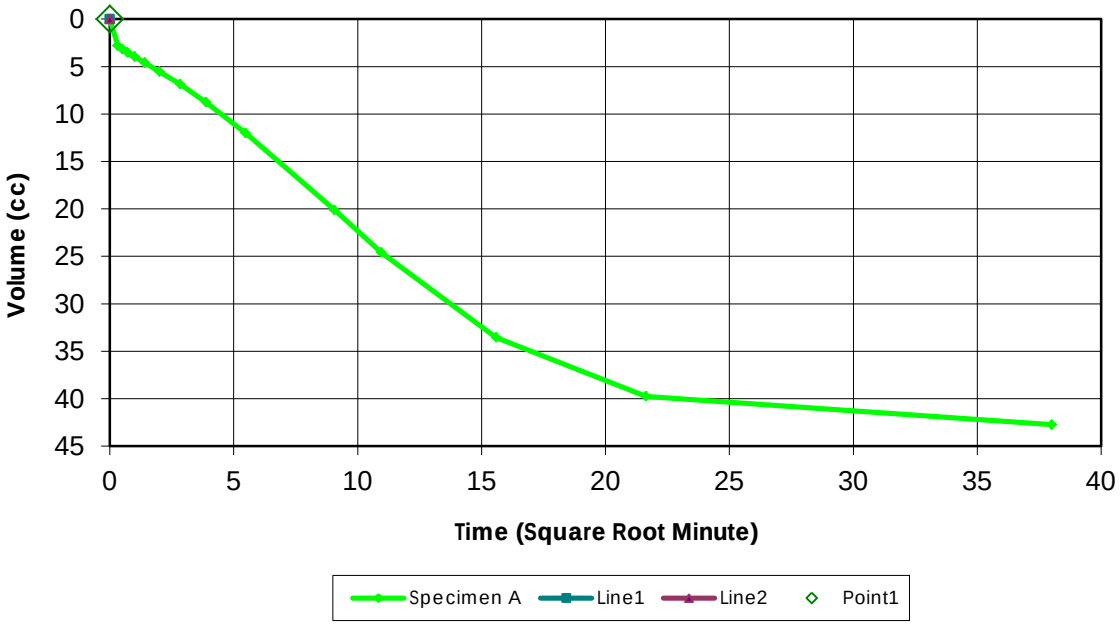



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

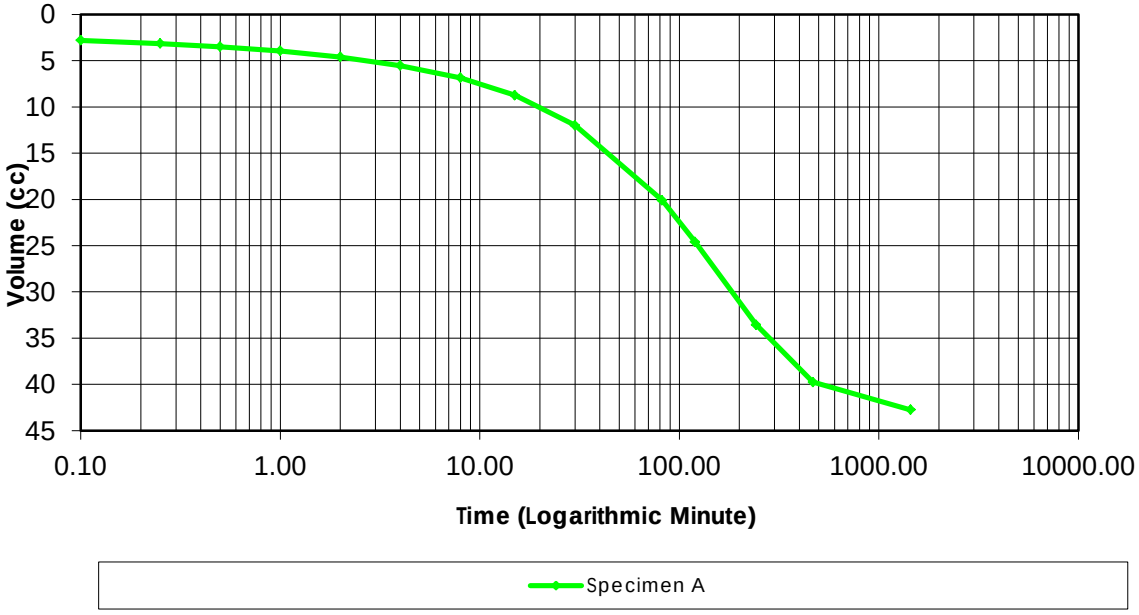

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: -4E+14

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 70.0 | 40.0 | 10.0 | 0.0 | 72.00 |
| 3 | 70.0 | 50.0 | 0.0 | 10.0 | |
| 4 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 5 | 80.0 | 50.0 | 10.0 | 0.0 | 95.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 9.1-9.63

| | |
|---|---|
| Cell Pressure (kPa) | 650 |
| Back Pressure (kPa) | 50 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.1 |
| Initial Sample Height (mm) | 156.2 |
| Initial Sample Area (cm2) | 40.83 |
| Initial Volume (cm3) | 637.7 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 43.25 | N/A |
| 00:00:06 | 40.45 | 2.800 |
| 00:00:15 | 40.10 | 3.150 |
| 00:00:30 | 39.75 | 3.500 |
| 00:01:00 | 39.30 | 3.950 |
| 00:02:00 | 38.65 | 4.600 |
| 00:04:00 | 37.70 | 5.550 |
| 00:08:00 | 36.40 | 6.850 |
| 00:15:00 | 34.50 | 8.750 |
| 00:30:00 | 31.25 | 12.000 |
| 01:22:00 | 23.15 | 20.100 |
| 02:00:00 | 18.65 | 24.600 |
| 04:03:00 | 9.70 | 33.550 |
| 07:48:00 | 3.50 | 39.750 |
| 24:04:00 | 0.50 | 42.750 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

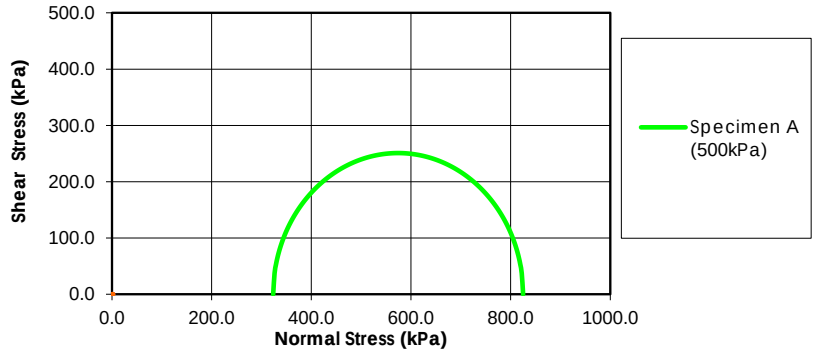
Stantec

Reviewed By C. Lamoureux

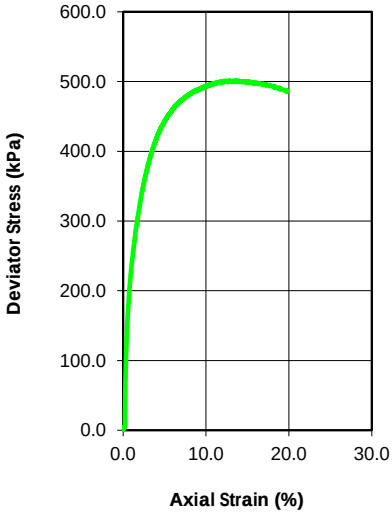
Date: 25-Oct-16

Tested By: C. Woods

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 20.8 | | | |
| Dry Density (g/cm3) | 1.686 | | | |
| Saturation (%) | 93.12 | | | |
| Void Ratio | 0.602 | | | |
| Diameter (mm) | 72.3 | | | |
| Height (mm) | 154.4 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.93 | | | |
| Water Content (%) | 16.4 | | | |
| Dry Density (g/cm3) | 1.768 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.527 | | | |
| Effective Stress (kPa) | 501.4 | | | |
| Back Press. (kPa) | 48.6 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

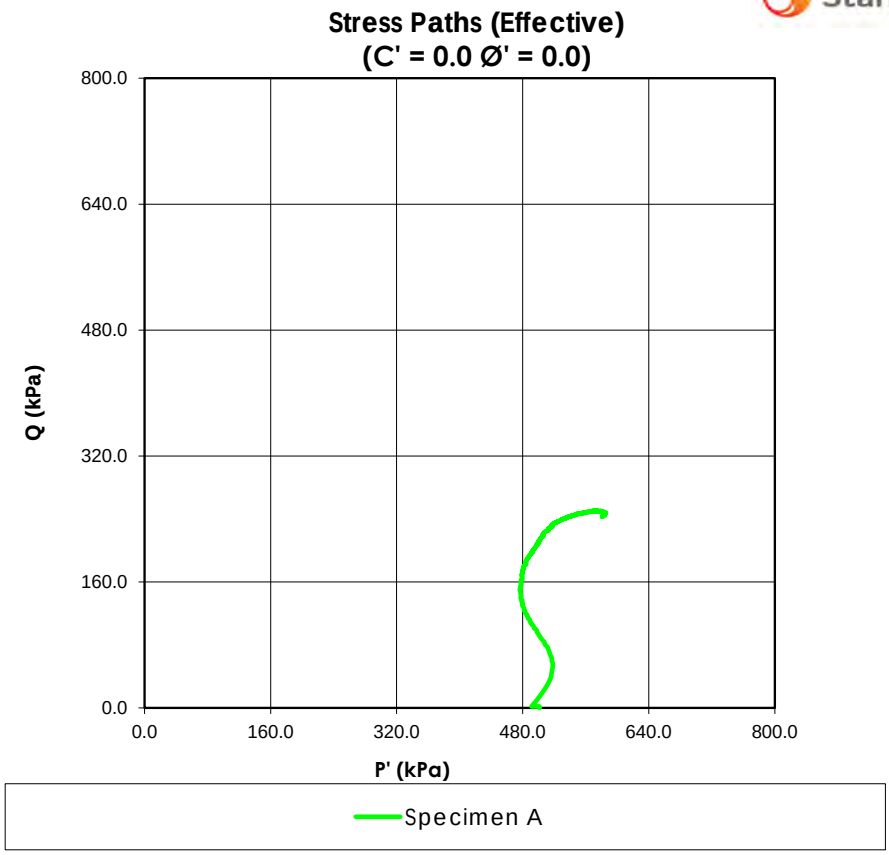
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 825.04 | | | |
| σ'3 at Failure (kPa) | 323.44 | | | |
| | | | | |
| | | | | |

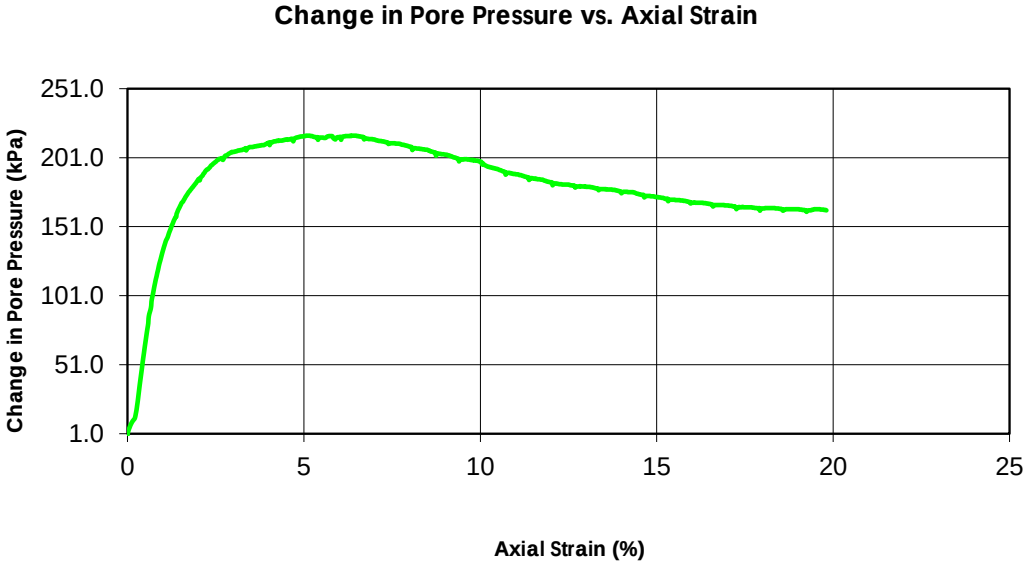
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D29 S2 |
| **Depth:** | 4.26-4.60m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, Trace Sand, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

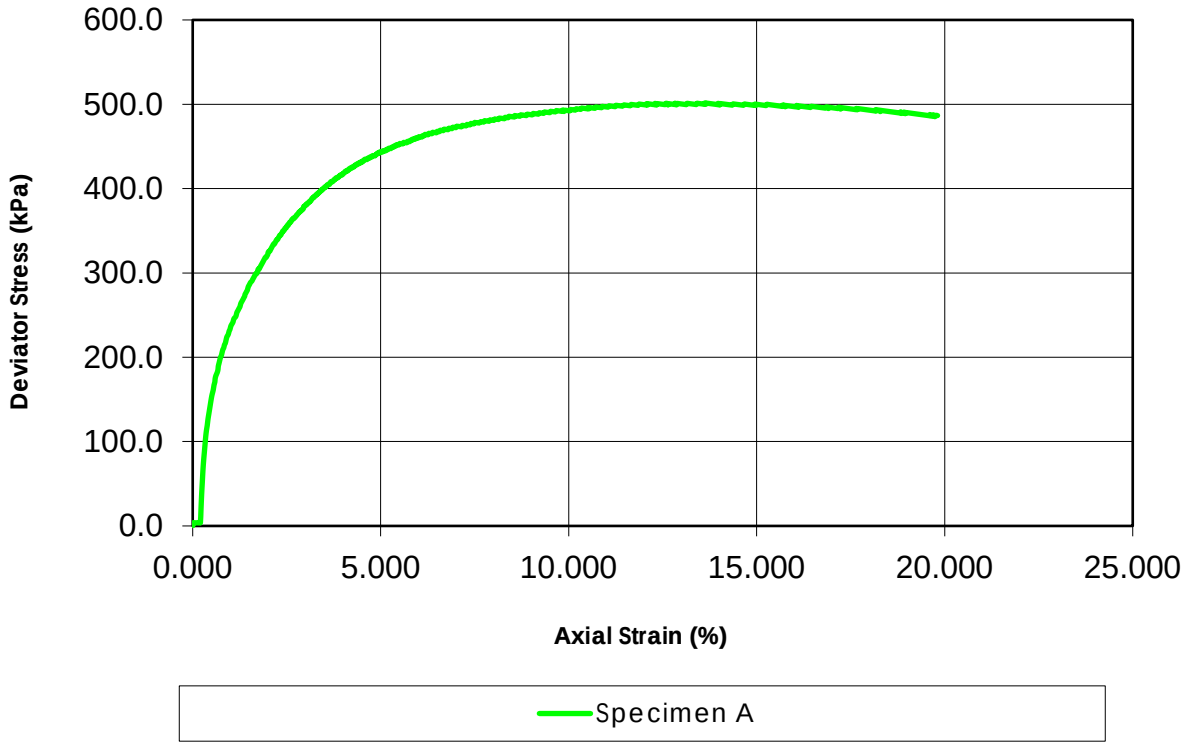
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

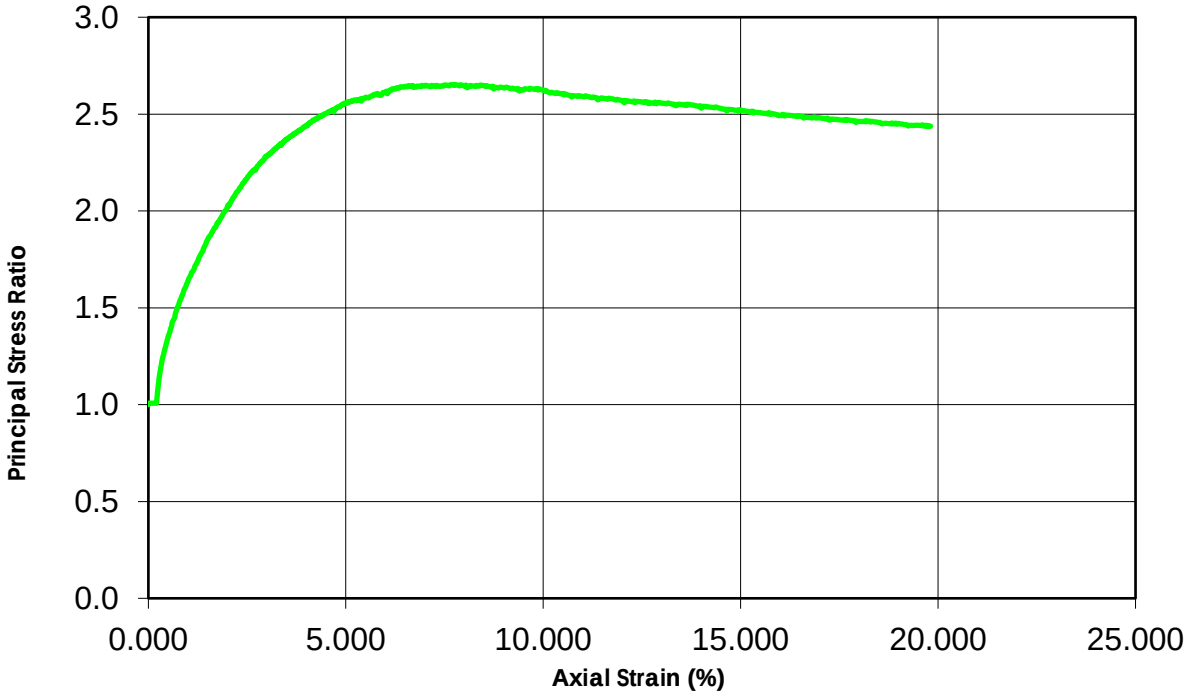


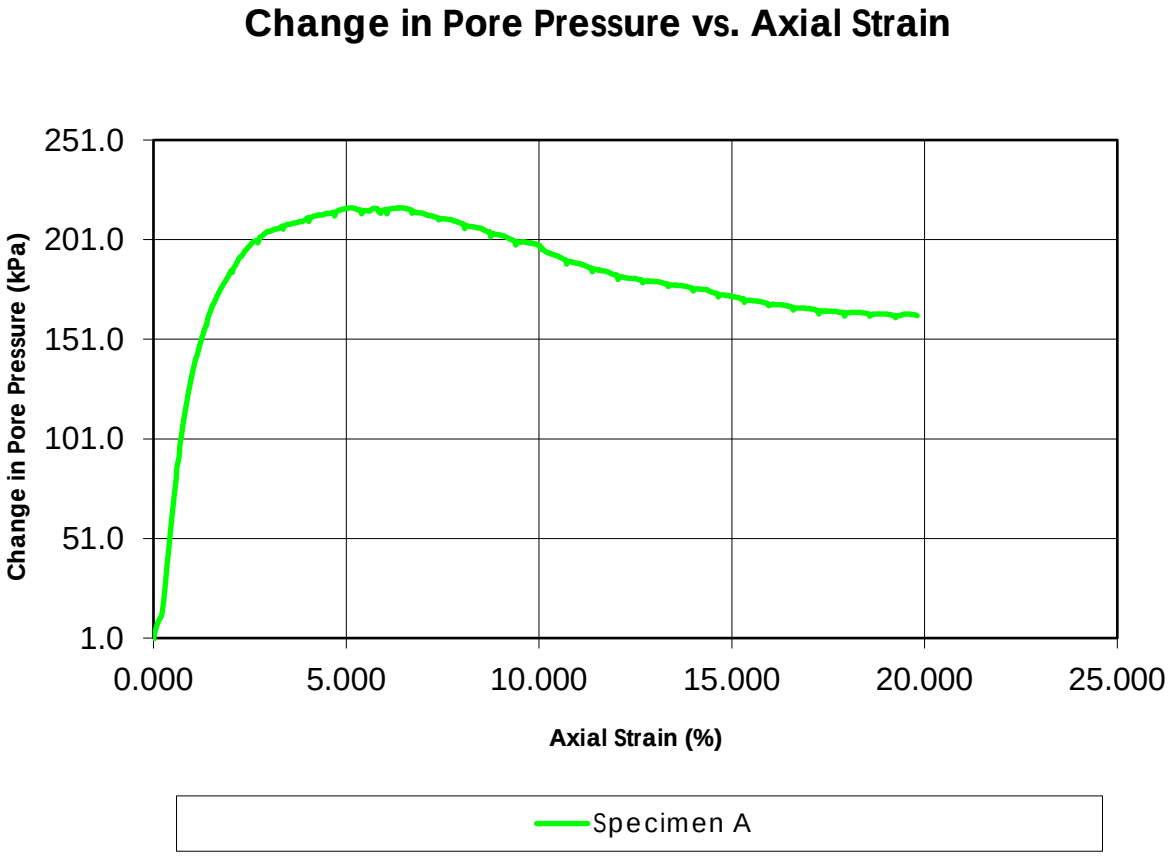



## Deviator Stress vs. Axial Strain



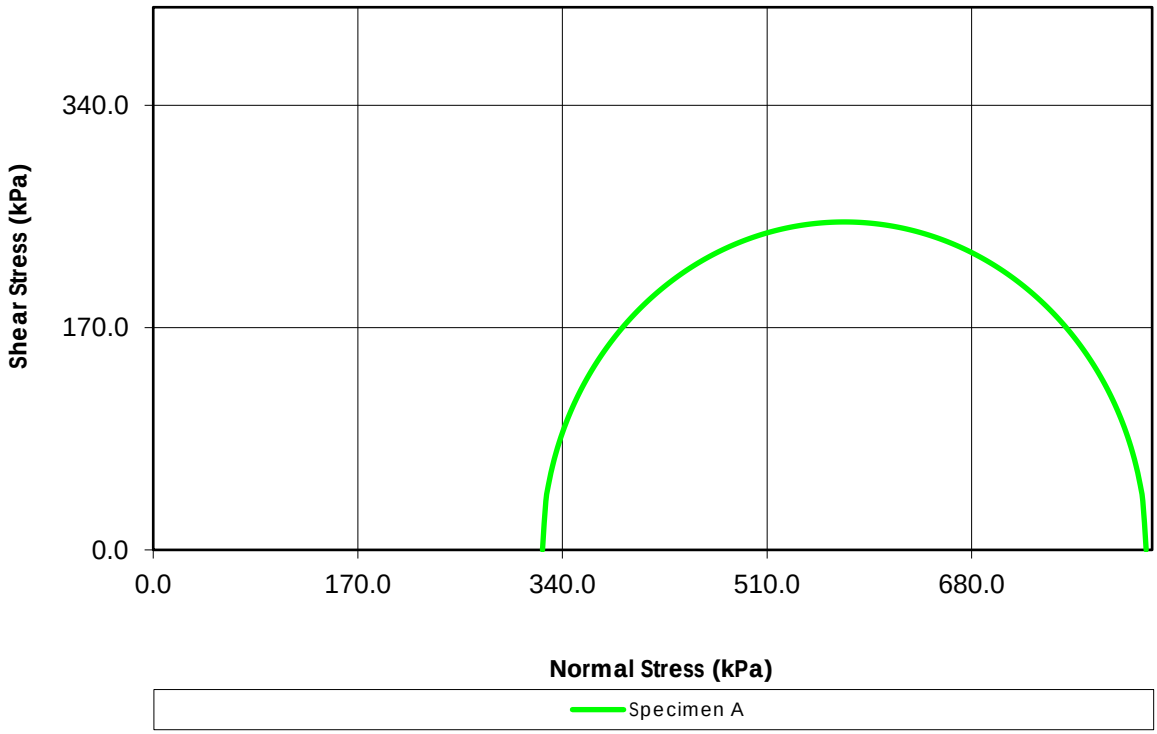

## Principal Stress Ratio vs. Axial Strain



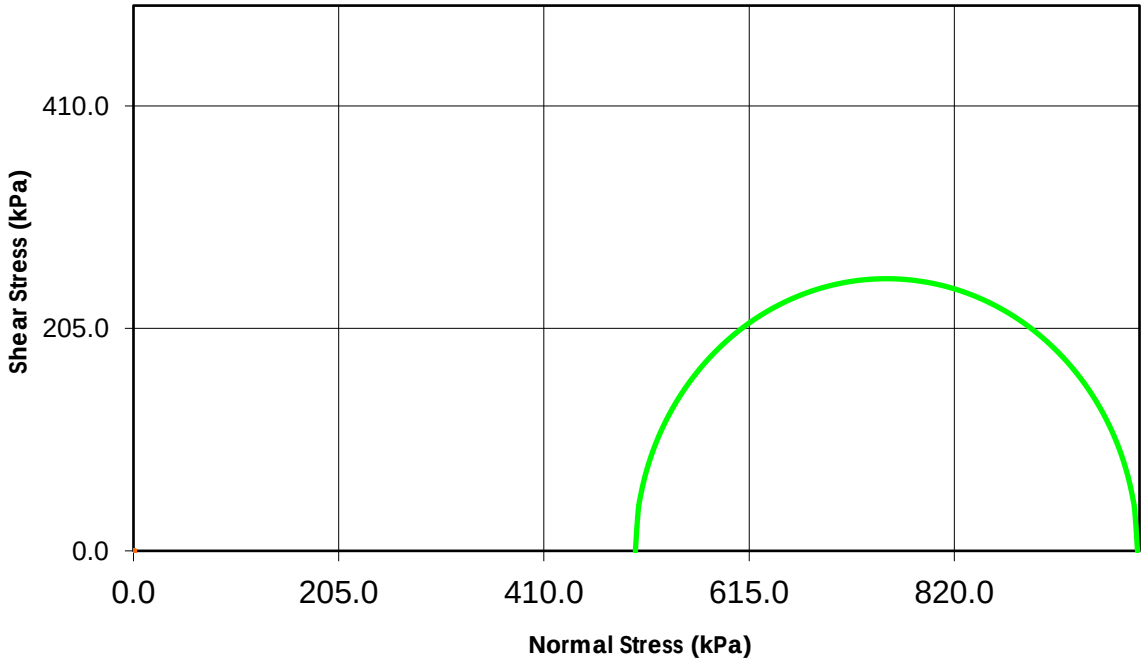

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

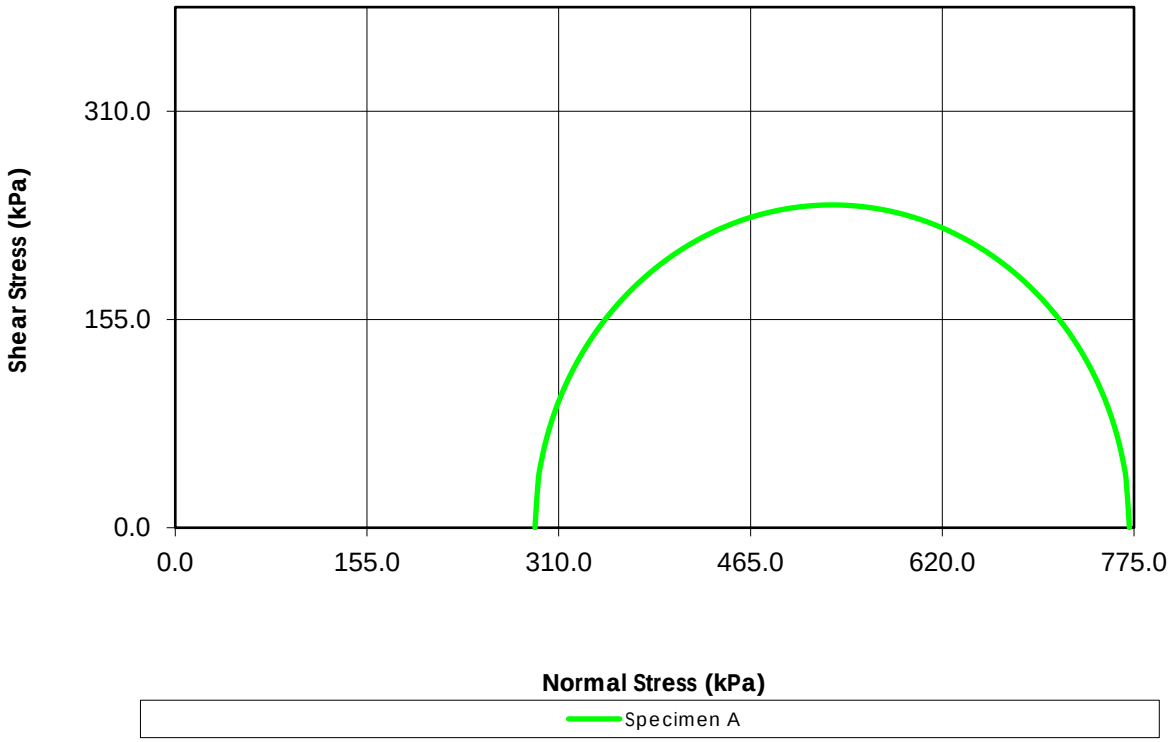



### Total Stress
### (C = 0.0 Ø = 0.0)

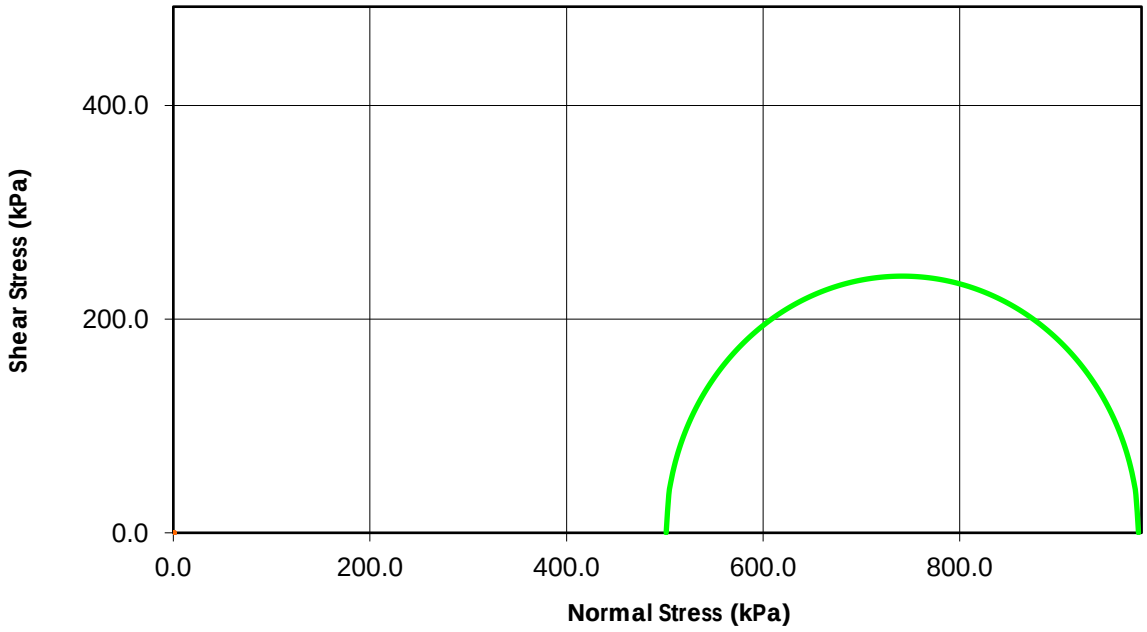


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

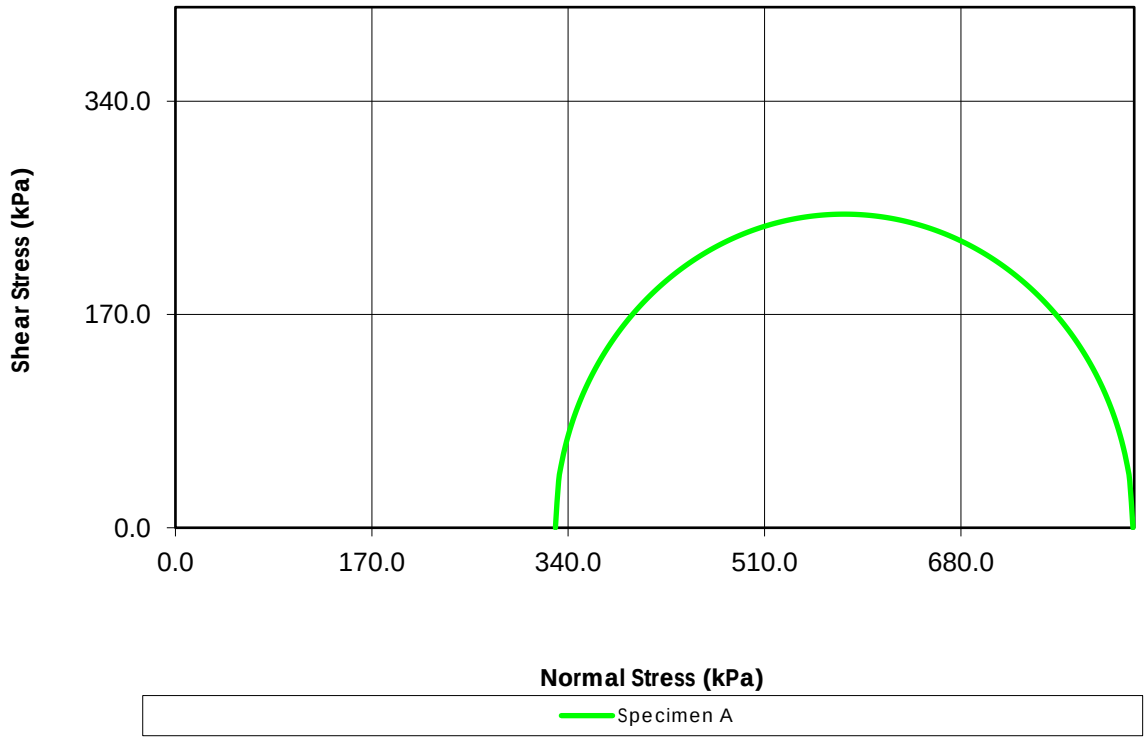



## Total Stress
## (C = 0.0 Ø = 0.0)

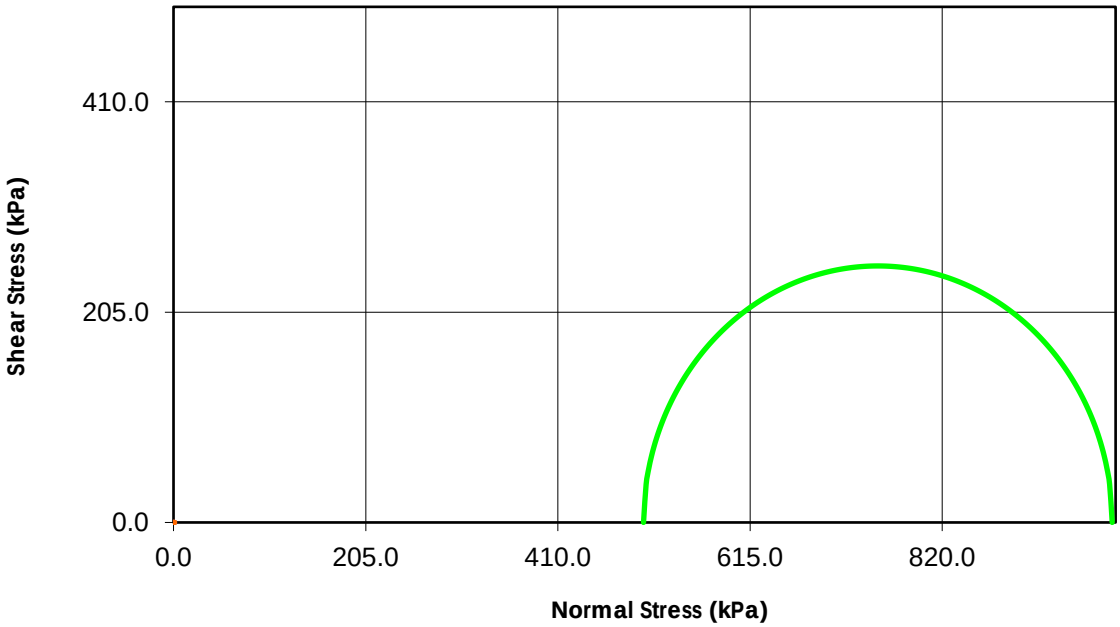


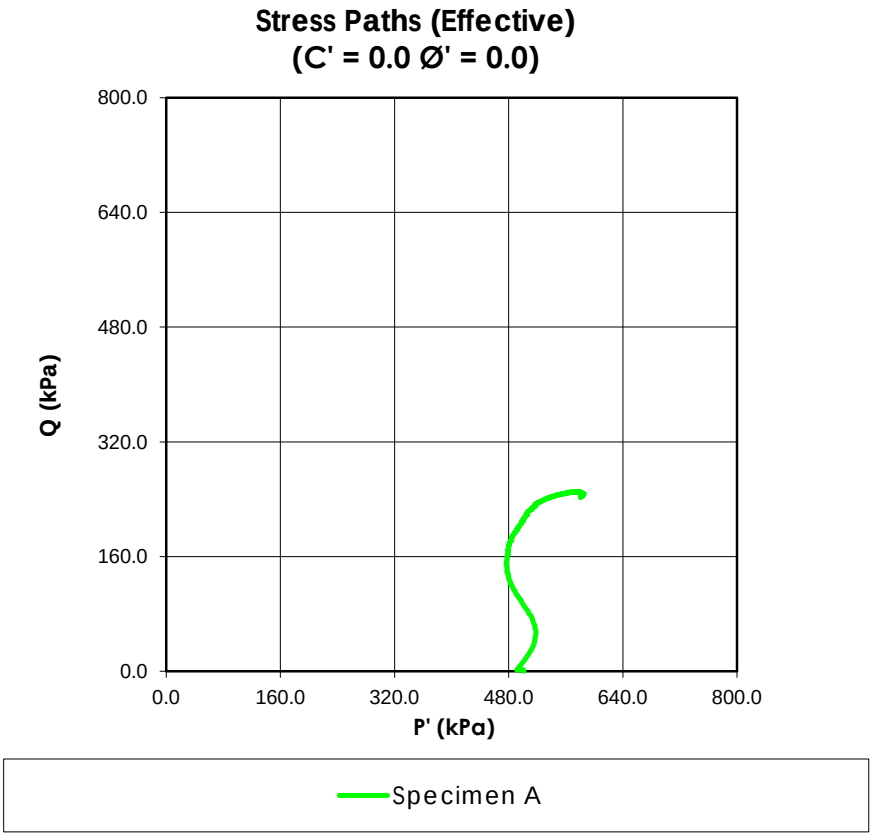
# Mohr Stress Circles at 15% Axial Strain Criterion

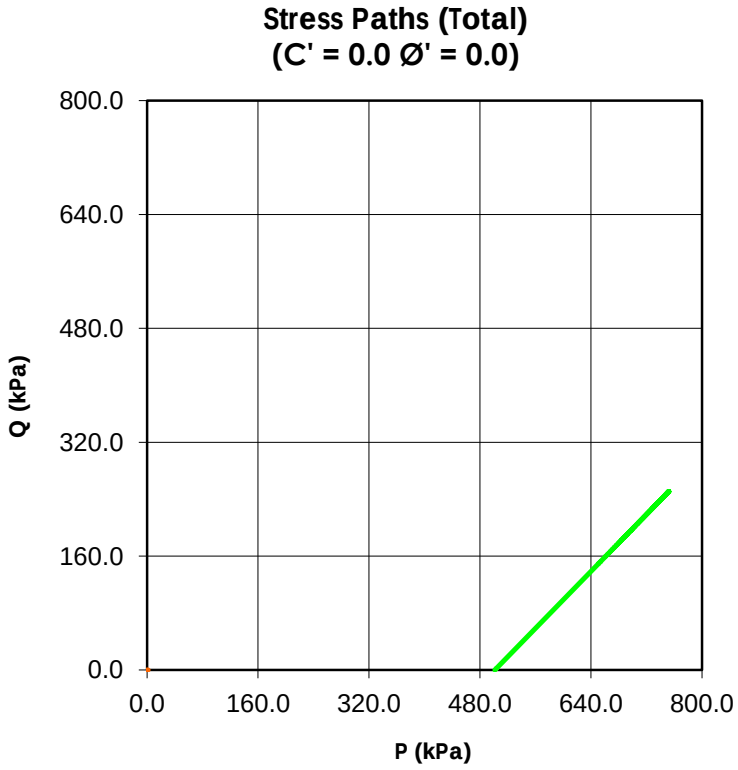
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

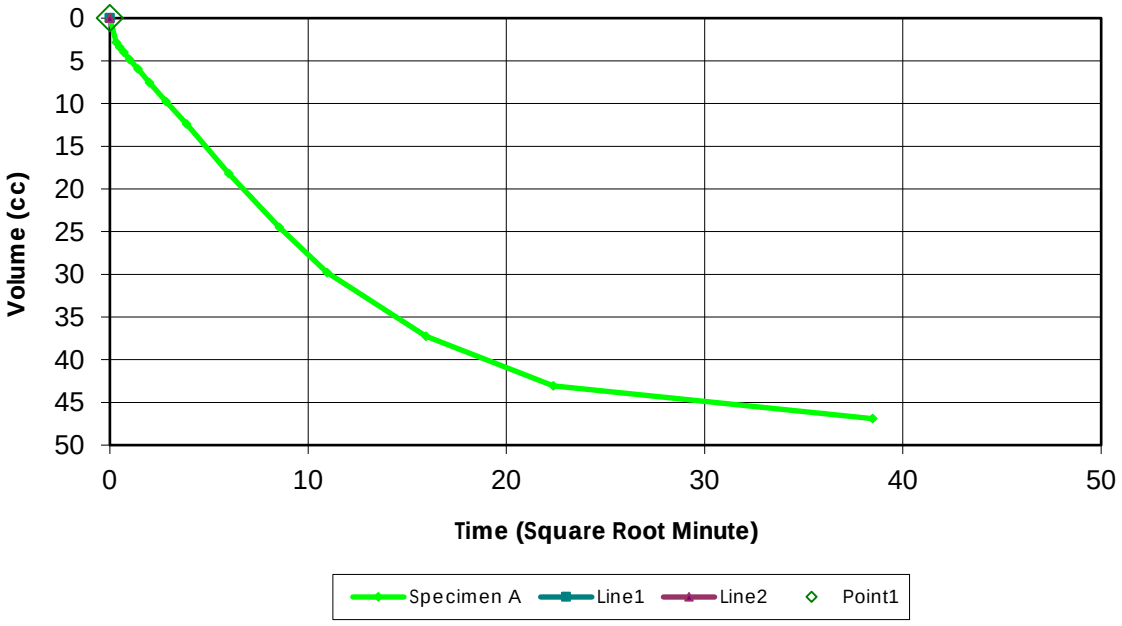



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A

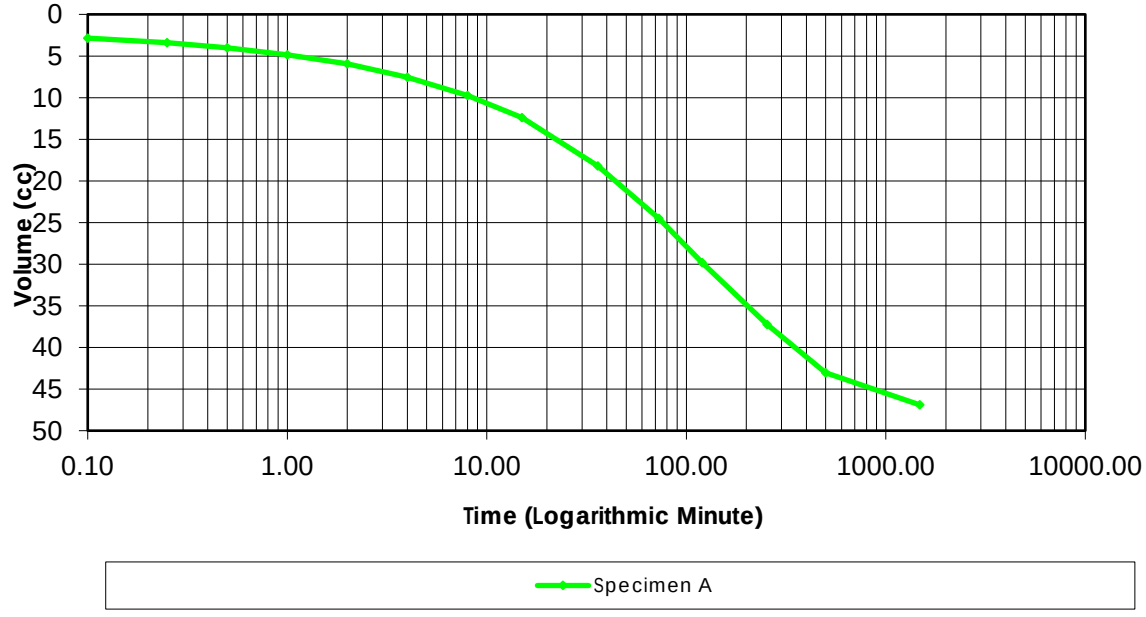

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.93

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 70.0 | 40.0 | 10.0 | 0.0 | 74.00 |
| 3 | 70.0 | 50.0 | 0.0 | 10.0 | |
| 4 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 5 | 90.0 | 50.0 | 20.0 | 0.0 | -1945.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 4.26-4.60m

| | |
|---|---|
| Cell Pressure (kPa) | 550 |
| Back Pressure (kPa) | 50 |
| Effective Pressure (kPa) | 500 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.3 |
| Initial Sample Height (mm) | 154.4 |
| Initial Sample Area (cm2) | 41.06 |
| Initial Volume (cm3) | 633.9 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 46.25 | N/A |
| 00:00:06 | 43.40 | 2.850 |
| 00:00:15 | 42.85 | 3.400 |
| 00:00:30 | 42.25 | 4.000 |
| 00:01:00 | 41.40 | 4.850 |
| 00:02:00 | 40.30 | 5.950 |
| 00:04:00 | 38.70 | 7.550 |
| 00:08:00 | 36.50 | 9.750 |
| 00:15:00 | 33.85 | 12.400 |
| 00:36:00 | 28.05 | 18.200 |
| 01:13:00 | 21.75 | 24.500 |
| 02:00:00 | 16.45 | 29.800 |
| 04:14:00 | 9.00 | 37.250 |
| 08:20:00 | 3.20 | 43.050 |
| 24:40:00 | -0.65 | 46.900 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

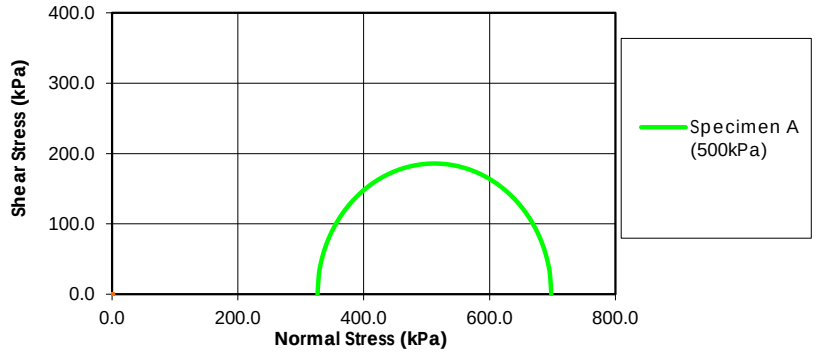
Stantec

Reviewed By C. Lamoureux

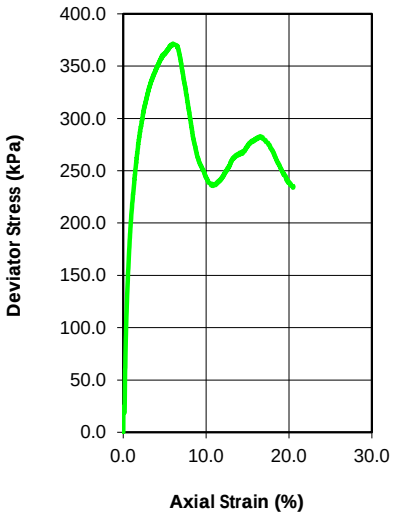
Date: 15-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.7 | | | |
| Dry Density (g/cm3) | 1.563 | | | |
| Saturation (%) | 95.45 | | | |
| Void Ratio | 0.727 | | | |
| Diameter (mm) | 72.300 | | | |
| Height (mm) | 151.300 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 20.0 | | | |
| Dry Density (g/cm3) | 1.674 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.613 | | | |
| Effective Stress (kPa) | 497.1 | | | |
| Back Press. (kPa) | 62.9 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

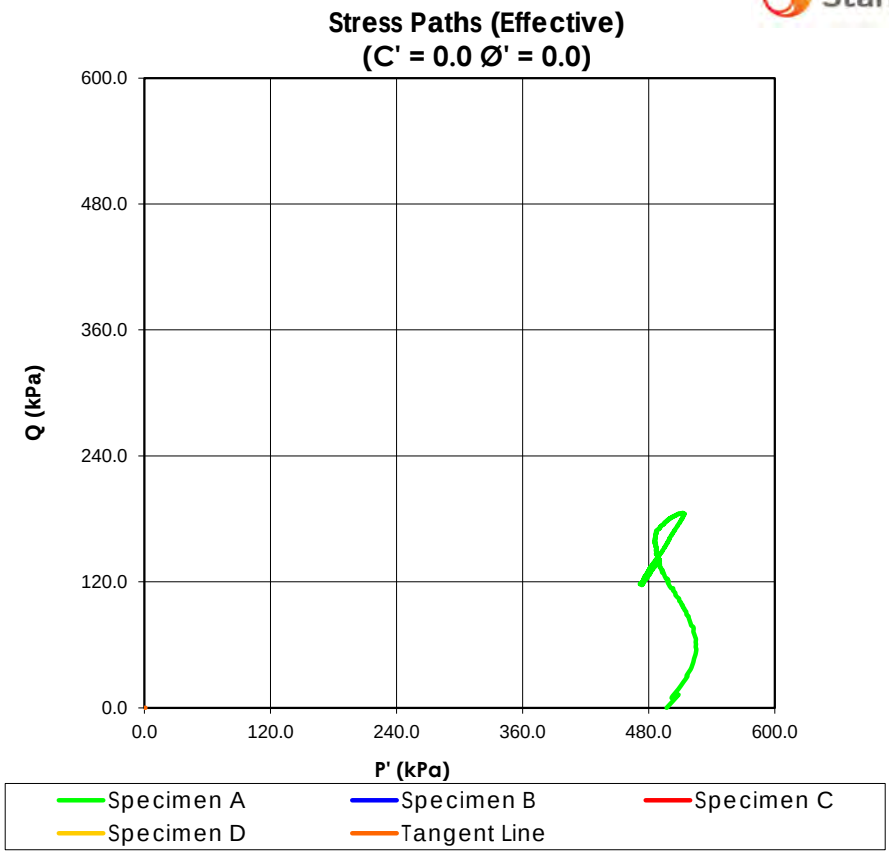
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 698.12 | | | |
| σ'3 at Failure (kPa) | 326.58 | | | |
| | | | | |
| | | | | |

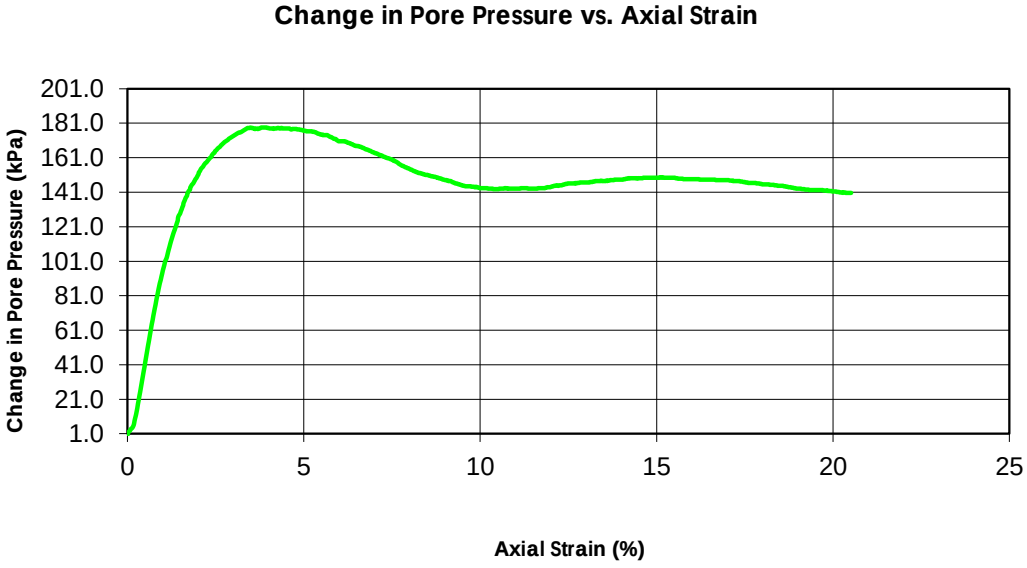
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D36 ST2 |
| **Depth:** | 0.90-1.35m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Silty Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

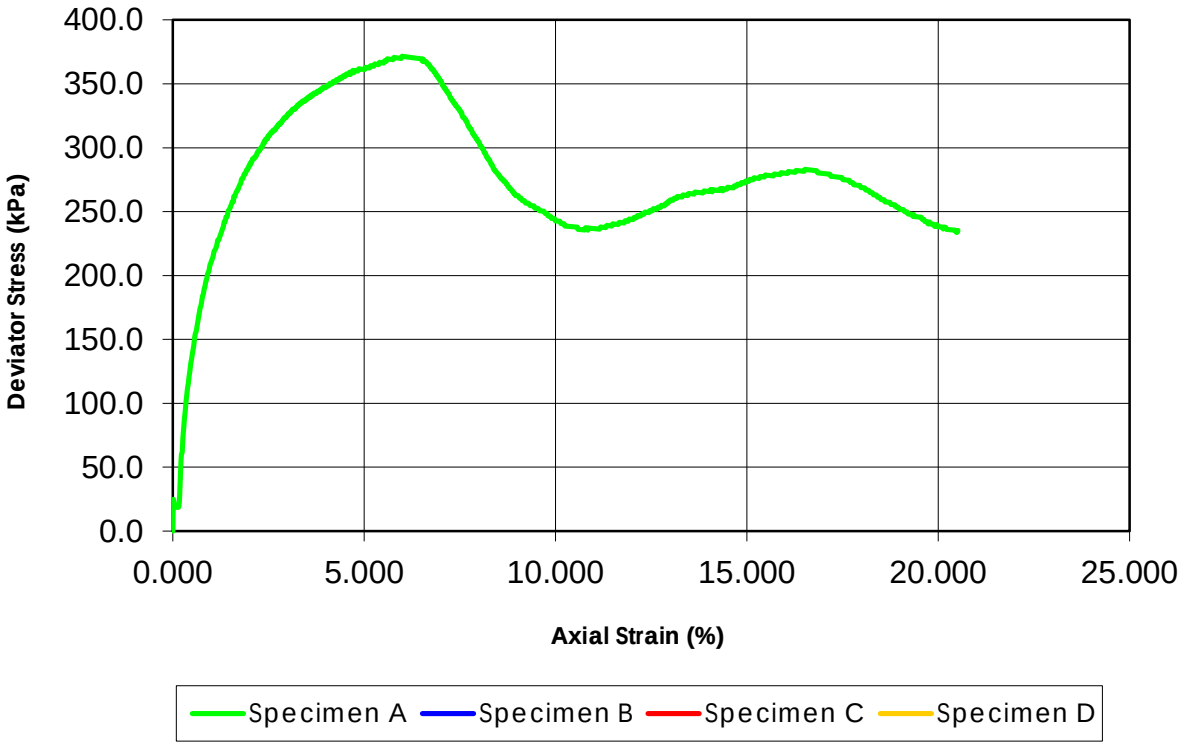
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

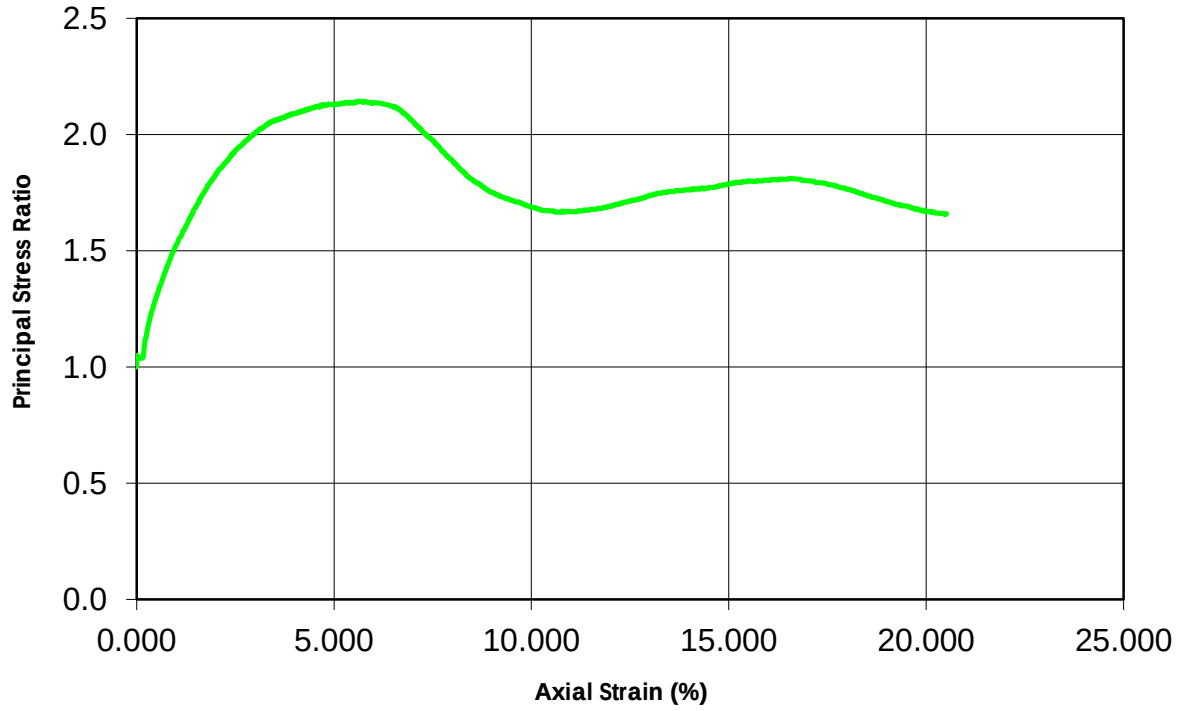


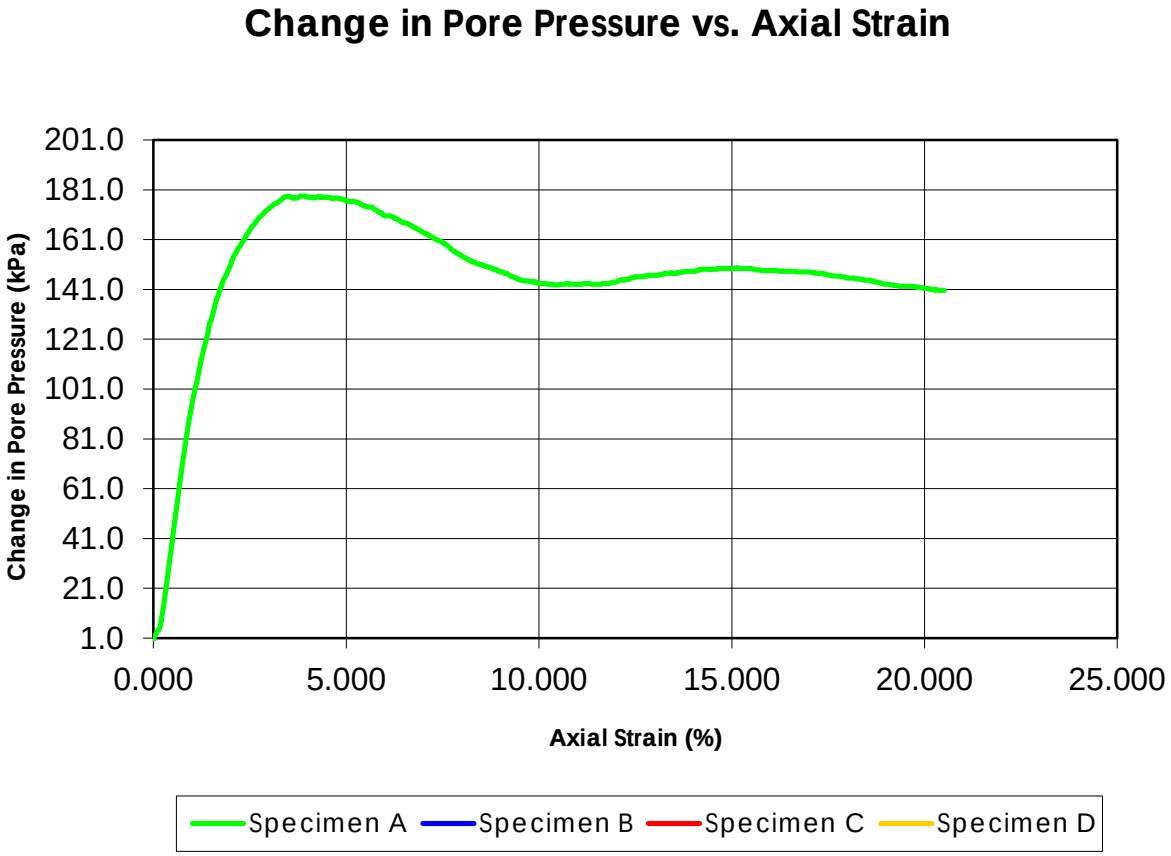



## Deviator Stress vs. Axial Strain



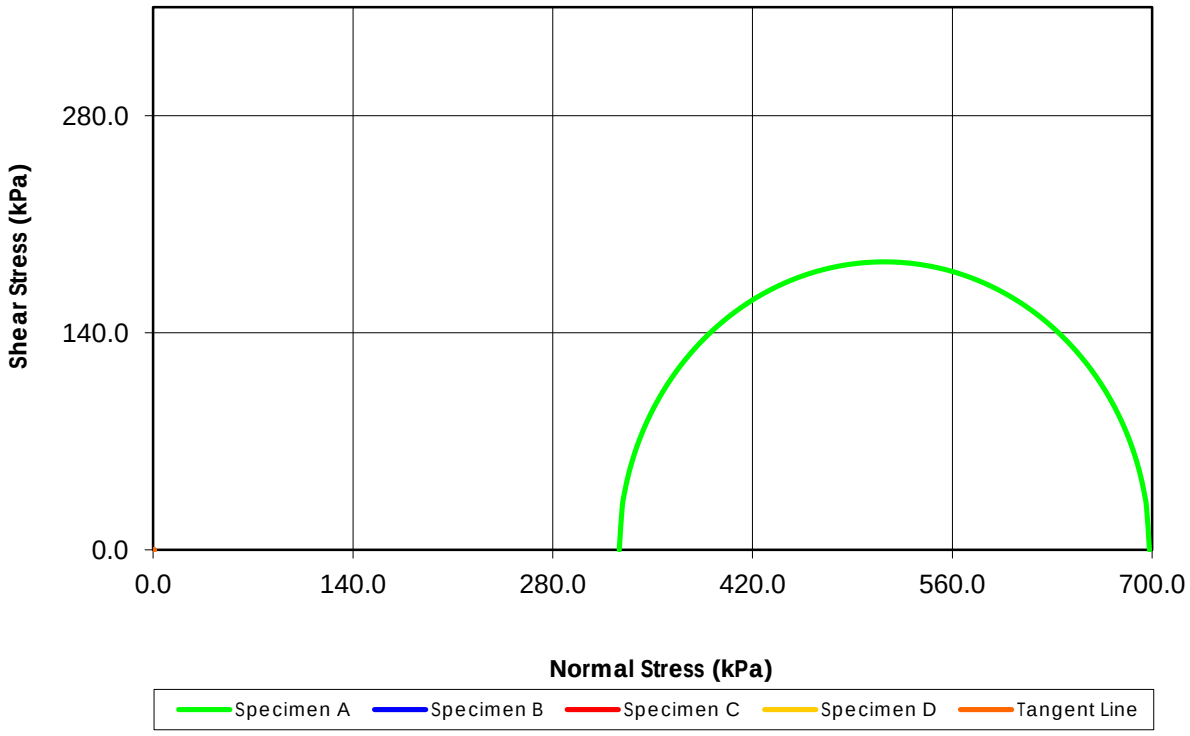

## Principal Stress Ratio vs. Axial Strain



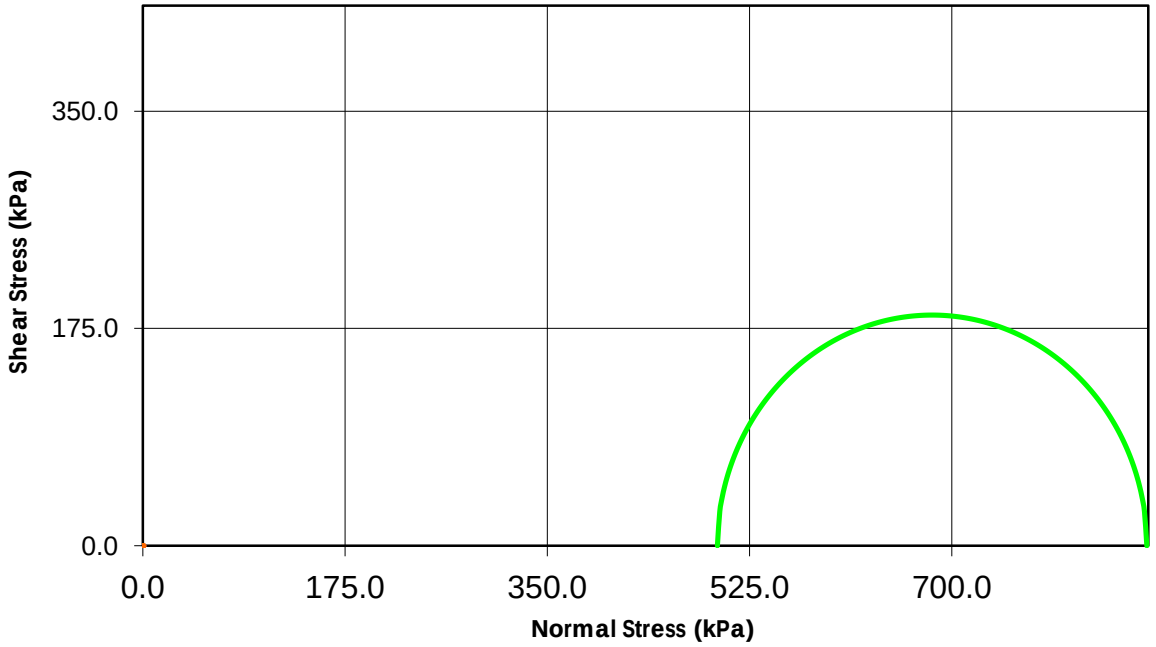

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
201.0
181.0
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

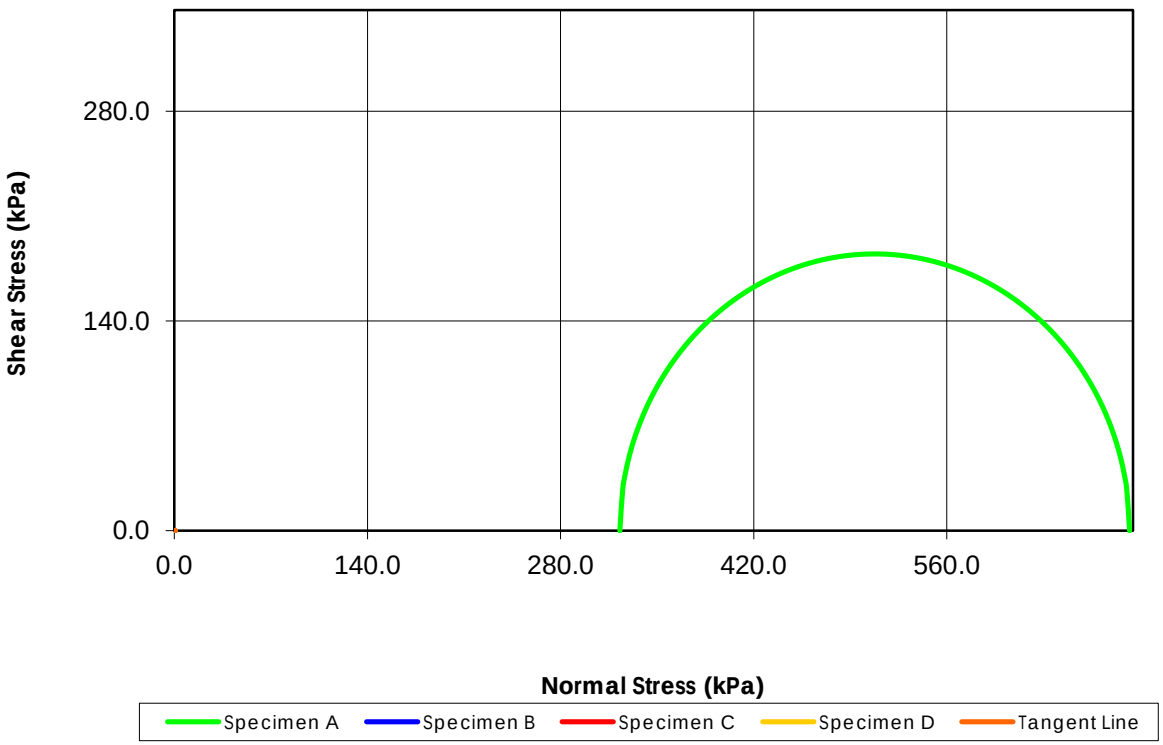



### Total Stress
### (C = 0.0 Ø = 0.0)

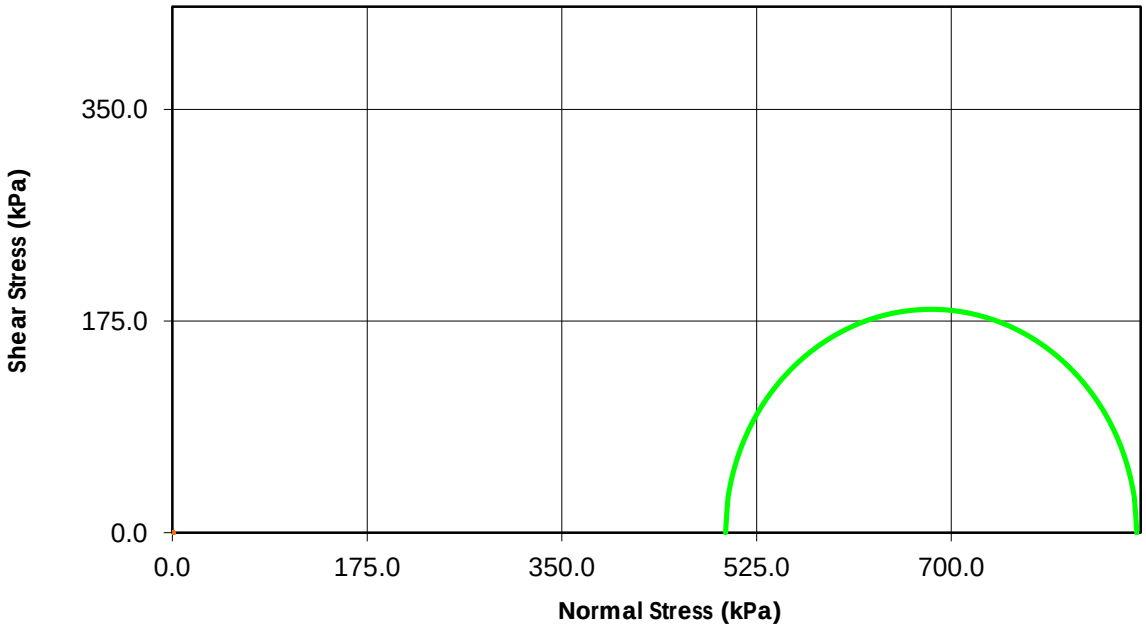


## Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

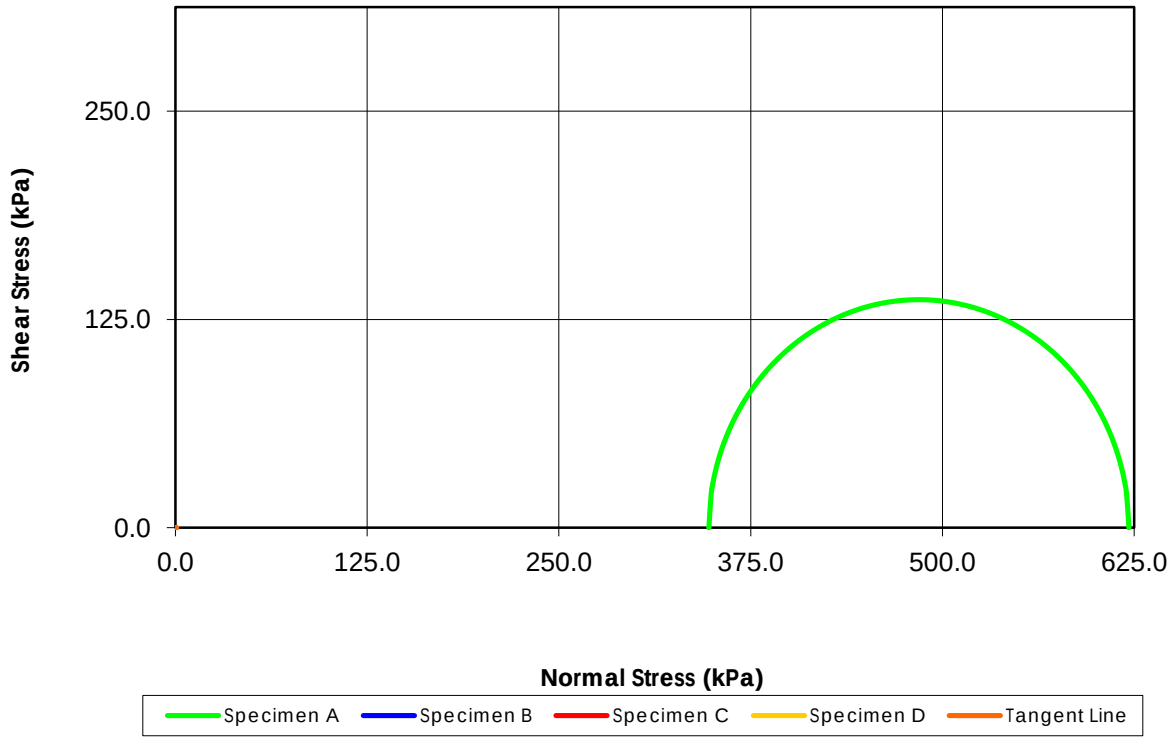



### Total Stress
### (C = 0.0 Ø = 0.0)

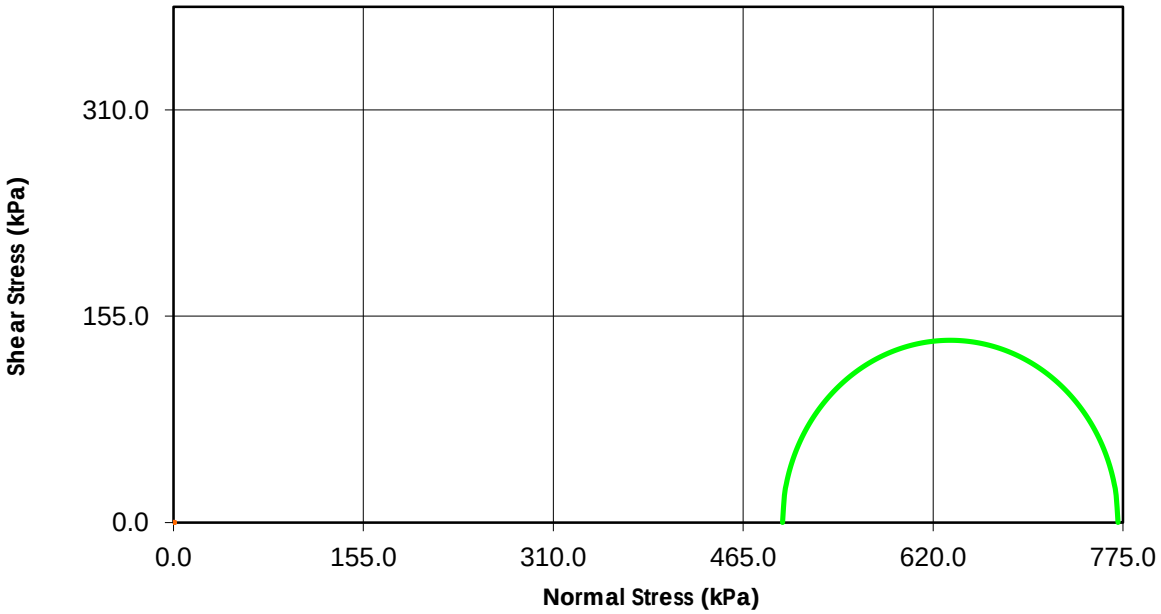


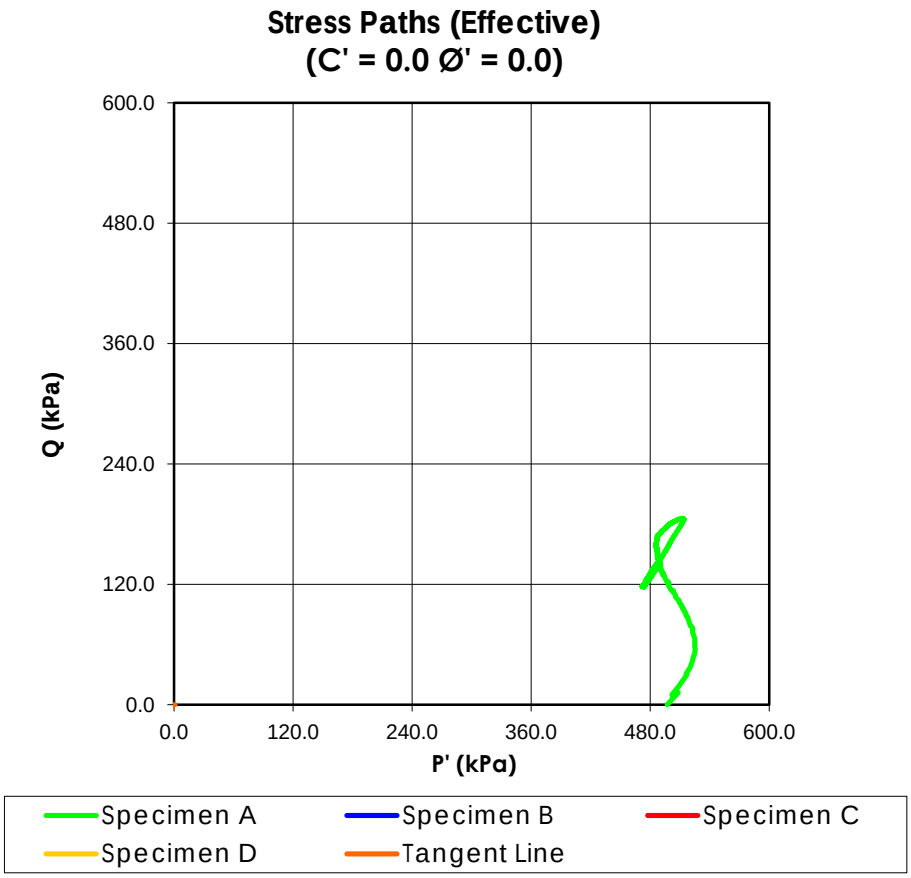
# Mohr Stress Circles at 15% Axial Strain Criterion

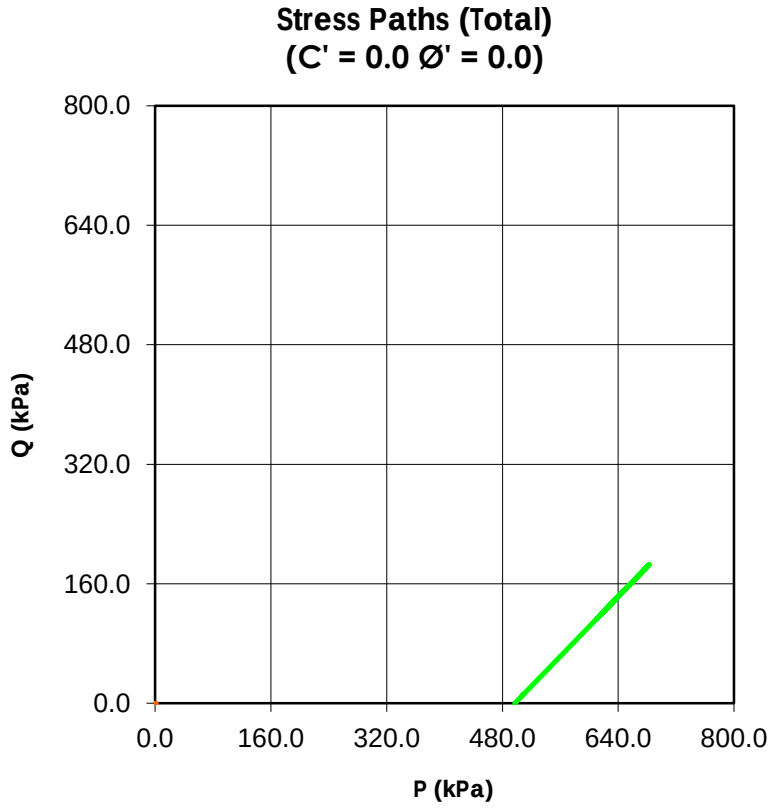
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

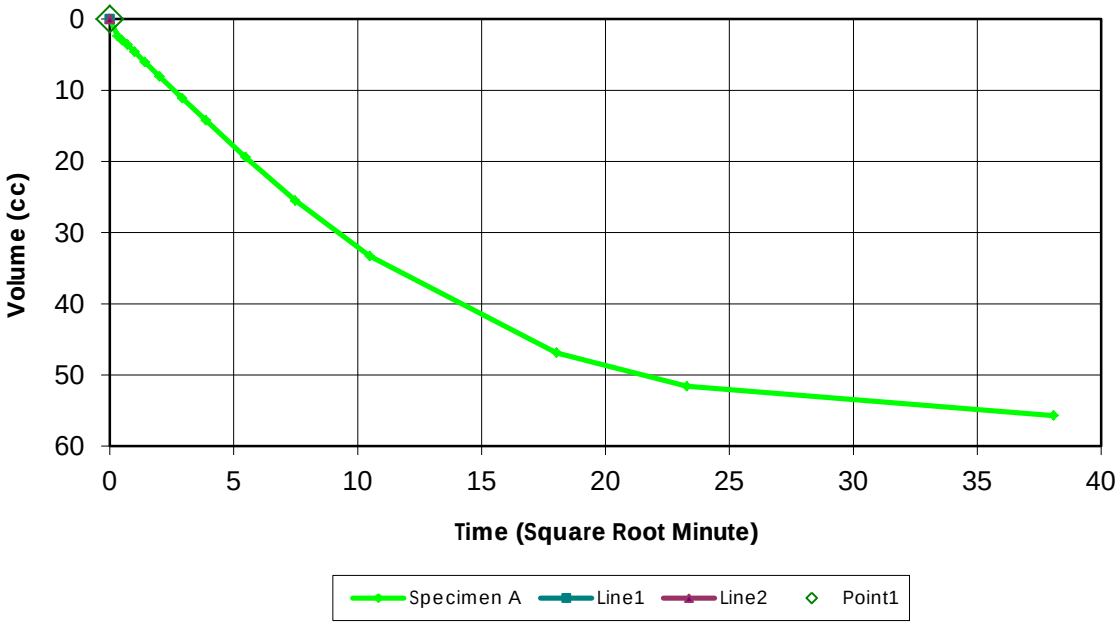



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

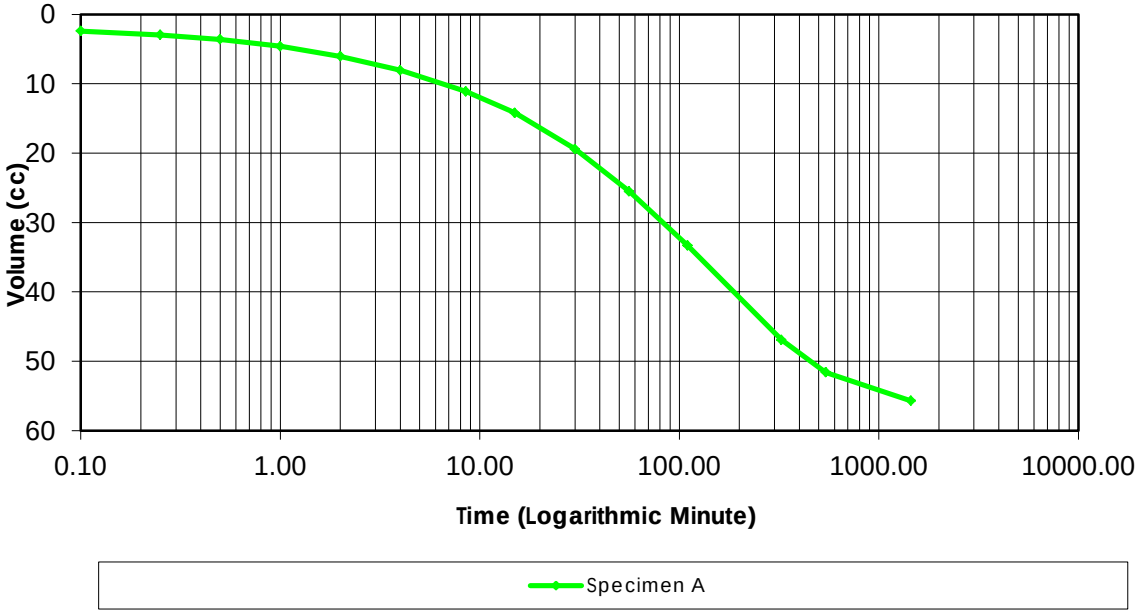

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 715.00 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 60.0 | 20.0 | 0.0 | 96.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 0.90-1.35m

| | |
|---|---|
| Cell Pressure (kPa) | 560 |
| Back Pressure (kPa) | 60 |
| Effective Pressure (kPa) | 500 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.3 |
| Initial Sample Height (mm) | 151.3 |
| Initial Sample Area (cm2) | 41.06 |
| Initial Volume (cm3) | 621.2 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 43.70 | N/A |
| 00:00:06 | 41.30 | 2.400 |
| 00:00:15 | 40.75 | 2.950 |
| 00:00:30 | 40.10 | 3.600 |
| 00:01:00 | 39.10 | 4.600 |
| 00:02:00 | 37.65 | 6.050 |
| 00:04:00 | 35.65 | 8.050 |
| 00:08:30 | 32.60 | 11.100 |
| 00:15:00 | 29.50 | 14.200 |
| 00:30:00 | 24.30 | 19.400 |
| 00:56:00 | 18.20 | 25.500 |
| 01:50:00 | 10.40 | 33.300 |
| 05:25:00 | -3.20 | 46.900 |
| 09:02:00 | -7.90 | 51.600 |
| 24:10:00 | -12.00 | 55.700 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

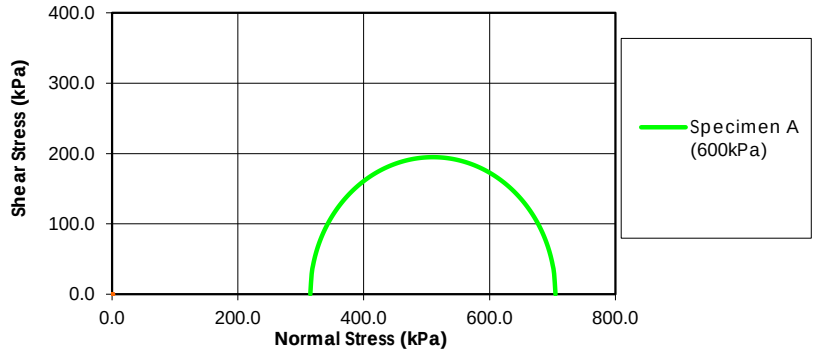
Stantec

Reviewed By C. Lamoureux

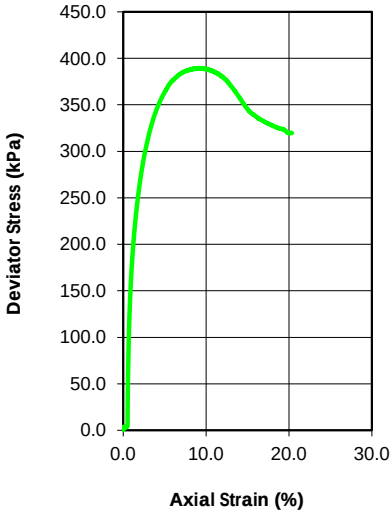
Date: 17-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 26.5 | | | |
| Dry Density (g/cm3) | 1.574 | | | |
| Saturation (%) | 100.20 | | | |
| Void Ratio | 0.715 | | | |
| Diameter (mm) | 73.100 | | | |
| Height (mm) | 151.000 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 20.6 | | | |
| Dry Density (g/cm3) | 1.727 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.563 | | | |
| Effective Stress (kPa) | 593.9 | | | |
| Back Press. (kPa) | 76.1 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

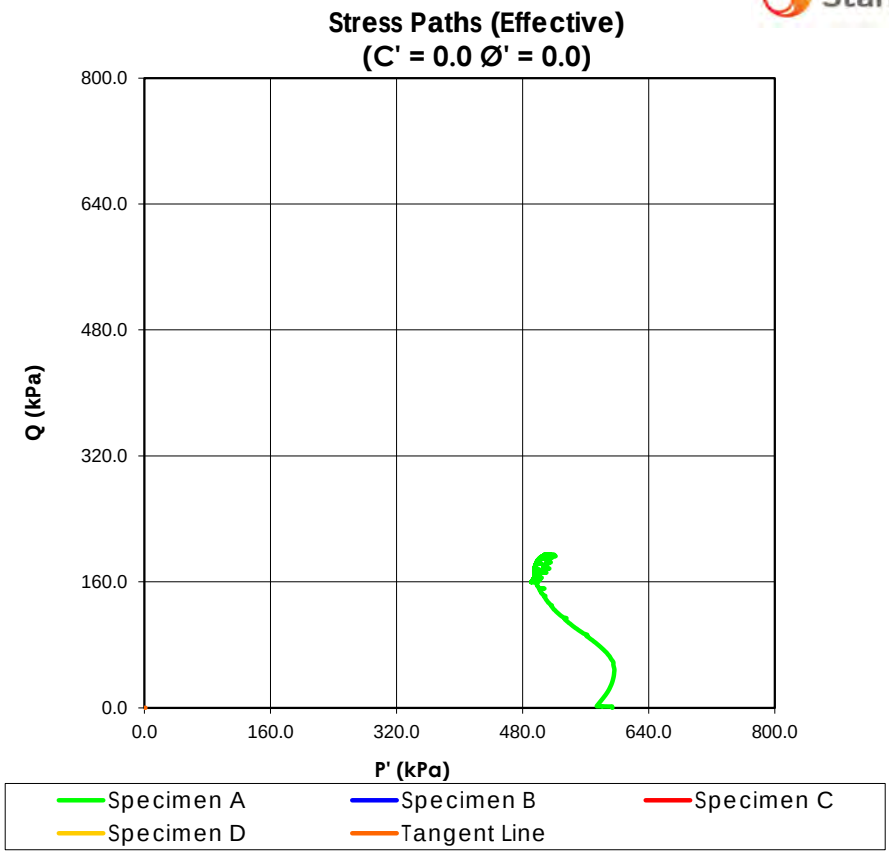
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 704.74 | | | |
| σ'3 at Failure (kPa) | 315.11 | | | |
| | | | | |
| | | | | |

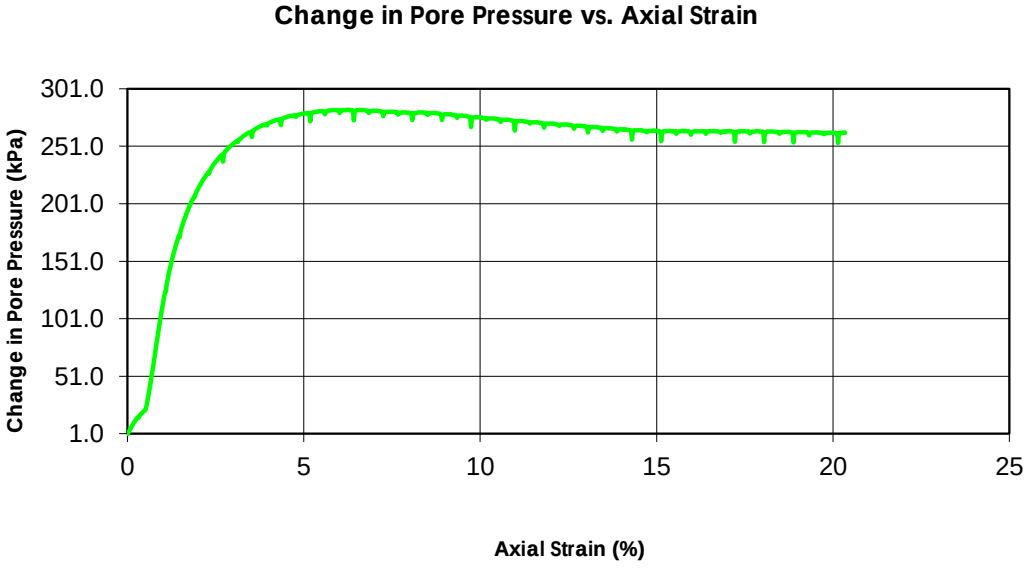
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D36 ST8 |
| **Depth:** | 3.60-4.05m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

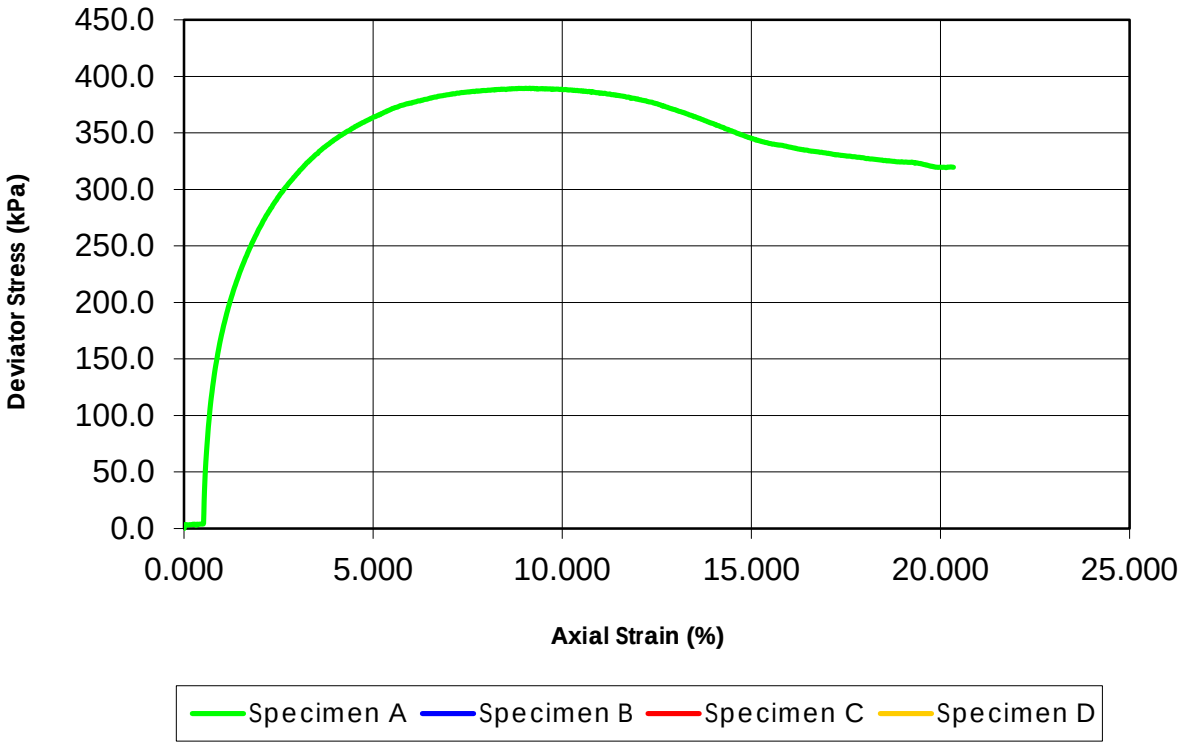
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

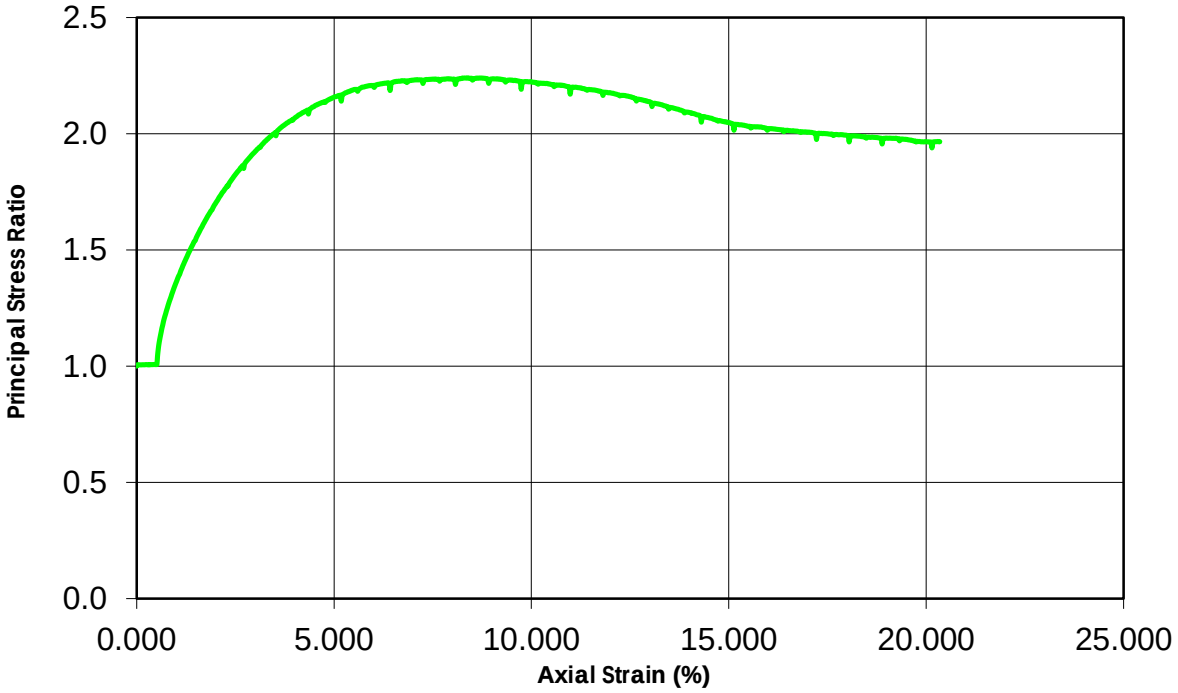


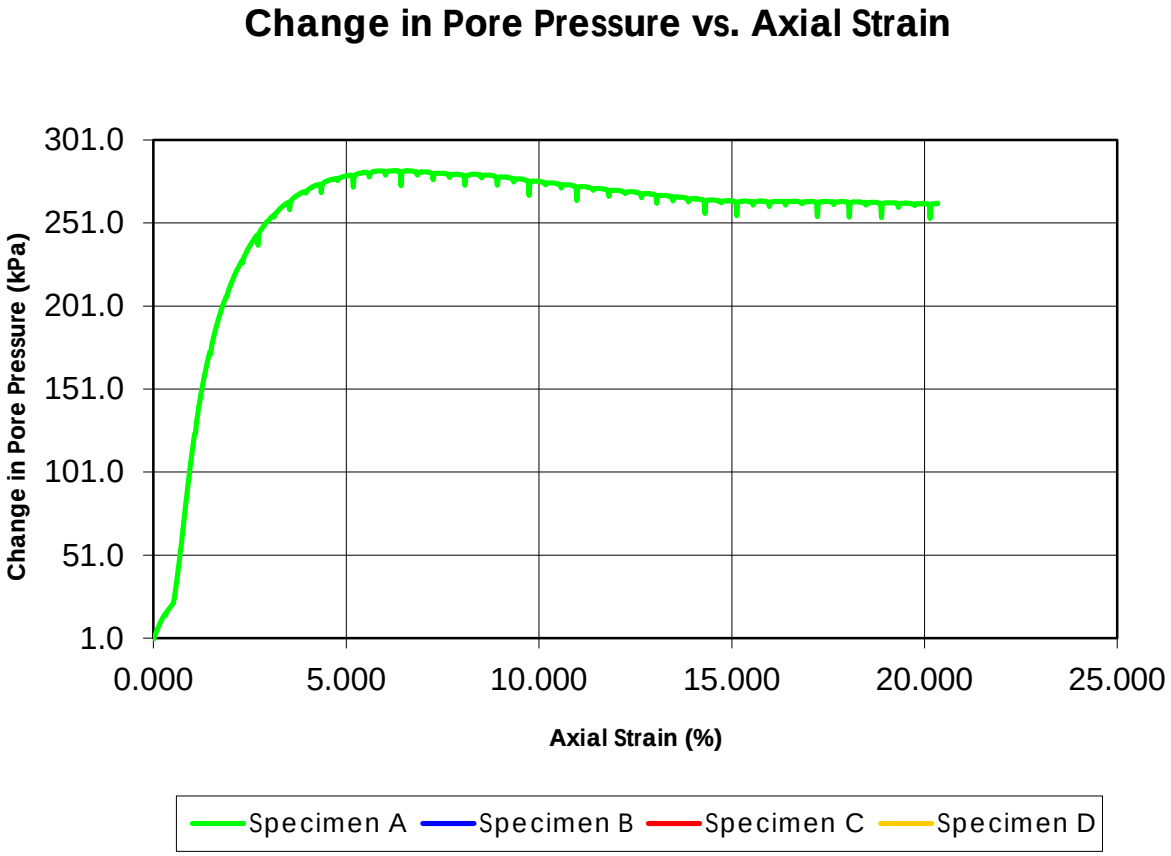



## Deviator Stress vs. Axial Strain



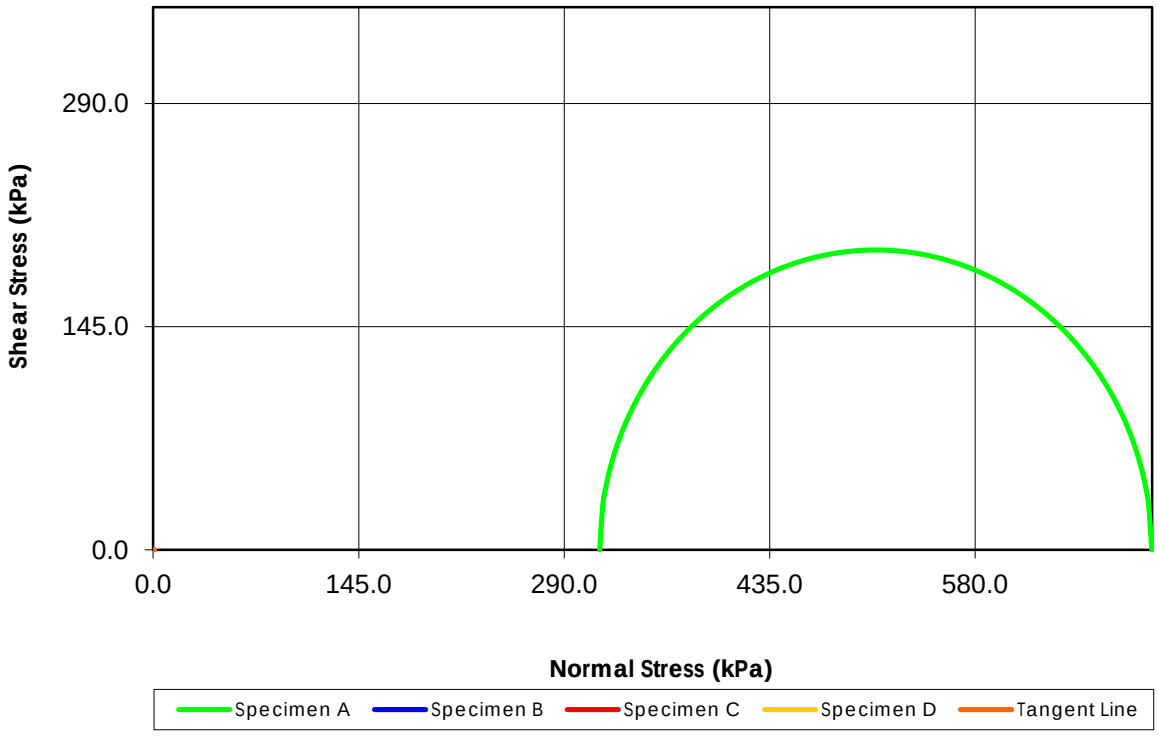

## Principal Stress Ratio vs. Axial Strain



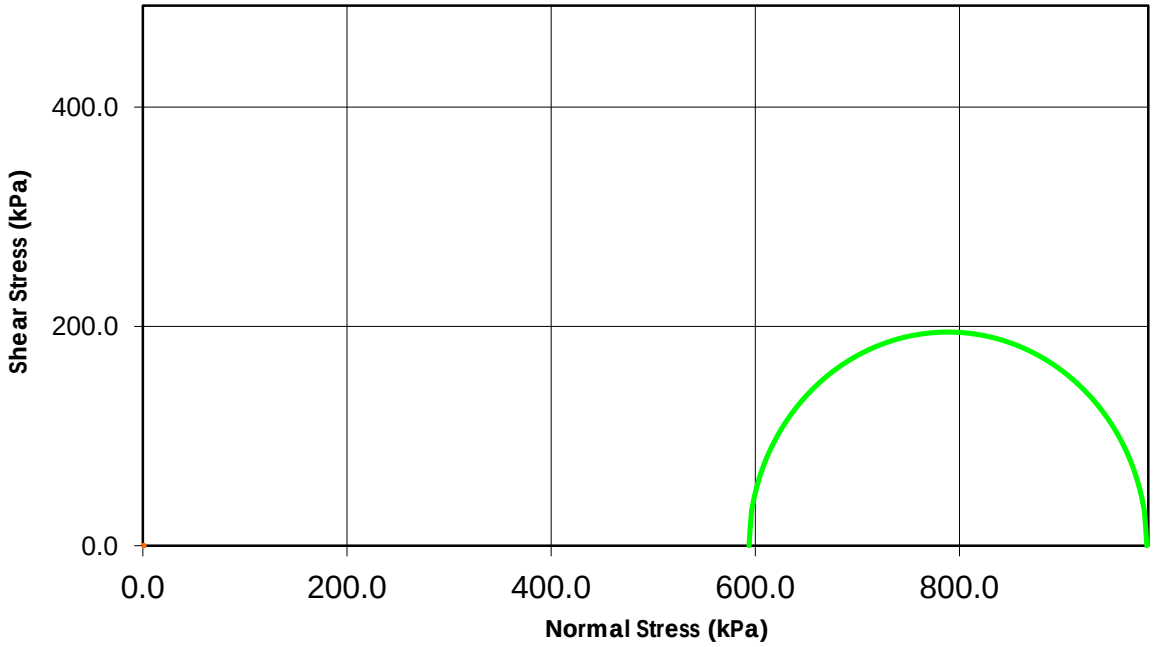

Change in Pore Pressure vs. Axial Strain
301.0
251.0
201.0
151.0
101.0
51.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

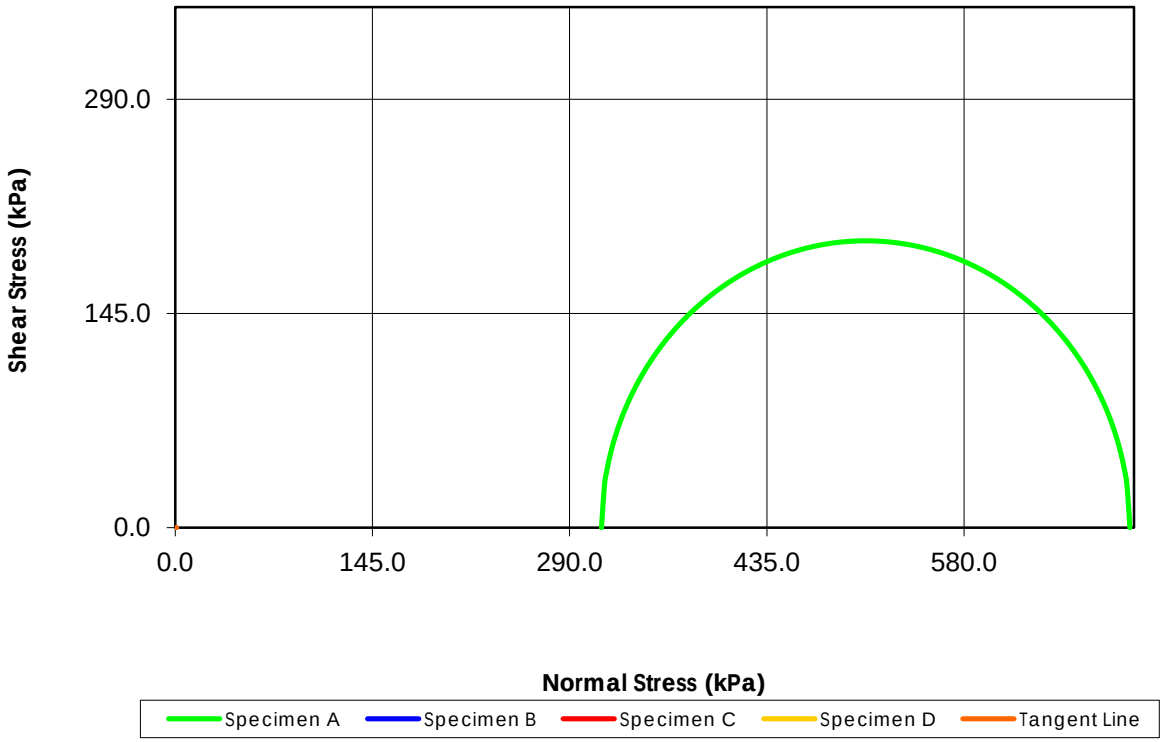



### Total Stress
### (C = 0.0 Ø = 0.0)

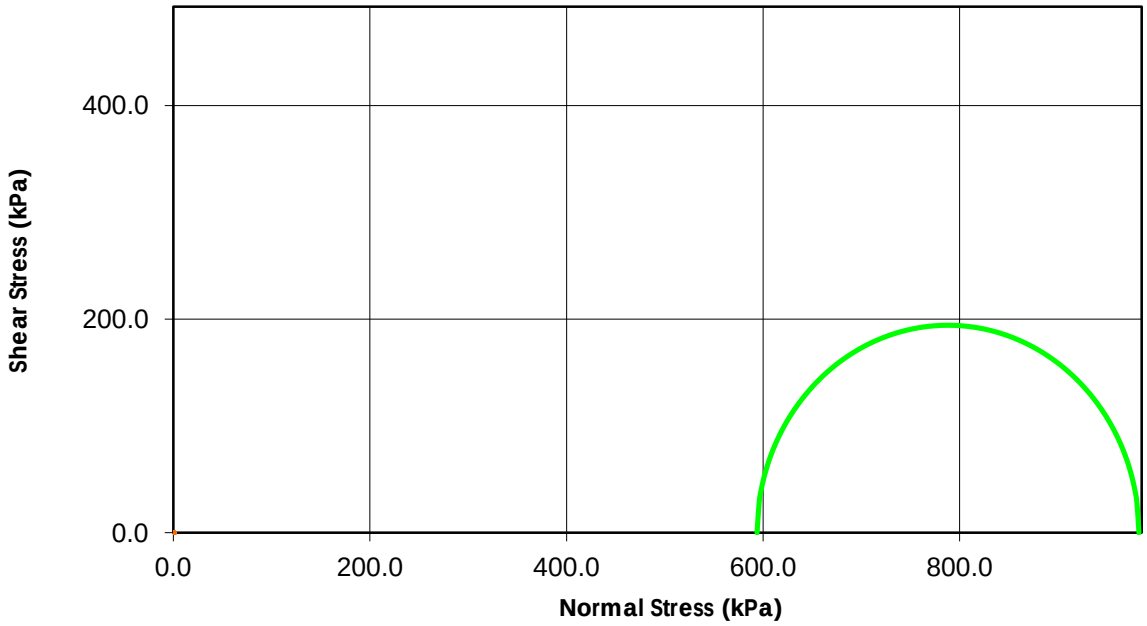


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

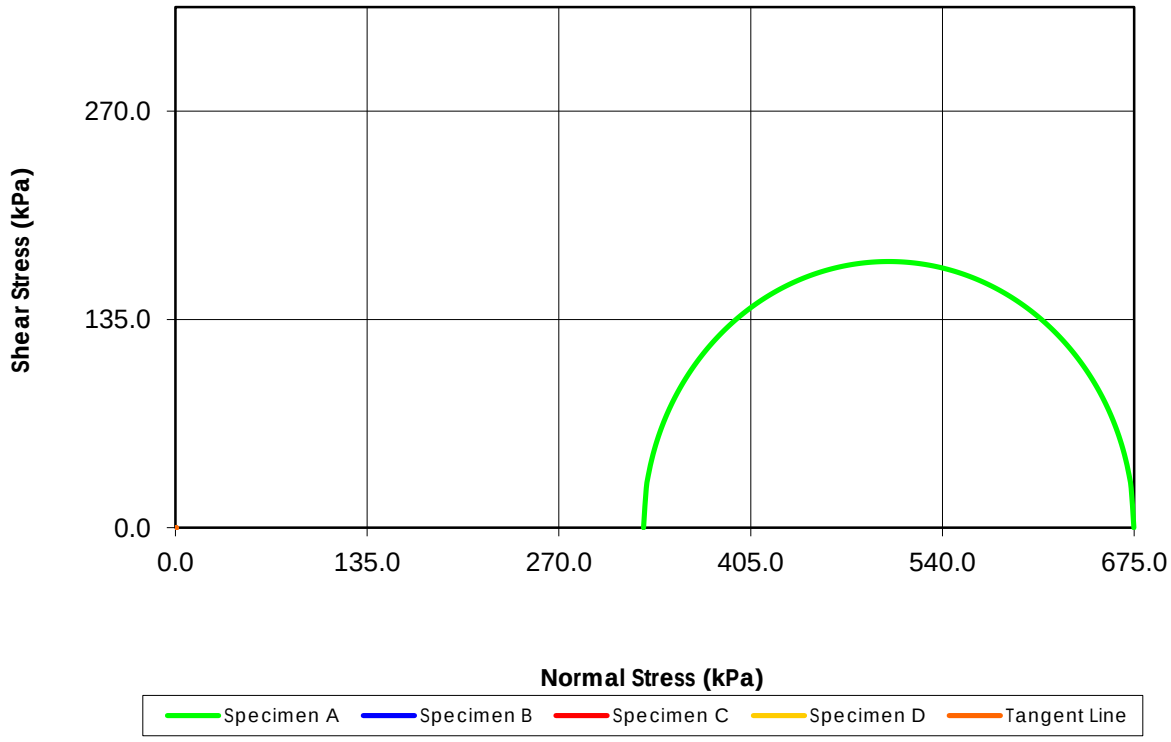



## Total Stress
## (C = 0.0 Ø = 0.0)

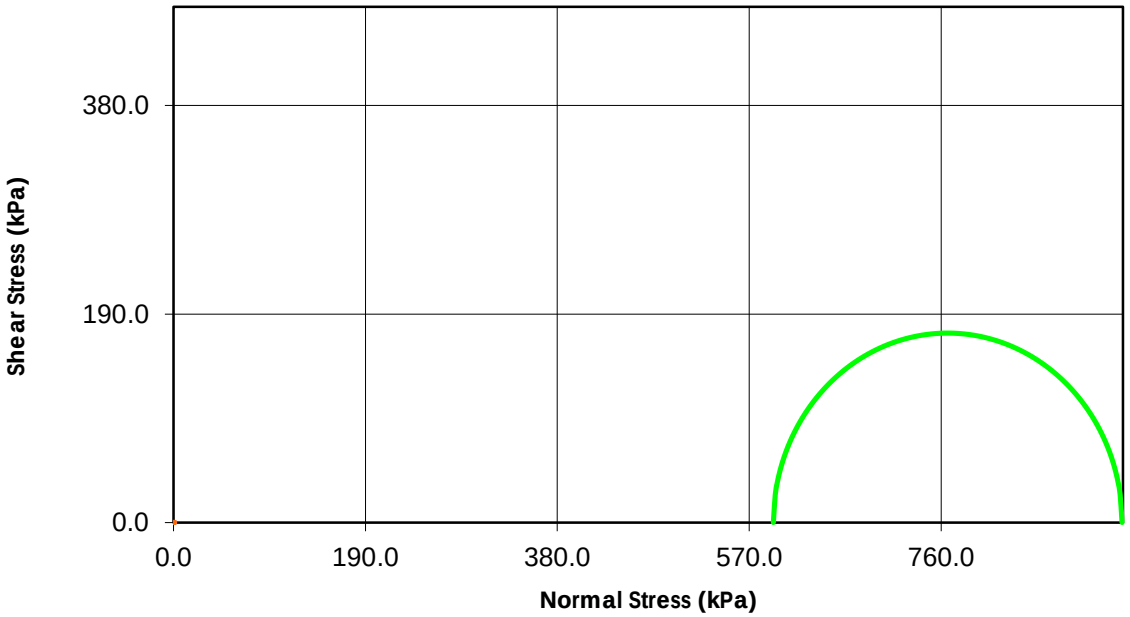


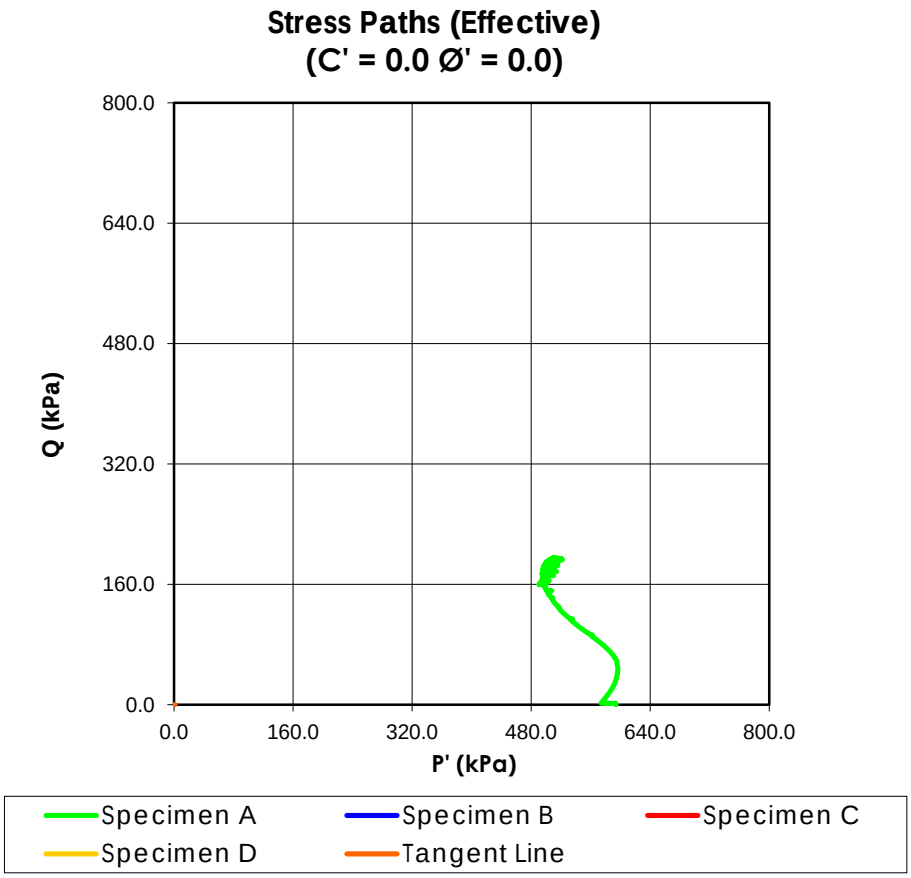
# Mohr Stress Circles at 15% Axial Strain Criterion

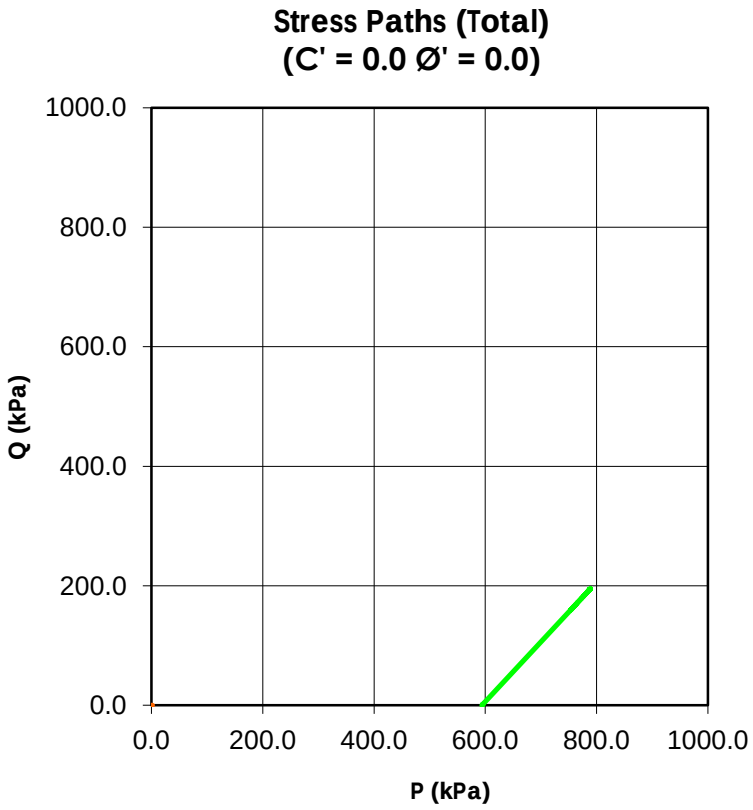
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

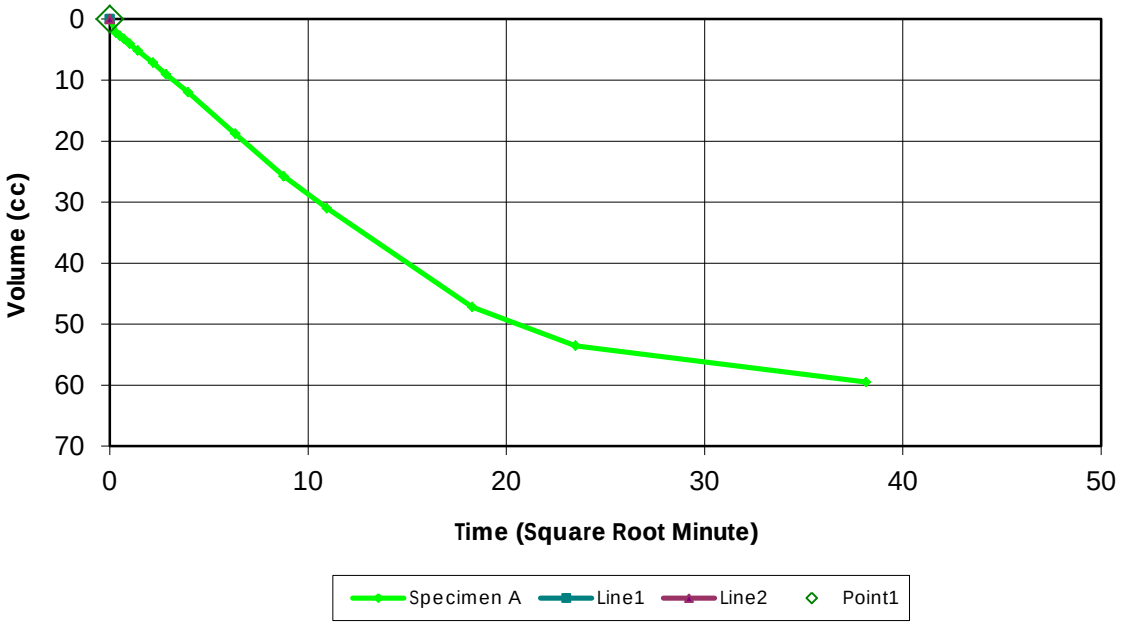



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

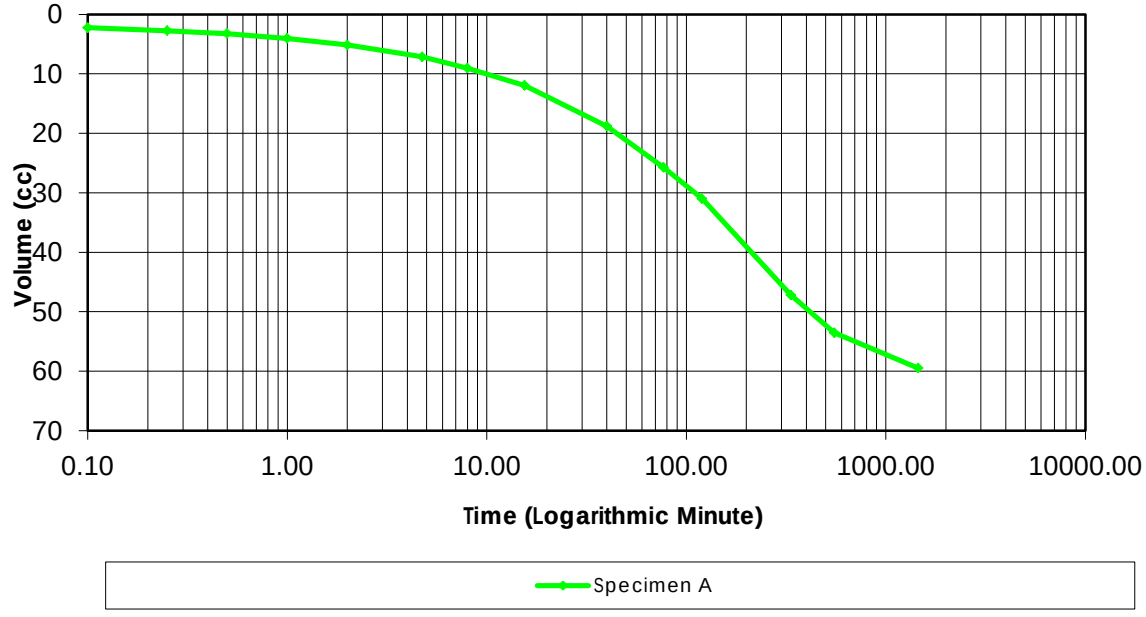

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 0.60 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 90.0 | 60.0 | 10.0 | 0.0 | 0.69 |
| 6 | 90.0 | 70.0 | 0.0 | 10.0 | |
| 7 | 90.0 | 70.0 | 0.0 | 0.0 | |
| 8 | 100.0 | 70.0 | 10.0 | 0.0 | 0.96 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.60-4.05m

| | |
|---|---|
| Cell Pressure (kPa) | 670 |
| Back Pressure (kPa) | 70 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 73.1 |
| Initial Sample Height (mm) | 151 |
| Initial Sample Area (cm2) | 41.97 |
| Initial Volume (cm3) | 633.7 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 41.90 | N/A |
| 00:00:06 | 39.65 | 2.250 |
| 00:00:15 | 39.15 | 2.750 |
| 00:00:30 | 38.65 | 3.250 |
| 00:01:00 | 37.85 | 4.050 |
| 00:02:00 | 36.75 | 5.150 |
| 00:04:45 | 34.75 | 7.150 |
| 00:08:00 | 32.85 | 9.050 |
| 00:15:30 | 29.95 | 11.950 |
| 00:40:00 | 23.10 | 18.800 |
| 01:17:00 | 16.15 | 25.750 |
| 02:00:00 | 10.90 | 31.000 |
| 05:34:00 | -5.30 | 47.200 |
| 09:12:00 | -11.65 | 53.550 |
| 24:15:00 | -17.60 | 59.500 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

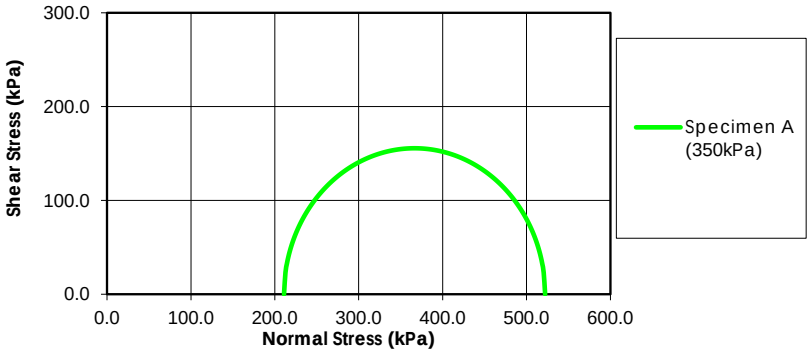
Stantec

Reviewed By: C. Lamoureux

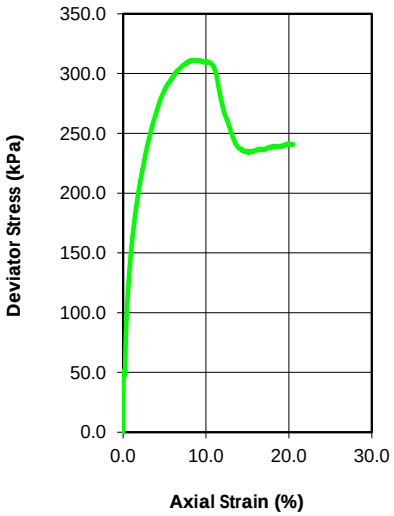
Date: 18-Oct-16

Tested By: C. Woods

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.7 | | | |
| Dry Density (g/cm3) | 1.548 | | | |
| Saturation (%) | 100.53 | | | |
| Void Ratio | 0.744 | | | |
| Diameter (mm) | 72.0 | | | |
| Height (mm) | 148.6 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 23.6 | | | |
| Dry Density (g/cm3) | 1.662 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.625 | | | |
| Effective Stress (kPa) | 343.8 | | | |
| Back Press. (kPa) | 206.2 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

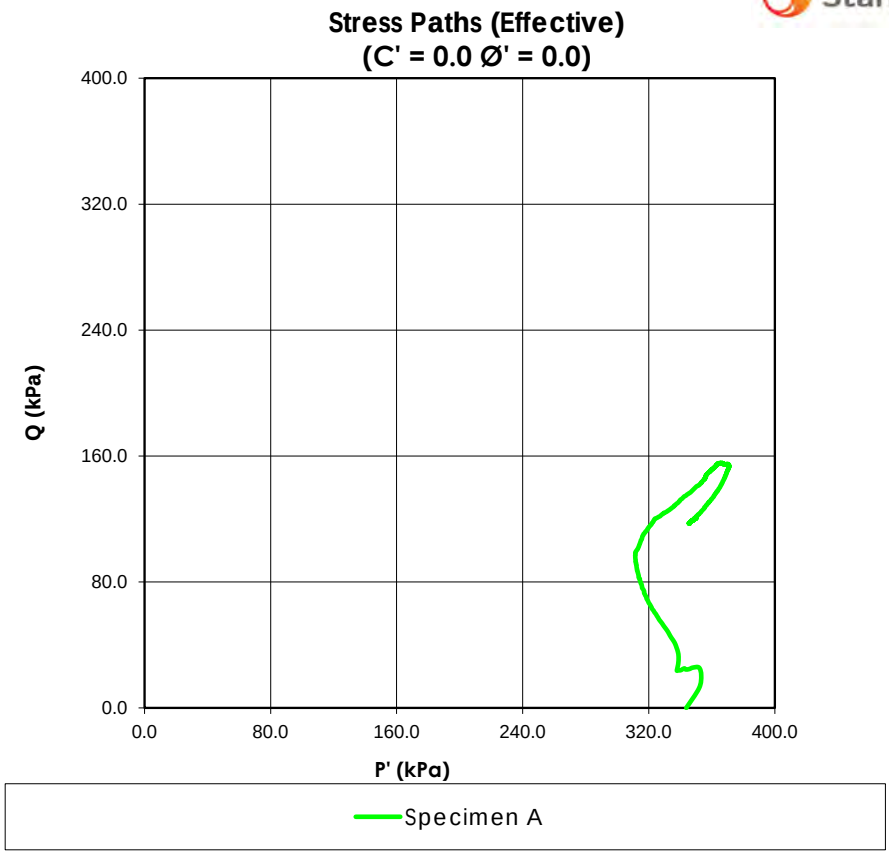
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 522.16 | | | |
| σ'3 at Failure (kPa) | 210.95 | | | |
| | | | | |
| | | | | |

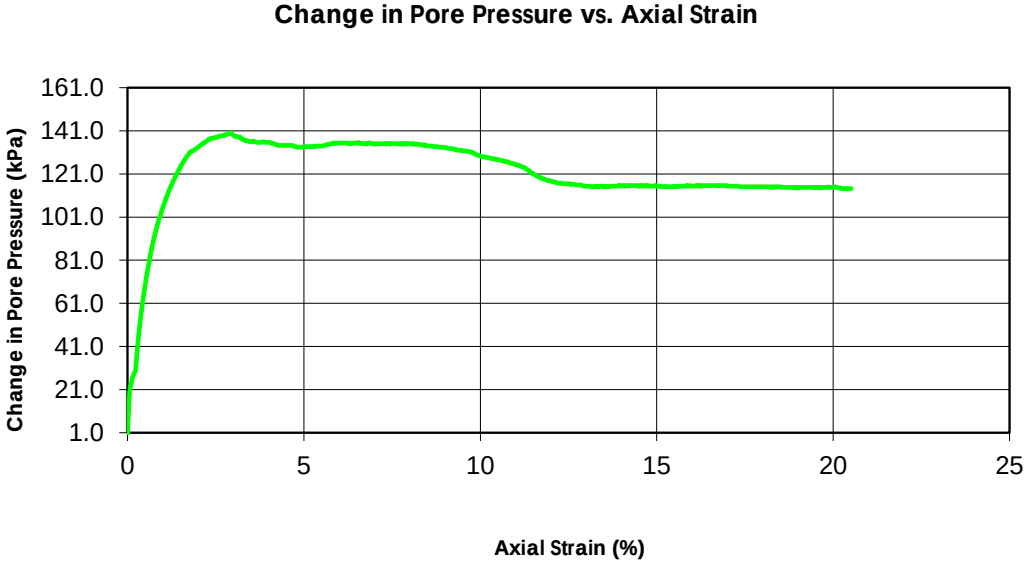
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D38 S4 |
| **Depth:** | 4.9-5.2m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, Trace Sand |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

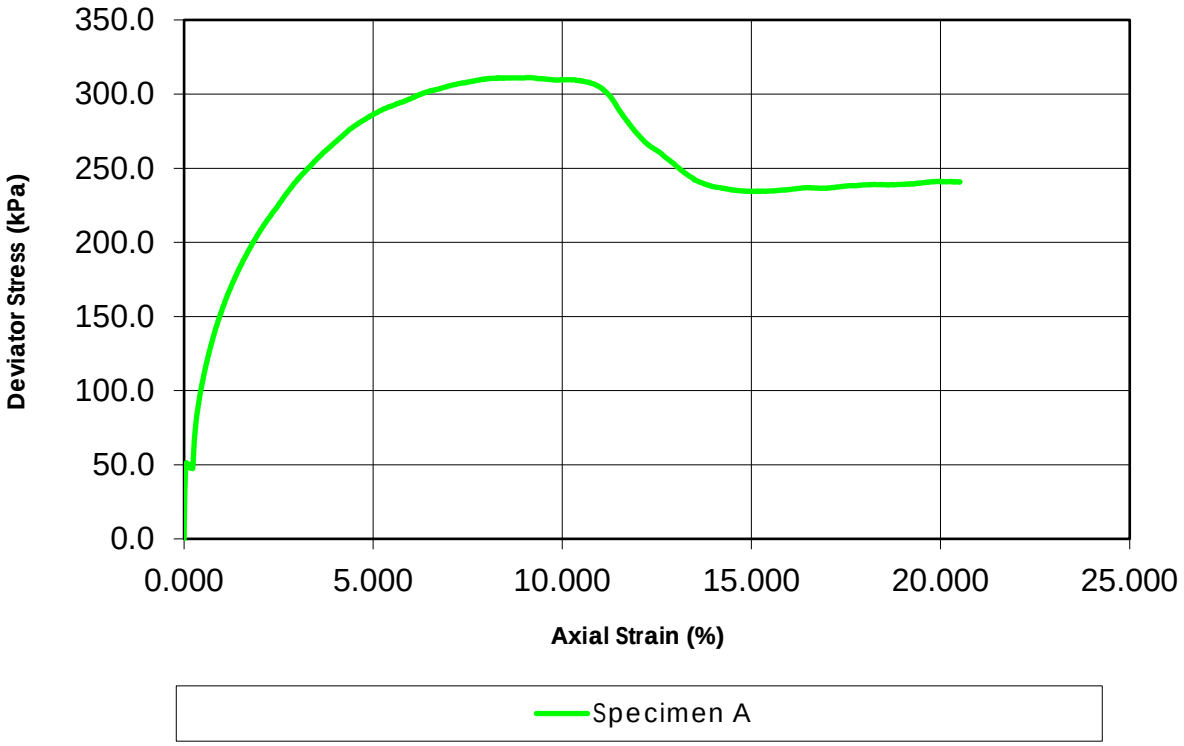
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

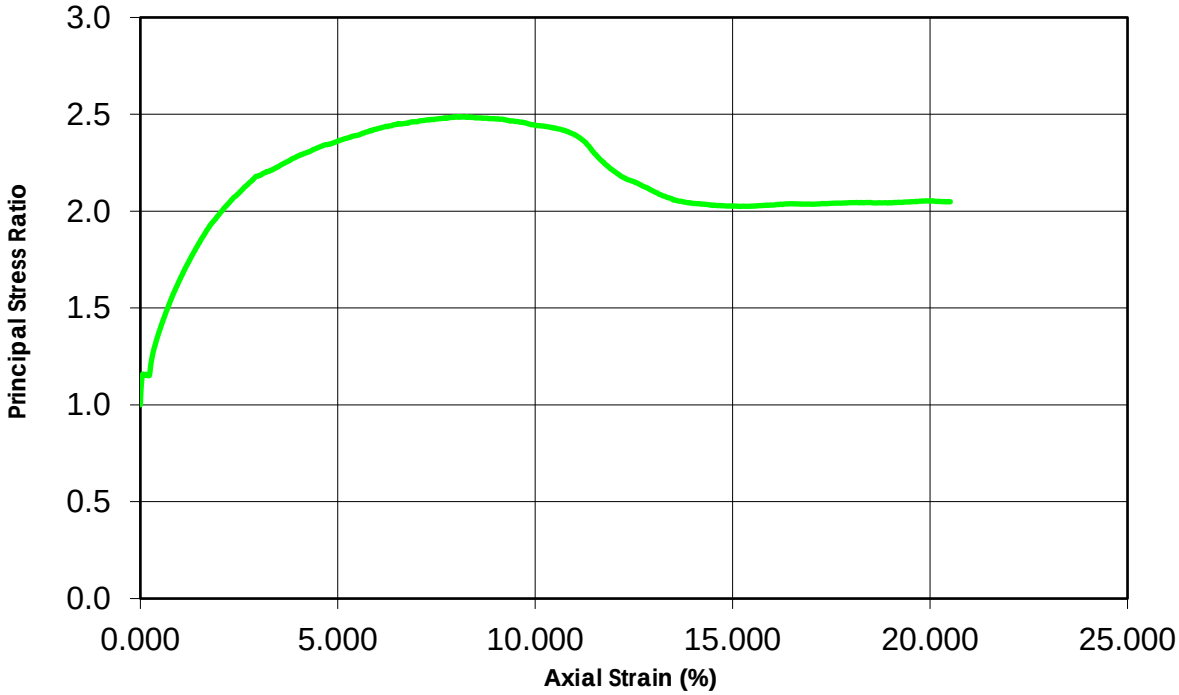


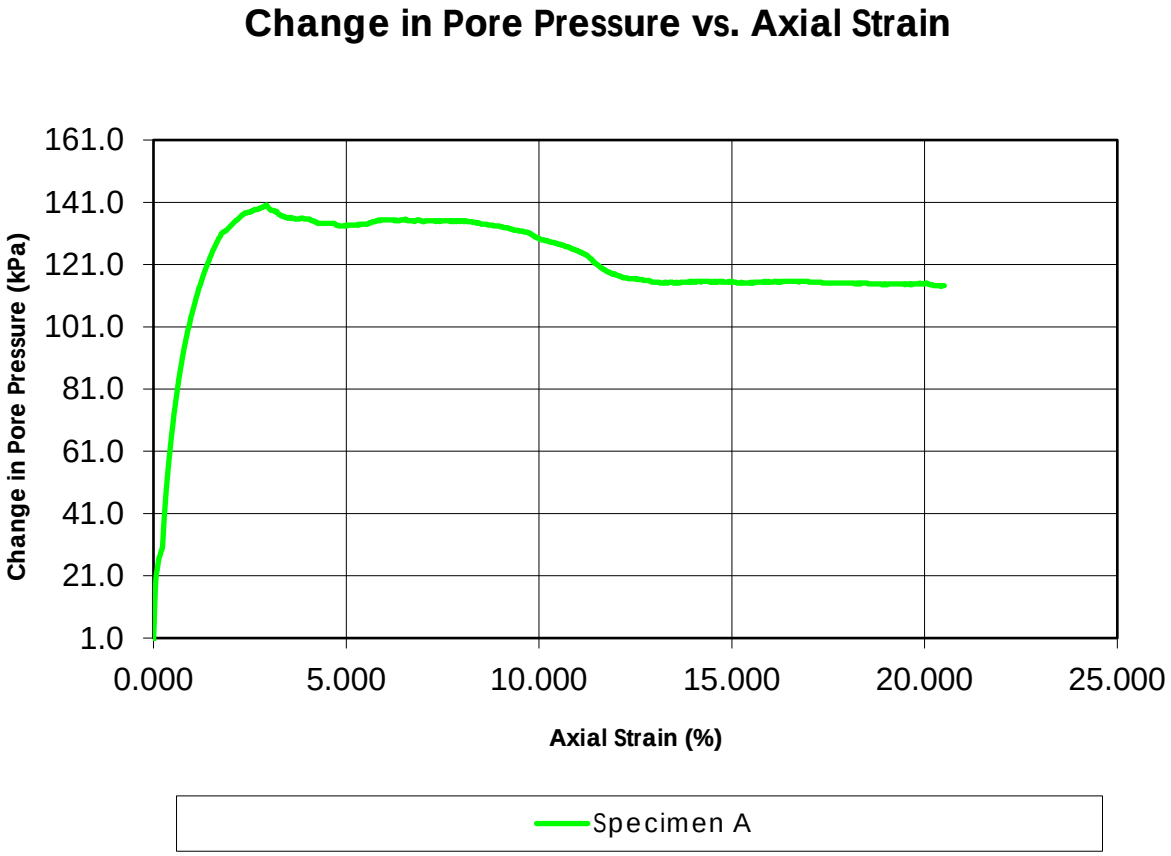



## Deviator Stress vs. Axial Strain



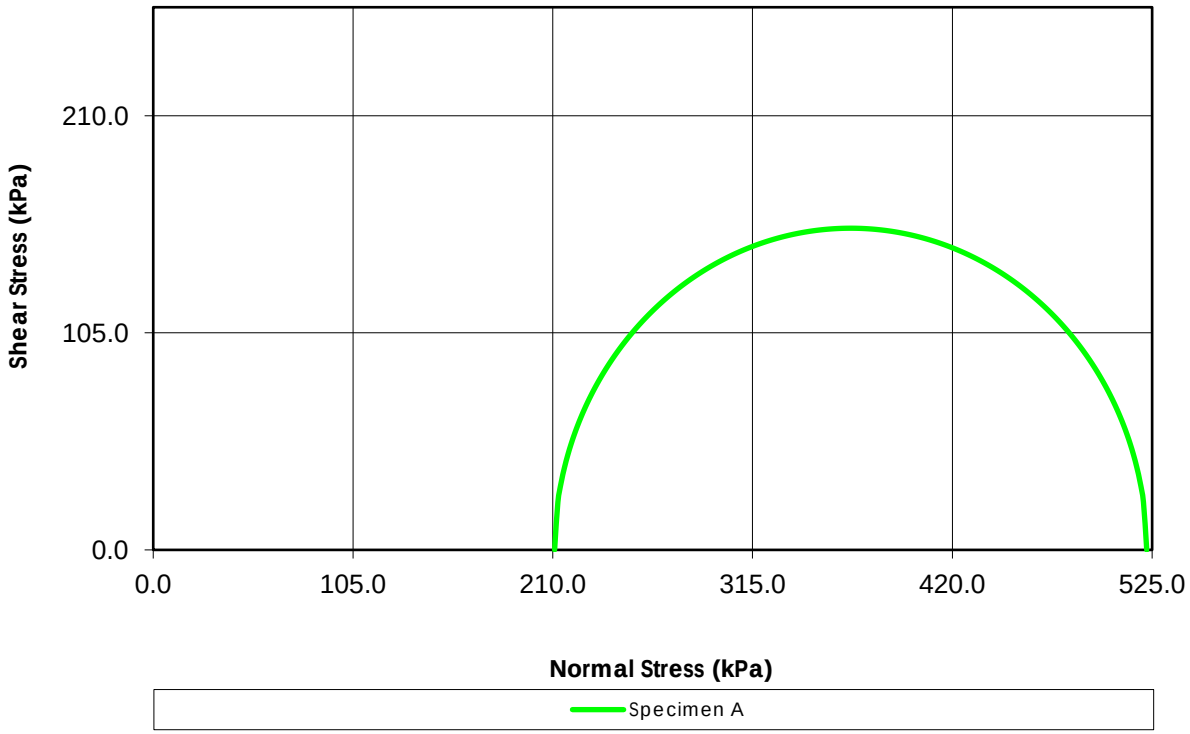

## Principal Stress Ratio vs. Axial Strain



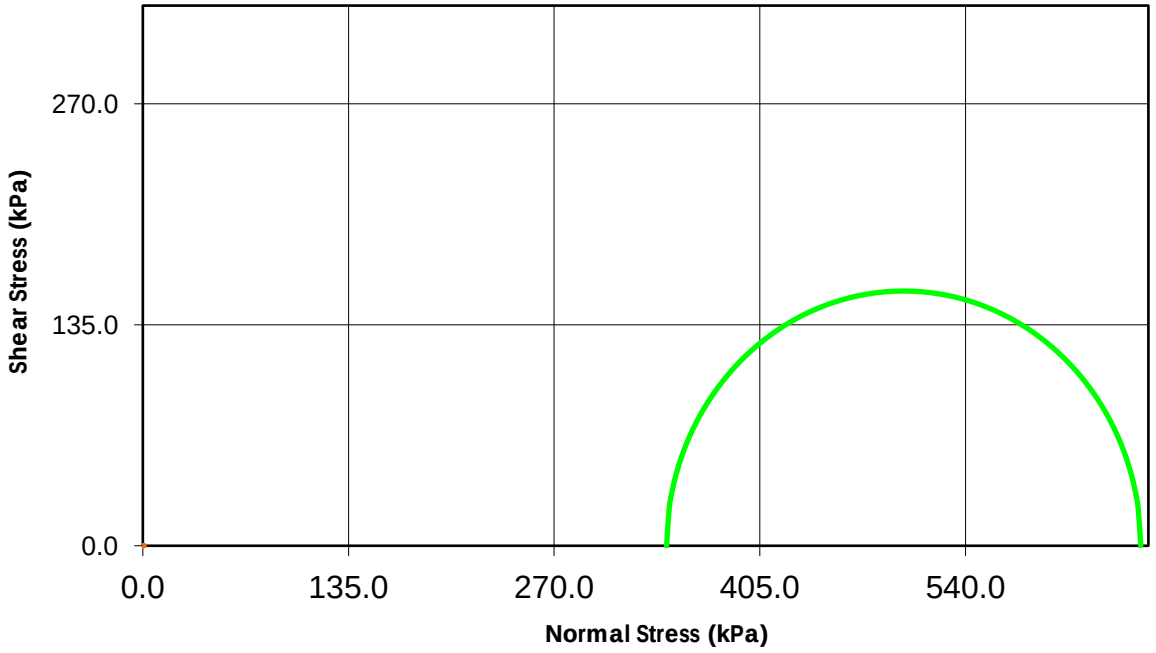

Change in Pore Pressure vs. Axial Strain
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

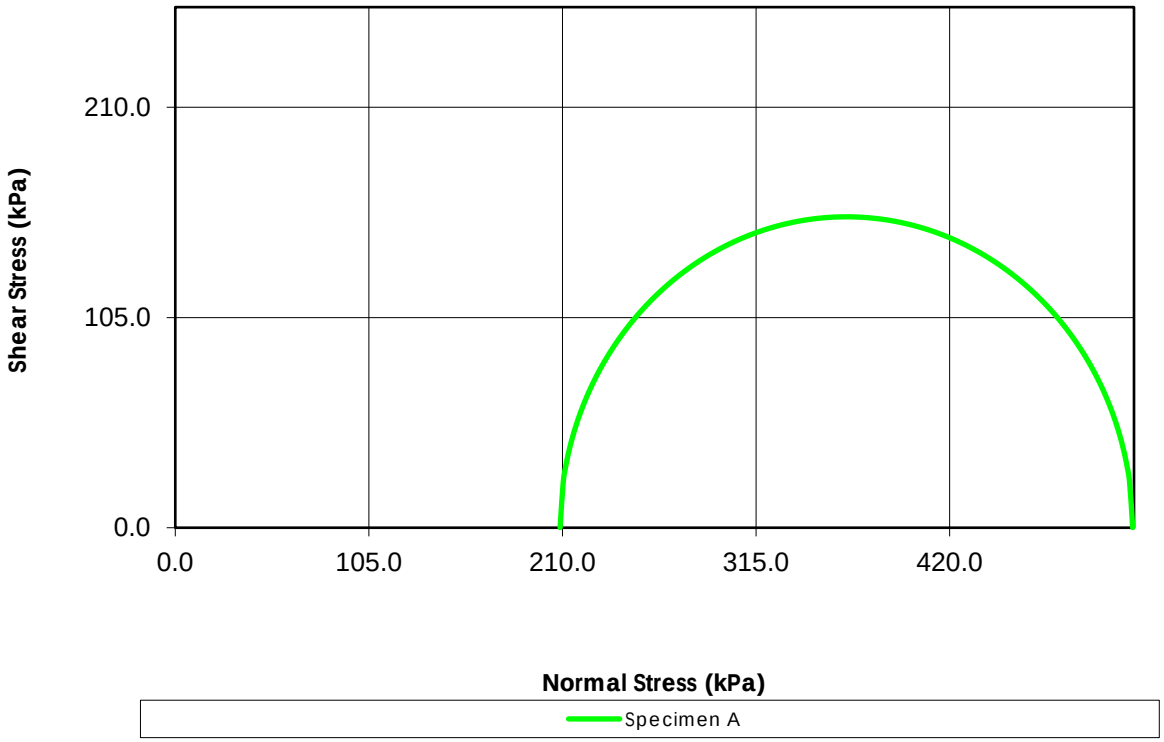



### Total Stress
### (C = 0.0 Ø = 0.0)

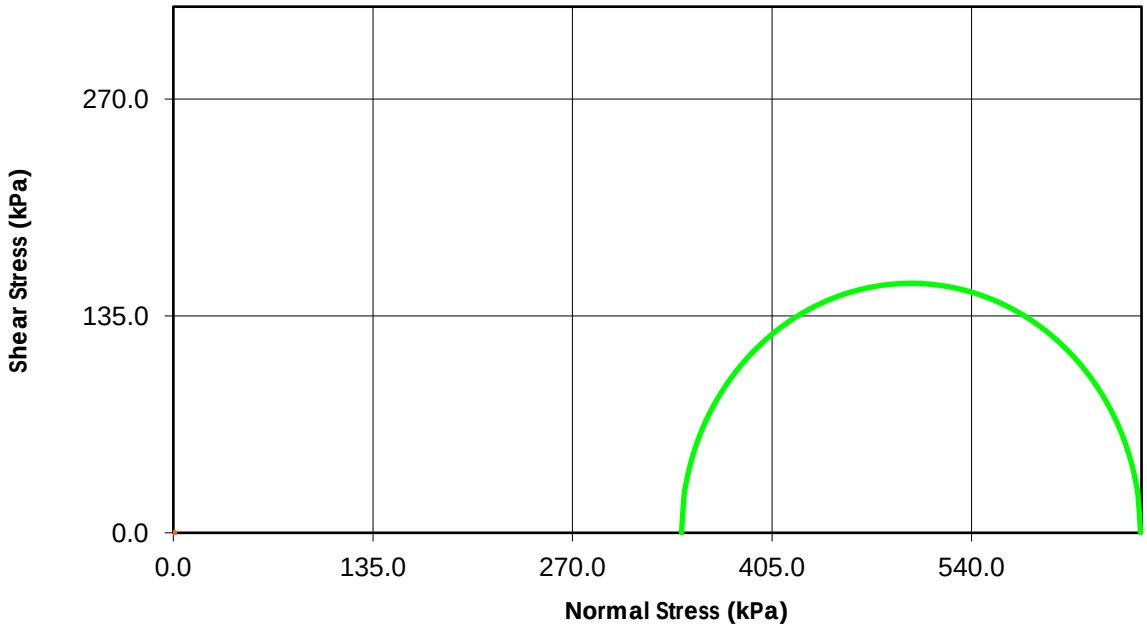


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

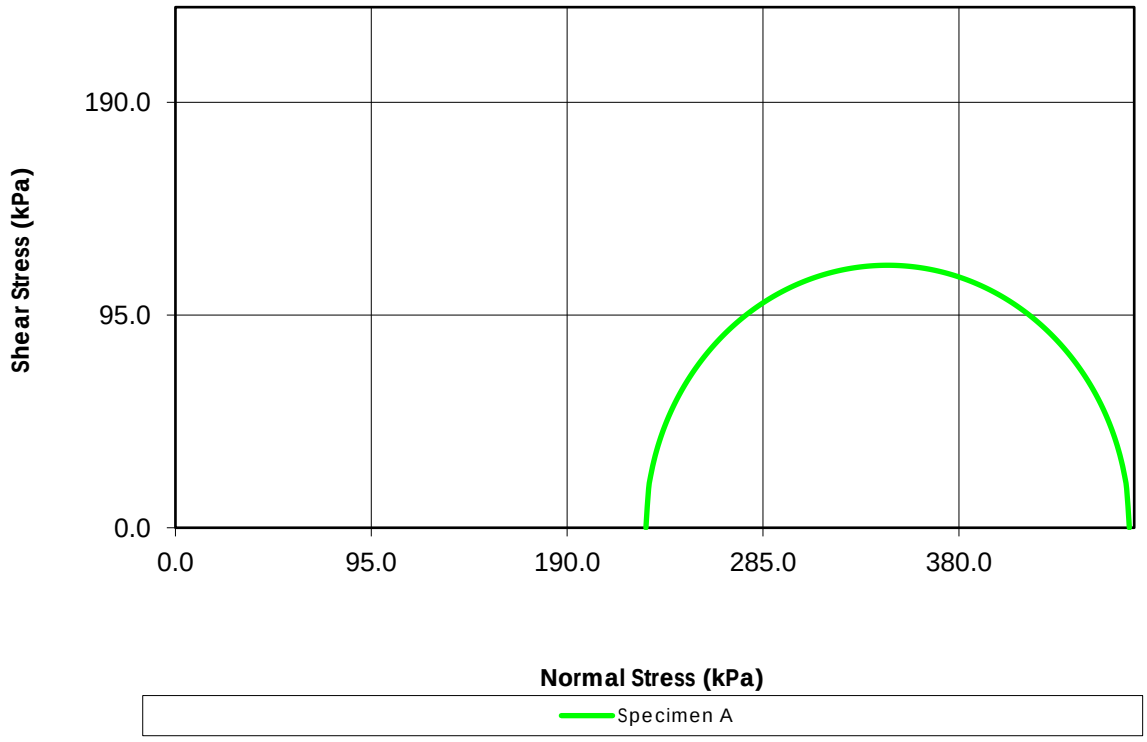



## Total Stress
## (C = 0.0 Ø = 0.0)

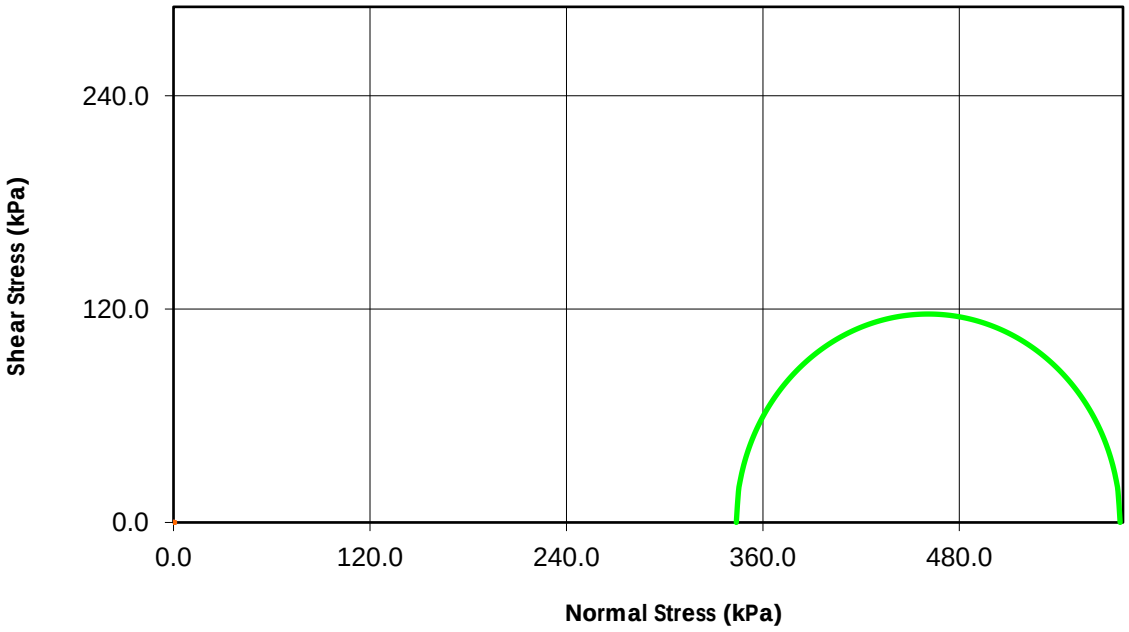


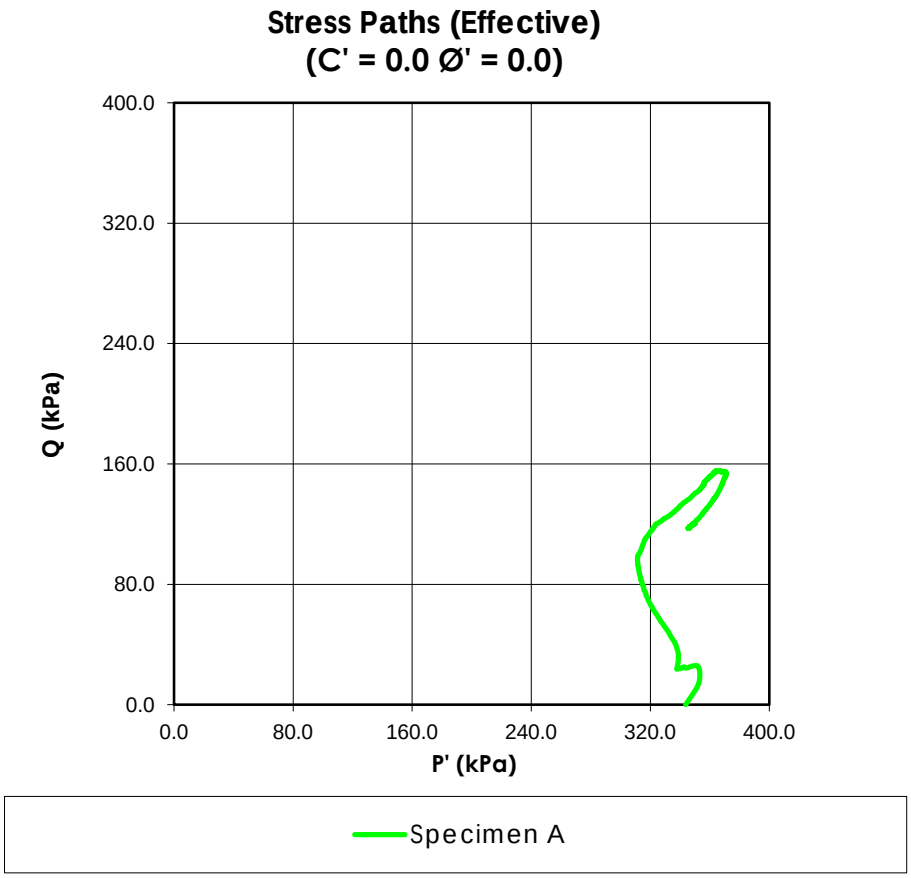
# Mohr Stress Circles at 15% Axial Strain Criterion

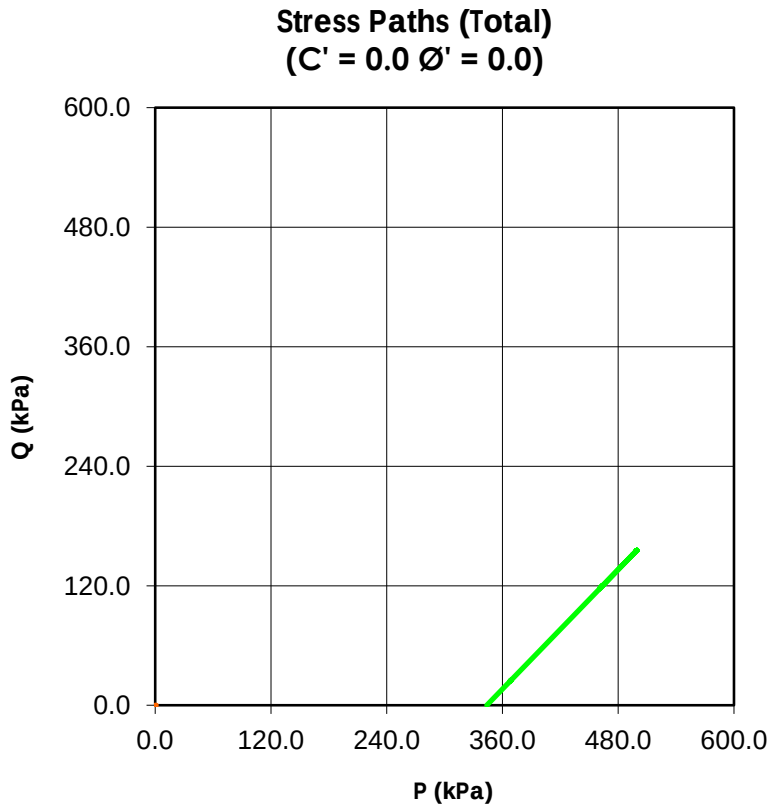
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

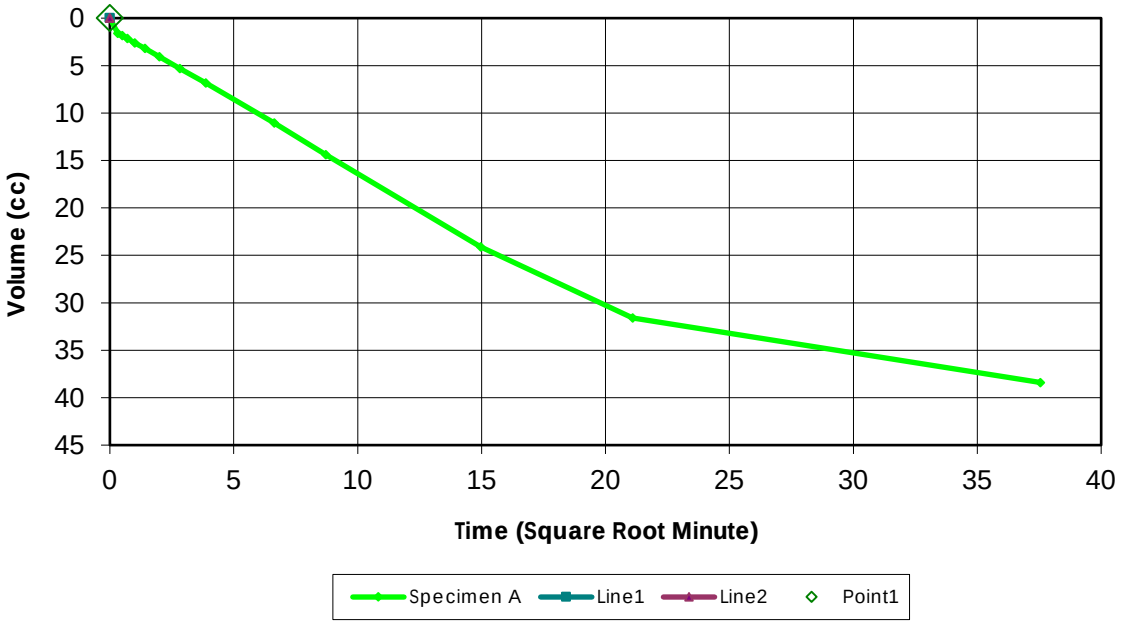



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A

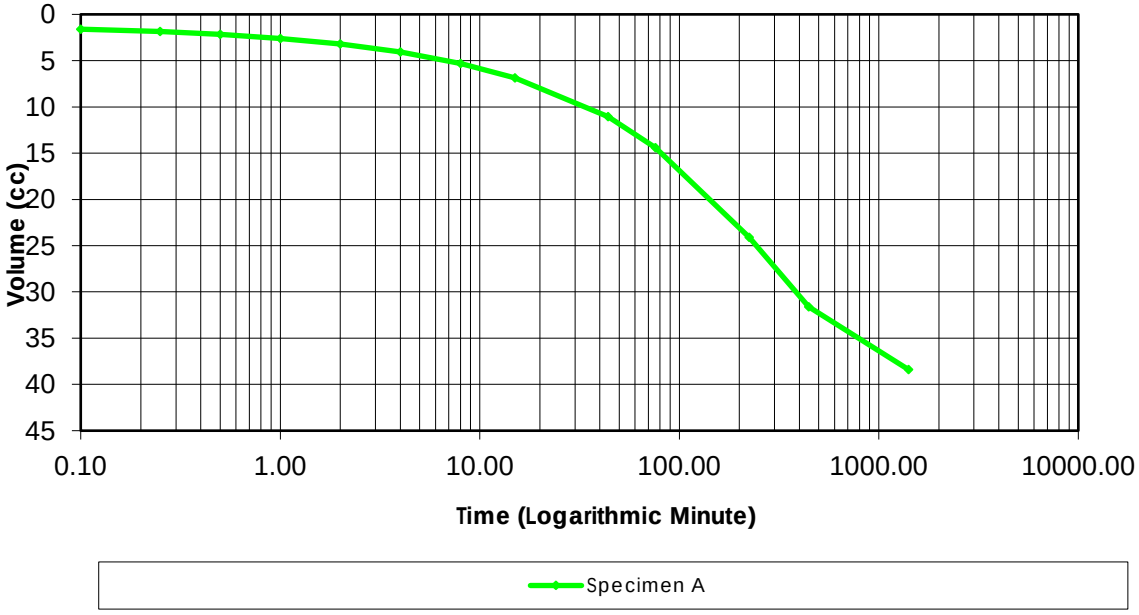

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.98

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 73.00 |
| 3 | 150.0 | 130.0 | 0.0 | 70.0 | |
| 4 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 5 | 220.0 | 130.0 | 70.0 | 0.0 | 91.00 |
| 6 | 290.0 | 270.0 | 70.0 | 140.0 | |
| 7 | 290.0 | 270.0 | 0.0 | 0.0 | |
| 8 | 360.0 | 270.0 | 70.0 | 0.0 | 98.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 4.9-5.2m

| | |
|---|---|
| Cell Pressure (kPa) | 550 |
| Back Pressure (kPa) | 200 |
| Effective Pressure (kPa) | 350 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72 |
| Initial Sample Height (mm) | 148.6 |
| Initial Sample Area (cm2) | 40.72 |
| Initial Volume (cm3) | 605 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 47.40 | N/A |
| 00:00:06 | 45.80 | 1.600 |
| 00:00:15 | 45.55 | 1.850 |
| 00:00:30 | 45.25 | 2.150 |
| 00:01:00 | 44.80 | 2.600 |
| 00:02:00 | 44.20 | 3.200 |
| 00:04:00 | 43.35 | 4.050 |
| 00:08:00 | 42.10 | 5.300 |
| 00:15:00 | 40.55 | 6.850 |
| 00:44:00 | 36.35 | 11.050 |
| 01:16:00 | 33.00 | 14.400 |
| 03:44:00 | 23.30 | 24.100 |
| 07:25:00 | 15.80 | 31.600 |
| 23:30:00 | 9.00 | 38.400 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

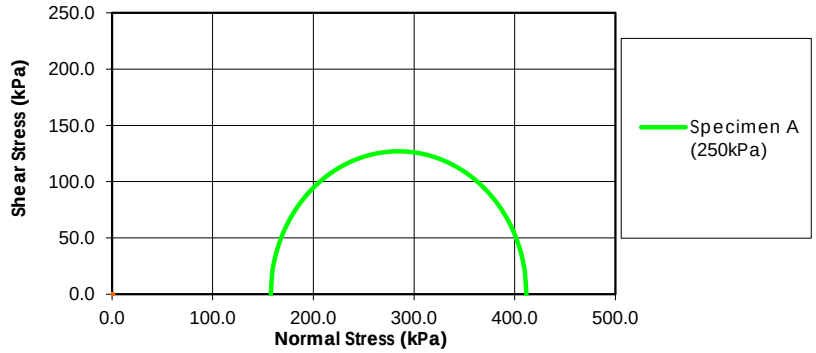
Stantec

Reviewed By C. Lamoureux

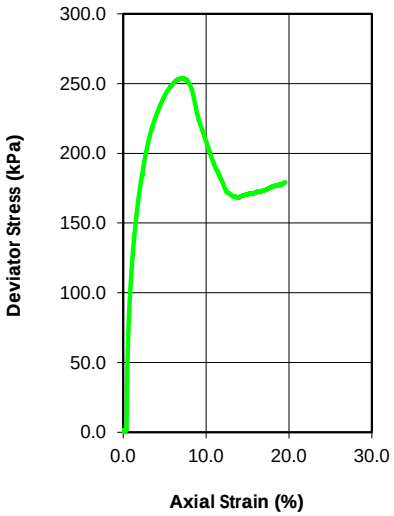
Date: 1-Sep-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 24.7 | | | |
| Dry Density (g/cm3) | 1.582 | | | |
| Saturation (%) | 94.23 | | | |
| Void Ratio | 0.707 | | | |
| Diameter (mm) | 72.400 | | | |
| Height (mm) | 152.600 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 1.00 | | | |
| Water Content (%) | 20.7 | | | |
| Dry Density (g/cm3) | 1.645 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.641 | | | |
| Effective Stress (kPa) | 243.8 | | | |
| Back Press. (kPa) | 86.2 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

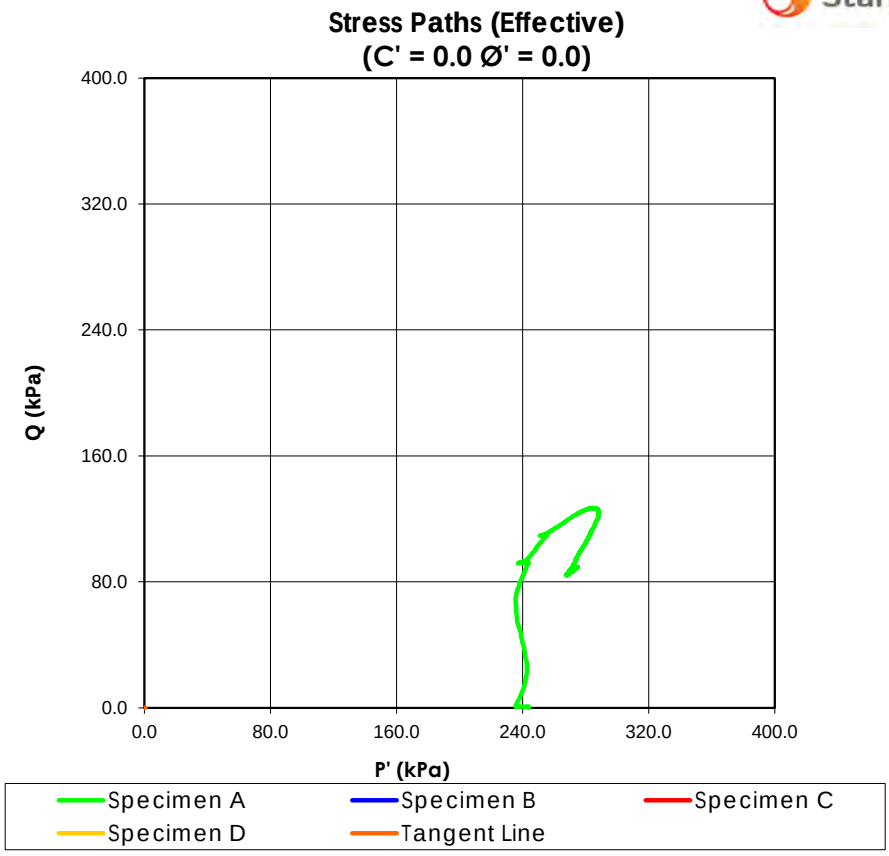
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 411.58 | | | |
| σ'3 at Failure (kPa) | 157.70 | | | |
| | | | | |
| | | | | |

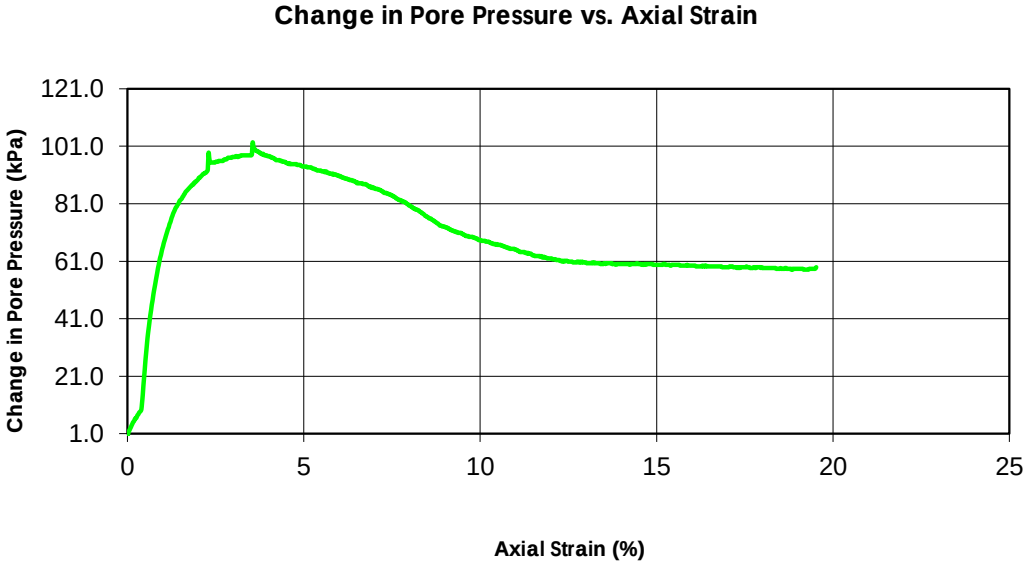
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D42 ST2 |
| **Depth:** | 0.8-1.3m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

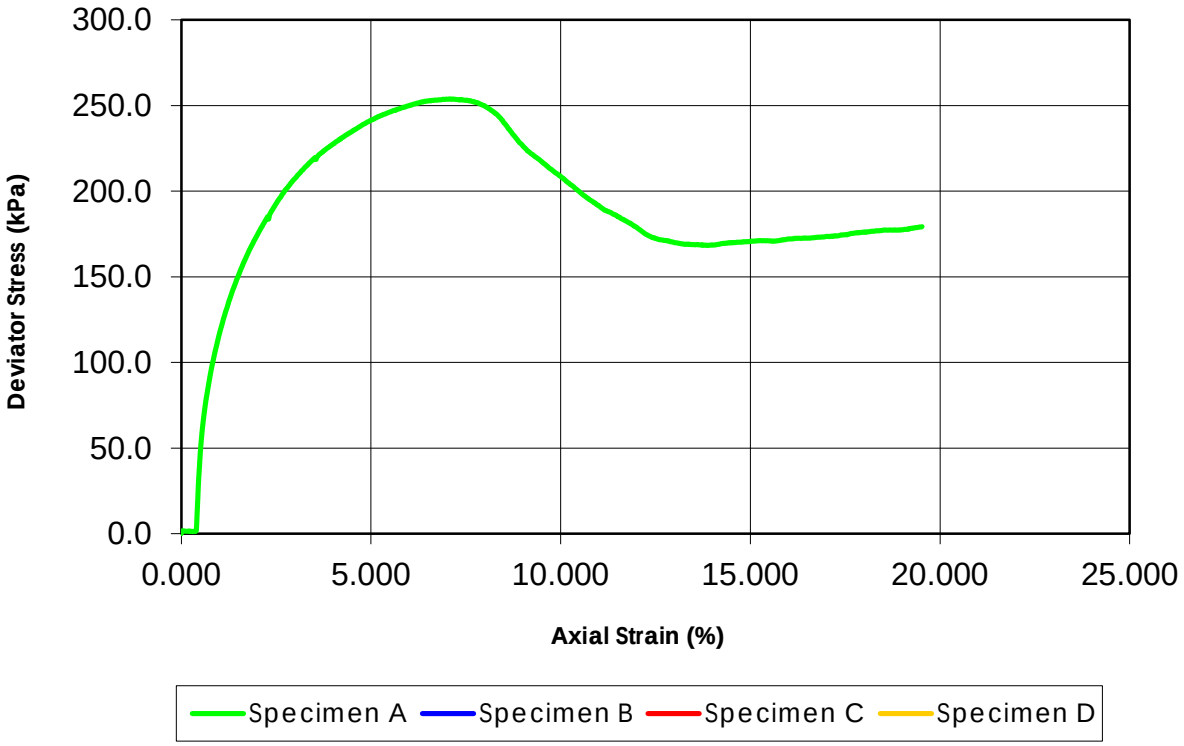
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

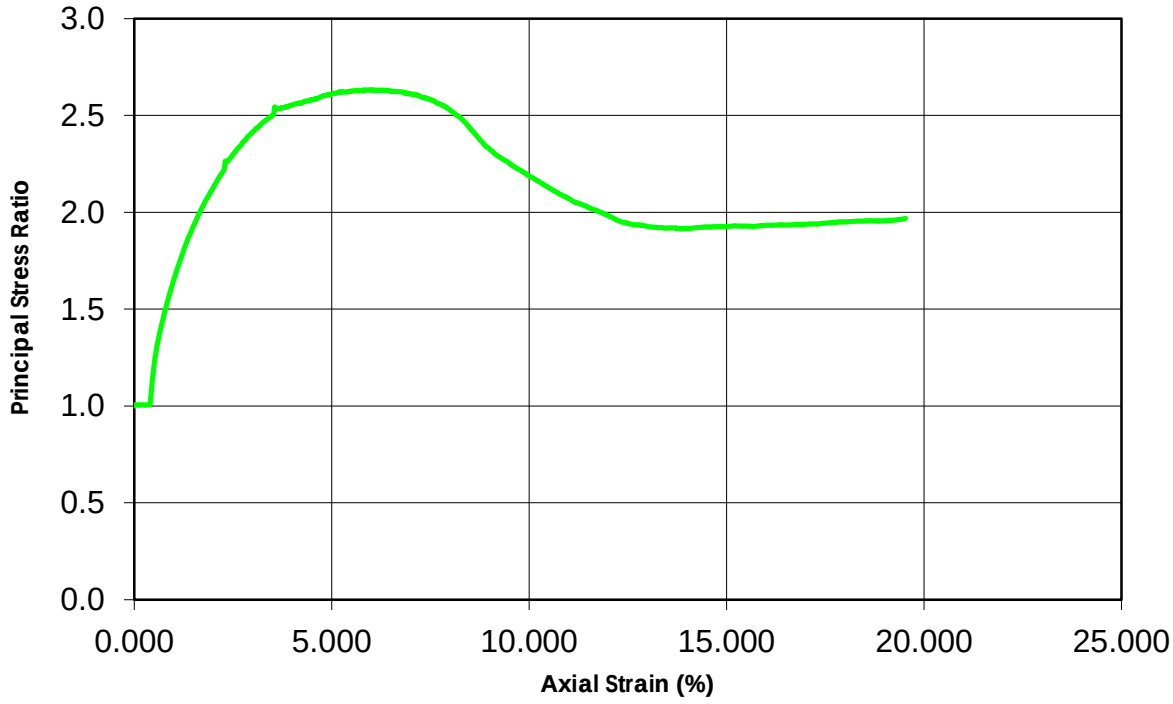


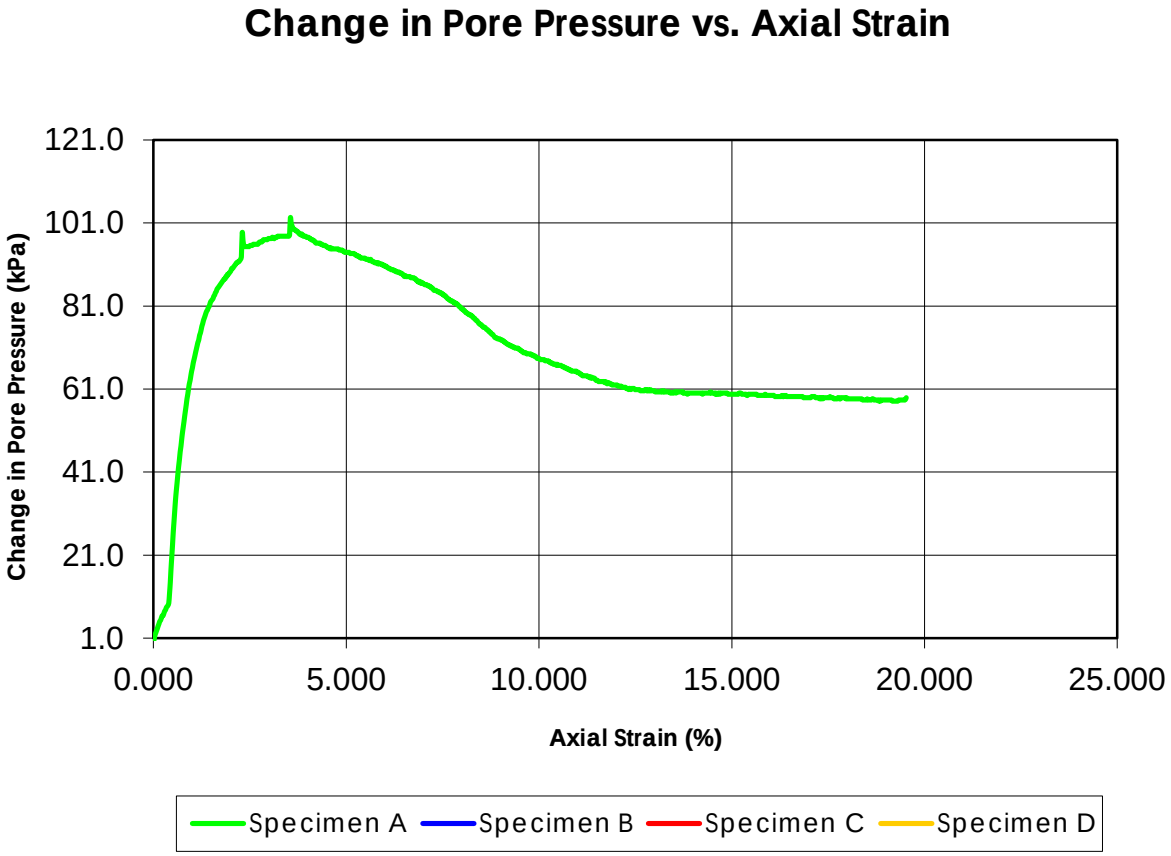



## Deviator Stress vs. Axial Strain



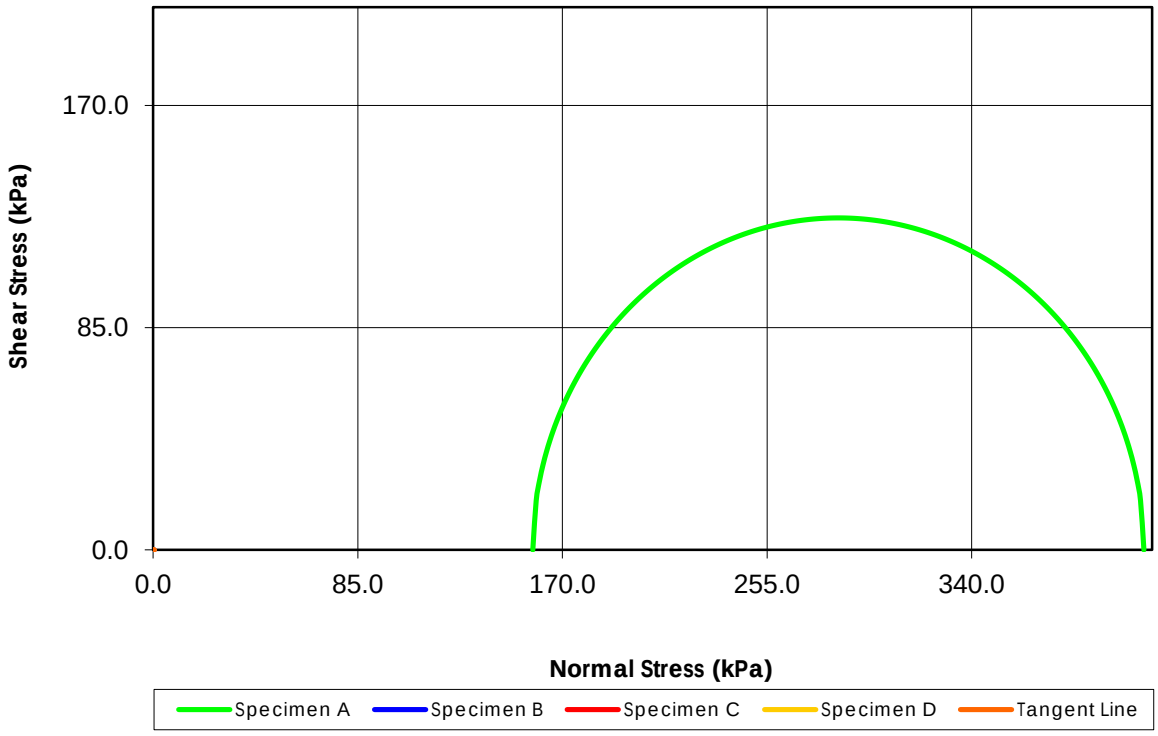

## Principal Stress Ratio vs. Axial Strain



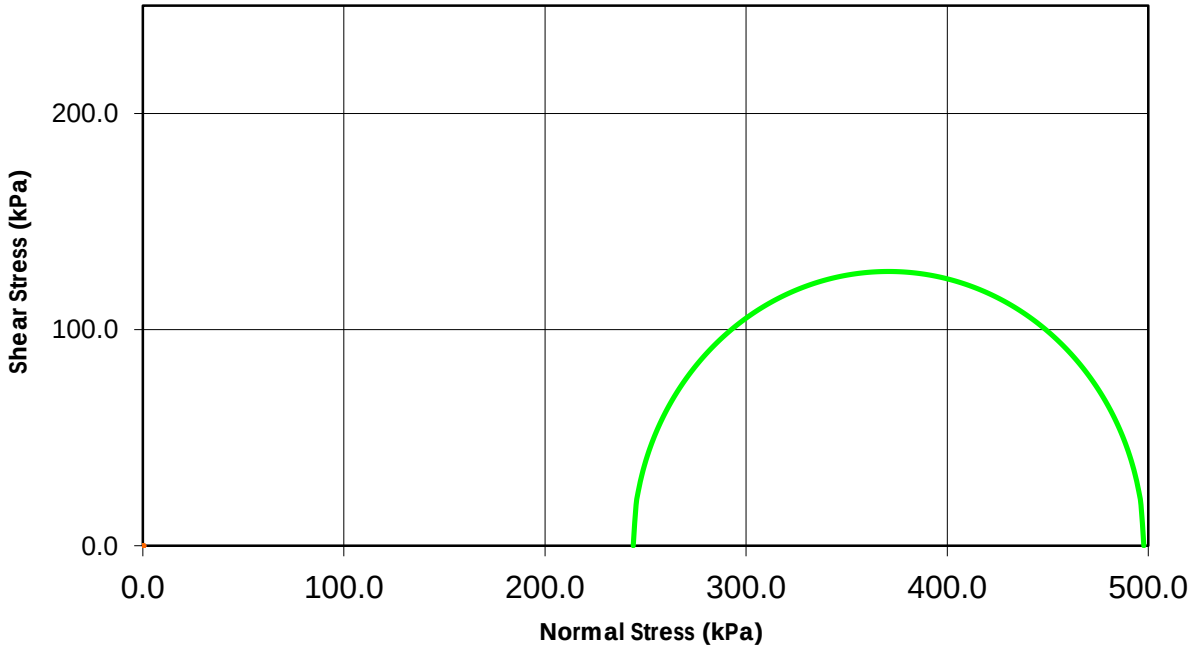

Change in Pore Pressure vs. Axial Strain
121.0
101.0
81.0
61.0
41.0
21.0
1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

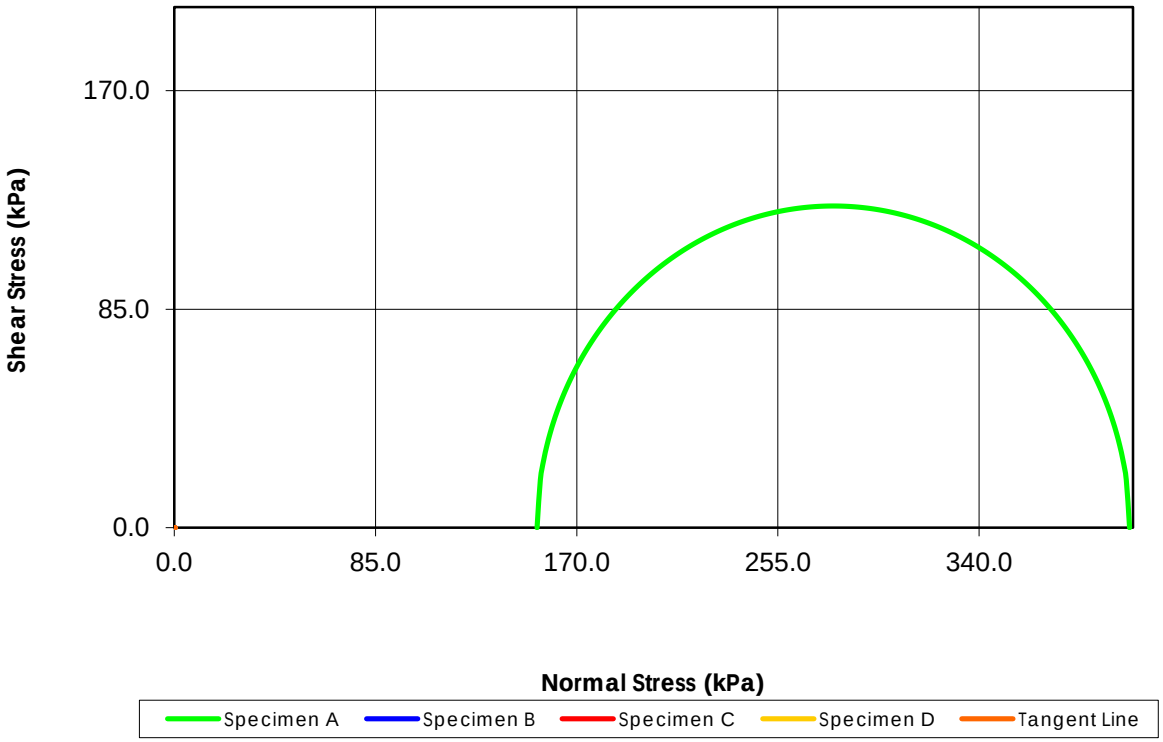



### Total Stress
### (C = 0.0 Ø = 0.0)

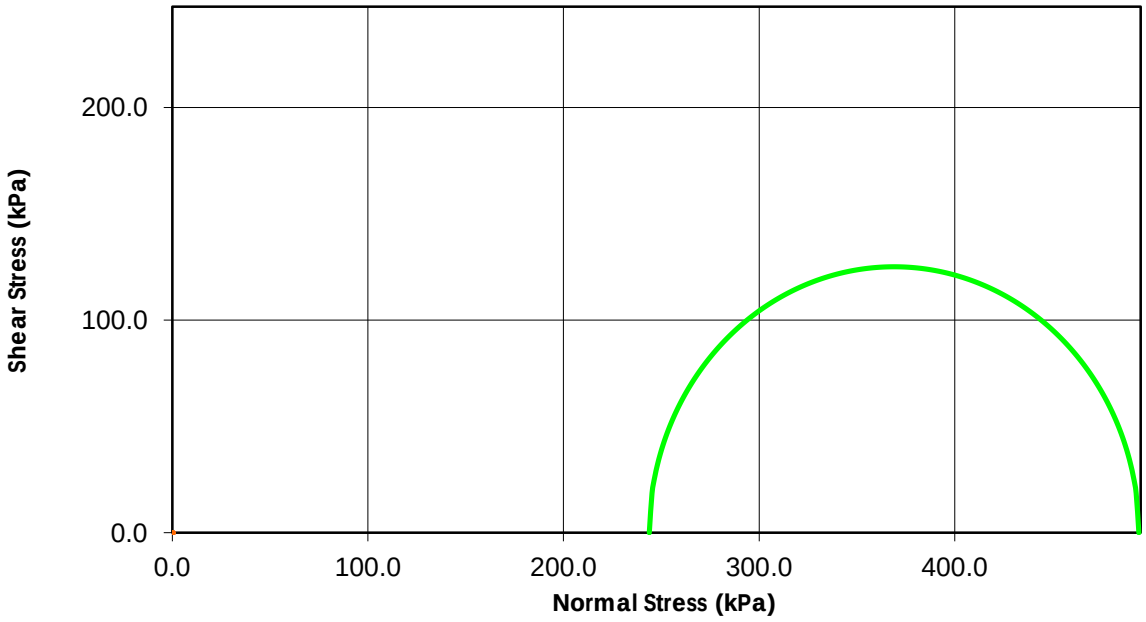


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

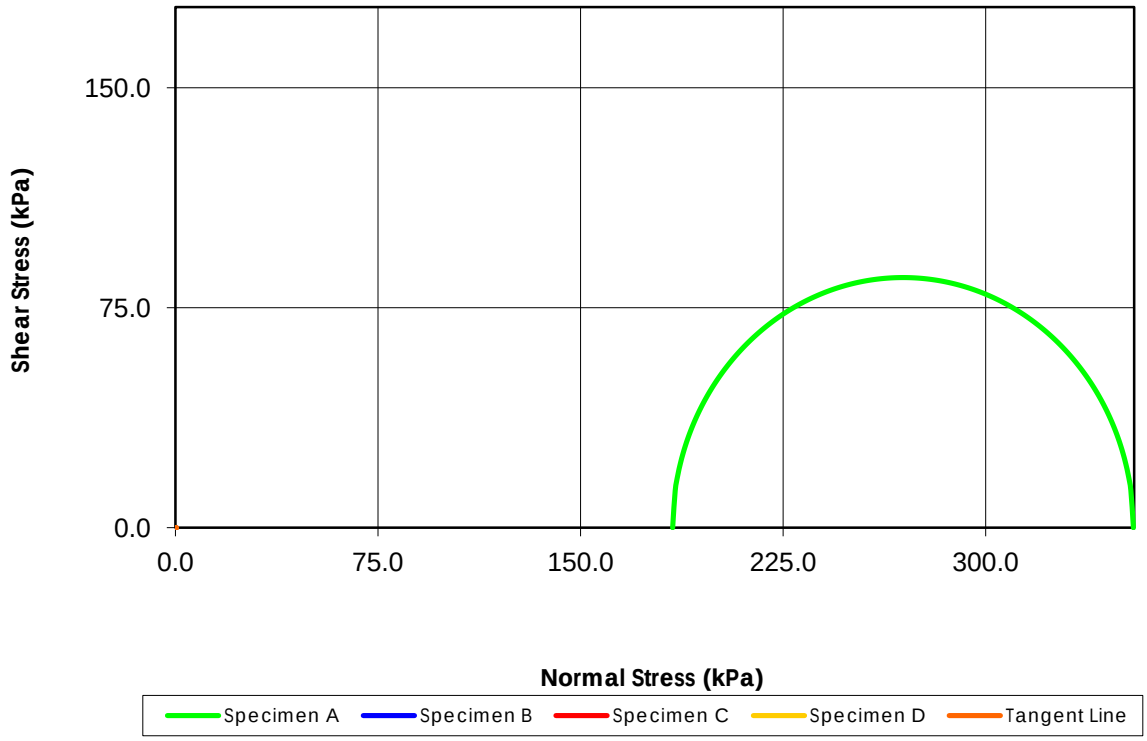



## Total Stress
## (C = 0.0 Ø = 0.0)

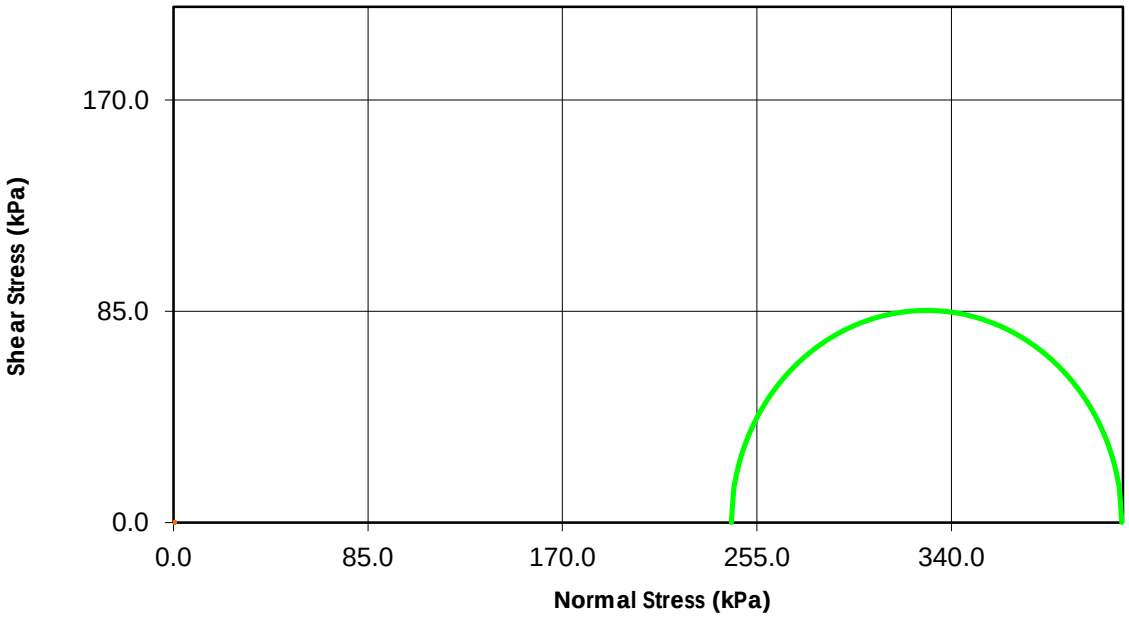


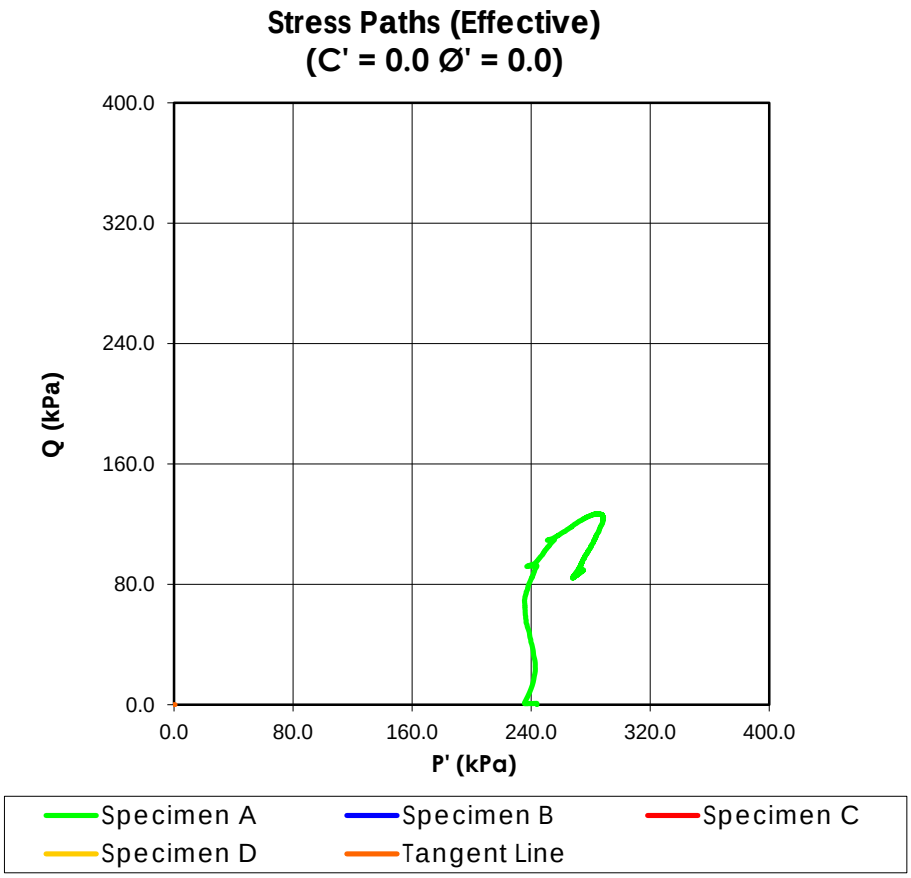
# Mohr Stress Circles at 15% Axial Strain Criterion

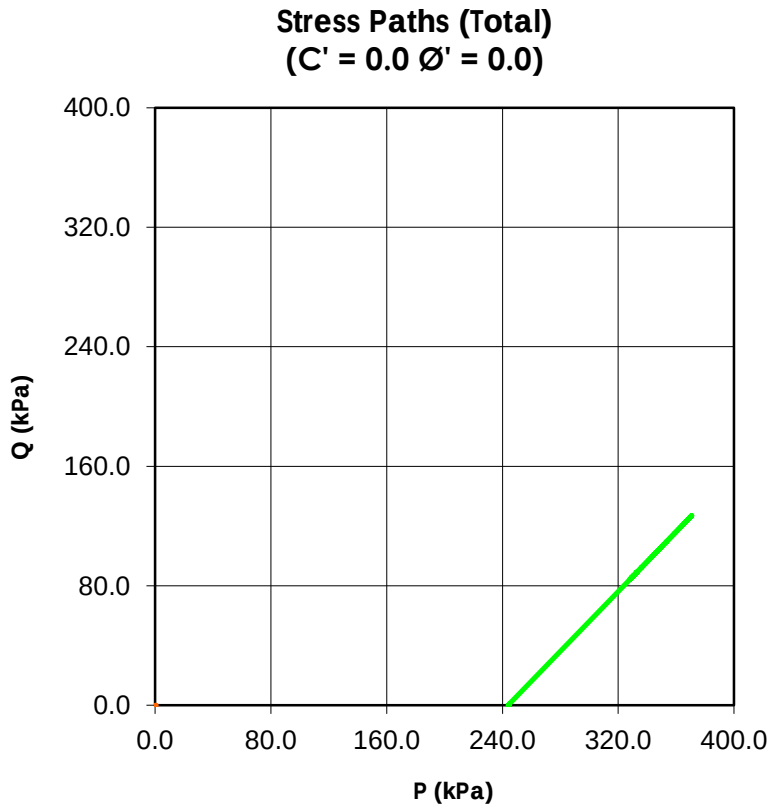
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

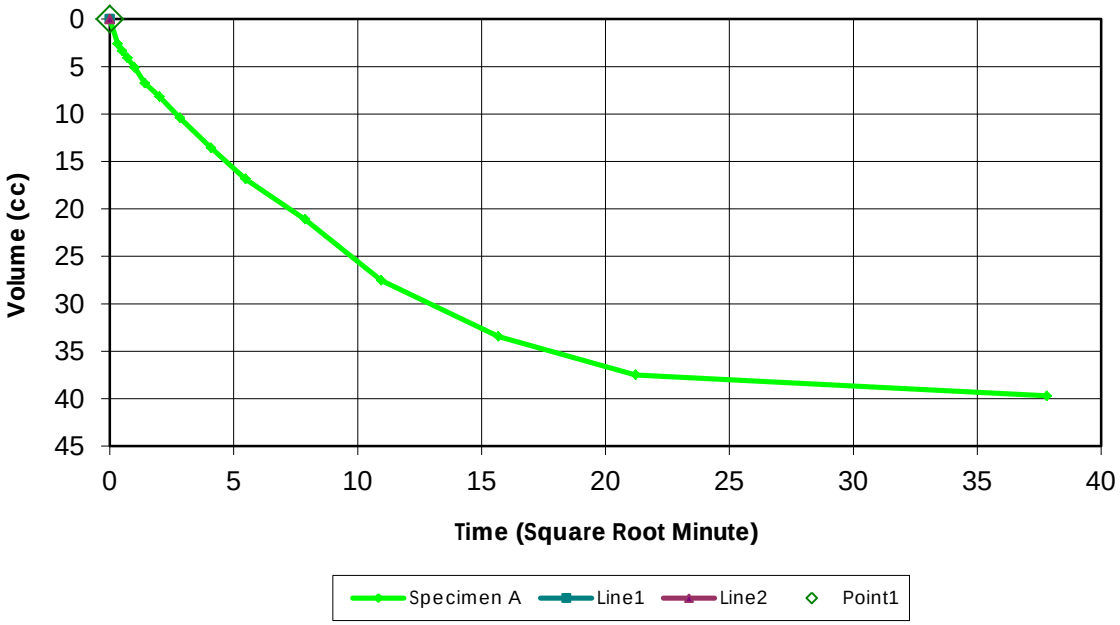



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

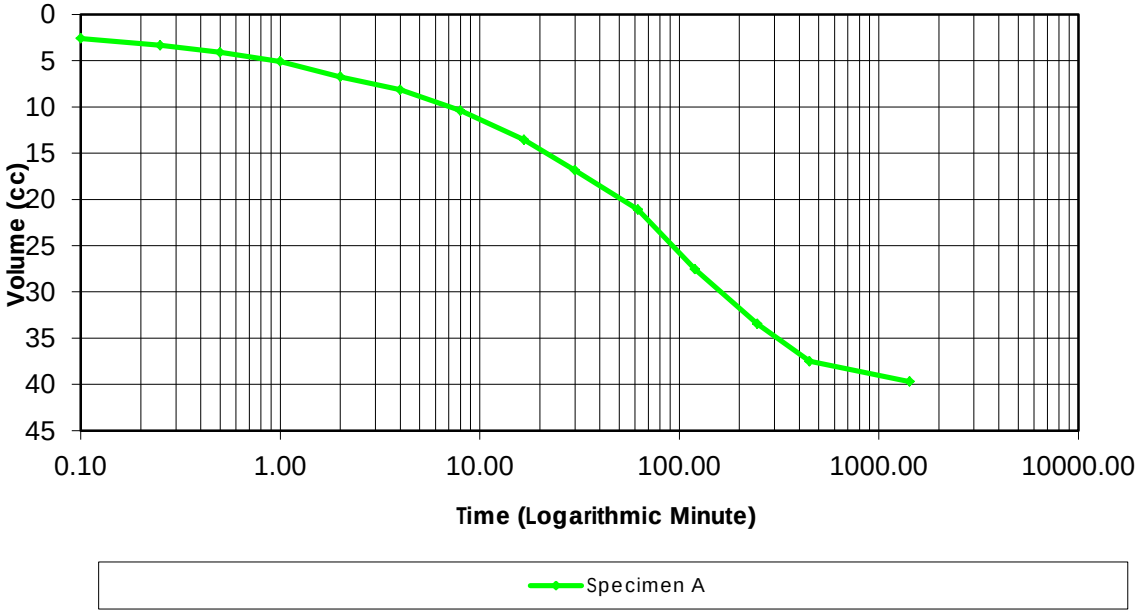

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 1.00

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 100.0 | 40.0 | 40.0 | 0.0 | 655.00 |
| 3 | 100.0 | 80.0 | 0.0 | 40.0 | |
| 4 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 5 | 150.0 | 80.0 | 50.0 | 0.0 | 1.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 0.8-1.3m

| | |
|---|---|
| Cell Pressure (kPa) | 330 |
| Back Pressure (kPa) | 80 |
| Effective Pressure (kPa) | 250 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 152.6 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 628.2 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.95 | N/A |
| 00:00:06 | 42.35 | 2.600 |
| 00:00:15 | 41.60 | 3.350 |
| 00:00:30 | 40.85 | 4.100 |
| 00:01:00 | 39.85 | 5.100 |
| 00:02:00 | 38.20 | 6.750 |
| 00:04:00 | 36.80 | 8.150 |
| 00:08:00 | 34.55 | 10.400 |
| 00:16:40 | 31.40 | 13.550 |
| 00:30:00 | 28.10 | 16.850 |
| 01:02:00 | 23.85 | 21.100 |
| 02:00:00 | 17.40 | 27.550 |
| 04:06:00 | 11.50 | 33.450 |
| 07:30:00 | 7.45 | 37.500 |
| 23:50:00 | 5.25 | 39.700 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

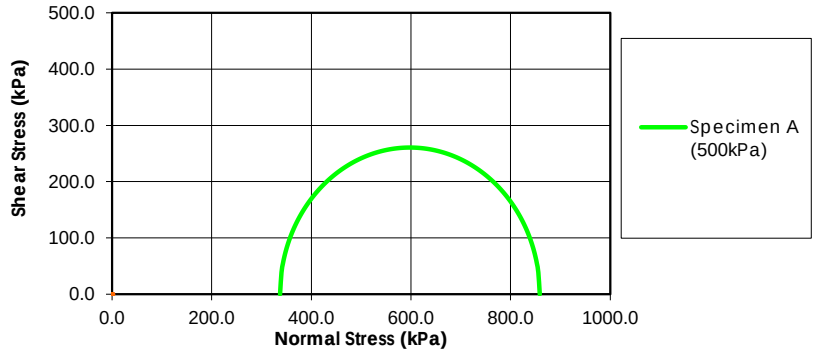
Stantec

Reviewed By C. Lamoureux

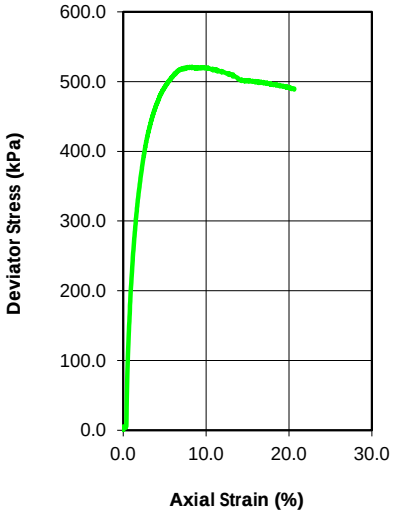
Date: 1-Sep-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 23.8 | | | |
| Dry Density (g/cm3) | 1.683 | | | |
| Saturation (%) | 106.41 | | | |
| Void Ratio | 0.604 | | | |
| Diameter (mm) | 72.400 | | | |
| Height (mm) | 147.800 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 19.7 | | | |
| Dry Density (g/cm3) | 1.834 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.472 | | | |
| Effective Stress (kPa) | 495.7 | | | |
| Back Press. (kPa) | 84.3 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

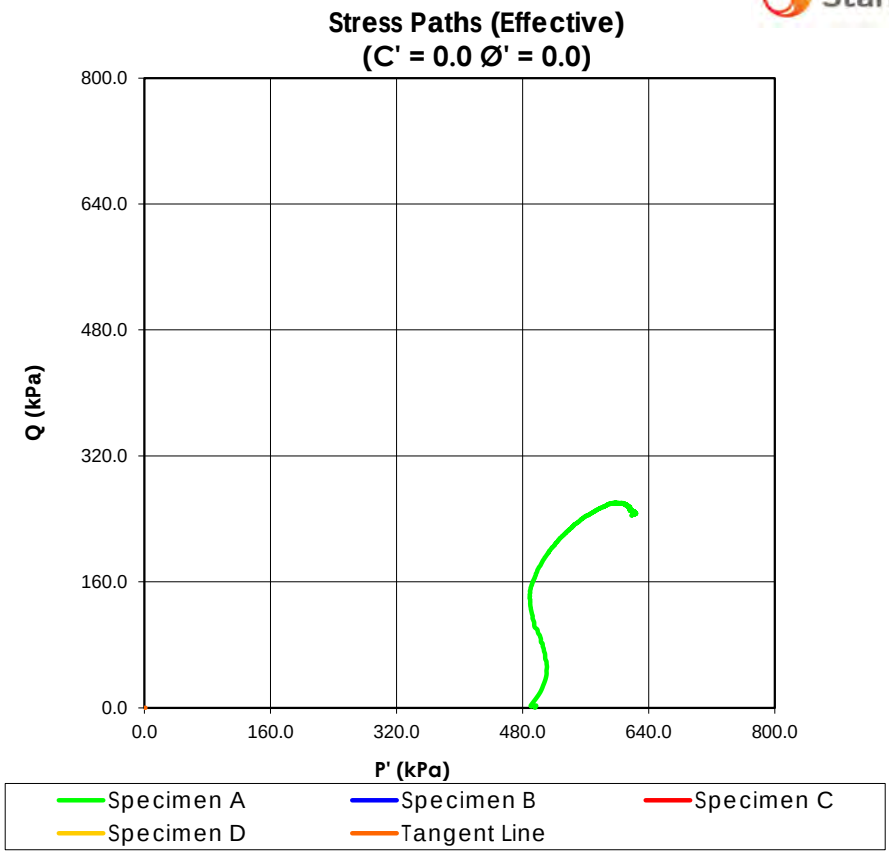
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 858.47 | | | |
| σ'3 at Failure (kPa) | 337.24 | | | |
| | | | | |
| | | | | |

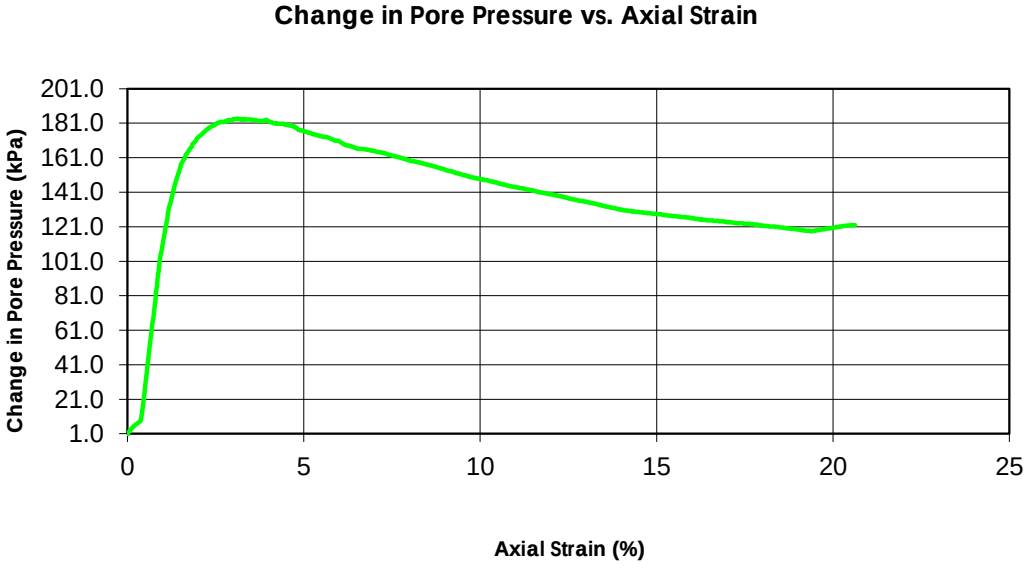
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D42 ST6 |
| **Depth:** | 2.8-3.3m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

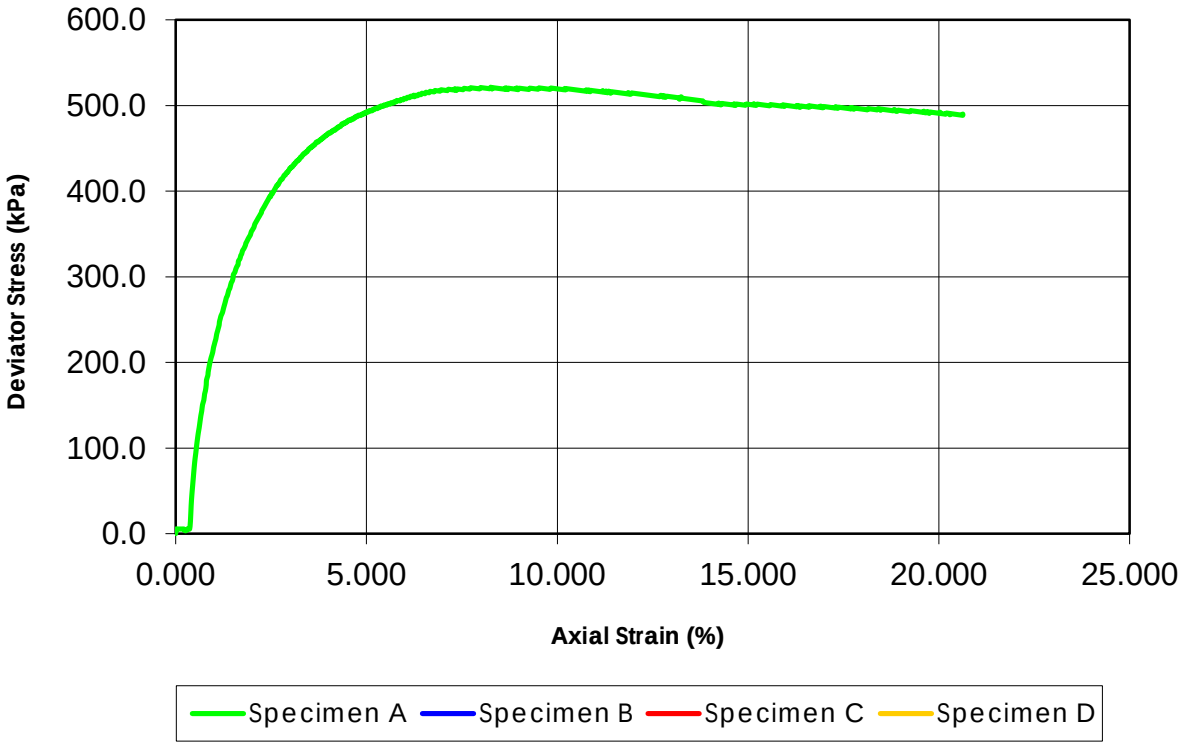
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

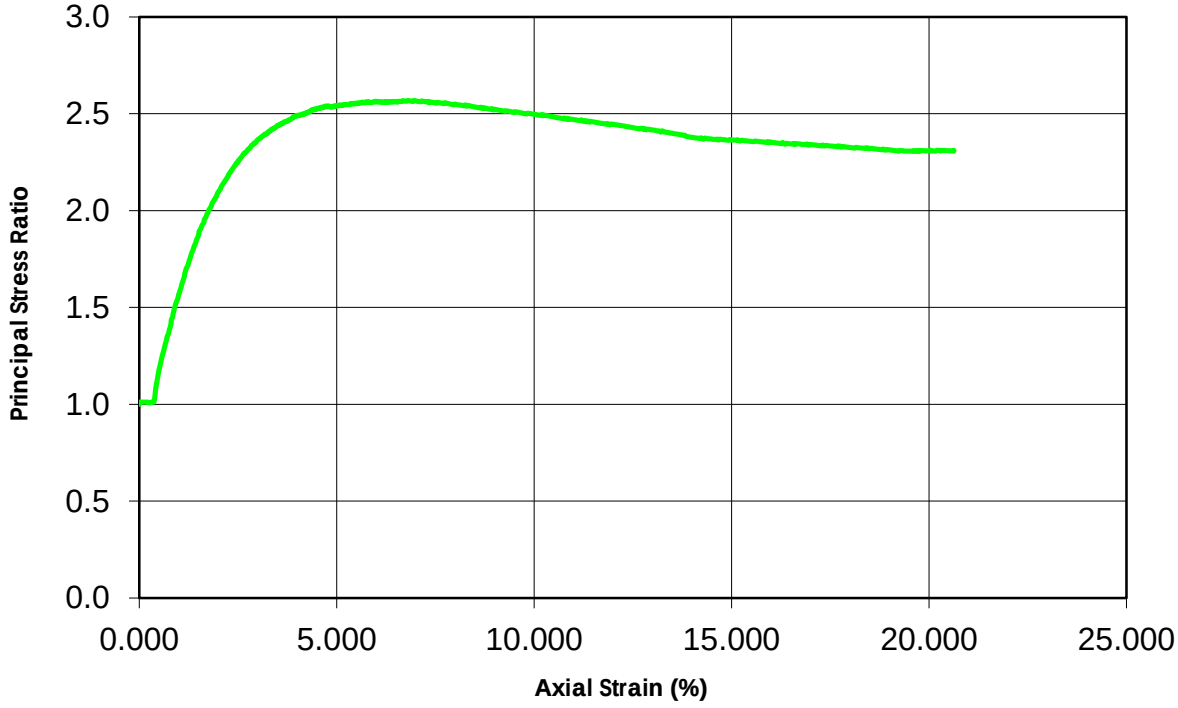


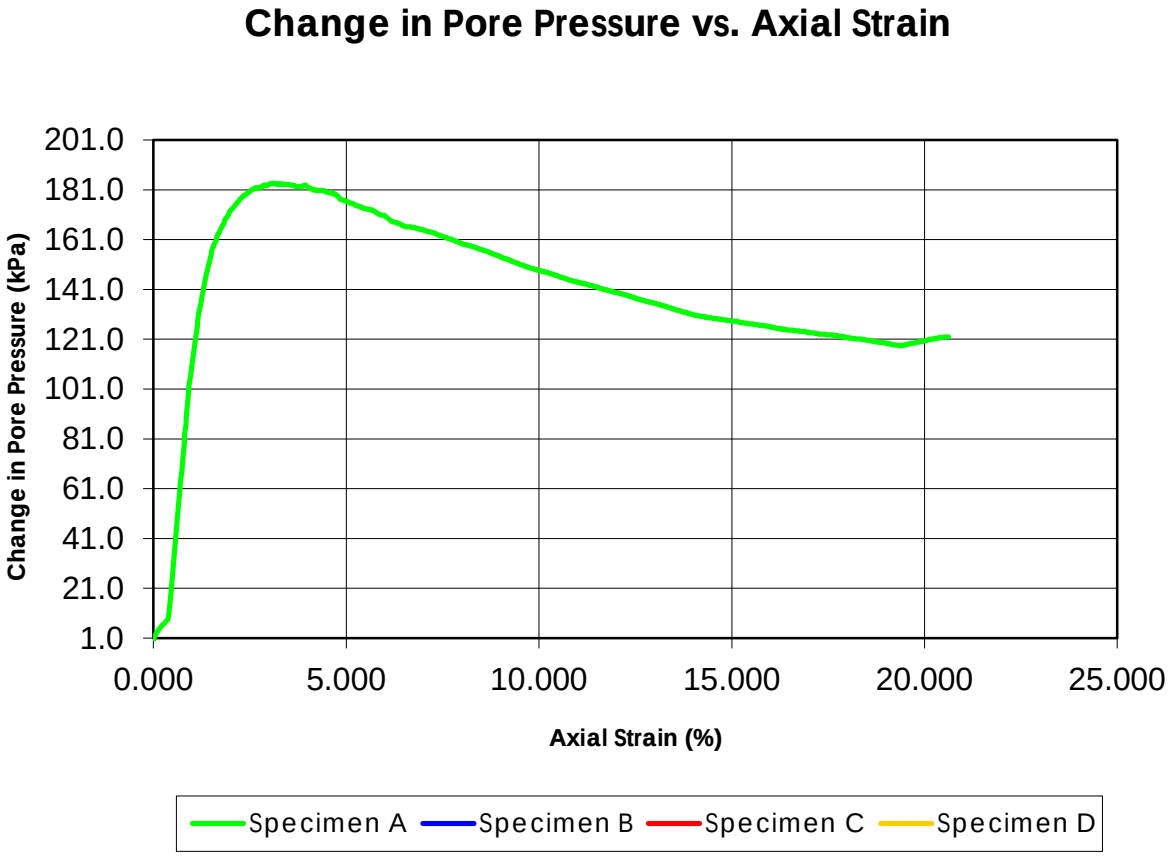



## Deviator Stress vs. Axial Strain



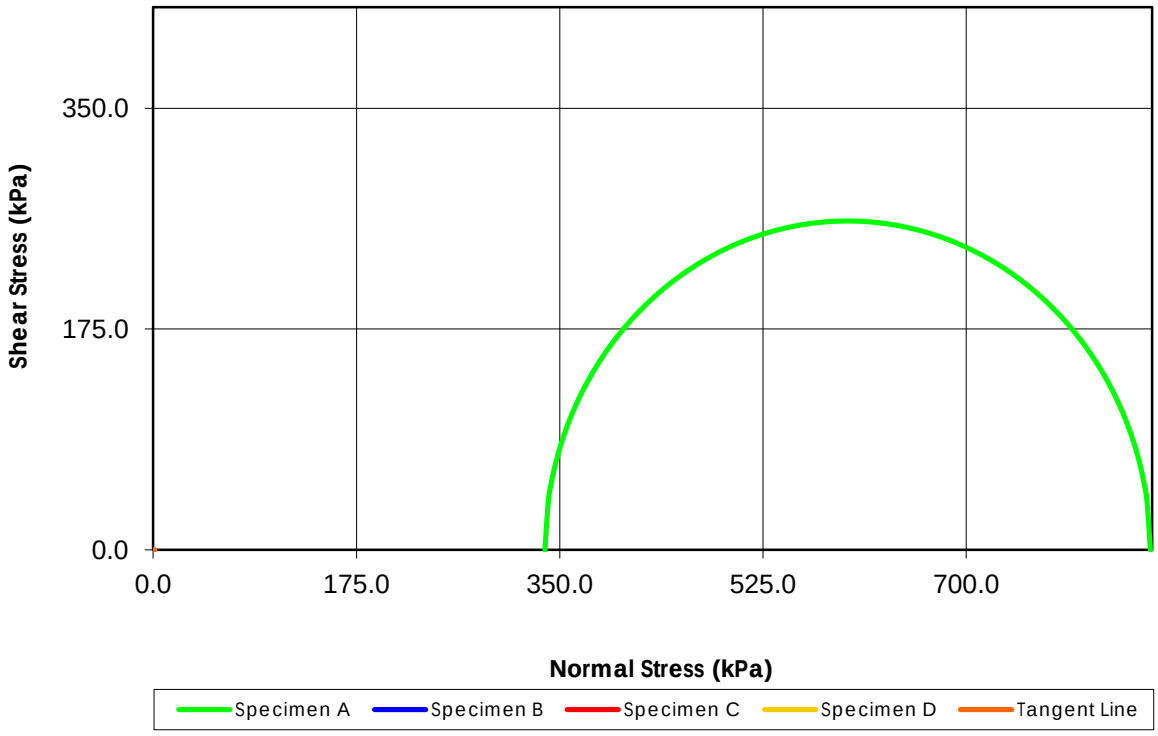

## Principal Stress Ratio vs. Axial Strain



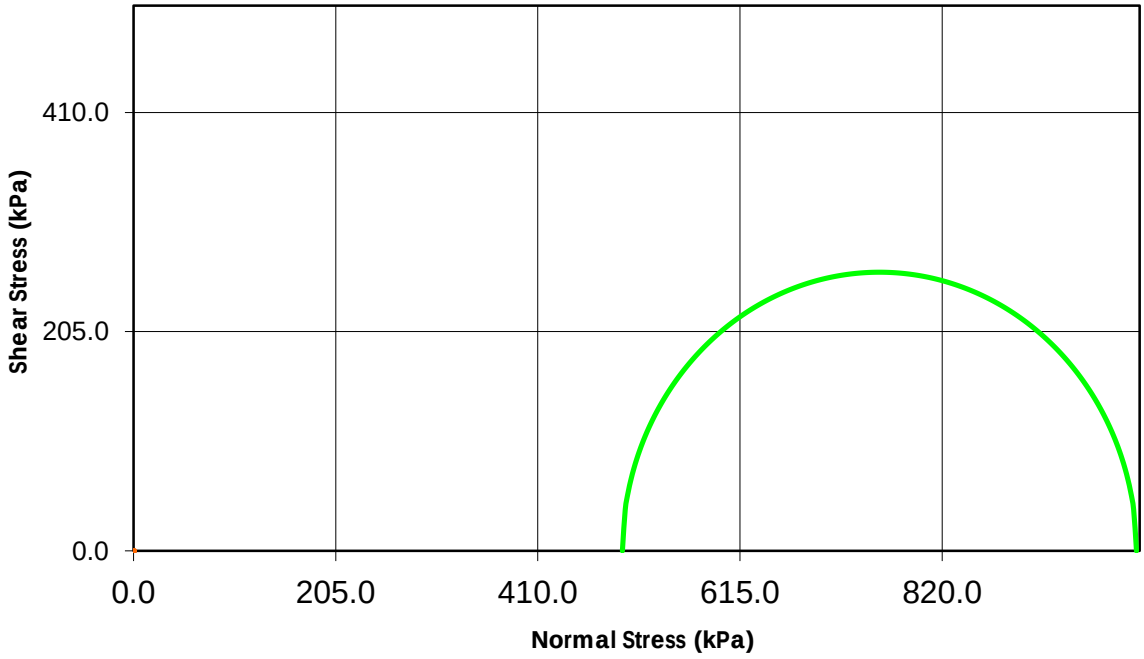

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
201.0
181.0
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

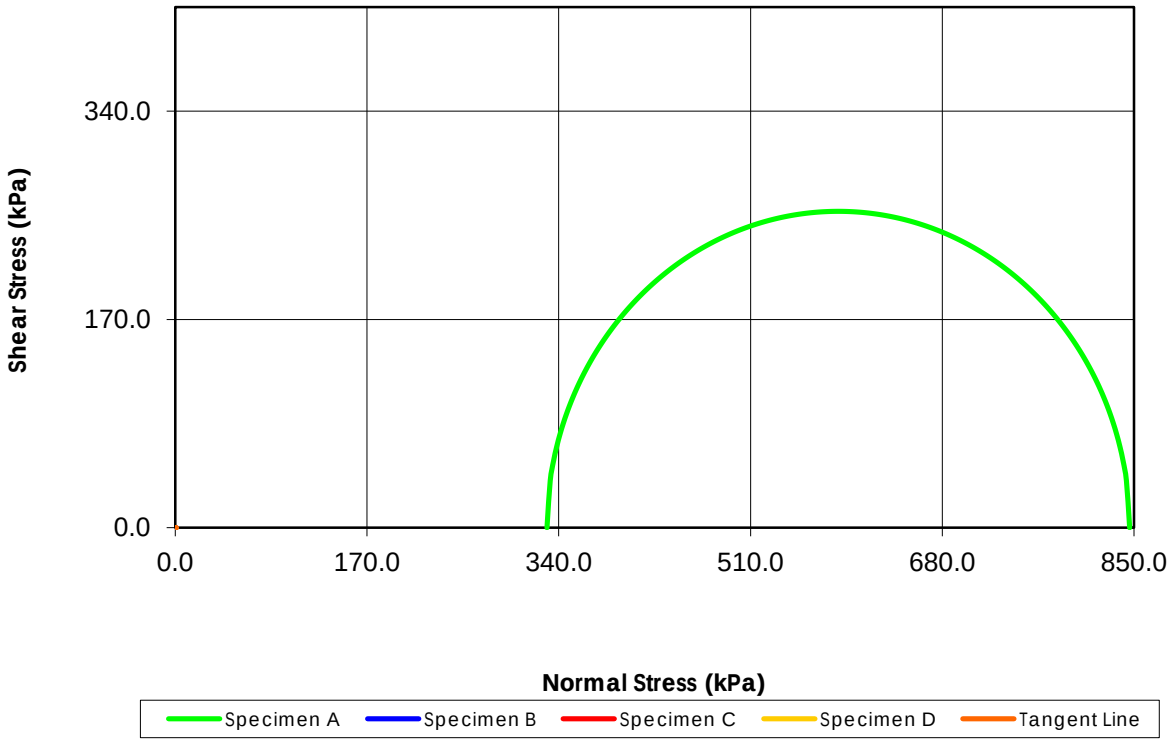



### Total Stress
### (C = 0.0 Ø = 0.0)

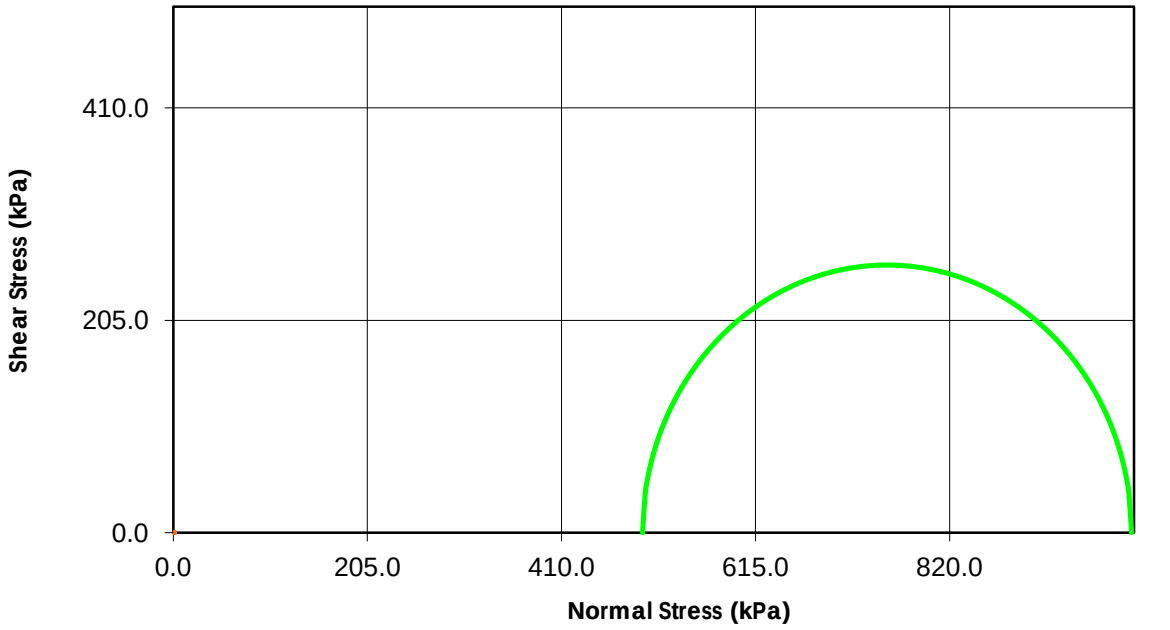


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

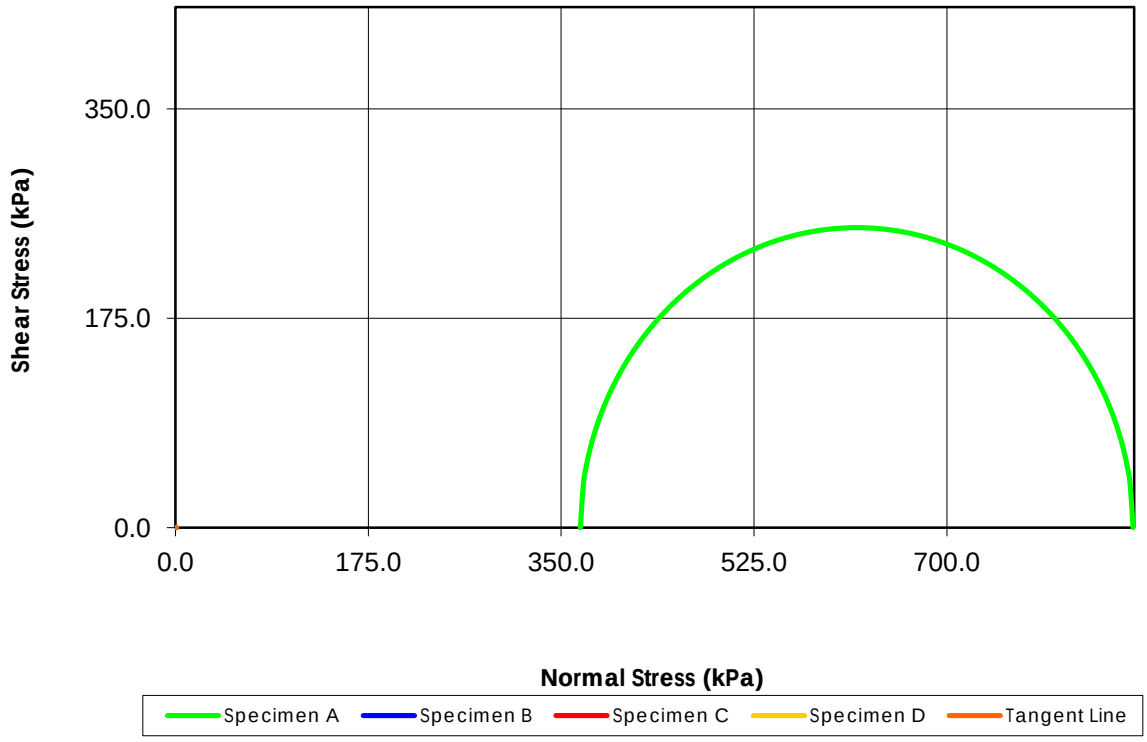



## Total Stress
## (C = 0.0 Ø = 0.0)

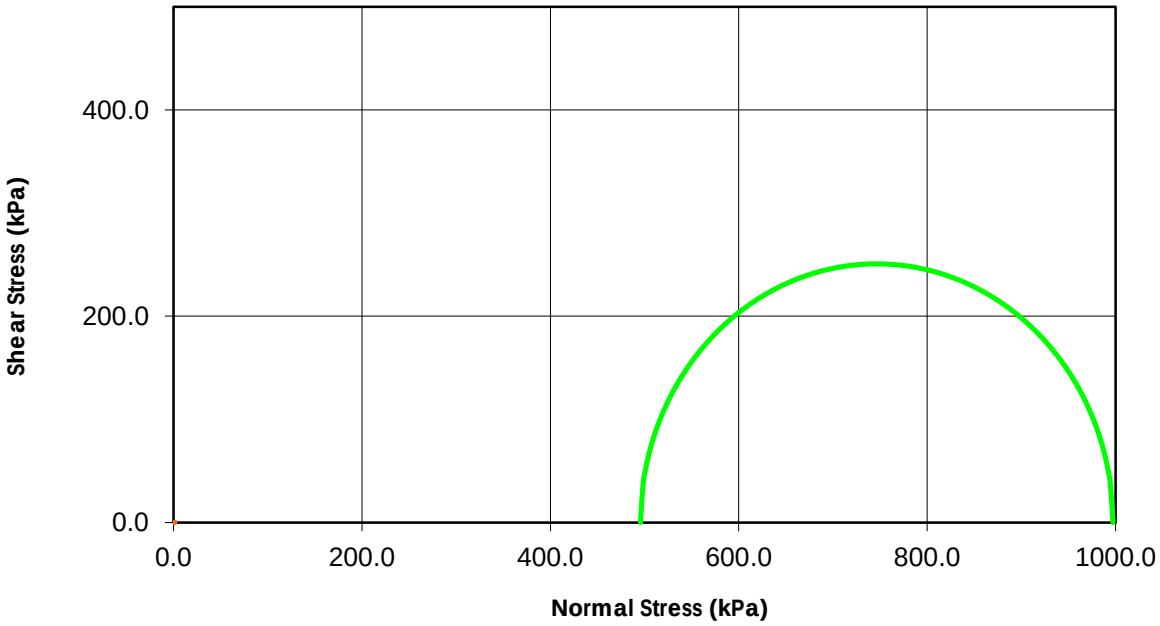


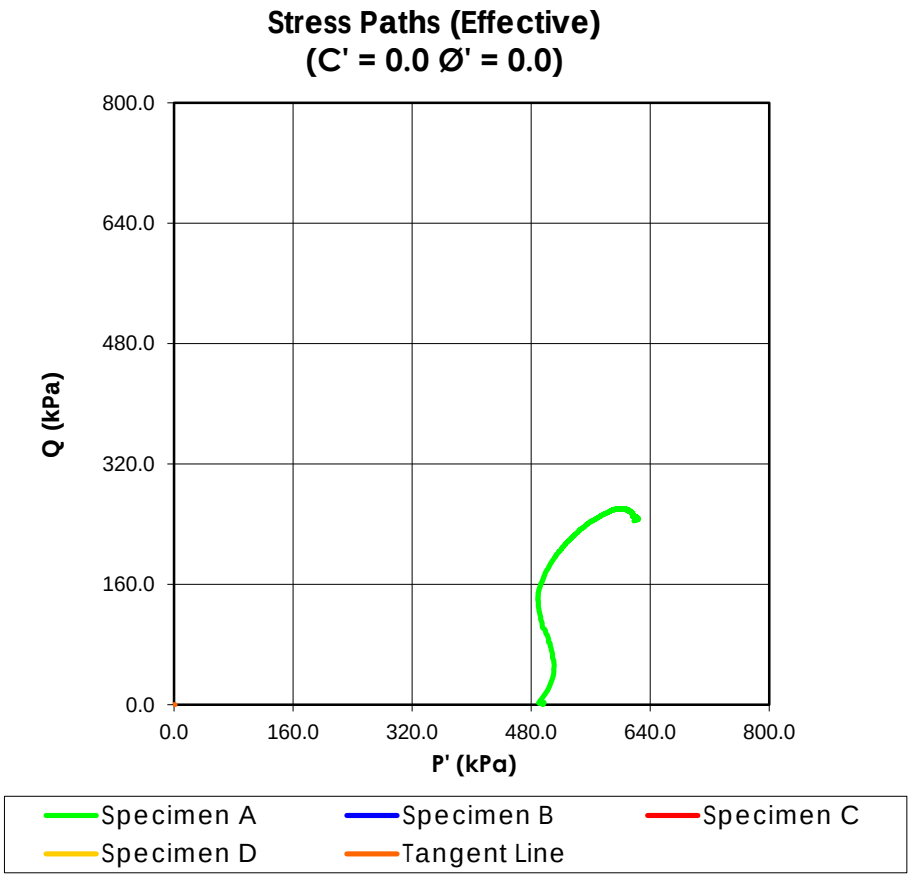
# Mohr Stress Circles at 15% Axial Strain Criterion

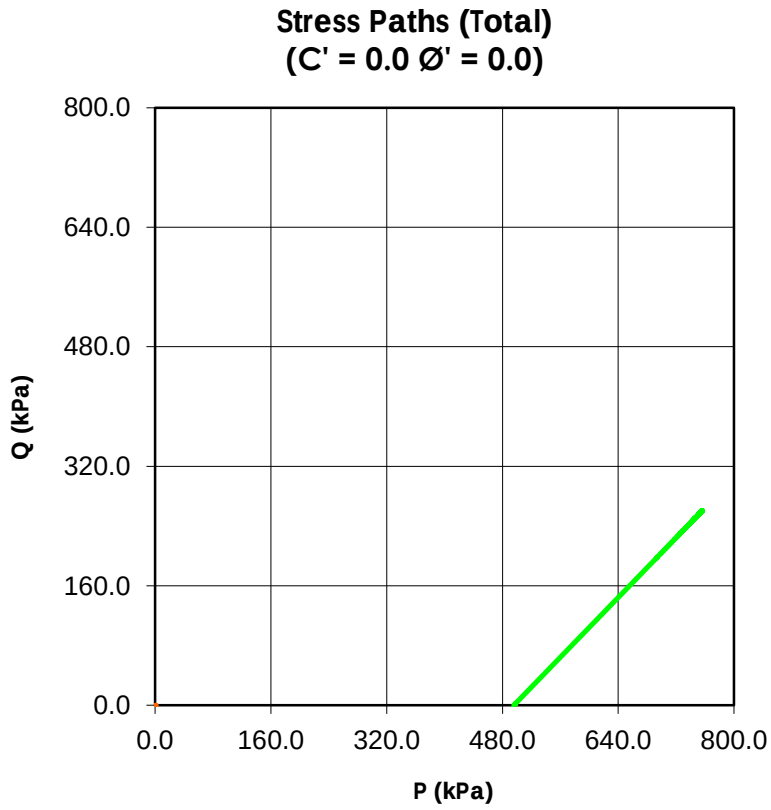
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

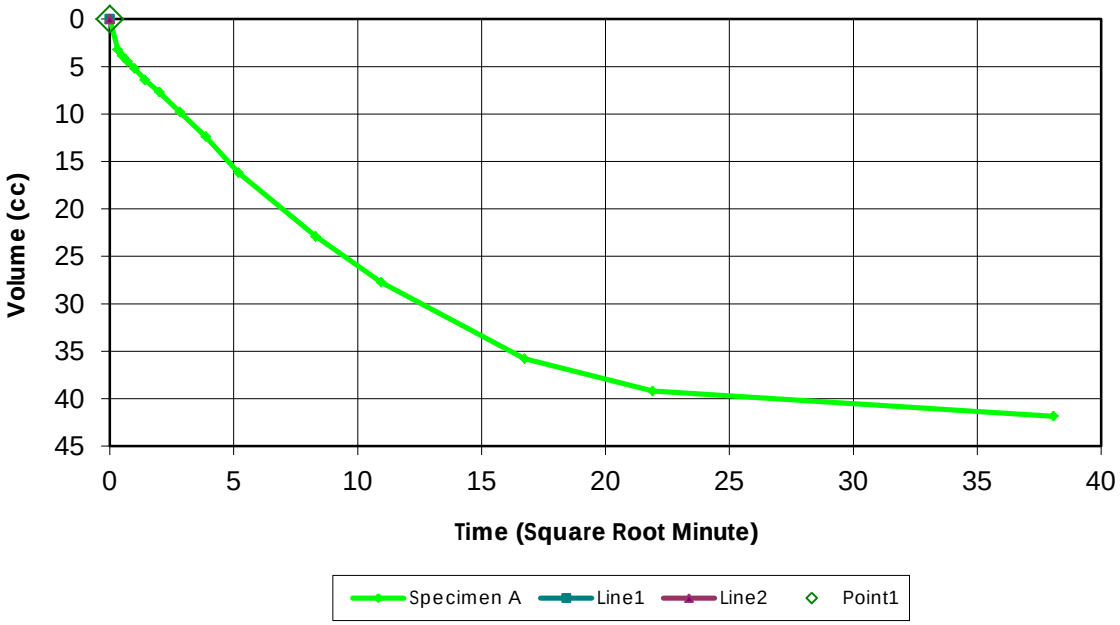



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

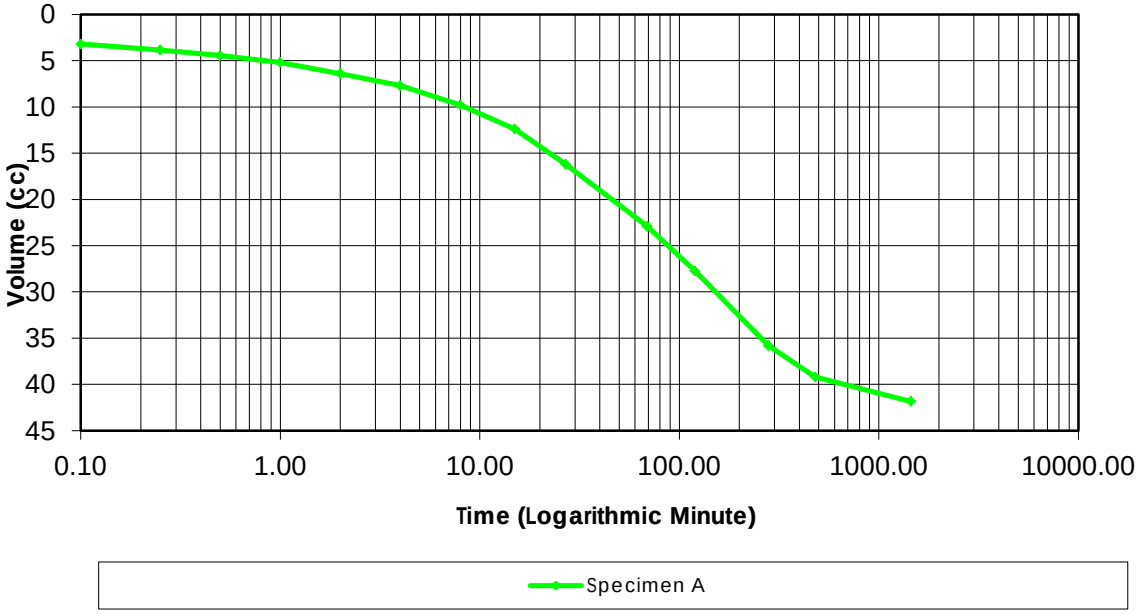

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.98

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 68.50 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 60.0 | 20.0 | 0.0 | 82.50 |
| 6 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 7 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 8 | 150.0 | 80.0 | 50.0 | 0.0 | 98.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 2.8-3.3m

| | |
|---|---|
| Cell Pressure (kPa) | 580 |
| Back Pressure (kPa) | 80 |
| Effective Pressure (kPa) | 500 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 147.8 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 608.5 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 42.20 | N/A |
| 00:00:06 | 39.00 | 3.200 |
| 00:00:15 | 38.35 | 3.850 |
| 00:00:30 | 37.75 | 4.450 |
| 00:01:00 | 37.00 | 5.200 |
| 00:02:00 | 35.80 | 6.400 |
| 00:04:00 | 34.50 | 7.700 |
| 00:08:00 | 32.40 | 9.800 |
| 00:15:00 | 29.80 | 12.400 |
| 00:27:00 | 26.00 | 16.200 |
| 01:09:00 | 19.30 | 22.900 |
| 02:00:00 | 14.45 | 27.750 |
| 04:40:00 | 6.40 | 35.800 |
| 08:00:00 | 3.00 | 39.200 |
| 24:10:00 | 0.35 | 41.850 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

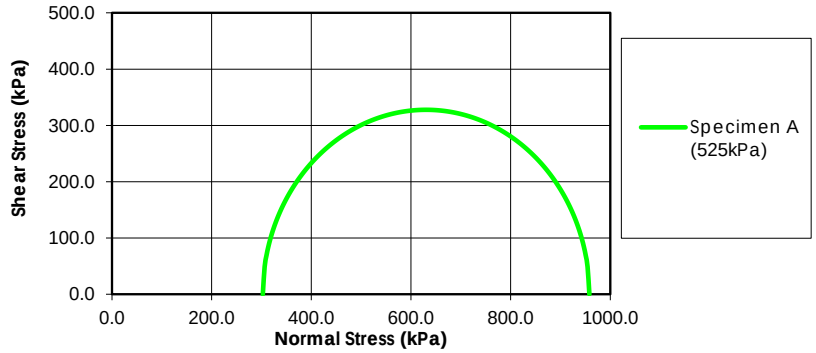
Stantec

Reviewed By C. Lamoureux

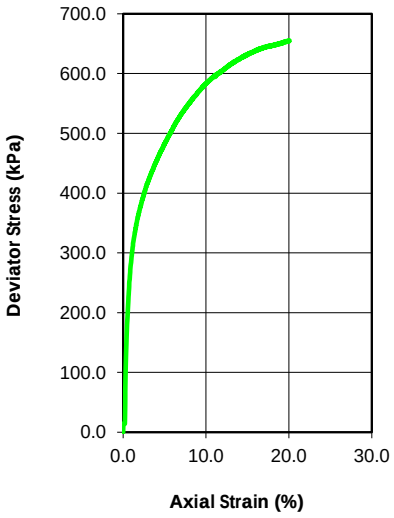
Date: 25-Oct-16

Tested By: C. Woods

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 10.3 | | | |
| Dry Density (g/cm3) | 2.013 | | | |
| Saturation (%) | 81.70 | | | |
| Void Ratio | 0.341 | | | |
| Diameter (mm) | 73.4 | | | |
| Height (mm) | 152.9 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.93 | | | |
| Water Content (%) | 7.3 | | | |
| Dry Density (g/cm3) | 2.080 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.298 | | | |
| Effective Stress (kPa) | 522.6 | | | |
| Back Press. (kPa) | 132.4 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

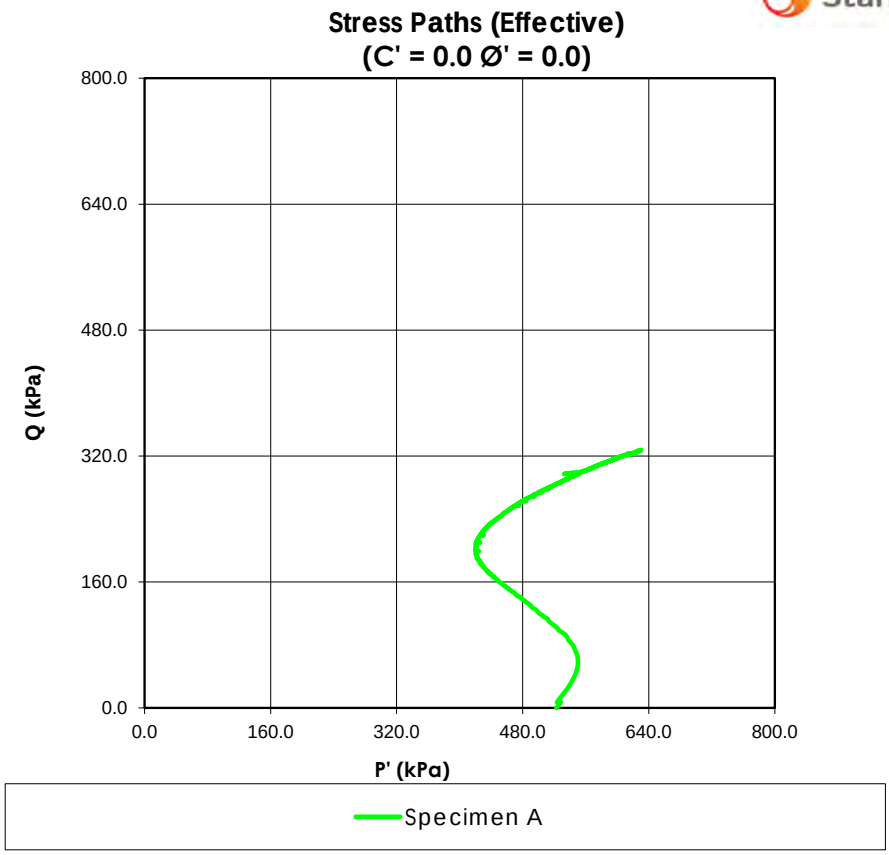
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 958.01 | | | |
| σ'3 at Failure (kPa) | 302.67 | | | |
| | | | | |
| | | | | |

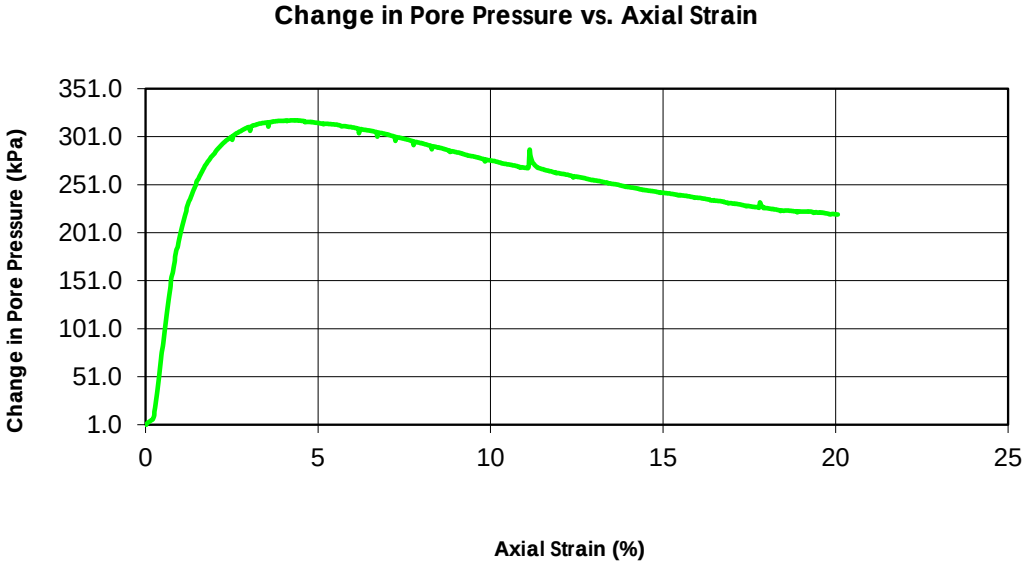
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D46 BSC |
| **Depth:** | - |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay, Some Sand |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

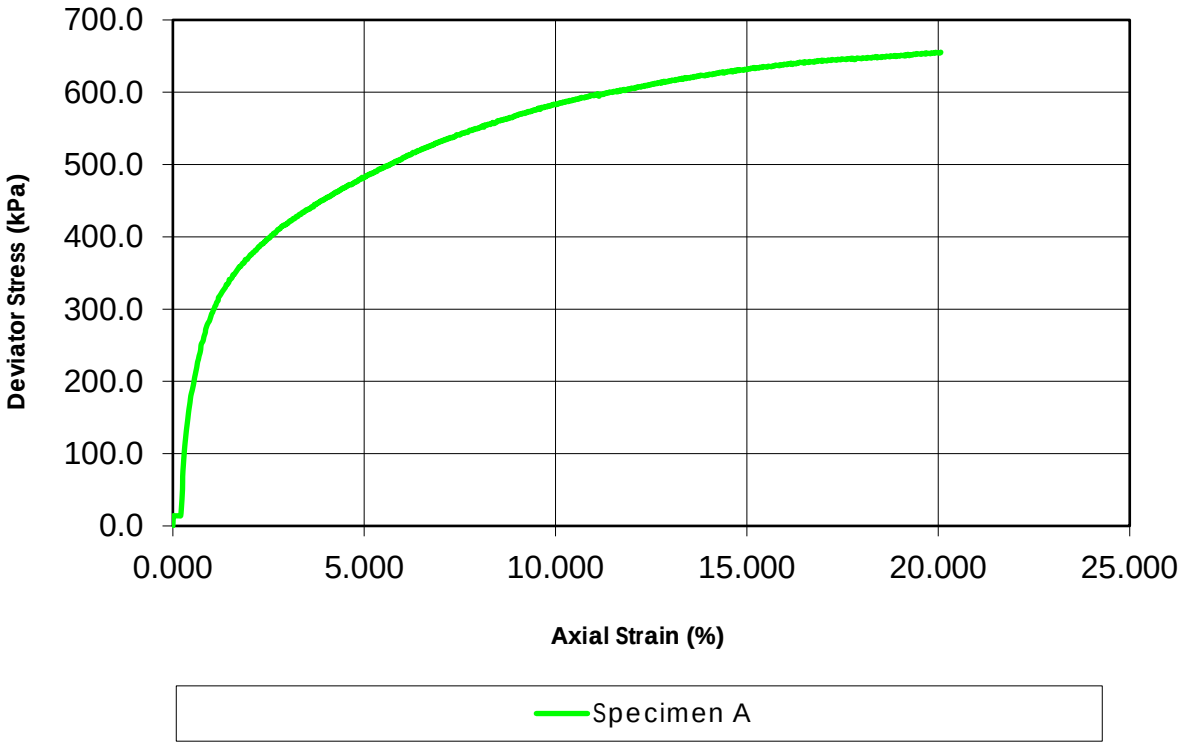
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

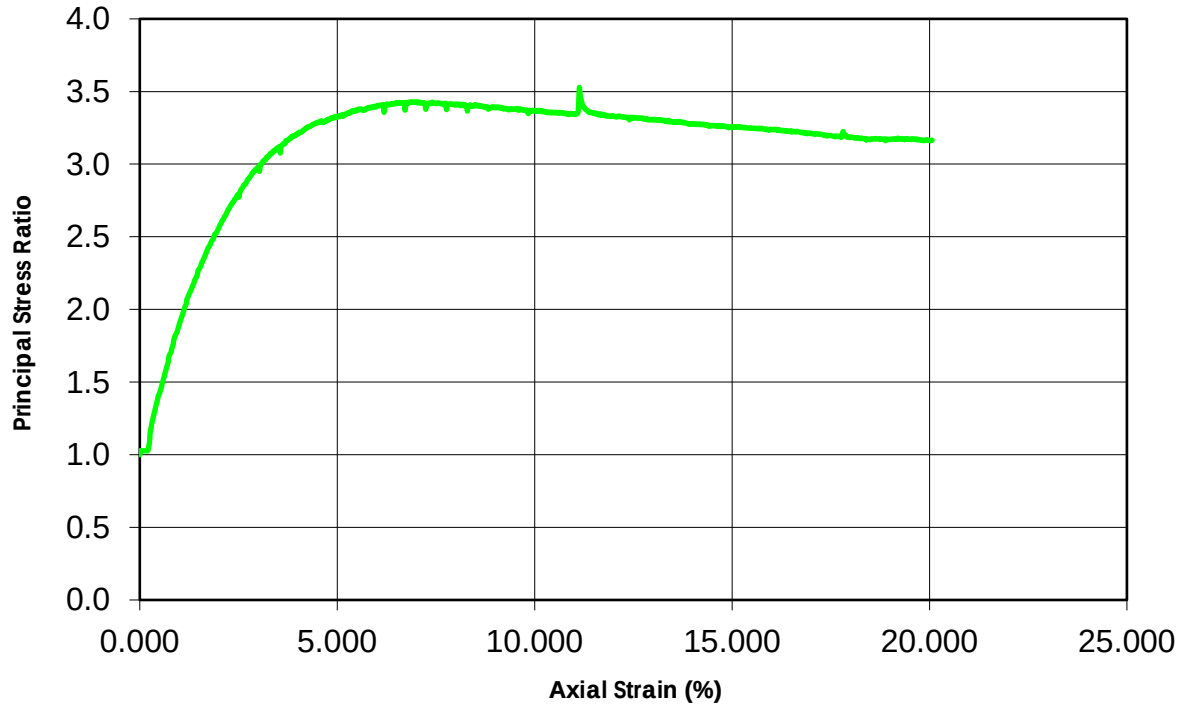


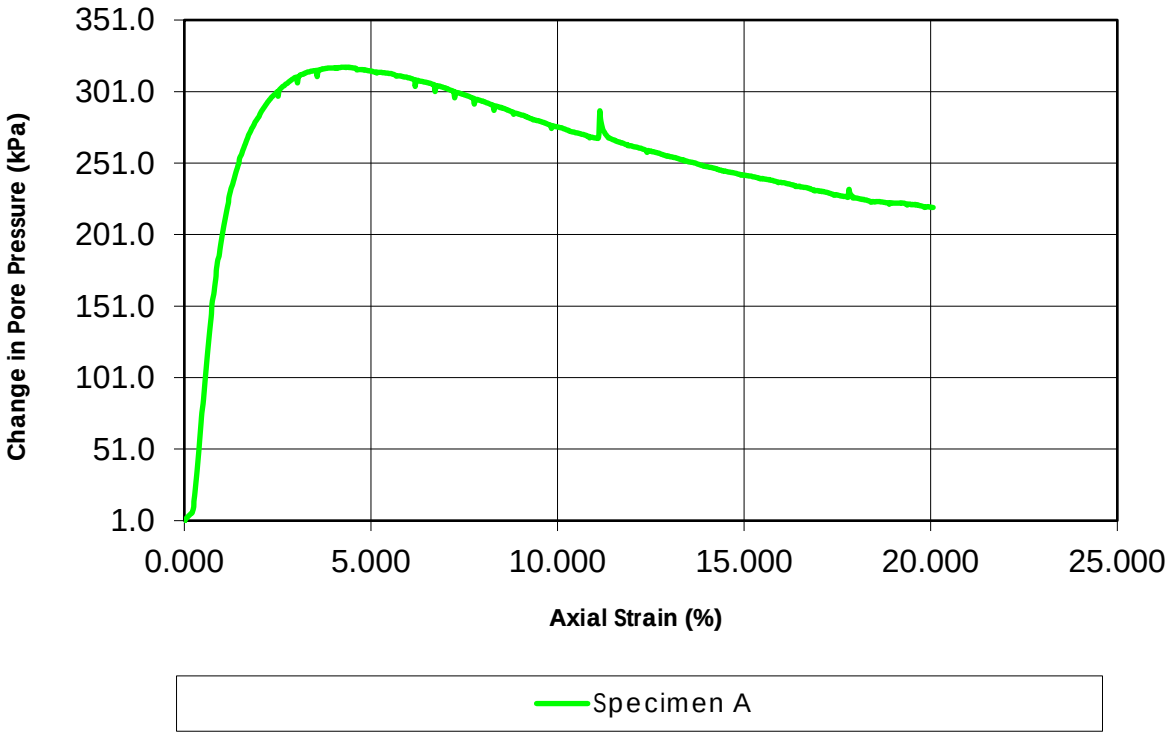
## Deviator Stress vs. Axial Strain




## Principal Stress Ratio vs. Axial Strain

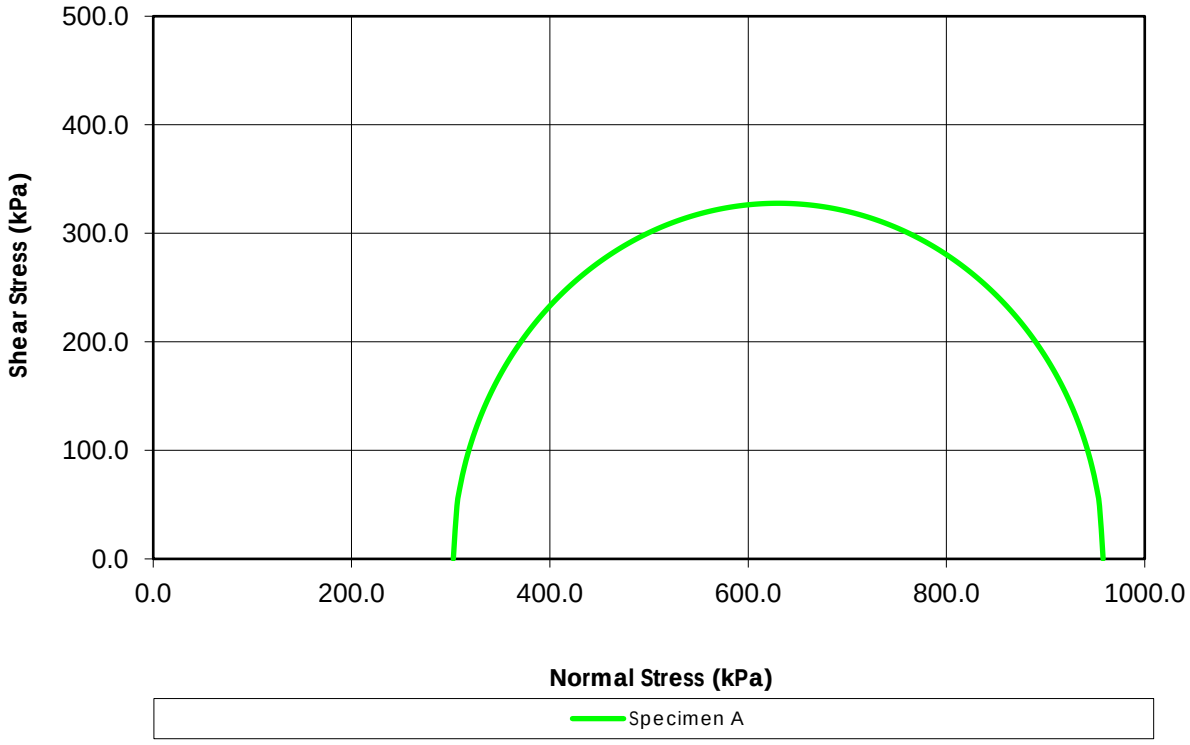


## Change in Pore Pressure vs. Axial Strain

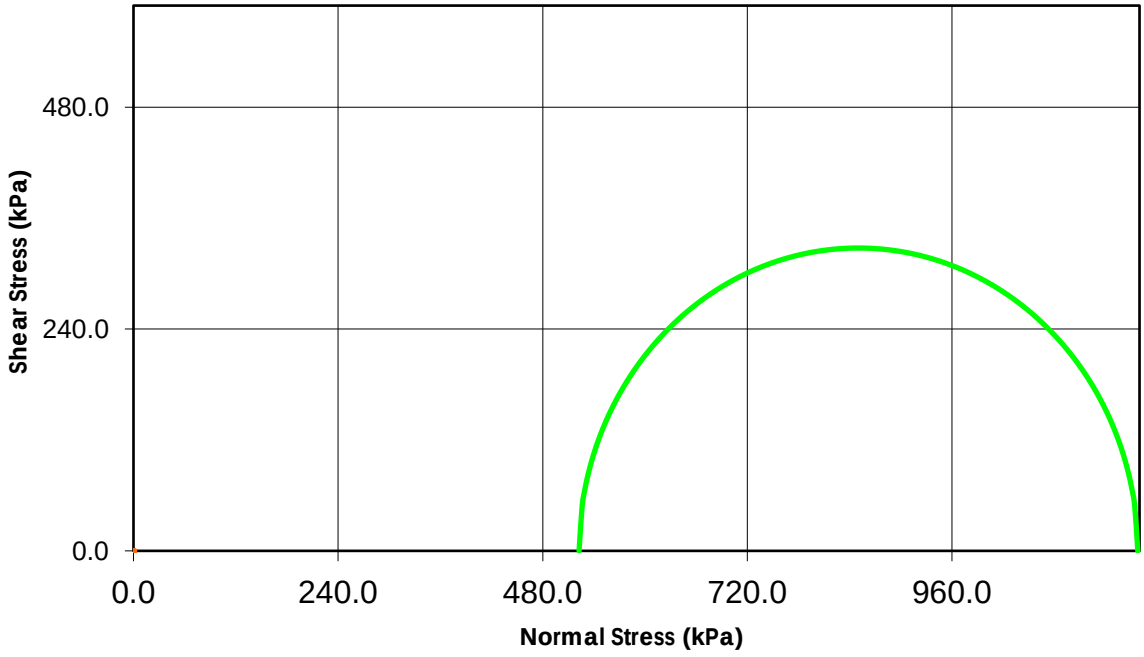


## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)



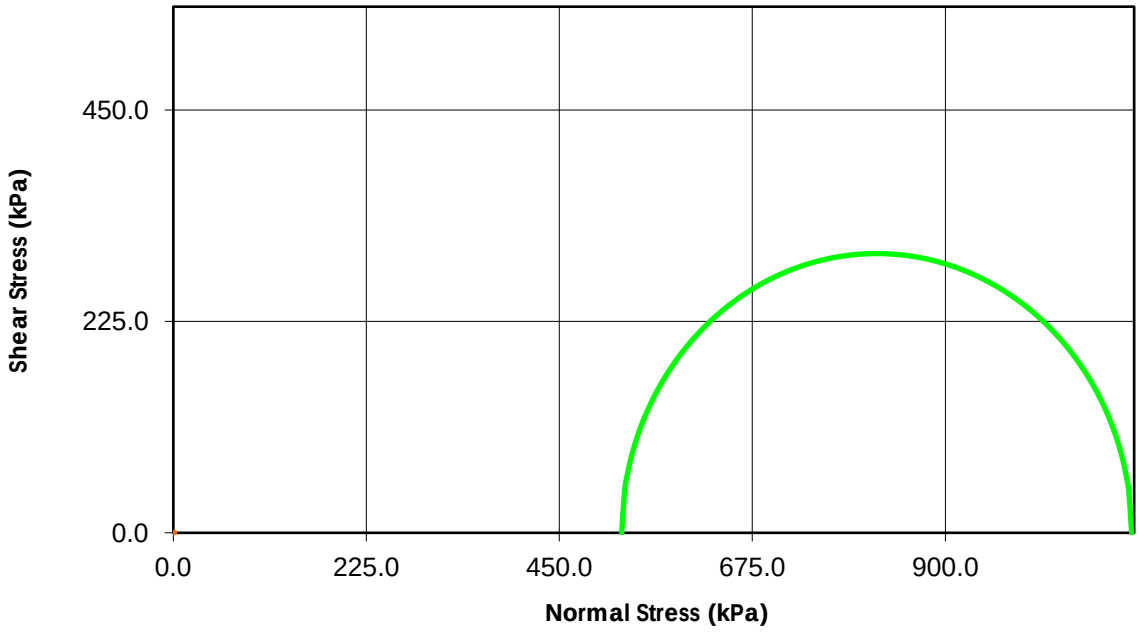

### Total Stress
### (C = 0.0 Ø = 0.0)



# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

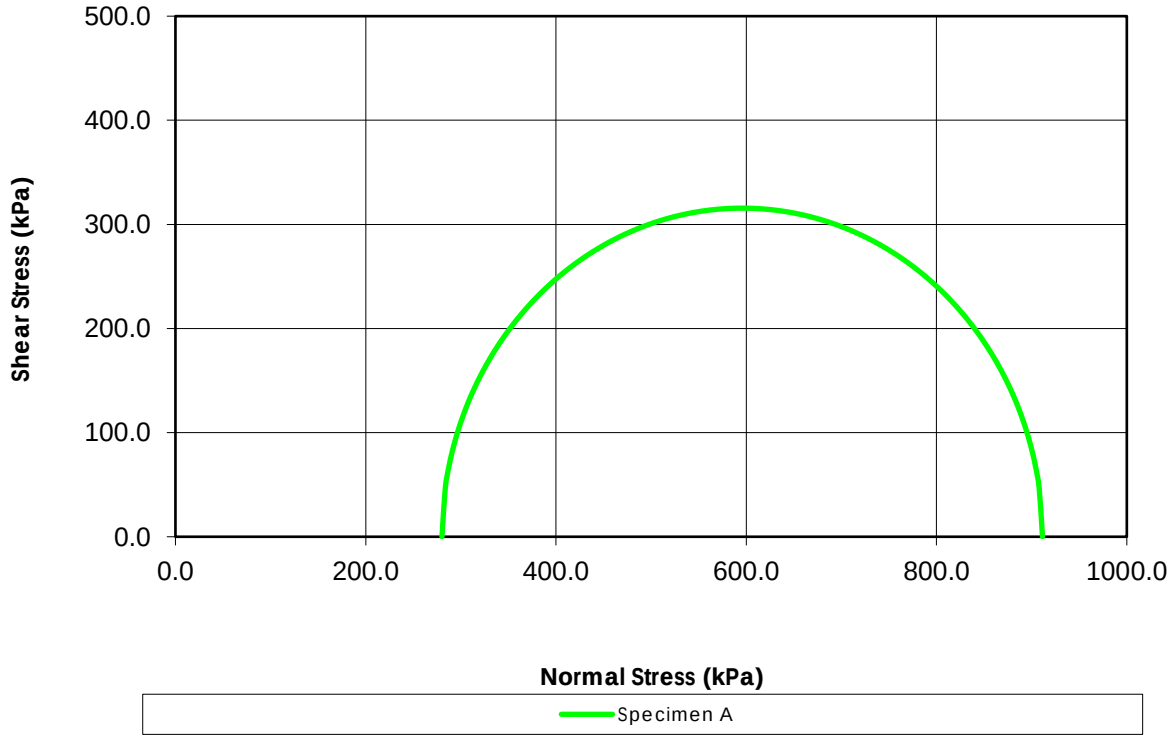
## Effective Stress
## (C' = 0.0 Ø' = 0.0)


## Total Stress
## (C = 0.0 Ø = 0.0)

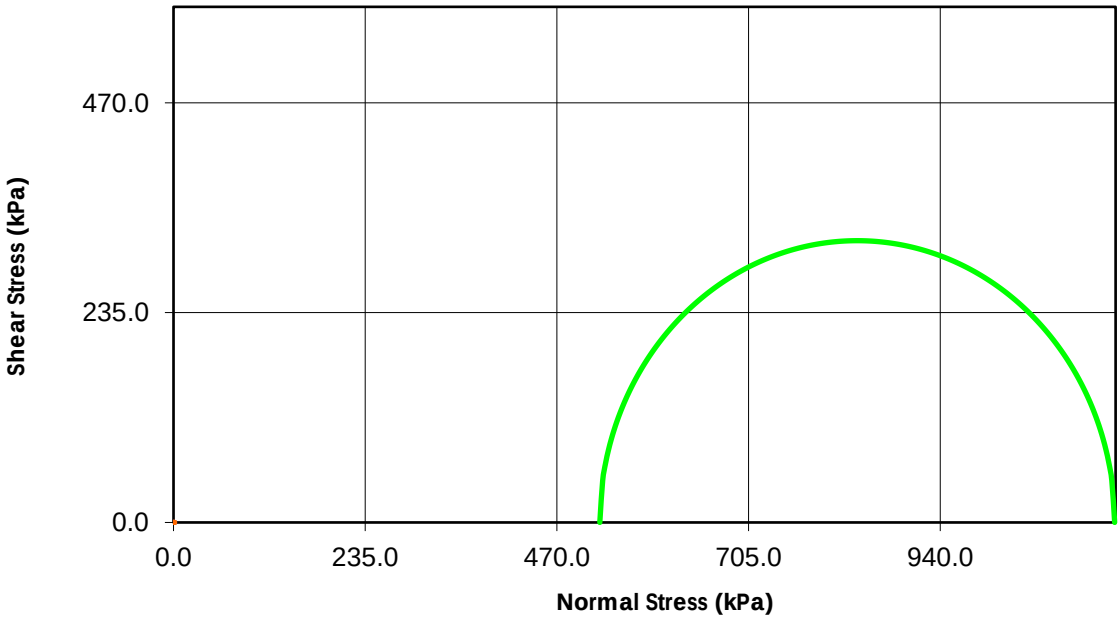


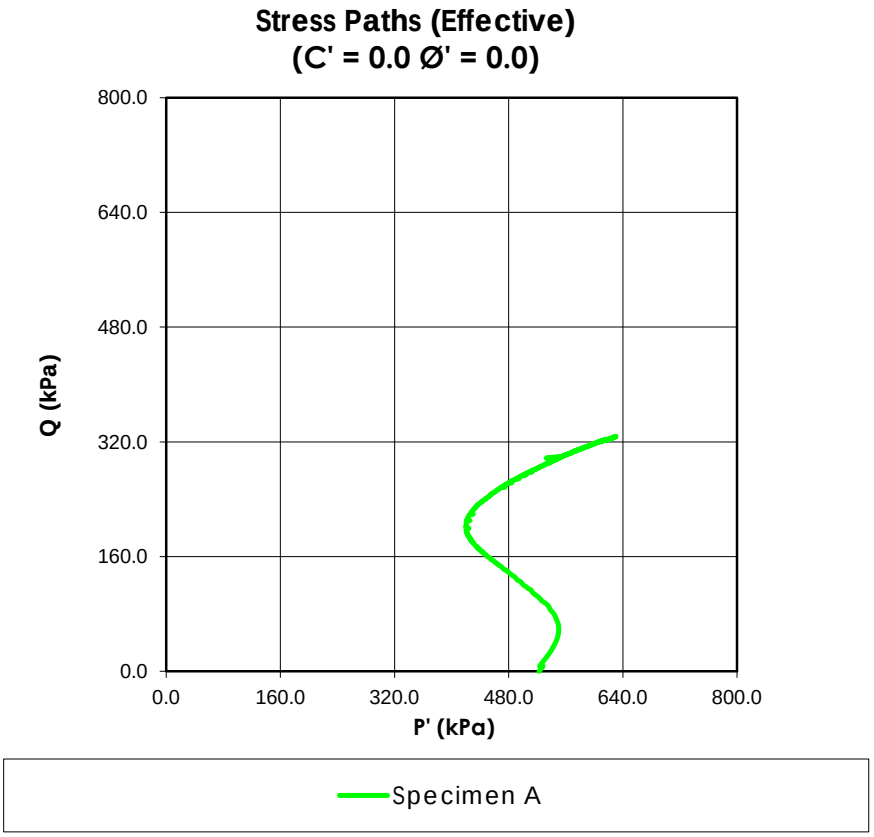
## Mohr Stress Circles at 15% Axial Strain Criterion

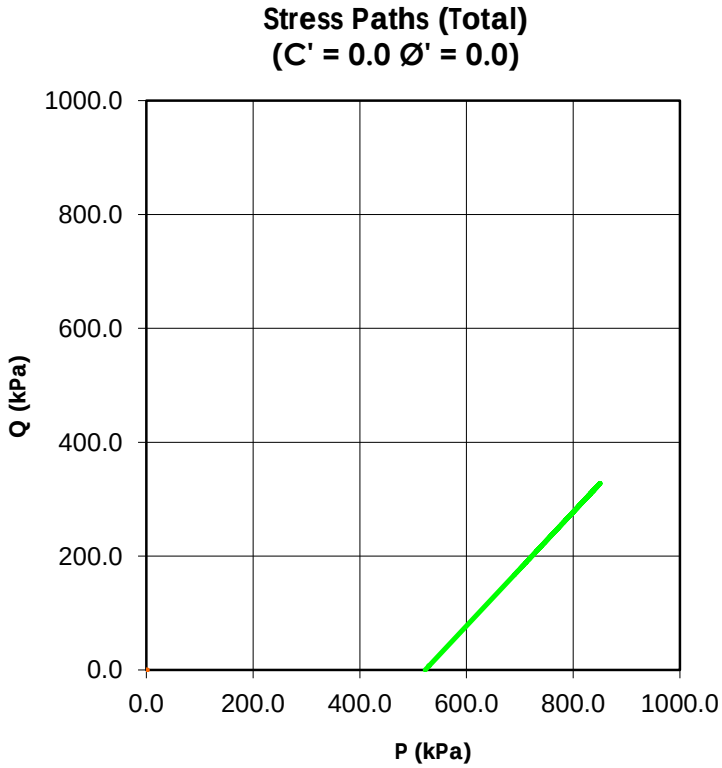
### Effective Stress
### (C' = 0.0 Ø' = 0.0)




### Total Stress
### (C = 0.0 Ø = 0.0)

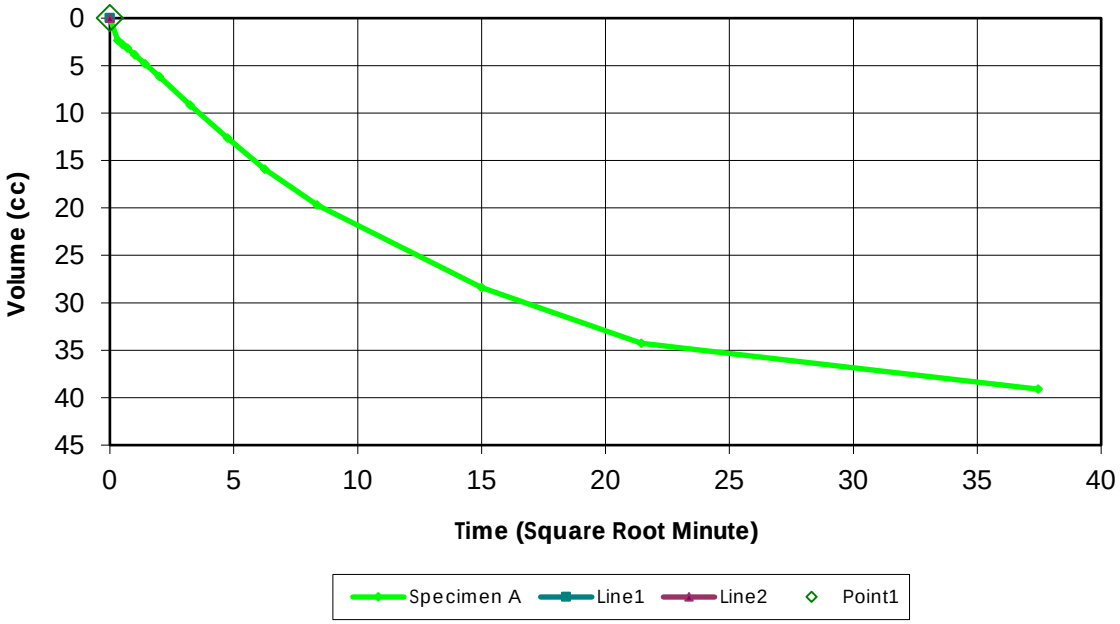



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A

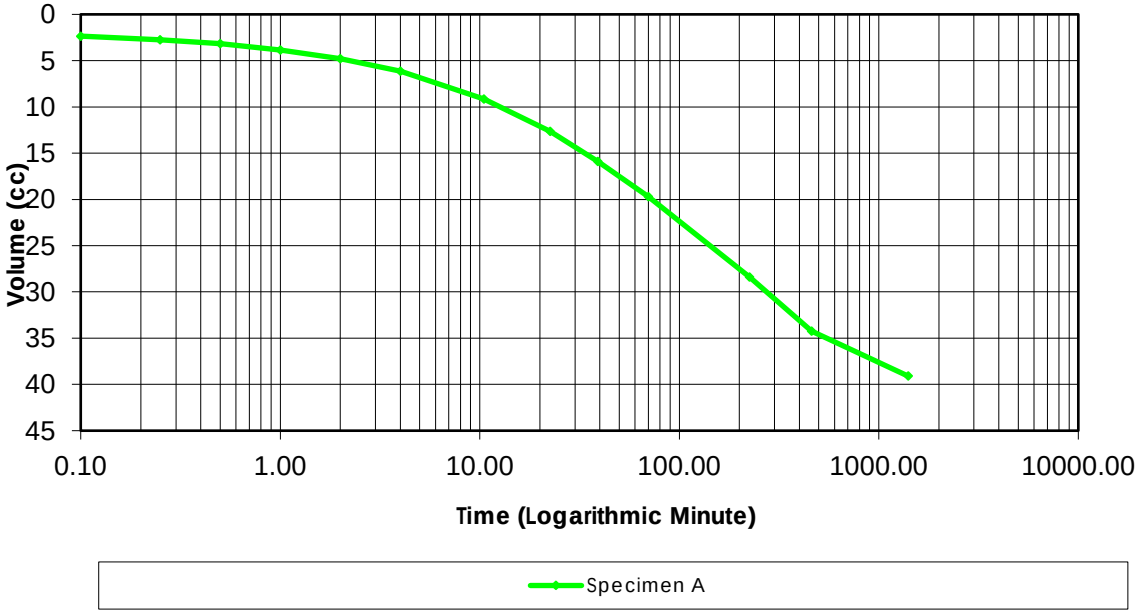

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.93

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 130.0 | 60.0 | 50.0 | 0.0 | 76.00 |
| 3 | 130.0 | 110.0 | 0.0 | 50.0 | |
| 4 | 130.0 | 110.0 | 0.0 | 0.0 | |
| 5 | 150.0 | 110.0 | 20.0 | 0.0 | 93.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 0

| | |
|---|---|
| Cell Pressure (kPa) | 655 |
| Back Pressure (kPa) | 130 |
| Effective Pressure (kPa) | 525 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 73.4 |
| Initial Sample Height (mm) | 152.9 |
| Initial Sample Area (cm2) | 42.31 |
| Initial Volume (cm3) | 647 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 47.90 | N/A |
| 00:00:06 | 45.55 | 2.350 |
| 00:00:15 | 45.15 | 2.750 |
| 00:00:30 | 44.75 | 3.150 |
| 00:01:00 | 44.05 | 3.850 |
| 00:02:00 | 43.10 | 4.800 |
| 00:04:00 | 41.75 | 6.150 |
| 00:10:30 | 38.75 | 9.150 |
| 00:22:30 | 35.25 | 12.650 |
| 00:39:00 | 32.00 | 15.900 |
| 01:10:00 | 28.20 | 19.700 |
| 03:45:00 | 19.50 | 28.400 |
| 07:40:00 | 13.65 | 34.250 |
| 23:23:00 | 8.80 | 39.100 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

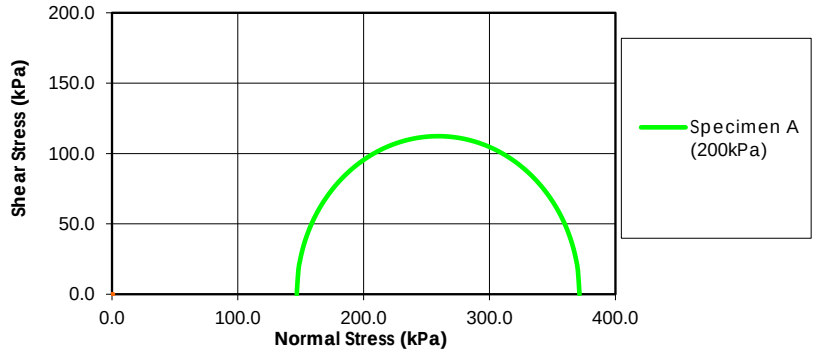
Stantec

Reviewed By C. Lamoureux

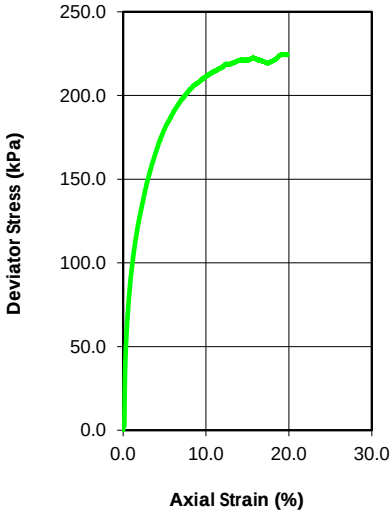
Date: 5-Oct-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 18.5 | | | |
| Dry Density (g/cm3) | 1.750 | | | |
| Saturation (%) | 91.85 | | | |
| Void Ratio | 0.540 | | | |
| Diameter (mm) | 71.5 | | | |
| Height (mm) | 153.8 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 15.9 | | | |
| Dry Density (g/cm3) | 1.828 | | | |
| Saturation (%) | 100.0 | | | |
| Void Ratio | 0.477 | | | |
| Effective Stress (kPa) | 192.9 | | | |
| Back Press. (kPa) | 277.1 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

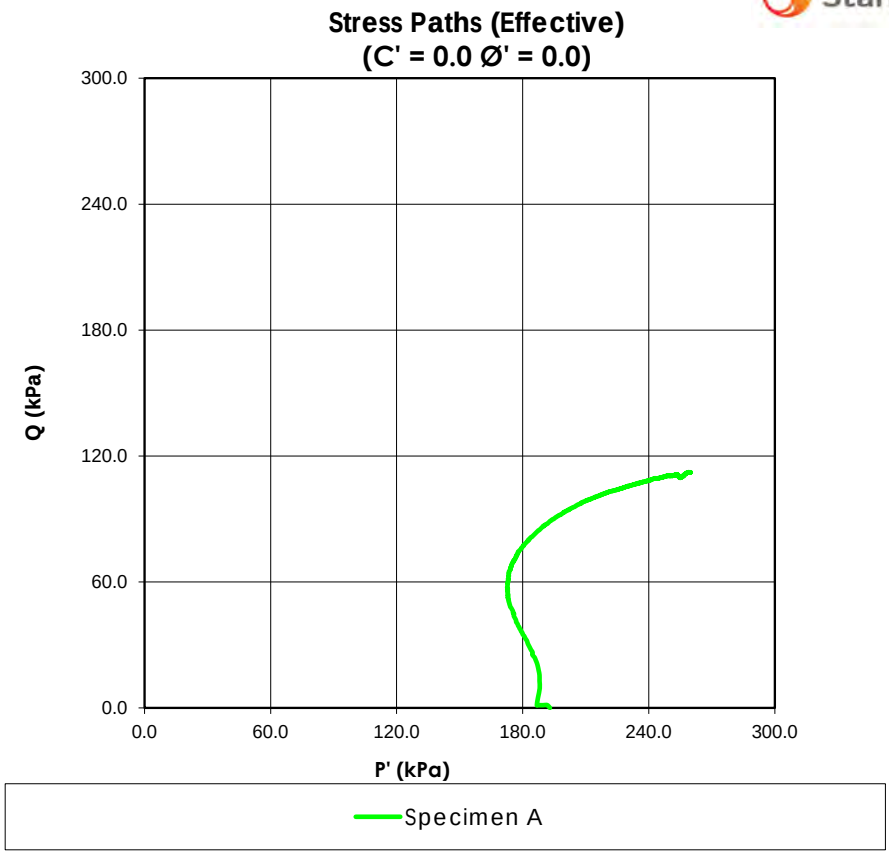
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 371.43 | | | |
| σ'3 at Failure (kPa) | 146.79 | | | |
| | | | | |
| | | | | |

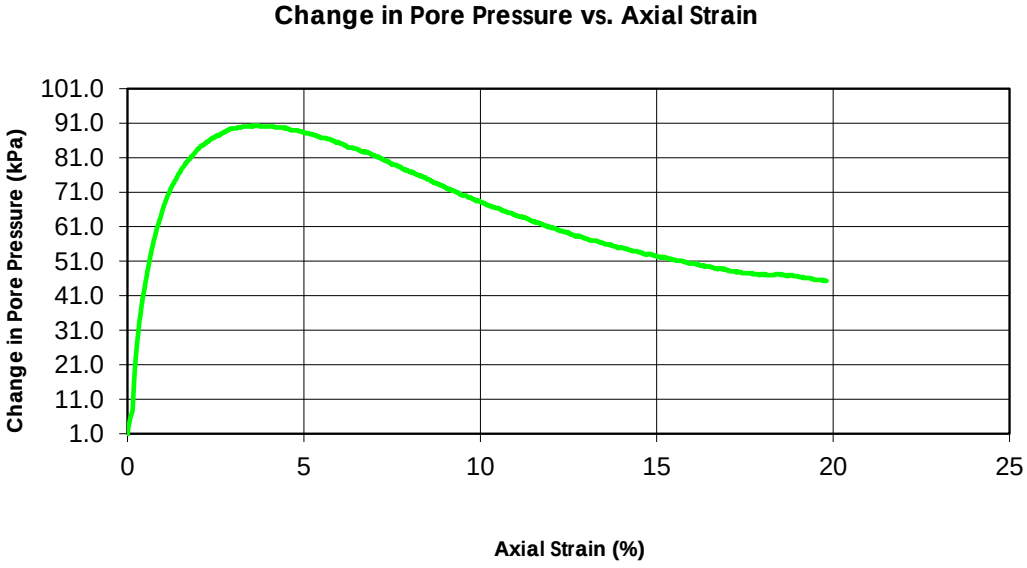
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 10773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D51 ST8 |
| **Depth:** | 3.6-4.2m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

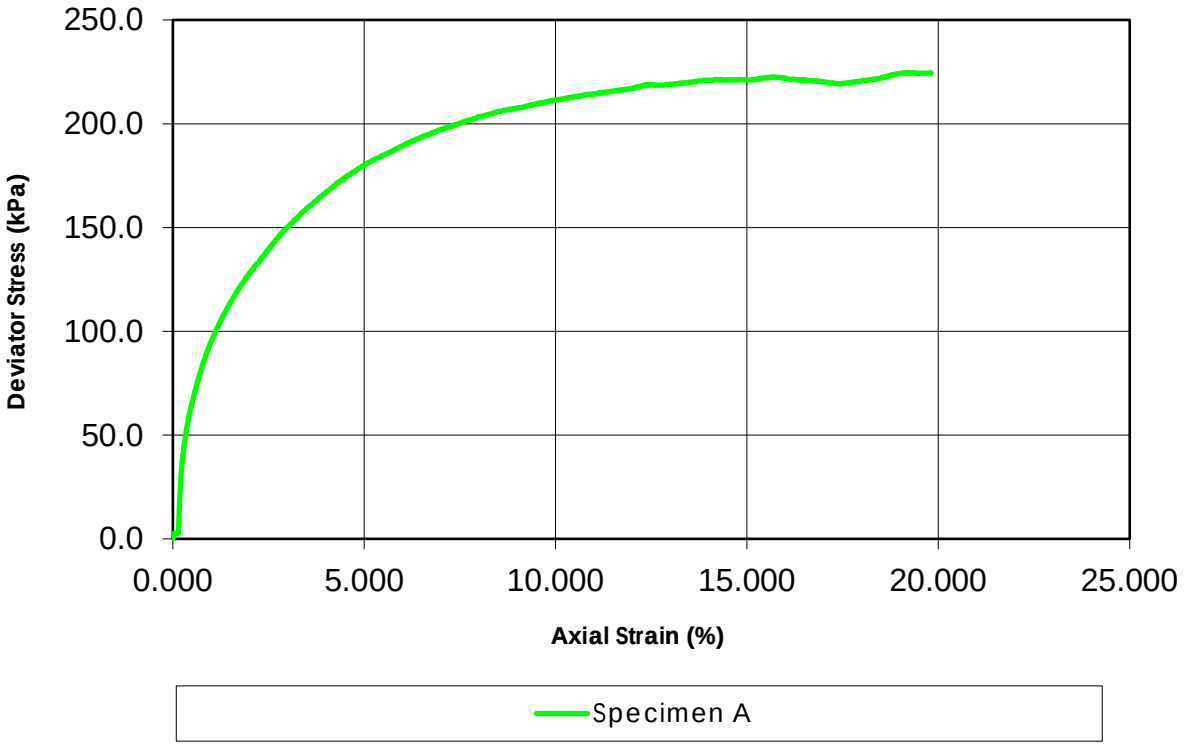
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

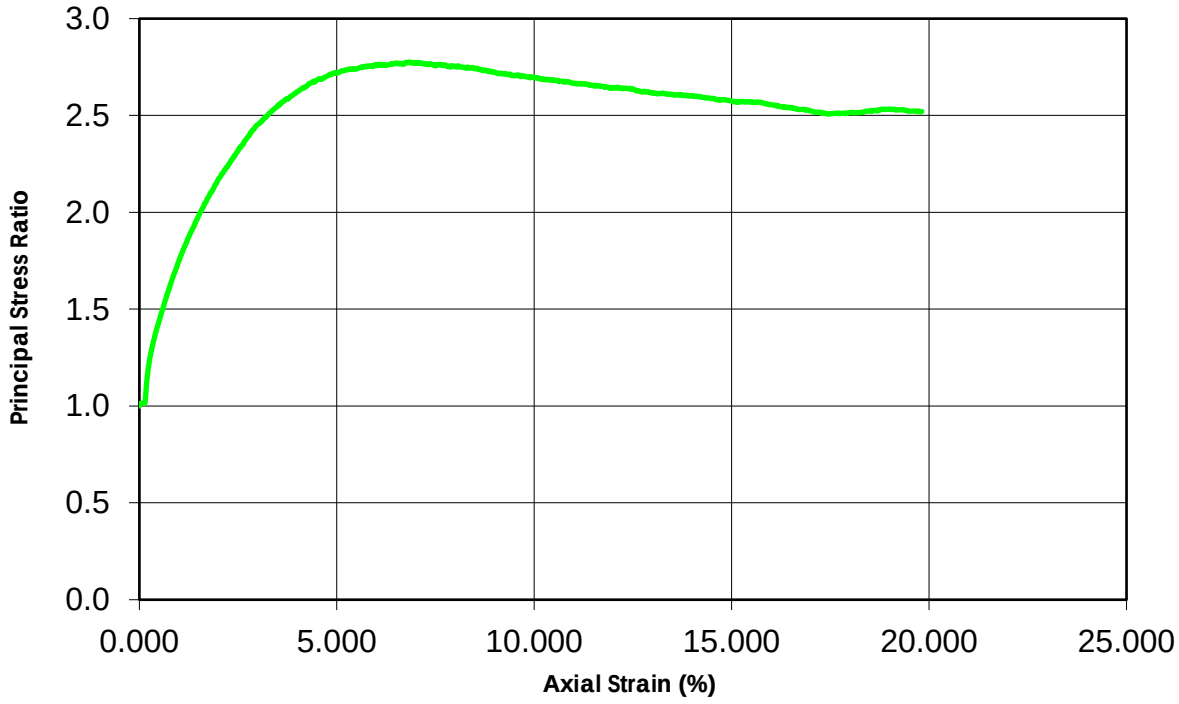


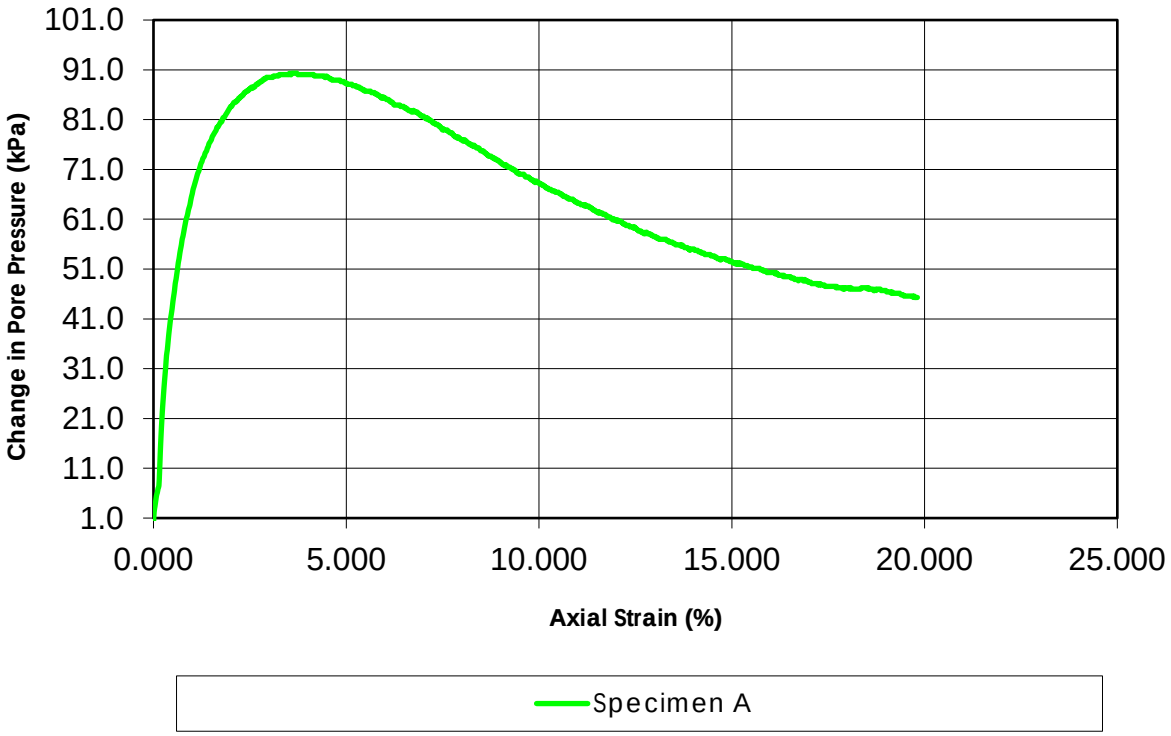
## Deviator Stress vs. Axial Strain




## Principal Stress Ratio vs. Axial Strain

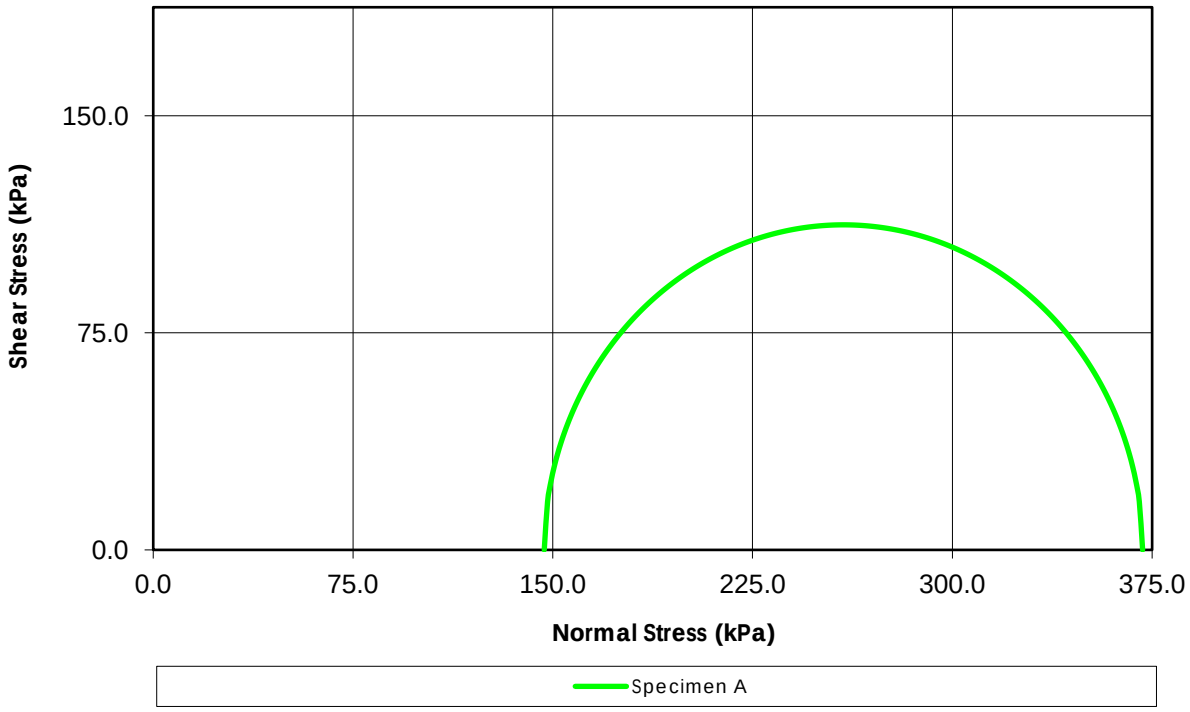


## Change in Pore Pressure vs. Axial Strain

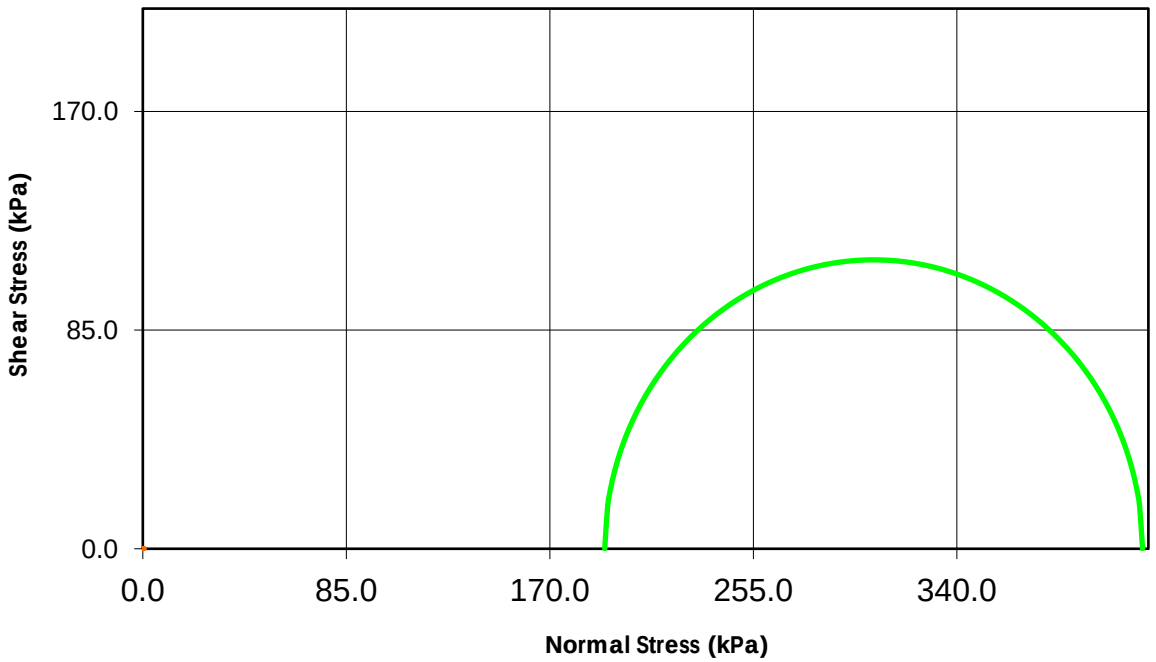


## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

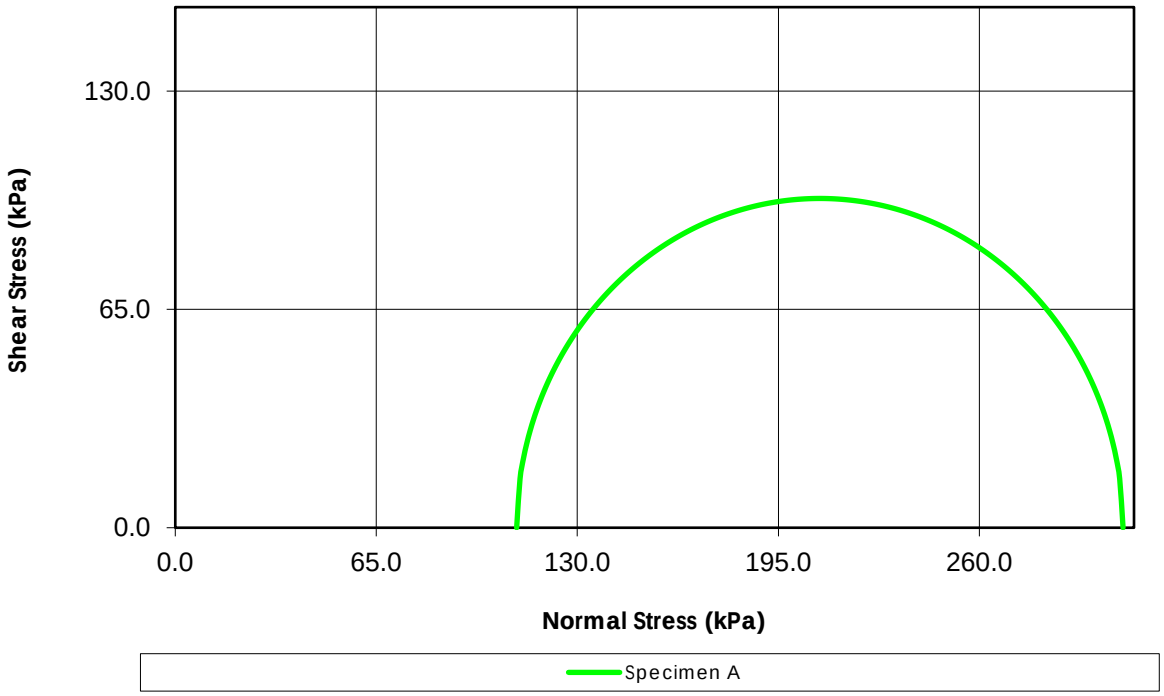



### Total Stress
### (C = 0.0 Ø = 0.0)

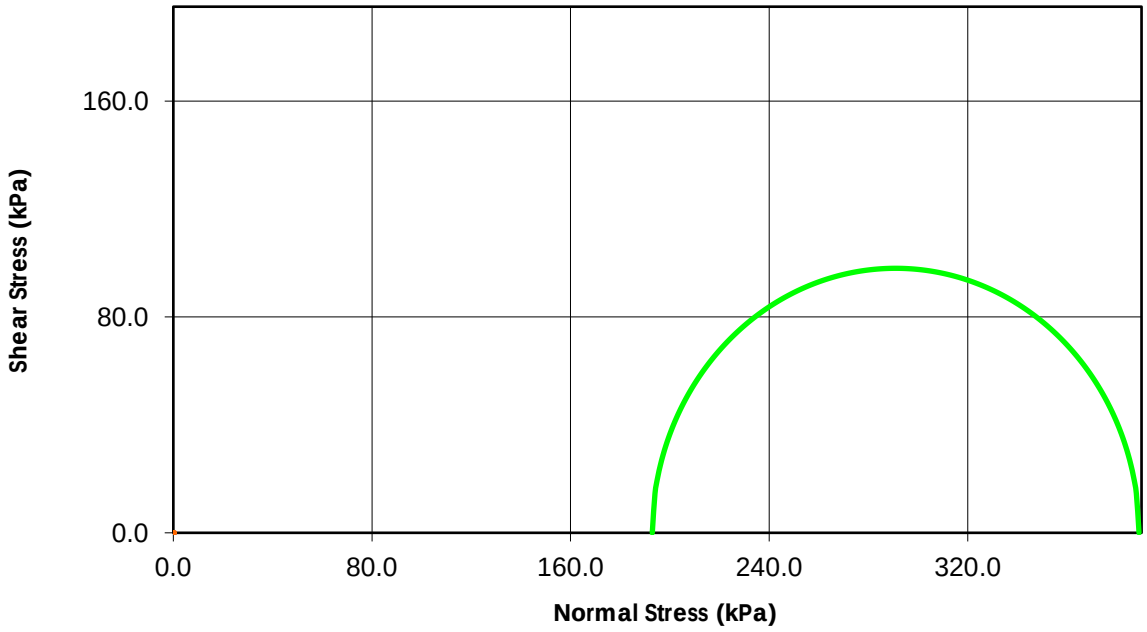


## Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

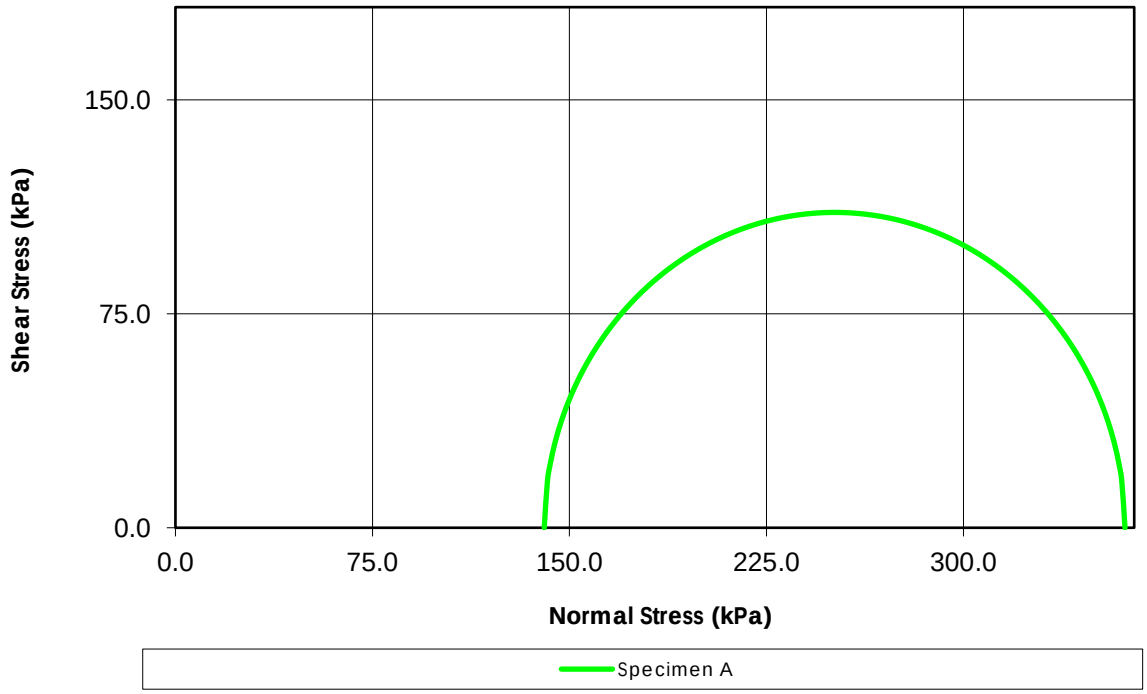



### Total Stress
### (C = 0.0 Ø = 0.0)

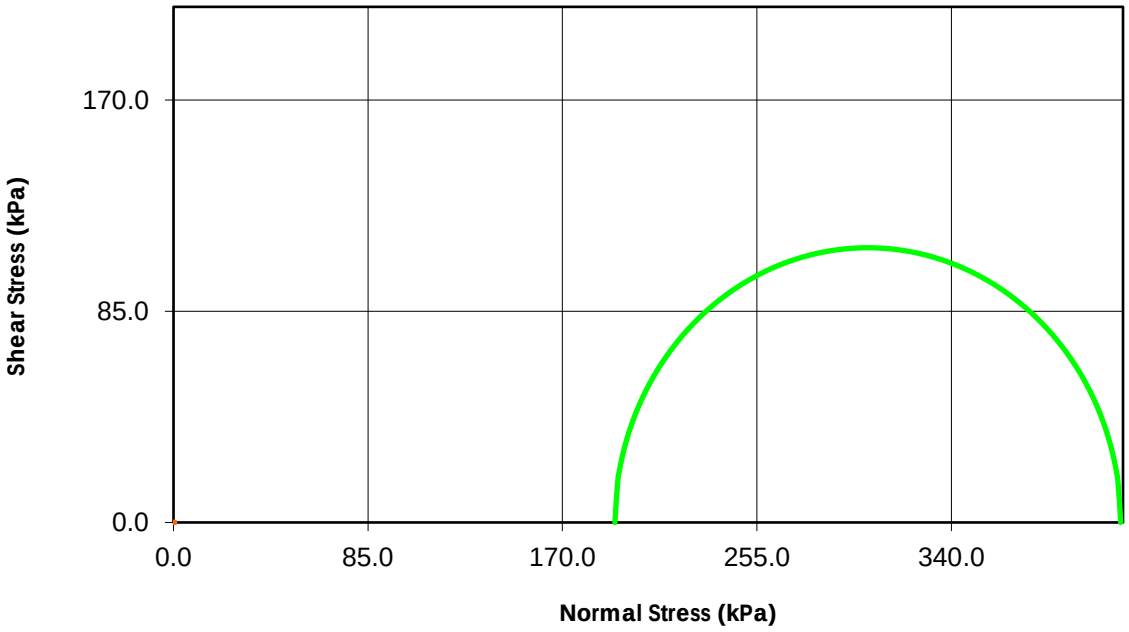


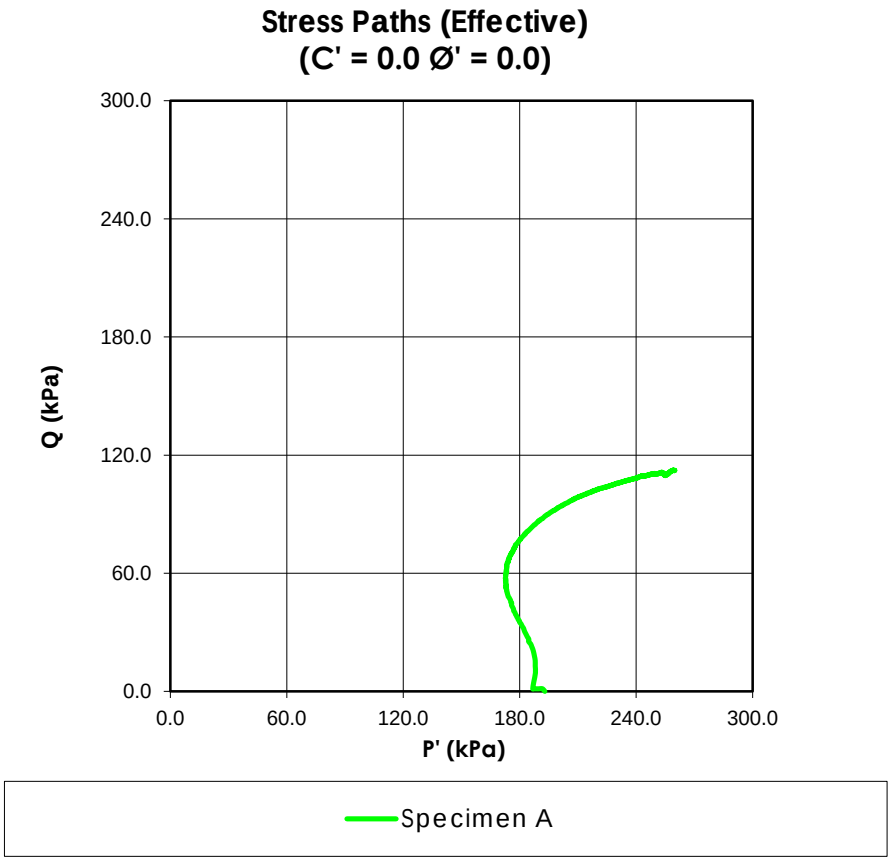
## Mohr Stress Circles at 15% Axial Strain Criterion

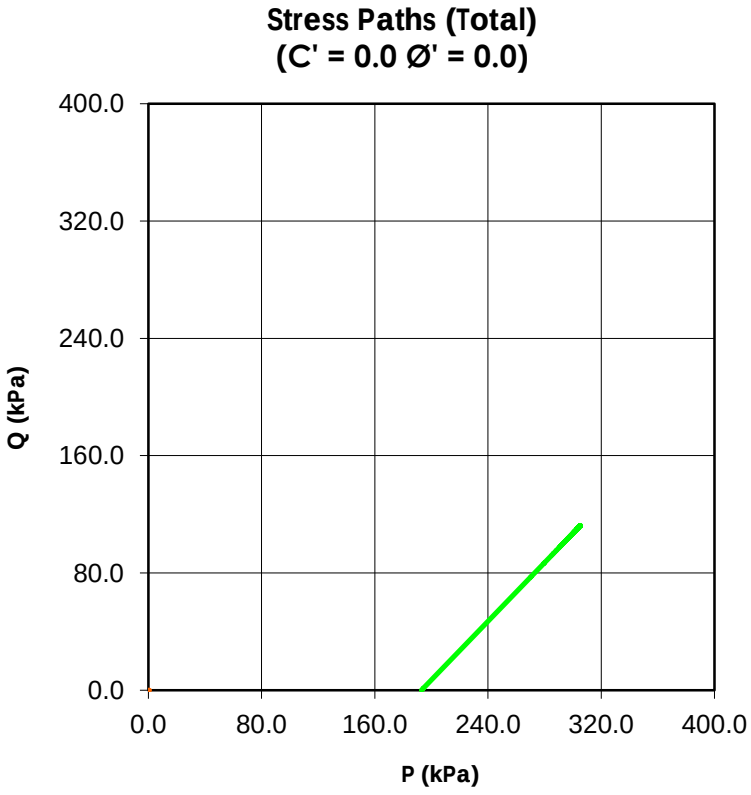
### Effective Stress
### (C' = 0.0 Ø' = 0.0)




### Total Stress
### (C = 0.0 Ø = 0.0)

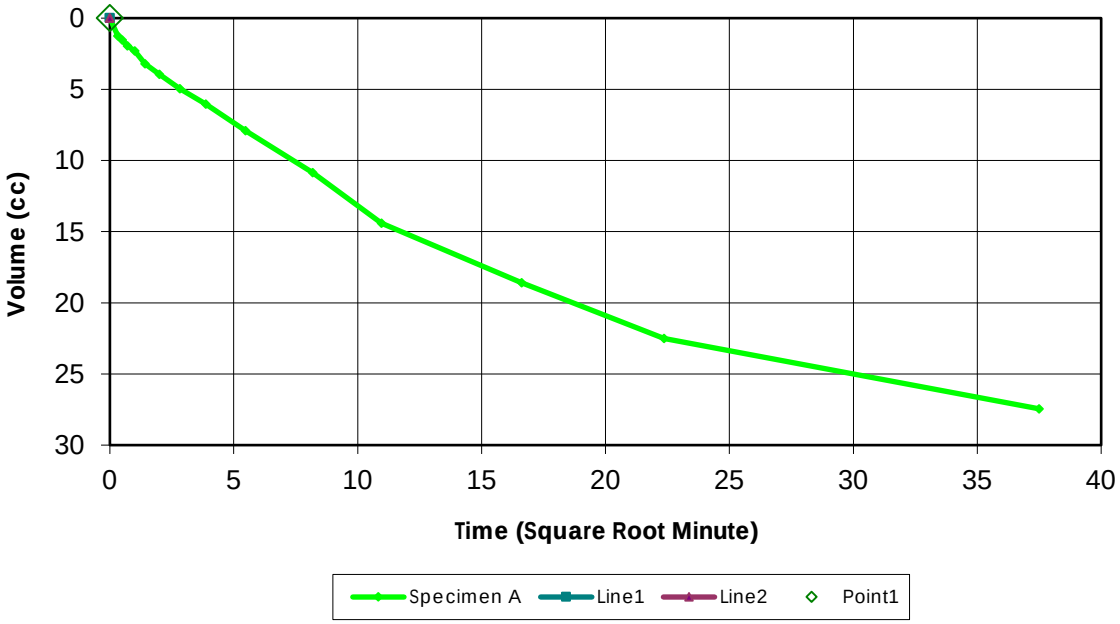



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P' (kPa)
Specimen A

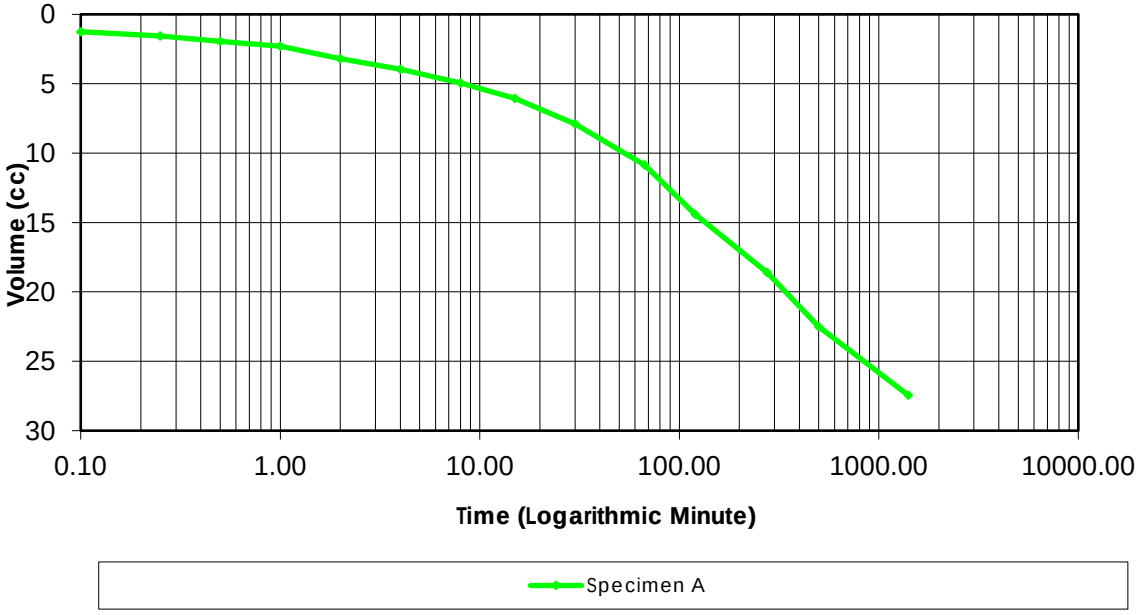

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 10773396.302.70

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 98.00

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 37.00 |
| 3 | 150.0 | 130.0 | 0.0 | 70.0 | |
| 4 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 5 | 220.0 | 130.0 | 70.0 | 0.0 | 57.00 |
| 6 | 220.0 | 200.0 | 0.0 | 70.0 | |
| 7 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 8 | 290.0 | 200.0 | 70.0 | 0.0 | 83.00 |
| 9 | 290.0 | 270.0 | 0.0 | 70.0 | |
| 10 | 290.0 | 270.0 | 0.0 | 0.0 | |
| 11 | 360.0 | 270.0 | 70.0 | 0.0 | 98.00 |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 10773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.6-4.2m

| | |
|---|---|
| Cell Pressure (kPa) | 470 |
| Back Pressure (kPa) | 270 |
| Effective Pressure (kPa) | 200 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71.5 |
| Initial Sample Height (mm) | 153.8 |
| Initial Sample Area (cm2) | 40.15 |
| Initial Volume (cm3) | 617.5 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 42.65 | N/A |
| 00:00:06 | 41.40 | 1.250 |
| 00:00:15 | 41.10 | 1.550 |
| 00:00:30 | 40.70 | 1.950 |
| 00:01:00 | 40.35 | 2.300 |
| 00:02:00 | 39.45 | 3.200 |
| 00:04:00 | 38.70 | 3.950 |
| 00:08:00 | 37.70 | 4.950 |
| 00:15:00 | 36.60 | 6.050 |
| 00:30:00 | 34.75 | 7.900 |
| 01:07:00 | 31.80 | 10.850 |
| 02:00:00 | 28.25 | 14.400 |
| 04:36:00 | 24.05 | 18.600 |
| 08:20:00 | 20.15 | 22.500 |
| 23:26:00 | 15.20 | 27.450 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

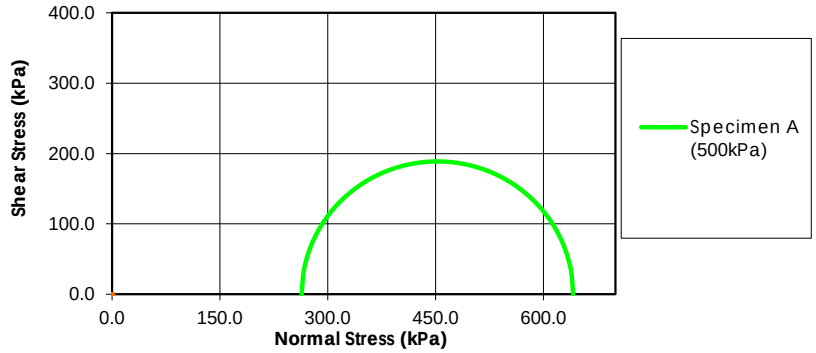
Stantec

Reviewed By C. Lamoureux

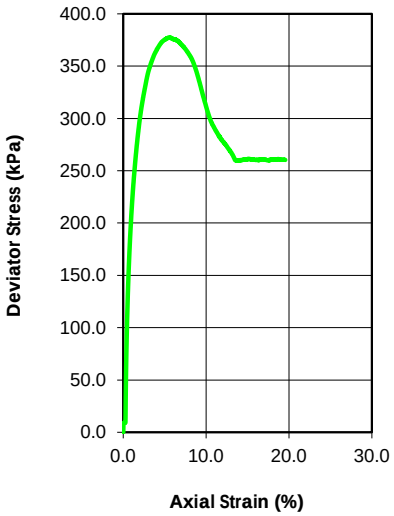
Date: 27-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.7 | | | |
| Dry Density (g/cm3) | 1.597 | | | |
| Saturation (%) | 100.63 | | | |
| Void Ratio | 0.690 | | | |
| Diameter (mm) | 72.700 | | | |
| Height (mm) | 146.300 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 19.0 | | | |
| Dry Density (g/cm3) | 1.691 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.597 | | | |
| Effective Stress (kPa) | 493.9 | | | |
| Back Press. (kPa) | 46.1 | | | |
| Rate of Strain | 0.02 | | | |

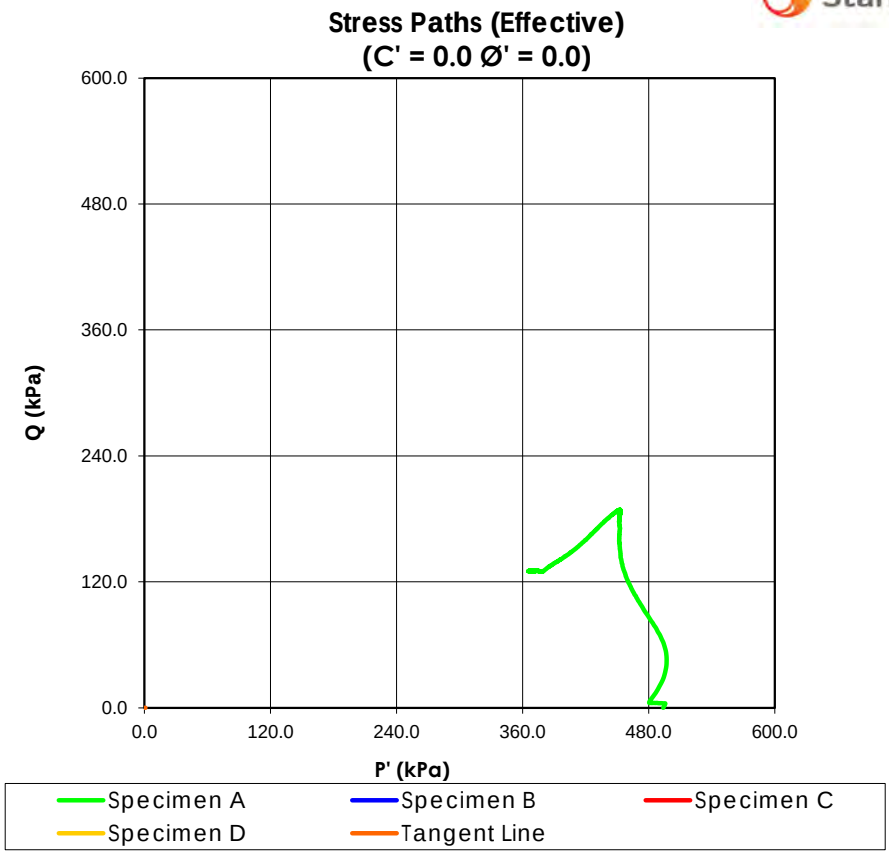
| Maximium Deviator Stress Criterion | | After Shear | A | B | C | D |
|---|---|---|---|---|---|---|
| C (kPa) | 0.0 | σ'1 at Failure (kPa) | 641.20 | | | |
| C' (kPa) | 0.0 | σ'3 at Failure (kPa) | 263.76 | | | |
| Ø (deg) | 0.0 | | | | | |
| Ø' (deg) | 0.0 | | | | | |

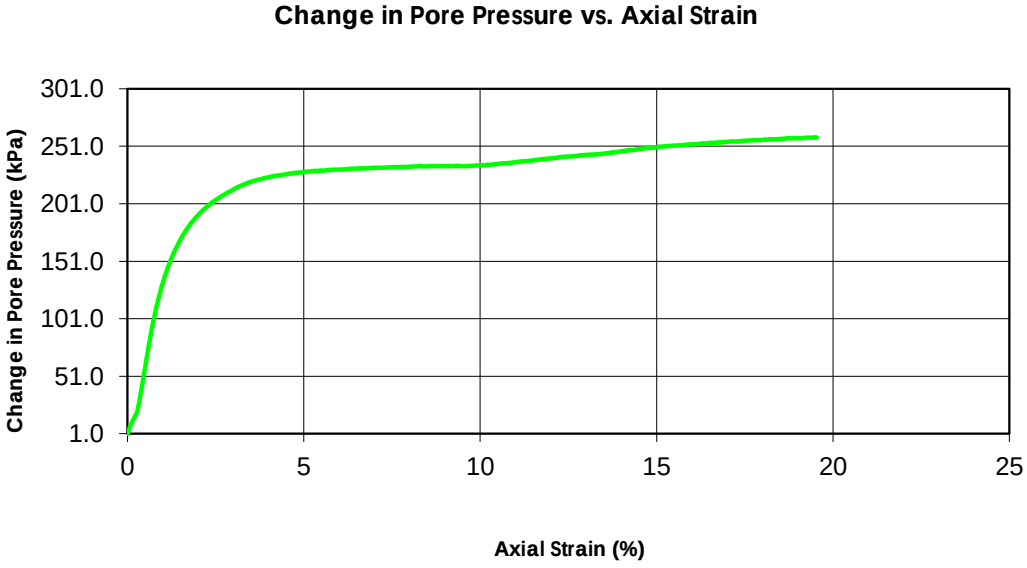
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D58 ST5 |
| **Depth:** | 3.0-3.6m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

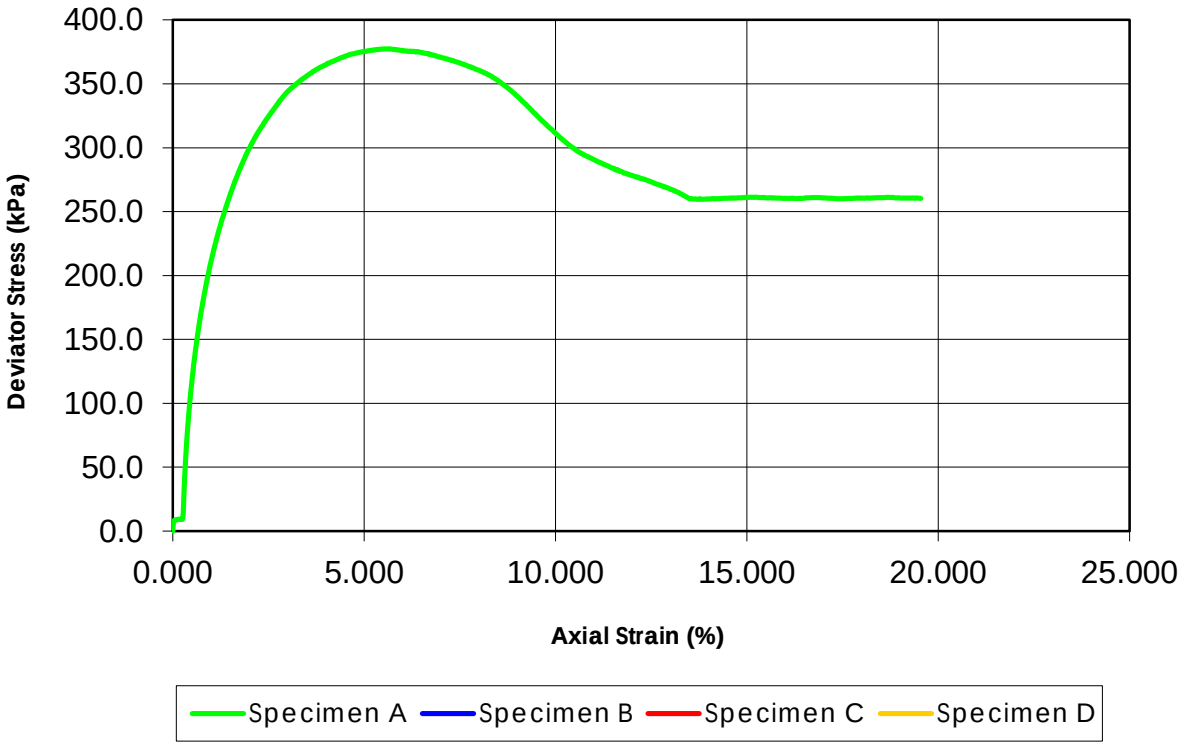
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

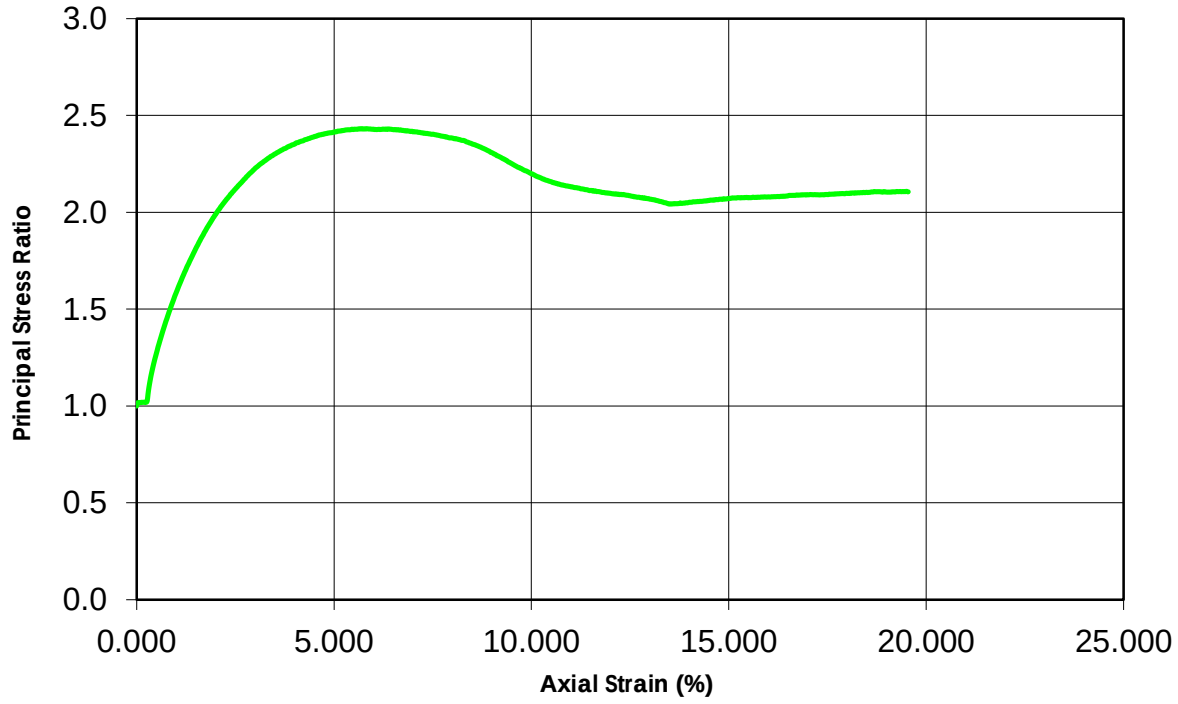


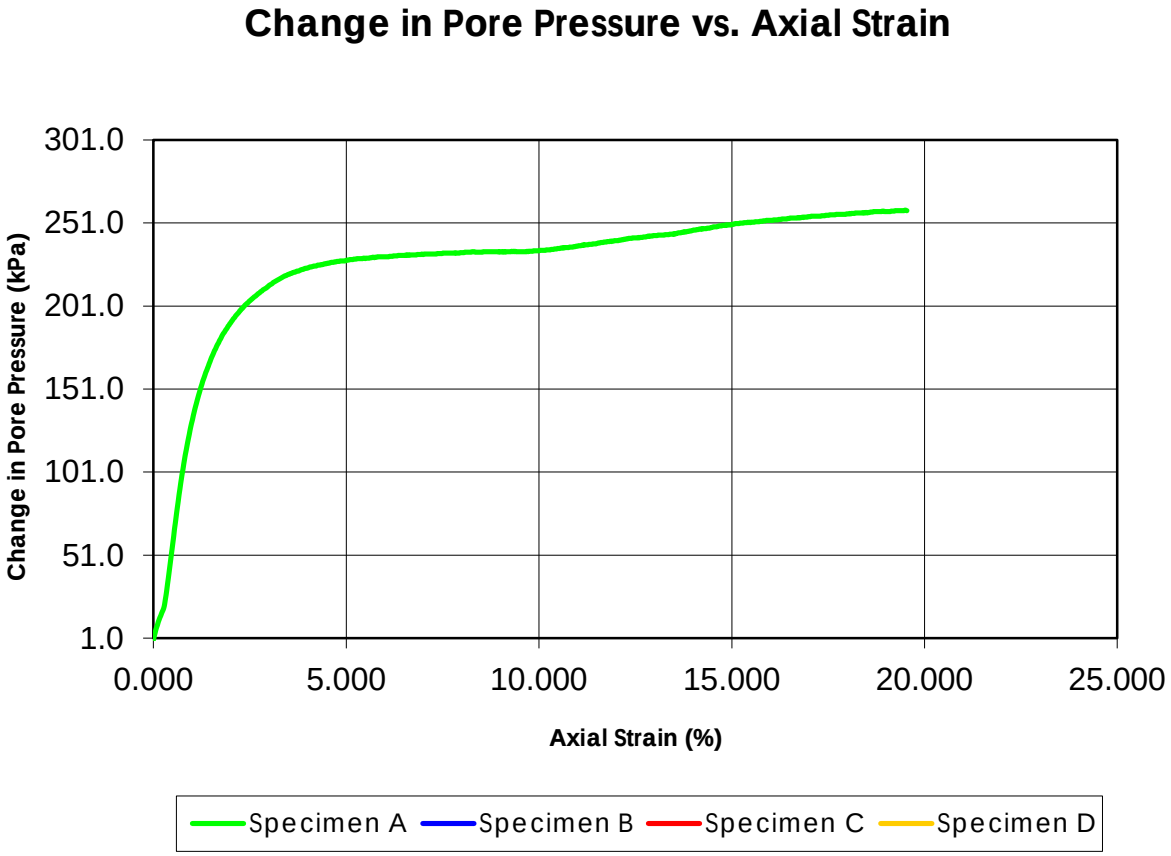



## Deviator Stress vs. Axial Strain



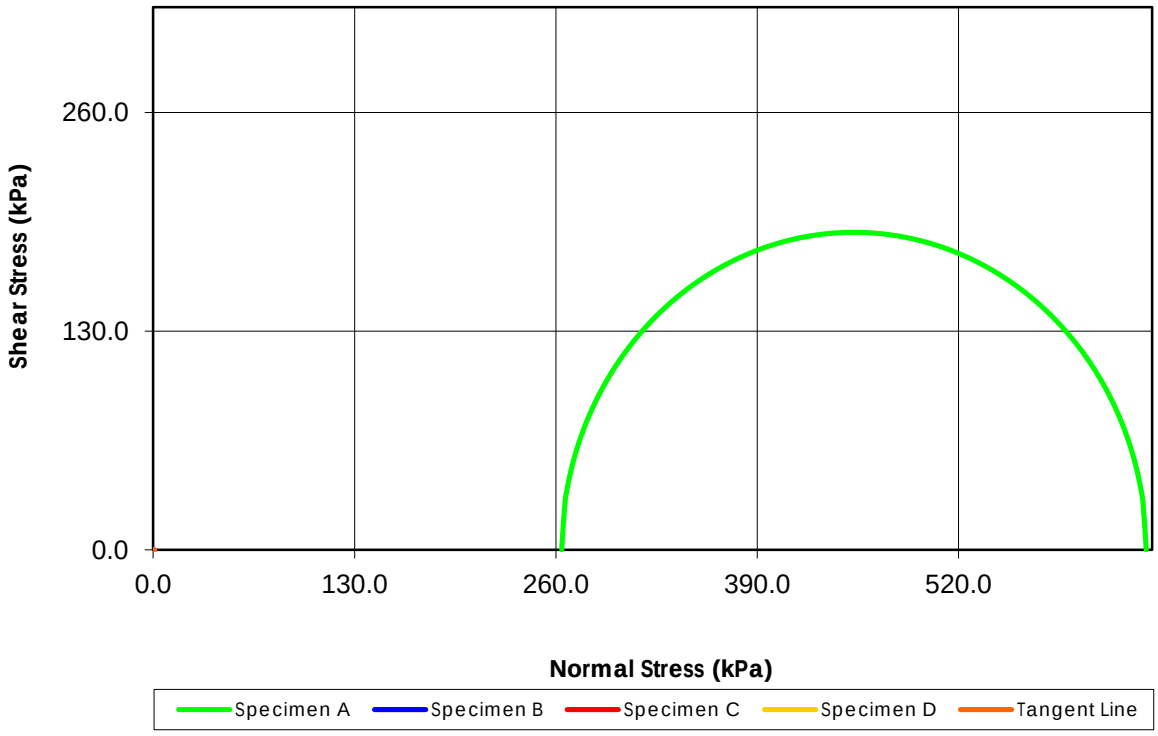

## Principal Stress Ratio vs. Axial Strain



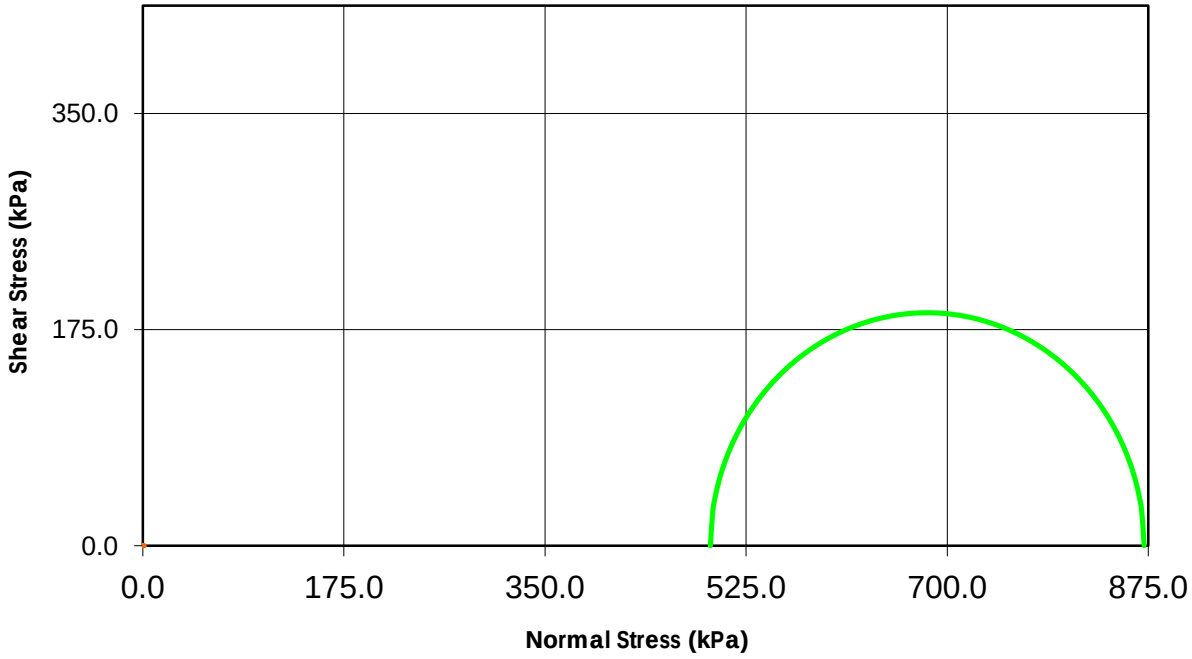

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
301.0
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

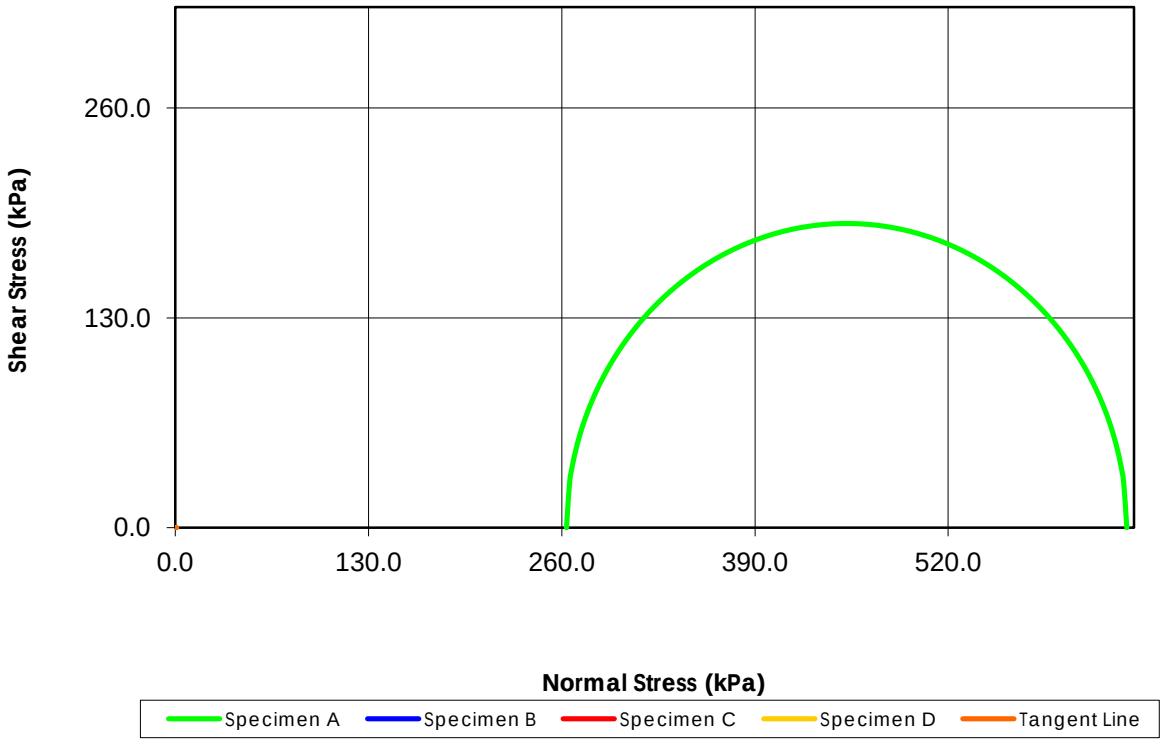



### Total Stress
### (C = 0.0 Ø = 0.0)

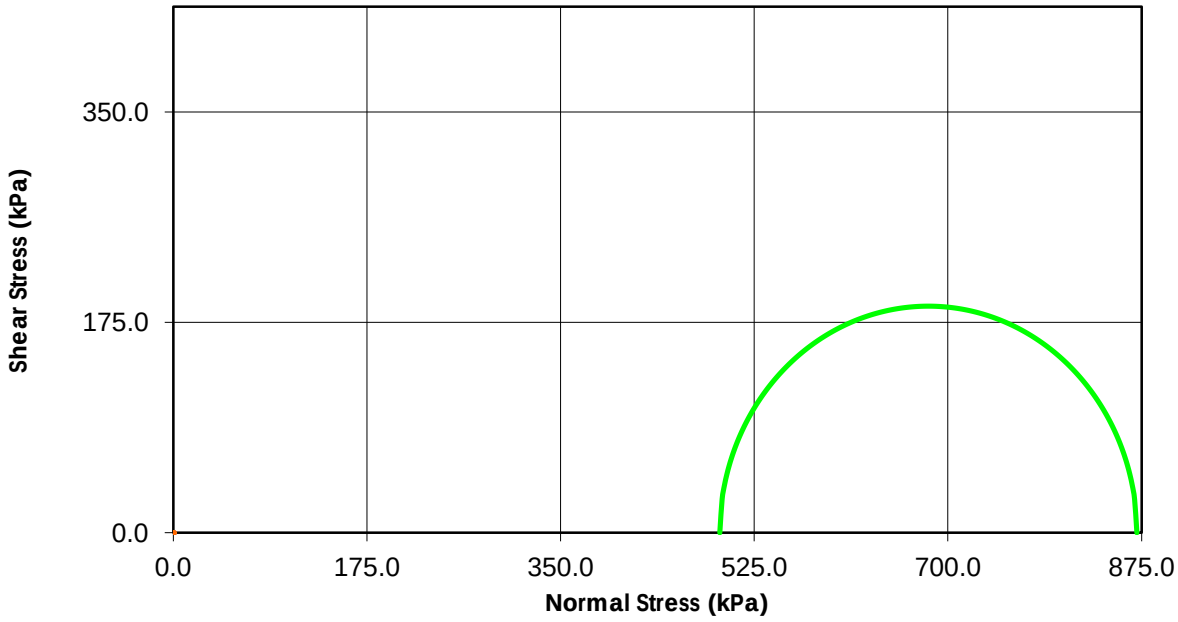


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

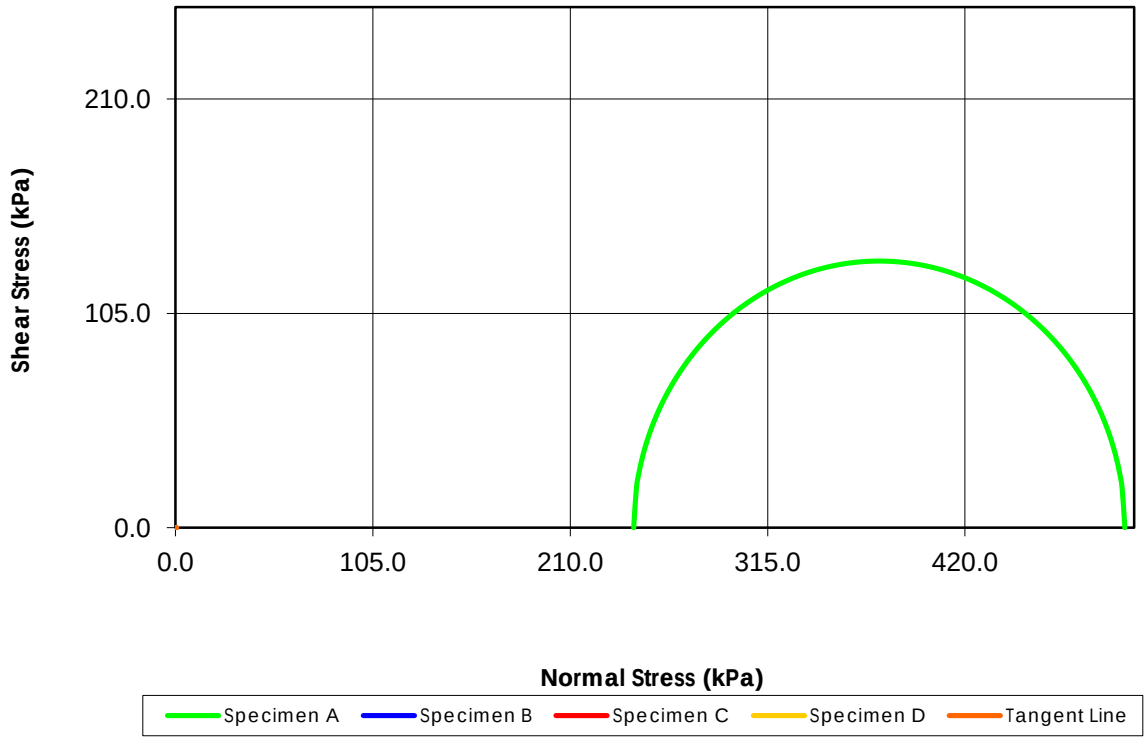



## Total Stress
## (C = 0.0 Ø = 0.0)

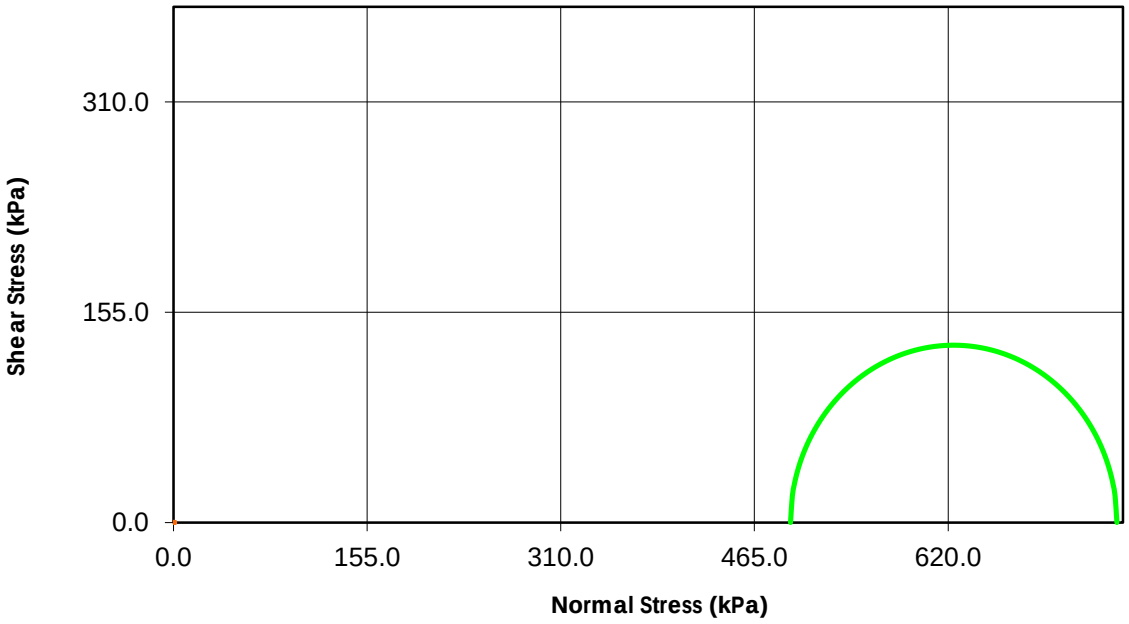


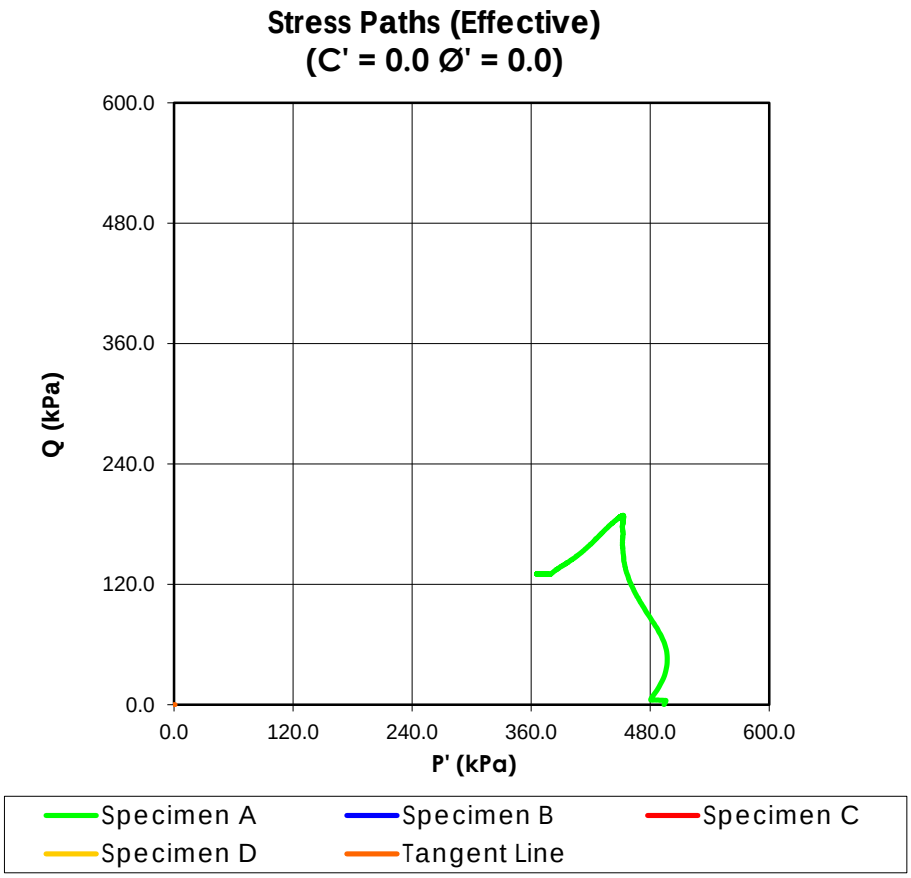
# Mohr Stress Circles at 15% Axial Strain Criterion

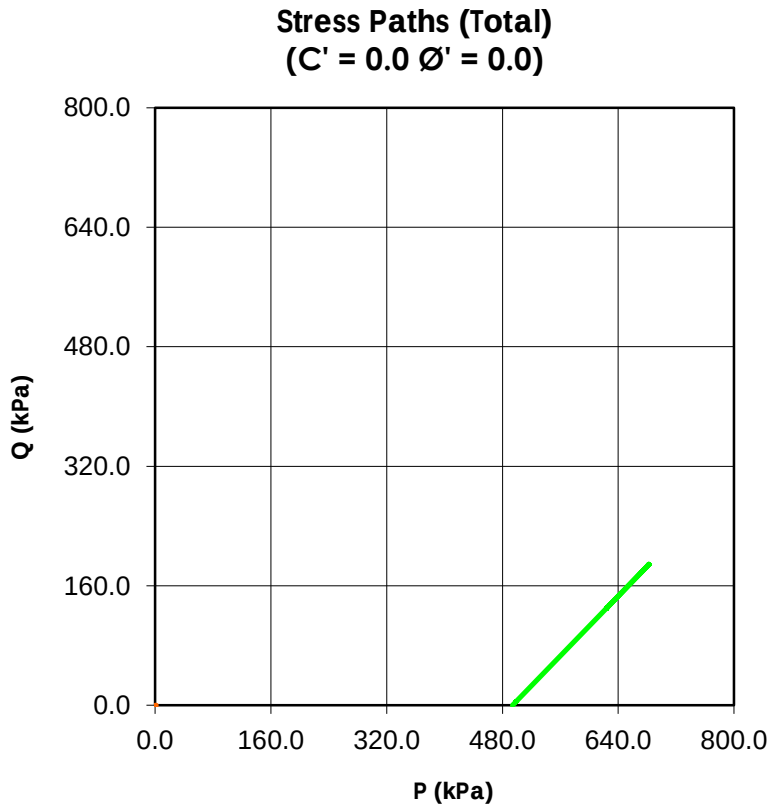
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

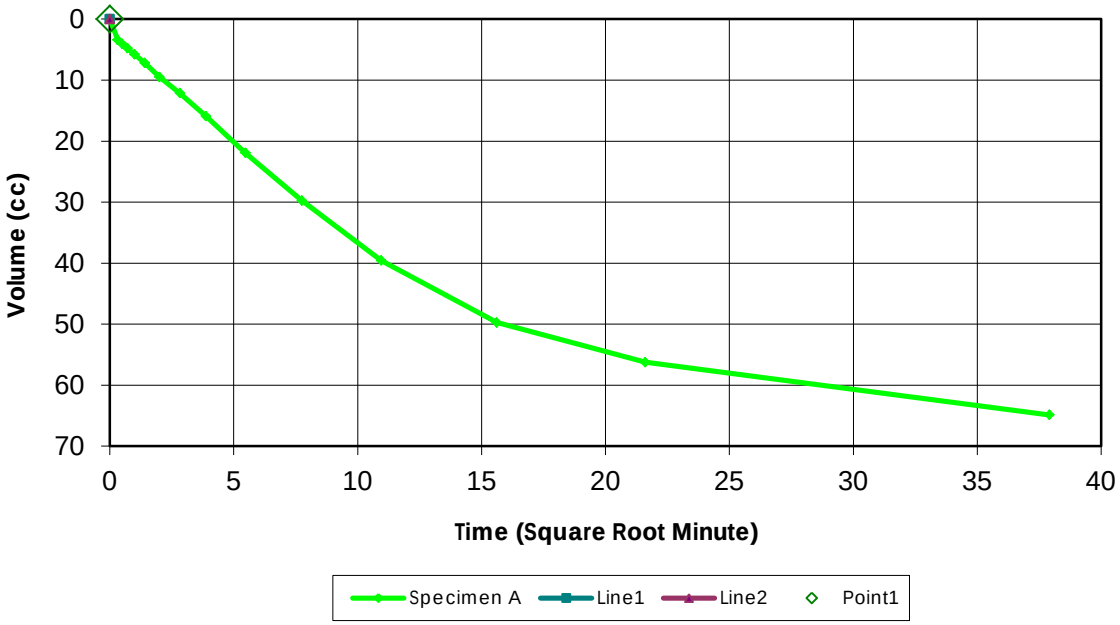



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

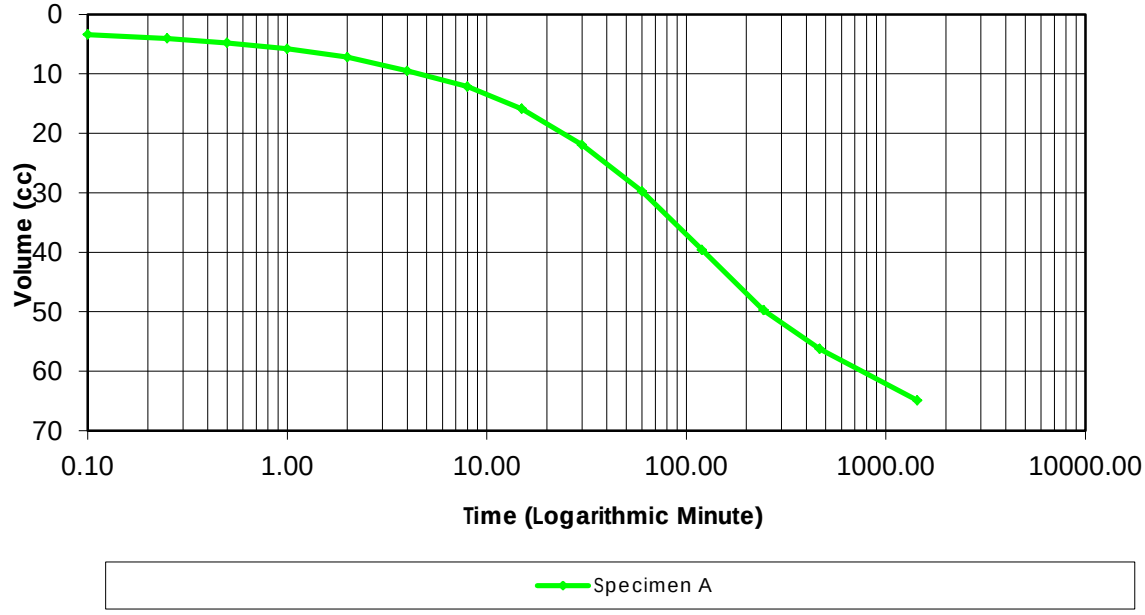

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 96.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.0-3.6m

| | |
|---|---|
| Cell Pressure (kPa) | 540 |
| Back Pressure (kPa) | 40 |
| Effective Pressure (kPa) | 500 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.7 |
| Initial Sample Height (mm) | 146.3 |
| Initial Sample Area (cm2) | 41.51 |
| Initial Volume (cm3) | 607.3 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 47.15 | N/A |
| 00:00:06 | 43.75 | 3.400 |
| 00:00:15 | 43.10 | 4.050 |
| 00:00:30 | 42.35 | 4.800 |
| 00:01:00 | 41.35 | 5.800 |
| 00:02:00 | 39.95 | 7.200 |
| 00:04:00 | 37.65 | 9.500 |
| 00:08:00 | 35.00 | 12.150 |
| 00:15:00 | 31.25 | 15.900 |
| 00:30:00 | 25.20 | 21.950 |
| 01:00:00 | 17.40 | 29.750 |
| 02:00:00 | 7.55 | 39.600 |
| 04:04:00 | -2.60 | 49.750 |
| 07:47:00 | -9.10 | 56.250 |
| 23:58:00 | -17.75 | 64.900 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

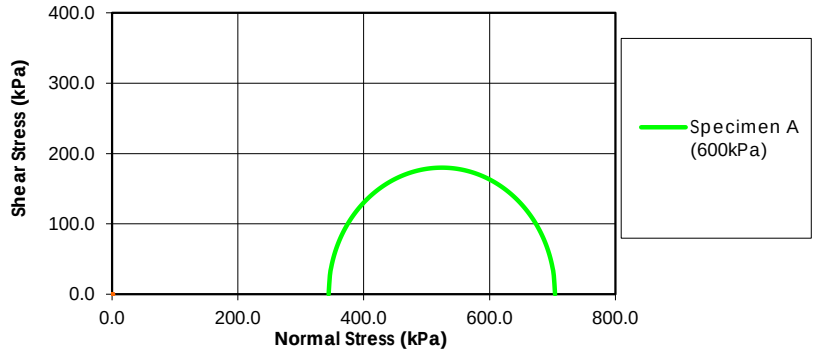
Stantec

Reviewed By C. Lamoureux

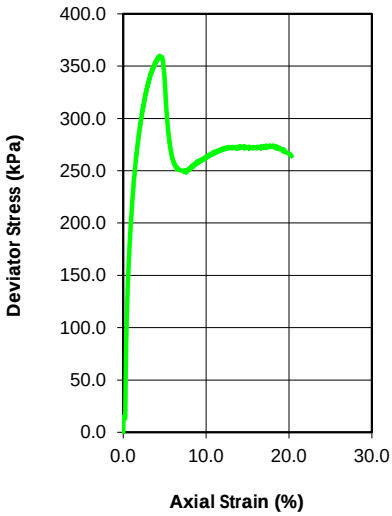
Date: 27-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 24.1 | | | |
| Dry Density (g/cm3) | 1.599 | | | |
| Saturation (%) | 94.54 | | | |
| Void Ratio | 0.689 | | | |
| Diameter (mm) | 71.900 | | | |
| Height (mm) | 151.400 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 18.5 | | | |
| Dry Density (g/cm3) | 1.672 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.615 | | | |
| Effective Stress (kPa) | 597.2 | | | |
| Back Press. (kPa) | 42.8 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

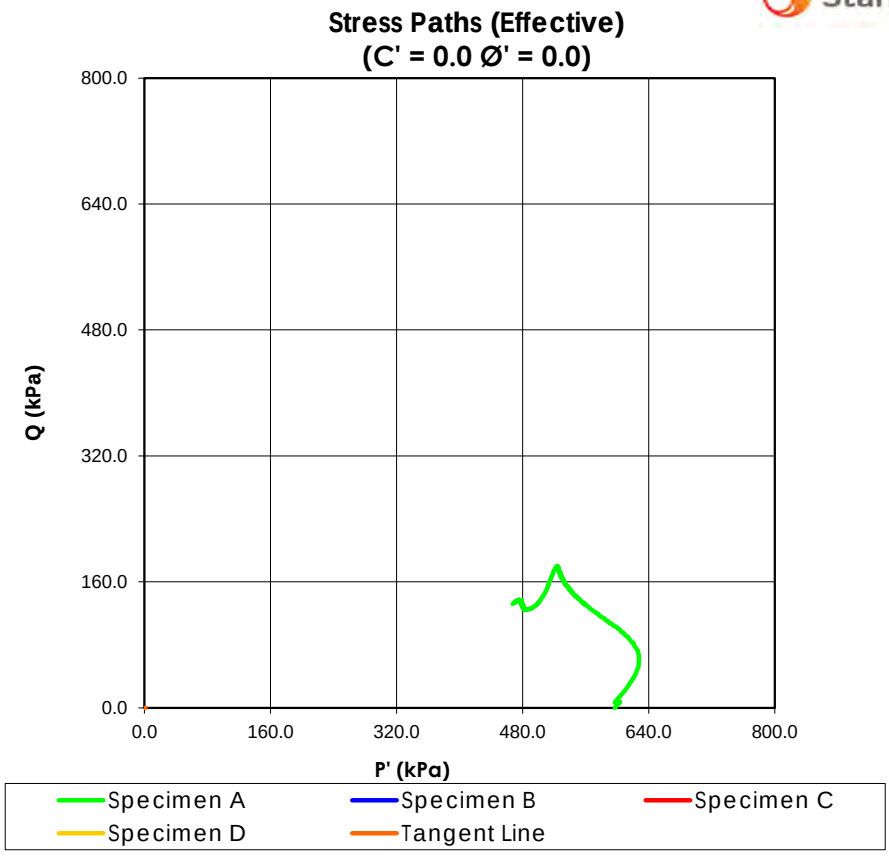
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 704.04 | | | |
| σ'3 at Failure (kPa) | 344.24 | | | |
| | | | | |
| | | | | |

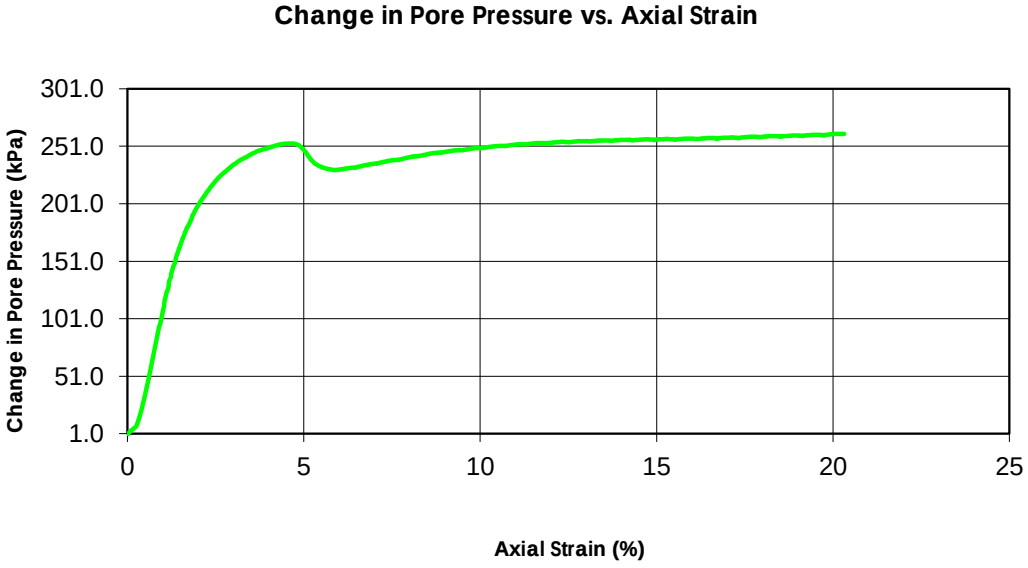
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D58 ST21 |
| **Depth:** | 13.7-14.3m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, some gravel, trace sand |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

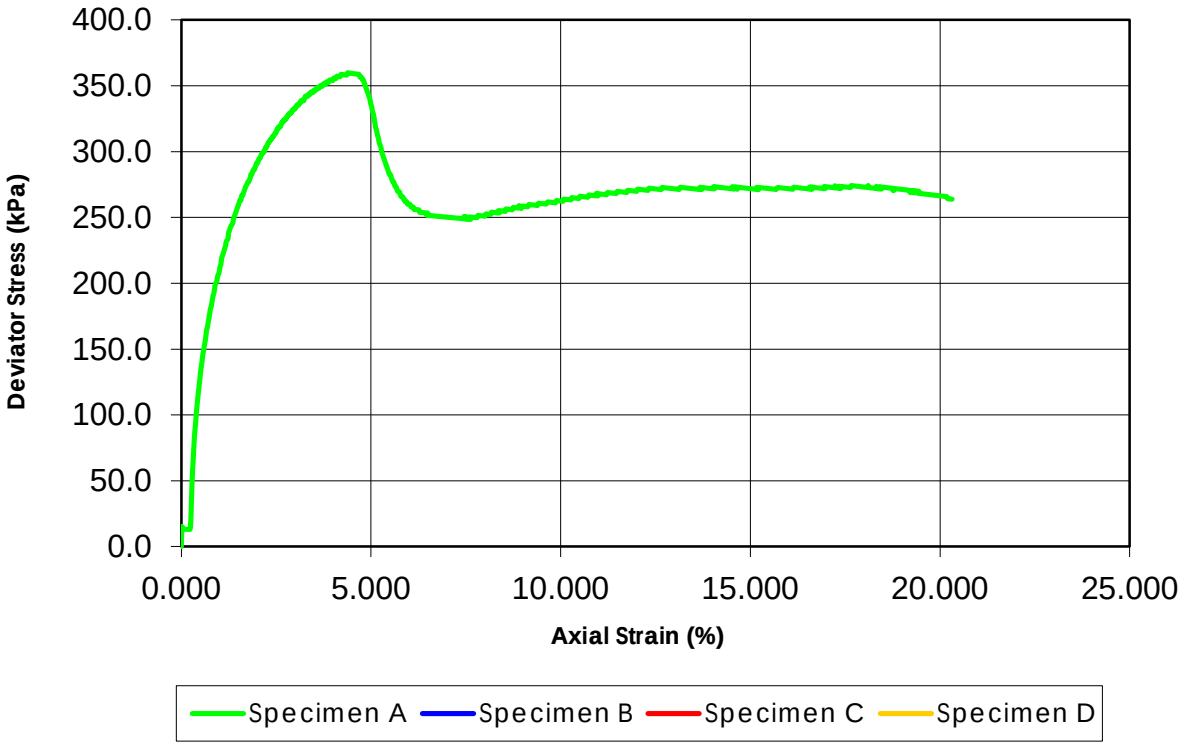
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

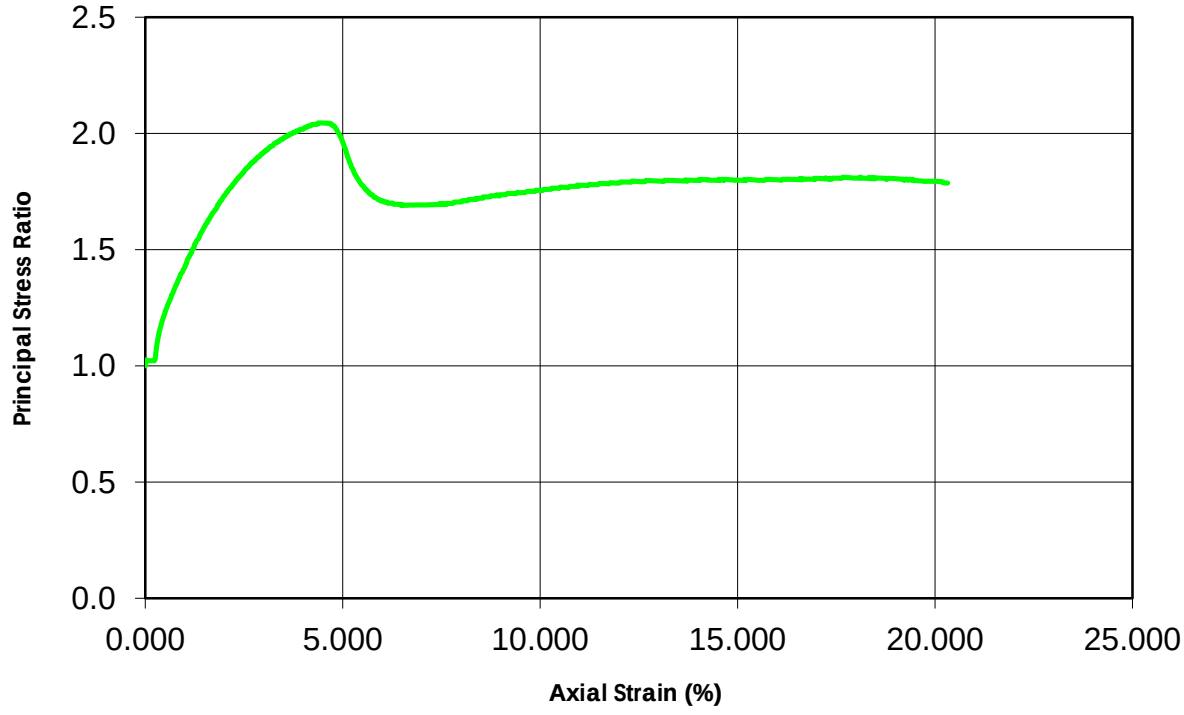


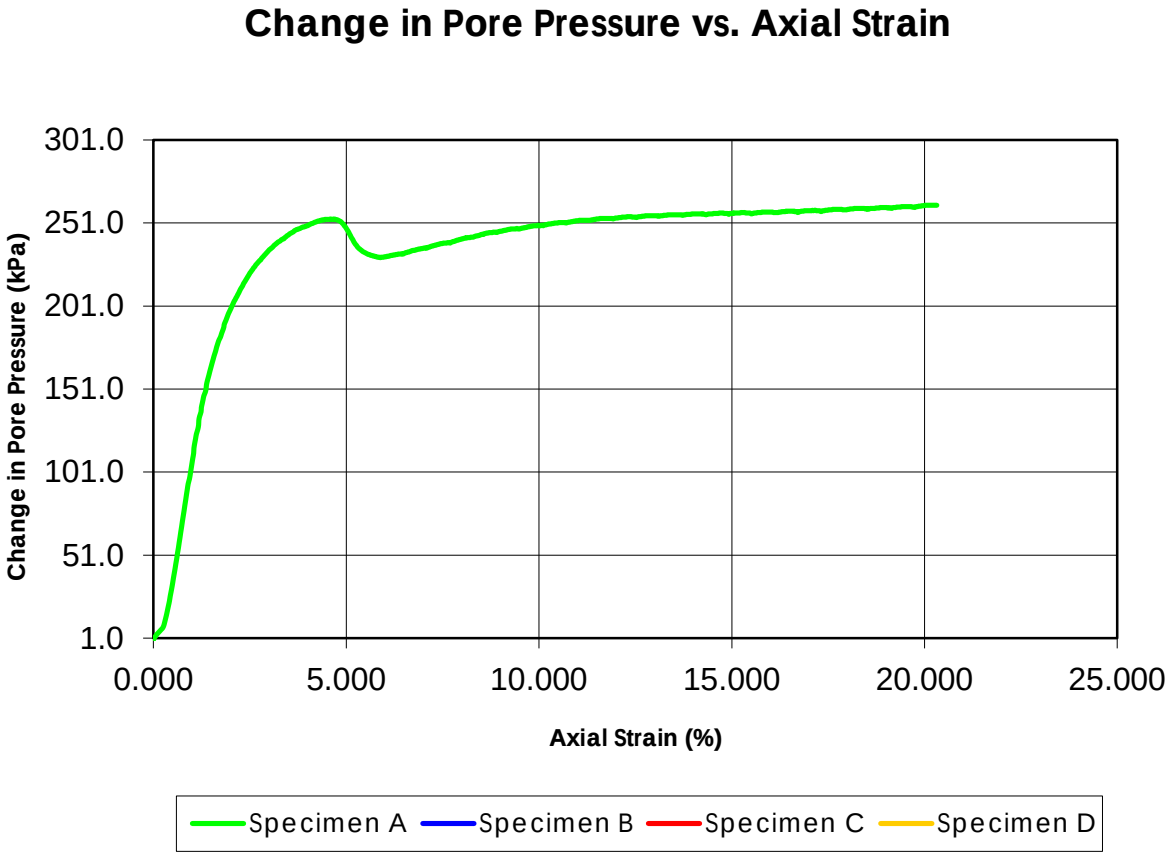



## Deviator Stress vs. Axial Strain



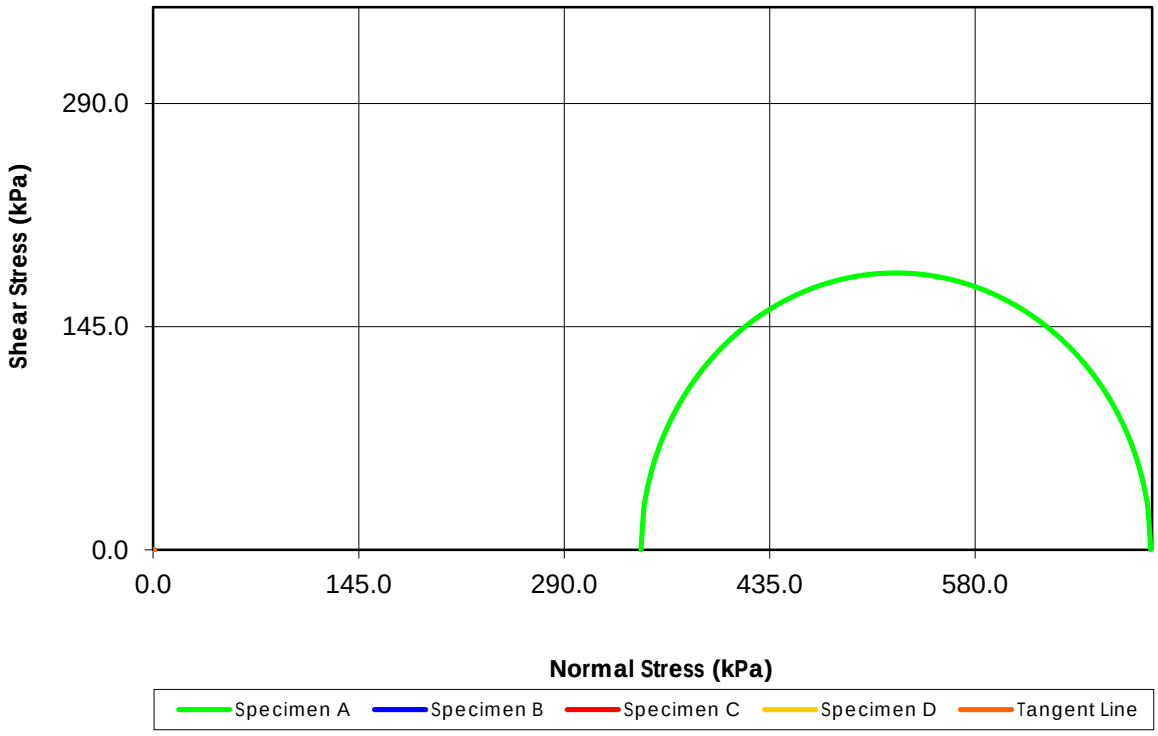

## Principal Stress Ratio vs. Axial Strain



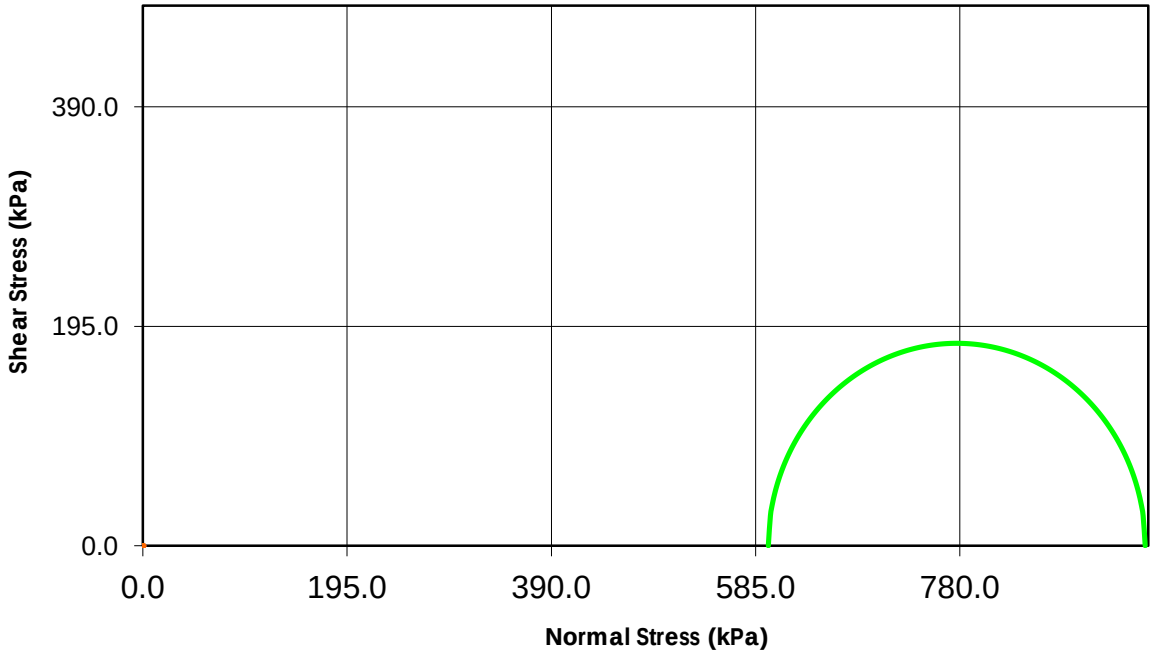

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
301.0
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

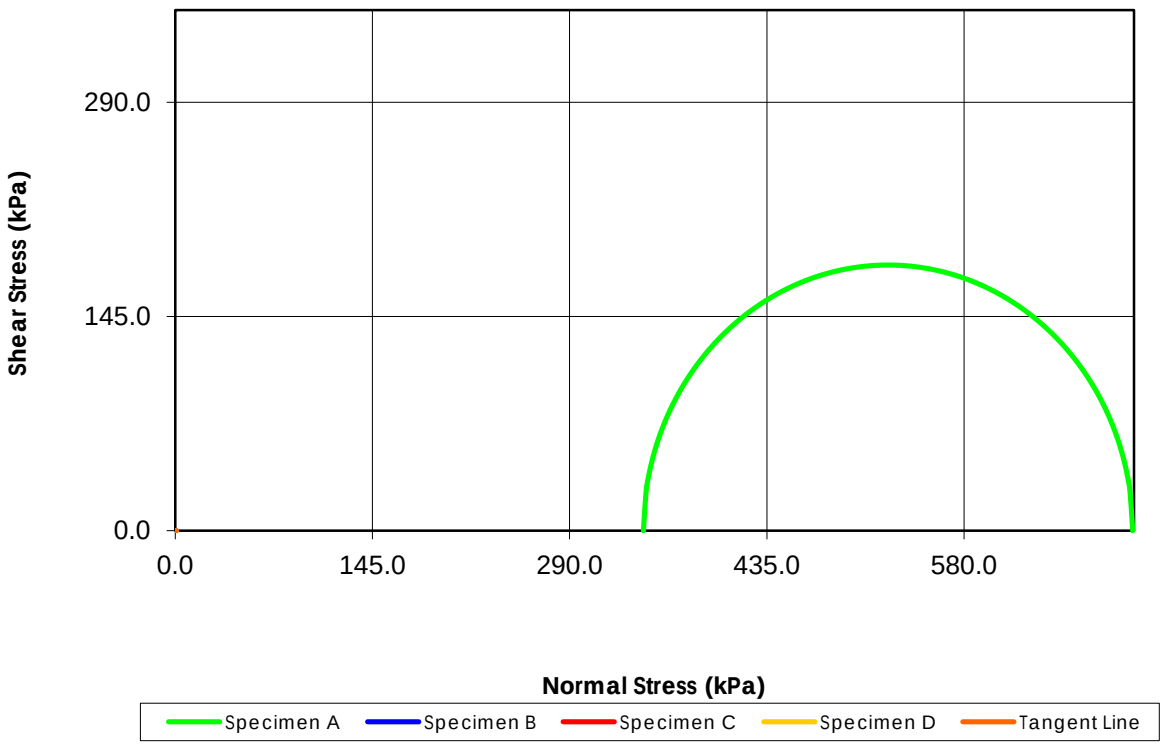



### Total Stress
### (C = 0.0 Ø = 0.0)

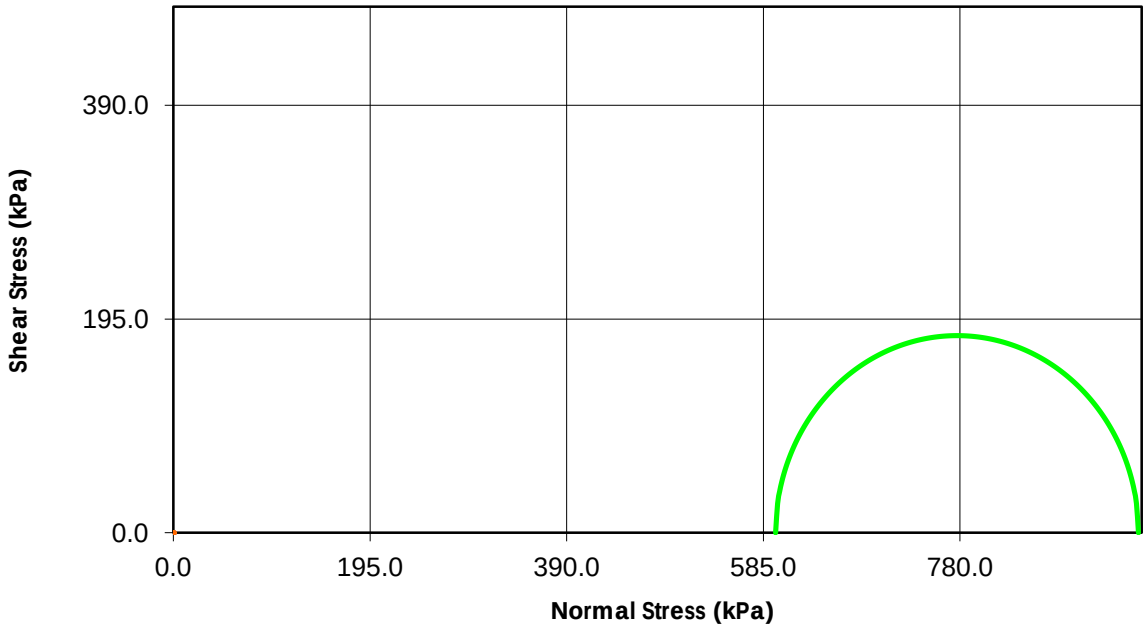


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

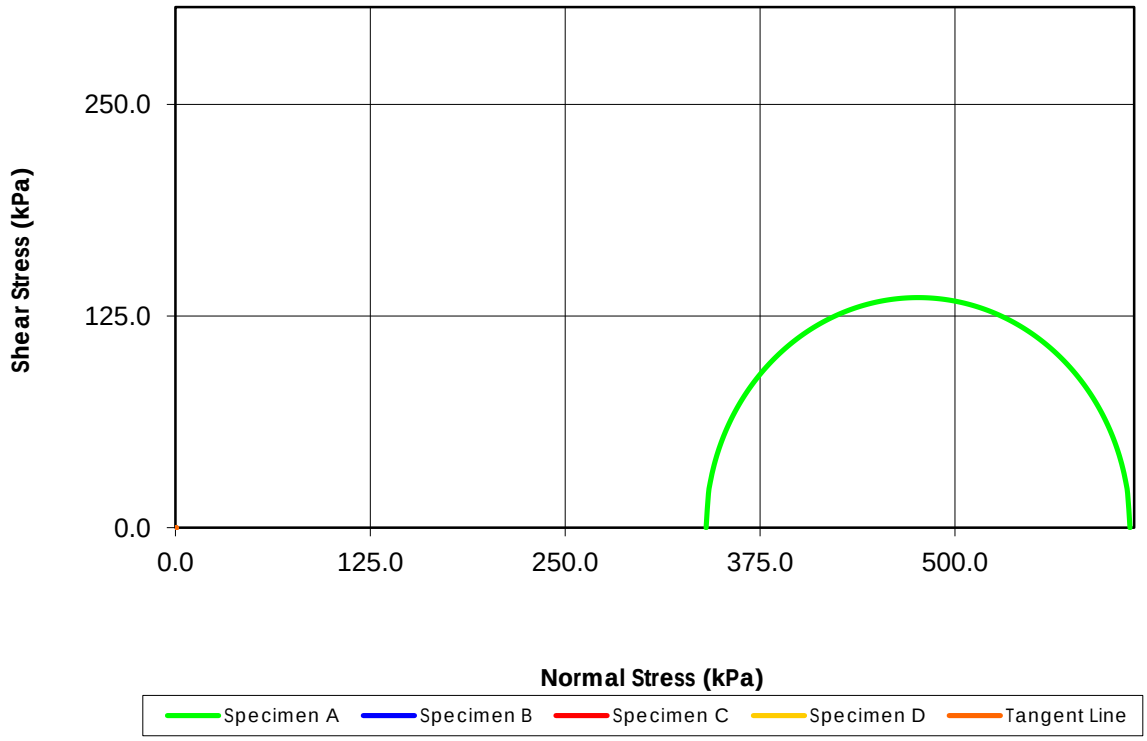



## Total Stress
## (C = 0.0 Ø = 0.0)

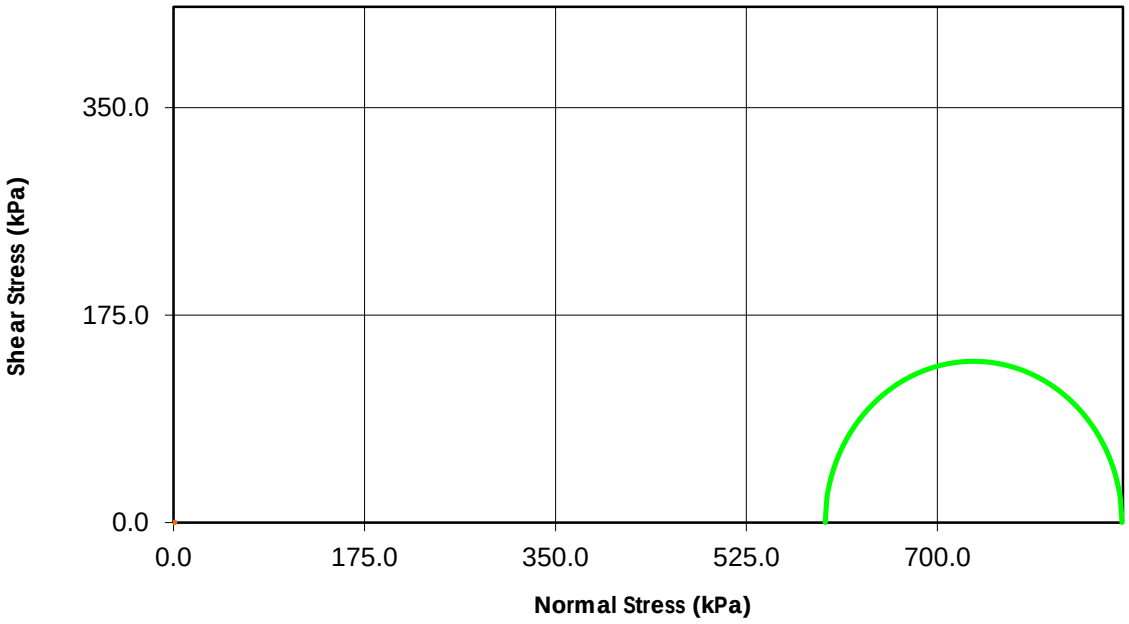


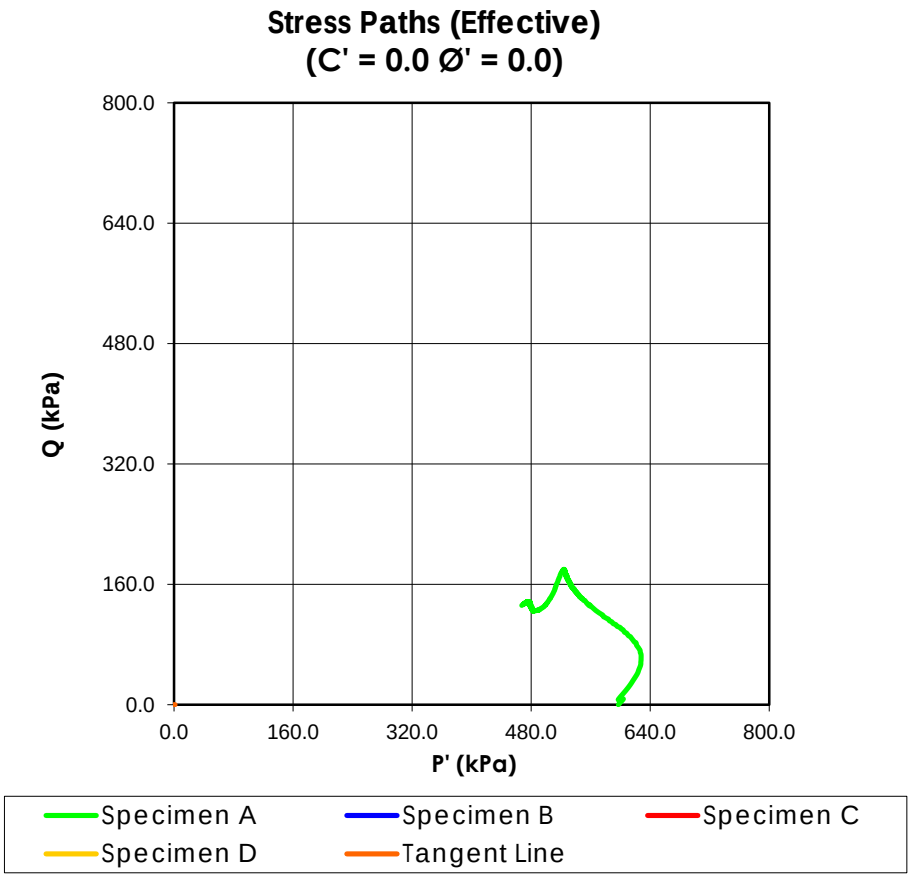
# Mohr Stress Circles at 15% Axial Strain Criterion

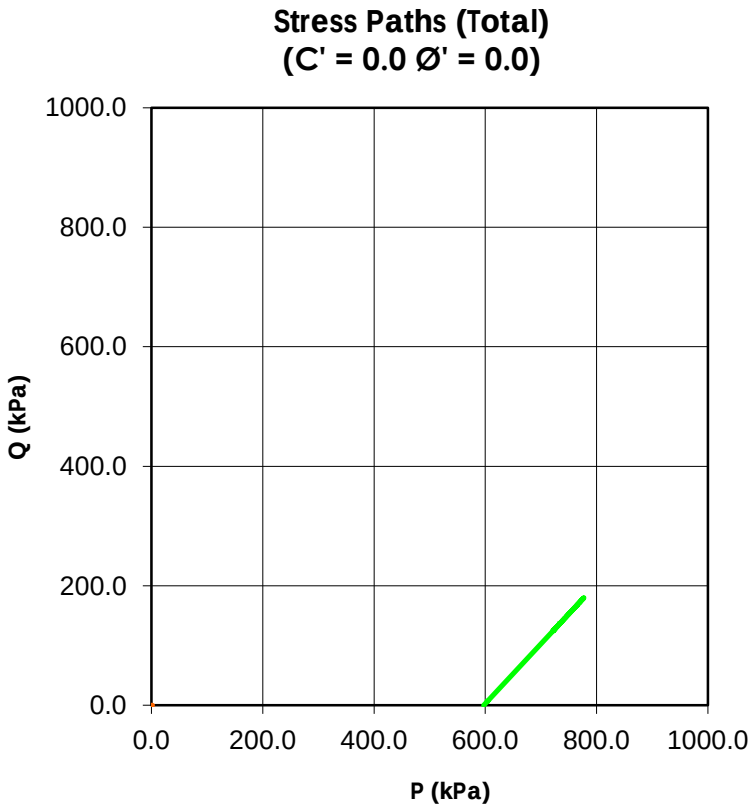
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

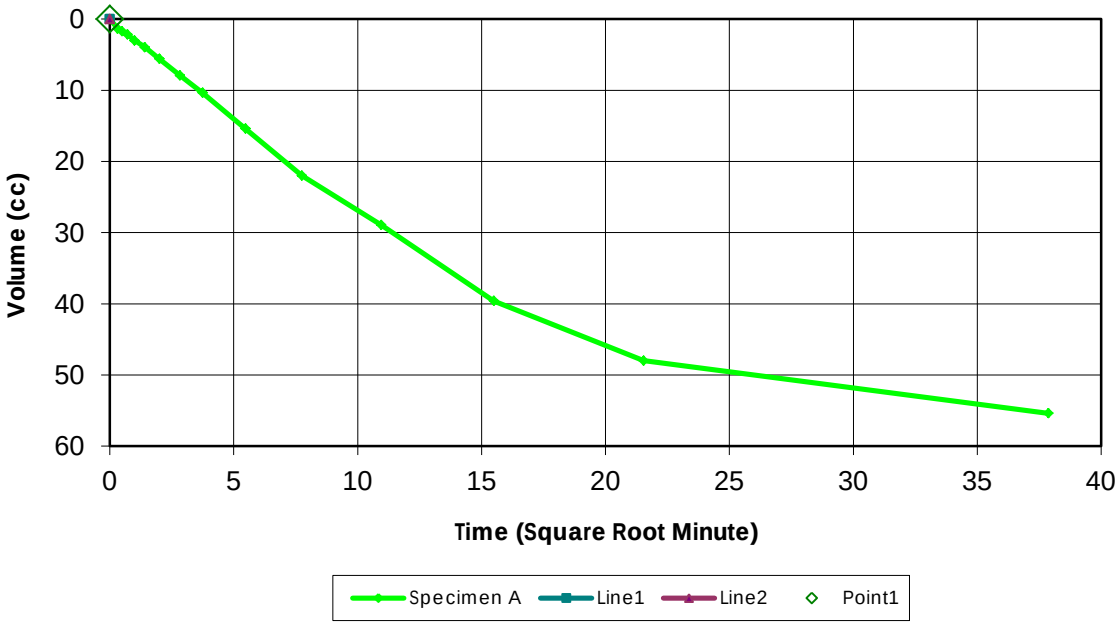



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

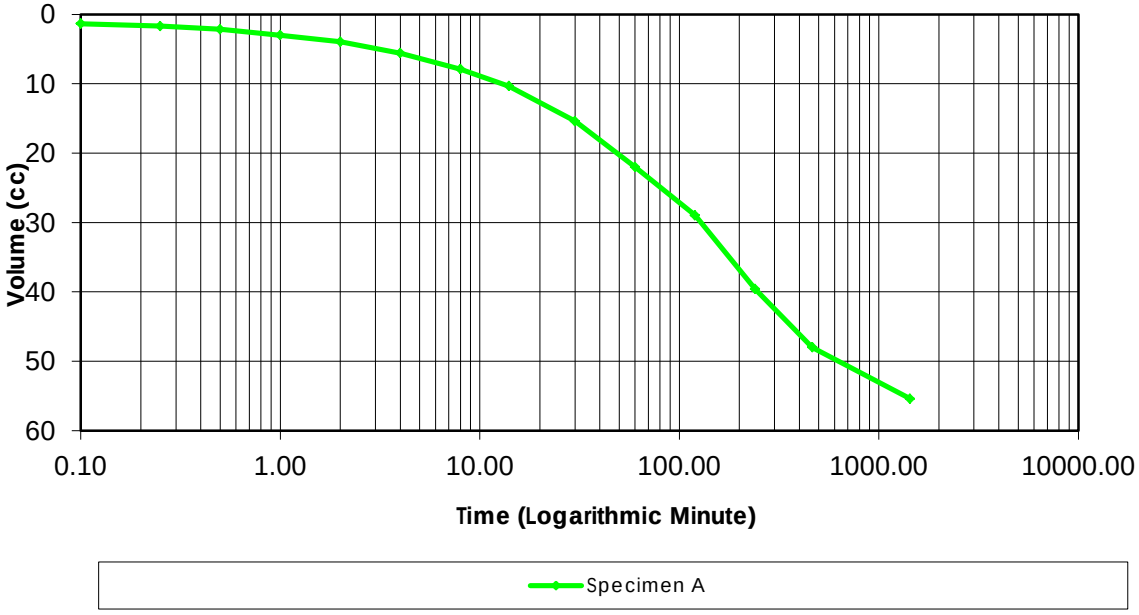

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 95.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 13.7-14.3m

| | |
|---|---|
| Cell Pressure (kPa) | 640 |
| Back Pressure (kPa) | 40 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71.9 |
| Initial Sample Height (mm) | 151.4 |
| Initial Sample Area (cm2) | 40.6 |
| Initial Volume (cm3) | 614.7 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 43.80 | N/A |
| 00:00:06 | 42.45 | 1.350 |
| 00:00:15 | 42.10 | 1.700 |
| 00:00:30 | 41.65 | 2.150 |
| 00:01:00 | 40.80 | 3.000 |
| 00:02:00 | 39.85 | 3.950 |
| 00:04:00 | 38.20 | 5.600 |
| 00:08:00 | 35.90 | 7.900 |
| 00:14:00 | 33.45 | 10.350 |
| 00:30:00 | 28.40 | 15.400 |
| 01:00:00 | 21.80 | 22.000 |
| 02:00:00 | 14.85 | 28.950 |
| 04:00:00 | 4.20 | 39.600 |
| 07:44:00 | -4.20 | 48.000 |
| 23:55:00 | -11.60 | 55.400 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

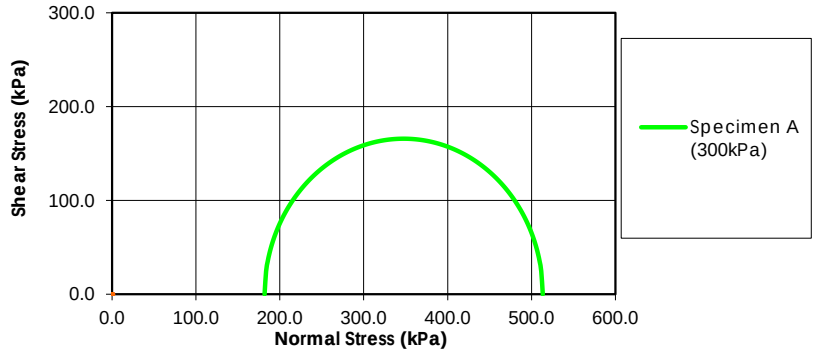
Stantec

Reviewed By C. Lamoureux

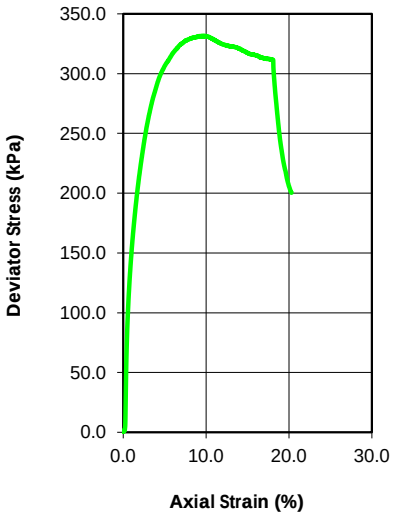
Date: 20-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 23.8 | | | |
| Dry Density (g/cm3) | 1.631 | | | |
| Saturation (%) | 98.06 | | | |
| Void Ratio | 0.655 | | | |
| Diameter (mm) | 72.30 | | | |
| Height (mm) | 155.00 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 1.00 | | | |
| Water Content (%) | 20.6 | | | |
| Dry Density (g/cm3) | 1.694 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.594 | | | |
| Effective Stress (kPa) | 286.0 | | | |
| Back Press. (kPa) | 144.0 | | | |
| Rate of Strain | 0.022 | | | |

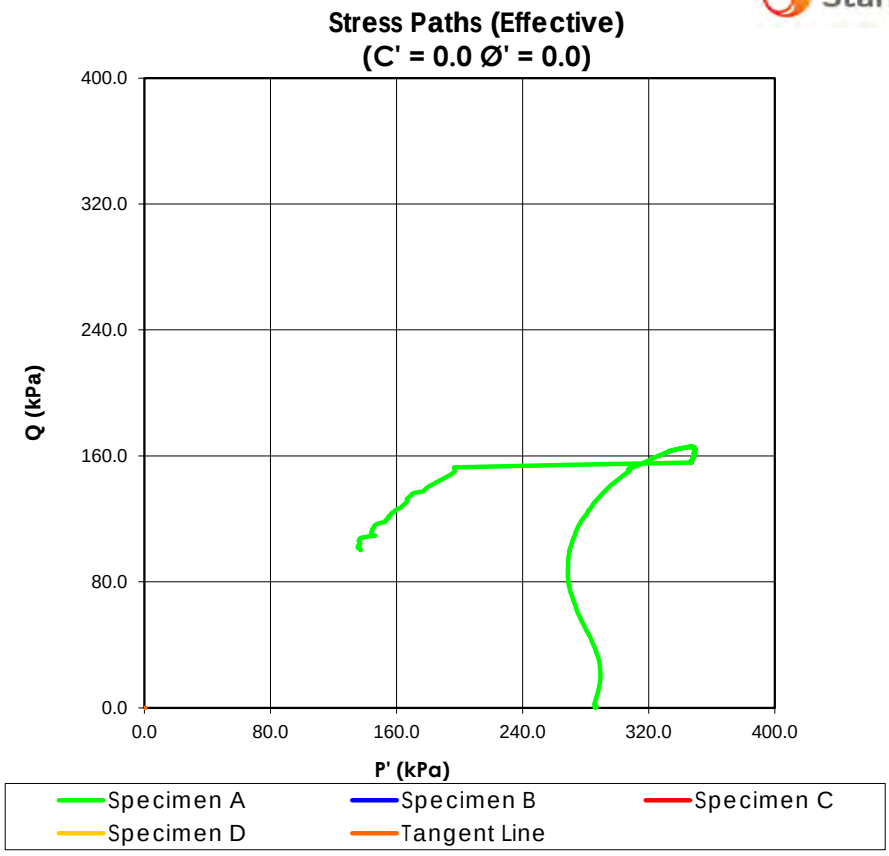
| Maximium Deviator Stress Criterion | | After Shear | A | B | C | D |
|---|---|---|---|---|---|---|
| C (kPa) | 0.0 | σ'1 at Failure (kPa) | 513.41 | | | |
| C' (kPa) | 0.0 | σ'3 at Failure (kPa) | 181.83 | | | |
| Ø (deg) | 0.0 | | | | | |
| Ø' (deg) | 0.0 | | | | | |

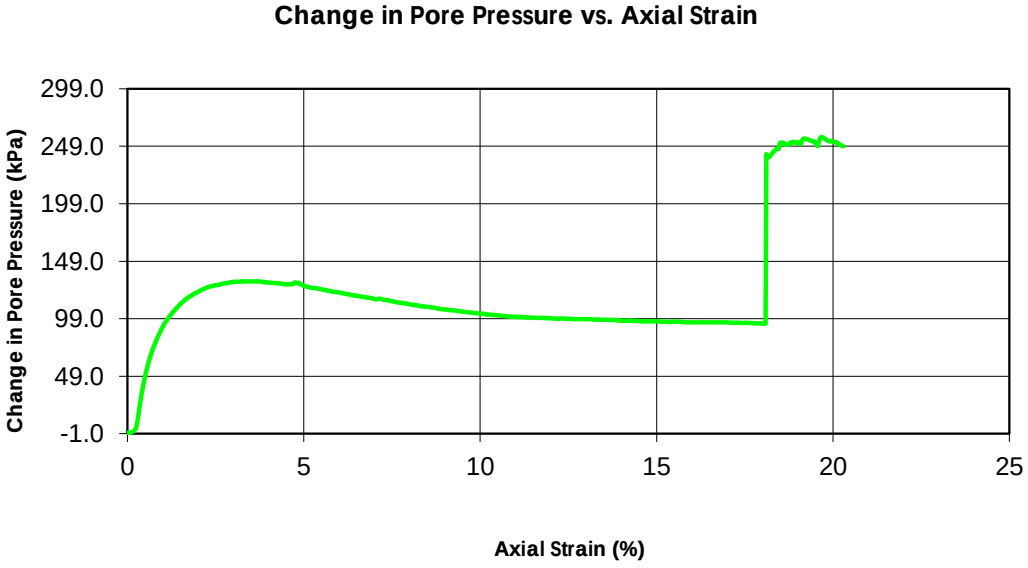
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D59 ST8 |
| **Depth:** | 3.40-3.81m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

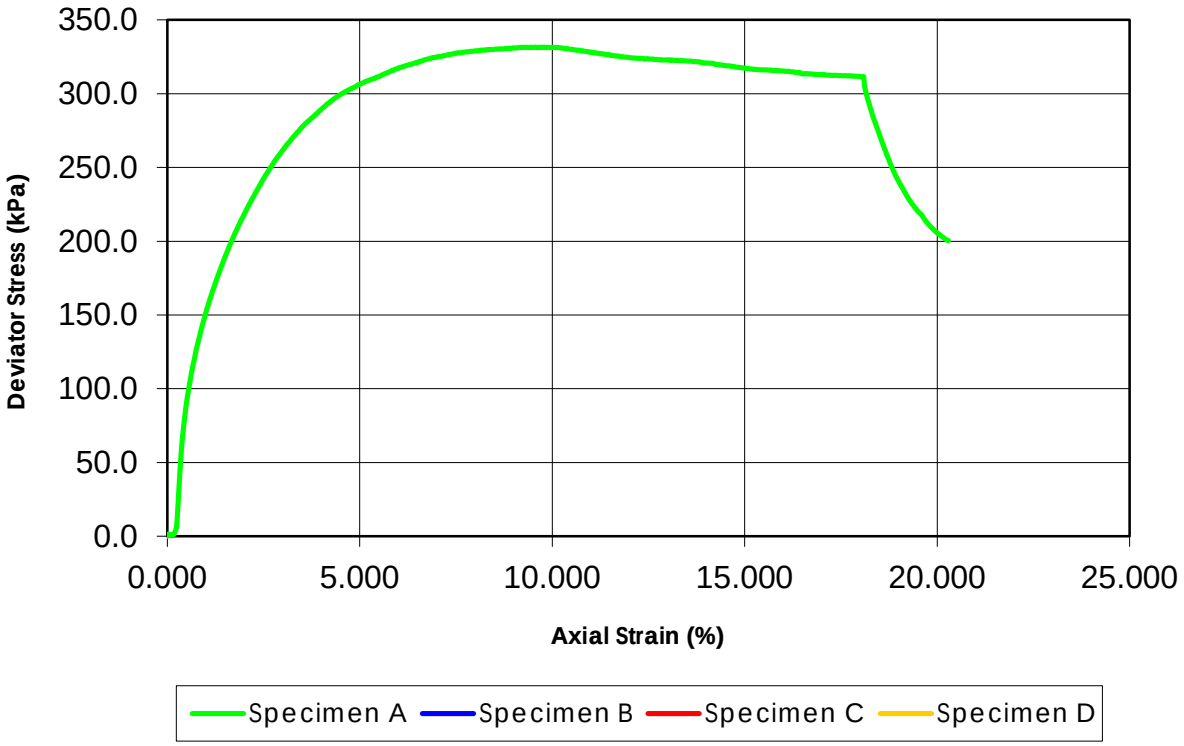
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

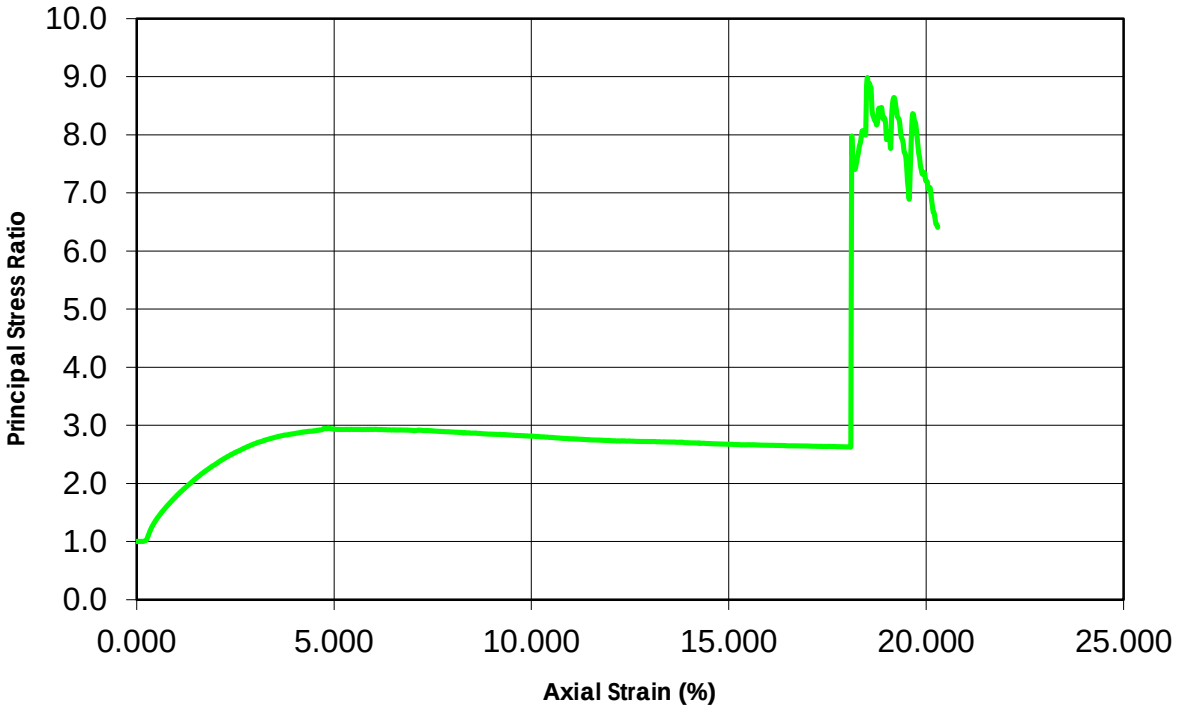


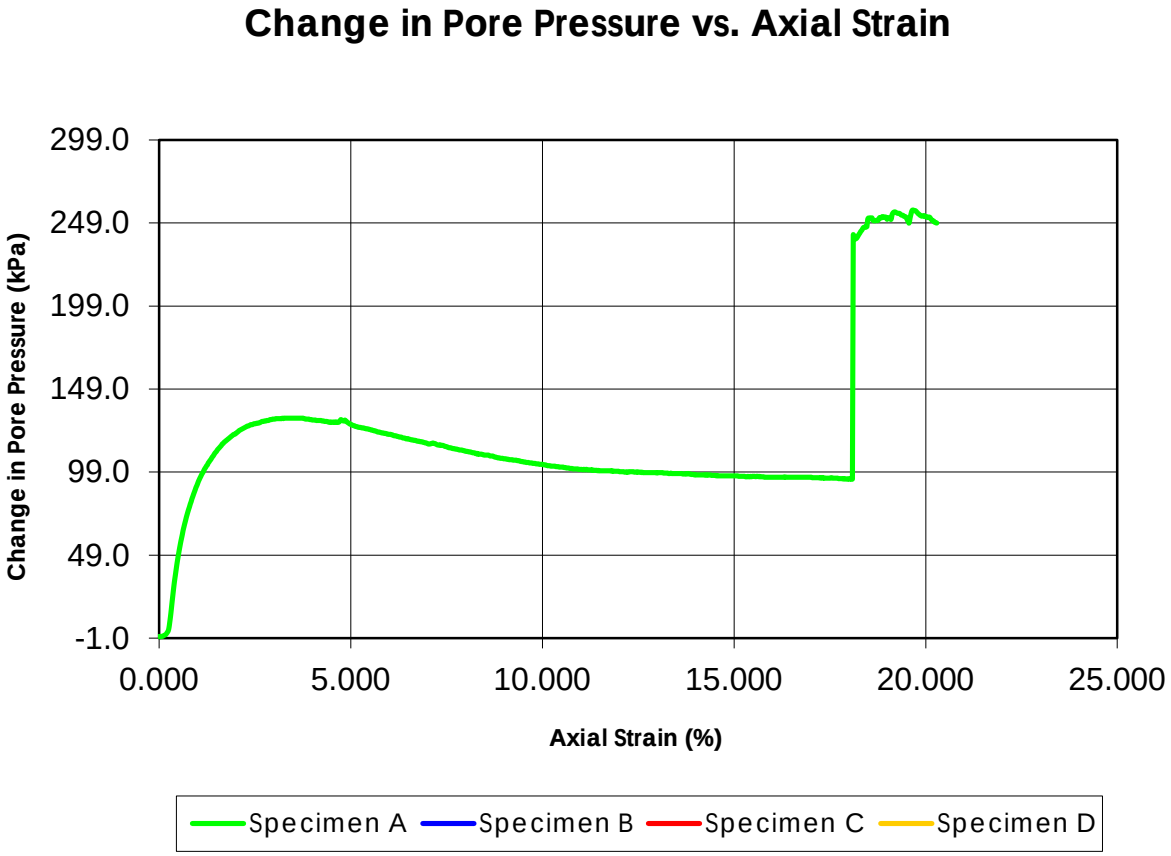



## Deviator Stress vs. Axial Strain



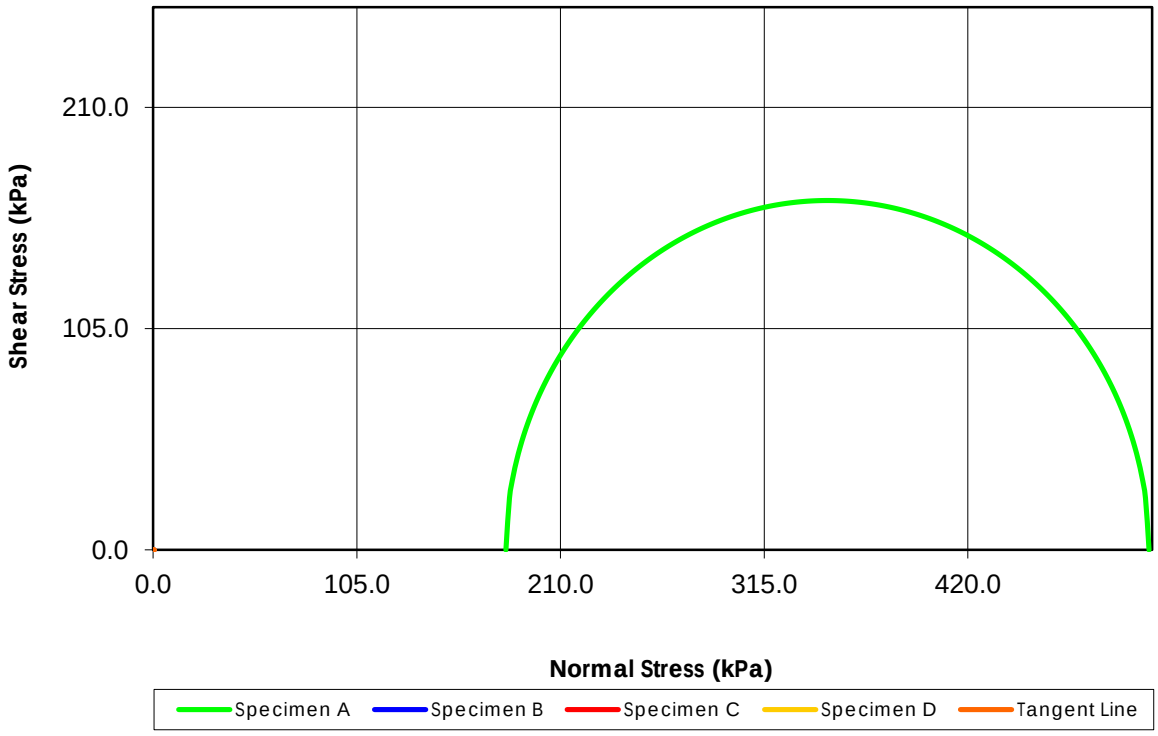

## Principal Stress Ratio vs. Axial Strain



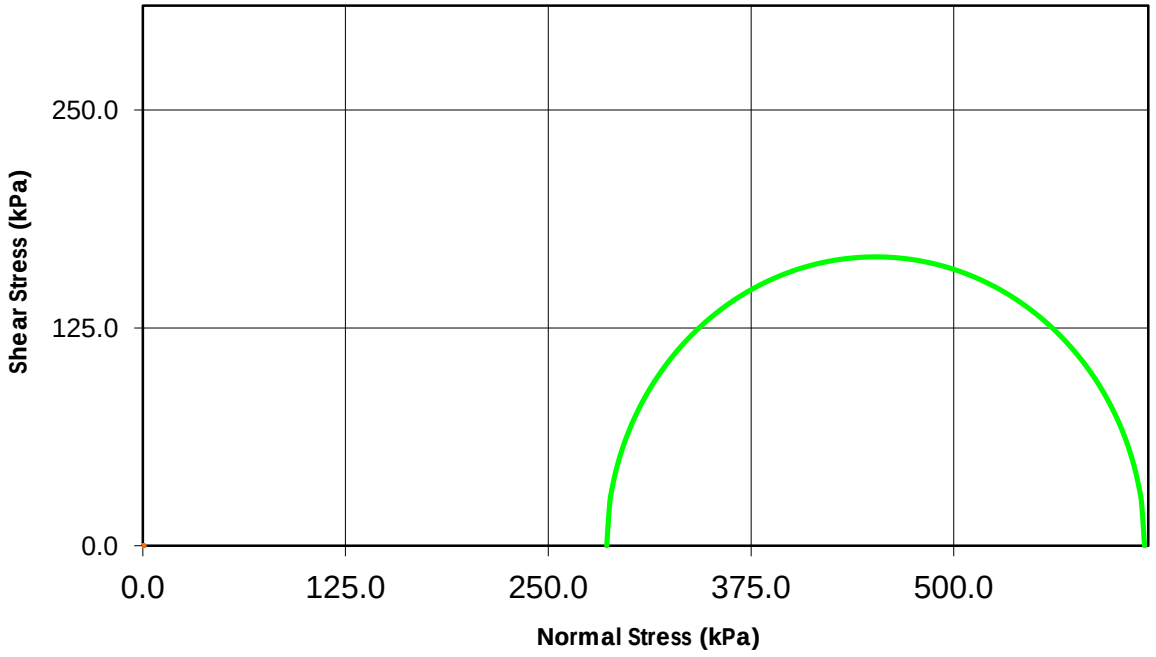

Change in Pore Pressure vs. Axial Strain
299.0
249.0
199.0
149.0
99.0
49.0
-1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

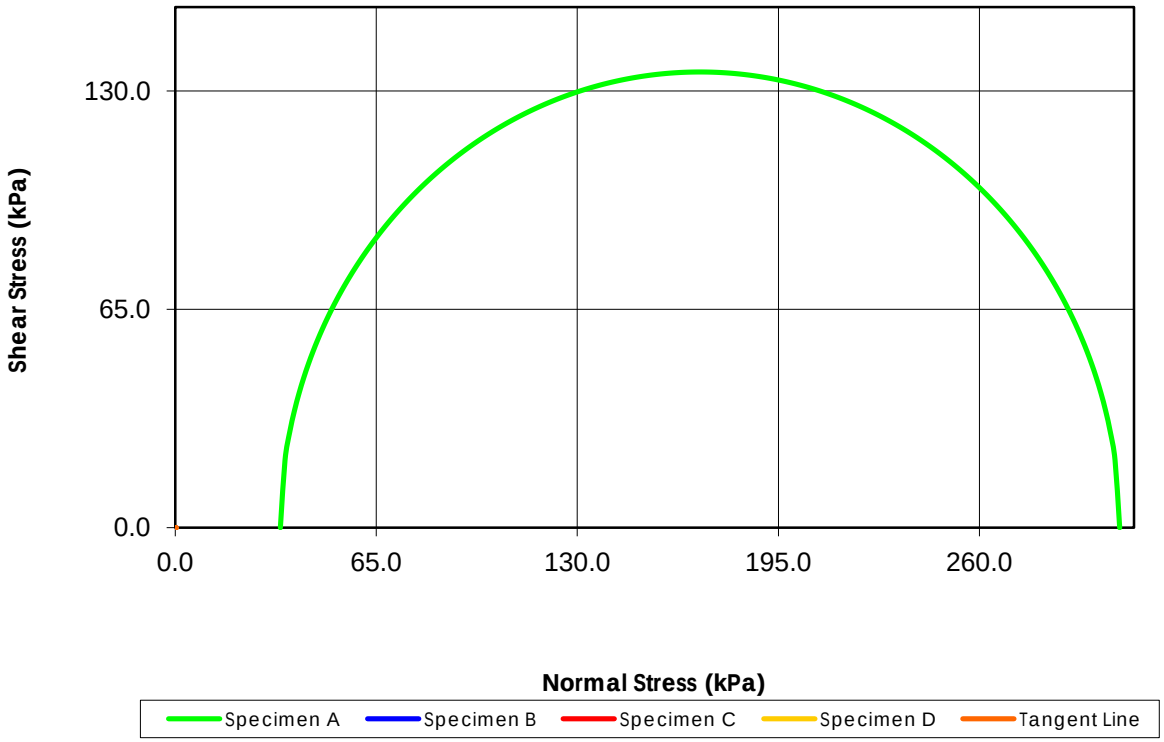



### Total Stress
### (C = 0.0 Ø = 0.0)

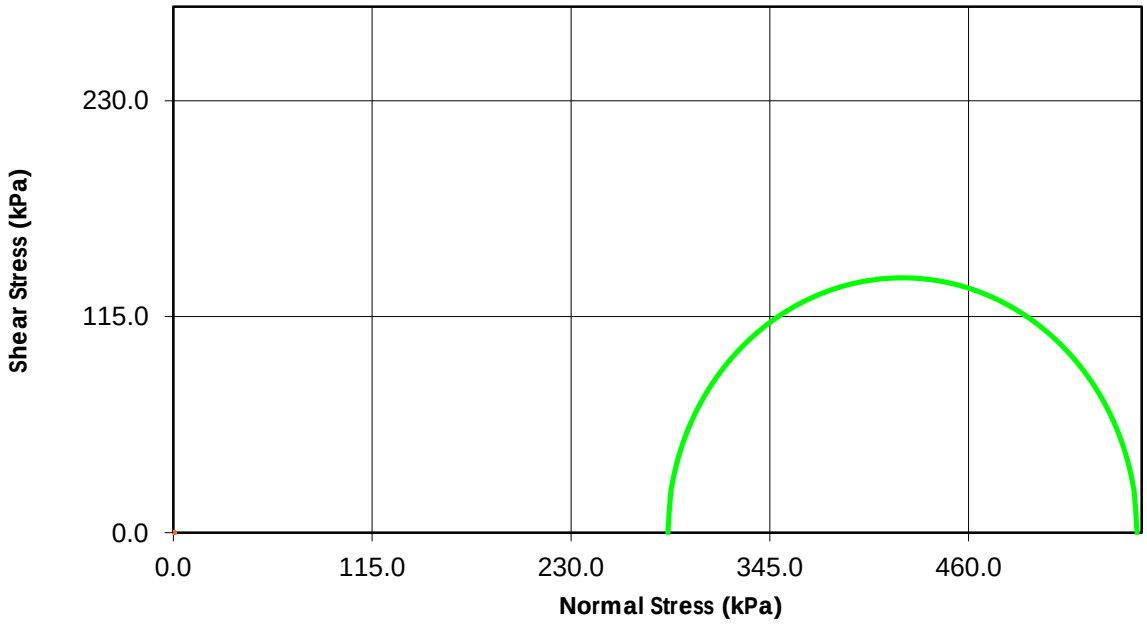


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

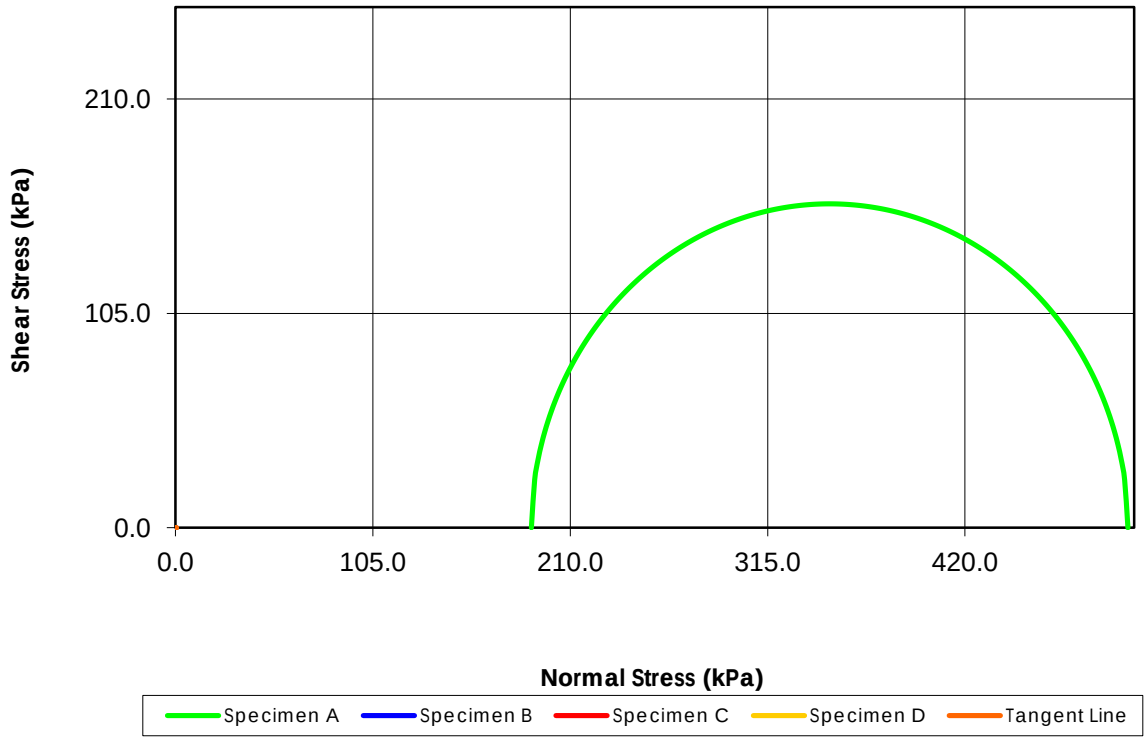



## Total Stress
## (C = 0.0 Ø = 0.0)

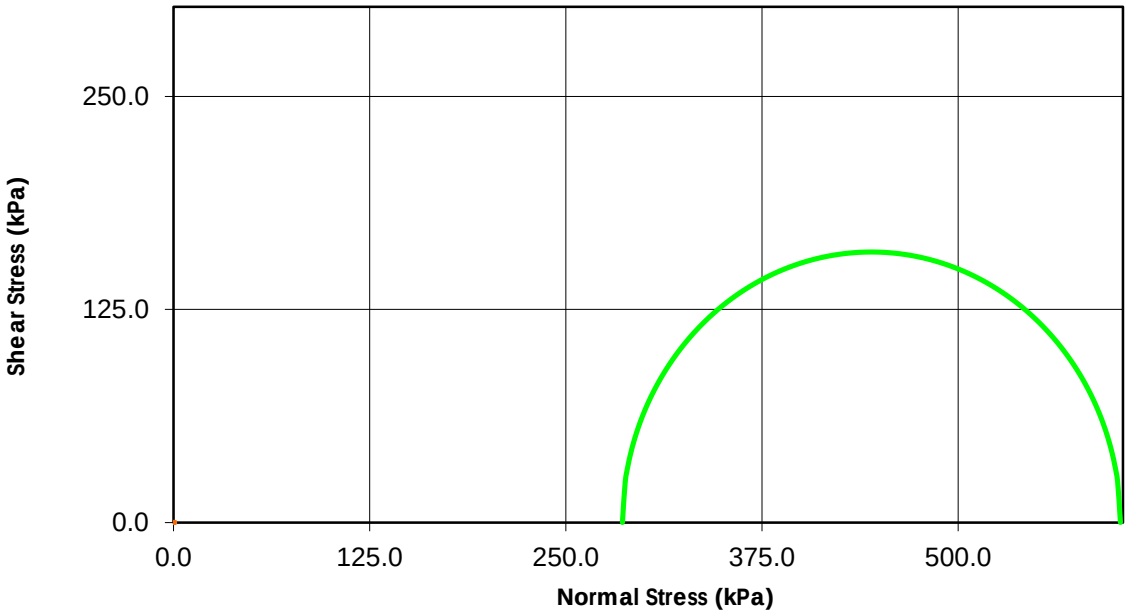


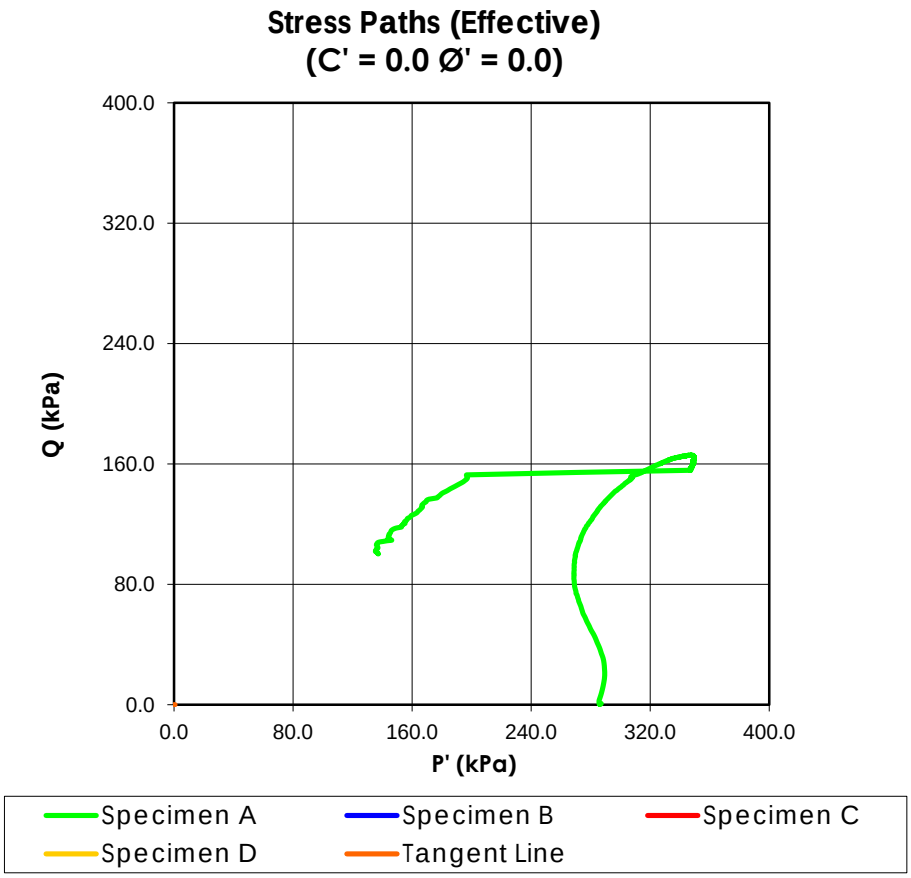
# Mohr Stress Circles at 15% Axial Strain Criterion

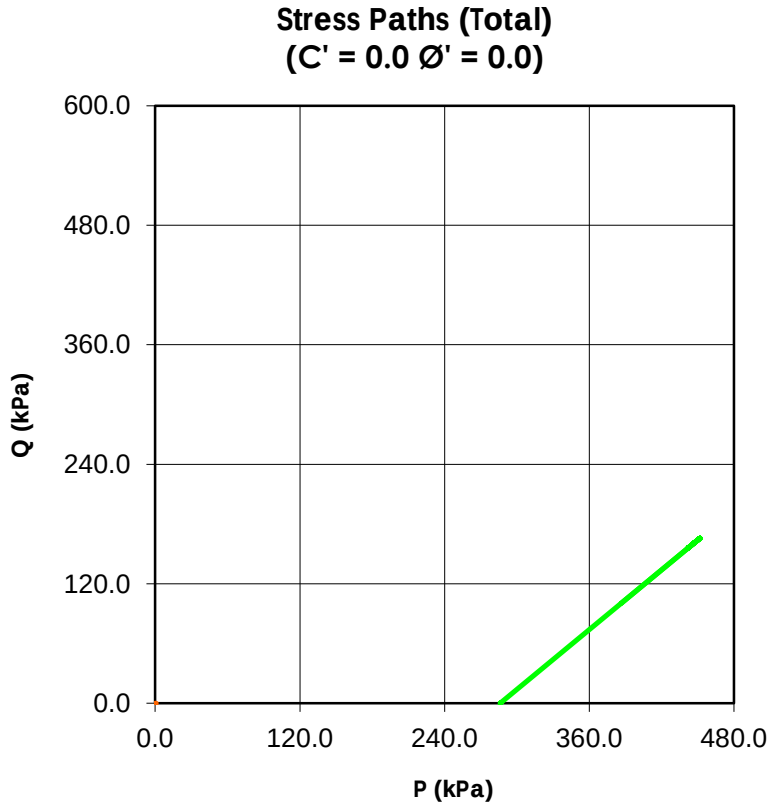
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

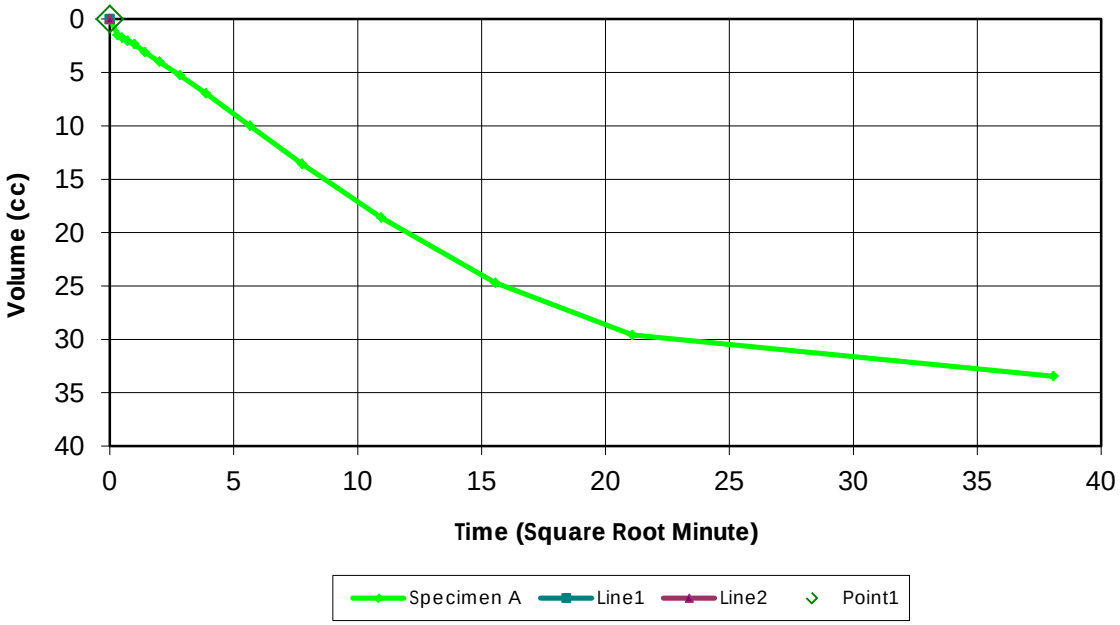



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

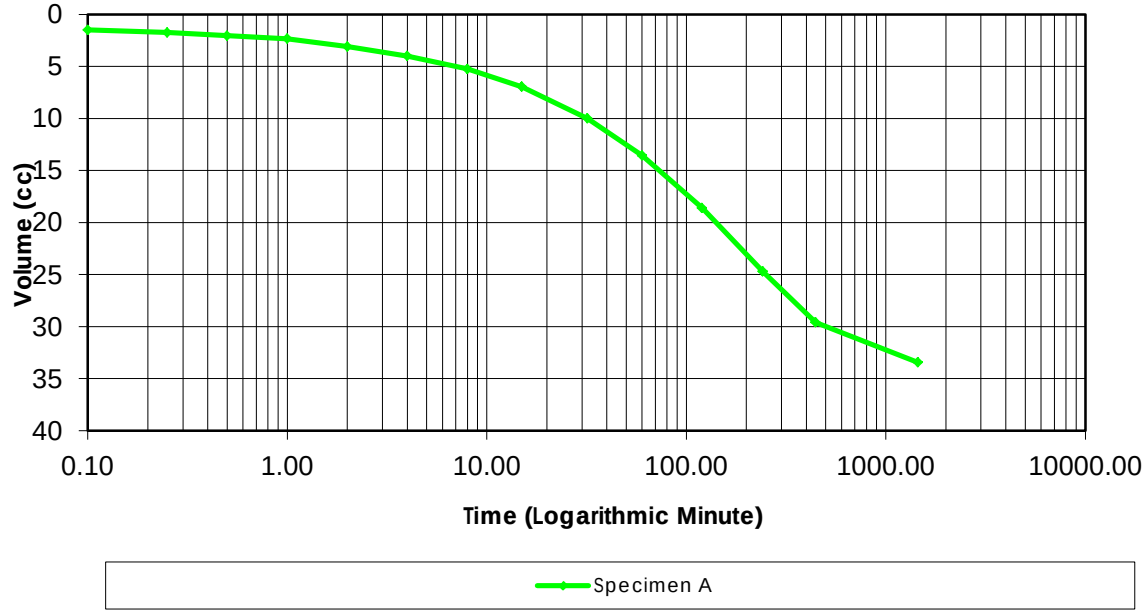

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 1.00

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 0.90 |
| 3 | 150.0 | 130.0 | 0.0 | 70.0 | |
| 4 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 5 | 220.0 | 130.0 | 70.0 | 0.0 | 1.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.40-3.81m

| | |
|---|---|
| Cell Pressure (kPa) | 430 |
| Back Pressure (kPa) | 130 |
| Effective Pressure (kPa) | 300 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.3 |
| Initial Sample Height (mm) | 155 |
| Initial Sample Area (cm2) | 41.06 |
| Initial Volume (cm3) | 636.4 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 45.80 | N/A |
| 00:00:06 | 44.30 | 1.500 |
| 00:00:15 | 44.05 | 1.750 |
| 00:00:30 | 43.75 | 2.050 |
| 00:01:00 | 43.45 | 2.350 |
| 00:02:00 | 42.70 | 3.100 |
| 00:04:00 | 41.80 | 4.000 |
| 00:08:00 | 40.55 | 5.250 |
| 00:15:00 | 38.85 | 6.950 |
| 00:32:00 | 35.80 | 10.000 |
| 01:00:00 | 32.25 | 13.550 |
| 02:00:00 | 27.20 | 18.600 |
| 04:02:00 | 21.10 | 24.700 |
| 07:25:00 | 16.20 | 29.600 |
| 24:10:00 | 12.35 | 33.450 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

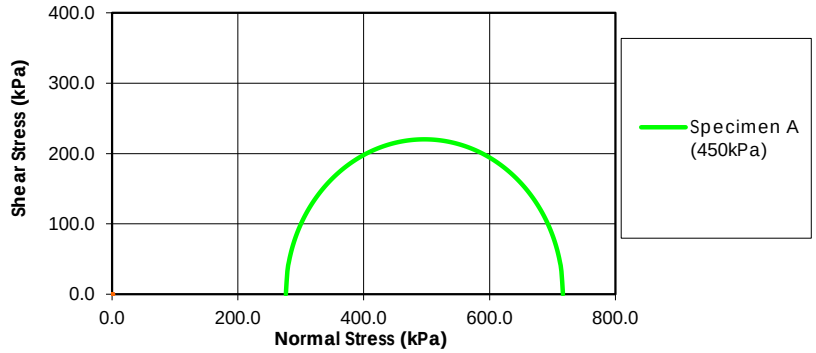
Stantec

Reviewed By C. Lamoureux

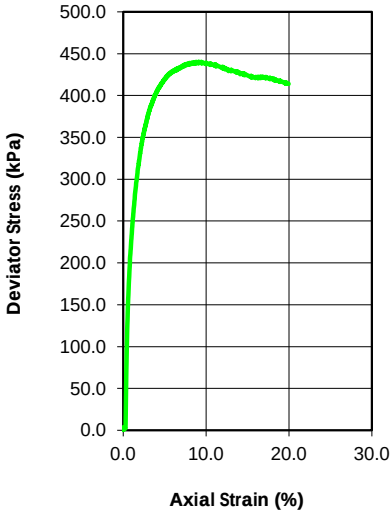
Date: 20-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 24.2 | | | |
| Dry Density (g/cm3) | 1.643 | | | |
| Saturation (%) | 101.73 | | | |
| Void Ratio | 0.643 | | | |
| Diameter (mm) | 72.400 | | | |
| Height (mm) | 146.000 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 21.0 | | | |
| Dry Density (g/cm3) | 1.712 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.577 | | | |
| Effective Stress (kPa) | 445.4 | | | |
| Back Press. (kPa) | 84.6 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

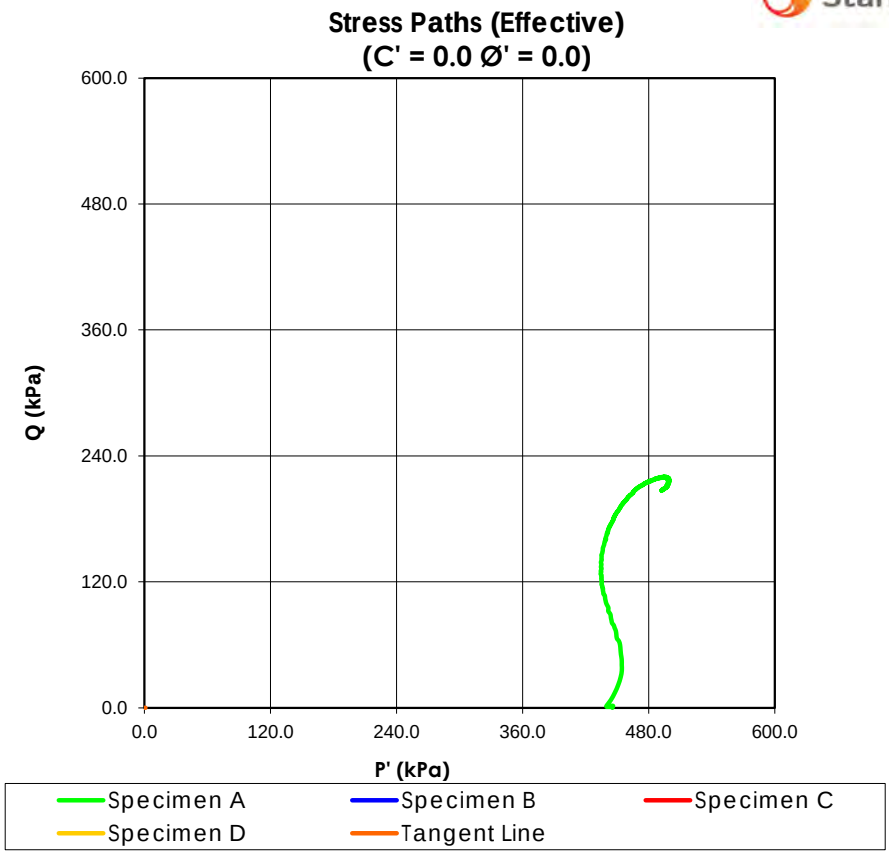
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 716.59 | | | |
| σ'3 at Failure (kPa) | 276.25 | | | |
| | | | | |
| | | | | |

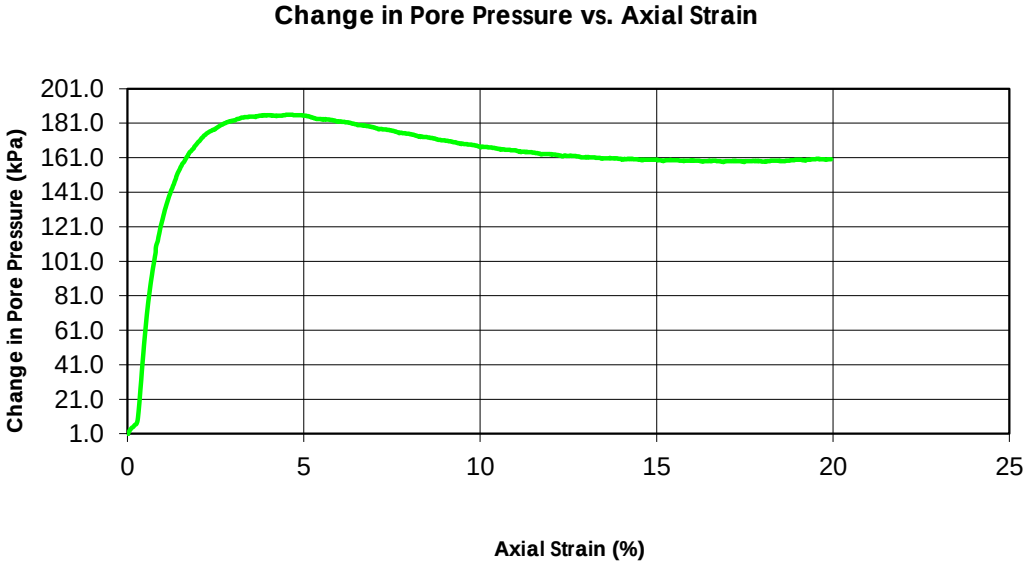
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D59 ST10 |
| **Depth:** | 4.30-4.77m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

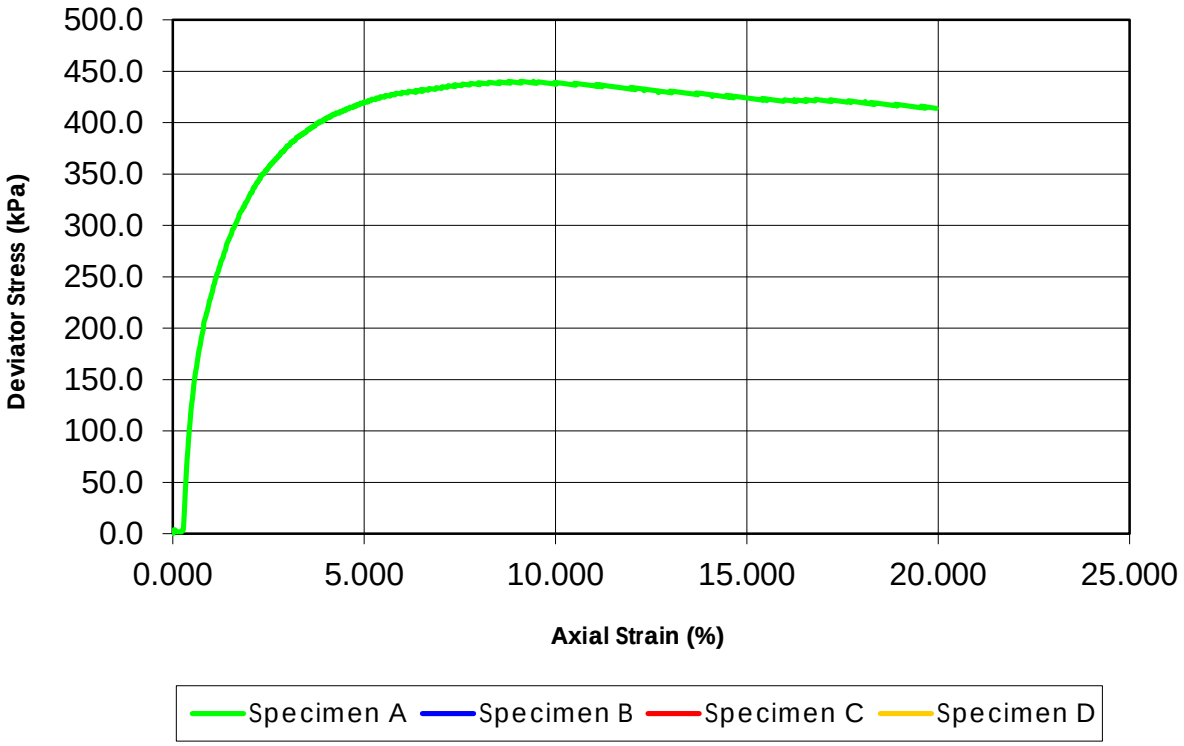
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

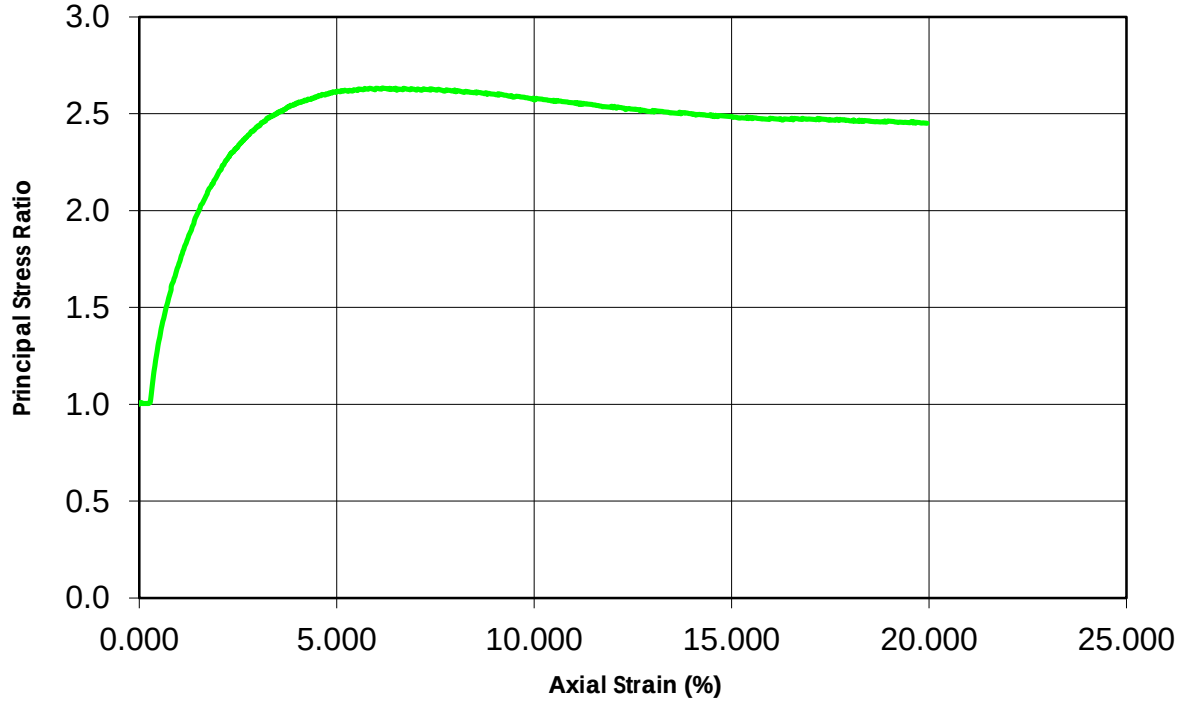


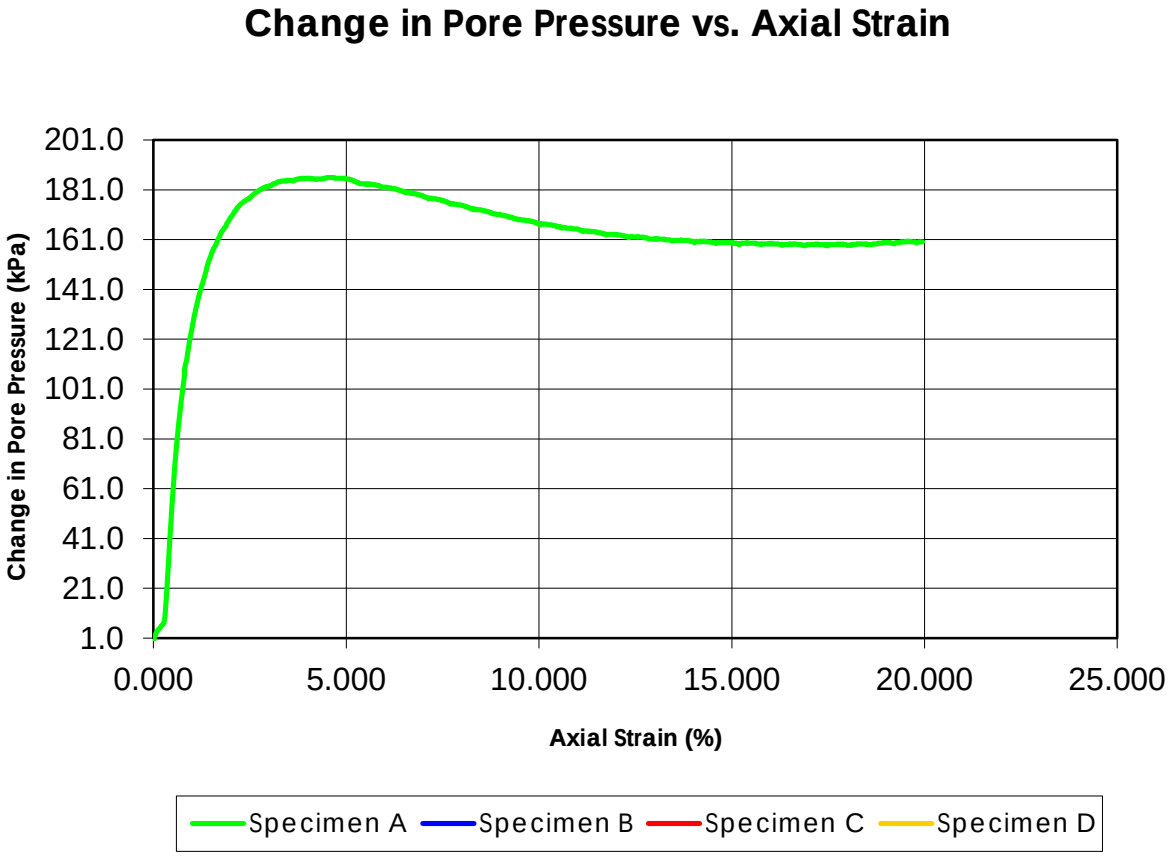



## Deviator Stress vs. Axial Strain



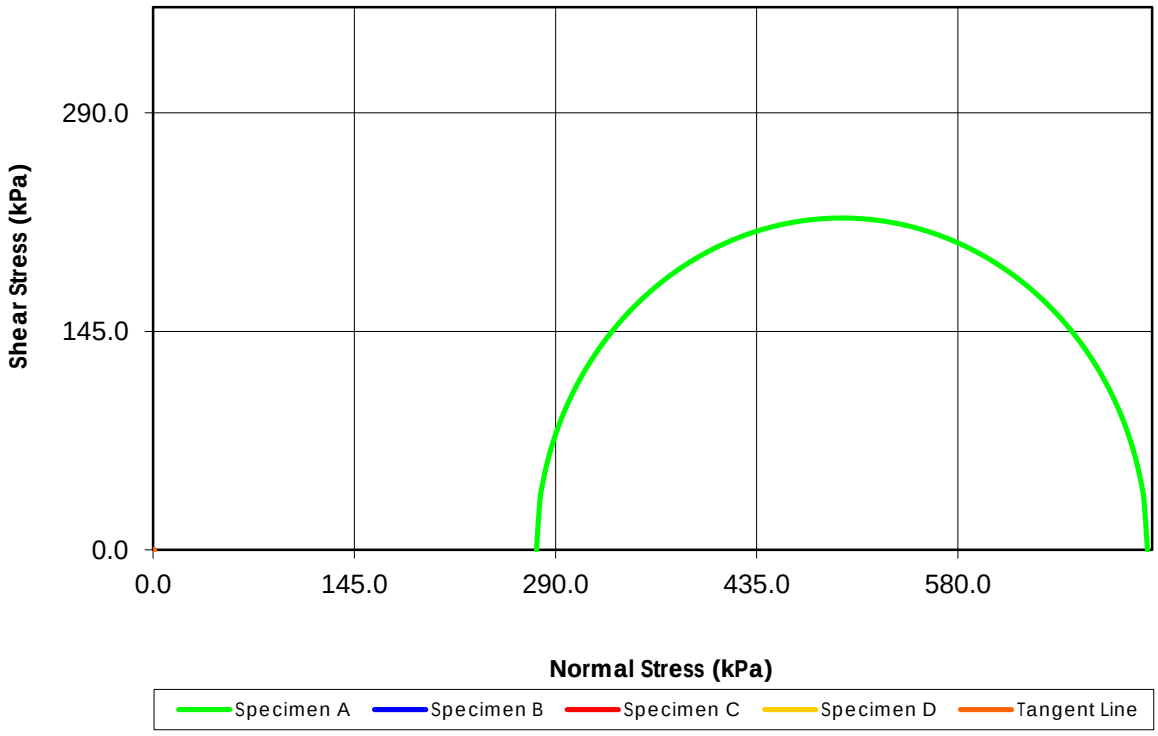

## Principal Stress Ratio vs. Axial Strain



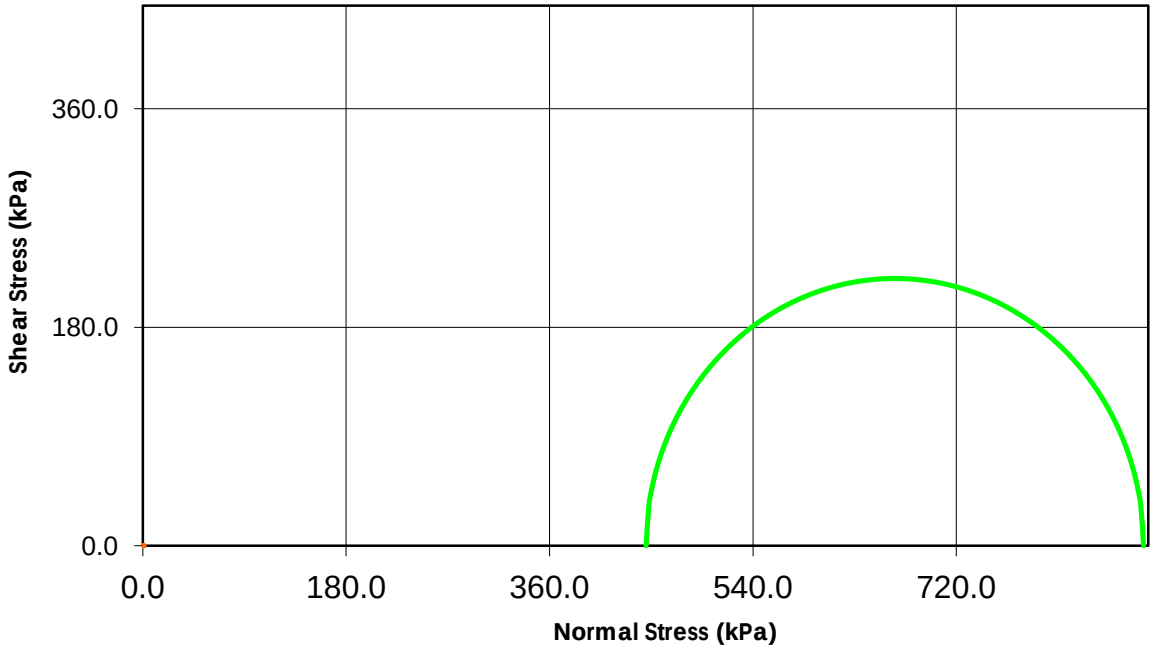

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
201.0
181.0
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

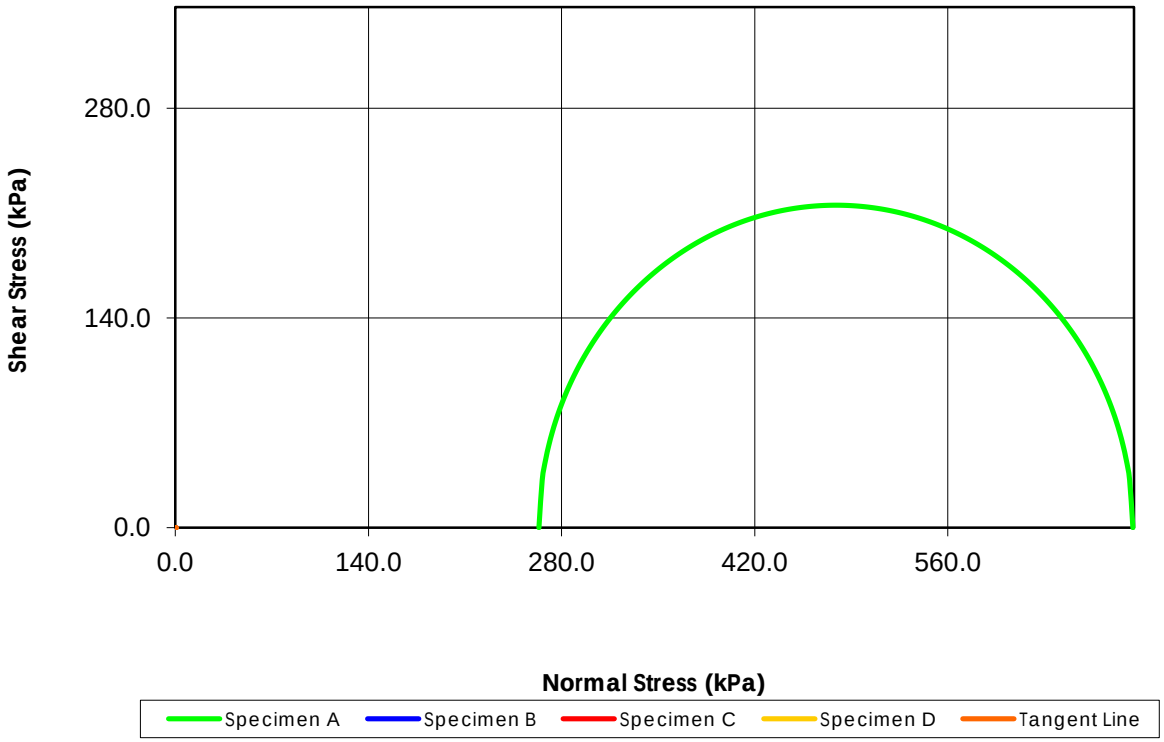



### Total Stress
### (C = 0.0 Ø = 0.0)

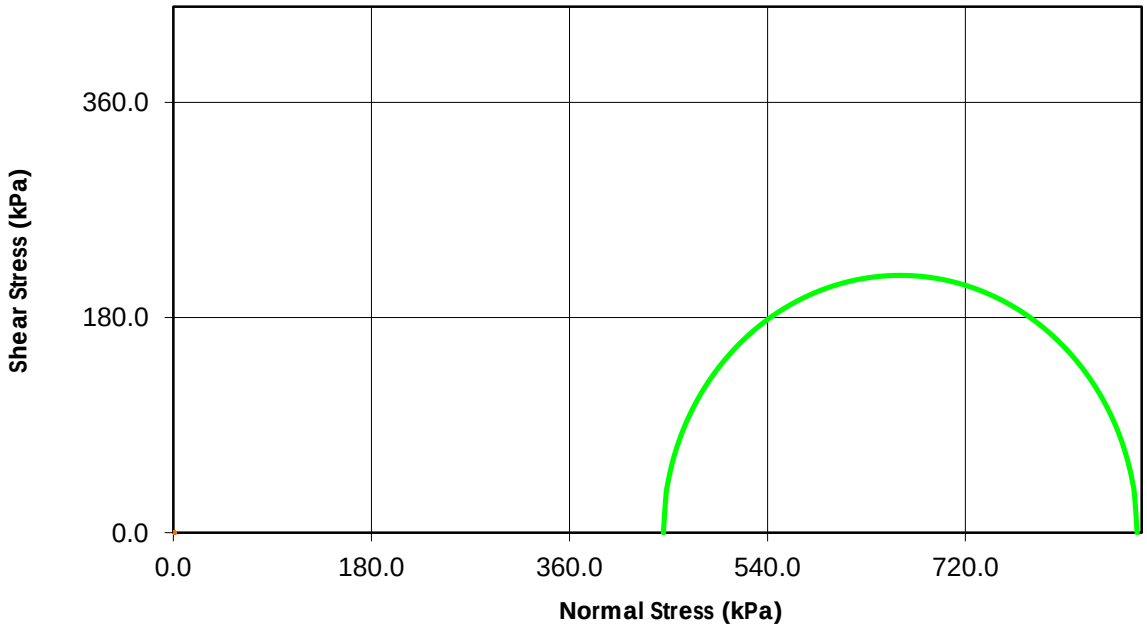


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

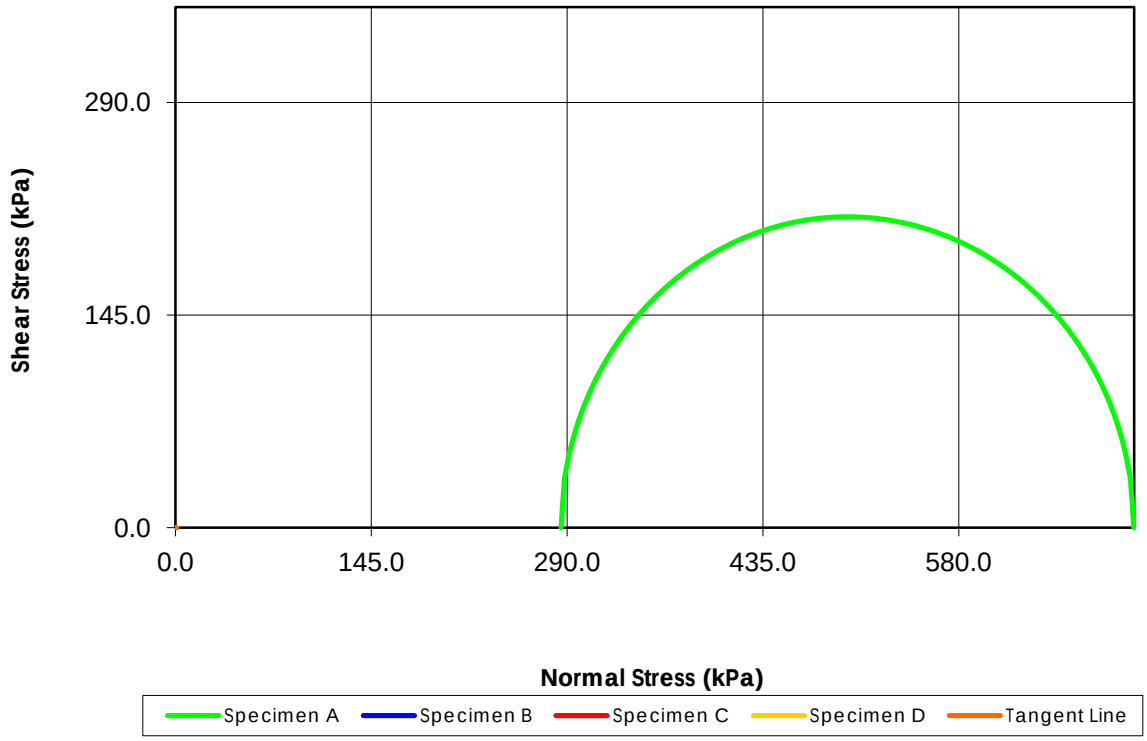



## Total Stress
## (C = 0.0 Ø = 0.0)

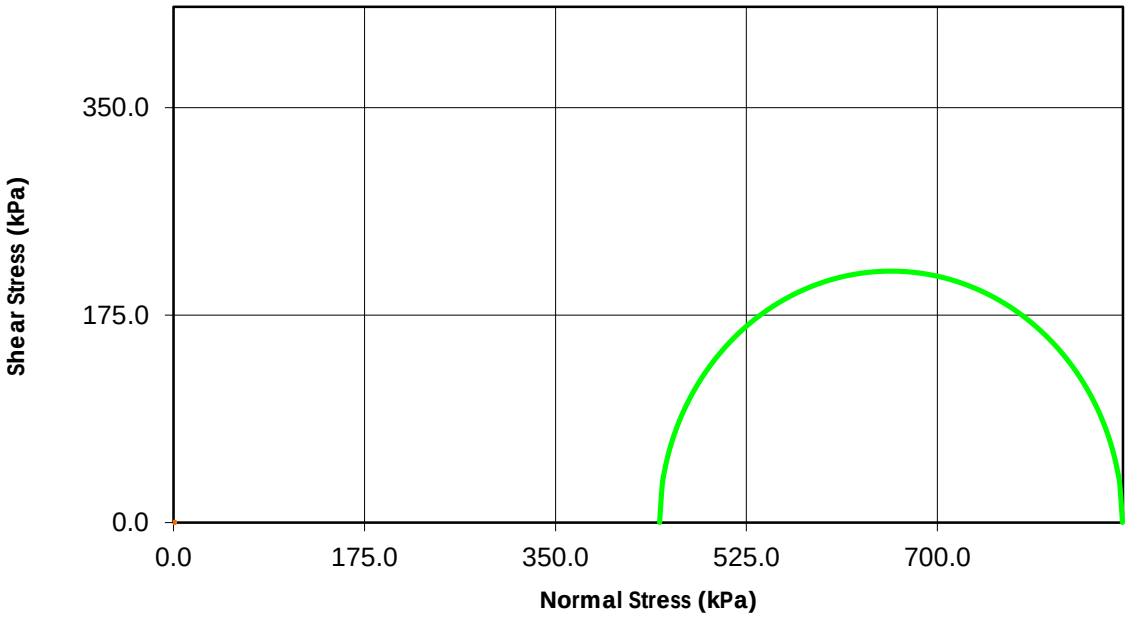


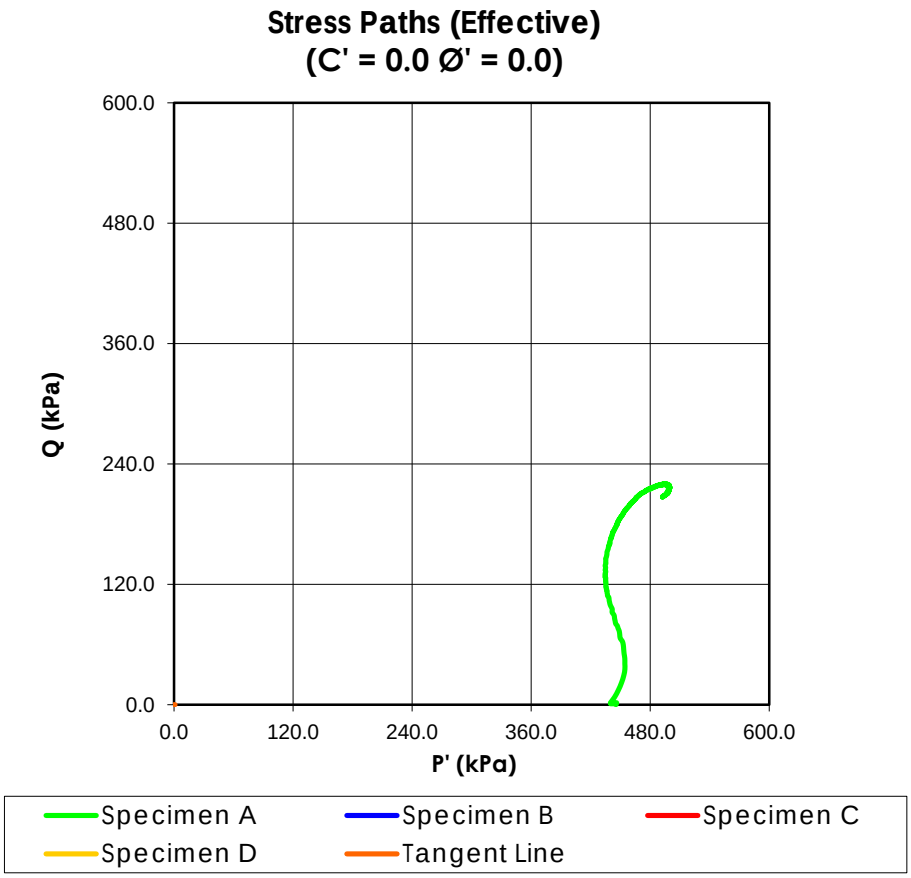
# Mohr Stress Circles at 15% Axial Strain Criterion

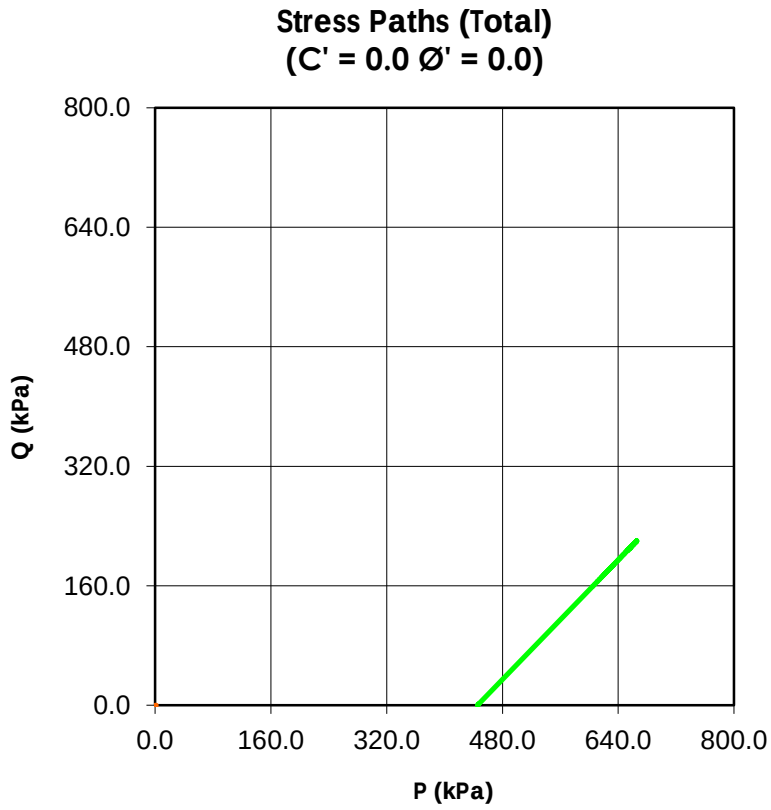
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

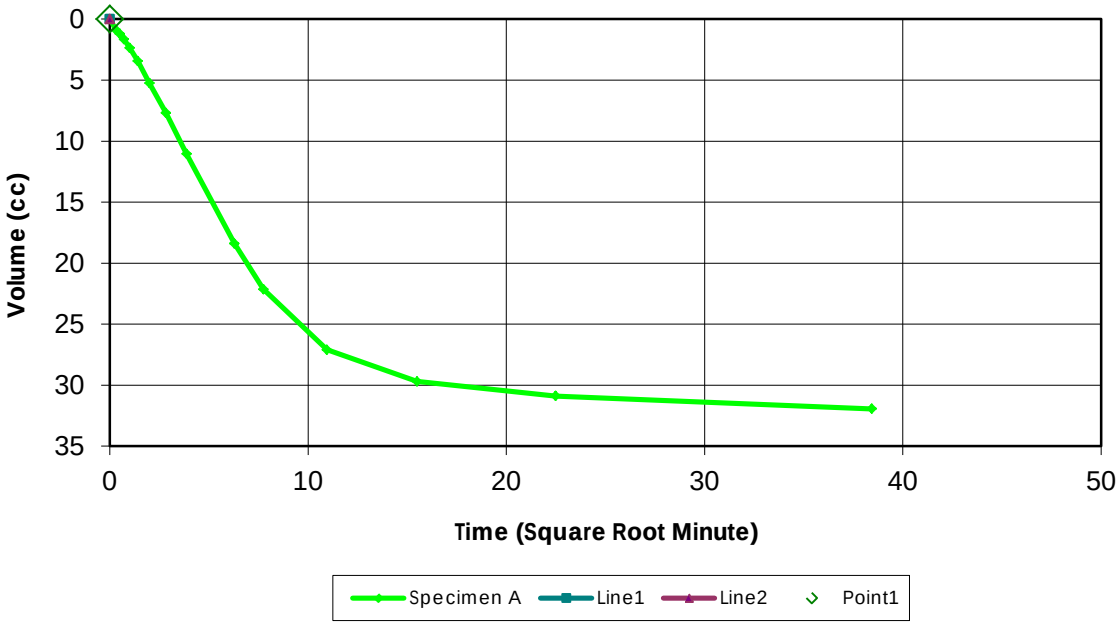



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

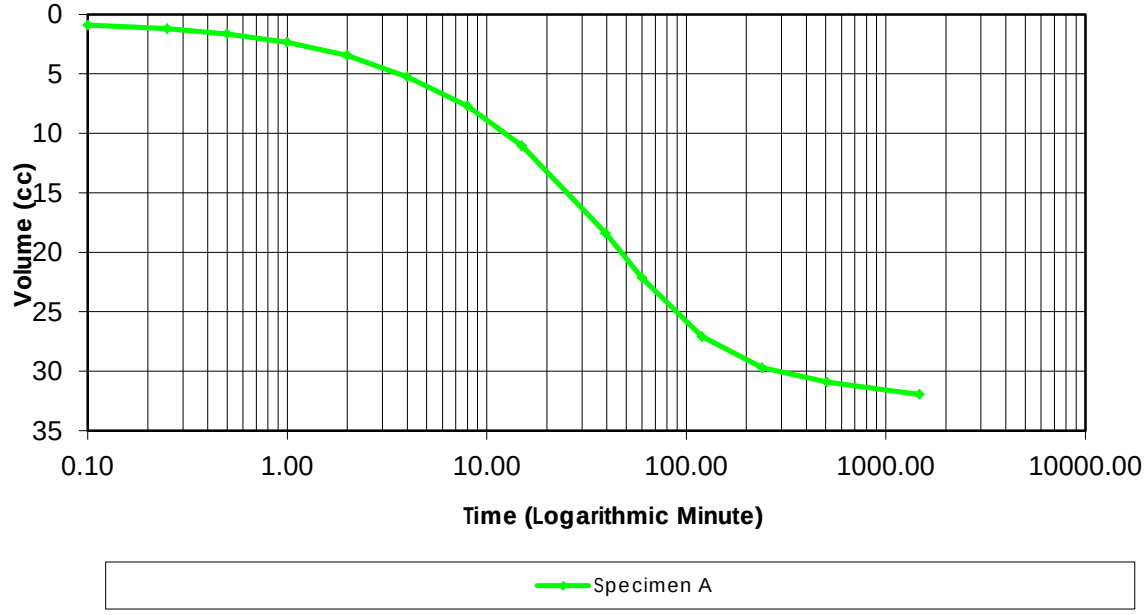

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 100.0 | 60.0 | 20.0 | 0.0 | 72.00 |
| 3 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 4 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 5 | 120.0 | 80.0 | 20.0 | 0.0 | 96.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 4.30-4.77m

| | |
|---|---|
| Cell Pressure (kPa) | 530 |
| Back Pressure (kPa) | 80 |
| Effective Pressure (kPa) | 450 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 146 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 601.1 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.95 | N/A |
| 00:00:06 | 44.05 | 0.900 |
| 00:00:15 | 43.75 | 1.200 |
| 00:00:30 | 43.30 | 1.650 |
| 00:01:00 | 42.60 | 2.350 |
| 00:02:00 | 41.50 | 3.450 |
| 00:04:00 | 39.70 | 5.250 |
| 00:08:00 | 37.25 | 7.700 |
| 00:15:00 | 33.90 | 11.050 |
| 00:39:30 | 26.55 | 18.400 |
| 01:00:00 | 22.80 | 22.150 |
| 02:00:00 | 17.85 | 27.100 |
| 04:00:00 | 15.25 | 29.700 |
| 08:26:00 | 14.05 | 30.900 |
| 24:37:00 | 13.00 | 31.950 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

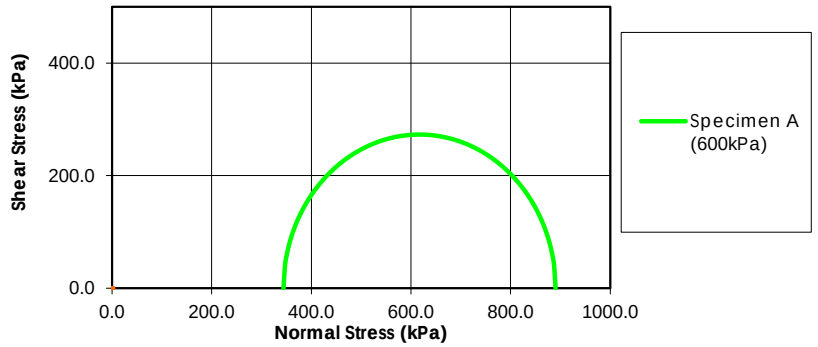
Stantec

Reviewed By C. Lamoureux

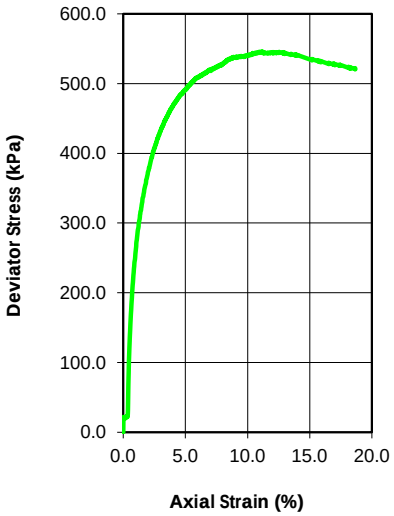
Date: 25-Jul-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 22.6 | | | |
| Dry Density (g/cm3) | 1.680 | | | |
| Saturation (%) | 100.45 | | | |
| Void Ratio | 0.607 | | | |
| Diameter (mm) | 72.700 | | | |
| Height (mm) | 150.700 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 18.3 | | | |
| Dry Density (g/cm3) | 1.772 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.524 | | | |
| Effective Stress (kPa) | 605.1 | | | |
| Back Press. (kPa) | 54.9 | | | |
| Rate of Strain | 0.021 | | | |

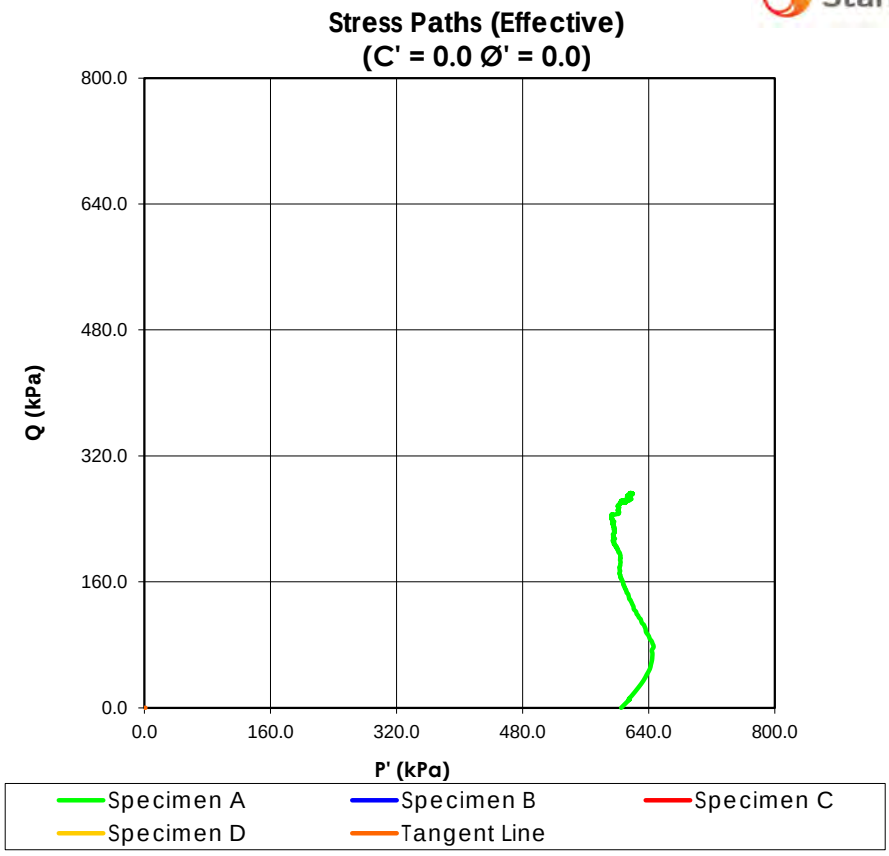
| Maximium Deviator Stress Criterion | | After Shear | A | B | C | D |
|---|---|---|---|---|---|---|
| C (kPa) | 0.0 | σ'1 at Failure (kPa) | 890.23 | | | |
| C' (kPa) | 0.0 | σ'3 at Failure (kPa) | 344.19 | | | |
| Ø (deg) | 0.0 | | | | | |
| Ø' (deg) | 0.0 | | | | | |

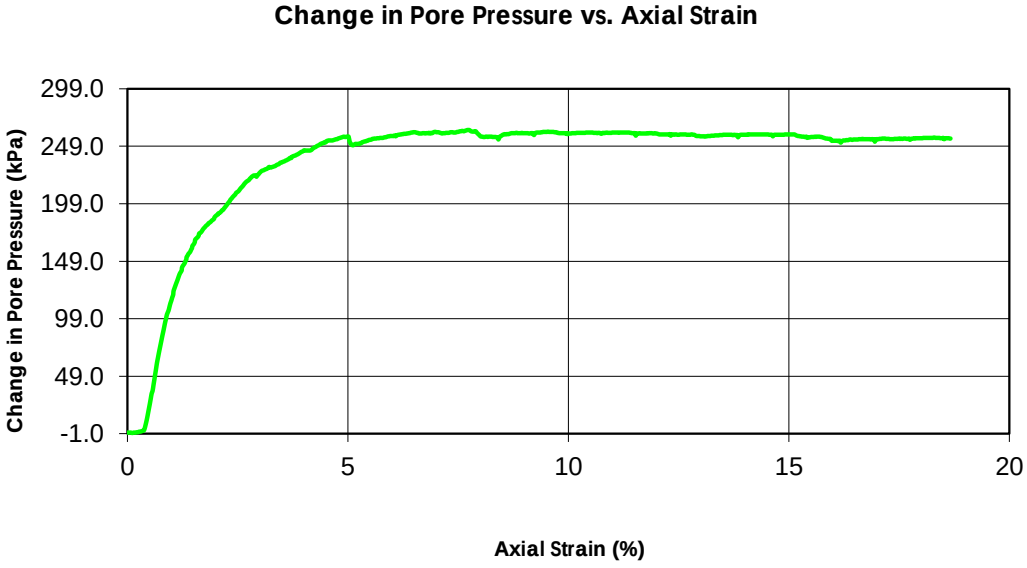
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D59 ST13 |
| **Depth:** | 6.1-6.5m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

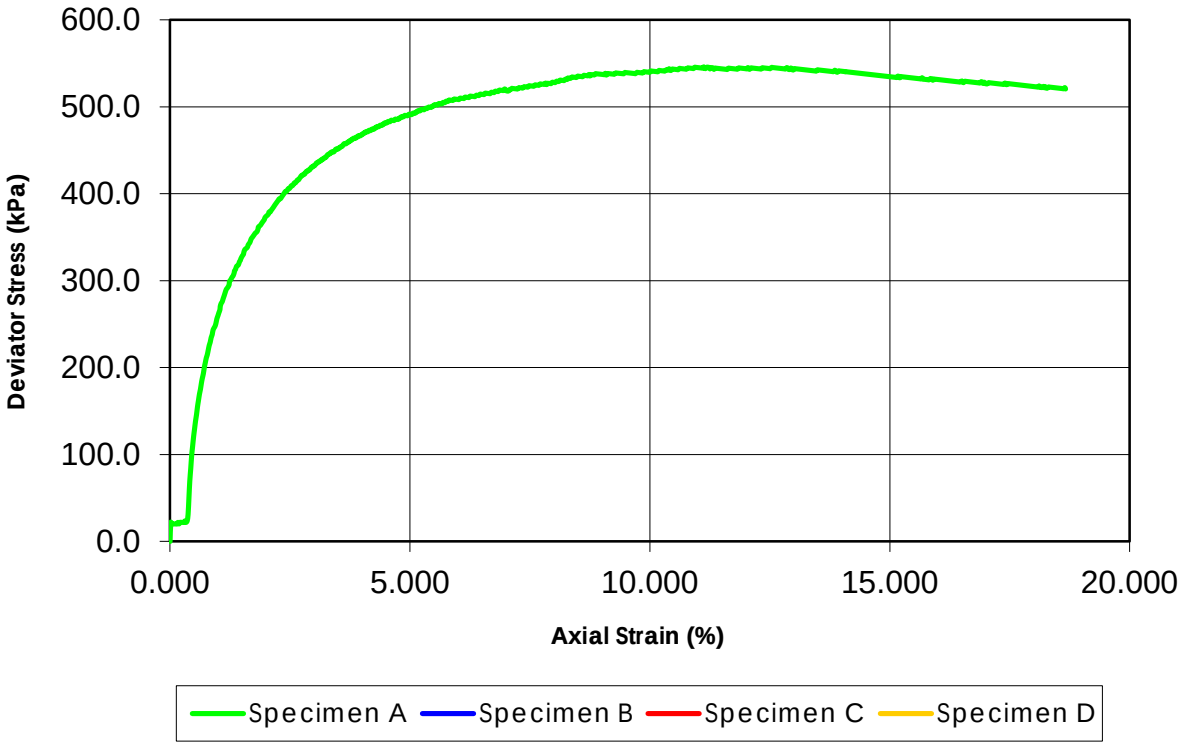
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

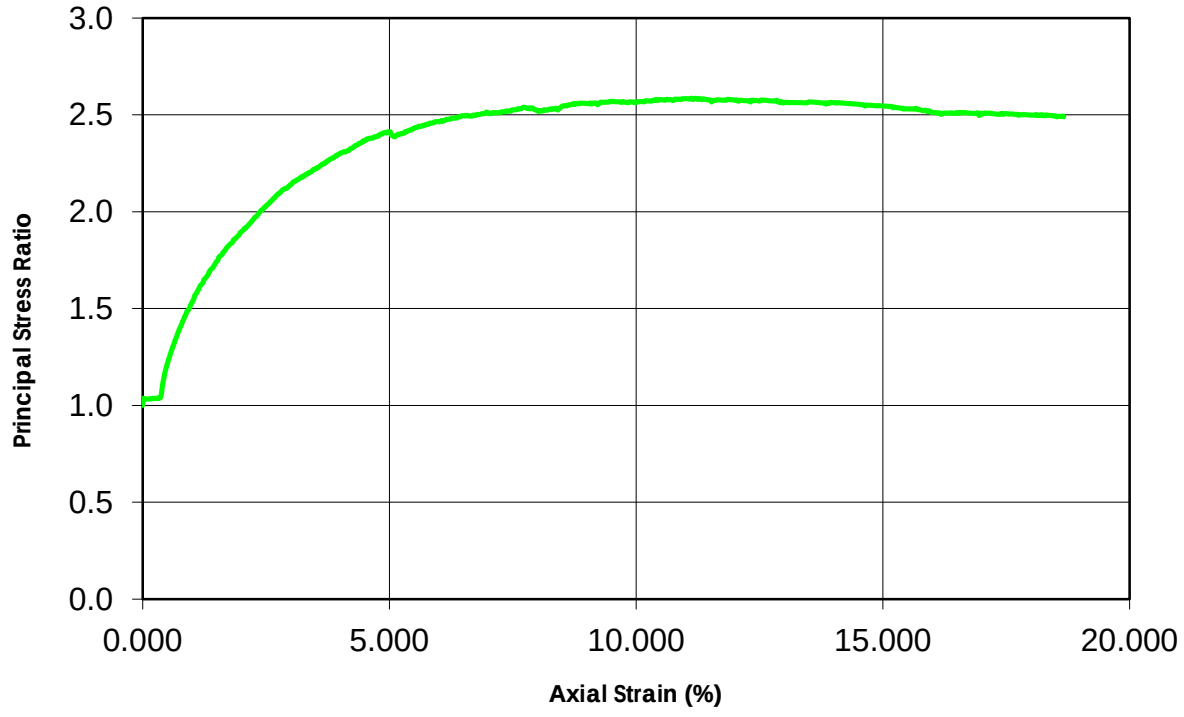


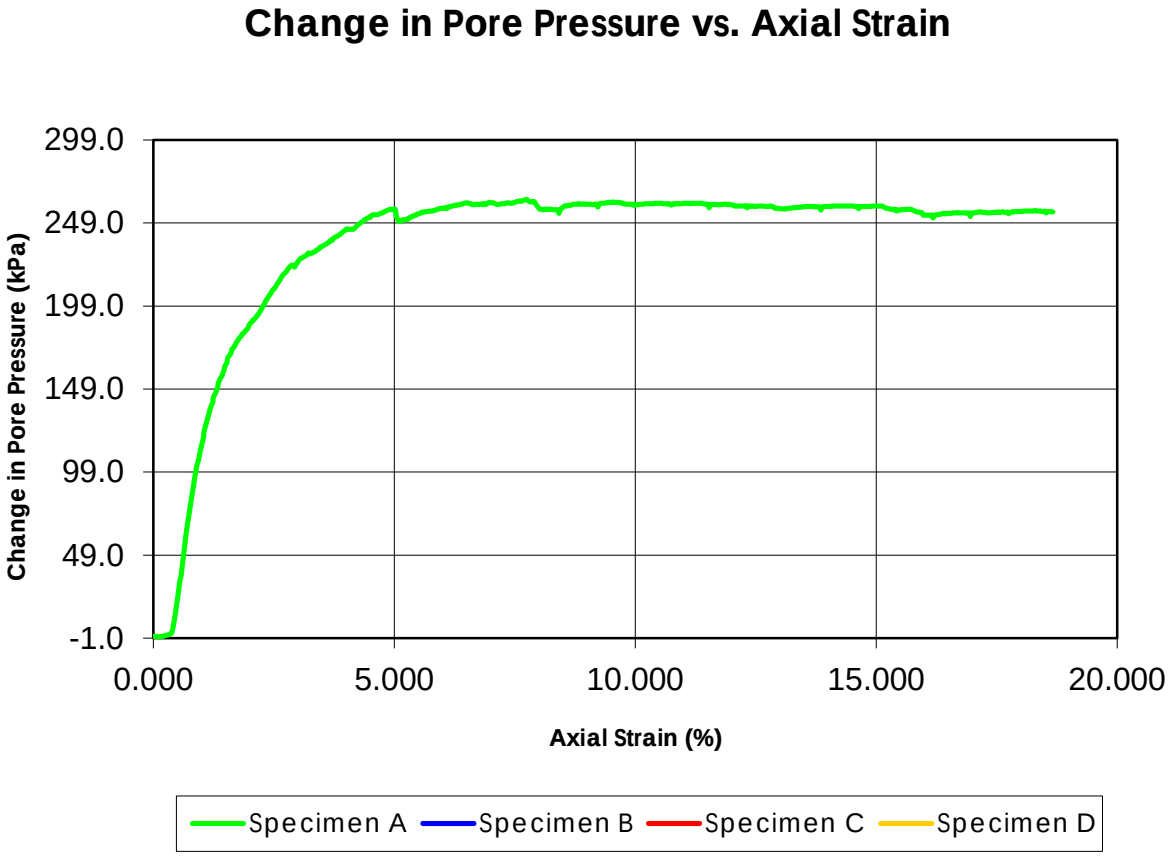



## Deviator Stress vs. Axial Strain



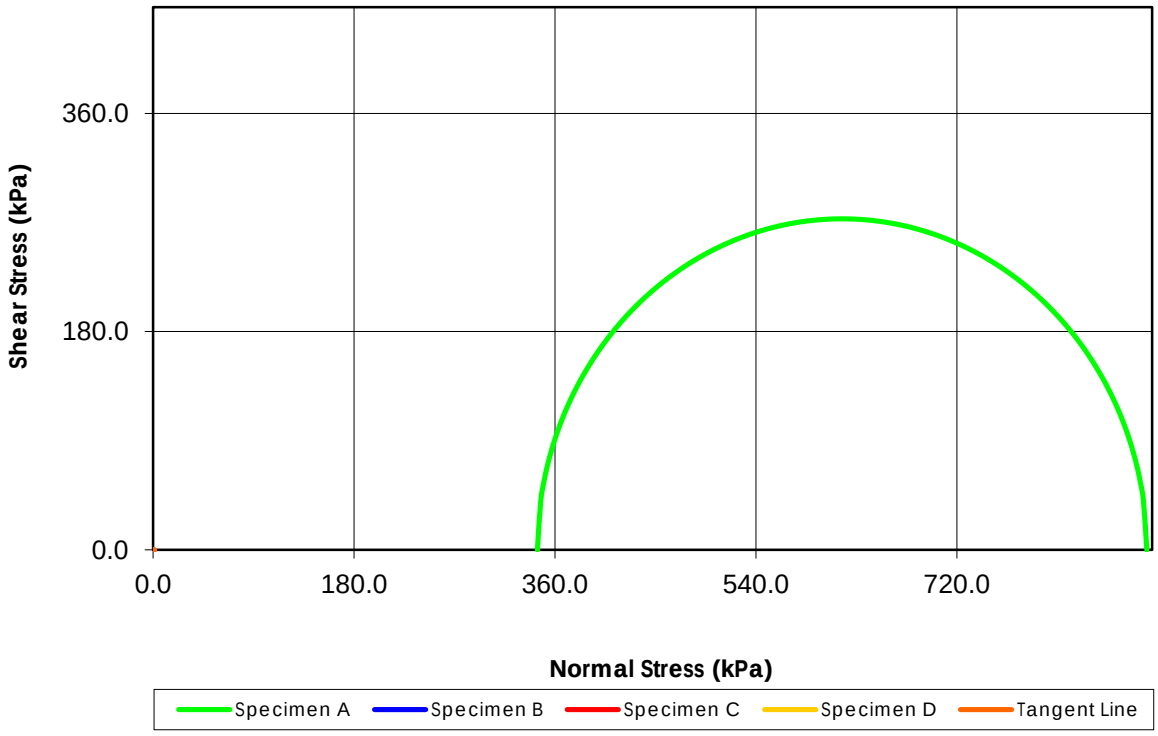

## Principal Stress Ratio vs. Axial Strain



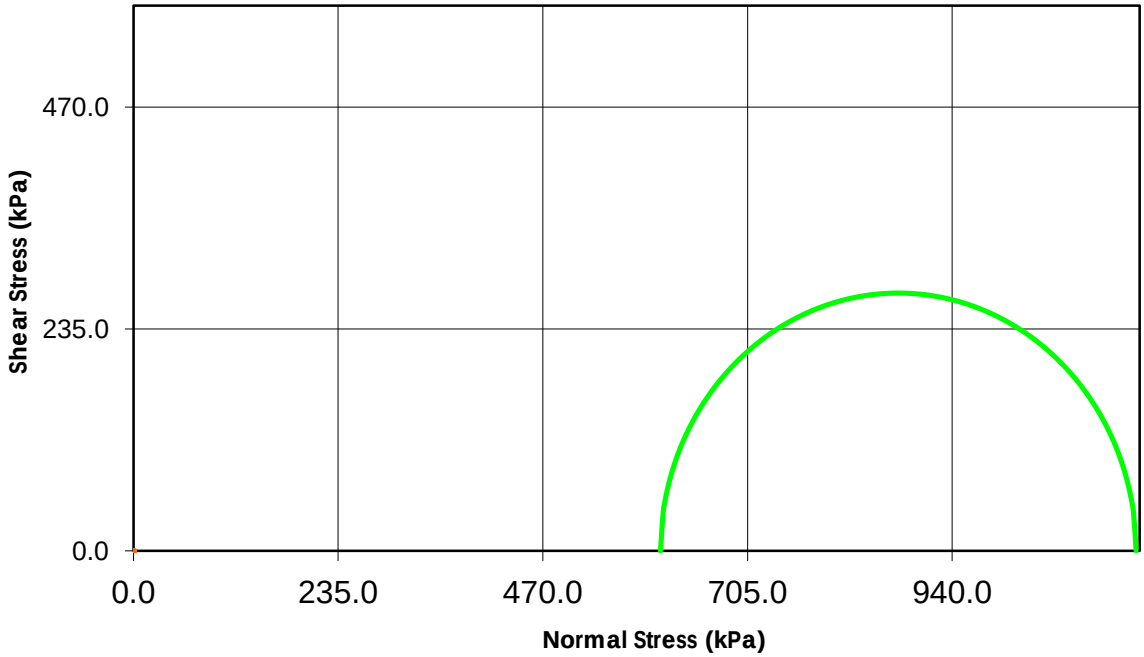

Change in Pore Pressure vs. Axial Strain
299.0
249.0
199.0
149.0
99.0
49.0
-1.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

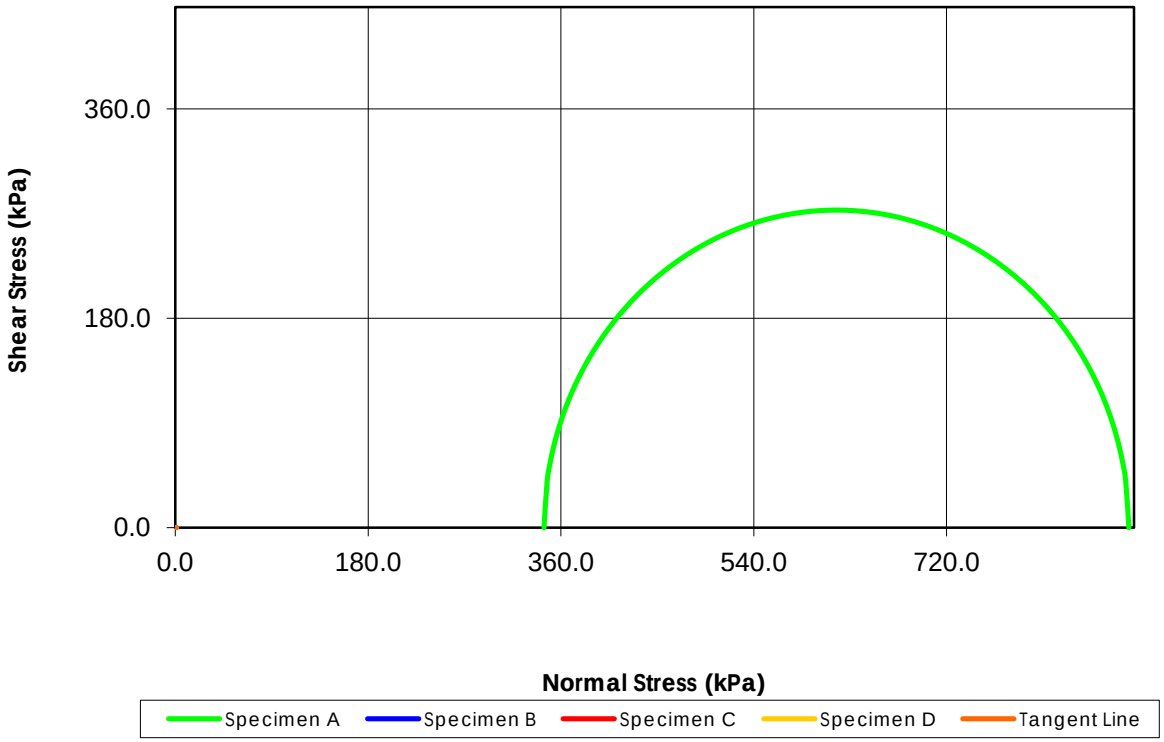



### Total Stress
### (C = 0.0 Ø = 0.0)

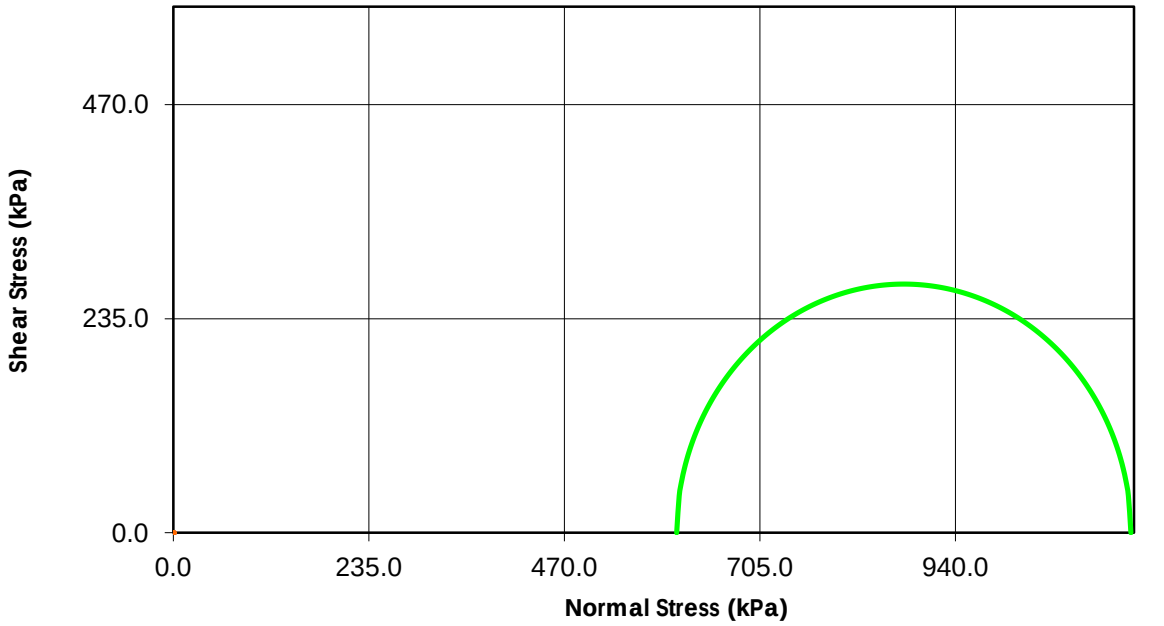


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

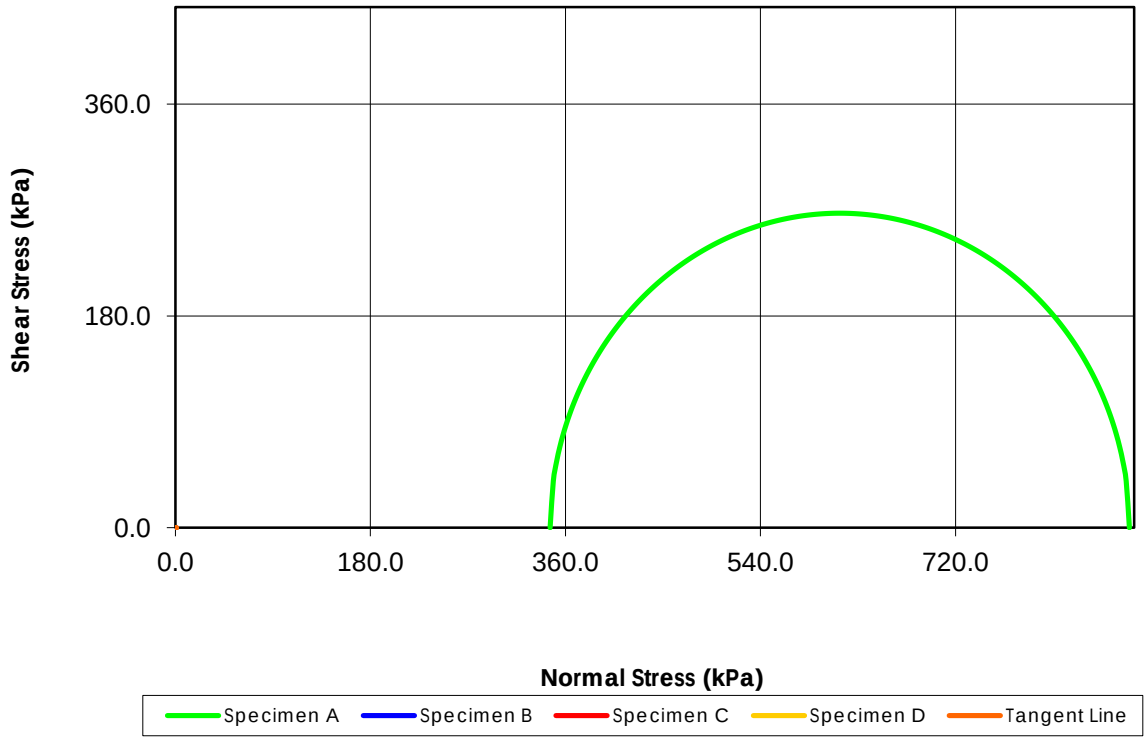



## Total Stress
## (C = 0.0 Ø = 0.0)

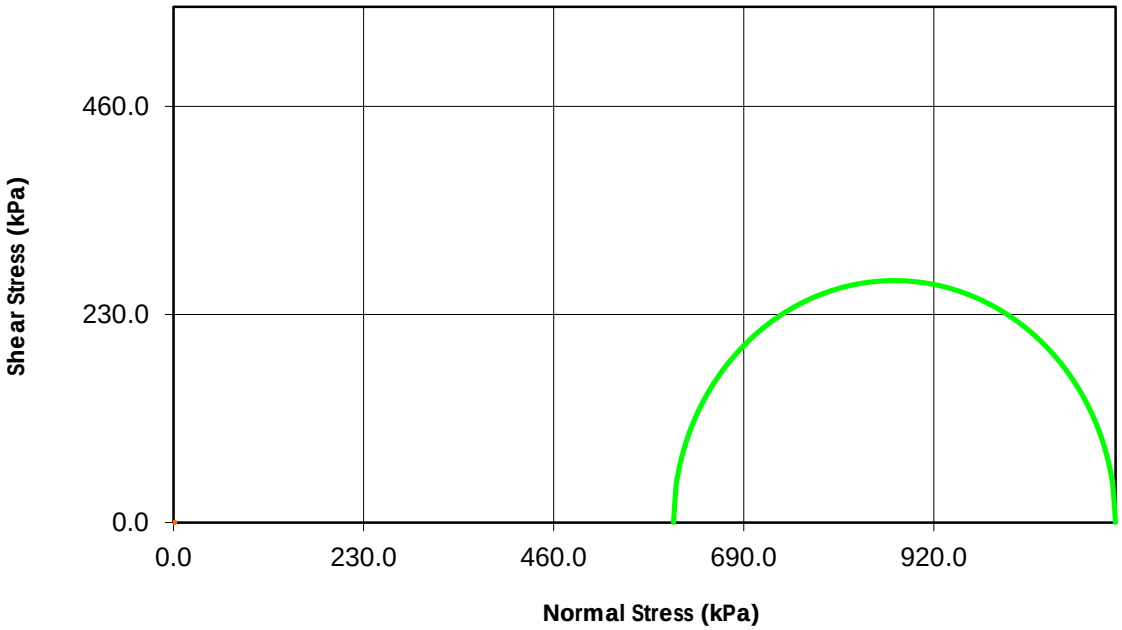


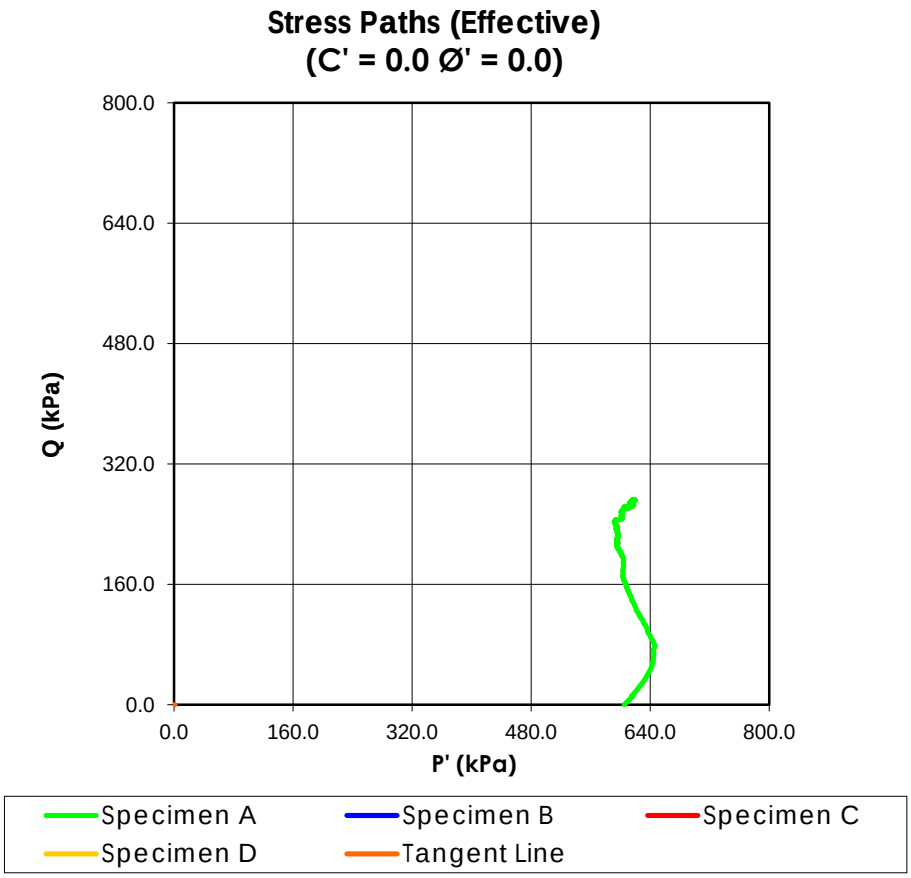
# Mohr Stress Circles at 15% Axial Strain Criterion

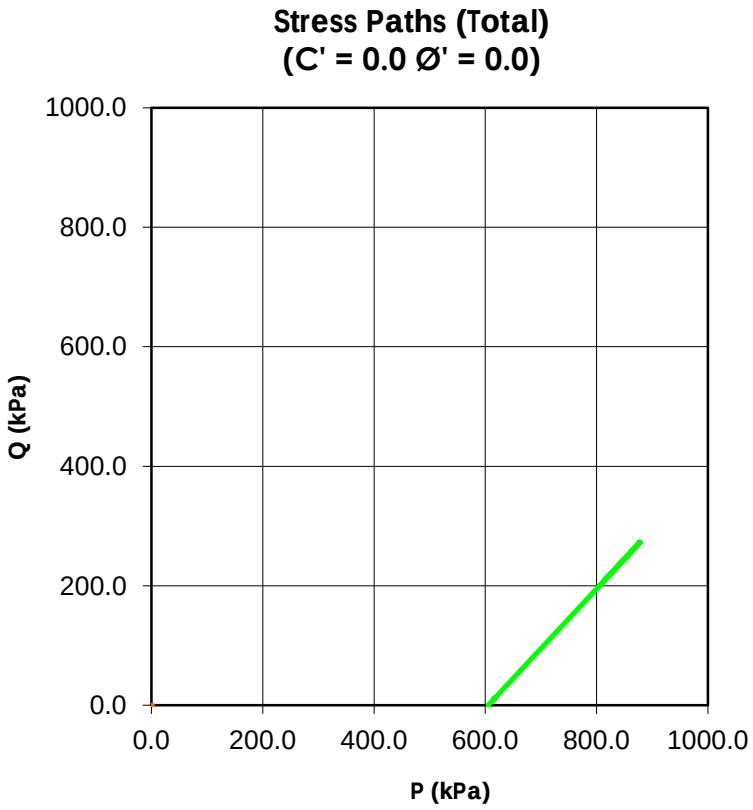
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

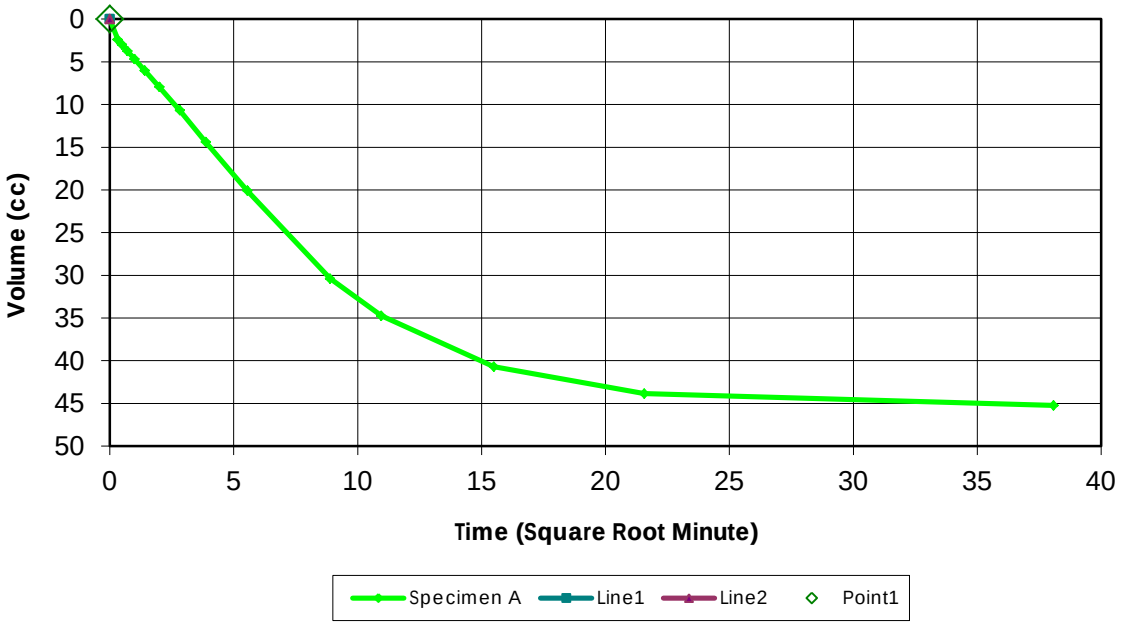



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

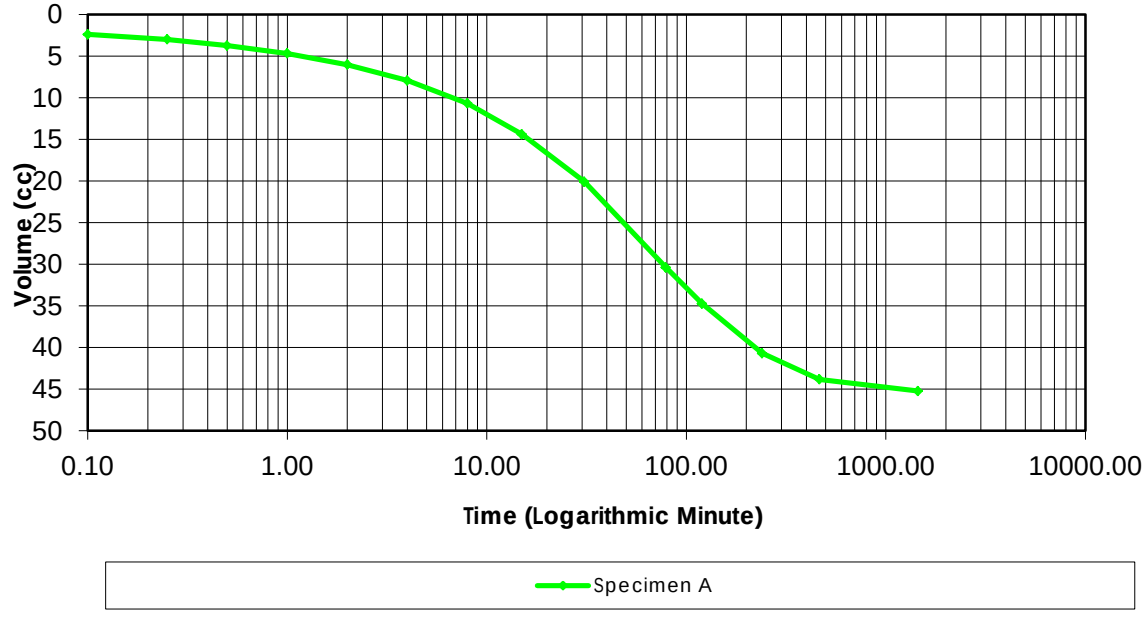

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: -3E+14

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 70.0 | 40.0 | 10.0 | 0.0 | 30.00 |
| 3 | 70.0 | 50.0 | 0.0 | 10.0 | |
| 4 | 70.0 | 50.0 | 0.0 | 0.0 | |
| 5 | 80.0 | 50.0 | 10.0 | 0.0 | 50.00 |
| 6 | 80.0 | 60.0 | 0.0 | 10.0 | |
| 7 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 8 | 100.0 | 60.0 | 20.0 | 0.0 | 95.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 6.1-6.5m

| | |
|---|---|
| Cell Pressure (kPa) | 660 |
| Back Pressure (kPa) | 60 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.7 |
| Initial Sample Height (mm) | 150.7 |
| Initial Sample Area (cm2) | 41.51 |
| Initial Volume (cm3) | 625.6 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 43.70 | N/A |
| 00:00:06 | 41.30 | 2.400 |
| 00:00:15 | 40.70 | 3.000 |
| 00:00:30 | 39.95 | 3.750 |
| 00:01:00 | 39.00 | 4.700 |
| 00:02:00 | 37.65 | 6.050 |
| 00:04:00 | 35.75 | 7.950 |
| 00:08:00 | 33.00 | 10.700 |
| 00:15:00 | 29.30 | 14.400 |
| 00:30:50 | 23.60 | 20.100 |
| 01:19:00 | 13.30 | 30.400 |
| 02:00:00 | 8.95 | 34.750 |
| 04:00:00 | 3.00 | 40.700 |
| 07:45:00 | -0.15 | 43.850 |
| 24:10:00 | -1.55 | 45.250 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

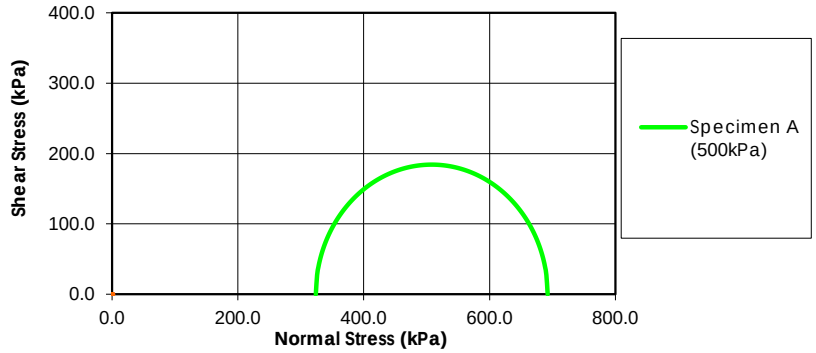
Stantec

Reviewed By C. Lamoureux

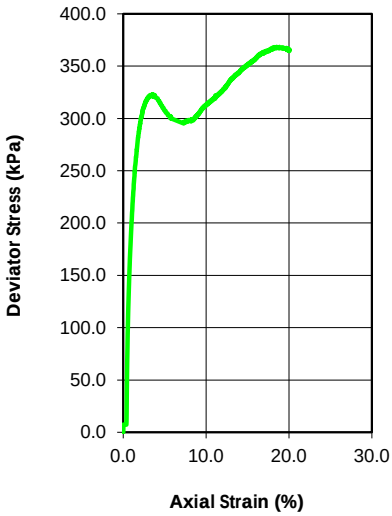
Date: 15-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 31.9 | | | |
| Dry Density (g/cm3) | 1.519 | | | |
| Saturation (%) | 110.75 | | | |
| Void Ratio | 0.777 | | | |
| Diameter (mm) | 72.600 | | | |
| Height (mm) | 153.100 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 26.9 | | | |
| Dry Density (g/cm3) | 1.70 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.591 | | | |
| Effective Stress (kPa) | 495.5 | | | |
| Back Press. (kPa) | 44.5 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

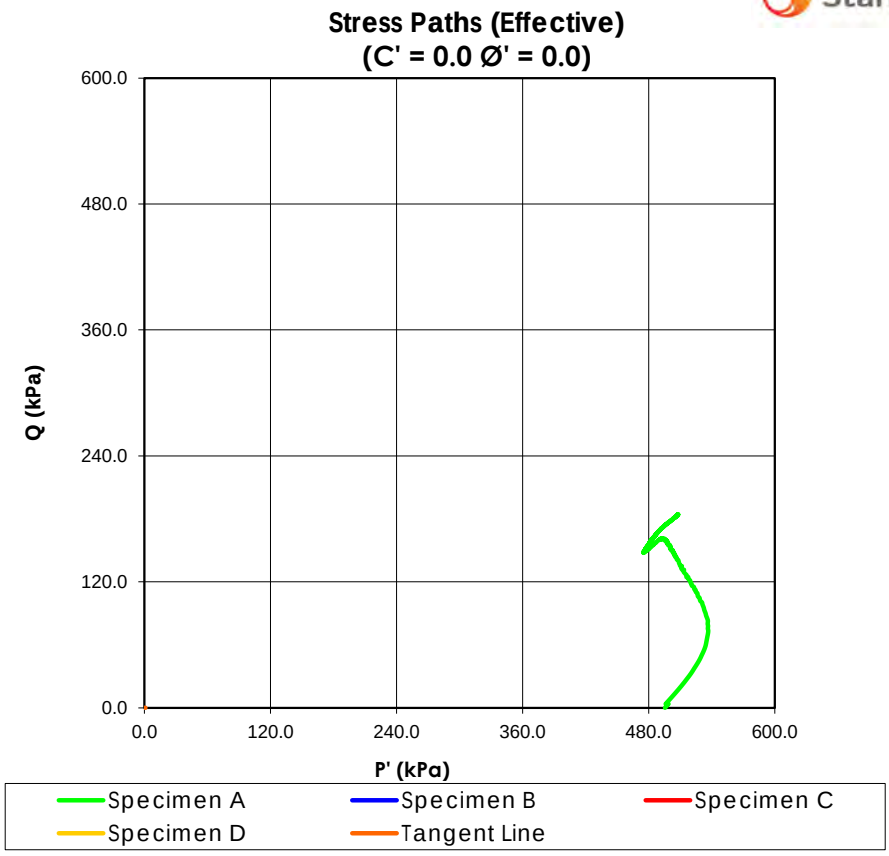
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 692.30 | | | |
| σ'3 at Failure (kPa) | 323.88 | | | |
| | | | | |
| | | | | |

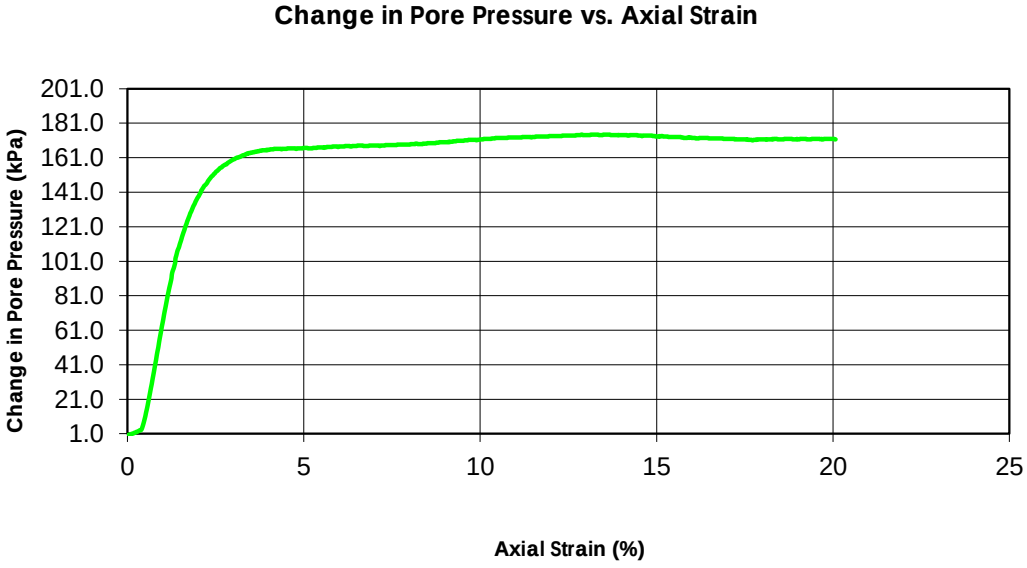
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D60 ST6 |
| **Depth:** | 2.60-3.05m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

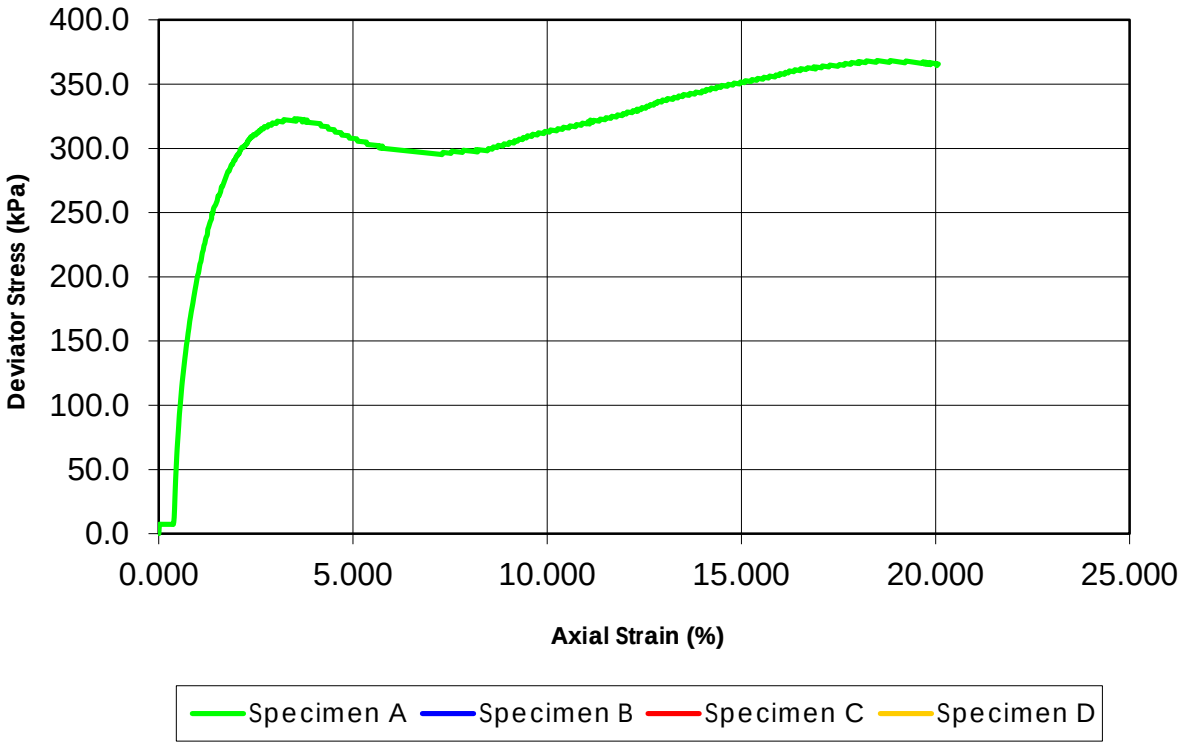
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

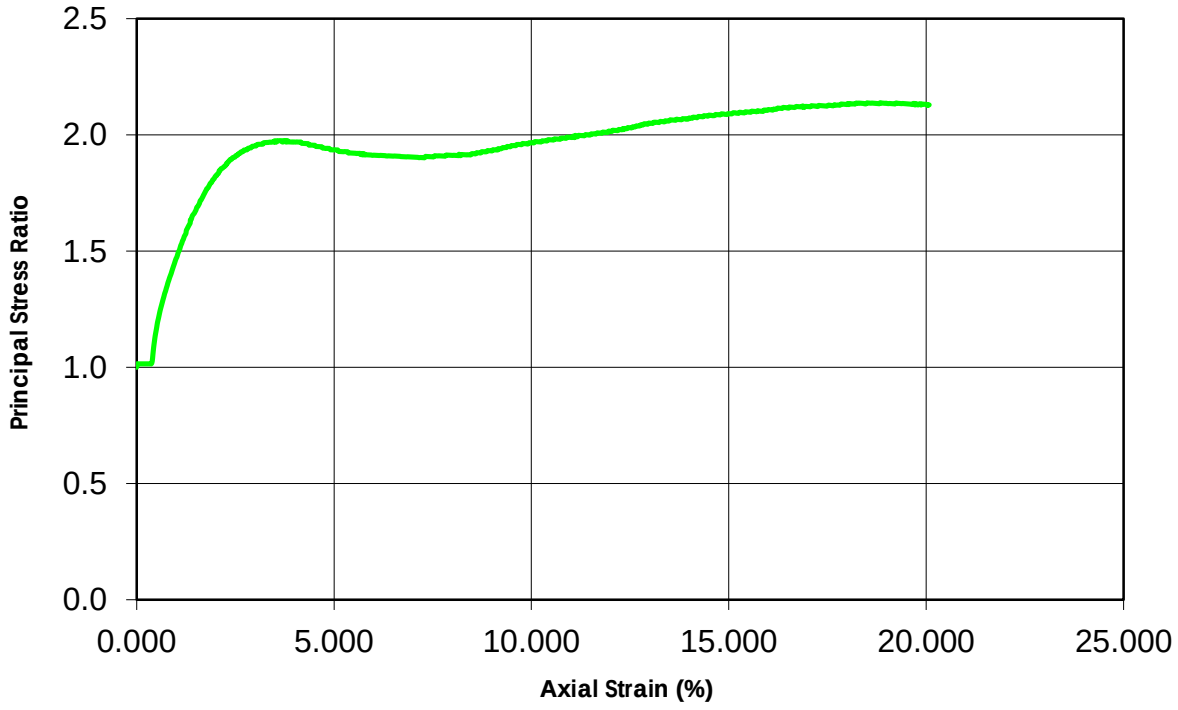


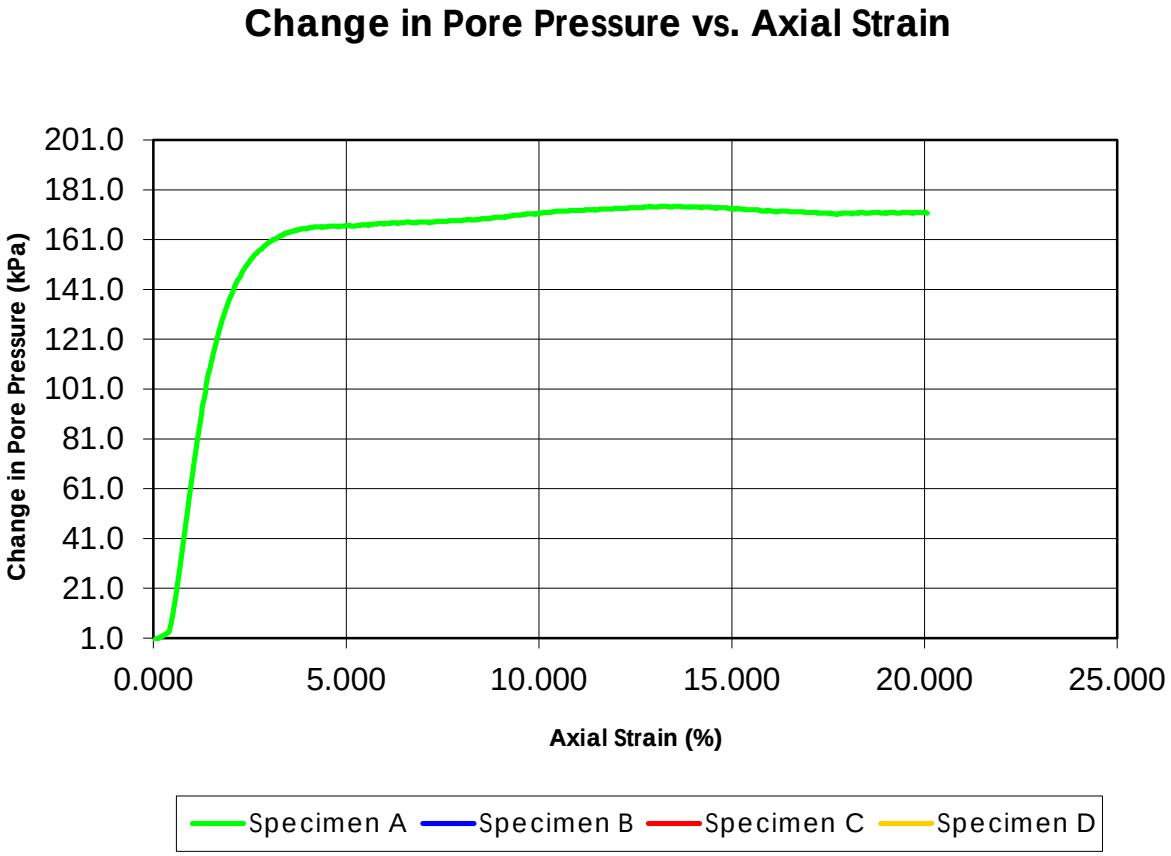



## Deviator Stress vs. Axial Strain



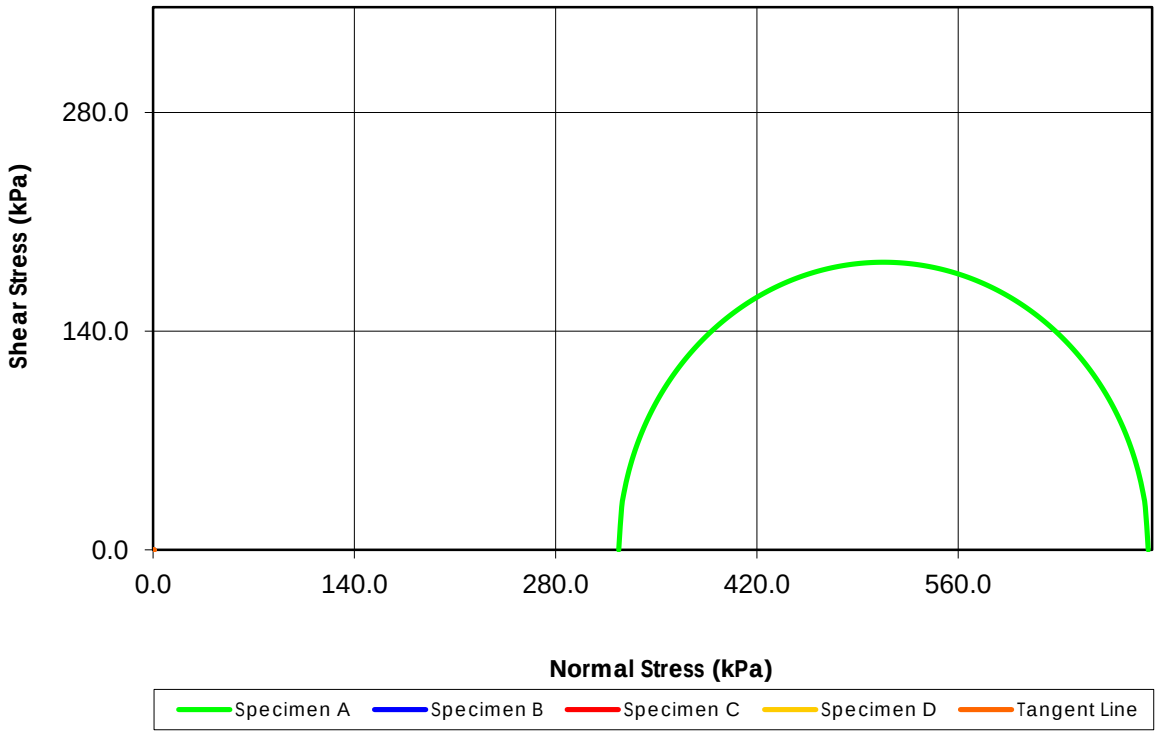

## Principal Stress Ratio vs. Axial Strain



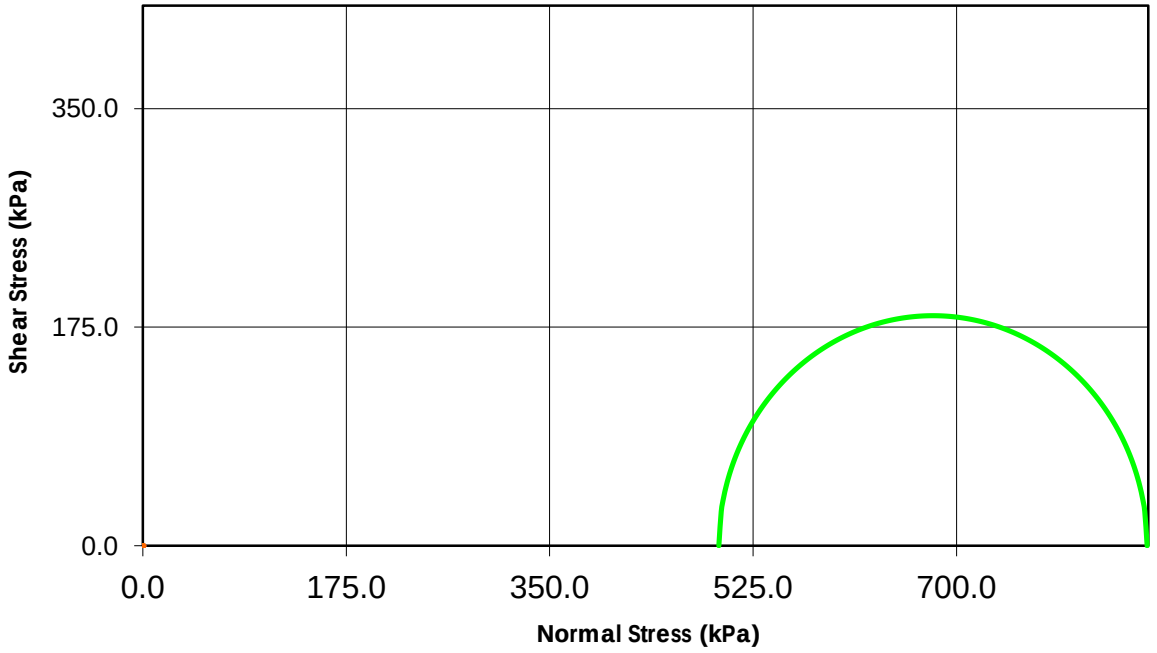

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
201.0
181.0
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

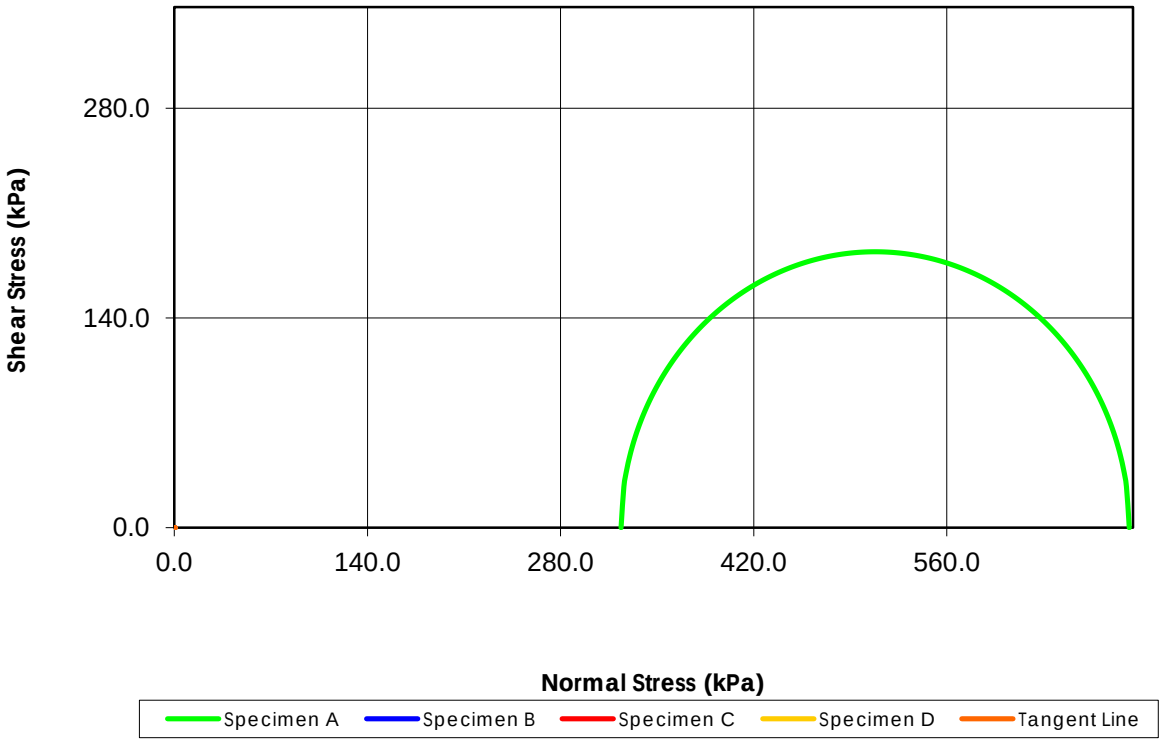



### Total Stress
### (C = 0.0 Ø = 0.0)

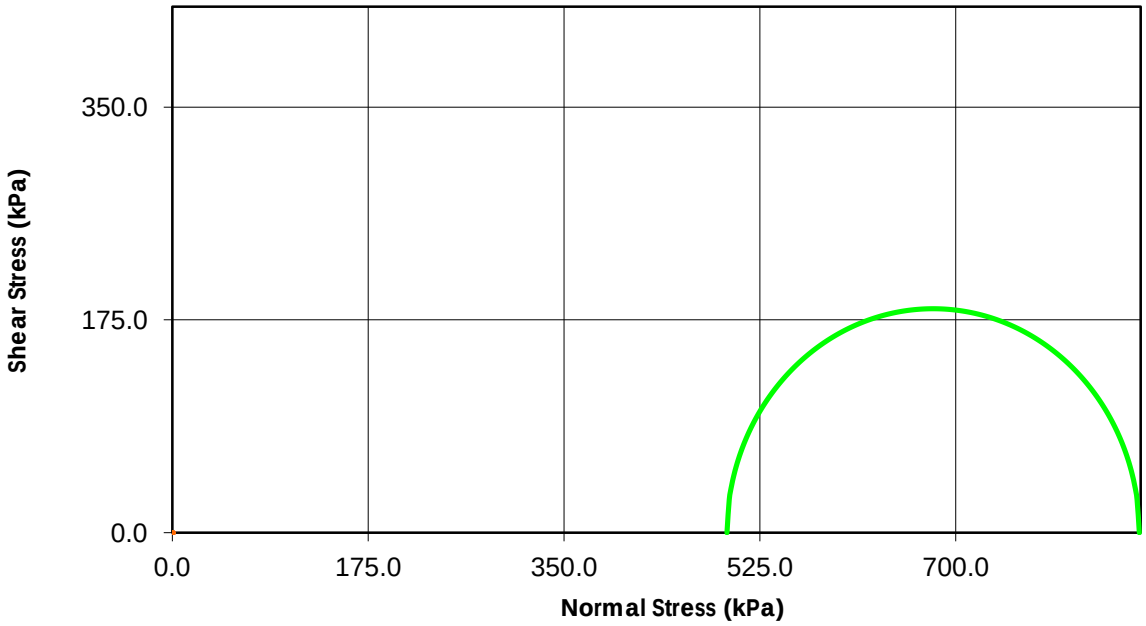


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

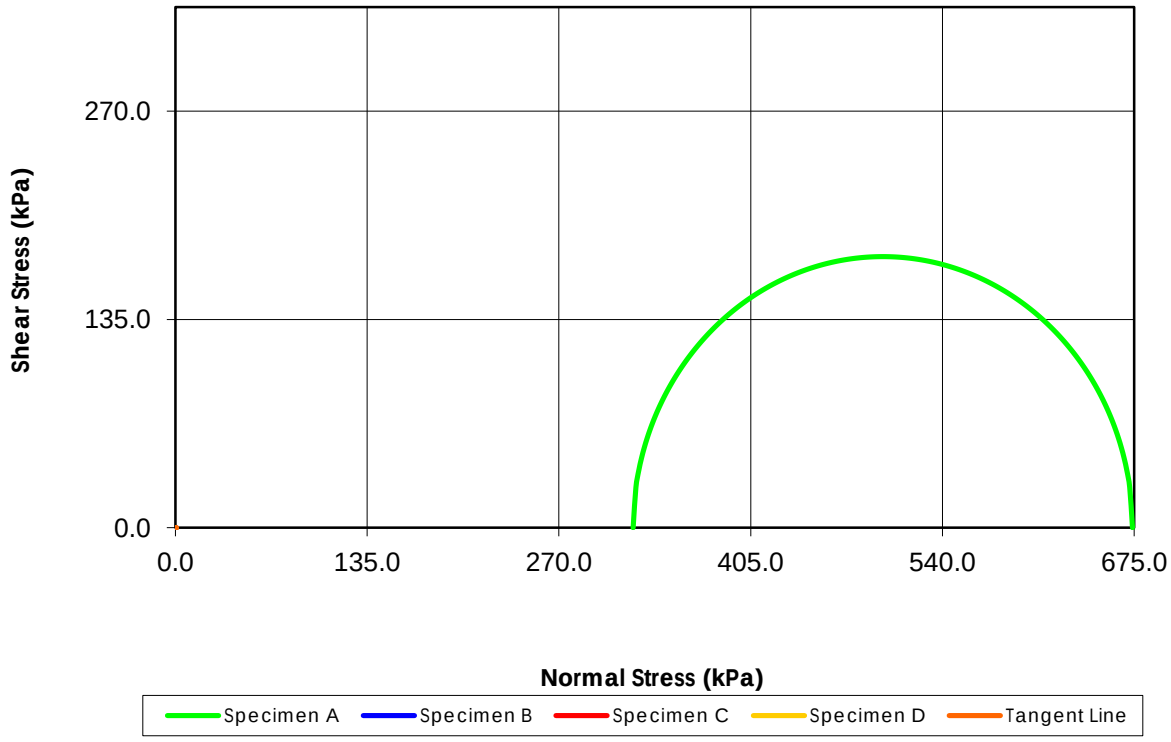



## Total Stress
## (C = 0.0 Ø = 0.0)

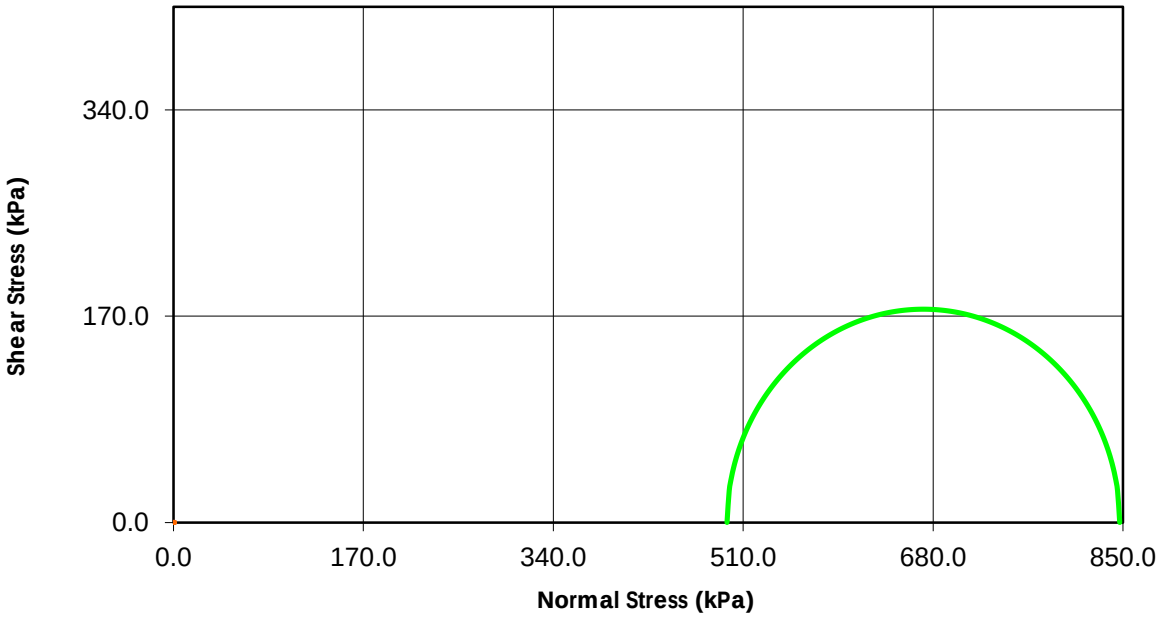


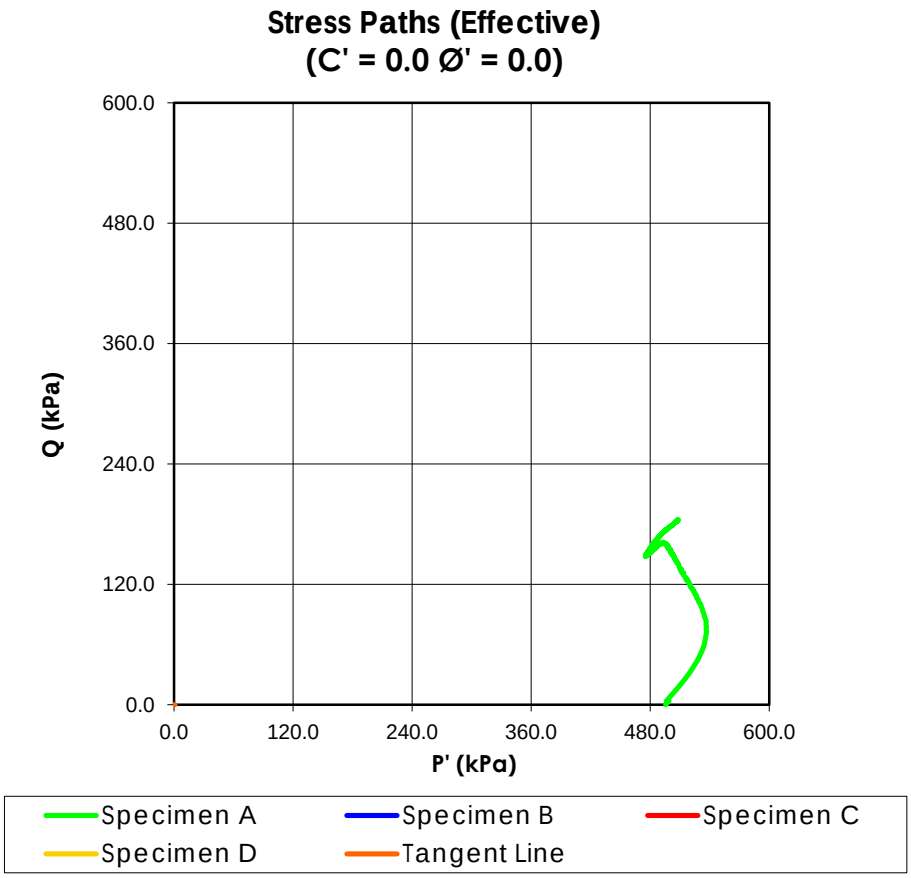
# Mohr Stress Circles at 15% Axial Strain Criterion

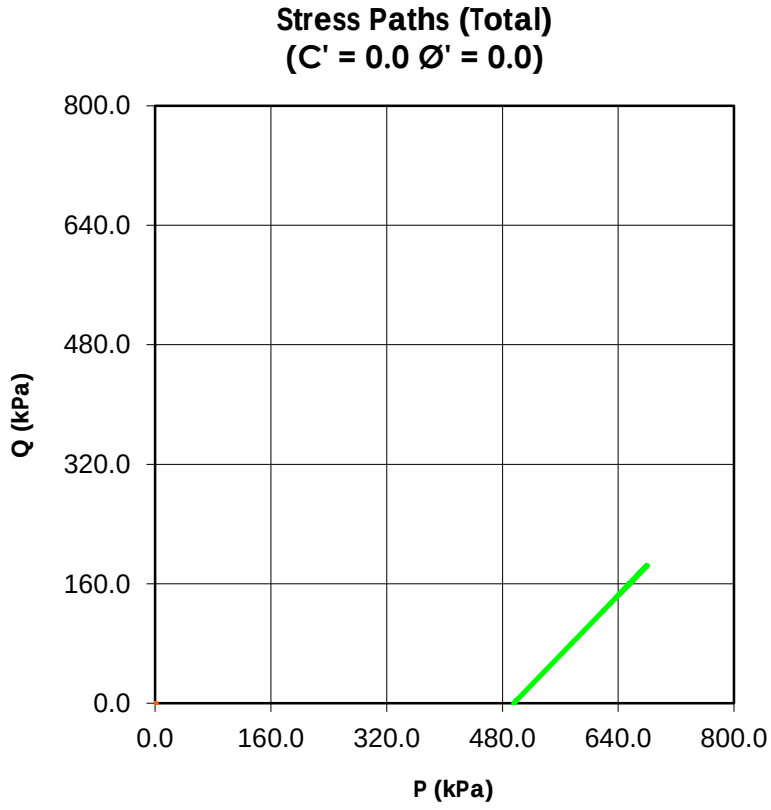
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

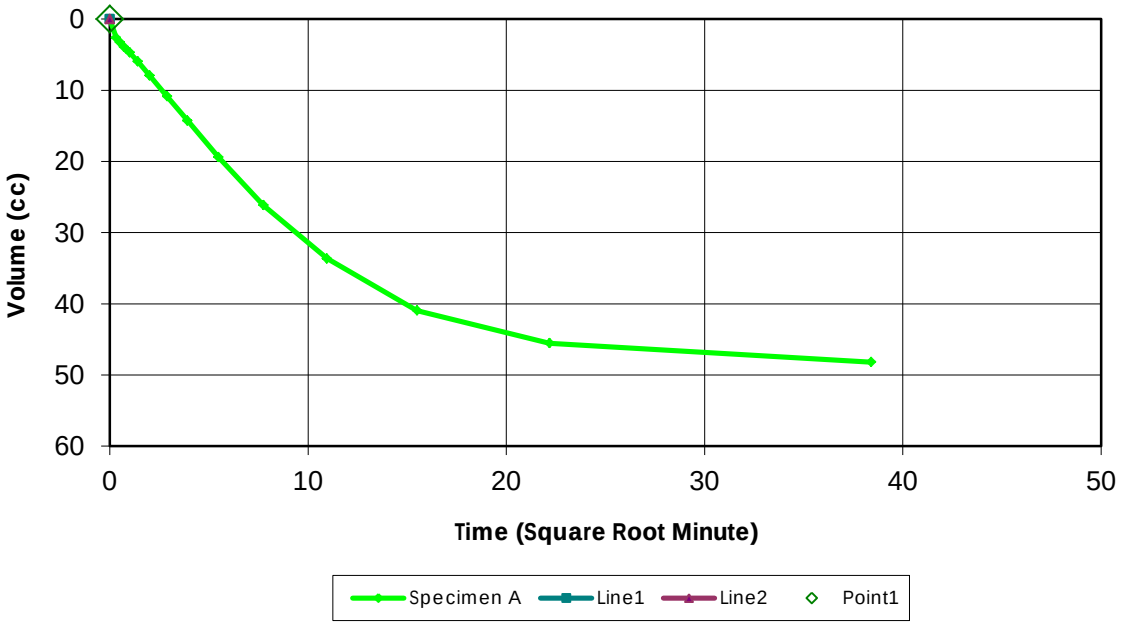



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

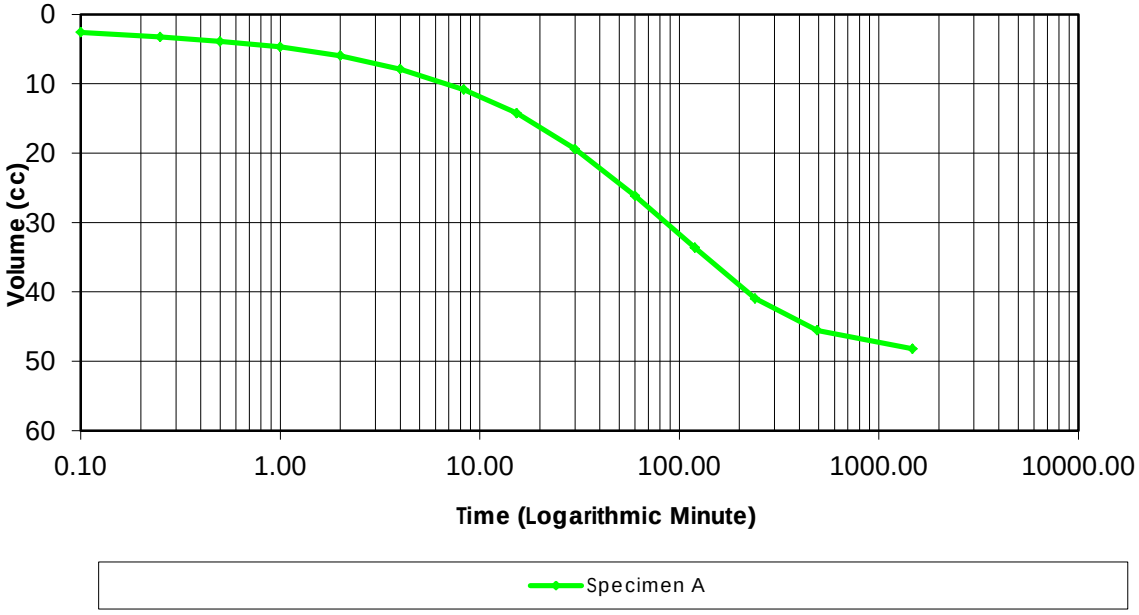

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
**CU Triaxial Test**

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.95

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 95.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 2.60-3.05m

| | |
|---|---|
| Cell Pressure (kPa) | 540 |
| Back Pressure (kPa) | 40 |
| Effective Pressure (kPa) | 500 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.6 |
| Initial Sample Height (mm) | 153.1 |
| Initial Sample Area (cm2) | 41.4 |
| Initial Volume (cm3) | 633.8 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 42.35 | N/A |
| 00:00:06 | 39.75 | 2.600 |
| 00:00:15 | 39.10 | 3.250 |
| 00:00:30 | 38.45 | 3.900 |
| 00:01:00 | 37.65 | 4.700 |
| 00:02:00 | 36.40 | 5.950 |
| 00:04:00 | 34.45 | 7.900 |
| 00:08:20 | 31.50 | 10.850 |
| 00:15:20 | 28.10 | 14.250 |
| 00:30:00 | 22.95 | 19.400 |
| 01:00:00 | 16.20 | 26.150 |
| 02:00:00 | 8.70 | 33.650 |
| 04:00:00 | 1.40 | 40.950 |
| 08:12:00 | -3.20 | 45.550 |
| 24:35:00 | -5.85 | 48.200 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

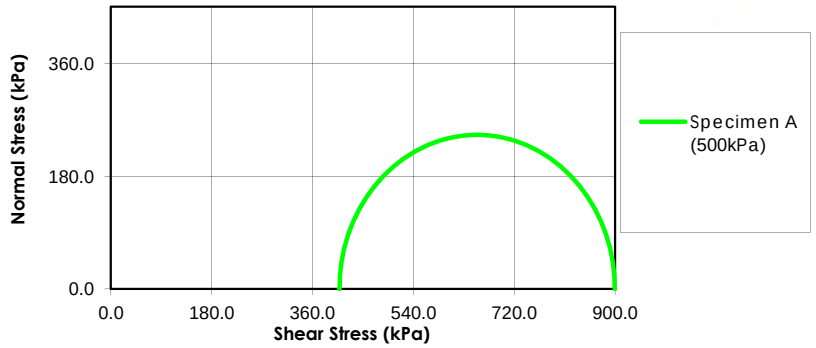
Stantec

Reviewed By C.Lamoureux

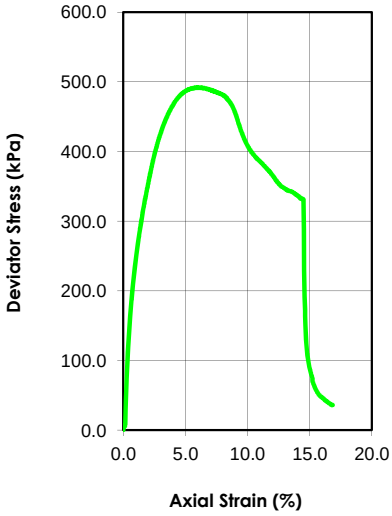
Date: 2-Oct-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.4 | | | |
| Dry Density (g/cm3) | 1.594 | | | |
| Saturation (%) | 106.52 | | | |
| Void Ratio | 0.691 | | | |
| Diameter (mm) | 71.9 | | | |
| Height (mm) | 154.5 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.94 | | | |
| Water Content (%) | 22.6 | | | |
| Dry Density (g/cm3) | 1.698 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.590 | | | |
| Effective Stress (kPa) | 495.2 | | | |
| Back Press. (kPa) | 104.8 | | | |
| Rate of Strain | 0.018 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 899.53 | | | |
| σ'3 at Failure (kPa) | 407.96 | | | |
| | | | | |
| | | | | |

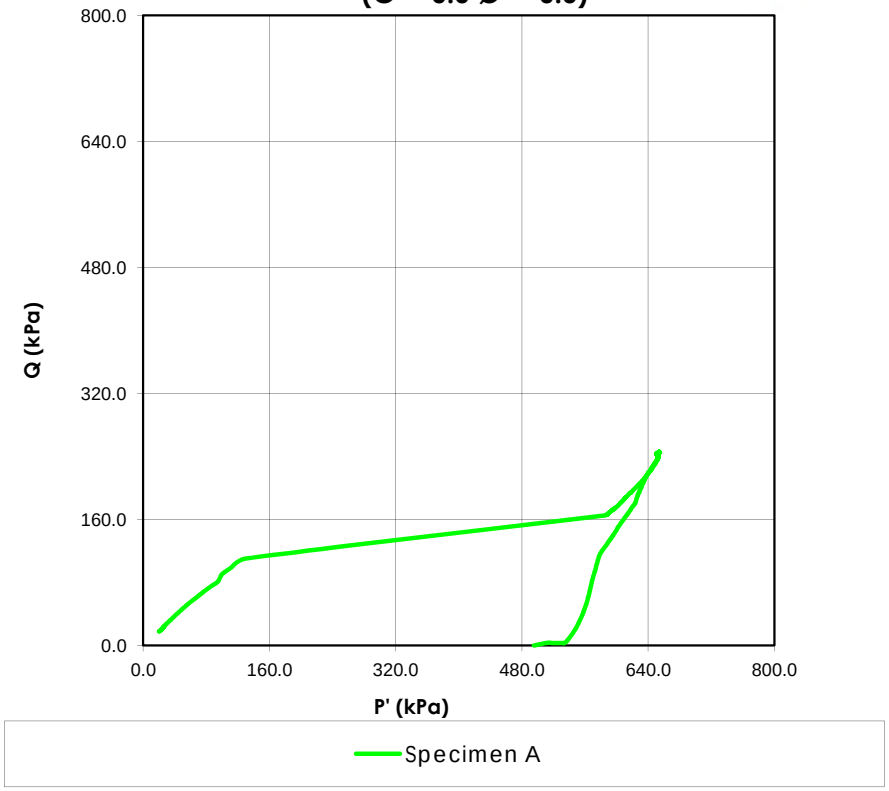
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D60 ST8 |
| **Depth:** | 3.5-4.0m |
| **Sample Type:** | Undisturbed |
| **Description:** | Light Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

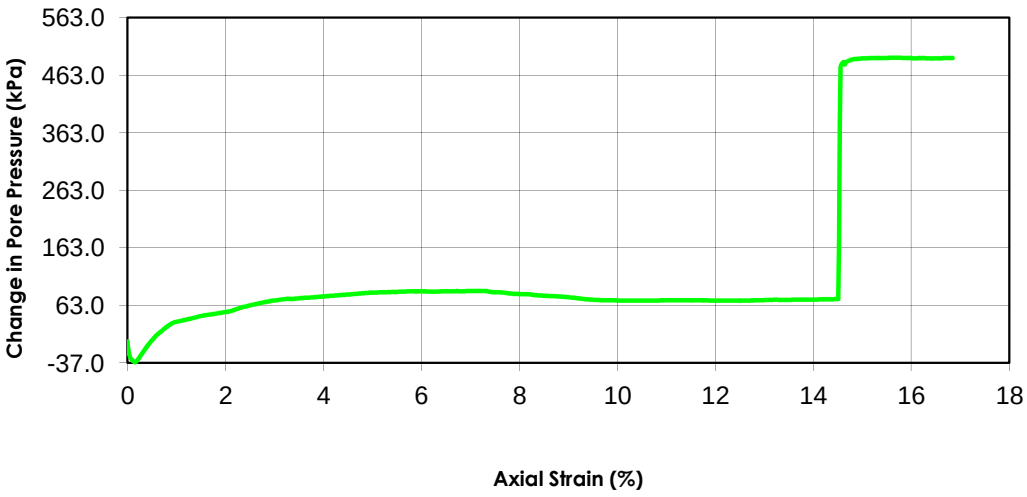
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

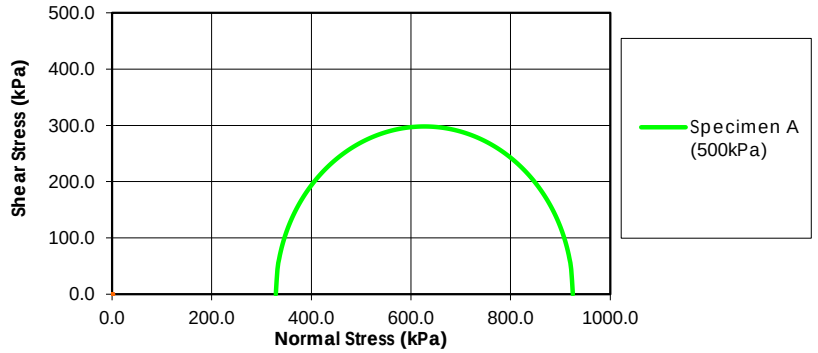
Stantec

Reviewed By C. Lamoureux

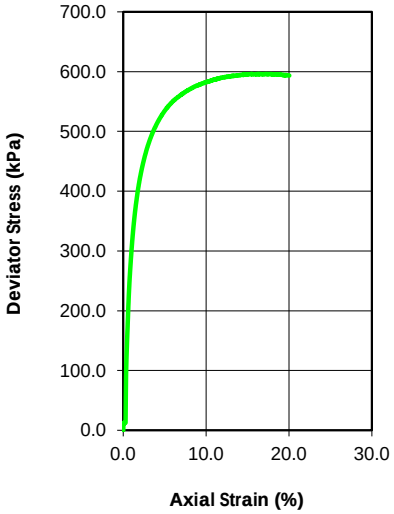
Date: 15-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 16.8 | | | |
| Dry Density (g/cm3) | 1.863 | | | |
| Saturation (%) | 100.83 | | | |
| Void Ratio | 0.449 | | | |
| Diameter (mm) | 71.100 | | | |
| Height (mm) | 152.600 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 13.0 | | | |
| Dry Density (g/cm3) | 2.026 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.332 | | | |
| Effective Stress (kPa) | 593.0 | | | |
| Back Press. (kPa) | 67.0 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

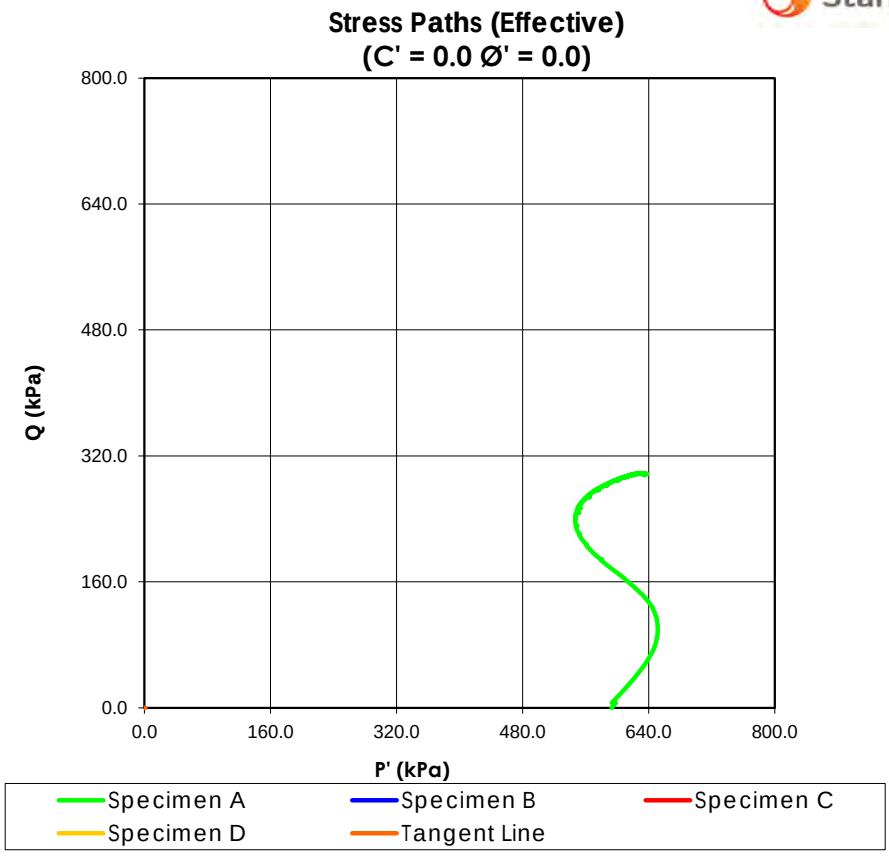
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 924.85 | | | |
| σ'3 at Failure (kPa) | 328.73 | | | |
| | | | | |
| | | | | |

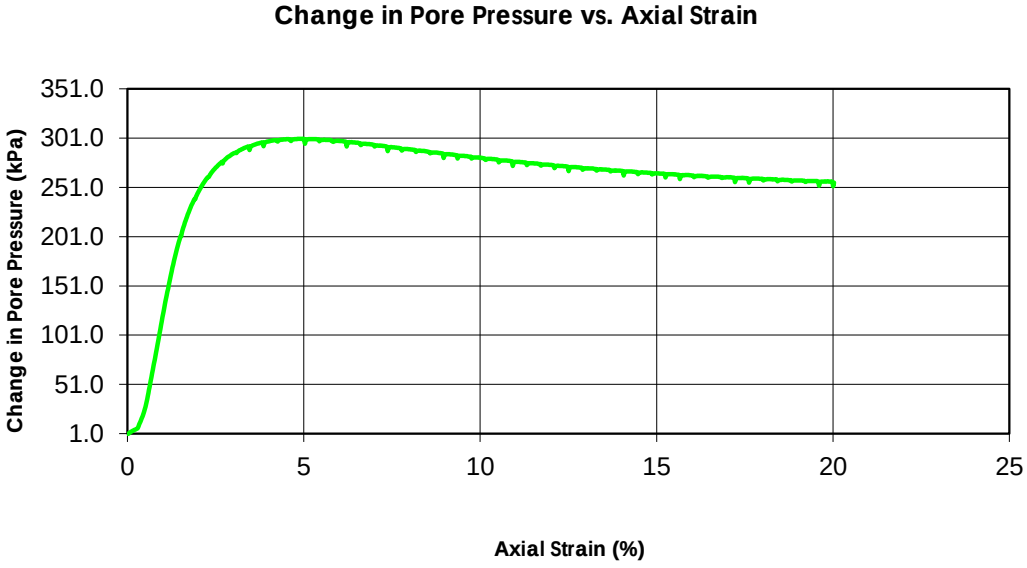
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D60 ST10 |
| **Depth:** | 4.40-4.85m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Gravelly Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

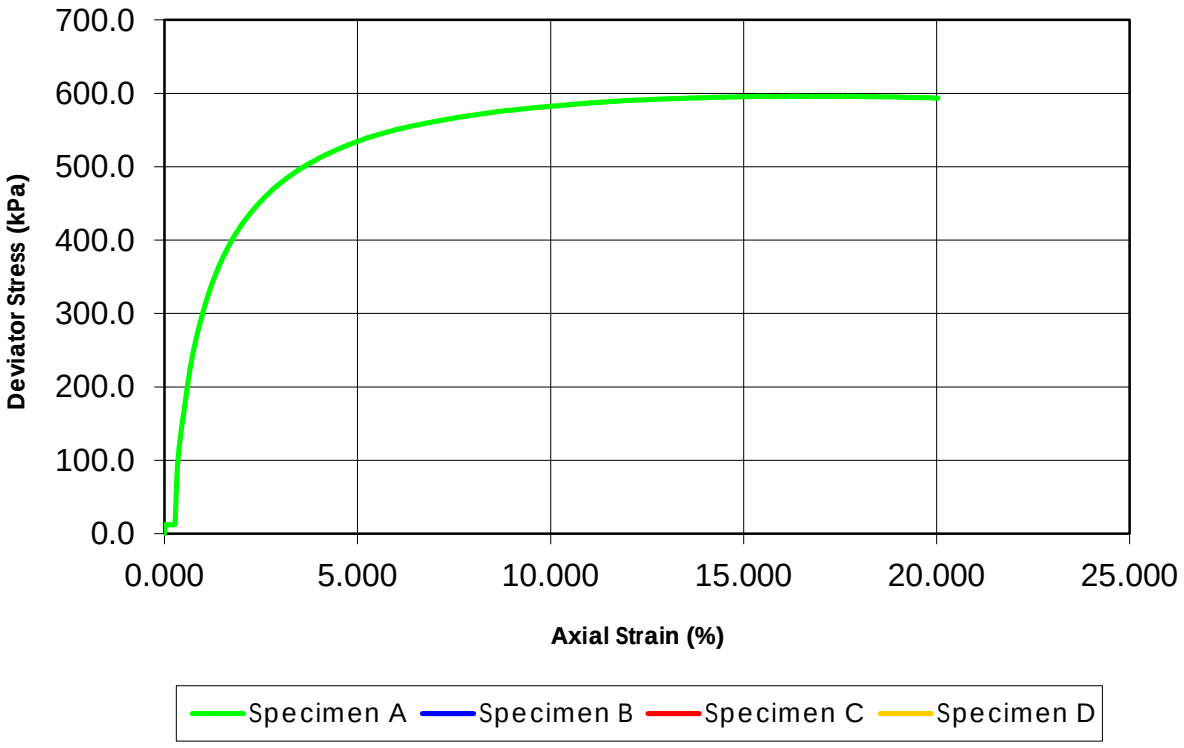
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

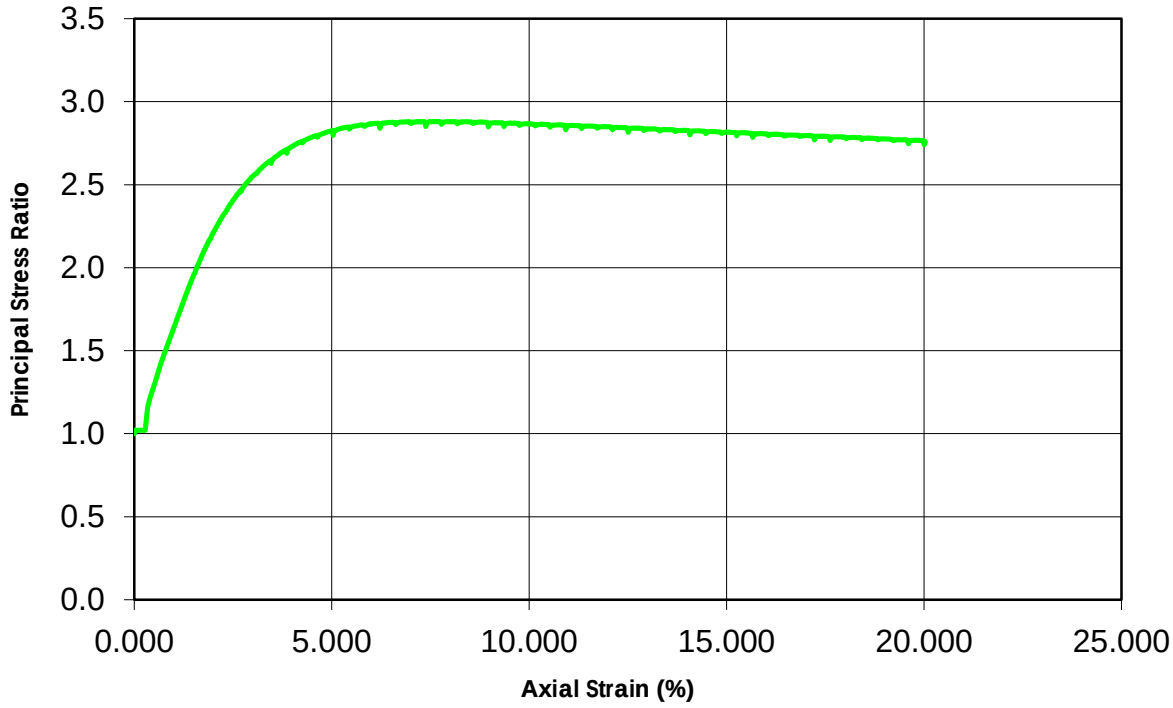


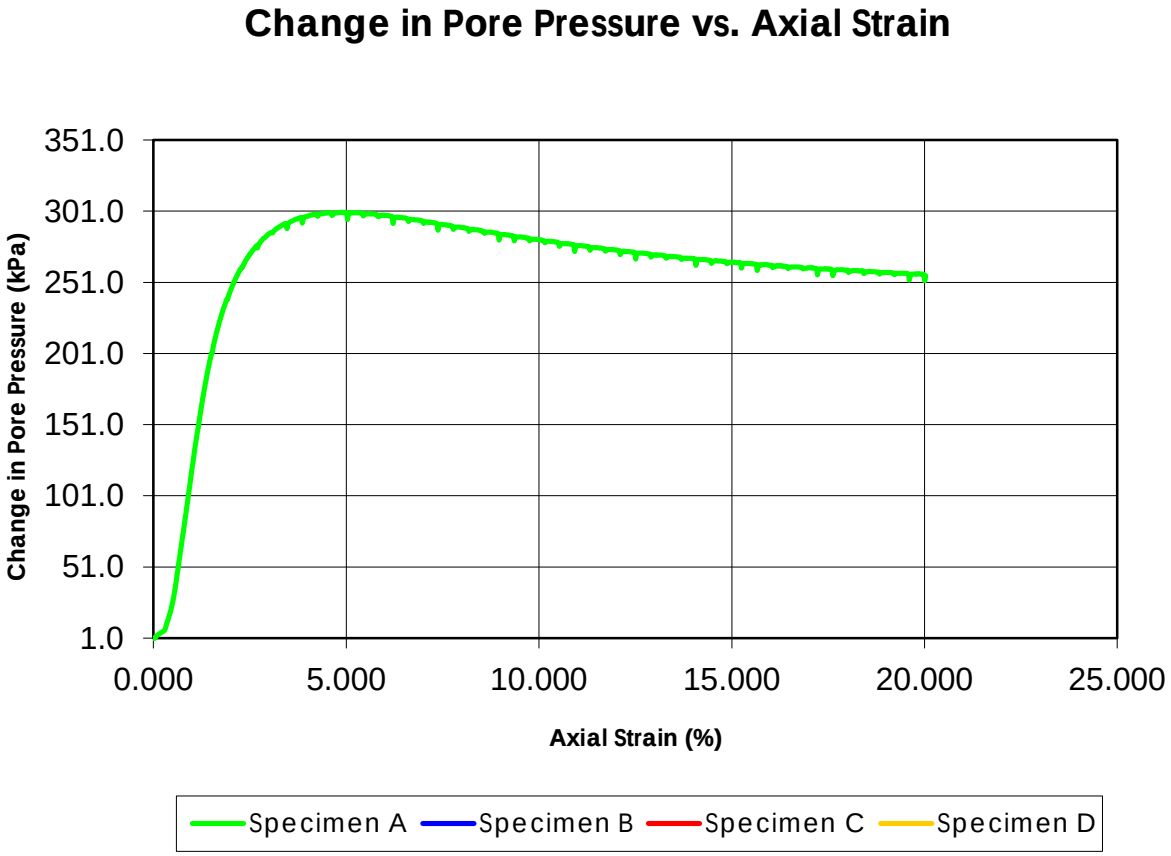



## Deviator Stress vs. Axial Strain



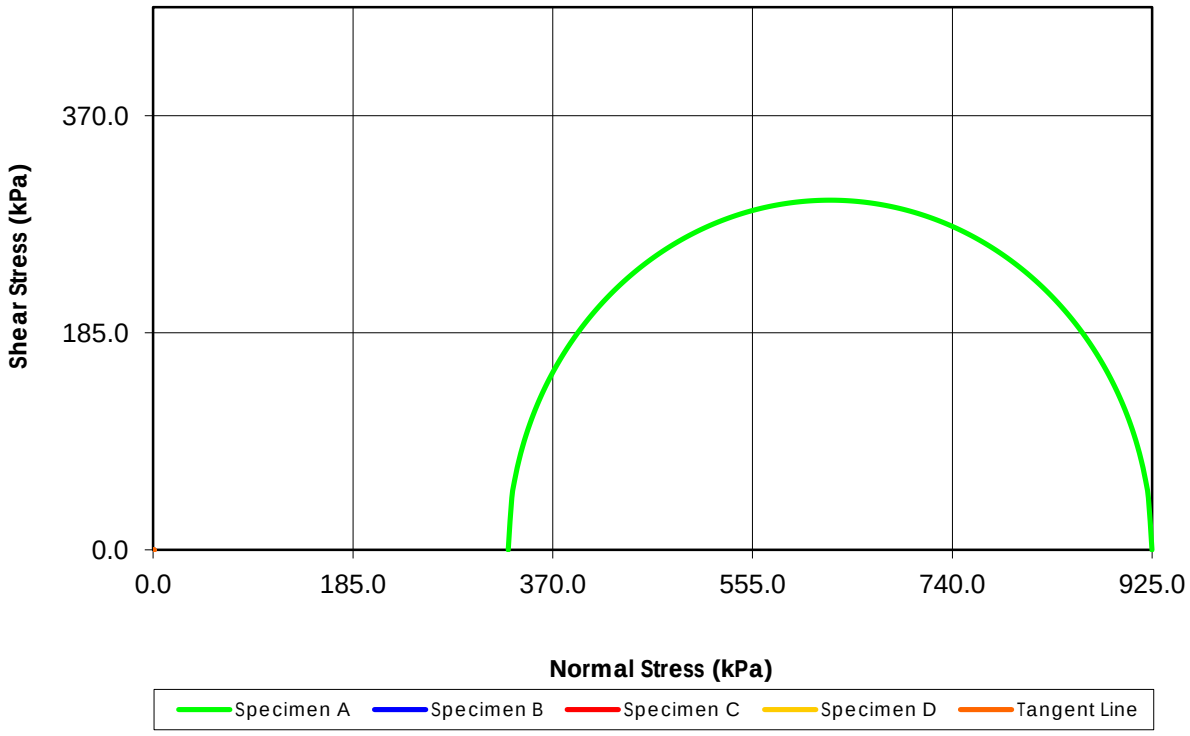

## Principal Stress Ratio vs. Axial Strain



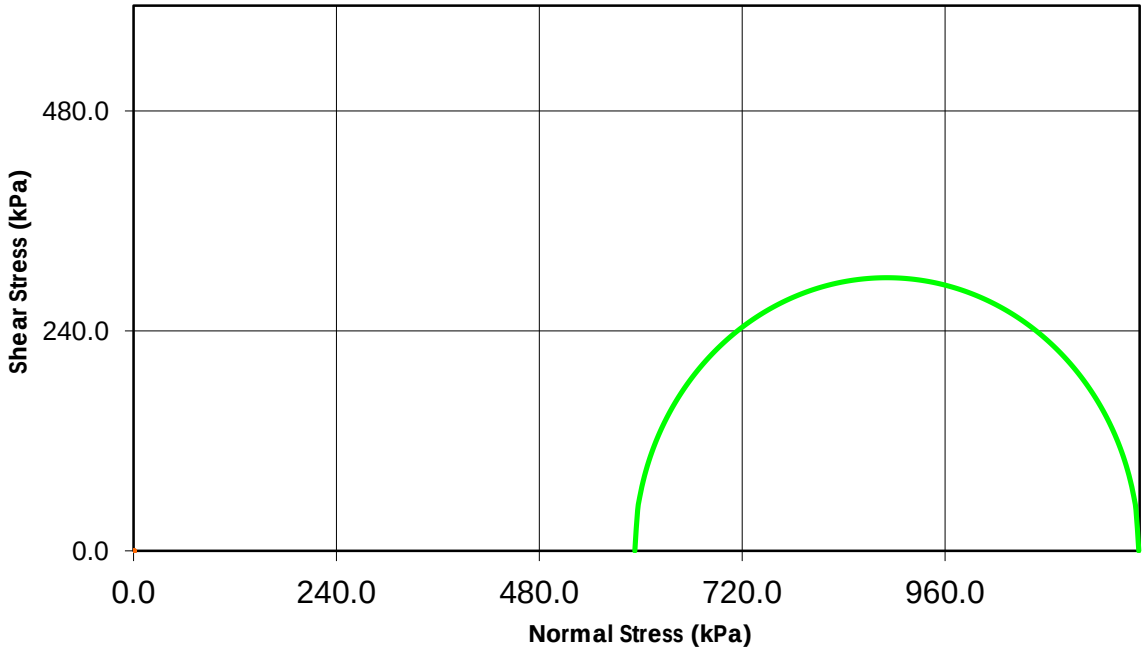

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
351.0
301.0
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

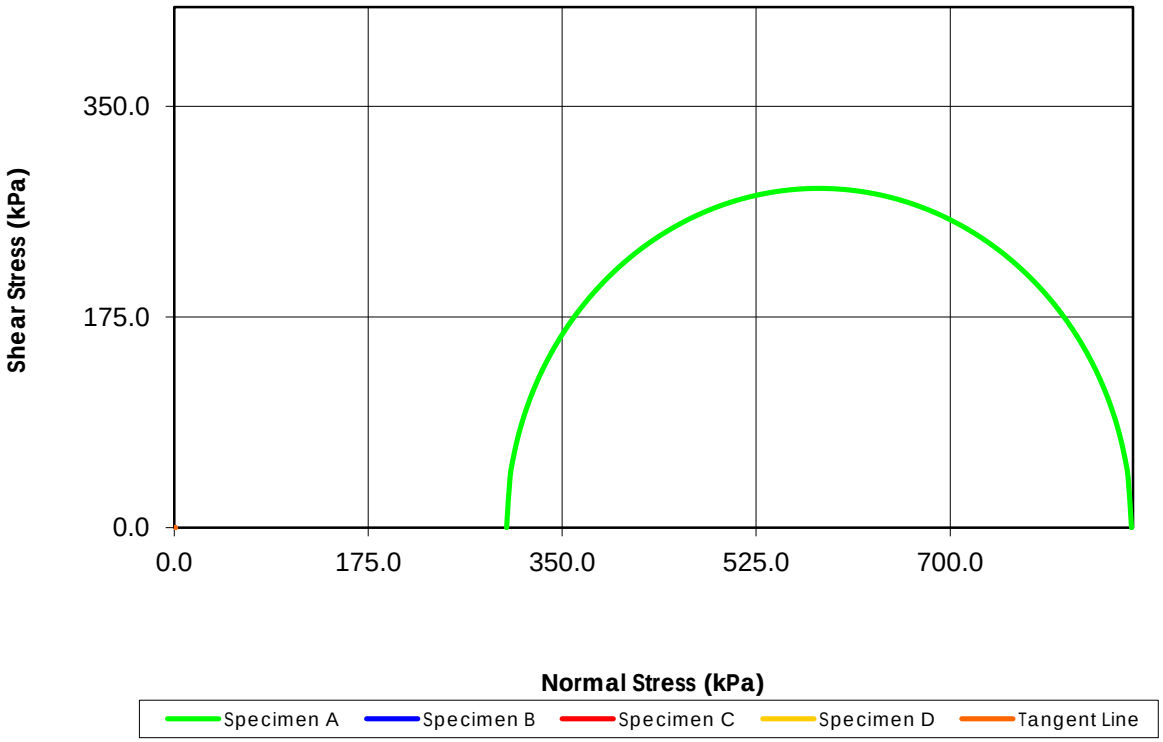



### Total Stress
### (C = 0.0 Ø = 0.0)

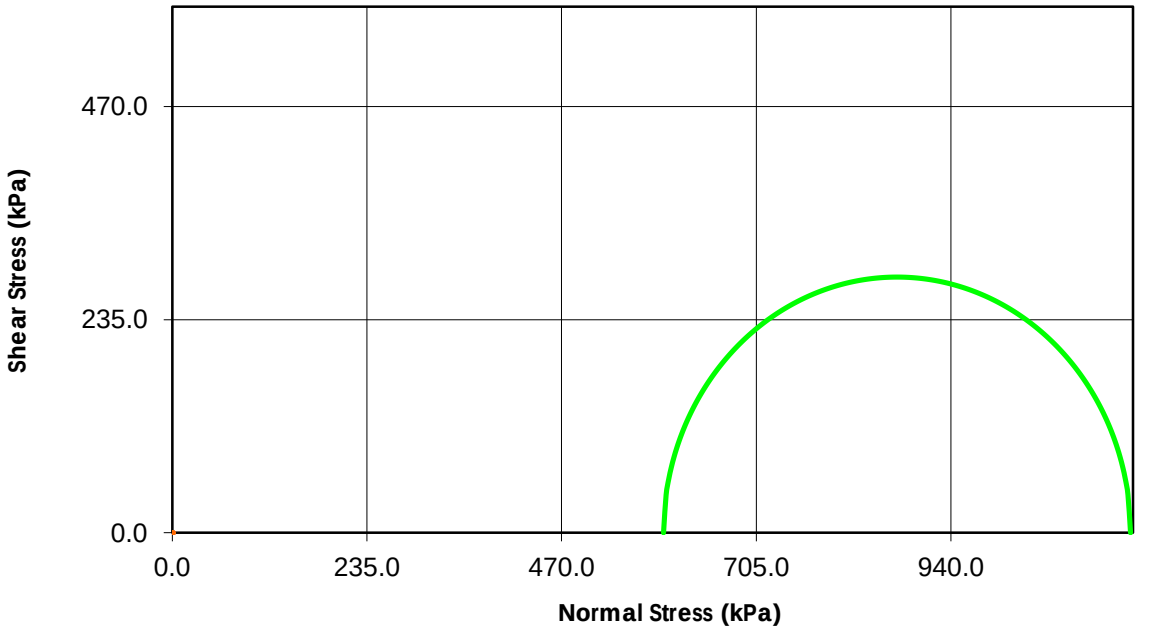


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

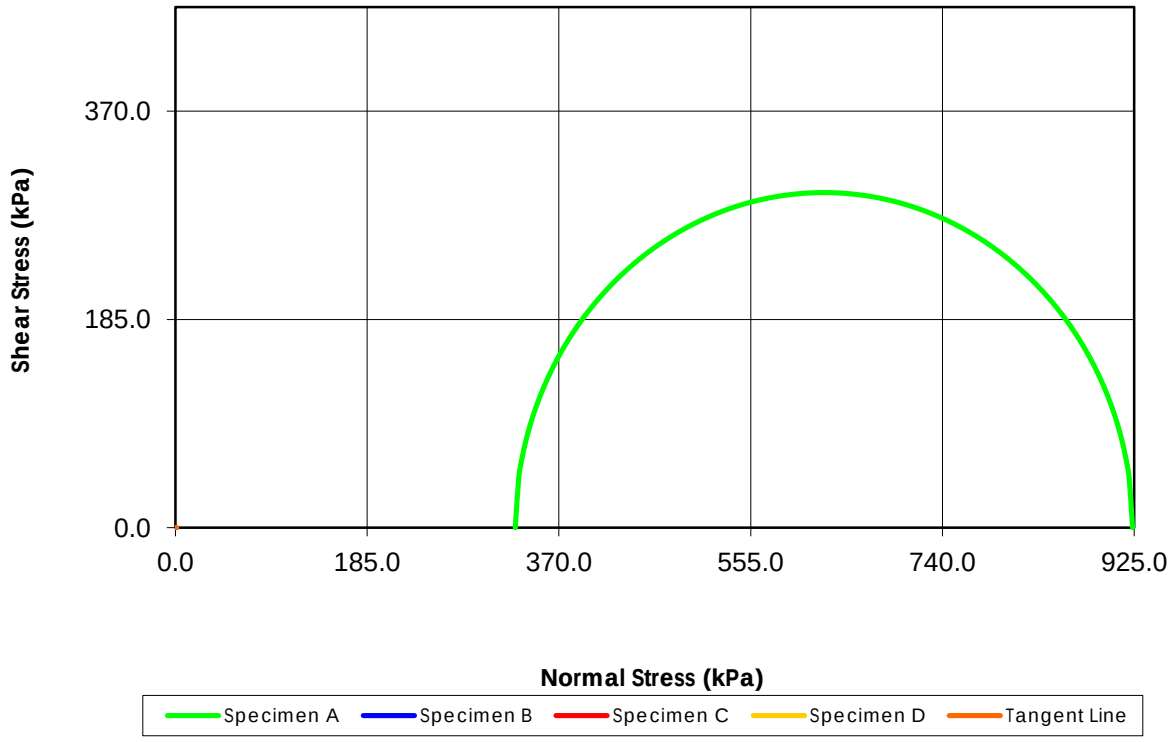



## Total Stress
## (C = 0.0 Ø = 0.0)

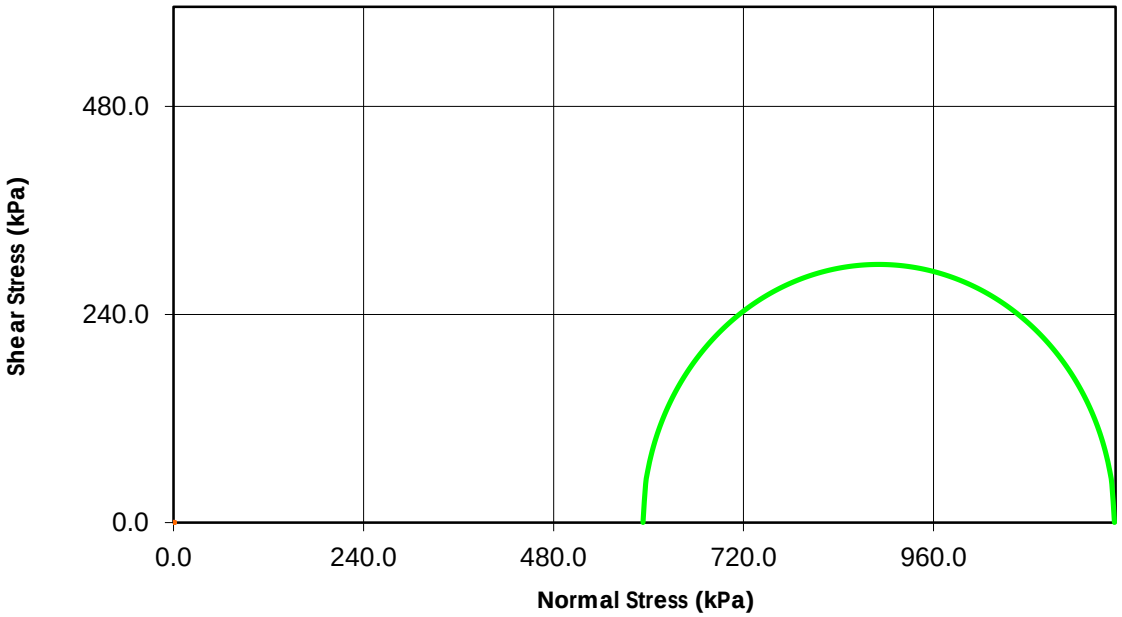


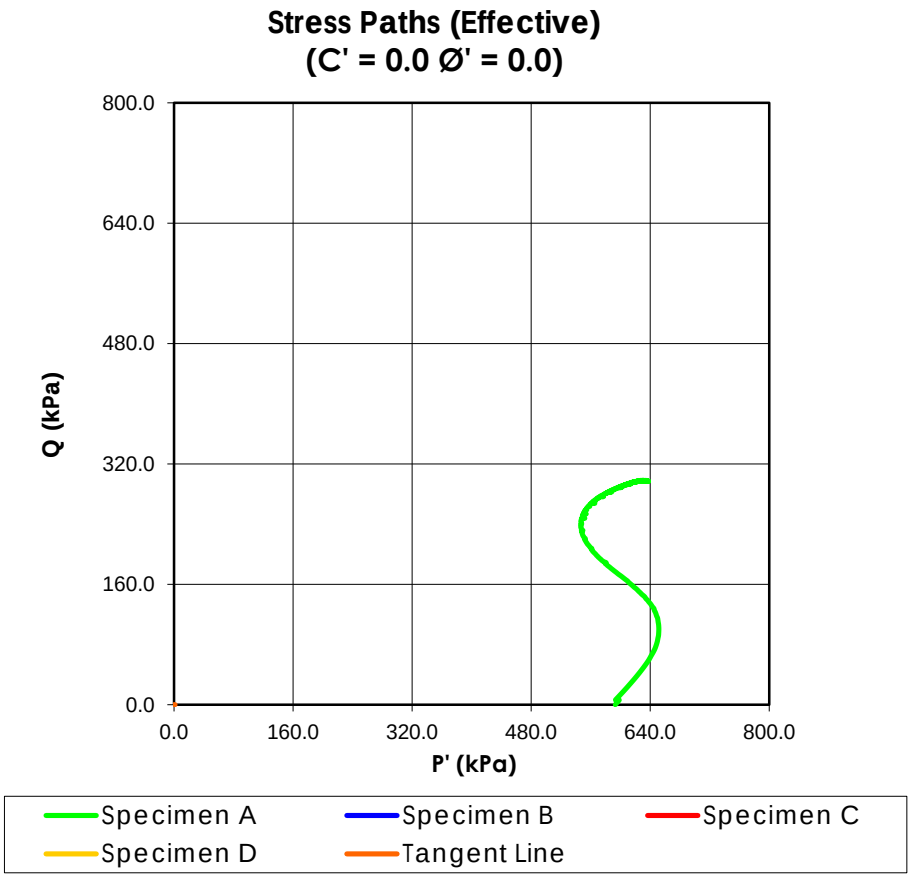
# Mohr Stress Circles at 15% Axial Strain Criterion

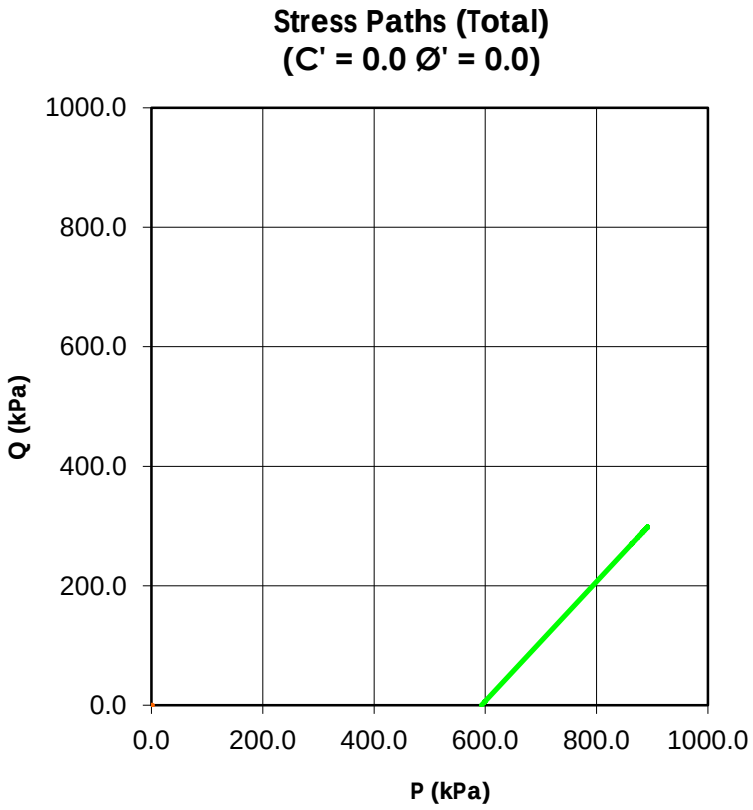
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

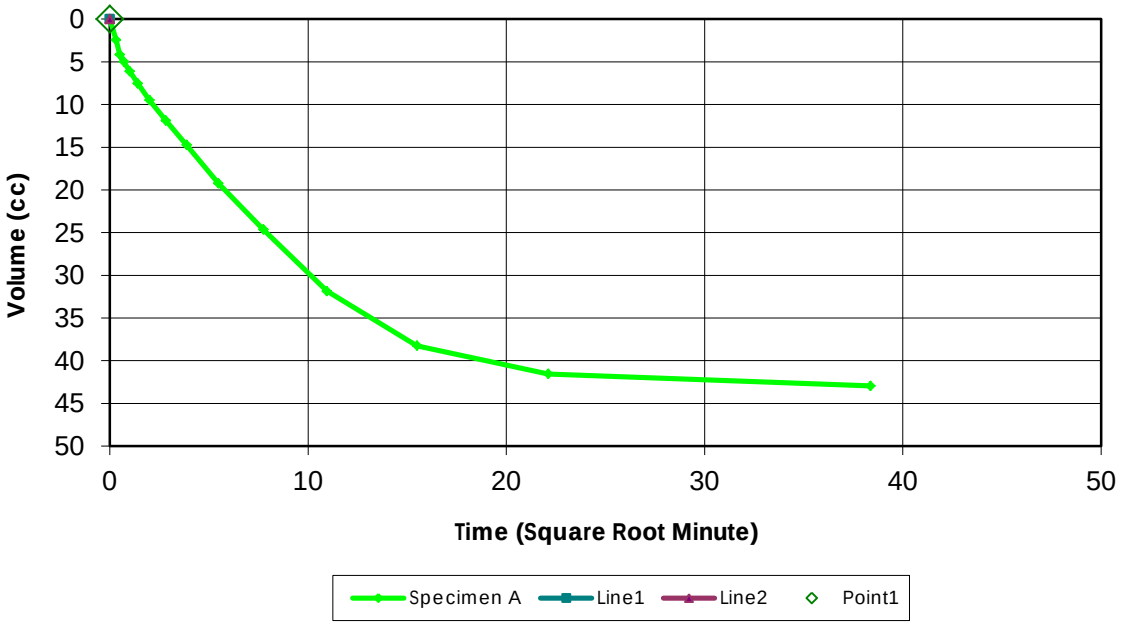



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

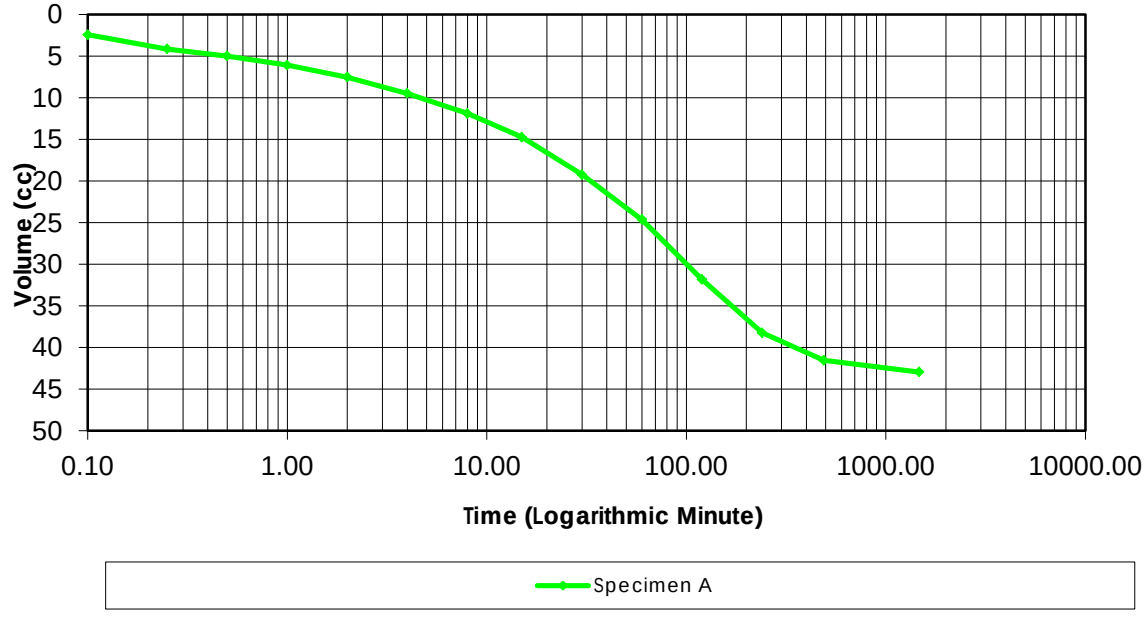

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.97

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 0.74 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 90.0 | 60.0 | 10.0 | 0.0 | 0.97 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 4.40-4.85m

| | |
|---|---|
| Cell Pressure (kPa) | 660 |
| Back Pressure (kPa) | 60 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71.1 |
| Initial Sample Height (mm) | 152.6 |
| Initial Sample Area (cm2) | 39.7 |
| Initial Volume (cm3) | 605.9 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.05 | N/A |
| 00:00:06 | 41.60 | 2.450 |
| 00:00:15 | 39.90 | 4.150 |
| 00:00:30 | 39.05 | 5.000 |
| 00:01:00 | 37.95 | 6.100 |
| 00:02:00 | 36.50 | 7.550 |
| 00:04:00 | 34.55 | 9.500 |
| 00:08:00 | 32.15 | 11.900 |
| 00:15:00 | 29.30 | 14.750 |
| 00:30:00 | 24.80 | 19.250 |
| 01:00:00 | 19.40 | 24.650 |
| 02:00:00 | 12.20 | 31.850 |
| 04:00:00 | 5.80 | 38.250 |
| 08:09:00 | 2.50 | 41.550 |
| 24:32:00 | 1.10 | 42.950 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

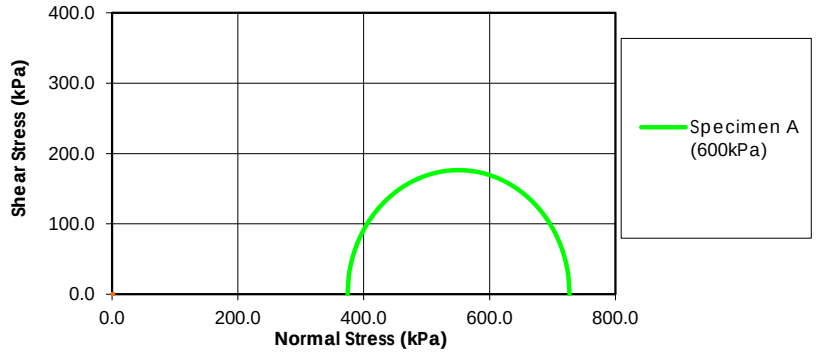
Stantec

Reviewed By C. Lamoureux

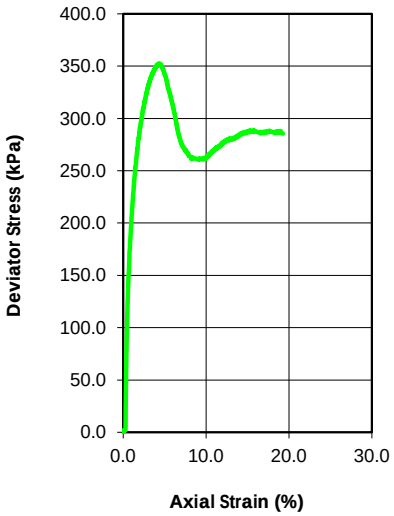
Date: 31-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.9 | | | |
| Dry Density (g/cm3) | 1.527 | | | |
| Saturation (%) | 98.10 | | | |
| Void Ratio | 0.768 | | | |
| Diameter (mm) | 72.200 | | | |
| Height (mm) | 150.800 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.99 | | | |
| Water Content (%) | 21.7 | | | |
| Dry Density (g/cm3) | 1.652 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.634 | | | |
| Effective Stress (kPa) | 600.6 | | | |
| Back Press. (kPa) | 79.4 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

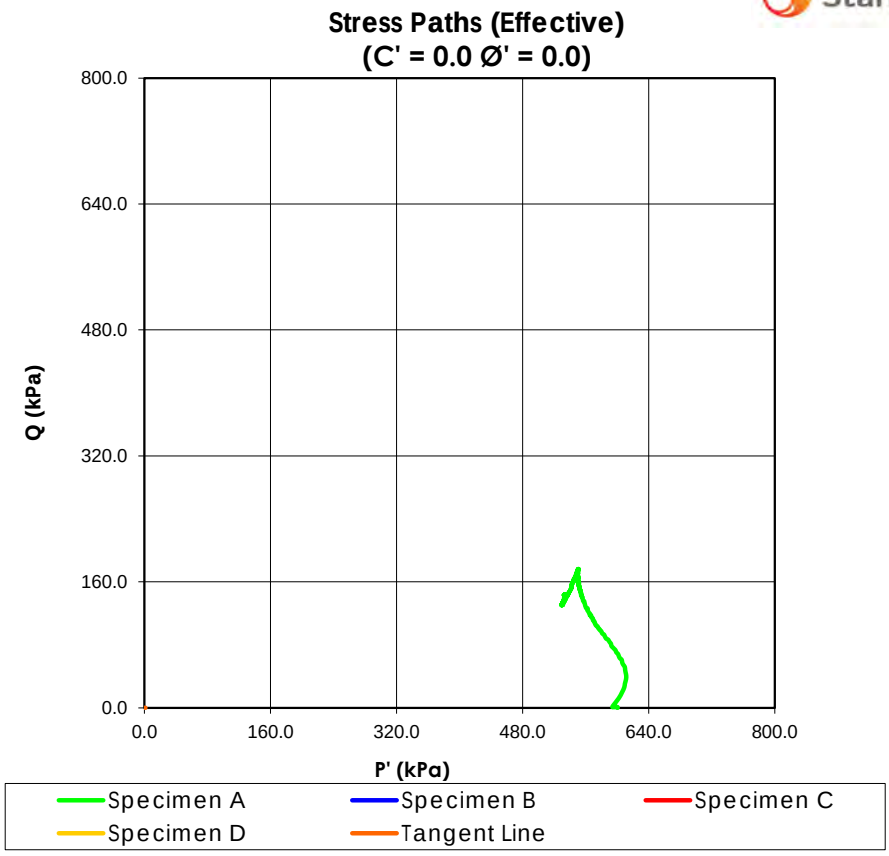
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 727.09 | | | |
| σ'3 at Failure (kPa) | 374.35 | | | |
| | | | | |
| | | | | |

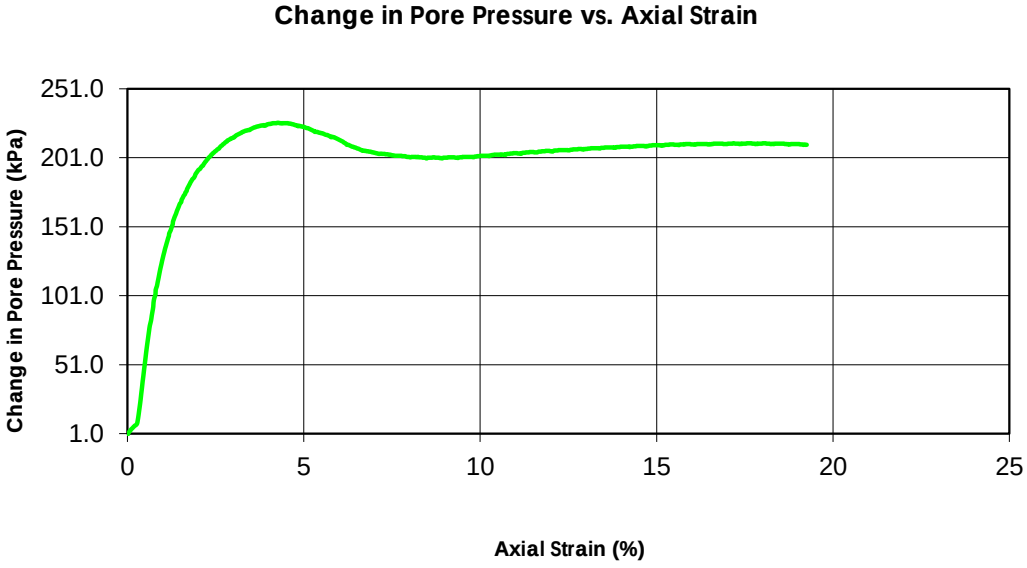
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | D68 ST6 |
| **Depth:** | 2.60-3.05m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

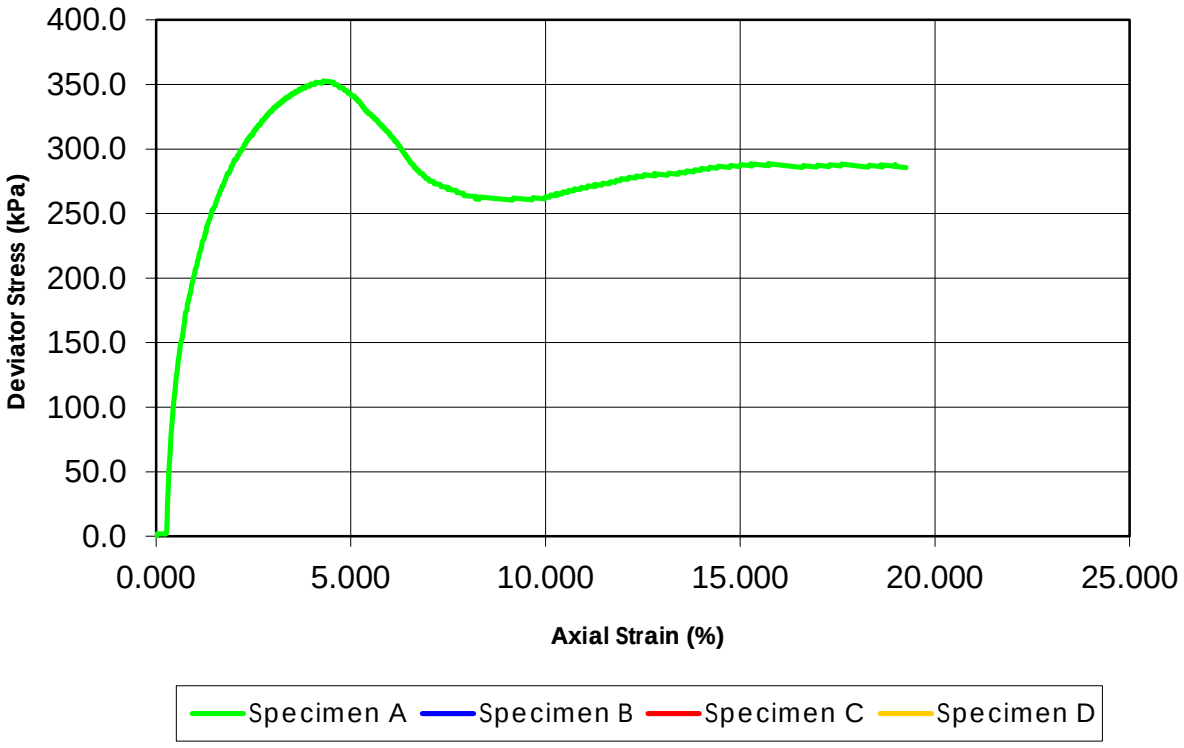
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

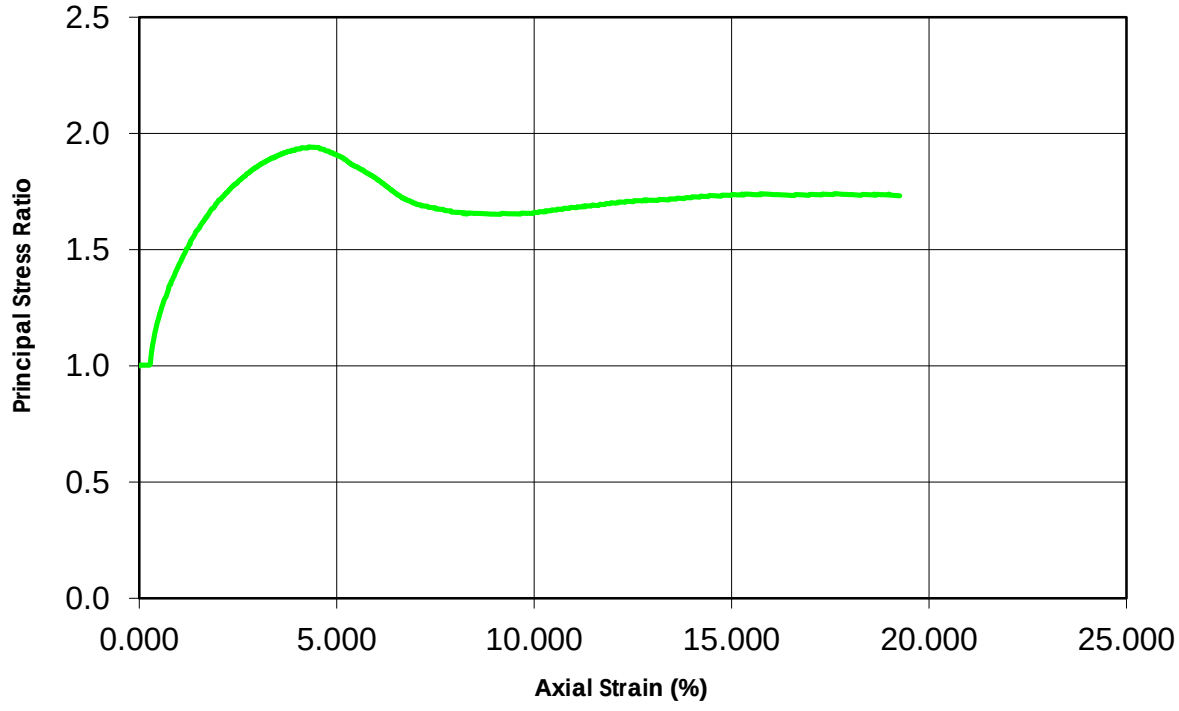


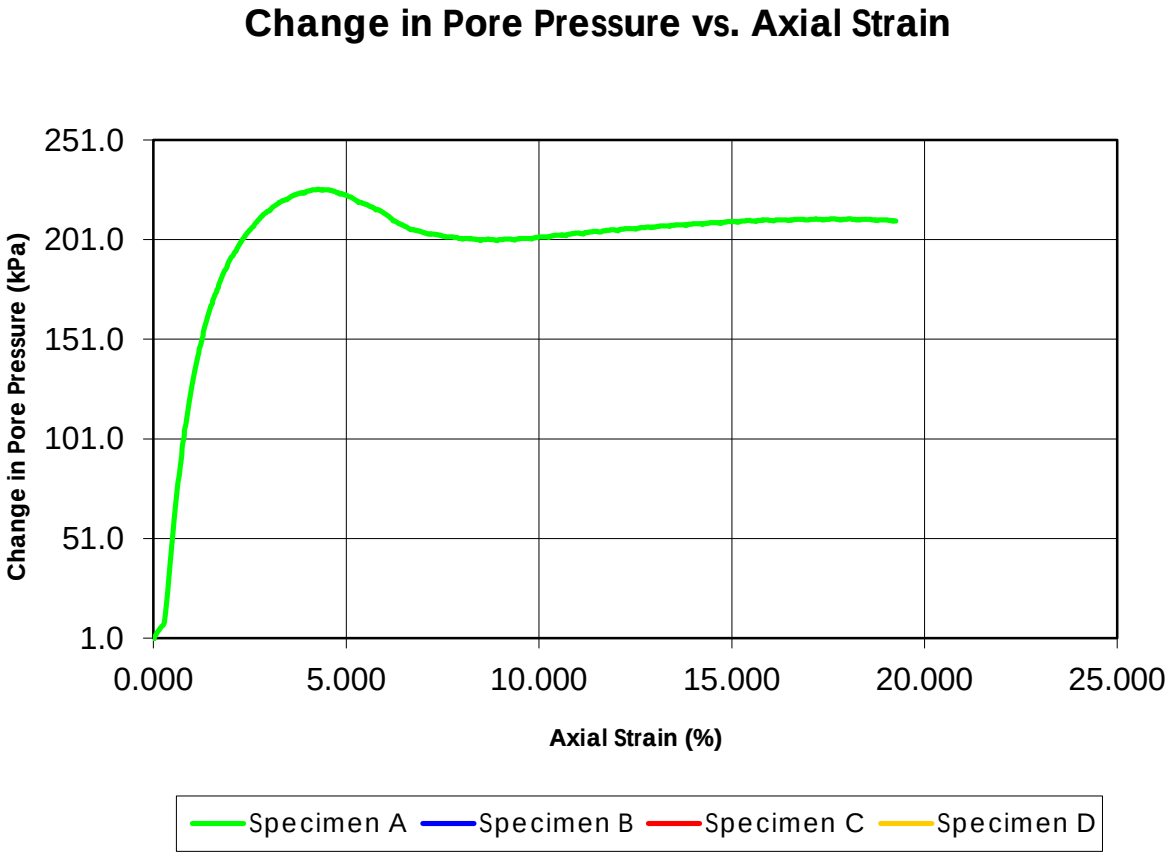



## Deviator Stress vs. Axial Strain



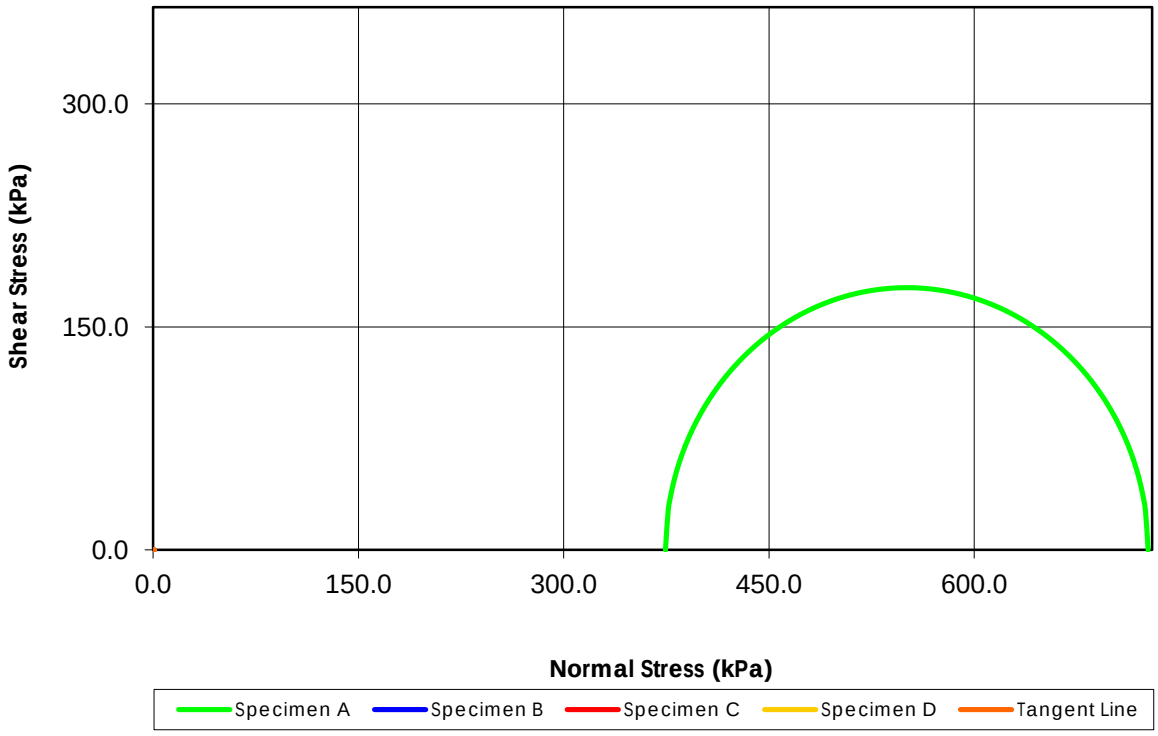

## Principal Stress Ratio vs. Axial Strain



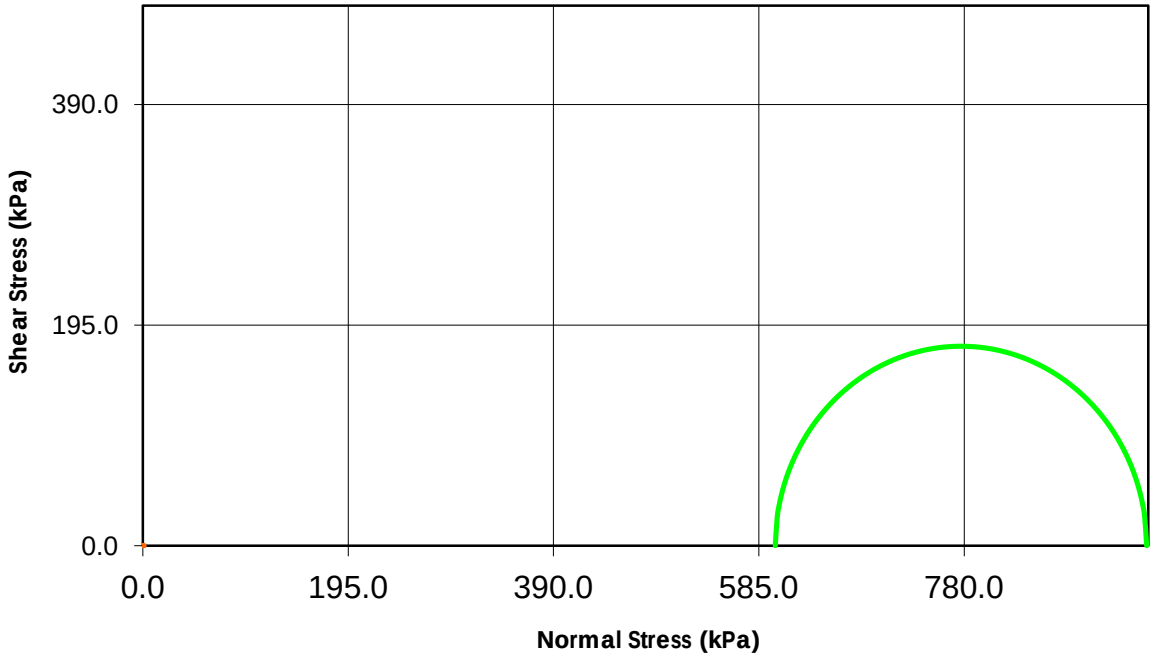

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
251.0
201.0
151.0
101.0
51.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

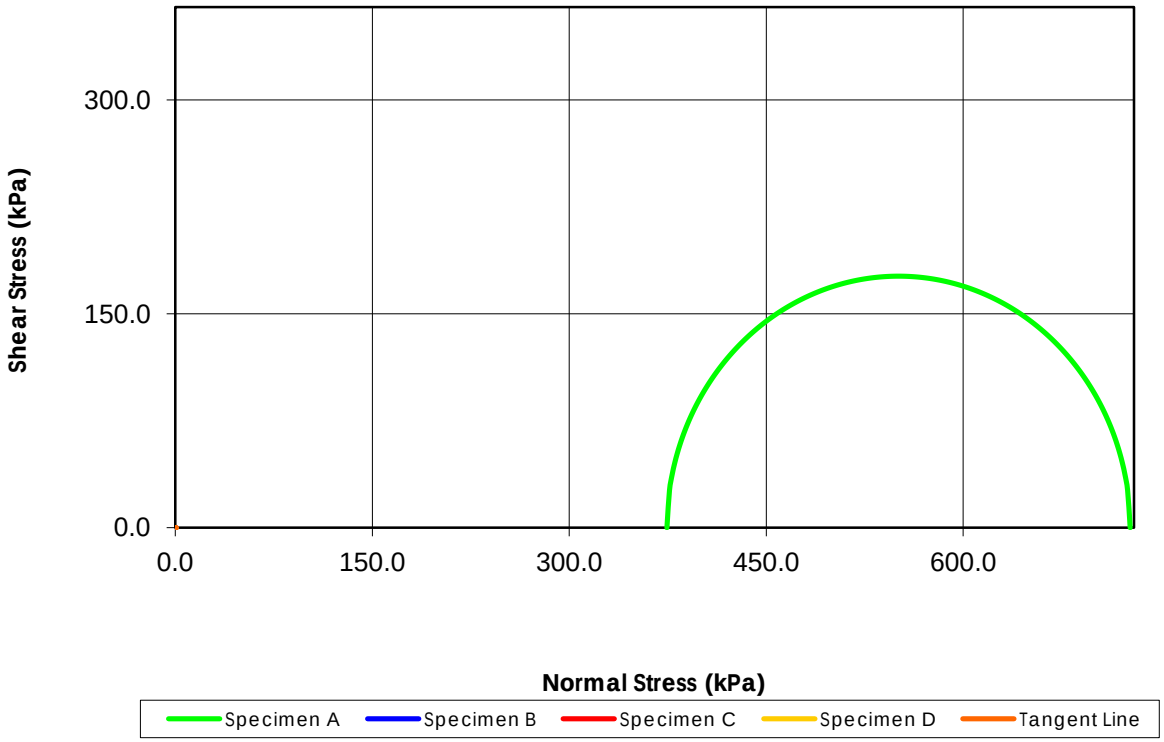



### Total Stress
### (C = 0.0 Ø = 0.0)

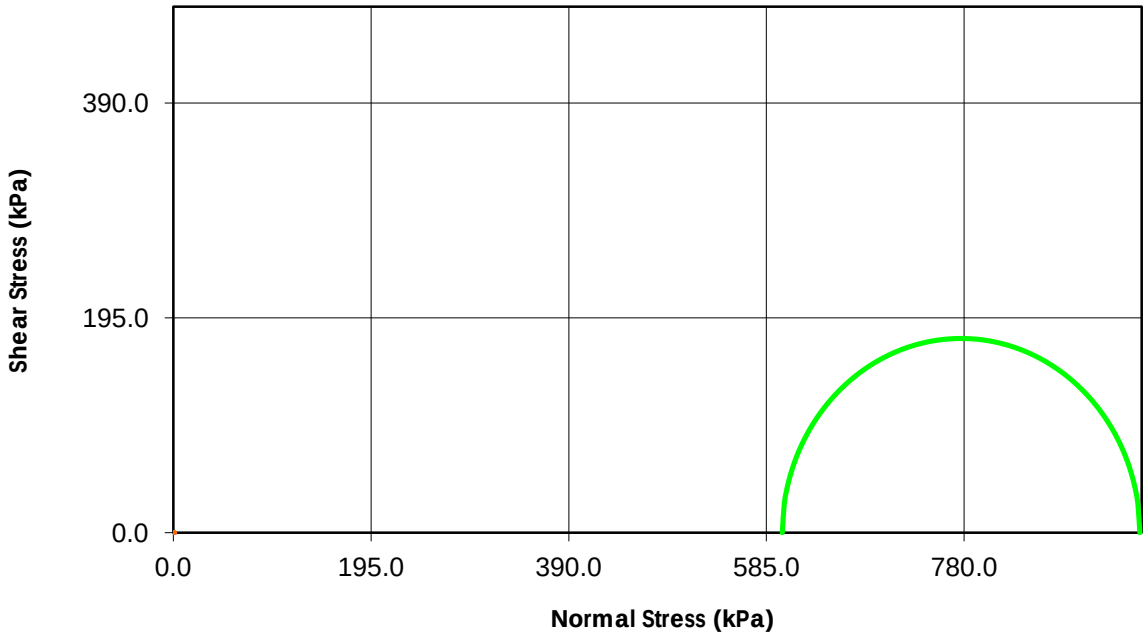


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)



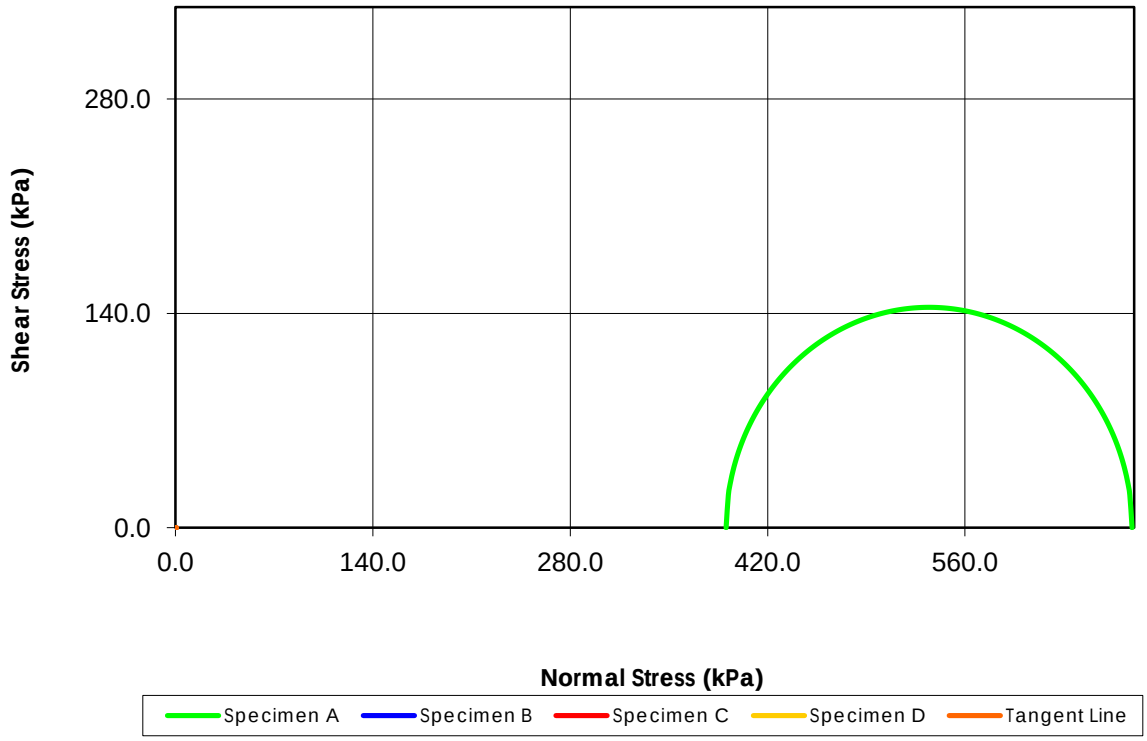

## Total Stress
## (C = 0.0 Ø = 0.0)



# Mohr Stress Circles at 15% Axial Strain Criterion

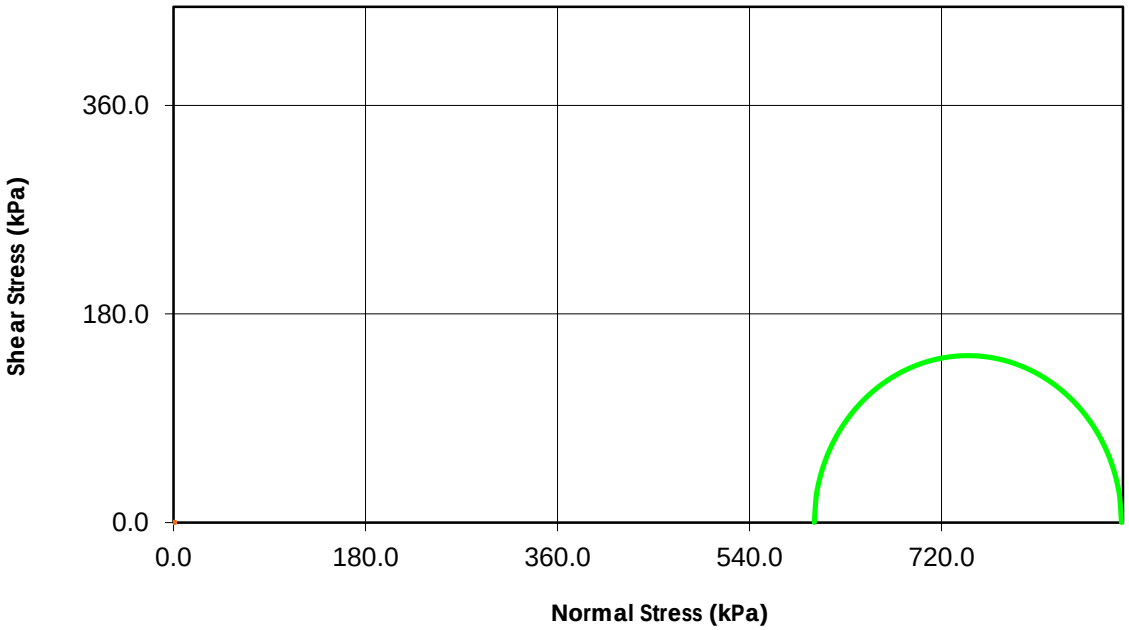
## Effective Stress

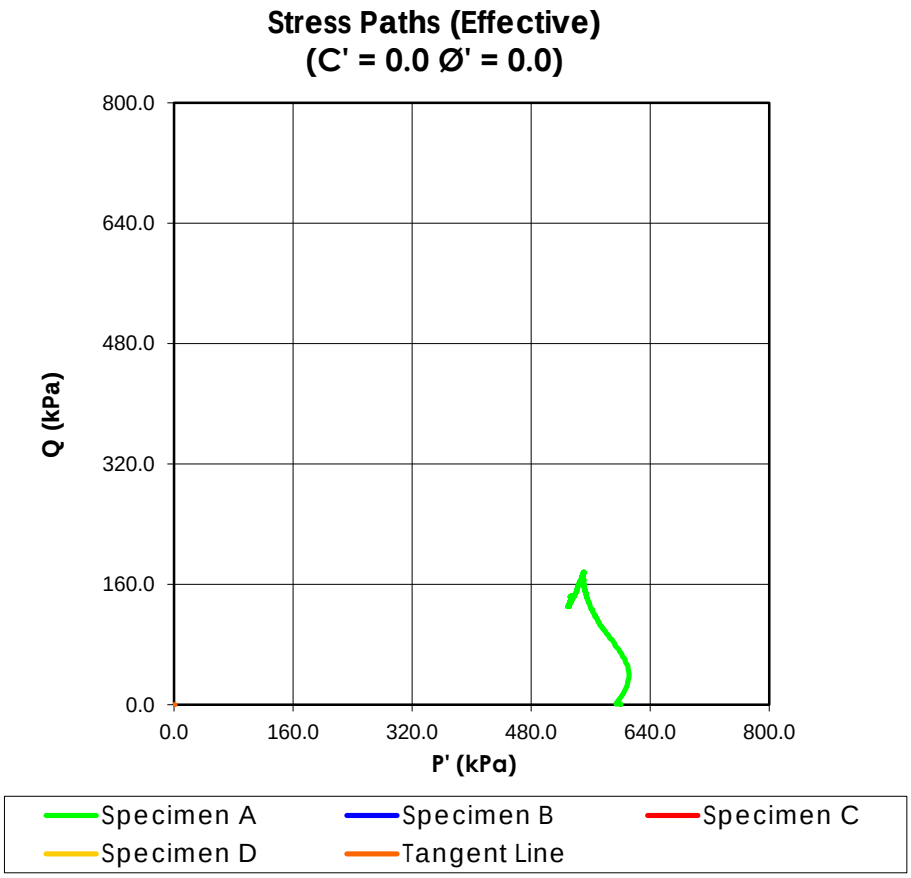
(C' = 0.0 Ø' = 0.0)

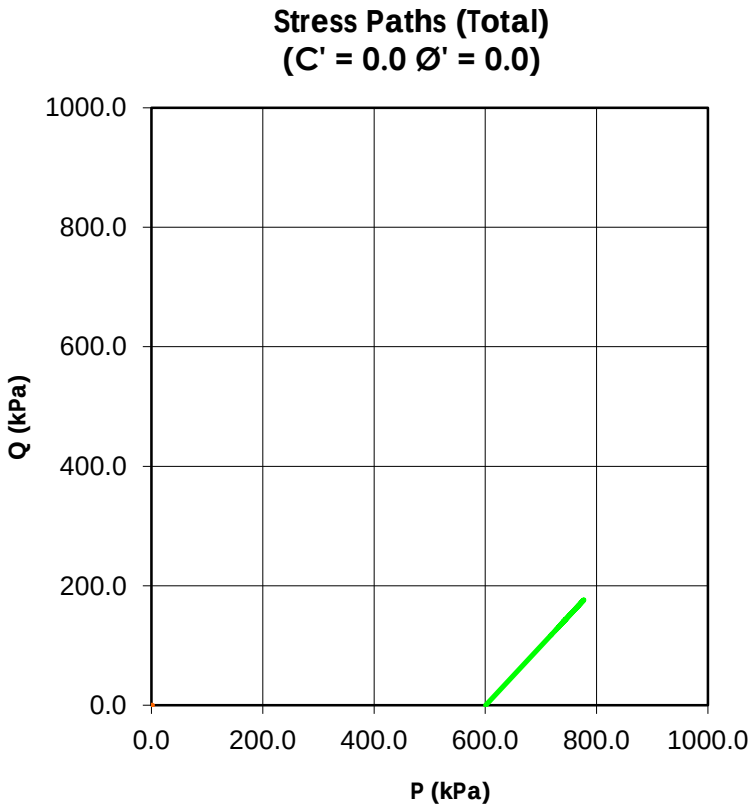



## Total Stress

(C = 0.0 Ø = 0.0)

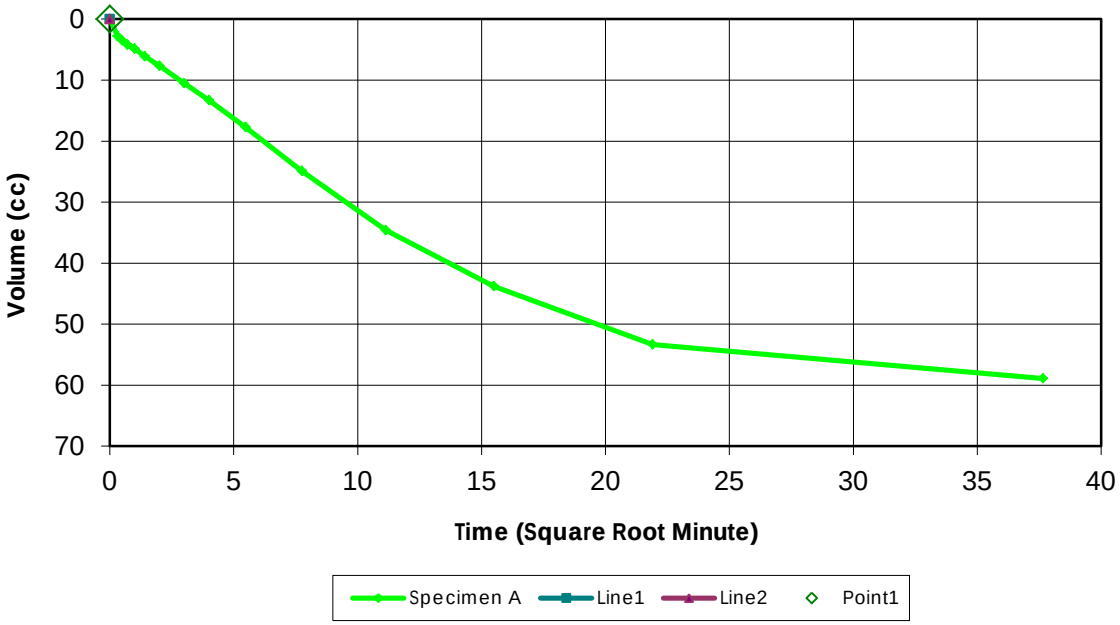



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

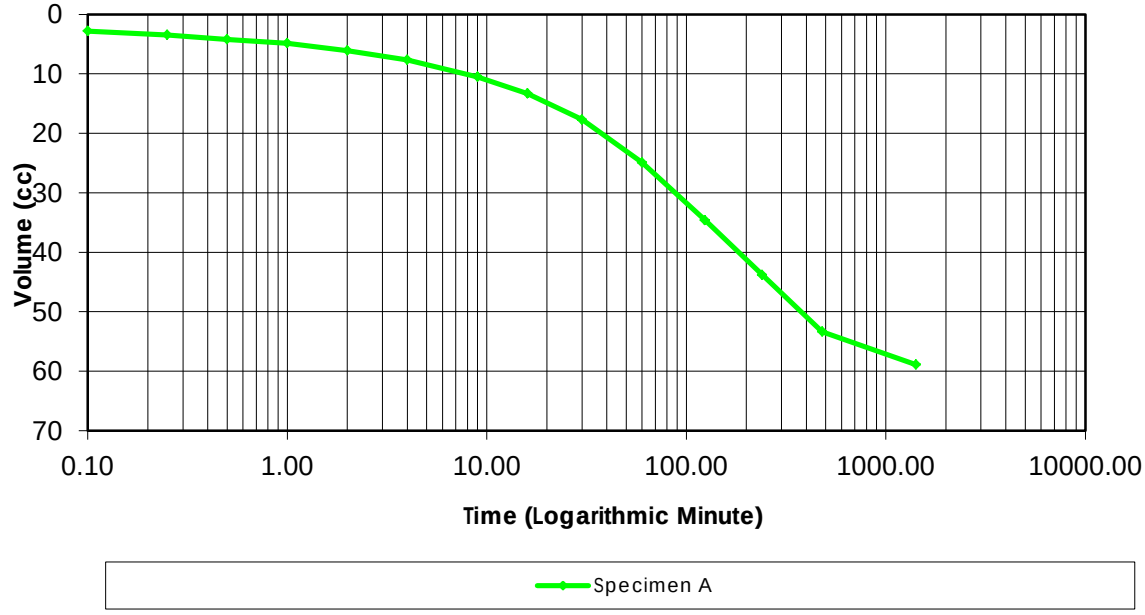

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.99

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 80.50 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 60.0 | 20.0 | 0.0 | 86.00 |
| 6 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 7 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 8 | 110.0 | 80.0 | 10.0 | 0.0 | 99.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.230

Project Name: SR1

Project Location:

Hole No. 0  Depth: 2.60-3.05m

| | |
|---|---|
| Cell Pressure (kPa) | 680 |
| Back Pressure (kPa) | 80 |
| Effective Pressure (kPa) | 600 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.2 |
| Initial Sample Height (mm) | 150.8 |
| Initial Sample Area (cm2) | 40.94 |
| Initial Volume (cm3) | 617.4 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.80 | N/A |
| 00:00:06 | 42.00 | 2.800 |
| 00:00:15 | 41.35 | 3.450 |
| 00:00:30 | 40.60 | 4.200 |
| 00:01:00 | 39.95 | 4.850 |
| 00:02:00 | 38.70 | 6.100 |
| 00:04:00 | 37.15 | 7.650 |
| 00:09:00 | 34.30 | 10.500 |
| 00:16:00 | 31.50 | 13.300 |
| 00:30:00 | 27.10 | 17.700 |
| 01:00:00 | 19.90 | 24.900 |
| 02:04:00 | 10.20 | 34.600 |
| 04:00:00 | 1.00 | 43.800 |
| 08:00:00 | -8.55 | 53.350 |
| 23:38:00 | -14.10 | 58.900 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

**Unconsolidated Undrained Triaxial Test (ASTM D2850)**

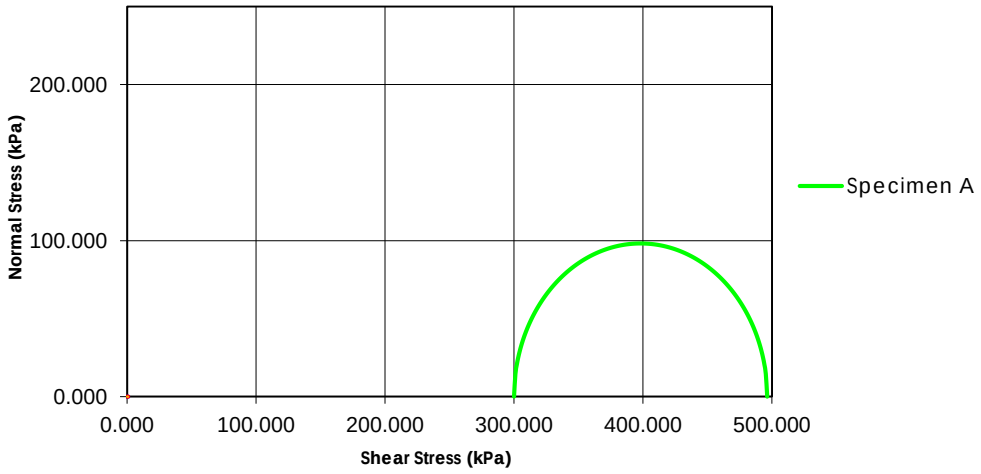
Stantec

Checked By: C. Lamoureux

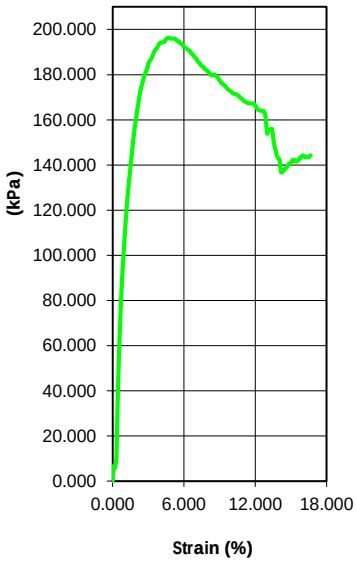
Date 10-Jun-16

Tested By: C. Oost

### Mohr Circles




### Stress-Strain Curve

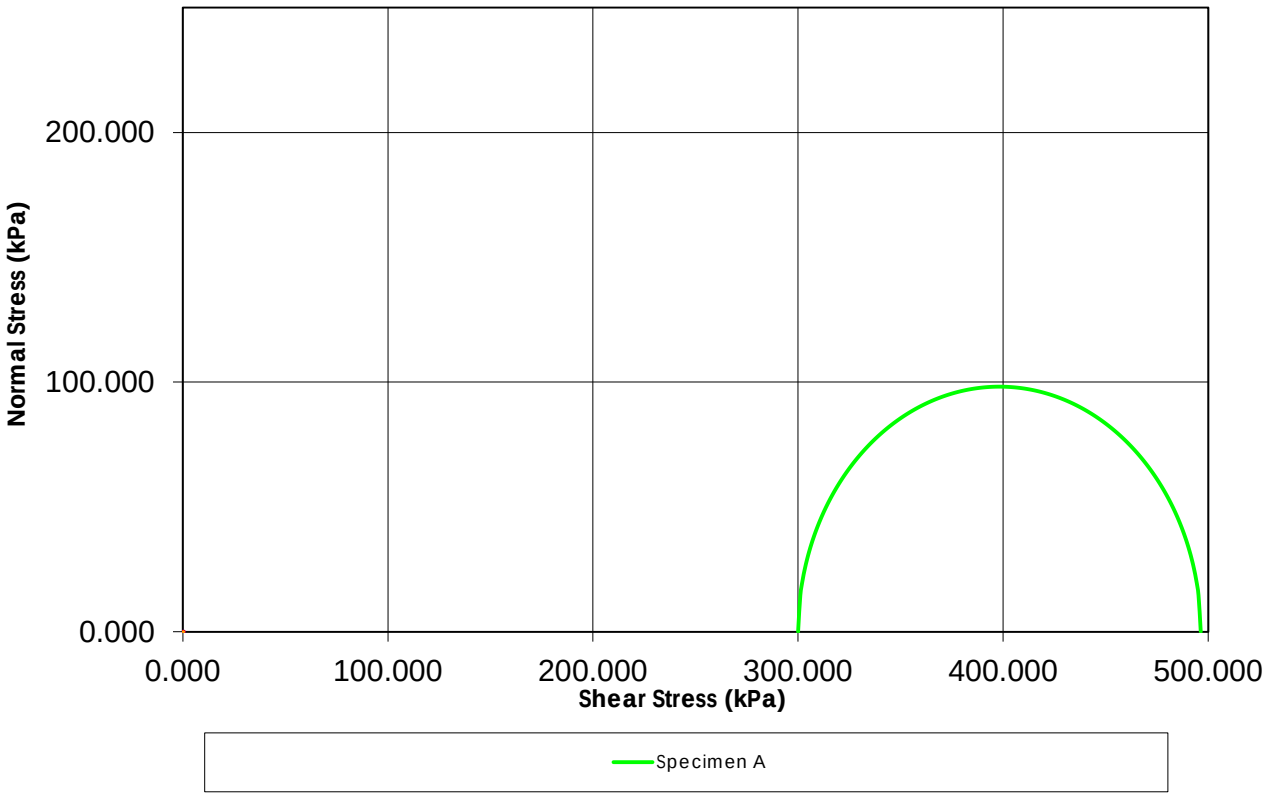


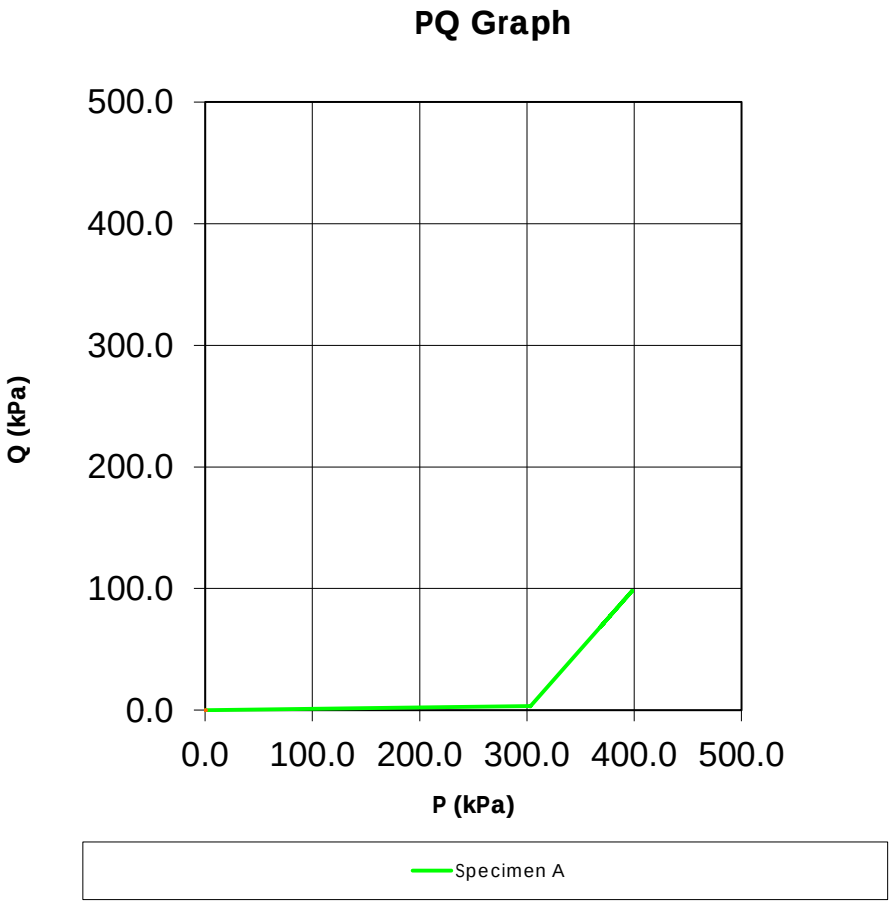

| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.0 | | | |
| Dry Density (g/cm3) | 1.610 | | | |
| Saturation (%) | 102.72 | | | |
| Void Ratio | 0.65 | | | |
| Diameter (mm) | 72.10 | | | |
| Height (mm) | 157.00 | | | |
| Liquid Limit | | | | |
| Plastic Limit | | | | |
| Specific Gravity | 2.650 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 26.5 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | | | |
| Peak Dev. Stress (kPa) | 196.330 | | | |
| Axial Strain @ Failure (%) | 4.710 | | | |
| | **Cell Pressure** | | | |
| Cell (kPa) | 300.0 | | | |
| Back (kPa) | n/a | | | |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 496.3 | | | |
| σ3 (kPa) | 300.0 | | | |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Clay |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.230 | Job Number: | |
| Location: | | Boring Number: | |
| Client: | Alberta Transportation | Sample Num: | D13 ST4 |
| Remarks: | | | |

## Mohr Circles




PQ Graph
500.0
400.0
300.0
200.0
100.0
0.0
Q (kPa)
0.0
100.0
200.0
300.0
400.0
500.0
P (kPa)
Specimen A

| Specimen A Information<br>UU Triaxial Test | Stantec Consulting Ltd. |
|---|---|

File Location
lab_110773396_uut_d13st4.HSD

## Project Information

Project No. 110773396.302.702.2 Test Date: 10-Jun-16 Sample Number: D13 ST4
Project Name: SR1
Client: Alberta Transportation
Sample Location:
Sample Description: Brown Clay
Remarks:

## Specimen A Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.65 LL: PL:

| Sample Parameters | Before Test | After Test |
|---|---|---|
| Diameter (mm) | 72.10 | |
| Height (mm) | 157.00 | |
| Weight (g) | 1290.4 | |
| Moisture (%) | 25.0 | 26.5 |
| Dry Density (g/cm3) | 1.610 | |
| Saturation (%) | 102.72 | |
| Void Ratio | 0.65 | |

## Specimen A Test Data

Rate of Strain: 2 (mm/min)
Cell Pressure: 300.0 (kPa)
Effective Confining Stress: 300.0 (kPa)
Peak Deviator Stress: 196.330 (kPa) at reading number: 45
Height\Diameter Ratio: 2.18
Axial Strain @ Failure: 4.710 (%)

| Read Number | Disp (mm) | Load Kn) | Axial Strain (%) | Deviator Stress (kPa) | Corr. Deviator Stress (kPa) | Principal Stresses | | | P (kPa) | Q (kPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $Q_1$ (kPa) | $Q_3$ (kPa) | 1:3 Ratio (kPa) | | |
| 0 | 2.197 | 0.1 | 0.000 | 0.000 | 0.000 | 300.0 | 300.0 | 1.00 | 0.0 | 0.0 |
| 1 | 2.351 | 0.1 | 0.098 | 6.808 | 6.801 | 306.8 | 300.0 | 1.02 | 303.4 | 3.4 |
| 2 | 2.518 | 0.1 | 0.204 | 6.091 | 6.079 | 306.1 | 300.0 | 1.02 | 303.0 | 3.0 |
| 3 | 2.690 | 0.1 | 0.314 | 10.391 | 10.359 | 310.4 | 300.0 | 1.03 | 305.2 | 5.2 |
| 4 | 2.847 | 0.2 | 0.414 | 34.399 | 34.256 | 334.3 | 300.0 | 1.11 | 317.1 | 17.1 |
| 5 | 3.003 | 0.3 | 0.514 | 53.748 | 53.472 | 353.5 | 300.0 | 1.18 | 326.7 | 26.7 |
| 6 | 3.160 | 0.4 | 0.613 | 68.618 | 68.198 | 368.2 | 300.0 | 1.23 | 334.1 | 34.1 |
| 7 | 3.316 | 0.4 | 0.713 | 81.697 | 81.115 | 381.1 | 300.0 | 1.27 | 340.6 | 40.6 |
| 8 | 3.478 | 0.5 | 0.816 | 92.447 | 91.692 | 391.7 | 300.0 | 1.31 | 345.8 | 45.8 |
| 9 | 3.640 | 0.5 | 0.919 | 101.763 | 100.828 | 400.8 | 300.0 | 1.34 | 350.4 | 50.4 |
| 10 | 3.802 | 0.5 | 1.022 | 110.363 | 109.235 | 409.2 | 300.0 | 1.36 | 354.6 | 54.6 |
| 11 | 3.966 | 0.6 | 1.127 | 118.783 | 117.445 | 417.4 | 300.0 | 1.39 | 358.7 | 58.7 |
| 12 | 4.125 | 0.6 | 1.228 | 125.950 | 124.403 | 424.4 | 300.0 | 1.41 | 362.2 | 62.2 |
| 13 | 4.292 | 0.6 | 1.335 | 132.399 | 130.632 | 430.6 | 300.0 | 1.44 | 365.3 | 65.3 |
| 14 | 4.454 | 0.6 | 1.438 | 137.953 | 135.970 | 436.0 | 300.0 | 1.45 | 368.0 | 68.0 |
| 15 | 4.624 | 0.7 | 1.546 | 143.686 | 141.466 | 441.5 | 300.0 | 1.47 | 370.7 | 70.7 |
| 16 | 4.780 | 0.7 | 1.645 | 149.061 | 146.609 | 446.6 | 300.0 | 1.49 | 373.3 | 73.3 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 4.947 | 0.7 | 1.752 | 154.794 | 152.083 | 452.1 | 300.0 | 1.51 | 376.0 | 76.0 |
| 18 | 5.114 | 0.7 | 1.858 | 159.452 | 156.490 | 456.5 | 300.0 | 1.52 | 378.2 | 78.2 |
| 19 | 5.284 | 0.8 | 1.966 | 163.752 | 160.533 | 460.5 | 300.0 | 1.54 | 380.3 | 80.3 |
| 20 | 5.454 | 0.8 | 2.074 | 168.052 | 164.566 | 464.6 | 300.0 | 1.55 | 382.3 | 82.3 |
| 21 | 5.618 | 0.8 | 2.179 | 171.815 | 168.071 | 468.1 | 300.0 | 1.56 | 384.0 | 84.0 |
| 22 | 5.777 | 0.8 | 2.280 | 175.398 | 171.398 | 471.4 | 300.0 | 1.57 | 385.7 | 85.7 |
| 23 | 5.944 | 0.8 | 2.387 | 178.264 | 174.010 | 474.0 | 300.0 | 1.58 | 387.0 | 87.0 |
| 24 | 6.111 | 0.8 | 2.493 | 180.593 | 176.091 | 476.1 | 300.0 | 1.59 | 388.0 | 88.0 |
| 25 | 6.268 | 0.8 | 2.593 | 182.922 | 178.180 | 478.2 | 300.0 | 1.59 | 389.1 | 89.1 |
| 26 | 6.435 | 0.8 | 2.699 | 184.893 | 179.903 | 479.9 | 300.0 | 1.60 | 390.0 | 90.0 |
| 27 | 6.602 | 0.8 | 2.805 | 186.506 | 181.273 | 481.3 | 300.0 | 1.60 | 390.6 | 90.6 |
| 28 | 6.769 | 0.9 | 2.912 | 188.476 | 182.988 | 483.0 | 300.0 | 1.61 | 391.5 | 91.5 |
| 29 | 6.925 | 0.9 | 3.012 | 190.626 | 184.886 | 484.9 | 300.0 | 1.62 | 392.4 | 92.4 |
| 30 | 7.092 | 0.9 | 3.118 | 192.060 | 186.071 | 486.1 | 300.0 | 1.62 | 393.0 | 93.0 |
| 31 | 7.259 | 0.9 | 3.224 | 193.135 | 186.907 | 486.9 | 300.0 | 1.62 | 393.5 | 93.5 |
| 32 | 7.426 | 0.9 | 3.331 | 194.568 | 188.088 | 488.1 | 300.0 | 1.63 | 394.0 | 94.0 |
| 33 | 7.593 | 0.9 | 3.437 | 196.180 | 189.438 | 489.4 | 300.0 | 1.63 | 394.7 | 94.7 |
| 34 | 7.763 | 0.9 | 3.545 | 197.614 | 190.608 | 490.6 | 300.0 | 1.64 | 395.3 | 95.3 |
| 35 | 7.938 | 0.9 | 3.656 | 198.689 | 191.424 | 491.4 | 300.0 | 1.64 | 395.7 | 95.7 |
| 36 | 8.107 | 0.9 | 3.764 | 199.584 | 192.071 | 492.1 | 300.0 | 1.64 | 396.0 | 96.0 |
| 37 | 8.272 | 0.9 | 3.869 | 201.018 | 193.240 | 493.2 | 300.0 | 1.64 | 396.6 | 96.6 |
| 38 | 8.433 | 0.9 | 3.972 | 202.093 | 194.065 | 494.1 | 300.0 | 1.65 | 397.0 | 97.0 |
| 39 | 8.600 | 0.9 | 4.079 | 202.451 | 194.194 | 494.2 | 300.0 | 1.65 | 397.1 | 97.1 |
| 40 | 8.762 | 0.9 | 4.182 | 202.809 | 194.329 | 494.3 | 300.0 | 1.65 | 397.2 | 97.2 |
| 41 | 8.929 | 0.9 | 4.288 | 203.168 | 194.456 | 494.5 | 300.0 | 1.65 | 397.2 | 97.2 |
| 42 | 9.096 | 0.9 | 4.394 | 203.705 | 194.754 | 494.8 | 300.0 | 1.65 | 397.4 | 97.4 |
| 43 | 9.263 | 0.9 | 4.501 | 204.959 | 195.735 | 495.7 | 300.0 | 1.65 | 397.9 | 97.9 |
| 44 | 9.430 | 0.9 | 4.607 | 205.676 | 196.200 | 496.2 | 300.0 | 1.65 | 398.1 | 98.1 |
| 45 | 9.592 | 0.9 | 4.710 | 206.034 | 196.330 | 496.3 | 300.0 | 1.65 | 398.2 | 98.2 |
| 46 | 9.759 | 0.9 | 4.816 | 206.034 | 196.111 | 496.1 | 300.0 | 1.65 | 398.1 | 98.1 |
| 47 | 9.921 | 0.9 | 4.920 | 206.034 | 195.898 | 495.9 | 300.0 | 1.65 | 397.9 | 97.9 |
| 48 | 10.093 | 0.9 | 5.029 | 206.392 | 196.013 | 496.0 | 300.0 | 1.65 | 398.0 | 98.0 |
| 49 | 10.265 | 0.9 | 5.139 | 206.572 | 195.956 | 496.0 | 300.0 | 1.65 | 398.0 | 98.0 |
| 50 | 10.437 | 0.9 | 5.249 | 206.751 | 195.899 | 495.9 | 300.0 | 1.65 | 397.9 | 97.9 |
| 51 | 10.610 | 0.9 | 5.358 | 206.392 | 195.333 | 495.3 | 300.0 | 1.65 | 397.7 | 97.7 |
| 52 | 10.774 | 0.9 | 5.463 | 206.034 | 194.779 | 494.8 | 300.0 | 1.65 | 397.4 | 97.4 |
| 53 | 10.938 | 0.9 | 5.568 | 206.213 | 194.732 | 494.7 | 300.0 | 1.65 | 397.4 | 97.4 |
| 54 | 11.103 | 0.9 | 5.672 | 205.676 | 194.009 | 494.0 | 300.0 | 1.65 | 397.0 | 97.0 |
| 55 | 11.270 | 0.9 | 5.779 | 205.497 | 193.622 | 493.6 | 300.0 | 1.65 | 396.8 | 96.8 |
| 56 | 11.437 | 0.9 | 5.885 | 205.317 | 193.234 | 493.2 | 300.0 | 1.64 | 396.6 | 96.6 |
| 57 | 11.596 | 0.9 | 5.987 | 204.780 | 192.521 | 492.5 | 300.0 | 1.64 | 396.3 | 96.3 |
| 58 | 11.765 | 0.9 | 6.095 | 204.243 | 191.795 | 491.8 | 300.0 | 1.64 | 395.9 | 95.9 |
| 59 | 11.922 | 0.9 | 6.194 | 204.243 | 191.591 | 491.6 | 300.0 | 1.64 | 395.8 | 95.8 |
| 60 | 12.092 | 0.9 | 6.302 | 204.063 | 191.203 | 491.2 | 300.0 | 1.64 | 395.6 | 95.6 |
| 61 | 12.261 | 0.9 | 6.410 | 203.884 | 190.815 | 490.8 | 300.0 | 1.64 | 395.4 | 95.4 |
| 62 | 12.428 | 0.9 | 6.517 | 203.526 | 190.263 | 490.3 | 300.0 | 1.63 | 395.1 | 95.1 |
| 63 | 12.598 | 0.9 | 6.625 | 202.988 | 189.541 | 489.5 | 300.0 | 1.63 | 394.8 | 94.8 |
| 64 | 12.760 | 0.9 | 6.728 | 202.451 | 188.831 | 488.8 | 300.0 | 1.63 | 394.4 | 94.4 |
| 65 | 12.927 | 0.9 | 6.834 | 202.093 | 188.281 | 488.3 | 300.0 | 1.63 | 394.1 | 94.1 |
| 66 | 13.096 | 0.9 | 6.942 | 201.555 | 187.563 | 487.6 | 300.0 | 1.63 | 393.8 | 93.8 |
| 67 | 13.261 | 0.9 | 7.047 | 201.197 | 187.019 | 487.0 | 300.0 | 1.62 | 393.5 | 93.5 |
| 68 | 13.425 | 0.9 | 7.152 | 200.301 | 185.976 | 486.0 | 300.0 | 1.62 | 393.0 | 93.0 |
| 69 | 13.589 | 0.9 | 7.256 | 199.943 | 185.434 | 485.4 | 300.0 | 1.62 | 392.7 | 92.7 |
| 70 | 13.754 | 0.9 | 7.361 | 199.584 | 184.893 | 484.9 | 300.0 | 1.62 | 392.4 | 92.4 |
| 71 | 13.918 | 0.9 | 7.466 | 198.689 | 183.855 | 483.9 | 300.0 | 1.61 | 391.9 | 91.9 |
| 72 | 14.085 | 0.9 | 7.572 | 198.689 | 183.644 | 483.6 | 300.0 | 1.61 | 391.8 | 91.8 |
| 73 | 14.252 | 0.9 | 7.678 | 198.330 | 183.102 | 483.1 | 300.0 | 1.61 | 391.6 | 91.6 |
| 74 | 14.417 | 0.9 | 7.783 | 197.793 | 182.398 | 482.4 | 300.0 | 1.61 | 391.2 | 91.2 |
| 75 | 14.581 | 0.9 | 7.888 | 197.614 | 182.026 | 482.0 | 300.0 | 1.61 | 391.0 | 91.0 |
| 76 | 14.745 | 0.9 | 7.993 | 197.434 | 181.654 | 481.7 | 300.0 | 1.61 | 390.8 | 90.8 |
| 77 | 14.912 | 0.9 | 8.099 | 196.897 | 180.950 | 481.0 | 300.0 | 1.60 | 390.5 | 90.5 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 15.085 | 0.9 | 8.209 | 196.359 | 180.241 | 480.2 | 300.0 | 1.60 | 390.1 | 90.1 |
| 79 | 15.254 | 0.9 | 8.317 | 196.001 | 179.700 | 479.7 | 300.0 | 1.60 | 389.9 | 89.9 |
| 80 | 15.424 | 0.9 | 8.425 | 196.359 | 179.817 | 479.8 | 300.0 | 1.60 | 389.9 | 89.9 |
| 81 | 15.606 | 0.9 | 8.541 | 196.897 | 180.080 | 480.1 | 300.0 | 1.60 | 390.0 | 90.0 |
| 82 | 15.768 | 0.9 | 8.644 | 196.718 | 179.713 | 479.7 | 300.0 | 1.60 | 389.9 | 89.9 |
| 83 | 15.933 | 0.9 | 8.749 | 196.539 | 179.344 | 479.3 | 300.0 | 1.60 | 389.7 | 89.7 |
| 84 | 16.100 | 0.9 | 8.855 | 196.001 | 178.645 | 478.6 | 300.0 | 1.60 | 389.3 | 89.3 |
| 85 | 16.256 | 0.9 | 8.955 | 195.285 | 177.797 | 477.8 | 300.0 | 1.59 | 388.9 | 88.9 |
| 86 | 16.428 | 0.9 | 9.065 | 194.747 | 177.094 | 477.1 | 300.0 | 1.59 | 388.5 | 88.5 |
| 87 | 16.588 | 0.9 | 9.166 | 194.030 | 176.246 | 476.2 | 300.0 | 1.59 | 388.1 | 88.1 |
| 88 | 16.760 | 0.9 | 9.276 | 193.851 | 175.870 | 475.9 | 300.0 | 1.59 | 387.9 | 87.9 |
| 89 | 16.916 | 0.9 | 9.375 | 193.493 | 175.352 | 475.4 | 300.0 | 1.58 | 387.7 | 87.7 |
| 90 | 17.094 | 0.9 | 9.488 | 193.135 | 174.809 | 474.8 | 300.0 | 1.58 | 387.4 | 87.4 |
| 91 | 17.250 | 0.9 | 9.588 | 192.597 | 174.131 | 474.1 | 300.0 | 1.58 | 387.1 | 87.1 |
| 92 | 17.417 | 0.9 | 9.694 | 192.239 | 173.602 | 473.6 | 300.0 | 1.58 | 386.8 | 86.8 |
| 93 | 17.584 | 0.9 | 9.801 | 191.880 | 173.075 | 473.1 | 300.0 | 1.58 | 386.5 | 86.5 |
| 94 | 17.749 | 0.9 | 9.905 | 191.701 | 172.712 | 472.7 | 300.0 | 1.58 | 386.4 | 86.4 |
| 95 | 17.918 | 0.9 | 10.014 | 191.343 | 172.183 | 472.2 | 300.0 | 1.57 | 386.1 | 86.1 |
| 96 | 18.088 | 0.9 | 10.122 | 191.164 | 171.815 | 471.8 | 300.0 | 1.57 | 385.9 | 85.9 |
| 97 | 18.257 | 0.9 | 10.230 | 190.985 | 171.448 | 471.4 | 300.0 | 1.57 | 385.7 | 85.7 |
| 98 | 18.422 | 0.9 | 10.334 | 191.164 | 171.408 | 471.4 | 300.0 | 1.57 | 385.7 | 85.7 |
| 99 | 18.589 | 0.9 | 10.441 | 191.164 | 171.205 | 471.2 | 300.0 | 1.57 | 385.6 | 85.6 |
| 100 | 18.753 | 0.9 | 10.545 | 190.806 | 170.684 | 470.7 | 300.0 | 1.57 | 385.3 | 85.3 |
| 101 | 18.918 | 0.9 | 10.650 | 190.626 | 170.325 | 470.3 | 300.0 | 1.57 | 385.2 | 85.2 |
| 102 | 19.082 | 0.9 | 10.755 | 190.268 | 169.805 | 469.8 | 300.0 | 1.57 | 384.9 | 84.9 |
| 103 | 19.254 | 0.9 | 10.864 | 189.910 | 169.277 | 469.3 | 300.0 | 1.56 | 384.6 | 84.6 |
| 104 | 19.419 | 0.9 | 10.969 | 189.551 | 168.759 | 468.8 | 300.0 | 1.56 | 384.4 | 84.4 |
| 105 | 19.583 | 0.9 | 11.074 | 189.193 | 168.242 | 468.2 | 300.0 | 1.56 | 384.1 | 84.1 |
| 106 | 19.755 | 0.9 | 11.184 | 189.193 | 168.035 | 468.0 | 300.0 | 1.56 | 384.0 | 84.0 |
| 107 | 19.917 | 0.9 | 11.287 | 189.014 | 167.681 | 467.7 | 300.0 | 1.56 | 383.8 | 83.8 |
| 108 | 20.084 | 0.9 | 11.393 | 188.835 | 167.321 | 467.3 | 300.0 | 1.56 | 383.7 | 83.7 |
| 109 | 20.251 | 0.9 | 11.499 | 189.014 | 167.279 | 467.3 | 300.0 | 1.56 | 383.6 | 83.6 |
| 110 | 20.418 | 0.9 | 11.606 | 189.193 | 167.236 | 467.2 | 300.0 | 1.56 | 383.6 | 83.6 |
| 111 | 20.598 | 0.9 | 11.720 | 189.551 | 167.335 | 467.3 | 300.0 | 1.56 | 383.7 | 83.7 |
| 112 | 20.768 | 0.9 | 11.828 | 189.551 | 167.130 | 467.1 | 300.0 | 1.56 | 383.6 | 83.6 |
| 113 | 20.935 | 0.9 | 11.935 | 189.551 | 166.929 | 466.9 | 300.0 | 1.56 | 383.5 | 83.5 |
| 114 | 21.096 | 0.9 | 12.038 | 188.656 | 165.946 | 465.9 | 300.0 | 1.55 | 383.0 | 83.0 |
| 115 | 21.258 | 0.9 | 12.141 | 188.118 | 165.279 | 465.3 | 300.0 | 1.55 | 382.6 | 82.6 |
| 116 | 21.425 | 0.8 | 12.247 | 187.401 | 164.450 | 464.4 | 300.0 | 1.55 | 382.2 | 82.2 |
| 117 | 21.592 | 0.8 | 12.354 | 187.401 | 164.251 | 464.3 | 300.0 | 1.55 | 382.1 | 82.1 |
| 118 | 21.754 | 0.8 | 12.457 | 187.401 | 164.058 | 464.1 | 300.0 | 1.55 | 382.0 | 82.0 |
| 119 | 21.918 | 0.8 | 12.561 | 187.581 | 164.018 | 464.0 | 300.0 | 1.55 | 382.0 | 82.0 |
| 120 | 22.091 | 0.8 | 12.671 | 187.760 | 163.969 | 464.0 | 300.0 | 1.55 | 382.0 | 82.0 |
| 121 | 22.255 | 0.8 | 12.776 | 187.222 | 163.303 | 463.3 | 300.0 | 1.54 | 381.7 | 81.7 |
| 122 | 22.419 | 0.8 | 12.880 | 184.356 | 160.610 | 460.6 | 300.0 | 1.54 | 380.3 | 80.3 |
| 123 | 22.592 | 0.8 | 12.990 | 177.010 | 154.016 | 454.0 | 300.0 | 1.51 | 377.0 | 77.0 |
| 124 | 22.756 | 0.8 | 13.095 | 178.623 | 155.232 | 455.2 | 300.0 | 1.52 | 377.6 | 77.6 |
| 125 | 22.926 | 0.8 | 13.203 | 179.339 | 155.661 | 455.7 | 300.0 | 1.52 | 377.8 | 77.8 |
| 126 | 23.093 | 0.8 | 13.309 | 179.698 | 155.781 | 455.8 | 300.0 | 1.52 | 377.9 | 77.9 |
| 127 | 23.260 | 0.8 | 13.416 | 180.056 | 155.900 | 455.9 | 300.0 | 1.52 | 378.0 | 78.0 |
| 128 | 23.427 | 0.8 | 13.522 | 175.219 | 151.526 | 451.5 | 300.0 | 1.51 | 375.8 | 75.8 |
| 129 | 23.594 | 0.8 | 13.628 | 171.456 | 148.090 | 448.1 | 300.0 | 1.49 | 374.0 | 74.0 |
| 130 | 23.771 | 0.8 | 13.741 | 169.127 | 145.887 | 445.9 | 300.0 | 1.49 | 372.9 | 72.9 |
| 131 | 23.938 | 0.8 | 13.848 | 166.798 | 143.700 | 443.7 | 300.0 | 1.48 | 371.9 | 71.9 |
| 132 | 24.095 | 0.8 | 13.947 | 166.081 | 142.917 | 442.9 | 300.0 | 1.48 | 371.5 | 71.5 |
| 133 | 24.264 | 0.8 | 14.055 | 165.365 | 142.122 | 442.1 | 300.0 | 1.47 | 371.1 | 71.1 |
| 134 | 24.434 | 0.7 | 14.164 | 159.452 | 136.868 | 436.9 | 300.0 | 1.46 | 368.4 | 68.4 |
| 135 | 24.603 | 0.7 | 14.272 | 159.632 | 136.850 | 436.8 | 300.0 | 1.46 | 368.4 | 68.4 |
| 136 | 24.773 | 0.7 | 14.380 | 160.707 | 137.598 | 437.6 | 300.0 | 1.46 | 368.8 | 68.8 |
| 137 | 24.930 | 0.7 | 14.479 | 161.423 | 138.050 | 438.1 | 300.0 | 1.46 | 369.0 | 69.0 |
| 138 | 25.099 | 0.7 | 14.587 | 162.498 | 138.794 | 438.8 | 300.0 | 1.46 | 369.4 | 69.4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 25.269 | 0.7 | 14.695 | 163.215 | 139.230 | 439.2 | 300.0 | 1.46 | 369.6 | 69.6 |
| 140 | 25.438 | 0.8 | 14.803 | 164.827 | 140.427 | 440.4 | 300.0 | 1.47 | 370.2 | 70.2 |
| 141 | 25.608 | 0.8 | 14.911 | 165.186 | 140.554 | 440.6 | 300.0 | 1.47 | 370.3 | 70.3 |
| 142 | 25.778 | 0.8 | 15.019 | 166.081 | 141.137 | 441.1 | 300.0 | 1.47 | 370.6 | 70.6 |
| 143 | 25.950 | 0.8 | 15.129 | 167.515 | 142.171 | 442.2 | 300.0 | 1.47 | 371.1 | 71.1 |
| 144 | 26.114 | 0.8 | 15.234 | 167.515 | 141.996 | 442.0 | 300.0 | 1.47 | 371.0 | 71.0 |
| 145 | 26.281 | 0.8 | 15.340 | 167.873 | 142.121 | 442.1 | 300.0 | 1.47 | 371.1 | 71.1 |
| 146 | 26.446 | 0.8 | 15.445 | 167.336 | 141.491 | 441.5 | 300.0 | 1.47 | 370.7 | 70.7 |
| 147 | 26.610 | 0.8 | 15.550 | 168.231 | 142.072 | 442.1 | 300.0 | 1.47 | 371.0 | 71.0 |
| 148 | 26.777 | 0.8 | 15.656 | 168.590 | 142.195 | 442.2 | 300.0 | 1.47 | 371.1 | 71.1 |
| 149 | 26.934 | 0.8 | 15.756 | 170.023 | 143.235 | 443.2 | 300.0 | 1.48 | 371.6 | 71.6 |
| 150 | 27.101 | 0.8 | 15.862 | 170.202 | 143.205 | 443.2 | 300.0 | 1.48 | 371.6 | 71.6 |
| 151 | 27.268 | 0.8 | 15.968 | 171.456 | 144.077 | 444.1 | 300.0 | 1.48 | 372.0 | 72.0 |
| 152 | 27.435 | 0.8 | 16.075 | 171.815 | 144.196 | 444.2 | 300.0 | 1.48 | 372.1 | 72.1 |
| 153 | 27.599 | 0.8 | 16.180 | 171.277 | 143.565 | 443.6 | 300.0 | 1.48 | 371.8 | 71.8 |
| 154 | 27.768 | 0.8 | 16.288 | 171.277 | 143.380 | 443.4 | 300.0 | 1.48 | 371.7 | 71.7 |
| 155 | 27.938 | 0.8 | 16.396 | 171.635 | 143.495 | 443.5 | 300.0 | 1.48 | 371.7 | 71.7 |
| 156 | 28.108 | 0.8 | 16.504 | 171.815 | 143.459 | 443.5 | 300.0 | 1.48 | 371.7 | 71.7 |
| 157 | 28.277 | 0.8 | 16.612 | 172.890 | 144.170 | 444.2 | 300.0 | 1.48 | 372.1 | 72.1 |
| 158 | 28.356 | 0.8 | 16.661 | 173.069 | 144.233 | 444.2 | 300.0 | 1.48 | 372.1 | 72.1 |

Test Performed By: Checked By:

## Stantec Consulting Ltd.

### Unconsolidated Undrained Triaxial Test (ASTM D2850)

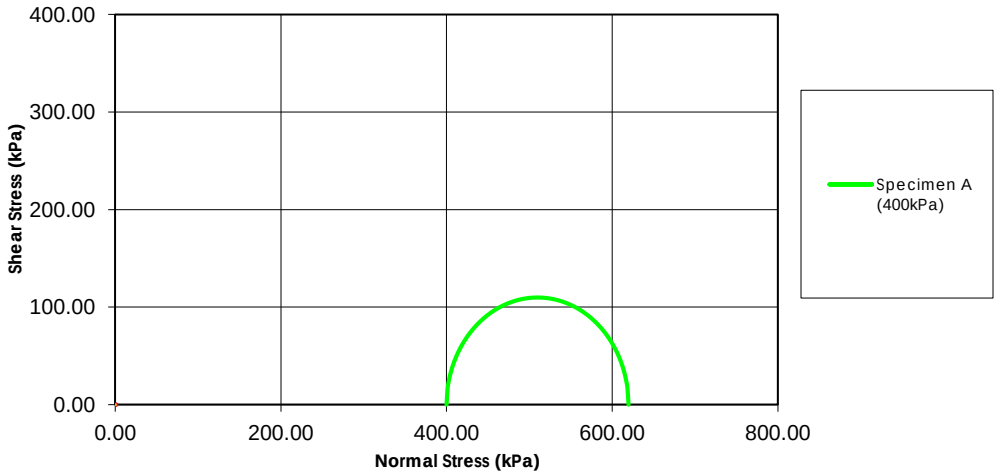
Stantec

Checked By: C. Lamoureux

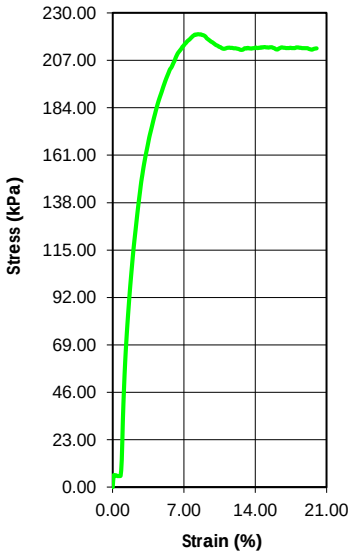
Date 12-Sep-16

Tested By: C. Oost

**Mohr Circles**



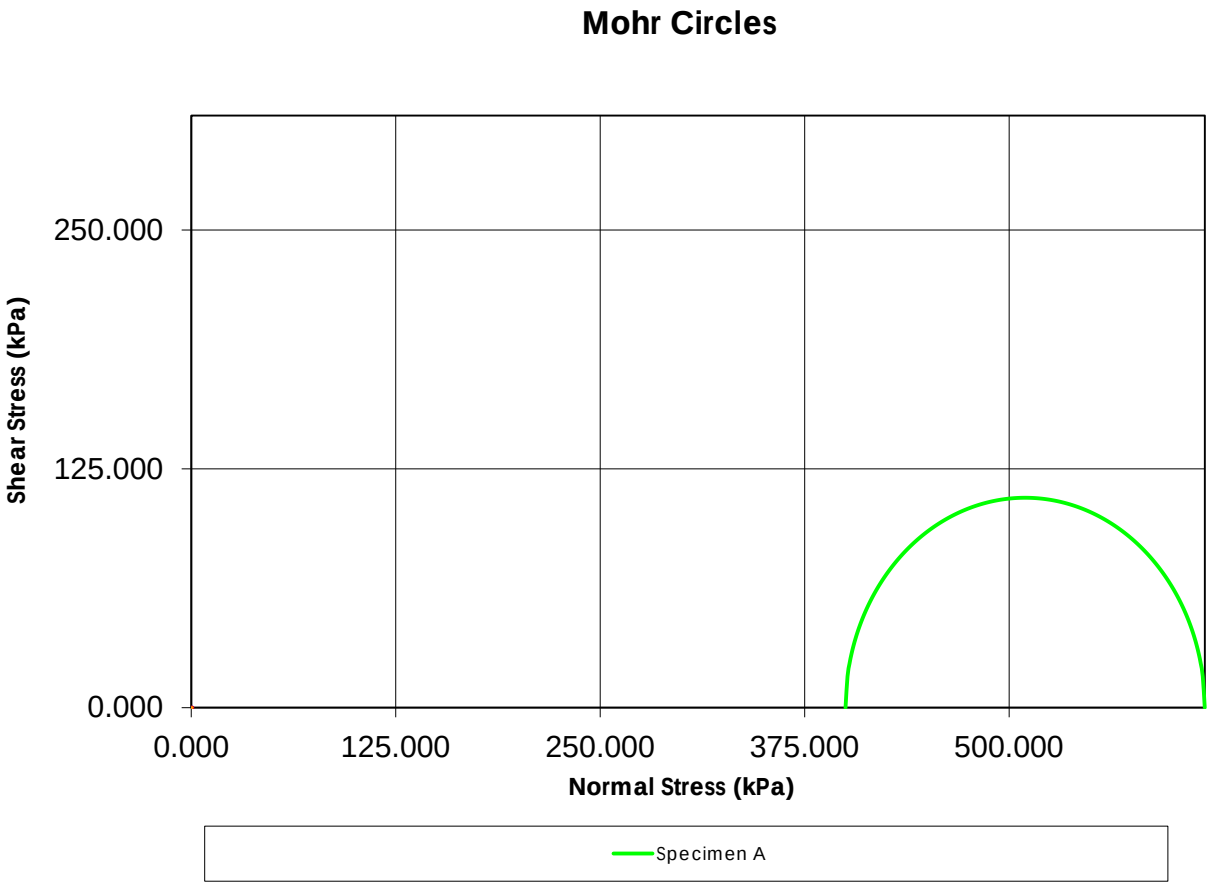

**Stress-Strain Curve**

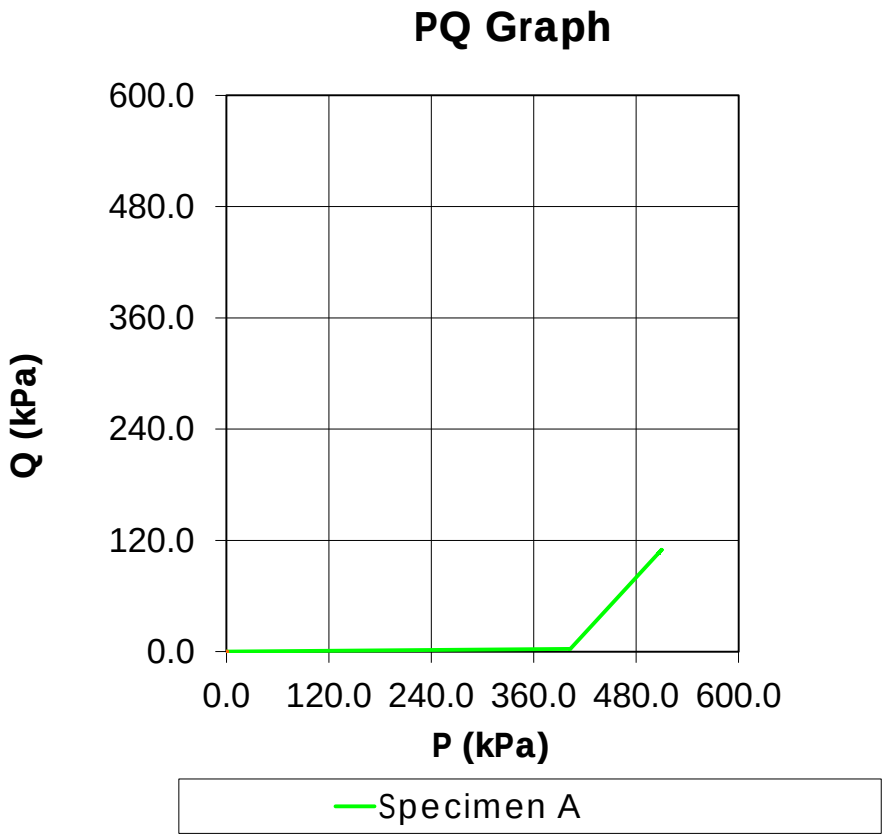



| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 22.4 | | | |
| Dry Density (g/cm3) | 1.635 | | | |
| Saturation (%) | 92.85 | | | |
| Void Ratio | 0.65 | | | |
| Diameter (mm) | 72.800 | | | |
| Height (mm) | 147.800 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 16.2 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | | | |
| Peak Dev. Stress (kPa) | 219.656 | | | |
| Axial Strain @ Failure (%) | 8.428 | | | |
| | **Cell Pressure** | | | |
| Cell (kPa) | 400.0 | | | |
| Back (kPa) | n/a | | | |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 619.7 | | | |
| σ3 (kPa) | 400.0 | | | |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Silty Clay |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.230 | Job Number: | - |
| Location: | - | Boring Number: | - |
| Client: | Alberta Transportation | Sample Number: | D30 ST2 |
| Remarks: | | | |


Mohr Circles
250.000
125.000
0.000
Shear Stress (kPa)
0.000
125.000
250.000
375.000
500.000
Normal Stress (kPa)
Specimen A


PQ Graph
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P (kPa)
Specimen A

| Specimen A Information<br>UU Triaxial Test | Stantec Consulting Ltd. |
|---|---|

File Location
lab_110773396_uut_d30st2.HSD

## Project Information

Project No. 110773396.302.702.2 Test Date: 12-Sep-16 Sample Number: D30 ST2
Project Name: SR1
Client: Alberta Transportation
Sample Location:
Sample Description: Brown Silty Clay
Remarks:

## Specimen A Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.70 LL: - PL: -

| Sample Parameters | Before Test | After Test |
|---|---|---|
| Diameter (mm) | 72.800 | |
| Height (mm) | 147.800 | |
| Weight (g) | 1231.30 | |
| Moisture (%) | 22.39 | 16.20 |
| Dry Density (g/cm3) | 1.635 | |
| Saturation (%) | 92.85 | |
| Void Ratio | 0.65 | |

## Specimen A Test Data

Rate of Strain: 2 (mm/min)
Cell Pressure: 400.0 (kPa)
Effective Confining Stress: 400.0 (kPa)
Peak Deviator Stress: 219.656 (kPa) at reading number: 75
Height\Diameter Ratio: 2.03
Axial Strain @ Failure: 8.428 (%)

| Read Number | Disp (mm) | Load Kn) | Axial Strain (%) | Deviator Stress (kPa) | Corr. Deviator Stress (kPa) | Principal Stresses | | | P (kPa) | Q (kPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $Q_1$ (kPa) | $Q_3$ (kPa) | 1:3 Ratio (kPa) | | |
| 0 | 0.365 | 0.1 | 0.000 | 0.000 | 0.000 | 400.0 | 400.0 | 1.00 | 0.0 | 0.0 |
| 1 | 0.517 | 0.1 | 0.102 | 5.799 | 5.793 | 405.8 | 400.0 | 1.01 | 402.9 | 2.9 |
| 2 | 0.689 | 0.1 | 0.219 | 5.799 | 5.786 | 405.8 | 400.0 | 1.01 | 402.9 | 2.9 |
| 3 | 0.858 | 0.1 | 0.334 | 5.799 | 5.780 | 405.8 | 400.0 | 1.01 | 402.9 | 2.9 |
| 4 | 1.023 | 0.1 | 0.445 | 5.448 | 5.423 | 405.4 | 400.0 | 1.01 | 402.7 | 2.7 |
| 5 | 1.192 | 0.1 | 0.560 | 5.448 | 5.417 | 405.4 | 400.0 | 1.01 | 402.7 | 2.7 |
| 6 | 1.359 | 0.1 | 0.673 | 5.448 | 5.411 | 405.4 | 400.0 | 1.01 | 402.7 | 2.7 |
| 7 | 1.516 | 0.1 | 0.779 | 5.623 | 5.580 | 405.6 | 400.0 | 1.01 | 402.8 | 2.8 |
| 8 | 1.683 | 0.1 | 0.892 | 13.356 | 13.237 | 413.2 | 400.0 | 1.03 | 406.6 | 6.6 |
| 9 | 1.842 | 0.2 | 0.999 | 32.686 | 32.359 | 432.4 | 400.0 | 1.08 | 416.2 | 16.2 |
| 10 | 2.012 | 0.3 | 1.114 | 48.678 | 48.135 | 448.1 | 400.0 | 1.12 | 424.1 | 24.1 |
| 11 | 2.174 | 0.3 | 1.223 | 61.154 | 60.406 | 460.4 | 400.0 | 1.15 | 430.2 | 30.2 |
| 12 | 2.335 | 0.4 | 1.333 | 71.171 | 70.223 | 470.2 | 400.0 | 1.18 | 435.1 | 35.1 |
| 13 | 2.502 | 0.4 | 1.446 | 80.133 | 78.975 | 479.0 | 400.0 | 1.20 | 439.5 | 39.5 |
| 14 | 2.669 | 0.4 | 1.559 | 88.217 | 86.842 | 486.8 | 400.0 | 1.22 | 443.4 | 43.4 |
| 15 | 2.836 | 0.5 | 1.672 | 95.949 | 94.345 | 494.3 | 400.0 | 1.24 | 447.2 | 47.2 |
| 16 | 3.003 | 0.5 | 1.785 | 102.979 | 101.141 | 501.1 | 400.0 | 1.25 | 450.6 | 50.6 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 3.173 | 0.5 | 1.900 | 109.656 | 107.573 | 507.6 | 400.0 | 1.27 | 453.8 | 53.8 |
| 18 | 3.345 | 0.5 | 2.016 | 116.334 | 113.989 | 514.0 | 400.0 | 1.28 | 457.0 | 57.0 |
| 19 | 3.520 | 0.6 | 2.134 | 122.309 | 119.698 | 519.7 | 400.0 | 1.30 | 459.8 | 59.8 |
| 20 | 3.697 | 0.6 | 2.254 | 127.932 | 125.048 | 525.0 | 400.0 | 1.31 | 462.5 | 62.5 |
| 21 | 3.864 | 0.6 | 2.367 | 133.380 | 130.222 | 530.2 | 400.0 | 1.33 | 465.1 | 65.1 |
| 22 | 4.021 | 0.6 | 2.473 | 138.301 | 134.880 | 534.9 | 400.0 | 1.34 | 467.4 | 67.4 |
| 23 | 4.188 | 0.7 | 2.586 | 143.221 | 139.517 | 539.5 | 400.0 | 1.35 | 469.8 | 69.8 |
| 24 | 4.355 | 0.7 | 2.699 | 147.966 | 143.972 | 544.0 | 400.0 | 1.36 | 472.0 | 72.0 |
| 25 | 4.509 | 0.7 | 2.804 | 152.359 | 148.088 | 548.1 | 400.0 | 1.37 | 474.0 | 74.0 |
| 26 | 4.679 | 0.7 | 2.918 | 156.225 | 151.666 | 551.7 | 400.0 | 1.38 | 475.8 | 75.8 |
| 27 | 4.835 | 0.7 | 3.024 | 159.915 | 155.079 | 555.1 | 400.0 | 1.39 | 477.5 | 77.5 |
| 28 | 5.005 | 0.7 | 3.139 | 163.430 | 158.300 | 558.3 | 400.0 | 1.40 | 479.2 | 79.2 |
| 29 | 5.174 | 0.8 | 3.254 | 166.769 | 161.343 | 561.3 | 400.0 | 1.40 | 480.7 | 80.7 |
| 30 | 5.341 | 0.8 | 3.367 | 169.756 | 164.041 | 564.0 | 400.0 | 1.41 | 482.0 | 82.0 |
| 31 | 5.503 | 0.8 | 3.476 | 172.744 | 166.739 | 566.7 | 400.0 | 1.42 | 483.4 | 83.4 |
| 32 | 5.670 | 0.8 | 3.589 | 175.907 | 169.593 | 569.6 | 400.0 | 1.42 | 484.8 | 84.8 |
| 33 | 5.837 | 0.8 | 3.702 | 178.543 | 171.933 | 571.9 | 400.0 | 1.43 | 486.0 | 86.0 |
| 34 | 6.009 | 0.8 | 3.819 | 181.179 | 174.260 | 574.3 | 400.0 | 1.44 | 487.1 | 87.1 |
| 35 | 6.176 | 0.8 | 3.932 | 183.815 | 176.588 | 576.6 | 400.0 | 1.44 | 488.3 | 88.3 |
| 36 | 6.343 | 0.8 | 4.045 | 186.451 | 178.910 | 578.9 | 400.0 | 1.45 | 489.5 | 89.5 |
| 37 | 6.500 | 0.8 | 4.151 | 188.735 | 180.902 | 580.9 | 400.0 | 1.45 | 490.5 | 90.5 |
| 38 | 6.664 | 0.9 | 4.262 | 191.196 | 183.047 | 583.0 | 400.0 | 1.46 | 491.5 | 91.5 |
| 39 | 6.836 | 0.9 | 4.378 | 193.656 | 185.177 | 585.2 | 400.0 | 1.46 | 492.6 | 92.6 |
| 40 | 6.996 | 0.9 | 4.486 | 195.765 | 186.983 | 587.0 | 400.0 | 1.47 | 493.5 | 93.5 |
| 41 | 7.168 | 0.9 | 4.603 | 197.873 | 188.766 | 588.8 | 400.0 | 1.47 | 494.4 | 94.4 |
| 42 | 7.335 | 0.9 | 4.716 | 199.806 | 190.385 | 590.4 | 400.0 | 1.48 | 495.2 | 95.2 |
| 43 | 7.502 | 0.9 | 4.828 | 201.740 | 191.999 | 592.0 | 400.0 | 1.48 | 496.0 | 96.0 |
| 44 | 7.669 | 0.9 | 4.941 | 203.848 | 193.775 | 593.8 | 400.0 | 1.48 | 496.9 | 96.9 |
| 45 | 7.836 | 0.9 | 5.054 | 205.781 | 195.380 | 595.4 | 400.0 | 1.49 | 497.7 | 97.7 |
| 46 | 8.003 | 0.9 | 5.167 | 207.714 | 196.981 | 597.0 | 400.0 | 1.49 | 498.5 | 98.5 |
| 47 | 8.165 | 0.9 | 5.277 | 209.472 | 198.418 | 598.4 | 400.0 | 1.50 | 499.2 | 99.2 |
| 48 | 8.337 | 0.9 | 5.393 | 211.229 | 199.837 | 599.8 | 400.0 | 1.50 | 499.9 | 99.9 |
| 49 | 8.509 | 1.0 | 5.510 | 212.986 | 201.251 | 601.3 | 400.0 | 1.50 | 500.6 | 100.6 |
| 50 | 8.681 | 1.0 | 5.626 | 214.744 | 202.661 | 602.7 | 400.0 | 1.51 | 501.3 | 101.3 |
| 51 | 8.853 | 1.0 | 5.743 | 215.798 | 203.405 | 603.4 | 400.0 | 1.51 | 501.7 | 101.7 |
| 52 | 9.018 | 1.0 | 5.854 | 217.204 | 204.488 | 604.5 | 400.0 | 1.51 | 502.2 | 102.2 |
| 53 | 9.180 | 1.0 | 5.964 | 218.785 | 205.738 | 605.7 | 400.0 | 1.51 | 502.9 | 102.9 |
| 54 | 9.347 | 1.0 | 6.077 | 220.191 | 206.811 | 606.8 | 400.0 | 1.52 | 503.4 | 103.4 |
| 55 | 9.503 | 1.0 | 6.183 | 221.949 | 208.226 | 608.2 | 400.0 | 1.52 | 504.1 | 104.1 |
| 56 | 9.670 | 1.0 | 6.296 | 223.530 | 209.458 | 609.5 | 400.0 | 1.52 | 504.7 | 104.7 |
| 57 | 9.837 | 1.0 | 6.409 | 224.936 | 210.521 | 610.5 | 400.0 | 1.53 | 505.3 | 105.3 |
| 58 | 10.004 | 1.0 | 6.522 | 225.990 | 211.252 | 611.3 | 400.0 | 1.53 | 505.6 | 105.6 |
| 59 | 10.171 | 1.0 | 6.635 | 227.045 | 211.981 | 612.0 | 400.0 | 1.53 | 506.0 | 106.0 |
| 60 | 10.338 | 1.0 | 6.748 | 228.099 | 212.708 | 612.7 | 400.0 | 1.53 | 506.4 | 106.4 |
| 61 | 10.503 | 1.0 | 6.859 | 229.329 | 213.600 | 613.6 | 400.0 | 1.53 | 506.8 | 106.8 |
| 62 | 10.672 | 1.0 | 6.974 | 230.208 | 214.154 | 614.2 | 400.0 | 1.54 | 507.1 | 107.1 |
| 63 | 10.829 | 1.0 | 7.079 | 231.262 | 214.890 | 614.9 | 400.0 | 1.54 | 507.4 | 107.4 |
| 64 | 10.998 | 1.0 | 7.194 | 232.141 | 215.440 | 615.4 | 400.0 | 1.54 | 507.7 | 107.7 |
| 65 | 11.168 | 1.0 | 7.309 | 233.195 | 216.151 | 616.2 | 400.0 | 1.54 | 508.1 | 108.1 |
| 66 | 11.343 | 1.0 | 7.427 | 234.074 | 216.689 | 616.7 | 400.0 | 1.54 | 508.3 | 108.3 |
| 67 | 11.505 | 1.0 | 7.537 | 234.777 | 217.083 | 617.1 | 400.0 | 1.54 | 508.5 | 108.5 |
| 68 | 11.661 | 1.0 | 7.643 | 235.656 | 217.645 | 617.6 | 400.0 | 1.54 | 508.8 | 108.8 |
| 69 | 11.828 | 1.0 | 7.756 | 236.534 | 218.190 | 618.2 | 400.0 | 1.55 | 509.1 | 109.1 |
| 70 | 11.990 | 1.1 | 7.865 | 237.413 | 218.740 | 618.7 | 400.0 | 1.55 | 509.4 | 109.4 |
| 71 | 12.157 | 1.1 | 7.978 | 238.116 | 219.119 | 619.1 | 400.0 | 1.55 | 509.6 | 109.6 |
| 72 | 12.313 | 1.1 | 8.084 | 238.819 | 219.513 | 619.5 | 400.0 | 1.55 | 509.8 | 109.8 |
| 73 | 12.480 | 1.1 | 8.197 | 238.995 | 219.404 | 619.4 | 400.0 | 1.55 | 509.7 | 109.7 |
| 74 | 12.647 | 1.1 | 8.310 | 239.522 | 219.618 | 619.6 | 400.0 | 1.55 | 509.8 | 109.8 |
| 75 | 12.822 | 1.1 | 8.428 | 239.873 | 219.656 | 619.7 | 400.0 | 1.55 | 509.8 | 109.8 |
| 76 | 12.987 | 1.1 | 8.539 | 240.049 | 219.550 | 619.6 | 400.0 | 1.55 | 509.8 | 109.8 |
| 77 | 13.156 | 1.1 | 8.654 | 240.400 | 219.596 | 619.6 | 400.0 | 1.55 | 509.8 | 109.8 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 13.323 | 1.1 | 8.767 | 240.400 | 219.324 | 619.3 | 400.0 | 1.55 | 509.7 | 109.7 |
| 79 | 13.495 | 1.1 | 8.884 | 240.576 | 219.204 | 619.2 | 400.0 | 1.55 | 509.6 | 109.6 |
| 80 | 13.668 | 1.1 | 9.000 | 240.576 | 218.924 | 618.9 | 400.0 | 1.55 | 509.5 | 109.5 |
| 81 | 13.840 | 1.1 | 9.117 | 240.400 | 218.484 | 618.5 | 400.0 | 1.55 | 509.2 | 109.2 |
| 82 | 14.007 | 1.1 | 9.230 | 239.873 | 217.734 | 617.7 | 400.0 | 1.54 | 508.9 | 108.9 |
| 83 | 14.169 | 1.1 | 9.339 | 239.697 | 217.312 | 617.3 | 400.0 | 1.54 | 508.7 | 108.7 |
| 84 | 14.330 | 1.1 | 9.449 | 239.522 | 216.890 | 616.9 | 400.0 | 1.54 | 508.4 | 108.4 |
| 85 | 14.497 | 1.1 | 9.562 | 239.346 | 216.461 | 616.5 | 400.0 | 1.54 | 508.2 | 108.2 |
| 86 | 14.662 | 1.1 | 9.673 | 239.170 | 216.036 | 616.0 | 400.0 | 1.54 | 508.0 | 108.0 |
| 87 | 14.824 | 1.1 | 9.782 | 239.170 | 215.774 | 615.8 | 400.0 | 1.54 | 507.9 | 107.9 |
| 88 | 14.991 | 1.1 | 9.895 | 238.995 | 215.345 | 615.3 | 400.0 | 1.54 | 507.7 | 107.7 |
| 89 | 15.158 | 1.1 | 10.008 | 238.819 | 214.917 | 614.9 | 400.0 | 1.54 | 507.5 | 107.5 |
| 90 | 15.325 | 1.1 | 10.121 | 238.643 | 214.489 | 614.5 | 400.0 | 1.54 | 507.2 | 107.2 |
| 91 | 15.492 | 1.1 | 10.234 | 238.643 | 214.220 | 614.2 | 400.0 | 1.54 | 507.1 | 107.1 |
| 92 | 15.659 | 1.1 | 10.347 | 238.643 | 213.950 | 614.0 | 400.0 | 1.53 | 507.0 | 107.0 |
| 93 | 15.815 | 1.1 | 10.453 | 238.467 | 213.540 | 613.5 | 400.0 | 1.53 | 506.8 | 106.8 |
| 94 | 15.982 | 1.1 | 10.566 | 238.643 | 213.428 | 613.4 | 400.0 | 1.53 | 506.7 | 106.7 |
| 95 | 16.152 | 1.1 | 10.681 | 238.467 | 212.997 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 96 | 16.321 | 1.1 | 10.796 | 238.467 | 212.723 | 612.7 | 400.0 | 1.53 | 506.4 | 106.4 |
| 97 | 16.491 | 1.1 | 10.910 | 238.643 | 212.606 | 612.6 | 400.0 | 1.53 | 506.3 | 106.3 |
| 98 | 16.648 | 1.1 | 11.016 | 238.995 | 212.666 | 612.7 | 400.0 | 1.53 | 506.3 | 106.3 |
| 99 | 16.820 | 1.1 | 11.133 | 239.522 | 212.856 | 612.9 | 400.0 | 1.53 | 506.4 | 106.4 |
| 100 | 16.984 | 1.1 | 11.244 | 240.049 | 213.058 | 613.1 | 400.0 | 1.53 | 506.5 | 106.5 |
| 101 | 17.149 | 1.1 | 11.355 | 240.400 | 213.102 | 613.1 | 400.0 | 1.53 | 506.6 | 106.6 |
| 102 | 17.313 | 1.1 | 11.467 | 240.752 | 213.146 | 613.1 | 400.0 | 1.53 | 506.6 | 106.6 |
| 103 | 17.485 | 1.1 | 11.583 | 240.928 | 213.021 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 104 | 17.650 | 1.1 | 11.694 | 241.279 | 213.063 | 613.1 | 400.0 | 1.53 | 506.5 | 106.5 |
| 105 | 17.822 | 1.1 | 11.811 | 241.455 | 212.937 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 106 | 17.986 | 1.1 | 11.922 | 241.631 | 212.823 | 612.8 | 400.0 | 1.53 | 506.4 | 106.4 |
| 107 | 18.151 | 1.1 | 12.033 | 241.982 | 212.864 | 612.9 | 400.0 | 1.53 | 506.4 | 106.4 |
| 108 | 18.323 | 1.1 | 12.150 | 242.158 | 212.736 | 612.7 | 400.0 | 1.53 | 506.4 | 106.4 |
| 109 | 18.495 | 1.1 | 12.266 | 242.333 | 212.608 | 612.6 | 400.0 | 1.53 | 506.3 | 106.3 |
| 110 | 18.667 | 1.1 | 12.383 | 242.509 | 212.480 | 612.5 | 400.0 | 1.53 | 506.2 | 106.2 |
| 111 | 18.839 | 1.1 | 12.499 | 242.509 | 212.197 | 612.2 | 400.0 | 1.53 | 506.1 | 106.1 |
| 112 | 19.004 | 1.1 | 12.611 | 242.685 | 212.081 | 612.1 | 400.0 | 1.53 | 506.0 | 106.0 |
| 113 | 19.168 | 1.1 | 12.722 | 243.036 | 212.118 | 612.1 | 400.0 | 1.53 | 506.1 | 106.1 |
| 114 | 19.330 | 1.1 | 12.831 | 243.564 | 212.311 | 612.3 | 400.0 | 1.53 | 506.2 | 106.2 |
| 115 | 19.486 | 1.1 | 12.937 | 244.442 | 212.818 | 612.8 | 400.0 | 1.53 | 506.4 | 106.4 |
| 116 | 19.656 | 1.1 | 13.052 | 244.794 | 212.843 | 612.8 | 400.0 | 1.53 | 506.4 | 106.4 |
| 117 | 19.826 | 1.1 | 13.167 | 244.969 | 212.715 | 612.7 | 400.0 | 1.53 | 506.4 | 106.4 |
| 118 | 19.982 | 1.1 | 13.273 | 245.672 | 213.065 | 613.1 | 400.0 | 1.53 | 506.5 | 106.5 |
| 119 | 20.152 | 1.1 | 13.387 | 245.672 | 212.783 | 612.8 | 400.0 | 1.53 | 506.4 | 106.4 |
| 120 | 20.324 | 1.1 | 13.504 | 246.024 | 212.801 | 612.8 | 400.0 | 1.53 | 506.4 | 106.4 |
| 121 | 20.488 | 1.1 | 13.615 | 246.200 | 212.679 | 612.7 | 400.0 | 1.53 | 506.3 | 106.3 |
| 122 | 20.650 | 1.1 | 13.725 | 246.727 | 212.865 | 612.9 | 400.0 | 1.53 | 506.4 | 106.4 |
| 123 | 20.822 | 1.1 | 13.841 | 247.078 | 212.880 | 612.9 | 400.0 | 1.53 | 506.4 | 106.4 |
| 124 | 20.987 | 1.1 | 13.952 | 247.605 | 213.059 | 613.1 | 400.0 | 1.53 | 506.5 | 106.5 |
| 125 | 21.151 | 1.1 | 14.064 | 248.133 | 213.236 | 613.2 | 400.0 | 1.53 | 506.6 | 106.6 |
| 126 | 21.316 | 1.1 | 14.175 | 248.133 | 212.960 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 127 | 21.480 | 1.1 | 14.286 | 248.484 | 212.986 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 128 | 21.644 | 1.1 | 14.397 | 249.011 | 213.161 | 613.2 | 400.0 | 1.53 | 506.6 | 106.6 |
| 129 | 21.809 | 1.1 | 14.508 | 249.187 | 213.034 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 130 | 21.965 | 1.1 | 14.614 | 249.890 | 213.370 | 613.4 | 400.0 | 1.53 | 506.7 | 106.7 |
| 131 | 22.130 | 1.1 | 14.726 | 250.066 | 213.242 | 613.2 | 400.0 | 1.53 | 506.6 | 106.6 |
| 132 | 22.302 | 1.1 | 14.842 | 250.593 | 213.400 | 613.4 | 400.0 | 1.53 | 506.7 | 106.7 |
| 133 | 22.466 | 1.1 | 14.953 | 250.944 | 213.420 | 613.4 | 400.0 | 1.53 | 506.7 | 106.7 |
| 134 | 22.639 | 1.1 | 15.070 | 251.120 | 213.277 | 613.3 | 400.0 | 1.53 | 506.6 | 106.6 |
| 135 | 22.803 | 1.1 | 15.181 | 251.471 | 213.295 | 613.3 | 400.0 | 1.53 | 506.6 | 106.6 |
| 136 | 22.967 | 1.1 | 15.292 | 251.647 | 213.165 | 613.2 | 400.0 | 1.53 | 506.6 | 106.6 |
| 137 | 23.140 | 1.1 | 15.409 | 252.174 | 213.317 | 613.3 | 400.0 | 1.53 | 506.7 | 106.7 |
| 138 | 23.304 | 1.1 | 15.520 | 252.526 | 213.334 | 613.3 | 400.0 | 1.53 | 506.7 | 106.7 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 23.476 | 1.1 | 15.637 | 252.877 | 213.336 | 613.3 | 400.0 | 1.53 | 506.7 | 106.7 |
| 140 | 23.648 | 1.1 | 15.753 | 252.877 | 213.041 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 141 | 23.826 | 1.1 | 15.873 | 253.053 | 212.886 | 612.9 | 400.0 | 1.53 | 506.4 | 106.4 |
| 142 | 24.003 | 1.1 | 15.993 | 252.877 | 212.434 | 612.4 | 400.0 | 1.53 | 506.2 | 106.2 |
| 143 | 24.170 | 1.1 | 16.106 | 253.053 | 212.296 | 612.3 | 400.0 | 1.53 | 506.1 | 106.1 |
| 144 | 24.327 | 1.1 | 16.212 | 253.405 | 212.322 | 612.3 | 400.0 | 1.53 | 506.2 | 106.2 |
| 145 | 24.494 | 1.1 | 16.325 | 254.283 | 212.771 | 612.8 | 400.0 | 1.53 | 506.4 | 106.4 |
| 146 | 24.650 | 1.1 | 16.431 | 254.810 | 212.942 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 147 | 24.817 | 1.1 | 16.544 | 255.513 | 213.241 | 613.2 | 400.0 | 1.53 | 506.6 | 106.6 |
| 148 | 24.984 | 1.1 | 16.657 | 255.865 | 213.245 | 613.2 | 400.0 | 1.53 | 506.6 | 106.6 |
| 149 | 25.149 | 1.1 | 16.768 | 256.040 | 213.107 | 613.1 | 400.0 | 1.53 | 506.6 | 106.6 |
| 150 | 25.324 | 1.1 | 16.887 | 256.392 | 213.096 | 613.1 | 400.0 | 1.53 | 506.5 | 106.5 |
| 151 | 25.493 | 1.1 | 17.001 | 256.568 | 212.948 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 152 | 25.660 | 1.1 | 17.114 | 256.919 | 212.949 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 153 | 25.822 | 1.1 | 17.224 | 257.271 | 212.959 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 154 | 25.989 | 1.1 | 17.337 | 257.622 | 212.959 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 155 | 26.153 | 1.1 | 17.448 | 258.149 | 213.108 | 613.1 | 400.0 | 1.53 | 506.6 | 106.6 |
| 156 | 26.326 | 1.1 | 17.564 | 258.325 | 212.952 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 157 | 26.493 | 1.1 | 17.677 | 258.676 | 212.949 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 158 | 26.662 | 1.1 | 17.792 | 259.028 | 212.941 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 159 | 26.819 | 1.1 | 17.898 | 259.379 | 212.955 | 613.0 | 400.0 | 1.53 | 506.5 | 106.5 |
| 160 | 26.988 | 1.1 | 18.013 | 260.082 | 213.234 | 613.2 | 400.0 | 1.53 | 506.6 | 106.6 |
| 161 | 27.145 | 1.1 | 18.119 | 260.434 | 213.246 | 613.2 | 400.0 | 1.53 | 506.6 | 106.6 |
| 162 | 27.314 | 1.1 | 18.234 | 260.785 | 213.235 | 613.2 | 400.0 | 1.53 | 506.6 | 106.6 |
| 163 | 27.484 | 1.2 | 18.348 | 260.961 | 213.079 | 613.1 | 400.0 | 1.53 | 506.5 | 106.5 |
| 164 | 27.641 | 1.2 | 18.454 | 261.312 | 213.089 | 613.1 | 400.0 | 1.53 | 506.5 | 106.5 |
| 165 | 27.810 | 1.2 | 18.569 | 261.488 | 212.933 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 166 | 27.980 | 1.2 | 18.684 | 261.840 | 212.918 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 167 | 28.147 | 1.2 | 18.797 | 262.191 | 212.908 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 168 | 28.311 | 1.2 | 18.908 | 262.543 | 212.901 | 612.9 | 400.0 | 1.53 | 506.5 | 106.5 |
| 169 | 28.478 | 1.2 | 19.021 | 262.894 | 212.889 | 612.9 | 400.0 | 1.53 | 506.4 | 106.4 |
| 170 | 28.650 | 1.2 | 19.137 | 263.246 | 212.867 | 612.9 | 400.0 | 1.53 | 506.4 | 106.4 |
| 171 | 28.823 | 1.2 | 19.254 | 263.246 | 212.560 | 612.6 | 400.0 | 1.53 | 506.3 | 106.3 |
| 172 | 28.995 | 1.2 | 19.370 | 263.421 | 212.395 | 612.4 | 400.0 | 1.53 | 506.2 | 106.2 |
| 173 | 29.162 | 1.2 | 19.483 | 263.597 | 212.239 | 612.2 | 400.0 | 1.53 | 506.1 | 106.1 |
| 174 | 29.329 | 1.2 | 19.596 | 263.948 | 212.224 | 612.2 | 400.0 | 1.53 | 506.1 | 106.1 |
| 175 | 29.496 | 1.2 | 19.709 | 264.651 | 212.490 | 612.5 | 400.0 | 1.53 | 506.2 | 106.2 |
| 176 | 29.652 | 1.2 | 19.815 | 265.179 | 212.632 | 612.6 | 400.0 | 1.53 | 506.3 | 106.3 |
| 177 | 29.819 | 1.2 | 19.928 | 265.706 | 212.755 | 612.8 | 400.0 | 1.53 | 506.4 | 106.4 |
| 178 | 29.955 | 1.2 | 20.020 | 266.057 | 212.792 | 612.8 | 400.0 | 1.53 | 506.4 | 106.4 |

Test Performed By: Checked By:

**Stantec Consulting Ltd.**

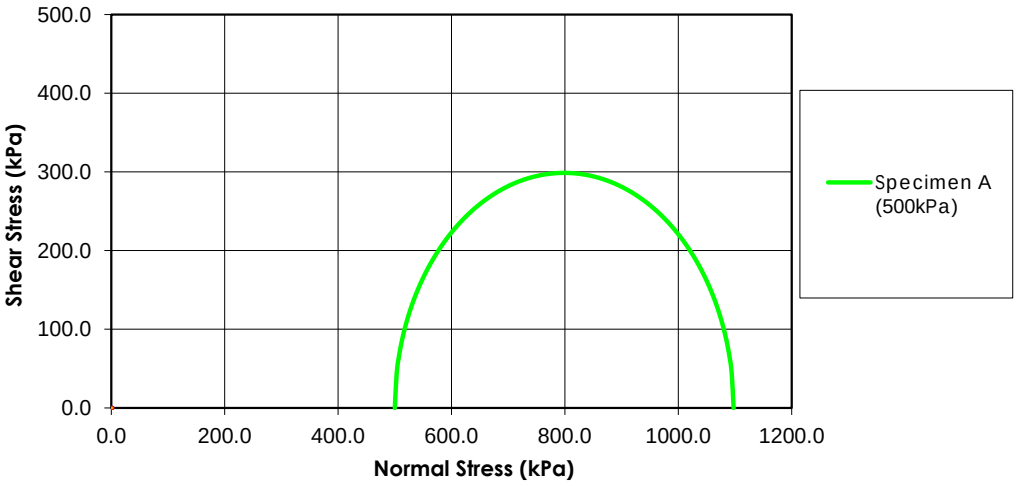
**Unconsolidated Undrained Triaxial Test (ASTM D2850)**

Checked By: C. Lamoureux

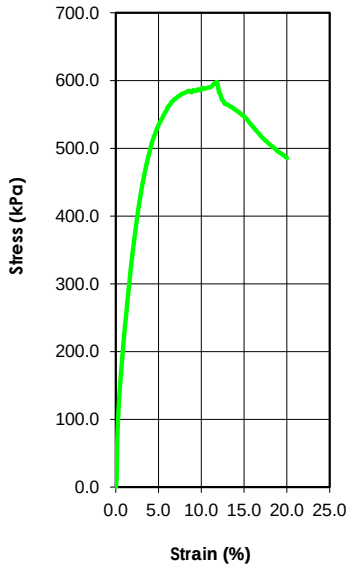
Date 1-Oct-16

Tested By: C. Tollifson

## Mohr Circles




### Stress-Strain Curve




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 15.4 | | | |
| Dry Density (g/cm3) | 1.872 | | | |
| Saturation (%) | 93.85 | | | |
| Void Ratio | 0.44 | | | |
| Diameter (mm) | 71.1 | | | |
| Height (mm) | 152.0 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 16.90 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | | | |
| Peak Dev. Stress (kPa) | 597.506 | | | |
| Axial Strain @ Failure (%) | 11.751 | | | |
| | **Cell Pressure** | | | |
| Cell (kPa) | 500.0 | | | |
| Back (kPa) | n/a | | | |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 1097.5 | | | |
| σ3 (kPa) | 500.0 | | | |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Clay Trace Sand Trace Gravel |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.230 | Job Number: | - |
| Location: | - | Boring Number: | - |
| Client: | Alberta Transportation | Sample Number: | D30 ST6 |
| Remarks: | | | |

**Stantec Consulting Ltd.**

**Unconsolidated Undrained Triaxial Test (ASTM D2850)**

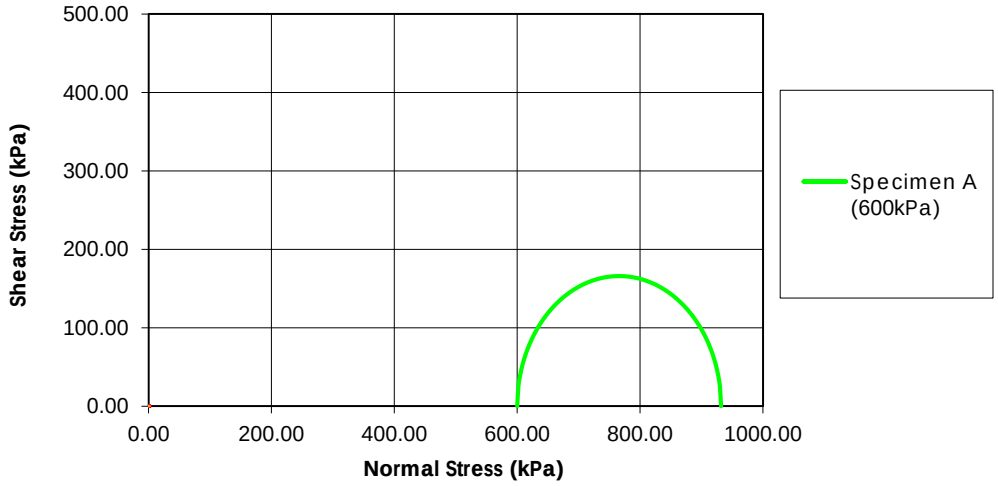
Stantec

Checked By: C. Lamoureux

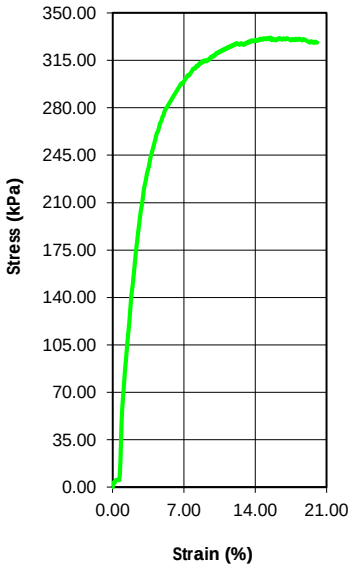
Date 12-Sep-16

Tested By: C. Oost

## Mohr Circles



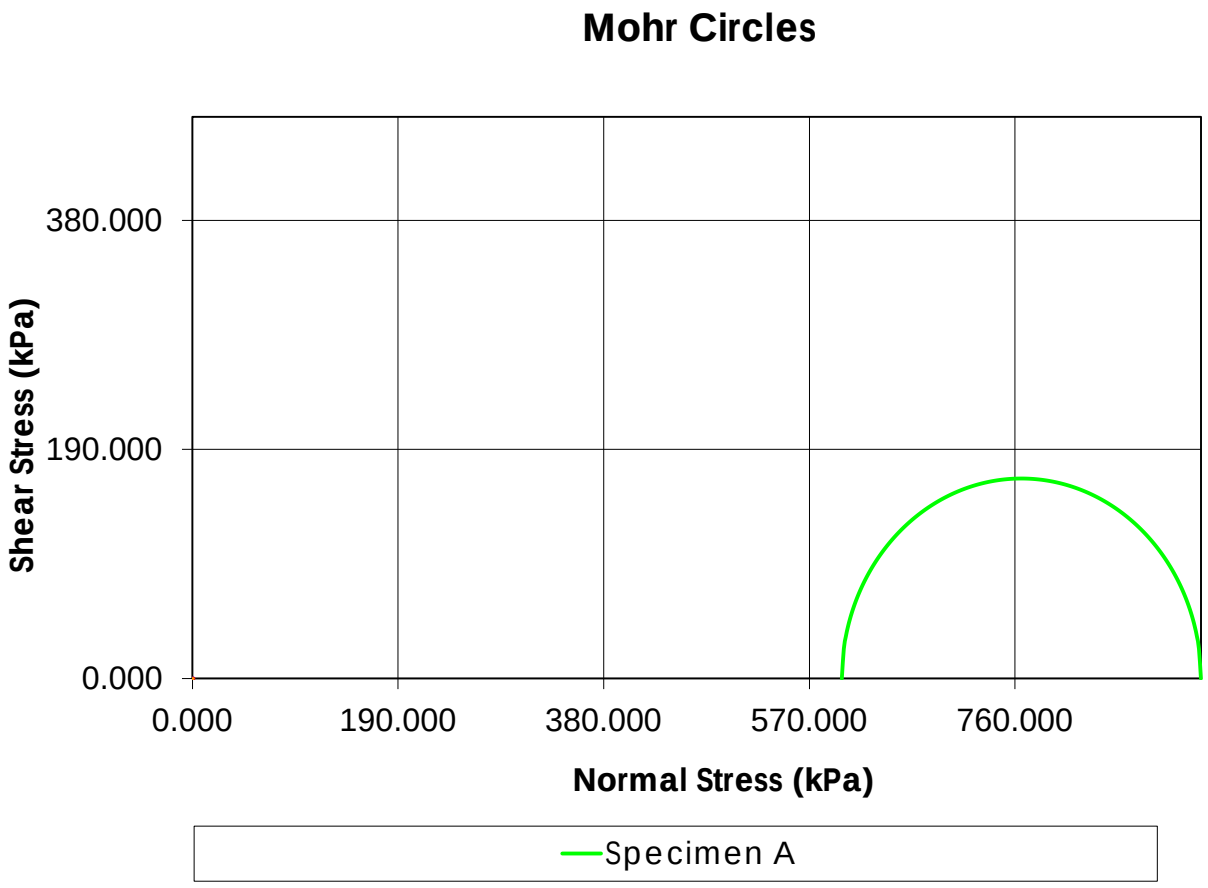

## Stress-Strain Curve

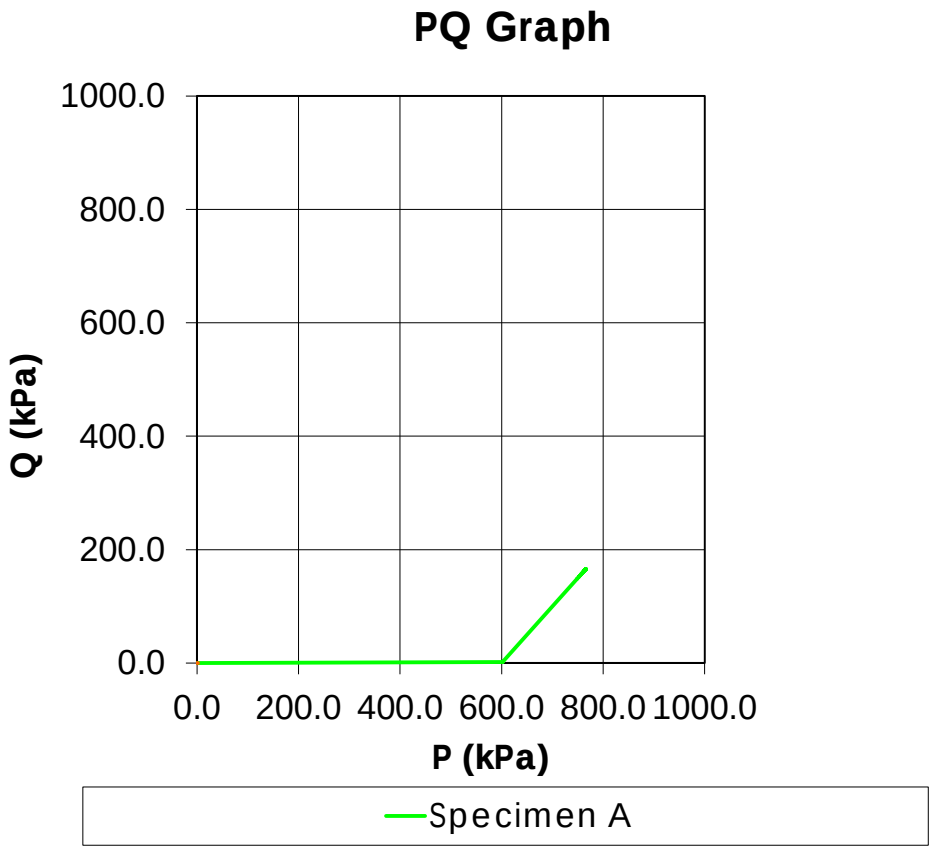



| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 21.6 | | | |
| Dry Density (g/cm3) | 1.739 | | | |
| Saturation (%) | 105.38 | | | |
| Void Ratio | 0.55 | | | |
| Diameter (mm) | 72.400 | | | |
| Height (mm) | 154.000 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 14.0 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | | | |
| Peak Dev. Stress (kPa) | 331.774 | | | |
| Axial Strain @ Failure (%) | 15.496 | | | |
| | **Cell Pressure** | | | |
| Cell (kPa) | 600.0 | | | |
| Back (kPa) | n/a | | | |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 931.8 | | | |
| σ3 (kPa) | 600.0 | | | |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Clay |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.230 | Job Number: | - |
| Location: | - | Boring Number: | - |
| Client: | Alberta Transportation | Sample Number: | D30 ST8 |
| Remarks: | | | |


Mohr Circles
380.000
190.000
0.000
Shear Stress (kPa)
0.000
190.000
380.000
570.000
760.000
Normal Stress (kPa)
Specimen A


PQ Graph
1000.0
800.0
600.0
400.0
200.0
0.0
Q (kPa)
0.0
200.0
400.0
600.0
800.0
1000.0
P (kPa)
Specimen A

## Specimen A Information
**UU Triaxial Test**

**Stantec Consulting Ltd.**

File Location
lab_110773396_uut_d30st8.HSD

## Project Information

Project No. 110773396.302.702.2 Test Date: 12-Sep-16 Sample Number: D30 ST8
Project Name: SR1
Client: Alberta Transportation
Sample Location:
Sample Description: Brown Clay
Remarks:

## Specimen A Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.70 LL: - PL: -

| Sample Parameters | Before Test | After Test |
|---|---|---|
| Diameter (mm) | 72.400 | |
| Height (mm) | 154.000 | |
| Weight (g) | 1340.30 | |
| Moisture (%) | 21.57 | 14.02 |
| Dry Density (g/cm3) | 1.739 | |
| Saturation (%) | 105.38 | |
| Void Ratio | 0.55 | |

## Specimen A Test Data

Rate of Strain: 2 (mm/min)
Cell Pressure: 600.0 (kPa)
Effective Confining Stress: 600.0 (kPa)
Peak Deviator Stress: 331.774 (kPa) at reading number: 143
Height\Diameter Ratio: 2.13
Axial Strain @ Failure: 15.496 (%)

| Read Number | Disp (mm) | Load Kn) | Axial Strain (%) | Deviator Stress (kPa) | Corr. Deviator Stress (kPa) | Principal Stresses $Q_1$ (kPa) | Principal Stresses $Q_3$ (kPa) | Principal Stresses 1:3 Ratio (kPa) | P (kPa) | Q (kPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0.521 | 0.0 | 0.000 | 0.000 | 0.000 | 600.0 | 600.0 | 1.00 | 0.0 | 0.0 |
| 1 | 0.678 | 0.0 | 0.102 | 3.569 | 3.566 | 603.6 | 600.0 | 1.01 | 601.8 | 1.8 |
| 2 | 0.851 | 0.0 | 0.215 | 3.569 | 3.562 | 603.6 | 600.0 | 1.01 | 601.8 | 1.8 |
| 3 | 1.014 | 0.1 | 0.320 | 5.354 | 5.337 | 605.3 | 600.0 | 1.01 | 602.7 | 2.7 |
| 4 | 1.182 | 0.1 | 0.429 | 5.354 | 5.331 | 605.3 | 600.0 | 1.01 | 602.7 | 2.7 |
| 5 | 1.356 | 0.1 | 0.542 | 5.354 | 5.325 | 605.3 | 600.0 | 1.01 | 602.7 | 2.7 |
| 6 | 1.524 | 0.1 | 0.651 | 5.354 | 5.319 | 605.3 | 600.0 | 1.01 | 602.7 | 2.7 |
| 7 | 1.694 | 0.1 | 0.762 | 19.631 | 19.481 | 619.5 | 600.0 | 1.03 | 609.7 | 9.7 |
| 8 | 1.849 | 0.2 | 0.862 | 46.400 | 46.000 | 646.0 | 600.0 | 1.08 | 623.0 | 23.0 |
| 9 | 2.017 | 0.3 | 0.972 | 62.461 | 61.854 | 661.9 | 600.0 | 1.10 | 630.9 | 30.9 |
| 10 | 2.182 | 0.3 | 1.079 | 73.169 | 72.379 | 672.4 | 600.0 | 1.12 | 636.2 | 36.2 |
| 11 | 2.356 | 0.4 | 1.192 | 85.661 | 84.640 | 684.6 | 600.0 | 1.14 | 642.3 | 42.3 |
| 12 | 2.518 | 0.4 | 1.297 | 94.584 | 93.357 | 693.4 | 600.0 | 1.16 | 646.7 | 46.7 |
| 13 | 2.689 | 0.5 | 1.408 | 105.292 | 103.809 | 703.8 | 600.0 | 1.17 | 651.9 | 51.9 |
| 14 | 2.852 | 0.5 | 1.514 | 114.215 | 112.486 | 712.5 | 600.0 | 1.19 | 656.2 | 56.2 |
| 15 | 3.023 | 0.5 | 1.625 | 123.138 | 121.137 | 721.1 | 600.0 | 1.20 | 660.6 | 60.6 |
| 16 | 3.185 | 0.6 | 1.730 | 133.845 | 131.529 | 731.5 | 600.0 | 1.22 | 665.8 | 65.8 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 3.356 | 0.6 | 1.841 | 144.553 | 141.892 | 741.9 | 600.0 | 1.24 | 670.9 | 70.9 |
| 18 | 3.535 | 0.7 | 1.957 | 151.691 | 148.722 | 748.7 | 600.0 | 1.25 | 674.4 | 74.4 |
| 19 | 3.711 | 0.7 | 2.072 | 160.614 | 157.287 | 757.3 | 600.0 | 1.26 | 678.6 | 78.6 |
| 20 | 3.879 | 0.7 | 2.181 | 169.537 | 165.840 | 765.8 | 600.0 | 1.28 | 682.9 | 82.9 |
| 21 | 4.048 | 0.8 | 2.290 | 178.460 | 174.373 | 774.4 | 600.0 | 1.29 | 687.2 | 87.2 |
| 22 | 4.210 | 0.8 | 2.396 | 185.599 | 181.152 | 781.2 | 600.0 | 1.30 | 690.6 | 90.6 |
| 23 | 4.367 | 0.8 | 2.498 | 192.737 | 187.923 | 787.9 | 600.0 | 1.31 | 694.0 | 94.0 |
| 24 | 4.541 | 0.9 | 2.610 | 199.875 | 194.658 | 794.7 | 600.0 | 1.32 | 697.3 | 97.3 |
| 25 | 4.703 | 0.9 | 2.716 | 207.014 | 201.392 | 801.4 | 600.0 | 1.34 | 700.7 | 100.7 |
| 26 | 4.860 | 0.9 | 2.818 | 212.368 | 206.383 | 806.4 | 600.0 | 1.34 | 703.2 | 103.2 |
| 27 | 5.031 | 0.9 | 2.929 | 217.721 | 211.345 | 811.3 | 600.0 | 1.35 | 705.7 | 105.7 |
| 28 | 5.188 | 1.0 | 3.031 | 224.860 | 218.045 | 818.0 | 600.0 | 1.36 | 709.0 | 109.0 |
| 29 | 5.362 | 1.0 | 3.144 | 230.214 | 222.977 | 823.0 | 600.0 | 1.37 | 711.5 | 111.5 |
| 30 | 5.522 | 1.0 | 3.247 | 233.783 | 226.191 | 826.2 | 600.0 | 1.38 | 713.1 | 113.1 |
| 31 | 5.690 | 1.0 | 3.356 | 239.137 | 231.110 | 831.1 | 600.0 | 1.39 | 715.6 | 115.6 |
| 32 | 5.860 | 1.0 | 3.467 | 242.706 | 234.290 | 834.3 | 600.0 | 1.39 | 717.1 | 117.1 |
| 33 | 6.023 | 1.0 | 3.573 | 246.275 | 237.476 | 837.5 | 600.0 | 1.40 | 718.7 | 118.7 |
| 34 | 6.199 | 1.1 | 3.687 | 251.629 | 242.350 | 842.4 | 600.0 | 1.40 | 721.2 | 121.2 |
| 35 | 6.362 | 1.1 | 3.793 | 255.198 | 245.518 | 845.5 | 600.0 | 1.41 | 722.8 | 122.8 |
| 36 | 6.536 | 1.1 | 3.906 | 258.767 | 248.661 | 848.7 | 600.0 | 1.41 | 724.3 | 124.3 |
| 37 | 6.706 | 1.1 | 4.017 | 262.337 | 251.799 | 851.8 | 600.0 | 1.42 | 725.9 | 125.9 |
| 38 | 6.874 | 1.1 | 4.126 | 265.906 | 254.935 | 854.9 | 600.0 | 1.42 | 727.5 | 127.5 |
| 39 | 7.034 | 1.1 | 4.230 | 269.475 | 258.077 | 858.1 | 600.0 | 1.43 | 729.0 | 129.0 |
| 40 | 7.197 | 1.2 | 4.335 | 273.044 | 261.207 | 861.2 | 600.0 | 1.44 | 730.6 | 130.6 |
| 41 | 7.368 | 1.2 | 4.446 | 274.829 | 262.610 | 862.6 | 600.0 | 1.44 | 731.3 | 131.3 |
| 42 | 7.536 | 1.2 | 4.555 | 278.398 | 265.716 | 865.7 | 600.0 | 1.44 | 732.9 | 132.9 |
| 43 | 7.701 | 1.2 | 4.663 | 281.967 | 268.820 | 868.8 | 600.0 | 1.45 | 734.4 | 134.4 |
| 44 | 7.880 | 1.2 | 4.779 | 283.752 | 270.192 | 870.2 | 600.0 | 1.45 | 735.1 | 135.1 |
| 45 | 8.045 | 1.2 | 4.886 | 287.321 | 273.282 | 873.3 | 600.0 | 1.46 | 736.6 | 136.6 |
| 46 | 8.213 | 1.2 | 4.995 | 289.106 | 274.664 | 874.7 | 600.0 | 1.46 | 737.3 | 137.3 |
| 47 | 8.384 | 1.2 | 5.106 | 292.675 | 277.730 | 877.7 | 600.0 | 1.46 | 738.9 | 138.9 |
| 48 | 8.561 | 1.2 | 5.221 | 294.459 | 279.086 | 879.1 | 600.0 | 1.47 | 739.5 | 139.5 |
| 49 | 8.729 | 1.2 | 5.330 | 296.244 | 280.455 | 880.5 | 600.0 | 1.47 | 740.2 | 140.2 |
| 50 | 8.894 | 1.3 | 5.437 | 298.029 | 281.824 | 881.8 | 600.0 | 1.47 | 740.9 | 140.9 |
| 51 | 9.057 | 1.3 | 5.543 | 299.813 | 283.195 | 883.2 | 600.0 | 1.47 | 741.6 | 141.6 |
| 52 | 9.227 | 1.3 | 5.654 | 301.598 | 284.546 | 884.5 | 600.0 | 1.47 | 742.3 | 142.3 |
| 53 | 9.395 | 1.3 | 5.763 | 303.382 | 285.899 | 885.9 | 600.0 | 1.48 | 742.9 | 142.9 |
| 54 | 9.558 | 1.3 | 5.868 | 305.167 | 287.259 | 887.3 | 600.0 | 1.48 | 743.6 | 143.6 |
| 55 | 9.715 | 1.3 | 5.970 | 306.952 | 288.625 | 888.6 | 600.0 | 1.48 | 744.3 | 144.3 |
| 56 | 9.883 | 1.3 | 6.079 | 308.736 | 289.967 | 890.0 | 600.0 | 1.48 | 745.0 | 145.0 |
| 57 | 10.057 | 1.3 | 6.192 | 310.521 | 291.293 | 891.3 | 600.0 | 1.49 | 745.6 | 145.6 |
| 58 | 10.225 | 1.3 | 6.301 | 312.305 | 292.626 | 892.6 | 600.0 | 1.49 | 746.3 | 146.3 |
| 59 | 10.387 | 1.3 | 6.407 | 314.090 | 293.966 | 894.0 | 600.0 | 1.49 | 747.0 | 147.0 |
| 60 | 10.555 | 1.3 | 6.516 | 315.875 | 295.292 | 895.3 | 600.0 | 1.49 | 747.6 | 147.6 |
| 61 | 10.718 | 1.3 | 6.622 | 317.659 | 296.625 | 896.6 | 600.0 | 1.49 | 748.3 | 148.3 |
| 62 | 10.881 | 1.3 | 6.727 | 319.444 | 297.954 | 898.0 | 600.0 | 1.50 | 749.0 | 149.0 |
| 63 | 11.051 | 1.3 | 6.838 | 319.444 | 297.600 | 897.6 | 600.0 | 1.50 | 748.8 | 148.8 |
| 64 | 11.219 | 1.4 | 6.947 | 321.228 | 298.912 | 898.9 | 600.0 | 1.50 | 749.5 | 149.5 |
| 65 | 11.385 | 1.4 | 7.055 | 323.013 | 300.226 | 900.2 | 600.0 | 1.50 | 750.1 | 150.1 |
| 66 | 11.561 | 1.4 | 7.169 | 324.798 | 301.513 | 901.5 | 600.0 | 1.50 | 750.8 | 150.8 |
| 67 | 11.715 | 1.4 | 7.269 | 326.582 | 302.842 | 902.8 | 600.0 | 1.50 | 751.4 | 151.4 |
| 68 | 11.895 | 1.4 | 7.386 | 328.367 | 304.115 | 904.1 | 600.0 | 1.51 | 752.1 | 152.1 |
| 69 | 12.052 | 1.4 | 7.488 | 328.367 | 303.780 | 903.8 | 600.0 | 1.51 | 751.9 | 151.9 |
| 70 | 12.220 | 1.4 | 7.597 | 330.151 | 305.071 | 905.1 | 600.0 | 1.51 | 752.5 | 152.5 |
| 71 | 12.393 | 1.4 | 7.709 | 331.936 | 306.346 | 906.3 | 600.0 | 1.51 | 753.2 | 153.2 |
| 72 | 12.550 | 1.4 | 7.811 | 333.721 | 307.652 | 907.7 | 600.0 | 1.51 | 753.8 | 153.8 |
| 73 | 12.721 | 1.4 | 7.922 | 335.505 | 308.925 | 908.9 | 600.0 | 1.51 | 754.5 | 154.5 |
| 74 | 12.889 | 1.4 | 8.031 | 335.505 | 308.559 | 908.6 | 600.0 | 1.51 | 754.3 | 154.3 |
| 75 | 13.066 | 1.4 | 8.146 | 337.290 | 309.814 | 909.8 | 600.0 | 1.52 | 754.9 | 154.9 |
| 76 | 13.231 | 1.4 | 8.253 | 339.074 | 311.090 | 911.1 | 600.0 | 1.52 | 755.5 | 155.5 |
| 77 | 13.402 | 1.4 | 8.364 | 339.074 | 310.713 | 910.7 | 600.0 | 1.52 | 755.4 | 155.4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 13.564 | 1.4 | 8.470 | 340.859 | 311.989 | 912.0 | 600.0 | 1.52 | 756.0 | 156.0 |
| 79 | 13.730 | 1.4 | 8.577 | 342.644 | 313.255 | 913.3 | 600.0 | 1.52 | 756.6 | 156.6 |
| 80 | 13.900 | 1.4 | 8.688 | 342.644 | 312.875 | 912.9 | 600.0 | 1.52 | 756.4 | 156.4 |
| 81 | 14.074 | 1.4 | 8.801 | 344.428 | 314.116 | 914.1 | 600.0 | 1.52 | 757.1 | 157.1 |
| 82 | 14.231 | 1.4 | 8.903 | 344.428 | 313.765 | 913.8 | 600.0 | 1.52 | 756.9 | 156.9 |
| 83 | 14.391 | 1.5 | 9.007 | 346.213 | 315.031 | 915.0 | 600.0 | 1.53 | 757.5 | 157.5 |
| 84 | 14.553 | 1.5 | 9.112 | 346.213 | 314.666 | 914.7 | 600.0 | 1.52 | 757.3 | 157.3 |
| 85 | 14.730 | 1.5 | 9.227 | 346.213 | 314.269 | 914.3 | 600.0 | 1.52 | 757.1 | 157.1 |
| 86 | 14.890 | 1.5 | 9.330 | 347.997 | 315.528 | 915.5 | 600.0 | 1.53 | 757.8 | 157.8 |
| 87 | 15.047 | 1.5 | 9.432 | 347.997 | 315.173 | 915.2 | 600.0 | 1.53 | 757.6 | 157.6 |
| 88 | 15.217 | 1.5 | 9.543 | 349.782 | 316.401 | 916.4 | 600.0 | 1.53 | 758.2 | 158.2 |
| 89 | 15.385 | 1.5 | 9.652 | 351.567 | 317.632 | 917.6 | 600.0 | 1.53 | 758.8 | 158.8 |
| 90 | 15.554 | 1.5 | 9.762 | 351.567 | 317.248 | 917.2 | 600.0 | 1.53 | 758.6 | 158.6 |
| 91 | 15.711 | 1.5 | 9.864 | 353.351 | 318.498 | 918.5 | 600.0 | 1.53 | 759.2 | 159.2 |
| 92 | 15.884 | 1.5 | 9.976 | 353.351 | 318.100 | 918.1 | 600.0 | 1.53 | 759.1 | 159.1 |
| 93 | 16.052 | 1.5 | 10.085 | 355.136 | 319.319 | 919.3 | 600.0 | 1.53 | 759.7 | 159.7 |
| 94 | 16.220 | 1.5 | 10.195 | 356.920 | 320.534 | 920.5 | 600.0 | 1.53 | 760.3 | 160.3 |
| 95 | 16.383 | 1.5 | 10.300 | 356.920 | 320.157 | 920.2 | 600.0 | 1.53 | 760.1 | 160.1 |
| 96 | 16.556 | 1.5 | 10.413 | 358.705 | 321.354 | 921.4 | 600.0 | 1.54 | 760.7 | 160.7 |
| 97 | 16.722 | 1.5 | 10.520 | 358.705 | 320.969 | 921.0 | 600.0 | 1.53 | 760.5 | 160.5 |
| 98 | 16.882 | 1.5 | 10.624 | 360.490 | 322.191 | 922.2 | 600.0 | 1.54 | 761.1 | 161.1 |
| 99 | 17.047 | 1.5 | 10.731 | 360.490 | 321.805 | 921.8 | 600.0 | 1.54 | 760.9 | 160.9 |
| 100 | 17.212 | 1.5 | 10.839 | 362.274 | 323.009 | 923.0 | 600.0 | 1.54 | 761.5 | 161.5 |
| 101 | 17.380 | 1.5 | 10.948 | 362.274 | 322.613 | 922.6 | 600.0 | 1.54 | 761.3 | 161.3 |
| 102 | 17.551 | 1.5 | 11.059 | 364.059 | 323.799 | 923.8 | 600.0 | 1.54 | 761.9 | 161.9 |
| 103 | 17.719 | 1.5 | 11.168 | 364.059 | 323.401 | 923.4 | 600.0 | 1.54 | 761.7 | 161.7 |
| 104 | 17.879 | 1.5 | 11.272 | 365.843 | 324.607 | 924.6 | 600.0 | 1.54 | 762.3 | 162.3 |
| 105 | 18.047 | 1.5 | 11.381 | 365.843 | 324.208 | 924.2 | 600.0 | 1.54 | 762.1 | 162.1 |
| 106 | 18.223 | 1.5 | 11.495 | 367.628 | 325.368 | 925.4 | 600.0 | 1.54 | 762.7 | 162.7 |
| 107 | 18.389 | 1.5 | 11.603 | 367.628 | 324.974 | 925.0 | 600.0 | 1.54 | 762.5 | 162.5 |
| 108 | 18.560 | 1.6 | 11.714 | 369.413 | 326.141 | 926.1 | 600.0 | 1.54 | 763.1 | 163.1 |
| 109 | 18.722 | 1.6 | 11.819 | 369.413 | 325.752 | 925.8 | 600.0 | 1.54 | 762.9 | 162.9 |
| 110 | 18.887 | 1.6 | 11.926 | 371.197 | 326.927 | 926.9 | 600.0 | 1.54 | 763.5 | 163.5 |
| 111 | 19.064 | 1.6 | 12.041 | 371.197 | 326.502 | 926.5 | 600.0 | 1.54 | 763.3 | 163.3 |
| 112 | 19.224 | 1.6 | 12.145 | 372.982 | 327.684 | 927.7 | 600.0 | 1.55 | 763.8 | 163.8 |
| 113 | 19.394 | 1.6 | 12.256 | 372.982 | 327.271 | 927.3 | 600.0 | 1.55 | 763.6 | 163.6 |
| 114 | 19.562 | 1.6 | 12.365 | 372.982 | 326.864 | 926.9 | 600.0 | 1.54 | 763.4 | 163.4 |
| 115 | 19.717 | 1.6 | 12.465 | 372.982 | 326.490 | 926.5 | 600.0 | 1.54 | 763.2 | 163.2 |
| 116 | 19.879 | 1.6 | 12.571 | 374.766 | 327.656 | 927.7 | 600.0 | 1.55 | 763.8 | 163.8 |
| 117 | 20.045 | 1.6 | 12.678 | 374.766 | 327.254 | 927.3 | 600.0 | 1.55 | 763.6 | 163.6 |
| 118 | 20.204 | 1.6 | 12.782 | 374.766 | 326.865 | 926.9 | 600.0 | 1.54 | 763.4 | 163.4 |
| 119 | 20.378 | 1.6 | 12.894 | 374.766 | 326.443 | 926.4 | 600.0 | 1.54 | 763.2 | 163.2 |
| 120 | 20.538 | 1.6 | 12.998 | 376.551 | 327.607 | 927.6 | 600.0 | 1.55 | 763.8 | 163.8 |
| 121 | 20.695 | 1.6 | 13.100 | 376.551 | 327.223 | 927.2 | 600.0 | 1.55 | 763.6 | 163.6 |
| 122 | 20.860 | 1.6 | 13.207 | 378.336 | 328.367 | 928.4 | 600.0 | 1.55 | 764.2 | 164.2 |
| 123 | 21.037 | 1.6 | 13.322 | 378.336 | 327.934 | 927.9 | 600.0 | 1.55 | 764.0 | 164.0 |
| 124 | 21.205 | 1.6 | 13.431 | 380.120 | 329.066 | 929.1 | 600.0 | 1.55 | 764.5 | 164.5 |
| 125 | 21.373 | 1.6 | 13.540 | 380.120 | 328.651 | 928.7 | 600.0 | 1.55 | 764.3 | 164.3 |
| 126 | 21.544 | 1.6 | 13.651 | 381.905 | 329.770 | 929.8 | 600.0 | 1.55 | 764.9 | 164.9 |
| 127 | 21.712 | 1.6 | 13.760 | 381.905 | 329.354 | 929.4 | 600.0 | 1.55 | 764.7 | 164.7 |
| 128 | 21.880 | 1.6 | 13.869 | 381.905 | 328.937 | 928.9 | 600.0 | 1.55 | 764.5 | 164.5 |
| 129 | 22.042 | 1.6 | 13.975 | 383.689 | 330.069 | 930.1 | 600.0 | 1.55 | 765.0 | 165.0 |
| 130 | 22.210 | 1.6 | 14.084 | 383.689 | 329.650 | 929.7 | 600.0 | 1.55 | 764.8 | 164.8 |
| 131 | 22.370 | 1.6 | 14.188 | 383.689 | 329.252 | 929.3 | 600.0 | 1.55 | 764.6 | 164.6 |
| 132 | 22.541 | 1.6 | 14.299 | 385.474 | 330.356 | 930.4 | 600.0 | 1.55 | 765.2 | 165.2 |
| 133 | 22.709 | 1.6 | 14.408 | 385.474 | 329.935 | 929.9 | 600.0 | 1.55 | 765.0 | 165.0 |
| 134 | 22.874 | 1.6 | 14.515 | 387.259 | 331.047 | 931.0 | 600.0 | 1.55 | 765.5 | 165.5 |
| 135 | 23.045 | 1.6 | 14.626 | 387.259 | 330.617 | 930.6 | 600.0 | 1.55 | 765.3 | 165.3 |
| 136 | 23.210 | 1.6 | 14.734 | 387.259 | 330.202 | 930.2 | 600.0 | 1.55 | 765.1 | 165.1 |
| 137 | 23.379 | 1.6 | 14.843 | 389.043 | 331.299 | 931.3 | 600.0 | 1.55 | 765.6 | 165.6 |
| 138 | 23.547 | 1.6 | 14.952 | 389.043 | 330.874 | 930.9 | 600.0 | 1.55 | 765.4 | 165.4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 23.715 | 1.6 | 15.061 | 389.043 | 330.450 | 930.4 | 600.0 | 1.55 | 765.2 | 165.2 |
| 140 | 23.883 | 1.6 | 15.170 | 390.828 | 331.539 | 931.5 | 600.0 | 1.55 | 765.8 | 165.8 |
| 141 | 24.054 | 1.6 | 15.281 | 390.828 | 331.105 | 931.1 | 600.0 | 1.55 | 765.6 | 165.6 |
| 142 | 24.216 | 1.6 | 15.387 | 390.828 | 330.693 | 930.7 | 600.0 | 1.55 | 765.3 | 165.3 |
| 143 | 24.384 | 1.6 | 15.496 | 392.612 | 331.774 | 931.8 | 600.0 | 1.55 | 765.9 | 165.9 |
| 144 | 24.544 | 1.6 | 15.600 | 390.828 | 329.861 | 929.9 | 600.0 | 1.55 | 764.9 | 164.9 |
| 145 | 24.707 | 1.6 | 15.705 | 392.612 | 330.952 | 931.0 | 600.0 | 1.55 | 765.5 | 165.5 |
| 146 | 24.869 | 1.6 | 15.811 | 392.612 | 330.538 | 930.5 | 600.0 | 1.55 | 765.3 | 165.3 |
| 147 | 25.029 | 1.6 | 15.914 | 392.612 | 330.131 | 930.1 | 600.0 | 1.55 | 765.1 | 165.1 |
| 148 | 25.191 | 1.6 | 16.020 | 392.612 | 329.716 | 929.7 | 600.0 | 1.55 | 764.9 | 164.9 |
| 149 | 25.351 | 1.7 | 16.124 | 394.397 | 330.806 | 930.8 | 600.0 | 1.55 | 765.4 | 165.4 |
| 150 | 25.506 | 1.7 | 16.224 | 394.397 | 330.410 | 930.4 | 600.0 | 1.55 | 765.2 | 165.2 |
| 151 | 25.682 | 1.7 | 16.338 | 396.182 | 331.452 | 931.5 | 600.0 | 1.55 | 765.7 | 165.7 |
| 152 | 25.842 | 1.7 | 16.442 | 396.182 | 331.041 | 931.0 | 600.0 | 1.55 | 765.5 | 165.5 |
| 153 | 26.010 | 1.7 | 16.551 | 396.182 | 330.608 | 930.6 | 600.0 | 1.55 | 765.3 | 165.3 |
| 154 | 26.175 | 1.7 | 16.659 | 396.182 | 330.183 | 930.2 | 600.0 | 1.55 | 765.1 | 165.1 |
| 155 | 26.332 | 1.7 | 16.761 | 397.966 | 331.264 | 931.3 | 600.0 | 1.55 | 765.6 | 165.6 |
| 156 | 26.511 | 1.7 | 16.877 | 397.966 | 330.802 | 930.8 | 600.0 | 1.55 | 765.4 | 165.4 |
| 157 | 26.677 | 1.7 | 16.984 | 397.966 | 330.374 | 930.4 | 600.0 | 1.55 | 765.2 | 165.2 |
| 158 | 26.845 | 1.7 | 17.093 | 399.751 | 331.420 | 931.4 | 600.0 | 1.55 | 765.7 | 165.7 |
| 159 | 27.013 | 1.7 | 17.203 | 399.751 | 330.983 | 931.0 | 600.0 | 1.55 | 765.5 | 165.5 |
| 160 | 27.178 | 1.7 | 17.310 | 399.751 | 330.554 | 930.6 | 600.0 | 1.55 | 765.3 | 165.3 |
| 161 | 27.335 | 1.7 | 17.412 | 399.751 | 330.147 | 930.1 | 600.0 | 1.55 | 765.1 | 165.1 |
| 162 | 27.506 | 1.7 | 17.523 | 399.751 | 329.703 | 929.7 | 600.0 | 1.55 | 764.9 | 164.9 |
| 163 | 27.677 | 1.7 | 17.634 | 401.535 | 330.730 | 930.7 | 600.0 | 1.55 | 765.4 | 165.4 |
| 164 | 27.848 | 1.7 | 17.745 | 401.535 | 330.284 | 930.3 | 600.0 | 1.55 | 765.1 | 165.1 |
| 165 | 28.007 | 1.7 | 17.848 | 401.535 | 329.868 | 929.9 | 600.0 | 1.55 | 764.9 | 164.9 |
| 166 | 28.184 | 1.7 | 17.963 | 403.320 | 330.872 | 930.9 | 600.0 | 1.55 | 765.4 | 165.4 |
| 167 | 28.357 | 1.7 | 18.076 | 403.320 | 330.417 | 930.4 | 600.0 | 1.55 | 765.2 | 165.2 |
| 168 | 28.523 | 1.7 | 18.183 | 403.320 | 329.984 | 930.0 | 600.0 | 1.55 | 765.0 | 165.0 |
| 169 | 28.682 | 1.7 | 18.287 | 405.105 | 331.024 | 931.0 | 600.0 | 1.55 | 765.5 | 165.5 |
| 170 | 28.859 | 1.7 | 18.401 | 405.105 | 330.560 | 930.6 | 600.0 | 1.55 | 765.3 | 165.3 |
| 171 | 29.021 | 1.7 | 18.507 | 405.105 | 330.133 | 930.1 | 600.0 | 1.55 | 765.1 | 165.1 |
| 172 | 29.192 | 1.7 | 18.618 | 405.105 | 329.683 | 929.7 | 600.0 | 1.55 | 764.8 | 164.8 |
| 173 | 29.357 | 1.7 | 18.725 | 406.889 | 330.699 | 930.7 | 600.0 | 1.55 | 765.3 | 165.3 |
| 174 | 29.526 | 1.7 | 18.834 | 406.889 | 330.255 | 930.3 | 600.0 | 1.55 | 765.1 | 165.1 |
| 175 | 29.688 | 1.7 | 18.940 | 406.889 | 329.825 | 929.8 | 600.0 | 1.55 | 764.9 | 164.9 |
| 176 | 29.853 | 1.7 | 19.047 | 406.889 | 329.388 | 929.4 | 600.0 | 1.55 | 764.7 | 164.7 |
| 177 | 30.016 | 1.7 | 19.153 | 406.889 | 328.959 | 929.0 | 600.0 | 1.55 | 764.5 | 164.5 |
| 178 | 30.173 | 1.7 | 19.255 | 406.889 | 328.544 | 928.5 | 600.0 | 1.55 | 764.3 | 164.3 |
| 179 | 30.347 | 1.7 | 19.367 | 406.889 | 328.085 | 928.1 | 600.0 | 1.55 | 764.0 | 164.0 |
| 180 | 30.504 | 1.7 | 19.469 | 408.674 | 329.107 | 929.1 | 600.0 | 1.55 | 764.6 | 164.6 |
| 181 | 30.666 | 1.7 | 19.575 | 408.674 | 328.676 | 928.7 | 600.0 | 1.55 | 764.3 | 164.3 |
| 182 | 30.829 | 1.7 | 19.681 | 408.674 | 328.245 | 928.2 | 600.0 | 1.55 | 764.1 | 164.1 |
| 183 | 30.994 | 1.7 | 19.788 | 408.674 | 327.806 | 927.8 | 600.0 | 1.55 | 763.9 | 163.9 |
| 184 | 31.165 | 1.7 | 19.899 | 410.458 | 328.782 | 928.8 | 600.0 | 1.55 | 764.4 | 164.4 |
| 185 | 31.325 | 1.7 | 20.003 | 410.458 | 328.356 | 928.4 | 600.0 | 1.55 | 764.2 | 164.2 |
| 186 | 31.427 | 1.7 | 20.069 | 410.458 | 328.084 | 928.1 | 600.0 | 1.55 | 764.0 | 164.0 |

Test Performed By: Checked By:

## Stantec Consulting Ltd.

**Unconsolidated Undrained Triaxial Test (ASTM D2850)**

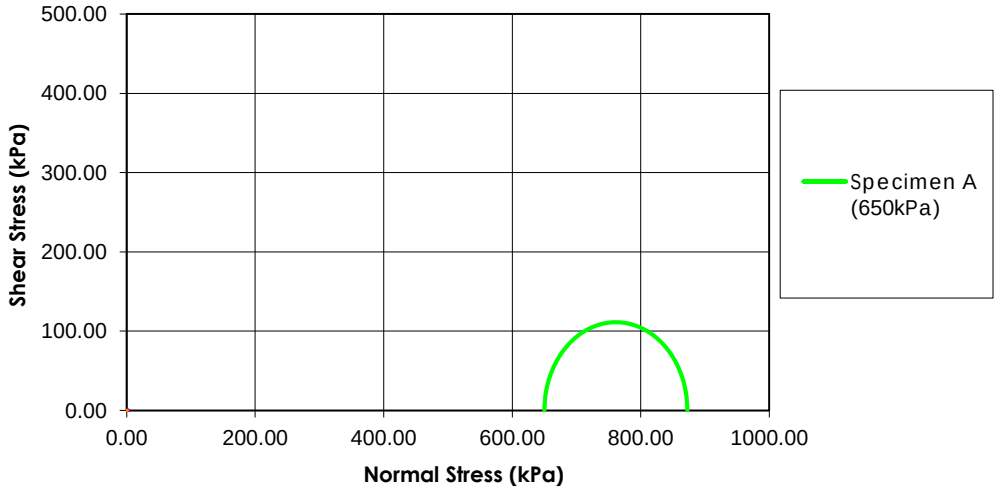
Stantec

Checked By: C. Lamoureux

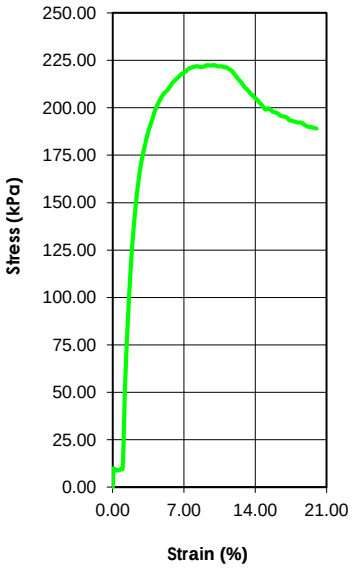
Date 12-Sep-16

Tested By: C. Oost

### Mohr Circles



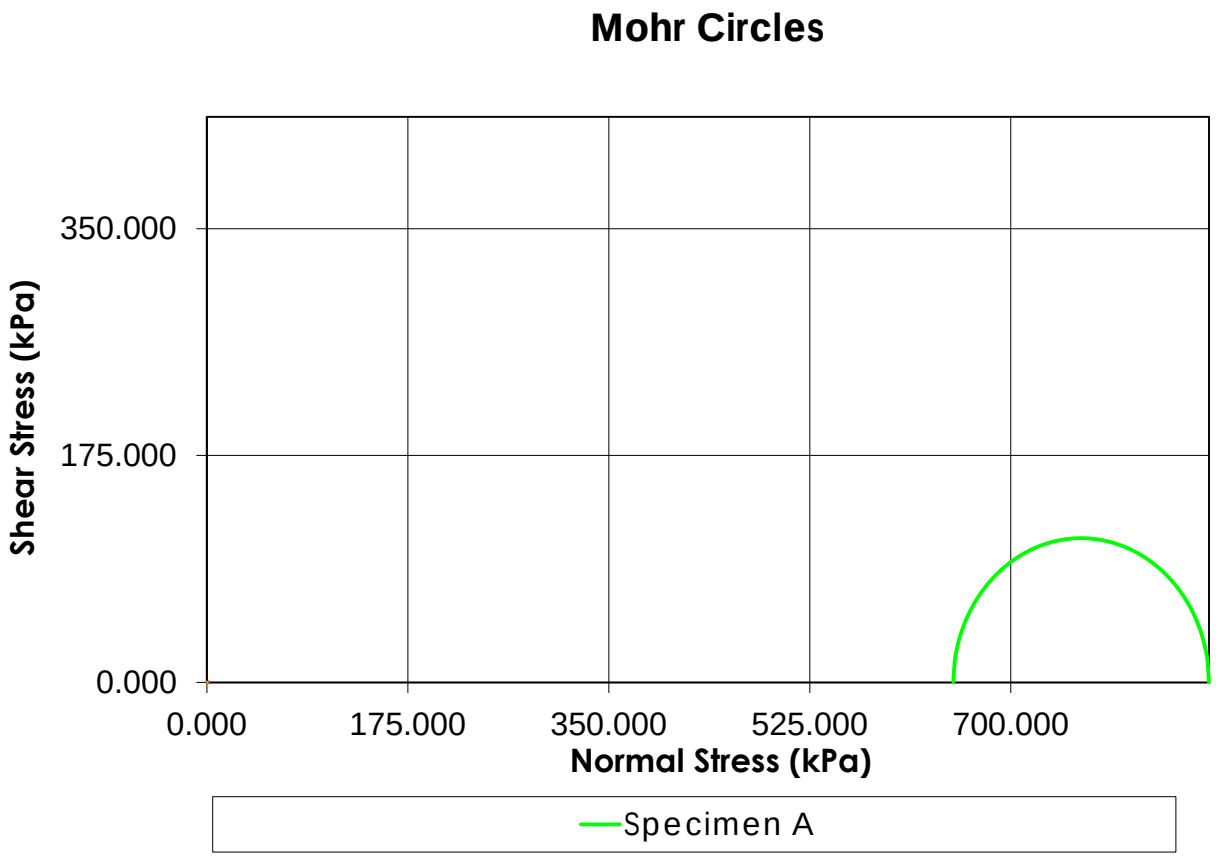

### Stress-Strain Curve

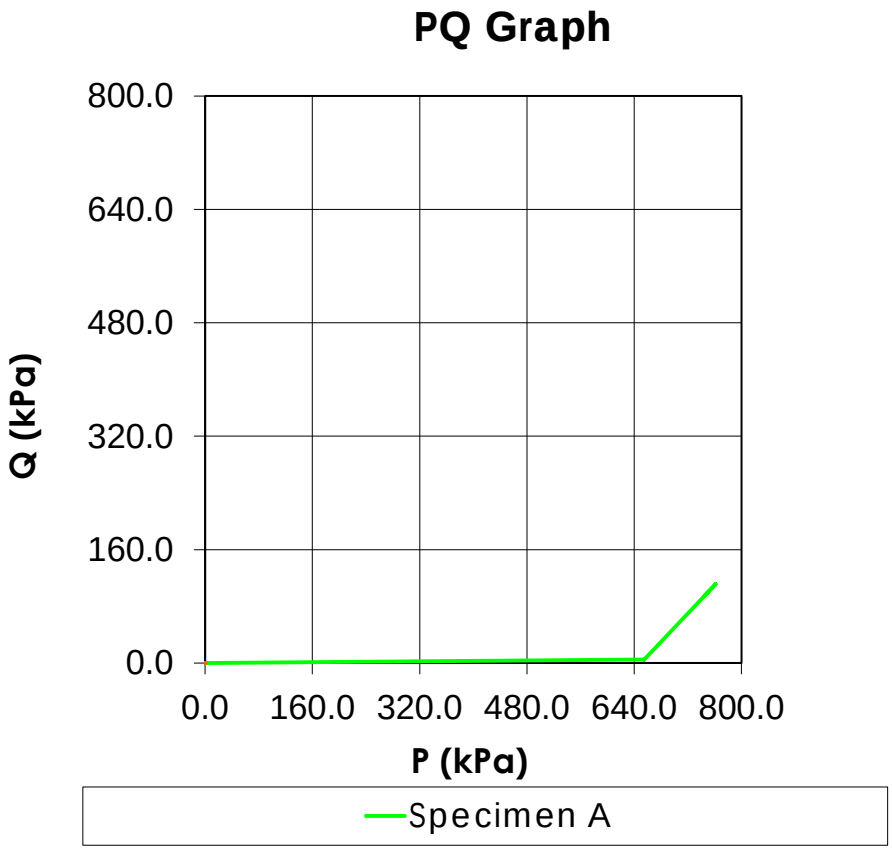



| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.6 | | | |
| Dry Density (g/cm3) | 1.600 | | | |
| Saturation (%) | 100.47 | | | |
| Void Ratio | 0.69 | | | |
| Diameter (mm) | 72.400 | | | |
| Height (mm) | 155.000 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 19.3 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | | | |
| Peak Dev. Stress (kPa) | 222.553 | | | |
| Axial Strain @ Failure (%) | 9.952 | | | |
| | **Cell Pressure** | | | |
| Cell (kPa) | 650.0 | | | |
| Back (kPa) | n/a | | | |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 872.6 | | | |
| σ3 (kPa) | 650.0 | | | |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Clay |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.230 | Job Number: | - |
| Location: | - | Boring Number: | - |
| Client: | Alberta Transportation | Sample Number: | D36 ST6 |
| Remarks: | | | |


Mohr Circles
350.000
175.000
0.000
Shear Stress (kPa)
0.000
175.000
350.000
525.000
700.000
Normal Stress (kPa)
Specimen A


PQ Graph
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)
Specimen A

## Specimen A Information
**UU Triaxial Test**

**Stantec Consulting Ltd.**

File Location
lab_110773396_uut_d36st6.HSD

## Project Information

Project No. 110773396.302.702.2 Test Date: 12-Sep-16 Sample Number: D36 ST6
Project Name: SR1
Client: Alberta Transportation
Sample Location: -
Sample Description: Brown Clay
Remarks: -

## Specimen A Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.70 LL: - PL: -

| Sample Parameters | Before Test | After Test |
|---|---|---|
| Diameter (mm) | 72.400 | |
| Height (mm) | 155.000 | |
| Weight (g) | 1282.20 | |
| Moisture (%) | 25.58 | 19.32 |
| Dry Density (g/cm3) | 1.600 | |
| Saturation (%) | 100.47 | |
| Void Ratio | 0.69 | |

## Specimen A Test Data

Rate of Strain: 2 (mm/min)
Cell Pressure: 650.0 (kPa)
Effective Confining Stress: 650.0 (kPa)
Peak Deviator Stress: 222.553 (kPa) at reading number: 93
Height\Diameter Ratio: 2.14
Axial Strain @ Failure: 9.952 (%)

| Read Number | Disp (mm) | Load Kn) | Axial Strain (%) | Deviator Stress (kPa) | Corr. Deviator Stress (kPa) | Principal Stresses $Q_1$ (kPa) | Principal Stresses $Q_3$ (kPa) | Principal Stresses 1:3 Ratio (kPa) | P (kPa) | Q (kPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1.216 | 0.1 | 0.000 | 0.000 | 0.000 | 650.0 | 650.0 | 1.00 | 0.0 | 0.0 |
| 1 | 1.367 | 0.1 | 0.098 | 9.950 | 9.940 | 659.9 | 650.0 | 1.02 | 655.0 | 5.0 |
| 2 | 1.540 | 0.1 | 0.209 | 9.417 | 9.397 | 659.4 | 650.0 | 1.01 | 654.7 | 4.7 |
| 3 | 1.709 | 0.1 | 0.318 | 9.062 | 9.033 | 659.0 | 650.0 | 1.01 | 654.5 | 4.5 |
| 4 | 1.879 | 0.1 | 0.428 | 9.062 | 9.023 | 659.0 | 650.0 | 1.01 | 654.5 | 4.5 |
| 5 | 2.051 | 0.1 | 0.539 | 8.884 | 8.836 | 658.8 | 650.0 | 1.01 | 654.4 | 4.4 |
| 6 | 2.213 | 0.1 | 0.643 | 9.062 | 9.003 | 659.0 | 650.0 | 1.01 | 654.5 | 4.5 |
| 7 | 2.380 | 0.1 | 0.751 | 9.417 | 9.346 | 659.3 | 650.0 | 1.01 | 654.7 | 4.7 |
| 8 | 2.547 | 0.1 | 0.859 | 9.595 | 9.512 | 659.5 | 650.0 | 1.01 | 654.8 | 4.8 |
| 9 | 2.714 | 0.1 | 0.966 | 9.595 | 9.502 | 659.5 | 650.0 | 1.01 | 654.8 | 4.8 |
| 10 | 2.870 | 0.2 | 1.067 | 23.276 | 23.027 | 673.0 | 650.0 | 1.04 | 661.5 | 11.5 |
| 11 | 3.035 | 0.3 | 1.173 | 46.907 | 46.357 | 696.4 | 650.0 | 1.07 | 673.2 | 23.2 |
| 12 | 3.194 | 0.4 | 1.276 | 62.898 | 62.096 | 712.1 | 650.0 | 1.10 | 681.0 | 31.0 |
| 13 | 3.350 | 0.4 | 1.377 | 76.224 | 75.174 | 725.2 | 650.0 | 1.12 | 687.6 | 37.6 |
| 14 | 3.520 | 0.5 | 1.486 | 88.484 | 87.169 | 737.2 | 650.0 | 1.13 | 693.6 | 43.6 |
| 15 | 3.677 | 0.5 | 1.587 | 100.033 | 98.445 | 748.4 | 650.0 | 1.15 | 699.2 | 49.2 |
| 16 | 3.846 | 0.6 | 1.697 | 110.516 | 108.641 | 758.6 | 650.0 | 1.17 | 704.3 | 54.3 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 4.016 | 0.6 | 1.806 | 120.821 | 118.639 | 768.6 | 650.0 | 1.18 | 709.3 | 59.3 |
| 18 | 4.185 | 0.6 | 1.916 | 129.705 | 127.220 | 777.2 | 650.0 | 1.20 | 713.6 | 63.6 |
| 19 | 4.358 | 0.7 | 2.027 | 137.168 | 134.388 | 784.4 | 650.0 | 1.21 | 717.2 | 67.2 |
| 20 | 4.519 | 0.7 | 2.131 | 144.275 | 141.200 | 791.2 | 650.0 | 1.22 | 720.6 | 70.6 |
| 21 | 4.686 | 0.7 | 2.239 | 150.849 | 147.472 | 797.5 | 650.0 | 1.23 | 723.7 | 73.7 |
| 22 | 4.853 | 0.7 | 2.347 | 156.535 | 152.861 | 802.9 | 650.0 | 1.24 | 726.4 | 76.4 |
| 23 | 5.010 | 0.8 | 2.448 | 161.687 | 157.730 | 807.7 | 650.0 | 1.24 | 728.9 | 78.9 |
| 24 | 5.177 | 0.8 | 2.555 | 166.307 | 162.057 | 812.1 | 650.0 | 1.25 | 731.0 | 81.0 |
| 25 | 5.331 | 0.8 | 2.655 | 170.749 | 166.216 | 816.2 | 650.0 | 1.26 | 733.1 | 83.1 |
| 26 | 5.500 | 0.8 | 2.764 | 174.480 | 169.657 | 819.7 | 650.0 | 1.26 | 734.8 | 84.8 |
| 27 | 5.657 | 0.8 | 2.865 | 178.034 | 172.933 | 822.9 | 650.0 | 1.27 | 736.5 | 86.5 |
| 28 | 5.827 | 0.8 | 2.975 | 181.054 | 175.669 | 825.7 | 650.0 | 1.27 | 737.8 | 87.8 |
| 29 | 5.996 | 0.9 | 3.084 | 184.075 | 178.398 | 828.4 | 650.0 | 1.27 | 739.2 | 89.2 |
| 30 | 6.166 | 0.9 | 3.193 | 186.740 | 180.777 | 830.8 | 650.0 | 1.28 | 740.4 | 90.4 |
| 31 | 6.322 | 0.9 | 3.294 | 189.583 | 183.337 | 833.3 | 650.0 | 1.28 | 741.7 | 91.7 |
| 32 | 6.492 | 0.9 | 3.404 | 192.070 | 185.532 | 835.5 | 650.0 | 1.29 | 742.8 | 92.8 |
| 33 | 6.662 | 0.9 | 3.513 | 194.558 | 187.722 | 837.7 | 650.0 | 1.29 | 743.9 | 93.9 |
| 34 | 6.831 | 0.9 | 3.623 | 196.690 | 189.564 | 839.6 | 650.0 | 1.29 | 744.8 | 94.8 |
| 35 | 7.001 | 0.9 | 3.732 | 198.822 | 191.402 | 841.4 | 650.0 | 1.29 | 745.7 | 95.7 |
| 36 | 7.176 | 0.9 | 3.845 | 200.954 | 193.228 | 843.2 | 650.0 | 1.30 | 746.6 | 96.6 |
| 37 | 7.340 | 0.9 | 3.951 | 202.909 | 194.892 | 844.9 | 650.0 | 1.30 | 747.4 | 97.4 |
| 38 | 7.502 | 0.9 | 4.055 | 205.219 | 196.896 | 846.9 | 650.0 | 1.30 | 748.4 | 98.4 |
| 39 | 7.669 | 1.0 | 4.163 | 207.173 | 198.548 | 848.5 | 650.0 | 1.31 | 749.3 | 99.3 |
| 40 | 7.831 | 1.0 | 4.268 | 208.772 | 199.863 | 849.9 | 650.0 | 1.31 | 749.9 | 99.9 |
| 41 | 7.998 | 1.0 | 4.375 | 210.549 | 201.337 | 851.3 | 650.0 | 1.31 | 750.7 | 100.7 |
| 42 | 8.165 | 1.0 | 4.483 | 211.970 | 202.468 | 852.5 | 650.0 | 1.31 | 751.2 | 101.2 |
| 43 | 8.326 | 1.0 | 4.587 | 213.392 | 203.603 | 853.6 | 650.0 | 1.31 | 751.8 | 101.8 |
| 44 | 8.493 | 1.0 | 4.695 | 214.813 | 204.727 | 854.7 | 650.0 | 1.31 | 752.4 | 102.4 |
| 45 | 8.660 | 1.0 | 4.803 | 216.057 | 205.680 | 855.7 | 650.0 | 1.32 | 752.8 | 102.8 |
| 46 | 8.825 | 1.0 | 4.909 | 217.301 | 206.634 | 856.6 | 650.0 | 1.32 | 753.3 | 103.3 |
| 47 | 8.997 | 1.0 | 5.020 | 218.544 | 207.574 | 857.6 | 650.0 | 1.32 | 753.8 | 103.8 |
| 48 | 9.154 | 1.0 | 5.121 | 219.255 | 208.027 | 858.0 | 650.0 | 1.32 | 754.0 | 104.0 |
| 49 | 9.331 | 1.0 | 5.235 | 220.144 | 208.618 | 858.6 | 650.0 | 1.32 | 754.3 | 104.3 |
| 50 | 9.508 | 1.0 | 5.350 | 221.032 | 209.207 | 859.2 | 650.0 | 1.32 | 754.6 | 104.6 |
| 51 | 9.683 | 1.0 | 5.463 | 221.920 | 209.797 | 859.8 | 650.0 | 1.32 | 754.9 | 104.9 |
| 52 | 9.848 | 1.0 | 5.569 | 223.164 | 210.737 | 860.7 | 650.0 | 1.32 | 755.4 | 105.4 |
| 53 | 10.004 | 1.0 | 5.670 | 224.230 | 211.517 | 861.5 | 650.0 | 1.33 | 755.8 | 105.8 |
| 54 | 10.171 | 1.0 | 5.778 | 225.474 | 212.447 | 862.4 | 650.0 | 1.33 | 756.2 | 106.2 |
| 55 | 10.328 | 1.0 | 5.879 | 226.540 | 213.223 | 863.2 | 650.0 | 1.33 | 756.6 | 106.6 |
| 56 | 10.495 | 1.0 | 5.986 | 227.428 | 213.814 | 863.8 | 650.0 | 1.33 | 756.9 | 106.9 |
| 57 | 10.662 | 1.0 | 6.094 | 228.317 | 214.403 | 864.4 | 650.0 | 1.33 | 757.2 | 107.2 |
| 58 | 10.818 | 1.0 | 6.195 | 229.027 | 214.839 | 864.8 | 650.0 | 1.33 | 757.4 | 107.4 |
| 59 | 10.988 | 1.0 | 6.304 | 230.094 | 215.587 | 865.6 | 650.0 | 1.33 | 757.8 | 107.8 |
| 60 | 11.157 | 1.1 | 6.414 | 230.627 | 215.834 | 865.8 | 650.0 | 1.33 | 757.9 | 107.9 |
| 61 | 11.327 | 1.1 | 6.523 | 231.693 | 216.579 | 866.6 | 650.0 | 1.33 | 758.3 | 108.3 |
| 62 | 11.484 | 1.1 | 6.624 | 232.581 | 217.174 | 867.2 | 650.0 | 1.33 | 758.6 | 108.6 |
| 63 | 11.656 | 1.1 | 6.735 | 233.469 | 217.744 | 867.7 | 650.0 | 1.33 | 758.9 | 108.9 |
| 64 | 11.825 | 1.1 | 6.845 | 234.002 | 217.985 | 868.0 | 650.0 | 1.34 | 759.0 | 109.0 |
| 65 | 11.992 | 1.1 | 6.953 | 234.713 | 218.395 | 868.4 | 650.0 | 1.34 | 759.2 | 109.2 |
| 66 | 12.159 | 1.1 | 7.060 | 235.246 | 218.637 | 868.6 | 650.0 | 1.34 | 759.3 | 109.3 |
| 67 | 12.324 | 1.1 | 7.166 | 235.957 | 219.047 | 869.0 | 650.0 | 1.34 | 759.5 | 109.5 |
| 68 | 12.488 | 1.1 | 7.272 | 237.023 | 219.786 | 869.8 | 650.0 | 1.34 | 759.9 | 109.9 |
| 69 | 12.653 | 1.1 | 7.379 | 237.734 | 220.193 | 870.2 | 650.0 | 1.34 | 760.1 | 110.1 |
| 70 | 12.809 | 1.1 | 7.480 | 238.444 | 220.610 | 870.6 | 650.0 | 1.34 | 760.3 | 110.3 |
| 71 | 12.976 | 1.1 | 7.587 | 239.155 | 221.010 | 871.0 | 650.0 | 1.34 | 760.5 | 110.5 |
| 72 | 13.143 | 1.1 | 7.695 | 239.511 | 221.080 | 871.1 | 650.0 | 1.34 | 760.5 | 110.5 |
| 73 | 13.310 | 1.1 | 7.803 | 240.044 | 221.314 | 871.3 | 650.0 | 1.34 | 760.7 | 110.7 |
| 74 | 13.477 | 1.1 | 7.910 | 240.577 | 221.546 | 871.5 | 650.0 | 1.34 | 760.8 | 110.8 |
| 75 | 13.634 | 1.1 | 8.011 | 240.932 | 221.630 | 871.6 | 650.0 | 1.34 | 760.8 | 110.8 |
| 76 | 13.803 | 1.1 | 8.121 | 241.287 | 221.693 | 871.7 | 650.0 | 1.34 | 760.8 | 110.8 |
| 77 | 13.973 | 1.1 | 8.230 | 241.820 | 221.918 | 871.9 | 650.0 | 1.34 | 761.0 | 111.0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 14.143 | 1.1 | 8.340 | 241.998 | 221.816 | 871.8 | 650.0 | 1.34 | 760.9 | 110.9 |
| 79 | 14.312 | 1.1 | 8.449 | 242.176 | 221.714 | 871.7 | 650.0 | 1.34 | 760.9 | 110.9 |
| 80 | 14.479 | 1.1 | 8.557 | 242.353 | 221.615 | 871.6 | 650.0 | 1.34 | 760.8 | 110.8 |
| 81 | 14.664 | 1.1 | 8.676 | 242.353 | 221.326 | 871.3 | 650.0 | 1.34 | 760.7 | 110.7 |
| 82 | 14.837 | 1.1 | 8.788 | 242.886 | 221.543 | 871.5 | 650.0 | 1.34 | 760.8 | 110.8 |
| 83 | 14.996 | 1.1 | 8.890 | 243.242 | 221.617 | 871.6 | 650.0 | 1.34 | 760.8 | 110.8 |
| 84 | 15.160 | 1.1 | 8.996 | 243.775 | 221.844 | 871.8 | 650.0 | 1.34 | 760.9 | 110.9 |
| 85 | 15.325 | 1.1 | 9.102 | 244.308 | 222.070 | 872.1 | 650.0 | 1.34 | 761.0 | 111.0 |
| 86 | 15.489 | 1.1 | 9.208 | 245.019 | 222.456 | 872.5 | 650.0 | 1.34 | 761.2 | 111.2 |
| 87 | 15.646 | 1.1 | 9.309 | 245.196 | 222.370 | 872.4 | 650.0 | 1.34 | 761.2 | 111.2 |
| 88 | 15.807 | 1.1 | 9.414 | 245.552 | 222.436 | 872.4 | 650.0 | 1.34 | 761.2 | 111.2 |
| 89 | 15.974 | 1.1 | 9.522 | 245.729 | 222.332 | 872.3 | 650.0 | 1.34 | 761.2 | 111.2 |
| 90 | 16.141 | 1.1 | 9.629 | 245.907 | 222.228 | 872.2 | 650.0 | 1.34 | 761.1 | 111.1 |
| 91 | 16.308 | 1.1 | 9.737 | 246.262 | 222.284 | 872.3 | 650.0 | 1.34 | 761.1 | 111.1 |
| 92 | 16.475 | 1.1 | 9.845 | 246.618 | 222.339 | 872.3 | 650.0 | 1.34 | 761.2 | 111.2 |
| 93 | 16.642 | 1.1 | 9.952 | 247.151 | 222.553 | 872.6 | 650.0 | 1.34 | 761.3 | 111.3 |
| 94 | 16.809 | 1.1 | 10.060 | 247.151 | 222.287 | 872.3 | 650.0 | 1.34 | 761.1 | 111.1 |
| 95 | 16.979 | 1.1 | 10.170 | 247.328 | 222.176 | 872.2 | 650.0 | 1.34 | 761.1 | 111.1 |
| 96 | 17.149 | 1.1 | 10.279 | 247.328 | 221.905 | 871.9 | 650.0 | 1.34 | 761.0 | 111.0 |
| 97 | 17.318 | 1.1 | 10.389 | 247.506 | 221.794 | 871.8 | 650.0 | 1.34 | 760.9 | 110.9 |
| 98 | 17.483 | 1.1 | 10.495 | 247.861 | 221.849 | 871.8 | 650.0 | 1.34 | 760.9 | 110.9 |
| 99 | 17.647 | 1.1 | 10.601 | 248.217 | 221.904 | 871.9 | 650.0 | 1.34 | 761.0 | 111.0 |
| 100 | 17.814 | 1.1 | 10.708 | 248.394 | 221.795 | 871.8 | 650.0 | 1.34 | 760.9 | 110.9 |
| 101 | 17.976 | 1.1 | 10.813 | 248.572 | 221.695 | 871.7 | 650.0 | 1.34 | 760.8 | 110.8 |
| 102 | 18.143 | 1.1 | 10.920 | 248.394 | 221.269 | 871.3 | 650.0 | 1.34 | 760.6 | 110.6 |
| 103 | 18.307 | 1.1 | 11.027 | 248.750 | 221.321 | 871.3 | 650.0 | 1.34 | 760.7 | 110.7 |
| 104 | 18.474 | 1.1 | 11.134 | 249.105 | 221.369 | 871.4 | 650.0 | 1.34 | 760.7 | 110.7 |
| 105 | 18.636 | 1.1 | 11.239 | 249.105 | 221.109 | 871.1 | 650.0 | 1.34 | 760.6 | 110.6 |
| 106 | 18.803 | 1.1 | 11.346 | 248.927 | 220.683 | 870.7 | 650.0 | 1.34 | 760.3 | 110.3 |
| 107 | 18.970 | 1.1 | 11.454 | 248.750 | 220.258 | 870.3 | 650.0 | 1.34 | 760.1 | 110.1 |
| 108 | 19.129 | 1.1 | 11.557 | 248.750 | 220.002 | 870.0 | 650.0 | 1.34 | 760.0 | 110.0 |
| 109 | 19.299 | 1.1 | 11.666 | 248.572 | 219.573 | 869.6 | 650.0 | 1.34 | 759.8 | 109.8 |
| 110 | 19.481 | 1.1 | 11.784 | 248.217 | 218.967 | 869.0 | 650.0 | 1.34 | 759.5 | 109.5 |
| 111 | 19.659 | 1.1 | 11.899 | 247.506 | 218.056 | 868.1 | 650.0 | 1.34 | 759.0 | 109.0 |
| 112 | 19.823 | 1.1 | 12.005 | 246.973 | 217.325 | 867.3 | 650.0 | 1.33 | 758.7 | 108.7 |
| 113 | 19.987 | 1.1 | 12.111 | 246.440 | 216.594 | 866.6 | 650.0 | 1.33 | 758.3 | 108.3 |
| 114 | 20.154 | 1.1 | 12.218 | 245.907 | 215.861 | 865.9 | 650.0 | 1.33 | 757.9 | 107.9 |
| 115 | 20.311 | 1.1 | 12.319 | 245.374 | 215.145 | 865.1 | 650.0 | 1.33 | 757.6 | 107.6 |
| 116 | 20.478 | 1.1 | 12.427 | 244.841 | 214.414 | 864.4 | 650.0 | 1.33 | 757.2 | 107.2 |
| 117 | 20.635 | 1.1 | 12.528 | 244.663 | 214.011 | 864.0 | 650.0 | 1.33 | 757.0 | 107.0 |
| 118 | 20.812 | 1.1 | 12.643 | 243.952 | 213.110 | 863.1 | 650.0 | 1.33 | 756.6 | 106.6 |
| 119 | 20.969 | 1.1 | 12.744 | 243.419 | 212.399 | 862.4 | 650.0 | 1.33 | 756.2 | 106.2 |
| 120 | 21.156 | 1.1 | 12.865 | 242.709 | 211.485 | 861.5 | 650.0 | 1.33 | 755.7 | 105.7 |
| 121 | 21.323 | 1.1 | 12.973 | 242.176 | 210.759 | 860.8 | 650.0 | 1.32 | 755.4 | 105.4 |
| 122 | 21.490 | 1.1 | 13.080 | 241.820 | 210.189 | 860.2 | 650.0 | 1.32 | 755.1 | 105.1 |
| 123 | 21.657 | 1.1 | 13.188 | 241.465 | 209.620 | 859.6 | 650.0 | 1.32 | 754.8 | 104.8 |
| 124 | 21.837 | 1.1 | 13.304 | 241.110 | 209.032 | 859.0 | 650.0 | 1.32 | 754.5 | 104.5 |
| 125 | 22.012 | 1.1 | 13.417 | 240.399 | 208.145 | 858.1 | 650.0 | 1.32 | 754.1 | 104.1 |
| 126 | 22.190 | 1.1 | 13.531 | 240.044 | 207.562 | 857.6 | 650.0 | 1.32 | 753.8 | 103.8 |
| 127 | 22.365 | 1.1 | 13.644 | 239.511 | 206.831 | 856.8 | 650.0 | 1.32 | 753.4 | 103.4 |
| 128 | 22.521 | 1.1 | 13.745 | 239.511 | 206.589 | 856.6 | 650.0 | 1.32 | 753.3 | 103.3 |
| 129 | 22.691 | 1.1 | 13.855 | 238.800 | 205.715 | 855.7 | 650.0 | 1.32 | 752.9 | 102.9 |
| 130 | 22.847 | 1.1 | 13.956 | 238.622 | 205.321 | 855.3 | 650.0 | 1.32 | 752.7 | 102.7 |
| 131 | 23.030 | 1.1 | 14.074 | 238.267 | 204.734 | 854.7 | 650.0 | 1.31 | 752.4 | 102.4 |
| 132 | 23.200 | 1.1 | 14.183 | 237.734 | 204.016 | 854.0 | 650.0 | 1.31 | 752.0 | 102.0 |
| 133 | 23.369 | 1.1 | 14.292 | 237.556 | 203.604 | 853.6 | 650.0 | 1.31 | 751.8 | 101.8 |
| 134 | 23.539 | 1.1 | 14.402 | 236.845 | 202.735 | 852.7 | 650.0 | 1.31 | 751.4 | 101.4 |
| 135 | 23.721 | 1.1 | 14.520 | 236.490 | 202.152 | 852.2 | 650.0 | 1.31 | 751.1 | 101.1 |
| 136 | 23.904 | 1.1 | 14.638 | 235.957 | 201.419 | 851.4 | 650.0 | 1.31 | 750.7 | 100.7 |
| 137 | 24.074 | 1.1 | 14.747 | 235.424 | 200.706 | 850.7 | 650.0 | 1.31 | 750.4 | 100.4 |
| 138 | 24.256 | 1.1 | 14.865 | 234.713 | 199.824 | 849.8 | 650.0 | 1.31 | 749.9 | 99.9 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 24.439 | 1.1 | 14.983 | 234.180 | 199.094 | 849.1 | 650.0 | 1.31 | 749.5 | 99.5 |
| 140 | 24.622 | 1.1 | 15.100 | 234.713 | 199.270 | 849.3 | 650.0 | 1.31 | 749.6 | 99.6 |
| 141 | 24.804 | 1.1 | 15.218 | 235.602 | 199.747 | 849.7 | 650.0 | 1.31 | 749.9 | 99.9 |
| 142 | 24.974 | 1.1 | 15.328 | 235.602 | 199.489 | 849.5 | 650.0 | 1.31 | 749.7 | 99.7 |
| 143 | 25.144 | 1.1 | 15.437 | 235.602 | 199.231 | 849.2 | 650.0 | 1.31 | 749.6 | 99.6 |
| 144 | 25.300 | 1.1 | 15.538 | 235.246 | 198.693 | 848.7 | 650.0 | 1.31 | 749.3 | 99.3 |
| 145 | 25.464 | 1.1 | 15.644 | 235.069 | 198.294 | 848.3 | 650.0 | 1.31 | 749.1 | 99.1 |
| 146 | 25.626 | 1.1 | 15.749 | 234.713 | 197.749 | 847.7 | 650.0 | 1.30 | 748.9 | 98.9 |
| 147 | 25.798 | 1.1 | 15.860 | 235.069 | 197.787 | 847.8 | 650.0 | 1.30 | 748.9 | 98.9 |
| 148 | 25.963 | 1.1 | 15.966 | 235.069 | 197.538 | 847.5 | 650.0 | 1.30 | 748.8 | 98.8 |
| 149 | 26.135 | 1.1 | 16.077 | 235.069 | 197.277 | 847.3 | 650.0 | 1.30 | 748.6 | 98.6 |
| 150 | 26.299 | 1.1 | 16.183 | 235.069 | 197.028 | 847.0 | 650.0 | 1.30 | 748.5 | 98.5 |
| 151 | 26.472 | 1.1 | 16.294 | 234.891 | 196.618 | 846.6 | 650.0 | 1.30 | 748.3 | 98.3 |
| 152 | 26.639 | 1.1 | 16.402 | 234.536 | 196.068 | 846.1 | 650.0 | 1.30 | 748.0 | 98.0 |
| 153 | 26.806 | 1.1 | 16.509 | 234.358 | 195.667 | 845.7 | 650.0 | 1.30 | 747.8 | 97.8 |
| 154 | 26.973 | 1.1 | 16.617 | 234.536 | 195.562 | 845.6 | 650.0 | 1.30 | 747.8 | 97.8 |
| 155 | 27.150 | 1.1 | 16.732 | 234.713 | 195.442 | 845.4 | 650.0 | 1.30 | 747.7 | 97.7 |
| 156 | 27.317 | 1.1 | 16.839 | 234.891 | 195.337 | 845.3 | 650.0 | 1.30 | 747.7 | 97.7 |
| 157 | 27.484 | 1.1 | 16.947 | 235.069 | 195.231 | 845.2 | 650.0 | 1.30 | 747.6 | 97.6 |
| 158 | 27.638 | 1.1 | 17.047 | 235.069 | 194.998 | 845.0 | 650.0 | 1.30 | 747.5 | 97.5 |
| 159 | 27.808 | 1.1 | 17.156 | 234.891 | 194.593 | 844.6 | 650.0 | 1.30 | 747.3 | 97.3 |
| 160 | 27.967 | 1.1 | 17.259 | 234.358 | 193.911 | 843.9 | 650.0 | 1.30 | 747.0 | 97.0 |
| 161 | 28.123 | 1.1 | 17.360 | 234.002 | 193.381 | 843.4 | 650.0 | 1.30 | 746.7 | 96.7 |
| 162 | 28.296 | 1.1 | 17.471 | 234.180 | 193.267 | 843.3 | 650.0 | 1.30 | 746.6 | 96.6 |
| 163 | 28.460 | 1.1 | 17.577 | 234.358 | 193.165 | 843.2 | 650.0 | 1.30 | 746.6 | 96.6 |
| 164 | 28.635 | 1.1 | 17.690 | 234.358 | 192.901 | 842.9 | 650.0 | 1.30 | 746.5 | 96.5 |
| 165 | 28.802 | 1.1 | 17.797 | 234.536 | 192.794 | 842.8 | 650.0 | 1.30 | 746.4 | 96.4 |
| 166 | 28.971 | 1.1 | 17.907 | 234.713 | 192.684 | 842.7 | 650.0 | 1.30 | 746.3 | 96.3 |
| 167 | 29.141 | 1.1 | 18.016 | 234.713 | 192.427 | 842.4 | 650.0 | 1.30 | 746.2 | 96.2 |
| 168 | 29.318 | 1.1 | 18.131 | 234.891 | 192.304 | 842.3 | 650.0 | 1.30 | 746.2 | 96.2 |
| 169 | 29.485 | 1.1 | 18.238 | 235.069 | 192.196 | 842.2 | 650.0 | 1.30 | 746.1 | 96.1 |
| 170 | 29.658 | 1.1 | 18.349 | 235.424 | 192.225 | 842.2 | 650.0 | 1.30 | 746.1 | 96.1 |
| 171 | 29.830 | 1.1 | 18.461 | 235.779 | 192.253 | 842.3 | 650.0 | 1.30 | 746.1 | 96.1 |
| 172 | 30.002 | 1.1 | 18.572 | 235.779 | 191.991 | 842.0 | 650.0 | 1.30 | 746.0 | 96.0 |
| 173 | 30.169 | 1.1 | 18.679 | 235.779 | 191.737 | 841.7 | 650.0 | 1.29 | 745.9 | 95.9 |
| 174 | 30.326 | 1.1 | 18.780 | 235.246 | 191.066 | 841.1 | 650.0 | 1.29 | 745.5 | 95.5 |
| 175 | 30.487 | 1.1 | 18.885 | 235.246 | 190.820 | 840.8 | 650.0 | 1.29 | 745.4 | 95.4 |
| 176 | 30.644 | 1.1 | 18.986 | 235.069 | 190.439 | 840.4 | 650.0 | 1.29 | 745.2 | 95.2 |
| 177 | 30.811 | 1.1 | 19.094 | 235.069 | 190.186 | 840.2 | 650.0 | 1.29 | 745.1 | 95.1 |
| 178 | 30.978 | 1.1 | 19.201 | 235.246 | 190.076 | 840.1 | 650.0 | 1.29 | 745.0 | 95.0 |
| 179 | 31.140 | 1.1 | 19.306 | 235.246 | 189.830 | 839.8 | 650.0 | 1.29 | 744.9 | 94.9 |
| 180 | 31.312 | 1.1 | 19.417 | 235.602 | 189.855 | 839.9 | 650.0 | 1.29 | 744.9 | 94.9 |
| 181 | 31.476 | 1.1 | 19.523 | 235.779 | 189.748 | 839.7 | 650.0 | 1.29 | 744.9 | 94.9 |
| 182 | 31.641 | 1.1 | 19.629 | 235.957 | 189.641 | 839.6 | 650.0 | 1.29 | 744.8 | 94.8 |
| 183 | 31.813 | 1.1 | 19.740 | 235.957 | 189.379 | 839.4 | 650.0 | 1.29 | 744.7 | 94.7 |
| 184 | 31.985 | 1.1 | 19.851 | 236.135 | 189.259 | 839.3 | 650.0 | 1.29 | 744.6 | 94.6 |
| 185 | 32.157 | 1.1 | 19.962 | 236.312 | 189.139 | 839.1 | 650.0 | 1.29 | 744.6 | 94.6 |
| 186 | 32.236 | 1.1 | 20.013 | 236.312 | 189.020 | 839.0 | 650.0 | 1.29 | 744.5 | 94.5 |

Test Performed By: Checked By:

## Stantec Consulting Ltd.

**Unconsolidated Undrained Triaxial Test (ASTM D2850)**

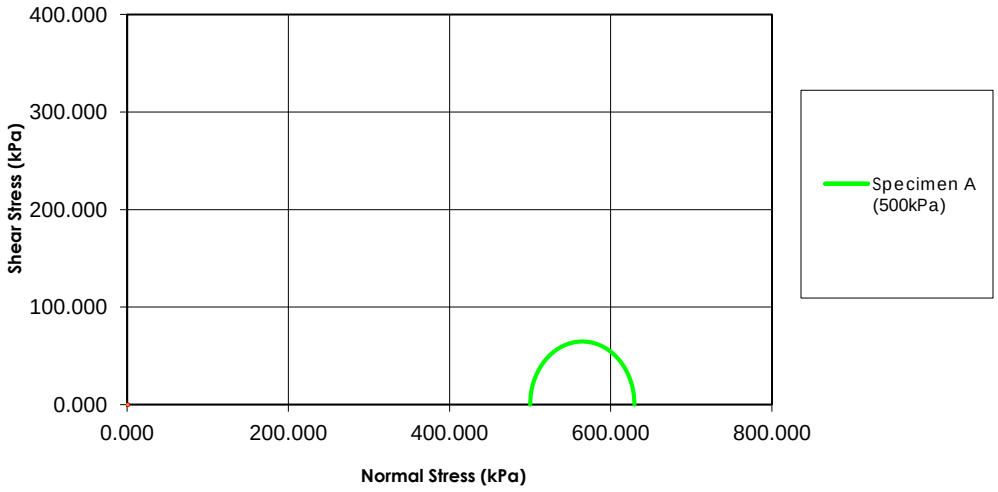
Stantec

Checked By: C. Lamoureux

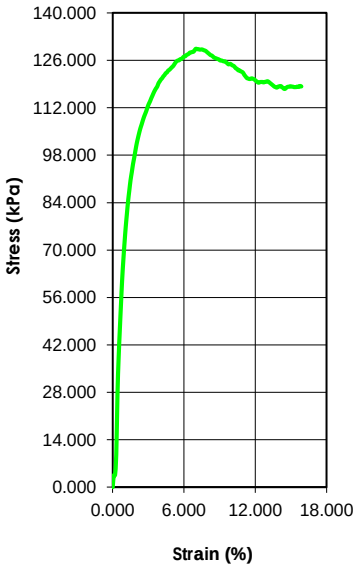
Date 31-Aug-16

Tested By: C. Oost

### Mohr Circles



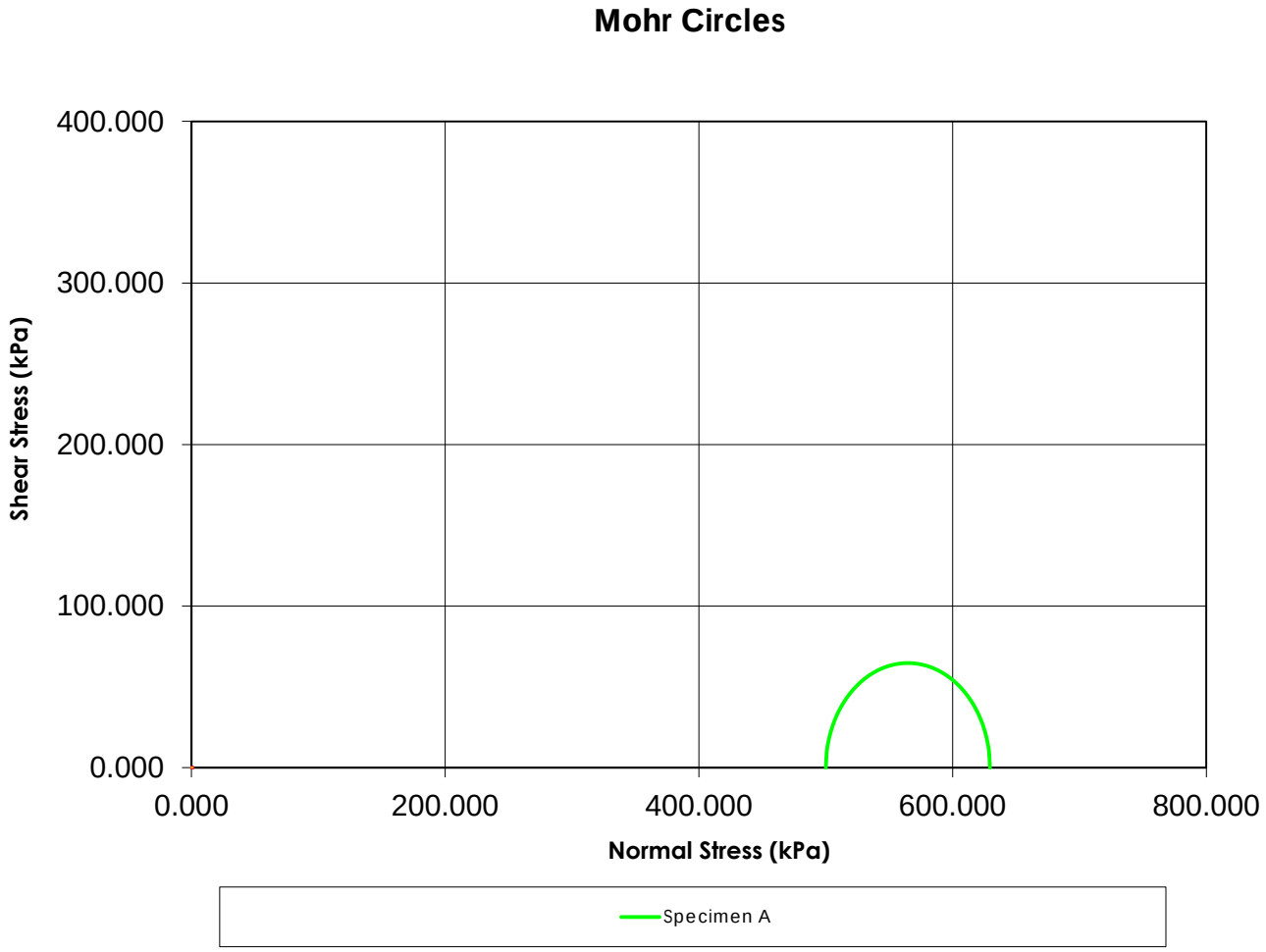

### Stress-Strain Curve

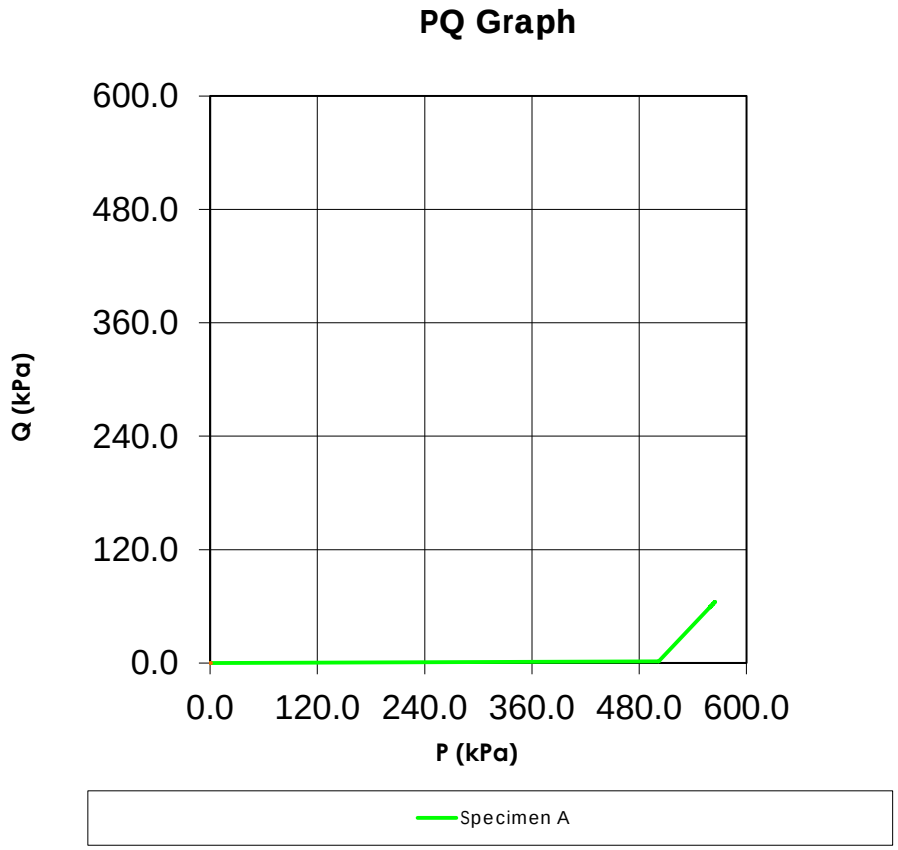



| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 16.76 | | | |
| Dry Density (g/cm3) | 1.711 | | | |
| Saturation (%) | 78.35 | | | |
| Void Ratio | 0.58 | | | |
| Diameter (mm) | 72.200 | | | |
| Height (mm) | 163.600 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| Specific Gravity | 2.700 | | | |
| **After Test** | **A** | **B** | **C** | **D** |
| Water Content (%) | 16.86 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Strain Rate (mm/min) | 50.80 | | | |
| Peak Dev. Stress (kPa) | 129.430 | | | |
| Axial Strain @ Failure (%) | 7.005 | | | |
| | **Cell Pressure** | | | |
| Cell (kPa) | 500.0 | | | |
| Back (kPa) | n/a | | | |
| | **Principle Stresses at Failure** | | | |
| σ1 (kPa) | 629.4 | | | |
| σ3 (kPa) | 500.0 | | | |

| Mohr-Coulomb Strength Parameters | | Sample Description |
|---|---|---|
| C (kPa) | 0.0 | Brown Clay |
| Friction Angle Ø | 0.00 | |

| Project Information | | | |
|---|---|---|---|
| Project Name: | SR1 | | |
| Project Number: | 110773396.302.702.230 | Job Number: | - |
| Location: | - | Boring Number: | - |
| Client: | Alberta Transportation | Sample Number: | D68 ST4 |
| Remarks: | | | |


Mohr Circles
400.000
300.000
200.000
100.000
0.000
Shear Stress (kPa)
0.000
200.000
400.000
600.000
800.000
Normal Stress (kPa)
Specimen A


PQ Graph
600.0
480.0
360.0
240.0
120.0
0.0
Q (kPa)
0.0
120.0
240.0
360.0
480.0
600.0
P (kPa)
Specimen A

## Specimen A Information
**UU Triaxial Test**

**Stantec Consulting Ltd.**

File Location
lab_110773396_uut_d68st4.HSD

### Project Information

Project No. 110773396.302.702.2 Test Date: 31-Aug-16 Sample Number: D68 ST4
Project Name: SR1
Client: Alberta Transportation
Sample Location: -
Sample Description: Brown Clay
Remarks: -

### Specimen A Sample Data

Sample Type: Undisturbed
Specific Gravity: 2.70 LL: - PL: -

| Sample Parameters | Before Test | After Test |
|---|---|---|
| Diameter (mm) | 72.200 | |
| Height (mm) | 163.600 | |
| Weight (g) | 1338.50 | |
| Moisture (%) | 16.76 | 16.86 |
| Dry Density (g/cm3) | 1.711 | |
| Saturation (%) | 78.35 | |
| Void Ratio | 0.58 | |

### Specimen A Test Data

Rate of Strain: 2 (mm/min)
Cell Pressure: 500.0 (kPa)
Effective Confining Stress: 500.0 (kPa)
Peak Deviator Stress: 129.430 (kPa) at reading number: 69
Height\Diameter Ratio: 2.27
Axial Strain @ Failure: 7.005 (%)

| Read Number | Disp (mm) | Load Kn) | Axial Strain (%) | Deviator Stress (kPa) | Corr. Deviator Stress (kPa) | Principal Stresses $Q_1$ (kPa) | Principal Stresses $Q_3$ (kPa) | Principal Stresses 1:3 Ratio (kPa) | P (kPa) | Q (kPa) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1.693 | 0.1 | 0.000 | 0.000 | 0.000 | 500.0 | 500.0 | 1.00 | 0.0 | 0.0 |
| 1 | 1.853 | 0.1 | 0.097 | 3.573 | 3.570 | 503.6 | 500.0 | 1.01 | 501.8 | 1.8 |
| 2 | 2.020 | 0.1 | 0.199 | 3.573 | 3.566 | 503.6 | 500.0 | 1.01 | 501.8 | 1.8 |
| 3 | 2.187 | 0.1 | 0.301 | 9.648 | 9.619 | 509.6 | 500.0 | 1.02 | 504.8 | 4.8 |
| 4 | 2.354 | 0.2 | 0.404 | 27.514 | 27.403 | 527.4 | 500.0 | 1.05 | 513.7 | 13.7 |
| 5 | 2.510 | 0.2 | 0.499 | 38.234 | 38.043 | 538.0 | 500.0 | 1.08 | 519.0 | 19.0 |
| 6 | 2.677 | 0.3 | 0.601 | 46.810 | 46.529 | 546.5 | 500.0 | 1.09 | 523.3 | 23.3 |
| 7 | 2.834 | 0.3 | 0.697 | 54.314 | 53.935 | 553.9 | 500.0 | 1.11 | 527.0 | 27.0 |
| 8 | 2.990 | 0.3 | 0.793 | 61.460 | 60.973 | 561.0 | 500.0 | 1.12 | 530.5 | 30.5 |
| 9 | 3.157 | 0.4 | 0.895 | 67.535 | 66.931 | 566.9 | 500.0 | 1.13 | 533.5 | 33.5 |
| 10 | 3.324 | 0.4 | 0.997 | 72.895 | 72.168 | 572.2 | 500.0 | 1.14 | 536.1 | 36.1 |
| 11 | 3.491 | 0.4 | 1.099 | 77.719 | 76.865 | 576.9 | 500.0 | 1.15 | 538.4 | 38.4 |
| 12 | 3.658 | 0.4 | 1.201 | 81.828 | 80.845 | 580.8 | 500.0 | 1.16 | 540.4 | 40.4 |
| 13 | 3.815 | 0.4 | 1.297 | 85.580 | 84.470 | 584.5 | 500.0 | 1.17 | 542.2 | 42.2 |
| 14 | 3.982 | 0.5 | 1.399 | 88.796 | 87.554 | 587.6 | 500.0 | 1.18 | 543.8 | 43.8 |
| 15 | 4.151 | 0.5 | 1.502 | 92.012 | 90.630 | 590.6 | 500.0 | 1.18 | 545.3 | 45.3 |
| 16 | 4.326 | 0.5 | 1.609 | 94.513 | 92.992 | 593.0 | 500.0 | 1.19 | 546.5 | 46.5 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 4.491 | 0.5 | 1.710 | 97.015 | 95.356 | 595.4 | 500.0 | 1.19 | 547.7 | 47.7 |
| 18 | 4.665 | 0.5 | 1.817 | 99.159 | 97.357 | 597.4 | 500.0 | 1.19 | 548.7 | 48.7 |
| 19 | 4.838 | 0.5 | 1.922 | 101.481 | 99.531 | 599.5 | 500.0 | 1.20 | 549.8 | 49.8 |
| 20 | 5.010 | 0.5 | 2.027 | 103.625 | 101.525 | 601.5 | 500.0 | 1.20 | 550.8 | 50.8 |
| 21 | 5.182 | 0.5 | 2.132 | 105.412 | 103.164 | 603.2 | 500.0 | 1.21 | 551.6 | 51.6 |
| 22 | 5.347 | 0.5 | 2.233 | 107.020 | 104.630 | 604.6 | 500.0 | 1.21 | 552.3 | 52.3 |
| 23 | 5.506 | 0.5 | 2.330 | 108.449 | 105.922 | 605.9 | 500.0 | 1.21 | 553.0 | 53.0 |
| 24 | 5.673 | 0.5 | 2.432 | 109.700 | 107.032 | 607.0 | 500.0 | 1.21 | 553.5 | 53.5 |
| 25 | 5.829 | 0.5 | 2.528 | 110.950 | 108.146 | 608.1 | 500.0 | 1.22 | 554.1 | 54.1 |
| 26 | 5.996 | 0.6 | 2.630 | 112.201 | 109.250 | 609.3 | 500.0 | 1.22 | 554.6 | 54.6 |
| 27 | 6.163 | 0.6 | 2.732 | 113.273 | 110.178 | 610.2 | 500.0 | 1.22 | 555.1 | 55.1 |
| 28 | 6.330 | 0.6 | 2.834 | 114.345 | 111.104 | 611.1 | 500.0 | 1.22 | 555.6 | 55.6 |
| 29 | 6.497 | 0.6 | 2.936 | 115.596 | 112.201 | 612.2 | 500.0 | 1.22 | 556.1 | 56.1 |
| 30 | 6.664 | 0.6 | 3.038 | 116.668 | 113.123 | 613.1 | 500.0 | 1.23 | 556.6 | 56.6 |
| 31 | 6.831 | 0.6 | 3.140 | 117.561 | 113.869 | 613.9 | 500.0 | 1.23 | 556.9 | 56.9 |
| 32 | 7.001 | 0.6 | 3.244 | 118.633 | 114.784 | 614.8 | 500.0 | 1.23 | 557.4 | 57.4 |
| 33 | 7.157 | 0.6 | 3.340 | 119.526 | 115.534 | 615.5 | 500.0 | 1.23 | 557.8 | 57.8 |
| 34 | 7.340 | 0.6 | 3.451 | 120.598 | 116.436 | 616.4 | 500.0 | 1.23 | 558.2 | 58.2 |
| 35 | 7.510 | 0.6 | 3.555 | 121.492 | 117.172 | 617.2 | 500.0 | 1.23 | 558.6 | 58.6 |
| 36 | 7.666 | 0.6 | 3.651 | 122.206 | 117.745 | 617.7 | 500.0 | 1.24 | 558.9 | 58.9 |
| 37 | 7.836 | 0.6 | 3.755 | 122.921 | 118.306 | 618.3 | 500.0 | 1.24 | 559.2 | 59.2 |
| 38 | 7.998 | 0.6 | 3.853 | 123.993 | 119.215 | 619.2 | 500.0 | 1.24 | 559.6 | 59.6 |
| 39 | 8.165 | 0.6 | 3.955 | 124.708 | 119.775 | 619.8 | 500.0 | 1.24 | 559.9 | 59.9 |
| 40 | 8.332 | 0.6 | 4.058 | 125.422 | 120.333 | 620.3 | 500.0 | 1.24 | 560.2 | 60.2 |
| 41 | 8.499 | 0.6 | 4.160 | 125.958 | 120.719 | 620.7 | 500.0 | 1.24 | 560.4 | 60.4 |
| 42 | 8.666 | 0.6 | 4.262 | 126.673 | 121.274 | 621.3 | 500.0 | 1.24 | 560.6 | 60.6 |
| 43 | 8.833 | 0.6 | 4.364 | 127.209 | 121.658 | 621.7 | 500.0 | 1.24 | 560.8 | 60.8 |
| 44 | 9.000 | 0.6 | 4.466 | 127.924 | 122.211 | 622.2 | 500.0 | 1.24 | 561.1 | 61.1 |
| 45 | 9.164 | 0.6 | 4.566 | 128.281 | 122.423 | 622.4 | 500.0 | 1.24 | 561.2 | 61.2 |
| 46 | 9.331 | 0.6 | 4.668 | 128.996 | 122.973 | 623.0 | 500.0 | 1.25 | 561.5 | 61.5 |
| 47 | 9.493 | 0.6 | 4.767 | 129.353 | 123.186 | 623.2 | 500.0 | 1.25 | 561.6 | 61.6 |
| 48 | 9.662 | 0.6 | 4.871 | 129.889 | 123.562 | 623.6 | 500.0 | 1.25 | 561.8 | 61.8 |
| 49 | 9.832 | 0.6 | 4.975 | 130.425 | 123.937 | 623.9 | 500.0 | 1.25 | 562.0 | 62.0 |
| 50 | 10.012 | 0.6 | 5.085 | 130.961 | 124.302 | 624.3 | 500.0 | 1.25 | 562.2 | 62.2 |
| 51 | 10.184 | 0.6 | 5.190 | 131.675 | 124.842 | 624.8 | 500.0 | 1.25 | 562.4 | 62.4 |
| 52 | 10.351 | 0.6 | 5.292 | 132.390 | 125.384 | 625.4 | 500.0 | 1.25 | 562.7 | 62.7 |
| 53 | 10.516 | 0.6 | 5.393 | 132.926 | 125.758 | 625.8 | 500.0 | 1.25 | 562.9 | 62.9 |
| 54 | 10.680 | 0.6 | 5.493 | 133.283 | 125.962 | 626.0 | 500.0 | 1.25 | 563.0 | 63.0 |
| 55 | 10.837 | 0.6 | 5.589 | 133.462 | 126.003 | 626.0 | 500.0 | 1.25 | 563.0 | 63.0 |
| 56 | 11.001 | 0.6 | 5.689 | 133.998 | 126.375 | 626.4 | 500.0 | 1.25 | 563.2 | 63.2 |
| 57 | 11.171 | 0.6 | 5.793 | 134.177 | 126.404 | 626.4 | 500.0 | 1.25 | 563.2 | 63.2 |
| 58 | 11.343 | 0.6 | 5.898 | 134.713 | 126.767 | 626.8 | 500.0 | 1.25 | 563.4 | 63.4 |
| 59 | 11.510 | 0.6 | 6.000 | 135.249 | 127.134 | 627.1 | 500.0 | 1.25 | 563.6 | 63.6 |
| 60 | 11.672 | 0.6 | 6.099 | 135.427 | 127.168 | 627.2 | 500.0 | 1.25 | 563.6 | 63.6 |
| 61 | 11.839 | 0.6 | 6.201 | 135.963 | 127.532 | 627.5 | 500.0 | 1.26 | 563.8 | 63.8 |
| 62 | 12.000 | 0.6 | 6.300 | 136.321 | 127.733 | 627.7 | 500.0 | 1.26 | 563.9 | 63.9 |
| 63 | 12.162 | 0.7 | 6.399 | 136.678 | 127.932 | 627.9 | 500.0 | 1.26 | 564.0 | 64.0 |
| 64 | 12.326 | 0.7 | 6.499 | 137.214 | 128.296 | 628.3 | 500.0 | 1.26 | 564.1 | 64.1 |
| 65 | 12.493 | 0.7 | 6.601 | 137.393 | 128.323 | 628.3 | 500.0 | 1.26 | 564.2 | 64.2 |
| 66 | 12.671 | 0.7 | 6.710 | 137.750 | 128.507 | 628.5 | 500.0 | 1.26 | 564.3 | 64.3 |
| 67 | 12.827 | 0.7 | 6.806 | 137.929 | 128.542 | 628.5 | 500.0 | 1.26 | 564.3 | 64.3 |
| 68 | 12.997 | 0.7 | 6.909 | 138.643 | 129.064 | 629.1 | 500.0 | 1.26 | 564.5 | 64.5 |
| 69 | 13.154 | 0.7 | 7.005 | 139.179 | 129.430 | 629.4 | 500.0 | 1.26 | 564.7 | 64.7 |
| 70 | 13.326 | 0.7 | 7.110 | 139.179 | 129.283 | 629.3 | 500.0 | 1.26 | 564.6 | 64.6 |
| 71 | 13.490 | 0.7 | 7.211 | 139.358 | 129.309 | 629.3 | 500.0 | 1.26 | 564.7 | 64.7 |
| 72 | 13.657 | 0.7 | 7.313 | 139.358 | 129.167 | 629.2 | 500.0 | 1.26 | 564.6 | 64.6 |
| 73 | 13.824 | 0.7 | 7.415 | 139.537 | 129.190 | 629.2 | 500.0 | 1.26 | 564.6 | 64.6 |
| 74 | 13.989 | 0.7 | 7.515 | 139.715 | 129.215 | 629.2 | 500.0 | 1.26 | 564.6 | 64.6 |
| 75 | 14.156 | 0.7 | 7.617 | 139.715 | 129.073 | 629.1 | 500.0 | 1.26 | 564.5 | 64.5 |
| 76 | 14.320 | 0.7 | 7.718 | 139.715 | 128.932 | 628.9 | 500.0 | 1.26 | 564.5 | 64.5 |
| 77 | 14.484 | 0.7 | 7.818 | 139.715 | 128.792 | 628.8 | 500.0 | 1.26 | 564.4 | 64.4 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 78 | 14.657 | 0.7 | 7.924 | 139.537 | 128.480 | 628.5 | 500.0 | 1.26 | 564.2 | 64.2 |
| 79 | 14.821 | 0.7 | 8.024 | 139.358 | 128.176 | 628.2 | 500.0 | 1.26 | 564.1 | 64.1 |
| 80 | 14.993 | 0.7 | 8.129 | 139.179 | 127.865 | 627.9 | 500.0 | 1.26 | 563.9 | 63.9 |
| 81 | 15.165 | 0.7 | 8.235 | 139.001 | 127.554 | 627.6 | 500.0 | 1.26 | 563.8 | 63.8 |
| 82 | 15.332 | 0.7 | 8.337 | 139.001 | 127.413 | 627.4 | 500.0 | 1.25 | 563.7 | 63.7 |
| 83 | 15.499 | 0.7 | 8.439 | 138.822 | 127.107 | 627.1 | 500.0 | 1.25 | 563.6 | 63.6 |
| 84 | 15.666 | 0.7 | 8.541 | 138.643 | 126.802 | 626.8 | 500.0 | 1.25 | 563.4 | 63.4 |
| 85 | 15.823 | 0.7 | 8.637 | 138.643 | 126.669 | 626.7 | 500.0 | 1.25 | 563.3 | 63.3 |
| 86 | 15.990 | 0.7 | 8.739 | 138.643 | 126.528 | 626.5 | 500.0 | 1.25 | 563.3 | 63.3 |
| 87 | 16.157 | 0.7 | 8.841 | 138.643 | 126.386 | 626.4 | 500.0 | 1.25 | 563.2 | 63.2 |
| 88 | 16.327 | 0.7 | 8.944 | 138.643 | 126.243 | 626.2 | 500.0 | 1.25 | 563.1 | 63.1 |
| 89 | 16.491 | 0.7 | 9.045 | 138.465 | 125.941 | 625.9 | 500.0 | 1.25 | 563.0 | 63.0 |
| 90 | 16.653 | 0.7 | 9.144 | 138.643 | 125.966 | 626.0 | 500.0 | 1.25 | 563.0 | 63.0 |
| 91 | 16.820 | 0.7 | 9.246 | 138.643 | 125.825 | 625.8 | 500.0 | 1.25 | 562.9 | 62.9 |
| 92 | 16.987 | 0.7 | 9.348 | 138.643 | 125.683 | 625.7 | 500.0 | 1.25 | 562.8 | 62.8 |
| 93 | 17.154 | 0.7 | 9.450 | 138.822 | 125.703 | 625.7 | 500.0 | 1.25 | 562.9 | 62.9 |
| 94 | 17.321 | 0.7 | 9.552 | 138.643 | 125.400 | 625.4 | 500.0 | 1.25 | 562.7 | 62.7 |
| 95 | 17.488 | 0.7 | 9.654 | 138.465 | 125.097 | 625.1 | 500.0 | 1.25 | 562.5 | 62.5 |
| 96 | 17.655 | 0.7 | 9.756 | 138.286 | 124.794 | 624.8 | 500.0 | 1.25 | 562.4 | 62.4 |
| 97 | 17.822 | 0.7 | 9.858 | 138.643 | 124.975 | 625.0 | 500.0 | 1.25 | 562.5 | 62.5 |
| 98 | 17.984 | 0.7 | 9.957 | 138.643 | 124.838 | 624.8 | 500.0 | 1.25 | 562.4 | 62.4 |
| 99 | 18.145 | 0.7 | 10.056 | 138.465 | 124.541 | 624.5 | 500.0 | 1.25 | 562.3 | 62.3 |
| 100 | 18.312 | 0.7 | 10.158 | 138.465 | 124.399 | 624.4 | 500.0 | 1.25 | 562.2 | 62.2 |
| 101 | 18.477 | 0.7 | 10.259 | 138.286 | 124.100 | 624.1 | 500.0 | 1.25 | 562.0 | 62.0 |
| 102 | 18.641 | 0.7 | 10.359 | 137.929 | 123.640 | 623.6 | 500.0 | 1.25 | 561.8 | 61.8 |
| 103 | 18.813 | 0.7 | 10.464 | 137.929 | 123.495 | 623.5 | 500.0 | 1.25 | 561.7 | 61.7 |
| 104 | 18.978 | 0.7 | 10.565 | 137.571 | 123.037 | 623.0 | 500.0 | 1.25 | 561.5 | 61.5 |
| 105 | 19.142 | 0.7 | 10.665 | 137.750 | 123.058 | 623.1 | 500.0 | 1.25 | 561.5 | 61.5 |
| 106 | 19.314 | 0.7 | 10.771 | 137.571 | 122.754 | 622.8 | 500.0 | 1.25 | 561.4 | 61.4 |
| 107 | 19.479 | 0.7 | 10.871 | 137.571 | 122.616 | 622.6 | 500.0 | 1.25 | 561.3 | 61.3 |
| 108 | 19.651 | 0.7 | 10.976 | 137.393 | 122.312 | 622.3 | 500.0 | 1.24 | 561.2 | 61.2 |
| 109 | 19.818 | 0.7 | 11.078 | 136.857 | 121.695 | 621.7 | 500.0 | 1.24 | 560.8 | 60.8 |
| 110 | 19.995 | 0.7 | 11.187 | 136.499 | 121.229 | 621.2 | 500.0 | 1.24 | 560.6 | 60.6 |
| 111 | 20.165 | 0.6 | 11.291 | 136.142 | 120.771 | 620.8 | 500.0 | 1.24 | 560.4 | 60.4 |
| 112 | 20.332 | 0.6 | 11.393 | 136.142 | 120.632 | 620.6 | 500.0 | 1.24 | 560.3 | 60.3 |
| 113 | 20.494 | 0.6 | 11.492 | 136.142 | 120.497 | 620.5 | 500.0 | 1.24 | 560.2 | 60.2 |
| 114 | 20.655 | 0.6 | 11.590 | 136.321 | 120.521 | 620.5 | 500.0 | 1.24 | 560.3 | 60.3 |
| 115 | 20.822 | 0.7 | 11.693 | 136.678 | 120.697 | 620.7 | 500.0 | 1.24 | 560.3 | 60.3 |
| 116 | 20.979 | 0.7 | 11.788 | 136.678 | 120.566 | 620.6 | 500.0 | 1.24 | 560.3 | 60.3 |
| 117 | 21.151 | 0.7 | 11.894 | 136.678 | 120.422 | 620.4 | 500.0 | 1.24 | 560.2 | 60.2 |
| 118 | 21.308 | 0.7 | 11.989 | 136.499 | 120.134 | 620.1 | 500.0 | 1.24 | 560.1 | 60.1 |
| 119 | 21.480 | 0.6 | 12.094 | 136.321 | 119.833 | 619.8 | 500.0 | 1.24 | 559.9 | 59.9 |
| 120 | 21.644 | 0.6 | 12.195 | 136.142 | 119.540 | 619.5 | 500.0 | 1.24 | 559.8 | 59.8 |
| 121 | 21.811 | 0.6 | 12.297 | 136.142 | 119.401 | 619.4 | 500.0 | 1.24 | 559.7 | 59.7 |
| 122 | 21.968 | 0.7 | 12.393 | 136.499 | 119.583 | 619.6 | 500.0 | 1.24 | 559.8 | 59.8 |
| 123 | 22.135 | 0.7 | 12.495 | 136.678 | 119.600 | 619.6 | 500.0 | 1.24 | 559.8 | 59.8 |
| 124 | 22.302 | 0.7 | 12.597 | 136.857 | 119.617 | 619.6 | 500.0 | 1.24 | 559.8 | 59.8 |
| 125 | 22.469 | 0.7 | 12.699 | 136.857 | 119.477 | 619.5 | 500.0 | 1.24 | 559.7 | 59.7 |
| 126 | 22.646 | 0.7 | 12.807 | 137.214 | 119.641 | 619.6 | 500.0 | 1.24 | 559.8 | 59.8 |
| 127 | 22.813 | 0.7 | 12.909 | 137.393 | 119.656 | 619.7 | 500.0 | 1.24 | 559.8 | 59.8 |
| 128 | 22.970 | 0.7 | 13.005 | 137.750 | 119.835 | 619.8 | 500.0 | 1.24 | 559.9 | 59.9 |
| 129 | 23.137 | 0.7 | 13.107 | 137.750 | 119.695 | 619.7 | 500.0 | 1.24 | 559.8 | 59.8 |
| 130 | 23.304 | 0.7 | 13.209 | 137.571 | 119.399 | 619.4 | 500.0 | 1.24 | 559.7 | 59.7 |
| 131 | 23.471 | 0.7 | 13.311 | 137.393 | 119.104 | 619.1 | 500.0 | 1.24 | 559.6 | 59.6 |
| 132 | 23.638 | 0.7 | 13.413 | 137.214 | 118.809 | 618.8 | 500.0 | 1.24 | 559.4 | 59.4 |
| 133 | 23.805 | 0.7 | 13.516 | 137.035 | 118.514 | 618.5 | 500.0 | 1.24 | 559.3 | 59.3 |
| 134 | 23.972 | 0.7 | 13.618 | 136.857 | 118.220 | 618.2 | 500.0 | 1.24 | 559.1 | 59.1 |
| 135 | 24.128 | 0.7 | 13.713 | 136.857 | 118.089 | 618.1 | 500.0 | 1.24 | 559.0 | 59.0 |
| 136 | 24.298 | 0.7 | 13.817 | 136.857 | 117.947 | 617.9 | 500.0 | 1.24 | 559.0 | 59.0 |
| 137 | 24.468 | 0.7 | 13.921 | 137.393 | 118.267 | 618.3 | 500.0 | 1.24 | 559.1 | 59.1 |
| 138 | 24.637 | 0.7 | 14.024 | 137.571 | 118.278 | 618.3 | 500.0 | 1.24 | 559.1 | 59.1 |

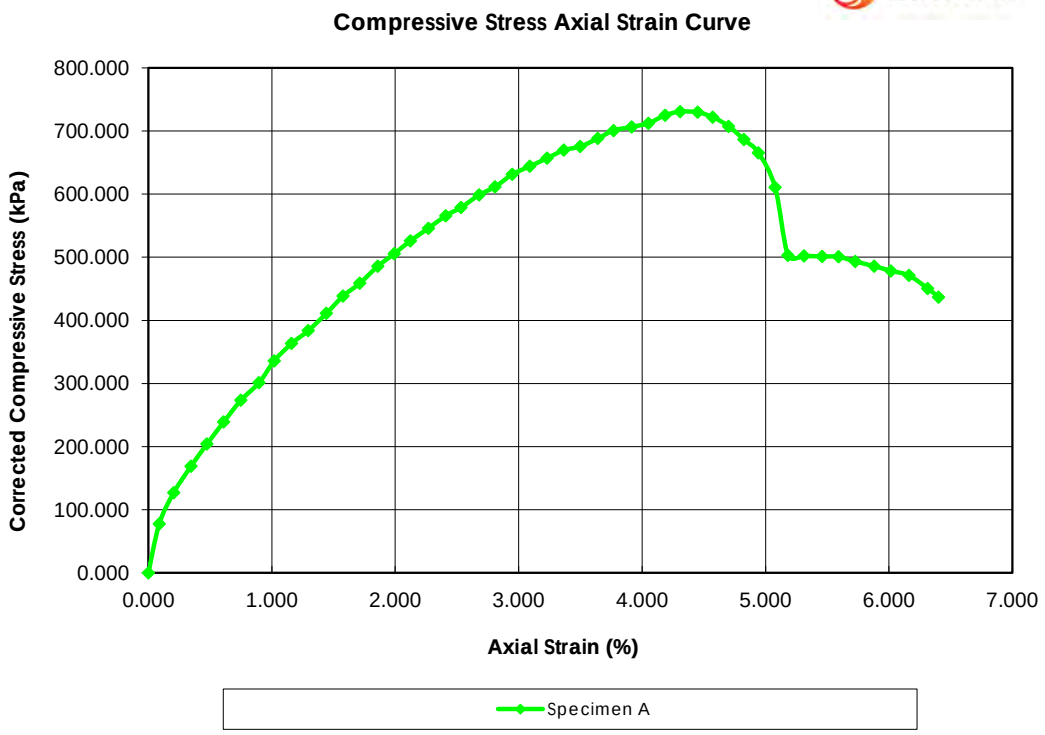
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 24.807 | 0.7 | 14.128 | 137.929 | 118.442 | 618.4 | 500.0 | 1.24 | 559.2 | 59.2 |
| 140 | 24.979 | 0.7 | 14.233 | 137.750 | 118.144 | 618.1 | 500.0 | 1.24 | 559.1 | 59.1 |
| 141 | 25.151 | 0.7 | 14.339 | 137.571 | 117.846 | 617.8 | 500.0 | 1.24 | 558.9 | 58.9 |
| 142 | 25.331 | 0.7 | 14.449 | 137.393 | 117.541 | 617.5 | 500.0 | 1.24 | 558.8 | 58.8 |
| 143 | 25.498 | 0.7 | 14.551 | 137.750 | 117.706 | 617.7 | 500.0 | 1.24 | 558.9 | 58.9 |
| 144 | 25.655 | 0.7 | 14.646 | 138.286 | 118.032 | 618.0 | 500.0 | 1.24 | 559.0 | 59.0 |
| 145 | 25.822 | 0.7 | 14.748 | 138.643 | 118.196 | 618.2 | 500.0 | 1.24 | 559.1 | 59.1 |
| 146 | 25.989 | 0.7 | 14.851 | 138.822 | 118.206 | 618.2 | 500.0 | 1.24 | 559.1 | 59.1 |
| 147 | 26.156 | 0.7 | 14.953 | 139.179 | 118.368 | 618.4 | 500.0 | 1.24 | 559.2 | 59.2 |
| 148 | 26.320 | 0.7 | 15.053 | 139.179 | 118.229 | 618.2 | 500.0 | 1.24 | 559.1 | 59.1 |
| 149 | 26.485 | 0.7 | 15.154 | 139.358 | 118.240 | 618.2 | 500.0 | 1.24 | 559.1 | 59.1 |
| 150 | 26.646 | 0.7 | 15.252 | 139.358 | 118.103 | 618.1 | 500.0 | 1.24 | 559.1 | 59.1 |
| 151 | 26.816 | 0.7 | 15.356 | 139.537 | 118.109 | 618.1 | 500.0 | 1.24 | 559.1 | 59.1 |
| 152 | 26.986 | 0.7 | 15.460 | 139.715 | 118.116 | 618.1 | 500.0 | 1.24 | 559.1 | 59.1 |
| 153 | 27.142 | 0.7 | 15.556 | 140.073 | 118.284 | 618.3 | 500.0 | 1.24 | 559.1 | 59.1 |
| 154 | 27.312 | 0.7 | 15.659 | 140.073 | 118.138 | 618.1 | 500.0 | 1.24 | 559.1 | 59.1 |
| 155 | 27.481 | 0.7 | 15.763 | 140.609 | 118.445 | 618.4 | 500.0 | 1.24 | 559.2 | 59.2 |
| 156 | 27.651 | 0.7 | 15.867 | 140.609 | 118.299 | 618.3 | 500.0 | 1.24 | 559.1 | 59.1 |
| 157 | 27.664 | 0.7 | 15.874 | 140.609 | 118.288 | 618.3 | 500.0 | 1.24 | 559.1 | 59.1 |

Test Performed By: Checked By:

## Stantec Consulting Ltd.
### Unconfined Compression Test Report (ASTM D2166)

Stantec

Reviewed By: C. Lamoureux




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 16.46 | | | |
| Dry Density (g/cm3) | 1.731 | | | |
| Saturation (%) | 79.37 | | | |
| Void Ratio | 0.56 | | | |
| Diameter (mm) | 72.400 | | | |
| Height (mm) | 121.000 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Unconfined Strength (kPa) | 730.752 | | | |
| Undrained Shear Strength (kgf/cm^2) | 3.726 | | | |
| Undrained Shear Strength | 365.376 | | | |
| Rate of Strain (mm/min) | 2.000 | | | |
| Strain at Failure (%) | 4.31 | | | |
| Description | | | | |

| Project Information | | Specimen Description | |
|---|---|---|---|
| Project Num | 110773396.302.702.230 | Specimen A | Brown Silty Clay |
| Project | SR1 | Specimen B | |
| Sampling Dat | 29-Jun-16 | Specimen C | |
| Sample # | D3 ST2 | Specimen D | |
| Client | Alberta Transportation | **Test Variables** | |
| | | Specific Gravity | 2.70 |
| | | Liquid Limit: | |
| | | Plastic Limit: | |

Remarks

Date: 26-Aug-16

Tested By: C. Oost

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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C.Tollifson |
| Project Name | SR1 | Date Tested | 9-May-16 |
| Project Number | 110773396.302.702.230 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D10 | **Sample ID:** | RC16 |
| **Depth (m):** | 7.4 | **Moisture Conent (%):** | 5.5 |
| **Sample Diameter (cm):** | 6.04 | **Sample Weight (g):** | 924.3 |
| **Load Rate (MPa/sec):** | 0.22 | **Sample Length (cm):** | 13.0 |
| **Peak Load (kN):** | 16.55 | **Unit Weight (kg/m3):** | 2352 |
| **Compressive Stregth (MPa):** | 5.78 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D10 | **Sample ID:** | RC15 |
| **Depth (m):** | 5.8 | **Moisture Conent (%):** | 4.1 |
| **Sample Diameter (cm):** | 6.08 | **Sample Weight (g):** | 844.1 |
| **Load Rate (MPa/sec):** | 0.18 | **Sample Length (cm):** | 12.16 |
| **Peak Load (kN):** | 91.45 | **Unit Weight (kg/m3):** | 2351 |
| **Compressive Stregth (MPa):** | 23.70 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D10 | **Sample ID:** | RC25 |
| **Depth (m):** | 19.6 | **Moisture Conent (%):** | 4.4% |
| **Sample Diameter (cm):** | 6.08 | **Sample Weight (g):** | 957.2 |
| **Load Rate (MPa/sec):** | 0.14 | **Sample Length (cm):** | 13.04 |
| **Peak Load (kN):** | 91.45 | **Unit Weight (kg/m3):** | 1982 |
| **Compressive Stregth (MPa):** | 32.30 | | |



Reviewed by: _____

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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C.Tollifson |
| Project Name | SR1 | Date Tested | 9-May-16 |
| Project Number | 110773396.302.702.230 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D14 | **Sample ID:** | RC35 |
| **Depth (m):** | 17.7 | **Moisture Conent (%):** | 4.1 |
| **Sample Diameter (cm):** | 6.06 | **Sample Weight (g):** | 875.8 |
| **Load Rate (MPa/sec):** | 0.23 | **Sample Length (cm):** | 12.99 |
| **Peak Load (kN):** | 63.78 | **Unit Weight (kg/m3):** | 2246 |
| **Compressive Stregth (MPa):** | 22.1 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D14 | **Sample ID:** | RC34 |
| **Depth (m):** | 16.5 | **Moisture Conent (%):** | 6.5 |
| **Sample Diameter (cm):** | 6.08 | **Sample Weight (g):** | 905.8 |
| **Load Rate (MPa/sec):** | 0.19 | **Sample Length (cm):** | 12.96 |
| **Peak Load (kN):** | 76.04 | **Unit Weight (kg/m3):** | 2275 |
| **Compressive Stregth (MPa):** | 26.40 | | |



Reviewed by: _____

## Stantec Consulting Ltd.

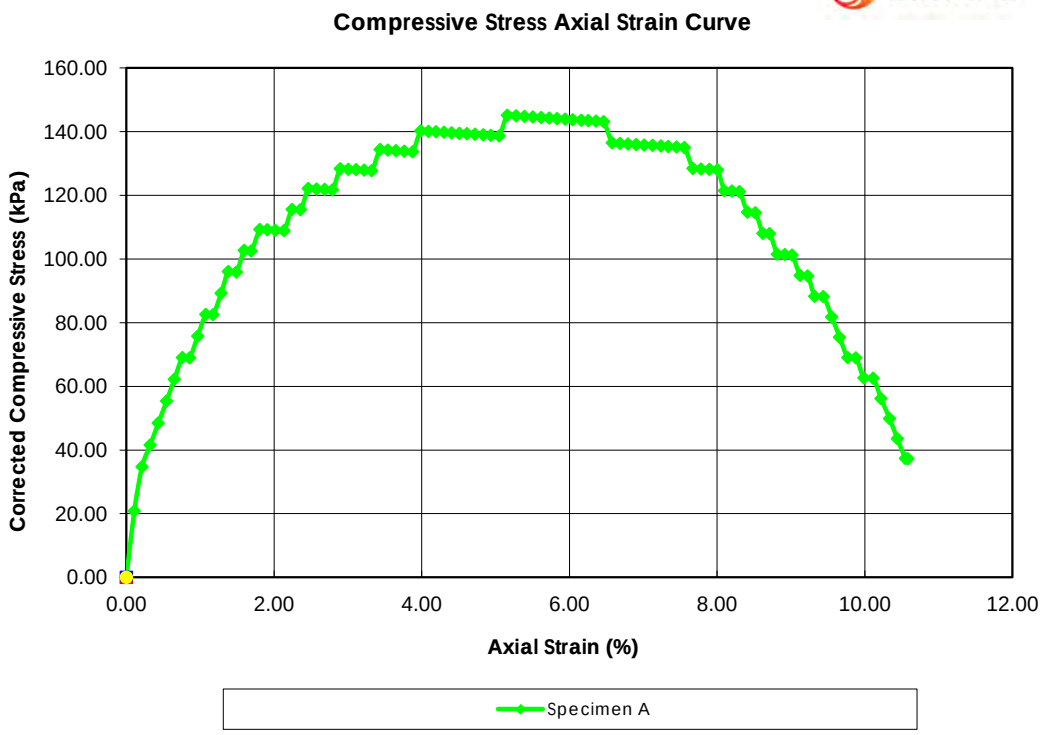
### Unconfined Compression Test Report (ASTM D2166)

Stantec

Reviewed By: C. Lamoureux

Date: 13-Jun-16

Tested By: C. Oost




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 22.7 | | | |
| Dry Density (g/cm3) | 1.663 | | | |
| Saturation (%) | 98.29 | | | |
| Void Ratio | 0.62 | | | |
| Diameter (mm) | 73.00 | | | |
| Height (mm) | 154.30 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Unconfined Strength (kPa) | 145.120 | | | |
| Undrained Shear Strength (kgf/cm^2) | 0.740 | | | |
| Undrained Shear Strength | 72.560 | | | |
| Rate of Strain (mm/min) | 2.00 | | | |
| Strain at Failure (%) | 5.16 | | | |
| Description | | | | |

| Project Information | | Specimen Description | |
|---|---|---|---|
| Project Num | 110773396.302.702.230 | Specimen A | Brown Clay |
| Project | SR1 | Specimen B | |
| Samp. Date | 29-Apr-16 | Specimen C | |
| Sample # | D17 ST4 | Specimen D | |
| Client | Alberta Transportation | **Test Variables** | |
| | | Specific Gravity | 2.70 |
| | | Liquid Limit: | |
| | | Plastic Limit: | |

Remarks

## Stantec Consulting Ltd.

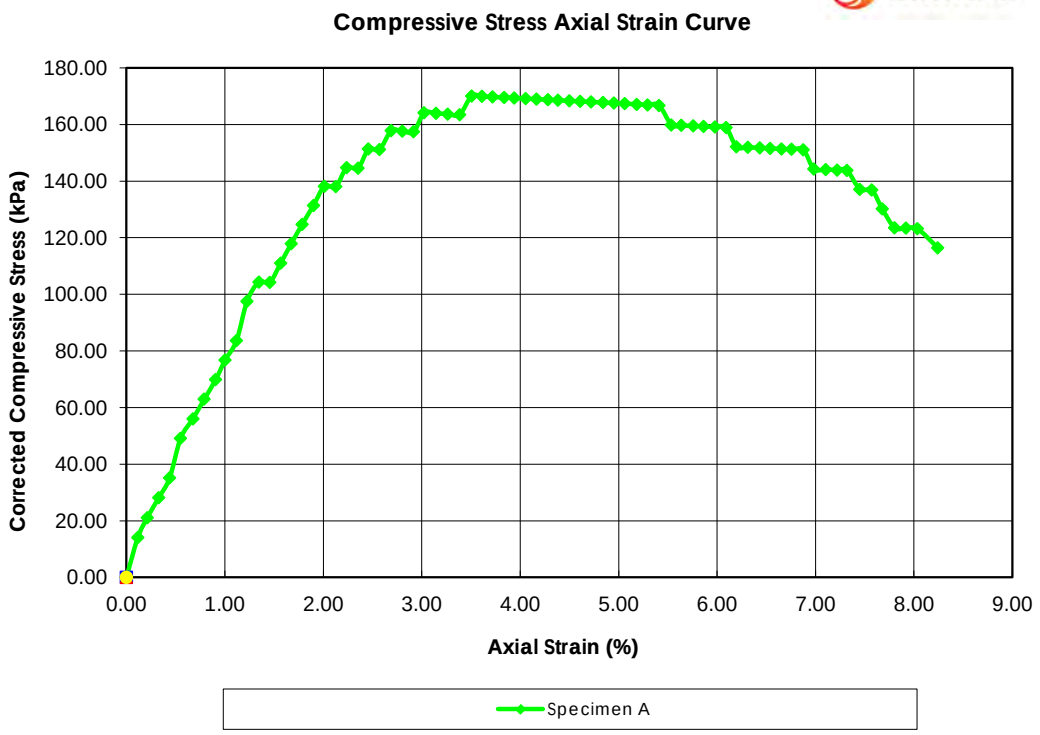
### Unconfined Compression Test Report (ASTM D2166)

Stantec

Reviewed By: C. Lamoureux

Date: 13-Jun-16

Tested By: C. Oost




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.0 | | | |
| Dry Density (g/cm3) | 1.596 | | | |
| Saturation (%) | 105.27 | | | |
| Void Ratio | 0.69 | | | |
| Diameter (mm) | 72.50 | | | |
| Height (mm) | 147.10 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Unconfined Strength (kPa) | 170.105 | | | |
| Undrained Shear Strength (kgf/cm^2) | 0.867 | | | |
| Undrained Shear Strength | 85.053 | | | |
| Rate of Strain (mm/min) | 2.00 | | | |
| Strain at Failure (%) | 3.51 | | | |
| Description | | | | |

| Project Information | | Specimen Description | |
|---|---|---|---|
| Project Num | 110773396.302.702.230 | Specimen A | Brown Clay |
| Project | SR1 | Specimen B | |
| Samp. Date | 29-Apr-16 | Specimen C | |
| Sample # | D17 ST8 | Specimen D | |
| Client | Alberta Transportation | **Test Variables** | |
| | | Specific Gravity | 2.70 |
| | | Liquid Limit: | |
| | | Plastic Limit: | |

Remarks

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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C.Tollifson |
| Project Name | SR1 | Date Tested | 9-May-16 |
| Project Number | 110773396.302.702.230 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D19 | **Sample ID:** | RC51 |
| **Depth (m):** | 22.1 | **Moisture Conent (%):** | 4.0 |
| **Sample Diameter (cm):** | 6.07 | **Sample Weight (g):** | 902 |
| **Load Rate (MPa/sec):** | 0.21 | **Sample Length (cm):** | 12.79 |
| **Peak Load (kN):** | 68.58 | **Unit Weight (kg/m3):** | 2343 |
| **Compressive Stregth (MPa):** | 23.7 | | |



Reviewed by: _____

## Stantec Consulting Ltd.

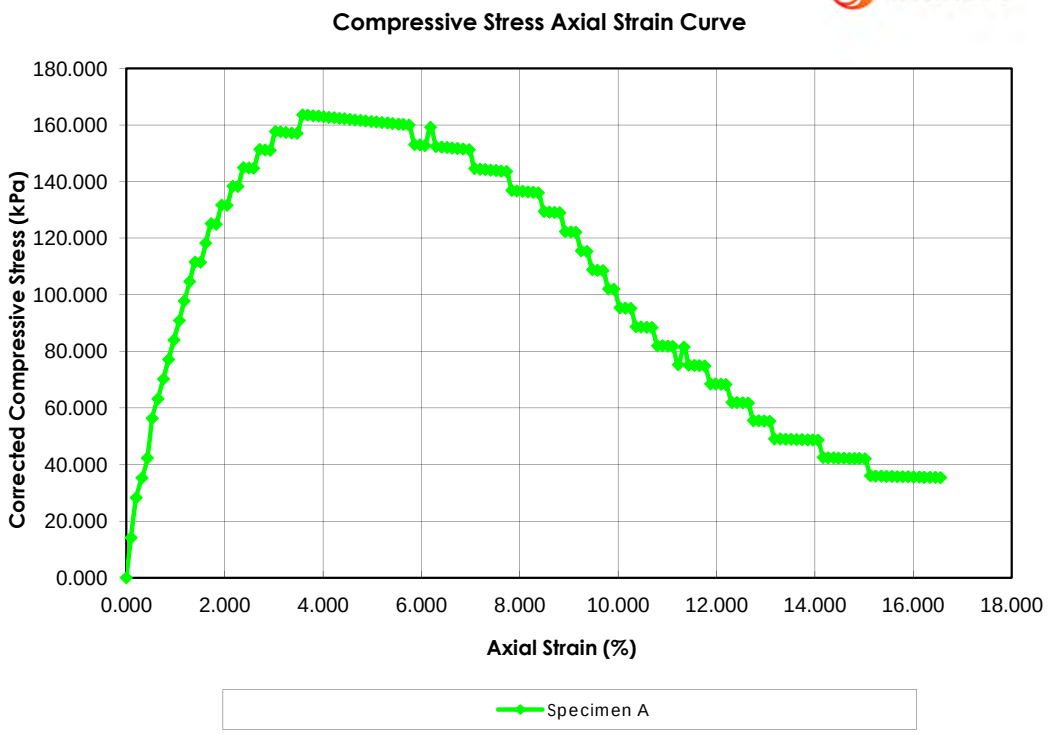
### Unconfined Compression Test Report (ASTM D2166)

Stantec

Reviewed By: C.Lamoureux

Date: 13-May-16

Tested By: C.Tollifson




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 30.0 | | | |
| Dry Density (g/cm3) | 1.507 | | | |
| Saturation (%) | 101.31 | | | |
| Void Ratio | 0.81 | | | |
| Diameter (mm) | 72.4 | | | |
| Height (mm) | 153.0 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Unconfined Strength (kPa) | 163.612 | | | |
| Undrained Shear Strength (kgf/cm^2) | 0.834 | | | |
| Undrained Shear Strength | 81.806 | | | |
| Rate of Strain (mm/min) | 2.000000 | | | |
| Strain at Failure (%) | 3.59 | | | |
| Description | | | | |

| Project Information | | Specimen Description | |
|---|---|---|---|
| Project Num | 110773396.302.702.230 | Specimen A | Brown Clay |
| Project | SR1 | Specimen B | |
| Sampling Dat | 25-Apr-16 | Specimen C | |
| Sample # | D20-ST10 | Specimen D | |
| Client | Alberta Transportation | **Test Variables** | |
| | | Specific Gravity | 2.72 |
| | | Liquid Limit: | |
| | | Plastic Limit: | |

Remarks

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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C. Oost |
| Project Name | SR1 | Date Tested | 16-Aug-16 |
| Project Number | 110773396.302.702.230 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D60 | **Sample ID:** | RC34 |
| **Depth (m):** | 22.80 | **Moisture Conent (%):** | 3.4 |
| **Sample Diameter (cm):** | 9.1 | **Sample Weight (g):** | 990.2 |
| **Load Rate (MPa/sec):** | 0.88 | **Sample Length (cm):** | 13.07 |
| **Peak Load (kN):** | 102.27 | **Unit Weight (kg/m3):** | 3388 |
| **Compressive Stregth (MPa):** | 35.0 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D36 | **Sample ID:** | RC28 |
| **Depth (m):** | 22.43 | **Moisture Conent (%):** | 1 |
| **Sample Diameter (cm):** | 6.08 | **Sample Weight (g):** | 955.2 |
| **Load Rate (MPa/sec):** | 0.78 | **Sample Length (cm):** | 12.76 |
| **Peak Load (kN):** | 197.48 | **Unit Weight (kg/m3):** | 3290 |
| **Compressive Stregth (MPa):** | 68.01 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D36 | **Sample ID:** | RC29 |
| **Depth (m):** | 24.07 | **Moisture Conent (%):** | 1.3 |
| **Sample Diameter (cm):** | 6.1 | **Sample Weight (g):** | 911.6 |
| **Load Rate (MPa/sec):** | 0.74 | **Sample Length (cm):** | 12.79 |
| **Peak Load (kN):** | 180.21 | **Unit Weight (kg/m3):** | 3140 |
| **Compressive Stregth (MPa):** | 61.67 | | |



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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C. Oost |
| Project Name | SR1 | Date Tested | 16-Aug-16 |
| Project Number | 110773396.302.702.230 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D41 | **Sample ID:** | RC21 |
| **Depth (m):** | 19.81 | **Moisture Conent (%):** | 0.7 |
| **Sample Diameter (cm):** | 6.05 | **Sample Weight (g):** | 977.6 |
| **Load Rate (MPa/sec):** | 0.76 | **Sample Length (cm):** | 13.26 |
| **Peak Load (kN):** | 213.39 | **Unit Weight (kg/m3):** | 3401 |
| **Compressive Stregth (MPa):** | 74.23 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D41 | **Sample ID:** | RC17 |
| **Depth (m):** | 14.1 | **Moisture Conent (%):** | 4.5 |
| **Sample Diameter (cm):** | 6.09 | **Sample Weight (g):** | 699.7 |
| **Load Rate (MPa/sec):** | N/A | **Sample Length (cm):** | 11.20 |
| **Peak Load (kN):** | 2.84 | **Unit Weight (kg/m3):** | 2402 |
| **Compressive Stregth (MPa):** | 1.00 | | |



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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | M. Boudreau |
| Project Name | SR1 | Date Tested | 14-Jul-16 |
| Project Number | 110773396.302.702.230 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D46 | **Sample ID:** | RC26 |
| **Depth (m):** | 18.9 | **Moisture Conent (%):** | 1.6 |
| **Sample Diameter (cm):** | 6.08 | **Sample Weight (g):** | 809.7 |
| **Load Rate (MPa/sec):** | 0.73 | **Sample Length (cm):** | 12.41 |
| **Peak Load (kN):** | 94.28 | **Unit Weight (kg/m3):** | 2249 |
| **Compressive Stregth (MPa):** | 35.5 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D46 | **Sample ID:** | RC28 |
| **Depth (m):** | 22.7 | **Moisture Conent (%):** | 2.1 |
| **Sample Diameter (cm):** | 6.08 | **Sample Weight (g):** | 893.0 |
| **Load Rate (MPa/sec):** | 0.74 | **Sample Length (cm):** | 12.37 |
| **Peak Load (kN):** | 175.99 | **Unit Weight (kg/m3):** | 2487 |
| **Compressive Stregth (MPa):** | 58.90 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D46 | **Sample ID:** | RC24 |
| **Depth (m):** | 16.8 | **Moisture Conent (%):** | 1.9 |
| **Sample Diameter (cm):** | 6.05 | **Sample Weight (g):** | 927.6 |
| **Load Rate (MPa/sec):** | 0.79 | **Sample Length (cm):** | 12.93 |
| **Peak Load (kN):** | 147.53 | **Unit Weight (kg/m3):** | 2496 |
| **Compressive Stregth (MPa):** | 51.30 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D46 | **Sample ID:** | RC20 |
| **Depth (m):** | 10.97 | **Moisture Conent (%):** | 0.8 |
| **Sample Diameter (cm):** | 6.04 | **Sample Weight (g):** | 698.7 |
| **Load Rate (MPa/sec):** | 0.68 | **Sample Length (cm):** | 11.3 |
| **Peak Load (kN):** | 55.45 | **Unit Weight (kg/m3):** | 2158 |
| **Compressive Stregth (MPa):** | 19.35 | | |



Reviewed by: _____

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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C. Oost |
| Project Name | SR1 | Date Tested | 16-Aug-16 |
| Project Number | 110773396.302.702.230 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D60 | **Sample ID:** | RC33 |
| **Depth (m):** | 21.22 | **Moisture Conent (%):** | 7.6 |
| **Sample Diameter (cm):** | 6.03 | **Sample Weight (g):** | 825.7 |
| **Load Rate (MPa/sec):** | N/A | **Sample Length (cm):** | 12.14 |
| **Peak Load (kN):** | 2.08 | **Unit Weight (kg/m3):** | 2891 |
| **Compressive Stregth (MPa):** | 0.73 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D60 | **Sample ID:** | RC37 |
| **Depth (m):** | 27.29 | **Moisture Conent (%):** | 7.6 |
| **Sample Diameter (cm):** | 6.03 | **Sample Weight (g):** | 832.6 |
| **Load Rate (MPa/sec):** | N/A | **Sample Length (cm):** | 12.13 |
| **Peak Load (kN):** | 5.83 | **Unit Weight (kg/m3):** | 2916 |
| **Compressive Stregth (MPa):** | 2.04 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D60 | **Sample ID:** | RC35 |
| **Depth (m):** | 23.9 | **Moisture Conent (%):** | 4.6 |
| **Sample Diameter (cm):** | 6.1 | **Sample Weight (g):** | 760.6 |
| **Load Rate (MPa/sec):** | 0.76 | **Sample Length (cm):** | 10.25 |
| **Peak Load (kN):** | 49.05 | **Unit Weight (kg/m3):** | 2603 |
| **Compressive Stregth (MPa):** | 16.78 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | D60 | **Sample ID:** | RC38 |
| **Depth (m):** | 28.65 | **Moisture Conent (%):** | 4.5 |
| **Sample Diameter (cm):** | 6.06 | **Sample Weight (g):** | 968.0 |
| **Load Rate (MPa/sec):** | 0.87 | **Sample Length (cm):** | 13.20 |
| **Peak Load (kN):** | 70.27 | **Unit Weight (kg/m3):** | 3356 |
| **Compressive Stregth (MPa):** | 24.36 | | |



Reviewed by: _____

# E. 5
Highway

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 23, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |


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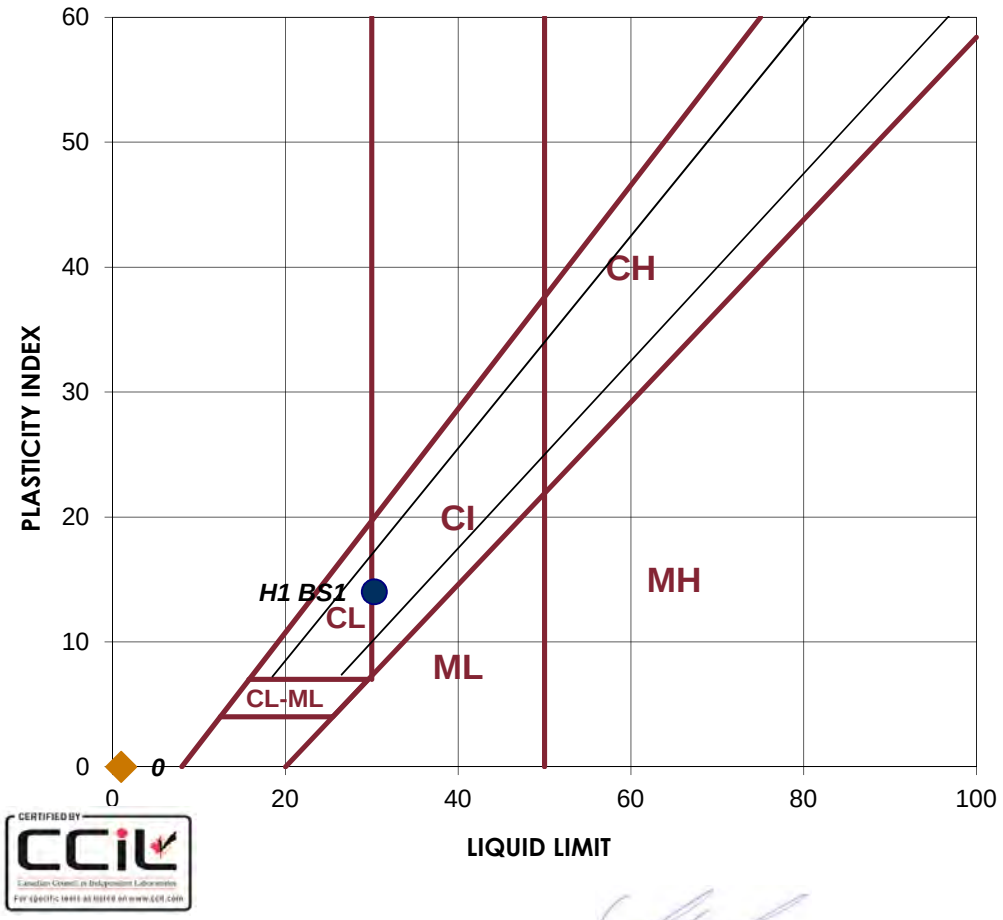
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H1 BS1 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 27.42 | 25.31 | Wt. Sample (wet+tare)(g) | | |
| 21.36 | 19.75 | Wt. Sample (dry+tare)(g) | | |
| 1.55 | 1.50 | Wt. Tare (g) | | |
| 19.8 | 18.3 | Wt. Dry Soil (g) | | |
| 6.1 | 5.6 | Wt. Water (g) | | |
| 30.6% | 30.5% | Water Content (%) | | |
| 30.3% | 30.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.99 | 24.26 | Wt. Sample (wet+tare)(g) | | |
| 24.3 | 22.85 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.72 | Wt. Tare (g) | | |
| 10.5 | 9.1 | Wt. Dry Soil (g) | | |
| 1.7 | 1.4 | Wt. Water (g) | | |
| 16.0% | 15.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 30 | | LL | |
| PL | 16 | | PL | |
| PI | 14 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 26, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |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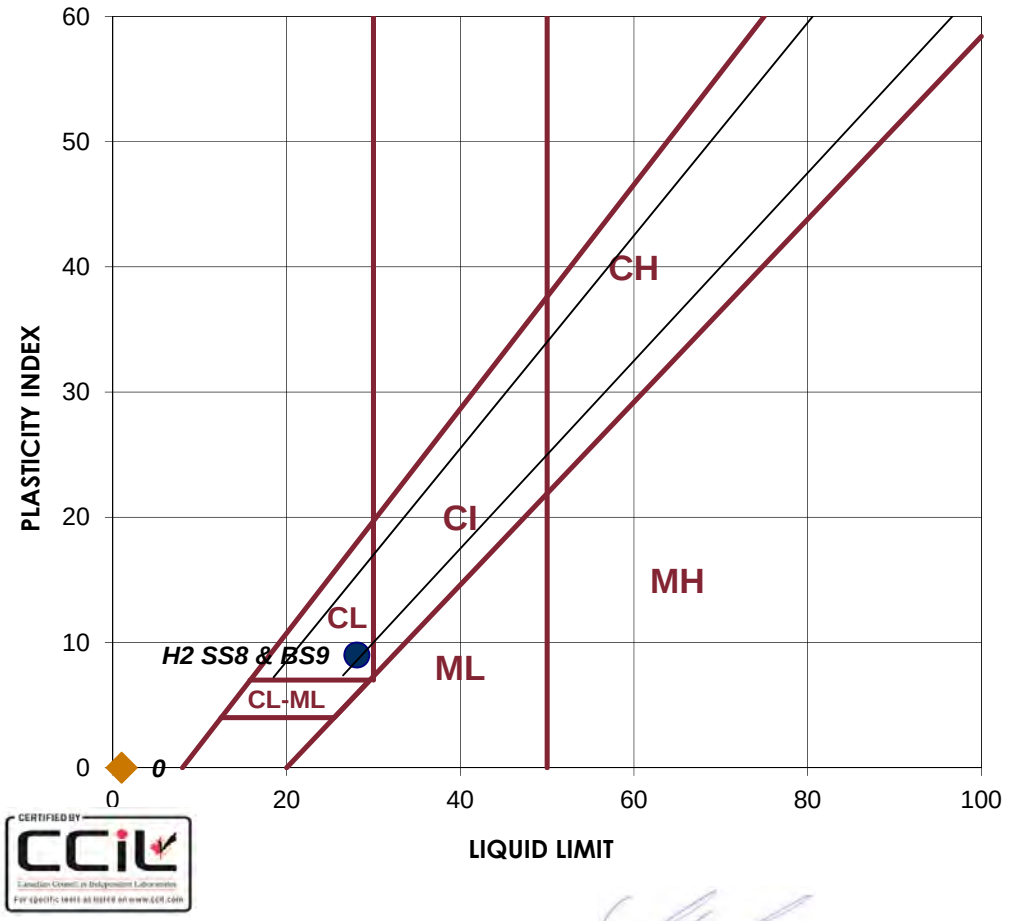
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H2 SS8 & BS9 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 24 | Number of Blows | | |
| | | Container Number | | |
| 30.17 | 28.10 | Wt. Sample (wet+tare)(g) | | |
| 23.83 | 22.18 | Wt. Sample (dry+tare)(g) | | |
| 1.38 | 1.20 | Wt. Tare (g) | | |
| 22.5 | 21.0 | Wt. Dry Soil (g) | | |
| 6.3 | 5.9 | Wt. Water (g) | | |
| 28.2% | 28.2% | Water Content (%) | | |
| 28.1% | 28.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.23 | 25.41 | Wt. Sample (wet+tare)(g) | | |
| 22.56 | 23.55 | Wt. Sample (dry+tare)(g) | | |
| 13.79 | 13.77 | Wt. Tare (g) | | |
| 8.8 | 9.8 | Wt. Dry Soil (g) | | |
| 1.7 | 1.9 | Wt. Water (g) | | |
| 19.0% | 19.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 28 | | LL | |
| PL | 19 | | PL | |
| PI | 9 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-CI*** | | | ***NON-PLASTIC*** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 27, 2016 |
| Date Tested: | November 3, 2016 |
| Tested By: | C. Woods |


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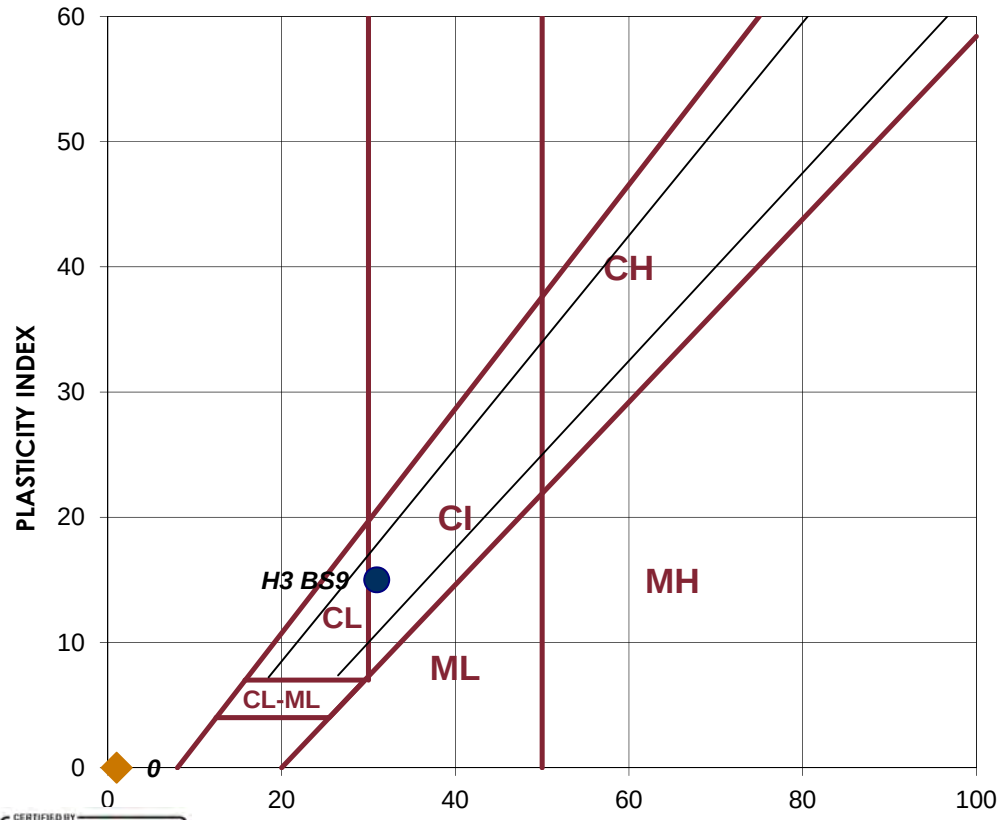
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H3 BS9 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 34.78 | 30.61 | Wt. Sample (wet+tare)(g) | | |
| 27.01 | 23.82 | Wt. Sample (dry+tare)(g) | | |
| 1.47 | 1.47 | Wt. Tare (g) | | |
| 25.5 | 22.4 | Wt. Dry Soil (g) | | |
| 7.8 | 6.8 | Wt. Water (g) | | |
| 30.4% | 30.4% | Water Content (%) | | |
| 31.0% | 30.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 29.18 | 25.51 | Wt. Sample (wet+tare)(g) | | |
| 27.07 | 23.94 | Wt. Sample (dry+tare)(g) | | |
| 13.89 | 13.91 | Wt. Tare (g) | | |
| 13.2 | 10.0 | Wt. Dry Soil (g) | | |
| 2.1 | 1.6 | Wt. Water (g) | | |
| 16.0% | 15.7% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 16 | | PL | |
| PI | 15 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CI-CL** | | | **NON-PLASTIC** | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 27, 2016 |
| Date Tested: | October 18, 2016 |
| Tested By: | B.Pelkey |


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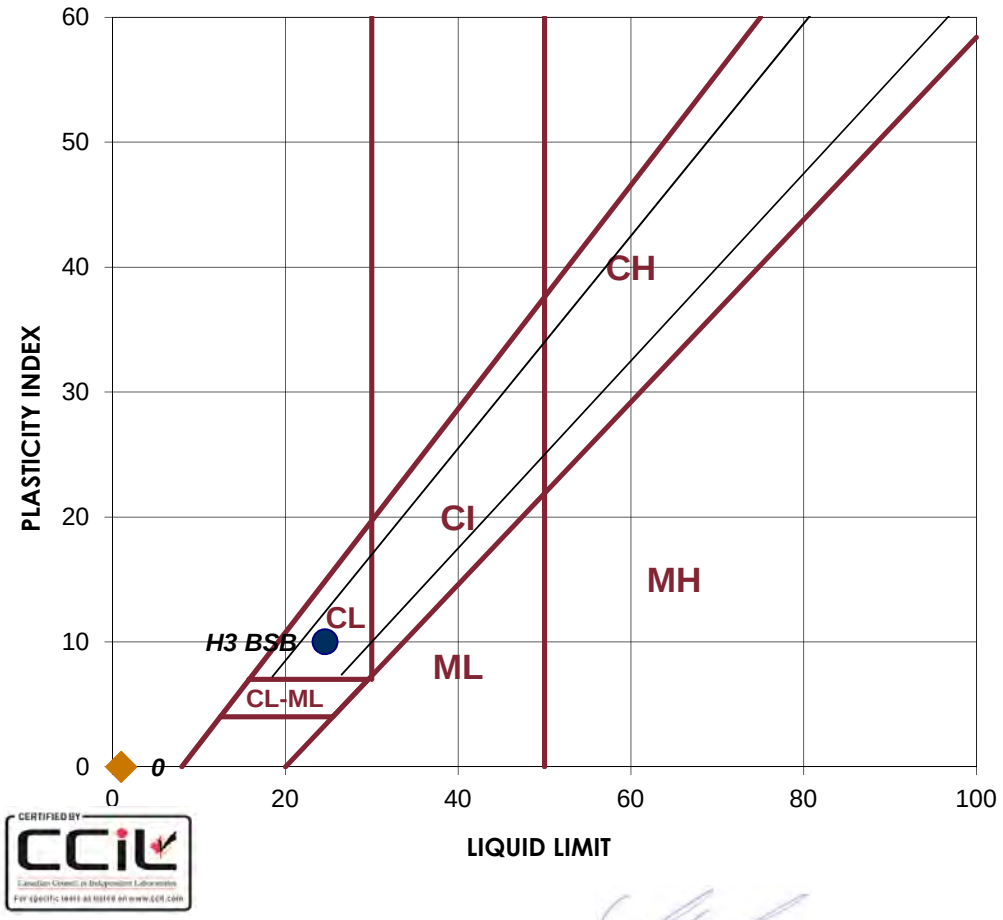
| Sample: H3 BSB | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 21 | Number of Blows | | |
| | | Container Number | | |
| 33.62 | 37.98 | Wt. Sample (wet+tare)(g) | | |
| 27.12 | 30.62 | Wt. Sample (dry+tare)(g) | | |
| 1.22 | 1.21 | Wt. Tare (g) | | |
| 25.9 | 29.4 | Wt. Dry Soil (g) | | |
| 6.5 | 7.4 | Wt. Water (g) | | |
| 25.1% | 25.0% | Water Content (%) | | |
| 24.7% | 24.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.8 | 26.06 | Wt. Sample (wet+tare)(g) | | |
| 23.43 | 24.47 | Wt. Sample (dry+tare)(g) | | |
| 13.91 | 13.83 | Wt. Tare (g) | | |
| 9.5 | 10.6 | Wt. Dry Soil (g) | | |
| 1.4 | 1.6 | Wt. Water (g) | | |
| 14.4% | 14.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 25 | | LL | |
| PL | 15 | | PL | |
| PI | 10 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 29, 2016 |
| Date Tested: | November 2, 2016 |
| Tested By: | C. Woods |


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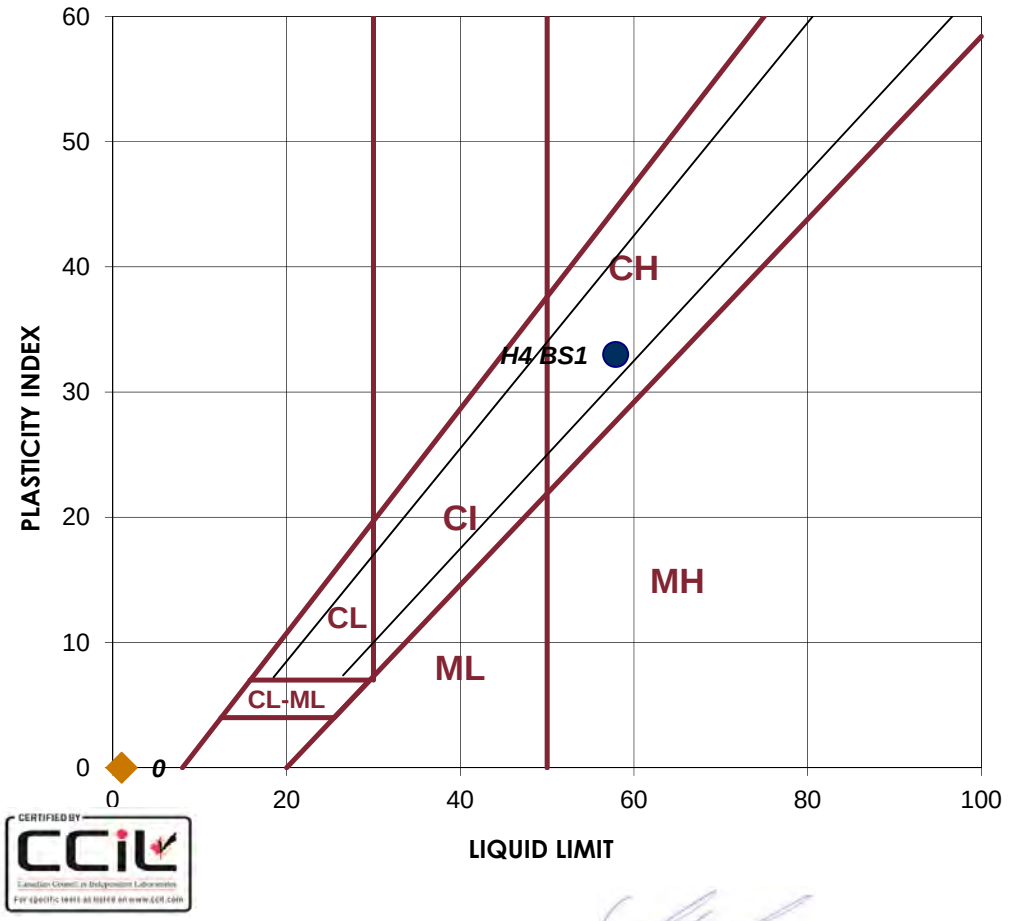
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H4 BS1 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 28 | Number of Blows | | |
| | | Container Number | | |
| 23.51 | 25.29 | Wt. Sample (wet+tare)(g) | | |
| 15.38 | 16.64 | Wt. Sample (dry+tare)(g) | | |
| 1.20 | 1.50 | Wt. Tare (g) | | |
| 14.2 | 15.1 | Wt. Dry Soil (g) | | |
| 8.1 | 8.7 | Wt. Water (g) | | |
| 57.3% | 57.1% | Water Content (%) | | |
| 57.9% | 57.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 21.76 | 23.32 | Wt. Sample (wet+tare)(g) | | |
| 20.14 | 21.44 | Wt. Sample (dry+tare)(g) | | |
| 13.89 | 13.92 | Wt. Tare (g) | | |
| 6.3 | 7.5 | Wt. Dry Soil (g) | | |
| 1.6 | 1.9 | Wt. Water (g) | | |
| 25.9% | 25.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 58 | | LL | |
| PL | 25 | | PL | |
| PI | 33 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 29, 2016 |
| Date Tested: | November 2, 2016 |
| Tested By: | C. Woods |


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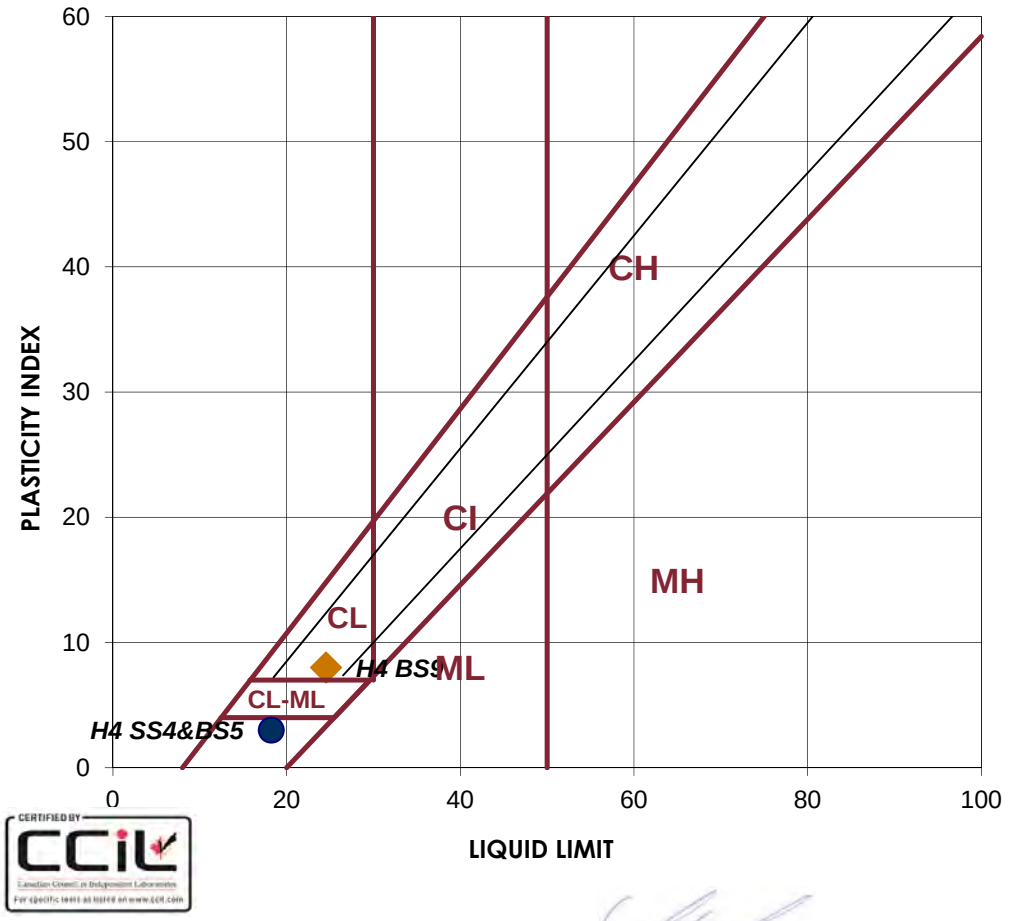
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H4 SS4&BS5 | | | H4 BS9 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 27 | Number of Blows | 27 | 28 |
| | | Container Number | | |
| 22.90 | 37.25 | Wt. Sample (wet+tare)(g) | 27.85 | 30.81 |
| 19.58 | 31.80 | Wt. Sample (dry+tare)(g) | 22.72 | 25.09 |
| 1.34 | 1.53 | Wt. Tare (g) | 1.57 | 1.50 |
| 18.2 | 30.3 | Wt. Dry Soil (g) | 21.2 | 23.6 |
| 3.3 | 5.5 | Wt. Water (g) | 5.1 | 5.7 |
| 18.2% | 18.0% | Water Content (%) | 24.3% | 24.2% |
| 18.3% | 18.2% | Corrected Water Content (%) | 24.5% | 24.6% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.31 | 23.23 | Wt. Sample (wet+tare)(g) | 23.81 | 26.46 |
| 23.83 | 22.04 | Wt. Sample (dry+tare)(g) | 22.36 | 24.63 |
| 13.77 | 13.82 | Wt. Tare (g) | 13.85 | 14.14 |
| 10.1 | 8.2 | Wt. Dry Soil (g) | 8.5 | 10.5 |
| 1.5 | 1.2 | Wt. Water (g) | 1.5 | 1.8 |
| 14.7% | 14.5% | Water Content (%) | 17.0% | 17.4% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 18 | | LL | 25 |
| PL | 15 | | PL | 17 |
| PI | 3 | | PI | 8 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ML | | | CL | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 25, 2016 |
| Date Tested: | October 17, 2016 |
| Tested By: | B.Pelkey |


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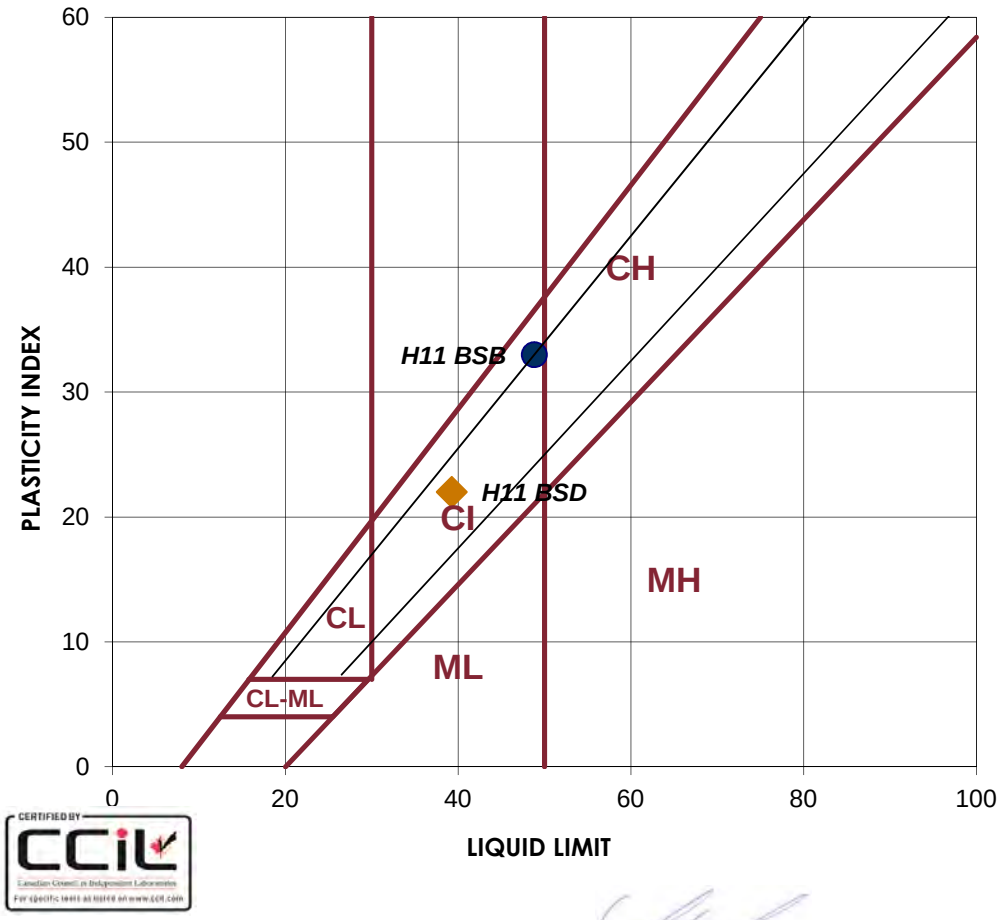
| Sample: H11 BSB | | | Sample: H11 BSD | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 29 | Number of Blows | 25 | 24 |
| | | Container Number | | |
| 26.69 | 25.08 | Wt. Sample (wet+tare)(g) | 24.24 | 27.34 |
| 18.53 | 17.42 | Wt. Sample (dry+tare)(g) | 17.71 | 20.07 |
| 1.56 | 1.55 | Wt. Tare (g) | 1.16 | 1.56 |
| 17.0 | 15.9 | Wt. Dry Soil (g) | 16.6 | 18.5 |
| 8.2 | 7.7 | Wt. Water (g) | 6.5 | 7.3 |
| 48.1% | 48.3% | Water Content (%) | 39.5% | 39.3% |
| 48.5% | 49.1% | Corrected Water Content (%) | 39.5% | 39.1% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.86 | 24.8 | Wt. Sample (wet+tare)(g) | 27.83 | 28.02 |
| 24.15 | 23.27 | Wt. Sample (dry+tare)(g) | 25.85 | 25.99 |
| 13.72 | 13.87 | Wt. Tare (g) | 13.78 | 13.77 |
| 10.4 | 9.4 | Wt. Dry Soil (g) | 12.1 | 12.2 |
| 1.7 | 1.5 | Wt. Water (g) | 2.0 | 2.0 |
| 16.4% | 16.3% | Water Content (%) | 16.4% | 16.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 49 | | LL | 39 |
| PL | 16 | | PL | 17 |
| PI | 33 | | PI | 22 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CH | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 18, 2016 |
| Date Tested: | October 25, 2016 |
| Tested By: | C. Woods |


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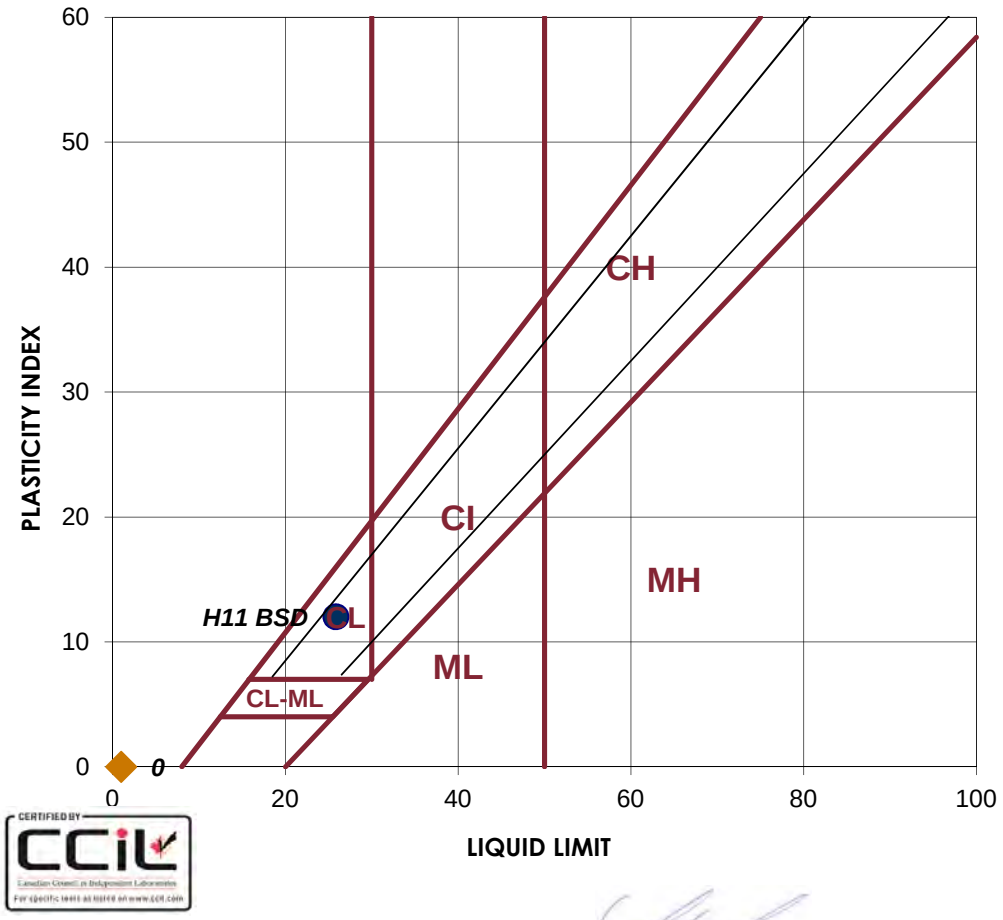
| Sample: H11 BSD | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 26 | Number of Blows | | |
| | | Container Number | | |
| 28.31 | 28.06 | Wt. Sample (wet+tare)(g) | | |
| 22.76 | 22.65 | Wt. Sample (dry+tare)(g) | | |
| 1.25 | 1.58 | Wt. Tare (g) | | |
| 21.5 | 21.1 | Wt. Dry Soil (g) | | |
| 5.6 | 5.4 | Wt. Water (g) | | |
| 25.8% | 25.7% | Water Content (%) | | |
| 25.9% | 25.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.98 | 26.11 | Wt. Sample (wet+tare)(g) | | |
| 22.76 | 24.66 | Wt. Sample (dry+tare)(g) | | |
| 13.79 | 13.87 | Wt. Tare (g) | | |
| 9.0 | 10.8 | Wt. Dry Soil (g) | | |
| 1.2 | 1.5 | Wt. Water (g) | | |
| 13.6% | 13.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 26 | | LL | |
| PL | 14 | | PL | |
| PI | 12 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318

Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 25, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |


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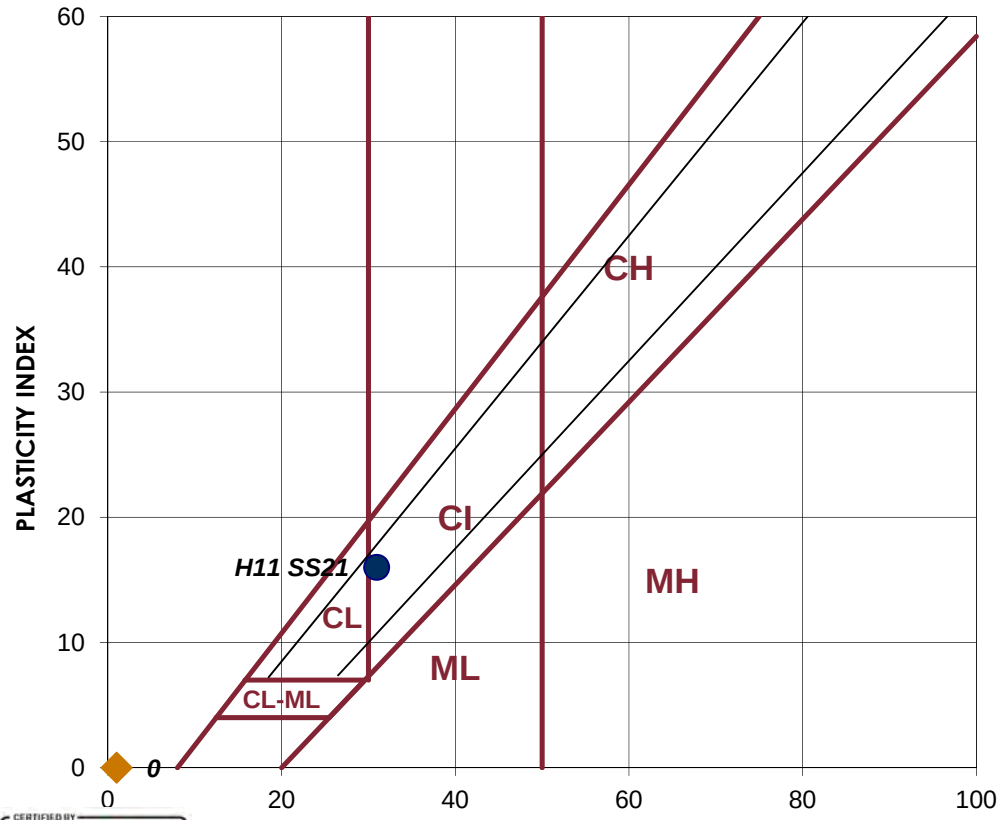
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H11 SS21 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 24 | Number of Blows | | |
| | | Container Number | | |
| 26.77 | 27.60 | Wt. Sample (wet+tare)(g) | | |
| 20.74 | 21.42 | Wt. Sample (dry+tare)(g) | | |
| 1.40 | 1.50 | Wt. Tare (g) | | |
| 19.3 | 19.9 | Wt. Dry Soil (g) | | |
| 6.0 | 6.2 | Wt. Water (g) | | |
| 31.2% | 31.0% | Water Content (%) | | |
| 31.0% | 30.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.21 | 28.27 | Wt. Sample (wet+tare)(g) | | |
| 24.6 | 26.42 | Wt. Sample (dry+tare)(g) | | |
| 13.8 | 13.77 | Wt. Tare (g) | | |
| 10.8 | 12.7 | Wt. Dry Soil (g) | | |
| 1.6 | 1.9 | Wt. Water (g) | | |
| 14.9% | 14.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 15 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CL*** | | | ***NON-PLASTIC*** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 24, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |


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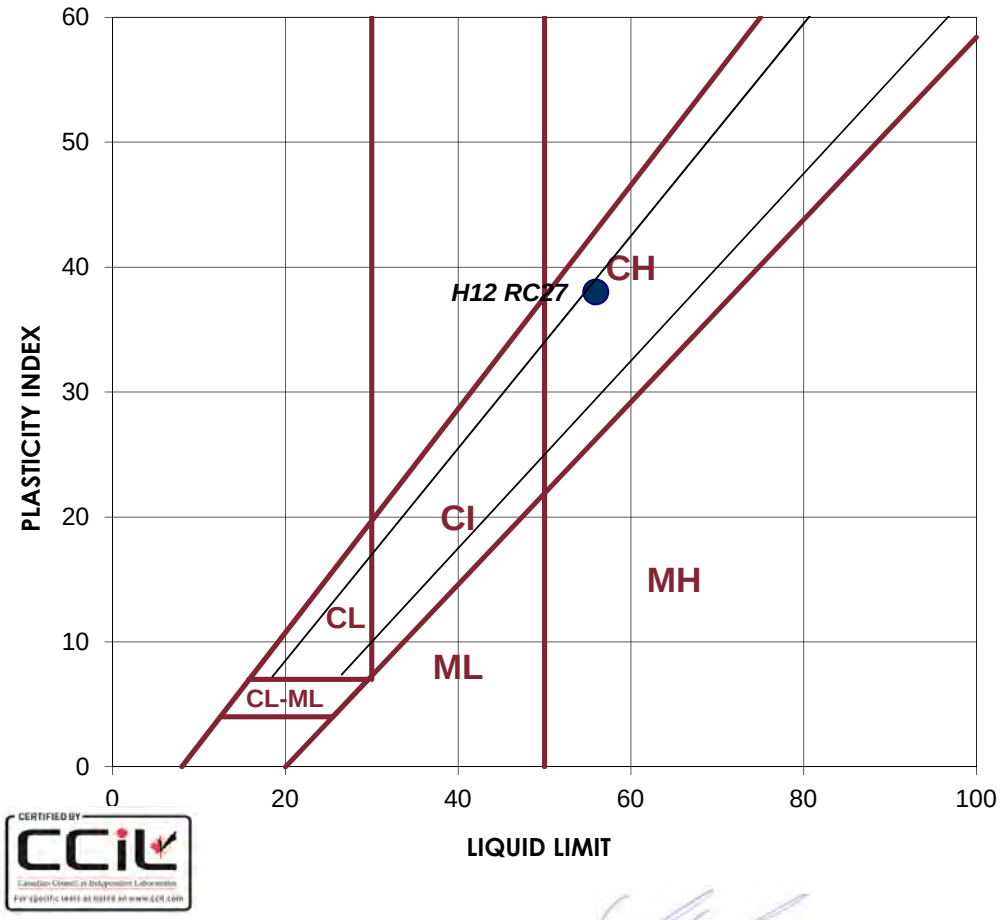
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H12 RC27 | | | H12 RC32 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 20 | 21 | Number of Blows | 23 | 24 |
| | | Container Number | | |
| 23.54 | 31.83 | Wt. Sample (wet+tare)(g) | 22.43 | 23.84 |
| 15.46 | 20.69 | Wt. Sample (dry+tare)(g) | 10.62 | 11.28 |
| 1.33 | 1.29 | Wt. Tare (g) | 1.25 | 1.26 |
| 14.1 | 19.4 | Wt. Dry Soil (g) | 9.4 | 10.0 |
| 8.1 | 11.1 | Wt. Water (g) | 11.8 | 12.6 |
| 57.2% | 57.4% | Water Content (%) | 126.0% | 125.3% |
| 55.7% | 56.2% | Corrected Water Content (%) | 124.8% | 124.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.6 | 25.7 | Wt. Sample (wet+tare)(g) | 24.77 | 25.69 |
| 22.12 | 23.87 | Wt. Sample (dry+tare)(g) | 22.84 | 23.63 |
| 13.83 | 13.92 | Wt. Tare (g) | 13.76 | 13.72 |
| 8.3 | 10.0 | Wt. Dry Soil (g) | 9.1 | 9.9 |
| 1.5 | 1.8 | Wt. Water (g) | 1.9 | 2.1 |
| 17.9% | 18.4% | Water Content (%) | 21.3% | 20.8% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 56 | | LL | 125 |
| PL | 18 | | PL | 21 |
| PI | 38 | | PI | 104 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CH | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 24, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |


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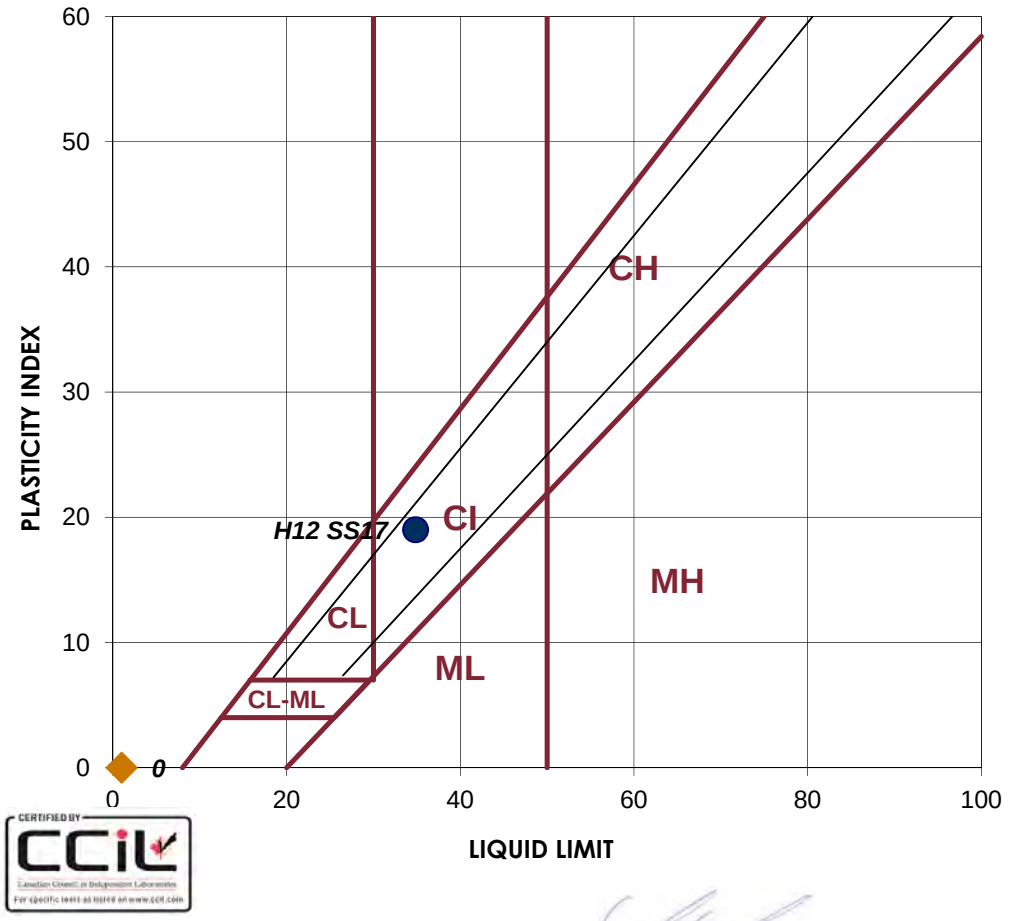
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H12 SS17 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 27 | Number of Blows | | |
| | | Container Number | | |
| 27.33 | 25.60 | Wt. Sample (wet+tare)(g) | | |
| 20.70 | 19.45 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.55 | Wt. Tare (g) | | |
| 19.2 | 17.9 | Wt. Dry Soil (g) | | |
| 6.6 | 6.2 | Wt. Water (g) | | |
| 34.5% | 34.4% | Water Content (%) | | |
| 35.0% | 34.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.33 | 24.73 | Wt. Sample (wet+tare)(g) | | |
| 21.21 | 23.25 | Wt. Sample (dry+tare)(g) | | |
| 13.9 | 13.91 | Wt. Tare (g) | | |
| 7.3 | 9.3 | Wt. Dry Soil (g) | | |
| 1.1 | 1.5 | Wt. Water (g) | | |
| 15.3% | 15.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 16 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 24, 2016 |
| Date Tested: | October 13, 2016 |
| Tested By: | C.Small |


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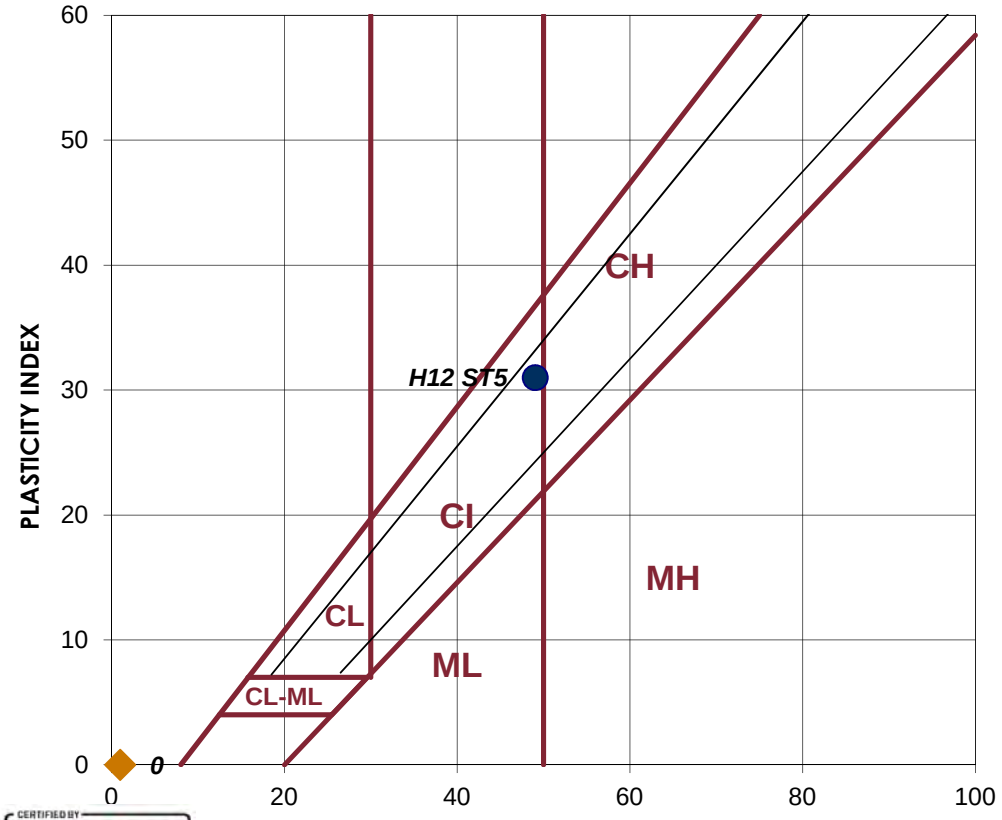
Tel: (403) 253-7876


| Sample: H12 ST5 | | | Sample: | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | | |
| | | Container Number | | |
| 19.70 | 19.00 | Wt. Sample (wet+tare)(g) | | |
| 13.68 | 13.24 | Wt. Sample (dry+tare)(g) | | |
| 1.48 | 1.48 | Wt. Tare (g) | | |
| 12.2 | 11.8 | Wt. Dry Soil (g) | | |
| 6.0 | 5.8 | Wt. Water (g) | | |
| 49.3% | 49.0% | Water Content (%) | | |
| 49.3% | 48.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.45 | 25.73 | Wt. Sample (wet+tare)(g) | | |
| 21.11 | 23.85 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.76 | Wt. Tare (g) | | |
| 7.3 | 10.1 | Wt. Dry Soil (g) | | |
| 1.3 | 1.9 | Wt. Water (g) | | |
| 18.3% | 18.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 49 | | LL | |
| PL | 18 | | PL | |
| PI | 31 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CH*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 23, 2016 |
| Date Tested: | October 24, 2016 |
| Tested By: | B. Pelkey |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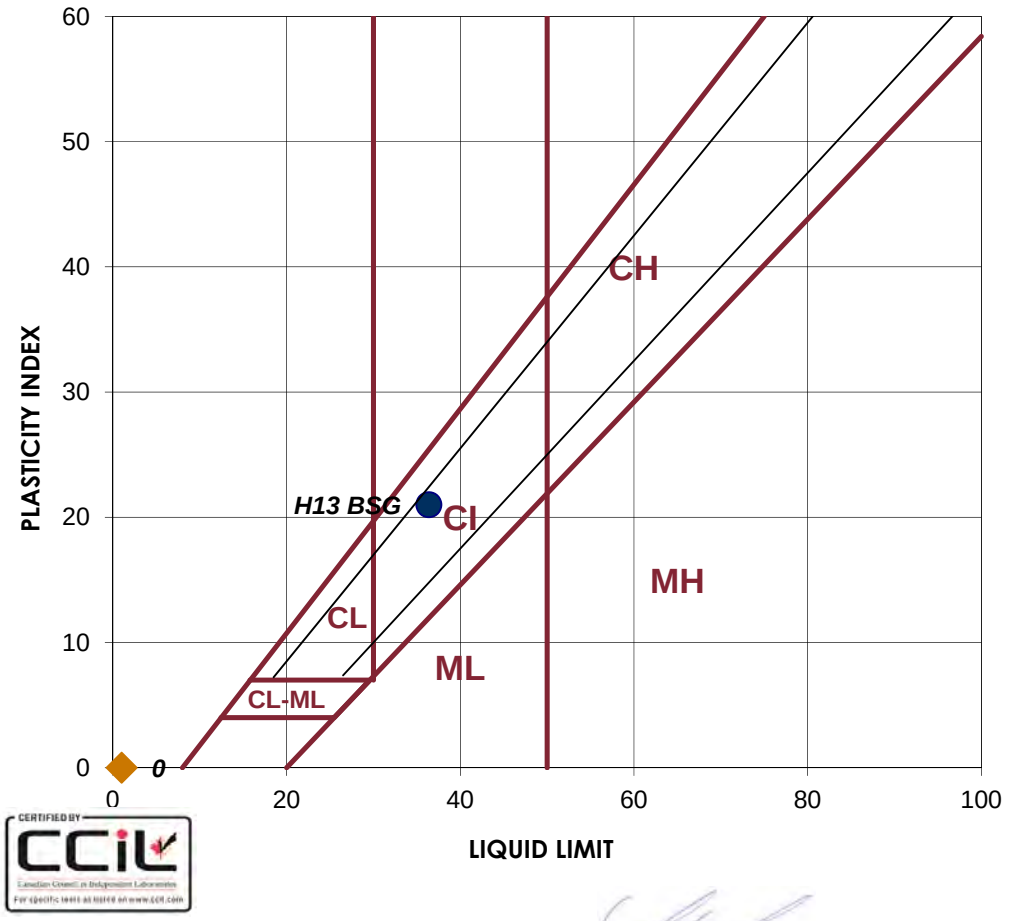
Canada T2C 1G4
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| H13 BSG | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | | |
| | | Container Number | | |
| 21.92 | 21.22 | Wt. Sample (wet+tare)(g) | | |
| 16.38 | 15.97 | Wt. Sample (dry+tare)(g) | | |
| 1.21 | 1.56 | Wt. Tare (g) | | |
| 15.2 | 14.4 | Wt. Dry Soil (g) | | |
| 5.5 | 5.3 | Wt. Water (g) | | |
| 36.5% | 36.4% | Water Content (%) | | |
| 36.5% | 36.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.35 | 24.54 | Wt. Sample (wet+tare)(g) | | |
| 26.47 | 23.18 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.76 | Wt. Tare (g) | | |
| 12.7 | 9.4 | Wt. Dry Soil (g) | | |
| 1.9 | 1.4 | Wt. Water (g) | | |
| 14.8% | 14.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | |
| PL | 15 | | PL | |
| PI | 21 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 23, 2016 |
| Date Tested: | November 4, 2016 |
| Tested By: | C. Woods |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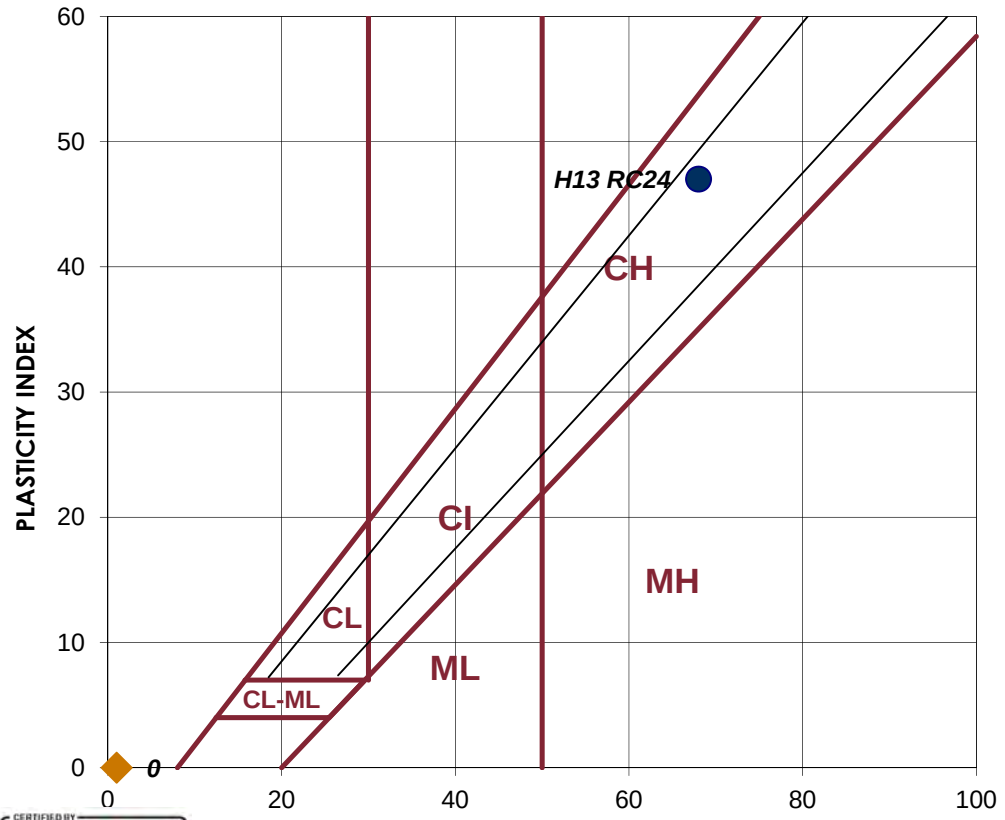
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H13 RC24 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 27 | Number of Blows | | |
| | | Container Number | | |
| 24.89 | 23.23 | Wt. Sample (wet+tare)(g) | | |
| 15.34 | 14.40 | Wt. Sample (dry+tare)(g) | | |
| 1.21 | 1.32 | Wt. Tare (g) | | |
| 14.1 | 13.1 | Wt. Dry Soil (g) | | |
| 9.6 | 8.8 | Wt. Water (g) | | |
| 67.6% | 67.5% | Water Content (%) | | |
| 67.9% | 68.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.46 | 25.71 | Wt. Sample (wet+tare)(g) | | |
| 23.46 | 23.67 | Wt. Sample (dry+tare)(g) | | |
| 13.85 | 13.78 | Wt. Tare (g) | | |
| 9.6 | 9.9 | Wt. Dry Soil (g) | | |
| 2.0 | 2.0 | Wt. Water (g) | | |
| 20.8% | 20.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 68 | | LL | |
| PL | 21 | | PL | |
| PI | 47 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | NON-PLASTIC | |




CERTIFIED BY CCIL

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. STANTEC is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of STANTEC.

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 23, 2016 |
| Date Tested: | November 3, 2016 |
| Tested By: | C. Woods |


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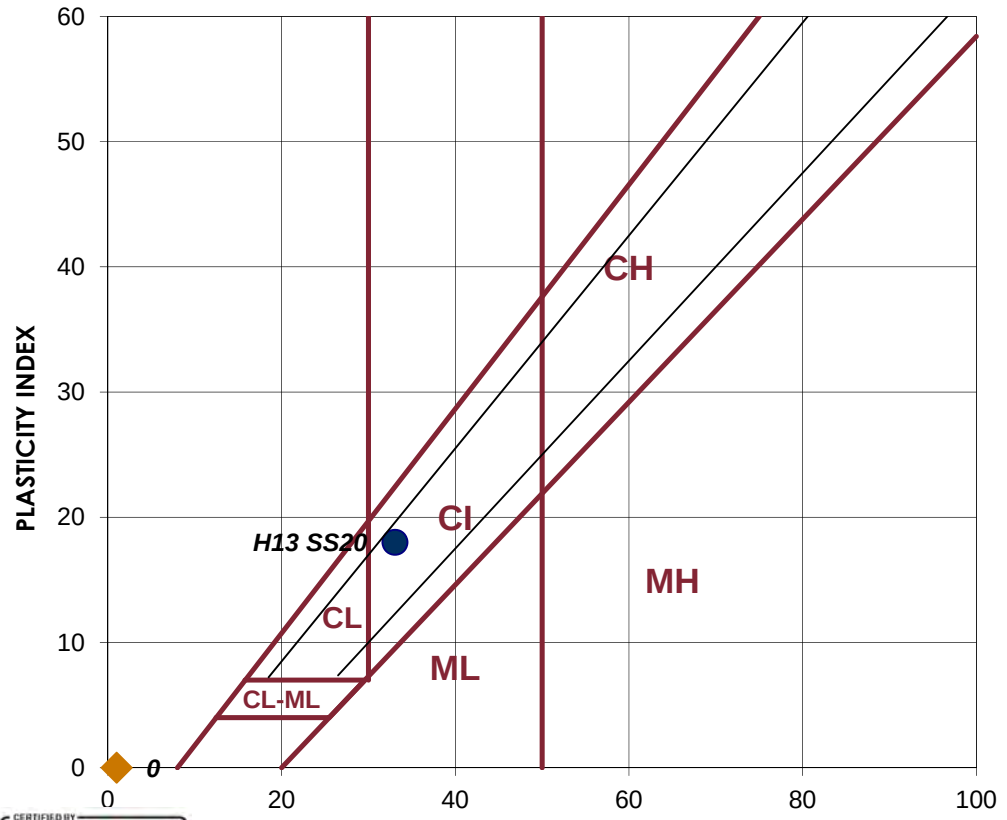
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H13 SS20 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 29 | Number of Blows | | |
| | | Container Number | | |
| 29.85 | 29.47 | Wt. Sample (wet+tare)(g) | | |
| 22.89 | 22.63 | Wt. Sample (dry+tare)(g) | | |
| 1.53 | 1.58 | Wt. Tare (g) | | |
| 21.4 | 21.1 | Wt. Dry Soil (g) | | |
| 7.0 | 6.8 | Wt. Water (g) | | |
| 32.6% | 32.5% | Water Content (%) | | |
| 33.0% | 33.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.17 | 26.51 | Wt. Sample (wet+tare)(g) | | |
| 25.36 | 24.84 | Wt. Sample (dry+tare)(g) | | |
| 13.79 | 13.78 | Wt. Tare (g) | | |
| 11.6 | 11.1 | Wt. Dry Soil (g) | | |
| 1.8 | 1.7 | Wt. Water (g) | | |
| 15.6% | 15.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | |
| PL | 15 | | PL | |
| PI | 18 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 27, 2016 |
| Date Tested: | October 18, 2016 |
| Tested By: | B.Pelkey |


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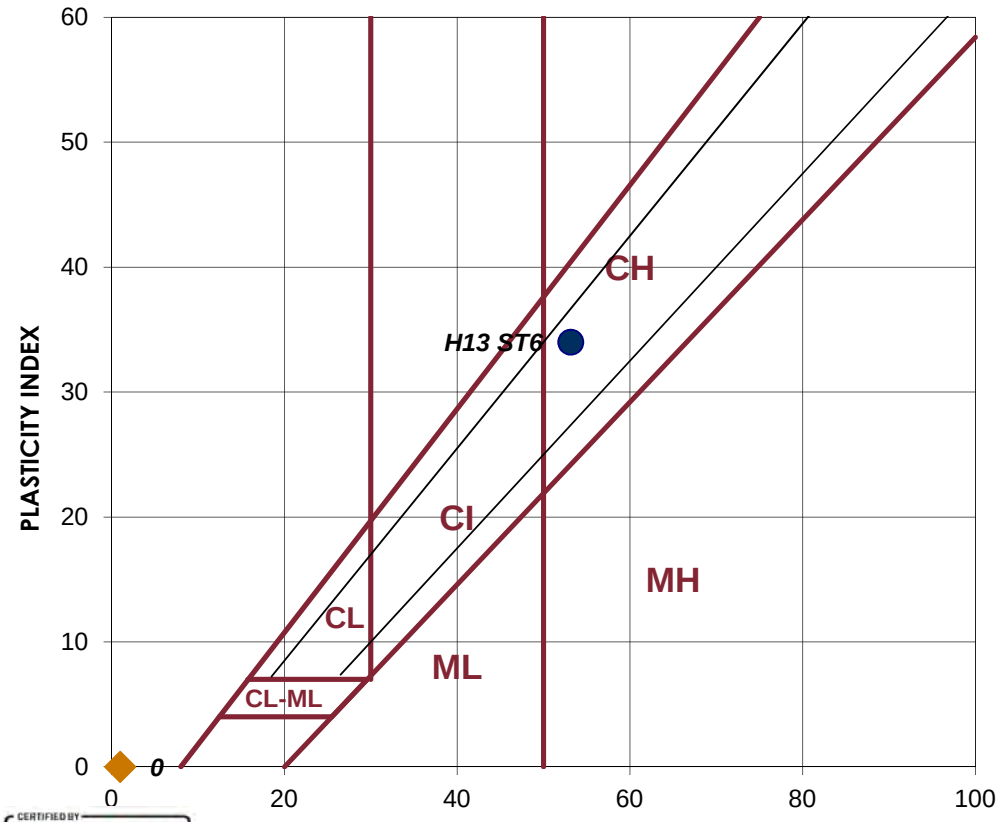
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H13 ST6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 22 | Number of Blows | | |
| | | Container Number | | |
| 18.23 | 25.08 | Wt. Sample (wet+tare)(g) | | |
| 12.39 | 16.83 | Wt. Sample (dry+tare)(g) | | |
| 1.54 | 1.51 | Wt. Tare (g) | | |
| 10.9 | 15.3 | Wt. Dry Soil (g) | | |
| 5.8 | 8.3 | Wt. Water (g) | | |
| 53.8% | 53.9% | Water Content (%) | | |
| 53.3% | 53.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.28 | 25.08 | Wt. Sample (wet+tare)(g) | | |
| 22.56 | 23.26 | Wt. Sample (dry+tare)(g) | | |
| 13.78 | 13.79 | Wt. Tare (g) | | |
| 8.8 | 9.5 | Wt. Dry Soil (g) | | |
| 1.7 | 1.8 | Wt. Water (g) | | |
| 19.6% | 19.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 53 | | LL | |
| PL | 19 | | PL | |
| PI | 34 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.260 |
| Date Received: | August 23, 2016 |
| Date Tested: | October 13, 2016 |
| Tested By: | C.Small |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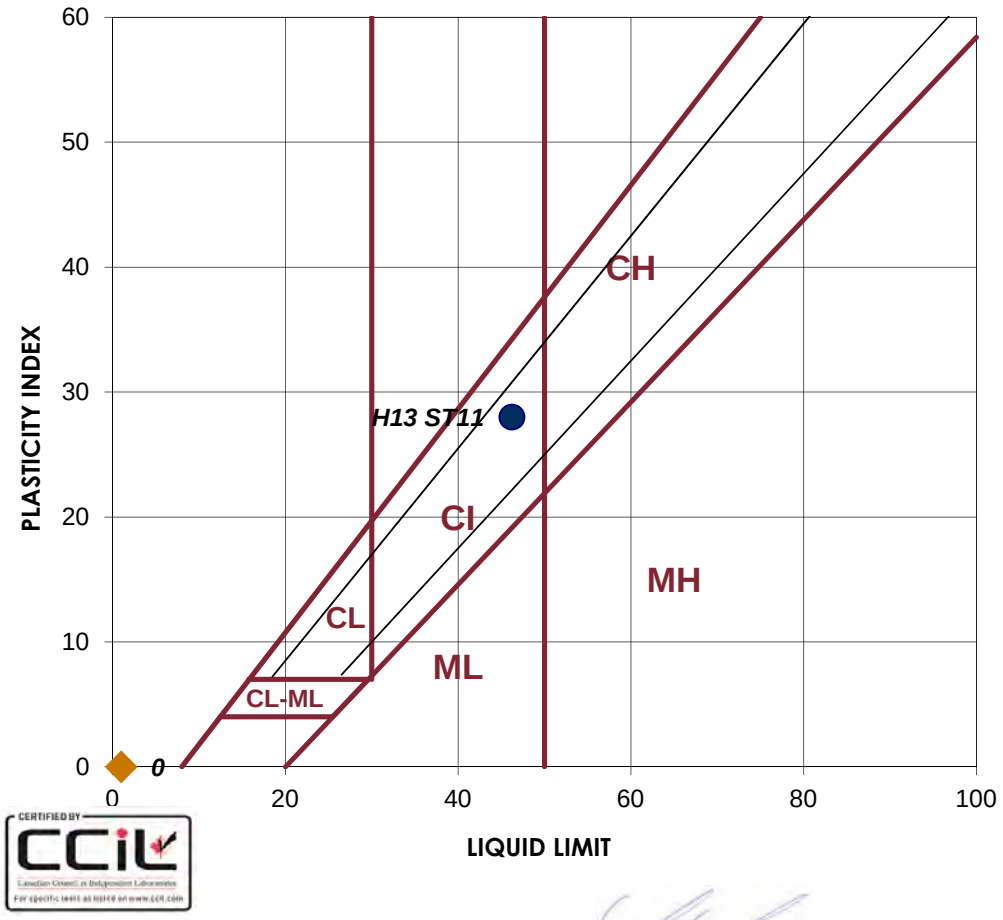
| Sample: | | | Sample: | |
|---|---|---|---|---|
| H13 ST11 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 28 | Number of Blows | | |
| | | Container Number | | |
| 19.85 | 20.24 | Wt. Sample (wet+tare)(g) | | |
| 14.03 | 14.26 | Wt. Sample (dry+tare)(g) | | |
| 1.30 | 1.18 | Wt. Tare (g) | | |
| 12.7 | 13.1 | Wt. Dry Soil (g) | | |
| 5.8 | 6.0 | Wt. Water (g) | | |
| 45.7% | 45.7% | Water Content (%) | | |
| 46.1% | 46.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.78 | 22.18 | Wt. Sample (wet+tare)(g) | | |
| 23.1 | 20.9 | Wt. Sample (dry+tare)(g) | | |
| 13.86 | 13.8 | Wt. Tare (g) | | |
| 9.2 | 7.1 | Wt. Dry Soil (g) | | |
| 1.7 | 1.3 | Wt. Water (g) | | |
| 18.2% | 18.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 46 | | LL | |
| PL | 18 | | PL | |
| PI | 28 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |






Reviewed By: _____

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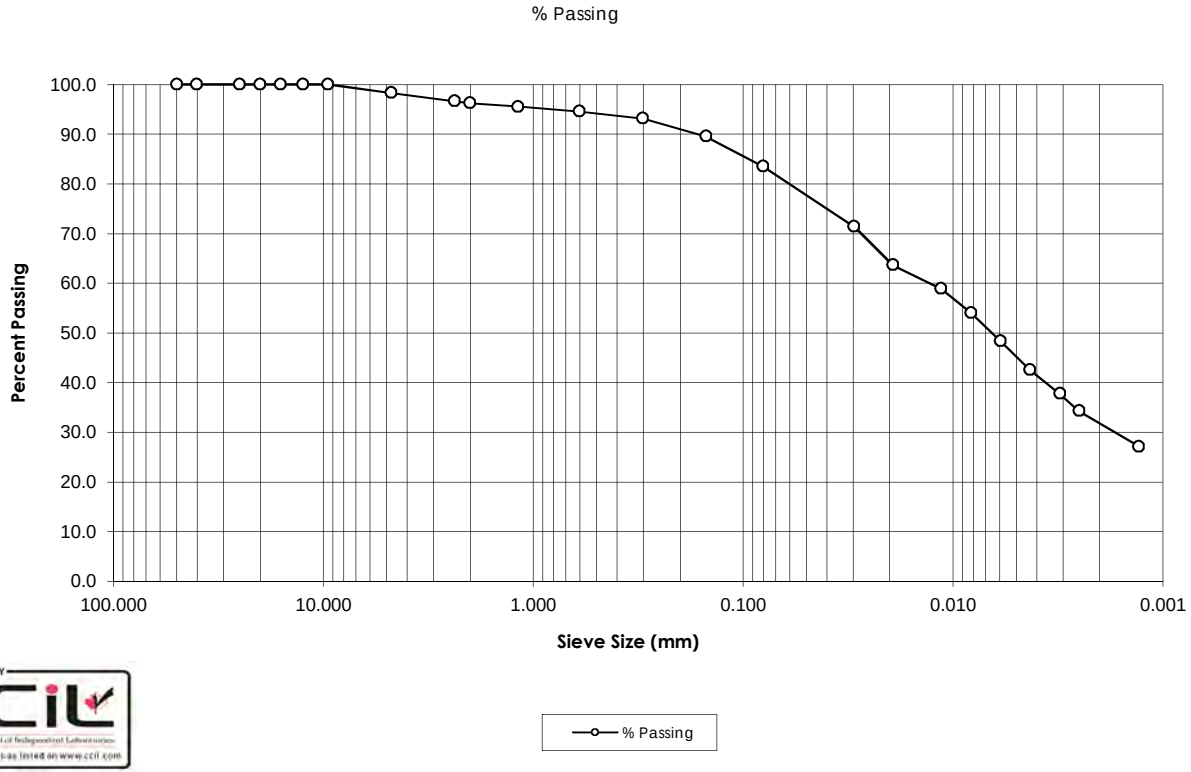
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: BS1
SOURCE: H1
TESTED BY: B. Pelkey

DATE TESTED: October 28, 2016
DATE RECEIVED: August 23, 2016
SAMPLE DESCRIPTION: Clay (CI-CL), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 48.3 |
| 40.0 | 100.0 | 0.0043 | 42.5 |
| 25.0 | 100.0 | 0.0031 | 37.7 |
| 20.0 | 100.0 | 0.0025 | 34.3 |
| 16.0 | 100.0 | 0.0013 | 27.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.3 | | |
| 2.36 | 96.6 | | |
| 2.00 | 96.3 | | |
| 1.18 | 95.6 | | |
| 0.600 | 94.6 | | |
| 0.300 | 93.2 | | |
| 0.150 | 89.6 | | |
| 0.080 | 83.5 | | |
| 0.0295 | 71.4 | | |
| 0.0193 | 63.7 | | |
| 0.0114 | 58.9 | | |
| 0.0082 | 54.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.7% | $D_{10}$: | - |
| Sand: | 14.8% | $D_{30}$: | 0.0018 |
| Silt: | 51.7% | $D_{60}$: | 0.0133 |
| Clay: | 31.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

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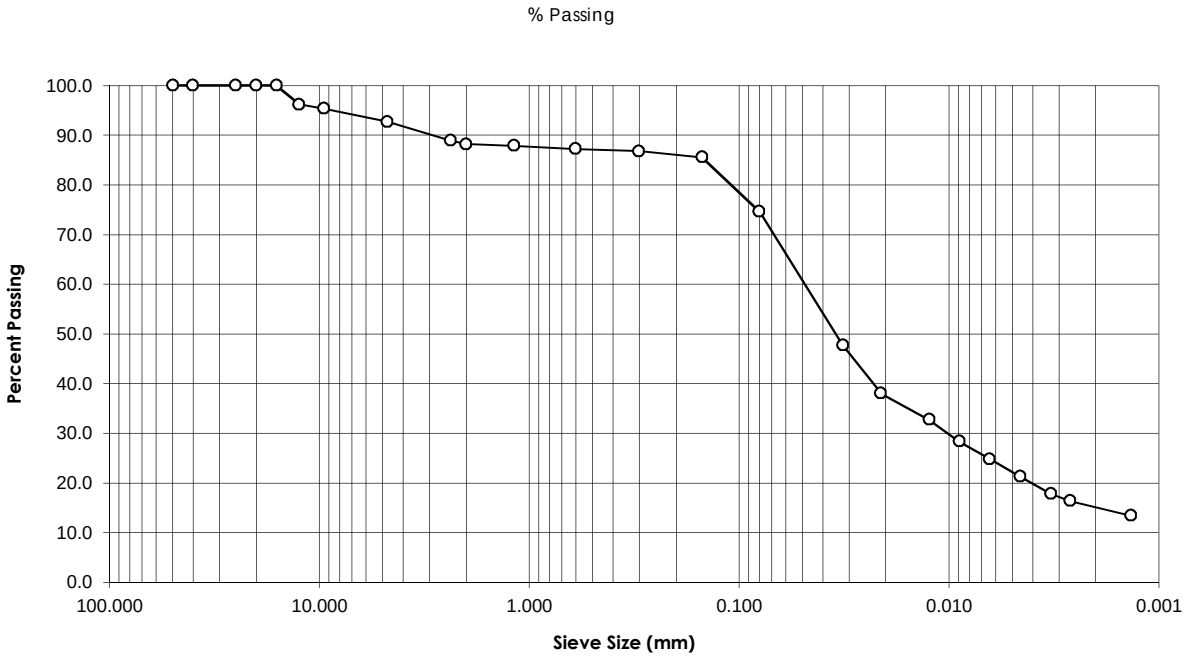
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: SS8 & BS9
SOURCE: H2
TESTED BY: B. Pelkey

DATE TESTED: October 28, 2016
DATE RECEIVED: August 26, 2016
SAMPLE DESCRIPTION: Clay (CL-CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0064 | 24.8 |
| 40.0 | 100.0 | 0.0046 | 21.3 |
| 25.0 | 100.0 | 0.0033 | 17.8 |
| 20.0 | 100.0 | 0.0027 | 16.3 |
| 16.0 | 100.0 | 0.0014 | 13.4 |
| 12.5 | 96.2 | | |
| 9.5 | 95.3 | | |
| 4.75 | 92.7 | | |
| 2.36 | 88.9 | | |
| 2.00 | 88.2 | | |
| 1.18 | 87.9 | | |
| 0.600 | 87.2 | | |
| 0.300 | 86.8 | | |
| 0.150 | 85.6 | | |
| 0.080 | 74.6 | | |
| 0.0321 | 47.6 | | |
| 0.0211 | 38.0 | | |
| 0.0124 | 32.7 | | |
| 0.0089 | 28.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.3% | $D_{10}$: | - |
| Sand: | 18.1% | $D_{30}$: | 0.0103 |
| Silt: | 59.5% | $D_{60}$: | 0.0567 |
| Clay: | 15.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

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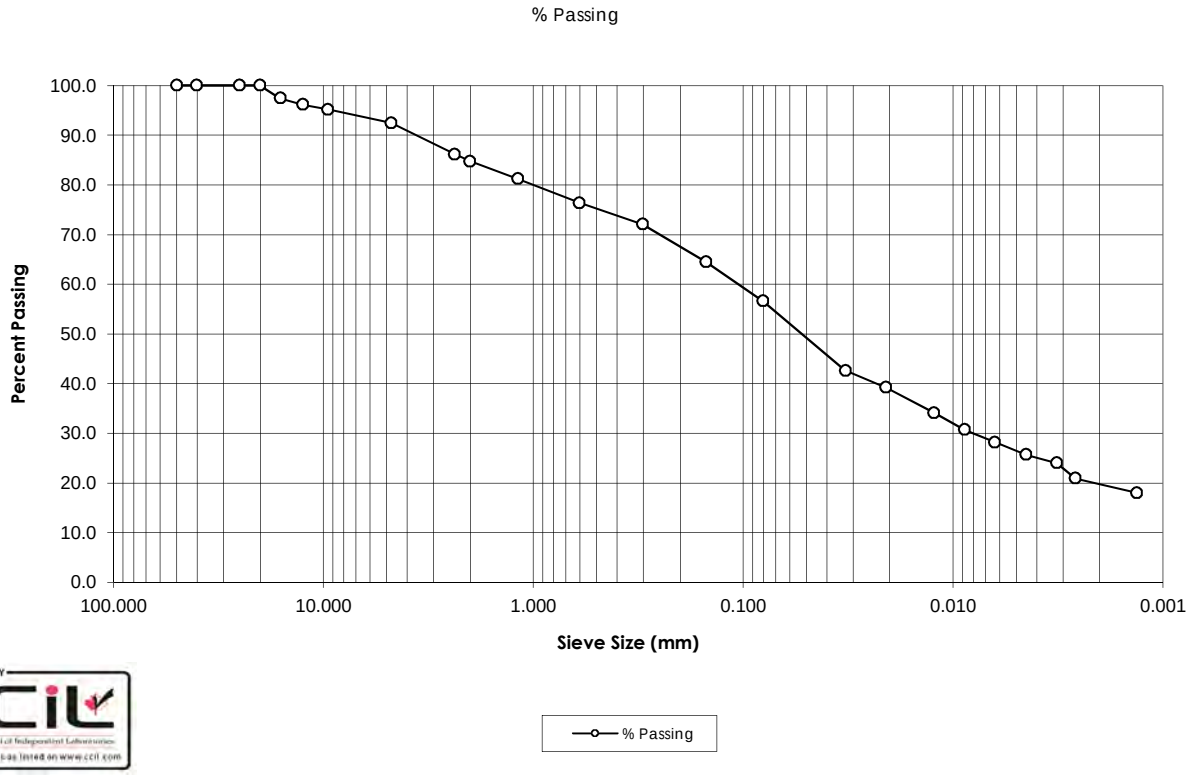
SAMPLE No.: BS9
SOURCE: H3
TESTED BY: B. Pelkey

DATE TESTED: October 28, 2016
DATE RECEIVED: August 27, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) and Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 28.2 |
| 40.0 | 100.0 | 0.0045 | 25.6 |
| 25.0 | 100.0 | 0.0032 | 23.9 |
| 20.0 | 100.0 | 0.0026 | 20.9 |
| 16.0 | 97.4 | 0.0013 | 18.0 |
| 12.5 | 96.2 | | |
| 9.5 | 95.1 | | |
| 4.75 | 92.5 | | |
| 2.36 | 86.1 | | |
| 2.00 | 84.7 | | |
| 1.18 | 81.2 | | |
| 0.600 | 76.4 | | |
| 0.300 | 72.0 | | |
| 0.150 | 64.5 | | |
| 0.080 | 56.6 | | |
| 0.0325 | 42.6 | | |
| 0.0208 | 39.2 | | |
| 0.0123 | 34.1 | | |
| 0.0088 | 30.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.5% | $D_{10}$: | - |
| Sand: | 35.9% | $D_{30}$: | 0.0081 |
| Silt: | 36.9% | $D_{60}$: | 0.1114 |
| Clay: | 19.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

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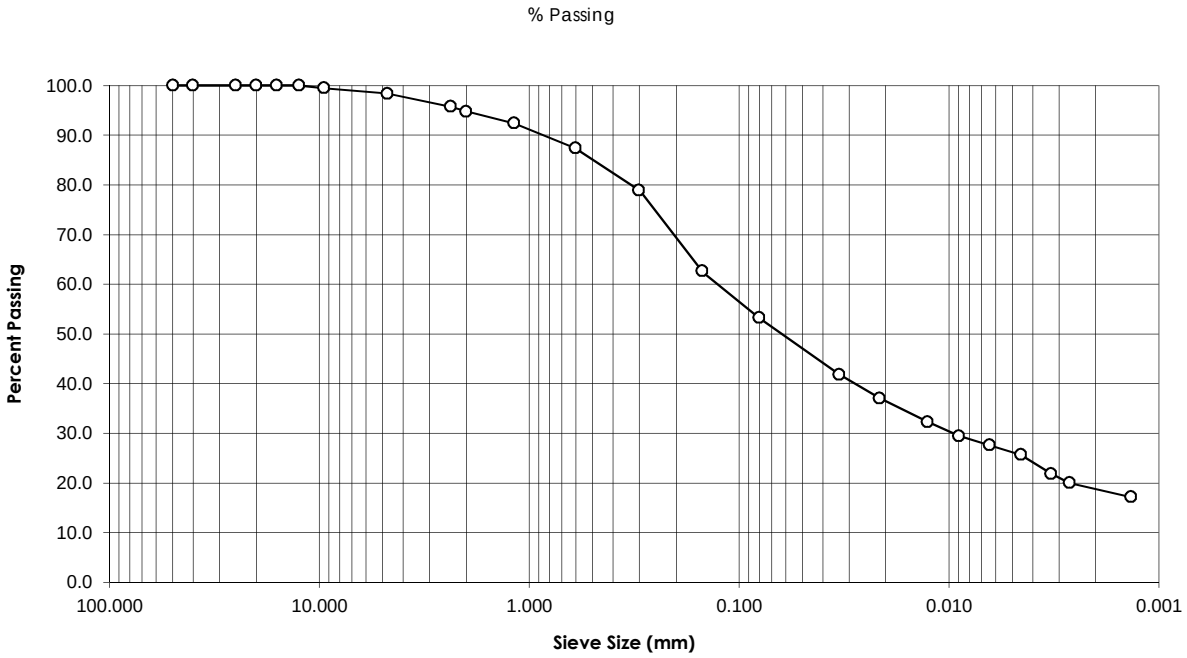
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: BSB
SOURCE: H3
TESTED BY: B. Pelkey

DATE TESTED: October 11, 2016
DATE RECEIVED: August 27, 2016
SAMPLE DESCRIPTION: Clay (CL) and Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0064 | 27.5 |
| 40.0 | 100.0 | 0.0045 | 25.6 |
| 25.0 | 100.0 | 0.0033 | 21.8 |
| 20.0 | 100.0 | 0.0027 | 19.9 |
| 16.0 | 100.0 | 0.0014 | 17.1 |
| 12.5 | 100.0 | | |
| 9.5 | 99.5 | | |
| 4.75 | 98.4 | | |
| 2.36 | 95.8 | | |
| 2.00 | 94.8 | | |
| 1.18 | 92.4 | | |
| 0.600 | 87.4 | | |
| 0.300 | 78.9 | | |
| 0.150 | 62.6 | | |
| 0.080 | 53.2 | | |
| 0.0333 | 41.8 | | |
| 0.0214 | 37.0 | | |
| 0.0126 | 32.3 | | |
| 0.0090 | 29.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.6% | $D_{10}$: | - |
| Sand: | 45.2% | $D_{30}$: | 0.0097 |
| Silt: | 34.5% | $D_{60}$: | 0.1315 |
| Clay: | 18.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Soil description (MUSCS) derived from both Grain Size and Atterberg Limit test results.

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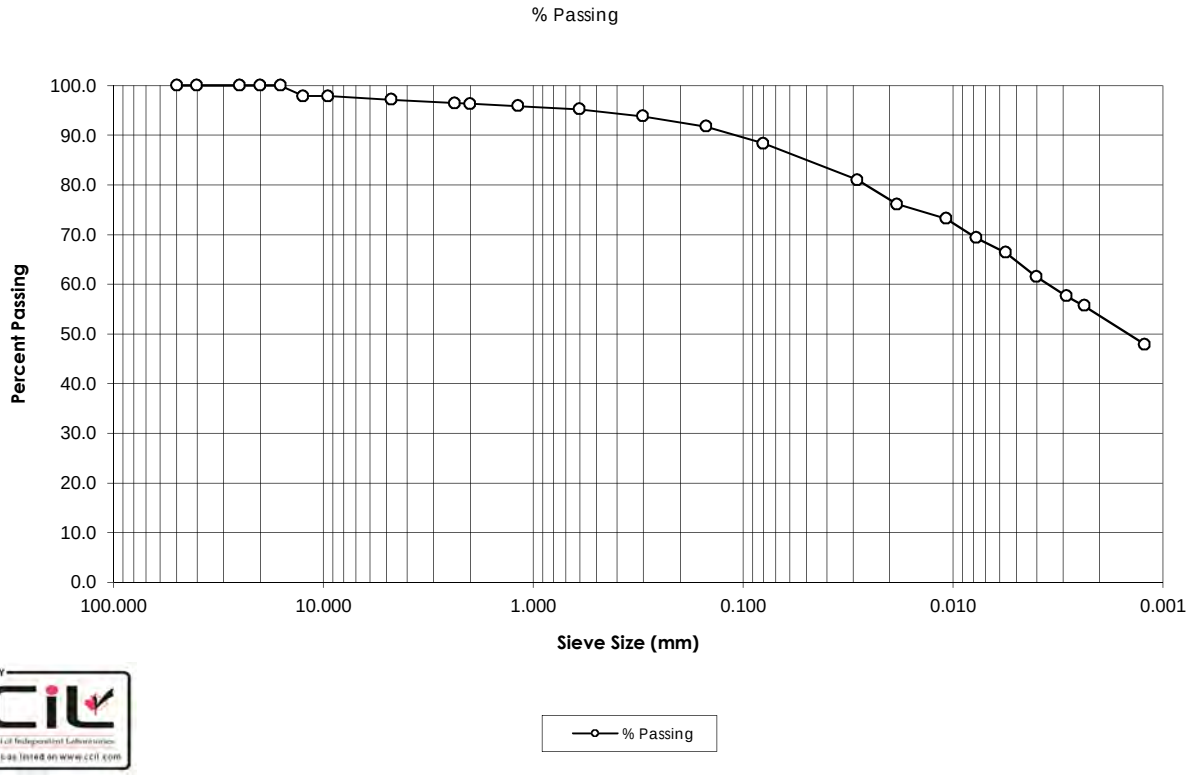
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: BS1
SOURCE: H4
TESTED BY: B. Pelkey

DATE TESTED: October 26, 2016
DATE RECEIVED: August 29, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0056 | 66.4 |
| 40.0 | 100.0 | 0.0040 | 61.5 |
| 25.0 | 100.0 | 0.0029 | 57.6 |
| 20.0 | 100.0 | 0.0024 | 55.7 |
| 16.0 | 100.0 | 0.0012 | 47.9 |
| 12.5 | 97.9 | | |
| 9.5 | 97.9 | | |
| 4.75 | 97.1 | | |
| 2.36 | 96.4 | | |
| 2.00 | 96.4 | | |
| 1.18 | 95.9 | | |
| 0.600 | 95.2 | | |
| 0.300 | 93.8 | | |
| 0.150 | 91.7 | | |
| 0.080 | 88.3 | | |
| 0.0285 | 81.0 | | |
| 0.0185 | 76.1 | | |
| 0.0108 | 73.2 | | |
| 0.0077 | 69.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.9% | $D_{10}$: | - |
| Sand: | 8.8% | $D_{30}$: | - |
| Silt: | 34.6% | $D_{60}$: | 0.0036 |
| Clay: | 53.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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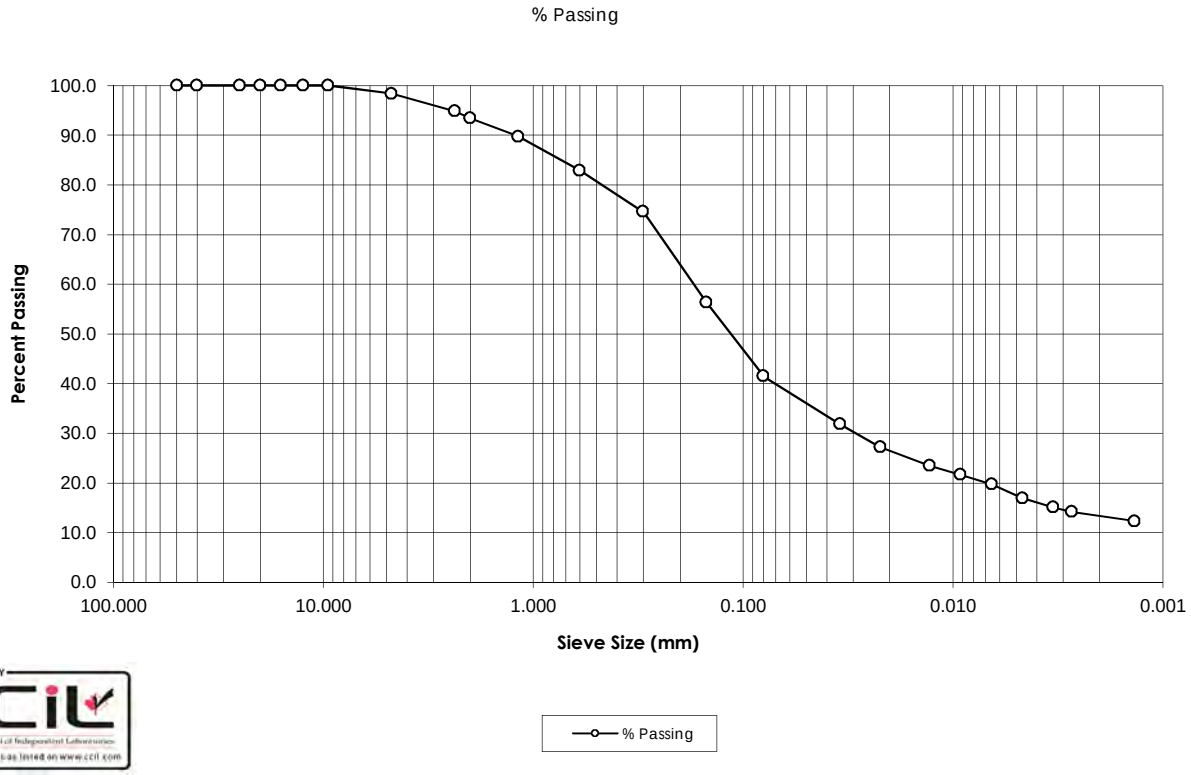
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: BS9
SOURCE: H4
TESTED BY: B. Pelkey

DATE TESTED: October 26, 2016
DATE RECEIVED: August 29, 2016
SAMPLE DESCRIPTION: Clayey (CL) Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0065 | 19.7 |
| 40.0 | 100.0 | 0.0047 | 17.0 |
| 25.0 | 100.0 | 0.0033 | 15.1 |
| 20.0 | 100.0 | 0.0027 | 14.2 |
| 16.0 | 100.0 | 0.0014 | 12.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.4 | | |
| 2.36 | 94.8 | | |
| 2.00 | 93.4 | | |
| 1.18 | 89.8 | | |
| 0.600 | 82.9 | | |
| 0.300 | 74.6 | | |
| 0.150 | 56.4 | | |
| 0.080 | 41.4 | | |
| 0.0346 | 31.9 | | |
| 0.0221 | 27.2 | | |
| 0.0129 | 23.5 | | |
| 0.0092 | 21.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.6% | $D_{10}$: | - |
| Sand: | 56.9% | $D_{30}$: | 0.0298 |
| Silt: | 28.1% | $D_{60}$: | 0.1832 |
| Clay: | 13.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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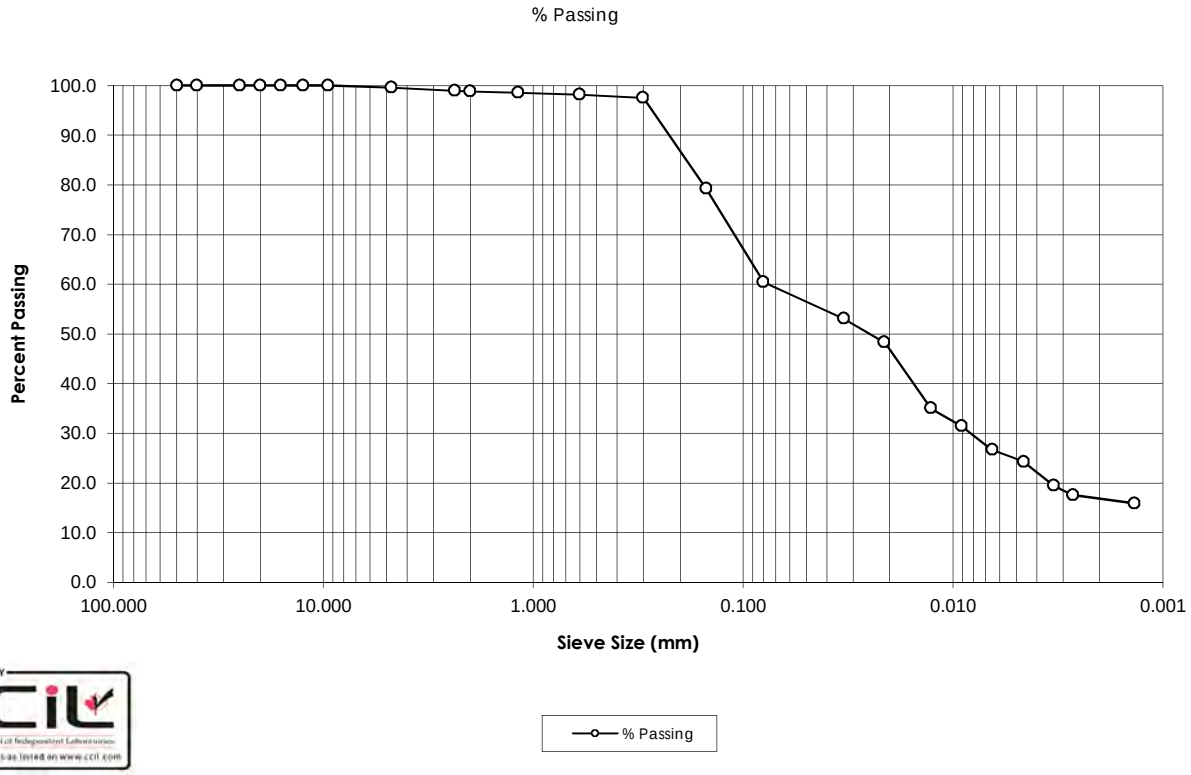
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: SS4&BS5
SOURCE: H4
TESTED BY: B. Pelkey

DATE TESTED: October 28, 2016
DATE RECEIVED: August 29, 2016
SAMPLE DESCRIPTION: Sandy Silt (ML)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0065 | 26.7 |
| 40.0 | 100.0 | 0.0046 | 24.3 |
| 25.0 | 100.0 | 0.0033 | 19.5 |
| 20.0 | 100.0 | 0.0027 | 17.5 |
| 16.0 | 100.0 | 0.0014 | 15.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.6 | | |
| 2.36 | 99.0 | | |
| 2.00 | 98.8 | | |
| 1.18 | 98.6 | | |
| 0.600 | 98.2 | | |
| 0.300 | 97.5 | | |
| 0.150 | 79.3 | | |
| 0.080 | 60.4 | | |
| 0.0332 | 53.1 | | |
| 0.0213 | 48.3 | | |
| 0.0128 | 35.1 | | |
| 0.0091 | 31.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.4% | $D_{10}$: | - |
| Sand: | 39.2% | $D_{30}$: | 0.0083 |
| Silt: | 43.6% | $D_{60}$: | 0.0774 |
| Clay: | 16.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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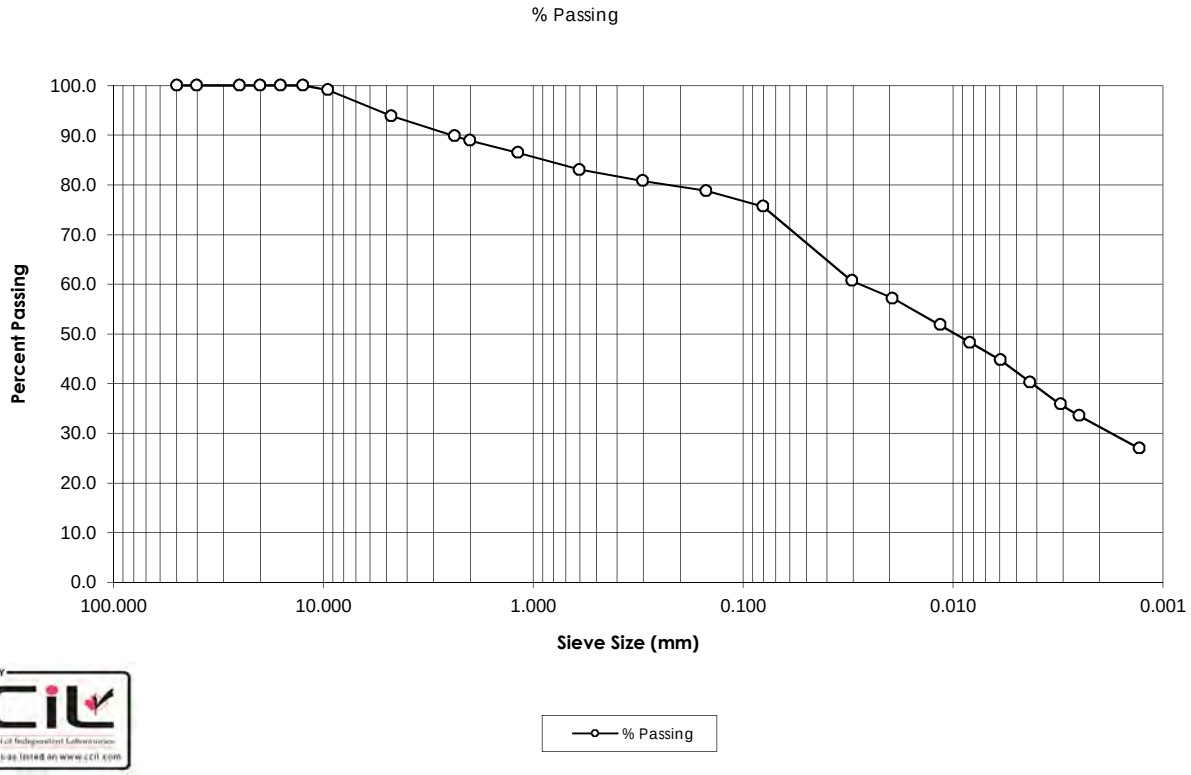
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: SS21
SOURCE: H11
TESTED BY: B. Pelkey

DATE TESTED: October 28, 2016
DATE RECEIVED: August 25, 2016
SAMPLE DESCRIPTION: Clay (CI-CL), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 44.7 |
| 40.0 | 100.0 | 0.0043 | 40.2 |
| 25.0 | 100.0 | 0.0031 | 35.8 |
| 20.0 | 100.0 | 0.0025 | 33.5 |
| 16.0 | 100.0 | 0.0013 | 26.9 |
| 12.5 | 100.0 | | |
| 9.5 | 99.1 | | |
| 4.75 | 93.9 | | |
| 2.36 | 89.8 | | |
| 2.00 | 88.9 | | |
| 1.18 | 86.5 | | |
| 0.600 | 83.0 | | |
| 0.300 | 80.8 | | |
| 0.150 | 78.8 | | |
| 0.080 | 75.6 | | |
| 0.0303 | 60.7 | | |
| 0.0194 | 57.2 | | |
| 0.0115 | 51.8 | | |
| 0.0083 | 48.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 6.1% | $D_{10}$: | - |
| Sand: | 18.3% | $D_{30}$: | 0.0019 |
| Silt: | 44.3% | $D_{60}$: | 0.0281 |
| Clay: | 31.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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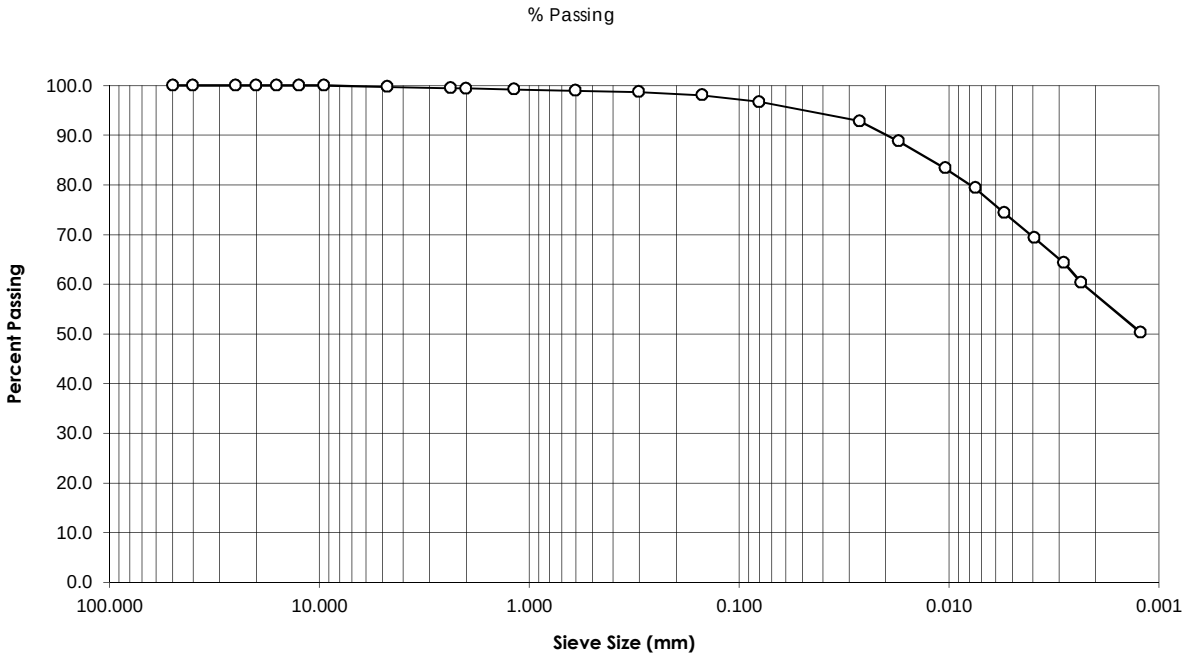
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: BSB
SOURCE: H11
TESTED BY: B. Pelkey

DATE TESTED: October 11, 2016
DATE RECEIVED: August 25, 2016
SAMPLE DESCRIPTION: Clay (CI-CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 74.3 |
| 40.0 | 100.0 | 0.0039 | 69.3 |
| 25.0 | 100.0 | 0.0028 | 64.3 |
| 20.0 | 100.0 | 0.0023 | 60.3 |
| 16.0 | 100.0 | 0.0012 | 50.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.8 | | |
| 2.36 | 99.5 | | |
| 2.00 | 99.4 | | |
| 1.18 | 99.2 | | |
| 0.600 | 99.0 | | |
| 0.300 | 98.7 | | |
| 0.150 | 98.1 | | |
| 0.080 | 96.7 | | |
| 0.0267 | 92.8 | | |
| 0.0173 | 88.8 | | |
| 0.0104 | 83.4 | | |
| 0.0075 | 79.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 3.1% | $D_{30}$: | - |
| Silt: | 38.9% | $D_{60}$: | 0.0023 |
| Clay: | 57.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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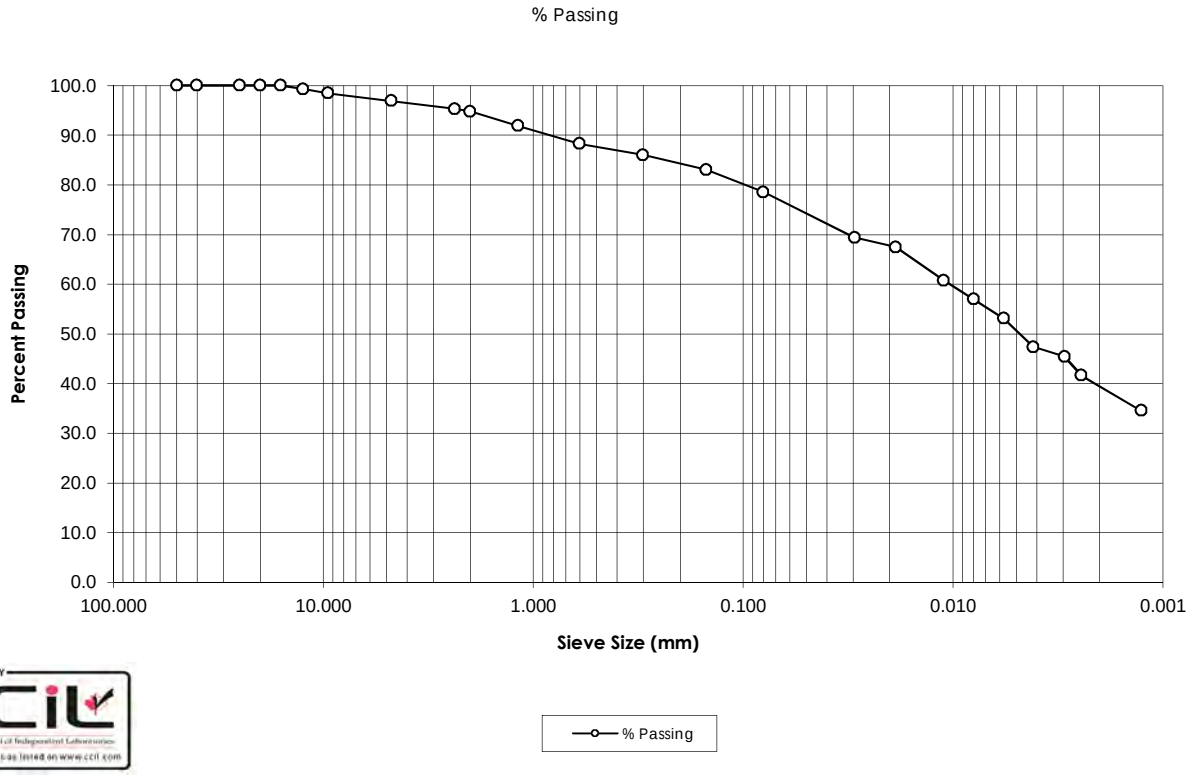
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: BSD
SOURCE: H11
TESTED BY: B. Pelkey

DATE TESTED: October 11, 2016
DATE RECEIVED: August 25, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 53.1 |
| 40.0 | 100.0 | 0.0041 | 47.3 |
| 25.0 | 100.0 | 0.0029 | 45.4 |
| 20.0 | 100.0 | 0.0024 | 41.6 |
| 16.0 | 100.0 | 0.0013 | 34.5 |
| 12.5 | 99.3 | | |
| 9.5 | 98.4 | | |
| 4.75 | 96.9 | | |
| 2.36 | 95.3 | | |
| 2.00 | 94.8 | | |
| 1.18 | 91.9 | | |
| 0.600 | 88.3 | | |
| 0.300 | 86.0 | | |
| 0.150 | 83.1 | | |
| 0.080 | 78.6 | | |
| 0.0294 | 69.4 | | |
| 0.0187 | 67.5 | | |
| 0.0111 | 60.7 | | |
| 0.0080 | 56.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.1% | $D_{10}$: | - |
| Sand: | 18.3% | $D_{30}$: | - |
| Silt: | 39.1% | $D_{60}$: | 0.0105 |
| Clay: | 39.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample descriptoing (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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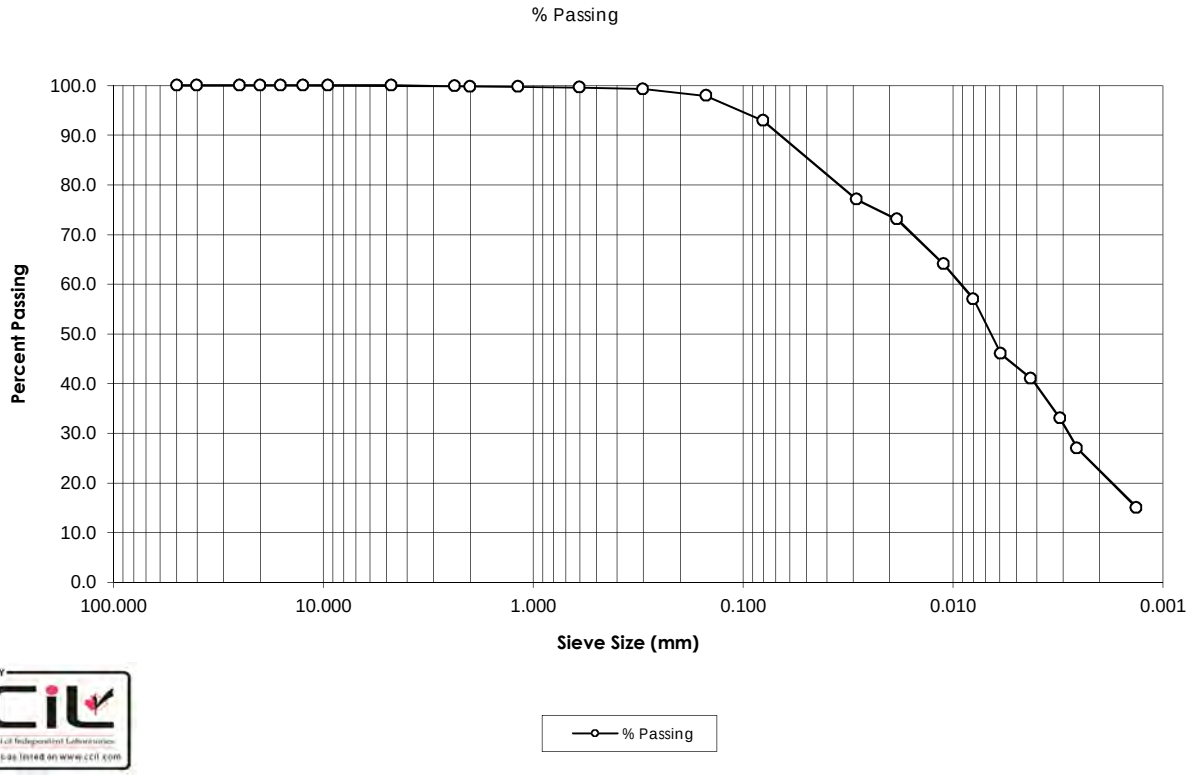
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: RC27
SOURCE: H12
TESTED BY: B. Pelkey

DATE TESTED: November 2, 2016
DATE RECEIVED: August 24, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 46.0 |
| 40.0 | 100.0 | 0.0043 | 41.0 |
| 25.0 | 100.0 | 0.0031 | 33.0 |
| 20.0 | 100.0 | 0.0026 | 27.0 |
| 16.0 | 100.0 | 0.0013 | 15.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.8 | | |
| 1.18 | 99.8 | | |
| 0.600 | 99.6 | | |
| 0.300 | 99.3 | | |
| 0.150 | 97.9 | | |
| 0.080 | 92.9 | | |
| 0.0287 | 77.0 | | |
| 0.0184 | 73.0 | | |
| 0.0111 | 64.0 | | |
| 0.0080 | 57.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 7.1% | $D_{30}$: | 0.0028 |
| Silt: | 70.5% | $D_{60}$: | 0.0094 |
| Clay: | 22.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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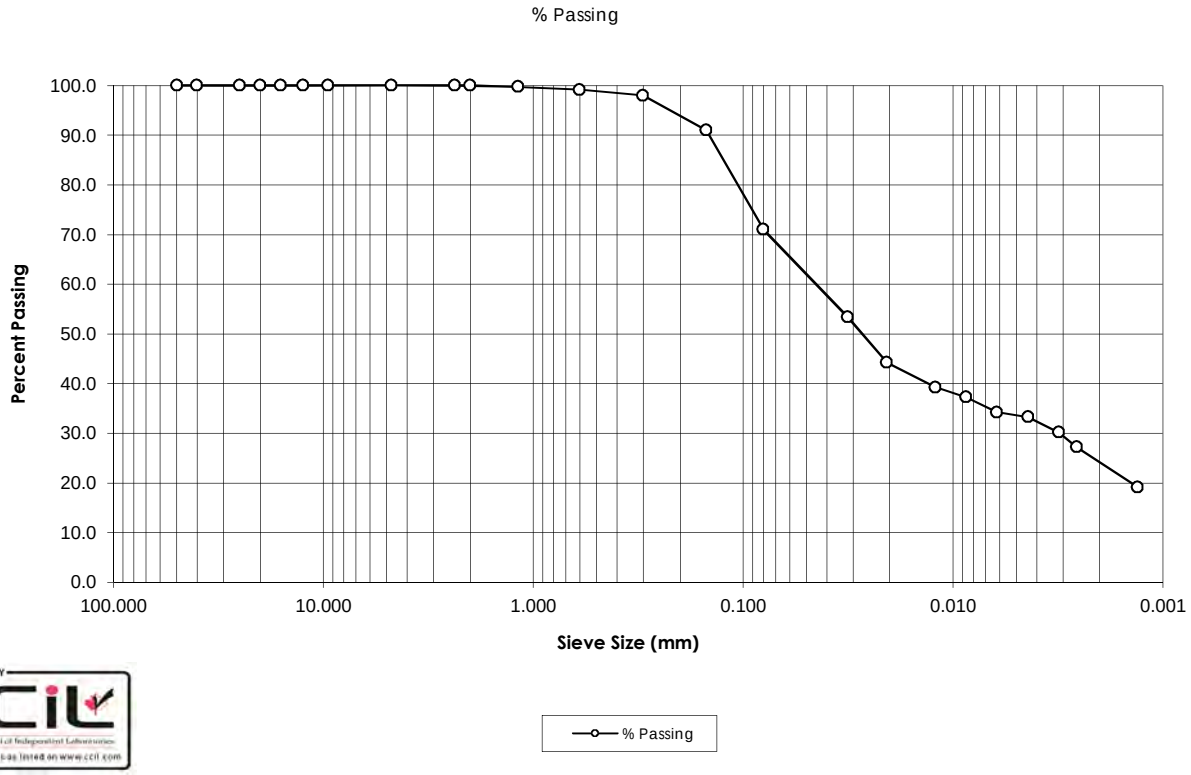
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: RC32
SOURCE: H12
TESTED BY: B. Pelkey

DATE TESTED: November 2, 2016
DATE RECEIVED: August 24, 2016
SAMPLE DESCRIPTION: Sandy Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 34.2 |
| 40.0 | 100.0 | 0.0044 | 33.2 |
| 25.0 | 100.0 | 0.0031 | 30.2 |
| 20.0 | 100.0 | 0.0026 | 27.2 |
| 16.0 | 100.0 | 0.0013 | 19.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 99.8 | | |
| 0.600 | 99.1 | | |
| 0.300 | 98.0 | | |
| 0.150 | 91.1 | | |
| 0.080 | 71.0 | | |
| 0.0317 | 53.3 | | |
| 0.0207 | 44.3 | | |
| 0.0121 | 39.2 | | |
| 0.0086 | 37.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 29.0% | $D_{30}$: | 0.0031 |
| Silt: | 46.8% | $D_{60}$: | 0.0516 |
| Clay: | 24.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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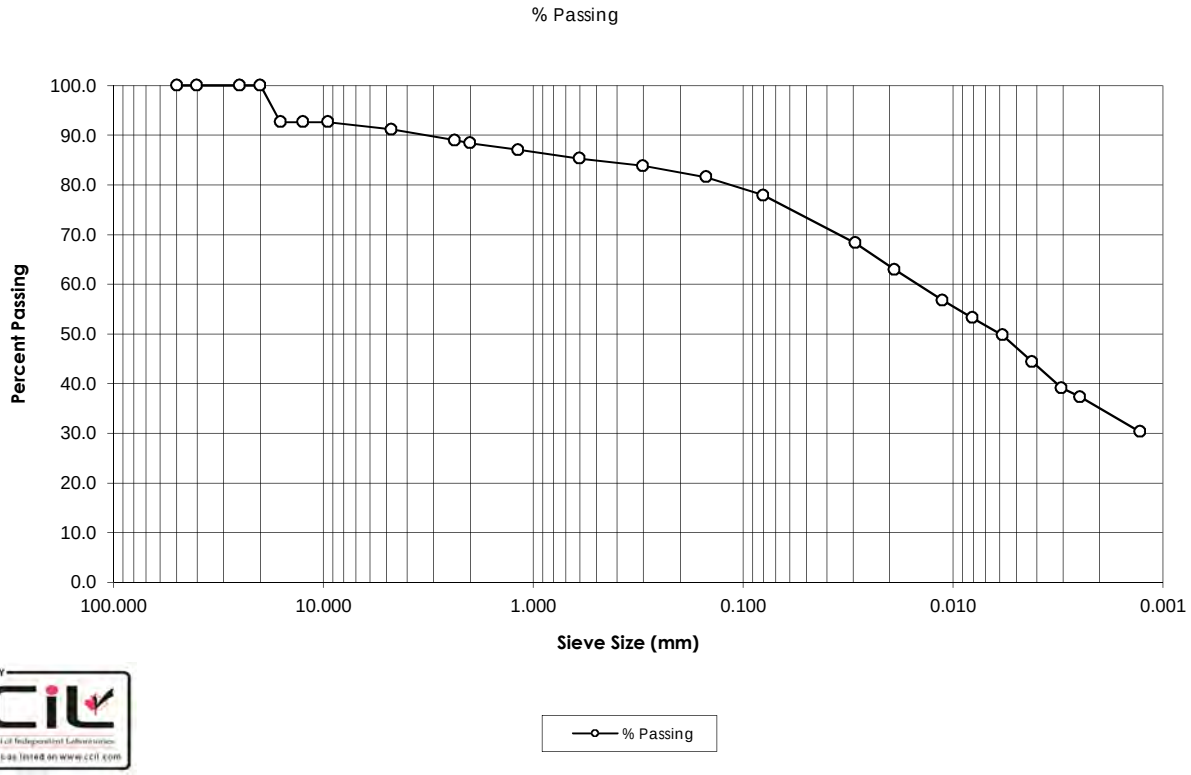
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: SS17
SOURCE: H12
TESTED BY: B. Pelkey

DATE TESTED: October 28, 2016
DATE RECEIVED: August 24, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 49.7 |
| 40.0 | 100.0 | 0.0042 | 44.4 |
| 25.0 | 100.0 | 0.0030 | 39.1 |
| 20.0 | 100.0 | 0.0025 | 37.3 |
| 16.0 | 92.7 | 0.0013 | 30.2 |
| 12.5 | 92.7 | | |
| 9.5 | 92.7 | | |
| 4.75 | 91.2 | | |
| 2.36 | 89.0 | | |
| 2.00 | 88.4 | | |
| 1.18 | 87.1 | | |
| 0.600 | 85.3 | | |
| 0.300 | 83.8 | | |
| 0.150 | 81.6 | | |
| 0.080 | 77.9 | | |
| 0.0292 | 68.3 | | |
| 0.0190 | 63.0 | | |
| 0.0112 | 56.8 | | |
| 0.0081 | 53.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.8% | $D_{10}$: | - |
| Sand: | 13.3% | $D_{30}$: | - |
| Silt: | 42.9% | $D_{60}$: | 0.0154 |
| Clay: | 35.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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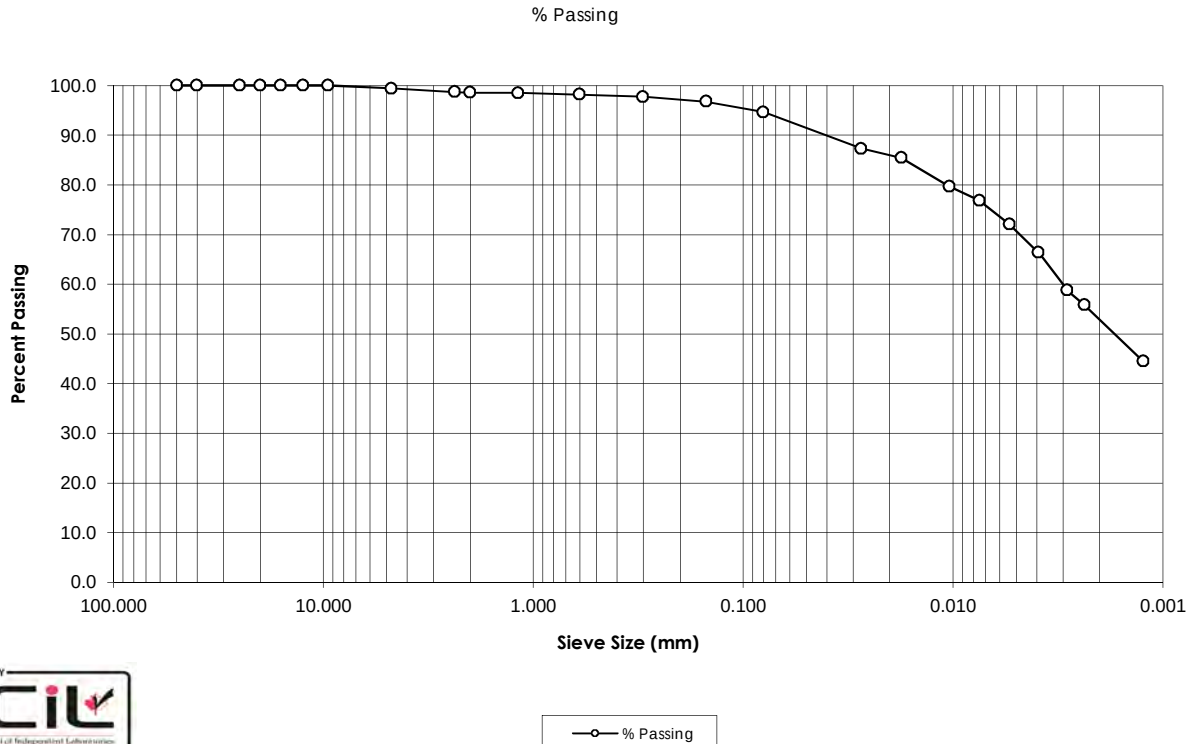
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396302.702.260

SAMPLE No.: ST5
SOURCE: H12
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: August 24, 2016
SAMPLE DESCRIPTION: Clay (CI-CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 72.1 |
| 40.0 | 100.0 | 0.0039 | 66.4 |
| 25.0 | 100.0 | 0.0028 | 58.7 |
| 20.0 | 100.0 | 0.0024 | 55.9 |
| 16.0 | 100.0 | 0.0012 | 44.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.4 | | |
| 2.36 | 98.7 | | |
| 2.00 | 98.6 | | |
| 1.18 | 98.5 | | |
| 0.600 | 98.2 | | |
| 0.300 | 97.8 | | |
| 0.150 | 96.8 | | |
| 0.080 | 94.6 | | |
| 0.0274 | 87.3 | | |
| 0.0175 | 85.4 | | |
| 0.0104 | 79.7 | | |
| 0.0075 | 76.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.6% | $D_{10}$: | - |
| Sand: | 4.7% | $D_{30}$: | - |
| Silt: | 41.8% | $D_{60}$: | 0.0030 |
| Clay: | 52.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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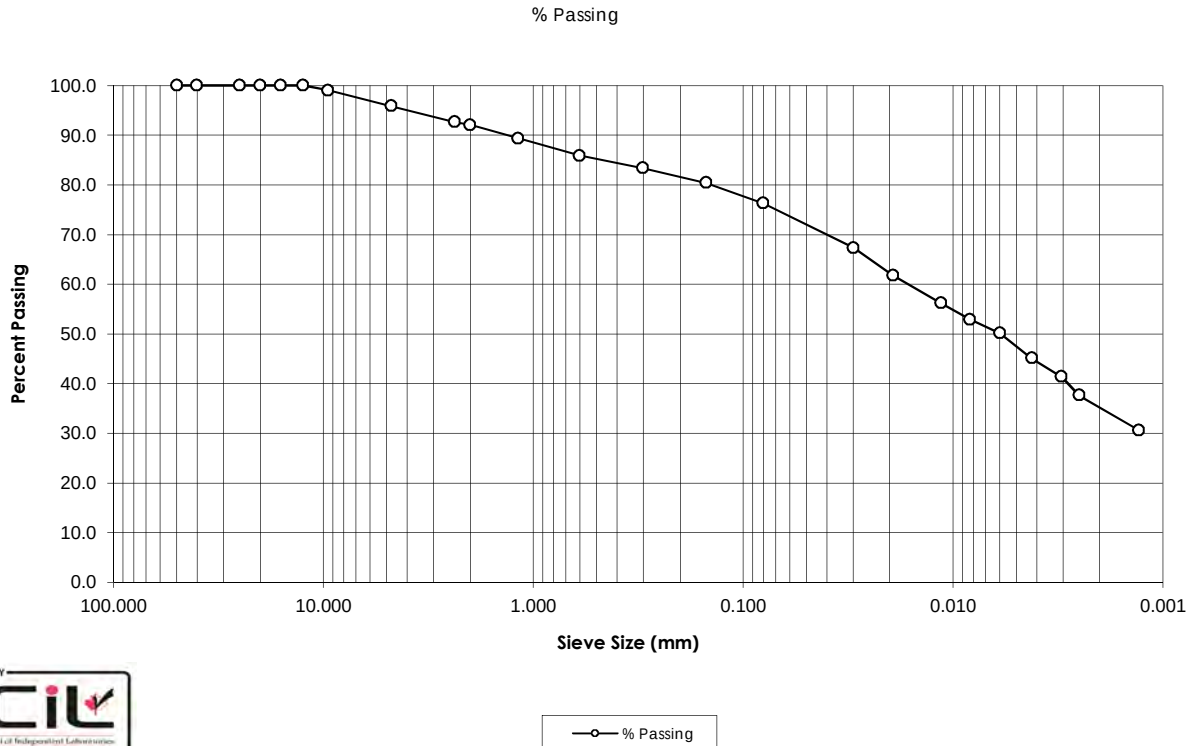
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: BSG
SOURCE: H13
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 23, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 50.1 |
| 40.0 | 100.0 | 0.0042 | 45.1 |
| 25.0 | 100.0 | 0.0030 | 41.4 |
| 20.0 | 100.0 | 0.0025 | 37.7 |
| 16.0 | 100.0 | 0.0013 | 30.6 |
| 12.5 | 100.0 | | |
| 9.5 | 99.0 | | |
| 4.75 | 95.8 | | |
| 2.36 | 92.7 | | |
| 2.00 | 92.1 | | |
| 1.18 | 89.4 | | |
| 0.600 | 85.9 | | |
| 0.300 | 83.4 | | |
| 0.150 | 80.4 | | |
| 0.080 | 76.3 | | |
| 0.0298 | 67.3 | | |
| 0.0193 | 61.8 | | |
| 0.0114 | 56.2 | | |
| 0.0083 | 52.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.2% | $D_{10}$: | - |
| Sand: | 19.6% | $D_{30}$: | - |
| Silt: | 41.0% | $D_{60}$: | 0.0169 |
| Clay: | 35.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results

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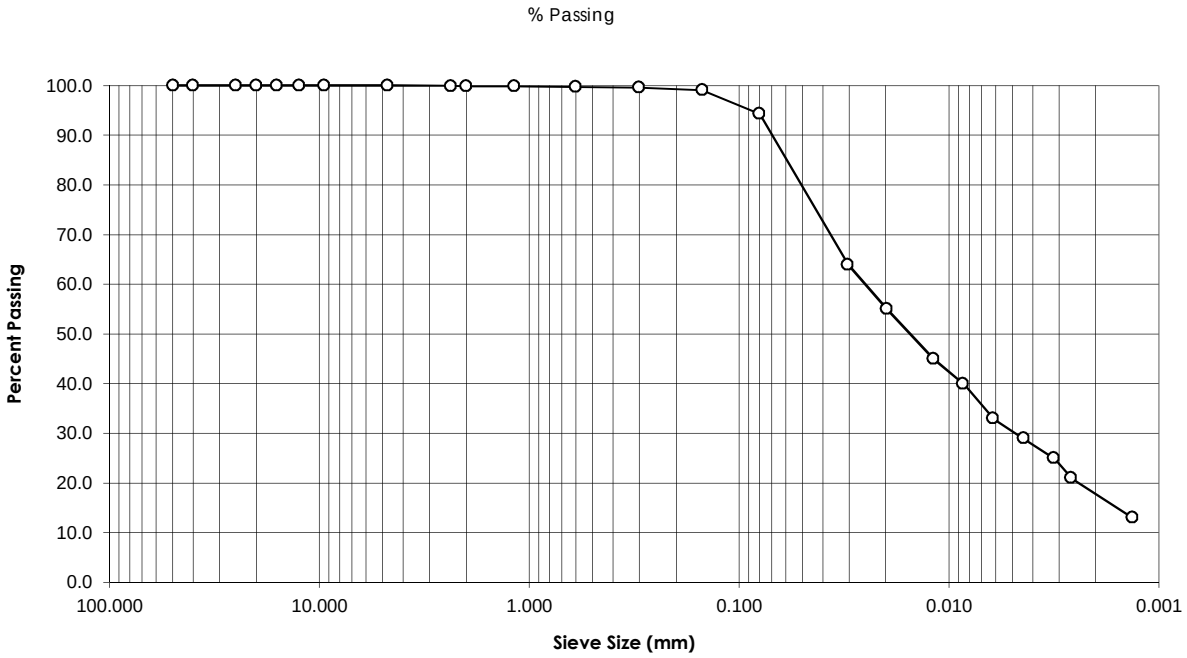
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: RC24
SOURCE: H13
TESTED BY: B. Pelkey

DATE TESTED: November 2, 2016
DATE RECEIVED: August 23, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 33.0 |
| 40.0 | 100.0 | 0.0044 | 29.0 |
| 25.0 | 100.0 | 0.0032 | 25.0 |
| 20.0 | 100.0 | 0.0026 | 21.0 |
| 16.0 | 100.0 | 0.0013 | 13.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.6 | | |
| 0.150 | 99.1 | | |
| 0.080 | 94.3 | | |
| 0.0304 | 64.0 | | |
| 0.0198 | 55.0 | | |
| 0.0119 | 45.0 | | |
| 0.0086 | 40.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 5.7% | $D_{30}$: | 0.0049 |
| Silt: | 76.6% | $D_{60}$: | 0.0259 |
| Clay: | 17.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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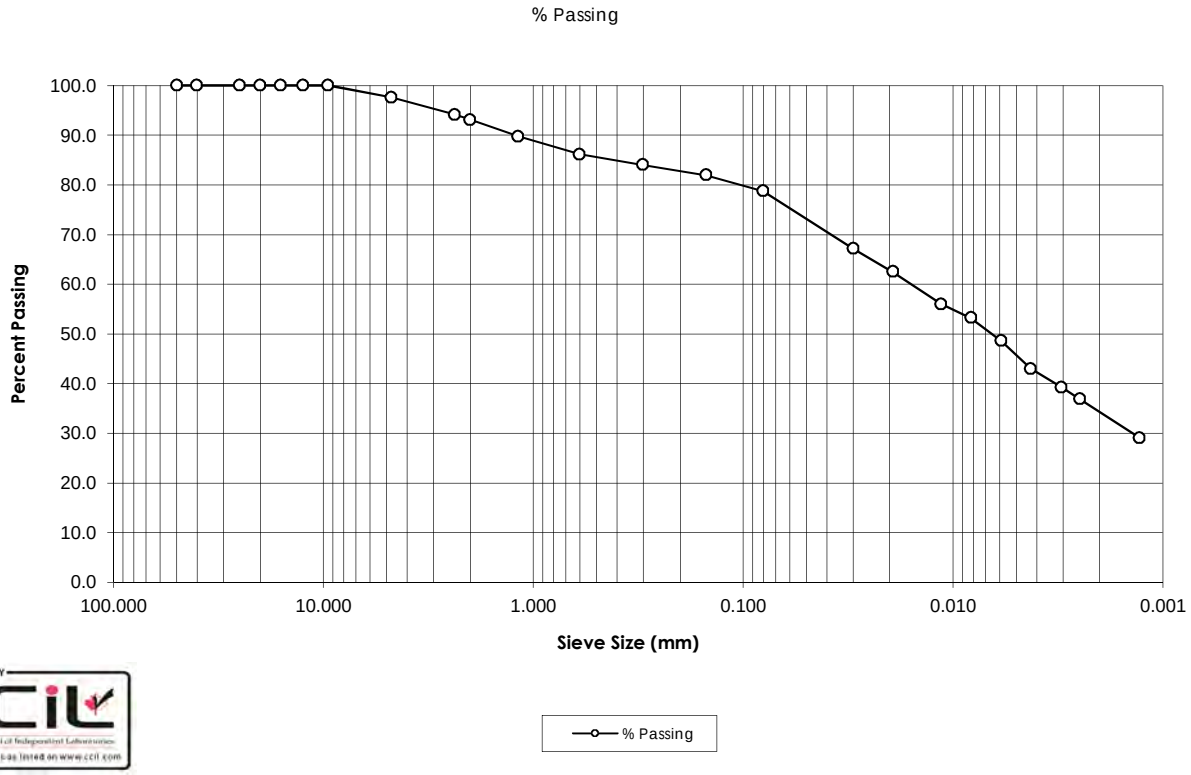
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: SS20
SOURCE: H13
TESTED BY: B. Pelkey

DATE TESTED: October 28, 2016
DATE RECEIVED: August 23, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 48.5 |
| 40.0 | 100.0 | 0.0042 | 43.0 |
| 25.0 | 100.0 | 0.0030 | 39.2 |
| 20.0 | 100.0 | 0.0025 | 36.8 |
| 16.0 | 100.0 | 0.0013 | 29.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 97.6 | | |
| 2.36 | 94.1 | | |
| 2.00 | 93.1 | | |
| 1.18 | 89.8 | | |
| 0.600 | 86.2 | | |
| 0.300 | 84.0 | | |
| 0.150 | 82.0 | | |
| 0.080 | 78.7 | | |
| 0.0298 | 67.2 | | |
| 0.0193 | 62.5 | | |
| 0.0114 | 56.0 | | |
| 0.0082 | 53.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.4% | $D_{10}$: | - |
| Sand: | 18.9% | $D_{30}$: | 0.0015 |
| Silt: | 44.5% | $D_{60}$: | 0.0164 |
| Clay: | 34.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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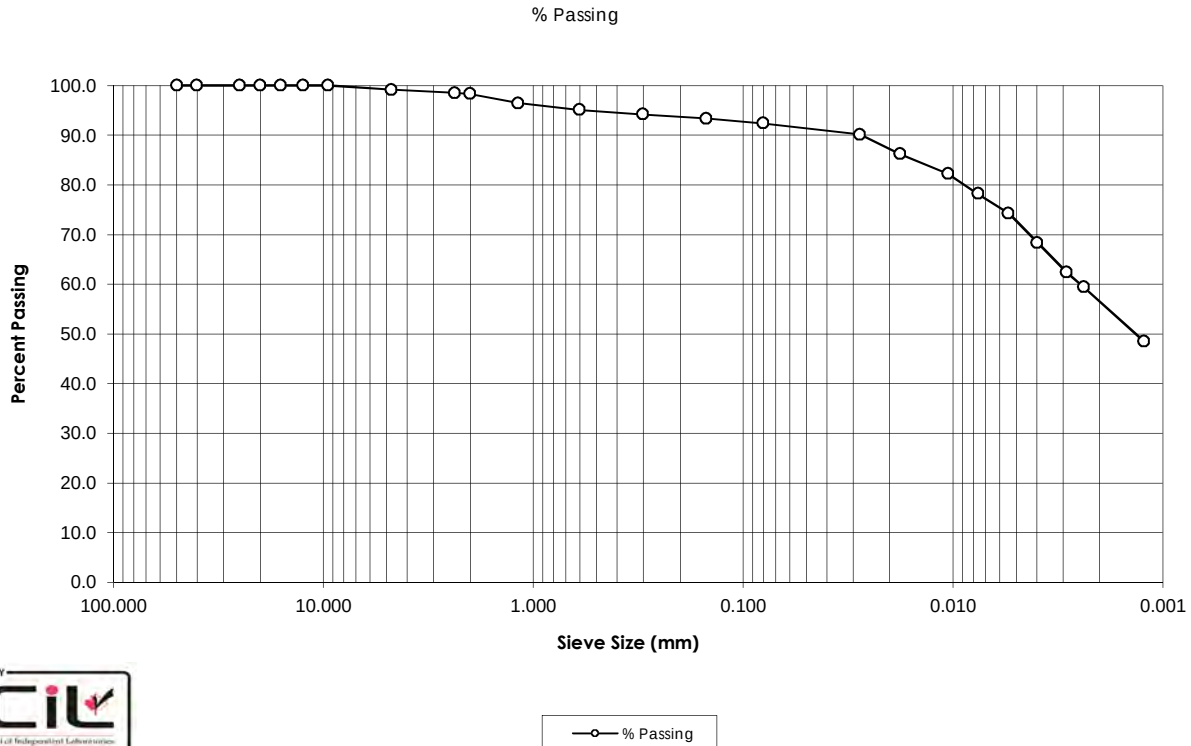
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.260

SAMPLE No.: ST6
SOURCE: H13
TESTED BY: B. Pelkey

DATE TESTED: October 14, 2016
DATE RECEIVED: August 23, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 74.3 |
| 40.0 | 100.0 | 0.0040 | 68.3 |
| 25.0 | 100.0 | 0.0029 | 62.4 |
| 20.0 | 100.0 | 0.0024 | 59.4 |
| 16.0 | 100.0 | 0.0012 | 48.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.2 | | |
| 2.36 | 98.5 | | |
| 2.00 | 98.3 | | |
| 1.18 | 96.4 | | |
| 0.600 | 95.1 | | |
| 0.300 | 94.2 | | |
| 0.150 | 93.4 | | |
| 0.080 | 92.4 | | |
| 0.0277 | 90.1 | | |
| 0.0179 | 86.2 | | |
| 0.0106 | 82.2 | | |
| 0.0076 | 78.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.8% | $D_{10}$: | - |
| Sand: | 6.8% | $D_{30}$: | - |
| Silt: | 35.8% | $D_{60}$: | 0.0025 |
| Clay: | 56.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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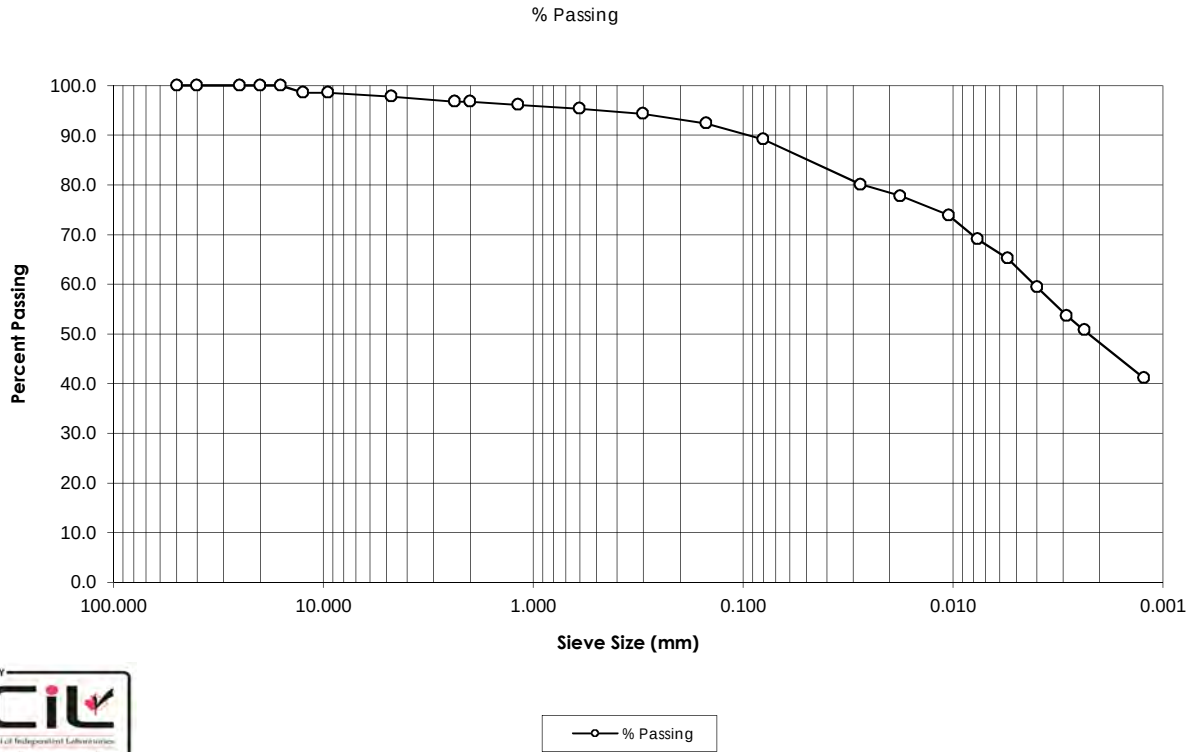
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396302.702.260

SAMPLE No.: ST11
SOURCE: H13
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: August 23, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 65.2 |
| 40.0 | 100.0 | 0.0040 | 59.4 |
| 25.0 | 100.0 | 0.0029 | 53.6 |
| 20.0 | 100.0 | 0.0024 | 50.8 |
| 16.0 | 100.0 | 0.0012 | 41.1 |
| 12.5 | 98.6 | | |
| 9.5 | 98.6 | | |
| 4.75 | 97.8 | | |
| 2.36 | 96.7 | | |
| 2.00 | 96.7 | | |
| 1.18 | 96.1 | | |
| 0.600 | 95.3 | | |
| 0.300 | 94.3 | | |
| 0.150 | 92.4 | | |
| 0.080 | 89.2 | | |
| 0.0275 | 80.1 | | |
| 0.0178 | 77.8 | | |
| 0.0105 | 73.9 | | |
| 0.0076 | 69.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.2% | $D_{10}$: | - |
| Sand: | 8.6% | $D_{30}$: | - |
| Silt: | 40.9% | $D_{60}$: | 0.0041 |
| Clay: | 48.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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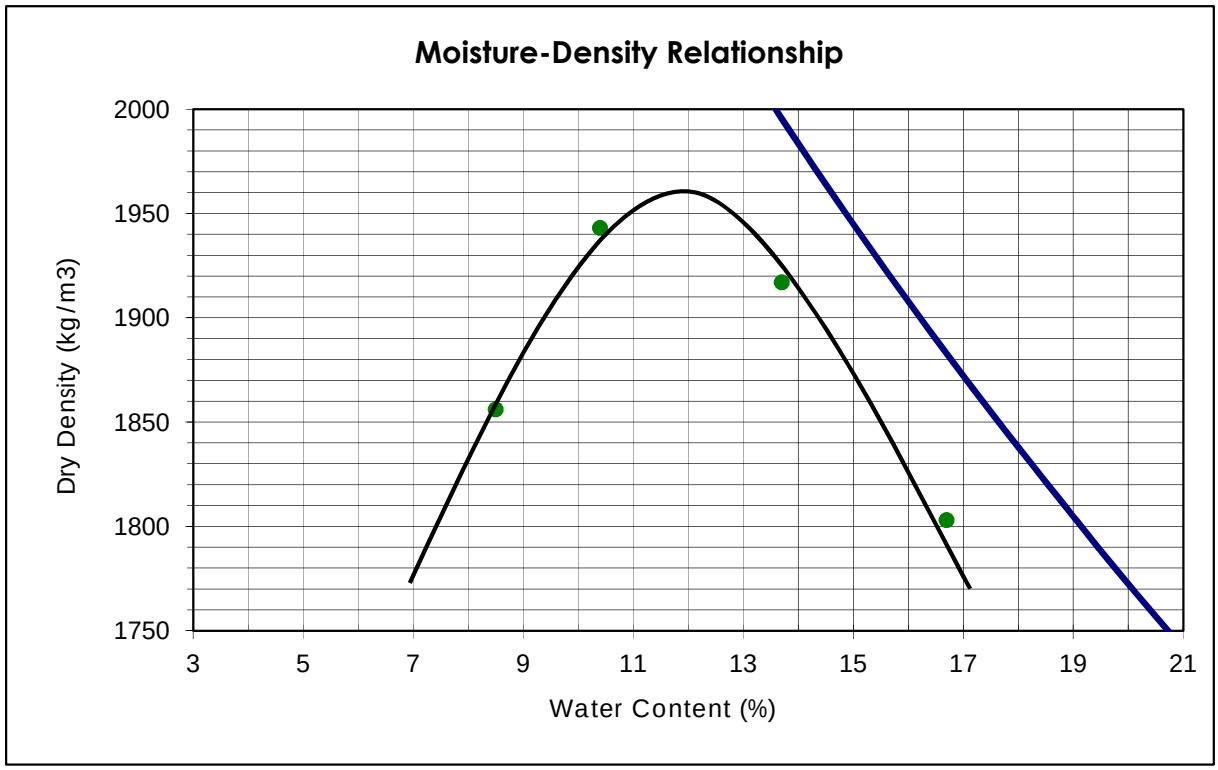
Fax: (403) 253-0021

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.260

Date Sampled: August 27, 2016
Date Tested: October 7, 2016
Tested By: B.Pelkey

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1856 | 1943 | 1917 | 1803 | 1701 |
| MOISTURE CONTENT (%) | 8.5 | 10.4 | 13.7 | 16.7 | 19.4 |

**Source of Sample:** H3 BSB (3.2-5.5m)
**Visual Soil Description:** Clay (CL) and Sand, Trace Gravel
**Maximum Dry Density (kg/m3):** 1960
**Optimum M.C. (%):** 12.0
**Natural M.C.(%):** -






Reviewed by:

Stantec

## Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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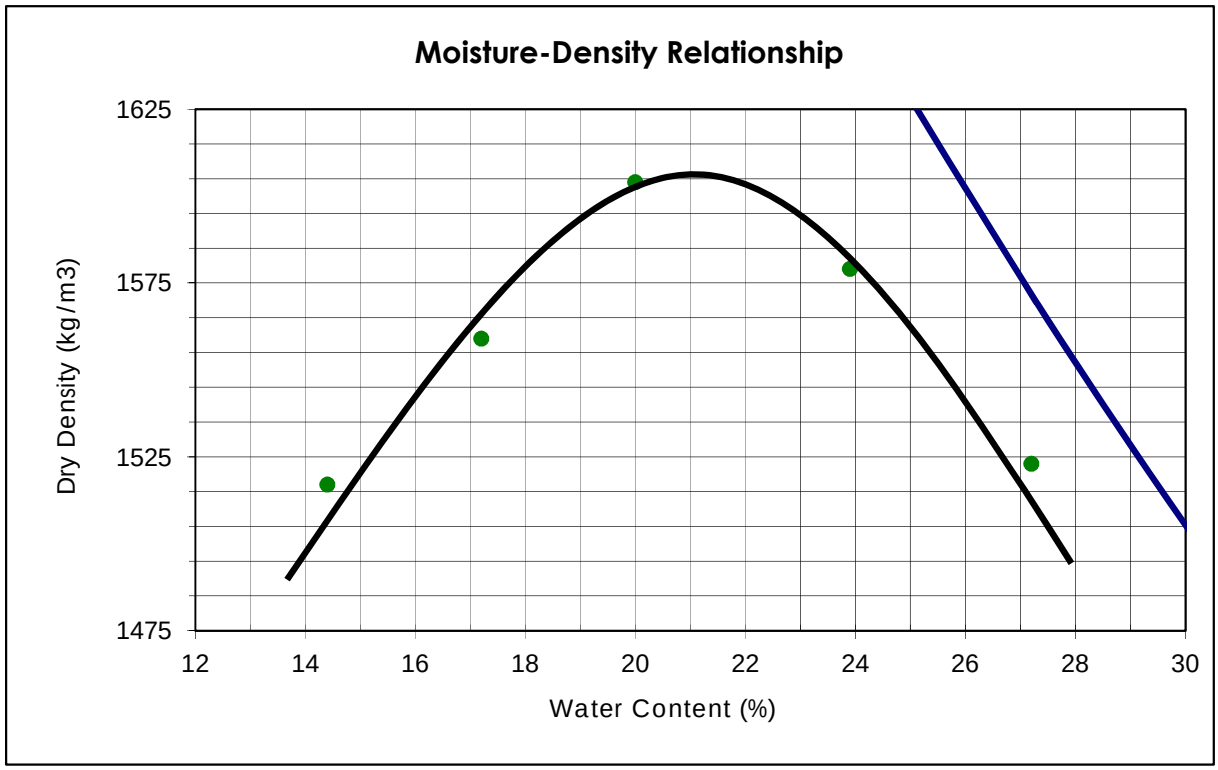
Fax: (403) 253-0021

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.250

Date Sampled: August 18, 2016
Date Tested: October 24, 2016
Tested By: M.Pilkington

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1517 | 1559 | 1604 | 1579 | 1523 |
| MOISTURE CONTENT (%) | 14.4 | 17.2 | 20.0 | 23.9 | 27.2 |

**Source of Sample:** H11 BSB
**Visual Soil Description:** Clay (CI-CH), Trace Sand
**Maximum Dry Density (kg/m3):** 1605
**Optimum M.C. (%):** 21.0
**Natural M.C.(%):** 22.1






Reviewed by:

Stantec

# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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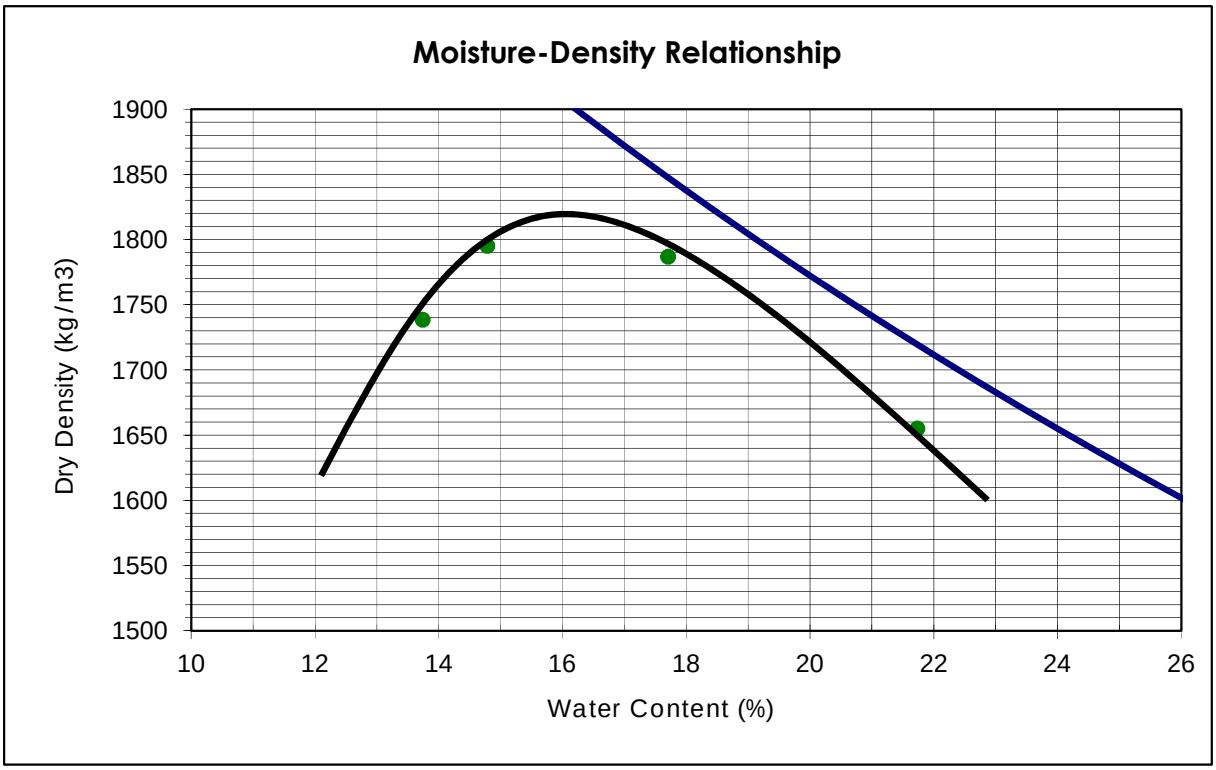
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.260

Date Sampled: August 25, 2016
Date Tested: October 13, 2016
Tested By: M. Pilkington

| TRIAL No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1738 | 1795 | 1787 | 1655 |
| MOISTURE CONTENT (%) | 13.7 | 14.8 | 17.7 | 21.7 |

**Source of Sample:** H11 BSD (4.6-6.1m)
**Visual Soil Description:** Clay (CI), Some Sand, Trace Gravel
**Maximum Dry Density (kg/m3):** 1820
**Optimum M.C. (%):** 16.0
**Natural M.C.(%):** -






Reviewed by: _____

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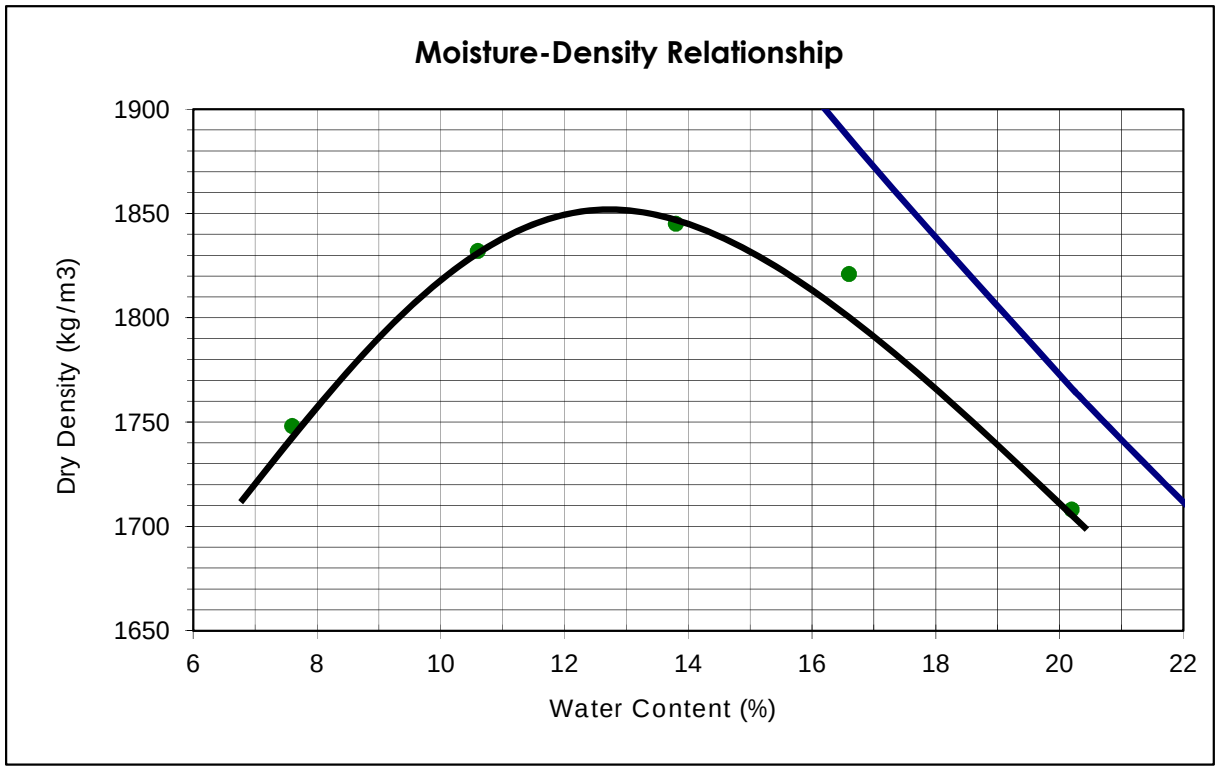
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | August 23, 2016 |
| Project Name: | SR1 | Date Tested: | November 14, 2016 |
| Project No.: | 110773396.302.702.260 | Tested By: | C.Small |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1748 | 1832 | 1845 | 1821 | 1708 |
| MOISTURE CONTENT (%) | 7.6 | 10.6 | 13.8 | 16.6 | 20.2 |

**Source of Sample:** H13 BSG 9.1-10.7m
**Visual Soil Description:** Clay (CI), Some Sand, Trace Gravel
**Maximum Dry Density (kg/m3):** 1850
**Optimum M.C. (%):** 12.5
**Natural M.C.(%):** 14.9






Reviewed by: _____

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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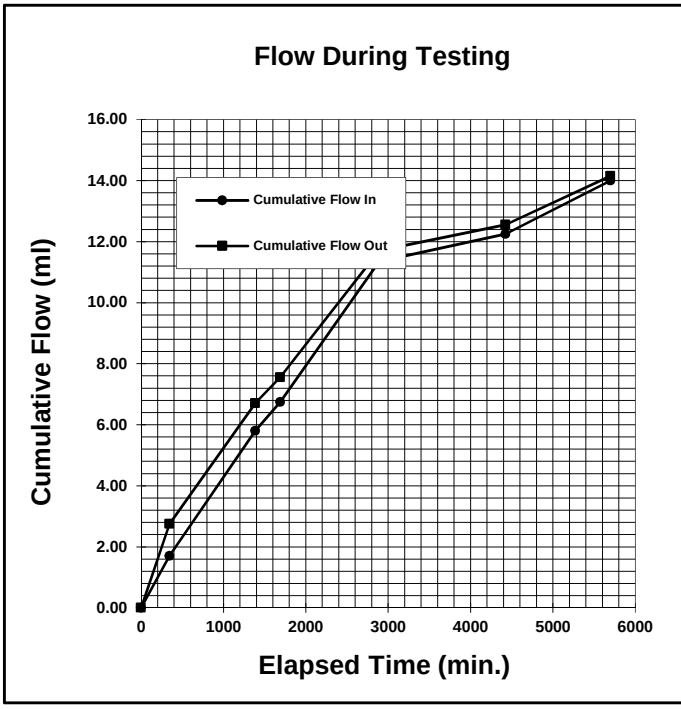
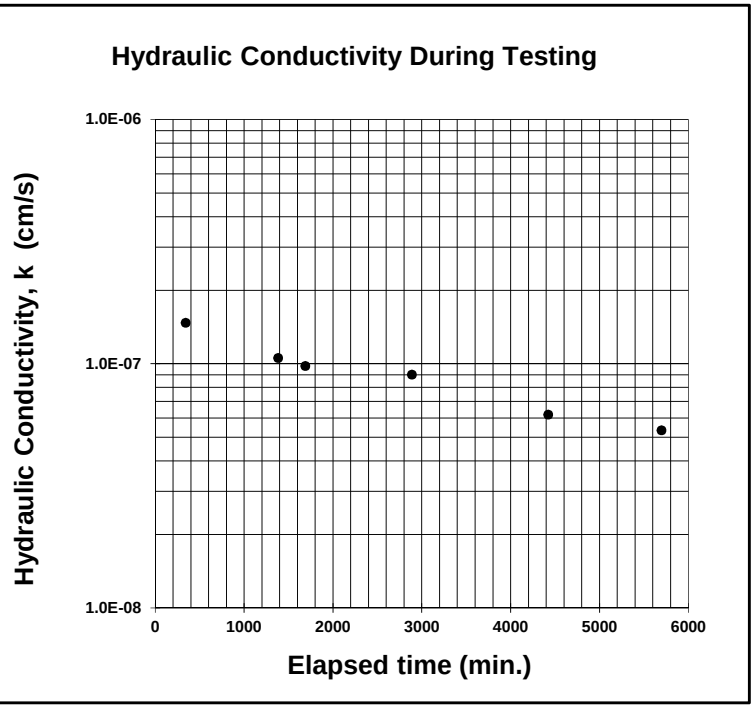
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.260 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 25, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Some Sand, Tr. Gravel | **SAMPLE No.:** | H11 BSD |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 10.79 | Length (cm) | 11.76 |
| Diameter (cm) | 7.25 | Diameter (cm) | 7.29 |
| Area (cm ²) | 41.28 | Area (cm ²) | 41.74 |
| Total Mass (g) | 866.2 | Total Mass (g) | 1082.0 |
| Volume (cm³) | 445.4 | Volume (cm³) | 490.9 |
| Water Content (%) | 10.9 | Water Content (%) | 12.2 |
| Degree of Saturation (%) | 55 | Beta Saturation (%) | 94 |
| Wet Density (g/cm³) | 1.945 | Wet Density (g/cm³) | 2.204 |
| Dry Density(g/cm³) | 1.753 | Dry Density(g/cm³) | 1.964 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 220 | Cell Pressure (kPa) | 240 |
| Top Cap Pressure(kPa) | 200 | Top Cap Pressure (kPa) | 220 |
| Bottom Cap Pressure(kPa) | 200 | Bottom Cap Pressure(kPa) | 200 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 18.9 |




**Hydraulic Conductivity (cm/s) = 8.2E-08**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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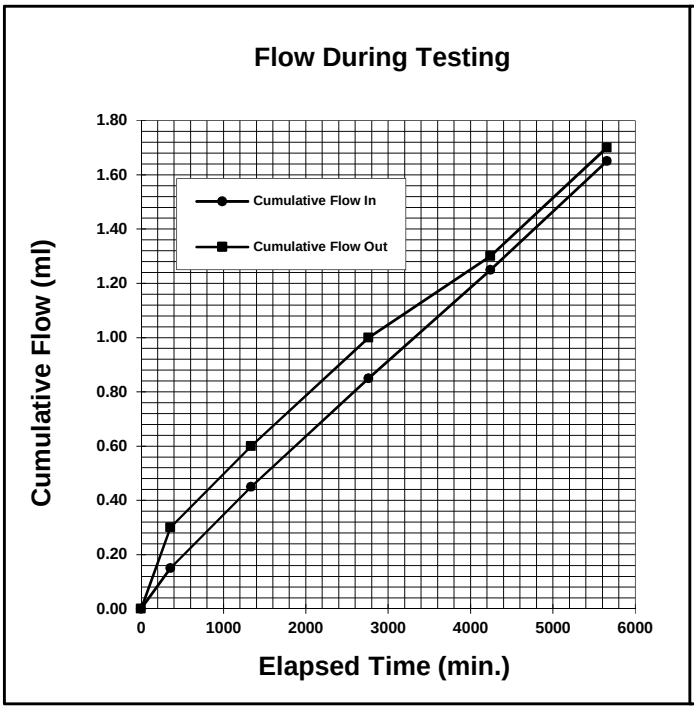
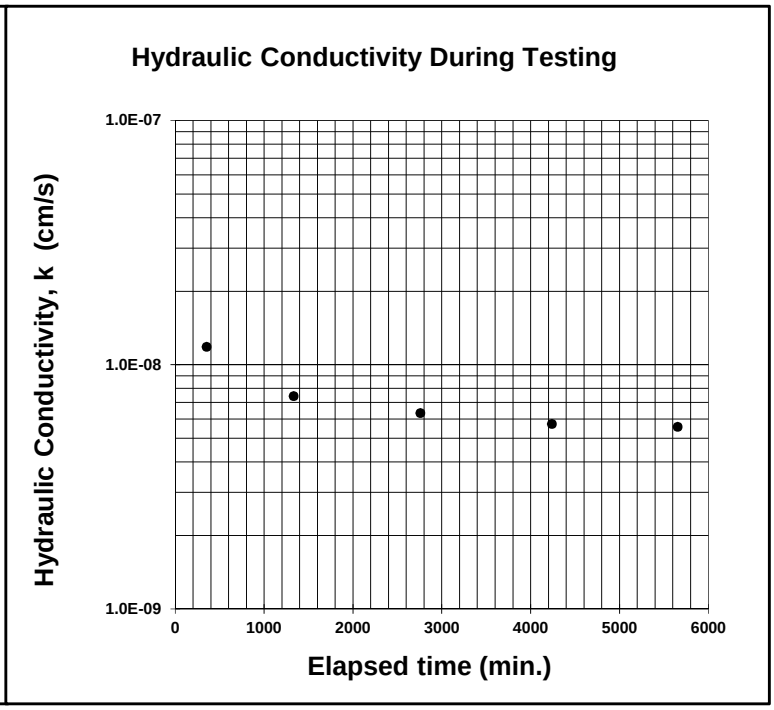
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.260 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 19, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Some Sand | **SAMPLE No.:** | H13 BSG |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 10.14 | Length (cm) | 10.14 |
| Diameter (cm) | 7.26 | Diameter (cm) | 7.32 |
| Area (cm ²) | 41.40 | Area (cm ²) | 42.08 |
| Total Mass (g) | 920.3 | Total Mass (g) | 929.6 |
| Volume (cm³) | 419.8 | Volume (cm³) | 426.7 |
| Water Content (%) | 14.5 | Water Content (%) | 14.3 |
| Degree of Saturation (%) | 96 | Beta Saturation (%) | 97 |
| Wet Density (g/cm³) | 2.192 | Wet Density (g/cm³) | 2.178 |
| Dry Density(g/cm³) | 1.914 | Dry Density(g/cm³) | 1.907 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 220 | Cell Pressure (kPa) | 240 |
| Top Cap Pressure(kPa) | 200 | Top Cap Pressure (kPa) | 220 |
| Bottom Cap Pressure(kPa) | 200 | Bottom Cap Pressure(kPa) | 200 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 20.1 |




**Hydraulic Conductivity (cm/s) = 6.3E-09**

Reviewed by:

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

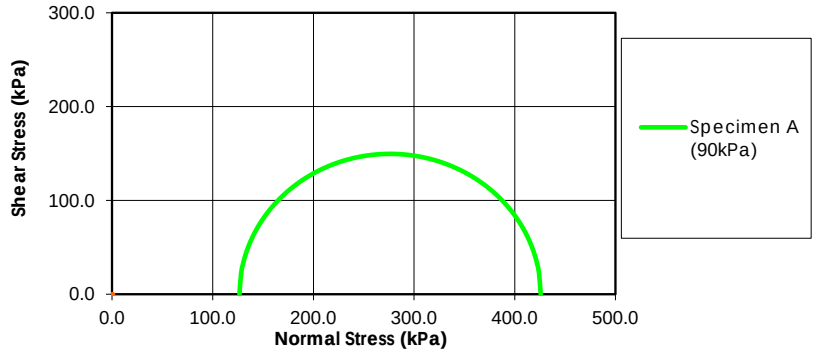
Stantec

Reviewed By C. Lamoureux

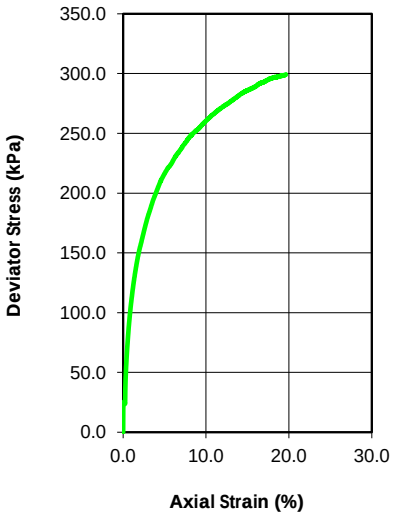
Date: 6-Oct-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 12.9 | | | |
| Dry Density (g/cm3) | 1.952 | | | |
| Saturation (%) | 90.77 | | | |
| Void Ratio | 0.383 | | | |
| Diameter (mm) | 70.0 | | | |
| Height (mm) | 147.4 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.93 | | | |
| Water Content (%) | 12.4 | | | |
| Dry Density (g/cm3) | 2.011 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.343 | | | |
| Effective Stress (kPa) | 86.3 | | | |
| Back Press. (kPa) | 273.7 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

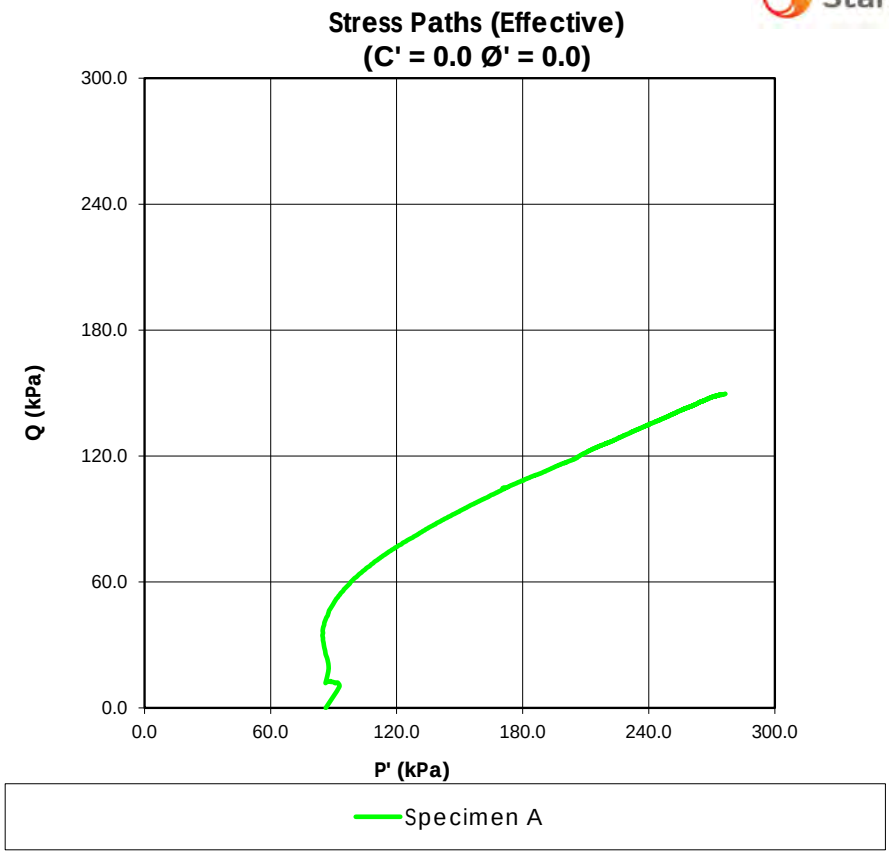
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 425.79 | | | |
| σ'3 at Failure (kPa) | 126.56 | | | |
| | | | | |
| | | | | |

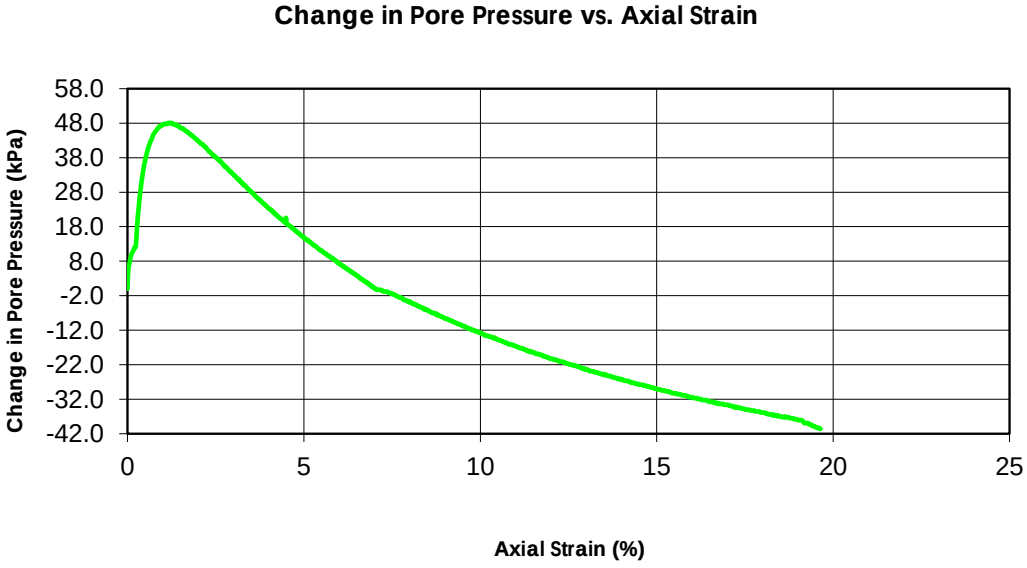
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.260 |
| **Boring Number:** | - |
| **Sample Number:** | H3 BSB |
| **Depth:** | 3.2-5.5m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay with Silt, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

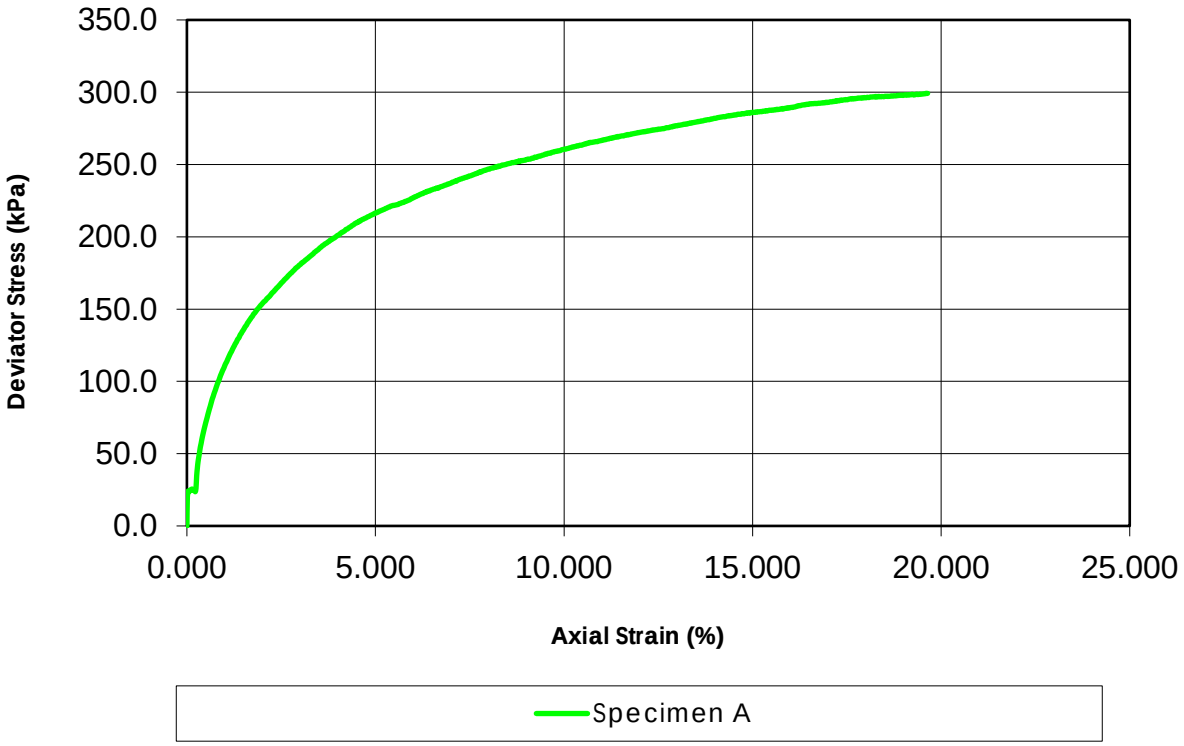
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

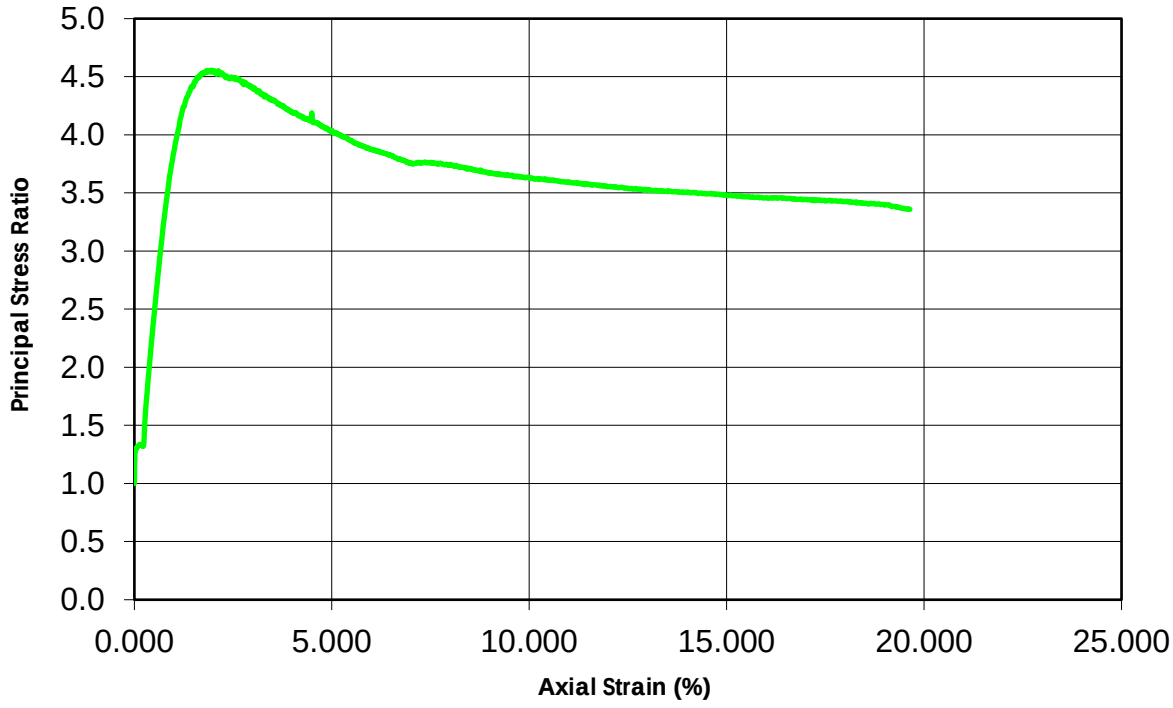


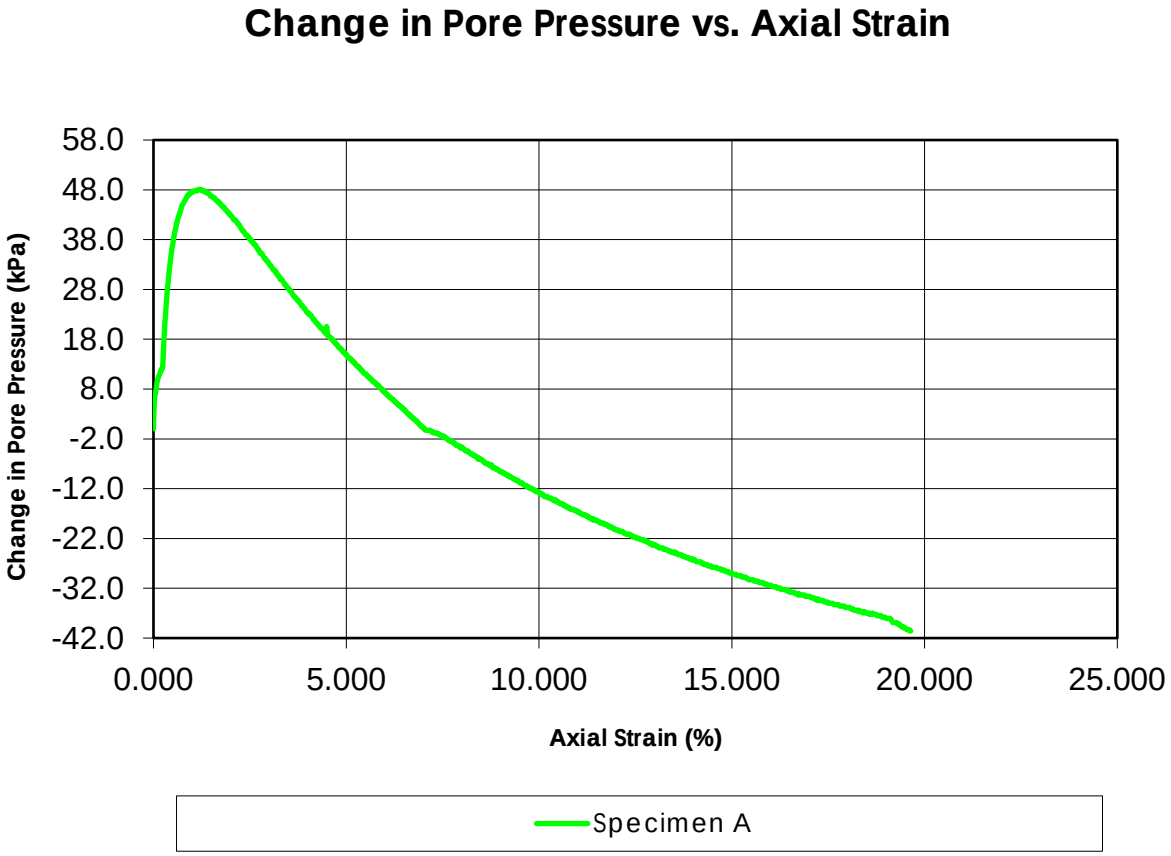



## Deviator Stress vs. Axial Strain



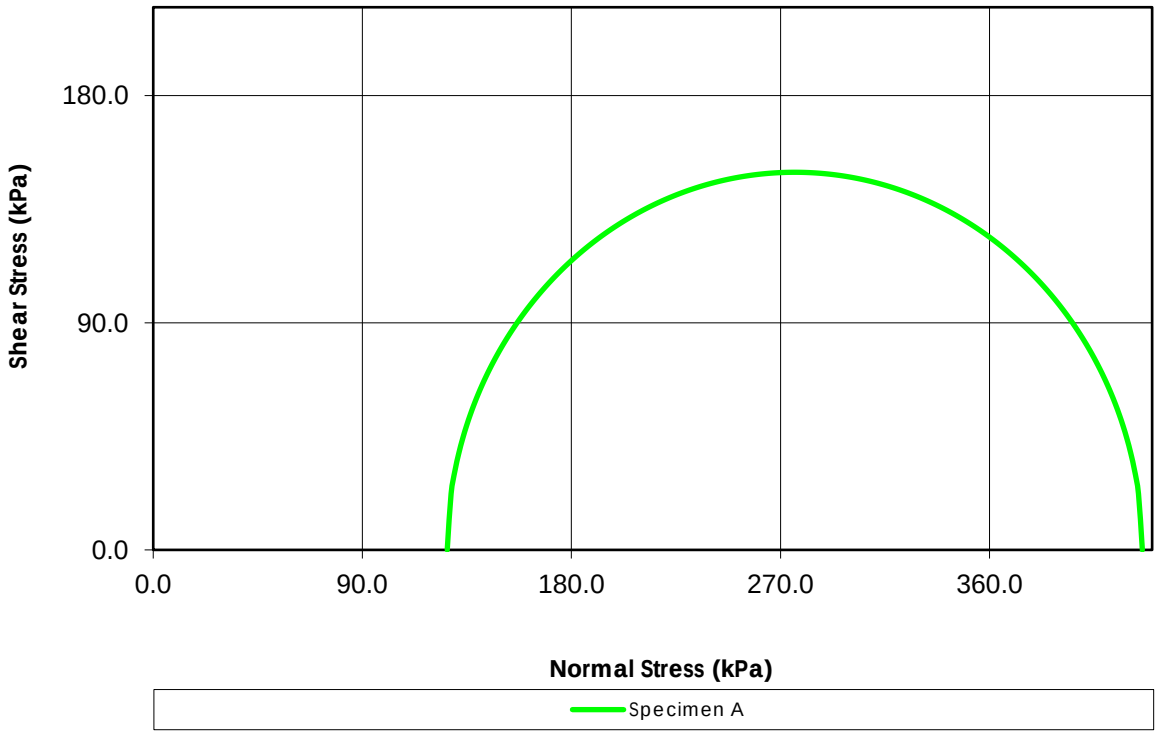

## Principal Stress Ratio vs. Axial Strain



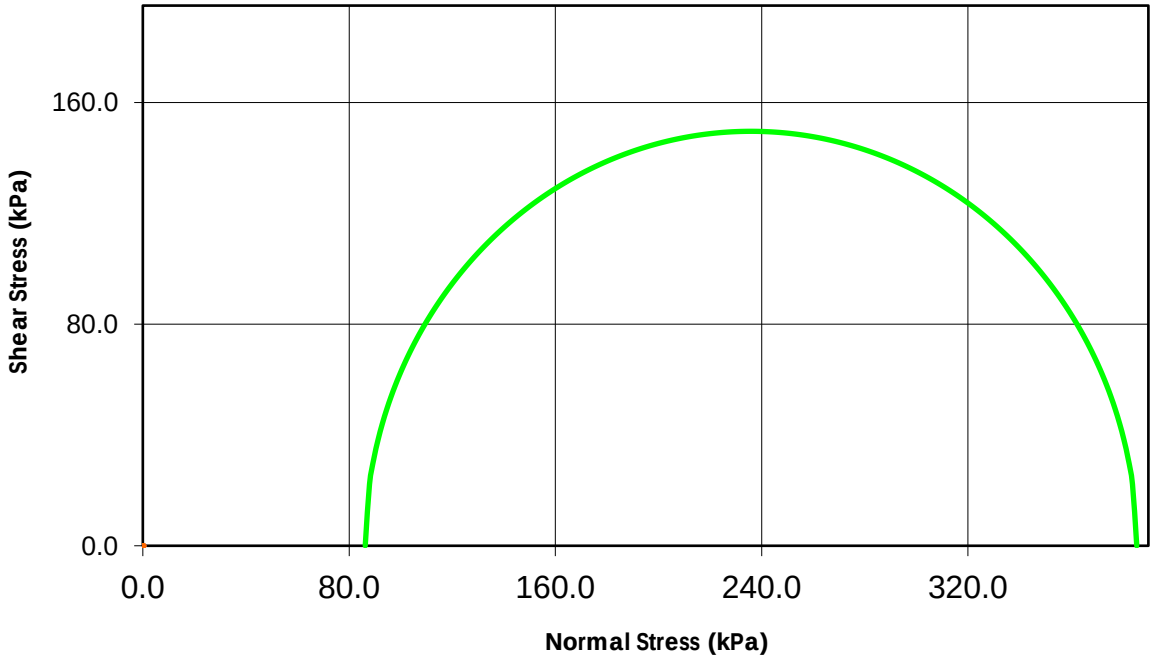

Change in Pore Pressure vs. Axial Strain
58.0
48.0
38.0
28.0
18.0
8.0
-2.0
-12.0
-22.0
-32.0
-42.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

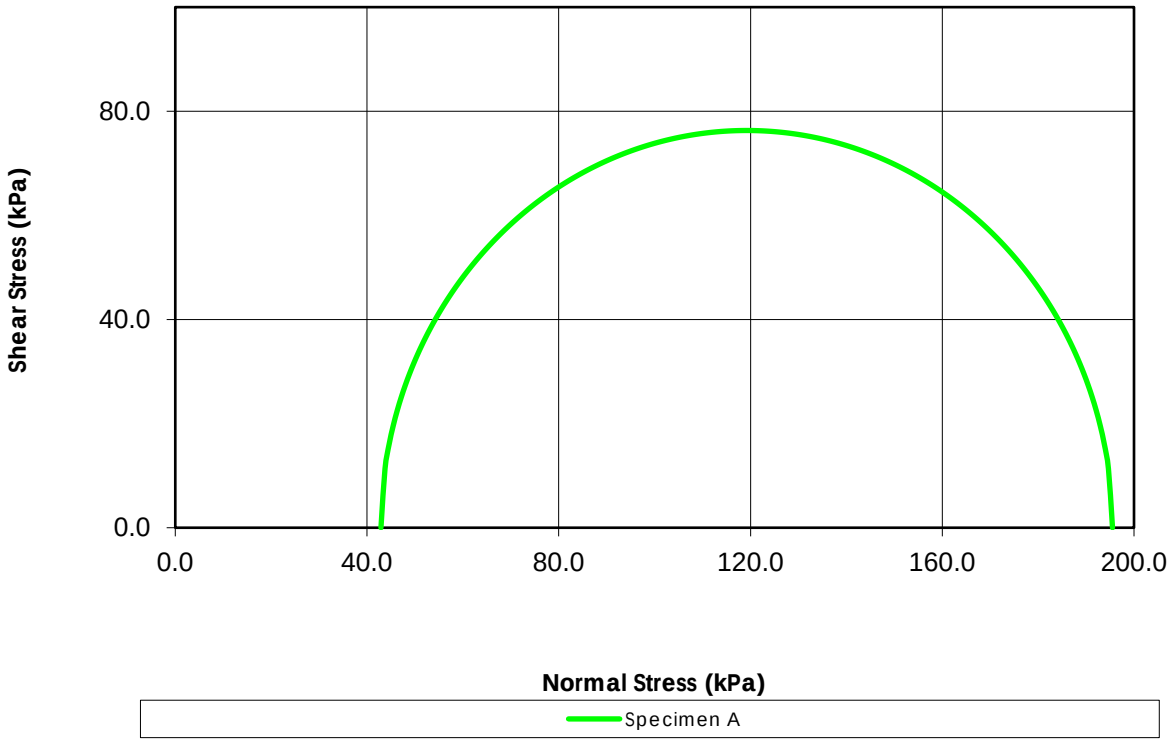



### Total Stress
### (C = 0.0 Ø = 0.0)

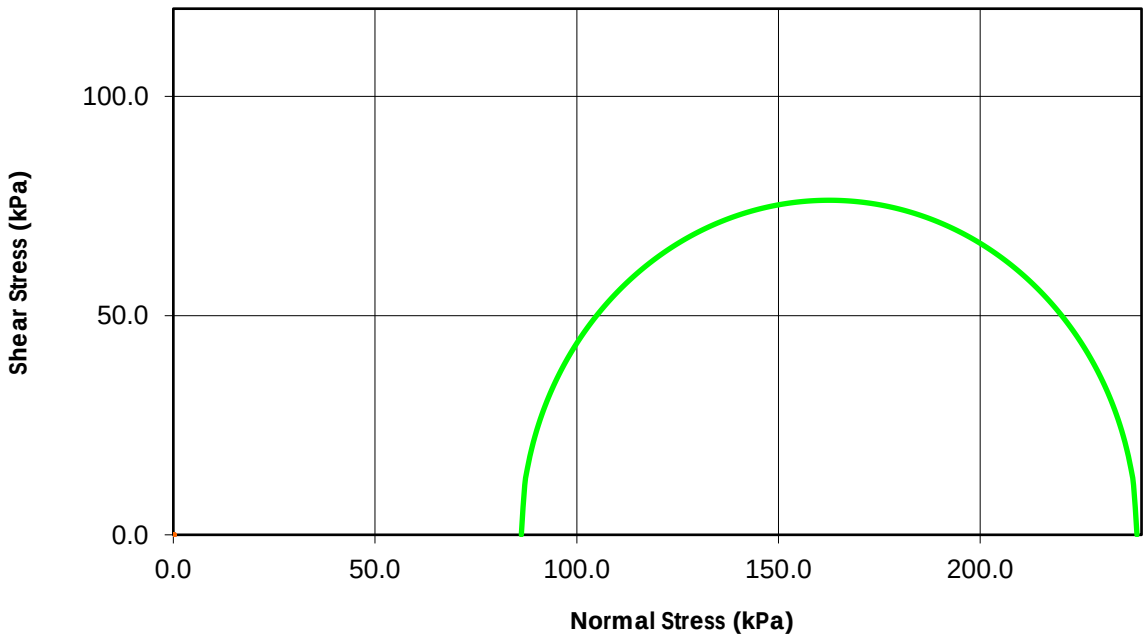


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

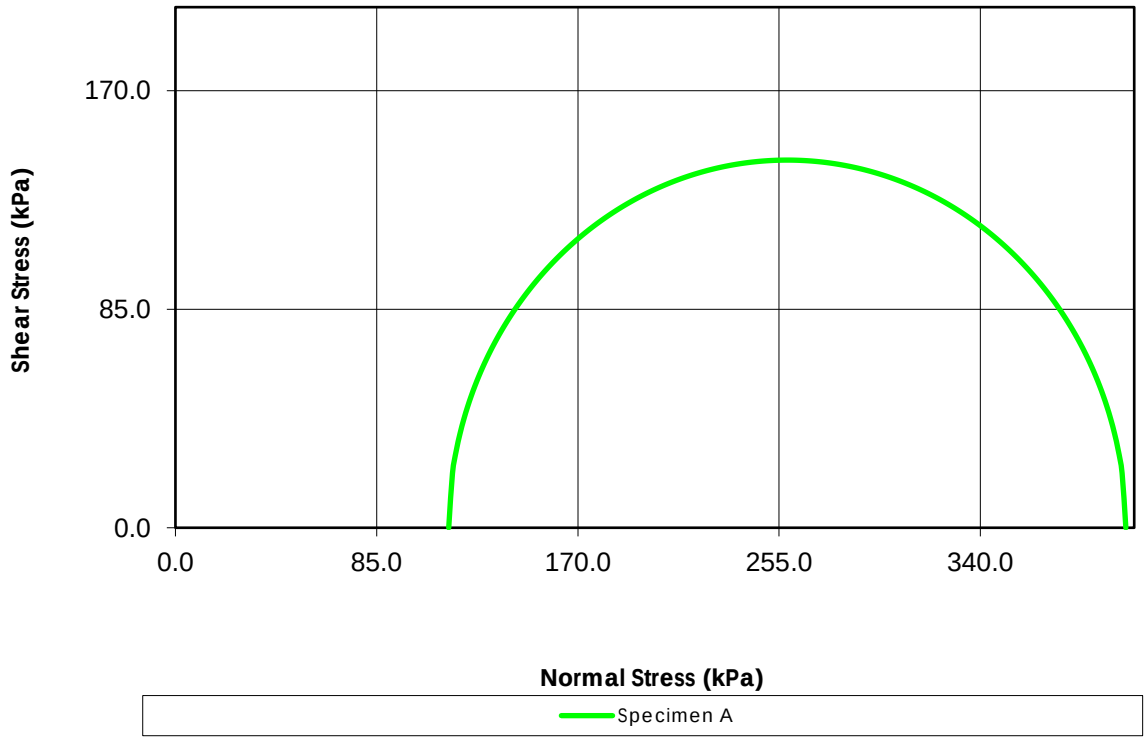



## Total Stress
## (C = 0.0 Ø = 0.0)

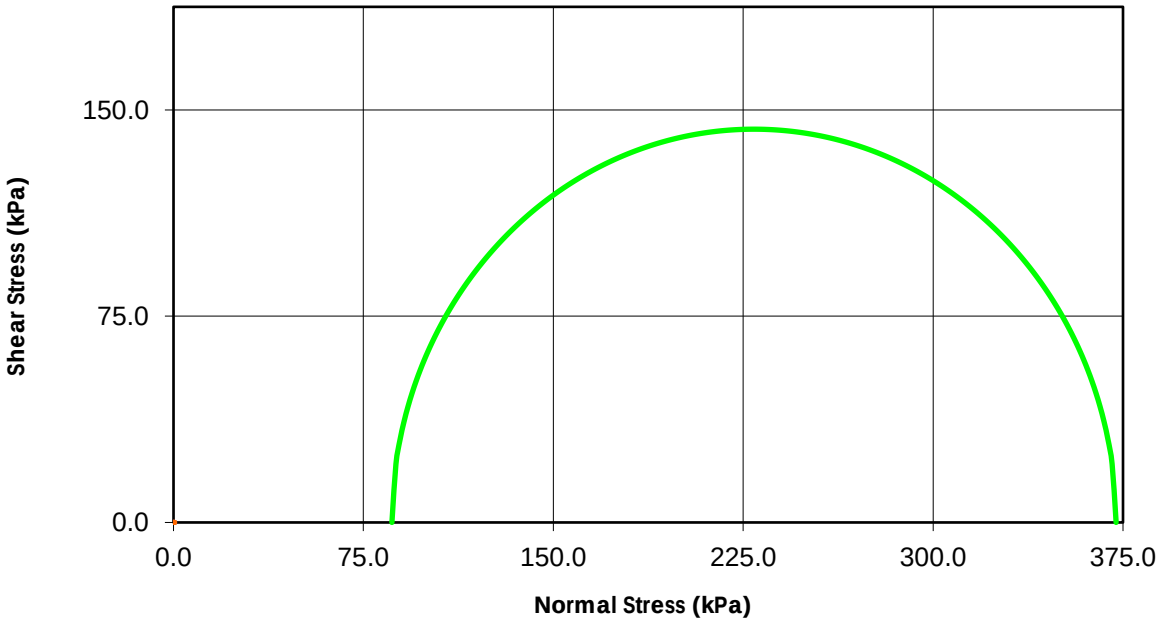


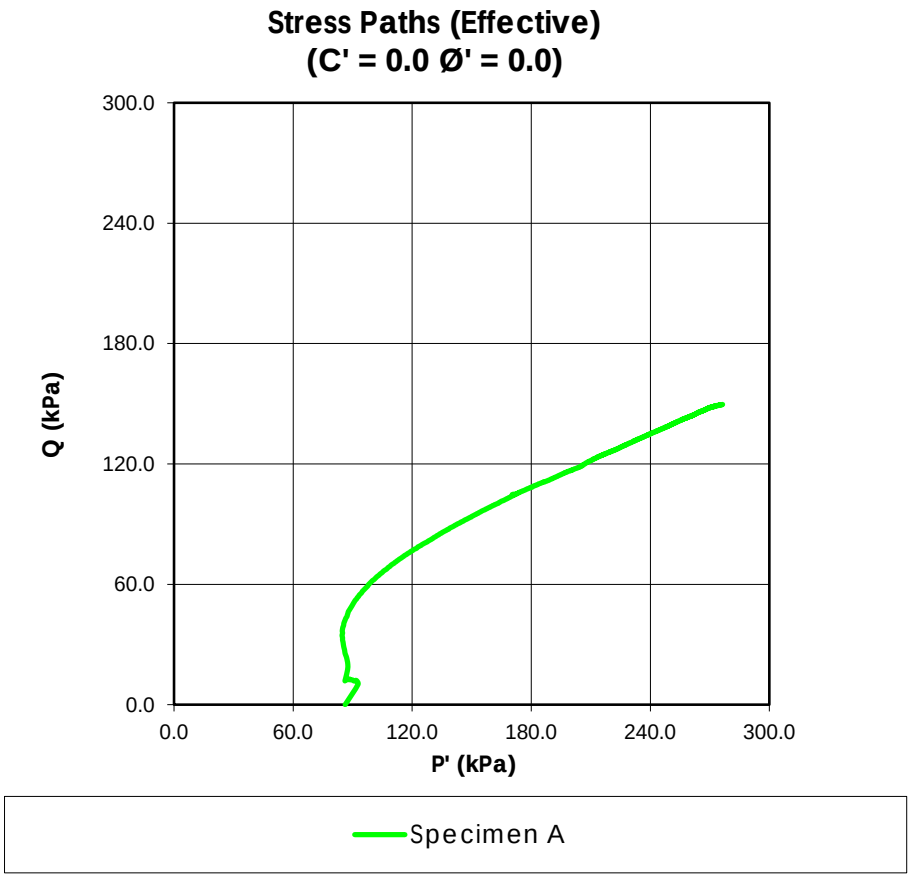
# Mohr Stress Circles at 15% Axial Strain Criterion

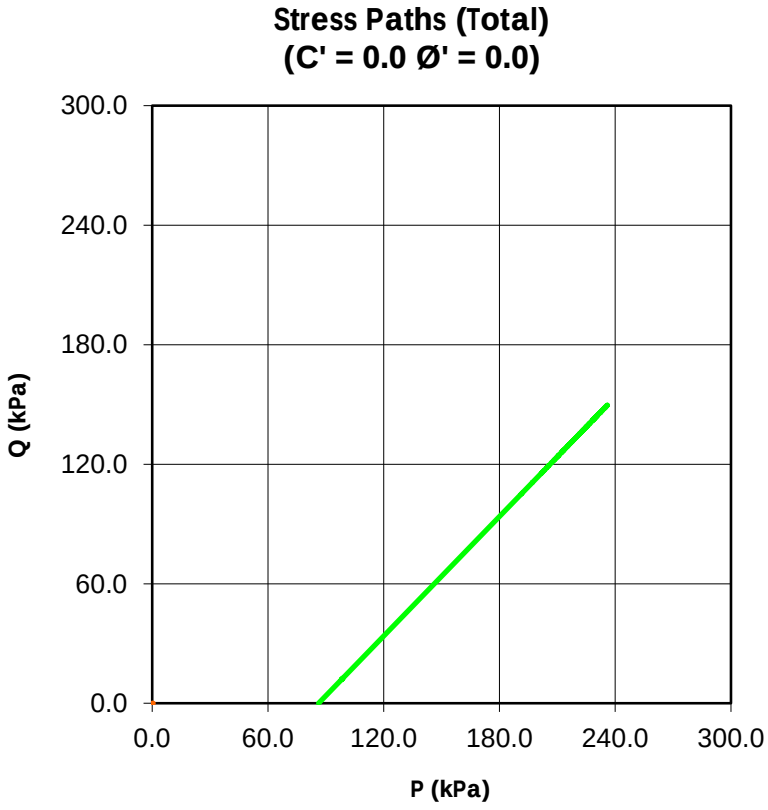
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

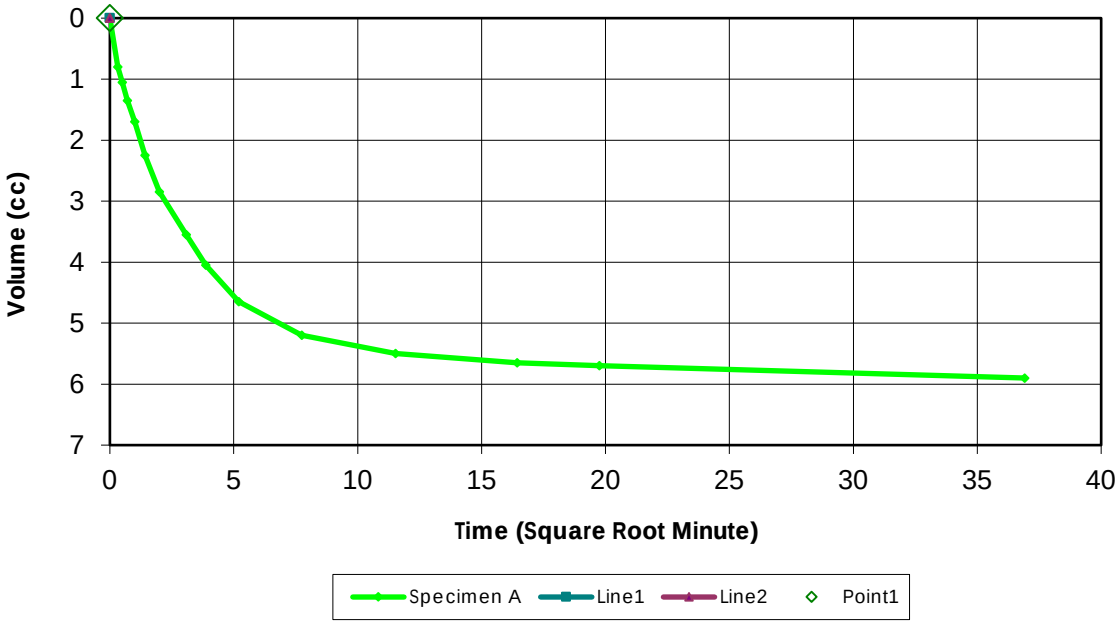



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P' (kPa)
Specimen A

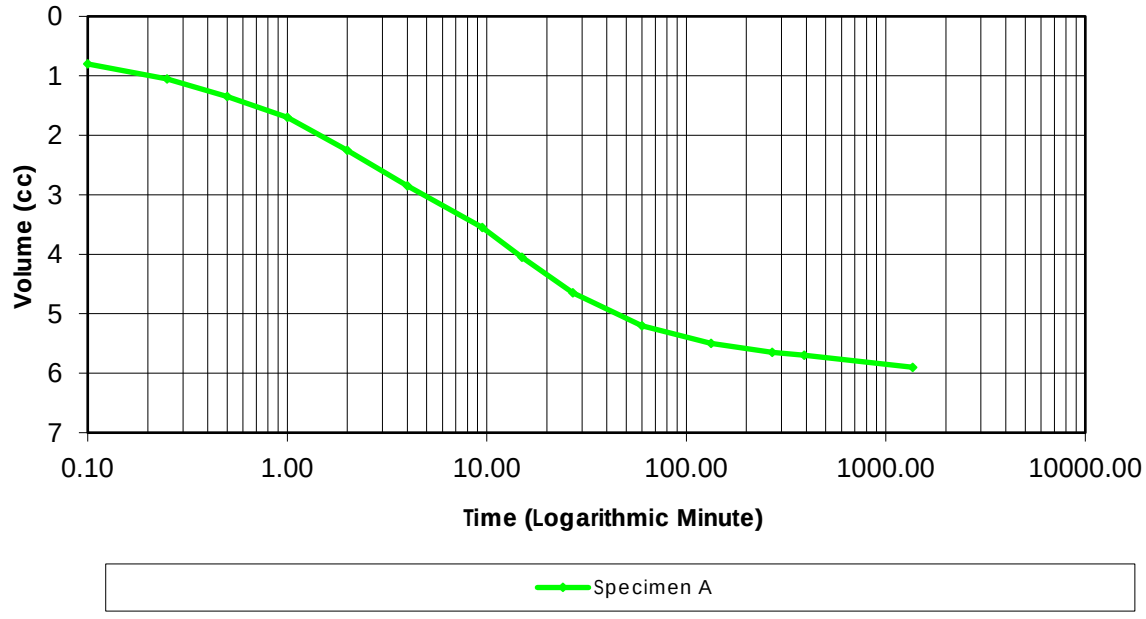

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.93

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 220.0 | 200.0 | N/A | N/A | N/A |
| 1 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 2 | 290.0 | 200.0 | 70.0 | 0.0 | 90.00 |
| 3 | 290.0 | 270.0 | 0.0 | 70.0 | |
| 4 | 290.0 | 270.0 | 0.0 | 0.0 | |
| 5 | 360.0 | 270.0 | 70.0 | 0.0 | 93.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.260

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.2-5.5m

| | |
|---|---|
| Cell Pressure (kPa) | 360 |
| Back Pressure (kPa) | 270 |
| Effective Pressure (kPa) | 90 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 70 |
| Initial Sample Height (mm) | 147.4 |
| Initial Sample Area (cm2) | 38.49 |
| Initial Volume (cm3) | 567.3 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 40.85 | N/A |
| 00:00:06 | 40.05 | 0.800 |
| 00:00:15 | 39.80 | 1.050 |
| 00:00:30 | 39.50 | 1.350 |
| 00:01:00 | 39.15 | 1.700 |
| 00:02:00 | 38.60 | 2.250 |
| 00:04:00 | 38.00 | 2.850 |
| 00:09:30 | 37.30 | 3.550 |
| 00:15:00 | 36.80 | 4.050 |
| 00:27:00 | 36.20 | 4.650 |
| 01:00:00 | 35.65 | 5.200 |
| 02:13:00 | 35.35 | 5.500 |
| 04:30:00 | 35.20 | 5.650 |
| 06:30:00 | 35.15 | 5.700 |
| 22:43:00 | 34.95 | 5.900 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

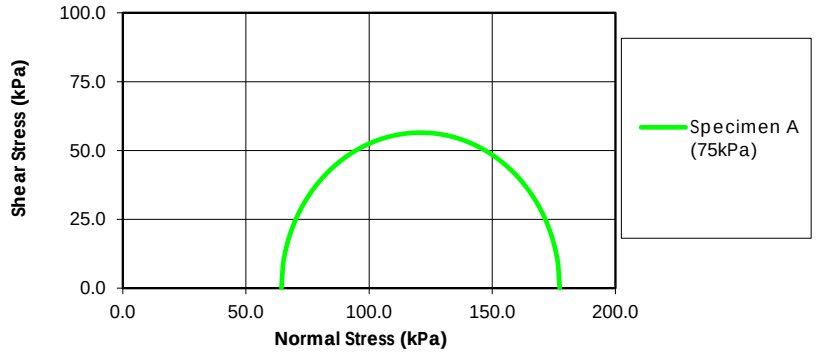
Stantec

Reviewed By C. Lamoureux

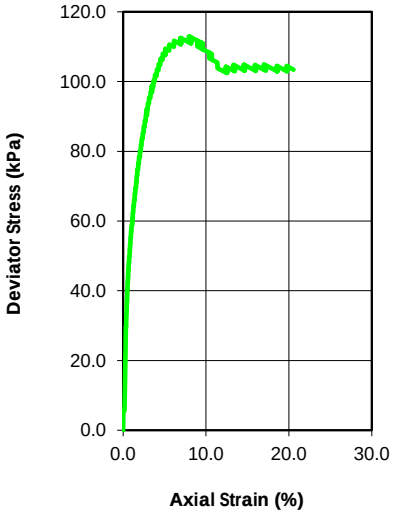
Date: 7-Oct-16

Tested By:

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 22.1 | | | |
| Dry Density (g/cm3) | 1.645 | | | |
| Saturation (%) | 93.04 | | | |
| Void Ratio | 0.641 | | | |
| Diameter (mm) | 71.0 | | | |
| Height (mm) | 146.8 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.96 | | | |
| Water Content (%) | 21.2 | | | |
| Dry Density (g/cm3) | 1.681 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.606 | | | |
| Effective Stress (kPa) | 71.5 | | | |
| Back Press. (kPa) | 133.5 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

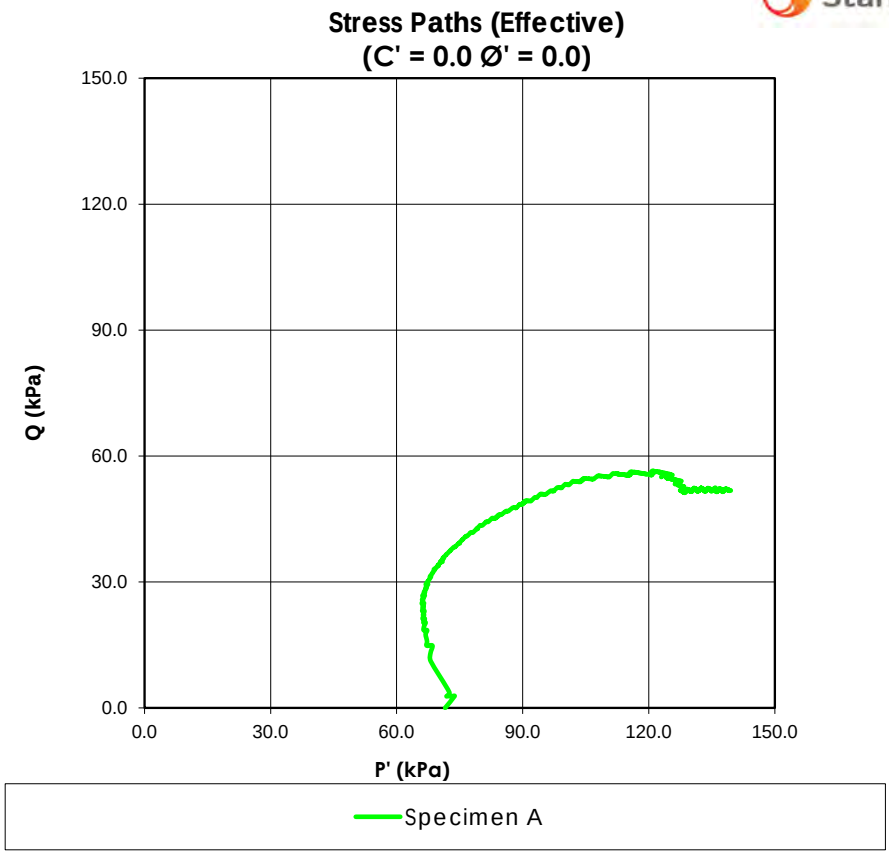
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 177.35 | | | |
| σ'3 at Failure (kPa) | 64.40 | | | |
| | | | | |
| | | | | |

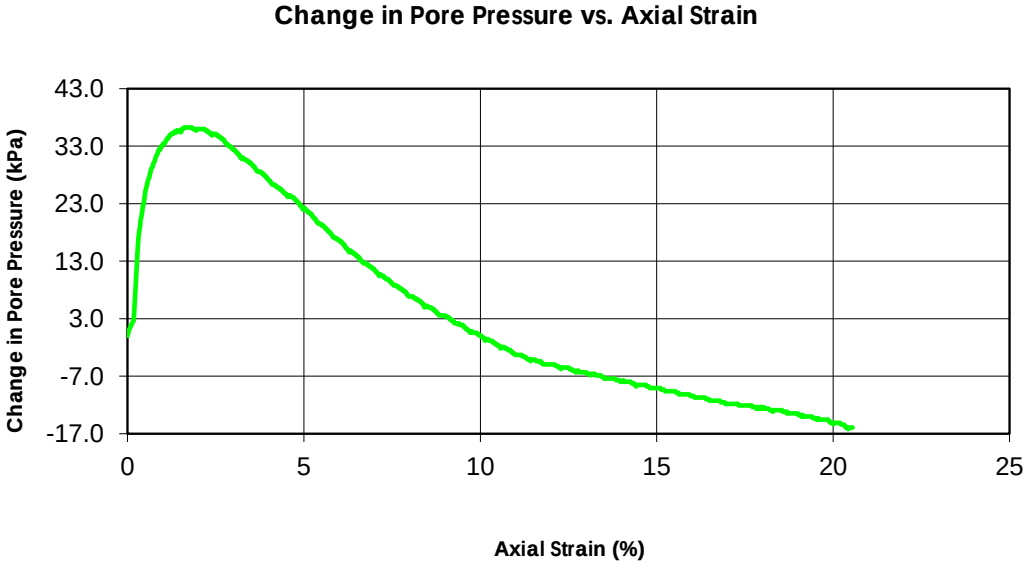
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.260 |
| **Boring Number:** | - |
| **Sample Number:** | H11 BSB |
| **Depth:** | 1.5-3.0m |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

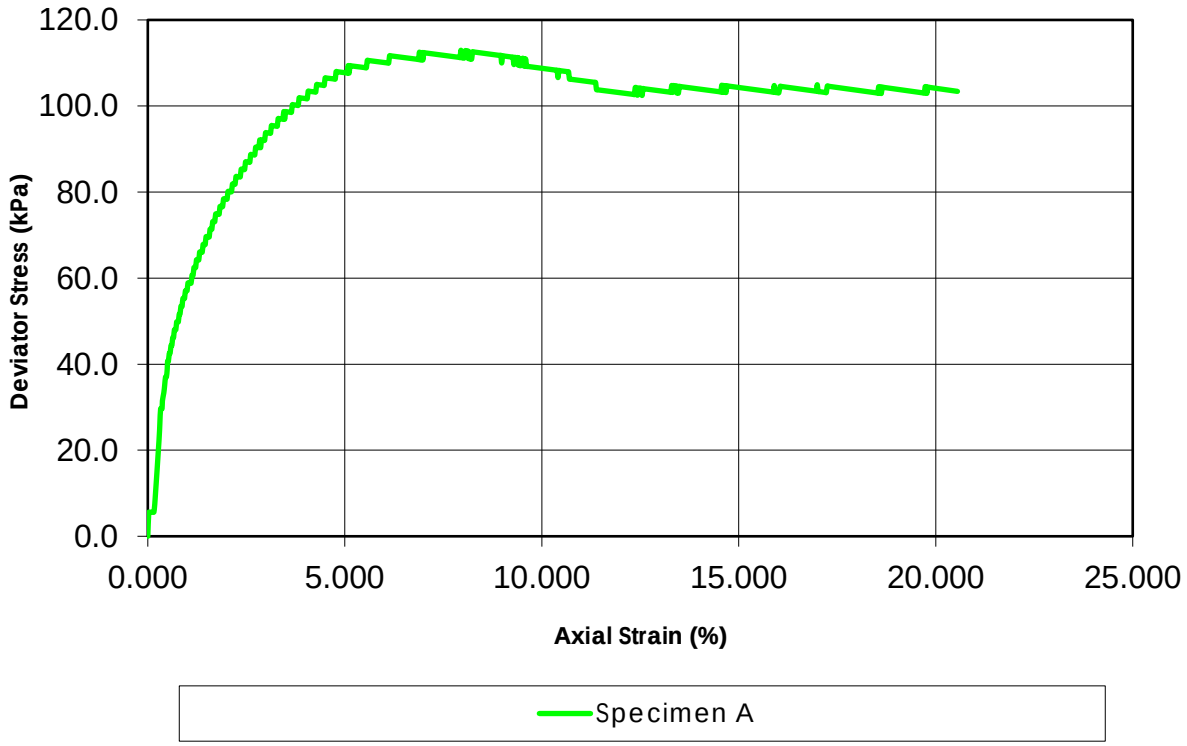
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

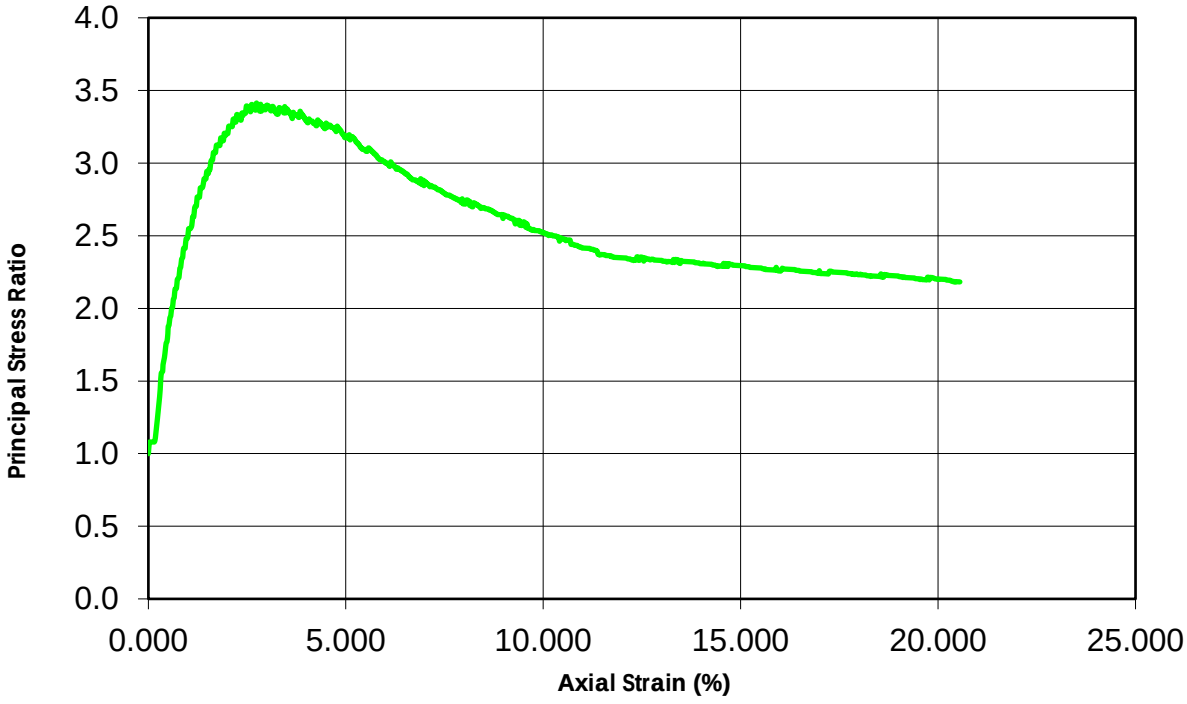


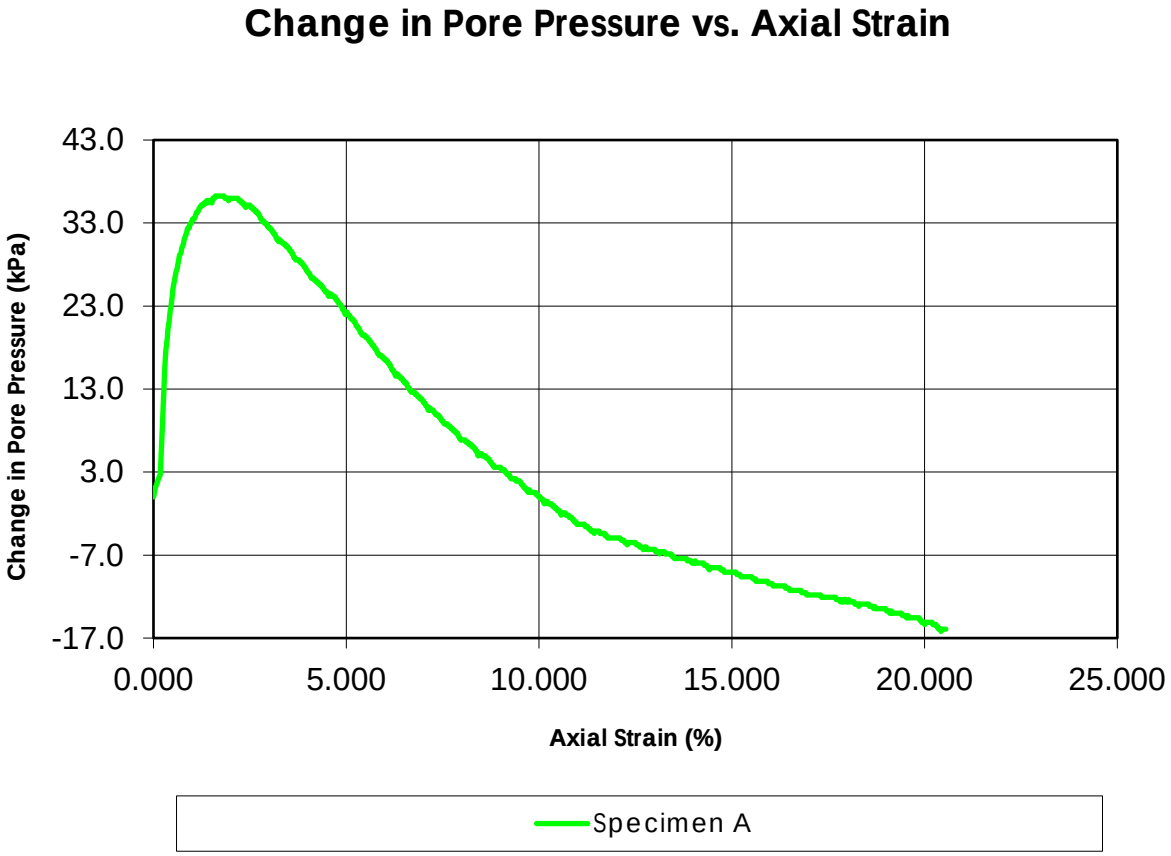



## Deviator Stress vs. Axial Strain



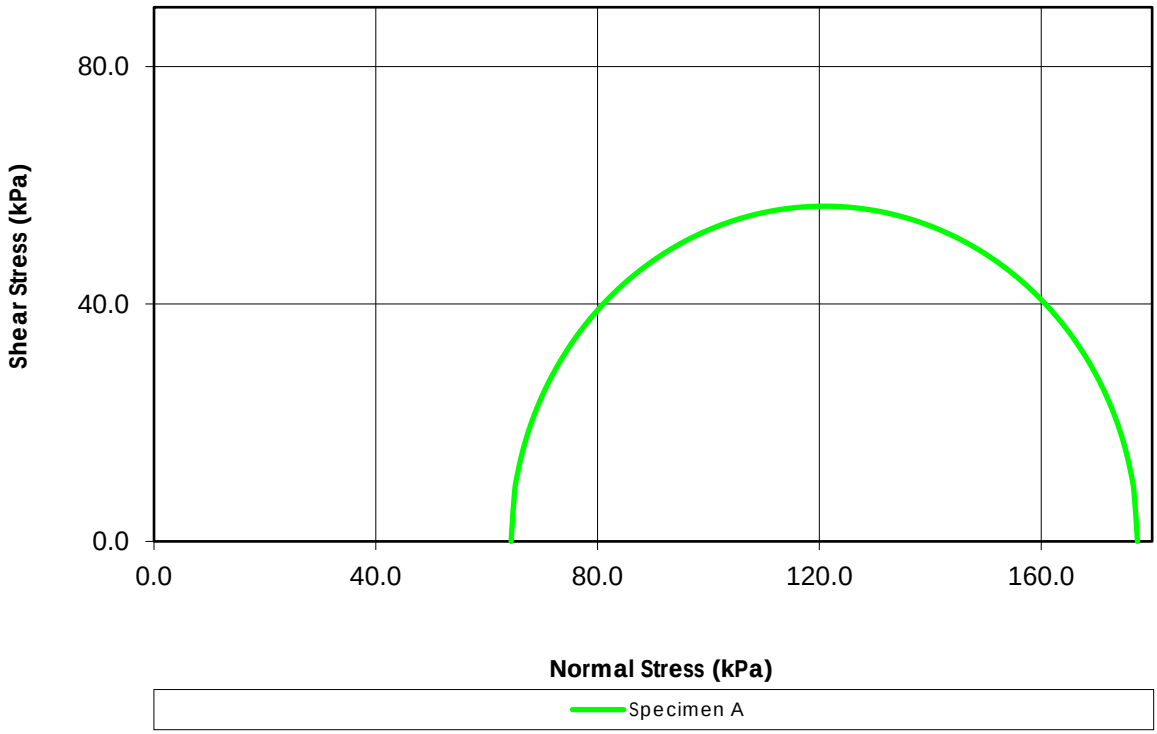

## Principal Stress Ratio vs. Axial Strain



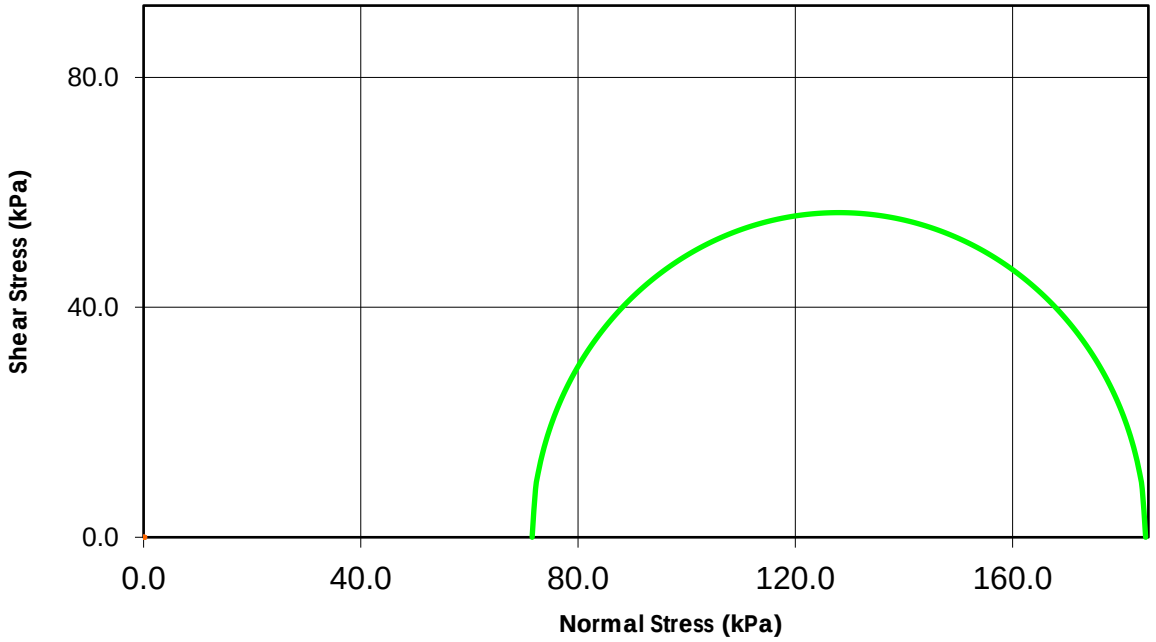

Change in Pore Pressure vs. Axial Strain
43.0
33.0
23.0
13.0
3.0
-7.0
-17.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

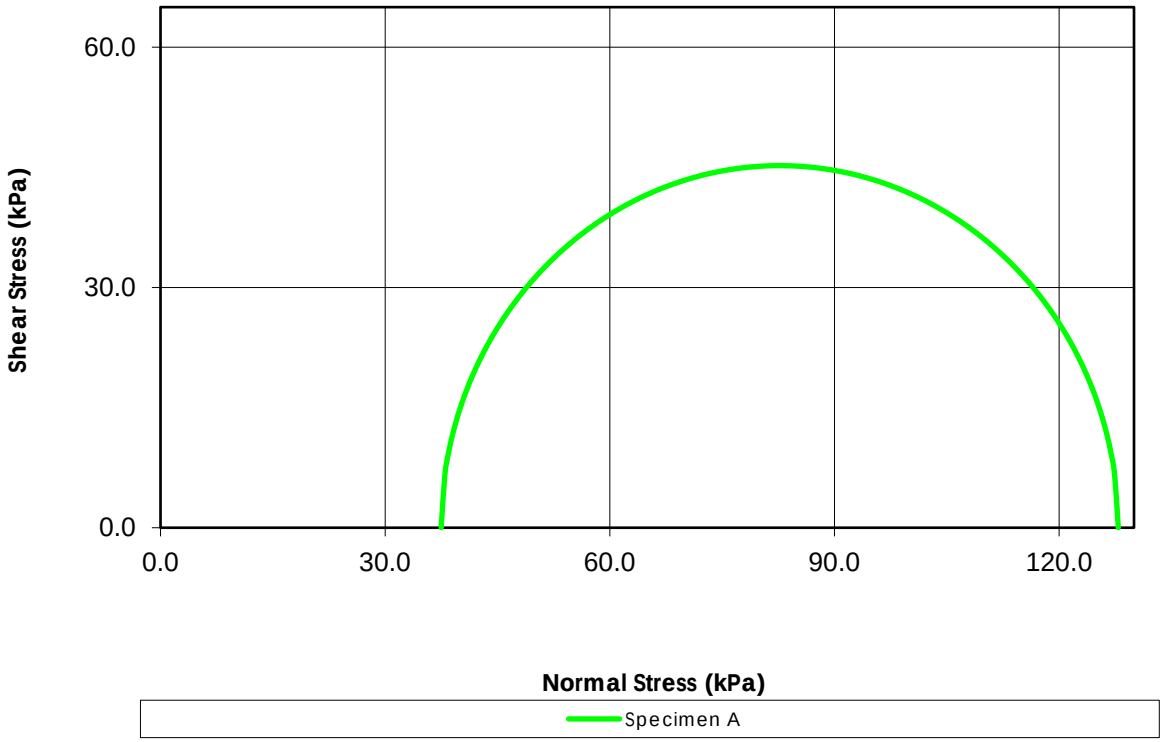



### Total Stress
### (C = 0.0 Ø = 0.0)

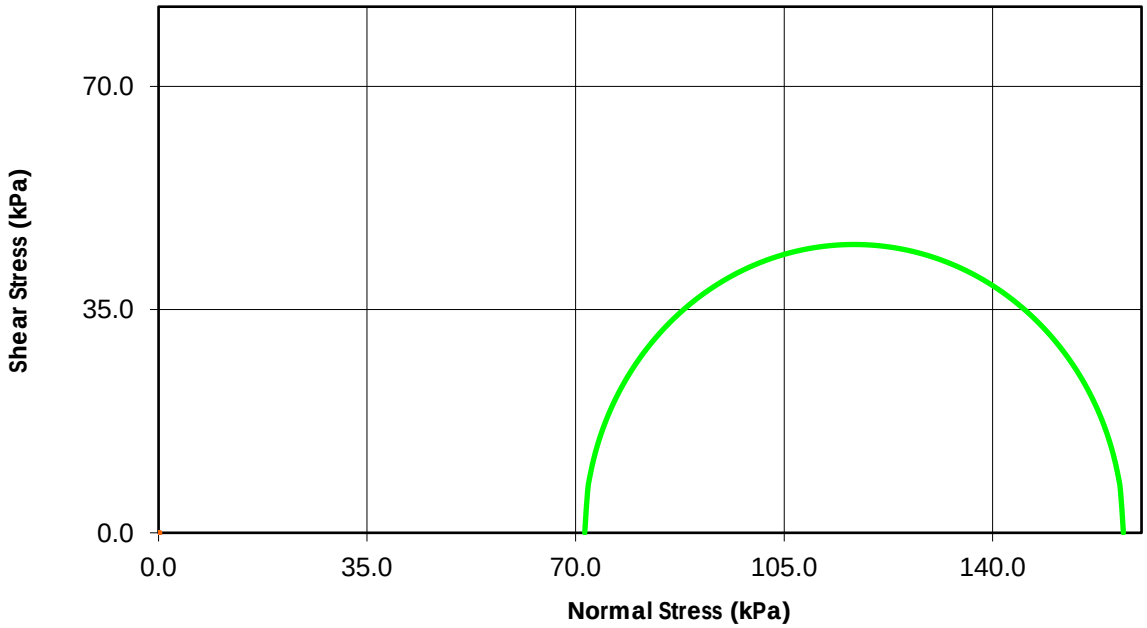


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

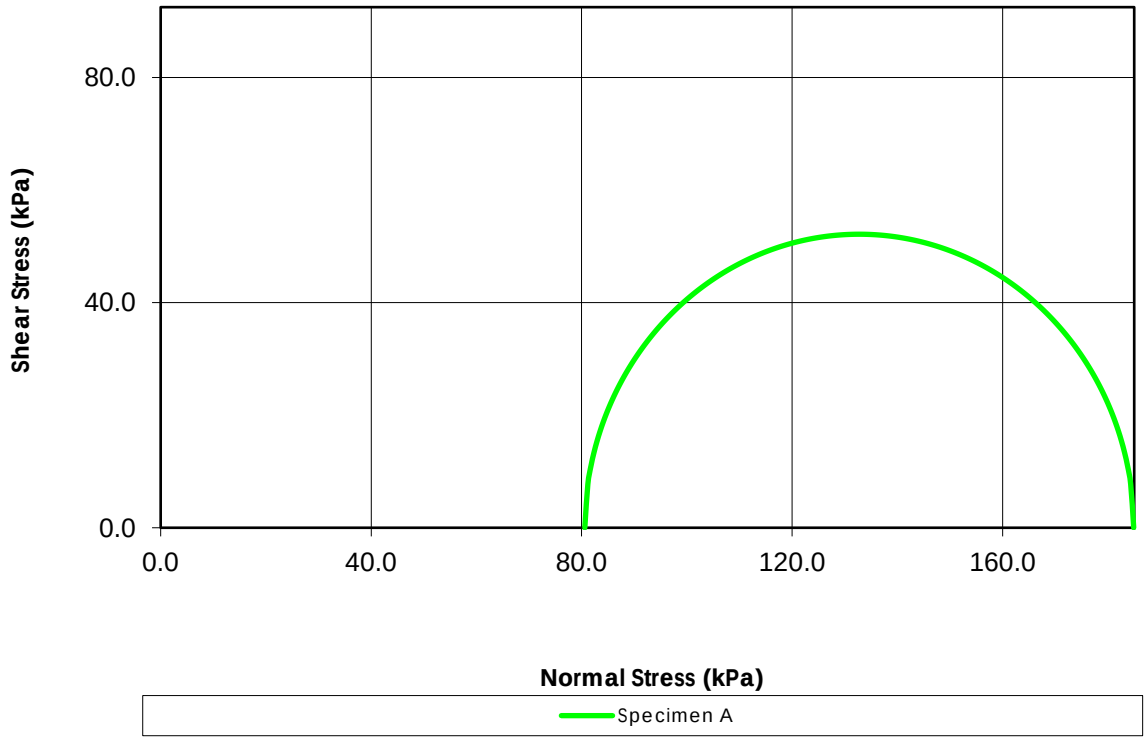



## Total Stress
## (C = 0.0 Ø = 0.0)

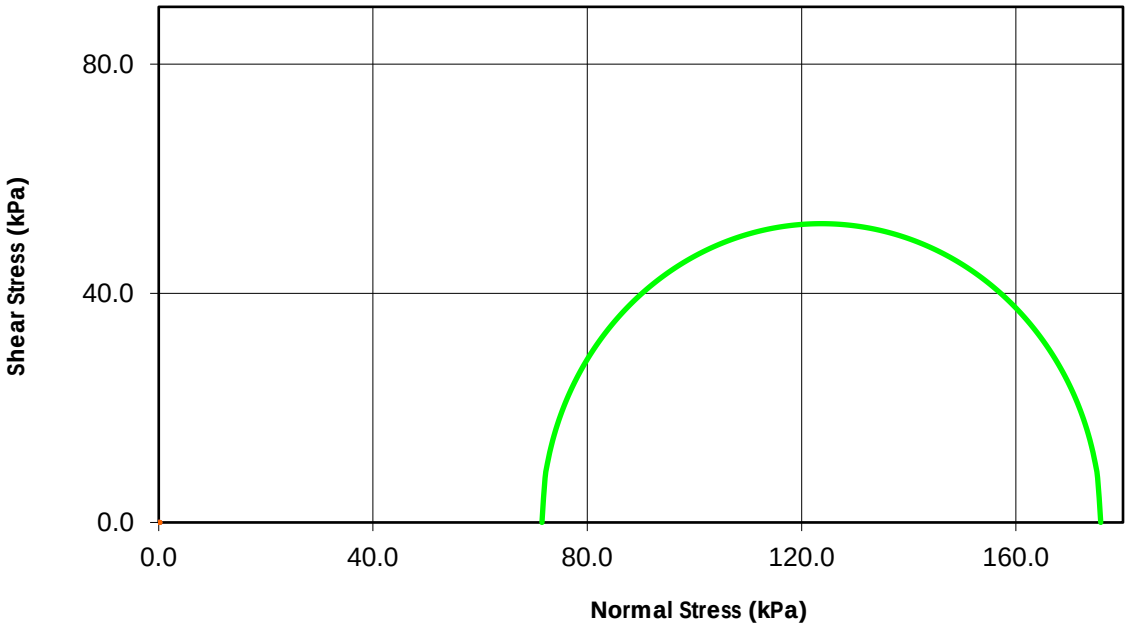


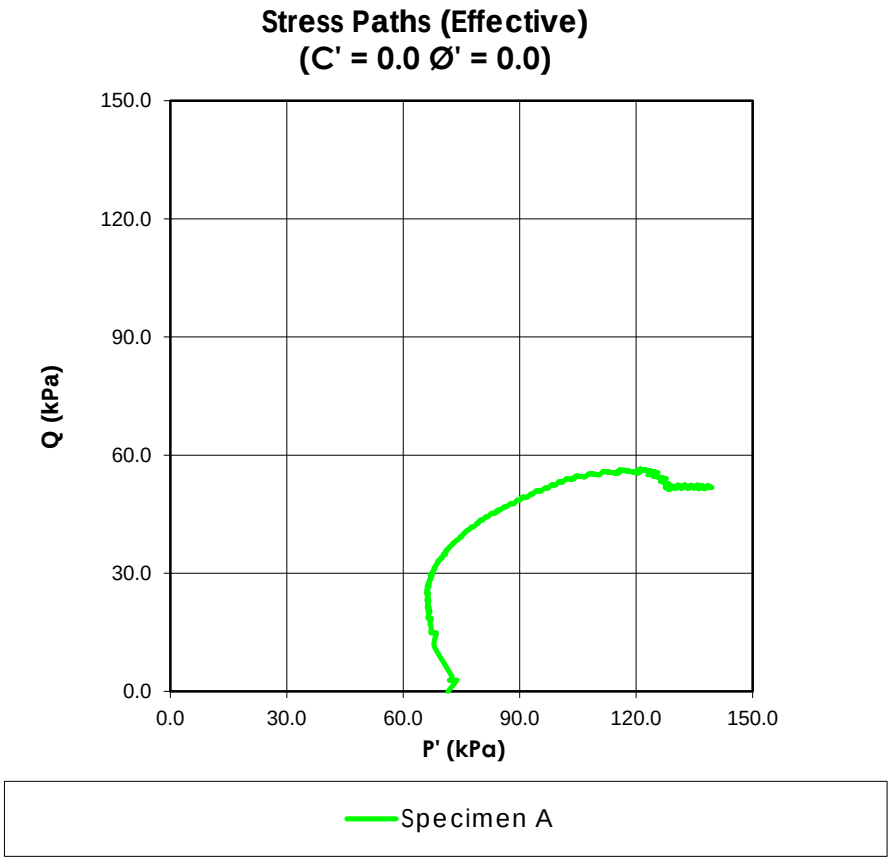
# Mohr Stress Circles at 15% Axial Strain Criterion

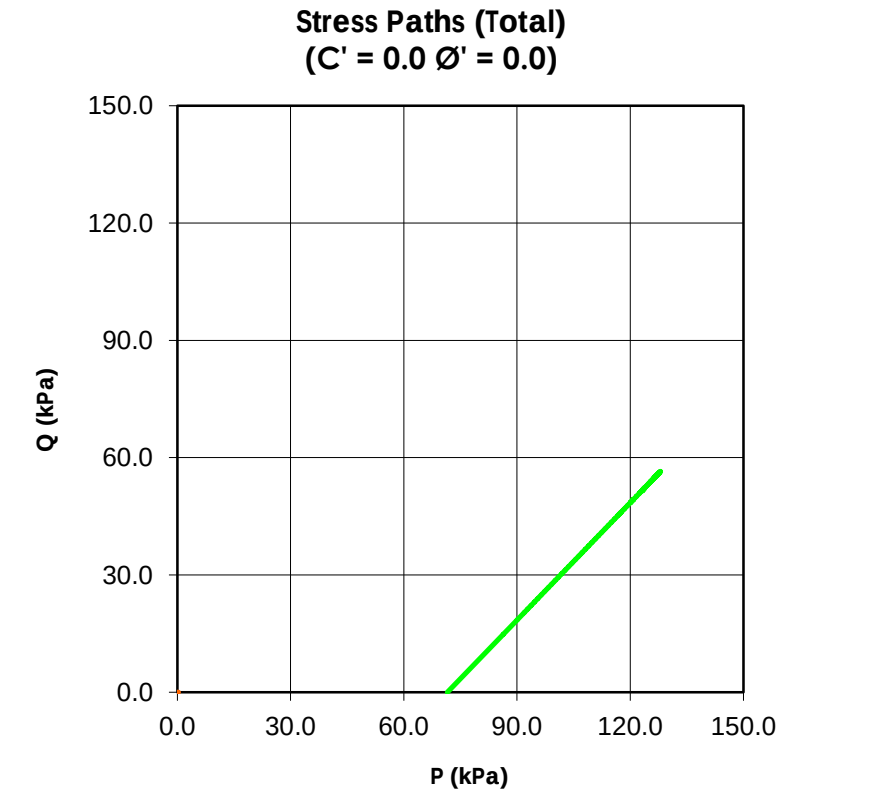
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

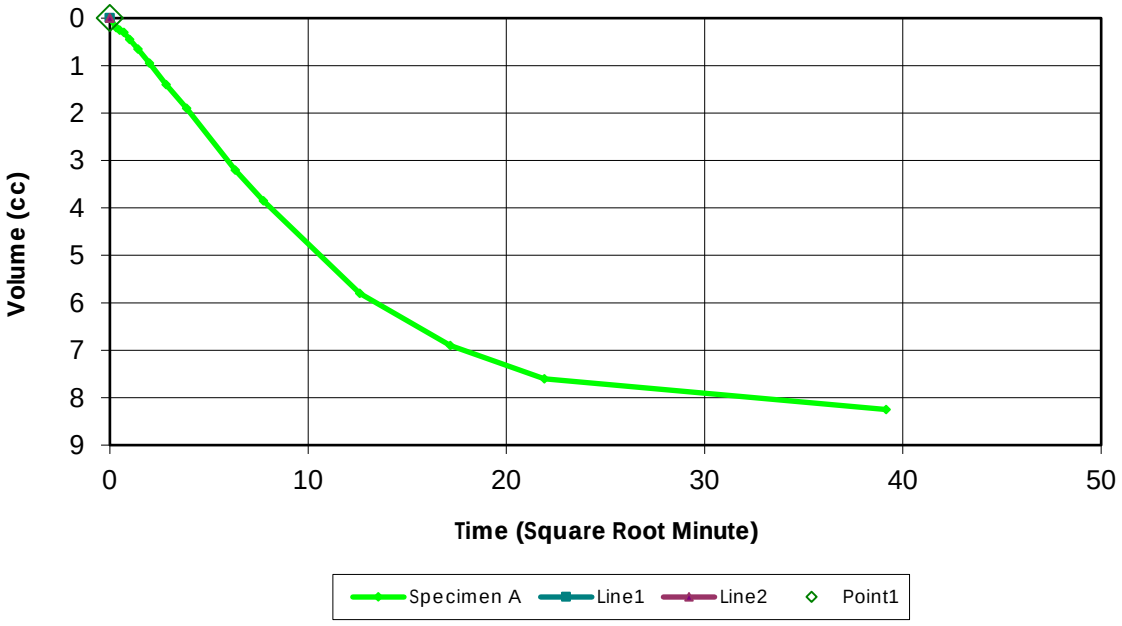



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
150.0
120.0
90.0
60.0
30.0
0.0
Q (kPa)
0.0
30.0
60.0
90.0
120.0
150.0
P' (kPa)
Specimen A

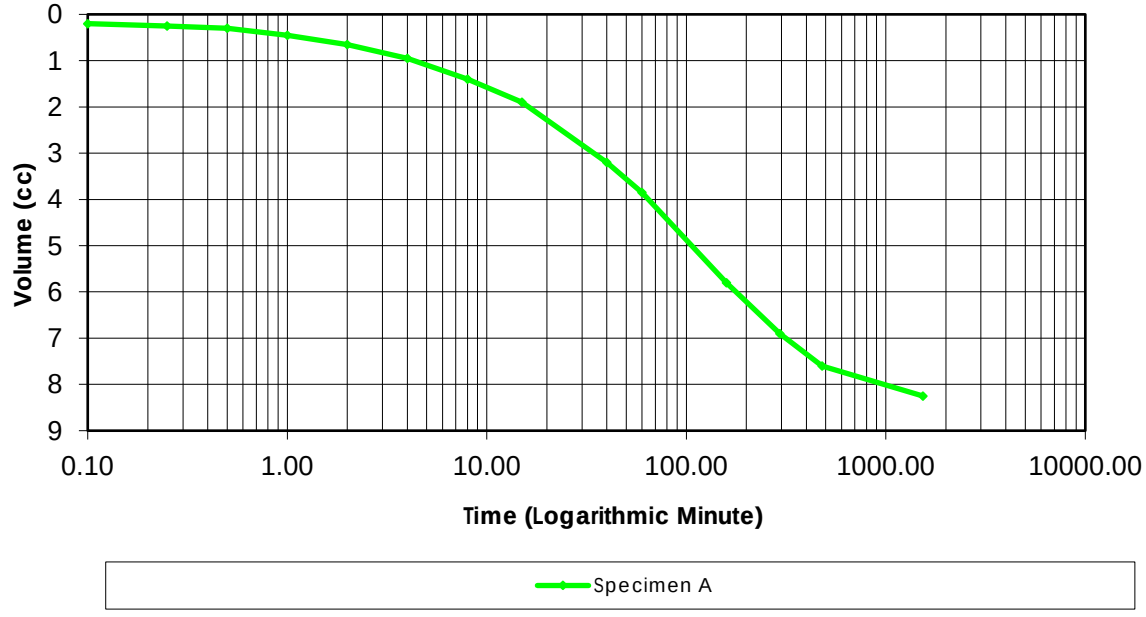

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
150.0
120.0
90.0
60.0
30.0
0.0
Q (kPa)
0.0
30.0
60.0
90.0
120.0
150.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.96

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 150.0 | 130.0 | N/A | N/A | N/A |
| 1 | 220.0 | 130.0 | 70.0 | 0.0 | 96.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.260

Project Name: SR1

Project Location:

Hole No. 0  Depth: 1.5-3.0m

| | |
|---|---|
| Cell Pressure (kPa) | 205 |
| Back Pressure (kPa) | 130 |
| Effective Pressure (kPa) | 75 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71 |
| Initial Sample Height (mm) | 146.8 |
| Initial Sample Area (cm2) | 39.59 |
| Initial Volume (cm3) | 581.2 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 37.70 | N/A |
| 00:00:06 | 37.50 | 0.200 |
| 00:00:15 | 37.45 | 0.250 |
| 00:00:30 | 37.40 | 0.300 |
| 00:01:00 | 37.25 | 0.450 |
| 00:02:00 | 37.05 | 0.650 |
| 00:04:00 | 36.75 | 0.950 |
| 00:08:00 | 36.30 | 1.400 |
| 00:15:00 | 35.80 | 1.900 |
| 00:40:00 | 34.50 | 3.200 |
| 01:00:00 | 33.85 | 3.850 |
| 02:39:00 | 31.90 | 5.800 |
| 04:55:00 | 30.80 | 6.900 |
| 08:00:00 | 30.10 | 7.600 |
| 25:33:00 | 29.45 | 8.250 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

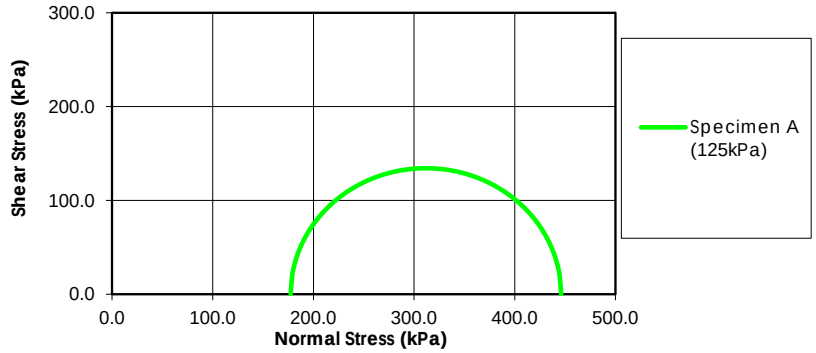
Stantec

Reviewed By C. Lamoureux

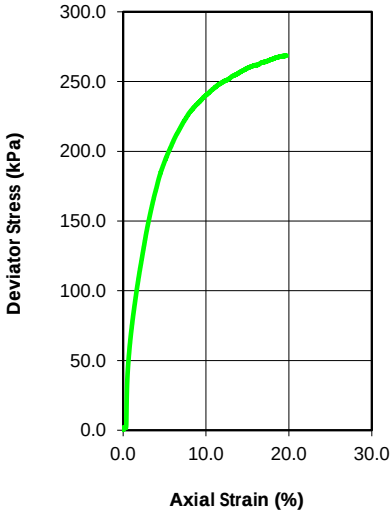
Date: 7-Oct-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 16.6 | | | |
| Dry Density (g/cm3) | 1.833 | | | |
| Saturation (%) | 94.63 | | | |
| Void Ratio | 0.473 | | | |
| Diameter (mm) | 71.2 | | | |
| Height (mm) | 144.2 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 14.0 | | | |
| Dry Density (g/cm3) | 1.874 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.441 | | | |
| Effective Stress (kPa) | 119.6 | | | |
| Back Press. (kPa) | 205.4 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

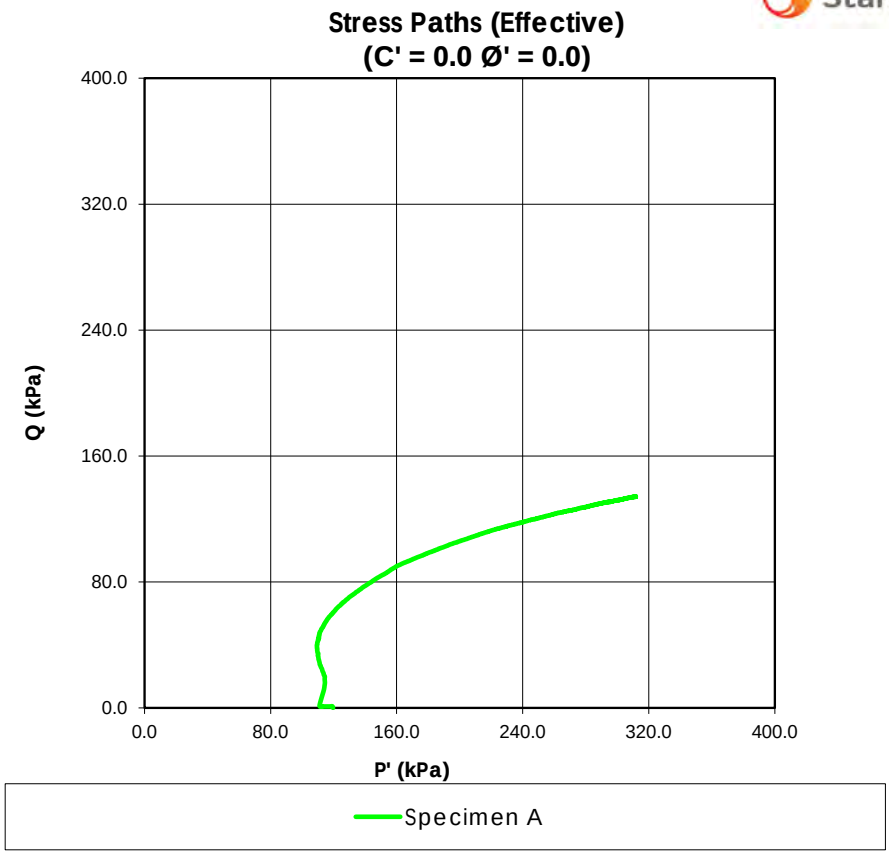
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 446.09 | | | |
| σ'3 at Failure (kPa) | 177.43 | | | |
| | | | | |
| | | | | |

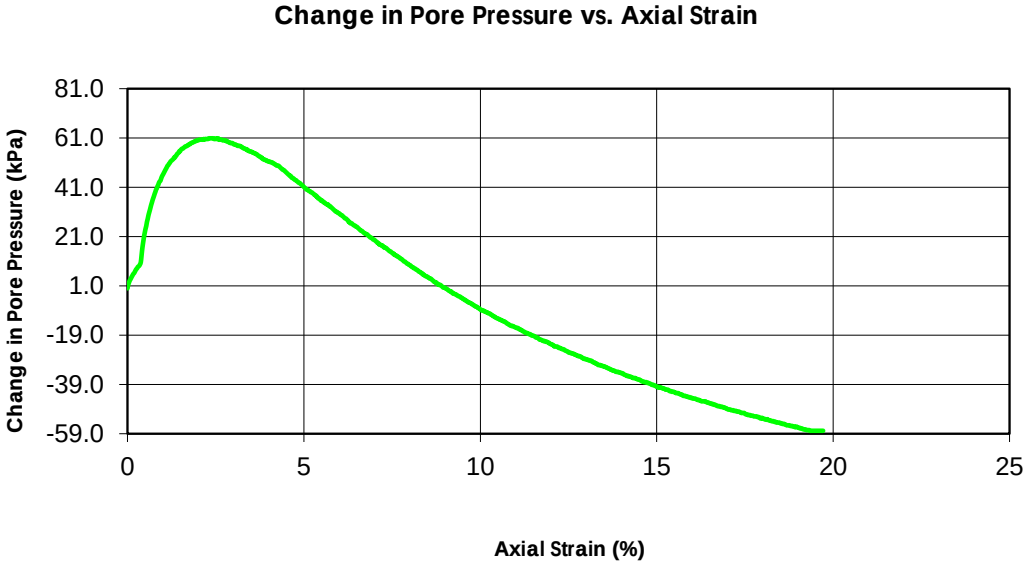
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.260 |
| **Boring Number:** | - |
| **Sample Number:** | H11 BSD |
| **Depth:** | 4.6-6.1m |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay, Trace Sand, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

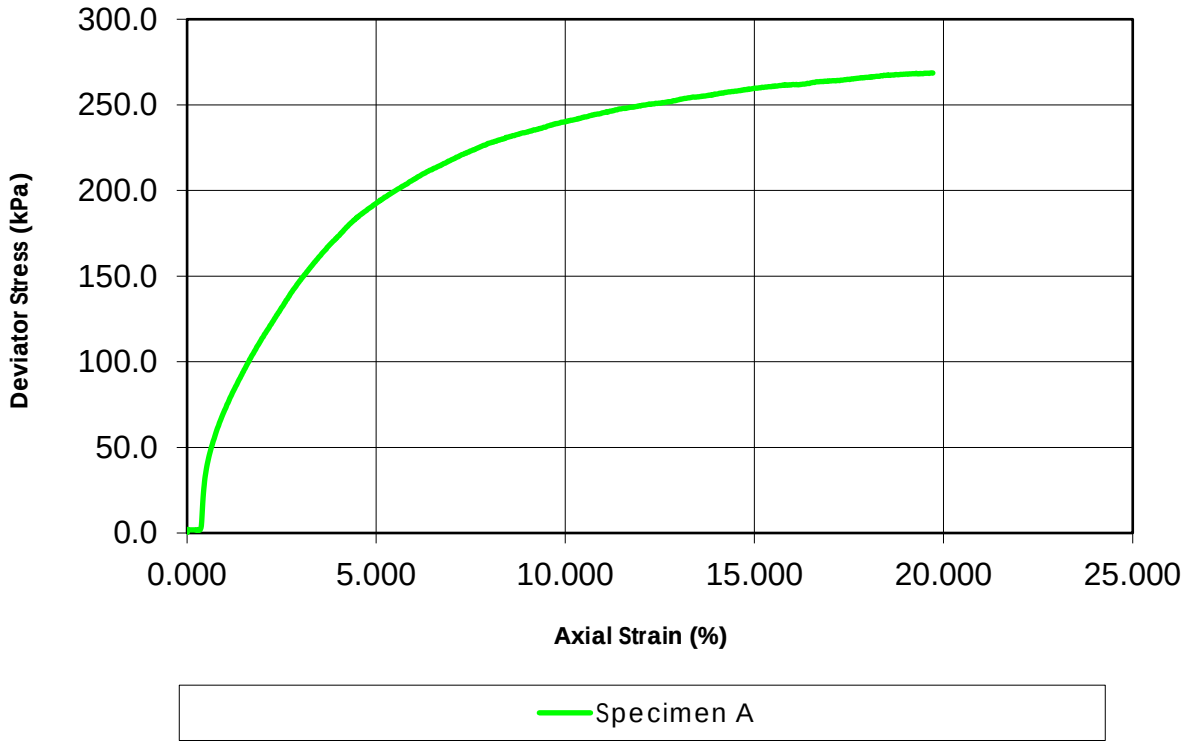
**Stantec Consulting Ltd.**

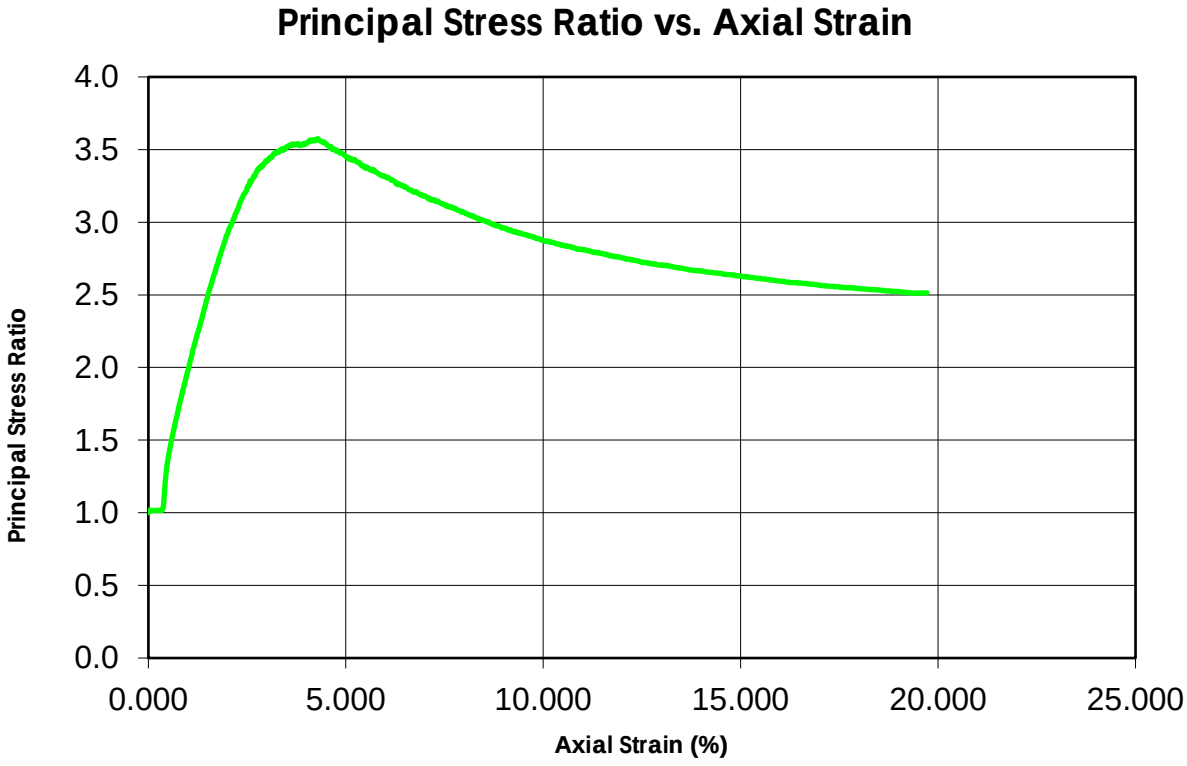
**Consolidated Undrained Triaxial Test (ASTM D4767)**

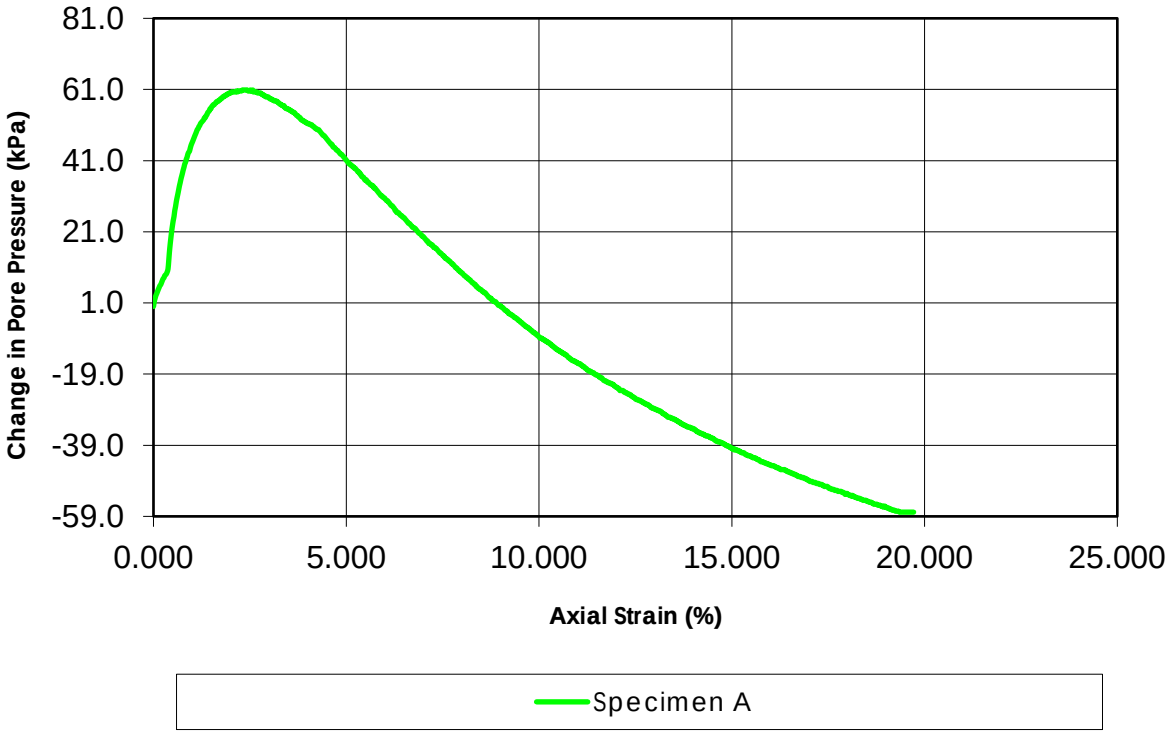
Stantec



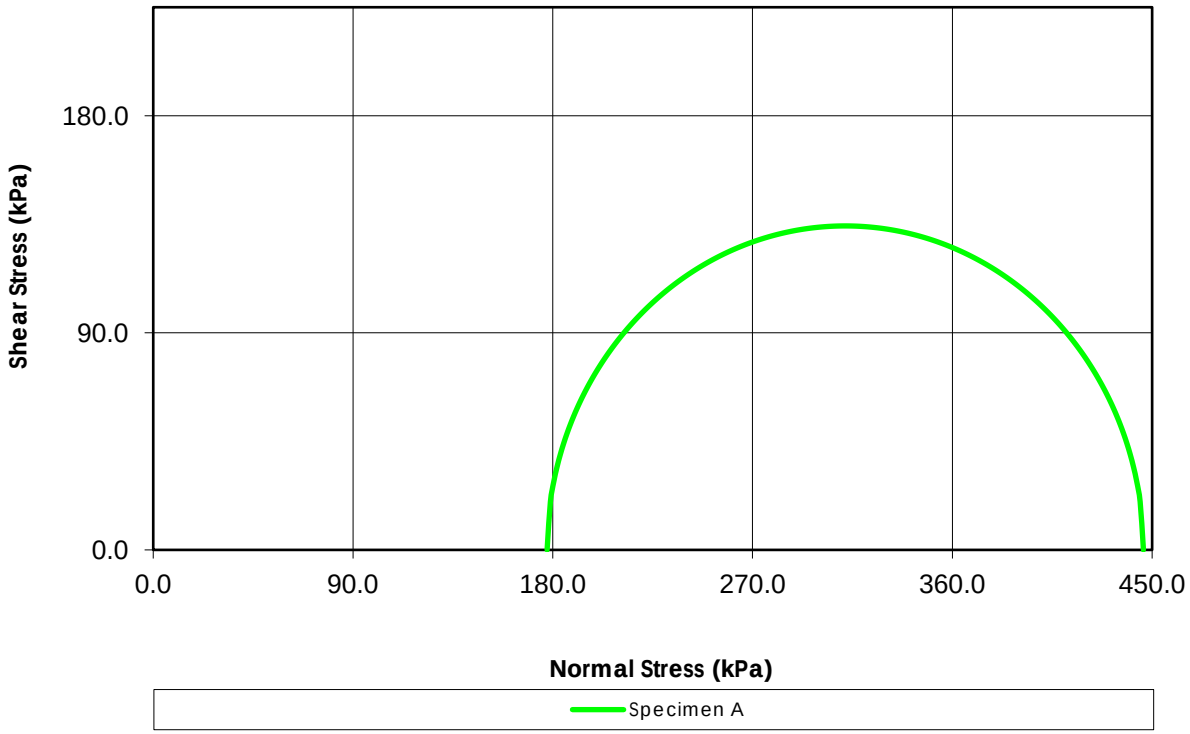

300.0
250.0
200.0
150.0
100.0
50.0
0.0
Deviator Stress (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A


Principal Stress Ratio vs. Axial Strain
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Principal Stress Ratio
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)

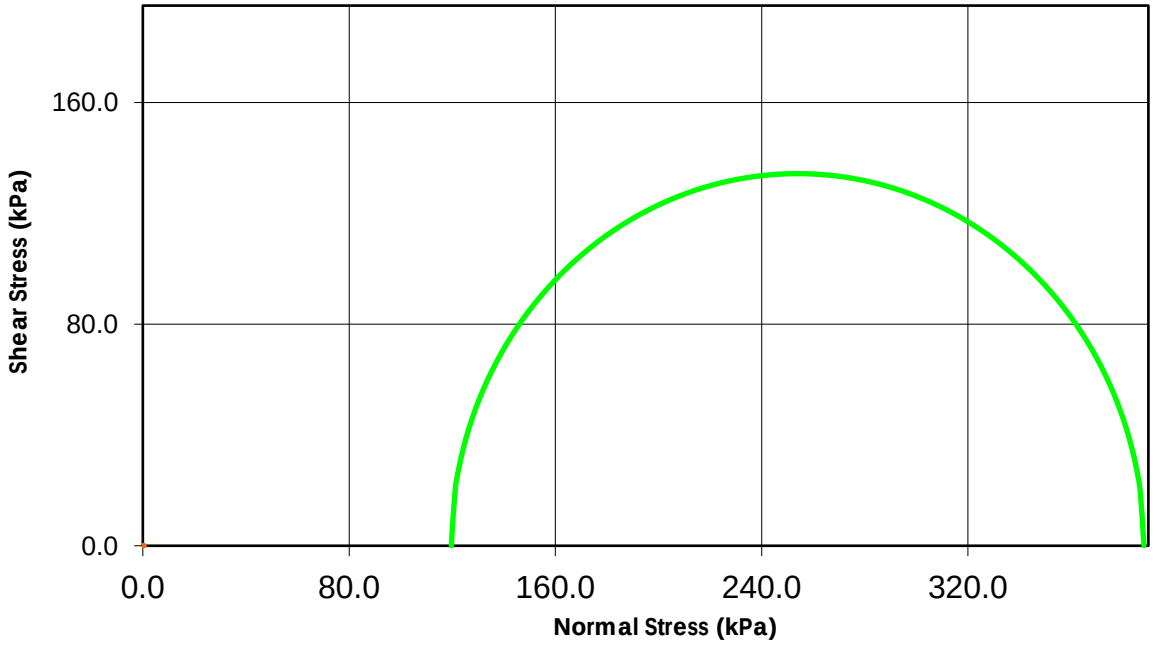

81.0
61.0
41.0
21.0
1.0
-19.0
-39.0
-59.0
Change in Pore Pressure (kPa)
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

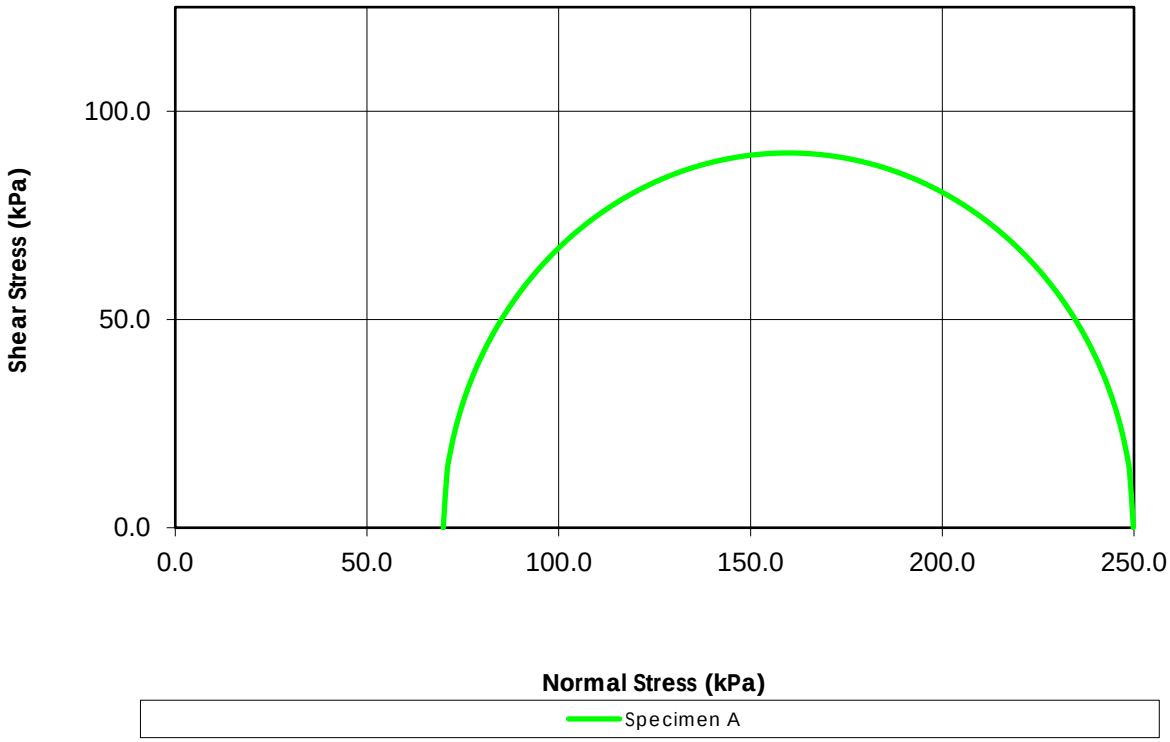



### Total Stress
### (C = 0.0 Ø = 0.0)

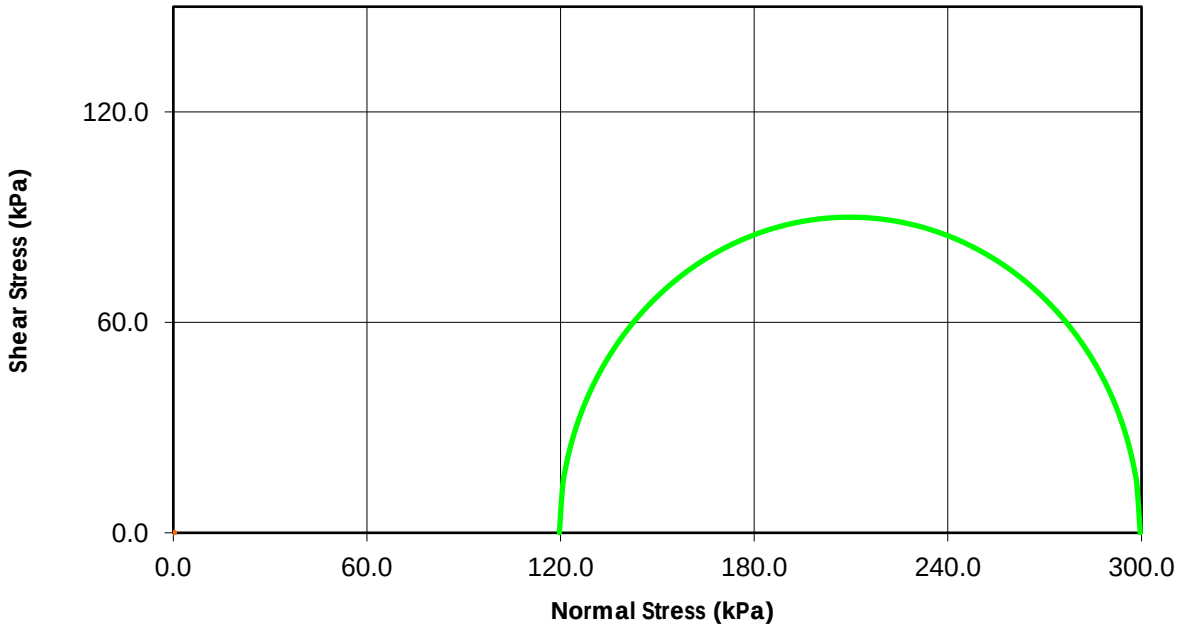


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

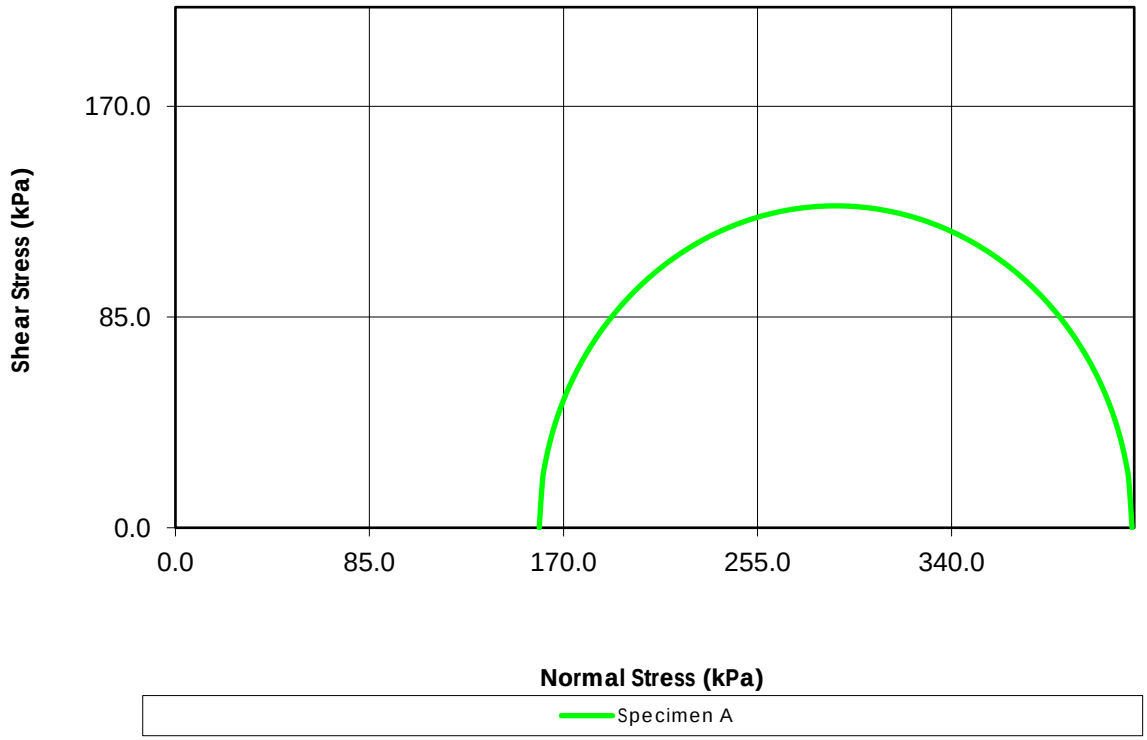



## Total Stress
## (C = 0.0 Ø = 0.0)

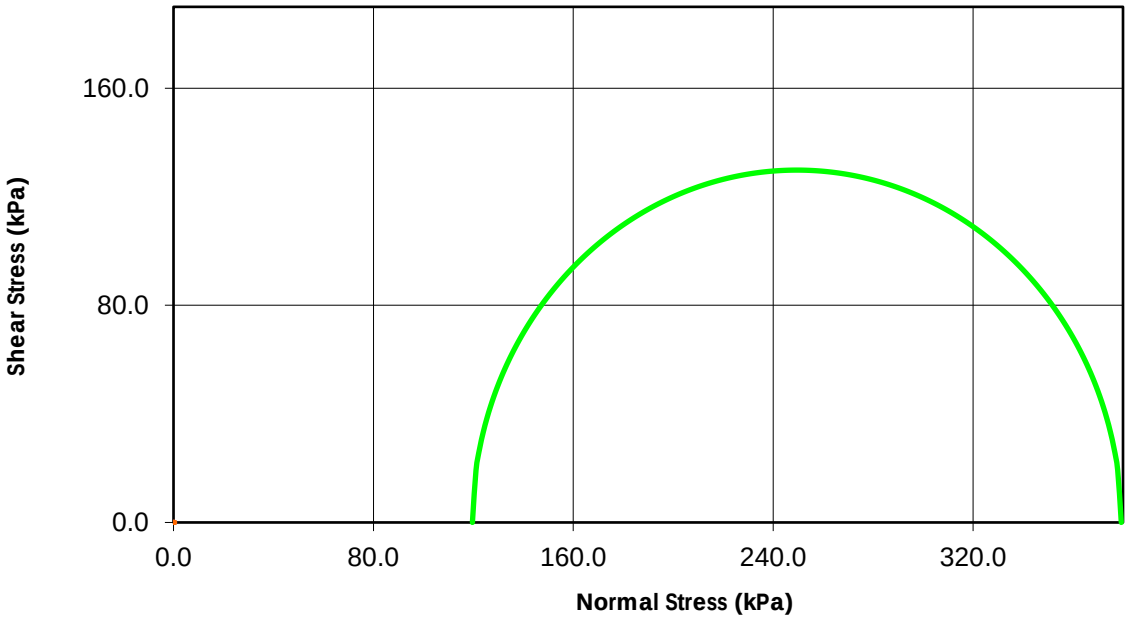


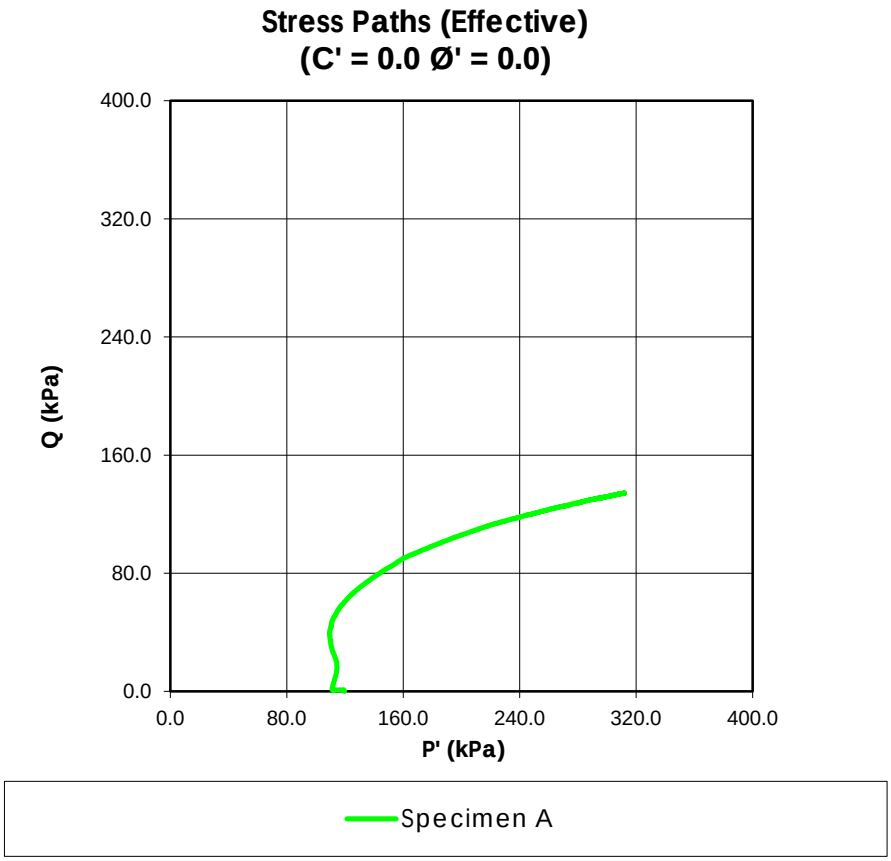
# Mohr Stress Circles at 15% Axial Strain Criterion

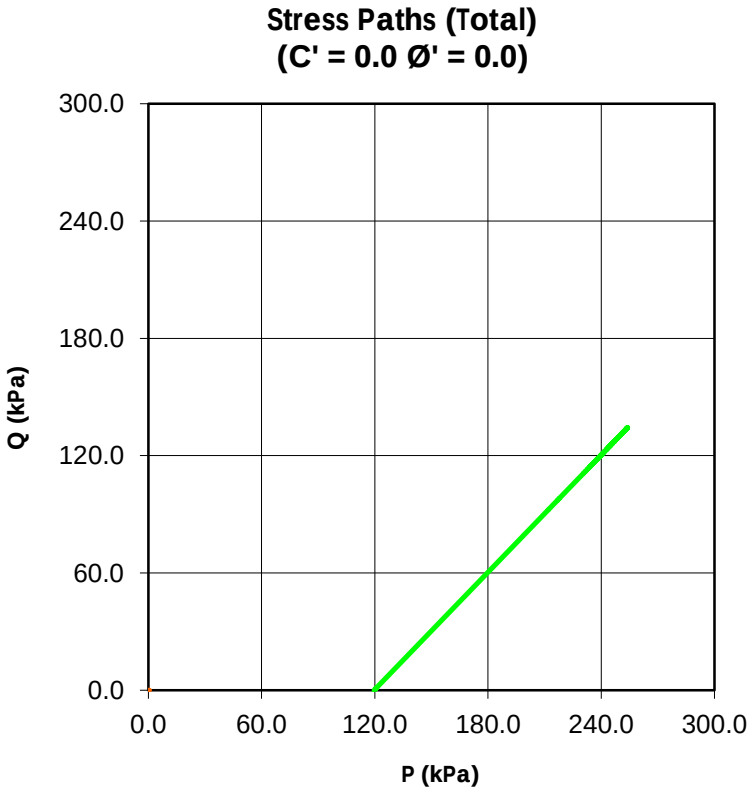
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

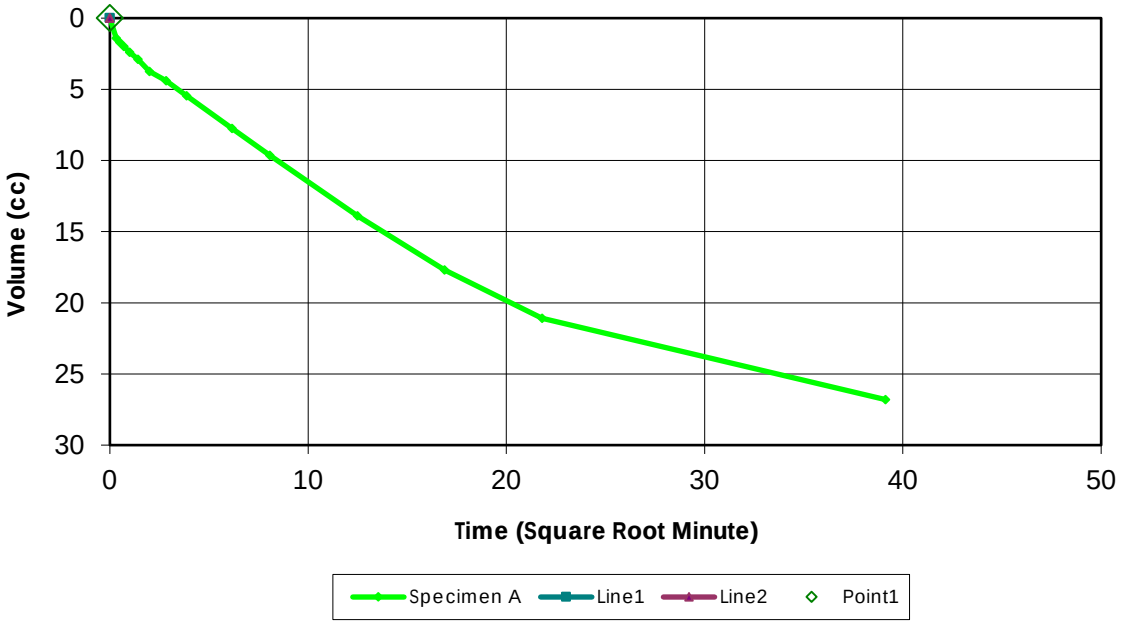



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A

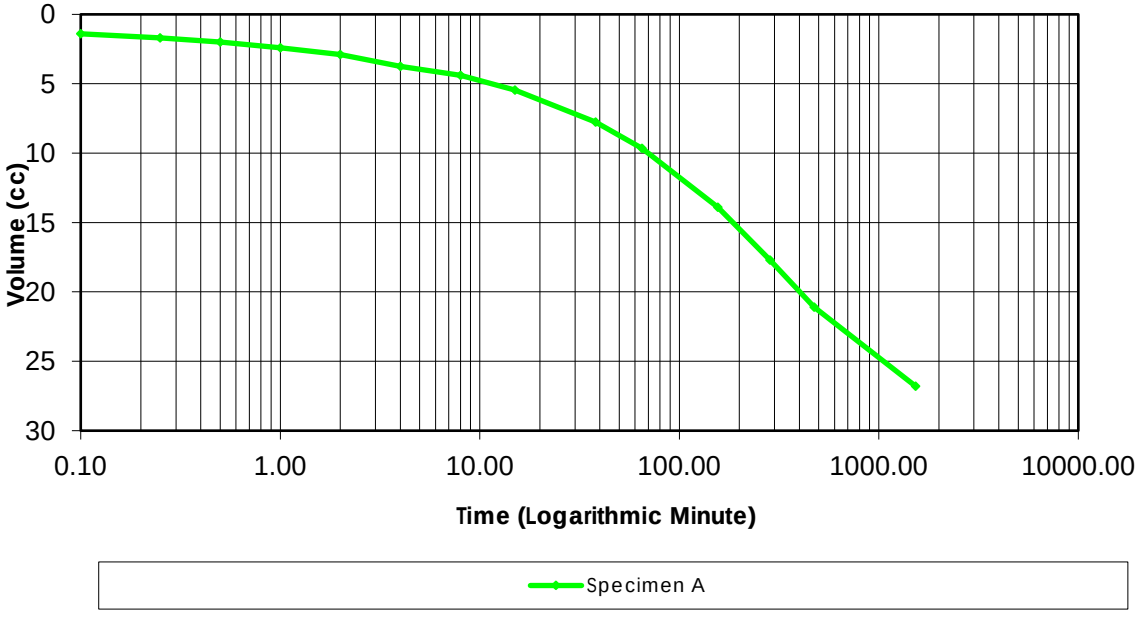

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.98

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 150.0 | 130.0 | N/A | N/A | N/A |
| 1 | 220.0 | 130.0 | 70.0 | 0.0 | 98.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.260

Project Name: SR1

Project Location:

Hole No. 0  Depth: 4.6-6.1m

| | |
|---|---|
| Cell Pressure (kPa) | 325 |
| Back Pressure (kPa) | 200 |
| Effective Pressure (kPa) | 125 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71.2 |
| Initial Sample Height (mm) | 144.2 |
| Initial Sample Area (cm2) | 39.81 |
| Initial Volume (cm3) | 574.1 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 40.50 | N/A |
| 00:00:06 | 39.10 | 1.400 |
| 00:00:15 | 38.80 | 1.700 |
| 00:00:30 | 38.50 | 2.000 |
| 00:01:00 | 38.10 | 2.400 |
| 00:02:00 | 37.60 | 2.900 |
| 00:04:00 | 36.75 | 3.750 |
| 00:08:00 | 36.10 | 4.400 |
| 00:15:00 | 35.05 | 5.450 |
| 00:38:00 | 32.75 | 7.750 |
| 01:05:00 | 30.85 | 9.650 |
| 02:36:00 | 26.60 | 13.900 |
| 04:45:00 | 22.80 | 17.700 |
| 07:55:00 | 19.40 | 21.100 |
| 25:30:00 | 13.70 | 26.800 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

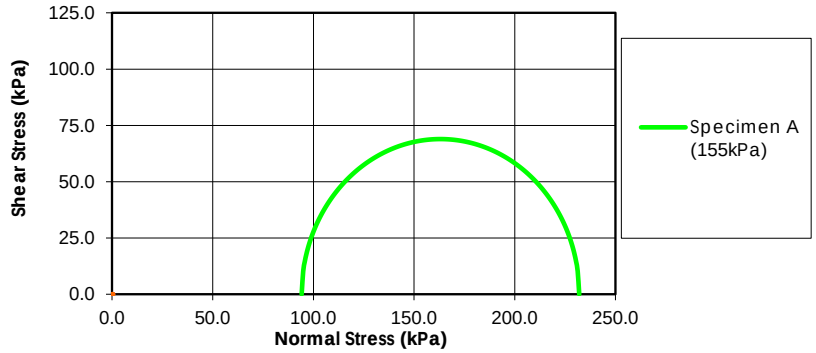
Stantec

Reviewed By C. Lamoureux

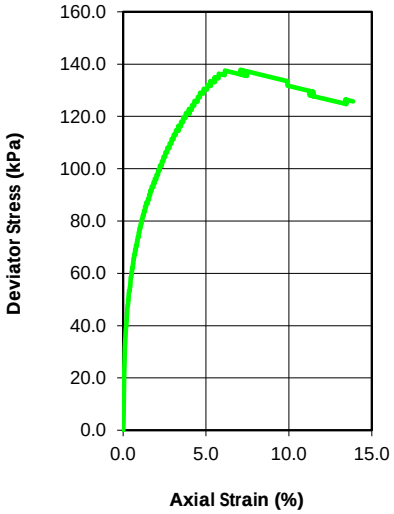
Date: 3-Oct-16

Tested By: C. Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.1 | | | |
| Dry Density (g/cm3) | 1.615 | | | |
| Saturation (%) | 100.88 | | | |
| Void Ratio | 0.668 | | | |
| Diameter (mm) | 71.400 | | | |
| Height (mm) | 167.800 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 22.5 | | | |
| Dry Density (g/cm3) | 1.621 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.665 | | | |
| Effective Stress (kPa) | 155.4 | | | |
| Back Press. (kPa) | 229.6 | | | |
| Rate of Strain | 0.018 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

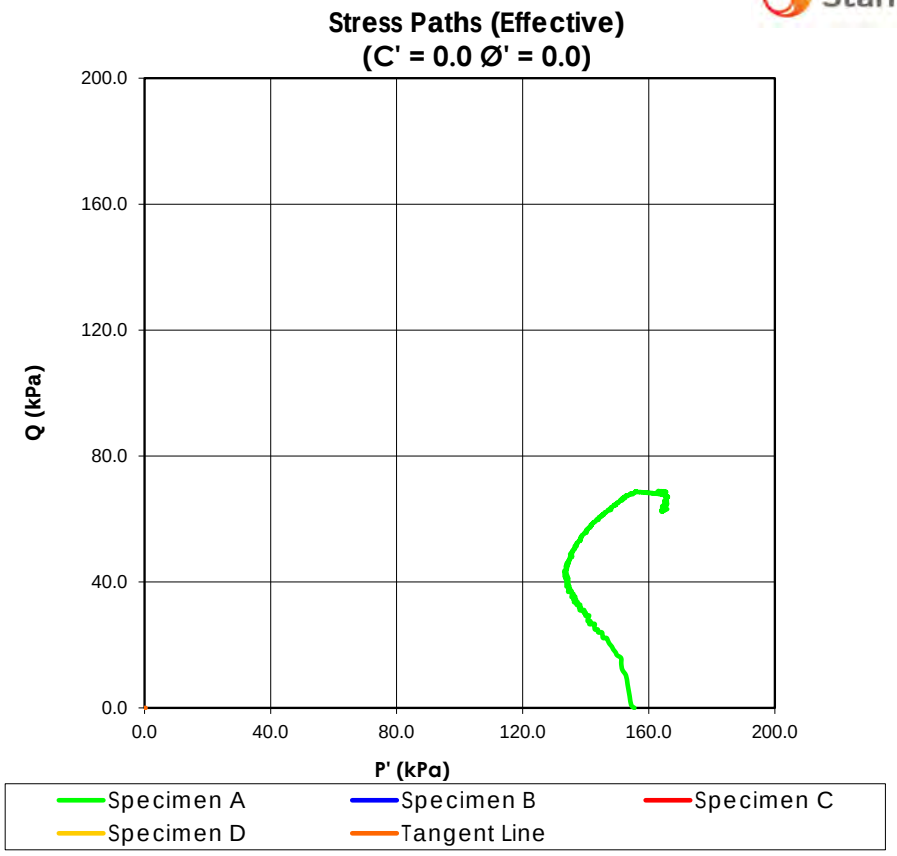
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 232.01 | | | |
| σ'3 at Failure (kPa) | 94.18 | | | |
| | | | | |
| | | | | |

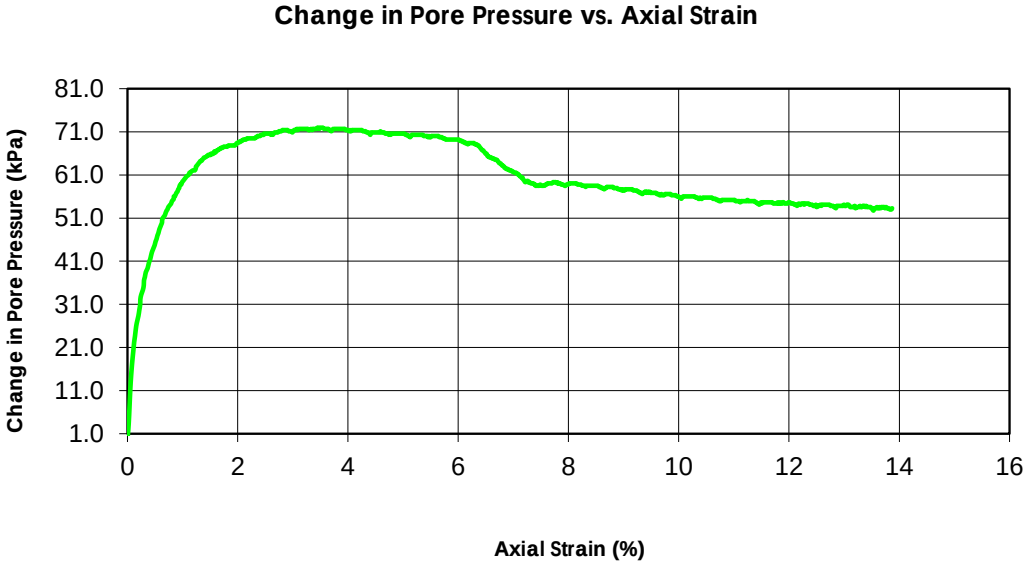
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.260 |
| **Boring Number:** | - |
| **Sample Number:** | H13 ST11 |
| **Depth:** | 7.6-8.1m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

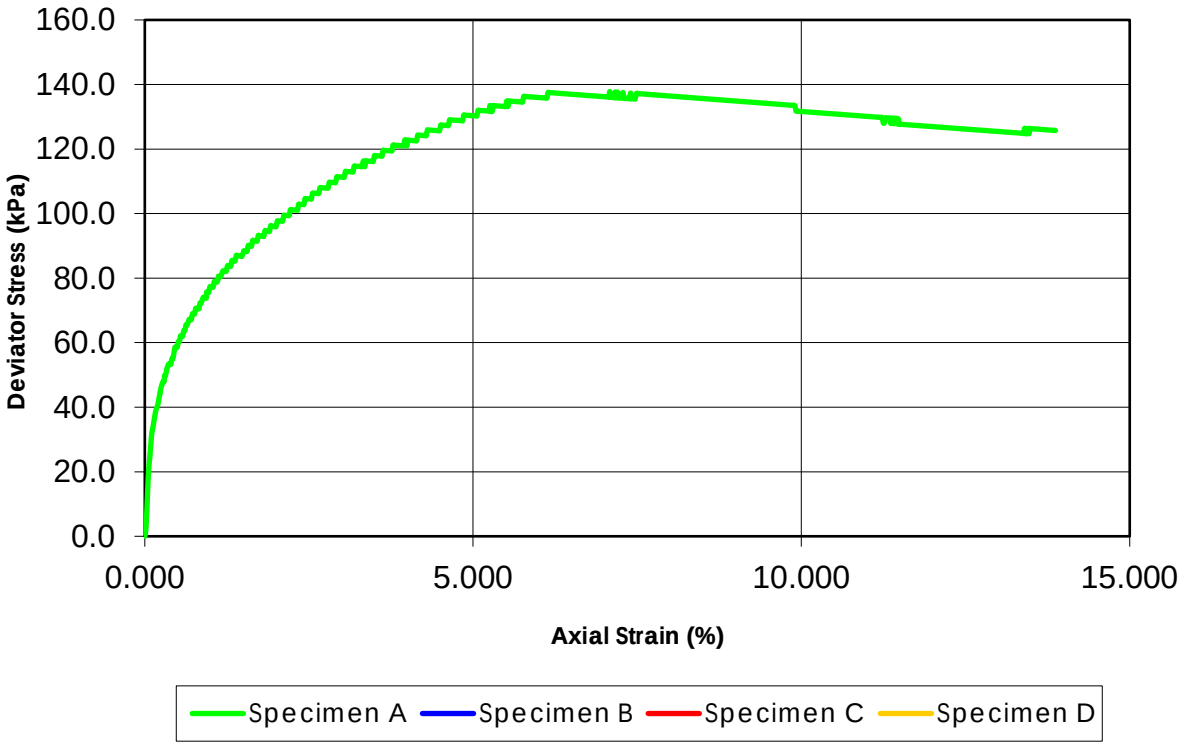
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

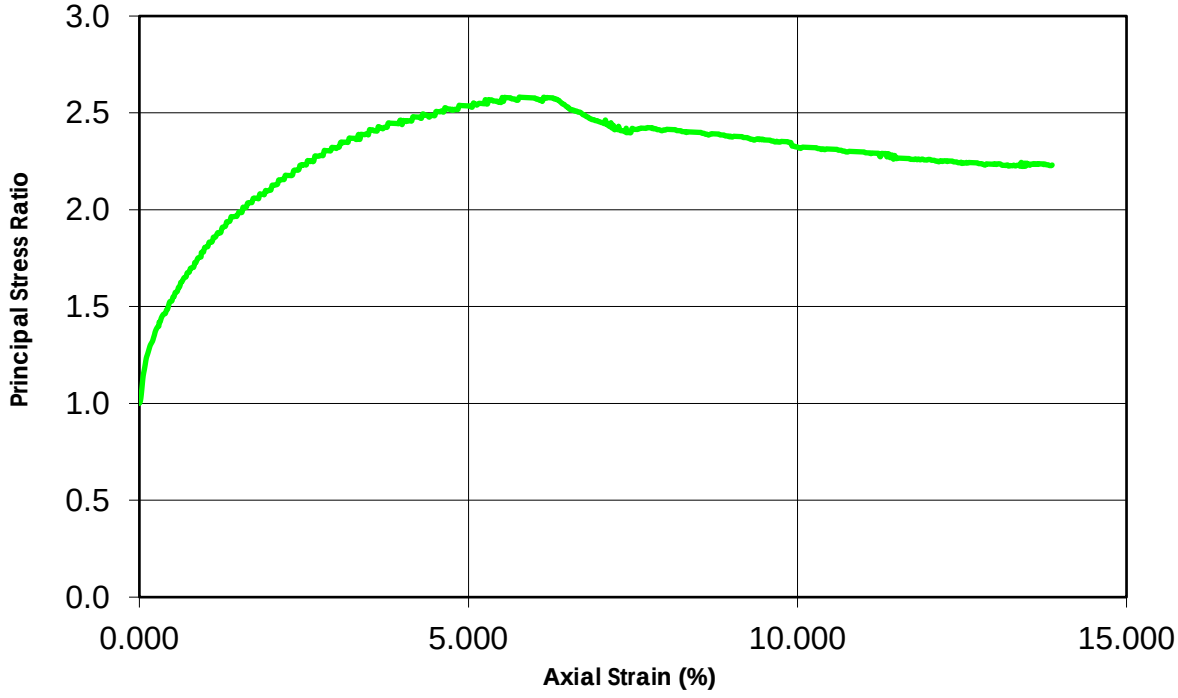


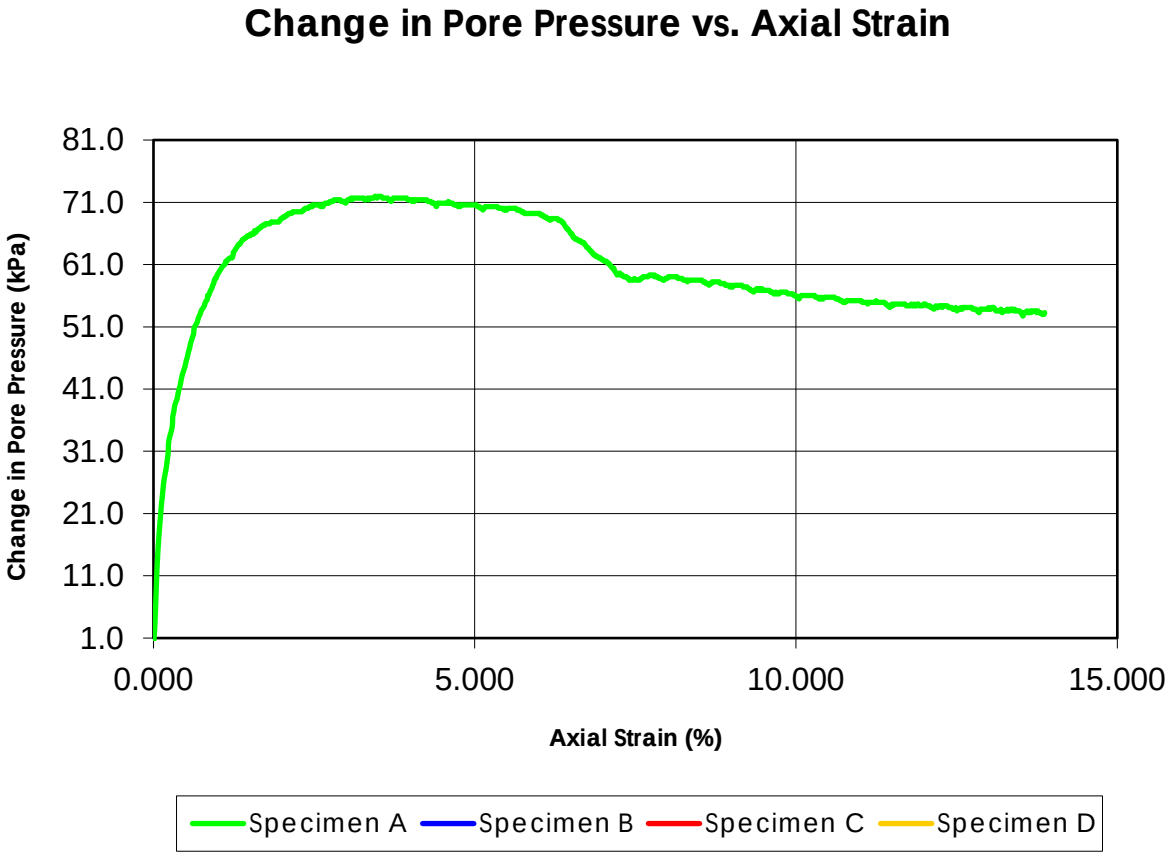



## Deviator Stress vs. Axial Strain



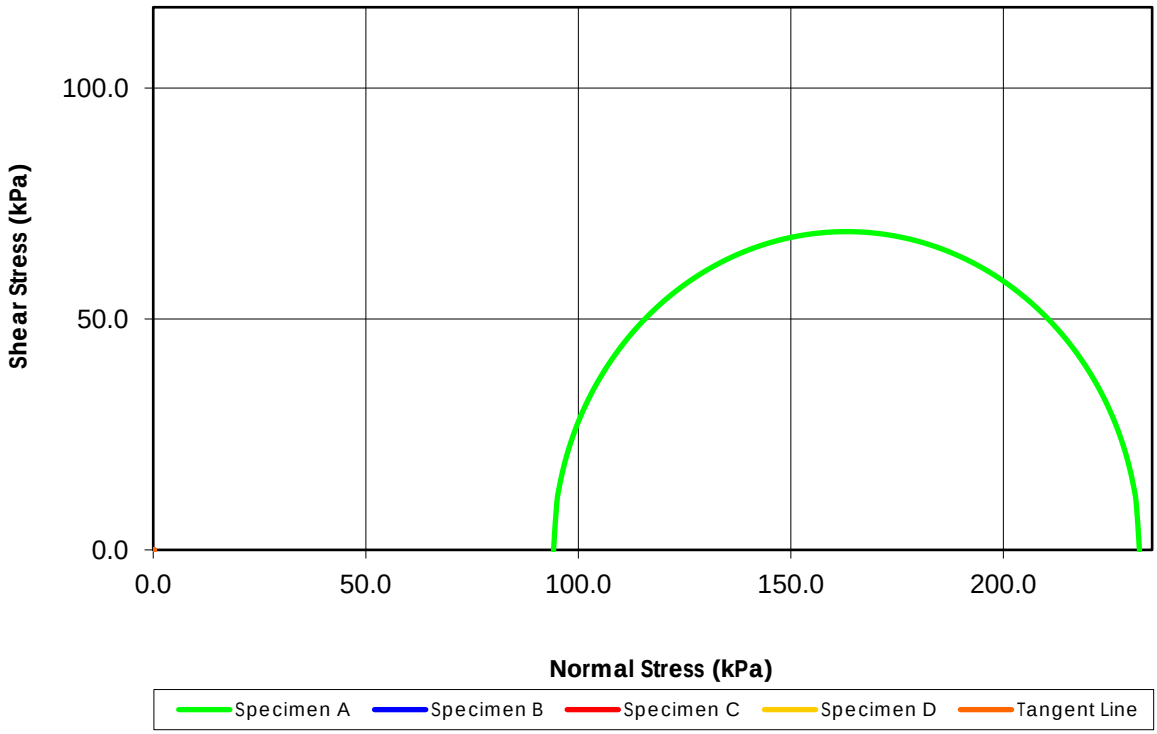

## Principal Stress Ratio vs. Axial Strain



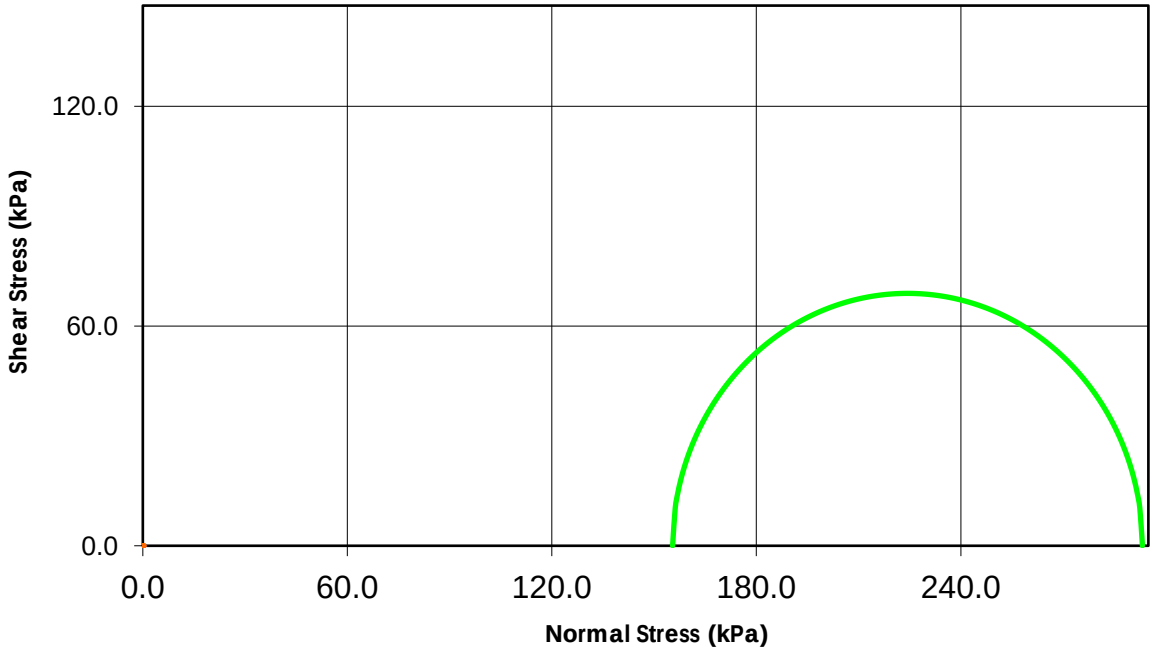

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
81.0
71.0
61.0
51.0
41.0
31.0
21.0
11.0
1.0
0.000
5.000
10.000
15.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

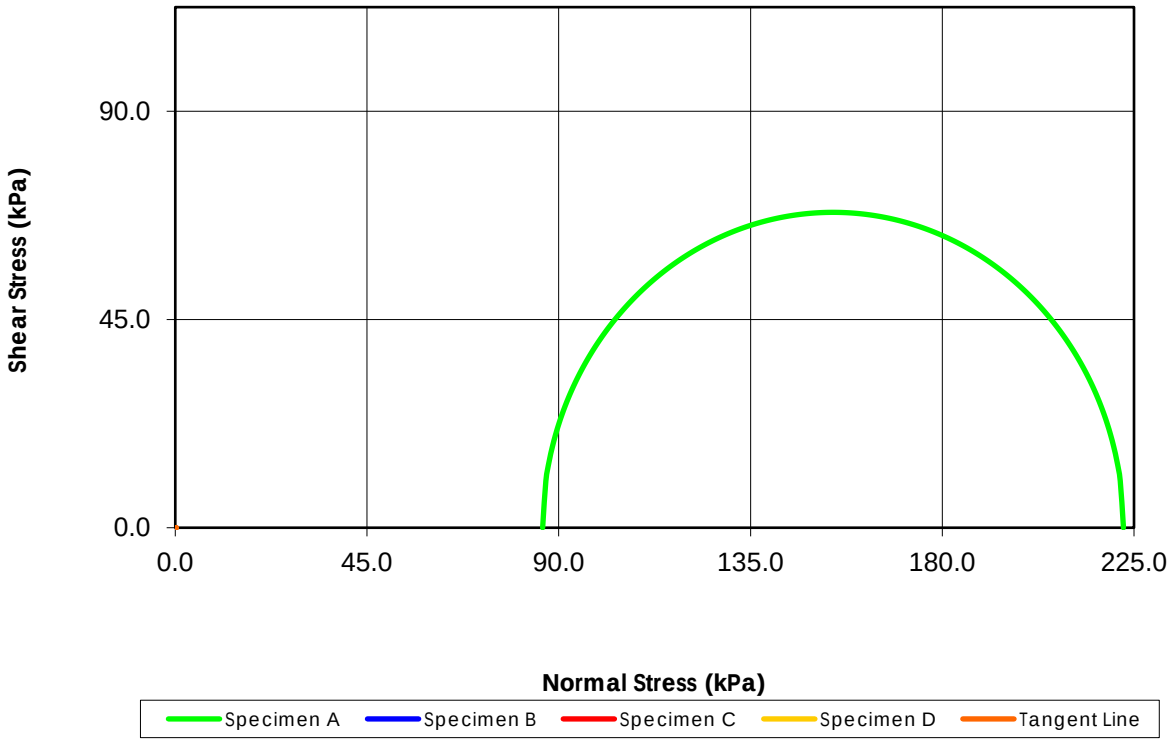



### Total Stress
### (C = 0.0 Ø = 0.0)

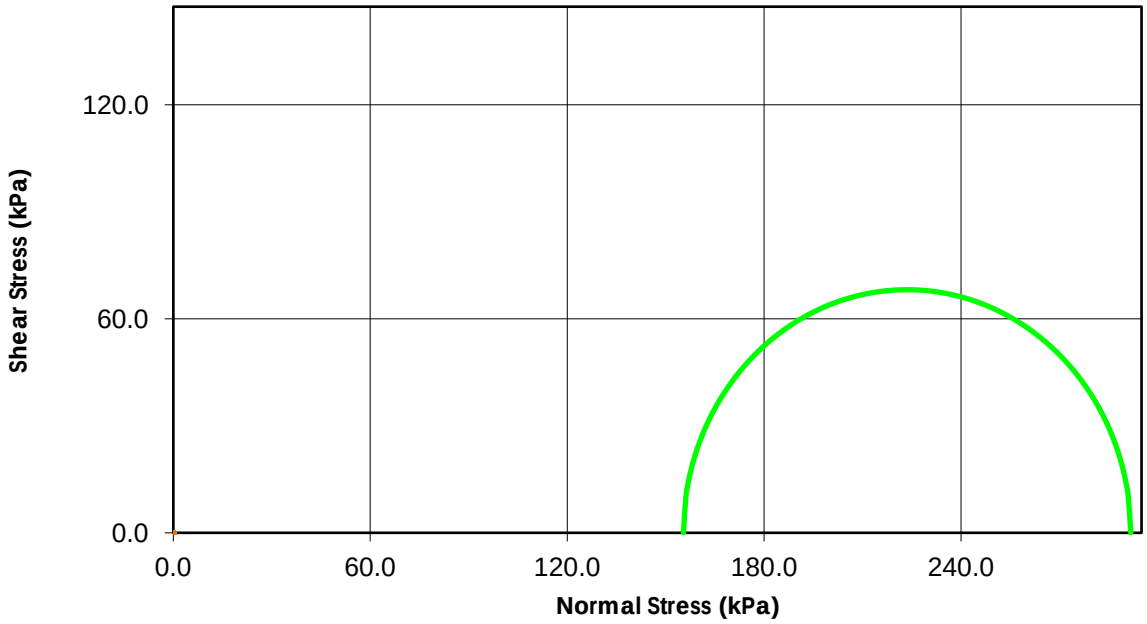


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

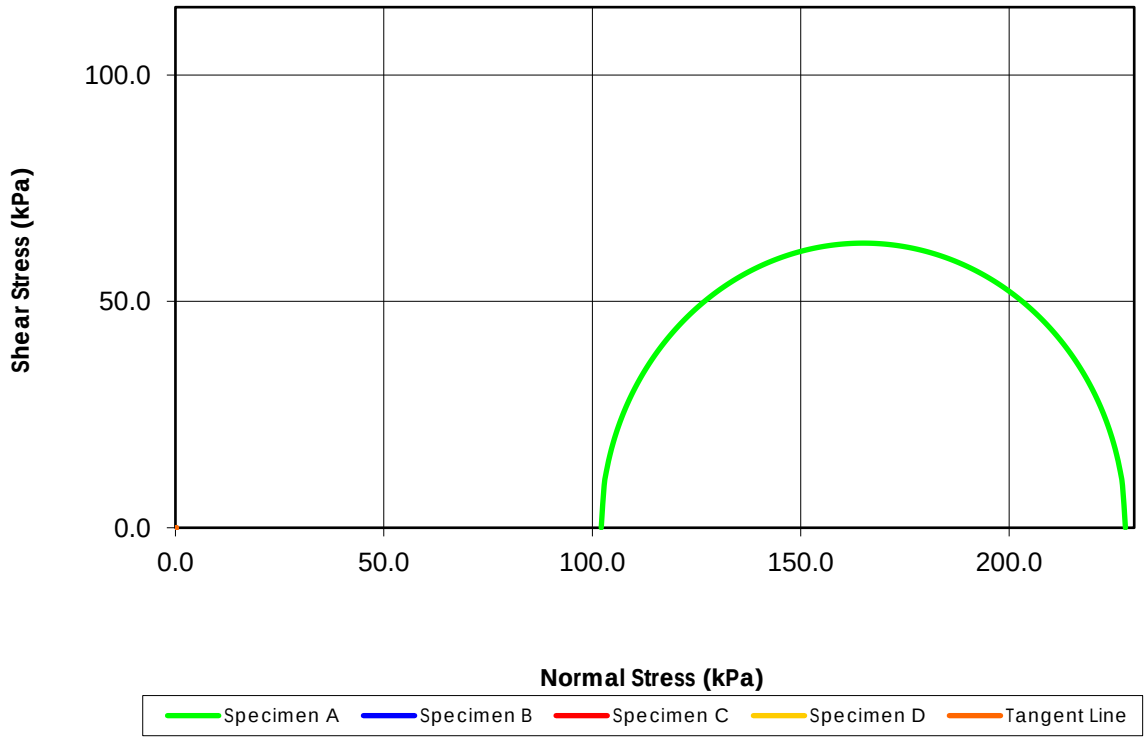



## Total Stress
## (C = 0.0 Ø = 0.0)

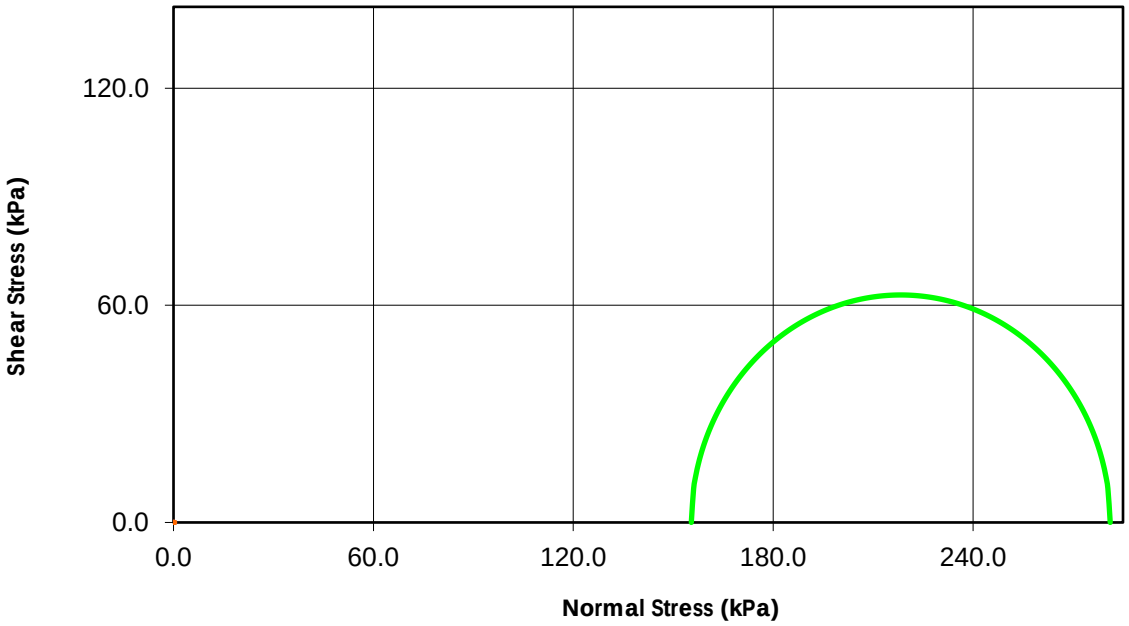


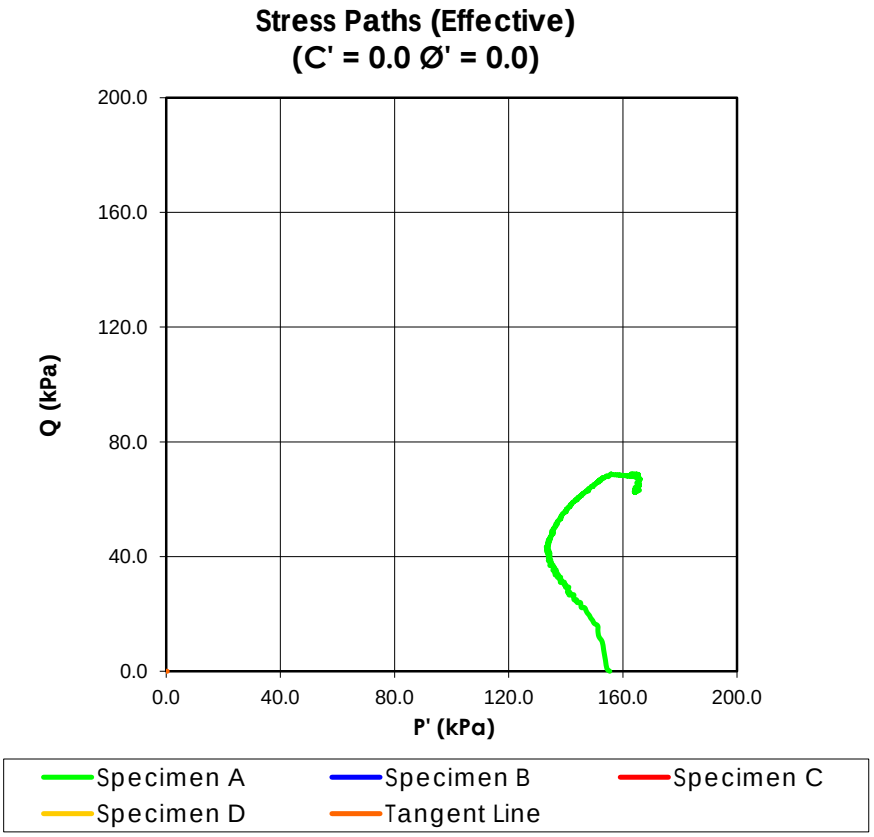
# Mohr Stress Circles at 15% Axial Strain Criterion

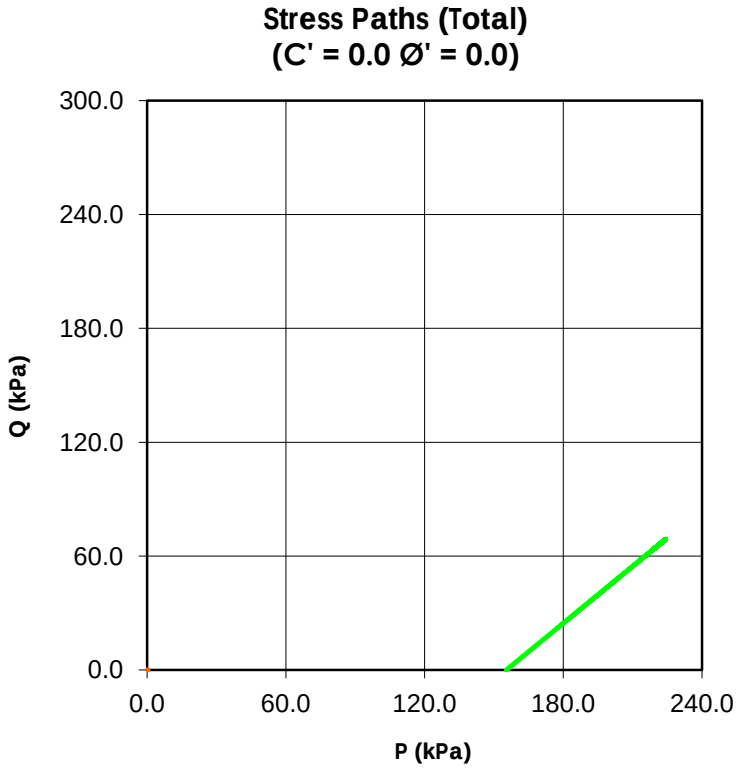
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

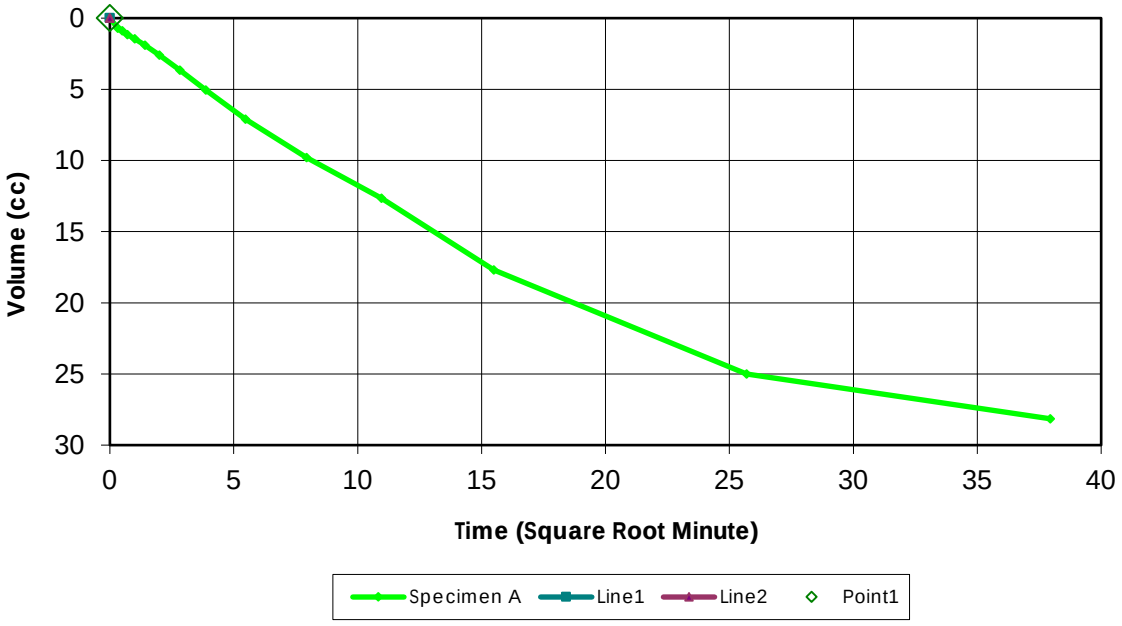



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
200.0
160.0
120.0
80.0
40.0
0.0
Q (kPa)
0.0
40.0
80.0
120.0
160.0
200.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

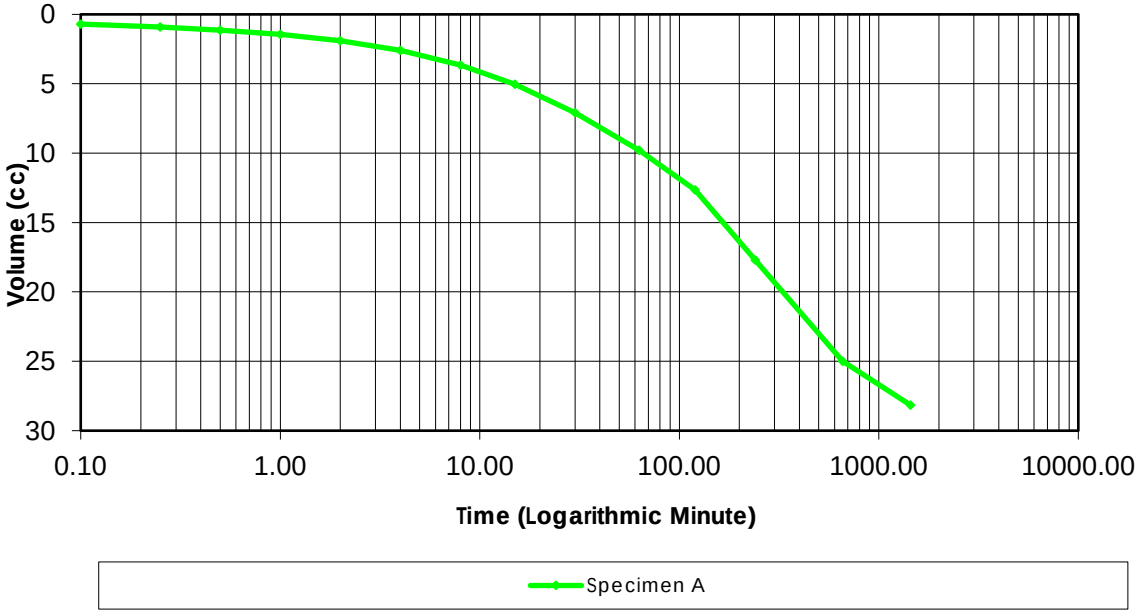

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 97

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 250.0 | 230.0 | N/A | N/A | N/A |
| 1 | 320.0 | 230.0 | 70.0 | 0.0 | 97.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.260

Project Name: SR1

Project Location:

Hole No. 0  Depth: 7.6-8.1m

| | |
|---|---|
| Cell Pressure (kPa) | 385 |
| Back Pressure (kPa) | 230 |
| Effective Pressure (kPa) | 155 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 71.4 |
| Initial Sample Height (mm) | 167.8 |
| Initial Sample Area (cm2) | 40.04 |
| Initial Volume (cm3) | 671.9 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 45.10 | N/A |
| 00:00:06 | 44.40 | 0.700 |
| 00:00:15 | 44.20 | 0.900 |
| 00:00:30 | 43.95 | 1.150 |
| 00:01:00 | 43.65 | 1.450 |
| 00:02:00 | 43.20 | 1.900 |
| 00:04:00 | 42.50 | 2.600 |
| 00:08:00 | 41.45 | 3.650 |
| 00:15:00 | 40.05 | 5.050 |
| 00:30:00 | 38.00 | 7.100 |
| 01:03:00 | 35.30 | 9.800 |
| 02:00:00 | 32.45 | 12.650 |
| 04:00:00 | 27.40 | 17.700 |
| 11:00:00 | 20.10 | 25.000 |
| 24:00:00 | 16.95 | 28.150 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

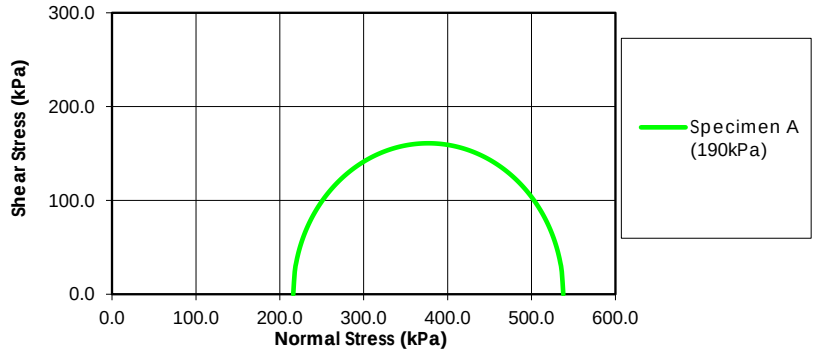
Stantec

Reviewed By: C. Lamoureux

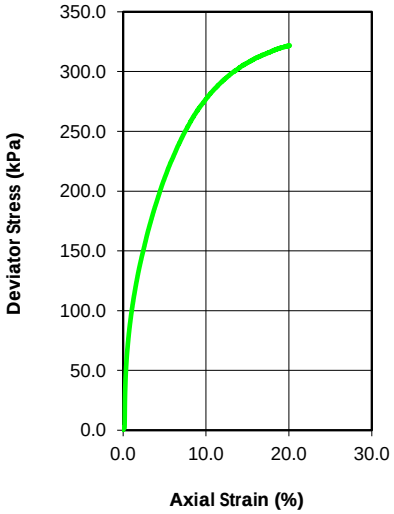
Date: 17-Oct-16

Tested By: C. Woods

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 13.5 | | | |
| Dry Density (g/cm3) | 1.958 | | | |
| Saturation (%) | 96.33 | | | |
| Void Ratio | 0.379 | | | |
| Diameter (mm) | 72.1 | | | |
| Height (mm) | 144.1 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 11.8 | | | |
| Dry Density (g/cm3) | 2.048 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.318 | | | |
| Effective Stress (kPa) | 184.3 | | | |
| Back Press. (kPa) | 275.7 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

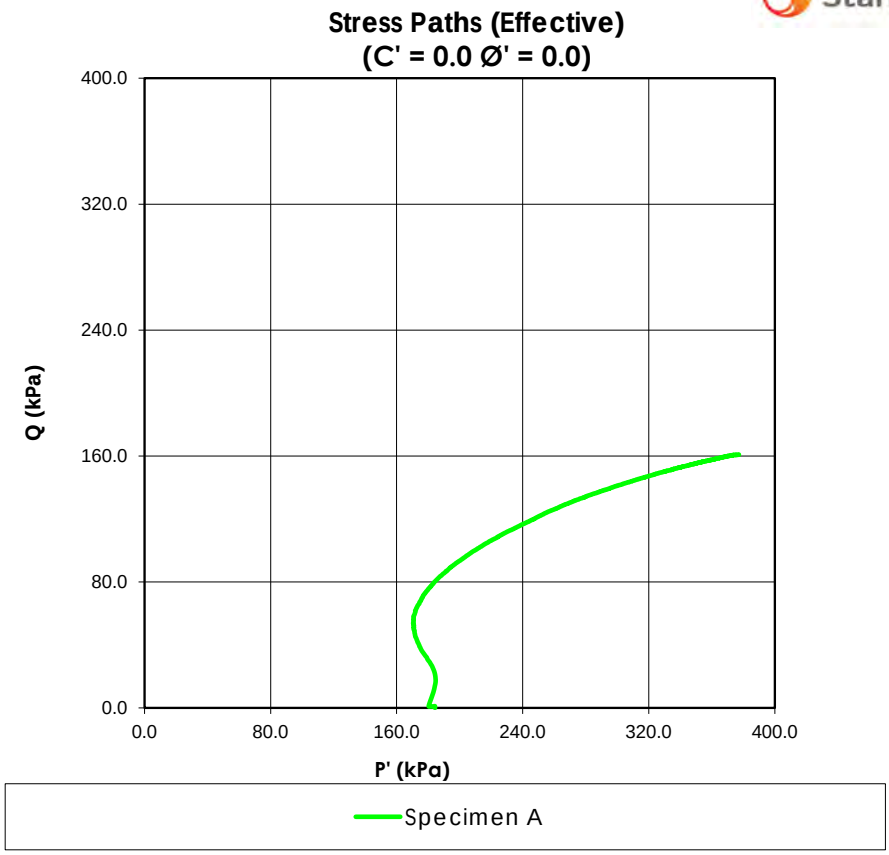
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 537.84 | | | |
| σ'3 at Failure (kPa) | 216.00 | | | |
| | | | | |
| | | | | |

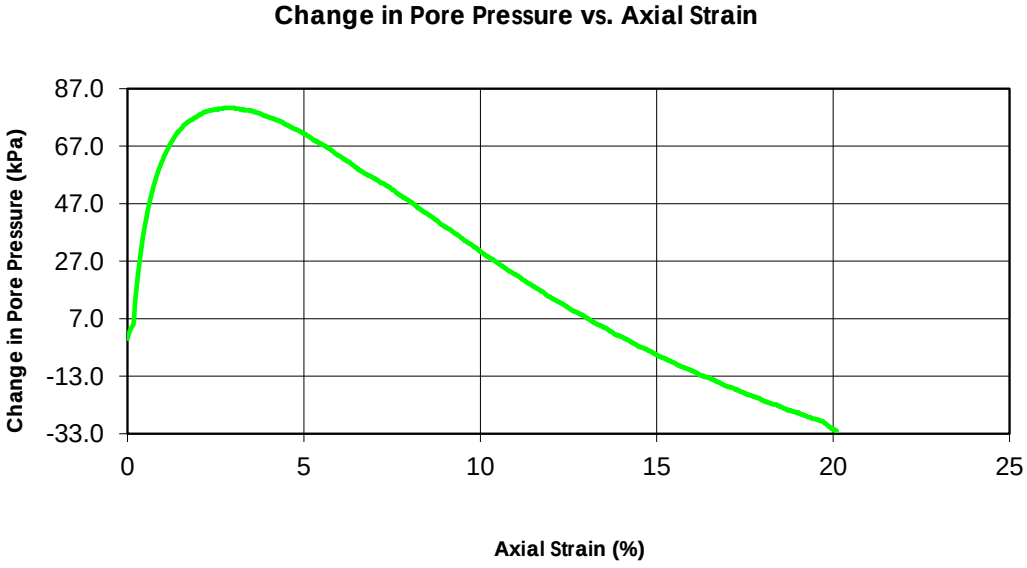
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.260 |
| **Boring Number:** | - |
| **Sample Number:** | H13 BSG |
| **Depth:** | 9.1-10.7m |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay, Trace Sand, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

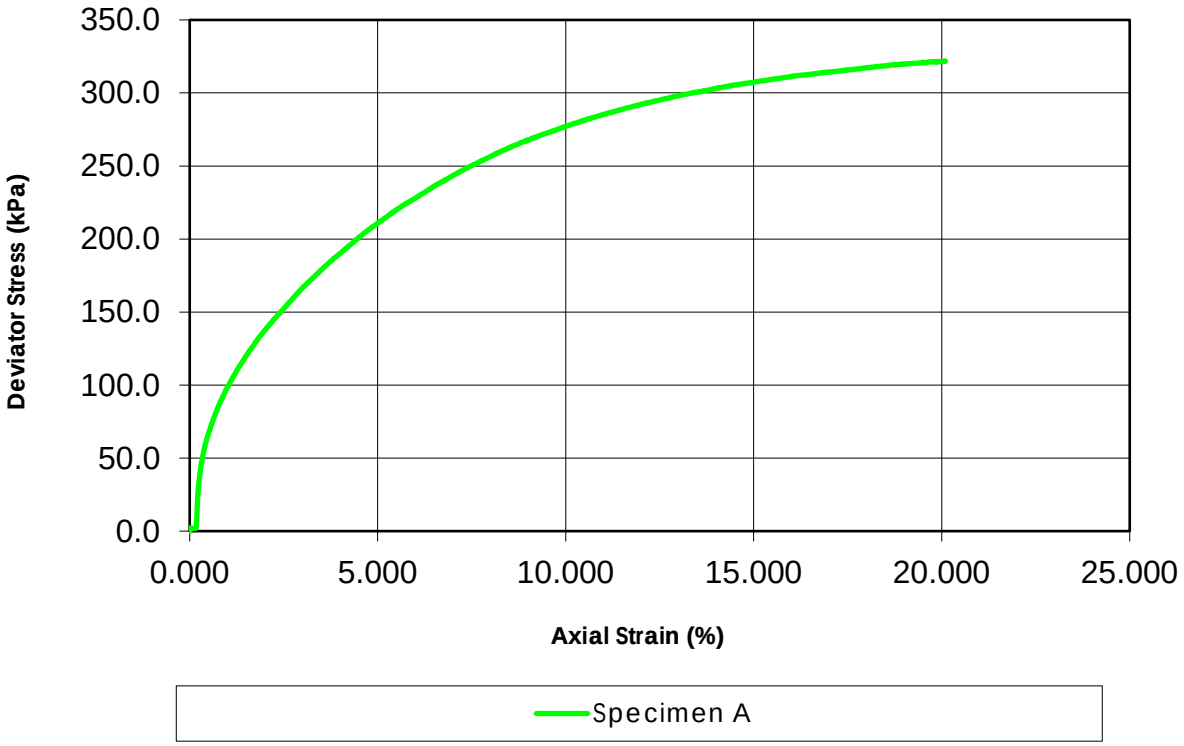
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

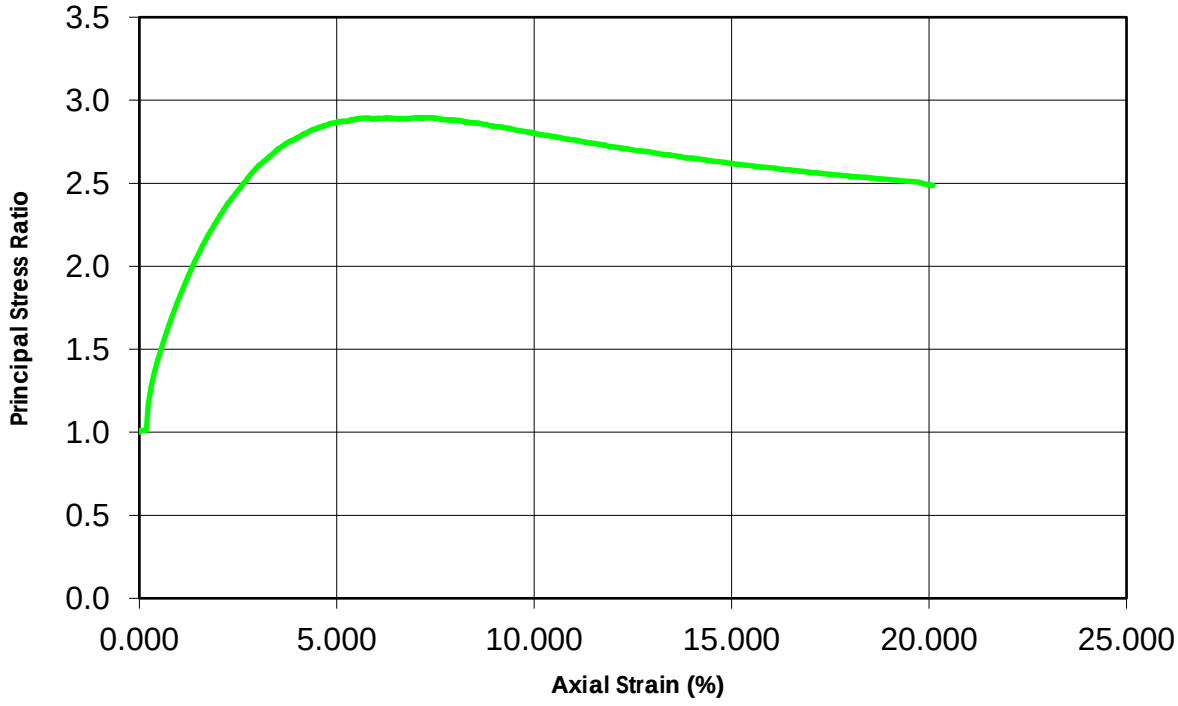


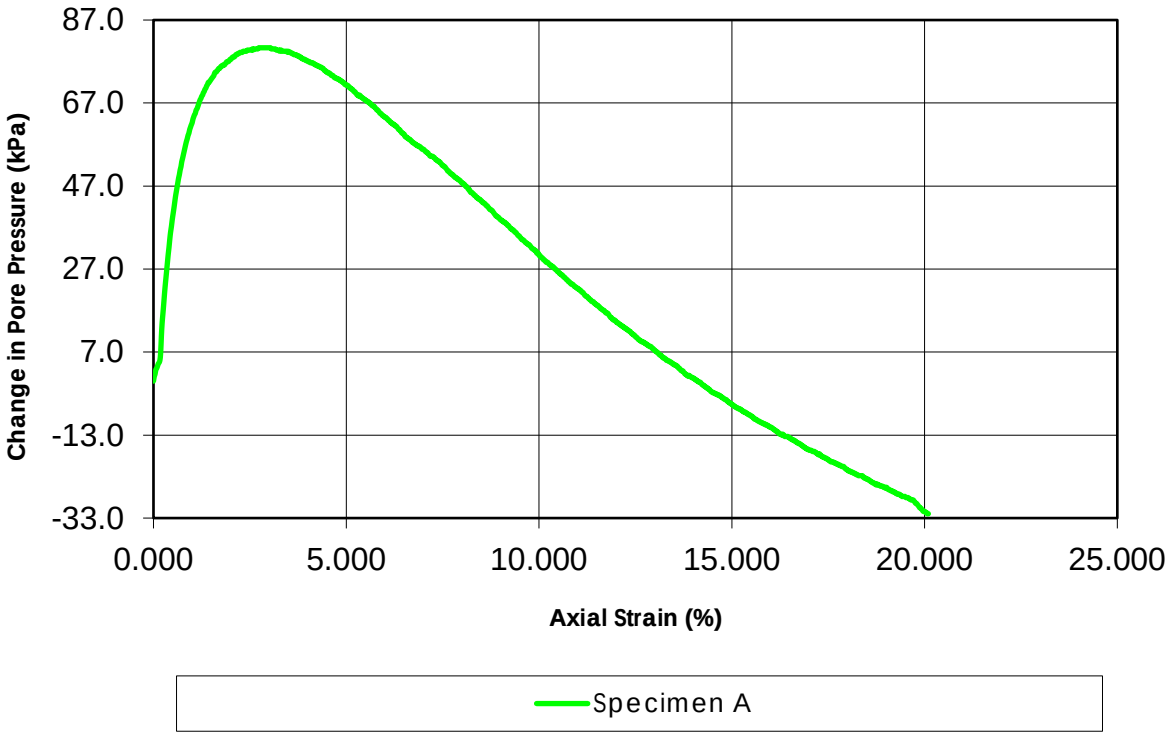
## Deviator Stress vs. Axial Strain




## Principal Stress Ratio vs. Axial Strain

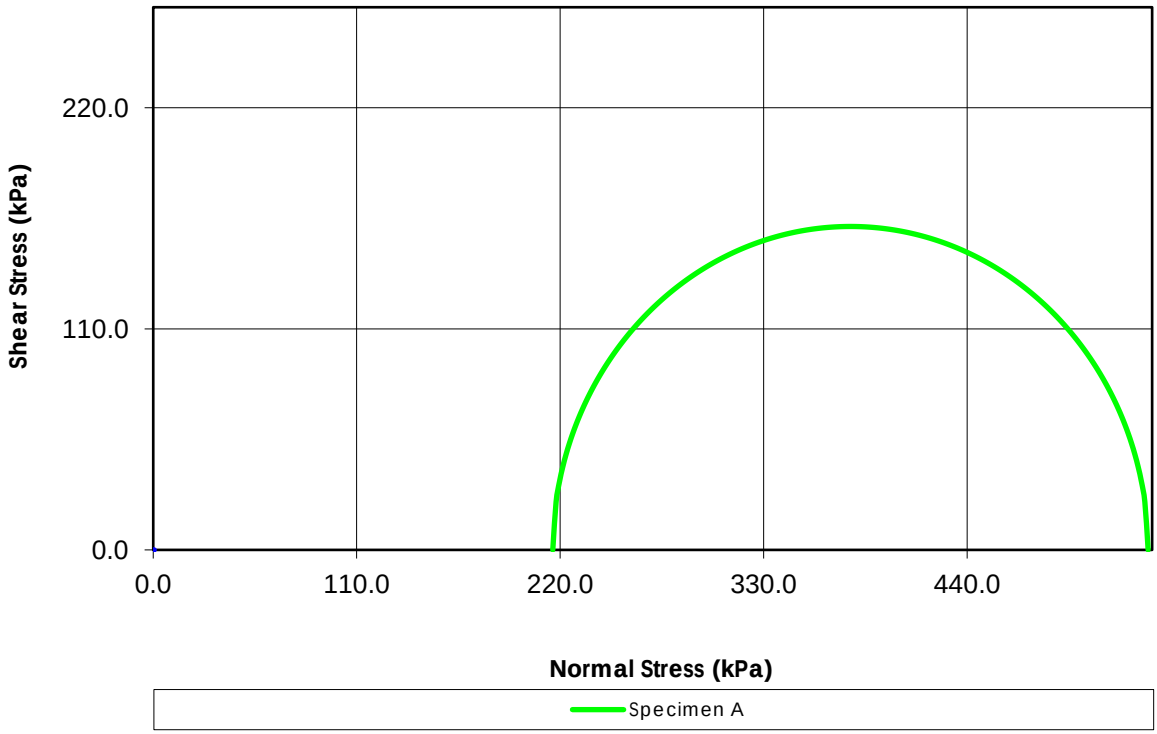


## Change in Pore Pressure vs. Axial Strain

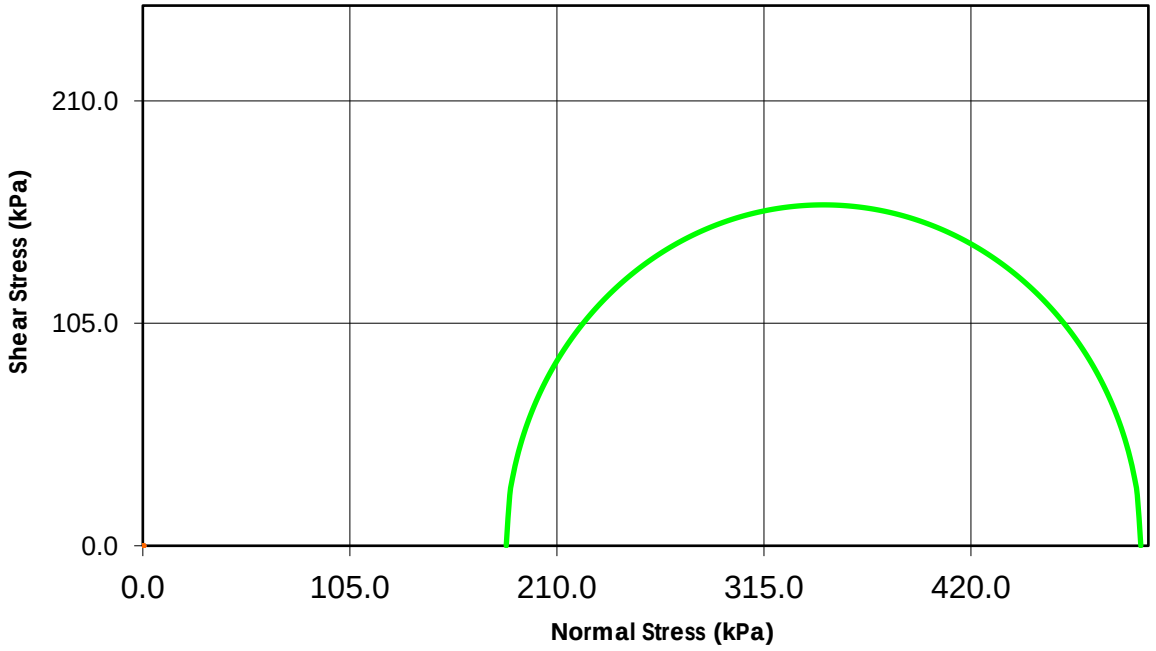


## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

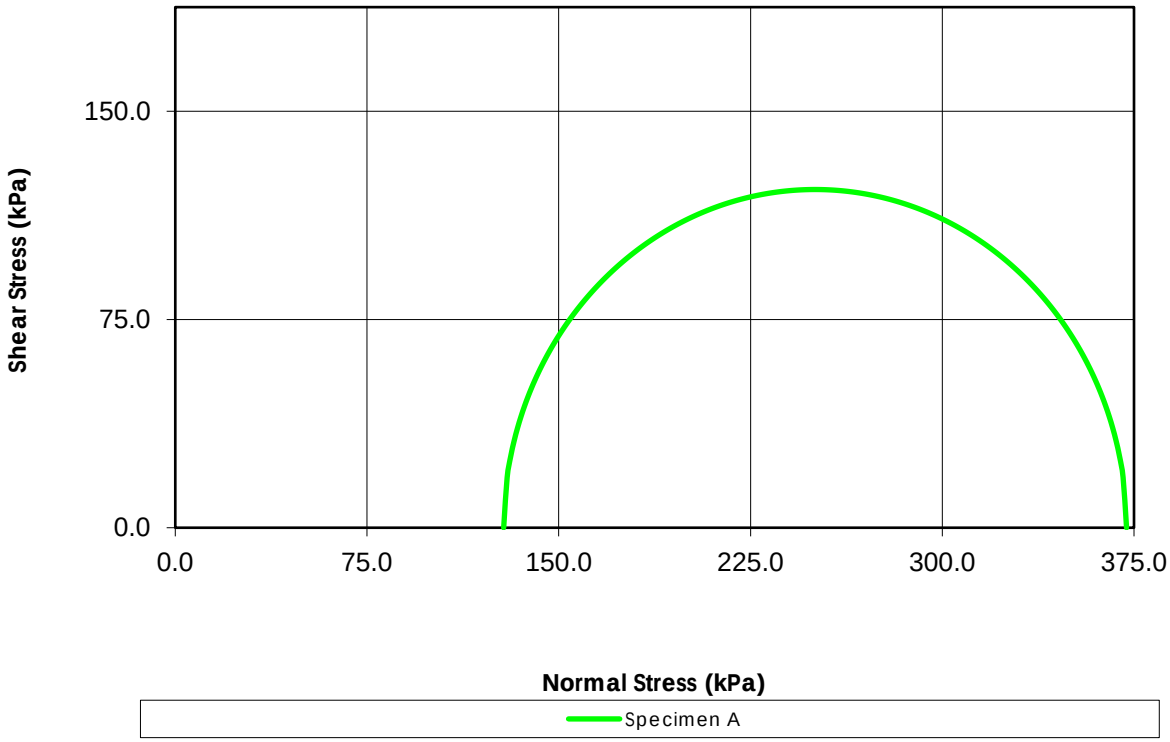



### Total Stress
### (C = 0.0 Ø = 0.0)

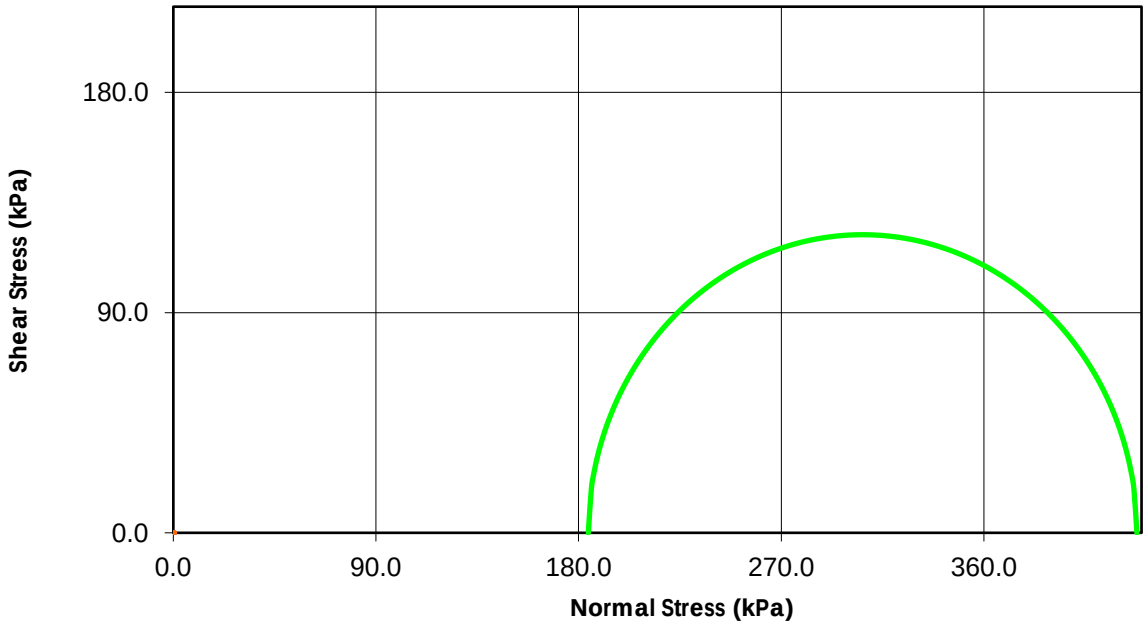


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

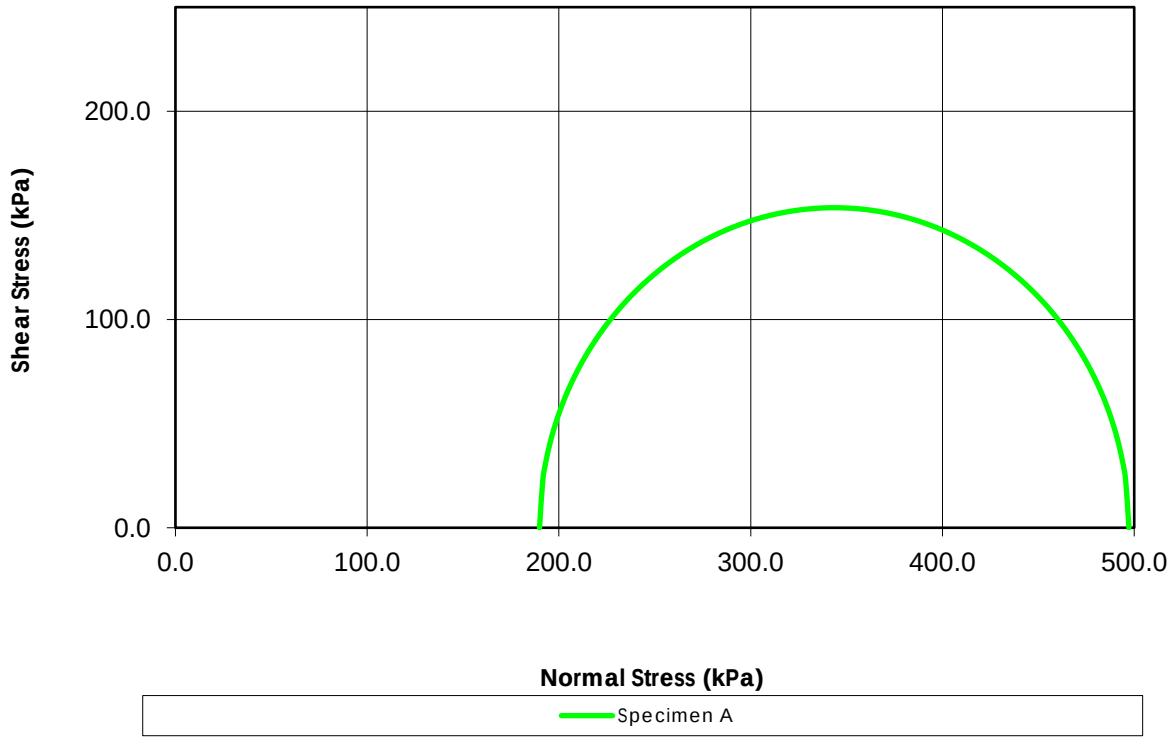



## Total Stress
## (C = 0.0 Ø = 0.0)

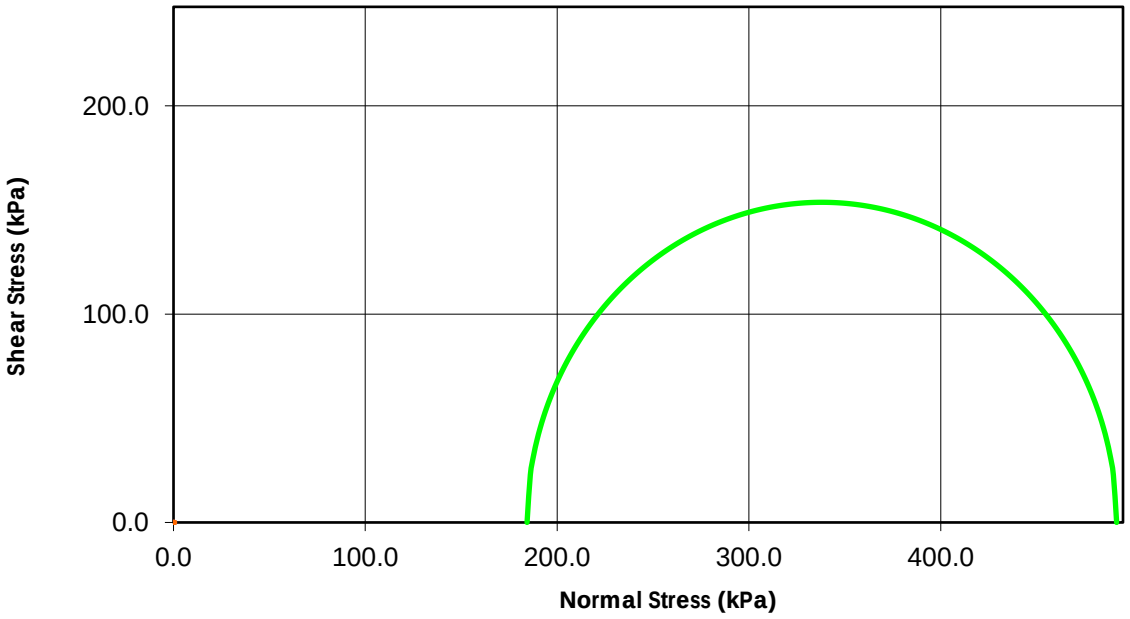


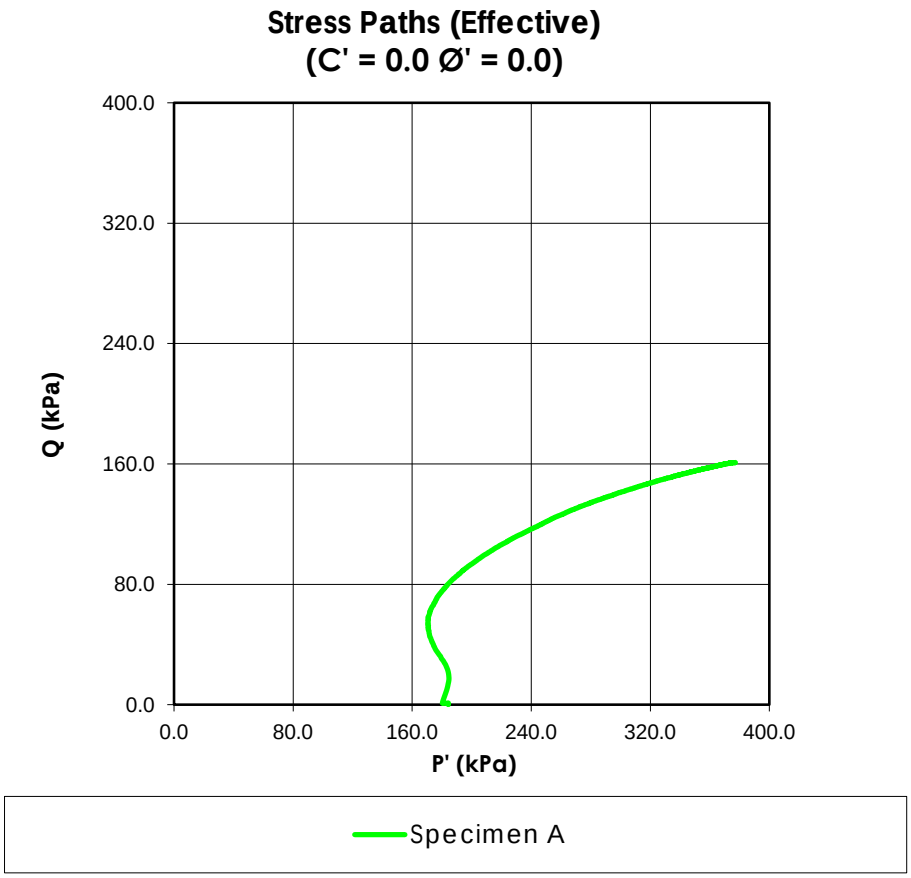
# Mohr Stress Circles at 15% Axial Strain Criterion

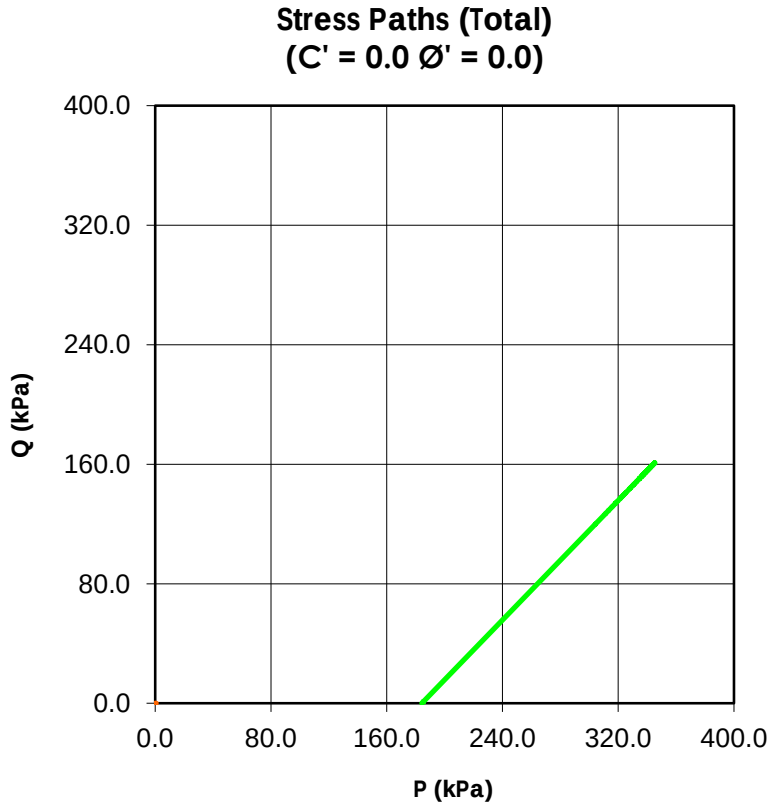
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

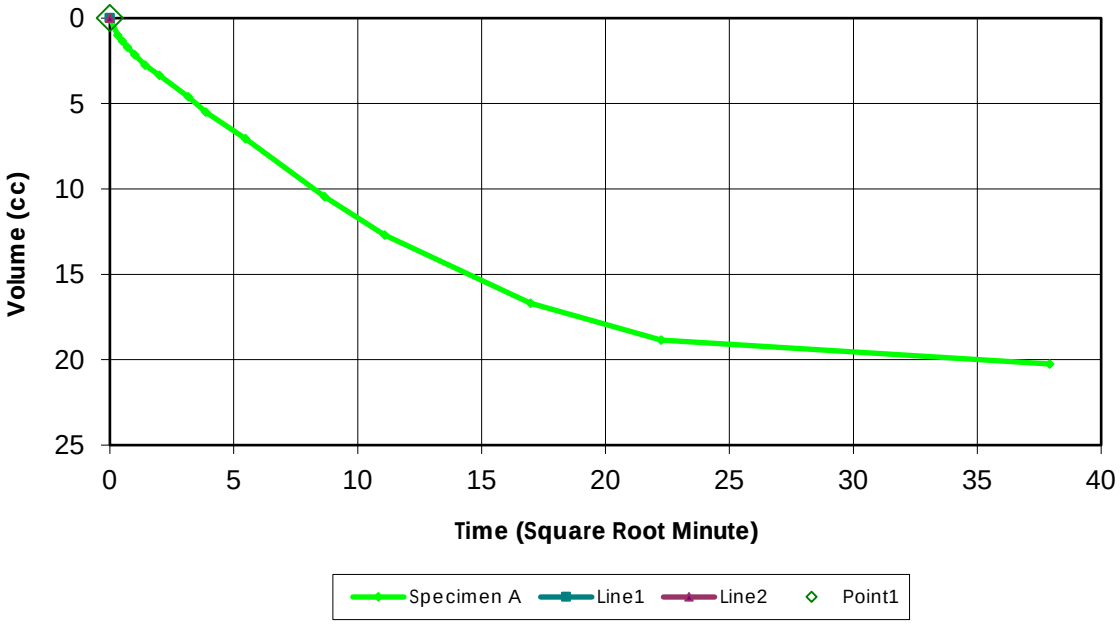



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P' (kPa)
Specimen A

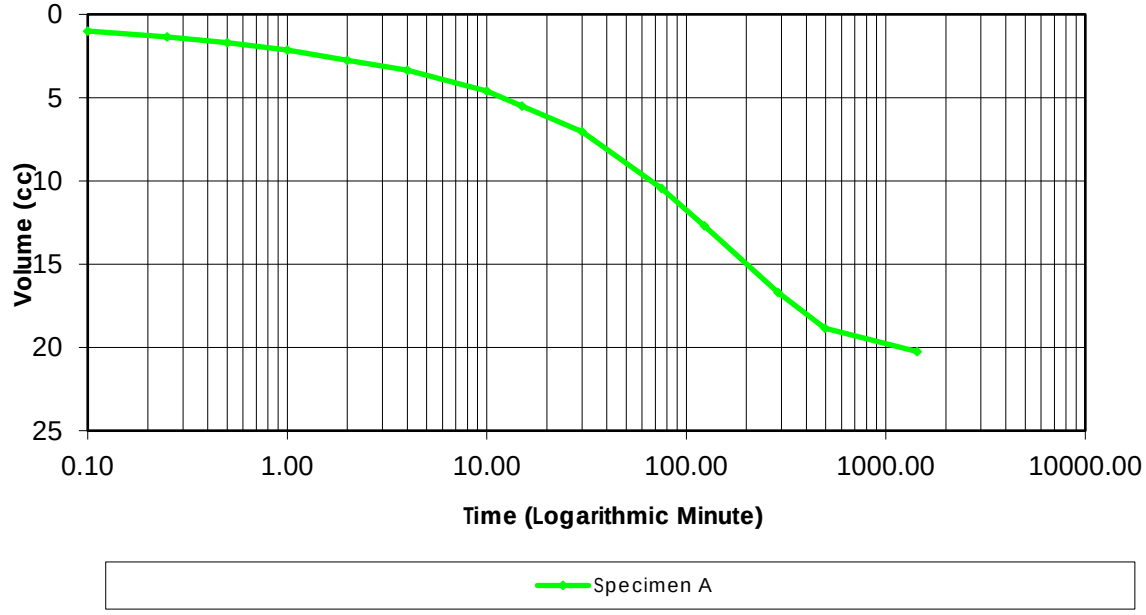

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
400.0
320.0
240.0
160.0
80.0
0.0
Q (kPa)
0.0
80.0
160.0
240.0
320.0
400.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Aberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.97

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 220.0 | 200.0 | N/A | N/A | N/A |
| 1 | 220.0 | 200.0 | 0.0 | 0.0 | |
| 2 | 290.0 | 200.0 | 70.0 | 0.0 | 90.00 |
| 3 | 290.0 | 270.0 | 0.0 | 70.0 | |
| 4 | 290.0 | 270.0 | 0.0 | 0.0 | |
| 5 | 360.0 | 270.0 | 70.0 | 0.0 | 97.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Aberta Transportation  Project No. 110773396.302.702.260

Project Name: SR1

Project Location:

Hole No. 0  Depth: 9.1-10.7m

| | |
|---|---|
| Cell Pressure (kPa) | 460 |
| Back Pressure (kPa) | 270 |
| Effective Pressure (kPa) | 190 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.1 |
| Initial Sample Height (mm) | 144.1 |
| Initial Sample Area (cm2) | 40.83 |
| Initial Volume (cm3) | 588.3 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 47.05 | N/A |
| 00:00:06 | 46.05 | 1.000 |
| 00:00:15 | 45.70 | 1.350 |
| 00:00:30 | 45.35 | 1.700 |
| 00:01:00 | 44.90 | 2.150 |
| 00:02:00 | 44.30 | 2.750 |
| 00:04:00 | 43.70 | 3.350 |
| 00:10:00 | 42.45 | 4.600 |
| 00:15:00 | 41.55 | 5.500 |
| 00:30:00 | 40.00 | 7.050 |
| 01:15:00 | 36.60 | 10.450 |
| 02:03:00 | 34.35 | 12.700 |
| 04:48:00 | 30.35 | 16.700 |
| 08:15:00 | 28.20 | 18.850 |
| 23:58:00 | 26.80 | 20.250 |
| | | |

Laboratory Supervisor

# Stantec Consulting Ltd.

## Consolidated Undrained Triaxial Test (ASTM D4767)

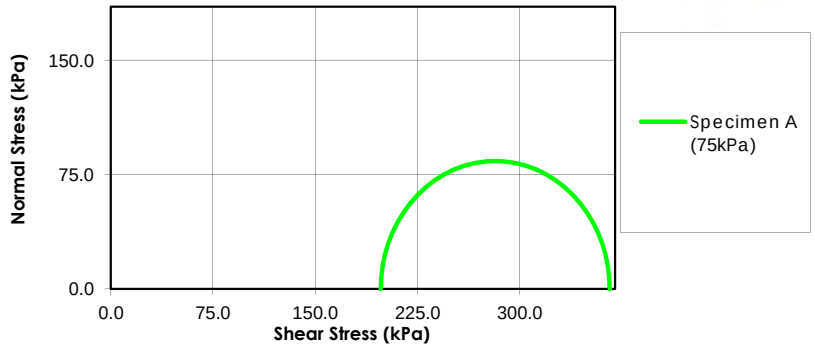
Stantec

Reviewed By C.Lamoureux

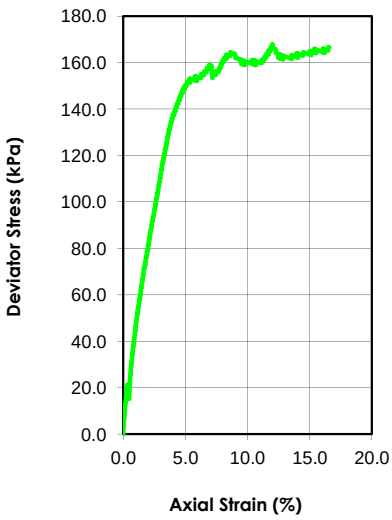
Date: 2-Oct-16

Tested By: C.Tollifson

### Effective Stress at Maximum Deviator Stress Criterion




### Deviator Stress Vs. Axial Strain




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 23.5 | | | |
| Dry Density (g/cm3) | 1.630 | | | |
| Saturation (%) | 96.66 | | | |
| Void Ratio | 0.653 | | | |
| Diameter (mm) | 72.3 | | | |
| Height (mm) | 155.8 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.99 | | | |
| Water Content (%) | 23.0 | | | |
| Dry Density (g/cm3) | 1.680 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.607 | | | |
| Effective Stress (kPa) | 205.2 | | | |
| Back Press. (kPa) | 69.8 | | | |
| Rate of Strain | 0.018 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 365.94 | | | |
| σ'3 at Failure (kPa) | 198.11 | | | |
| | | | | |
| | | | | |

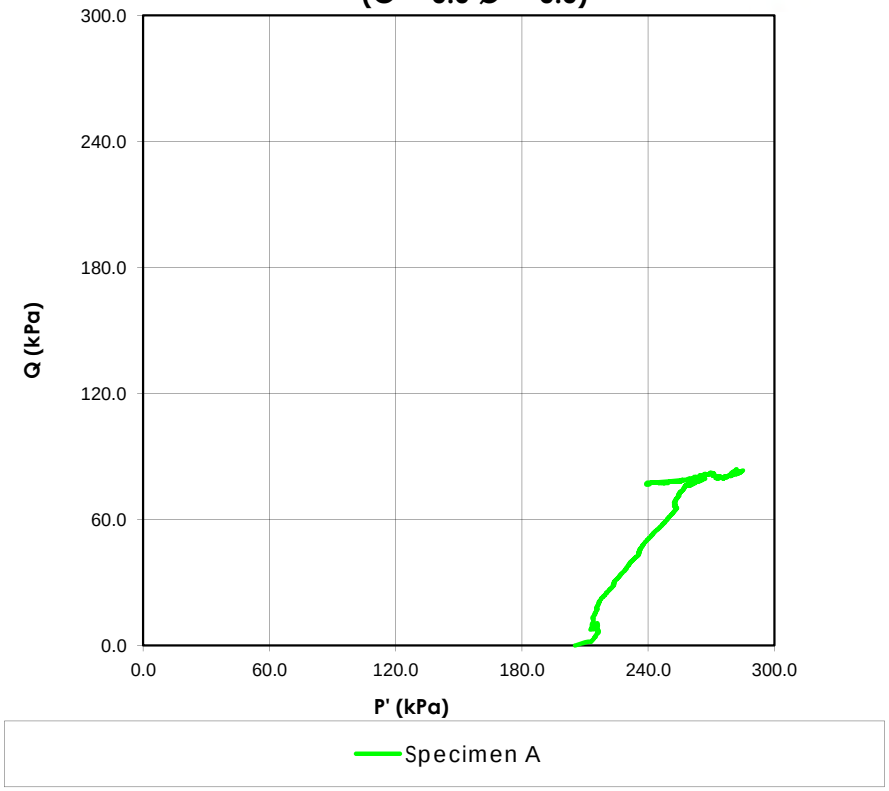
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.260 |
| **Boring Number:** | - |
| **Sample Number:** | H12 ST5 |
| **Depth:** | 3.5-4.0m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay Trace Sand |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

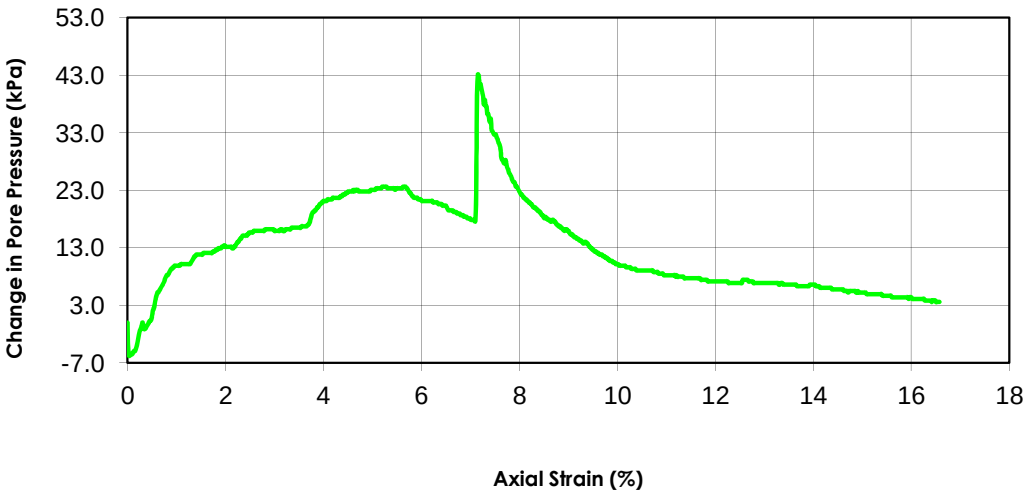
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

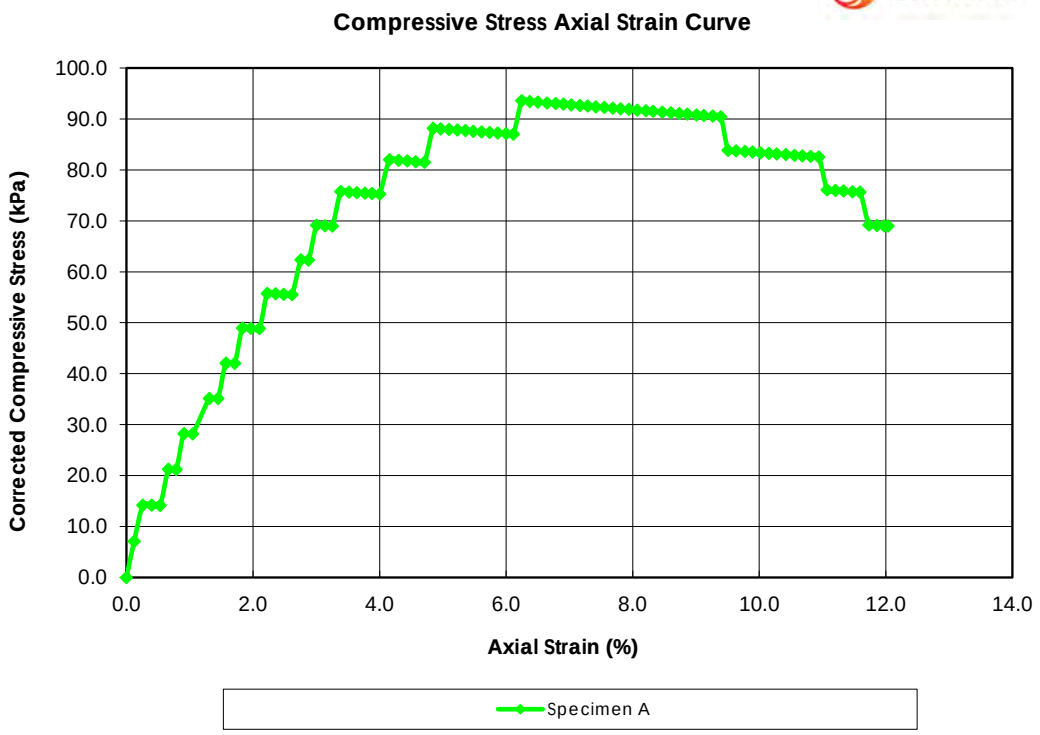
### Unconfined Compression Test Report (ASTM D2166)

Stantec

Reviewed By: C. Lamoureux

Date: 13-Oct-16

Tested By: C. Woods




| Before Test | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 25.4 | | | |
| Dry Density (g/cm3) | 1.548 | | | |
| Saturation (%) | 92.31 | | | |
| Void Ratio | 0.74 | | | |
| Diameter (mm) | 72.1 | | | |
| Height (mm) | 128.2 | | | |
| **Test Data** | **A** | **B** | **C** | **D** |
| Unconfined Strength (kPa) | 93.582 | | | |
| Undrained Shear Strength (kgf/cm^2) | 0.477 | | | |
| Undrained Shear Strength | 46.791 | | | |
| Rate of Strain (mm/min) | 2.00 | | | |
| Strain at Failure (%) | 6.25 | | | |
| Description | Brown Clay | | | |

| Project Information | | Specimen Description | |
|---|---|---|---|
| Project Num | 110773396.302.702.260 | Specimen A | Brown Clay |
| Project | SR1 | Specimen B | |
| Samp. Date | 23-Aug-16 | Specimen C | |
| Sample # | H13 ST6 | Specimen D | |
| Client | Alberta Transportation | **Test Variables** | |
| | | Specific Gravity | 2.70 |
| | | Liquid Limit: | |
| | | Plastic Limit: | |

Remarks

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Calgary, Alberta
Canada T2C 1G4
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Fax: (403) 253-0021

# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C. Oost |
| Project Name | SR1 | Date Tested | 13-Oct-16 |
| Project Number | 110773396.302.702.260 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | H12 | **Sample ID:** | RC32 |
| **Depth (m):** | 28.94 | **Moisture Conent (%):** | 7.4 |
| **Sample Diameter (cm):** | 6.08 | **Sample Weight (g):** | 860.6 |
| **Load Rate (MPa/sec):** | 0.58 | **Sample Length (cm):** | 12.52 |
| **Peak Load (kN):** | 11.18 | **Unit Weight (kg/m3):** | 2368 |
| **Compressive Stregth (MPa):** | 38.51 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | H12 | **Sample ID:** | RC27 |
| **Depth (m):** | 21.12 | **Moisture Conent (%):** | 5.9 |
| **Sample Diameter (cm):** | 6.06 | **Sample Weight (g):** | 913.6 |
| **Load Rate (MPa/sec):** | 0.54 | **Sample Length (cm):** | 13.20 |
| **Peak Load (kN):** | 23.47 | **Unit Weight (kg/m3):** | 2400 |
| **Compressive Stregth (MPa):** | 81.37 | | |



Reviewed by: 

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# Unconfined Compressive Strength - Rock Cores

| | | | |
|---|---|---|---|
| Client | Alberta Transportation | Tested By | C. Oost |
| Project Name | SR1 | Date Tested | 13-Oct-16 |
| Project Number | 110773396.302.702.260 | | |

| | | | |
|---|---|---|---|
| **Borehole:** | H13 | **Sample ID:** | RC24 |
| **Depth (m):** | 20.65 | **Moisture Conent (%):** | 7.4 |
| **Sample Diameter (cm):** | 6.06 | **Sample Weight (g):** | 754.8 |
| **Load Rate (MPa/sec):** | 0.34 | **Sample Length (cm):** | 11.00 |
| **Peak Load (kN):** | 15.41 | **Unit Weight (kg/m3):** | 2379 |
| **Compressive Stregth (MPa):** | 53.43 | | |



Reviewed by: _____

# E. 6
## Borrow Source

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 12, 2016 |
| Date Tested: | October 6, 2016 |
| Tested By: | E.Farries |

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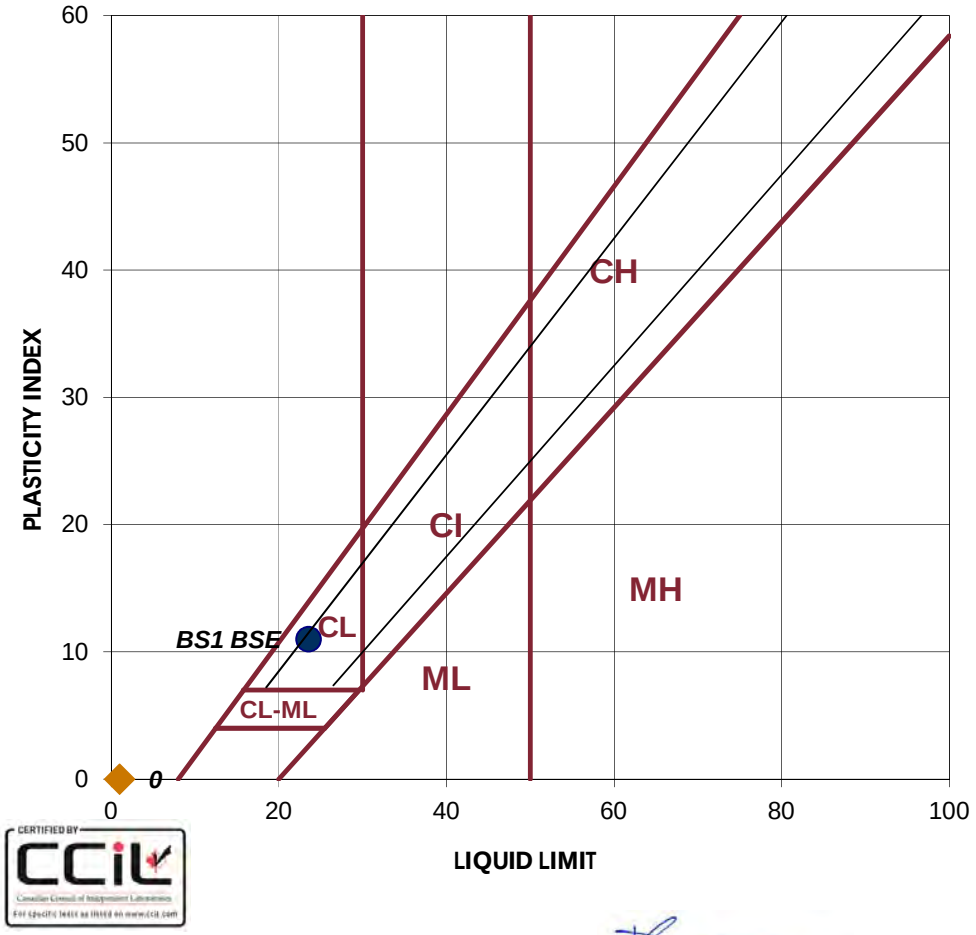
**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS1 BSE | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 26 | Number of Blows | | |
| | | Container Number | | |
| 27.02 | 32.20 | Wt. Sample (wet+tare)(g) | | |
| 22.18 | 26.39 | Wt. Sample (dry+tare)(g) | | |
| 1.55 | 1.51 | Wt. Tare (g) | | |
| 20.6 | 24.9 | Wt. Dry Soil (g) | | |
| 4.8 | 5.8 | Wt. Water (g) | | |
| 23.5% | 23.4% | Water Content (%) | | |
| 23.6% | 23.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.09 | 22.61 | Wt. Sample (wet+tare)(g) | | |
| 21.99 | 21.6 | Wt. Sample (dry+tare)(g) | | |
| 13.89 | 13.9 | Wt. Tare (g) | | |
| 8.1 | 7.7 | Wt. Dry Soil (g) | | |
| 1.1 | 1.0 | Wt. Water (g) | | |
| 13.6% | 13.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 24 | | LL | |
| PL | 13 | | PL | |
| PI | 11 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL*** | | | ***NON-PLASTIC*** | |






Reviewed By:

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 12, 2016 |
| Date Tested: | October 28, 2016 |
| Tested By: | C. Woods |


**OFFICE**
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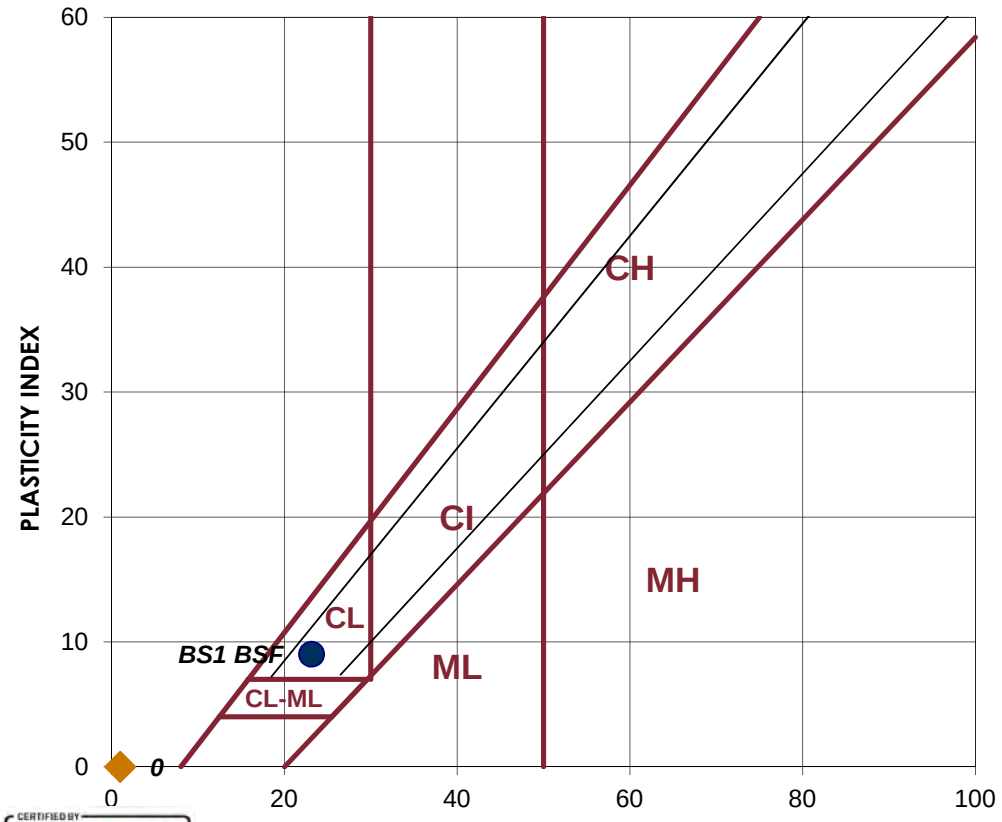
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS1 BSF | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 26 | Number of Blows | | |
| | | Container Number | | |
| 31.37 | 29.25 | Wt. Sample (wet+tare)(g) | | |
| 25.75 | 24.07 | Wt. Sample (dry+tare)(g) | | |
| 1.54 | 1.46 | Wt. Tare (g) | | |
| 24.2 | 22.6 | Wt. Dry Soil (g) | | |
| 5.6 | 5.2 | Wt. Water (g) | | |
| 23.2% | 22.9% | Water Content (%) | | |
| 23.3% | 23.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.6 | 26.93 | Wt. Sample (wet+tare)(g) | | |
| 24.16 | 25.35 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.91 | Wt. Tare (g) | | |
| 10.4 | 11.4 | Wt. Dry Soil (g) | | |
| 1.4 | 1.6 | Wt. Water (g) | | |
| 13.9% | 13.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | |
| PL | 14 | | PL | |
| PI | 9 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 11, 2016 |
| Date Tested: | September 30, 2016 |
| Tested By: | B.Pelkey |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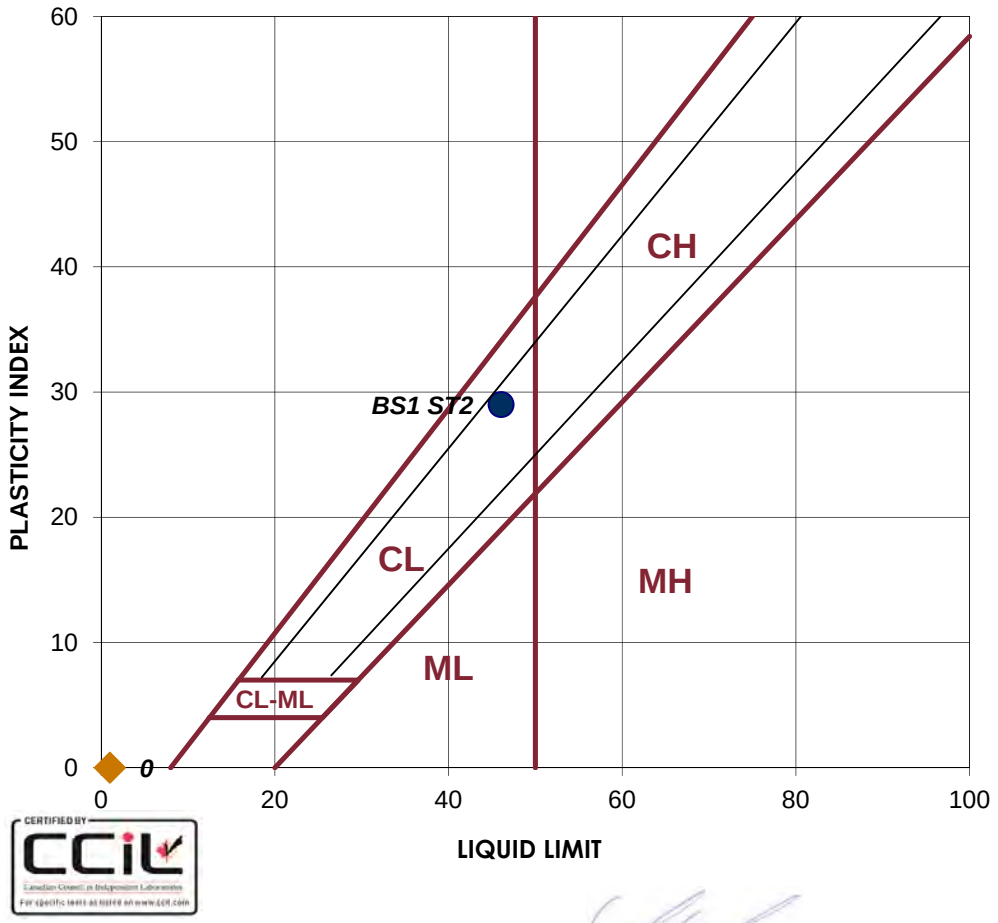
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS1 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 17.41 | 19.16 | Wt. Sample (wet+tare)(g) | | |
| 12.35 | 13.56 | Wt. Sample (dry+tare)(g) | | |
| 1.19 | 1.15 | Wt. Tare (g) | | |
| 11.2 | 12.4 | Wt. Dry Soil (g) | | |
| 5.1 | 5.6 | Wt. Water (g) | | |
| 45.3% | 45.1% | Water Content (%) | | |
| 46.2% | 45.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.99 | 24.73 | Wt. Sample (wet+tare)(g) | | |
| 22.53 | 23.12 | Wt. Sample (dry+tare)(g) | | |
| 13.91 | 13.77 | Wt. Tare (g) | | |
| 8.6 | 9.4 | Wt. Dry Soil (g) | | |
| 1.5 | 1.6 | Wt. Water (g) | | |
| 16.9% | 17.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 46 | | LL | |
| PL | 17 | | PL | |
| PI | 29 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 12, 2016 |
| Date Tested: | October 21, 2016 |
| Tested By: | B. Pelkey |


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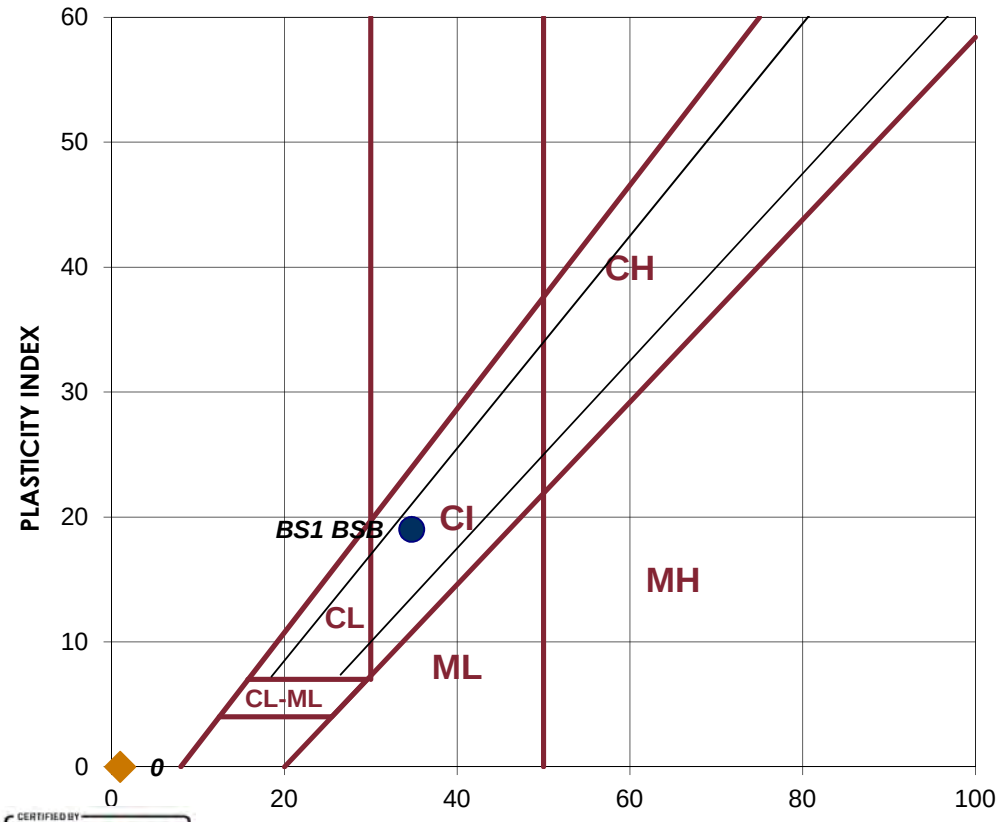
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS1 BSB | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 23 | Number of Blows | | |
| | | Container Number | | |
| 24.92 | 23.02 | Wt. Sample (wet+tare)(g) | | |
| 18.85 | 17.45 | Wt. Sample (dry+tare)(g) | | |
| 1.62 | 1.53 | Wt. Tare (g) | | |
| 17.2 | 15.9 | Wt. Dry Soil (g) | | |
| 6.1 | 5.6 | Wt. Water (g) | | |
| 35.2% | 35.0% | Water Content (%) | | |
| 34.9% | 34.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.21 | 27.36 | Wt. Sample (wet+tare)(g) | | |
| 25.36 | 25.54 | Wt. Sample (dry+tare)(g) | | |
| 13.82 | 13.87 | Wt. Tare (g) | | |
| 11.5 | 11.7 | Wt. Dry Soil (g) | | |
| 1.9 | 1.8 | Wt. Water (g) | | |
| 16.0% | 15.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 16 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 12, 2016 |
| Date Tested: | October 21, 2016 |
| Tested By: | B. Pelkey |


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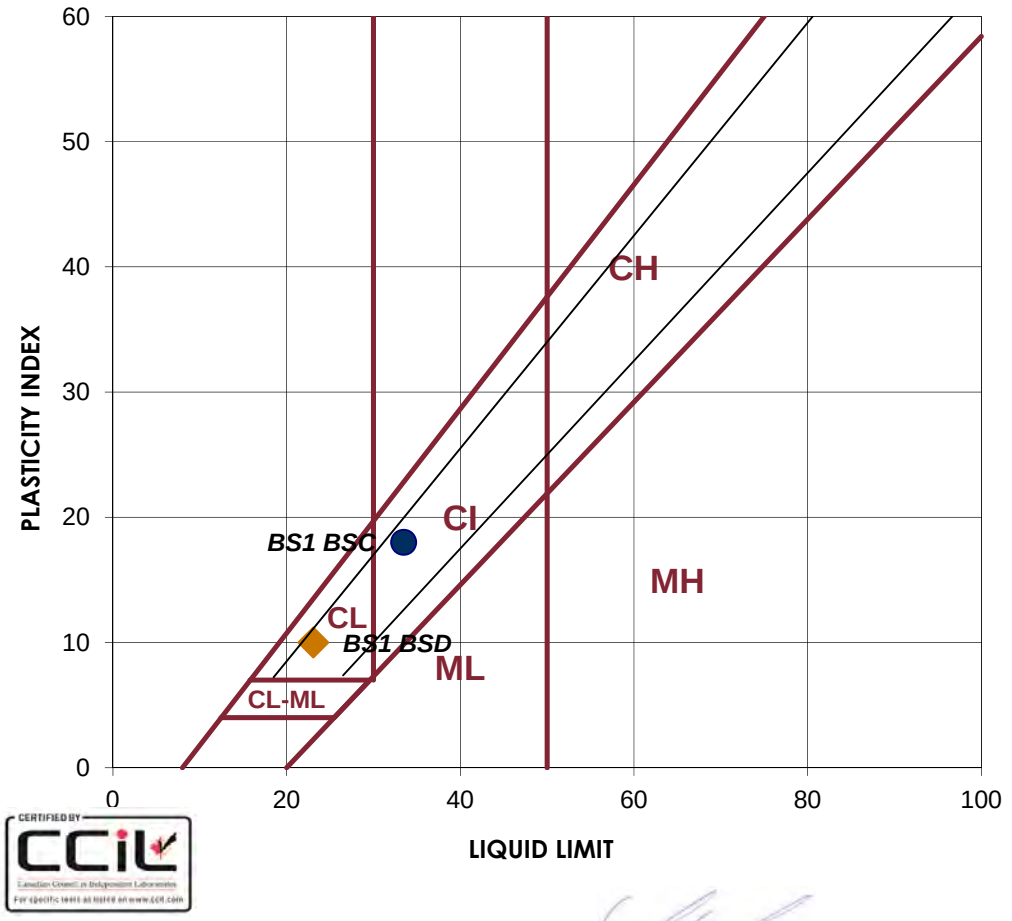
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS1 BSC | | | BS1 BSD | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | 24 | 24 |
| | | Container Number | | |
| 23.19 | 22.70 | Wt. Sample (wet+tare)(g) | 24.15 | 23.67 |
| 17.72 | 17.40 | Wt. Sample (dry+tare)(g) | 19.87 | 19.50 |
| 1.53 | 1.50 | Wt. Tare (g) | 1.46 | 1.46 |
| 16.2 | 15.9 | Wt. Dry Soil (g) | 18.4 | 18.0 |
| 5.5 | 5.3 | Wt. Water (g) | 4.3 | 4.2 |
| 33.8% | 33.3% | Water Content (%) | 23.2% | 23.1% |
| 33.8% | 33.2% | Corrected Water Content (%) | 23.1% | 23.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.95 | 26.04 | Wt. Sample (wet+tare)(g) | 22.06 | 23.15 |
| 23.49 | 24.41 | Wt. Sample (dry+tare)(g) | 21.09 | 22.03 |
| 13.89 | 13.77 | Wt. Tare (g) | 13.8 | 13.78 |
| 9.6 | 10.6 | Wt. Dry Soil (g) | 7.3 | 8.3 |
| 1.5 | 1.6 | Wt. Water (g) | 1.0 | 1.1 |
| 15.2% | 15.3% | Water Content (%) | 13.3% | 13.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | 23 |
| PL | 15 | | PL | 13 |
| PI | 18 | | PI | 10 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CL | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 12, 2016 |
| Date Tested: | October 24, 2016 |
| Tested By: | C. Woods |


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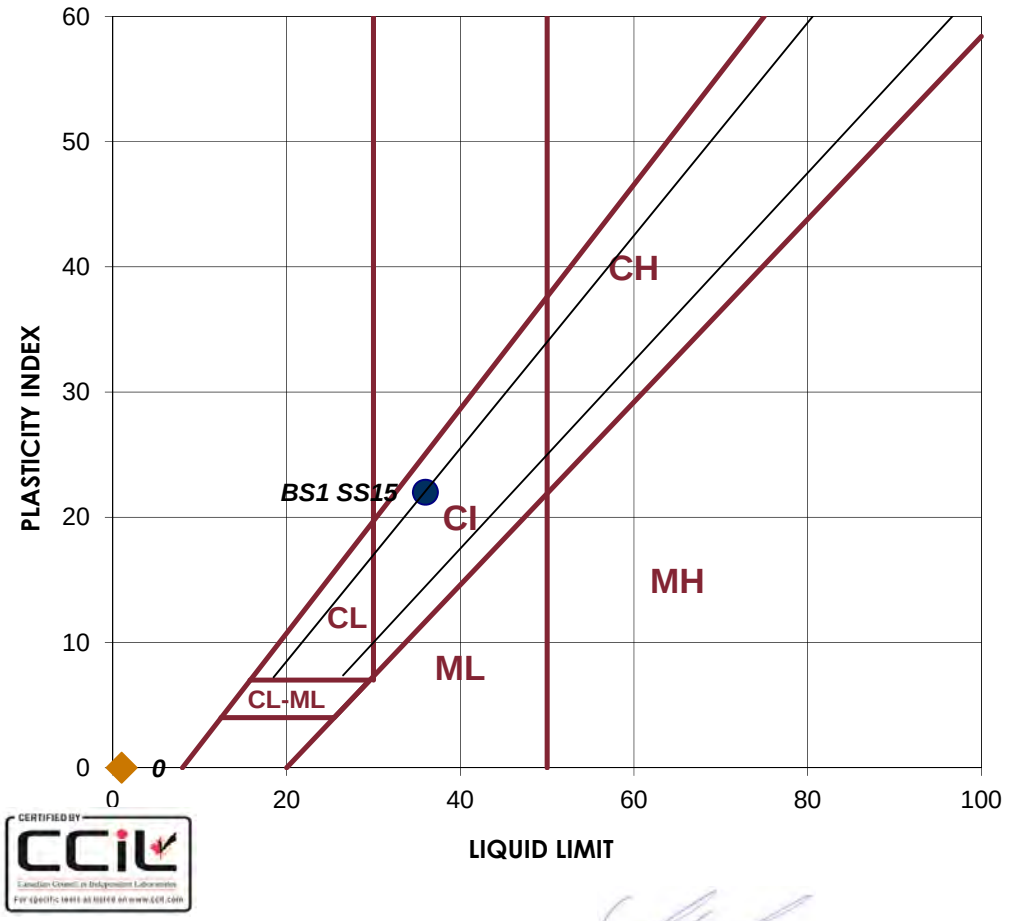
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS1 SS15 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 25 | Number of Blows | | |
| | | Container Number | | |
| 24.93 | 19.38 | Wt. Sample (wet+tare)(g) | | |
| 18.70 | 14.59 | Wt. Sample (dry+tare)(g) | | |
| 1.54 | 1.23 | Wt. Tare (g) | | |
| 17.2 | 13.4 | Wt. Dry Soil (g) | | |
| 6.2 | 4.8 | Wt. Water (g) | | |
| 36.3% | 35.9% | Water Content (%) | | |
| 36.1% | 35.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.16 | 27.35 | Wt. Sample (wet+tare)(g) | | |
| 23.78 | 25.64 | Wt. Sample (dry+tare)(g) | | |
| 13.85 | 13.78 | Wt. Tare (g) | | |
| 9.9 | 11.9 | Wt. Dry Soil (g) | | |
| 1.4 | 1.7 | Wt. Water (g) | | |
| 13.9% | 14.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | |
| PL | 14 | | PL | |
| PI | 22 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 18, 2016 |
| Date Tested: | October 24, 2016 |
| Tested By: | C. Woods |


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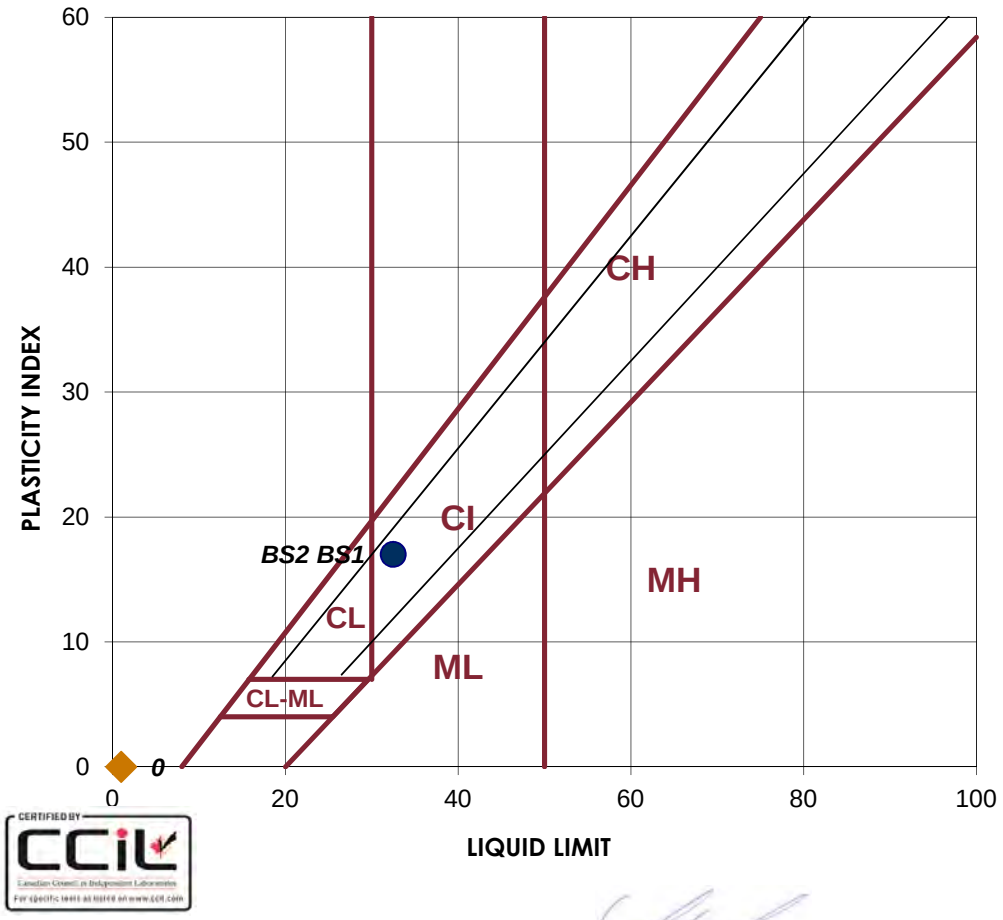
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS2 BS1 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 25 | Number of Blows | | |
| | | Container Number | | |
| 24.21 | 24.33 | Wt. Sample (wet+tare)(g) | | |
| 18.64 | 18.75 | Wt. Sample (dry+tare)(g) | | |
| 1.56 | 1.58 | Wt. Tare (g) | | |
| 17.1 | 17.2 | Wt. Dry Soil (g) | | |
| 5.6 | 5.6 | Wt. Water (g) | | |
| 32.6% | 32.5% | Water Content (%) | | |
| 32.5% | 32.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.19 | 25.24 | Wt. Sample (wet+tare)(g) | | |
| 25.47 | 23.77 | Wt. Sample (dry+tare)(g) | | |
| 13.87 | 13.91 | Wt. Tare (g) | | |
| 11.6 | 9.9 | Wt. Dry Soil (g) | | |
| 1.7 | 1.5 | Wt. Water (g) | | |
| 14.8% | 14.9% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | |
| PL | 15 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 8, 2016 |
| Date Tested: | October 12, 2016 |
| Tested By: | C.Small |


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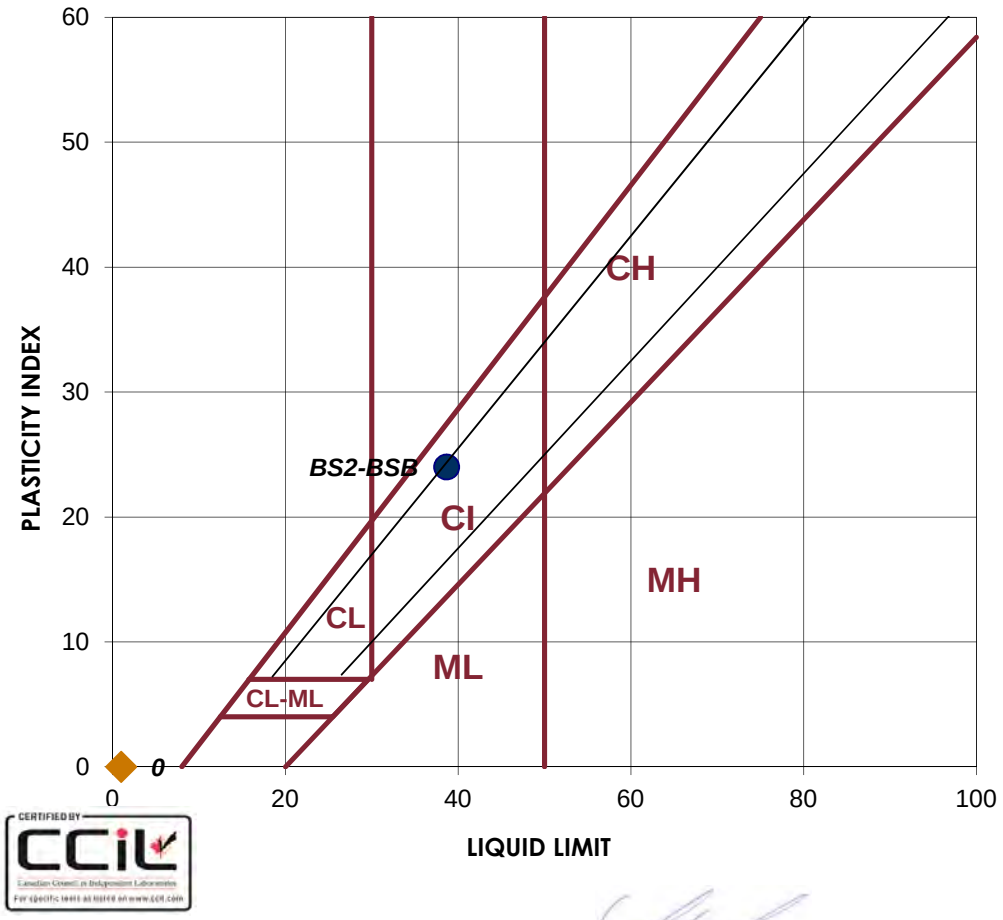
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS2-BSB | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 26 | Number of Blows | | |
| | | Container Number | | |
| 23.48 | 25.95 | Wt. Sample (wet+tare)(g) | | |
| 17.31 | 19.14 | Wt. Sample (dry+tare)(g) | | |
| 1.22 | 1.43 | Wt. Tare (g) | | |
| 16.1 | 17.7 | Wt. Dry Soil (g) | | |
| 6.2 | 6.8 | Wt. Water (g) | | |
| 38.3% | 38.5% | Water Content (%) | | |
| 38.7% | 38.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.4 | 26.48 | Wt. Sample (wet+tare)(g) | | |
| 22.41 | 25.06 | Wt. Sample (dry+tare)(g) | | |
| 15.77 | 15.79 | Wt. Tare (g) | | |
| 6.6 | 9.3 | Wt. Dry Soil (g) | | |
| 1.0 | 1.4 | Wt. Water (g) | | |
| 14.9% | 15.3% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 39 | | LL | |
| PL | 15 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 18, 2016 |
| Date Tested: | October 11, 2016 |
| Tested By: | C.Small |


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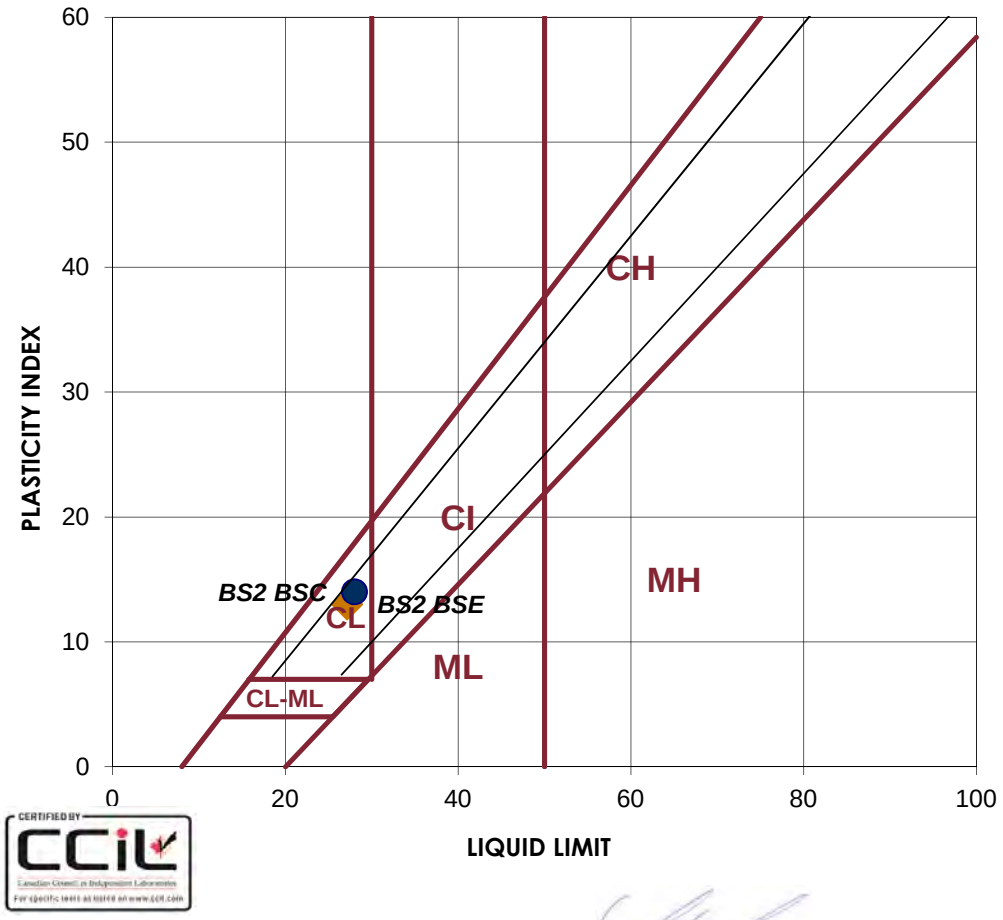
| Sample: BS2 BSC | | | Sample: BS2 BSE | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 26 | Number of Blows | 29 | 29 |
| | | Container Number | | |
| 23.63 | 27.22 | Wt. Sample (wet+tare)(g) | 25.41 | 26.60 |
| 18.79 | 21.65 | Wt. Sample (dry+tare)(g) | 20.35 | 21.33 |
| 1.57 | 1.70 | Wt. Tare (g) | 1.44 | 1.52 |
| 17.2 | 20.0 | Wt. Dry Soil (g) | 18.9 | 19.8 |
| 4.8 | 5.6 | Wt. Water (g) | 5.1 | 5.3 |
| 28.1% | 27.9% | Water Content (%) | 26.8% | 26.6% |
| 28.0% | 28.1% | Corrected Water Content (%) | 27.2% | 27.1% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 20.58 | 20.45 | Wt. Sample (wet+tare)(g) | 24.06 | 22.86 |
| 19.78 | 19.65 | Wt. Sample (dry+tare)(g) | 22.78 | 21.77 |
| 13.83 | 13.76 | Wt. Tare (g) | 13.76 | 13.89 |
| 6.0 | 5.9 | Wt. Dry Soil (g) | 9.0 | 7.9 |
| 0.8 | 0.8 | Wt. Water (g) | 1.3 | 1.1 |
| 13.4% | 13.6% | Water Content (%) | 14.2% | 13.8% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 28 | | LL | 27 |
| PL | 14 | | PL | 14 |
| PI | 14 | | PI | 13 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL-CI | | | CL | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 18, 2016 |
| Date Tested: | October 20, 2016 |
| Tested By: | B. Pelkey |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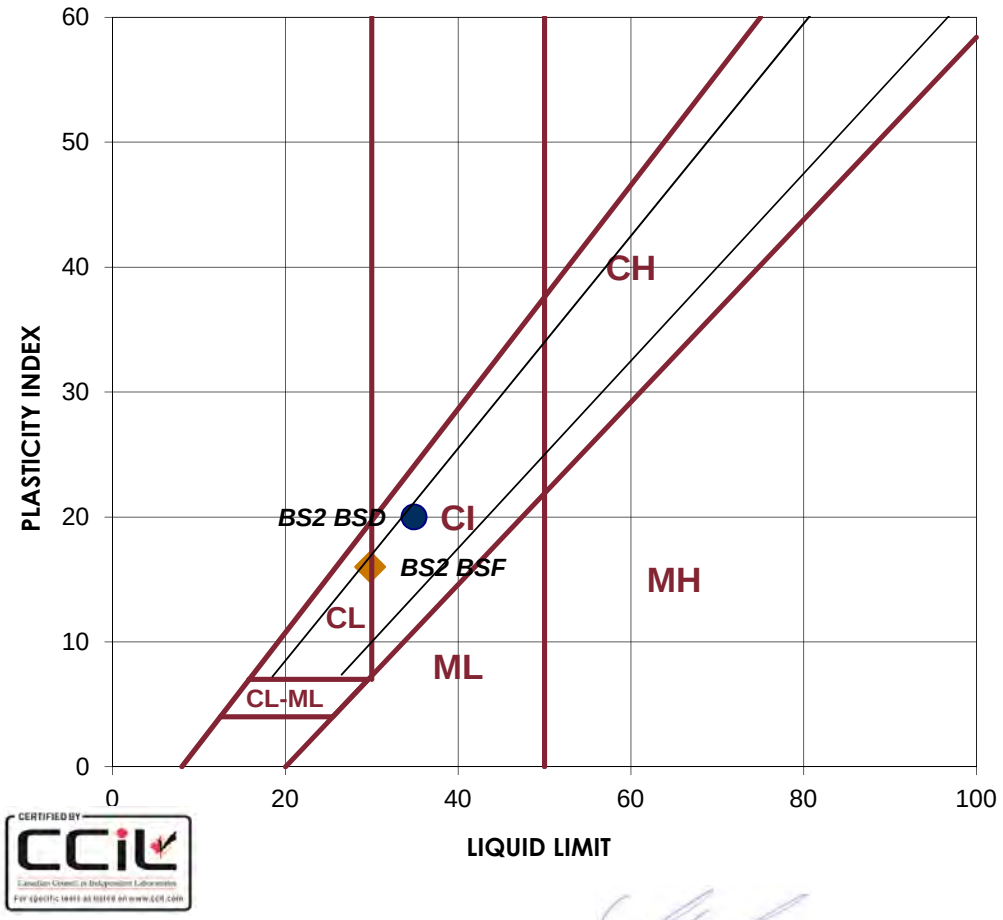
| Sample: BS2 BSD | | | Sample: BS2 BSF | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 23 | Number of Blows | 23 | 24 |
| | | Container Number | | |
| 24.21 | 23.93 | Wt. Sample (wet+tare)(g) | 28.60 | 28.81 |
| 18.30 | 18.11 | Wt. Sample (dry+tare)(g) | 22.33 | 22.53 |
| 1.52 | 1.53 | Wt. Tare (g) | 1.47 | 1.63 |
| 16.8 | 16.6 | Wt. Dry Soil (g) | 20.9 | 20.9 |
| 5.9 | 5.8 | Wt. Water (g) | 6.3 | 6.3 |
| 35.2% | 35.1% | Water Content (%) | 30.1% | 30.0% |
| 35.0% | 34.8% | Corrected Water Content (%) | 29.8% | 29.9% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.51 | 22.68 | Wt. Sample (wet+tare)(g) | 24.81 | 23.87 |
| 23.05 | 21.51 | Wt. Sample (dry+tare)(g) | 23.43 | 22.64 |
| 13.77 | 13.84 | Wt. Tare (g) | 13.72 | 13.77 |
| 9.3 | 7.7 | Wt. Dry Soil (g) | 9.7 | 8.9 |
| 1.5 | 1.2 | Wt. Water (g) | 1.4 | 1.2 |
| 15.7% | 15.3% | Water Content (%) | 14.2% | 13.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | 30 |
| PL | 15 | | PL | 14 |
| PI | 20 | | PI | 16 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CL-CI | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 19, 2016 |
| Date Tested: | October 12, 2016 |
| Tested By: | C.Small |

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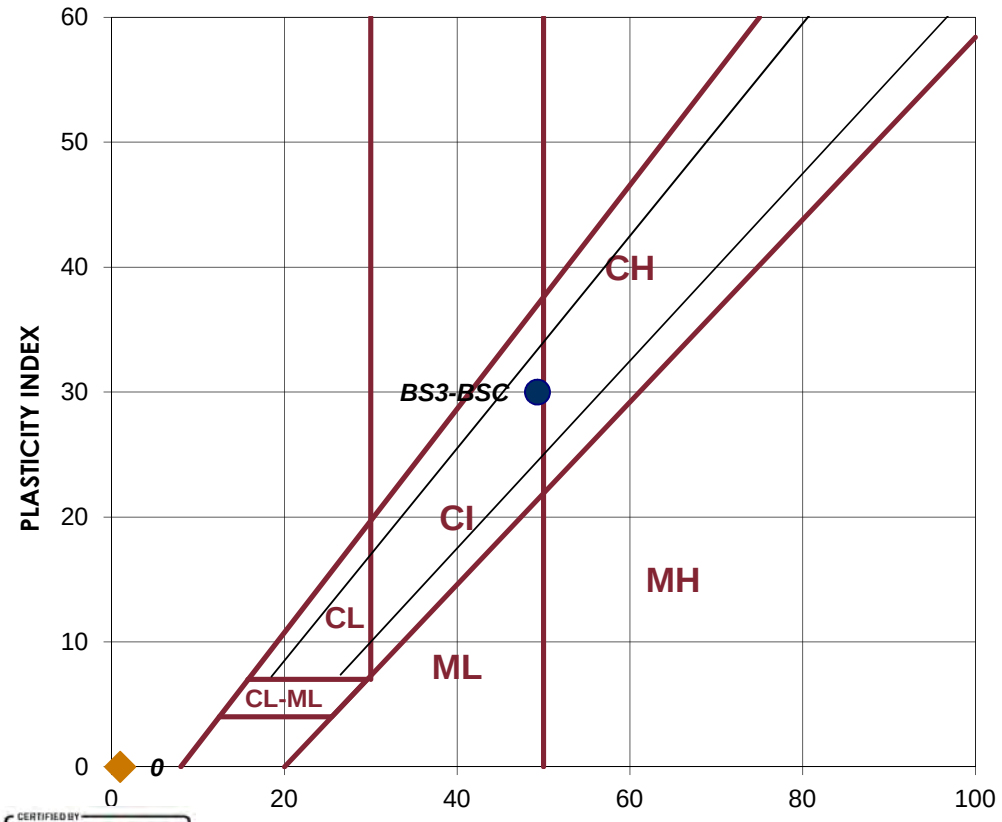
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS3-BSC | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 23 | Number of Blows | | |
| | | Container Number | | |
| 25.82 | 26.06 | Wt. Sample (wet+tare)(g) | | |
| 17.73 | 17.95 | Wt. Sample (dry+tare)(g) | | |
| 1.42 | 1.57 | Wt. Tare (g) | | |
| 16.3 | 16.4 | Wt. Dry Soil (g) | | |
| 8.1 | 8.1 | Wt. Water (g) | | |
| 49.6% | 49.5% | Water Content (%) | | |
| 49.6% | 49.0% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.58 | 22.71 | Wt. Sample (wet+tare)(g) | | |
| 23.69 | 21.34 | Wt. Sample (dry+tare)(g) | | |
| 13.82 | 13.91 | Wt. Tare (g) | | |
| 9.9 | 7.4 | Wt. Dry Soil (g) | | |
| 1.9 | 1.4 | Wt. Water (g) | | |
| 19.1% | 18.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 49 | | LL | |
| PL | 19 | | PL | |
| PI | 30 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CH*** | | | ***NON-PLASTIC*** | |



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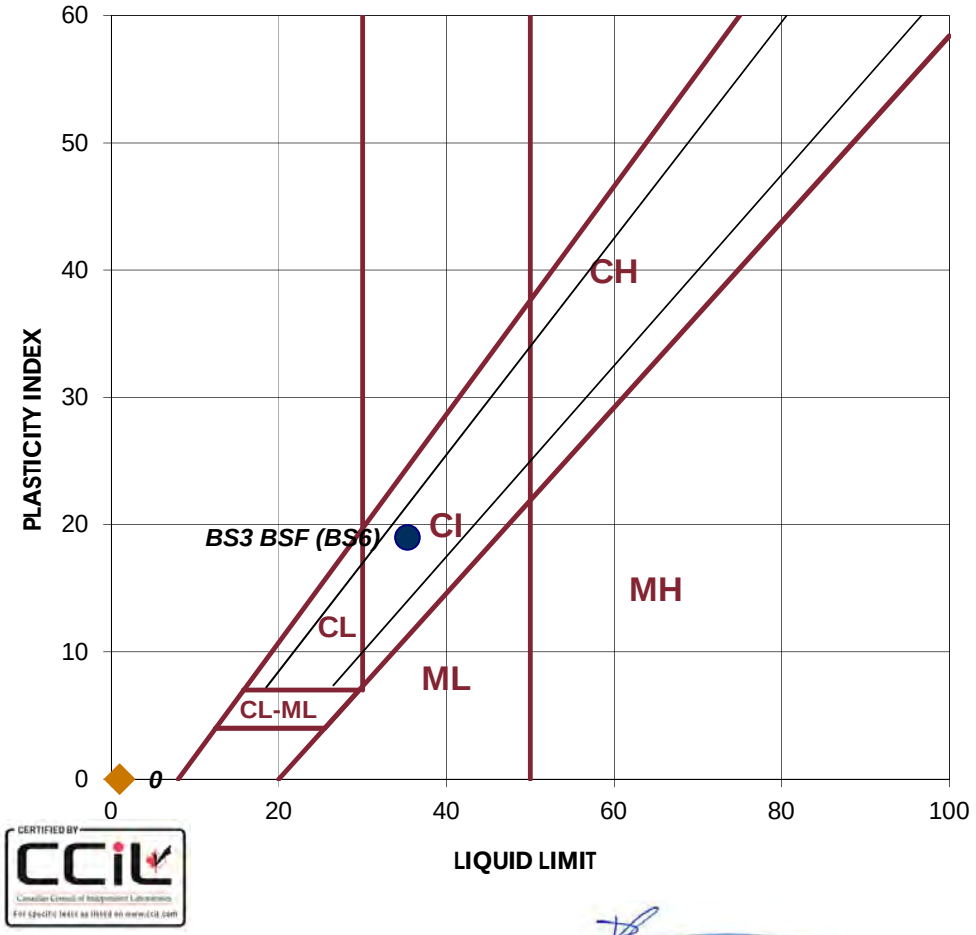
## Atterberg Limits

ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250
Date Received: August 19, 2016
Date Tested: October 4, 2016
Tested By: E.Farries

| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS3 BSF (BS6) | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | | |
| | | Container Number | | |
| 22.79 | 25.49 | Wt. Sample (wet+tare)(g) | | |
| 17.13 | 19.15 | Wt. Sample (dry+tare)(g) | | |
| 1.28 | 1.26 | Wt. Tare (g) | | |
| 15.9 | 17.9 | Wt. Dry Soil (g) | | |
| 5.7 | 6.3 | Wt. Water (g) | | |
| 35.7% | 35.4% | Water Content (%) | | |
| 35.4% | 35.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.98 | 28.68 | Wt. Sample (wet+tare)(g) | | |
| 26.31 | 26.95 | Wt. Sample (dry+tare)(g) | | |
| 15.77 | 15.82 | Wt. Tare (g) | | |
| 10.5 | 11.1 | Wt. Dry Soil (g) | | |
| 1.7 | 1.7 | Wt. Water (g) | | |
| 15.8% | 15.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 35 | | LL | |
| PL | 16 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***NON-PLASTIC*** | |






Reviewed By:

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 19, 2016 |
| Date Tested: | October 20, 2016 |
| Tested By: | B. Pelkey |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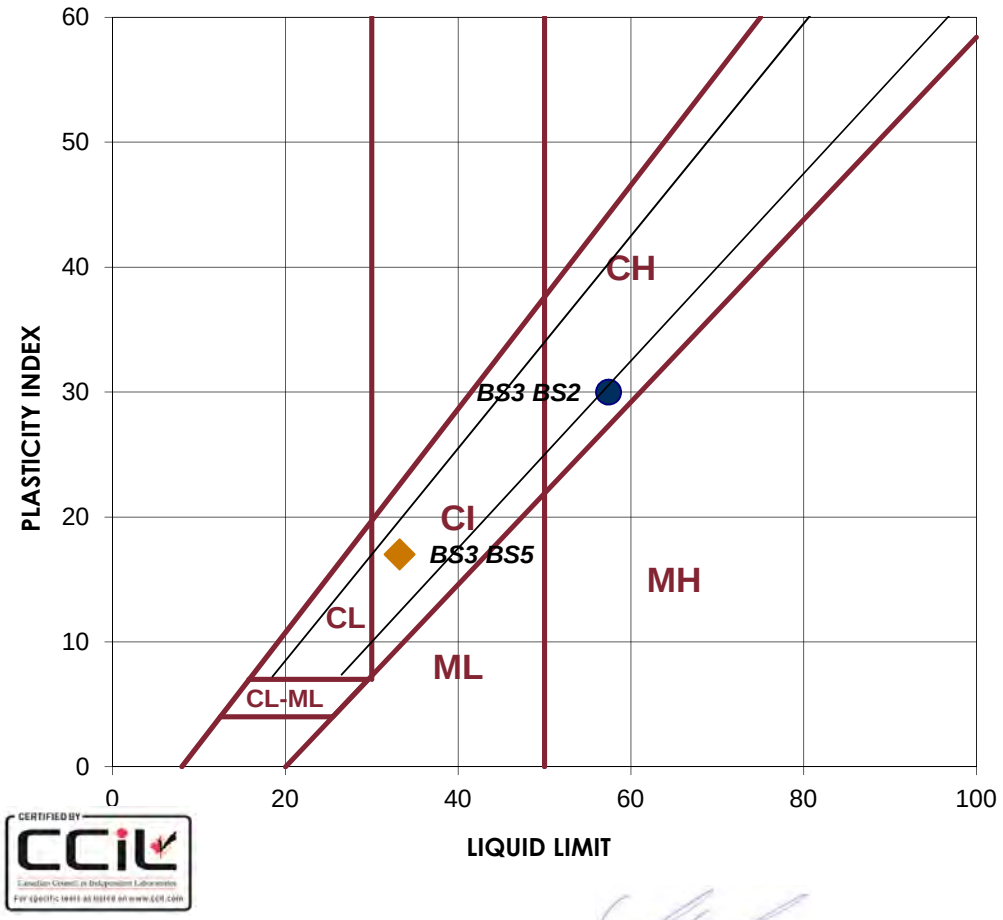
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS3 BS2 | | | BS3 BS5 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 28 | Number of Blows | 25 | 26 |
| | | Container Number | | |
| 22.44 | 21.17 | Wt. Sample (wet+tare)(g) | 26.93 | 26.69 |
| 14.85 | 14.08 | Wt. Sample (dry+tare)(g) | 20.57 | 20.44 |
| 1.49 | 1.58 | Wt. Tare (g) | 1.45 | 1.54 |
| 13.4 | 12.5 | Wt. Dry Soil (g) | 19.1 | 18.9 |
| 7.6 | 7.1 | Wt. Water (g) | 6.4 | 6.3 |
| 56.8% | 56.7% | Water Content (%) | 33.3% | 33.1% |
| 57.3% | 57.5% | Corrected Water Content (%) | 33.3% | 33.2% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.83 | 22.28 | Wt. Sample (wet+tare)(g) | 22.99 | 25.79 |
| 21.35 | 20.11 | Wt. Sample (dry+tare)(g) | 21.74 | 24.13 |
| 13.82 | 13.91 | Wt. Tare (g) | 13.76 | 13.79 |
| 7.5 | 6.2 | Wt. Dry Soil (g) | 8.0 | 10.3 |
| 1.5 | 2.2 | Wt. Water (g) | 1.3 | 1.7 |
| 19.7% | 35.0% | Water Content (%) | 15.7% | 16.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 57 | | LL | 33 |
| PL | 27 | | PL | 16 |
| PI | 30 | | PI | 17 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CI | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 19, 2016 |
| Date Tested: | October 4, 2016 |
| Tested By: | E.Farries |


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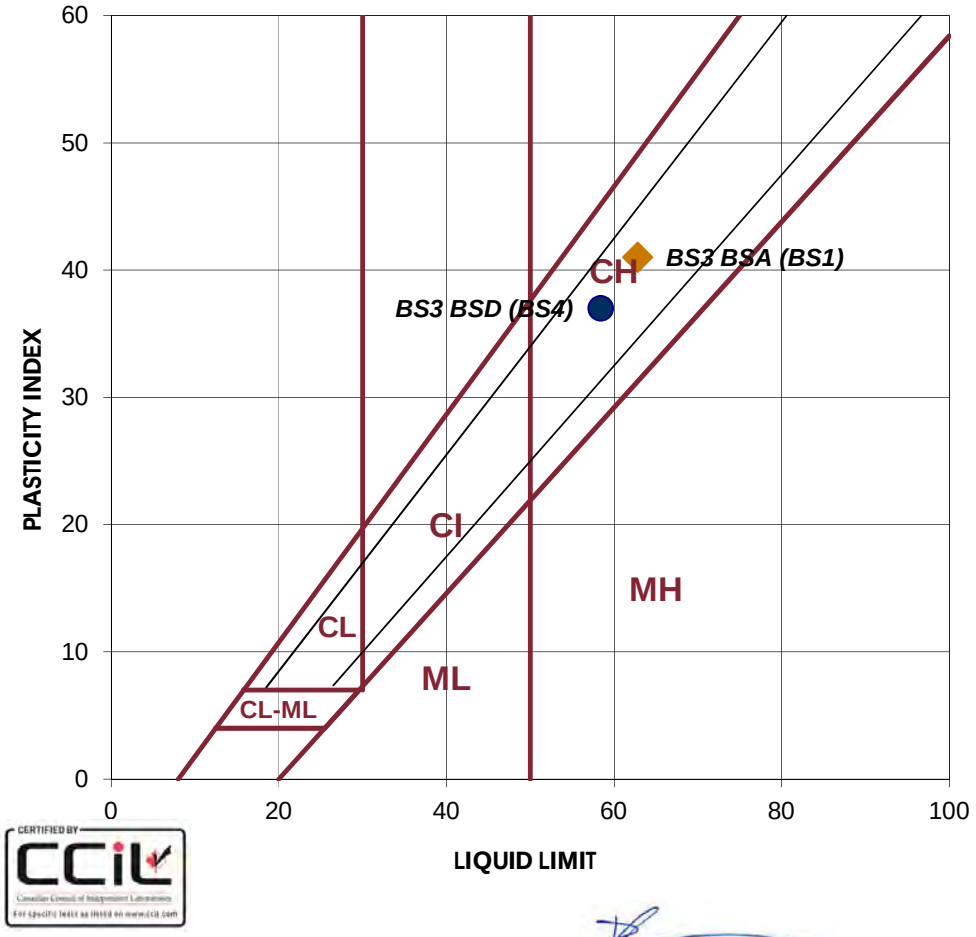
| Sample: BS3 BSD (BS4) | | | Sample: BS3 BSA (BS1) | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 25 | Number of Blows | 27 | 27 |
| | | Container Number | | |
| 22.03 | 22.83 | Wt. Sample (wet+tare)(g) | 24.26 | 22.28 |
| 14.39 | 14.93 | Wt. Sample (dry+tare)(g) | 15.45 | 14.21 |
| 1.27 | 1.29 | Wt. Tare (g) | 1.28 | 1.24 |
| 13.1 | 13.6 | Wt. Dry Soil (g) | 14.2 | 13.0 |
| 7.6 | 7.9 | Wt. Water (g) | 8.8 | 8.1 |
| 58.2% | 57.9% | Water Content (%) | 62.2% | 62.2% |
| 58.8% | 57.9% | Corrected Water Content (%) | 62.8% | 62.8% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.04 | 25.53 | Wt. Sample (wet+tare)(g) | 23.24 | 22.96 |
| 23.04 | 23.53 | Wt. Sample (dry+tare)(g) | 21.55 | 21.32 |
| 13.77 | 14.13 | Wt. Tare (g) | 13.91 | 13.84 |
| 9.3 | 9.4 | Wt. Dry Soil (g) | 7.6 | 7.5 |
| 2.0 | 2.0 | Wt. Water (g) | 1.7 | 1.6 |
| 21.6% | 21.3% | Water Content (%) | 22.1% | 21.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 58 | | LL | 63 |
| PL | 21 | | PL | 22 |
| PI | 37 | | PI | 41 |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **CH** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 18, 2016 |
| Date Tested: | October 28, 2016 |
| Tested By: | C. Woods |


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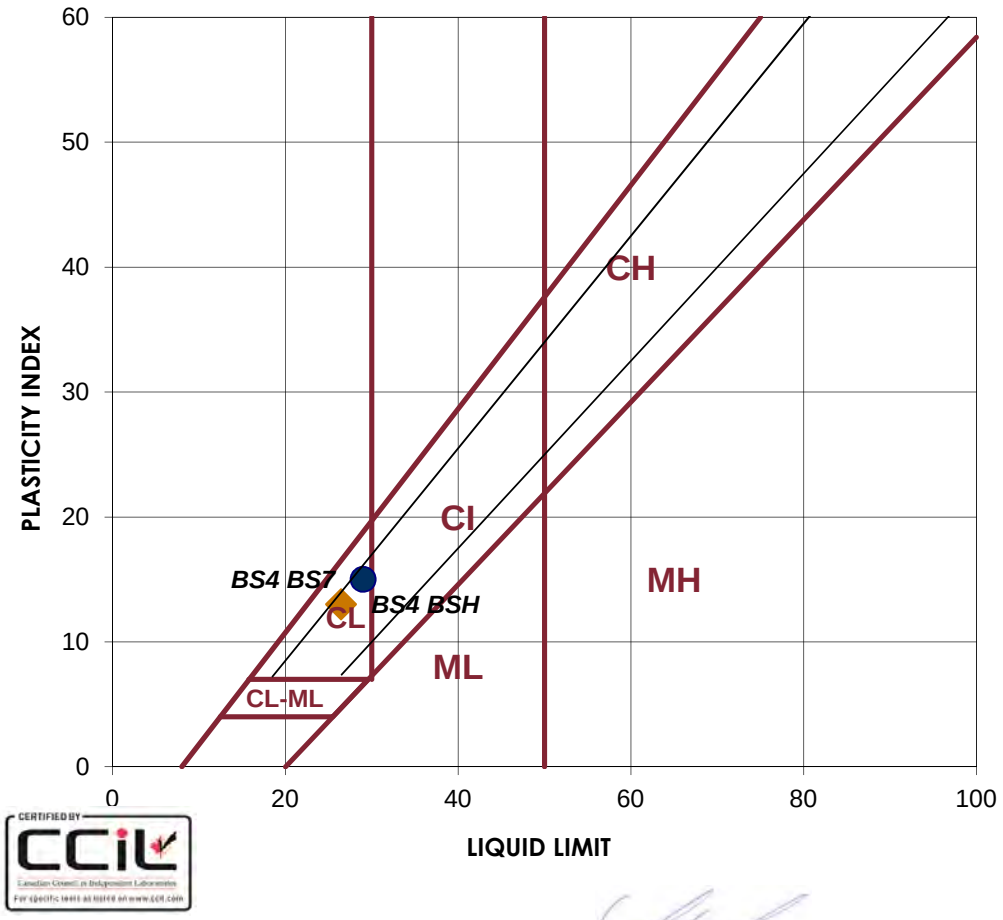
| Sample: BS4 BS7 | | | Sample: BS4 BSH | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 27 | Number of Blows | 24 | 23 |
| | | Container Number | | |
| 23.77 | 26.55 | Wt. Sample (wet+tare)(g) | 25.86 | 29.34 |
| 18.72 | 20.98 | Wt. Sample (dry+tare)(g) | 20.67 | 23.50 |
| 1.23 | 1.59 | Wt. Tare (g) | 1.25 | 1.52 |
| 17.5 | 19.4 | Wt. Dry Soil (g) | 19.4 | 22.0 |
| 5.1 | 5.6 | Wt. Water (g) | 5.2 | 5.8 |
| 28.9% | 28.7% | Water Content (%) | 26.7% | 26.6% |
| 29.0% | 29.0% | Corrected Water Content (%) | 26.6% | 26.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.89 | 26.7 | Wt. Sample (wet+tare)(g) | 21.2 | 24.81 |
| 26.19 | 25.12 | Wt. Sample (dry+tare)(g) | 20.35 | 23.49 |
| 13.77 | 13.77 | Wt. Tare (g) | 13.8 | 13.81 |
| 12.4 | 11.4 | Wt. Dry Soil (g) | 6.6 | 9.7 |
| 1.7 | 1.6 | Wt. Water (g) | 0.8 | 1.3 |
| 13.7% | 13.9% | Water Content (%) | 13.0% | 13.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 29 | | LL | 26 |
| PL | 14 | | PL | 13 |
| PI | 15 | | PI | 13 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL-CI | | | CL | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 12, 2016 |
| Date Tested: | October 6, 2016 |
| Tested By: | E.Farries |


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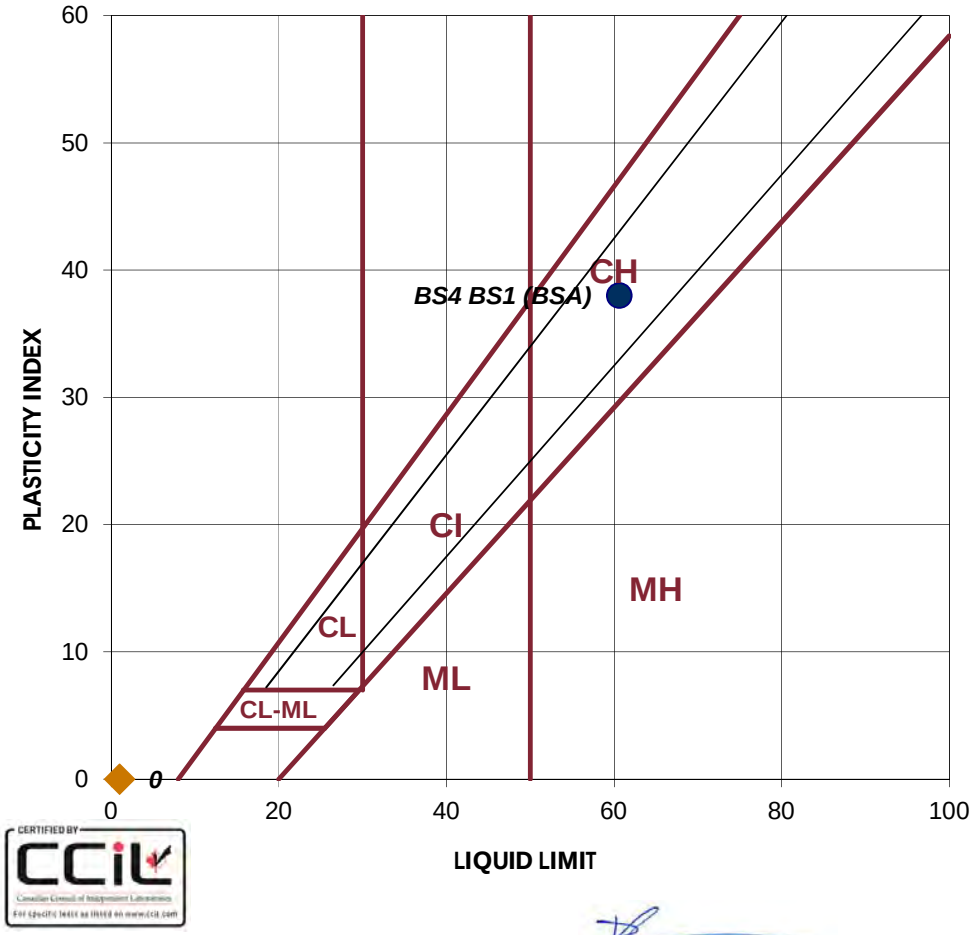
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS4 BS1 (BSA) | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 27 | Number of Blows | | |
| | | Container Number | | |
| 21.65 | 23.78 | Wt. Sample (wet+tare)(g) | | |
| 13.96 | 15.49 | Wt. Sample (dry+tare)(g) | | |
| 1.20 | 1.61 | Wt. Tare (g) | | |
| 12.8 | 13.9 | Wt. Dry Soil (g) | | |
| 7.7 | 8.3 | Wt. Water (g) | | |
| 60.3% | 59.7% | Water Content (%) | | |
| 60.8% | 60.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.31 | 25.15 | Wt. Sample (wet+tare)(g) | | |
| 23.51 | 23.38 | Wt. Sample (dry+tare)(g) | | |
| 15.79 | 15.8 | Wt. Tare (g) | | |
| 7.7 | 7.6 | Wt. Dry Soil (g) | | |
| 1.8 | 1.8 | Wt. Water (g) | | |
| 23.3% | 23.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 61 | | LL | |
| PL | 23 | | PL | |
| PI | 38 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 19, 2016 |
| Date Tested: | October 11, 2016 |
| Tested By: | C.Small |


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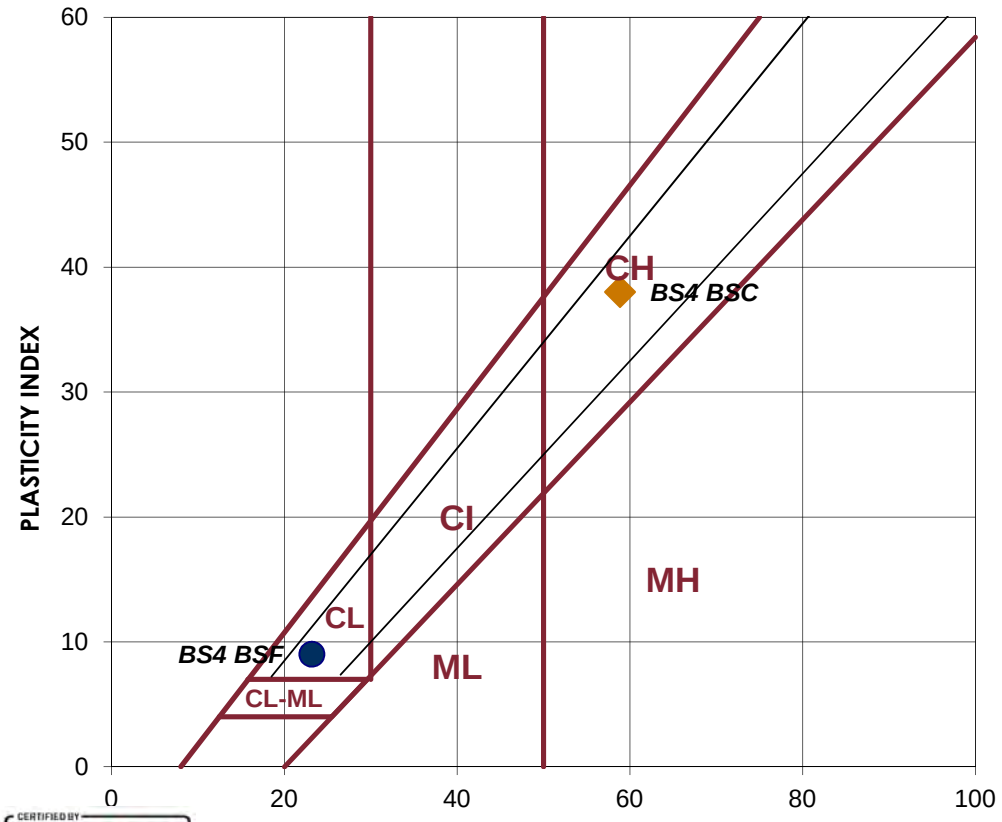
Sample:

| BS4 BSF | | | Sample: BS4 BSC | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 21 | Number of Blows | 21 | 22 |
| | | Container Number | | |
| 28.17 | 28.10 | Wt. Sample (wet+tare)(g) | 22.45 | 25.75 |
| 23.00 | 23.03 | Wt. Sample (dry+tare)(g) | 14.58 | 16.58 |
| 1.18 | 1.47 | Wt. Tare (g) | 1.48 | 1.26 |
| 21.8 | 21.6 | Wt. Dry Soil (g) | 13.1 | 15.3 |
| 5.2 | 5.1 | Wt. Water (g) | 7.9 | 9.2 |
| 23.7% | 23.5% | Water Content (%) | 60.1% | 59.9% |
| 23.3% | 23.0% | Corrected Water Content (%) | 58.8% | 58.9% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.49 | 25.21 | Wt. Sample (wet+tare)(g) | 25.13 | 24.49 |
| 22.36 | 23.83 | Wt. Sample (dry+tare)(g) | 23.16 | 22.56 |
| 13.92 | 13.87 | Wt. Tare (g) | 13.77 | 13.76 |
| 8.4 | 10.0 | Wt. Dry Soil (g) | 9.4 | 8.8 |
| 1.1 | 1.4 | Wt. Water (g) | 2.0 | 1.9 |
| 13.4% | 13.9% | Water Content (%) | 21.0% | 21.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 23 | | LL | 59 |
| PL | 14 | | PL | 21 |
| PI | 9 | | PI | 38 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CH | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 19, 2016 |
| Date Tested: | October 12, 2016 |
| Tested By: | C.Small |


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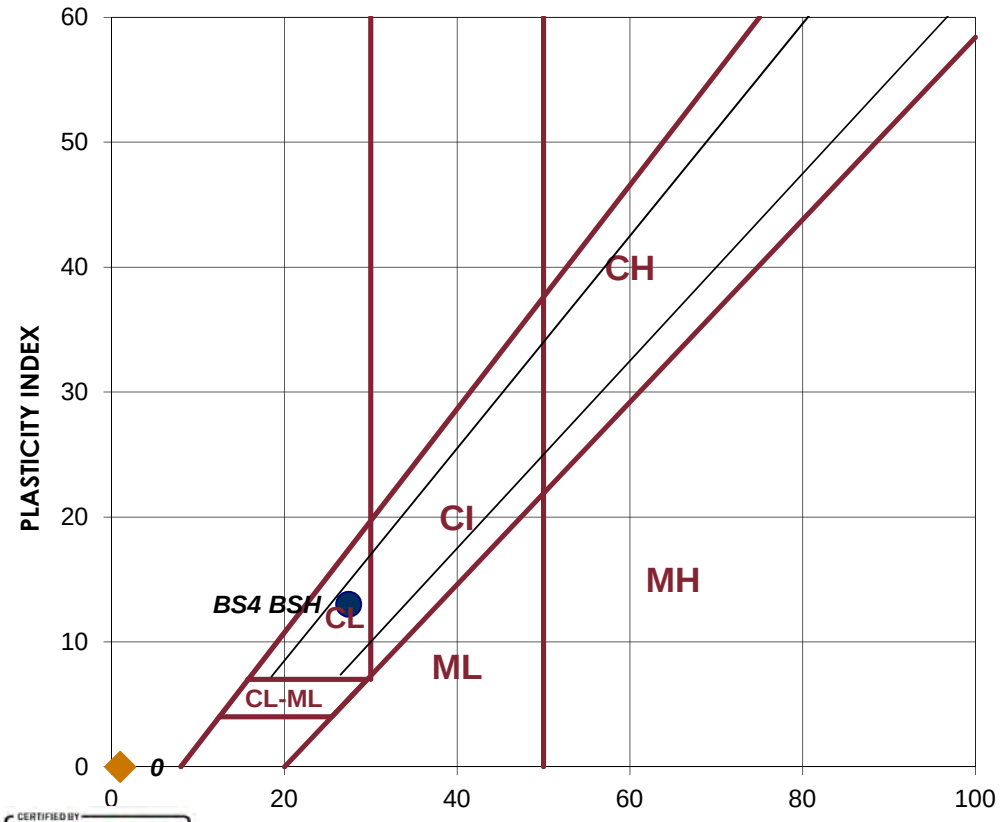
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS4 BSH | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 30 | Number of Blows | | |
| | | Container Number | | |
| 27.20 | 28.72 | Wt. Sample (wet+tare)(g) | | |
| 21.73 | 22.88 | Wt. Sample (dry+tare)(g) | | |
| 1.47 | 1.22 | Wt. Tare (g) | | |
| 20.3 | 21.7 | Wt. Dry Soil (g) | | |
| 5.5 | 5.8 | Wt. Water (g) | | |
| 27.0% | 27.0% | Water Content (%) | | |
| 27.4% | 27.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.6 | 24 | Wt. Sample (wet+tare)(g) | | |
| 22.41 | 22.8 | Wt. Sample (dry+tare)(g) | | |
| 13.71 | 13.85 | Wt. Tare (g) | | |
| 8.7 | 9.0 | Wt. Dry Soil (g) | | |
| 1.2 | 1.2 | Wt. Water (g) | | |
| 13.7% | 13.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 27 | | LL | |
| PL | 14 | | PL | |
| PI | 13 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | NON-PLASTIC | |



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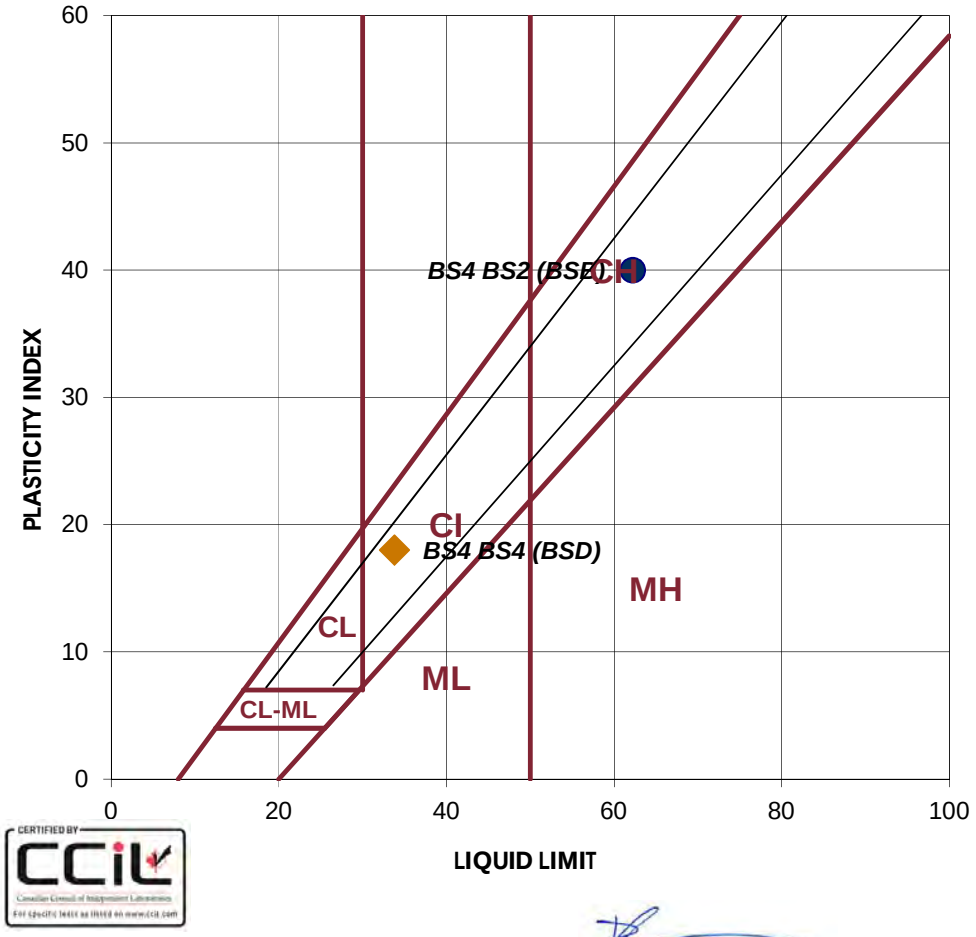
## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 16, 2016 |
| Date Tested: | October 6, 2016 |
| Tested By: | E.Farries |

| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS4 BS2 (BSB) | | | BS4 BS4 (BSD) | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 25 | Number of Blows | 29 | 30 |
| | | Container Number | | |
| 21.00 | 22.01 | Wt. Sample (wet+tare)(g) | 24.47 | 28.56 |
| 13.49 | 14.06 | Wt. Sample (dry+tare)(g) | 18.68 | 21.85 |
| 1.51 | 1.24 | Wt. Tare (g) | 1.25 | 1.51 |
| 12.0 | 12.8 | Wt. Dry Soil (g) | 17.4 | 20.3 |
| 7.5 | 8.0 | Wt. Water (g) | 5.8 | 6.7 |
| 62.7% | 62.0% | Water Content (%) | 33.2% | 33.0% |
| 62.4% | 62.0% | Corrected Water Content (%) | 33.8% | 33.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 21.99 | 22.86 | Wt. Sample (wet+tare)(g) | 25.63 | 29.76 |
| 20.48 | 21.23 | Wt. Sample (dry+tare)(g) | 24.06 | 27.62 |
| 13.75 | 13.81 | Wt. Tare (g) | 13.75 | 14.13 |
| 6.7 | 7.4 | Wt. Dry Soil (g) | 10.3 | 13.5 |
| 1.5 | 1.6 | Wt. Water (g) | 1.6 | 2.1 |
| 22.4% | 22.0% | Water Content (%) | 15.2% | 15.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 62 | | LL | 34 |
| PL | 22 | | PL | 16 |
| PI | 40 | | PI | 18 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***CI*** | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 18, 2016 |
| Date Tested: | October 21, 2016 |
| Tested By: | B. Pelkey |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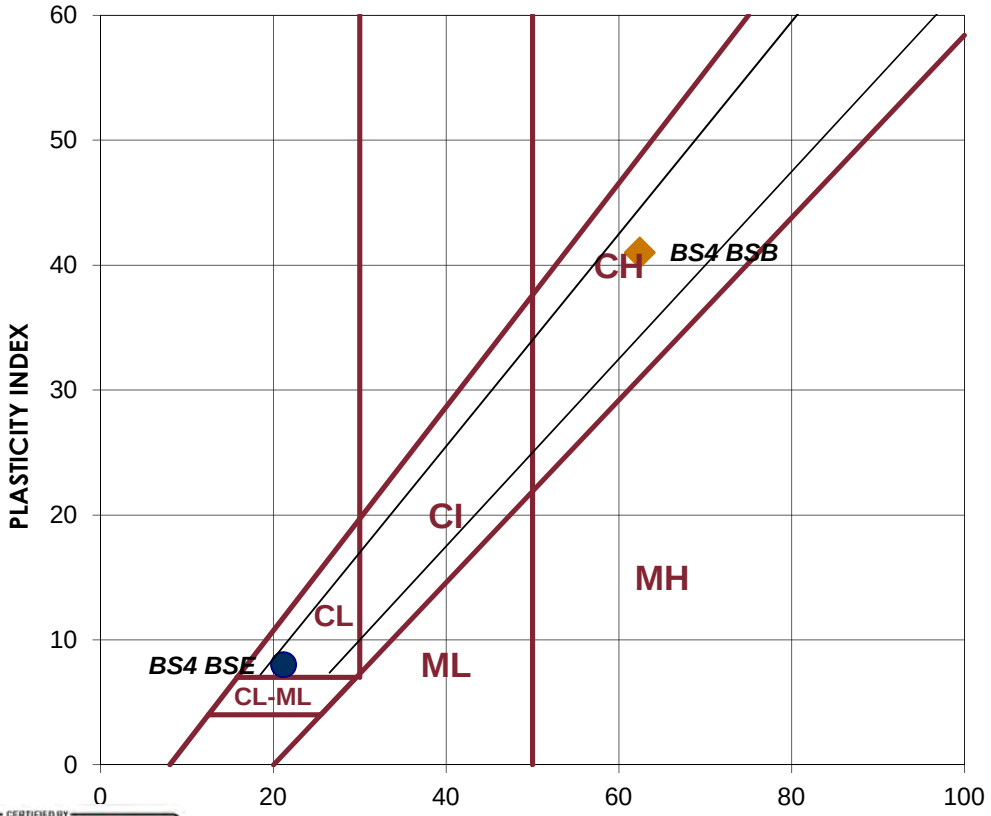
| Sample: BS4 BSE | | | Sample: BS4 BSB | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 25 | Number of Blows | 26 | 26 |
| | | Container Number | | |
| 29.39 | 26.27 | Wt. Sample (wet+tare)(g) | 24.44 | 22.54 |
| 24.50 | 21.95 | Wt. Sample (dry+tare)(g) | 15.67 | 14.48 |
| 1.56 | 1.54 | Wt. Tare (g) | 1.59 | 1.47 |
| 22.9 | 20.4 | Wt. Dry Soil (g) | 14.1 | 13.0 |
| 4.9 | 4.3 | Wt. Water (g) | 8.8 | 8.1 |
| 21.3% | 21.2% | Water Content (%) | 62.3% | 62.0% |
| 21.2% | 21.2% | Corrected Water Content (%) | 62.6% | 62.2% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.37 | 20.04 | Wt. Sample (wet+tare)(g) | 20.78 | 24.38 |
| 24.04 | 19.35 | Wt. Sample (dry+tare)(g) | 19.57 | 22.59 |
| 13.85 | 13.76 | Wt. Tare (g) | 13.75 | 13.91 |
| 10.2 | 5.6 | Wt. Dry Soil (g) | 5.8 | 8.7 |
| 1.3 | 0.7 | Wt. Water (g) | 1.2 | 1.8 |
| 13.1% | 12.3% | Water Content (%) | 20.8% | 20.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 21 | | LL | 62 |
| PL | 13 | | PL | 21 |
| PI | 8 | | PI | 41 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CH | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 11, 2016 |
| Date Tested: | November 9, 2016 |
| Tested By: | C. Woods |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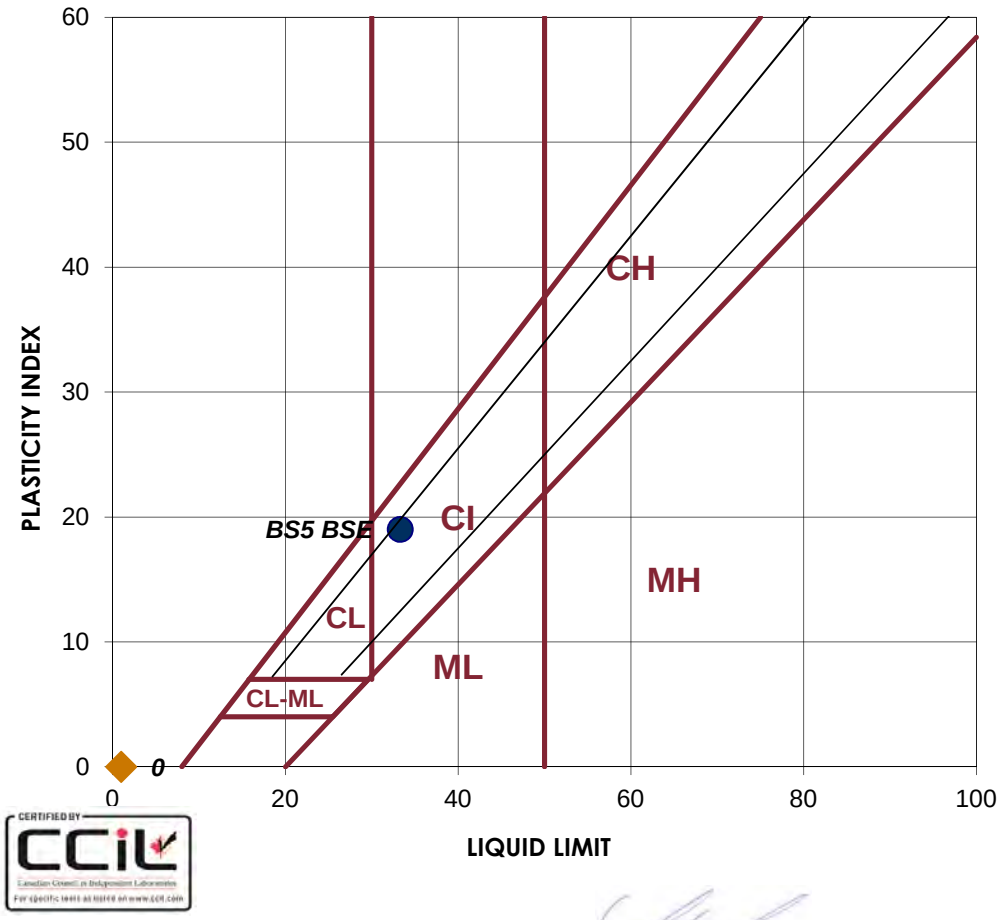
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS5 BSE | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 26 | Number of Blows | | |
| | | Container Number | | |
| 27.98 | 28.62 | Wt. Sample (wet+tare)(g) | | |
| 21.30 | 21.78 | Wt. Sample (dry+tare)(g) | | |
| 1.20 | 1.21 | Wt. Tare (g) | | |
| 20.1 | 20.6 | Wt. Dry Soil (g) | | |
| 6.7 | 6.8 | Wt. Water (g) | | |
| 33.2% | 33.3% | Water Content (%) | | |
| 33.2% | 33.4% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.92 | 21.65 | Wt. Sample (wet+tare)(g) | | |
| 24.43 | 20.71 | Wt. Sample (dry+tare)(g) | | |
| 13.79 | 13.74 | Wt. Tare (g) | | |
| 10.6 | 7.0 | Wt. Dry Soil (g) | | |
| 1.5 | 0.9 | Wt. Water (g) | | |
| 14.0% | 13.5% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | |
| PL | 14 | | PL | |
| PI | 19 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | April 28, 2016 |
| Date Tested: | October 31, 2016 |
| Tested By: | C. Woods |


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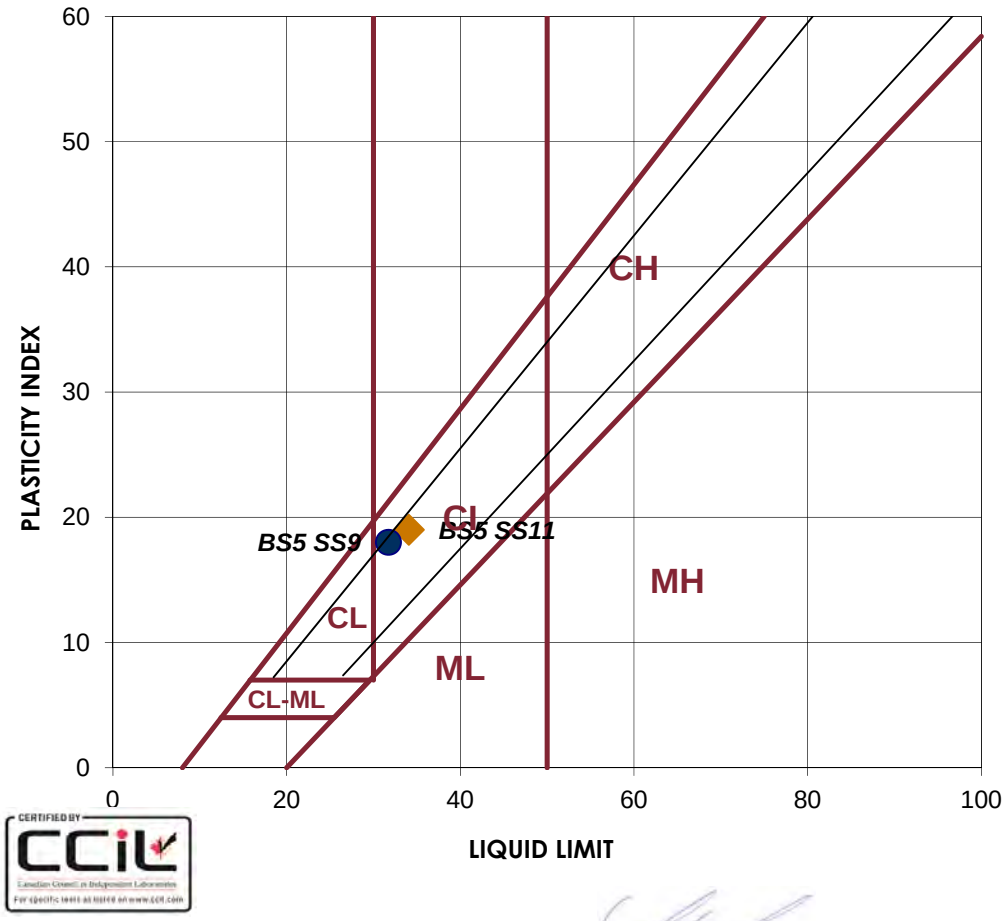
| Sample: BS5 SS9 | | | Sample: BS5 SS11 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | 25 | 24 |
| | | Container Number | | |
| 23.51 | 26.46 | Wt. Sample (wet+tare)(g) | 25.37 | 25.03 |
| 18.20 | 20.55 | Wt. Sample (dry+tare)(g) | 19.20 | 18.99 |
| 1.15 | 1.60 | Wt. Tare (g) | 1.16 | 1.28 |
| 17.1 | 19.0 | Wt. Dry Soil (g) | 18.0 | 17.7 |
| 5.3 | 5.9 | Wt. Water (g) | 6.2 | 6.0 |
| 31.1% | 31.2% | Water Content (%) | 34.2% | 34.1% |
| 31.7% | 31.8% | Corrected Water Content (%) | 34.2% | 33.9% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.63 | 26.07 | Wt. Sample (wet+tare)(g) | 24.78 | 26.75 |
| 24.14 | 24.52 | Wt. Sample (dry+tare)(g) | 23.37 | 25.04 |
| 13.77 | 13.92 | Wt. Tare (g) | 13.79 | 13.84 |
| 10.4 | 10.6 | Wt. Dry Soil (g) | 9.6 | 11.2 |
| 1.5 | 1.6 | Wt. Water (g) | 1.4 | 1.7 |
| 14.4% | 14.6% | Water Content (%) | 14.7% | 15.3% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | 34 |
| PL | 14 | | PL | 15 |
| PI | 18 | | PI | 19 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CL | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | April 28, 2016 |
| Date Tested: | October 31, 2016 |
| Tested By: | C. Woods |


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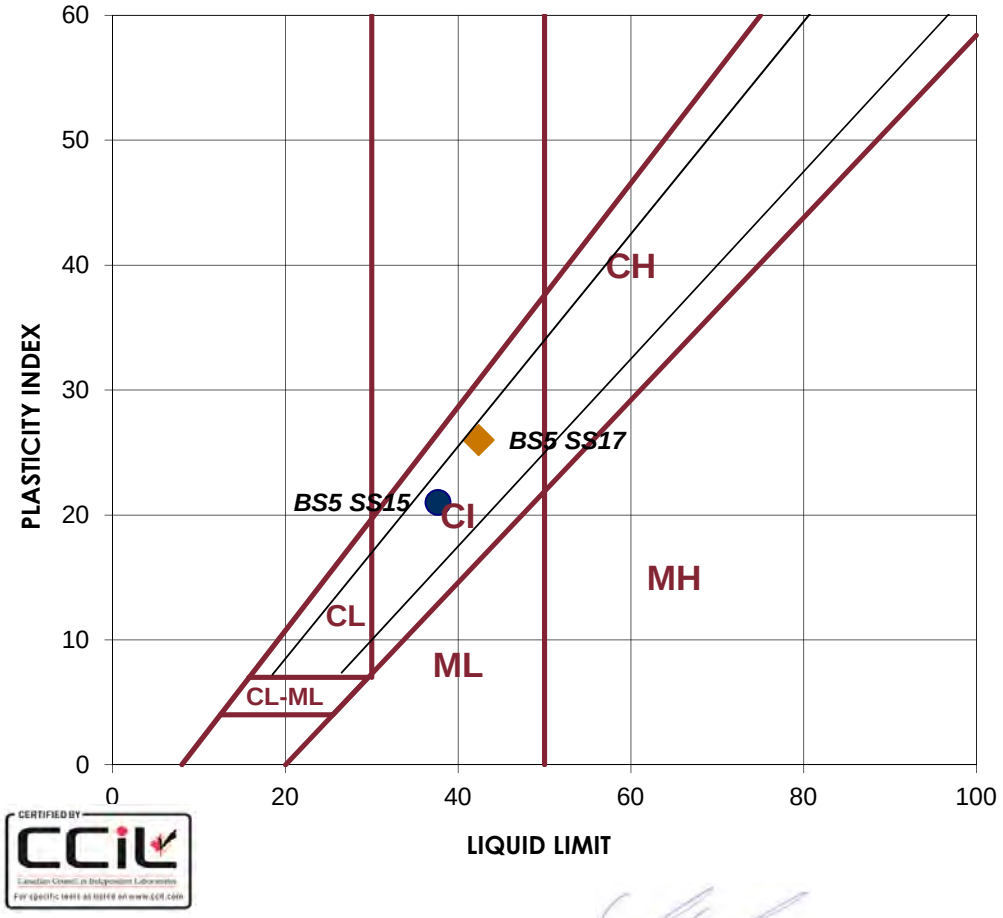
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS5 SS15 | | | BS5 SS17 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 26 | 27 | Number of Blows | 24 | 24 |
| | | Container Number | | |
| 25.54 | 22.07 | Wt. Sample (wet+tare)(g) | 21.07 | 26.40 |
| 18.99 | 16.42 | Wt. Sample (dry+tare)(g) | 15.22 | 18.98 |
| 1.54 | 1.28 | Wt. Tare (g) | 1.50 | 1.54 |
| 17.5 | 15.1 | Wt. Dry Soil (g) | 13.7 | 17.4 |
| 6.6 | 5.7 | Wt. Water (g) | 5.9 | 7.4 |
| 37.5% | 37.3% | Water Content (%) | 42.6% | 42.5% |
| 37.7% | 37.7% | Corrected Water Content (%) | 42.4% | 42.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.64 | 25.87 | Wt. Sample (wet+tare)(g) | 22.83 | 25.11 |
| 22.18 | 24.12 | Wt. Sample (dry+tare)(g) | 21.57 | 23.49 |
| 13.8 | 13.77 | Wt. Tare (g) | 13.72 | 13.87 |
| 8.4 | 10.4 | Wt. Dry Soil (g) | 7.9 | 9.6 |
| 1.5 | 1.8 | Wt. Water (g) | 1.3 | 1.6 |
| 17.4% | 16.9% | Water Content (%) | 16.1% | 16.8% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 38 | | LL | 42 |
| PL | 17 | | PL | 16 |
| PI | 21 | | PI | 26 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 11, 2016 |
| Date Tested: | October 25, 2016 |
| Tested By: | C. Woods |


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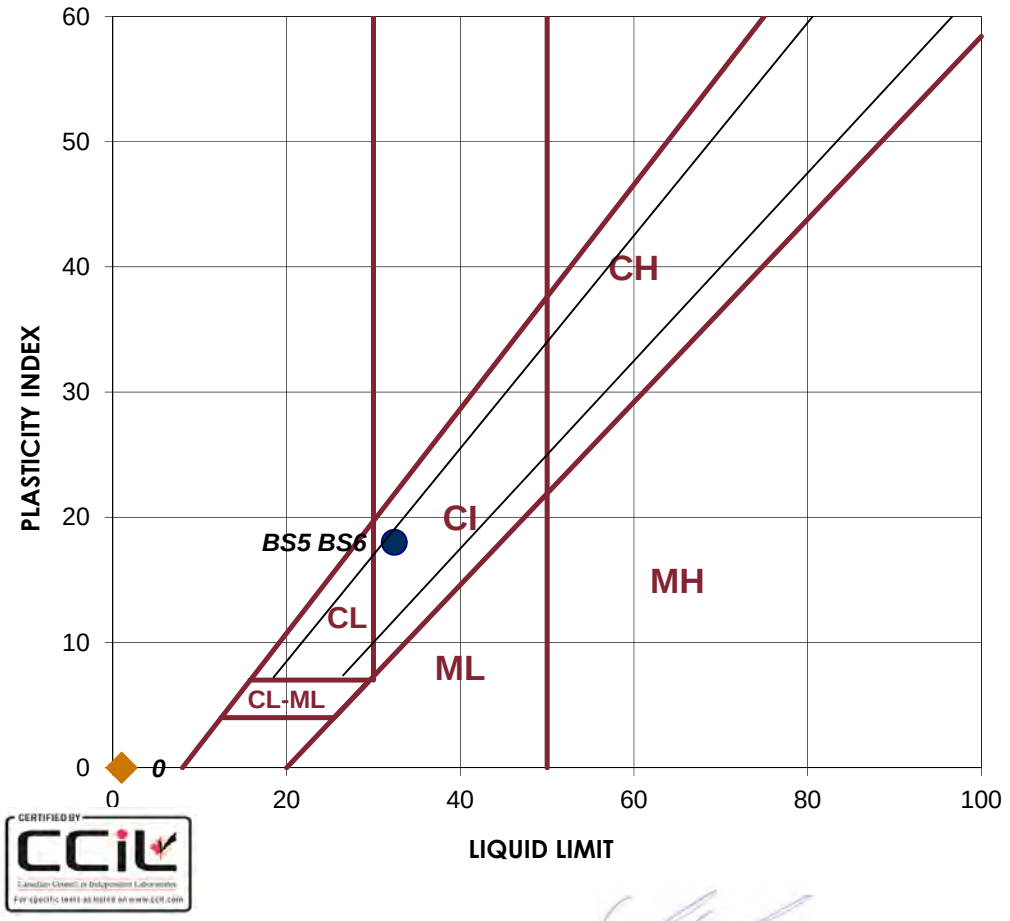
| Sample: | | | Sample: | |
|---|---|---|---|---|
| BS5 BS6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | | |
| | | Container Number | | |
| 24.81 | 27.77 | Wt. Sample (wet+tare)(g) | | |
| 19.12 | 21.34 | Wt. Sample (dry+tare)(g) | | |
| 1.53 | 1.53 | Wt. Tare (g) | | |
| 17.6 | 19.8 | Wt. Dry Soil (g) | | |
| 5.7 | 6.4 | Wt. Water (g) | | |
| 32.3% | 32.5% | Water Content (%) | | |
| 32.3% | 32.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.23 | 27.5 | Wt. Sample (wet+tare)(g) | | |
| 24.7 | 25.8 | Wt. Sample (dry+tare)(g) | | |
| 13.78 | 13.85 | Wt. Tare (g) | | |
| 10.9 | 12.0 | Wt. Dry Soil (g) | | |
| 1.5 | 1.7 | Wt. Water (g) | | |
| 14.0% | 14.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | |
| PL | 14 | | PL | |
| PI | 18 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.250 |
| Date Received: | August 16, 2016 |
| Date Tested: | October 11, 2016 |
| Tested By: | C.Small |


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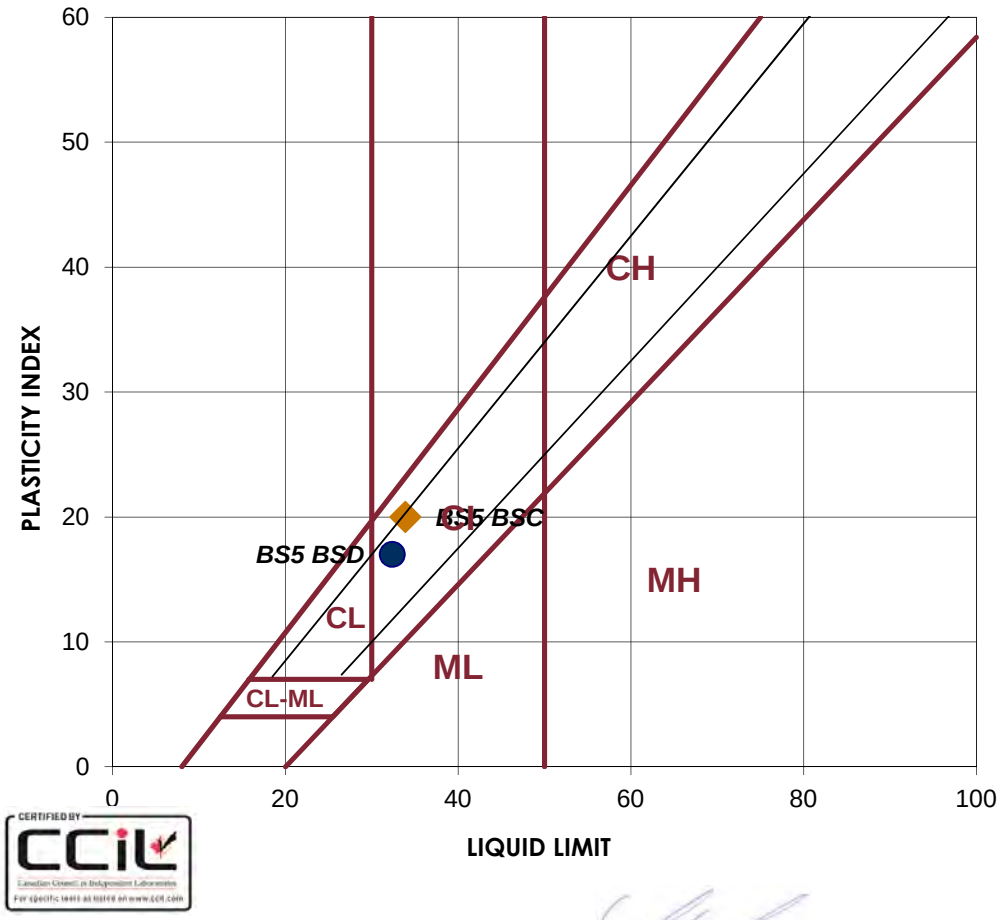
| Sample: BS5 BSD | | | Sample: BS5 BSC | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 25 | Number of Blows | 21 | 20 |
| | | Container Number | | |
| 29.43 | 24.87 | Wt. Sample (wet+tare)(g) | 29.19 | 28.30 |
| 22.61 | 19.14 | Wt. Sample (dry+tare)(g) | 21.97 | 21.41 |
| 1.57 | 1.52 | Wt. Tare (g) | 1.22 | 1.52 |
| 21.0 | 17.6 | Wt. Dry Soil (g) | 20.8 | 19.9 |
| 6.8 | 5.7 | Wt. Water (g) | 7.2 | 6.9 |
| 32.4% | 32.5% | Water Content (%) | 34.8% | 34.6% |
| 32.3% | 32.5% | Corrected Water Content (%) | 34.1% | 33.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.28 | 25.35 | Wt. Sample (wet+tare)(g) | 25.42 | 26.11 |
| 23.8 | 23.89 | Wt. Sample (dry+tare)(g) | 23.95 | 24.55 |
| 13.85 | 14.14 | Wt. Tare (g) | 13.79 | 13.77 |
| 10.0 | 9.8 | Wt. Dry Soil (g) | 10.2 | 10.8 |
| 1.5 | 1.5 | Wt. Water (g) | 1.5 | 1.6 |
| 14.9% | 15.0% | Water Content (%) | 14.5% | 14.5% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | 34 |
| PL | 15 | | PL | 14 |
| PI | 17 | | PI | 20 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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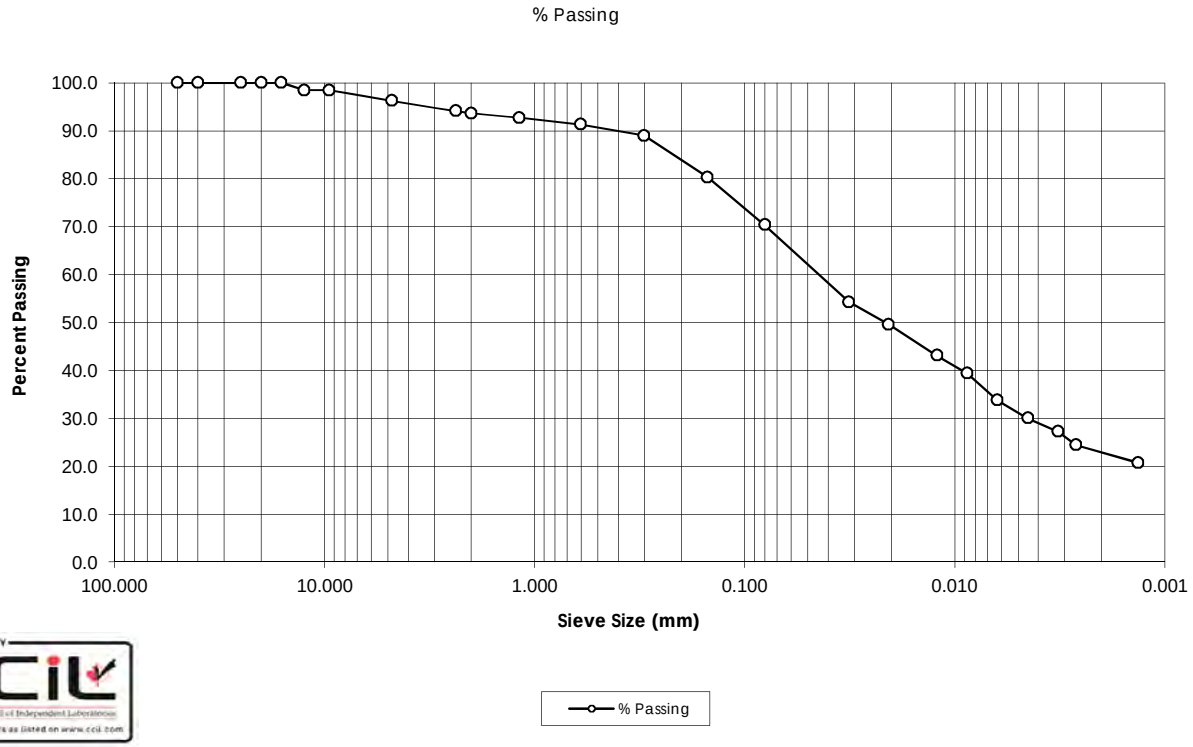
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSE
SOURCE: BS1
TESTED BY: B.Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0063** | **33.7** |
| **40.0** | **100.0** | **0.0045** | **30.0** |
| **25.0** | **100.0** | **0.0032** | **27.2** |
| **20.0** | **100.0** | **0.0026** | **24.4** |
| **16.0** | **100.0** | **0.0013** | **20.7** |
| **12.5** | **98.5** | | |
| **9.5** | **98.5** | | |
| **4.75** | **96.3** | | |
| **2.36** | **94.1** | | |
| **2.00** | **93.7** | | |
| **1.18** | **92.7** | | |
| **0.600** | **91.3** | | |
| **0.300** | **89.0** | | |
| **0.150** | **80.3** | | |
| **0.080** | **70.4** | | |
| **0.0318** | **54.2** | | |
| **0.0206** | **49.6** | | |
| **0.0121** | **43.1** | | |
| **0.0087** | **39.3** | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.7% | $D_{10}$: | - |
| Sand: | 25.9% | $D_{30}$: | 0.0045 |
| Silt: | 47.5% | $D_{60}$: | 0.0505 |
| Clay: | 22.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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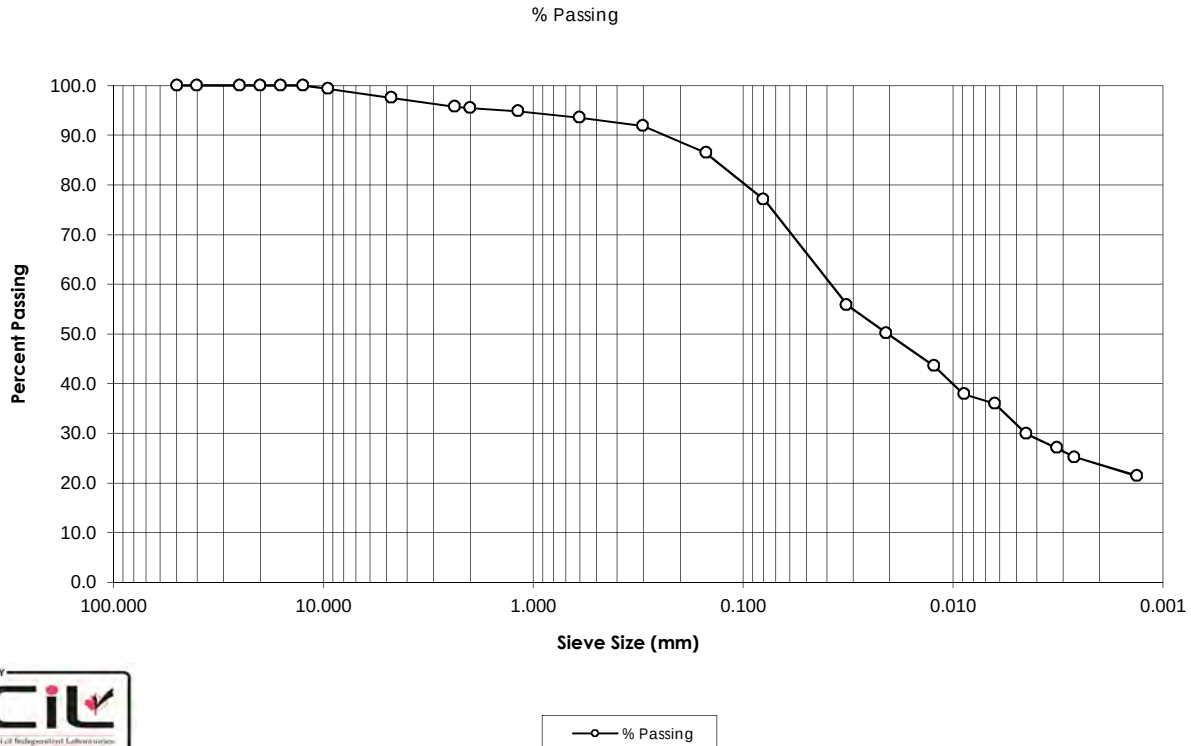
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSF
SOURCE: BS1
TESTED BY: B. Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 36.0 |
| 40.0 | 100.0 | 0.0045 | 29.9 |
| 25.0 | 100.0 | 0.0032 | 27.1 |
| 20.0 | 100.0 | 0.0026 | 25.2 |
| 16.0 | 100.0 | 0.0013 | 21.4 |
| 12.5 | 100.0 | | |
| 9.5 | 99.4 | | |
| 4.75 | 97.5 | | |
| 2.36 | 95.7 | | |
| 2.00 | 95.5 | | |
| 1.18 | 94.8 | | |
| 0.600 | 93.5 | | |
| 0.300 | 91.9 | | |
| 0.150 | 86.4 | | |
| 0.080 | 77.1 | | |
| 0.0322 | 55.9 | | |
| 0.0208 | 50.2 | | |
| 0.0123 | 43.5 | | |
| 0.0089 | 37.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.5% | $D_{10}$: | - |
| Sand: | 20.4% | $D_{30}$: | 0.0045 |
| Silt: | 53.5% | $D_{60}$: | 0.0428 |
| Clay: | 23.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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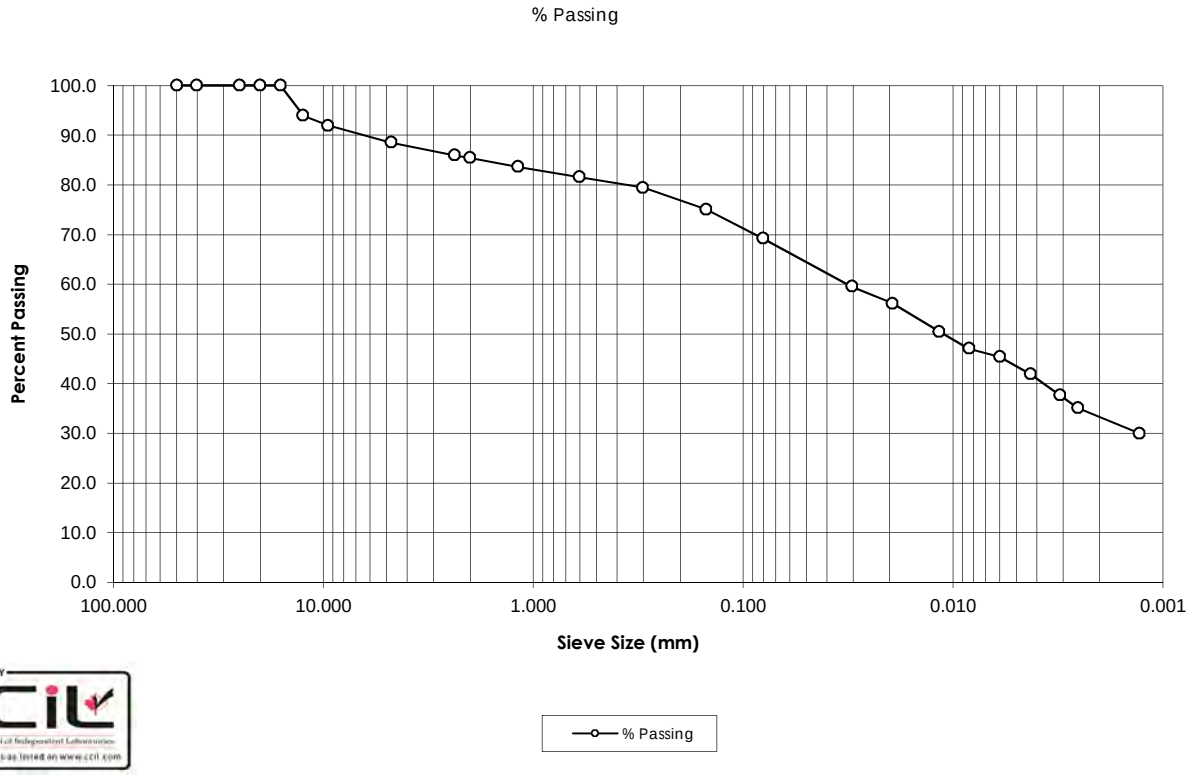
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: SS15
SOURCE: BS1
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 45.3 |
| 40.0 | 100.0 | 0.0043 | 41.9 |
| 25.0 | 100.0 | 0.0031 | 37.6 |
| 20.0 | 100.0 | 0.0025 | 35.1 |
| 16.0 | 100.0 | 0.0013 | 29.9 |
| 12.5 | 93.9 | | |
| 9.5 | 91.9 | | |
| 4.75 | 88.6 | | |
| 2.36 | 86.0 | | |
| 2.00 | 85.4 | | |
| 1.18 | 83.6 | | |
| 0.600 | 81.6 | | |
| 0.300 | 79.4 | | |
| 0.150 | 75.1 | | |
| 0.080 | 69.2 | | |
| 0.0303 | 59.5 | | |
| 0.0194 | 56.1 | | |
| 0.0116 | 50.5 | | |
| 0.0084 | 47.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 11.4% | $D_{10}$: | - |
| Sand: | 19.4% | $D_{30}$: | 0.0013 |
| Silt: | 35.9% | $D_{60}$: | 0.0329 |
| Clay: | 33.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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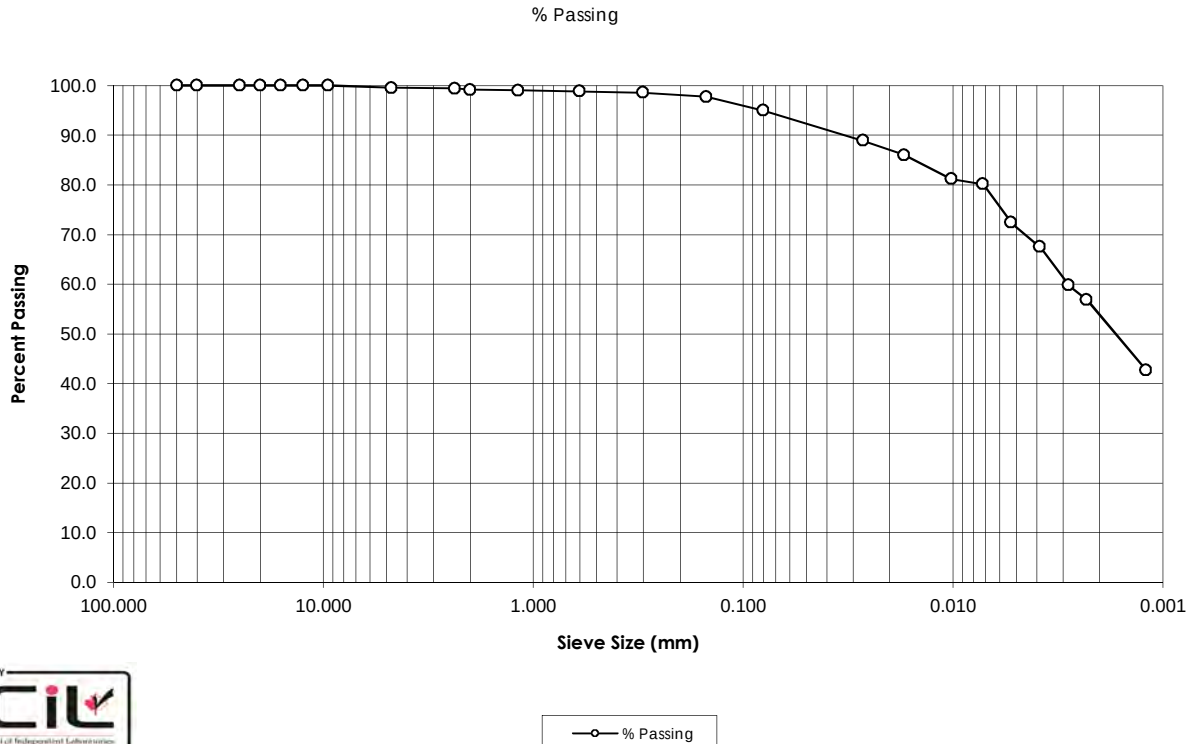
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: ST2
SOURCE: BS1
TESTED BY: C.Oost

DATE TESTED: September 16, 2016
DATE RECEIVED: August 11, 2016
SAMPLE DESCRIPTION: Clay (CL), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0053 | 72.4 |
| 40.0 | 100.0 | 0.0038 | 67.6 |
| 25.0 | 100.0 | 0.0028 | 59.8 |
| 20.0 | 100.0 | 0.0023 | 56.9 |
| 16.0 | 100.0 | 0.0012 | 42.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.5 | | |
| 2.36 | 99.4 | | |
| 2.00 | 99.2 | | |
| 1.18 | 99.0 | | |
| 0.600 | 98.8 | | |
| 0.300 | 98.6 | | |
| 0.150 | 97.8 | | |
| 0.080 | 95.0 | | |
| 0.0269 | 88.9 | | |
| 0.0171 | 86.0 | | |
| 0.0102 | 81.1 | | |
| 0.0072 | 80.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.5% | $D_{10}$: | - |
| Sand: | 4.5% | $D_{30}$: | - |
| Silt: | 41.3% | $D_{60}$: | 0.0028 |
| Clay: | 53.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

**OFFICE**
325 - 25th Street SE
Suite 200
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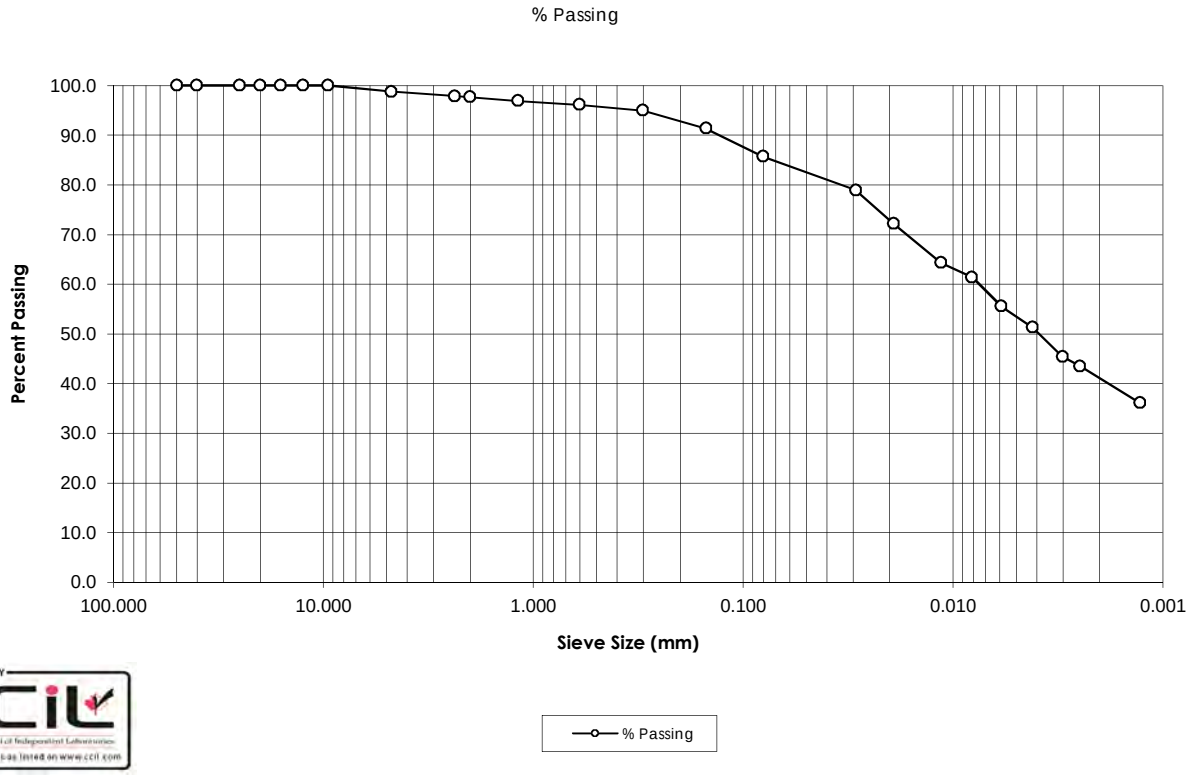
Tel: (403) 716-8000

**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

SAMPLE No.: BSB
SOURCE: BS1
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 55.6 |
| 40.0 | 100.0 | 0.0042 | 51.3 |
| 25.0 | 100.0 | 0.0030 | 45.4 |
| 20.0 | 100.0 | 0.0025 | 43.5 |
| 16.0 | 100.0 | 0.0013 | 36.1 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.8 | | |
| 2.36 | 97.9 | | |
| 2.00 | 97.6 | | |
| 1.18 | 96.9 | | |
| 0.600 | 96.1 | | |
| 0.300 | 95.0 | | |
| 0.150 | 91.3 | | |
| 0.080 | 85.7 | | |
| 0.0291 | 78.9 | | |
| 0.0191 | 72.1 | | |
| 0.0114 | 64.3 | | |
| 0.0081 | 61.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.2% | $D_{10}$: | - |
| Sand: | 13.1% | $D_{30}$: | - |
| Silt: | 44.6% | $D_{60}$: | 0.0076 |
| Clay: | 41.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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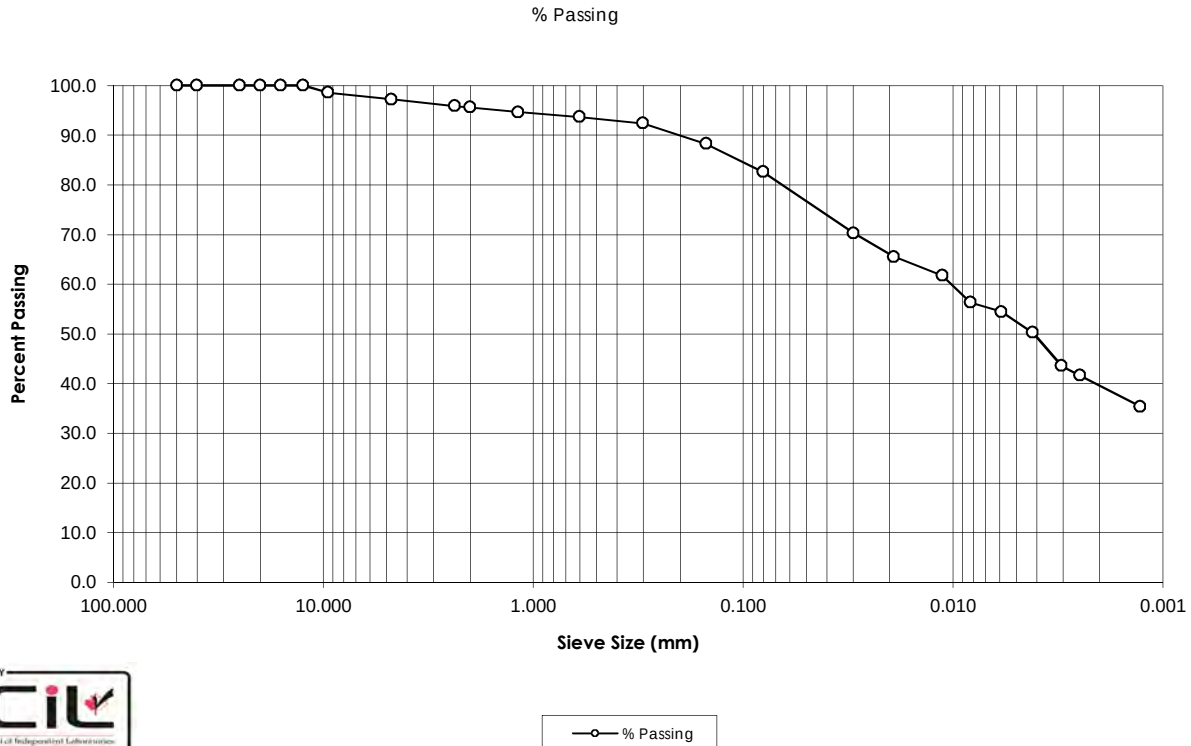
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSC
SOURCE: BS1
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 54.4 |
| 40.0 | 100.0 | 0.0042 | 50.2 |
| 25.0 | 100.0 | 0.0030 | 43.6 |
| 20.0 | 100.0 | 0.0025 | 41.6 |
| 16.0 | 100.0 | 0.0013 | 35.3 |
| 12.5 | 100.0 | | |
| 9.5 | 98.6 | | |
| 4.75 | 97.2 | | |
| 2.36 | 95.9 | | |
| 2.00 | 95.6 | | |
| 1.18 | 94.6 | | |
| 0.600 | 93.7 | | |
| 0.300 | 92.4 | | |
| 0.150 | 88.3 | | |
| 0.080 | 82.6 | | |
| 0.0298 | 70.3 | | |
| 0.0192 | 65.5 | | |
| 0.0112 | 61.7 | | |
| 0.0082 | 56.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.8% | $D_{10}$: | - |
| Sand: | 14.6% | $D_{30}$: | - |
| Silt: | 43.0% | $D_{60}$: | 0.0103 |
| Clay: | 39.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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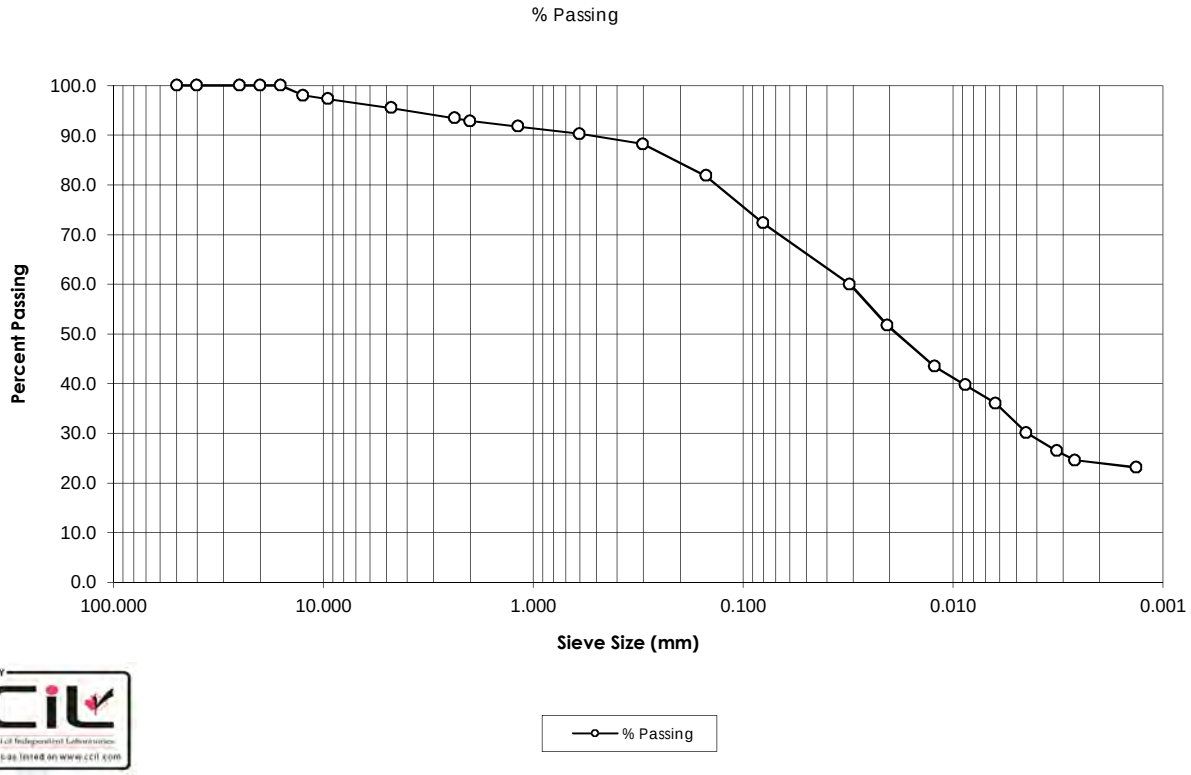
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSD
SOURCE: BS1
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 12, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0063** | **36.0** |
| **40.0** | **100.0** | **0.0045** | **30.1** |
| **25.0** | **100.0** | **0.0032** | **26.4** |
| **20.0** | **100.0** | **0.0026** | **24.6** |
| **16.0** | **100.0** | **0.0013** | **23.1** |
| **12.5** | **98.0** | | |
| **9.5** | **97.3** | | |
| **4.75** | **95.5** | | |
| **2.36** | **93.4** | | |
| **2.00** | **92.8** | | |
| **1.18** | **91.8** | | |
| **0.600** | **90.3** | | |
| **0.300** | **88.2** | | |
| **0.150** | **81.8** | | |
| **0.080** | **72.3** | | |
| **0.0311** | **60.0** | | |
| **0.0205** | **51.7** | | |
| **0.0122** | **43.4** | | |
| **0.0087** | **39.7** | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.5% | $D_{10}$: | - |
| Sand: | 23.2% | $D_{30}$: | 0.0044 |
| Silt: | 48.3% | $D_{60}$: | 0.0311 |
| Clay: | 24.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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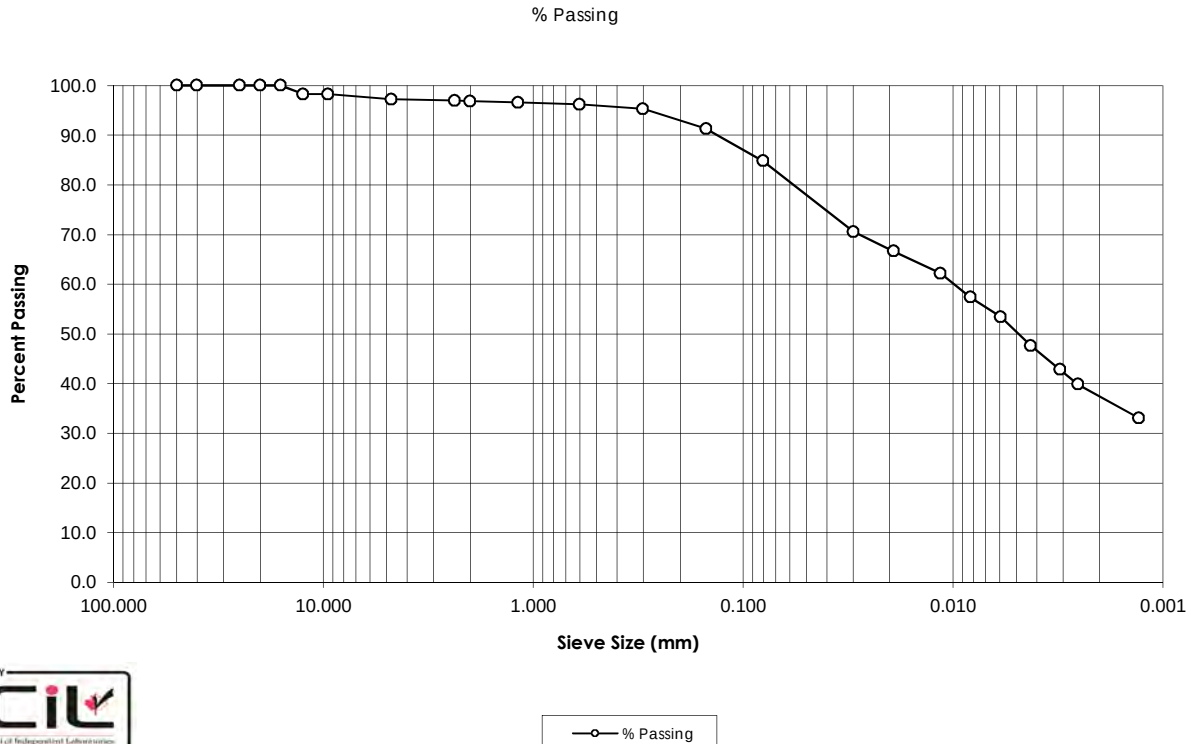
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BS1
SOURCE: BS2
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 53.4 |
| 40.0 | 100.0 | 0.0043 | 47.6 |
| 25.0 | 100.0 | 0.0031 | 42.7 |
| 20.0 | 100.0 | 0.0025 | 39.8 |
| 16.0 | 100.0 | 0.0013 | 33.0 |
| 12.5 | 98.2 | | |
| 9.5 | 98.2 | | |
| 4.75 | 97.2 | | |
| 2.36 | 97.0 | | |
| 2.00 | 96.8 | | |
| 1.18 | 96.6 | | |
| 0.600 | 96.2 | | |
| 0.300 | 95.3 | | |
| 0.150 | 91.3 | | |
| 0.080 | 84.8 | | |
| 0.0298 | 70.5 | | |
| 0.0192 | 66.6 | | |
| 0.0115 | 62.2 | | |
| 0.0082 | 57.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.8% | $D_{10}$: | - |
| Sand: | 12.4% | $D_{30}$: | - |
| Silt: | 47.4% | $D_{60}$: | 0.0101 |
| Clay: | 37.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample descripton (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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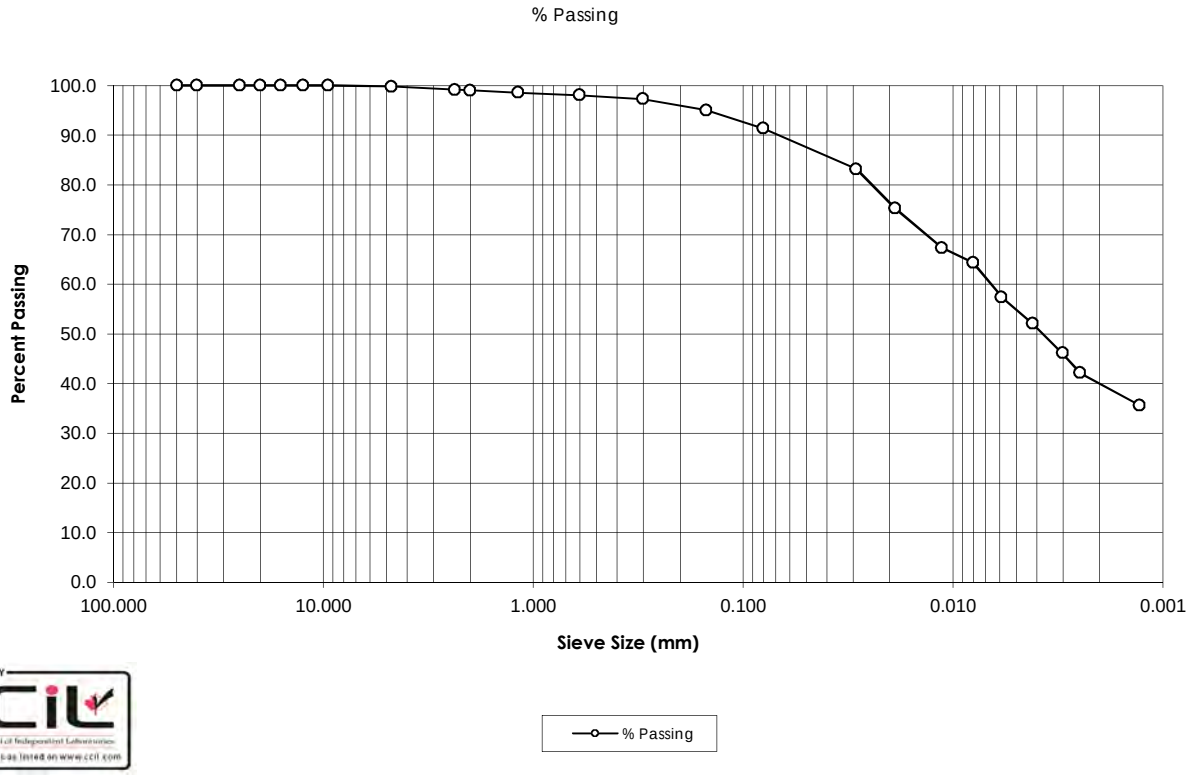
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSD
SOURCE: BS2
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (Cl), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 57.4 |
| 40.0 | 100.0 | 0.0042 | 52.1 |
| 25.0 | 100.0 | 0.0030 | 46.1 |
| 20.0 | 100.0 | 0.0025 | 42.2 |
| 16.0 | 100.0 | 0.0013 | 35.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.8 | | |
| 2.36 | 99.2 | | |
| 2.00 | 99.0 | | |
| 1.18 | 98.6 | | |
| 0.600 | 98.1 | | |
| 0.300 | 97.3 | | |
| 0.150 | 95.0 | | |
| 0.080 | 91.4 | | |
| 0.0289 | 83.2 | | |
| 0.0189 | 75.2 | | |
| 0.0113 | 67.3 | | |
| 0.0080 | 64.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.2% | $D_{10}$: | - |
| Sand: | 8.4% | $D_{30}$: | - |
| Silt: | 51.4% | $D_{60}$: | 0.0067 |
| Clay: | 40.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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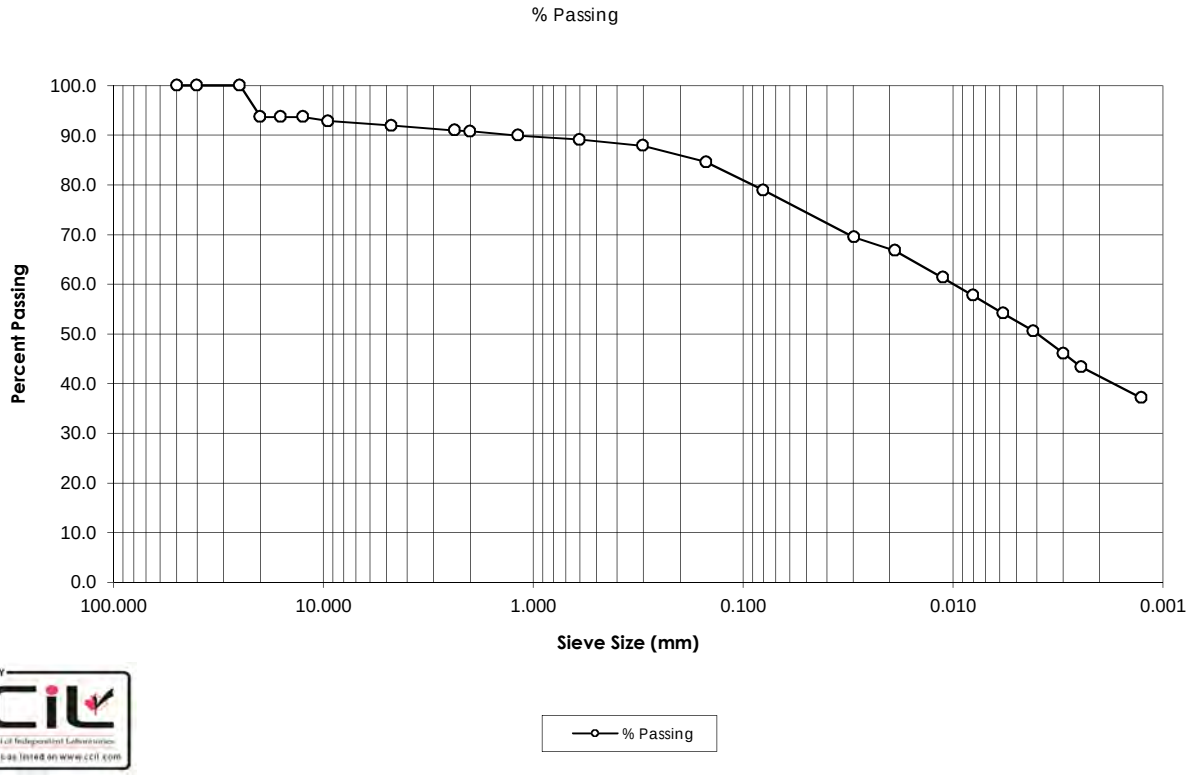
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSB
SOURCE: BS2
TESTED BY: B. Pelkey

DATE TESTED: October 3, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (Cl), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0057 | 54.2 |
| 40.0 | 100.0 | 0.0041 | 50.6 |
| 25.0 | 100.0 | 0.0030 | 46.1 |
| 20.0 | 93.7 | 0.0025 | 43.4 |
| 16.0 | 93.7 | 0.0013 | 37.1 |
| 12.5 | 93.7 | | |
| 9.5 | 92.8 | | |
| 4.75 | 92.0 | | |
| 2.36 | 91.0 | | |
| 2.00 | 90.8 | | |
| 1.18 | 89.9 | | |
| 0.600 | 89.1 | | |
| 0.300 | 87.9 | | |
| 0.150 | 84.6 | | |
| 0.080 | 78.9 | | |
| 0.0295 | 69.5 | | |
| 0.0189 | 66.8 | | |
| 0.0112 | 61.4 | | |
| 0.0080 | 57.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.0% | $D_{10}$: | - |
| Sand: | 13.0% | $D_{30}$: | - |
| Silt: | 37.5% | $D_{60}$: | 0.0100 |
| Clay: | 41.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) drerived from both the Grain Size and Atterberg test results.

Reviewed by:

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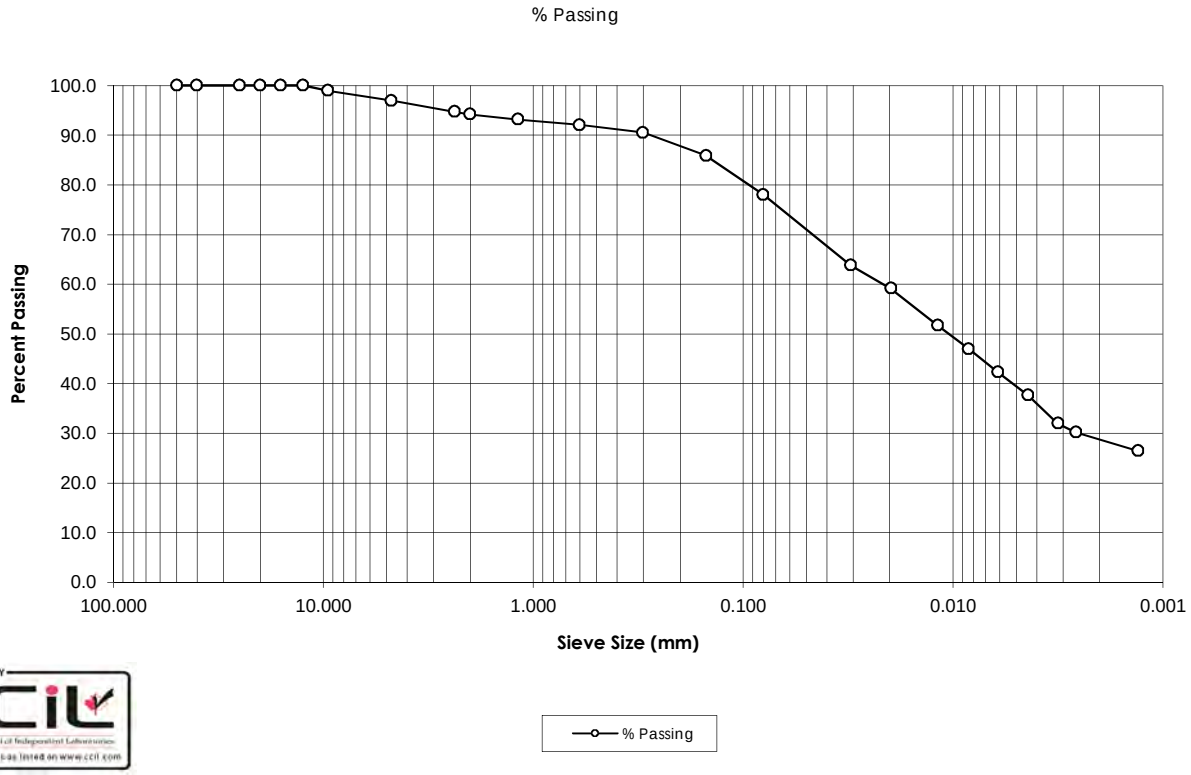
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSC
SOURCE: BS2
TESTED BY: B. Pelkey

DATE TESTED: October 3, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 42.3 |
| 40.0 | 100.0 | 0.0044 | 37.6 |
| 25.0 | 100.0 | 0.0032 | 32.0 |
| 20.0 | 100.0 | 0.0026 | 30.1 |
| 16.0 | 100.0 | 0.0013 | 26.4 |
| 12.5 | 100.0 | | |
| 9.5 | 99.0 | | |
| 4.75 | 97.0 | | |
| 2.36 | 94.7 | | |
| 2.00 | 94.2 | | |
| 1.18 | 93.2 | | |
| 0.600 | 92.1 | | |
| 0.300 | 90.5 | | |
| 0.150 | 85.9 | | |
| 0.080 | 78.0 | | |
| 0.0306 | 63.8 | | |
| 0.0197 | 59.1 | | |
| 0.0118 | 51.6 | | |
| 0.0084 | 47.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.0% | $D_{10}$: | - |
| Sand: | 18.9% | $D_{30}$: | 0.0025 |
| Silt: | 49.3% | $D_{60}$: | 0.0218 |
| Clay: | 28.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) drerived from both the Grain Size and Atterberg test results.

Reviewed by:

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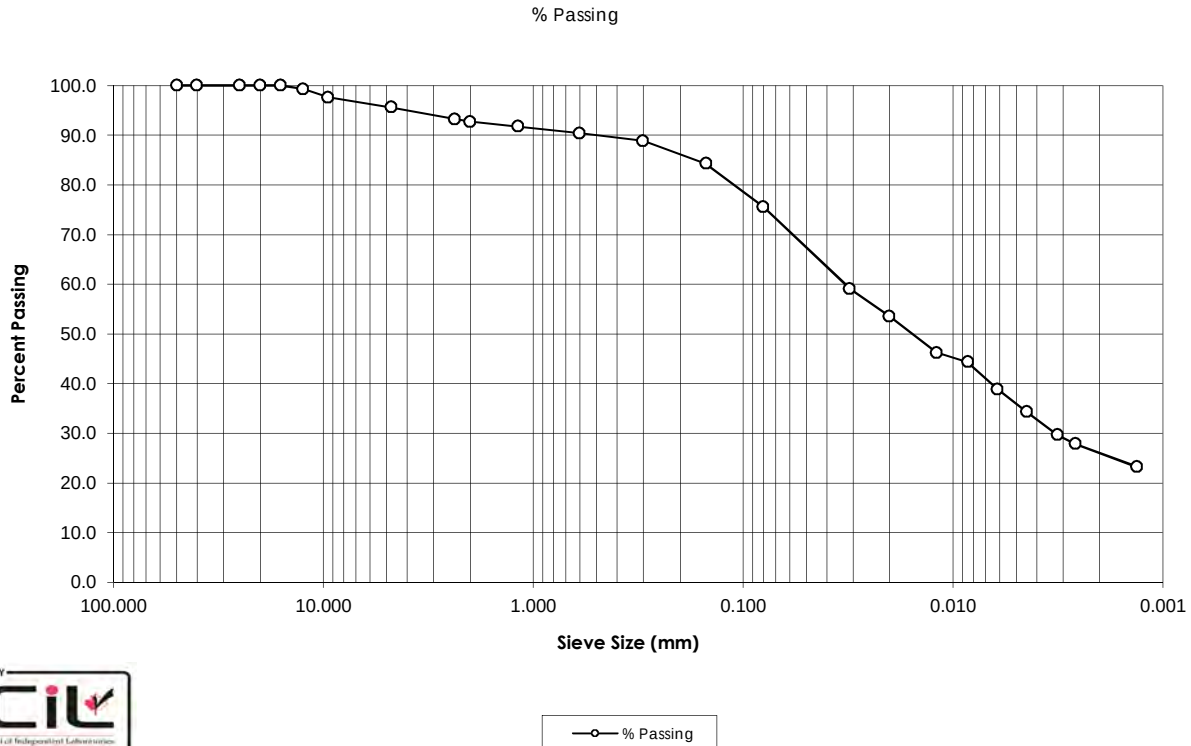
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396302.702.250

SAMPLE No.: BSE
SOURCE: BS2
TESTED BY: B. Pelkey

DATE TESTED: October 3, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (CL), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 38.8 |
| 40.0 | 100.0 | 0.0044 | 34.2 |
| 25.0 | 100.0 | 0.0032 | 29.6 |
| 20.0 | 100.0 | 0.0026 | 27.8 |
| 16.0 | 100.0 | 0.0013 | 23.2 |
| 12.5 | 99.3 | | |
| 9.5 | 97.6 | | |
| 4.75 | 95.6 | | |
| 2.36 | 93.3 | | |
| 2.00 | 92.7 | | |
| 1.18 | 91.7 | | |
| 0.600 | 90.4 | | |
| 0.300 | 88.8 | | |
| 0.150 | 84.3 | | |
| 0.080 | 75.6 | | |
| 0.0310 | 59.1 | | |
| 0.0201 | 53.6 | | |
| 0.0119 | 46.2 | | |
| 0.0085 | 44.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.4% | $D_{10}$: | - |
| Sand: | 20.0% | $D_{30}$: | 0.0033 |
| Silt: | 49.6% | $D_{60}$: | 0.0341 |
| Clay: | 26.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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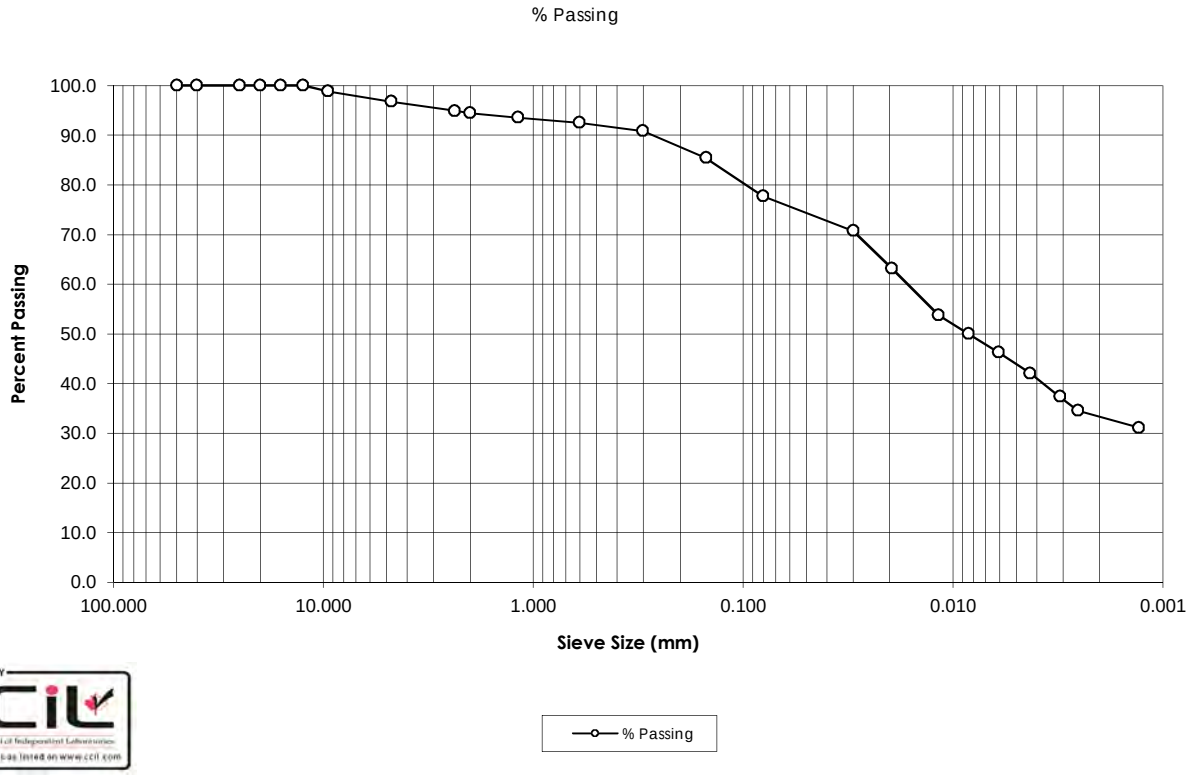
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSF
SOURCE: BS2
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 25, 2016
SAMPLE DESCRIPTION: Clay (CL-CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 46.2 |
| 40.0 | 100.0 | 0.0043 | 42.1 |
| 25.0 | 100.0 | 0.0031 | 37.4 |
| 20.0 | 100.0 | 0.0025 | 34.5 |
| 16.0 | 100.0 | 0.0013 | 31.1 |
| 12.5 | 100.0 | | |
| 9.5 | 98.8 | | |
| 4.75 | 96.8 | | |
| 2.36 | 94.9 | | |
| 2.00 | 94.5 | | |
| 1.18 | 93.5 | | |
| 0.600 | 92.5 | | |
| 0.300 | 90.9 | | |
| 0.150 | 85.4 | | |
| 0.080 | 77.7 | | |
| 0.0299 | 70.8 | | |
| 0.0196 | 63.2 | | |
| 0.0117 | 53.8 | | |
| 0.0084 | 50.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.2% | $D_{10}$: | - |
| Sand: | 19.1% | $D_{30}$: | - |
| Silt: | 44.4% | $D_{60}$: | 0.0171 |
| Clay: | 33.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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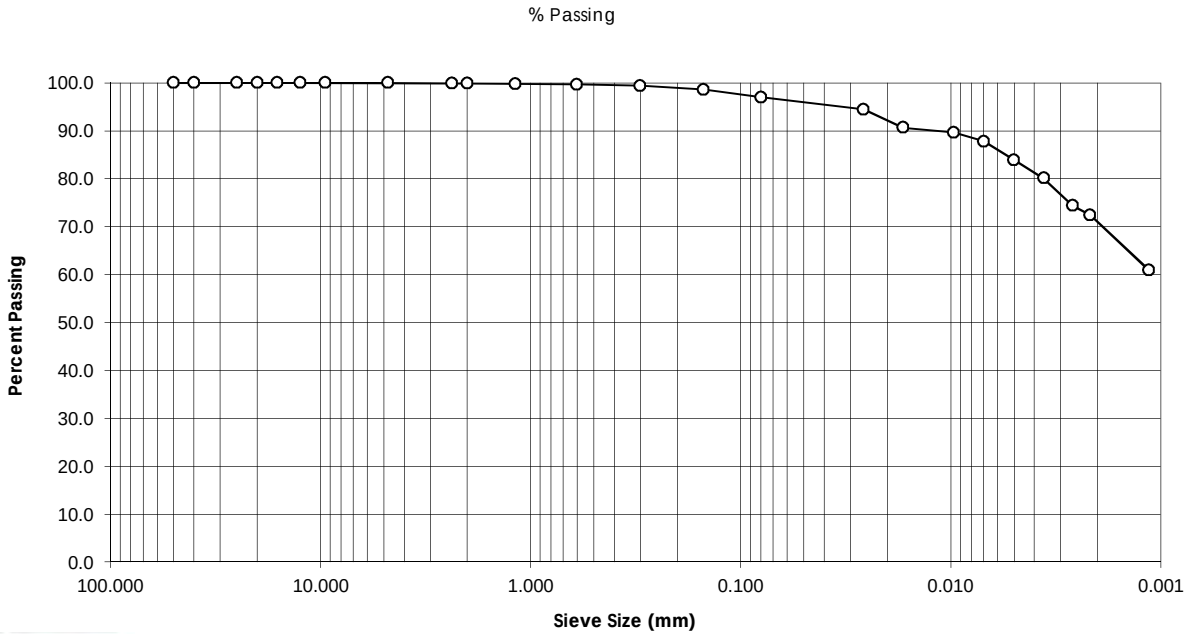
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSA
SOURCE: BS3
TESTED BY: B.Pelkey

DATE TESTED: October 3, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0050** | **83.9** |
| **40.0** | **100.0** | **0.0036** | **80.1** |
| **25.0** | **100.0** | **0.0026** | **74.3** |
| **20.0** | **100.0** | **0.0022** | **72.4** |
| **16.0** | **100.0** | **0.0011** | **60.9** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.9** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.8** | | |
| **0.600** | **99.7** | | |
| **0.300** | **99.4** | | |
| **0.150** | **98.6** | | |
| **0.080** | **97.0** | | |
| **0.0260** | **94.5** | | |
| **0.0168** | **90.6** | | |
| **0.0097** | **89.7** | | |
| **0.0069** | **87.8** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.9% | $D_{30}$: | - |
| Silt: | 26.0% | $D_{60}$: | - |
| Clay: | 71.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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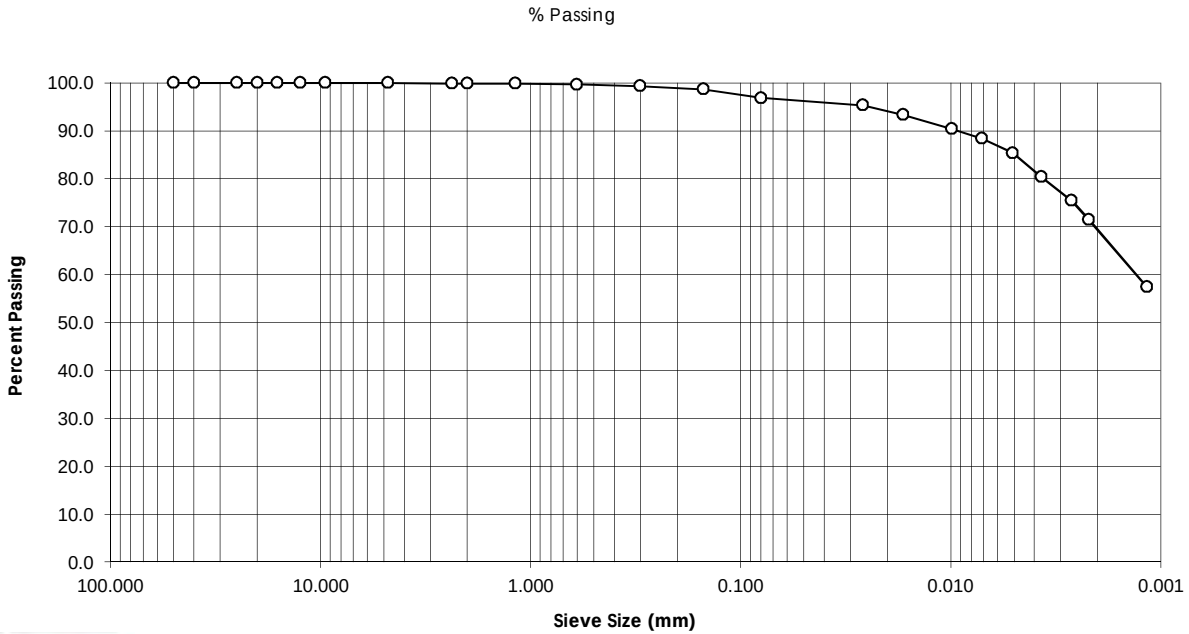
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSD
SOURCE: BS3
TESTED BY: B.Pelkey

DATE TESTED: October 3, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0051** | **85.4** |
| **40.0** | **100.0** | **0.0037** | **80.4** |
| **25.0** | **100.0** | **0.0027** | **75.4** |
| **20.0** | **100.0** | **0.0022** | **71.4** |
| **16.0** | **100.0** | **0.0012** | **57.4** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.8** | | |
| **2.00** | **99.8** | | |
| **1.18** | **99.8** | | |
| **0.600** | **99.6** | | |
| **0.300** | **99.4** | | |
| **0.150** | **98.7** | | |
| **0.080** | **96.8** | | |
| **0.0262** | **95.3** | | |
| **0.0168** | **93.3** | | |
| **0.0099** | **90.4** | | |
| **0.0071** | **88.4** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 3.1% | $D_{30}$: | - |
| Silt: | 27.5% | $D_{60}$: | 0.0014 |
| Clay: | 69.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

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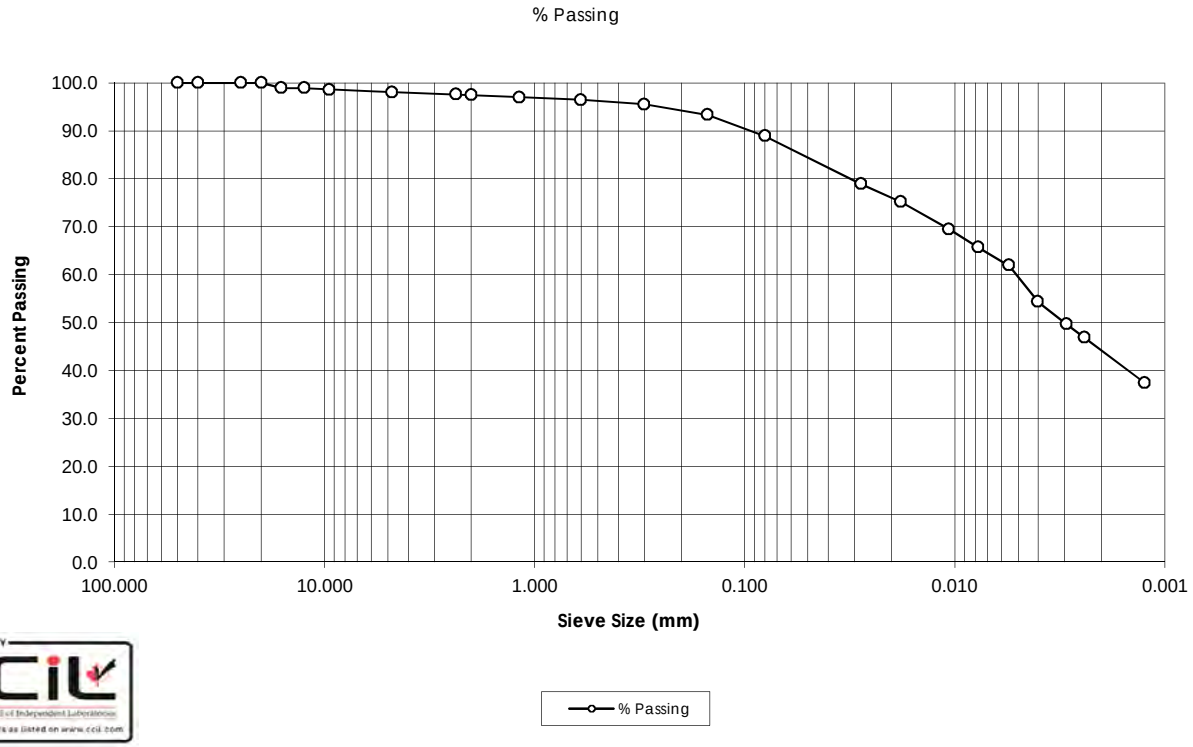
SAMPLE No.: BSF
SOURCE: BS3
TESTED BY: B.Pelkey

DATE TESTED: October 3, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0055** | **61.9** |
| **40.0** | **100.0** | **0.0040** | **54.4** |
| **25.0** | **100.0** | **0.0029** | **49.6** |
| **20.0** | **100.0** | **0.0024** | **46.8** |
| **16.0** | **99.0** | **0.0012** | **37.4** |
| **12.5** | **99.0** | | |
| **9.5** | **98.6** | | |
| **4.75** | **98.1** | | |
| **2.36** | **97.5** | | |
| **2.00** | **97.4** | | |
| **1.18** | **97.0** | | |
| **0.600** | **96.4** | | |
| **0.300** | **95.5** | | |
| **0.150** | **93.3** | | |
| **0.080** | **88.9** | | |
| **0.0279** | **78.9** | | |
| **0.0181** | **75.1** | | |
| **0.0107** | **69.5** | | |
| **0.0077** | **65.7** | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.9% | $D_{10}$: | - |
| Sand: | 9.2% | $D_{30}$: | - |
| Silt: | 44.7% | $D_{60}$: | 0.0052 |
| Clay: | 44.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

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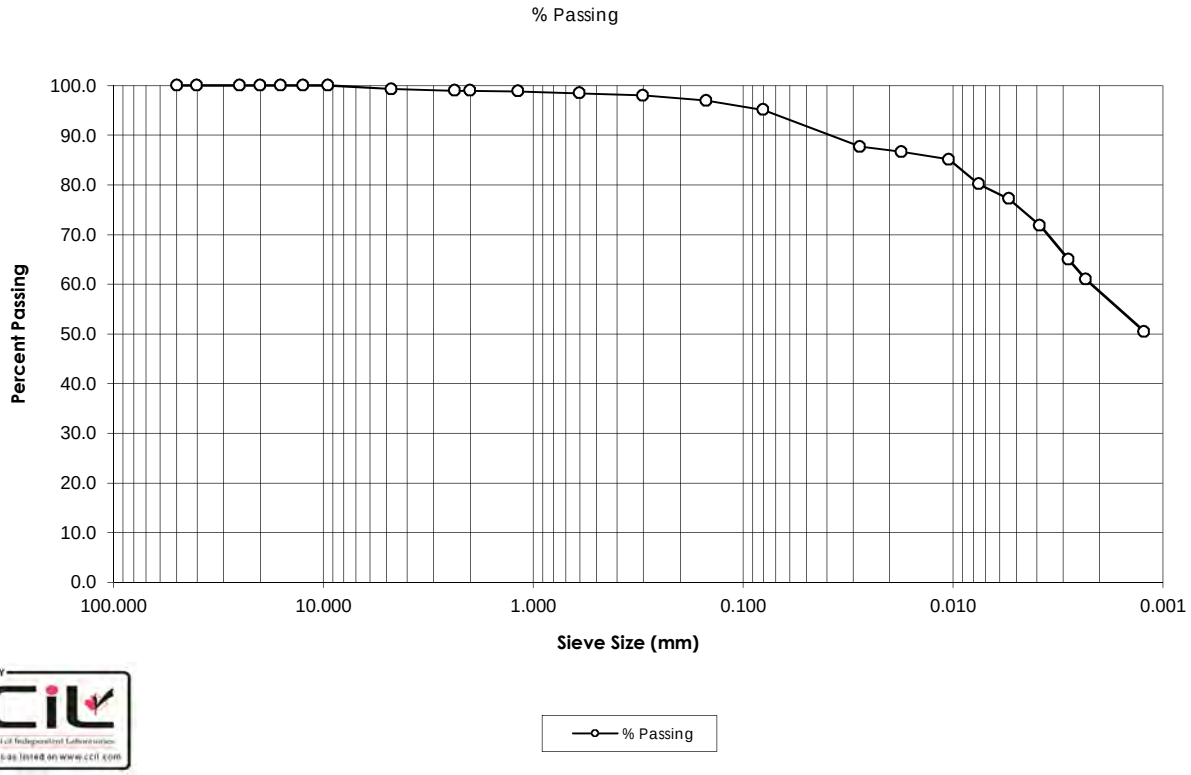
SAMPLE No.: BS2
SOURCE: BS3
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 77.2 |
| 40.0 | 100.0 | 0.0038 | 71.8 |
| 25.0 | 100.0 | 0.0028 | 64.9 |
| 20.0 | 100.0 | 0.0023 | 61.0 |
| 16.0 | 100.0 | 0.0012 | 50.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.3 | | |
| 2.36 | 99.0 | | |
| 2.00 | 98.9 | | |
| 1.18 | 98.8 | | |
| 0.600 | 98.5 | | |
| 0.300 | 98.0 | | |
| 0.150 | 96.9 | | |
| 0.080 | 95.1 | | |
| 0.0277 | 87.7 | | |
| 0.0176 | 86.7 | | |
| 0.0104 | 85.1 | | |
| 0.0075 | 80.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.7% | $D_{10}$: | - |
| Sand: | 4.2% | $D_{30}$: | - |
| Silt: | 36.6% | $D_{60}$: | 0.0022 |
| Clay: | 58.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Soil description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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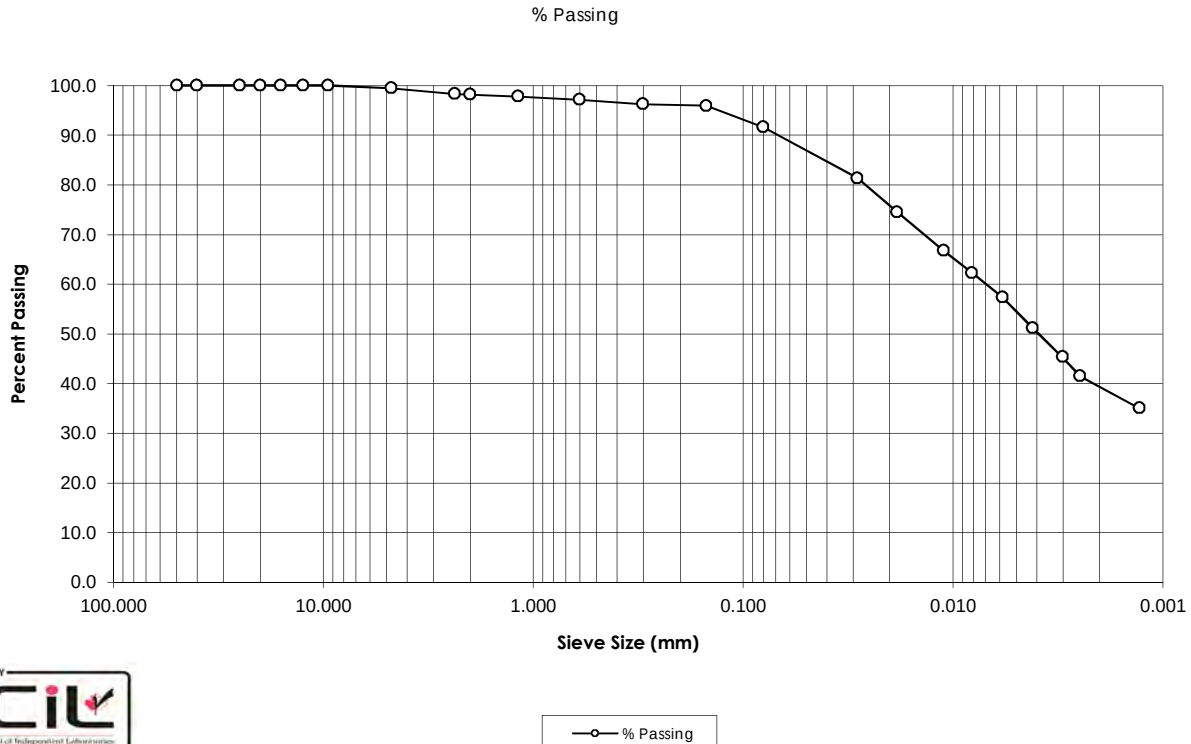
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BS5
SOURCE: BS3
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 57.4 |
| 40.0 | 100.0 | 0.0042 | 51.2 |
| 25.0 | 100.0 | 0.0030 | 45.3 |
| 20.0 | 100.0 | 0.0025 | 41.5 |
| 16.0 | 100.0 | 0.0013 | 35.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.5 | | |
| 2.36 | 98.4 | | |
| 2.00 | 98.2 | | |
| 1.18 | 97.8 | | |
| 0.600 | 97.2 | | |
| 0.300 | 96.2 | | |
| 0.150 | 95.9 | | |
| 0.080 | 91.6 | | |
| 0.0285 | 81.4 | | |
| 0.0185 | 74.5 | | |
| 0.0111 | 66.8 | | |
| 0.0081 | 62.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.5% | $D_{10}$: | - |
| Sand: | 7.9% | $D_{30}$: | - |
| Silt: | 52.3% | $D_{60}$: | 0.0071 |
| Clay: | 39.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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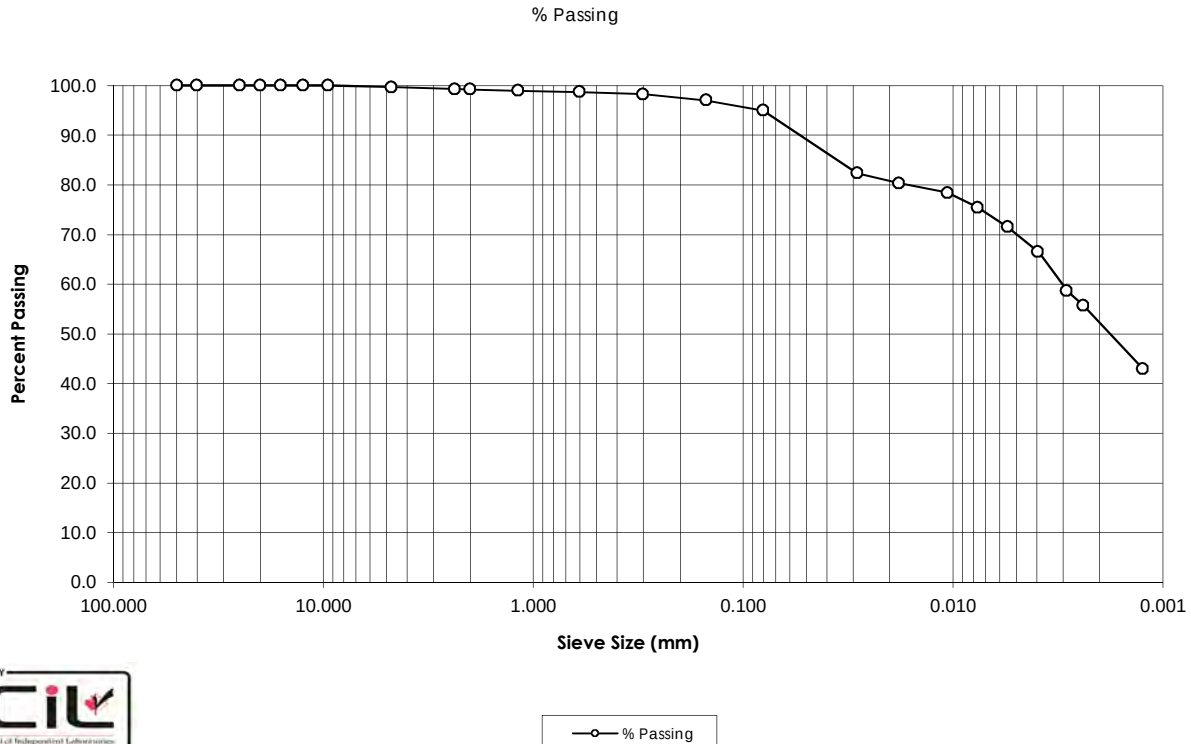
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396302.702.250

SAMPLE No.: BSC
SOURCE: BS3
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Clay (CI-CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 71.5 |
| 40.0 | 100.0 | 0.0039 | 66.6 |
| 25.0 | 100.0 | 0.0029 | 58.7 |
| 20.0 | 100.0 | 0.0024 | 55.7 |
| 16.0 | 100.0 | 0.0012 | 42.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.7 | | |
| 2.36 | 99.3 | | |
| 2.00 | 99.2 | | |
| 1.18 | 99.0 | | |
| 0.600 | 98.7 | | |
| 0.300 | 98.3 | | |
| 0.150 | 97.0 | | |
| 0.080 | 95.0 | | |
| 0.0285 | 82.3 | | |
| 0.0182 | 80.4 | | |
| 0.0106 | 78.4 | | |
| 0.0076 | 75.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.3% | $D_{10}$: | - |
| Sand: | 4.7% | $D_{30}$: | - |
| Silt: | 42.7% | $D_{60}$: | 0.0031 |
| Clay: | 52.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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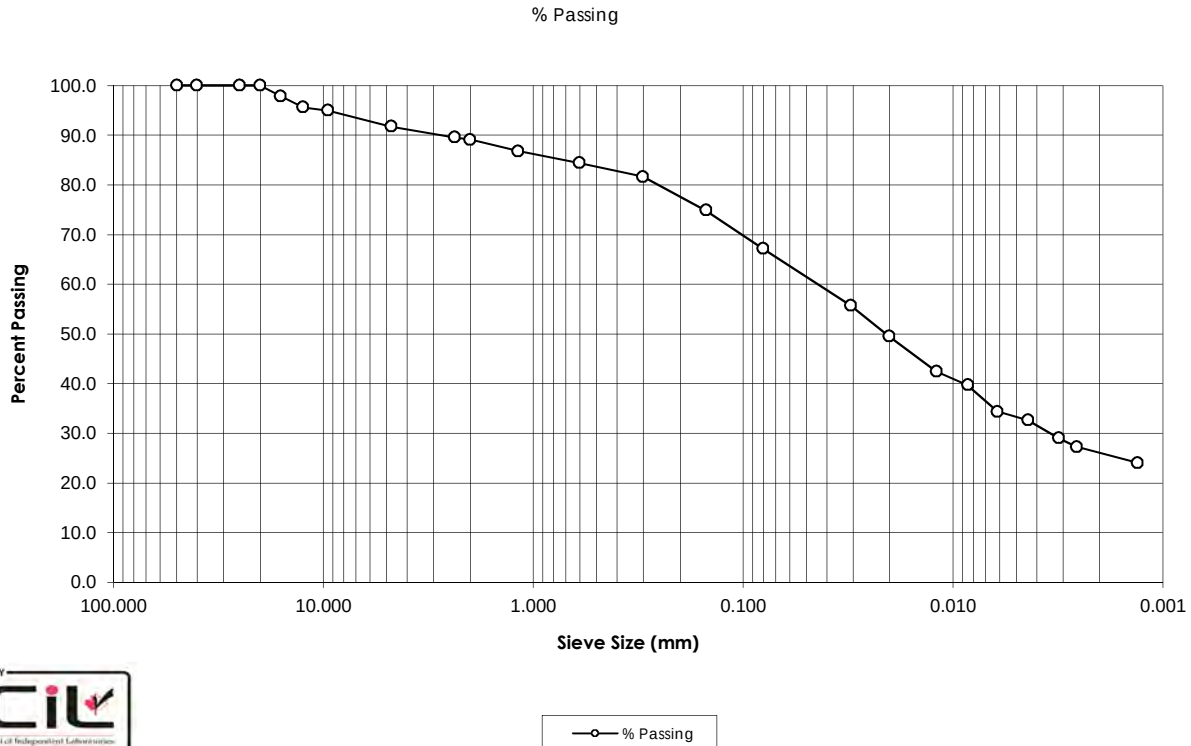
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BS7
SOURCE: BS4
TESTED BY: B. Pelkey

DATE TESTED: October 20, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL-CI), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 34.4 |
| 40.0 | 100.0 | 0.0044 | 32.6 |
| 25.0 | 100.0 | 0.0031 | 29.0 |
| 20.0 | 100.0 | 0.0026 | 27.2 |
| 16.0 | 97.9 | 0.0013 | 24.0 |
| 12.5 | 95.6 | | |
| 9.5 | 94.9 | | |
| 4.75 | 91.8 | | |
| 2.36 | 89.6 | | |
| 2.00 | 89.1 | | |
| 1.18 | 86.8 | | |
| 0.600 | 84.4 | | |
| 0.300 | 81.7 | | |
| 0.150 | 74.9 | | |
| 0.080 | 67.1 | | |
| 0.0307 | 55.7 | | |
| 0.0201 | 49.5 | | |
| 0.0119 | 42.4 | | |
| 0.0085 | 39.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.2% | $D_{10}$: | - |
| Sand: | 24.6% | $D_{30}$: | 0.0035 |
| Silt: | 41.1% | $D_{60}$: | 0.0503 |
| Clay: | 26.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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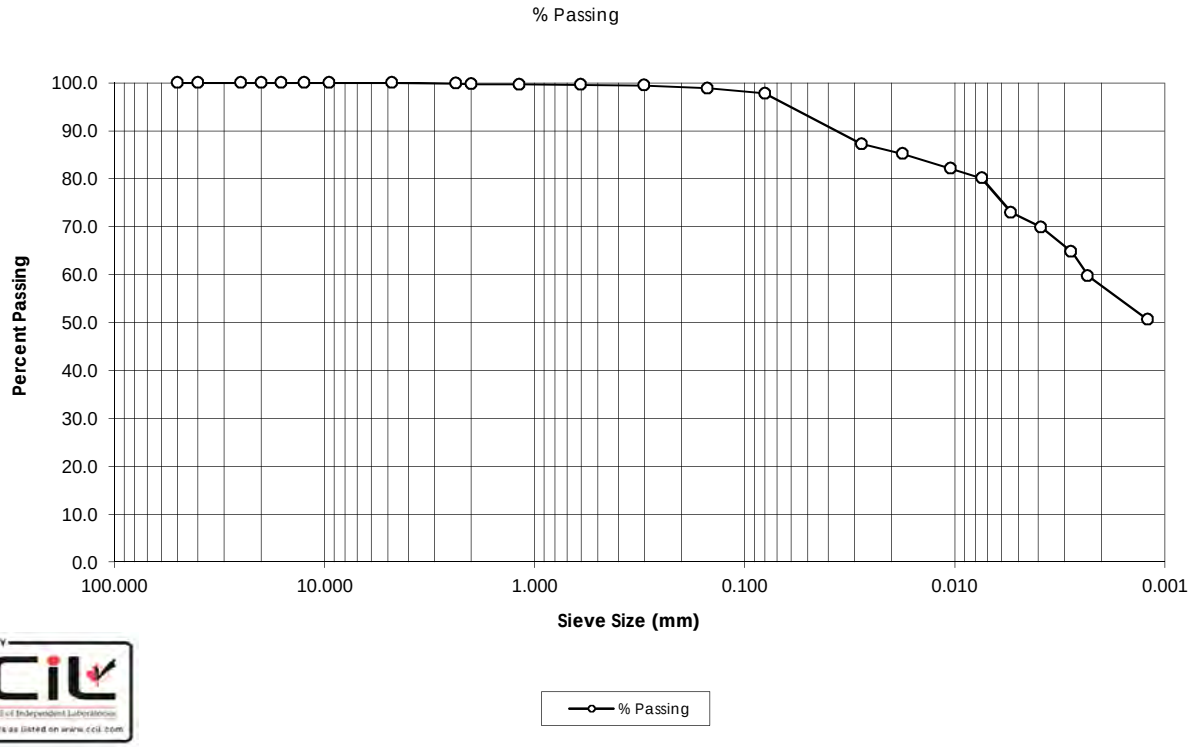
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSA
SOURCE: BS4
TESTED BY: B.Pelkey

DATE TESTED: September 22, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0054** | **73.0** |
| **40.0** | **100.0** | **0.0039** | **69.9** |
| **25.0** | **100.0** | **0.0028** | **64.8** |
| **20.0** | **100.0** | **0.0023** | **59.7** |
| **16.0** | **100.0** | **0.0012** | **50.5** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.9** | | |
| **2.00** | **99.8** | | |
| **1.18** | **99.7** | | |
| **0.600** | **99.6** | | |
| **0.300** | **99.4** | | |
| **0.150** | **98.8** | | |
| **0.080** | **97.8** | | |
| **0.0277** | **87.2** | | |
| **0.0176** | **85.2** | | |
| **0.0104** | **82.1** | | |
| **0.0074** | **80.1** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.2% | $D_{30}$: | - |
| Silt: | 40.2% | $D_{60}$: | 0.0024 |
| Clay: | 57.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

**Grain Size Analysis**
Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

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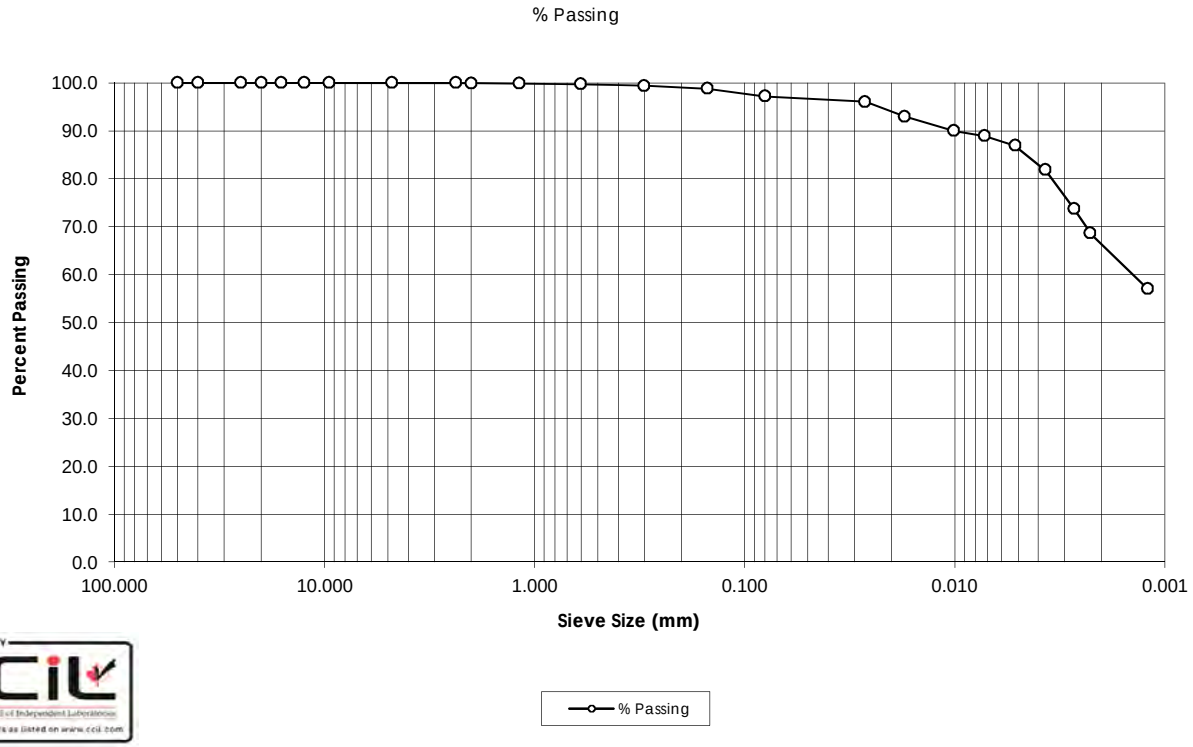
Tel: (403) 253-7876

SAMPLE No.: BSB
SOURCE: BS4
TESTED BY: C.Oost

DATE TESTED: September 21, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0051** | **86.9** |
| **40.0** | **100.0** | **0.0037** | **81.8** |
| **25.0** | **100.0** | **0.0027** | **73.7** |
| **20.0** | **100.0** | **0.0023** | **68.6** |
| **16.0** | **100.0** | **0.0012** | **57.0** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.8** | | |
| **0.600** | **99.7** | | |
| **0.300** | **99.4** | | |
| **0.150** | **98.8** | | |
| **0.080** | **97.2** | | |
| **0.0267** | **96.1** | | |
| **0.0173** | **93.0** | | |
| **0.0101** | **89.9** | | |
| **0.0072** | **88.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.8% | $D_{30}$: | - |
| Silt: | 30.9% | $D_{60}$: | 0.0015 |
| Clay: | 66.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

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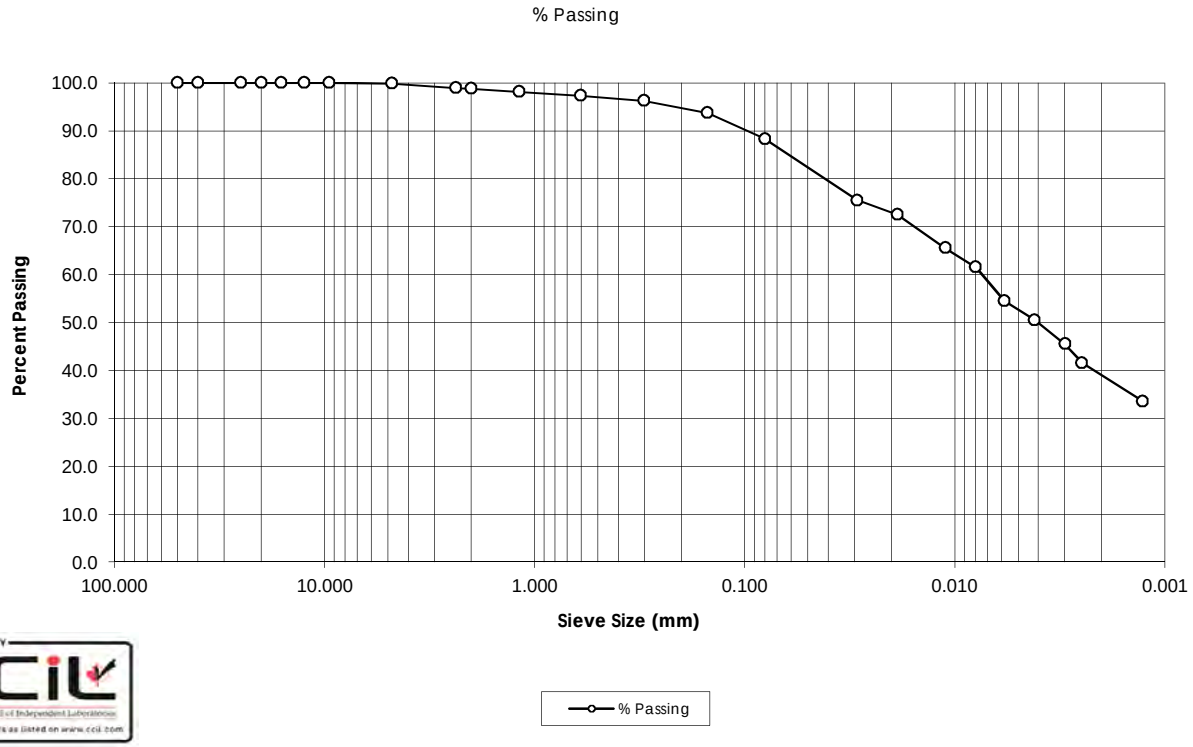
Tel: (403) 253-7876

SAMPLE No.: BSD
SOURCE: BS4
TESTED BY: B.Pelkey

DATE TESTED: September 22, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0058** | **54.5** |
| **40.0** | **100.0** | **0.0042** | **50.5** |
| **25.0** | **100.0** | **0.0030** | **45.5** |
| **20.0** | **100.0** | **0.0025** | **41.5** |
| **16.0** | **100.0** | **0.0013** | **33.6** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **99.9** | | |
| **2.36** | **98.9** | | |
| **2.00** | **98.8** | | |
| **1.18** | **98.1** | | |
| **0.600** | **97.3** | | |
| **0.300** | **96.2** | | |
| **0.150** | **93.7** | | |
| **0.080** | **88.3** | | |
| **0.0290** | **75.5** | | |
| **0.0187** | **72.5** | | |
| **0.0111** | **65.5** | | |
| **0.0079** | **61.5** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.1% | $D_{10}$: | - |
| Sand: | 11.5% | $D_{30}$: | - |
| Silt: | 49.3% | $D_{60}$: | 0.0075 |
| Clay: | 39.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

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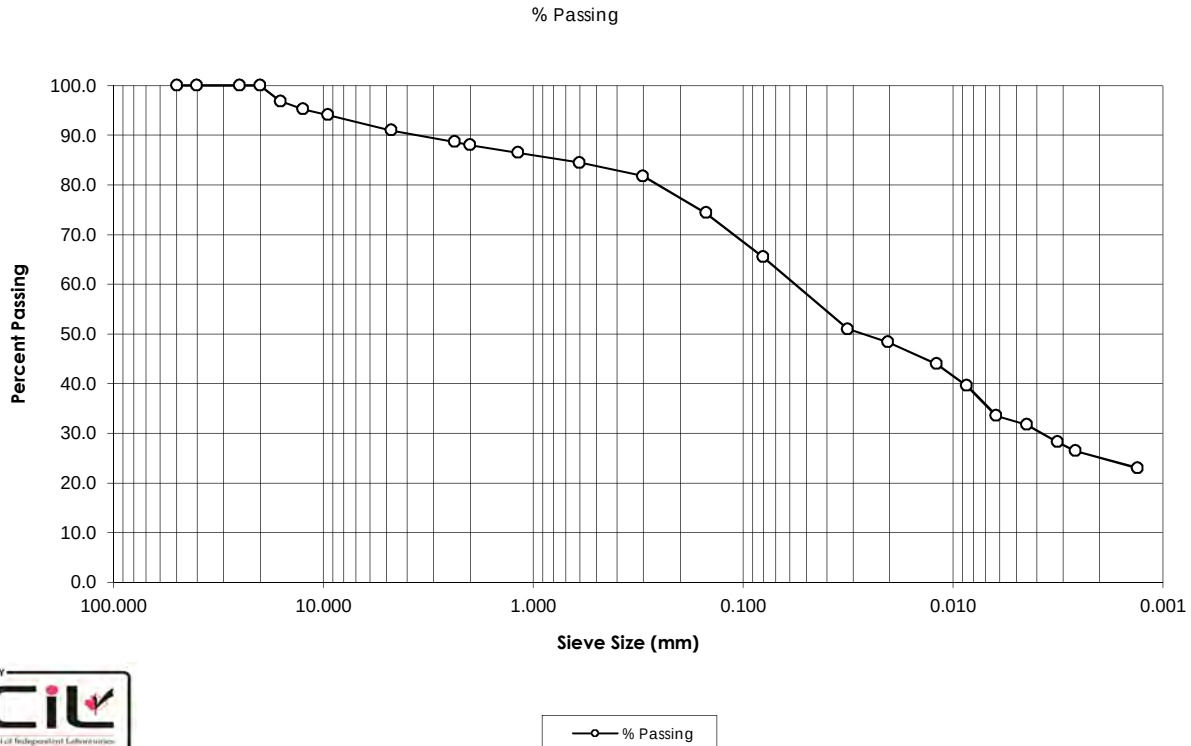
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSG
SOURCE: BS4
TESTED BY: B. Pelkey

DATE TESTED: October 4, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL-CI), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 33.5 |
| 40.0 | 100.0 | 0.0044 | 31.7 |
| 25.0 | 100.0 | 0.0032 | 28.2 |
| 20.0 | 100.0 | 0.0026 | 26.5 |
| 16.0 | 96.9 | 0.0013 | 22.9 |
| 12.5 | 95.3 | | |
| 9.5 | 94.1 | | |
| 4.75 | 90.9 | | |
| 2.36 | 88.6 | | |
| 2.00 | 88.0 | | |
| 1.18 | 86.5 | | |
| 0.600 | 84.5 | | |
| 0.300 | 81.8 | | |
| 0.150 | 74.4 | | |
| 0.080 | 65.5 | | |
| 0.0318 | 51.0 | | |
| 0.0204 | 48.3 | | |
| 0.0119 | 44.0 | | |
| 0.0086 | 39.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.1% | $D_{10}$: | - |
| Sand: | 25.5% | $D_{30}$: | 0.0038 |
| Silt: | 40.4% | $D_{60}$: | 0.0632 |
| Clay: | 25.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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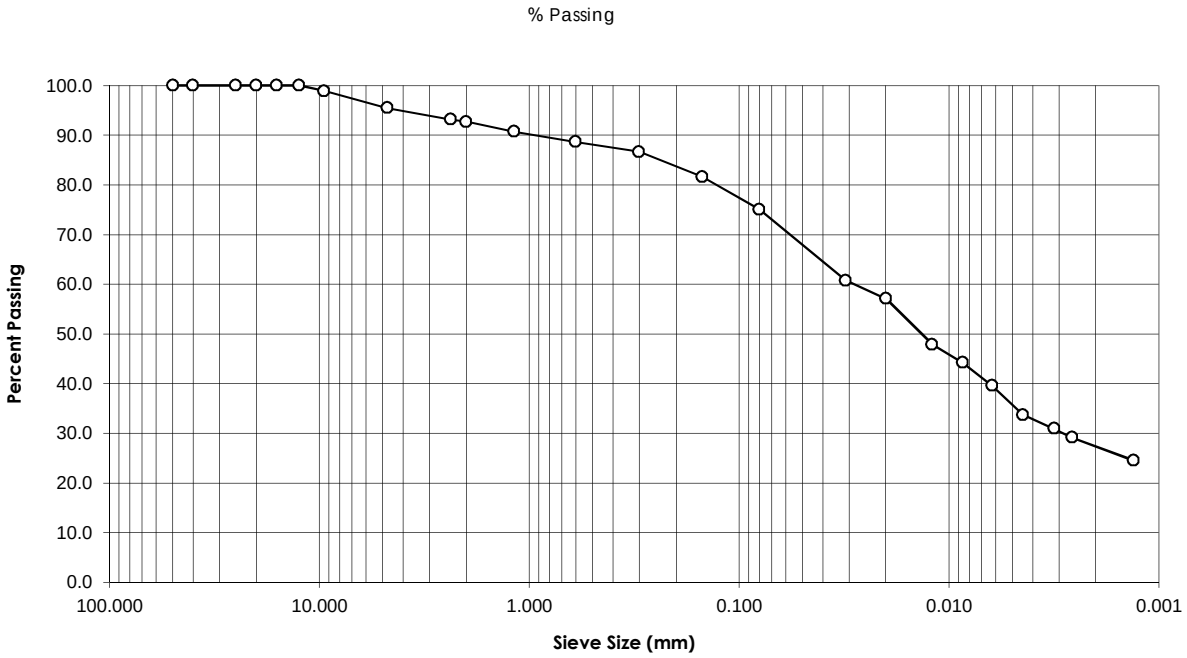
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSH
SOURCE: BS4
TESTED BY: B. Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 39.6 |
| 40.0 | 100.0 | 0.0044 | 33.7 |
| 25.0 | 100.0 | 0.0032 | 30.9 |
| 20.0 | 100.0 | 0.0026 | 29.1 |
| 16.0 | 100.0 | 0.0013 | 24.5 |
| 12.5 | 100.0 | | |
| 9.5 | 98.9 | | |
| 4.75 | 95.5 | | |
| 2.36 | 93.2 | | |
| 2.00 | 92.7 | | |
| 1.18 | 90.7 | | |
| 0.600 | 88.7 | | |
| 0.300 | 86.6 | | |
| 0.150 | 81.6 | | |
| 0.080 | 75.1 | | |
| 0.0311 | 60.7 | | |
| 0.0200 | 57.1 | | |
| 0.0120 | 47.9 | | |
| 0.0086 | 44.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.5% | $D_{10}$: | - |
| Sand: | 20.4% | $D_{30}$: | 0.0029 |
| Silt: | 47.7% | $D_{60}$: | 0.0289 |
| Clay: | 27.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

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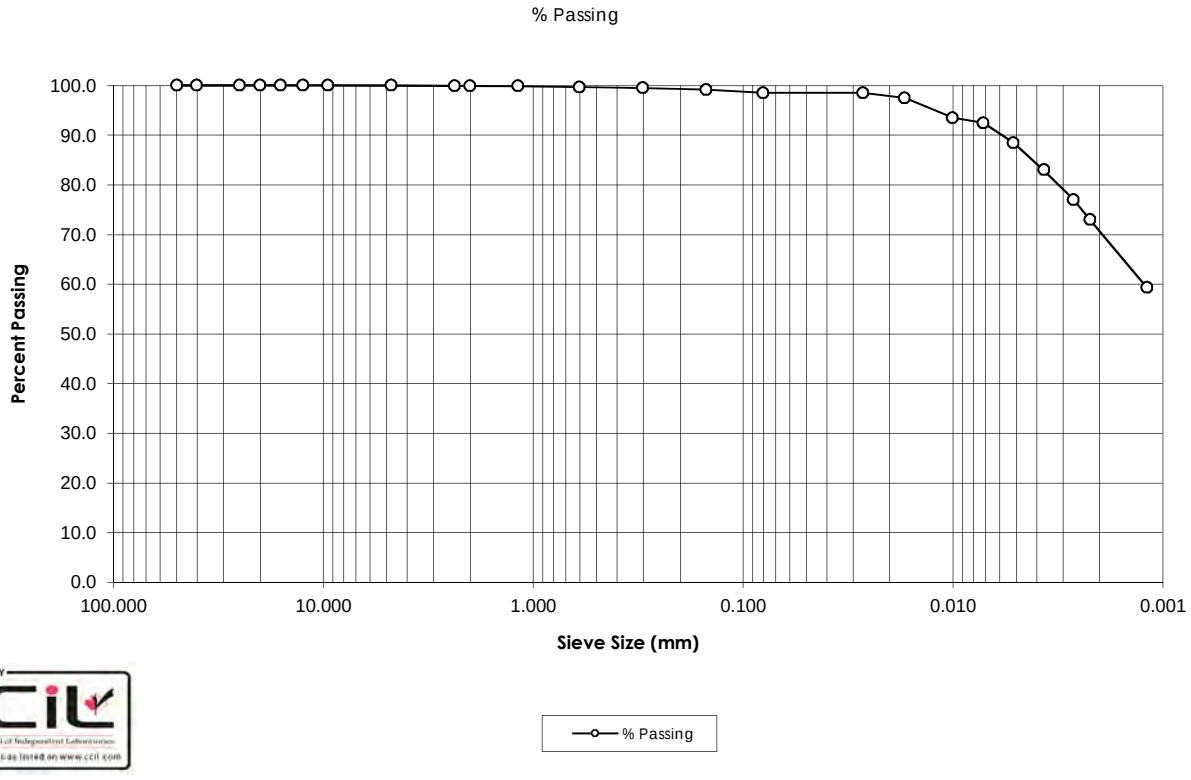
SAMPLE No.: BSB
SOURCE: BS4
TESTED BY: B. pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 8, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 88.4 |
| 40.0 | 100.0 | 0.0037 | 83.0 |
| 25.0 | 100.0 | 0.0027 | 77.0 |
| 20.0 | 100.0 | 0.0022 | 73.0 |
| 16.0 | 100.0 | 0.0012 | 59.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.8 | | |
| 0.600 | 99.7 | | |
| 0.300 | 99.5 | | |
| 0.150 | 99.2 | | |
| 0.080 | 98.5 | | |
| 0.0269 | 98.5 | | |
| 0.0170 | 97.5 | | |
| 0.0100 | 93.5 | | |
| 0.0072 | 92.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.5% | $D_{30}$: | - |
| Silt: | 27.9% | $D_{60}$: | 0.0012 |
| Clay: | 70.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396302.702.250

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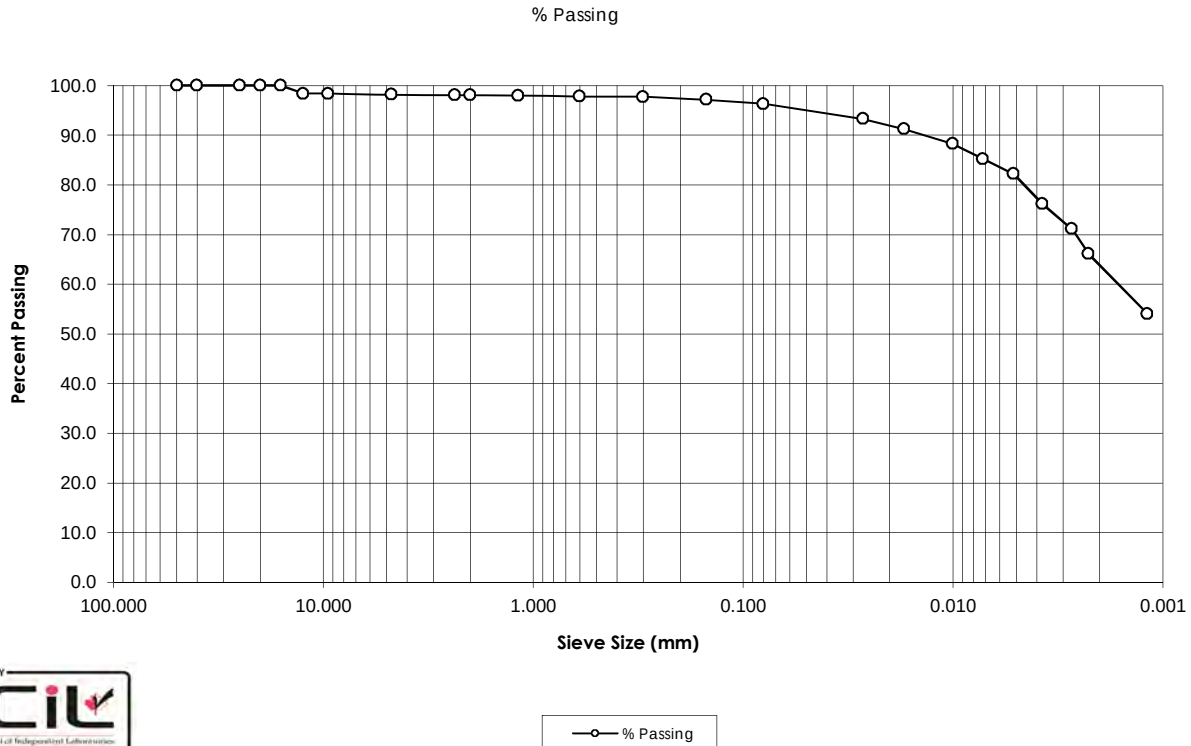
SAMPLE No.: BSC
SOURCE: BS4
TESTED BY: C. Oost

DATE TESTED: September 20, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand, Trace Gravel

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 82.2 |
| 40.0 | 100.0 | 0.0037 | 76.2 |
| 25.0 | 100.0 | 0.0027 | 71.1 |
| 20.0 | 100.0 | 0.0023 | 66.1 |
| 16.0 | 100.0 | 0.0012 | 54.0 |
| 12.5 | 98.4 | | |
| 9.5 | 98.4 | | |
| 4.75 | 98.2 | | |
| 2.36 | 98.1 | | |
| 2.00 | 98.0 | | |
| 1.18 | 98.0 | | |
| 0.600 | 97.8 | | |
| 0.300 | 97.7 | | |
| 0.150 | 97.2 | | |
| 0.080 | 96.3 | | |
| 0.0269 | 93.3 | | |
| 0.0171 | 91.3 | | |
| 0.0100 | 88.2 | | |
| 0.0072 | 85.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.8% | $D_{10}$: | - |
| Sand: | 1.8% | $D_{30}$: | - |
| Silt: | 32.5% | $D_{60}$: | 0.0017 |
| Clay: | 63.8% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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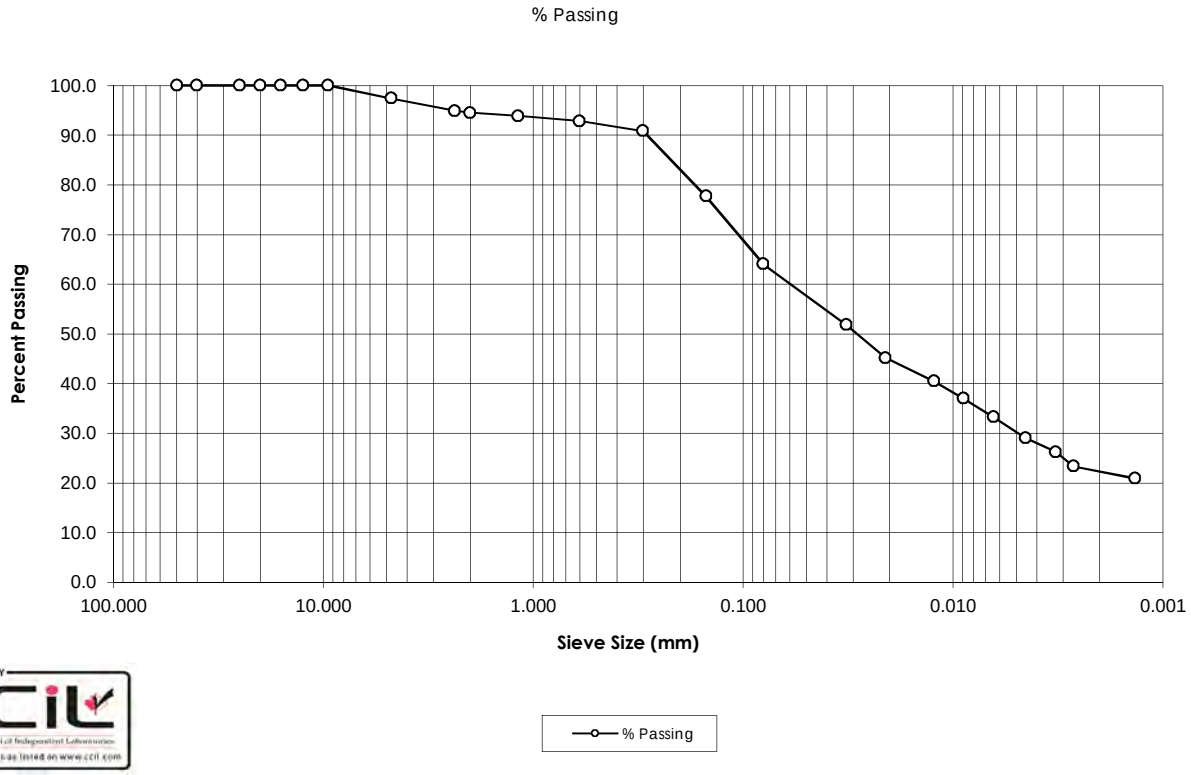
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BSE
SOURCE: BS4
TESTED BY: B. Pelkey

DATE TESTED: October 17, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0064 | 33.2 |
| 40.0 | 100.0 | 0.0045 | 29.0 |
| 25.0 | 100.0 | 0.0032 | 26.2 |
| 20.0 | 100.0 | 0.0027 | 23.3 |
| 16.0 | 100.0 | 0.0014 | 20.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 97.4 | | |
| 2.36 | 94.9 | | |
| 2.00 | 94.5 | | |
| 1.18 | 93.9 | | |
| 0.600 | 92.8 | | |
| 0.300 | 90.8 | | |
| 0.150 | 77.7 | | |
| 0.080 | 64.0 | | |
| 0.0322 | 51.8 | | |
| 0.0210 | 45.2 | | |
| 0.0123 | 40.4 | | |
| 0.0089 | 37.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.6% | $D_{10}$: | - |
| Sand: | 33.4% | $D_{30}$: | 0.0050 |
| Silt: | 41.7% | $D_{60}$: | 0.0653 |
| Clay: | 22.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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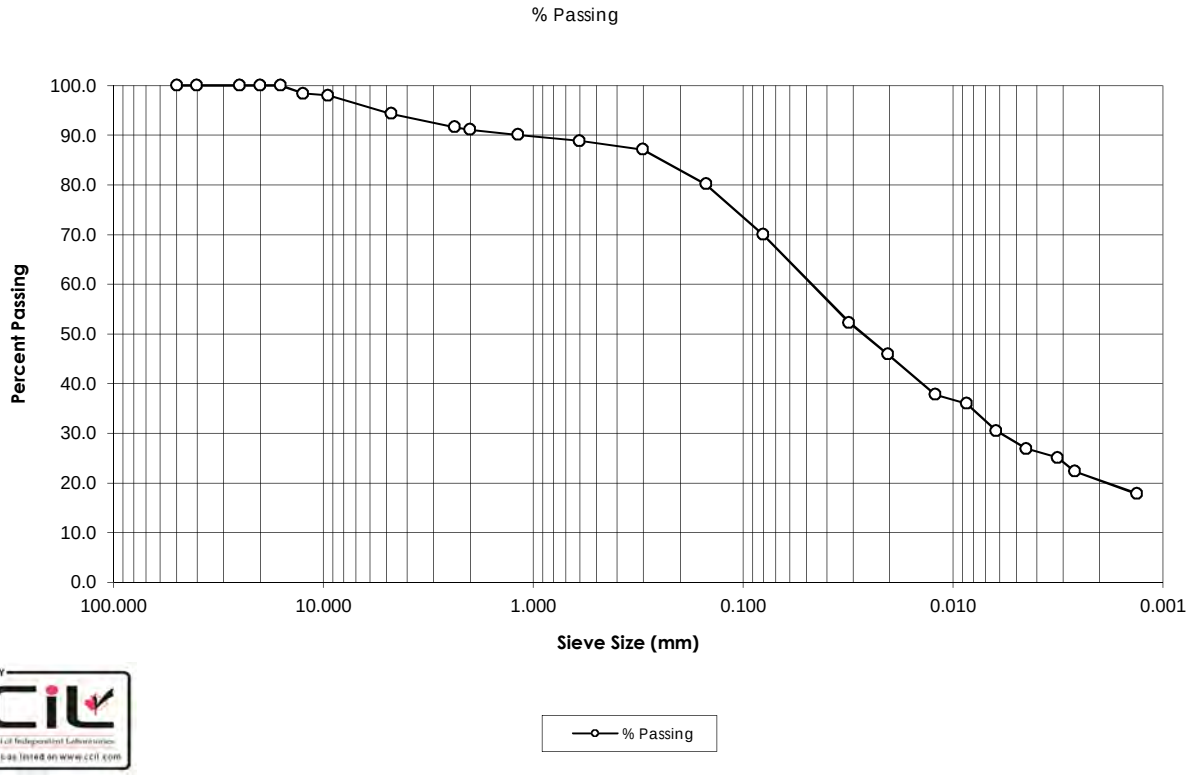
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396302.702.250

SAMPLE No.: BSF
SOURCE: BS4
TESTED BY: C. Oost

DATE TESTED: September 20, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0062 | 30.5 |
| 40.0 | 100.0 | 0.0045 | 26.9 |
| 25.0 | 100.0 | 0.0032 | 25.0 |
| 20.0 | 100.0 | 0.0026 | 22.3 |
| 16.0 | 100.0 | 0.0013 | 17.8 |
| 12.5 | 98.4 | | |
| 9.5 | 98.0 | | |
| 4.75 | 94.4 | | |
| 2.36 | 91.6 | | |
| 2.00 | 91.1 | | |
| 1.18 | 90.1 | | |
| 0.600 | 88.9 | | |
| 0.300 | 87.1 | | |
| 0.150 | 80.1 | | |
| 0.080 | 69.9 | | |
| 0.0312 | 52.3 | | |
| 0.0204 | 45.9 | | |
| 0.0121 | 37.7 | | |
| 0.0086 | 35.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.6% | $D_{10}$: | - |
| Sand: | 24.4% | $D_{30}$: | 0.0060 |
| Silt: | 49.4% | $D_{60}$: | 0.0543 |
| Clay: | 20.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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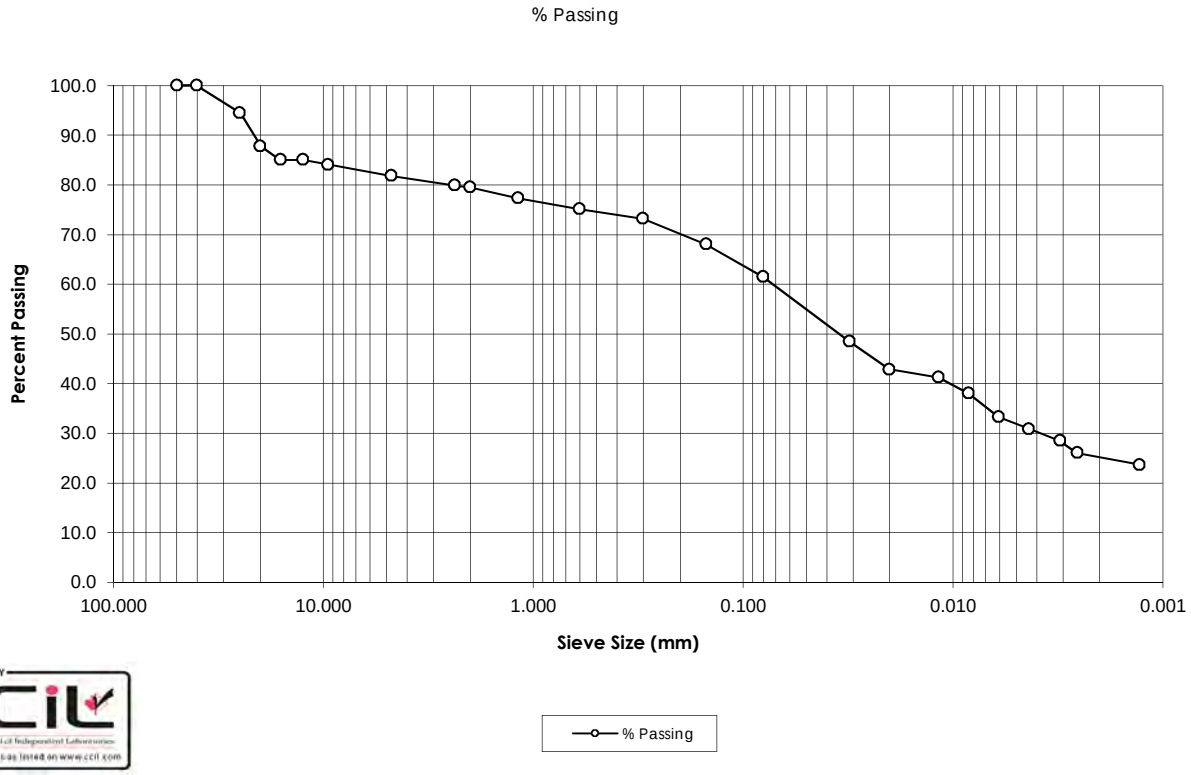
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396302.702.250

SAMPLE No.: BSH
SOURCE: BS4
TESTED BY: C. Oost

DATE TESTED: September 20, 2016
DATE RECEIVED: August 18, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0061 | 33.2 |
| 40.0 | 100.0 | 0.0043 | 30.8 |
| 25.0 | 94.5 | 0.0031 | 28.4 |
| 20.0 | 87.8 | 0.0026 | 26.0 |
| 16.0 | 85.0 | 0.0013 | 23.6 |
| 12.5 | 85.0 | | |
| 9.5 | 84.1 | | |
| 4.75 | 81.8 | | |
| 2.36 | 79.9 | | |
| 2.00 | 79.5 | | |
| 1.18 | 77.3 | | |
| 0.600 | 75.2 | | |
| 0.300 | 73.2 | | |
| 0.150 | 68.1 | | |
| 0.080 | 61.4 | | |
| 0.0310 | 48.4 | | |
| 0.0201 | 42.8 | | |
| 0.0117 | 41.2 | | |
| 0.0084 | 38.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 18.2% | $D_{10}$: | - |
| Sand: | 20.4% | $D_{30}$: | 0.0039 |
| Silt: | 36.2% | $D_{60}$: | 0.0751 |
| Clay: | 25.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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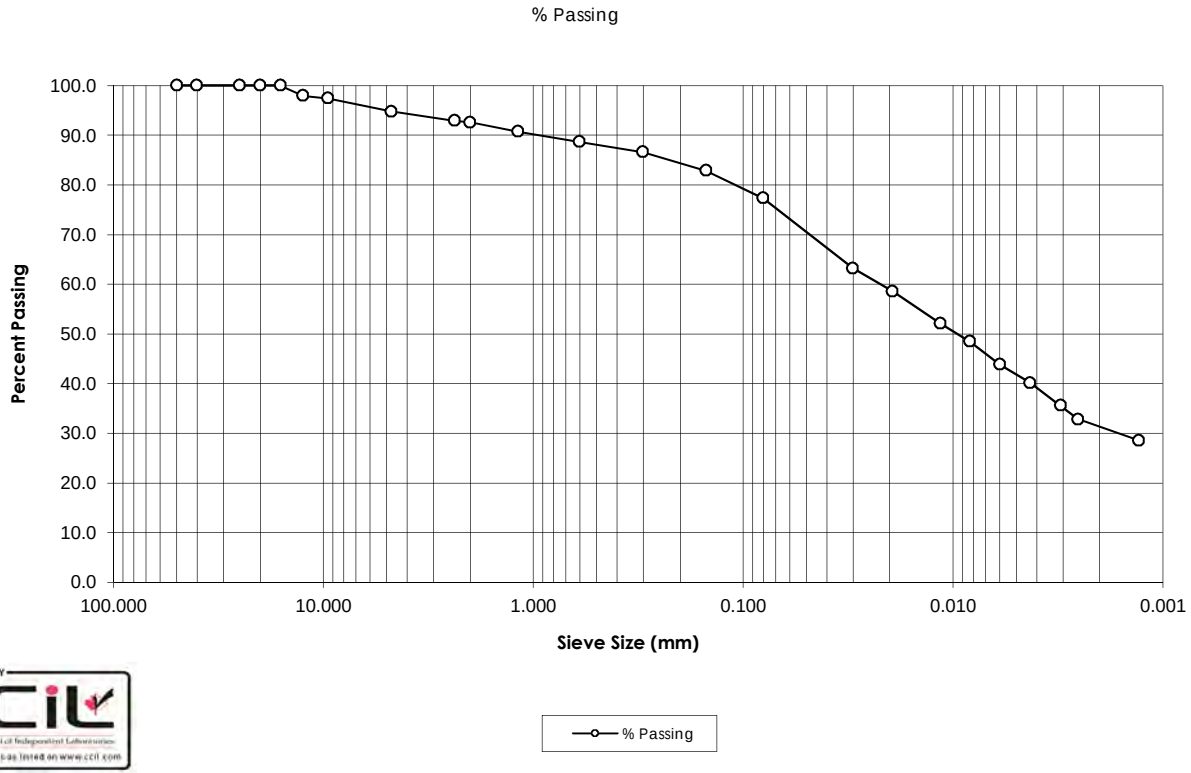
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: BS6
SOURCE: BS5
TESTED BY: B. Pelkey

DATE TESTED: October 20, 2016
DATE RECEIVED: August 11, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 43.8 |
| 40.0 | 100.0 | 0.0043 | 40.2 |
| 25.0 | 100.0 | 0.0031 | 35.6 |
| 20.0 | 100.0 | 0.0025 | 32.8 |
| 16.0 | 100.0 | 0.0013 | 28.6 |
| 12.5 | 97.9 | | |
| 9.5 | 97.4 | | |
| 4.75 | 94.8 | | |
| 2.36 | 92.9 | | |
| 2.00 | 92.6 | | |
| 1.18 | 90.7 | | |
| 0.600 | 88.6 | | |
| 0.300 | 86.6 | | |
| 0.150 | 82.9 | | |
| 0.080 | 77.3 | | |
| 0.0300 | 63.2 | | |
| 0.0194 | 58.6 | | |
| 0.0115 | 52.1 | | |
| 0.0083 | 48.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.2% | $D_{10}$: | - |
| Sand: | 17.5% | $D_{30}$: | 0.0017 |
| Silt: | 46.0% | $D_{60}$: | 0.0228 |
| Clay: | 31.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

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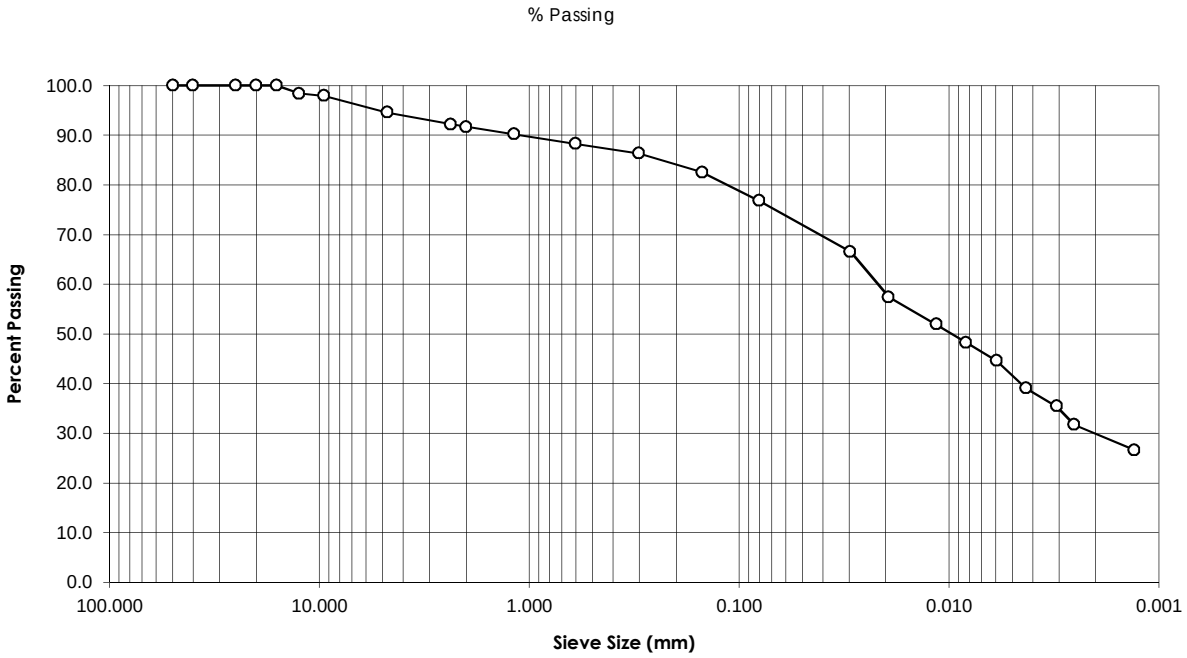
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: SS9
SOURCE: BS5
TESTED BY: B. Pelkey

DATE TESTED: October 20, 2016
DATE RECEIVED: August 11, 2016
SAMPLE DESCRIPTION: Clay (CI-CL), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 44.6 |
| 40.0 | 100.0 | 0.0043 | 39.1 |
| 25.0 | 100.0 | 0.0031 | 35.4 |
| 20.0 | 100.0 | 0.0025 | 31.7 |
| 16.0 | 100.0 | 0.0013 | 26.6 |
| 12.5 | 98.4 | | |
| 9.5 | 97.9 | | |
| 4.75 | 94.6 | | |
| 2.36 | 92.2 | | |
| 2.00 | 91.7 | | |
| 1.18 | 90.2 | | |
| 0.600 | 88.3 | | |
| 0.300 | 86.4 | | |
| 0.150 | 82.5 | | |
| 0.080 | 76.8 | | |
| 0.0295 | 66.6 | | |
| 0.0194 | 57.4 | | |
| 0.0115 | 51.9 | | |
| 0.0083 | 48.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.4% | $D_{10}$: | - |
| Sand: | 17.8% | $D_{30}$: | 0.0021 |
| Silt: | 46.9% | $D_{60}$: | 0.0224 |
| Clay: | 29.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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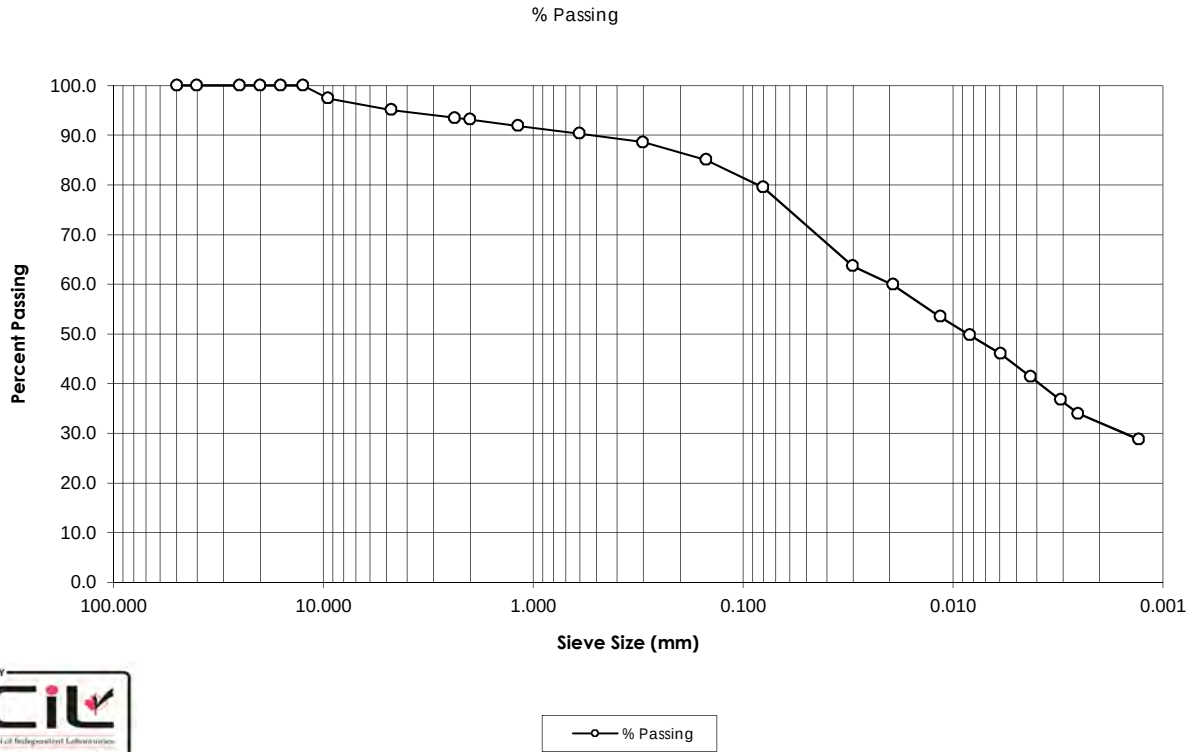
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: SS11
SOURCE: BS5
TESTED BY: B. Pelkey

DATE TESTED: October 20, 2016
DATE RECEIVED: August 11, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 46.0 |
| 40.0 | 100.0 | 0.0042 | 41.4 |
| 25.0 | 100.0 | 0.0031 | 36.7 |
| 20.0 | 100.0 | 0.0025 | 34.0 |
| 16.0 | 100.0 | 0.0013 | 28.8 |
| 12.5 | 100.0 | | |
| 9.5 | 97.4 | | |
| 4.75 | 95.1 | | |
| 2.36 | 93.5 | | |
| 2.00 | 93.1 | | |
| 1.18 | 91.9 | | |
| 0.600 | 90.4 | | |
| 0.300 | 88.6 | | |
| 0.150 | 85.0 | | |
| 0.080 | 79.5 | | |
| 0.0300 | 63.6 | | |
| 0.0193 | 59.9 | | |
| 0.0115 | 53.4 | | |
| 0.0083 | 49.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.9% | $D_{10}$: | - |
| Sand: | 15.6% | $D_{30}$: | 0.0016 |
| Silt: | 47.4% | $D_{60}$: | 0.0196 |
| Clay: | 32.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

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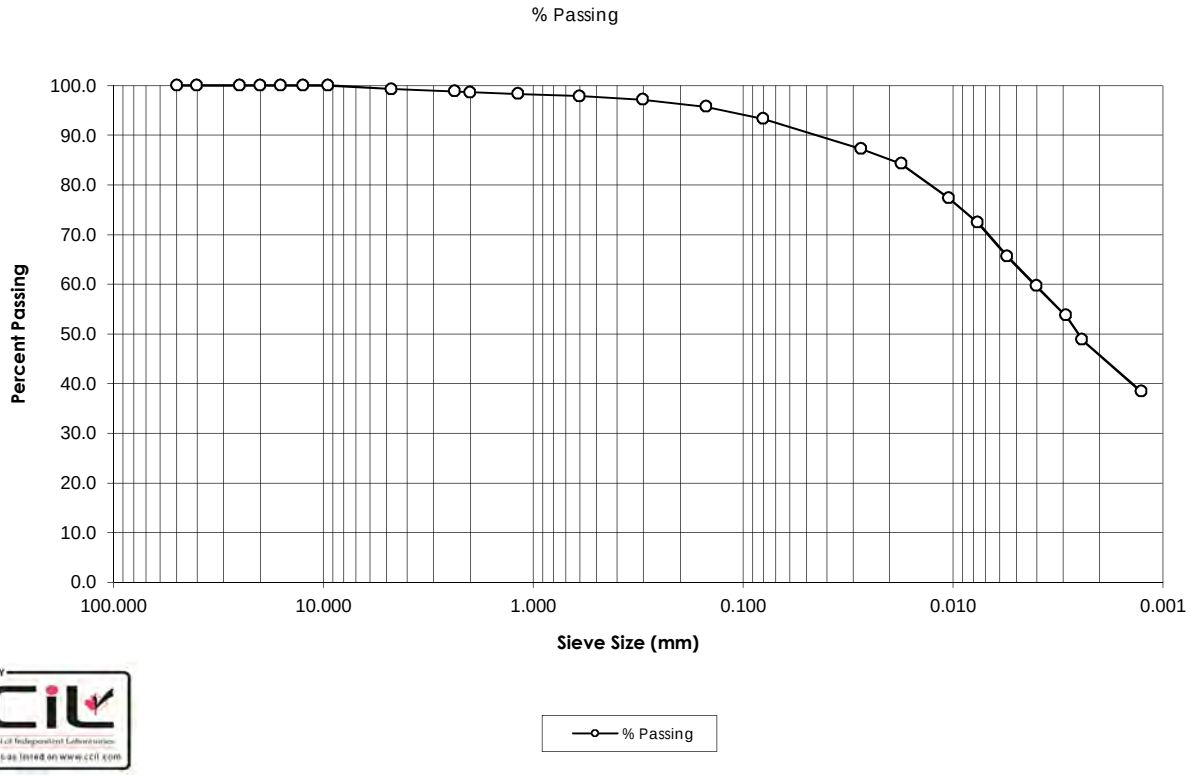
SAMPLE No.: SS15
SOURCE: BS5
TESTED BY: B. Pelkey

DATE TESTED: October 20, 2016
DATE RECEIVED: August 11, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 65.6 |
| 40.0 | 100.0 | 0.0040 | 59.6 |
| 25.0 | 100.0 | 0.0029 | 53.7 |
| 20.0 | 100.0 | 0.0024 | 48.8 |
| 16.0 | 100.0 | 0.0013 | 38.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.3 | | |
| 2.36 | 98.8 | | |
| 2.00 | 98.6 | | |
| 1.18 | 98.3 | | |
| 0.600 | 97.9 | | |
| 0.300 | 97.2 | | |
| 0.150 | 95.7 | | |
| 0.080 | 93.3 | | |
| 0.0274 | 87.2 | | |
| 0.0176 | 84.3 | | |
| 0.0105 | 77.4 | | |
| 0.0076 | 72.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.7% | $D_{10}$: | - |
| Sand: | 6.0% | $D_{30}$: | - |
| Silt: | 47.6% | $D_{60}$: | 0.0041 |
| Clay: | 45.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

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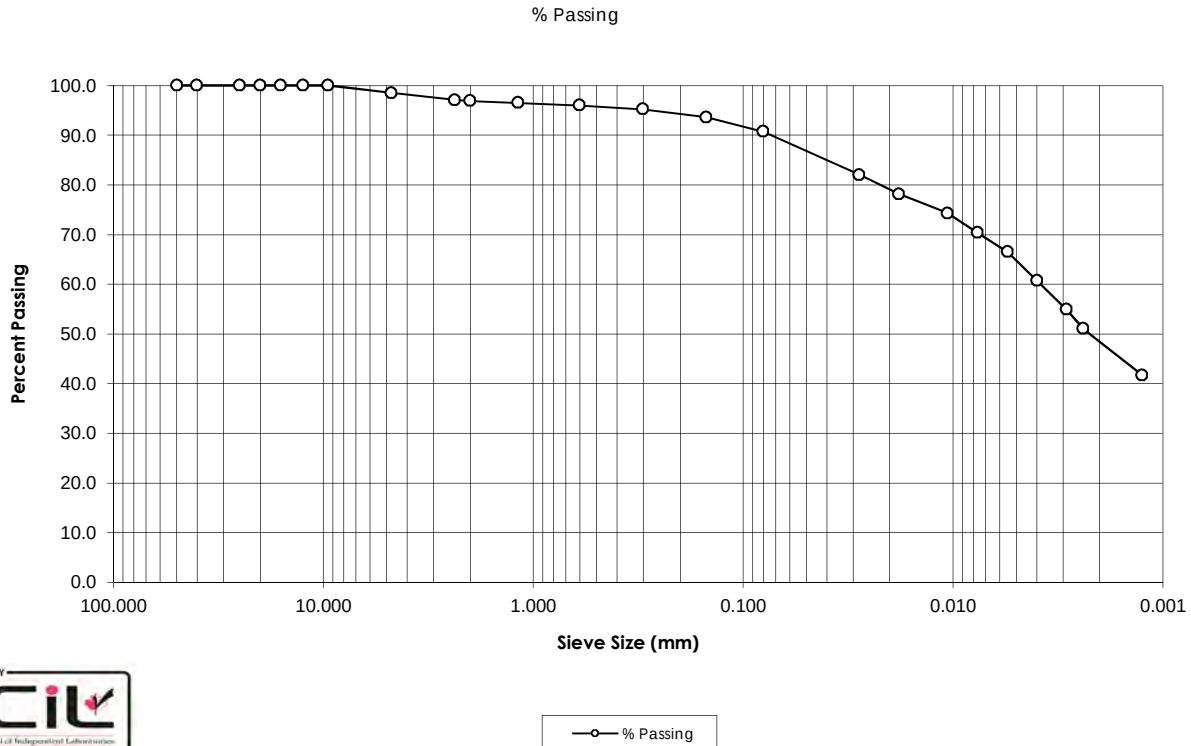
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.250

SAMPLE No.: SS17
SOURCE: BS5
TESTED BY: B. Pelkey

DATE TESTED: October 20, 2016
DATE RECEIVED: August 11, 2016
SAMPLE DESCRIPTION: Clay (CI), Trace Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0055 | 66.5 |
| 40.0 | 100.0 | 0.0040 | 60.7 |
| 25.0 | 100.0 | 0.0029 | 54.9 |
| 20.0 | 100.0 | 0.0024 | 51.0 |
| 16.0 | 100.0 | 0.0013 | 41.7 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.5 | | |
| 2.36 | 97.1 | | |
| 2.00 | 96.9 | | |
| 1.18 | 96.5 | | |
| 0.600 | 96.0 | | |
| 0.300 | 95.2 | | |
| 0.150 | 93.6 | | |
| 0.080 | 90.7 | | |
| 0.0279 | 82.0 | | |
| 0.0181 | 78.1 | | |
| 0.0106 | 74.3 | | |
| 0.0076 | 70.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.5% | $D_{10}$: | - |
| Sand: | 7.8% | $D_{30}$: | - |
| Silt: | 42.3% | $D_{60}$: | 0.0038 |
| Clay: | 48.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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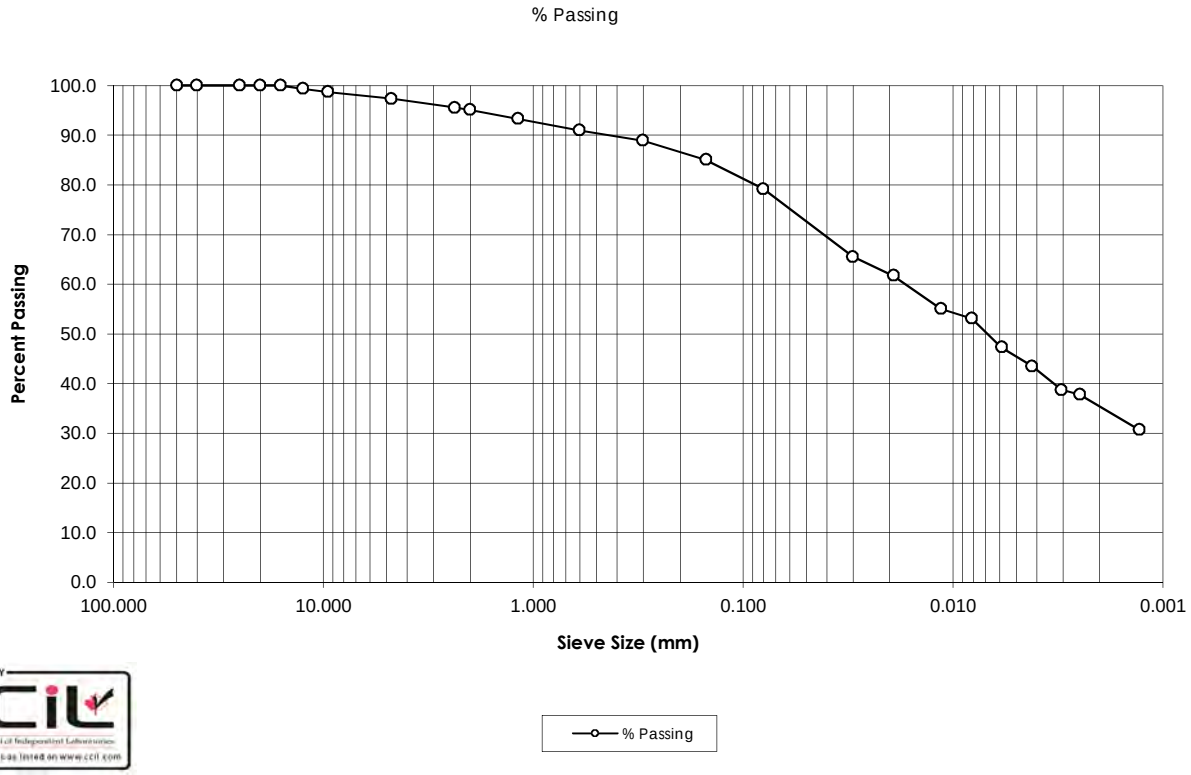
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396302.702.250

SAMPLE No.: BSC
SOURCE: BS5
TESTED BY: B. Pelkey

DATE TESTED: October 6, 2016
DATE RECEIVED: August 11, 2016
SAMPLE DESCRIPTION: Clay (CL), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 47.3 |
| 40.0 | 100.0 | 0.0042 | 43.5 |
| 25.0 | 100.0 | 0.0030 | 38.7 |
| 20.0 | 100.0 | 0.0025 | 37.7 |
| 16.0 | 100.0 | 0.0013 | 30.7 |
| 12.5 | 99.4 | | |
| 9.5 | 98.7 | | |
| 4.75 | 97.4 | | |
| 2.36 | 95.5 | | |
| 2.00 | 95.1 | | |
| 1.18 | 93.3 | | |
| 0.600 | 91.0 | | |
| 0.300 | 88.9 | | |
| 0.150 | 85.0 | | |
| 0.080 | 79.2 | | |
| 0.0299 | 65.5 | | |
| 0.0192 | 61.7 | | |
| 0.0114 | 55.0 | | |
| 0.0081 | 53.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 2.6% | $D_{10}$: | - |
| Sand: | 18.2% | $D_{30}$: | - |
| Silt: | 43.7% | $D_{60}$: | 0.0173 |
| Clay: | 35.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

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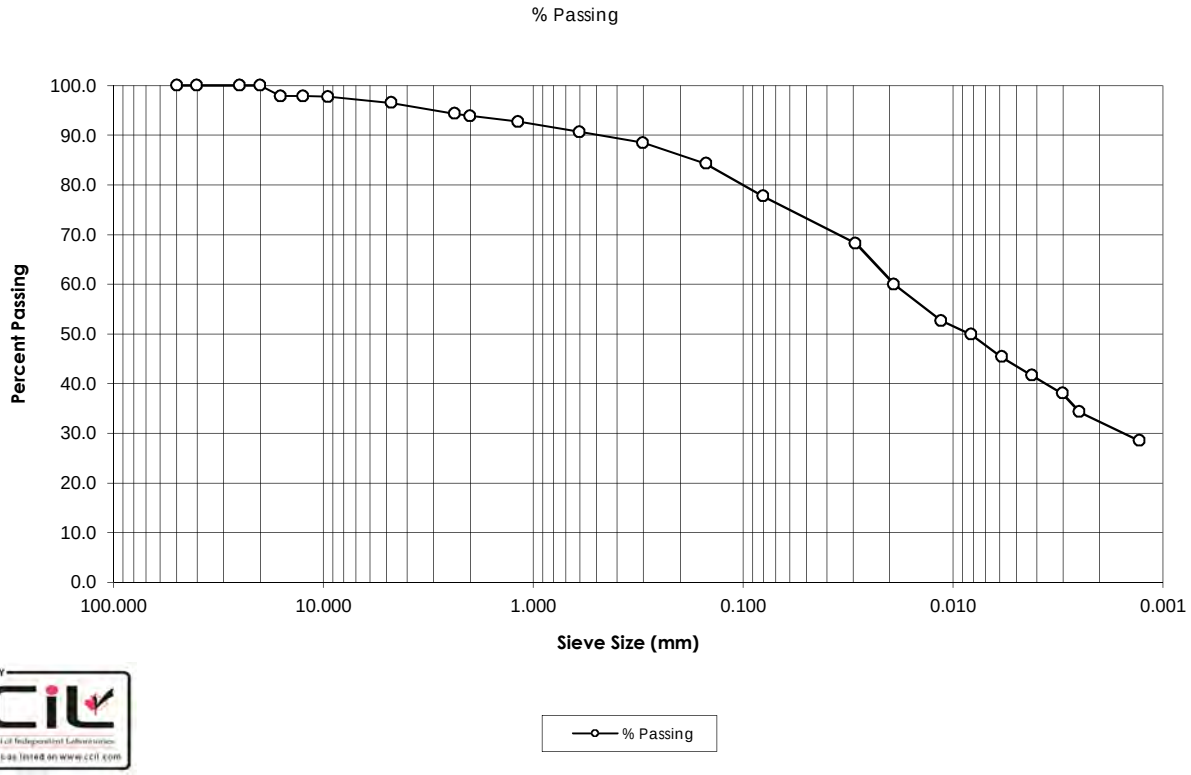
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396302.702.250

SAMPLE No.: BSD
SOURCE: BS5
TESTED BY: B. Pelkey

DATE TESTED: October 6, 2016
DATE RECEIVED: August 11, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 45.3 |
| 40.0 | 100.0 | 0.0042 | 41.6 |
| 25.0 | 100.0 | 0.0030 | 38.0 |
| 20.0 | 100.0 | 0.0025 | 34.3 |
| 16.0 | 97.9 | 0.0013 | 28.4 |
| 12.5 | 97.9 | | |
| 9.5 | 97.7 | | |
| 4.75 | 96.5 | | |
| 2.36 | 94.3 | | |
| 2.00 | 93.9 | | |
| 1.18 | 92.7 | | |
| 0.600 | 90.7 | | |
| 0.300 | 88.5 | | |
| 0.150 | 84.2 | | |
| 0.080 | 77.7 | | |
| 0.0291 | 68.2 | | |
| 0.0191 | 60.0 | | |
| 0.0114 | 52.7 | | |
| 0.0082 | 49.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.5% | $D_{10}$: | - |
| Sand: | 18.8% | $D_{30}$: | 0.0016 |
| Silt: | 45.3% | $D_{60}$: | 0.0191 |
| Clay: | 32.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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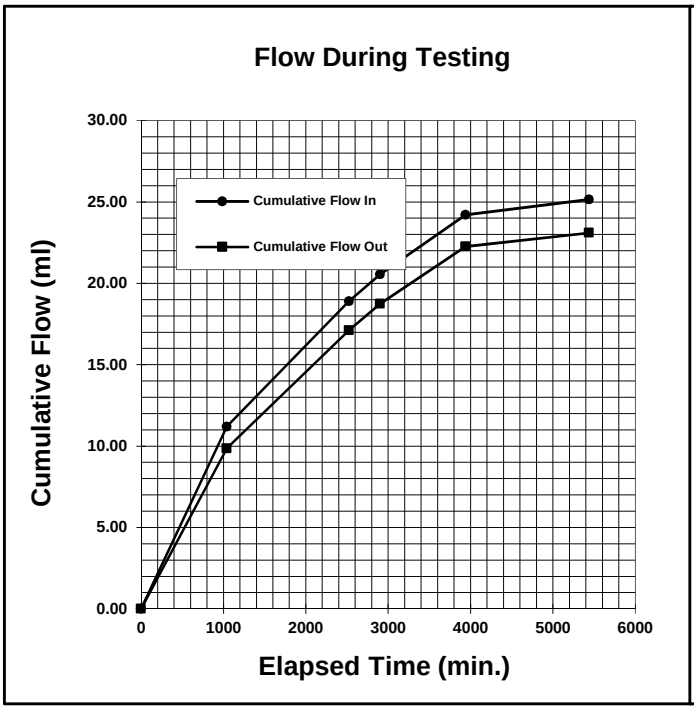
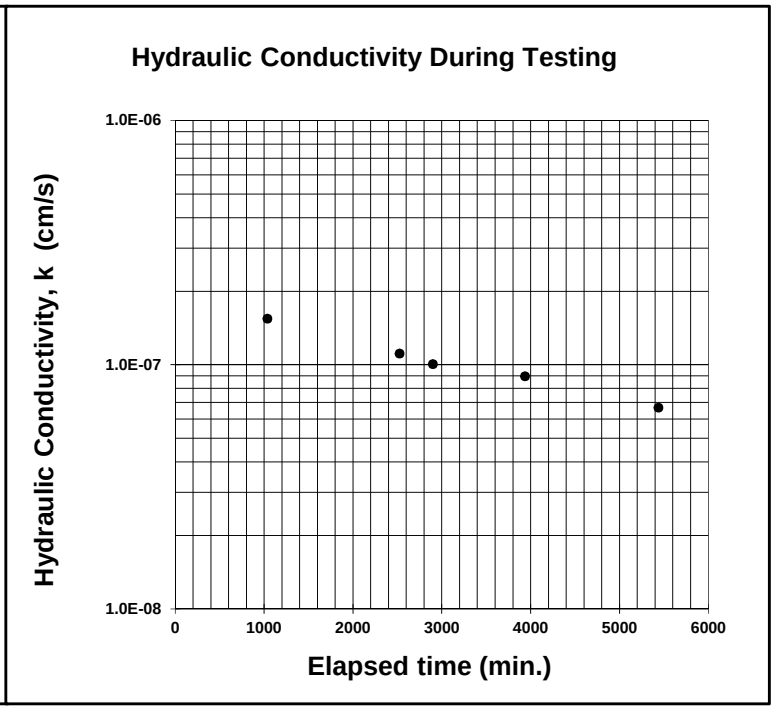
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 24, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Some Sand, Tr. Gravel | **SAMPLE No.:** | BS1 BSF |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 9.16 | Length (cm) | 9.16 |
| Diameter (cm) | 7.29 | Diameter (cm) | 7.35 |
| Area (cm ²) | 41.74 | Area (cm ²) | 42.43 |
| Total Mass (g) | 861.8 | Total Mass (g) | 869.7 |
| Volume (cm³) | 382.3 | Volume (cm³) | 388.7 |
| Water Content (%) | 11.7 | Water Content (%) | 12.6 |
| Degree of Saturation (%) | 94 | Beta Saturation (%) | 92 |
| Wet Density (g/cm³) | 2.254 | Wet Density (g/cm³) | 2.238 |
| Dry Density(g/cm³) | 2.018 | Dry Density(g/cm³) | 1.987 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 150 | Cell Pressure (kPa) | 170 |
| Top Cap Pressure(kPa) | 130 | Top Cap Pressure (kPa) | 150 |
| Bottom Cap Pressure(kPa) | 130 | Bottom Cap Pressure(kPa) | 130 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 22.3 |




**Hydraulic Conductivity (cm/s) = 1.0E-07**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Tested by: C. Tollifson

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.230 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 2, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay, Trace Gravel | **SAMPLE No.:** | BS3 BSC |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 8.97 |
| Diameter (cm) | 7.13 |
| Area (cm ²) | 39.93 |
| Total Mass (g) | 729.9 |
| Volume (cm³) | 358.1 |
| Water Content (%) | 21.3 |
| Degree of Saturation (%) | 95 |
| Wet Density (g/cm³) | 2.038 |
| Dry Density(g/cm³) | 1.680 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

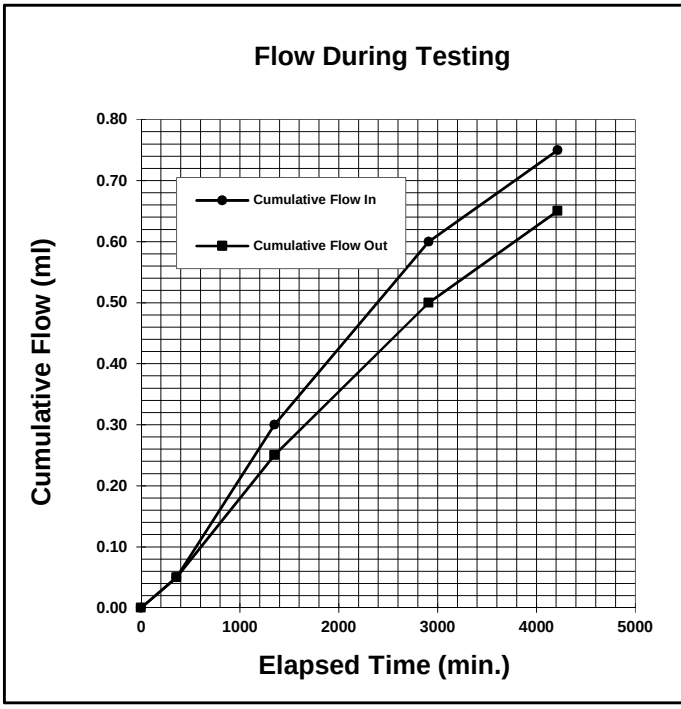
| | |
|---|---|
| Length (cm) | 9.09 |
| Diameter (cm) | 7.1 |
| Area (cm ²) | 39.59 |
| Total Mass (g) | 740.2 |
| Volume (cm³) | 359.9 |
| Water Content (%) | 22.2 |
| Beta Saturation (%) | 99 |
| Wet Density (g/cm³) | 2.057 |
| Dry Density(g/cm³) | 1.683 |

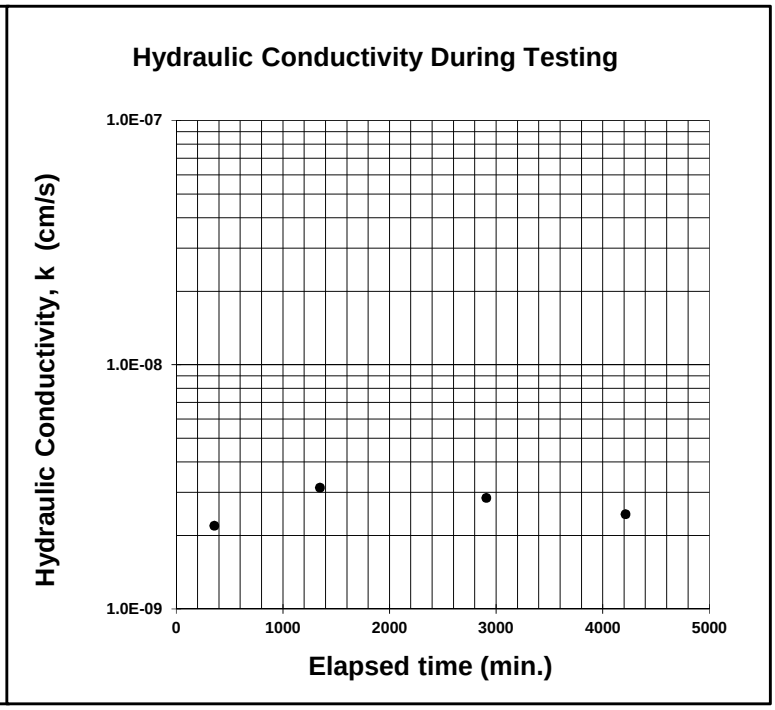
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 360 |
| Top Cap Pressure(kPa) | 340 |
| Bottom Cap Pressure(kPa) | 340 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 430 |
| Top Cap Pressure (kPa) | 410 |
| Bottom Cap Pressure(kPa) | 390 |
| Hydraulic Gradient | 22.7 |




**Hydraulic Conductivity (cm/s) = 2.7E-09**

Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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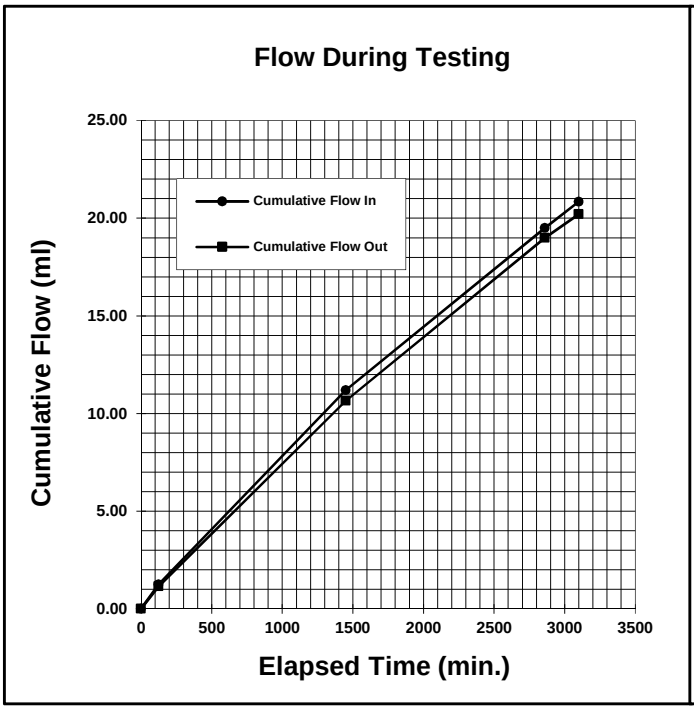
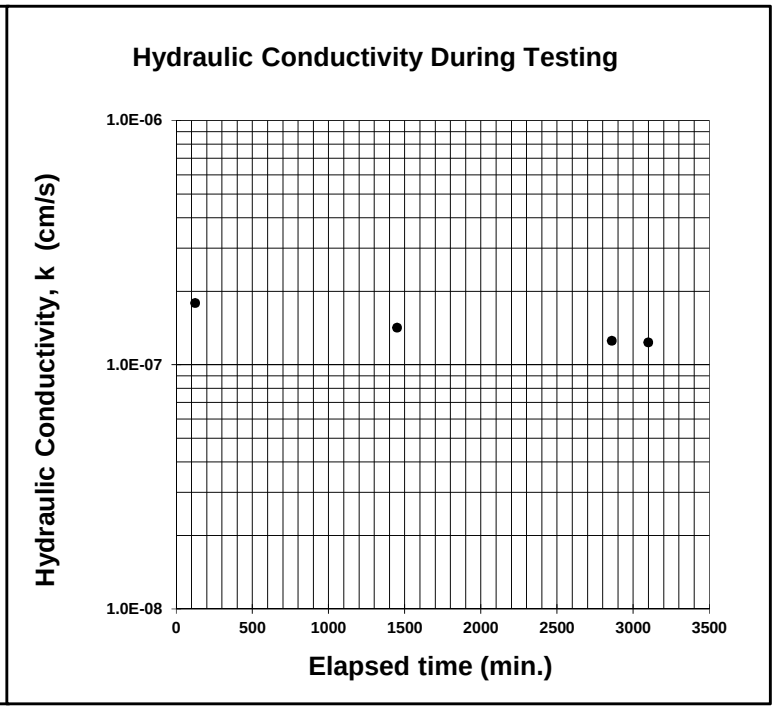
Tested by: C. Woods

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.250 |
| **PROJECT TITLE:** | SR1 | **DATE:** | October 19, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Silty Clay, Trace Gravel | **SAMPLE No.:** | BS4 BSH |

| **INITIAL SAMPLE DATA** | | **FINAL SAMPLE DATA** | |
|---|---|---|---|
| Length (cm) | 10.08 | Length (cm) | 10.21 |
| Diameter (cm) | 7.31 | Diameter (cm) | 7.36 |
| Area (cm ²) | 41.97 | Area (cm ²) | 42.54 |
| Total Mass (g) | 914.2 | Total Mass (g) | 933.3 |
| Volume (cm³) | 423.0 | Volume (cm³) | 434.4 |
| Water Content (%) | 14.0 | Water Content (%) | 14.4 |
| Degree of Saturation (%) | 89 | Beta Saturation (%) | 91 |
| Wet Density (g/cm³) | 2.161 | Wet Density (g/cm³) | 2.149 |
| Dry Density(g/cm³) | 1.895 | Dry Density(g/cm³) | 1.878 |
| Assumed Specific Gravity | 2.70 | | |

| **CONSOLIDATION PHASE** | | **HYDRAULIC CONDUCTIVITY PHASE** | |
|---|---|---|---|
| Cell Pressure(kPa) | 290 | Cell Pressure (kPa) | 310 |
| Top Cap Pressure(kPa) | 270 | Top Cap Pressure (kPa) | 290 |
| Bottom Cap Pressure(kPa) | 270 | Bottom Cap Pressure(kPa) | 270 |
| Consolidation Pressure(kPa) | 20 | Hydraulic Gradient | 20.2 |




**Hydraulic Conductivity (cm/s) = 1.4E-07**

Reviewed by:

Stantec

# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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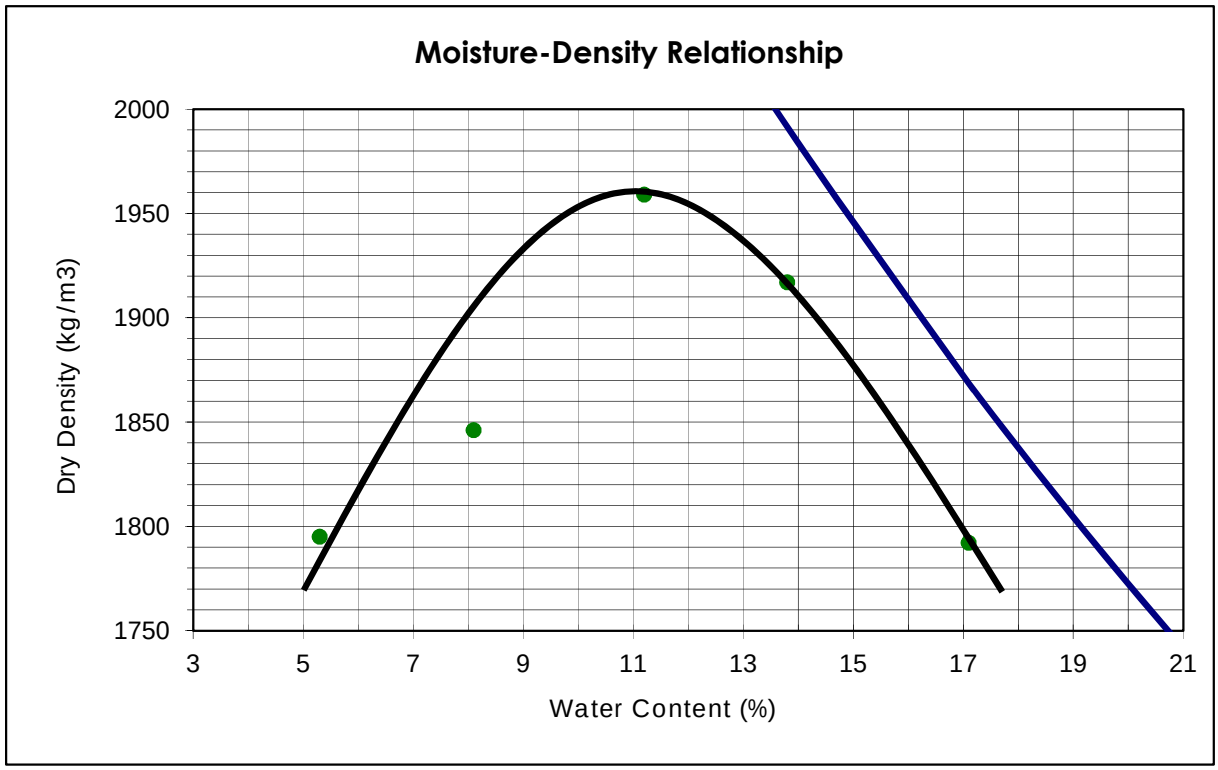
Fax: (403) 253-0021

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.250

Date Sampled: August 12, 2016
Date Tested: October 24, 2016
Tested By: M. Pilkington

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1795 | 1846 | 1959 | 1917 | 1792 |
| MOISTURE CONTENT (%) | 5.3 | 8.1 | 11.2 | 13.8 | 17.1 |

**Source of Sample:** BS1 BSD(4.6-6.1m)
**Visual Soil Description:** Sandy Clay (CL), Trace Gravel
**Maximum Dry Density (kg/m3):** 1960
**Optimum M.C. (%):** 11.0
**Natural M.C.(%):** 13.2



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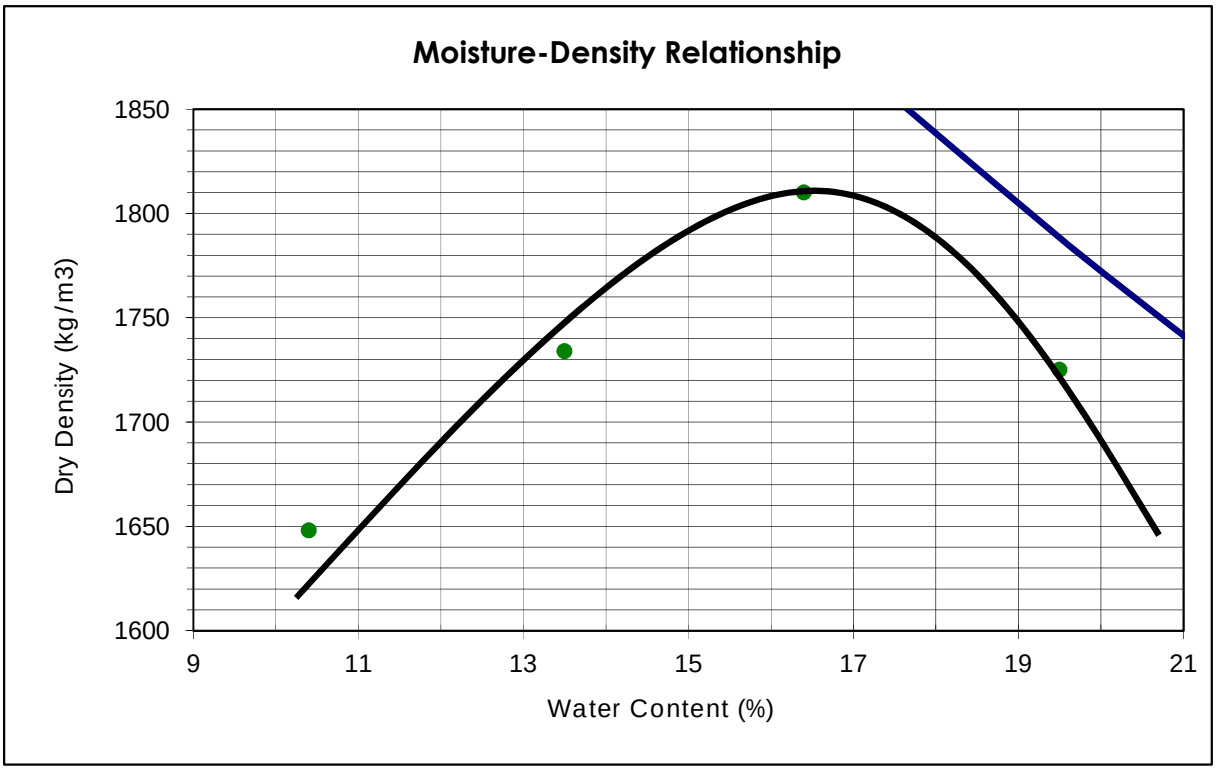
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | August 12, 2016 |
| Project Name: | SR1 | Date Tested: | October 25, 2016 |
| Project No.: | 110773396.302.702.250 | Tested By: | B.Pelkey |

| TRIAL No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1648 | 1734 | 1810 | 1725 |
| MOISTURE CONTENT (%) | 10.4 | 13.5 | 16.4 | 19.5 |

**Source of Sample:** BS1 BSB (1.5-3.0m)
**Visual Soil Description:** Clay (CI-CH), Some Sand, Trace Gravel
**Maximum Dry Density (kg/m3):** 1810
**Optimum M.C. (%):** 16.5
**Natural M.C.(%):** 14.1






Reviewed by: _____

Stantec

## Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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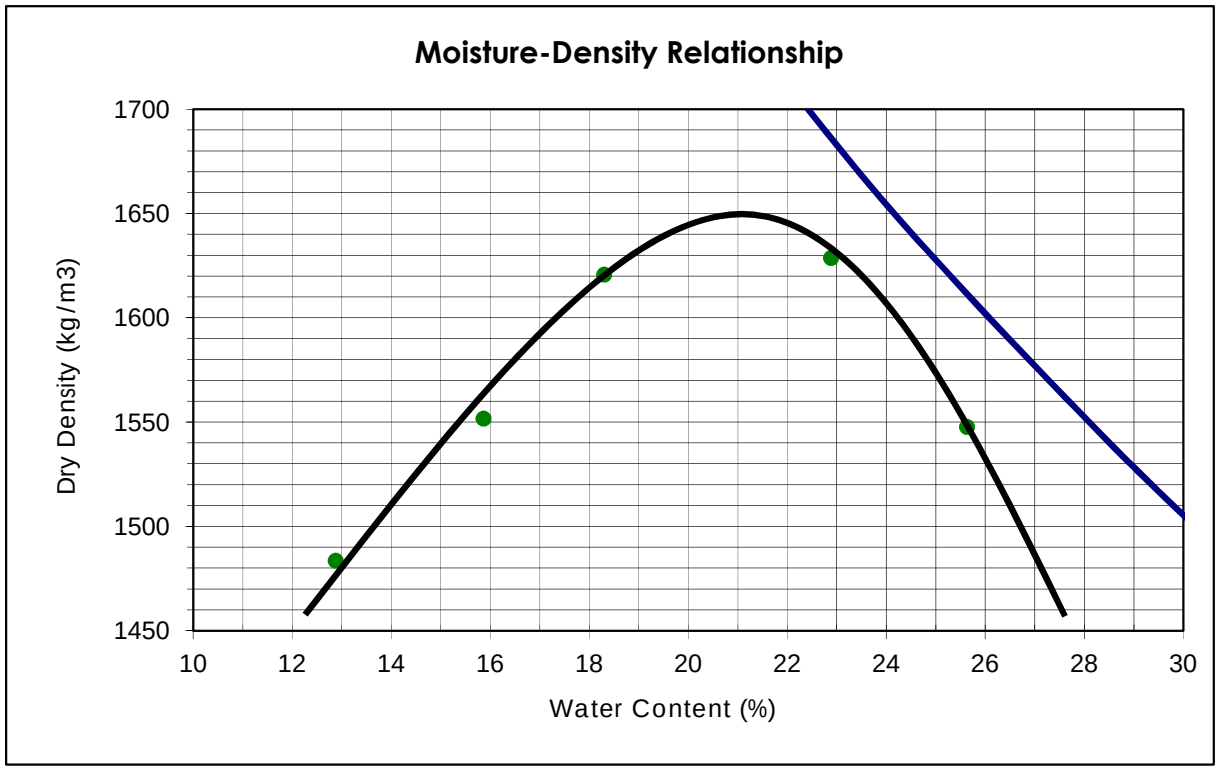
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.250

Date Sampled: August 18, 2016
Date Tested: November 2, 2016
Tested By: C.Woods

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1483 | 1552 | 1621 | 1629 | 1548 |
| MOISTURE CONTENT (%) | 12.9 | 15.9 | 18.3 | 22.9 | 25.6 |

**Source of Sample:** BS2 BSA
**Visual Soil Description:** Clay (CI) Some Sand, Trace Gravel
**Maximum Dry Density (kg/m3):** 1650
**Optimum M.C. (%):** 21.0%
**Natural M.C.(%):** 24.1%






Reviewed by:

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# Moisture - Density Relationship Report

☑ ASTM Designation: D698
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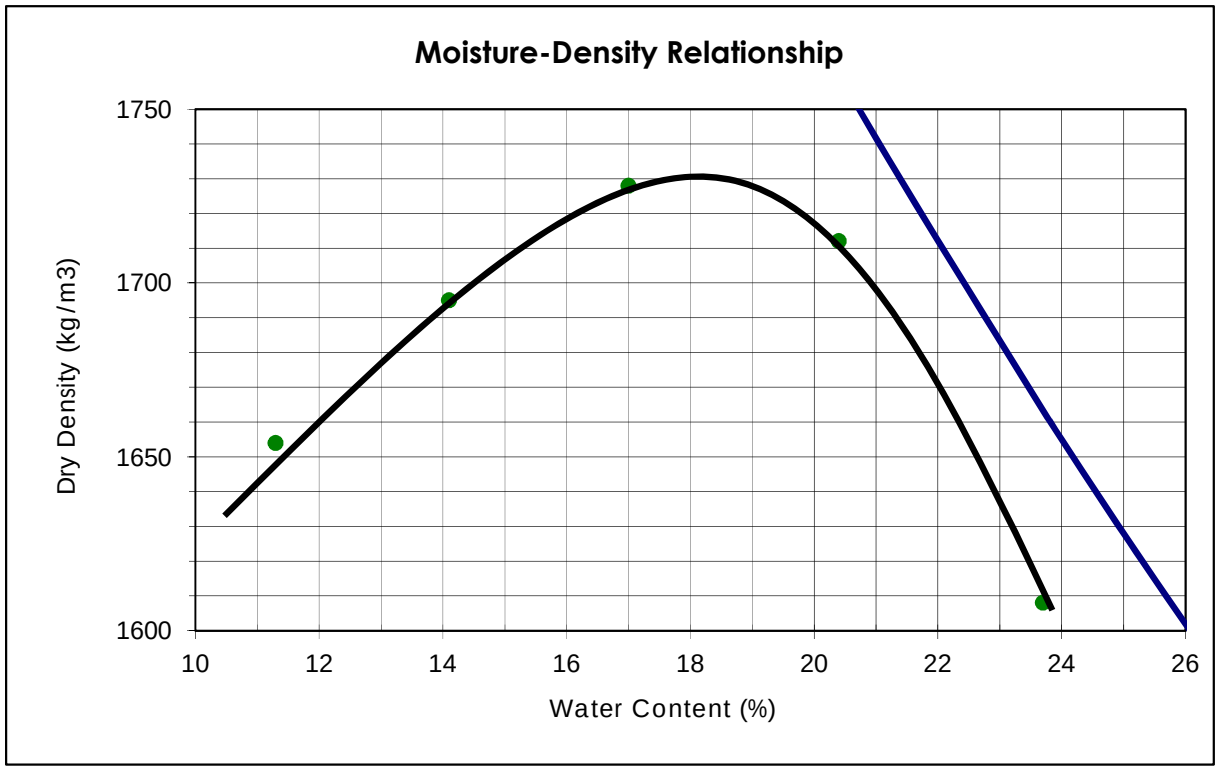
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.250

Date Sampled: August 18, 2016
Date Tested: November 2, 2016
Tested By: C.Woods

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1654 | 1695 | 1728 | 1712 | 1608 |
| MOISTURE CONTENT (%) | 11.3 | 14.1 | 17.0 | 20.4 | 23.7 |

**Source of Sample:** BS2 BSD
**Visual Soil Description:** Clay (CL) Trace Sand
**Maximum Dry Density (kg/m3):** 1730
**Optimum M.C. (%):** 18.0
**Natural M.C.(%):** 17.1






Reviewed by:

Stantec

## Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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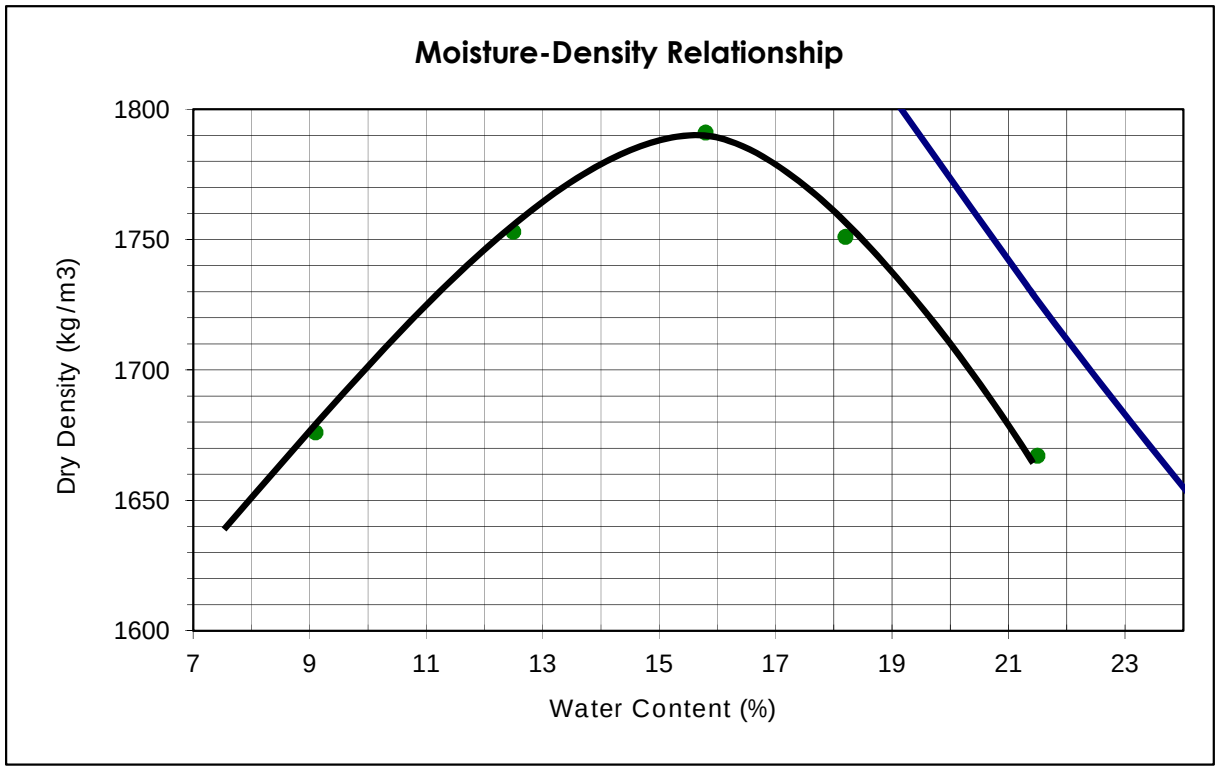
Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.250

Date Sampled: August 19, 2016
Date Tested: November 14, 2016
Tested By: C.Small

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1676 | 1753 | 1791 | 1751 | 1667 |
| MOISTURE CONTENT (%) | 9.1 | 12.5 | 15.8 | 18.2 | 21.5 |

**Source of Sample:** BS3 BSE 6.1-7.6m
**Visual Soil Description:** Clay (CI), Trace Sand
**Maximum Dry Density (kg/m3):** 1790
**Optimum M.C. (%):** 15.5
**Natural M.C.(%):** 22.6






Reviewed by:

Stantec

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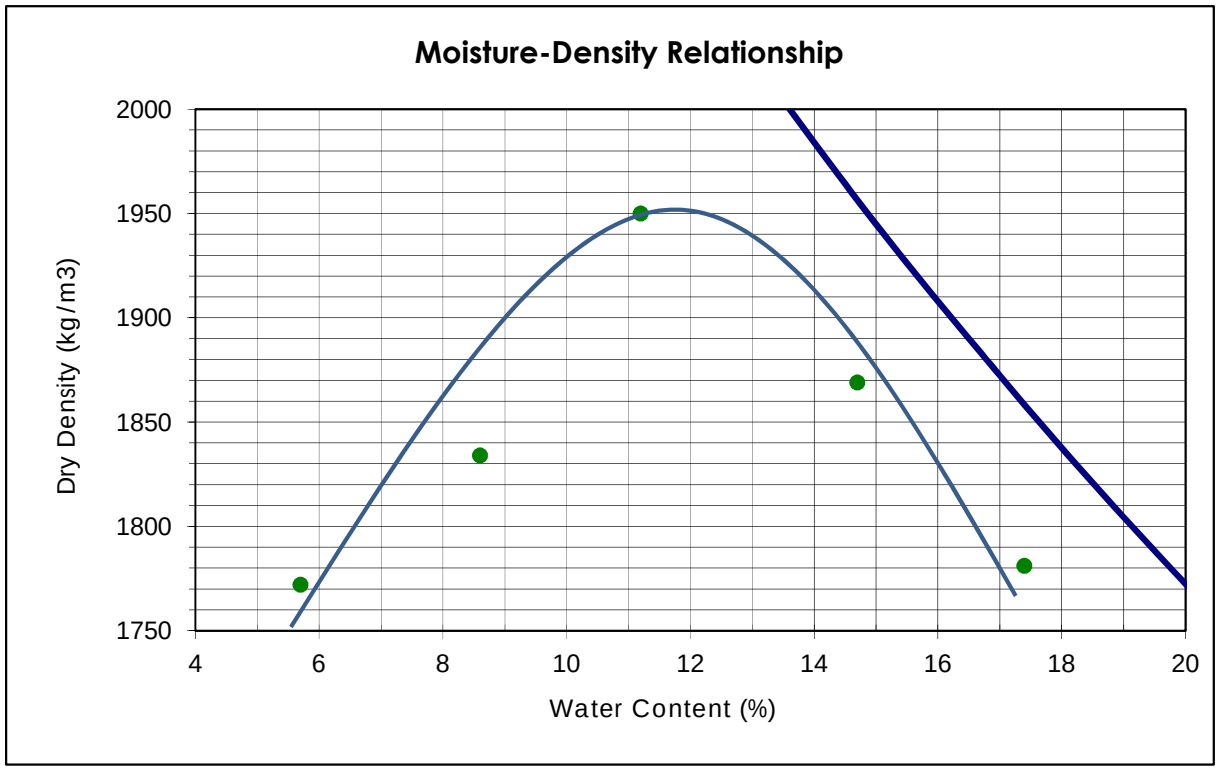
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | August 18, 2016 |
| Project Name: | SR1 | Date Tested: | October 14, 2016 |
| Project No.: | 110773396.302.702.250 | Tested By: | M.Pilkington |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1772 | 1834 | 1950 | 1869 | 1781 |
| MOISTURE CONTENT (%) | 5.7 | 8.6 | 11.2 | 14.7 | 17.4 |

**Source of Sample:** BS4 BSG
**Visual Soil Description:** Sandy Clay (CL-CI), Trace Gravel
**Maximum Dry Density (kg/m3):** 1950
**Optimum M.C. (%):** 11.5
**Natural M.C.(%):** 12.6






Reviewed by: _____

Stantec

## Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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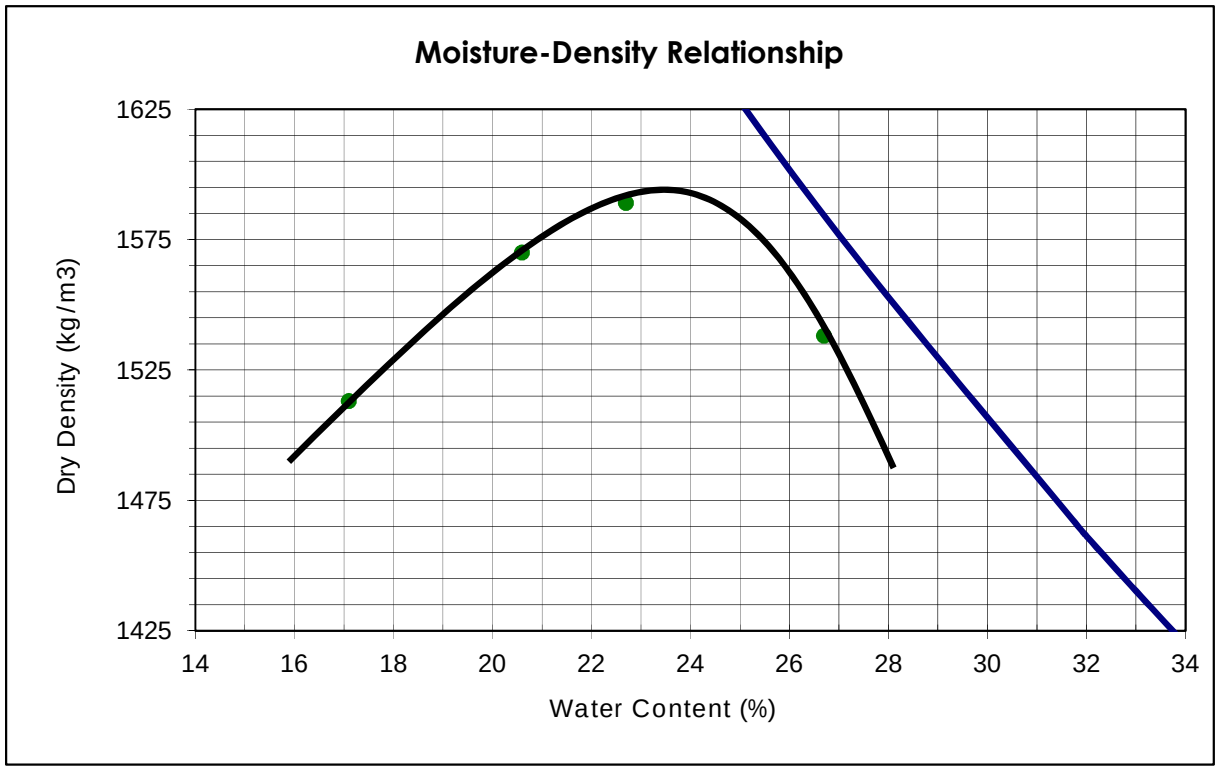
Fax: (403) 716-8099

**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876
Fax: (403) 253-0021

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | August 18, 2016 |
| Project Name: | SR1 | Date Tested: | October 14, 2016 |
| Project No.: | 110773396.302.702.250 | Tested By: | M.Pilkington |

| TRIAL No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1513 | 1570 | 1589 | 1538 |
| MOISTURE CONTENT (%) | 17.1 | 20.6 | 22.7 | 26.7 |

**Source of Sample:** BS4 BSB
**Visual Soil Description:** Clay (CH), Trace Sand
**Maximum Dry Density (kg/m3):** 1595
**Optimum M.C. (%):** 23.5
**Natural M.C.(%):** 27.2






Reviewed by: _____

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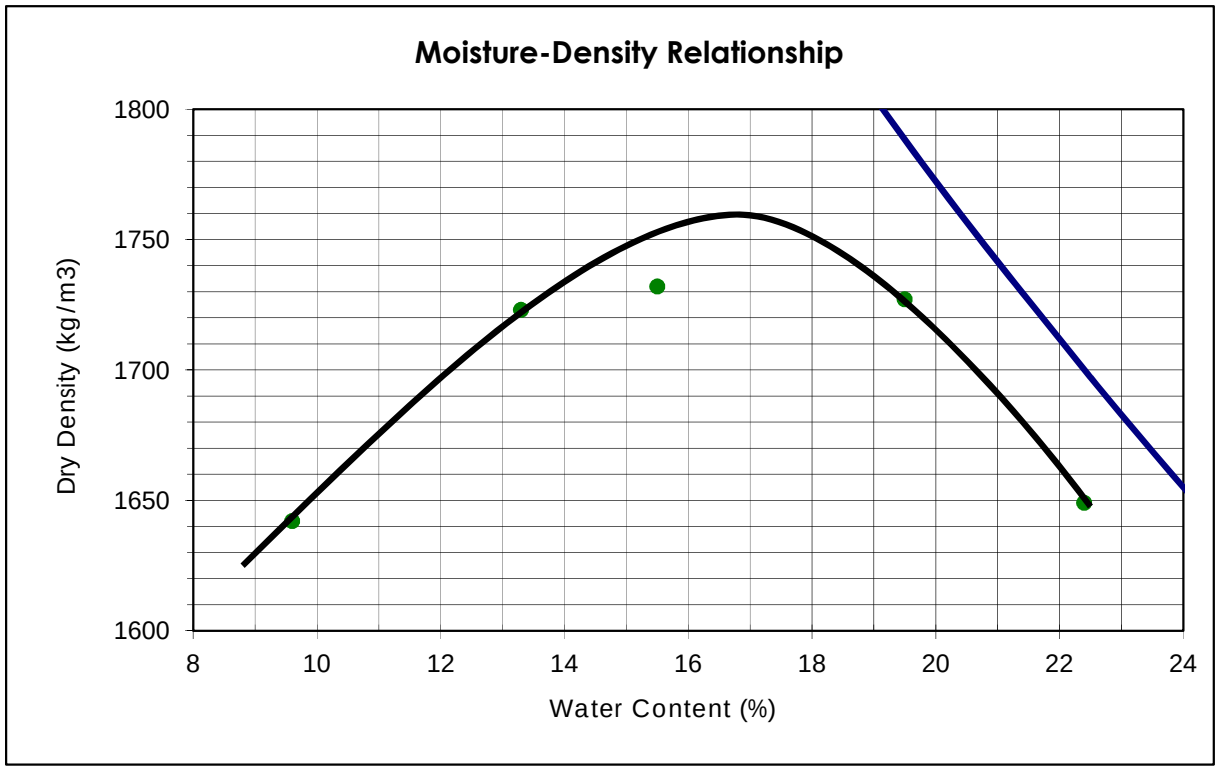
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | August 23, 2016 |
| Project Name: | SR1 | Date Tested: | November 14, 2016 |
| Project No.: | 110773396.302.702.260 | Tested By: | C.Small |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1642 | 1723 | 1732 | 1727 | 1649 |
| MOISTURE CONTENT (%) | 9.6 | 13.3 | 15.5 | 19.5 | 22.4 |

**Source of Sample:** BS5 BSB 1.54-3.0m
**Visual Soil Description:** Clay (CL), Some Sand
**Maximum Dry Density (kg/m3):** 1800
**Optimum M.C. (%):** 16.5
**Natural M.C.(%):** 15.0






Reviewed by: _____

Stantec

## Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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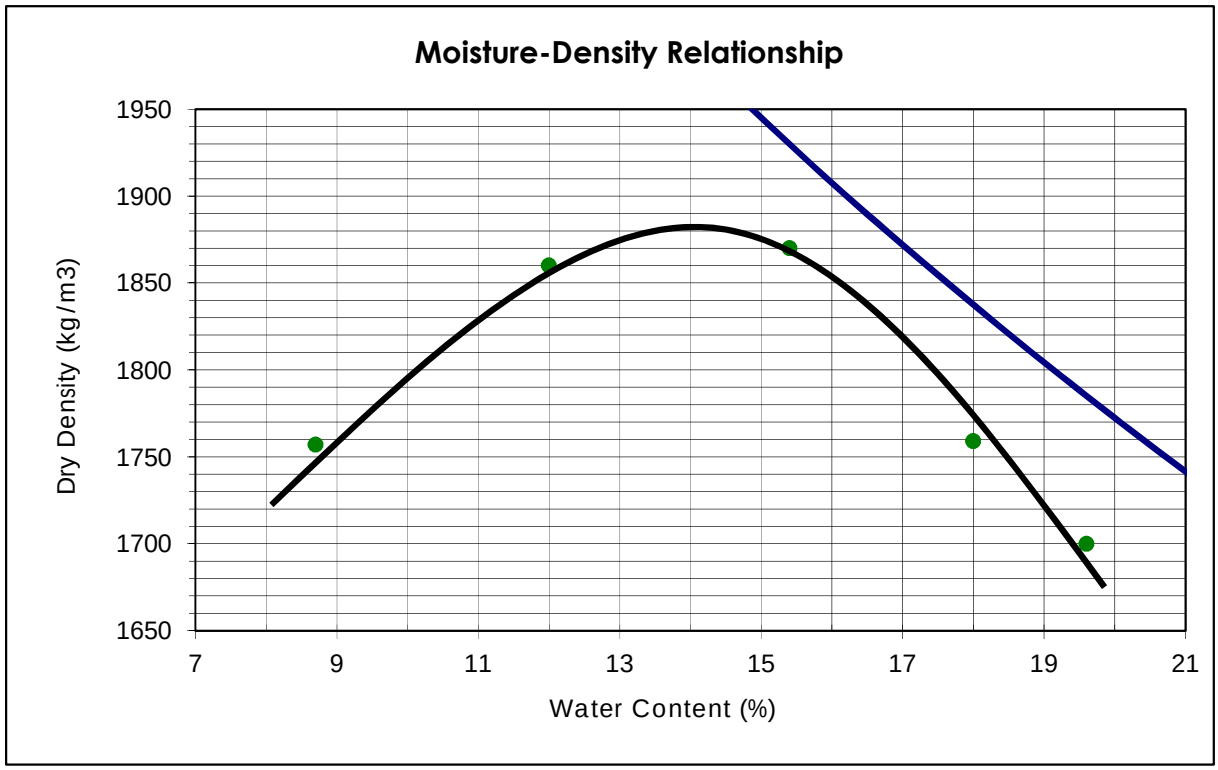
Tel: (403) 253-7876
Fax: (403) 253-0021

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | April 28, 2016 |
| Project Name: | SR1 | Date Tested: | November 3, 2016 |
| Project No.: | 110773396.302.702.250 | Tested By: | C.Woods |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1757 | 1860 | 1870 | 1759 | 1700 |
| MOISTURE CONTENT (%) | 8.7 | 12.0 | 15.4 | 18.0 | 19.6 |

**Source of Sample:** BS5 BSC
**Visual Soil Description:** Clay (CL), Some Sand, Trace Gravel
**Maximum Dry Density (kg/m3):** 1880
**Optimum M.C. (%):** 14.0
**Natural M.C.(%):** 13.9






Reviewed by: _____

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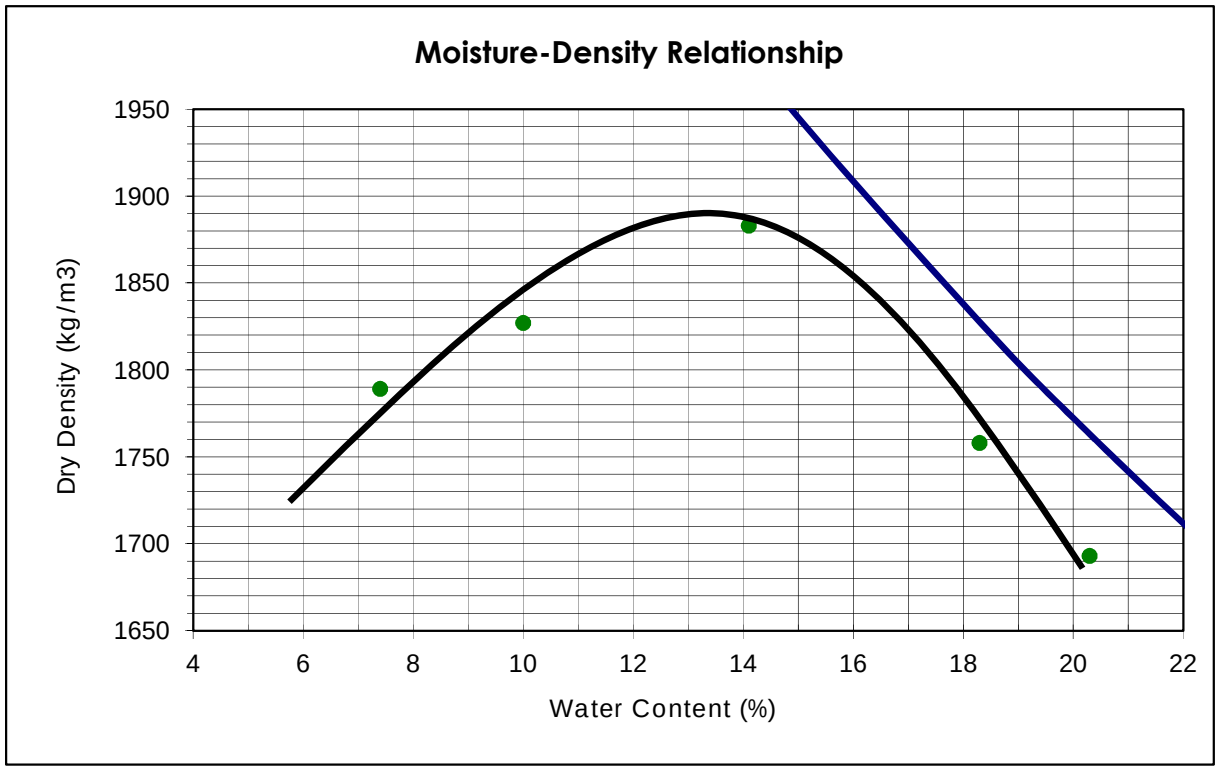
# Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

| | | | |
|---|---|---|---|
| Client: | Alberta Transportation | Date Sampled: | April 28, 2016 |
| Project Name: | SR1 | Date Tested: | November 3, 2016 |
| Project No.: | 110773396.302.702.250 | Tested By: | C.Woods |

| TRIAL No. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1789 | 1827 | 1883 | 1758 | 1693 |
| MOISTURE CONTENT (%) | 7.4 | 10.0 | 14.1 | 18.3 | 20.3 |

**Source of Sample:** BS5 BSE
**Visual Soil Description:** Clay (CI), Some Sand, Trace Gravel
**Maximum Dry Density (kg/m3):** 1890
**Optimum M.C. (%):** 13.5
**Natural M.C.(%):** 15.3






Reviewed by: _____

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

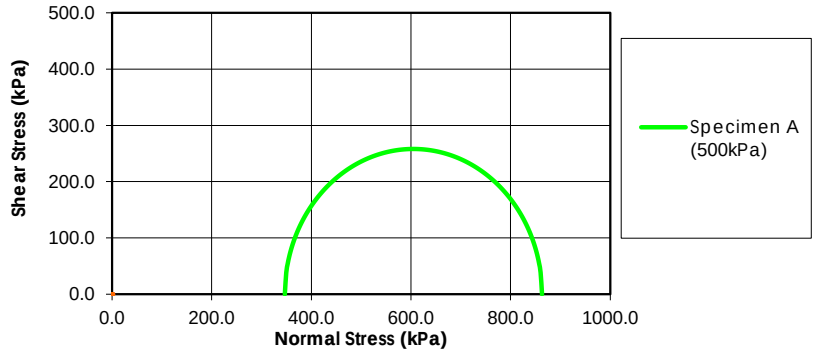
Stantec

Reviewed By C. Lamoureux

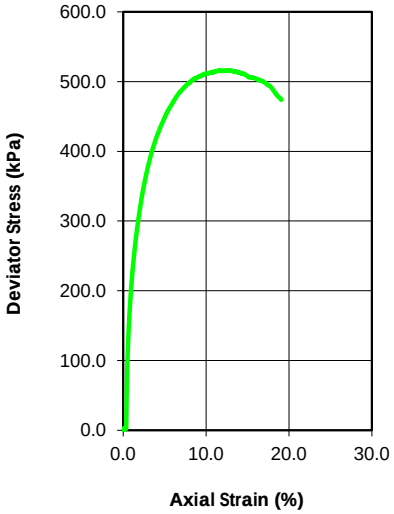
Date: 11-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 21.8 | | | |
| Dry Density (g/cm3) | 1.722 | | | |
| Saturation (%) | 103.81 | | | |
| Void Ratio | 0.568 | | | |
| Diameter (mm) | 72.400 | | | |
| Height (mm) | 163.400 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 17.7 | | | |
| Dry Density (g/cm3) | 1.892 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.427 | | | |
| Effective Stress (kPa) | 487.7 | | | |
| Back Press. (kPa) | 92.3 | | | |
| Rate of Strain | 0.023 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

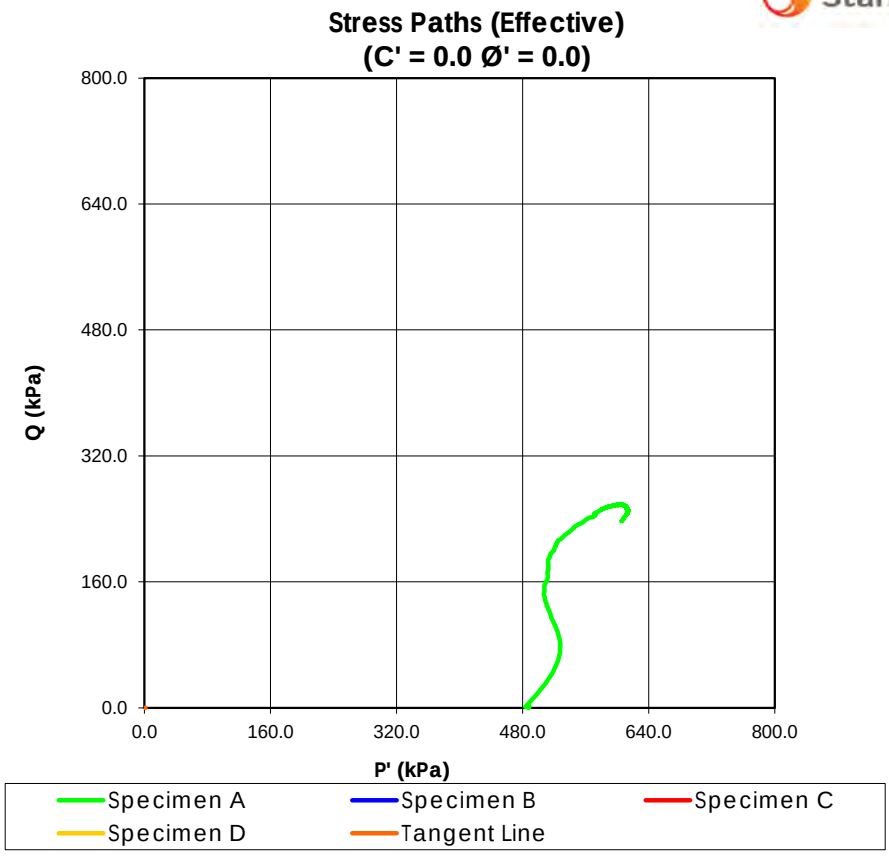
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 863.02 | | | |
| σ'3 at Failure (kPa) | 346.83 | | | |
| | | | | |
| | | | | |

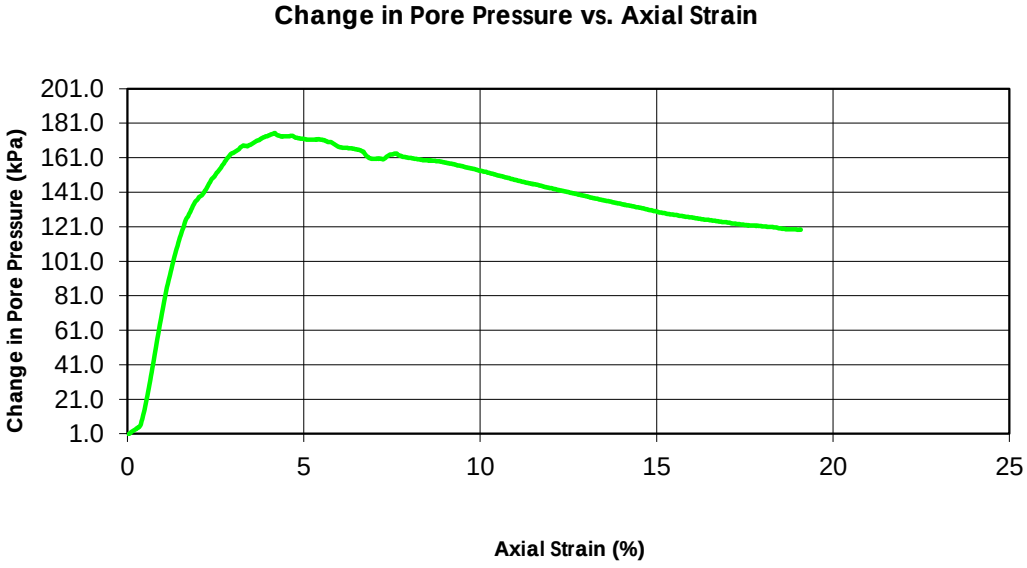
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.250 |
| **Boring Number:** | - |
| **Sample Number:** | BS1 ST2 |
| **Depth:** | 1.50-1.95m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

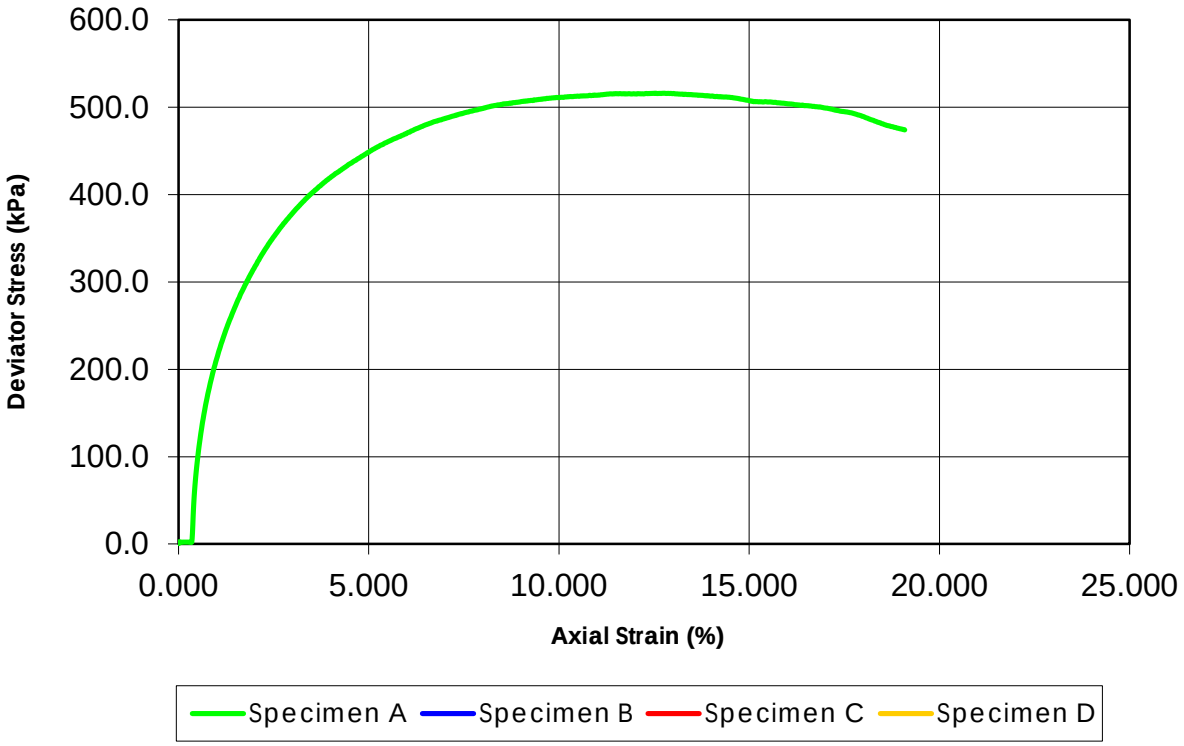
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

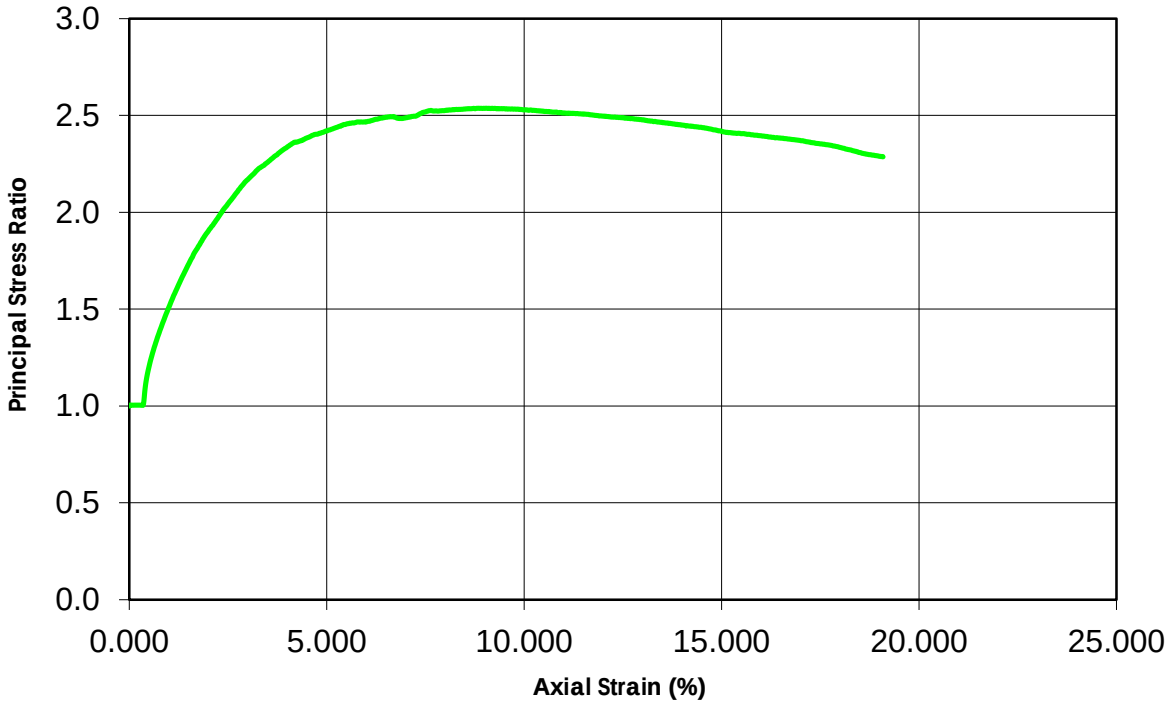


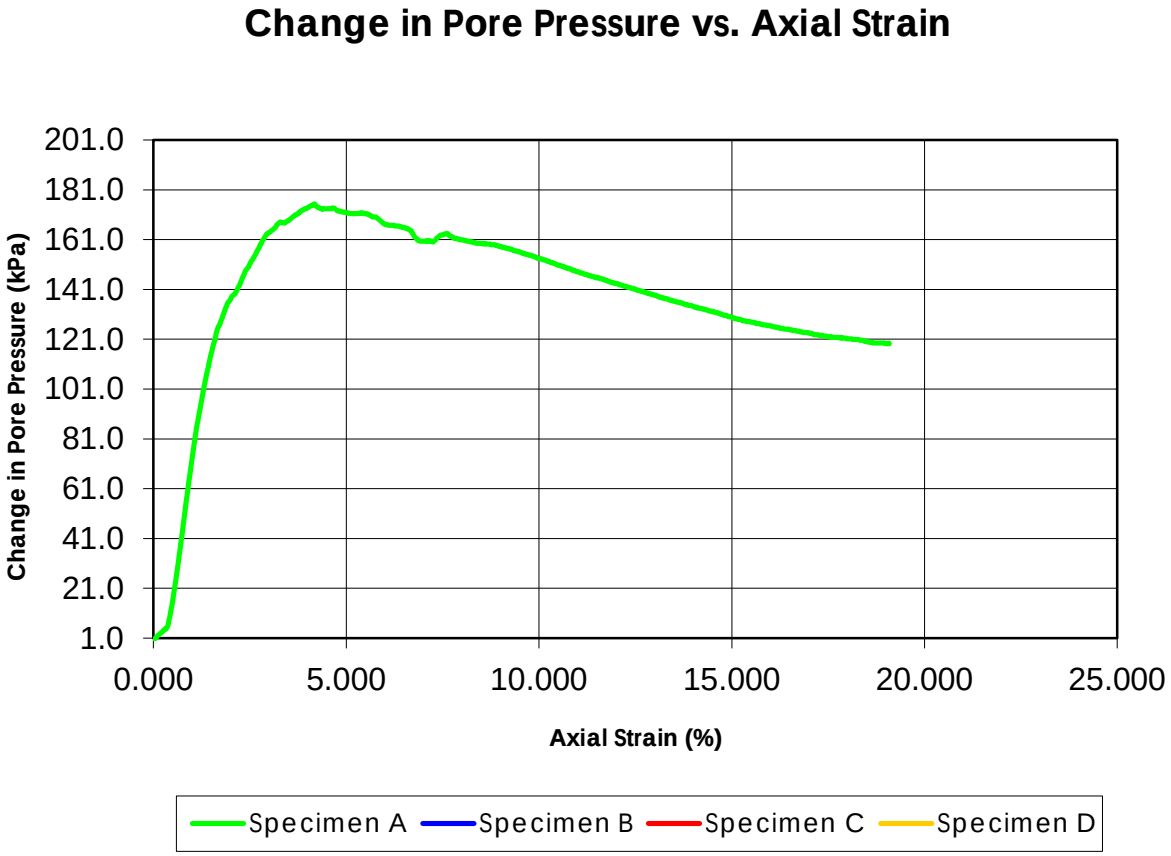



## Deviator Stress vs. Axial Strain



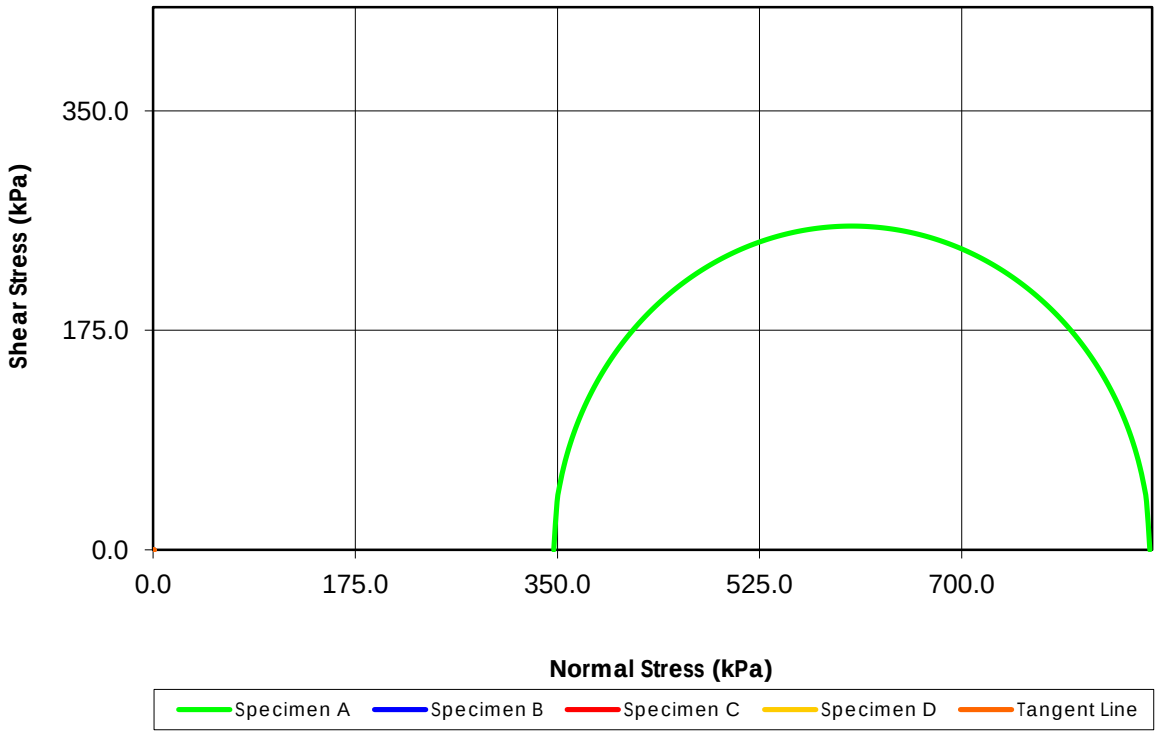

## Principal Stress Ratio vs. Axial Strain



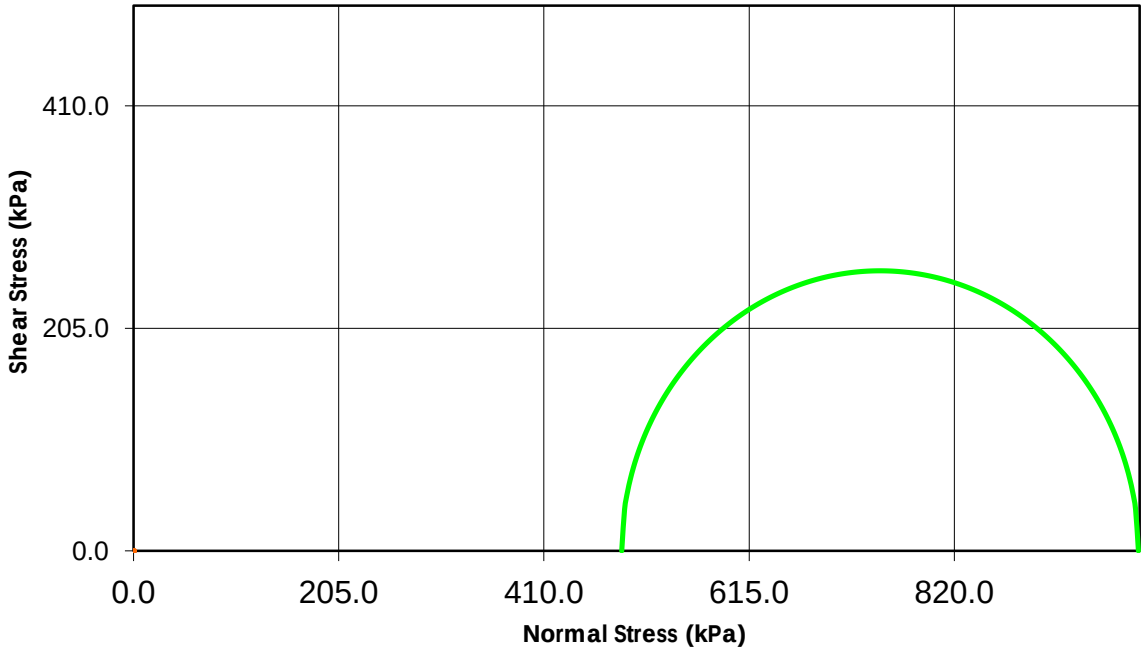

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
201.0
181.0
161.0
141.0
121.0
101.0
81.0
61.0
41.0
21.0
1.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

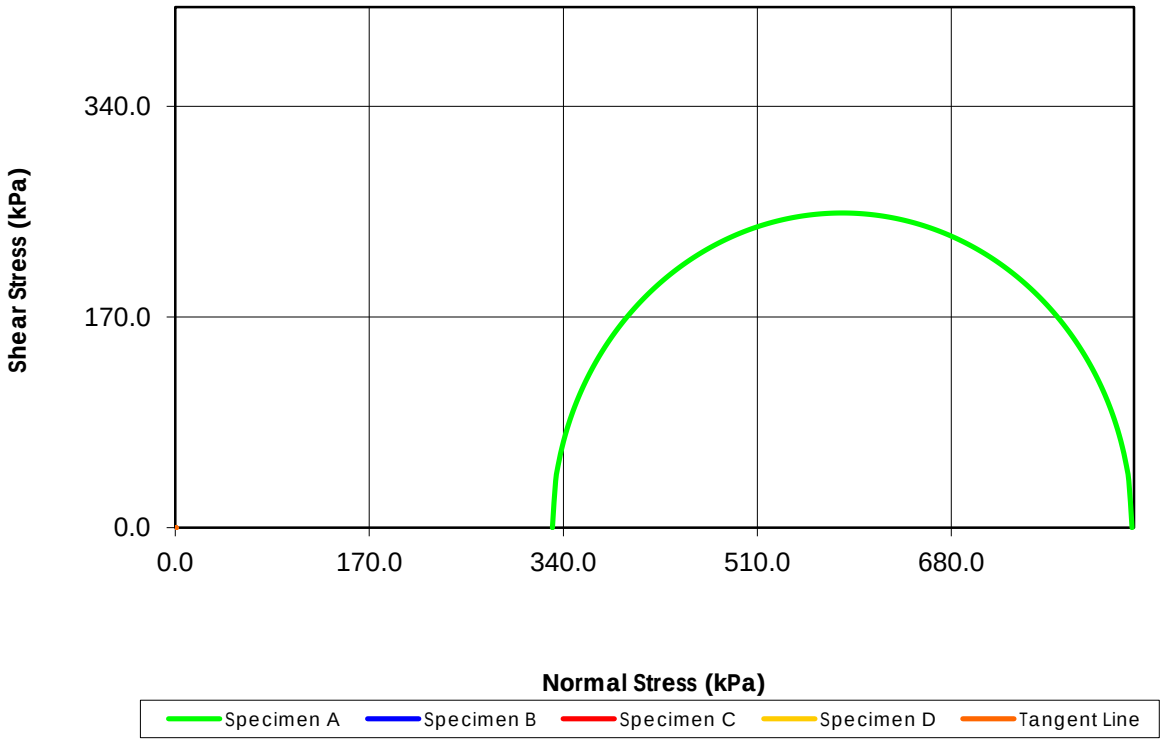



### Total Stress
### (C = 0.0 Ø = 0.0)

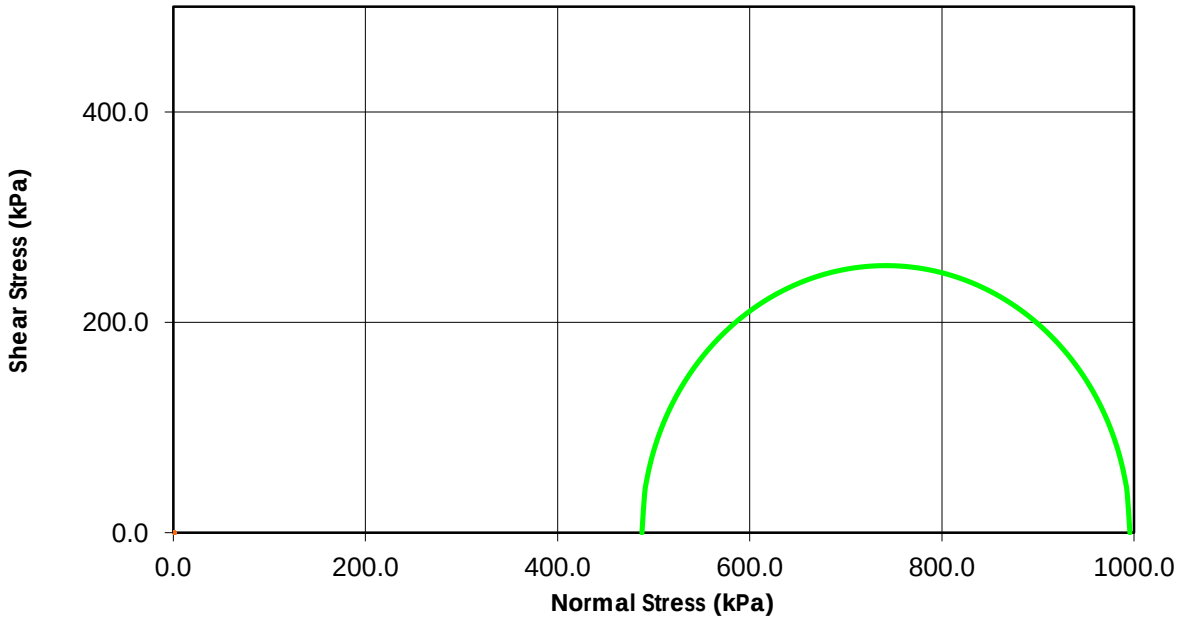


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

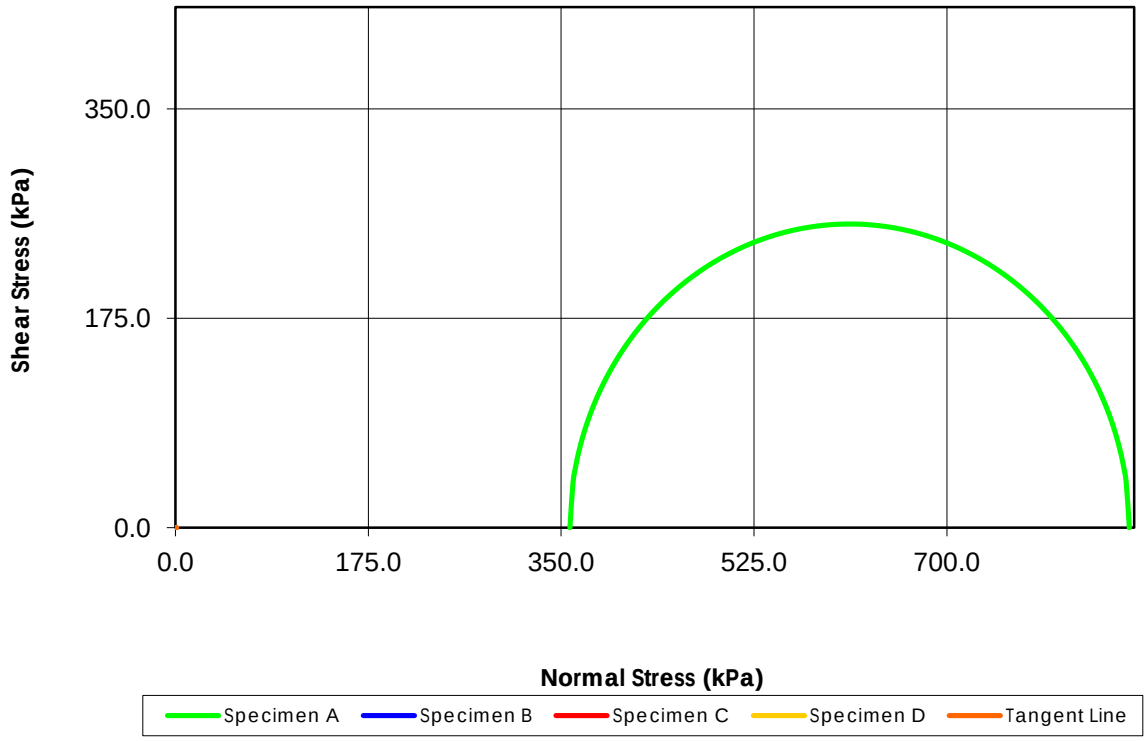



## Total Stress
## (C = 0.0 Ø = 0.0)

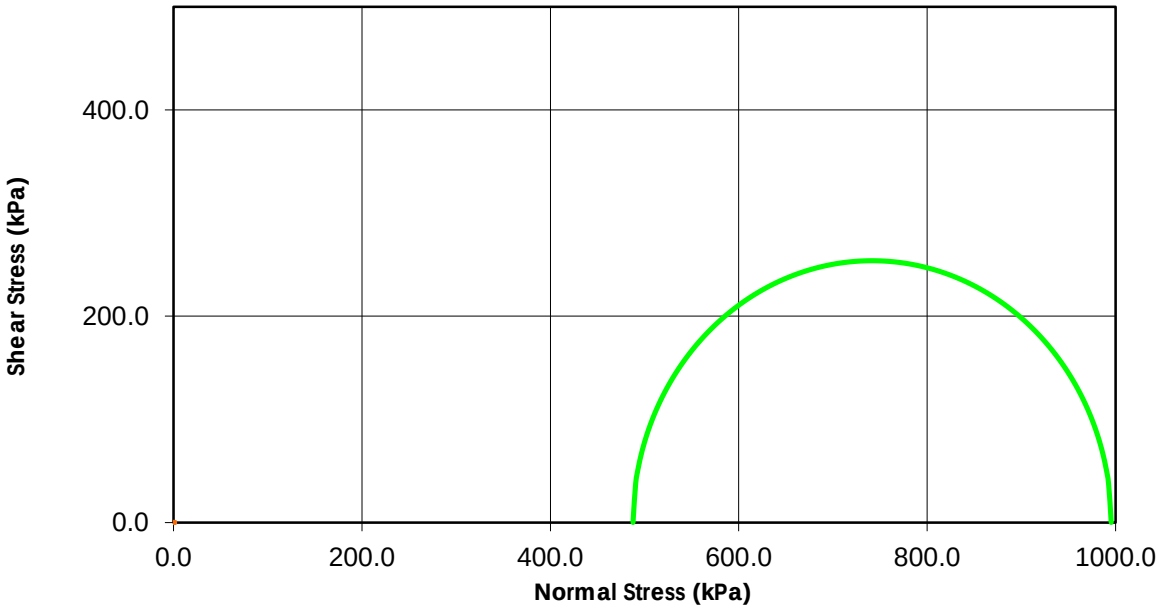


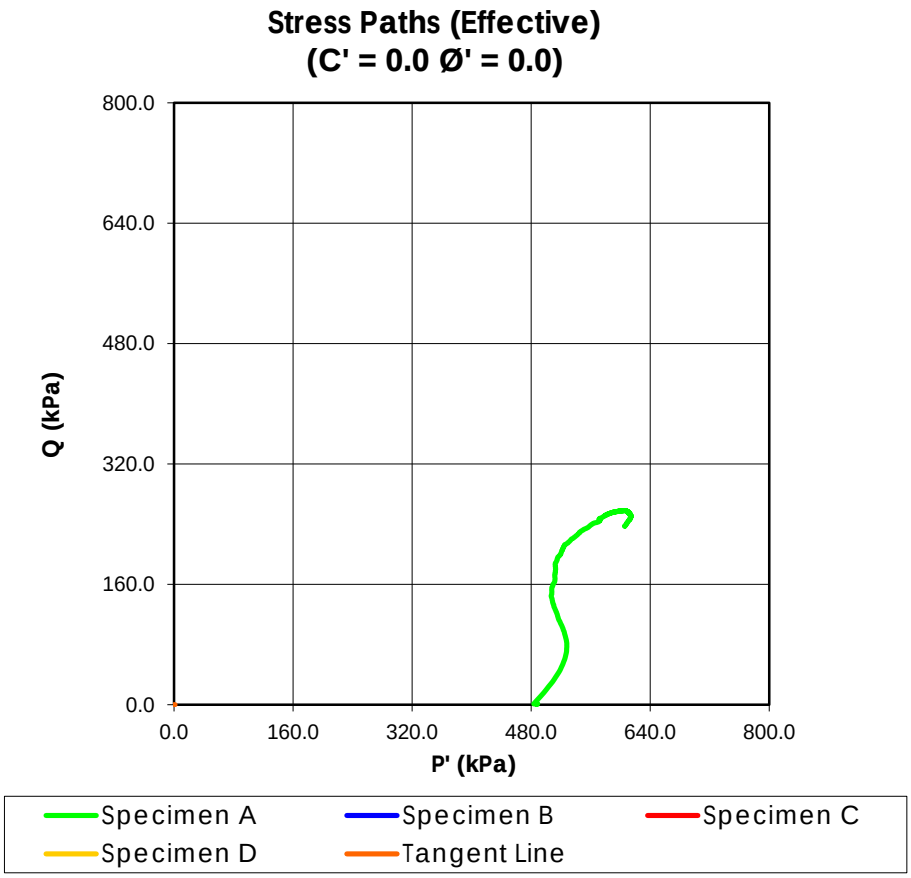
# Mohr Stress Circles at 15% Axial Strain Criterion

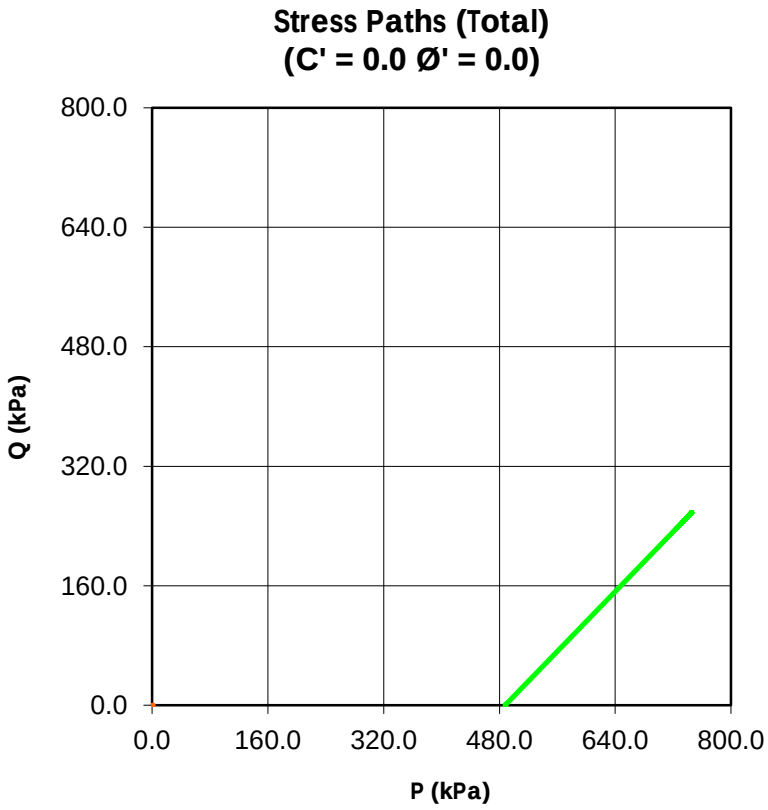
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

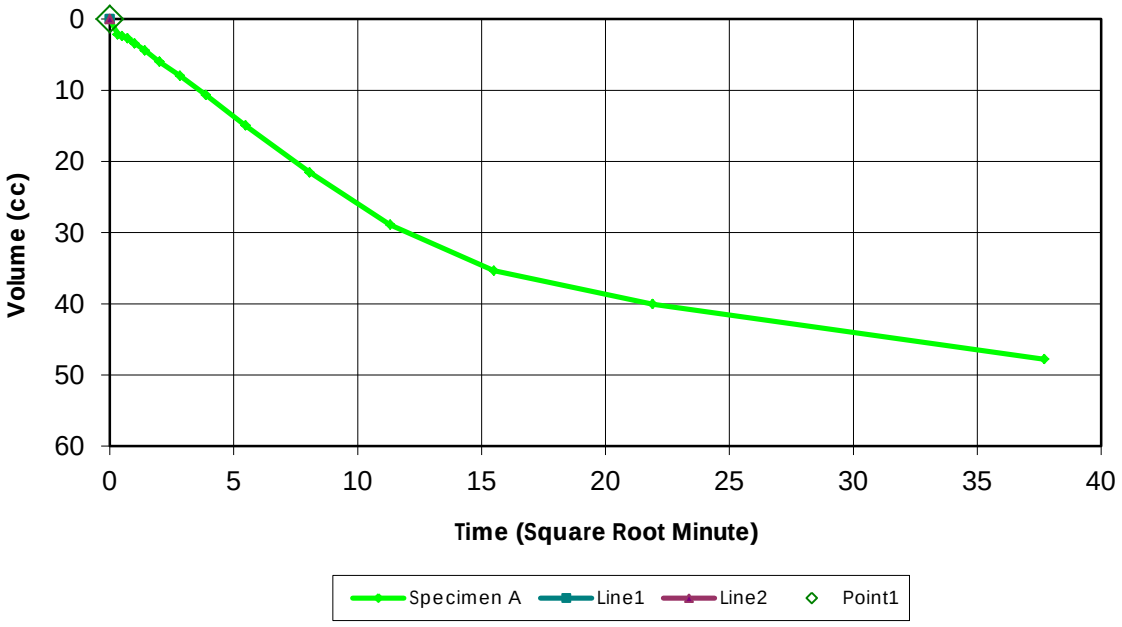



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

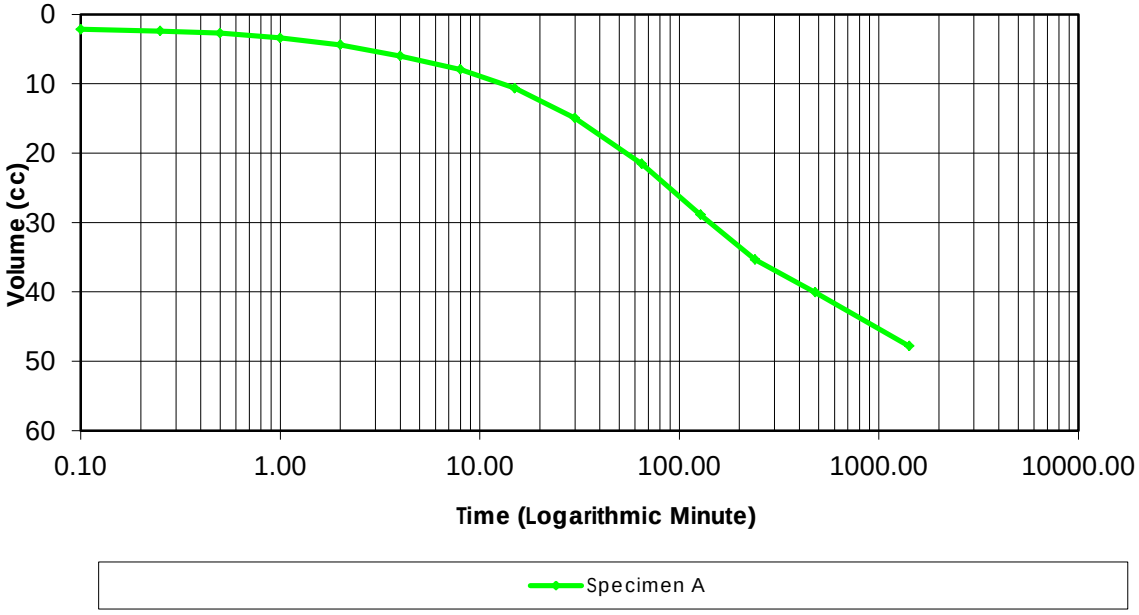

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
800.0
640.0
480.0
320.0
160.0
0.0
Q (kPa)
0.0
160.0
320.0
480.0
640.0
800.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.97

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 60.0 | 40.0 | N/A | N/A | N/A |
| 1 | 60.0 | 40.0 | 0.0 | 0.0 | |
| 2 | 80.0 | 40.0 | 20.0 | 0.0 | 0.40 |
| 3 | 80.0 | 60.0 | 0.0 | 20.0 | |
| 4 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 5 | 100.0 | 60.0 | 20.0 | 0.0 | 0.50 |
| 6 | 100.0 | 80.0 | 0.0 | 20.0 | |
| 7 | 100.0 | 80.0 | 0.0 | 0.0 | |
| 8 | 120.0 | 80.0 | 20.0 | 0.0 | 0.97 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.250

Project Name: SR1

Project Location:

Hole No. 0  Depth: 1.50-1.95m

| | |
|---|---|
| Cell Pressure (kPa) | 580 |
| Back Pressure (kPa) | 80 |
| Effective Pressure (kPa) | 500 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72.4 |
| Initial Sample Height (mm) | 163.4 |
| Initial Sample Area (cm2) | 41.17 |
| Initial Volume (cm3) | 672.7 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 48.70 | N/A |
| 00:00:06 | 46.55 | 2.150 |
| 00:00:15 | 46.30 | 2.400 |
| 00:00:30 | 46.00 | 2.700 |
| 00:01:00 | 45.30 | 3.400 |
| 00:02:00 | 44.30 | 4.400 |
| 00:04:00 | 42.70 | 6.000 |
| 00:08:00 | 40.75 | 7.950 |
| 00:15:00 | 38.05 | 10.650 |
| 00:30:00 | 33.75 | 14.950 |
| 01:05:00 | 27.15 | 21.550 |
| 02:08:00 | 19.80 | 28.900 |
| 04:00:00 | 13.35 | 35.350 |
| 08:00:00 | 8.65 | 40.050 |
| 23:42:00 | 0.90 | 47.800 |
| | | |

Laboratory Supervisor

# Stantec Consulting Ltd.

## Consolidated Undrained Triaxial Test (ASTM D4767)

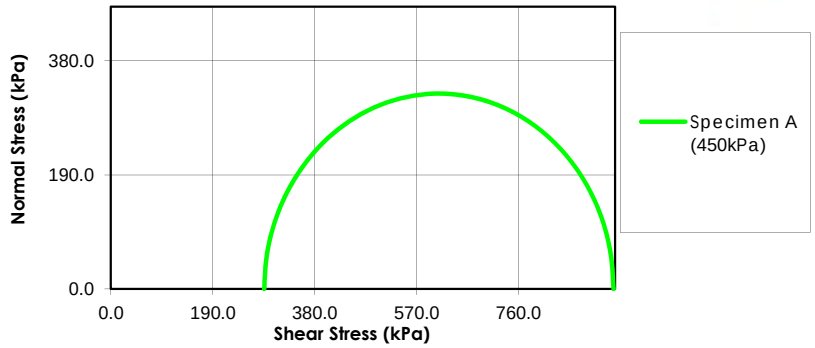
Stantec

Reviewed By C.Lamoureux

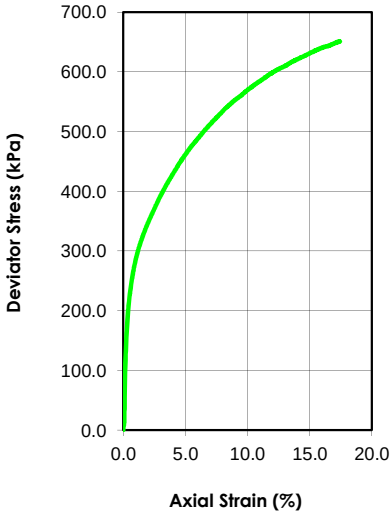
Date: 30-Sep-16

Tested By: C.Tollifson

### Effective Stress at Maximum Deviator Stress Criterion




### Deviator Stress Vs. Axial Strain




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 13.1 | | | |
| Dry Density (g/cm3) | 1.979 | | | |
| Saturation (%) | 97.25 | | | |
| Void Ratio | 0.362 | | | |
| Diameter (mm) | 69.8 | | | |
| Height (mm) | 145.8 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 10.6 | | | |
| Dry Density (g/cm3) | 2.047 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.319 | | | |
| Effective Stress (kPa) | 442.4 | | | |
| Back Press. (kPa) | 167.6 | | | |
| Rate of Strain | 0.018 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 936.86 | | | |
| σ'3 at Failure (kPa) | 285.96 | | | |
| | | | | |
| | | | | |

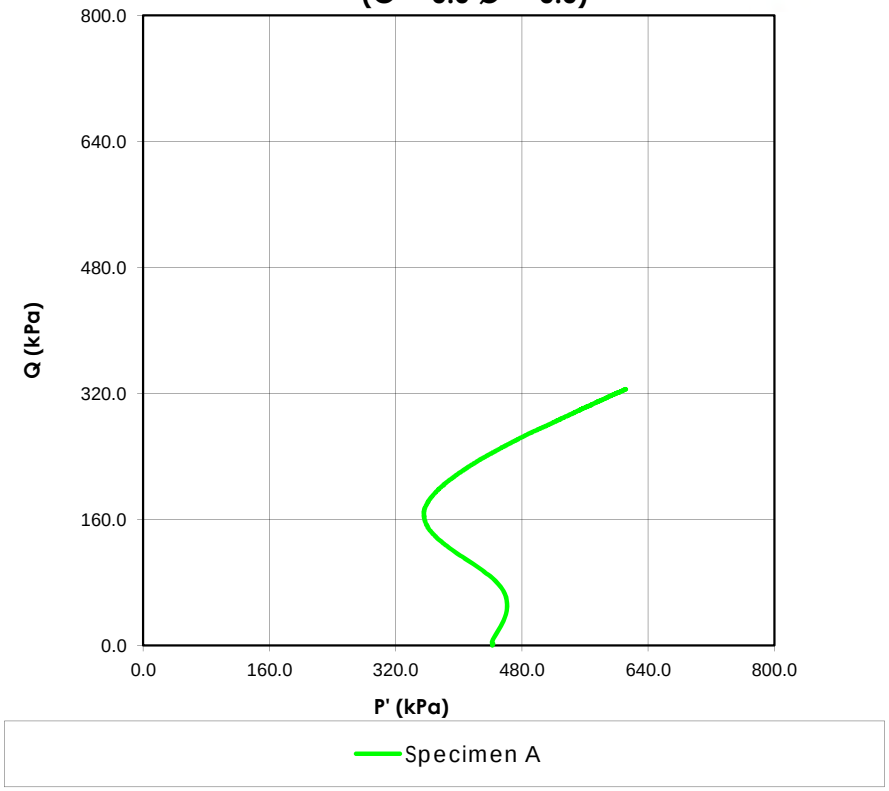
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.250 |
| **Boring Number:** | - |
| **Sample Number:** | BS1 BSE |
| **Depth:** | 6.1-7.6m |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay Trace Sand Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

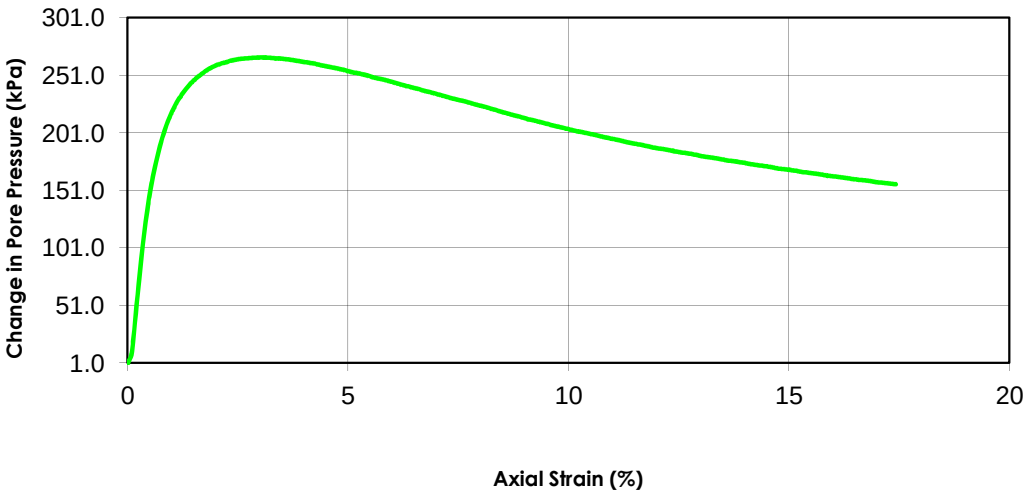
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



# Stantec Consulting Ltd.

## Consolidated Undrained Triaxial Test (ASTM D4767)

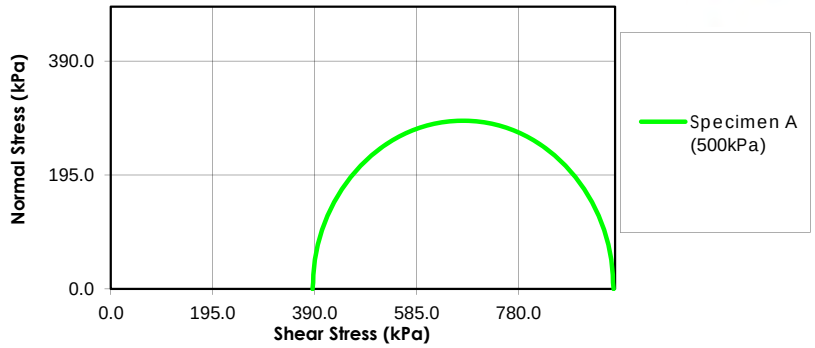
Stantec

Reviewed By C.Lamoureux

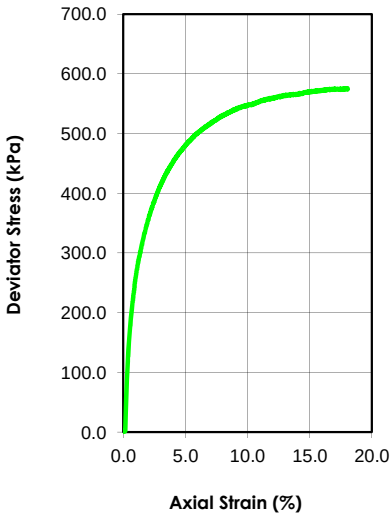
Date: 30-Sep-16

Tested By: C.Tollifson

### Effective Stress at Maximum Deviator Stress Criterion




### Deviator Stress Vs. Axial Strain




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 17.9 | | | |
| Dry Density (g/cm3) | 1.865 | | | |
| Saturation (%) | 107.67 | | | |
| Void Ratio | 0.445 | | | |
| Diameter (mm) | 69.8 | | | |
| Height (mm) | 141.2 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 15.4 | | | |
| Dry Density (g/cm3) | 1.986 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.359 | | | |
| Effective Stress (kPa) | 505.4 | | | |
| Back Press. (kPa) | 104.6 | | | |
| Rate of Strain | 0.018 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 961.93 | | | |
| σ'3 at Failure (kPa) | 386.19 | | | |
| | | | | |
| | | | | |

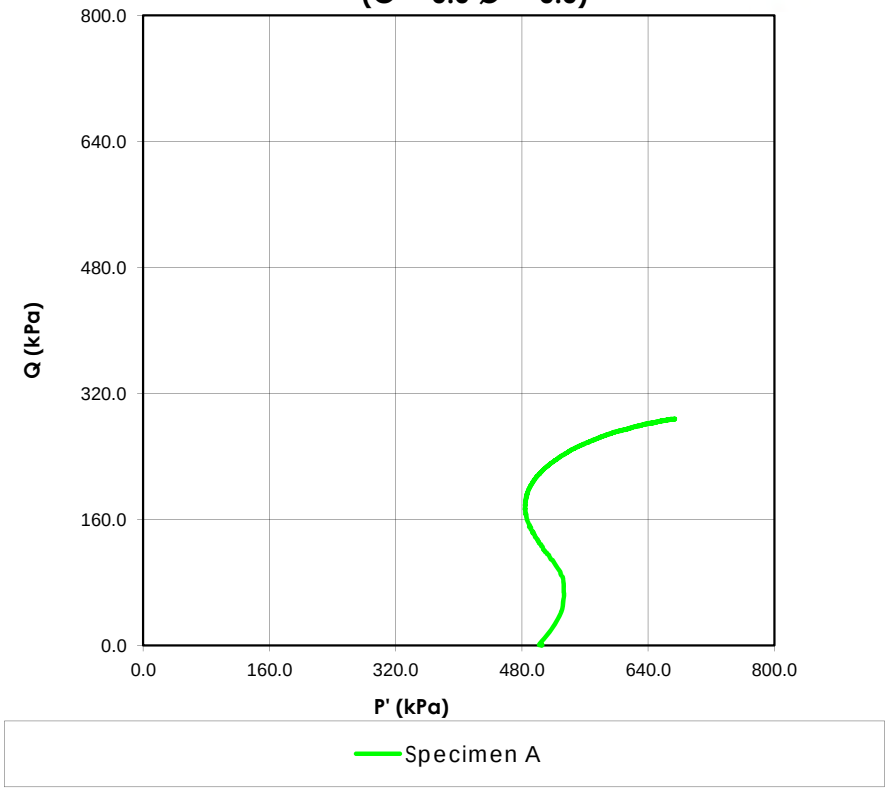
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.250 |
| **Boring Number:** | - |
| **Sample Number:** | BS2 BSB |
| **Depth:** | 1.5-3.0m |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay Trace Sand Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

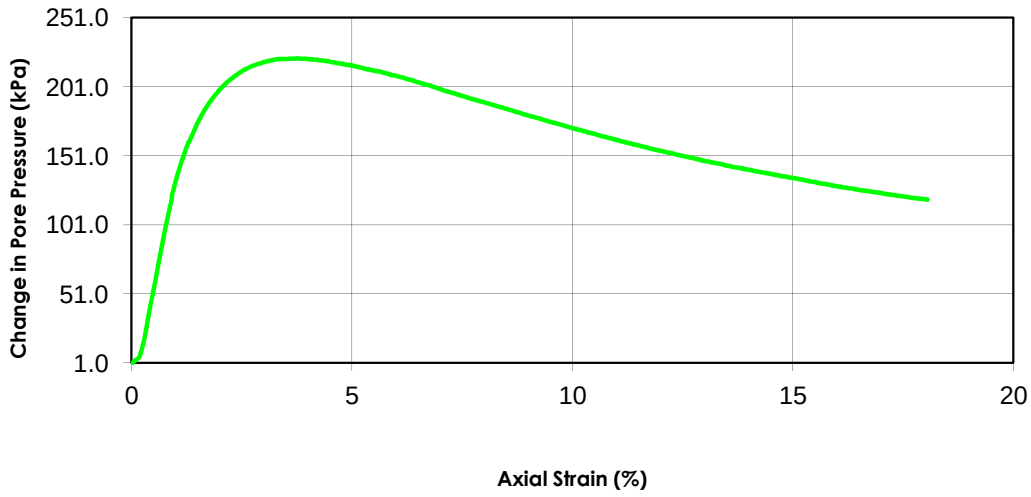
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

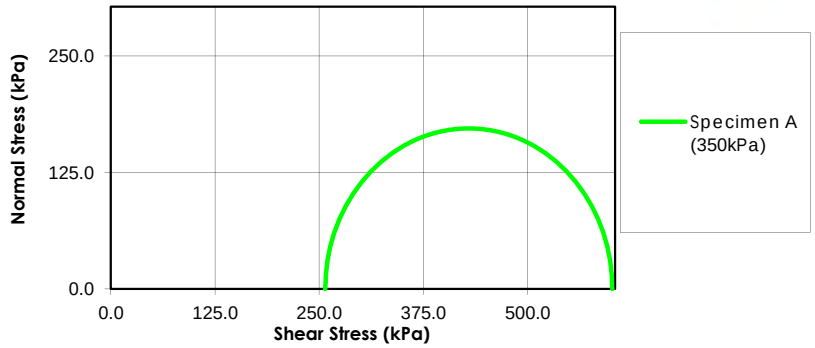
Stantec

Reviewed By C.Lamoureux

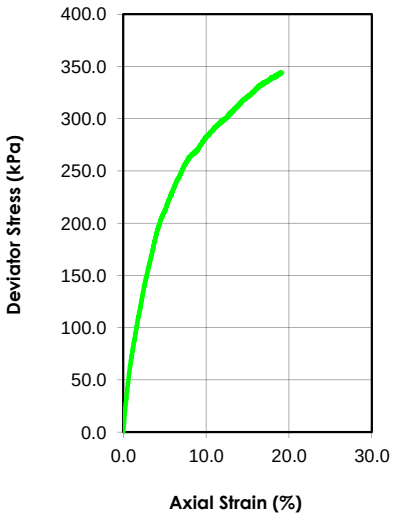
Date: 18-Aug-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 12.3 | | | |
| Dry Density (g/cm3) | 2.041 | | | |
| Saturation (%) | 102.91 | | | |
| Void Ratio | 0.320 | | | |
| Diameter (mm) | 69.6 | | | |
| Height (mm) | 136.7 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 1.00 | | | |
| Water Content (%) | 10.7 | | | |
| Dry Density (g/cm3) | 2.129 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.268 | | | |
| Effective Stress (kPa) | 185.9 | | | |
| Back Press. (kPa) | 414.1 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 601.62 | | | |
| σ'3 at Failure (kPa) | 257.28 | | | |
| | | | | |
| | | | | |

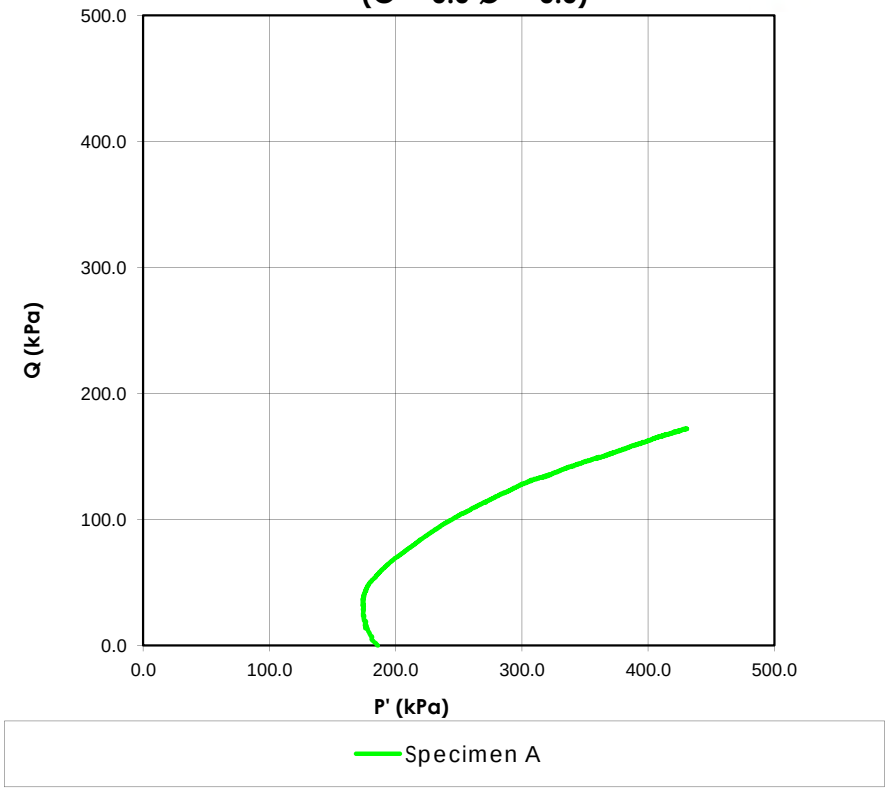
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.230 |
| **Boring Number:** | - |
| **Sample Number:** | BS2 BSC |
| **Depth:** | 3.0-4.6m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay with Sand Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

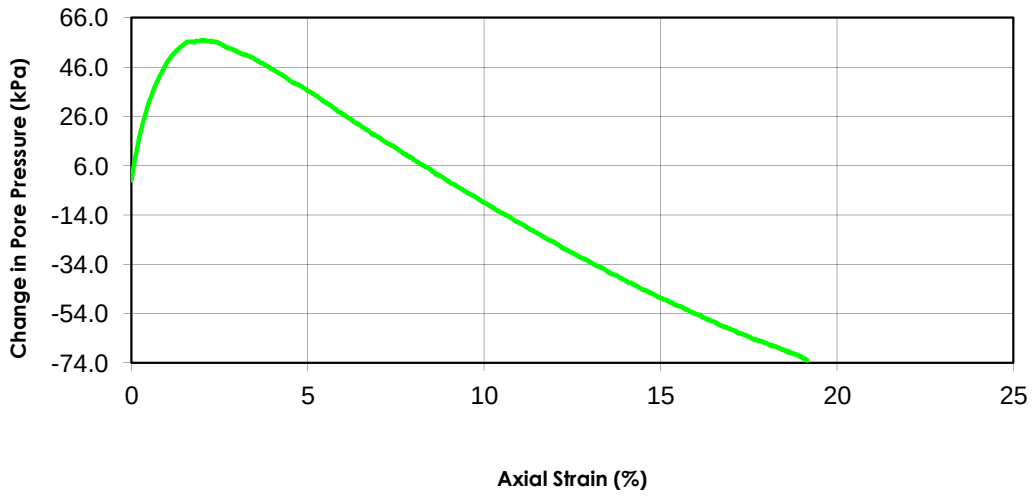
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



# Stantec Consulting Ltd.

## Consolidated Undrained Triaxial Test (ASTM D4767)

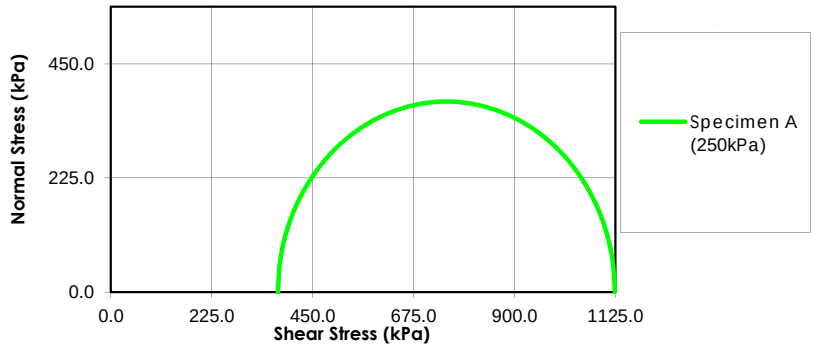
Stantec

Reviewed By C.Lamoureux

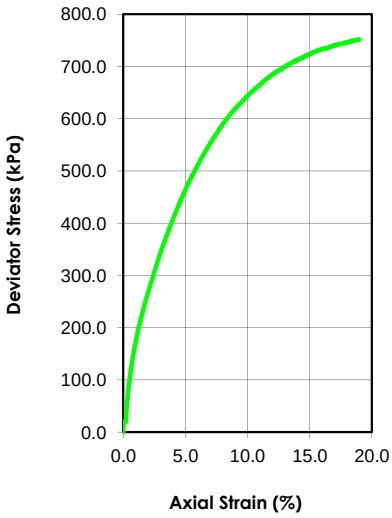
Date: 19-Aug-16

Tested By: C.Tollifson

### Effective Stress at Maximum Deviator Stress Criterion




### Deviator Stress Vs. Axial Strain




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.5 | | | |
| Dry Density (g/cm3) | 1.958 | | | |
| Saturation (%) | 103.32 | | | |
| Void Ratio | 0.376 | | | |
| Diameter (mm) | 70.0 | | | |
| Height (mm) | 147.6 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 12.5 | | | |
| Dry Density (g/cm3) | 2.063 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.309 | | | |
| Effective Stress (kPa) | 286.0 | | | |
| Back Press. (kPa) | 234.0 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 1123.72 | | | |
| σ'3 at Failure (kPa) | 372.43 | | | |
| | | | | |
| | | | | |

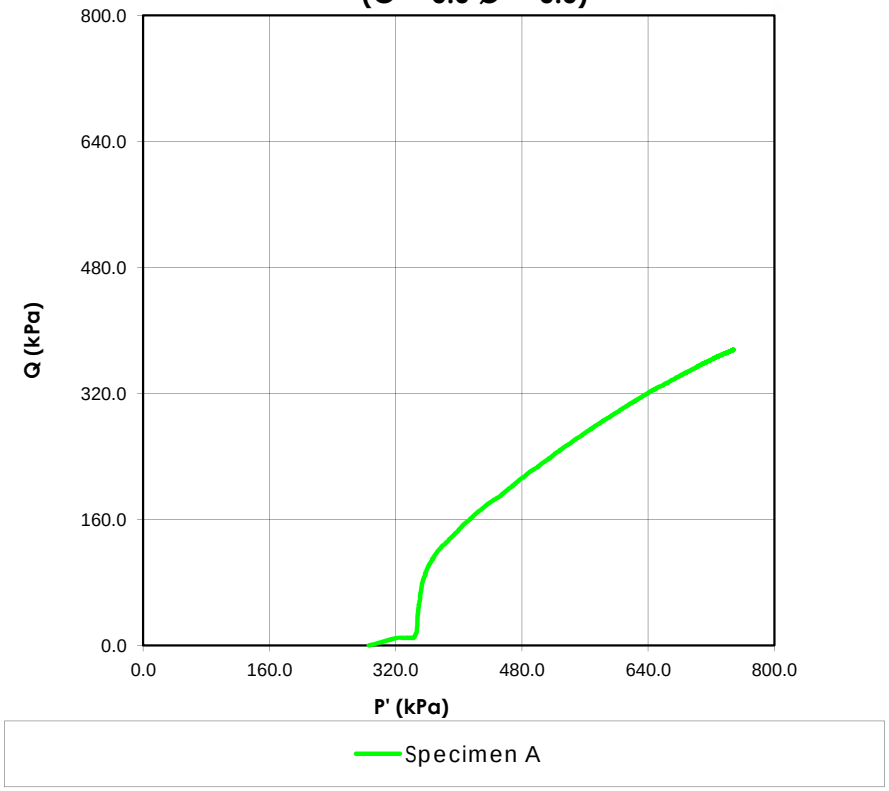
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.250 |
| **Boring Number:** | - |
| **Sample Number:** | BS2 BSE |
| **Depth:** | 6.1-7.6m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay, Trace Sand, Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

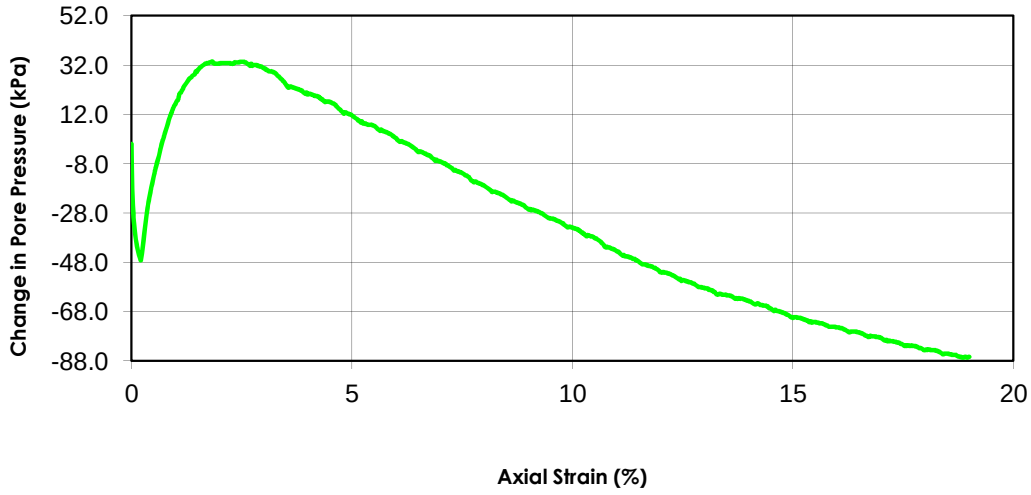
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

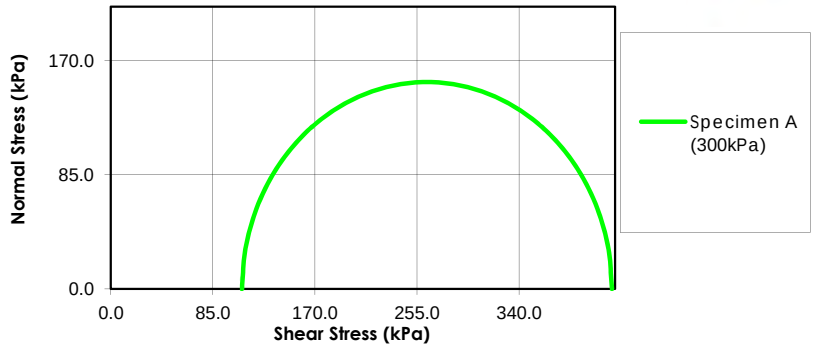
Stantec

Reviewed By C.Lamoureux

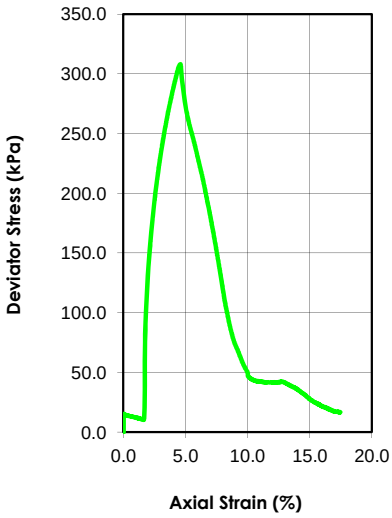
16-Aug-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 13.4 | | | |
| Dry Density (g/cm3) | 1.996 | | | |
| Saturation (%) | 102.73 | | | |
| Void Ratio | 0.350 | | | |
| Diameter (mm) | 69.7 | | | |
| Height (mm) | 145.3 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.97 | | | |
| Water Content (%) | 11.2 | | | |
| Dry Density (g/cm3) | 2.093 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.290 | | | |
| Effective Stress (kPa) | 287.7 | | | |
| Back Press. (kPa) | 142.3 | | | |
| Rate of Strain | 0.018 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 417.30 | | | |
| σ'3 at Failure (kPa) | 109.29 | | | |
| | | | | |
| | | | | |

| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.250 |
| **Boring Number:** | - |
| **Sample Number:** | BS5 BSC |
| **Depth:** | 3.0-4.5m |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay Trace Sand Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

**Consolidated Undrained Triaxial Test (ASTM D4767)**

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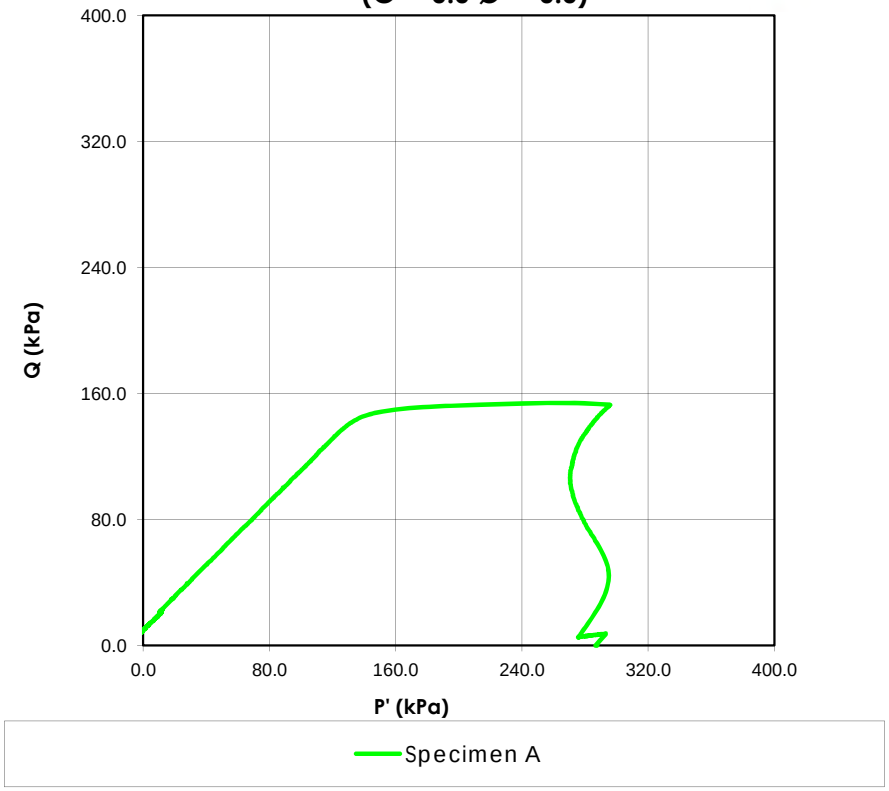
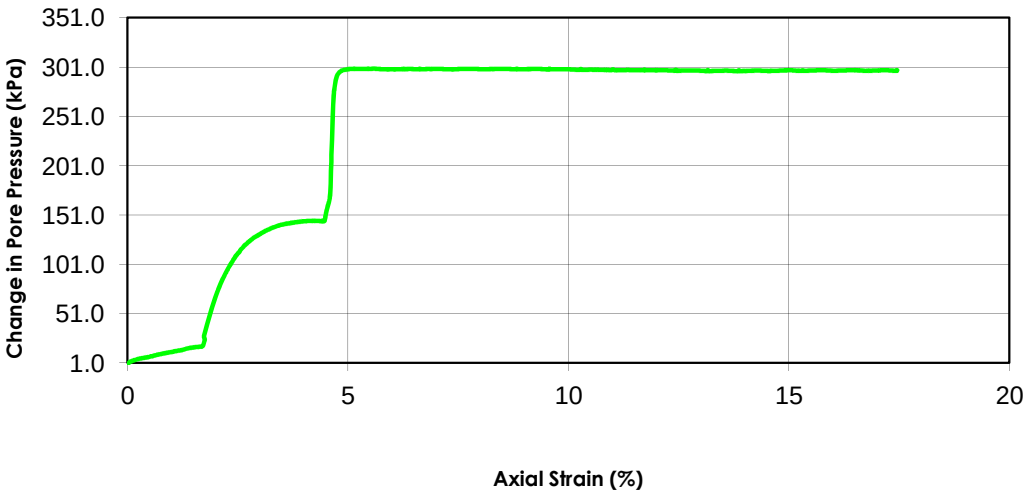
## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

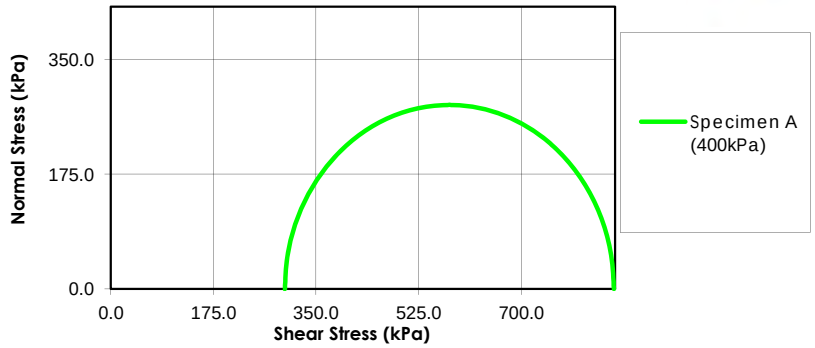
Stantec

Reviewed By C.Lamoureux

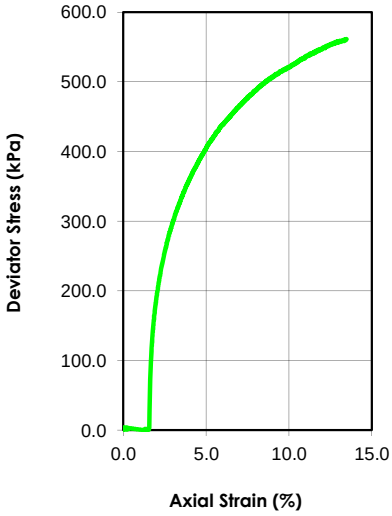
Date: 16-Aug-16

Tested By: C.Tollifson

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 14.0 | | | |
| Dry Density (g/cm3) | 2.0 | | | |
| Saturation (%) | 99.06 | | | |
| Void Ratio | 0.379 | | | |
| Diameter (mm) | 70.200 | | | |
| Height (mm) | 146.200 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | 0 | | | |
| Plastic Limit | 0 | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 11.9 | | | |
| Dry Density (g/cm3) | 0.00 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.000 | | | |
| Effective Stress (kPa) | 395.2 | | | |
| Back Press. (kPa) | 134.8 | | | |
| Rate of Strain | 0.017 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 857.93 | | | |
| σ'3 at Failure (kPa) | 296.85 | | | |
| | | | | |
| | | | | |

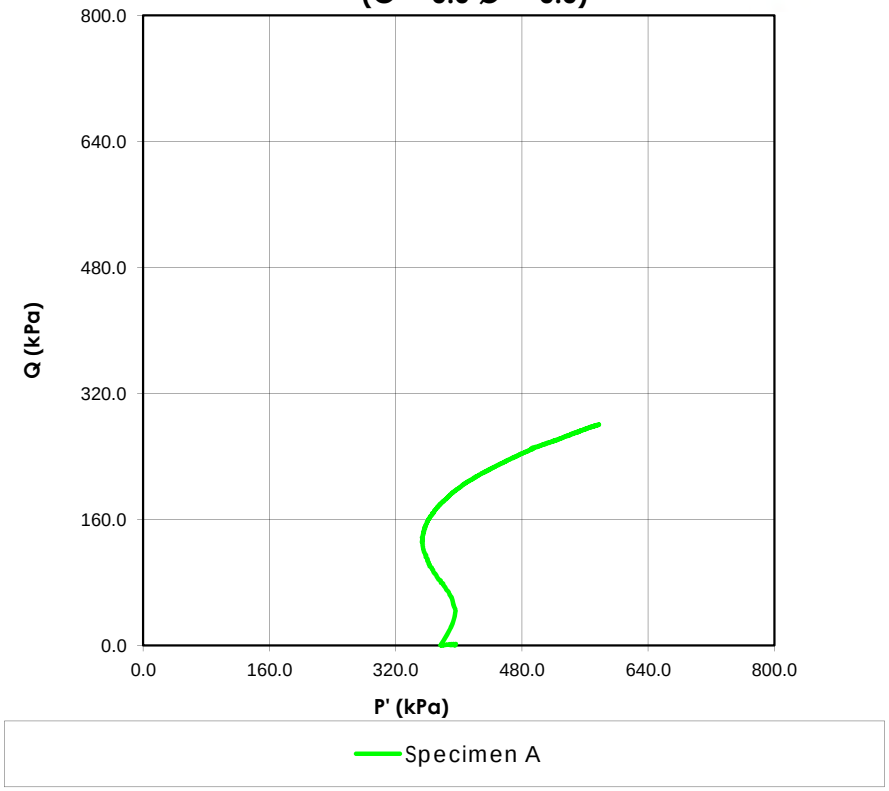
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.250 |
| **Boring Number:** | - |
| **Sample Number:** | BS5 BSD |
| **Depth:** | 4.5-6.0m |
| **Sample Type:** | Remolded |
| **Description:** | Brown Clay Trace Sand Trace Gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | - |

**Stantec Consulting Ltd.**

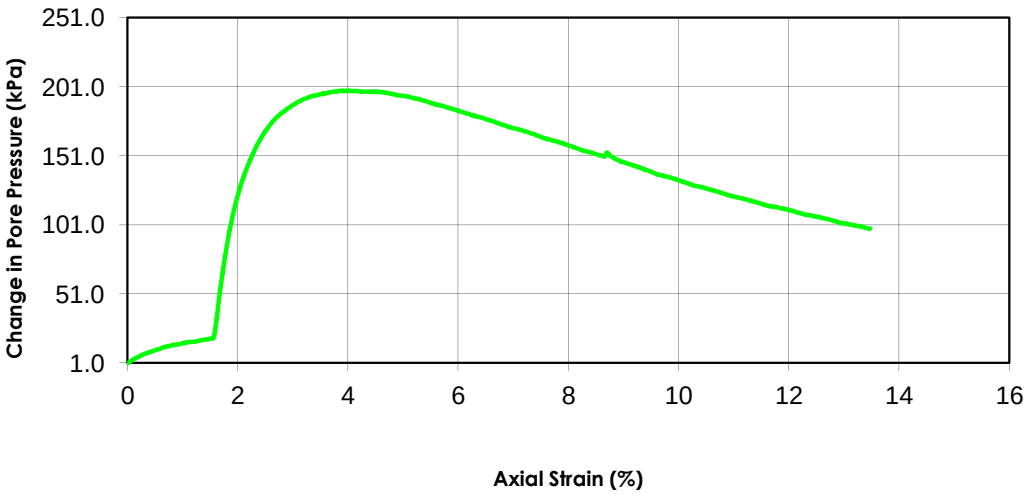
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



# E. 7
## Hydrogeology

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | May 19, 2016 |
| Date Tested: | August 11, 2016 |
| Tested By: | B. Pelkey |


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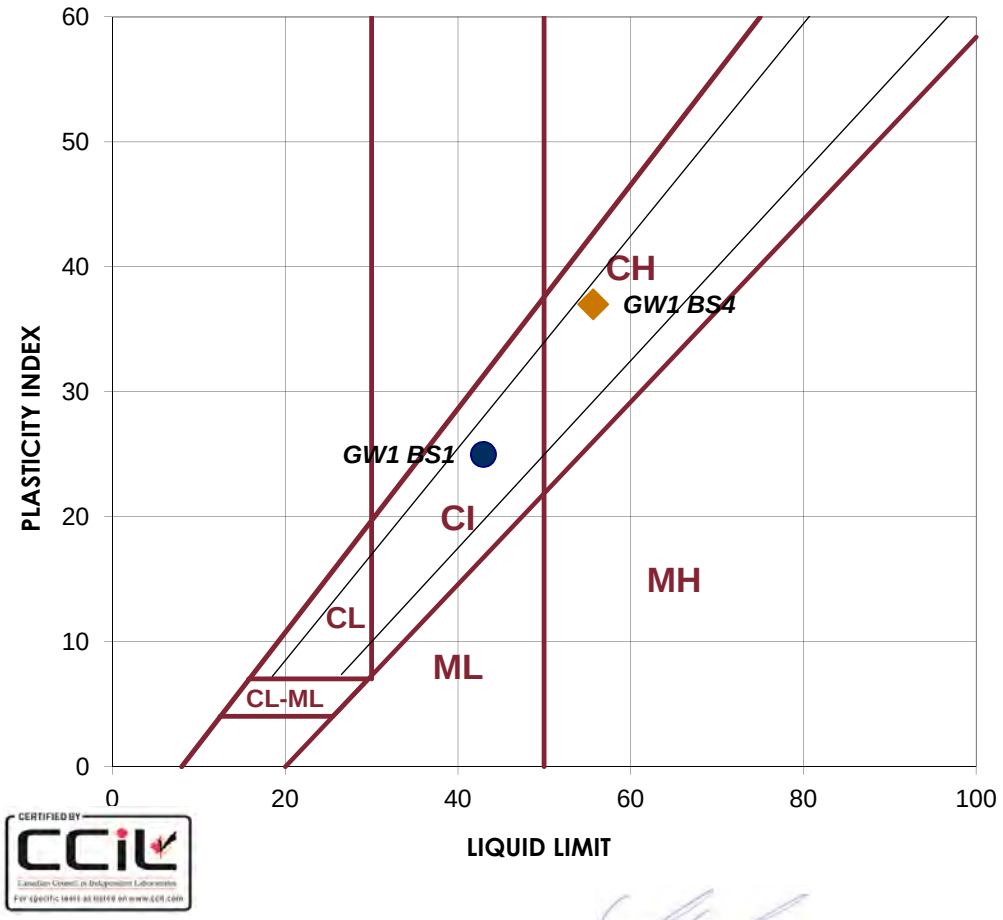
Tel: (403) 716-8000

**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876


| Sample: GW1 BS1 | | | Sample: GW1 BS4 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 23 | Number of Blows | 28 | 30 |
| | | Container Number | | |
| 29.37 | 20.28 | Wt. Sample (wet+tare)(g) | 24.40 | 25.25 |
| 20.96 | 14.67 | Wt. Sample (dry+tare)(g) | 16.24 | 16.86 |
| 1.62 | 1.56 | Wt. Tare (g) | 1.28 | 1.54 |
| 19.3 | 13.1 | Wt. Dry Soil (g) | 15.0 | 15.3 |
| 8.4 | 5.6 | Wt. Water (g) | 8.2 | 8.4 |
| 43.5% | 42.8% | Water Content (%) | 54.5% | 54.8% |
| 43.5% | 42.4% | Corrected Water Content (%) | 55.3% | 56.0% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.32 | 22.05 | Wt. Sample (wet+tare)(g) | 21.9 | 21.75 |
| 20.99 | 20.8 | Wt. Sample (dry+tare)(g) | 20.58 | 20.49 |
| 13.92 | 13.87 | Wt. Tare (g) | 13.8 | 13.77 |
| 7.1 | 6.9 | Wt. Dry Soil (g) | 6.8 | 6.7 |
| 1.3 | 1.3 | Wt. Water (g) | 1.3 | 1.3 |
| 18.8% | 18.0% | Water Content (%) | 19.5% | 18.8% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 43 | | LL | 56 |
| PL | 18 | | PL | 19 |
| PI | 25 | | PI | 37 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CH | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240
Date Received: May 29, 2016
Date Tested: August 11, 2016
Tested By: C. Oost

**OFFICE**
325 - 25th Street SE
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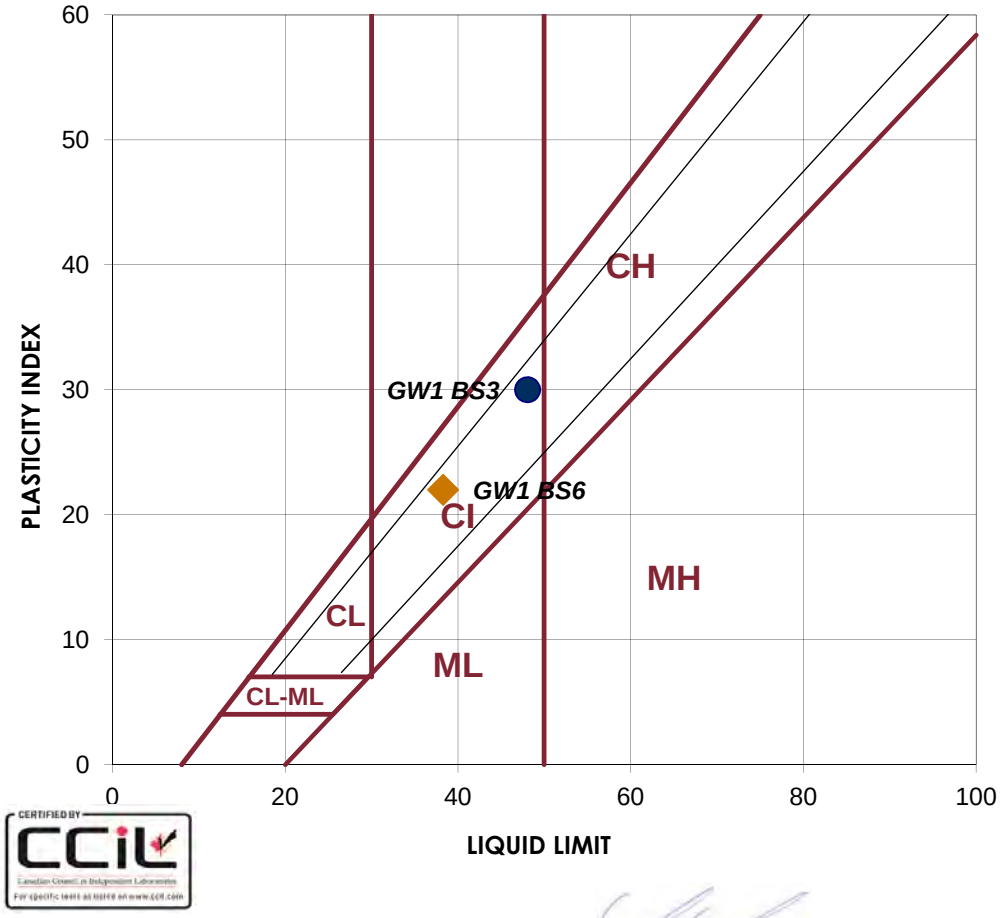
**LABORATORY**
10830 - 46th Street SE
Calgary, Alberta
Canada T2C 1G4
Tel: (403) 253-7876

| Sample: GW1 BS3 | | | Sample: GW1 BS6 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | 26 | 26 |
| | | Container Number | | |
| 19.93 | 19.23 | Wt. Sample (wet+tare)(g) | 18.92 | 22.98 |
| 14.01 | 13.58 | Wt. Sample (dry+tare)(g) | 14.03 | 17.07 |
| 1.52 | 1.55 | Wt. Tare (g) | 1.23 | 1.50 |
| 12.5 | 12.0 | Wt. Dry Soil (g) | 12.8 | 15.6 |
| 5.9 | 5.7 | Wt. Water (g) | 4.9 | 5.9 |
| 47.4% | 47.0% | Water Content (%) | 38.2% | 38.0% |
| 48.3% | 47.8% | Corrected Water Content (%) | 38.4% | 38.1% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 21.99 | 21.95 | Wt. Sample (wet+tare)(g) | 22.16 | 22.05 |
| 20.75 | 20.69 | Wt. Sample (dry+tare)(g) | 21.06 | 20.94 |
| 13.9 | 13.77 | Wt. Tare (g) | 14.14 | 13.82 |
| 6.9 | 6.9 | Wt. Dry Soil (g) | 6.9 | 7.1 |
| 1.2 | 1.3 | Wt. Water (g) | 1.1 | 1.1 |
| 18.1% | 18.2% | Water Content (%) | 15.9% | 15.6% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 48 | | LL | 38 |
| PL | 18 | | PL | 16 |
| PI | 30 | | PI | 22 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI-CH | | | CI | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | May 29, 2016 |
| Date Tested: | August 11, 2016 |
| Tested By: | B. Pelkey |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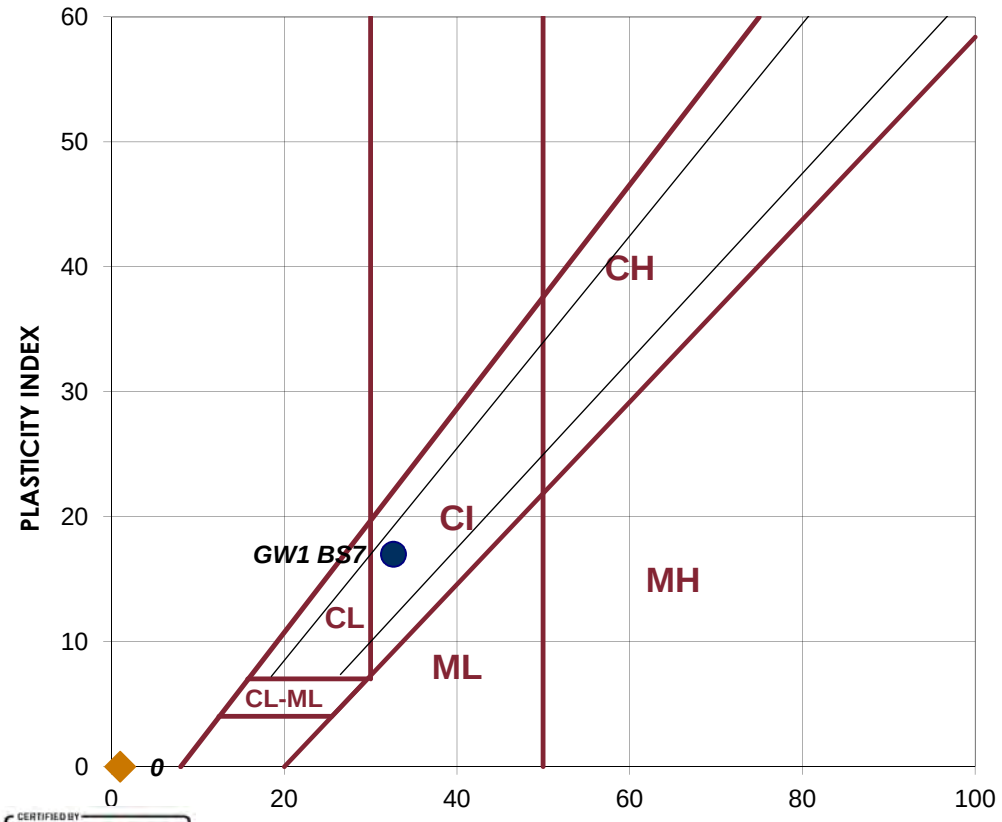
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW1 BS7 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 26 | Number of Blows | | |
| | | Container Number | | |
| 27.47 | 22.36 | Wt. Sample (wet+tare)(g) | | |
| 21.06 | 17.21 | Wt. Sample (dry+tare)(g) | | |
| 1.52 | 1.29 | Wt. Tare (g) | | |
| 19.5 | 15.9 | Wt. Dry Soil (g) | | |
| 6.4 | 5.2 | Wt. Water (g) | | |
| 32.8% | 32.3% | Water Content (%) | | |
| 32.8% | 32.5% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 29.29 | 29.1 | Wt. Sample (wet+tare)(g) | | |
| 27.15 | 26.94 | Wt. Sample (dry+tare)(g) | | |
| 13.79 | 13.77 | Wt. Tare (g) | | |
| 13.4 | 13.2 | Wt. Dry Soil (g) | | |
| 2.1 | 2.2 | Wt. Water (g) | | |
| 16.0% | 16.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | |
| PL | 16 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | August 19, 2016 |
| Date Tested: | August 31, 2016 |
| Tested By: | B. Pelkey |


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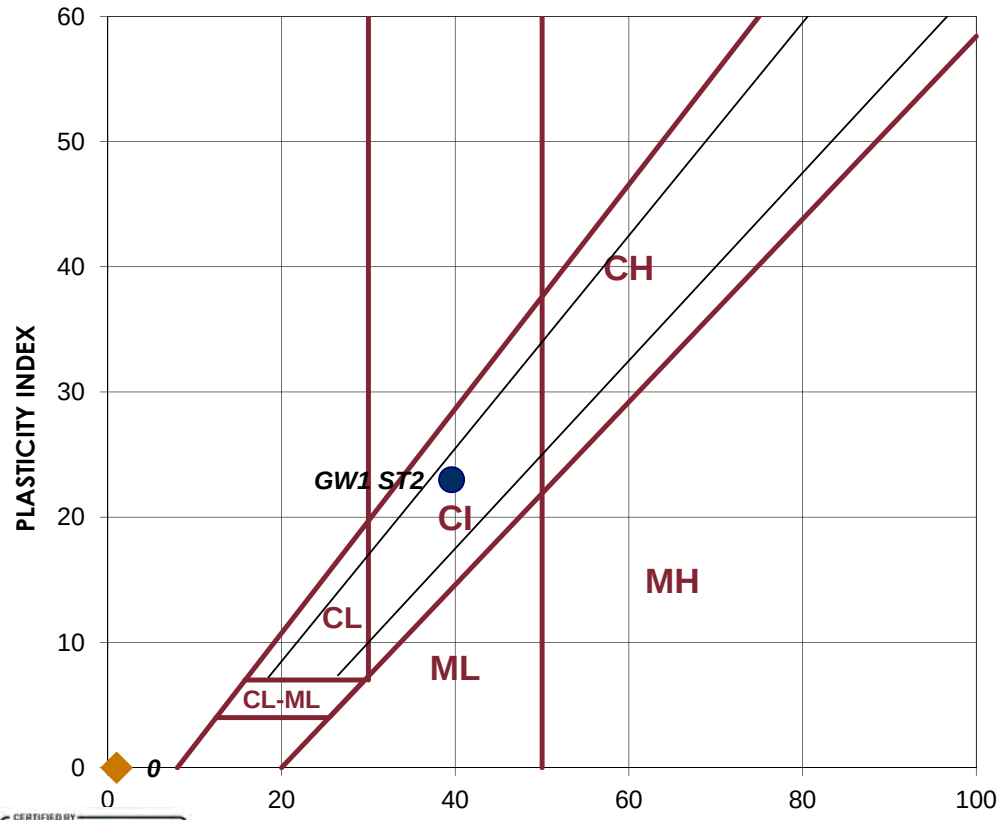
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW1 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 29 | Number of Blows | | |
| | | Container Number | | |
| 28.25 | 35.84 | Wt. Sample (wet+tare)(g) | | |
| 20.66 | 26.20 | Wt. Sample (dry+tare)(g) | | |
| 1.10 | 1.55 | Wt. Tare (g) | | |
| 19.6 | 24.7 | Wt. Dry Soil (g) | | |
| 7.6 | 9.6 | Wt. Water (g) | | |
| 38.8% | 39.1% | Water Content (%) | | |
| 39.3% | 39.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 29.1 | 28.48 | Wt. Sample (wet+tare)(g) | | |
| 27.15 | 26.63 | Wt. Sample (dry+tare)(g) | | |
| 15.81 | 15.78 | Wt. Tare (g) | | |
| 11.3 | 10.9 | Wt. Dry Soil (g) | | |
| 2.0 | 1.9 | Wt. Water (g) | | |
| 17.2% | 17.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 40 | | LL | |
| PL | 17 | | PL | |
| PI | 23 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | May 26, 2016 |
| Date Tested: | August 13, 2016 |
| Tested By: | B. Pelkey |


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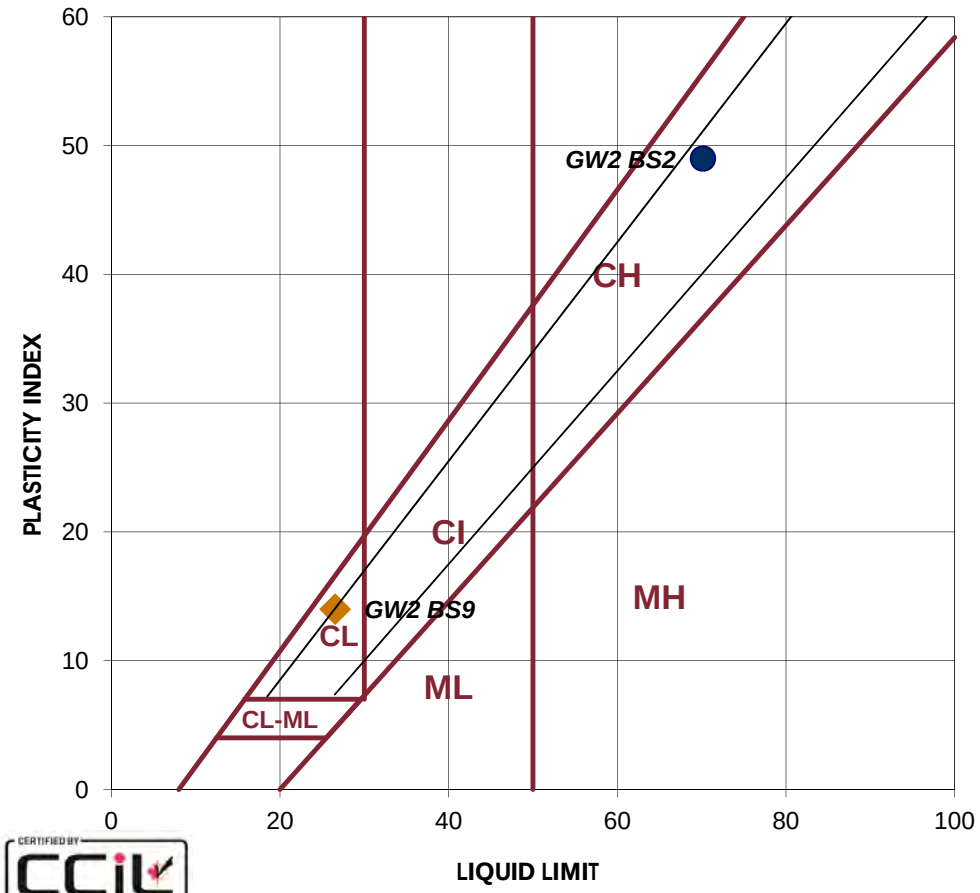
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW2 BS2 | | | GW2 BS9 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 21 | Number of Blows | 22 | 21 |
| | | Container Number | | |
| 17.87 | 18.68 | Wt. Sample (wet+tare)(g) | 26.12 | 25.75 |
| 10.98 | 11.53 | Wt. Sample (dry+tare)(g) | 20.81 | 20.59 |
| 1.37 | 1.54 | Wt. Tare (g) | 1.18 | 1.48 |
| 9.6 | 10.0 | Wt. Dry Soil (g) | 19.6 | 19.1 |
| 6.9 | 7.2 | Wt. Water (g) | 5.3 | 5.2 |
| 71.7% | 71.6% | Water Content (%) | 27.1% | 27.0% |
| 70.2% | 70.1% | Corrected Water Content (%) | 26.6% | 26.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 25.96 | 26.34 | Wt. Sample (wet+tare)(g) | 27.5 | 25.73 |
| 23.85 | 24.17 | Wt. Sample (dry+tare)(g) | 25.95 | 24.36 |
| 13.87 | 13.78 | Wt. Tare (g) | 14.14 | 13.77 |
| 10.0 | 10.4 | Wt. Dry Soil (g) | 11.8 | 10.6 |
| 2.1 | 2.2 | Wt. Water (g) | 1.6 | 1.4 |
| 21.1% | 20.9% | Water Content (%) | 13.1% | 12.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 70 | | LL | 27 |
| PL | 21 | | PL | 13 |
| PI | 49 | | PI | 14 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***CL*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | May 26, 2016 |
| Date Tested: | August 13, 2016 |
| Tested By: | B. Pelkey |


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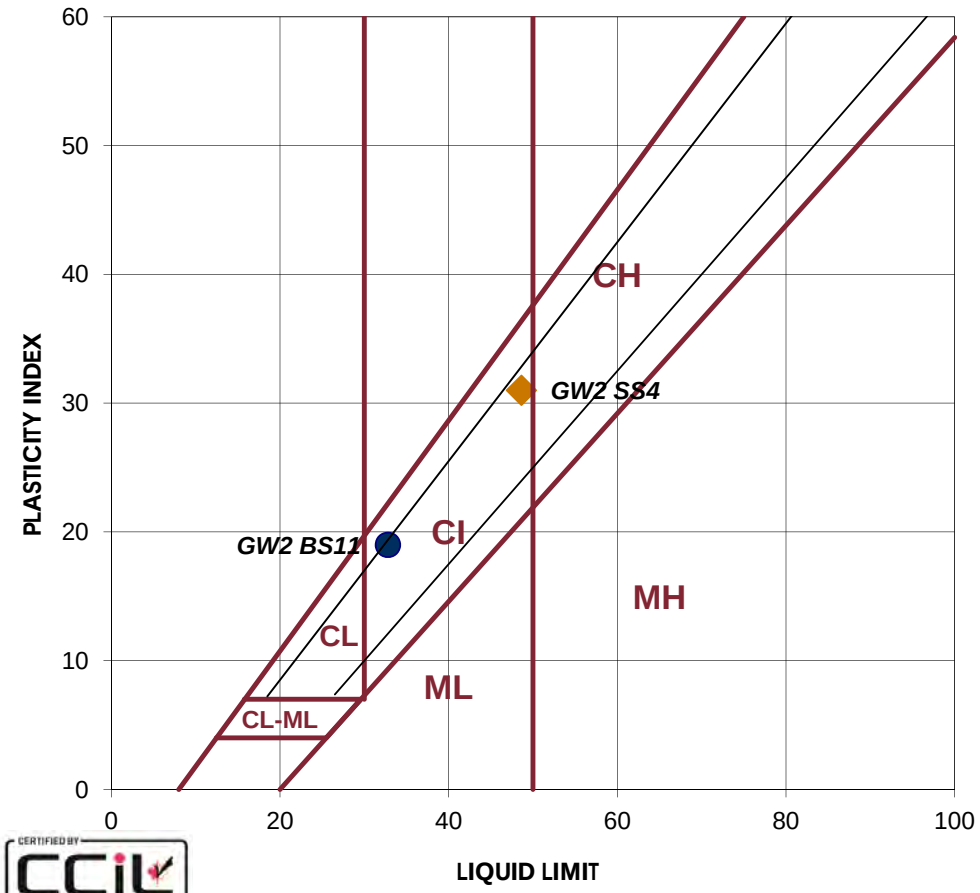
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW2 BS11 | | | GW2 SS4 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 22 | Number of Blows | 28 | 29 |
| | | Container Number | | |
| 26.83 | 31.59 | Wt. Sample (wet+tare)(g) | 30.21 | 26.78 |
| 20.44 | 24.00 | Wt. Sample (dry+tare)(g) | 20.88 | 18.60 |
| 1.24 | 1.21 | Wt. Tare (g) | 1.43 | 1.47 |
| 19.2 | 22.8 | Wt. Dry Soil (g) | 19.5 | 17.1 |
| 6.4 | 7.6 | Wt. Water (g) | 9.3 | 8.2 |
| 33.3% | 33.3% | Water Content (%) | 48.0% | 47.8% |
| 32.8% | 32.8% | Corrected Water Content (%) | 48.6% | 48.6% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.77 | 30.8 | Wt. Sample (wet+tare)(g) | 28.94 | 25.76 |
| 27.21 | 28.95 | Wt. Sample (dry+tare)(g) | 26.6 | 23.93 |
| 15.97 | 15.77 | Wt. Tare (g) | 13.8 | 13.81 |
| 11.2 | 13.2 | Wt. Dry Soil (g) | 12.8 | 10.1 |
| 1.6 | 1.9 | Wt. Water (g) | 2.3 | 1.8 |
| 13.9% | 14.0% | Water Content (%) | 18.3% | 18.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 33 | | LL | 49 |
| PL | 14 | | PL | 18 |
| PI | 19 | | PI | 31 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | May 26, 2016 |
| Date Tested: | August 13, 2016 |
| Tested By: | B. Pelkey |


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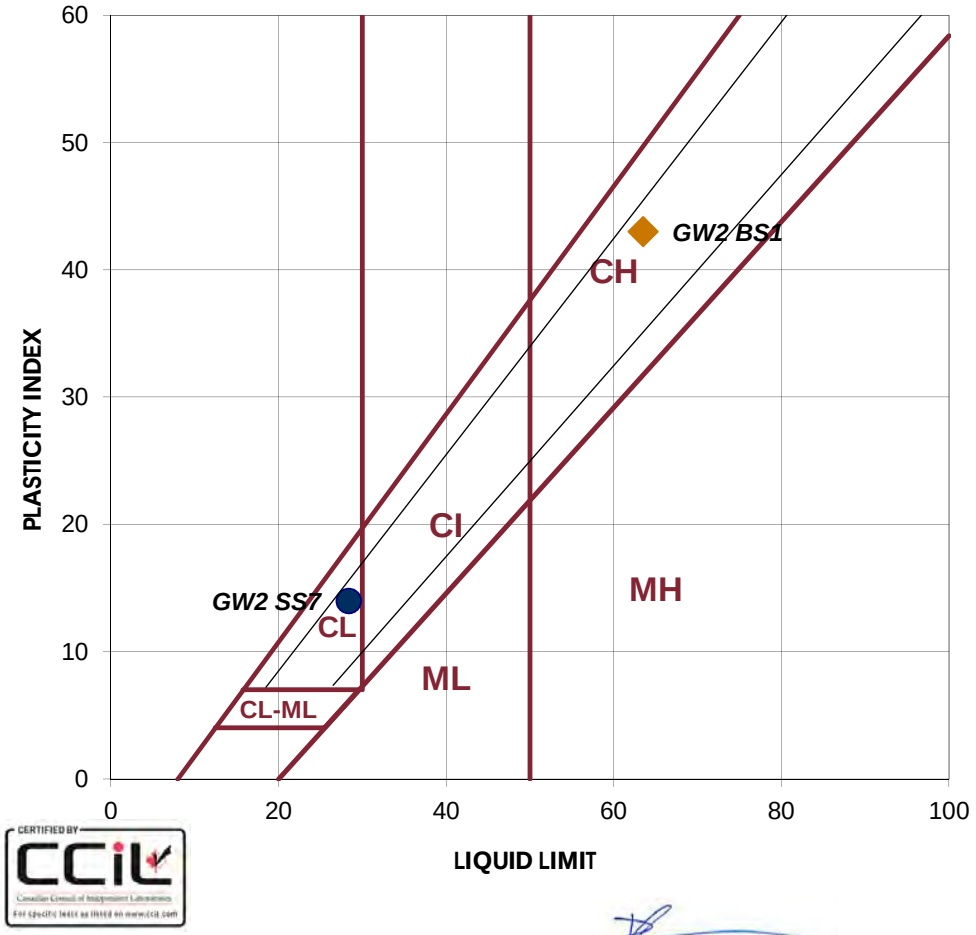
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW2 SS7 | | | GW2 BS1 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 21 | 22 | Number of Blows | 26 | 26 |
| | | Container Number | | |
| 30.48 | 30.79 | Wt. Sample (wet+tare)(g) | 20.73 | 27.00 |
| 24.00 | 24.26 | Wt. Sample (dry+tare)(g) | 13.28 | 17.05 |
| 1.57 | 1.60 | Wt. Tare (g) | 1.51 | 1.28 |
| 22.4 | 22.7 | Wt. Dry Soil (g) | 11.8 | 15.8 |
| 6.5 | 6.5 | Wt. Water (g) | 7.5 | 10.0 |
| 28.9% | 28.8% | Water Content (%) | 63.3% | 63.1% |
| 28.3% | 28.4% | Corrected Water Content (%) | 63.6% | 63.4% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 24.27 | 25.04 | Wt. Sample (wet+tare)(g) | 25.56 | 23.96 |
| 23.02 | 23.68 | Wt. Sample (dry+tare)(g) | 23.56 | 22.28 |
| 13.9 | 13.79 | Wt. Tare (g) | 13.77 | 13.93 |
| 9.1 | 9.9 | Wt. Dry Soil (g) | 9.8 | 8.4 |
| 1.3 | 1.4 | Wt. Water (g) | 2.0 | 1.7 |
| 13.7% | 13.8% | Water Content (%) | 20.4% | 20.1% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 28 | | LL | 63 |
| PL | 14 | | PL | 20 |
| PI | 14 | | PI | 43 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-CI*** | | | ***CH*** | |






Reviewed By: _____

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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | June 8, 2016 |
| Date Tested: | October 3, 2016 |
| Tested By: | E.Farries |


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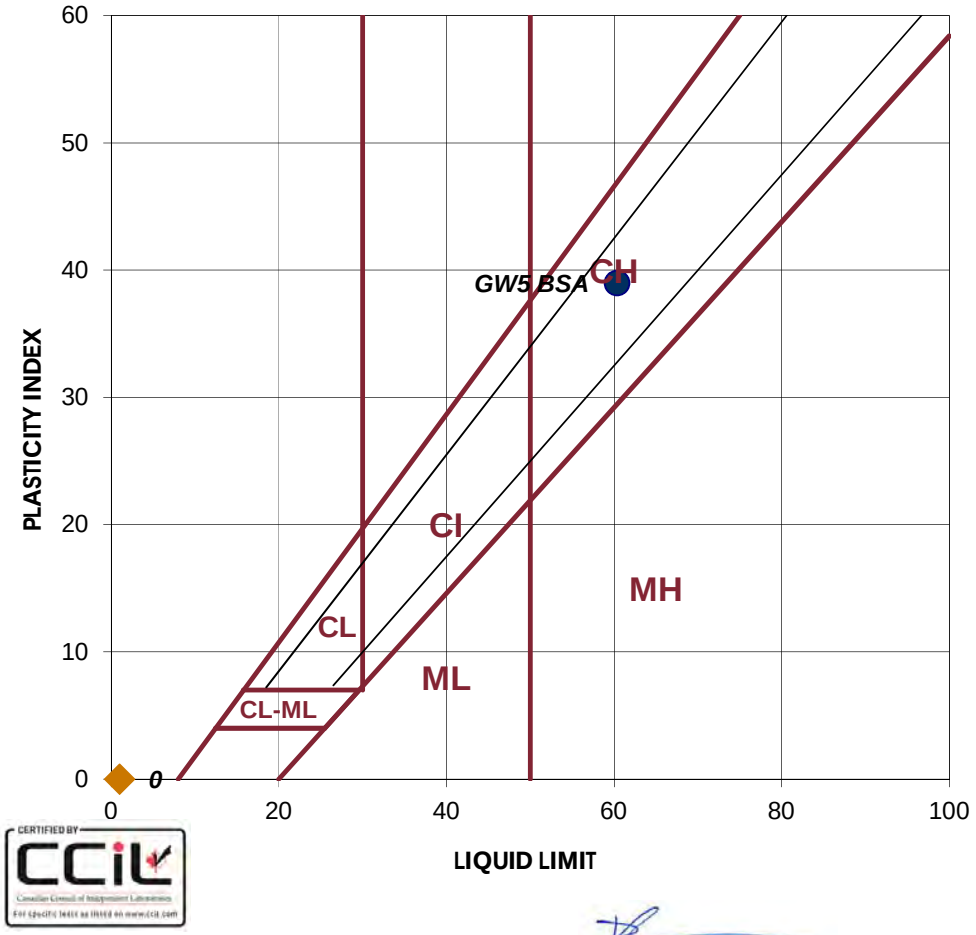
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW5 BSA | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 24 | 22 | Number of Blows | | |
| | | Container Number | | |
| 21.30 | 21.41 | Wt. Sample (wet+tare)(g) | | |
| 13.67 | 13.81 | Wt. Sample (dry+tare)(g) | | |
| 1.17 | 1.31 | Wt. Tare (g) | | |
| 12.5 | 12.5 | Wt. Dry Soil (g) | | |
| 7.6 | 7.6 | Wt. Water (g) | | |
| 61.0% | 60.8% | Water Content (%) | | |
| 60.7% | 59.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.85 | 25.38 | Wt. Sample (wet+tare)(g) | | |
| 21.28 | 23.41 | Wt. Sample (dry+tare)(g) | | |
| 13.76 | 13.84 | Wt. Tare (g) | | |
| 7.5 | 9.6 | Wt. Dry Soil (g) | | |
| 1.6 | 2.0 | Wt. Water (g) | | |
| 20.9% | 20.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 60 | | LL | |
| PL | 21 | | PL | |
| PI | 39 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CH*** | | | ***NON-PLASTIC*** | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | June 8, 2016 |
| Date Tested: | August 15, 2016 |
| Tested By: | B. Pelkey |


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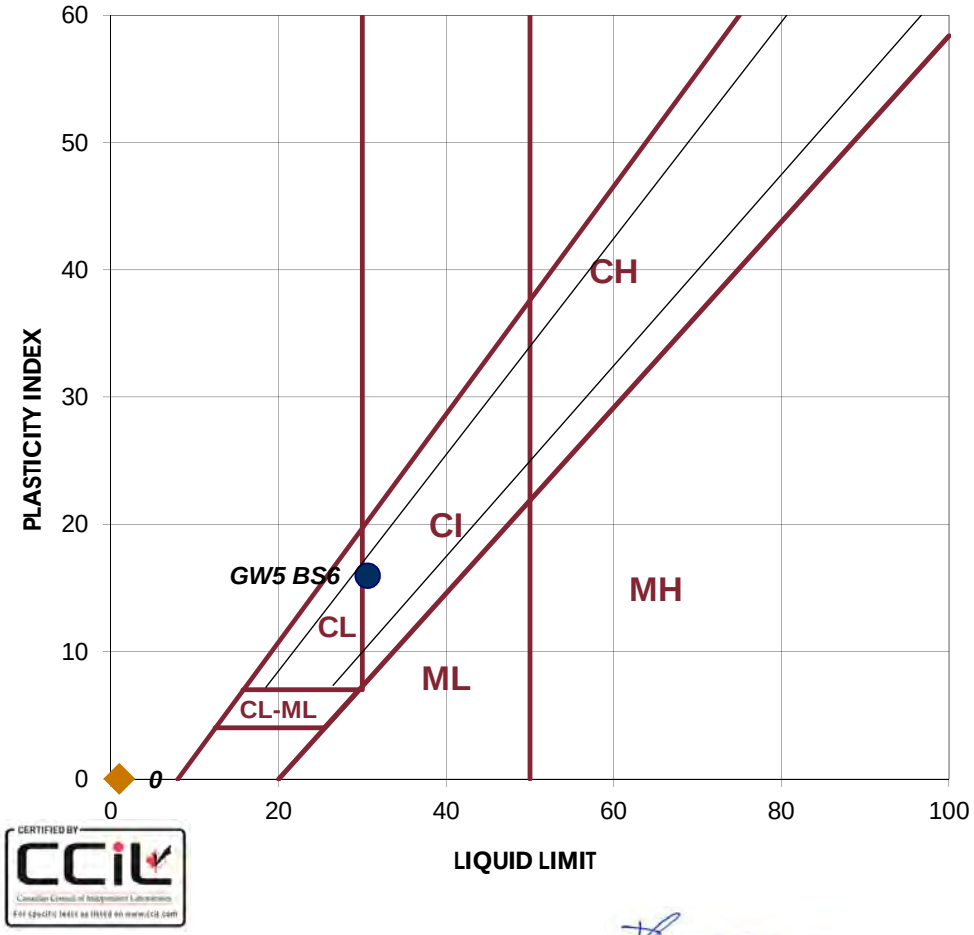
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW5 BS6 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 27 | Number of Blows | | |
| | | Container Number | | |
| 24.57 | 33.74 | Wt. Sample (wet+tare)(g) | | |
| 19.20 | 26.23 | Wt. Sample (dry+tare)(g) | | |
| 1.38 | 1.47 | Wt. Tare (g) | | |
| 17.8 | 24.8 | Wt. Dry Soil (g) | | |
| 5.4 | 7.5 | Wt. Water (g) | | |
| 30.1% | 30.3% | Water Content (%) | | |
| 30.6% | 30.6% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.21 | 26 | Wt. Sample (wet+tare)(g) | | |
| 24.57 | 24.37 | Wt. Sample (dry+tare)(g) | | |
| 13.89 | 13.8 | Wt. Tare (g) | | |
| 10.7 | 10.6 | Wt. Dry Soil (g) | | |
| 1.6 | 1.6 | Wt. Water (g) | | |
| 15.4% | 15.4% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 31 | | LL | |
| PL | 15 | | PL | |
| PI | 16 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI-CL*** | | | ***NON-PLASTIC*** | |

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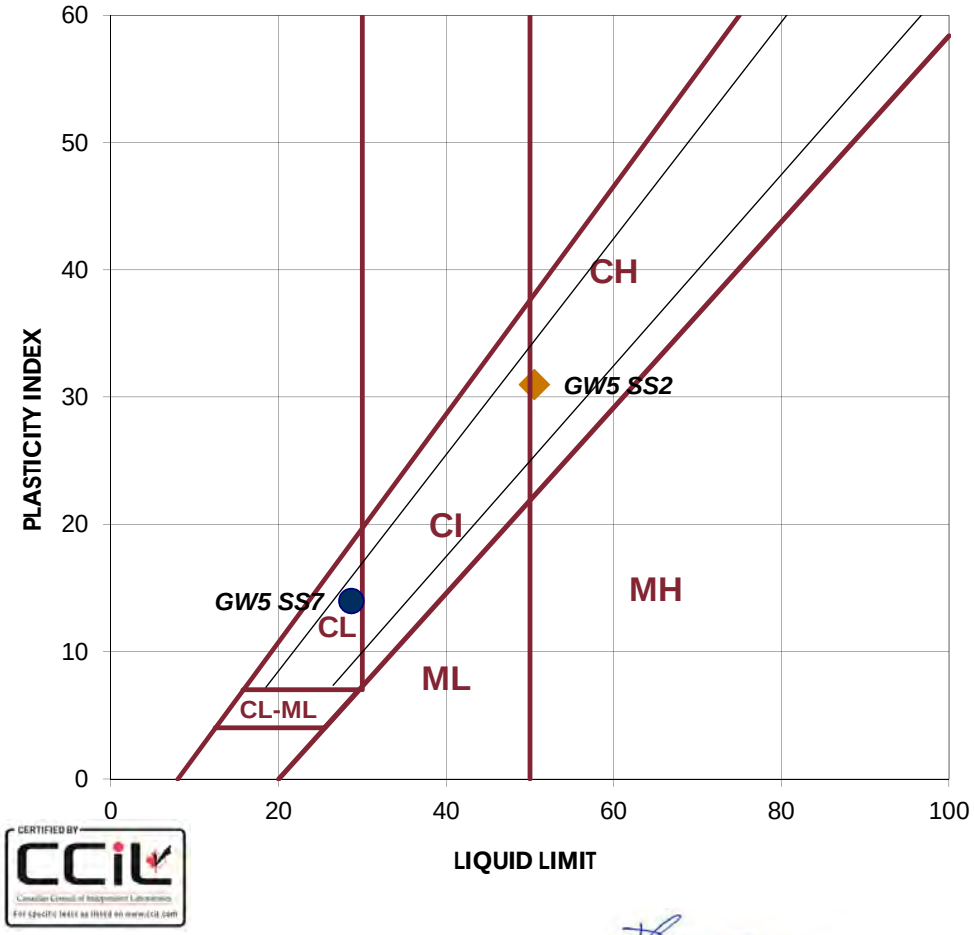
## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | June 8, 2016 |
| Date Tested: | August 15, 2016 |
| Tested By: | B. Pelkey |

| Sample: GW5 SS7 | | | Sample: GW5 SS2 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 20 | Number of Blows | 23 | 21 |
| | | Container Number | | |
| 32.70 | 32.41 | Wt. Sample (wet+tare)(g) | 26.67 | 27.73 |
| 25.66 | 25.34 | Wt. Sample (dry+tare)(g) | 18.14 | 18.84 |
| 1.53 | 1.24 | Wt. Tare (g) | 1.51 | 1.52 |
| 24.1 | 24.1 | Wt. Dry Soil (g) | 16.6 | 17.3 |
| 7.0 | 7.1 | Wt. Water (g) | 8.5 | 8.9 |
| 29.2% | 29.3% | Water Content (%) | 51.3% | 51.3% |
| 28.7% | 28.6% | Corrected Water Content (%) | 50.8% | 50.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.23 | 25.34 | Wt. Sample (wet+tare)(g) | 25.02 | 26.78 |
| 24.59 | 23.79 | Wt. Sample (dry+tare)(g) | 23.19 | 24.62 |
| 13.91 | 13.76 | Wt. Tare (g) | 13.86 | 13.77 |
| 10.7 | 10.0 | Wt. Dry Soil (g) | 9.3 | 10.9 |
| 1.6 | 1.6 | Wt. Water (g) | 1.8 | 2.2 |
| 15.4% | 15.5% | Water Content (%) | 19.6% | 19.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 29 | | LL | 51 |
| PL | 15 | | PL | 20 |
| PI | 14 | | PI | 31 |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CL-CI*** | | | ***CH-CI*** | |






Reviewed By: _____

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | June 9, 2016 |
| Date Tested: | August 31, 2016 |
| Tested By: | B. Pelkey |


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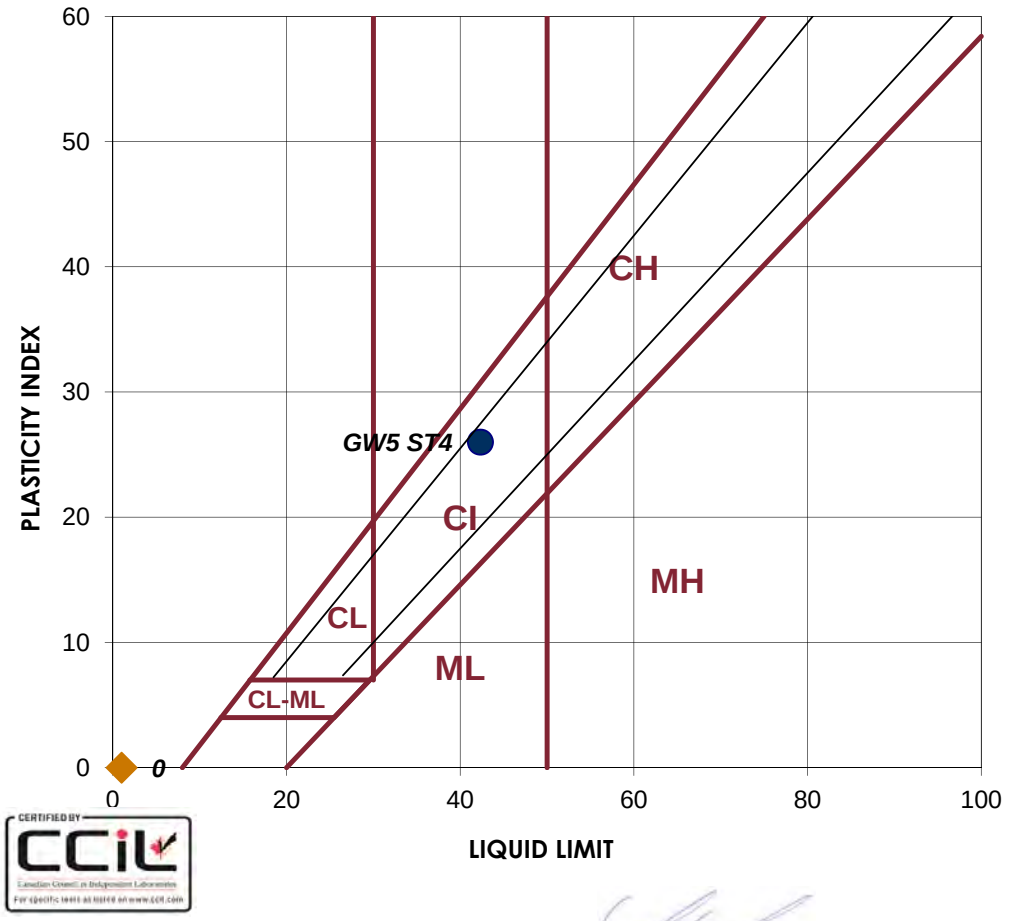
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW5 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 29 | 29 | Number of Blows | | |
| | | Container Number | | |
| 29.43 | 33.64 | Wt. Sample (wet+tare)(g) | | |
| 21.23 | 24.18 | Wt. Sample (dry+tare)(g) | | |
| 1.50 | 1.42 | Wt. Tare (g) | | |
| 19.7 | 22.8 | Wt. Dry Soil (g) | | |
| 8.2 | 9.5 | Wt. Water (g) | | |
| 41.6% | 41.6% | Water Content (%) | | |
| 42.3% | 42.3% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.75 | 33.03 | Wt. Sample (wet+tare)(g) | | |
| 25.82 | 30.34 | Wt. Sample (dry+tare)(g) | | |
| 13.9 | 13.77 | Wt. Tare (g) | | |
| 11.9 | 16.6 | Wt. Dry Soil (g) | | |
| 1.9 | 2.7 | Wt. Water (g) | | |
| 16.2% | 16.2% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 42 | | LL | |
| PL | 16 | | PL | |
| PI | 26 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | NON-PLASTIC | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | May 25, 2016 |
| Date Tested: | August 17, 2016 |
| Tested By: | B. Pelkey |


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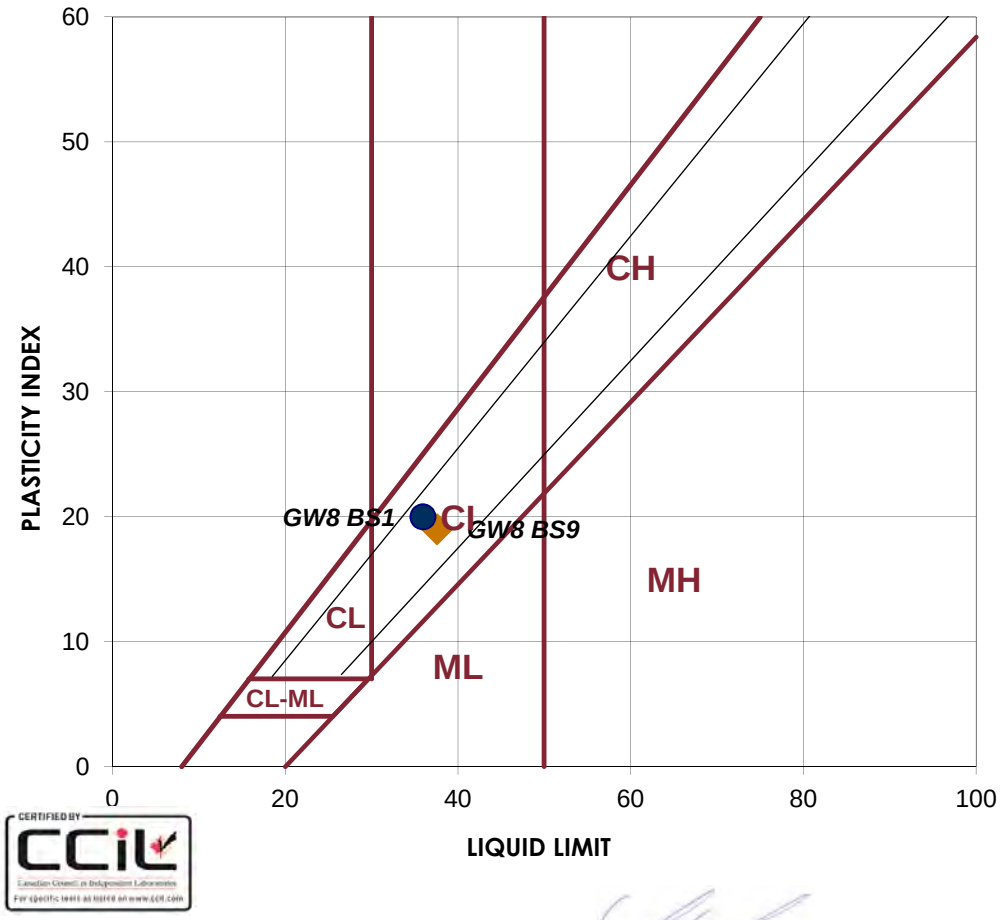
| Sample: GW8 BS1 | | | Sample: GW8 BS9 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 29 | Number of Blows | 25 | 24 |
| | | Container Number | | |
| 28.34 | 31.29 | Wt. Sample (wet+tare)(g) | 26.31 | 28.20 |
| 21.32 | 23.47 | Wt. Sample (dry+tare)(g) | 19.51 | 20.95 |
| 1.49 | 1.36 | Wt. Tare (g) | 1.53 | 1.60 |
| 19.8 | 22.1 | Wt. Dry Soil (g) | 18.0 | 19.4 |
| 7.0 | 7.8 | Wt. Water (g) | 6.8 | 7.3 |
| 35.4% | 35.4% | Water Content (%) | 37.8% | 37.5% |
| 35.9% | 36.0% | Corrected Water Content (%) | 37.8% | 37.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 28.47 | 25.22 | Wt. Sample (wet+tare)(g) | 25.13 | 27.16 |
| 26.45 | 23.64 | Wt. Sample (dry+tare)(g) | 23.35 | 25.03 |
| 13.86 | 13.78 | Wt. Tare (g) | 13.92 | 13.8 |
| 12.6 | 9.9 | Wt. Dry Soil (g) | 9.4 | 11.2 |
| 2.0 | 1.6 | Wt. Water (g) | 1.8 | 2.1 |
| 16.0% | 16.0% | Water Content (%) | 18.9% | 19.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 36 | | LL | 38 |
| PL | 16 | | PL | 19 |
| PI | 20 | | PI | 19 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CI | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | May 25, 2016 |
| Date Tested: | August 17, 2016 |
| Tested By: | B. Pelkey |


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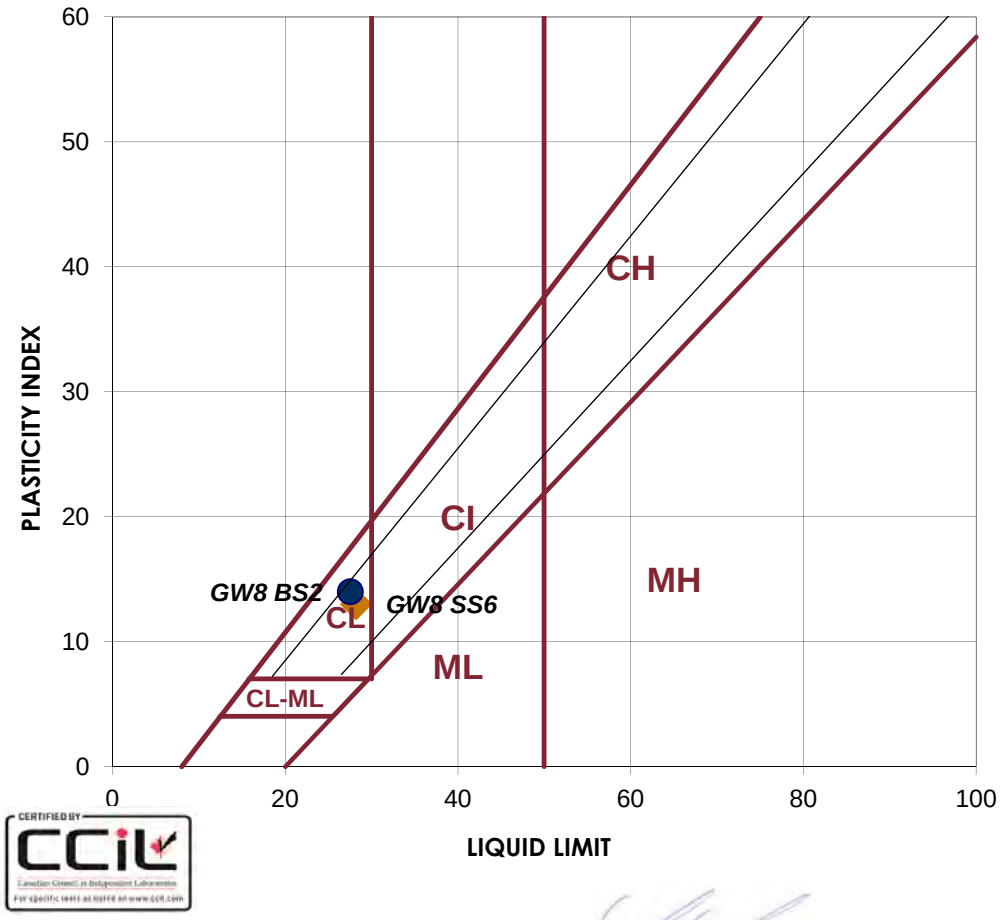
| Sample: GW8 BS2 | | | Sample: GW8 SS6 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 21 | Number of Blows | 24 | 25 |
| | | Container Number | | |
| 22.91 | 27.55 | Wt. Sample (wet+tare)(g) | 27.85 | 27.15 |
| 18.23 | 21.79 | Wt. Sample (dry+tare)(g) | 21.97 | 21.46 |
| 1.53 | 1.27 | Wt. Tare (g) | 1.20 | 1.29 |
| 16.7 | 20.5 | Wt. Dry Soil (g) | 20.8 | 20.2 |
| 4.7 | 5.8 | Wt. Water (g) | 5.9 | 5.7 |
| 28.0% | 28.1% | Water Content (%) | 28.3% | 28.2% |
| 27.6% | 27.5% | Corrected Water Content (%) | 28.2% | 28.2% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.77 | 25.88 | Wt. Sample (wet+tare)(g) | 29.11 | 26.74 |
| 22.54 | 24.38 | Wt. Sample (dry+tare)(g) | 27.14 | 25.11 |
| 13.82 | 13.76 | Wt. Tare (g) | 13.89 | 14.14 |
| 8.7 | 10.6 | Wt. Dry Soil (g) | 13.3 | 11.0 |
| 1.2 | 1.5 | Wt. Water (g) | 2.0 | 1.6 |
| 14.1% | 14.1% | Water Content (%) | 14.9% | 14.9% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 28 | | LL | 28 |
| PL | 14 | | PL | 15 |
| PI | 14 | | PI | 13 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CL-CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | May 25, 2016 |
| Date Tested: | August 19, 2016 |
| Tested By: | C. Oost |


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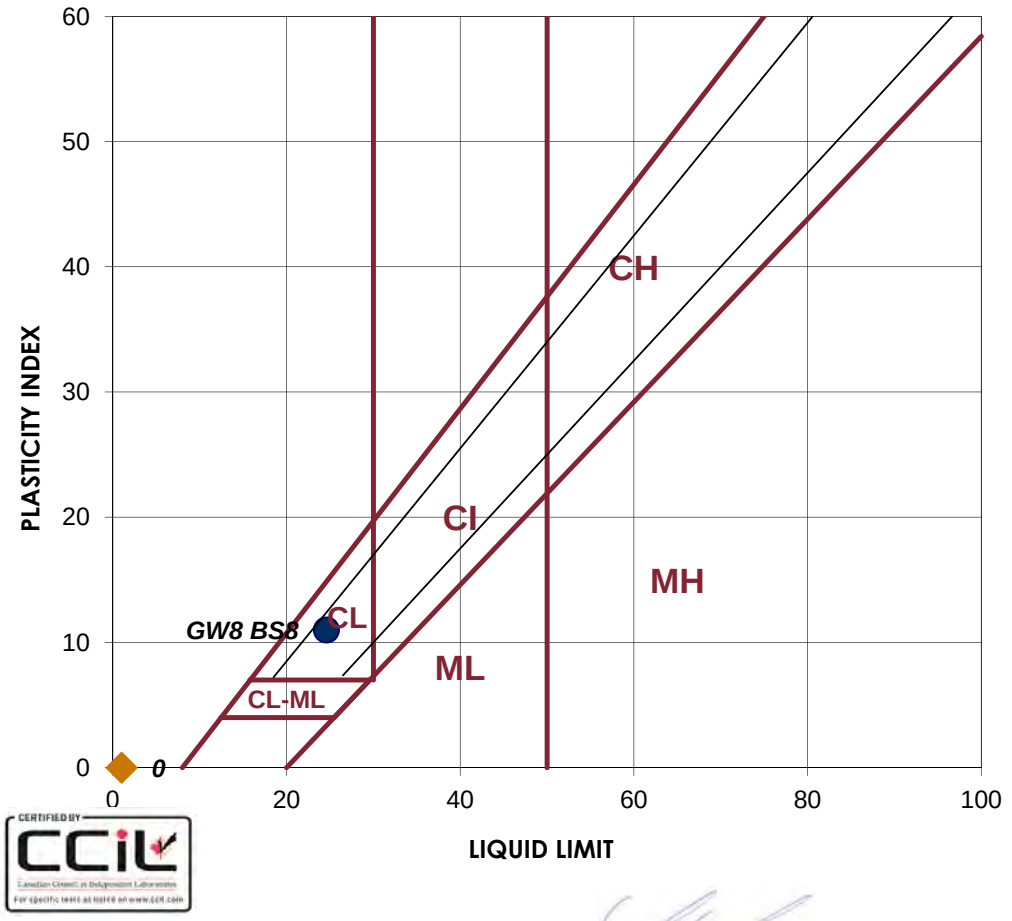
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW8 BS8 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 26 | Number of Blows | | |
| | | Container Number | | |
| 20.87 | 23.86 | Wt. Sample (wet+tare)(g) | | |
| 17.05 | 19.43 | Wt. Sample (dry+tare)(g) | | |
| 1.32 | 1.54 | Wt. Tare (g) | | |
| 15.7 | 17.9 | Wt. Dry Soil (g) | | |
| 3.8 | 4.4 | Wt. Water (g) | | |
| 24.3% | 24.8% | Water Content (%) | | |
| 24.3% | 24.9% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.63 | 23.47 | Wt. Sample (wet+tare)(g) | | |
| 22.66 | 22.54 | Wt. Sample (dry+tare)(g) | | |
| 15.83 | 15.94 | Wt. Tare (g) | | |
| 6.8 | 6.6 | Wt. Dry Soil (g) | | |
| 1.0 | 0.9 | Wt. Water (g) | | |
| 14.2% | 14.1% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 25 | | LL | |
| PL | 14 | | PL | |
| PI | 11 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CL** | | | **NON-PLASTIC** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 19, 2016 |
| Tested By: | C. Oost |


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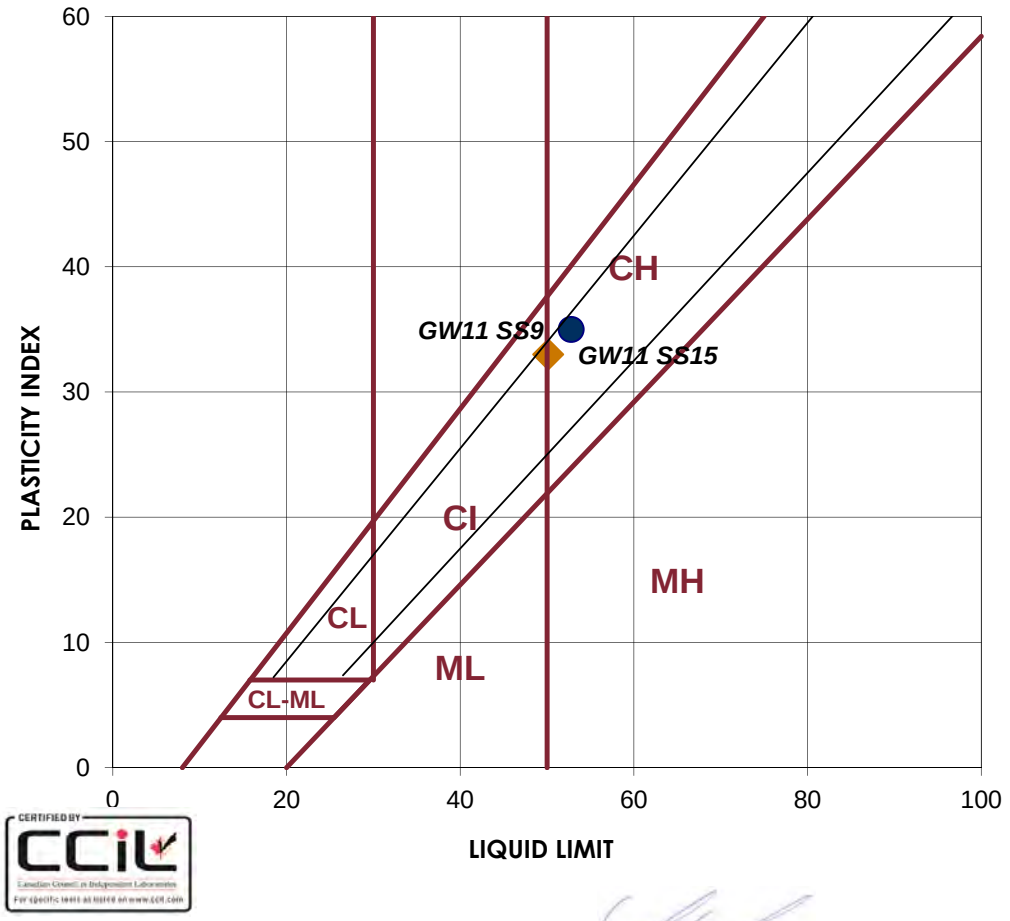
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW11 SS9 | | | GW11 SS15 | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 23 | 24 | Number of Blows | 24 | 22 |
| | | Container Number | | |
| 17.38 | 20.71 | Wt. Sample (wet+tare)(g) | 20.84 | 18.63 |
| 11.75 | 13.98 | Wt. Sample (dry+tare)(g) | 14.31 | 12.75 |
| 1.17 | 1.31 | Wt. Tare (g) | 1.30 | 1.24 |
| 10.6 | 12.7 | Wt. Dry Soil (g) | 13.0 | 11.5 |
| 5.6 | 6.7 | Wt. Water (g) | 6.5 | 5.9 |
| 53.2% | 53.1% | Water Content (%) | 50.2% | 51.1% |
| 52.7% | 52.9% | Corrected Water Content (%) | 49.9% | 50.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 23.7 | 23.23 | Wt. Sample (wet+tare)(g) | 21.83 | 21.13 |
| 22.49 | 22.09 | Wt. Sample (dry+tare)(g) | 20.69 | 20.08 |
| 15.81 | 15.77 | Wt. Tare (g) | 13.77 | 13.8 |
| 6.7 | 6.3 | Wt. Dry Soil (g) | 6.9 | 6.3 |
| 1.2 | 1.1 | Wt. Water (g) | 1.1 | 1.1 |
| 18.1% | 18.0% | Water Content (%) | 16.5% | 16.7% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 53 | | LL | 50 |
| PL | 18 | | PL | 17 |
| PI | 35 | | PI | 33 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CH-CI | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 19, 2016 |
| Tested By: | C. Oost |


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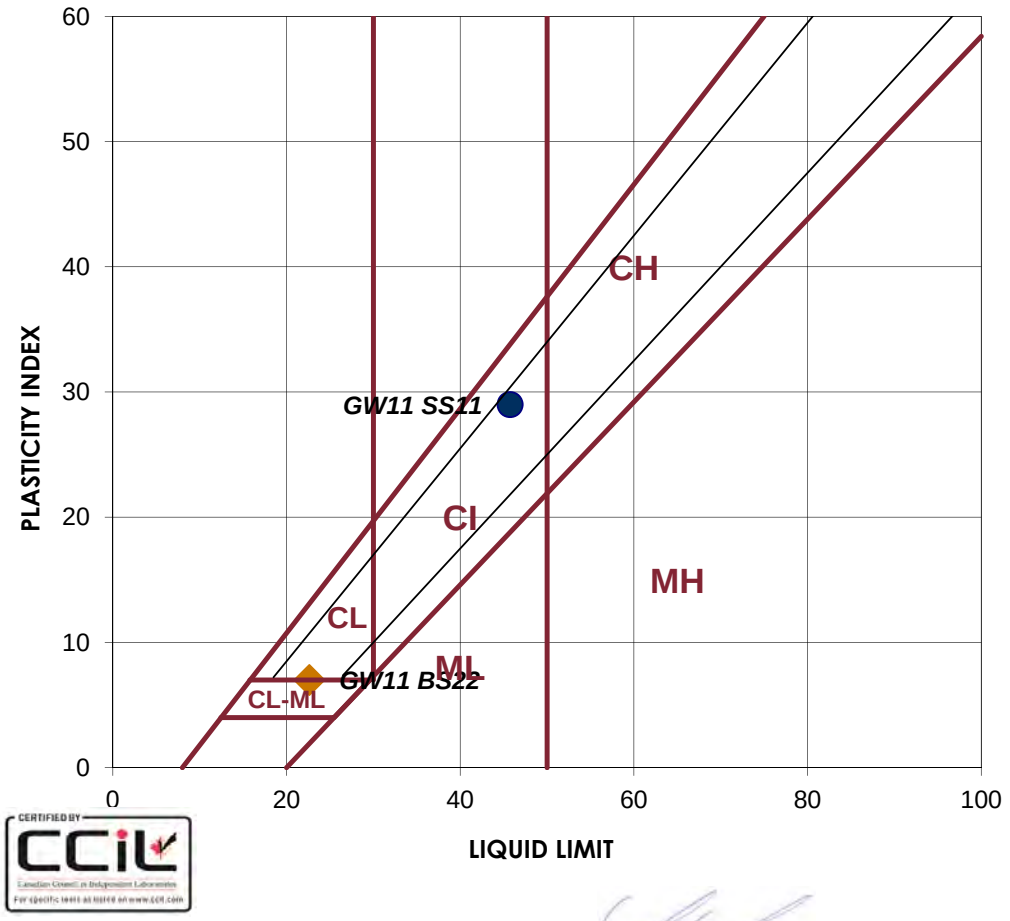
| Sample: GW11 SS11 | | | Sample: GW11 BS22 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 28 | Number of Blows | 21 | 20 |
| | | Container Number | | |
| 18.76 | 19.64 | Wt. Sample (wet+tare)(g) | 17.79 | 18.76 |
| 13.38 | 14.02 | Wt. Sample (dry+tare)(g) | 14.68 | 15.52 |
| 1.50 | 1.57 | Wt. Tare (g) | 1.31 | 1.48 |
| 11.9 | 12.5 | Wt. Dry Soil (g) | 13.4 | 14.0 |
| 5.4 | 5.6 | Wt. Water (g) | 3.1 | 3.2 |
| 45.3% | 45.1% | Water Content (%) | 23.3% | 23.1% |
| 45.7% | 45.8% | Corrected Water Content (%) | 22.8% | 22.5% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.48 | 22.64 | Wt. Sample (wet+tare)(g) | 22.4 | 24.45 |
| 21.46 | 21.66 | Wt. Sample (dry+tare)(g) | 21.46 | 23.24 |
| 15.65 | 15.97 | Wt. Tare (g) | 15.8 | 15.83 |
| 5.8 | 5.7 | Wt. Dry Soil (g) | 5.7 | 7.4 |
| 1.0 | 1.0 | Wt. Water (g) | 0.9 | 1.2 |
| 17.6% | 17.2% | Water Content (%) | 16.6% | 16.3% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 46 | | LL | 23 |
| PL | 17 | | PL | 16 |
| PI | 29 | | PI | 7 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CI | | | CL-ML | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 19, 2016 |
| Tested By: | C. Oost |


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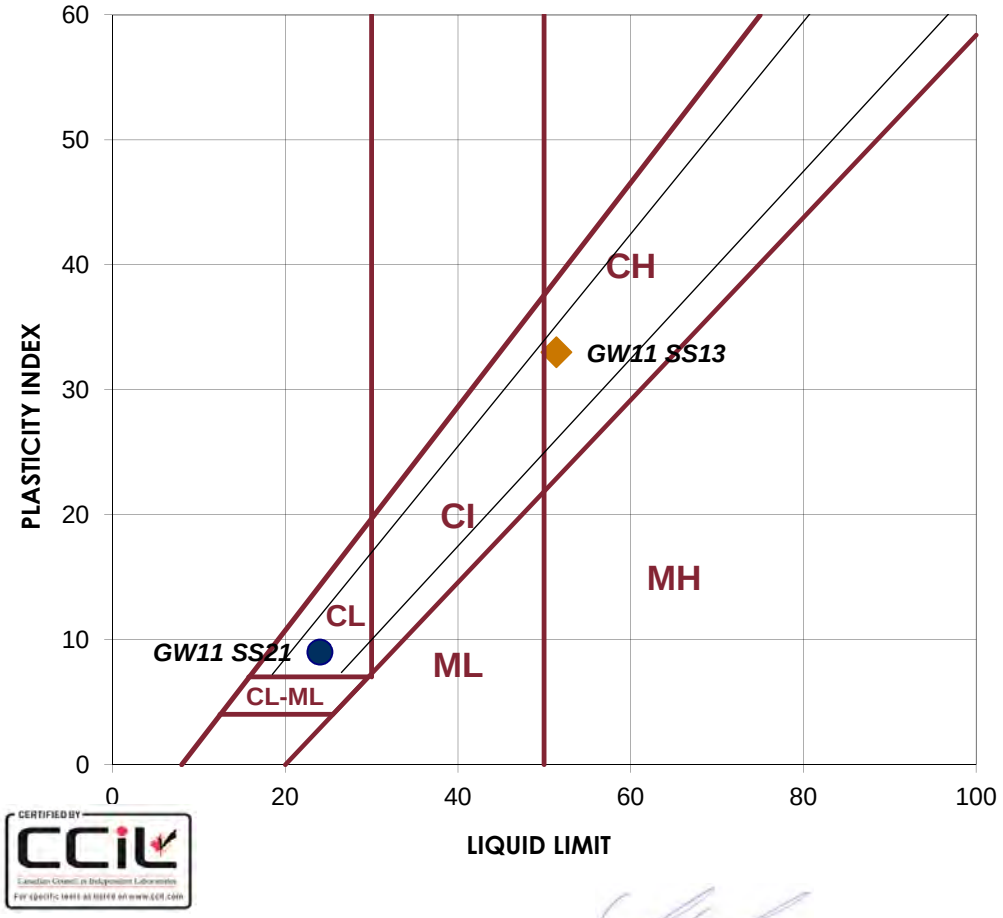
| Sample: GW11 SS21 | | | Sample: GW11 SS13 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 22 | 21 | Number of Blows | 22 | 22 |
| | | Container Number | | |
| 18.44 | 20.93 | Wt. Sample (wet+tare)(g) | 16.55 | 21.12 |
| 15.06 | 17.07 | Wt. Sample (dry+tare)(g) | 11.32 | 14.32 |
| 1.24 | 1.28 | Wt. Tare (g) | 1.31 | 1.27 |
| 13.8 | 15.8 | Wt. Dry Soil (g) | 10.0 | 13.1 |
| 3.4 | 3.9 | Wt. Water (g) | 5.2 | 6.8 |
| 24.5% | 24.4% | Water Content (%) | 52.2% | 52.1% |
| 24.1% | 23.9% | Corrected Water Content (%) | 51.4% | 51.3% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.03 | 22.06 | Wt. Sample (wet+tare)(g) | 21.51 | 21.53 |
| 21.01 | 21.02 | Wt. Sample (dry+tare)(g) | 20.34 | 20.36 |
| 14.14 | 13.88 | Wt. Tare (g) | 13.76 | 13.92 |
| 6.9 | 7.1 | Wt. Dry Soil (g) | 6.6 | 6.4 |
| 1.0 | 1.0 | Wt. Water (g) | 1.2 | 1.2 |
| 14.8% | 14.6% | Water Content (%) | 17.8% | 18.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 24 | | LL | 51 |
| PL | 15 | | PL | 18 |
| PI | 9 | | PI | 33 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CH-CI | |



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**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 23, 2016 |
| Tested By: | C. Oost |


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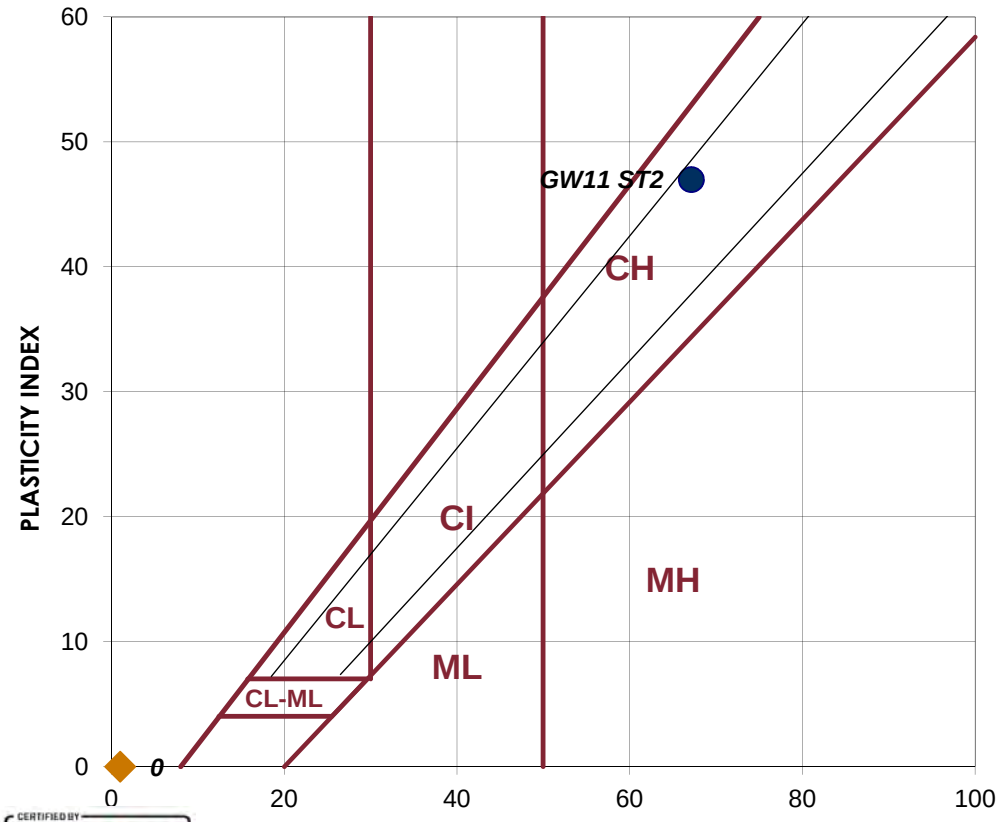
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW11 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 27 | 26 | Number of Blows | | |
| | | Container Number | | |
| 28.11 | 24.11 | Wt. Sample (wet+tare)(g) | | |
| 17.41 | 14.99 | Wt. Sample (dry+tare)(g) | | |
| 1.38 | 1.28 | Wt. Tare (g) | | |
| 16.0 | 13.7 | Wt. Dry Soil (g) | | |
| 10.7 | 9.1 | Wt. Water (g) | | |
| 66.7% | 66.5% | Water Content (%) | | |
| 67.4% | 66.8% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.44 | 24.59 | Wt. Sample (wet+tare)(g) | | |
| 21.37 | 23.16 | Wt. Sample (dry+tare)(g) | | |
| 15.8 | 15.94 | Wt. Tare (g) | | |
| 5.6 | 7.2 | Wt. Dry Soil (g) | | |
| 1.1 | 1.4 | Wt. Water (g) | | |
| 19.2% | 19.8% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 67 | | LL | |
| PL | 20 | | PL | |
| PI | 47 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CH** | | | **NON-PLASTIC** | |



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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | June 30, 2016 |
| Date Tested: | August 23, 2016 |
| Tested By: | C. Oost |


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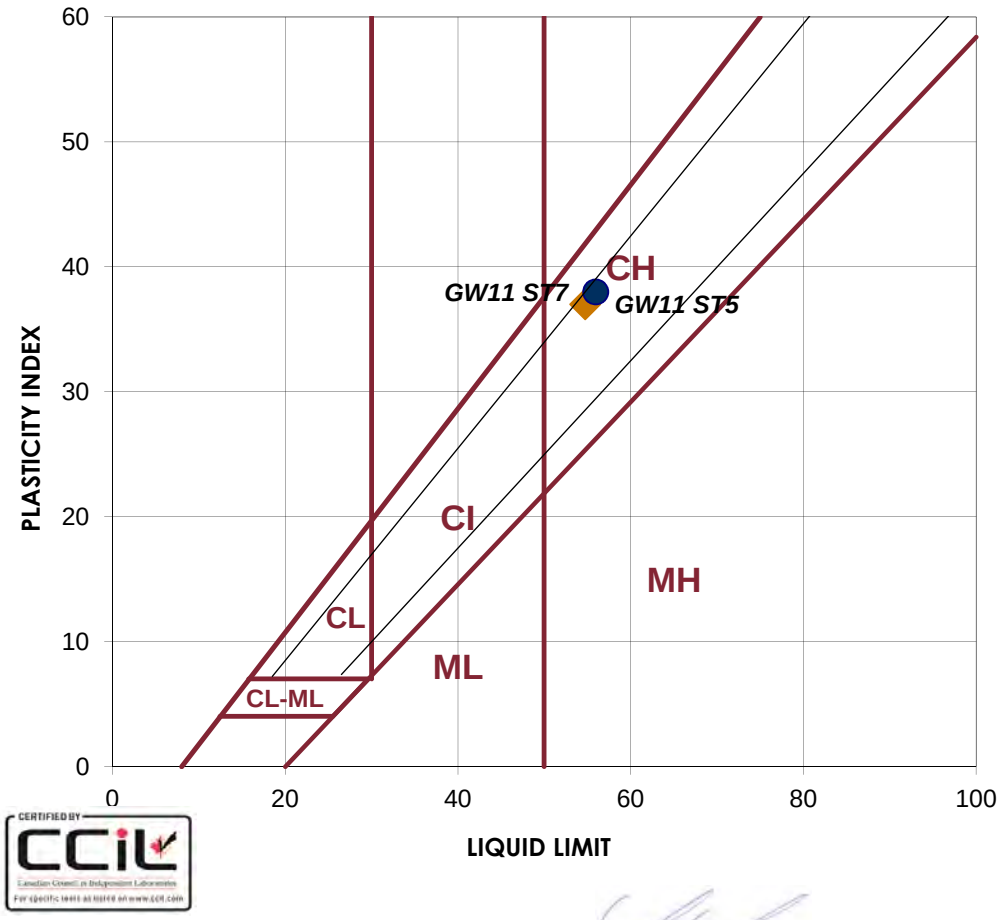
| Sample: GW11 ST7 | | | Sample: GW11 ST5 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 25 | Number of Blows | 25 | 26 |
| | | Container Number | | |
| 18.77 | 18.84 | Wt. Sample (wet+tare)(g) | 19.68 | 20.03 |
| 12.58 | 12.67 | Wt. Sample (dry+tare)(g) | 13.26 | 13.50 |
| 1.53 | 1.63 | Wt. Tare (g) | 1.52 | 1.51 |
| 11.1 | 11.0 | Wt. Dry Soil (g) | 11.7 | 12.0 |
| 6.2 | 6.2 | Wt. Water (g) | 6.4 | 6.5 |
| 56.0% | 55.9% | Water Content (%) | 54.7% | 54.5% |
| 56.0% | 55.9% | Corrected Water Content (%) | 54.7% | 54.7% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 21.74 | 22 | Wt. Sample (wet+tare)(g) | 23.09 | 20.39 |
| 20.53 | 20.74 | Wt. Sample (dry+tare)(g) | 21.7 | 19.37 |
| 13.86 | 13.76 | Wt. Tare (g) | 14.14 | 13.77 |
| 6.7 | 7.0 | Wt. Dry Soil (g) | 7.6 | 5.6 |
| 1.2 | 1.3 | Wt. Water (g) | 1.4 | 1.0 |
| 18.1% | 18.1% | Water Content (%) | 18.4% | 18.2% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 56 | | LL | 55 |
| PL | 18 | | PL | 18 |
| PI | 38 | | PI | 37 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CH | | | CH | |

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## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | August 19, 2016 |
| Date Tested: | October 25, 2016 |
| Tested By: | C. Woods |


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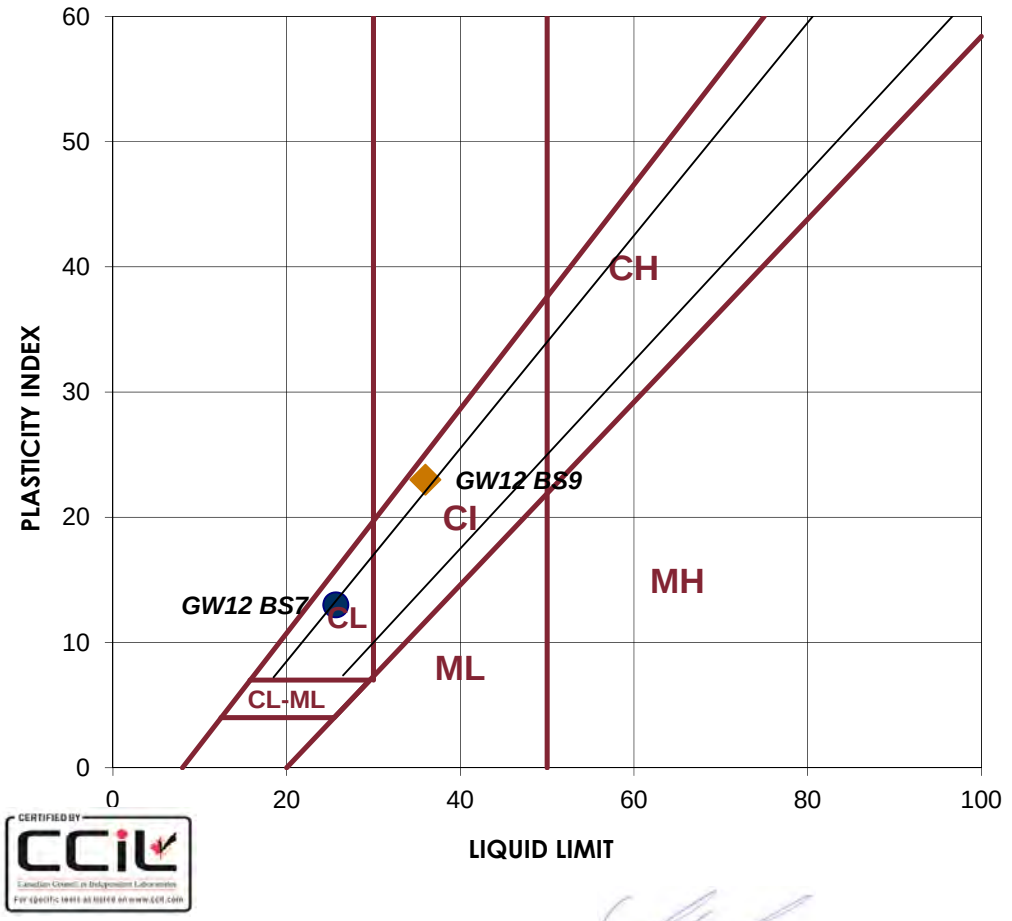
| Sample: GW12 BS7 | | | Sample: GW12 BS9 | |
|---|---|---|---|---|
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 25 | 24 | Number of Blows | 25 | 25 |
| | | Container Number | | |
| 24.31 | 24.22 | Wt. Sample (wet+tare)(g) | 21.84 | 22.45 |
| 19.58 | 19.51 | Wt. Sample (dry+tare)(g) | 16.37 | 16.94 |
| 1.21 | 1.19 | Wt. Tare (g) | 1.21 | 1.58 |
| 18.4 | 18.3 | Wt. Dry Soil (g) | 15.2 | 15.4 |
| 4.7 | 4.7 | Wt. Water (g) | 5.5 | 5.5 |
| 25.7% | 25.7% | Water Content (%) | 36.1% | 35.9% |
| 25.7% | 25.6% | Corrected Water Content (%) | 36.1% | 35.9% |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 27.34 | 26.34 | Wt. Sample (wet+tare)(g) | 25.31 | 26.74 |
| 25.79 | 24.9 | Wt. Sample (dry+tare)(g) | 24.03 | 25.24 |
| 13.82 | 13.77 | Wt. Tare (g) | 13.92 | 13.72 |
| 12.0 | 11.1 | Wt. Dry Soil (g) | 10.1 | 11.5 |
| 1.6 | 1.4 | Wt. Water (g) | 1.3 | 1.5 |
| 12.9% | 12.9% | Water Content (%) | 12.7% | 13.0% |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 26 | | LL | 36 |
| PL | 13 | | PL | 13 |
| PI | 13 | | PI | 23 |
| CLASSIFICATION | | | CLASSIFICATION | |
| CL | | | CI | |






Reviewed By: _____

Stantec

**Atterberg Limits**
ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | August 19, 2016 |
| Date Tested: | October 3, 2016 |
| Tested By: | E.Farries |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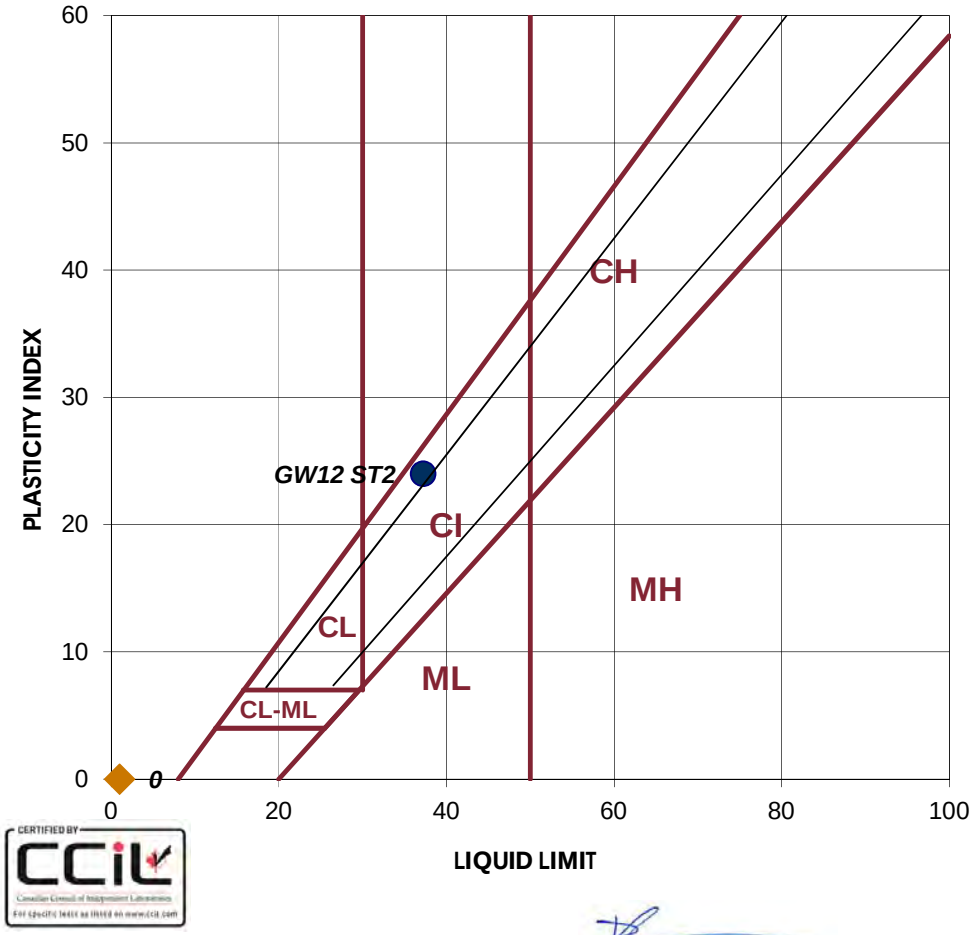
Tel: (403) 253-7876


| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW12 ST2 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 29 | Number of Blows | | |
| | | Container Number | | |
| 24.61 | 22.93 | Wt. Sample (wet+tare)(g) | | |
| 18.34 | 17.11 | Wt. Sample (dry+tare)(g) | | |
| 1.26 | 1.14 | Wt. Tare (g) | | |
| 17.1 | 16.0 | Wt. Dry Soil (g) | | |
| 6.3 | 5.8 | Wt. Water (g) | | |
| 36.7% | 36.4% | Water Content (%) | | |
| 37.2% | 37.1% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 22.35 | 22.38 | Wt. Sample (wet+tare)(g) | | |
| 21.37 | 21.35 | Wt. Sample (dry+tare)(g) | | |
| 13.91 | 13.75 | Wt. Tare (g) | | |
| 7.5 | 7.6 | Wt. Dry Soil (g) | | |
| 1.0 | 1.0 | Wt. Water (g) | | |
| 13.1% | 13.6% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 37 | | LL | |
| PL | 13 | | PL | |
| PI | 24 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| ***CI*** | | | ***NON-PLASTIC*** | |






Reviewed By: _____

Stantec

## Atterberg Limits

ASTM D4318
Method B- One Point

| | |
|---|---|
| Client: | Alberta Transportation |
| Project Name: | SR1 |
| Project No: | 110773396.302.702.240 |
| Date Received: | August 9, 2016 |
| Date Tested: | September 9, 2016 |
| Tested By: | B. Pelkey |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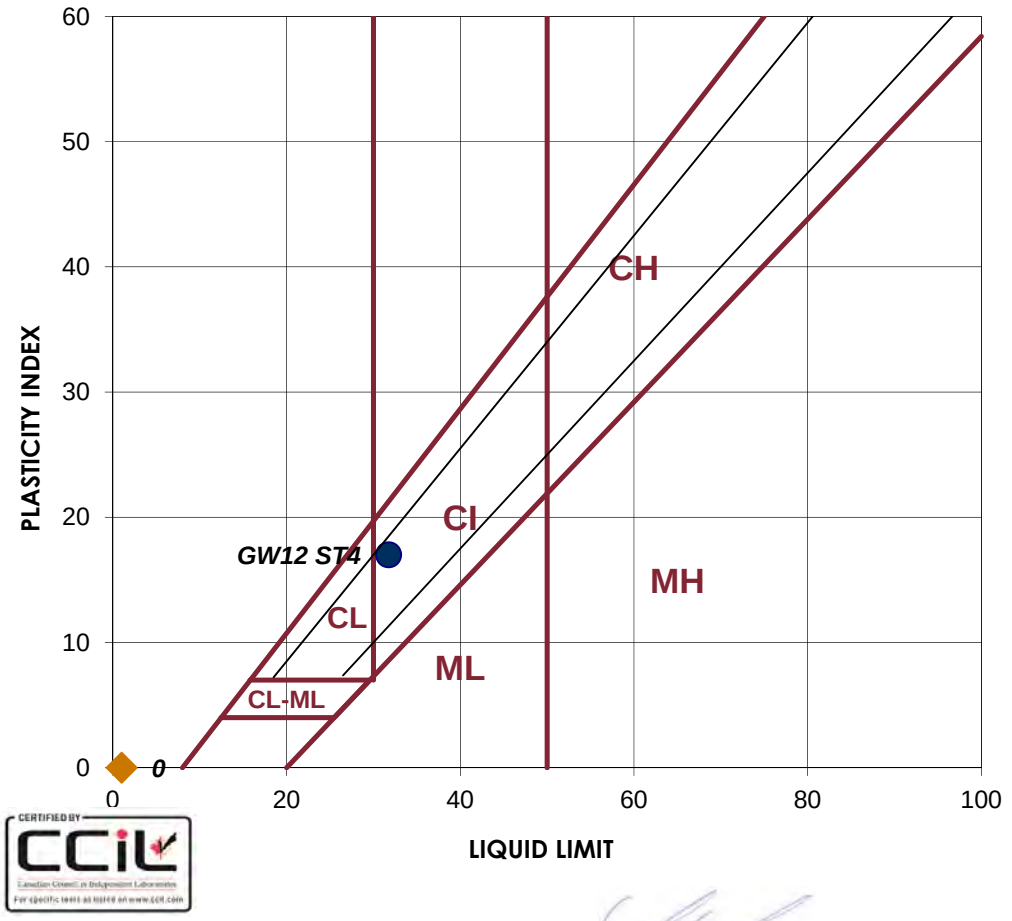
| Sample: | | | Sample: | |
|---|---|---|---|---|
| GW12 ST4 | | | | |
| LIQUID | | | LIQUID | |
| 1 | 2 | Trial No. | 1 | 2 |
| 28 | 27 | Number of Blows | | |
| | | Container Number | | |
| 22.79 | 31.83 | Wt. Sample (wet+tare)(g) | | |
| 17.71 | 24.62 | Wt. Sample (dry+tare)(g) | | |
| 1.51 | 1.67 | Wt. Tare (g) | | |
| 16.2 | 23.0 | Wt. Dry Soil (g) | | |
| 5.1 | 7.2 | Wt. Water (g) | | |
| 31.4% | 31.4% | Water Content (%) | | |
| 31.8% | 31.7% | Corrected Water Content (%) | | |
| PLASTIC | | | PLASTIC | |
| 1 | 2 | Trial No. | 1 | 2 |
| | | Container Number | | |
| 26.61 | 30.32 | Wt. Sample (wet+tare)(g) | | |
| 24.95 | 28.16 | Wt. Sample (dry+tare)(g) | | |
| 13.77 | 13.77 | Wt. Tare (g) | | |
| 11.2 | 14.4 | Wt. Dry Soil (g) | | |
| 1.7 | 2.2 | Wt. Water (g) | | |
| 14.8% | 15.0% | Water Content (%) | | |
| AVERAGE VALUES | | | AVERAGE VALUES | |
| 1 | 2 | | 1 | 2 |
| LL | 32 | | LL | |
| PL | 15 | | PL | |
| PI | 17 | | PI | |
| CLASSIFICATION | | | CLASSIFICATION | |
| **CI-CL** | | | **NON-PLASTIC** | |



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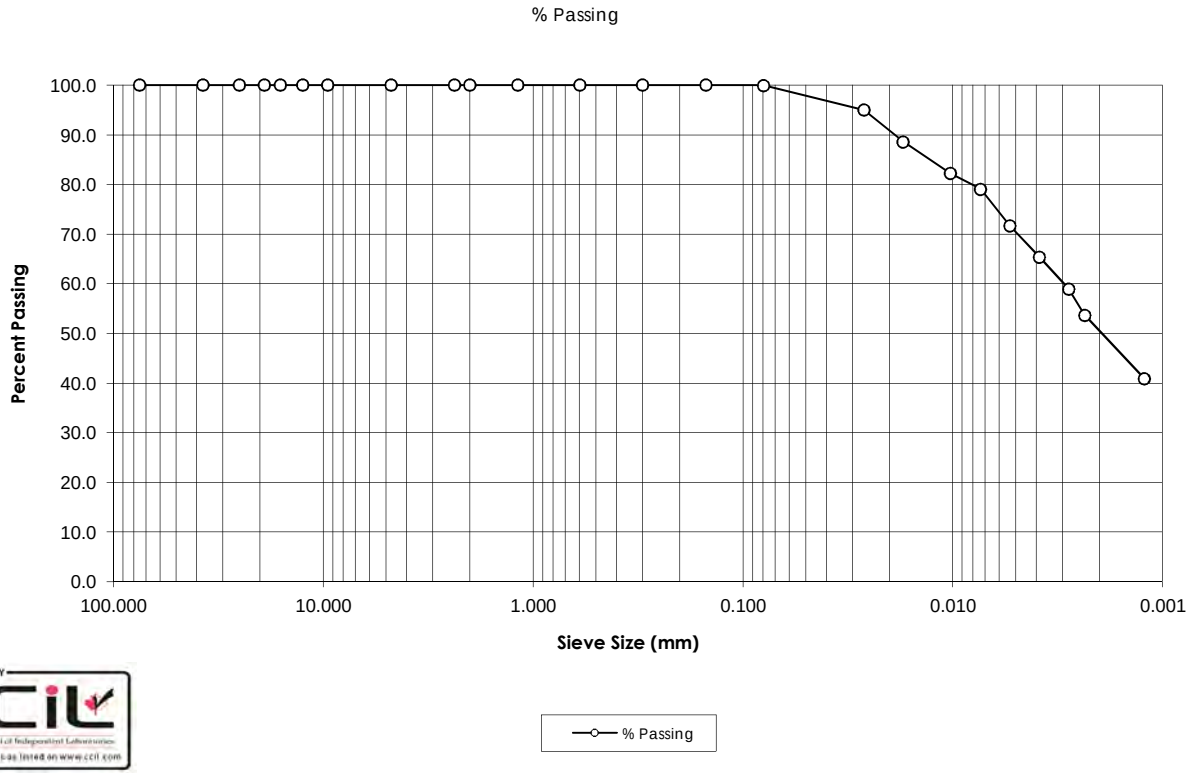
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS1
SOURCE: GW1
TESTED BY: B. Pelkey

DATE TESTED: August 10, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Clay (Cl)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0053 | 71.7 |
| 37.5 | 100.0 | 0.0039 | 65.3 |
| 25.0 | 100.0 | 0.0028 | 58.9 |
| 19.0 | 100.0 | 0.0023 | 53.6 |
| 16.0 | 100.0 | 0.0012 | 40.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 100.0 | | |
| 0.150 | 100.0 | | |
| 0.080 | 100.0 | | |
| 0.0264 | 95.0 | | |
| 0.0172 | 88.6 | | |
| 0.0102 | 82.3 | | |
| 0.0074 | 79.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.0% | $D_{30}$: | - |
| Silt: | 49.4% | $D_{60}$: | 0.0030 |
| Clay: | 50.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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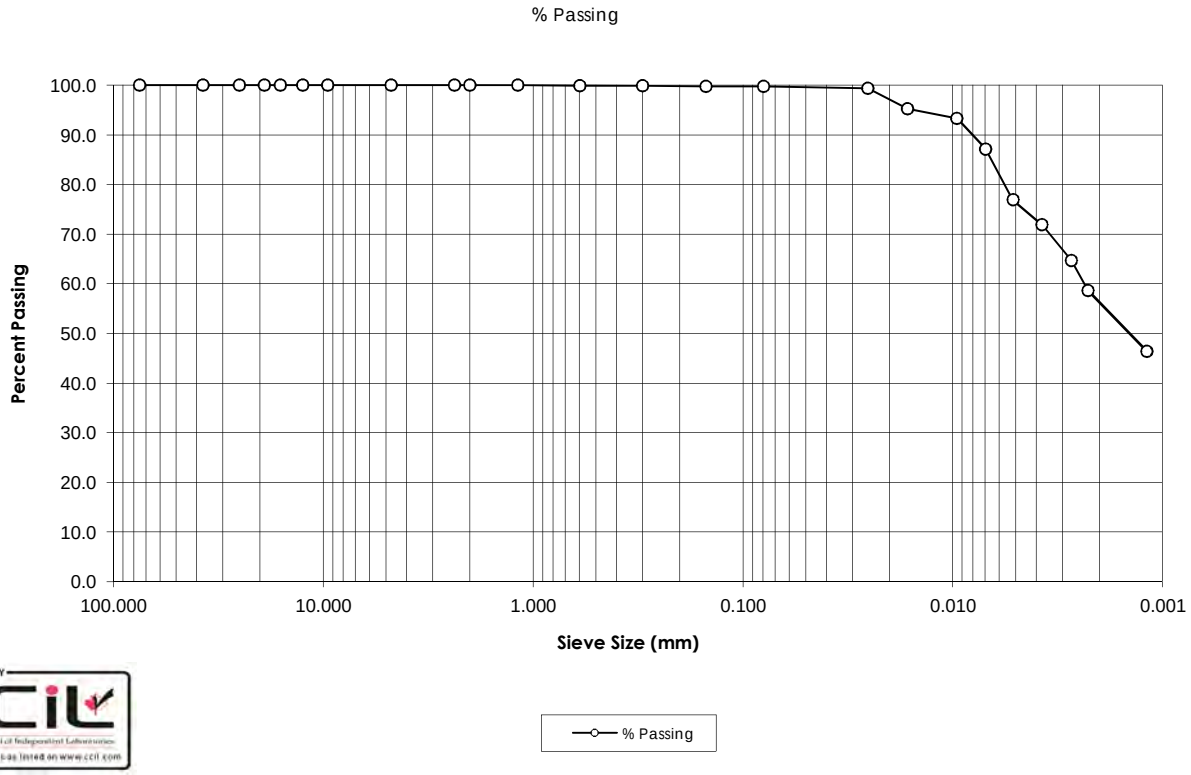
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS3
SOURCE: GW1
TESTED BY: B. Pelkey

DATE TESTED: August 10, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Clay (CI-CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0052 | 77.0 |
| 37.5 | 100.0 | 0.0038 | 71.9 |
| 25.0 | 100.0 | 0.0027 | 64.8 |
| 19.0 | 100.0 | 0.0023 | 58.7 |
| 16.0 | 100.0 | 0.0012 | 46.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.8 | | |
| 0.080 | 99.7 | | |
| 0.0254 | 99.4 | | |
| 0.0164 | 95.3 | | |
| 0.0096 | 93.3 | | |
| 0.0070 | 87.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.3% | $D_{30}$: | - |
| Silt: | 43.5% | $D_{60}$: | 0.0024 |
| Clay: | 56.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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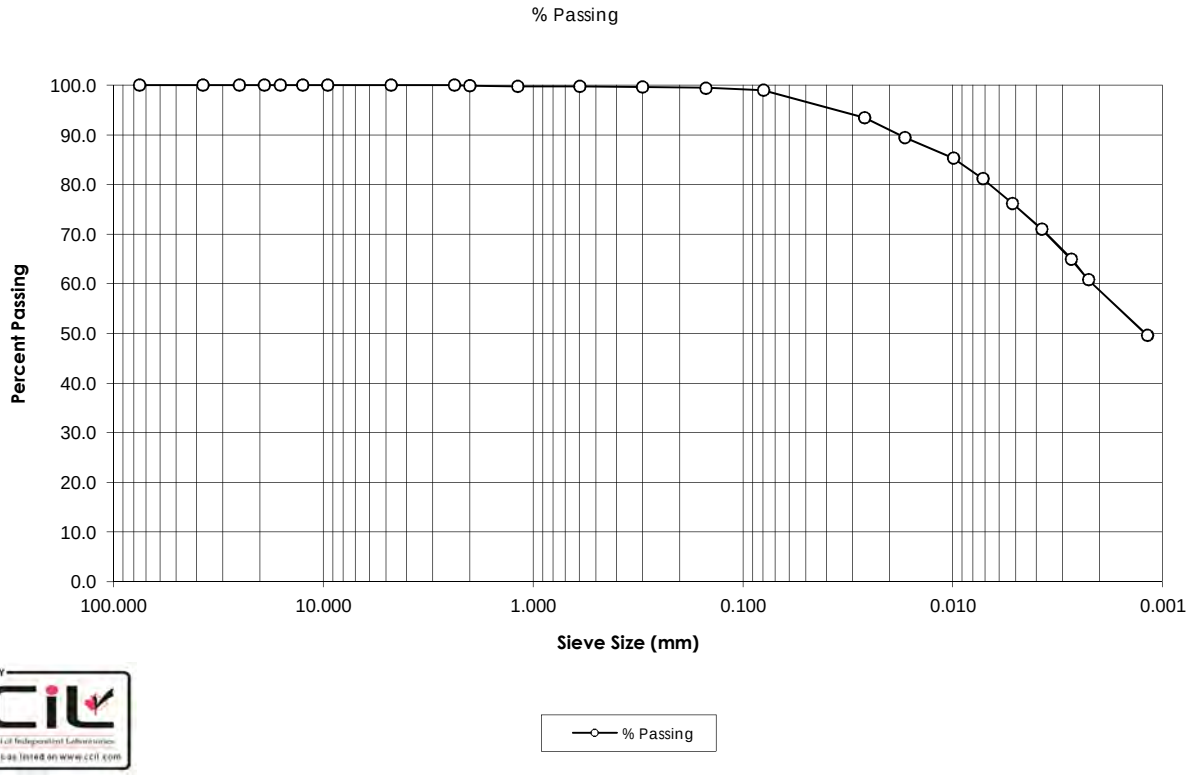
SAMPLE No.: BS4
SOURCE: GW1
TESTED BY: B. Pelkey

DATE TESTED: August 10, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0052 | 76.1 |
| 37.5 | 100.0 | 0.0038 | 71.0 |
| 25.0 | 100.0 | 0.0027 | 64.9 |
| 19.0 | 100.0 | 0.0023 | 60.8 |
| 16.0 | 100.0 | 0.0012 | 49.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.8 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.7 | | |
| 0.150 | 99.4 | | |
| 0.080 | 99.0 | | |
| 0.0262 | 93.5 | | |
| 0.0169 | 89.4 | | |
| 0.0099 | 85.3 | | |
| 0.0072 | 81.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.0% | $D_{30}$: | - |
| Silt: | 40.2% | $D_{60}$: | 0.0022 |
| Clay: | 58.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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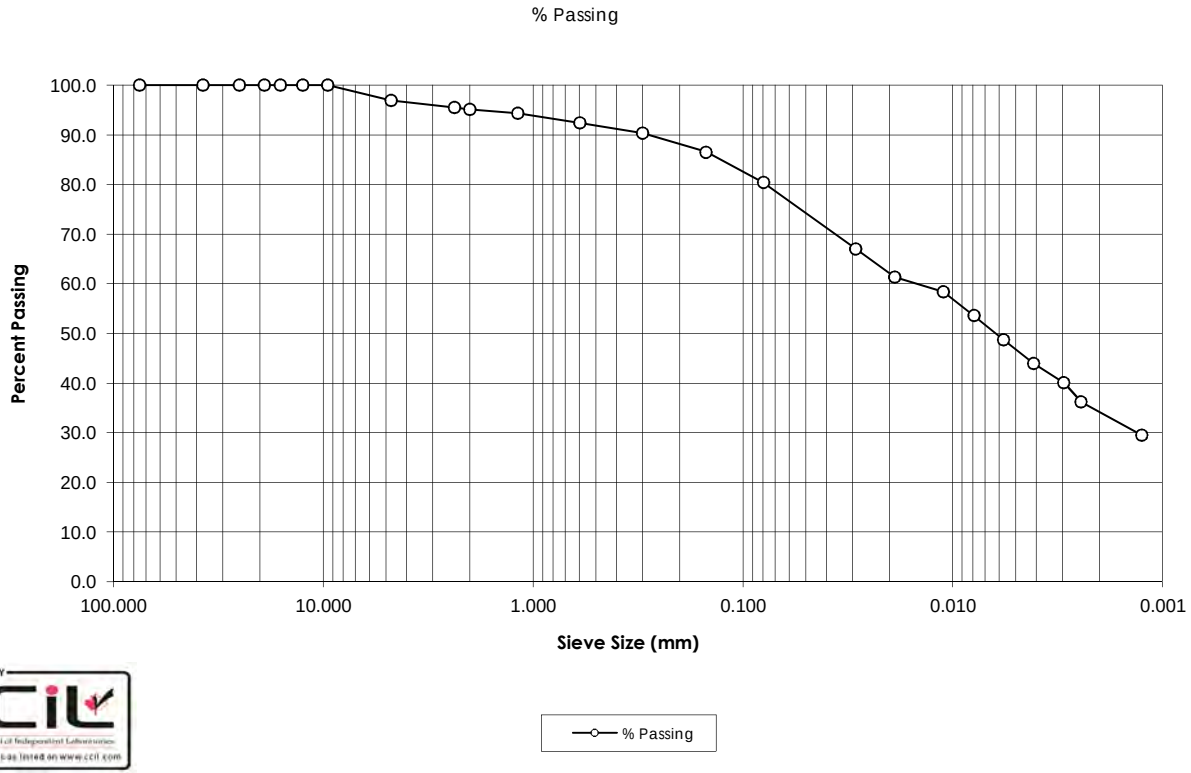
SAMPLE No.: BS6
SOURCE: GW1
TESTED BY: B. Pelkey

DATE TESTED: August 10, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0057 | 48.8 |
| 37.5 | 100.0 | 0.0041 | 44.0 |
| 25.0 | 100.0 | 0.0030 | 40.1 |
| 19.0 | 100.0 | 0.0024 | 36.2 |
| 16.0 | 100.0 | 0.0013 | 29.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 96.9 | | |
| 2.36 | 95.5 | | |
| 2.00 | 95.1 | | |
| 1.18 | 94.3 | | |
| 0.600 | 92.4 | | |
| 0.300 | 90.4 | | |
| 0.150 | 86.6 | | |
| 0.080 | 80.5 | | |
| 0.0291 | 67.1 | | |
| 0.0189 | 61.3 | | |
| 0.0111 | 58.4 | | |
| 0.0079 | 53.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.1% | $D_{10}$: | - |
| Sand: | 16.4% | $D_{30}$: | 0.0014 |
| Silt: | 46.2% | $D_{60}$: | 0.0154 |
| Clay: | 34.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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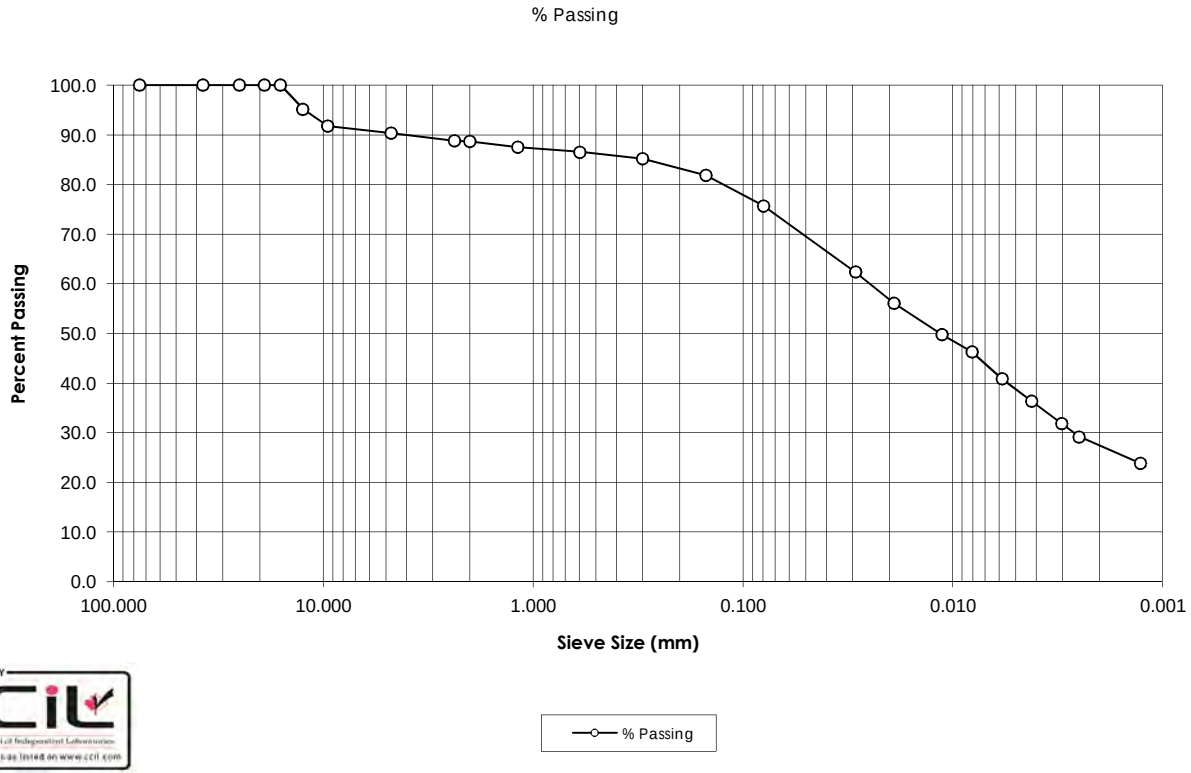
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS7
SOURCE: GW1
TESTED BY: B. Pelkey

DATE TESTED: August 10, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0058** | **40.9** |
| **37.5** | **100.0** | **0.0042** | **36.4** |
| **25.0** | **100.0** | **0.0030** | **31.9** |
| **19.0** | **100.0** | **0.0025** | **29.2** |
| **16.0** | **100.0** | **0.0013** | **23.8** |
| **12.5** | **95.2** | | |
| **9.5** | **91.7** | | |
| **4.75** | **90.3** | | |
| **2.36** | **88.8** | | |
| **2.00** | **88.6** | | |
| **1.18** | **87.5** | | |
| **0.600** | **86.5** | | |
| **0.300** | **85.2** | | |
| **0.150** | **81.8** | | |
| **0.080** | **75.7** | | |
| **0.0291** | **62.4** | | |
| **0.0190** | **56.1** | | |
| **0.0112** | **49.8** | | |
| **0.0081** | **46.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.7% | $D_{10}$: | - |
| Sand: | 14.6% | $D_{30}$: | 0.0027 |
| Silt: | 48.3% | $D_{60}$: | 0.0254 |
| Clay: | 27.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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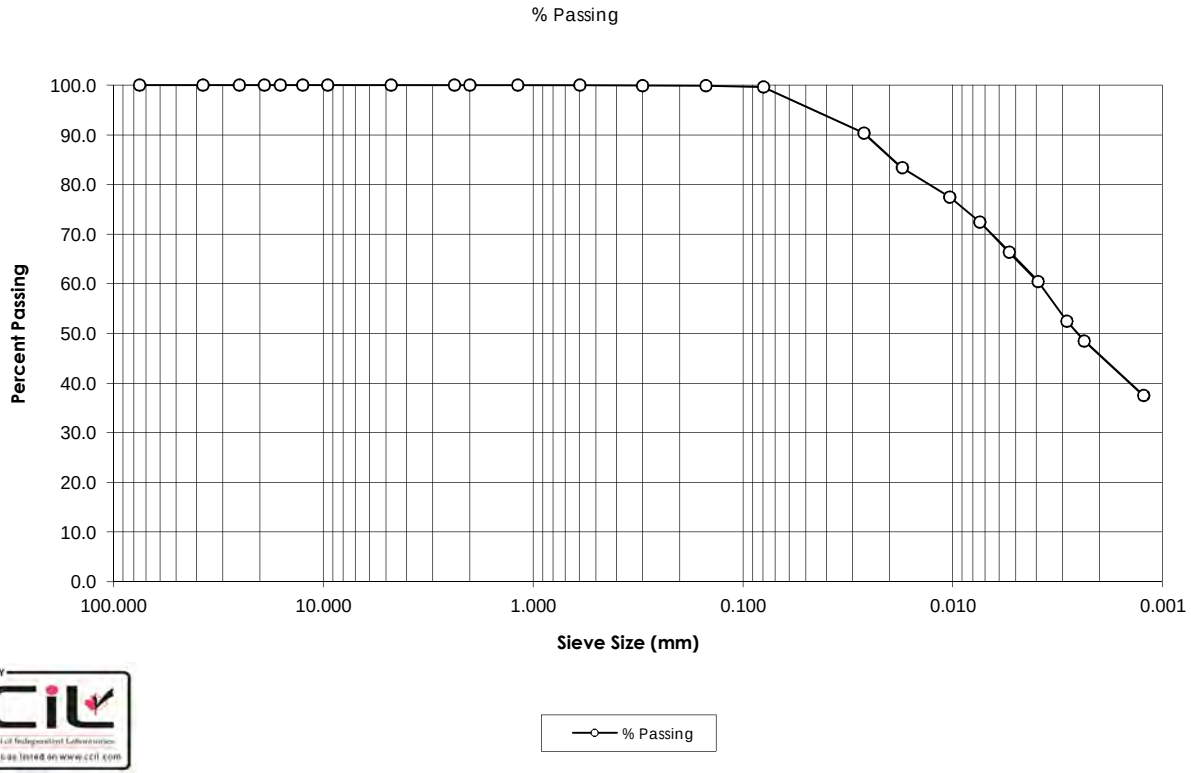
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: ST2
SOURCE: GW1
TESTED BY: B. Pelkey

DATE TESTED: August 25, 2016
DATE RECEIVED: May 19, 2016
SAMPLE DESCRIPTION: Clay (Cl)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0054 | 66.5 |
| 37.5 | 100.0 | 0.0039 | 60.5 |
| 25.0 | 100.0 | 0.0029 | 52.5 |
| 19.0 | 100.0 | 0.0024 | 48.5 |
| 16.0 | 100.0 | 0.0012 | 37.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.6 | | |
| 0.0264 | 90.4 | | |
| 0.0174 | 83.4 | | |
| 0.0103 | 77.4 | | |
| 0.0074 | 72.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.4% | $D_{30}$: | - |
| Silt: | 54.0% | $D_{60}$: | 0.0039 |
| Clay: | 45.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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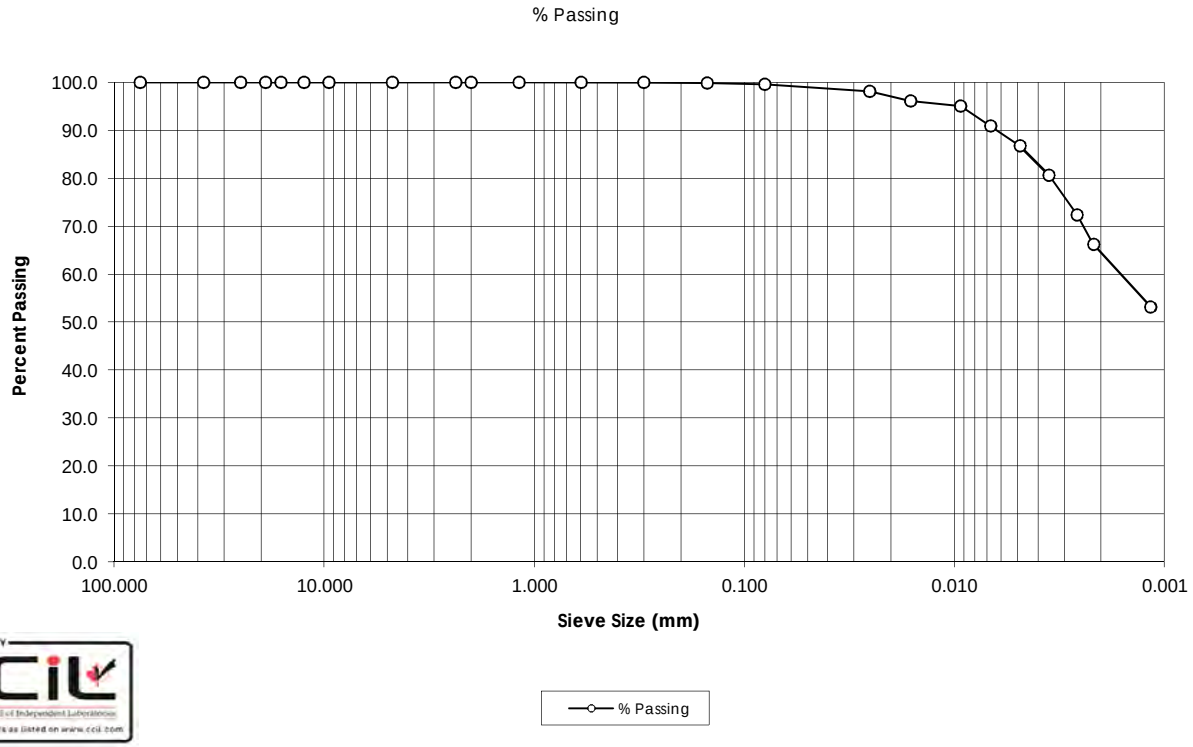
SAMPLE No.: BS1
SOURCE: GW2
TESTED BY: B. Pelkey

DATE TESTED: August 12, 2016
DATE RECEIVED: May 29, 2016
SAMPLE DESCRIPTION: Clay (CH)




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0049** | **86.8** |
| **37.5** | **100.0** | **0.0036** | **80.6** |
| **25.0** | **100.0** | **0.0026** | **72.4** |
| **19.0** | **100.0** | **0.0022** | **66.2** |
| **16.0** | **100.0** | **0.0012** | **53.2** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **100.0** | | |
| **1.18** | **100.0** | | |
| **0.600** | **100.0** | | |
| **0.300** | **100.0** | | |
| **0.150** | **99.9** | | |
| **0.080** | **99.6** | | |
| **0.0252** | **98.2** | | |
| **0.0162** | **96.1** | | |
| **0.0093** | **95.1** | | |
| **0.0067** | **90.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.4% | $D_{30}$: | - |
| Silt: | 35.2% | $D_{60}$: | 0.0017 |
| Clay: | 64.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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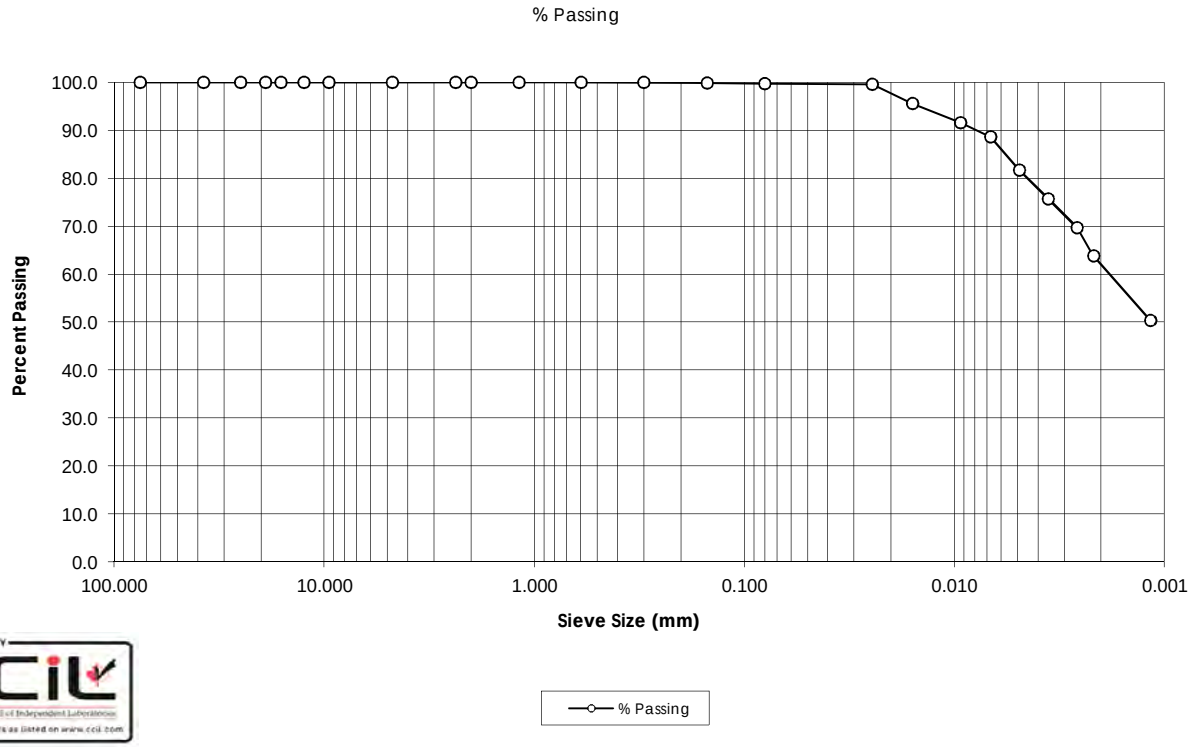
SAMPLE No.: BS2
SOURCE: GW2
TESTED BY: B. Pelkey and C. Oost

DATE TESTED: August 12, 2016
DATE RECEIVED: May 26, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0049** | **81.7** |
| **37.5** | **100.0** | **0.0036** | **75.7** |
| **25.0** | **100.0** | **0.0026** | **69.8** |
| **19.0** | **100.0** | **0.0022** | **63.8** |
| **16.0** | **100.0** | **0.0012** | **50.3** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **100.0** | | |
| **1.18** | **100.0** | | |
| **0.600** | **100.0** | | |
| **0.300** | **100.0** | | |
| **0.150** | **99.9** | | |
| **0.080** | **99.8** | | |
| **0.0245** | **99.6** | | |
| **0.0159** | **95.6** | | |
| **0.0093** | **91.6** | | |
| **0.0067** | **88.6** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.2% | $D_{30}$: | - |
| Silt: | 37.8% | $D_{60}$: | 0.0019 |
| Clay: | 62.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

**OFFICE**
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**LABORATORY**
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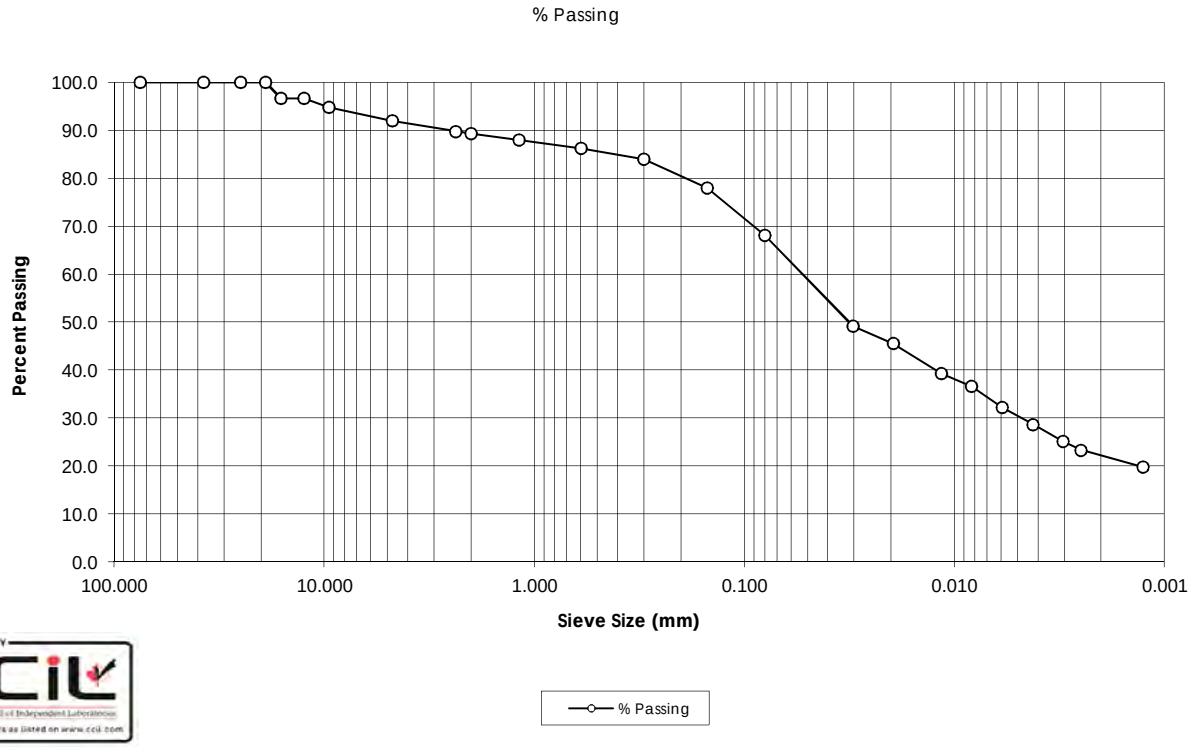
Canada T2C 1G4
Tel: (403) 253-7876

SAMPLE No.: BS9
SOURCE: GW2
TESTED BY: B. Pelkey

DATE TESTED: August 12, 2016
DATE RECEIVED: May 29, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Trace Gravel




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0059** | **32.2** |
| **37.5** | **100.0** | **0.0042** | **28.6** |
| **25.0** | **100.0** | **0.0030** | **25.1** |
| **19.0** | **100.0** | **0.0025** | **23.3** |
| **16.0** | **96.7** | **0.0013** | **19.7** |
| **12.5** | **96.7** | | |
| **9.5** | **94.8** | | |
| **4.75** | **92.0** | | |
| **2.36** | **89.8** | | |
| **2.00** | **89.3** | | |
| **1.18** | **88.0** | | |
| **0.600** | **86.3** | | |
| **0.300** | **84.0** | | |
| **0.150** | **77.9** | | |
| **0.080** | **68.0** | | |
| **0.0303** | **49.1** | | |
| **0.0195** | **45.5** | | |
| **0.0115** | **39.3** | | |
| **0.0083** | **36.6** | | |

| | | | |
|---|---|---|---|
| Gravel: | 8.0% | $D_{10}$: | - |
| Sand: | 24.0% | $D_{30}$: | 0.0049 |
| Silt: | 45.9% | $D_{60}$: | 0.0609 |
| Clay: | 22.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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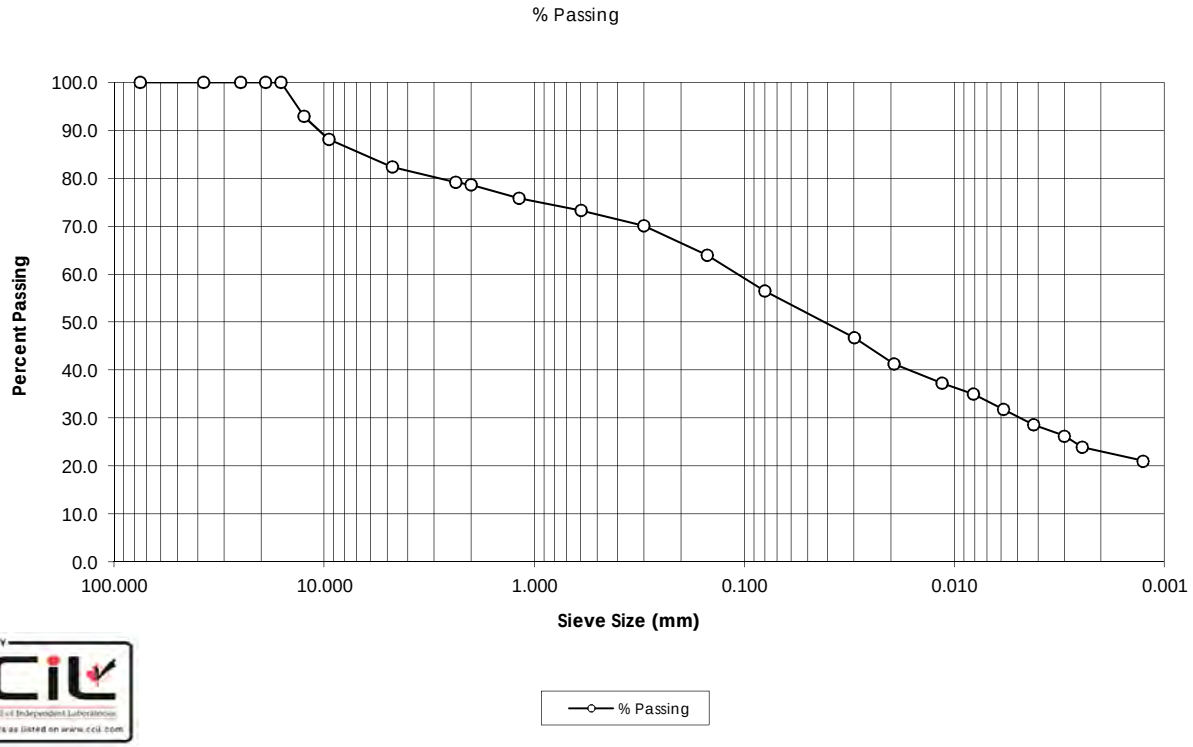
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS11
SOURCE: GW2
TESTED BY: B. Pelkey

DATE TESTED: August 11, 2016
DATE RECEIVED: May 29, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI) Some Gravel




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0058** | **31.8** |
| **37.5** | **100.0** | **0.0042** | **28.6** |
| **25.0** | **100.0** | **0.0030** | **26.2** |
| **19.0** | **100.0** | **0.0025** | **23.9** |
| **16.0** | **100.0** | **0.0013** | **21.0** |
| **12.5** | **92.9** | | |
| **9.5** | **88.2** | | |
| **4.75** | **82.4** | | |
| **2.36** | **79.2** | | |
| **2.00** | **78.7** | | |
| **1.18** | **75.9** | | |
| **0.600** | **73.3** | | |
| **0.300** | **70.1** | | |
| **0.150** | **63.9** | | |
| **0.080** | **56.5** | | |
| **0.0299** | **46.8** | | |
| **0.0194** | **41.3** | | |
| **0.0114** | **37.3** | | |
| **0.0081** | **34.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 17.6% | $D_{10}$: | - |
| Sand: | 25.9% | $D_{30}$: | 0.0049 |
| Silt: | 33.5% | $D_{60}$: | 0.1140 |
| Clay: | 23.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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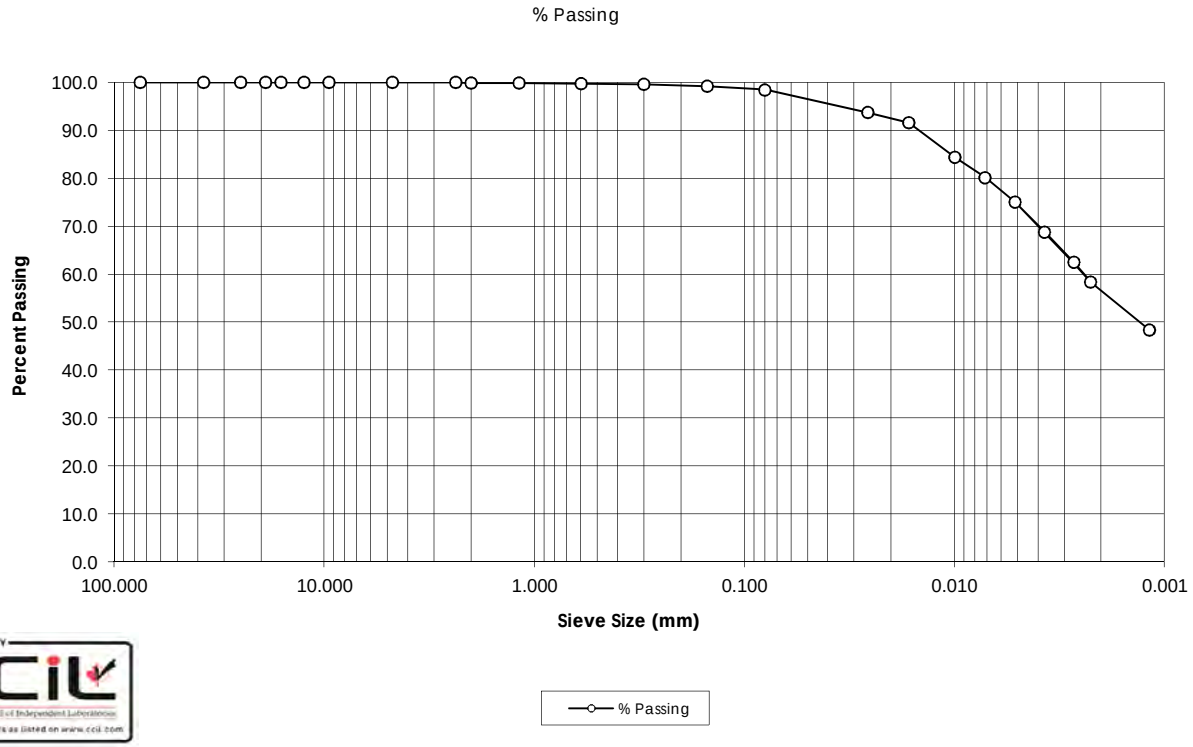
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: SS4
SOURCE: GW2
TESTED BY: B. Pelkey and C. Oost

DATE TESTED: August 11, 2016
DATE RECEIVED: May 29, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0051** | **75.0** |
| **37.5** | **100.0** | **0.0037** | **68.8** |
| **25.0** | **100.0** | **0.0027** | **62.5** |
| **19.0** | **100.0** | **0.0022** | **58.4** |
| **16.0** | **100.0** | **0.0012** | **48.4** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.8** | | |
| **0.600** | **99.7** | | |
| **0.300** | **99.6** | | |
| **0.150** | **99.2** | | |
| **0.080** | **98.5** | | |
| **0.0259** | **93.7** | | |
| **0.0165** | **91.6** | | |
| **0.0099** | **84.3** | | |
| **0.0071** | **80.2** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 1.5% | $D_{30}$: | - |
| Silt: | 41.9% | $D_{60}$: | 0.0024 |
| Clay: | 56.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

**Grain Size Analysis**
Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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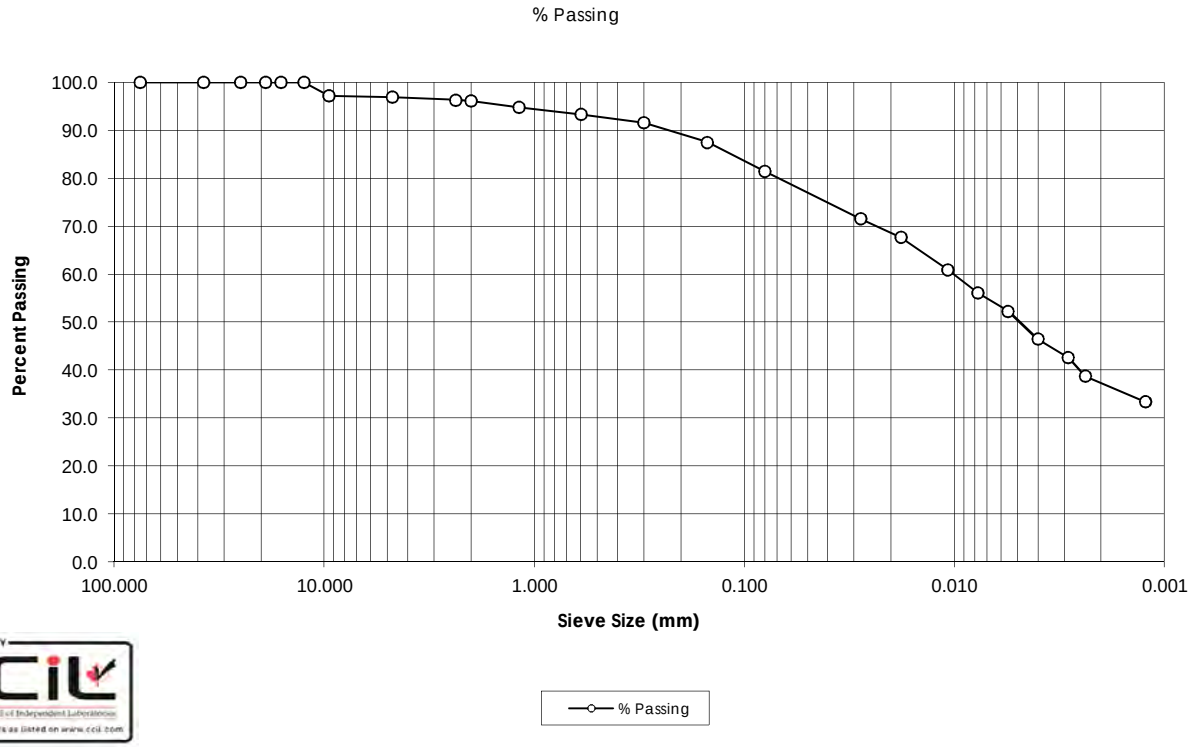
SAMPLE No.: SS7
SOURCE: GW2
TESTED BY: B. Pelkey and C. Oost

DATE TESTED: August 12, 2016
DATE RECEIVED: May 29, 2016
SAMPLE DESCRIPTION: Clay (CL-CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0055** | **52.3** |
| **37.5** | **100.0** | **0.0040** | **46.5** |
| **25.0** | **100.0** | **0.0029** | **42.6** |
| **19.0** | **100.0** | **0.0024** | **38.8** |
| **16.0** | **100.0** | **0.0012** | **33.4** |
| **12.5** | **100.0** | | |
| **9.5** | **97.2** | | |
| **4.75** | **96.9** | | |
| **2.36** | **96.3** | | |
| **2.00** | **96.1** | | |
| **1.18** | **94.8** | | |
| **0.600** | **93.3** | | |
| **0.300** | **91.6** | | |
| **0.150** | **87.5** | | |
| **0.080** | **81.4** | | |
| **0.0280** | **71.6** | | |
| **0.0180** | **67.7** | | |
| **0.0108** | **61.0** | | |
| **0.0077** | **56.1** | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.1% | $D_{10}$: | - |
| Sand: | 15.5% | $D_{30}$: | - |
| Silt: | 44.1% | $D_{60}$: | 0.0102 |
| Clay: | 37.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240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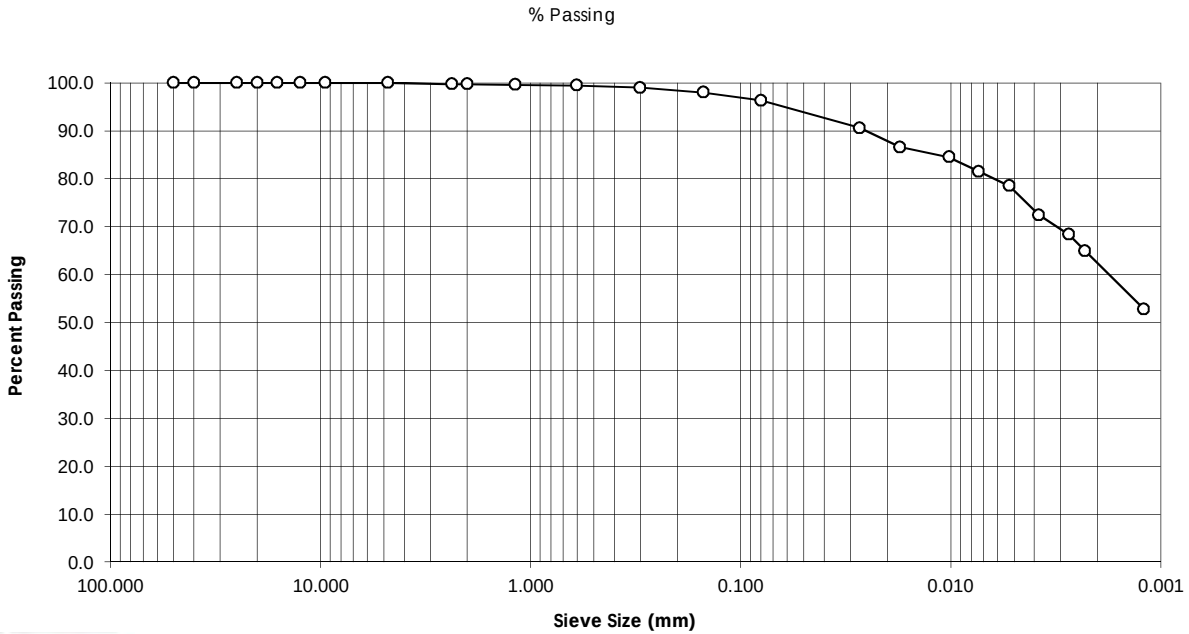
SAMPLE No.: BSA
SOURCE: GW5
TESTED BY: B.Pelkey

DATE TESTED: September 28, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Clay (CH), Trace Sand

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0052** | **78.5** |
| **40.0** | **100.0** | **0.0038** | **72.4** |
| **25.0** | **100.0** | **0.0027** | **68.4** |
| **20.0** | **100.0** | **0.0023** | **64.9** |
| **16.0** | **100.0** | **0.0012** | **52.8** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.7** | | |
| **2.00** | **99.7** | | |
| **1.18** | **99.6** | | |
| **0.600** | **99.4** | | |
| **0.300** | **99.0** | | |
| **0.150** | **98.0** | | |
| **0.080** | **96.3** | | |
| **0.0270** | **90.6** | | |
| **0.0174** | **86.6** | | |
| **0.0102** | **84.5** | | |
| **0.0073** | **81.5** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 3.7% | $D_{30}$: | - |
| Silt: | 33.9% | $D_{60}$: | 0.0019 |
| Clay: | 62.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.

Reviewed by:

Stantec

**Grain Size Analysis**
Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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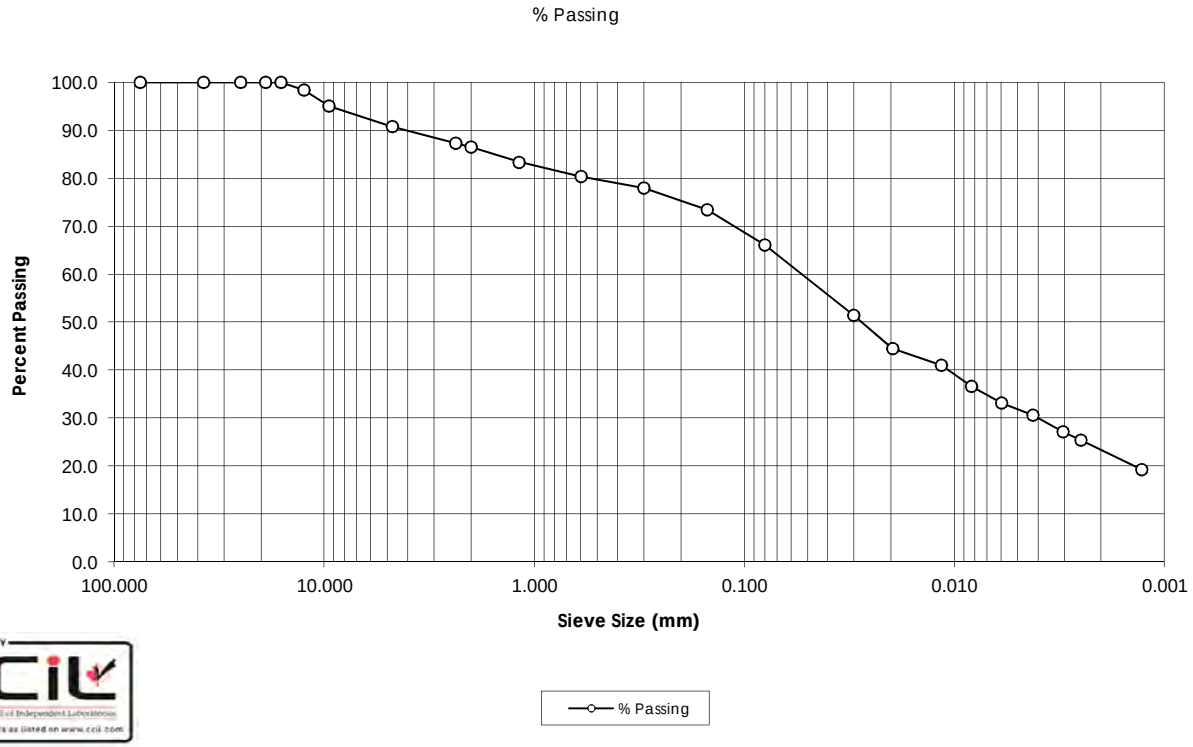
SAMPLE No.: BS6
SOURCE: GW5
TESTED BY: B. Pelkey

DATE TESTED: August 12, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI-CL) Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0060** | **33.2** |
| **37.5** | **100.0** | **0.0042** | **30.5** |
| **25.0** | **100.0** | **0.0030** | **27.1** |
| **19.0** | **100.0** | **0.0025** | **25.3** |
| **16.0** | **100.0** | **0.0013** | **19.3** |
| **12.5** | **98.4** | | |
| **9.5** | **95.1** | | |
| **4.75** | **90.8** | | |
| **2.36** | **87.4** | | |
| **2.00** | **86.6** | | |
| **1.18** | **83.4** | | |
| **0.600** | **80.3** | | |
| **0.300** | **77.9** | | |
| **0.150** | **73.5** | | |
| **0.080** | **66.1** | | |
| **0.0301** | **51.4** | | |
| **0.0196** | **44.4** | | |
| **0.0115** | **41.0** | | |
| **0.0083** | **36.6** | | |

| | | | |
|---|---|---|---|
| Gravel: | 9.2% | $D_{10}$: | - |
| Sand: | 24.7% | $D_{30}$: | 0.0041 |
| Silt: | 42.8% | $D_{60}$: | 0.0608 |
| Clay: | 23.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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**LABORATORY**
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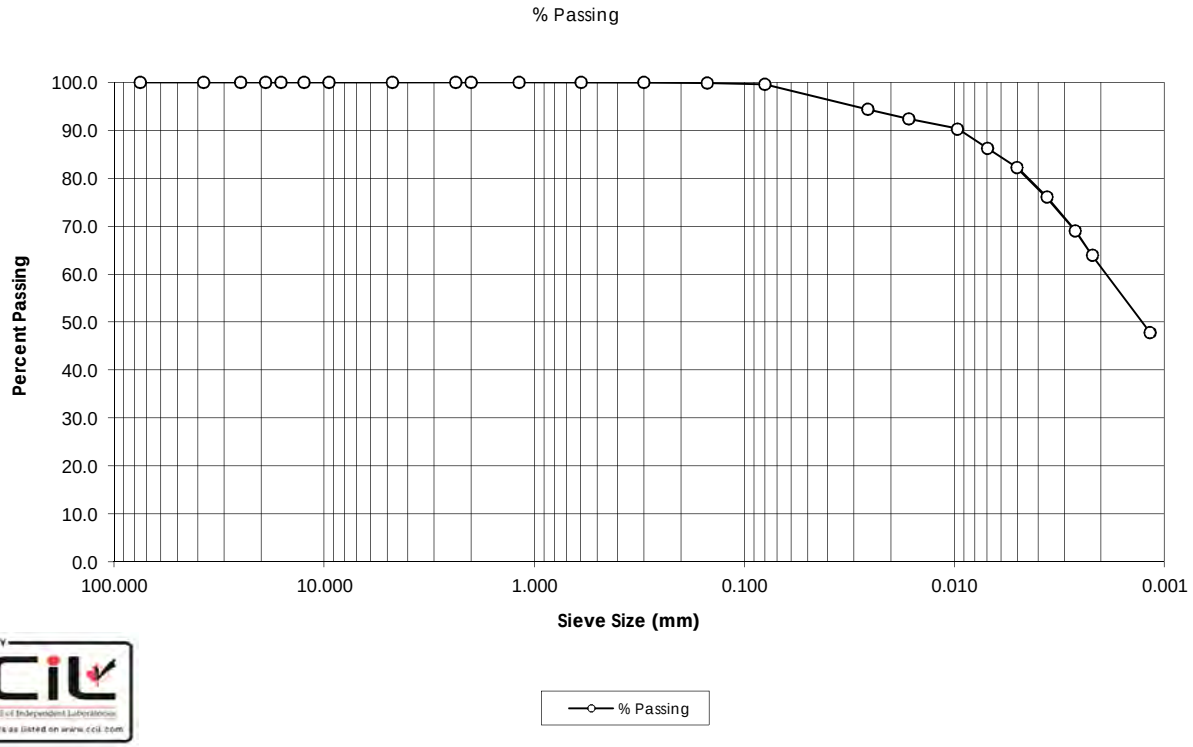
Tel: (403) 253-7876

SAMPLE No.: SS2
SOURCE: GW5
TESTED BY: B. Pelkey

DATE TESTED: August 12, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Clay (CH-CI)

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0050** | **82.2** |
| **37.5** | **100.0** | **0.0036** | **76.2** |
| **25.0** | **100.0** | **0.0027** | **69.1** |
| **19.0** | **100.0** | **0.0022** | **64.0** |
| **16.0** | **100.0** | **0.0012** | **47.8** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **100.0** | | |
| **2.00** | **100.0** | | |
| **1.18** | **100.0** | | |
| **0.600** | **100.0** | | |
| **0.300** | **100.0** | | |
| **0.150** | **99.9** | | |
| **0.080** | **99.6** | | |
| **0.0259** | **94.4** | | |
| **0.0165** | **92.4** | | |
| **0.0096** | **90.3** | | |
| **0.0069** | **86.3** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.4% | $D_{30}$: | - |
| Silt: | 38.1% | $D_{60}$: | 0.0020 |
| Clay: | 61.5% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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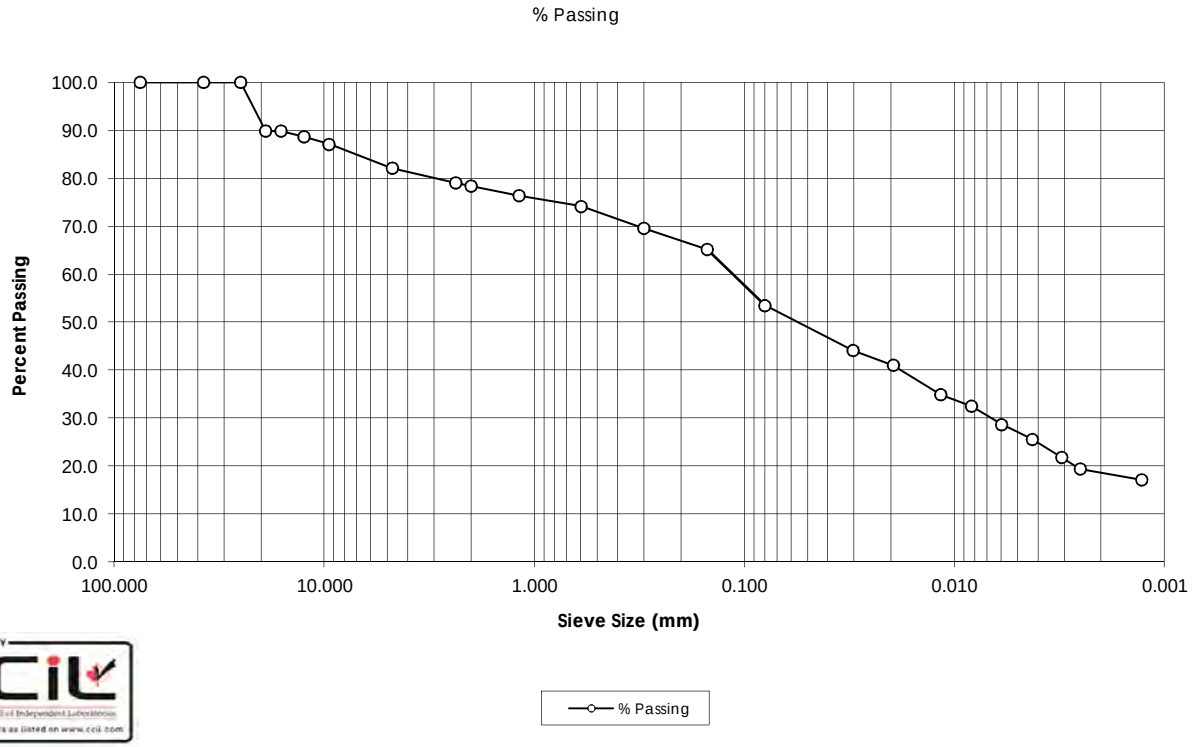
Tel: (403) 253-7876

SAMPLE No.: SS7
SOURCE: GW5
TESTED BY: B. Pelkey

DATE TESTED: August 12, 2016
DATE RECEIVED: June 8, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL-Cl) Some Gravel

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| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **75.0** | **100.0** | **0.0060** | **28.6** |
| **37.5** | **100.0** | **0.0043** | **25.6** |
| **25.0** | **100.0** | **0.0031** | **21.7** |
| **19.0** | **89.8** | **0.0025** | **19.4** |
| **16.0** | **89.8** | **0.0013** | **17.1** |
| **12.5** | **88.6** | | |
| **9.5** | **87.1** | | |
| **4.75** | **82.1** | | |
| **2.36** | **79.1** | | |
| **2.00** | **78.4** | | |
| **1.18** | **76.4** | | |
| **0.600** | **74.2** | | |
| **0.300** | **69.6** | | |
| **0.150** | **65.1** | | |
| **0.080** | **53.5** | | |
| **0.0303** | **44.1** | | |
| **0.0195** | **41.0** | | |
| **0.0116** | **34.8** | | |
| **0.0083** | **32.5** | | |

| | | | |
|---|---|---|---|
| Gravel: | 17.9% | $D_{10}$: | - |
| Sand: | 28.7% | $D_{30}$: | 0.0068 |
| Silt: | 34.9% | $D_{60}$: | 0.1209 |
| Clay: | 18.6% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

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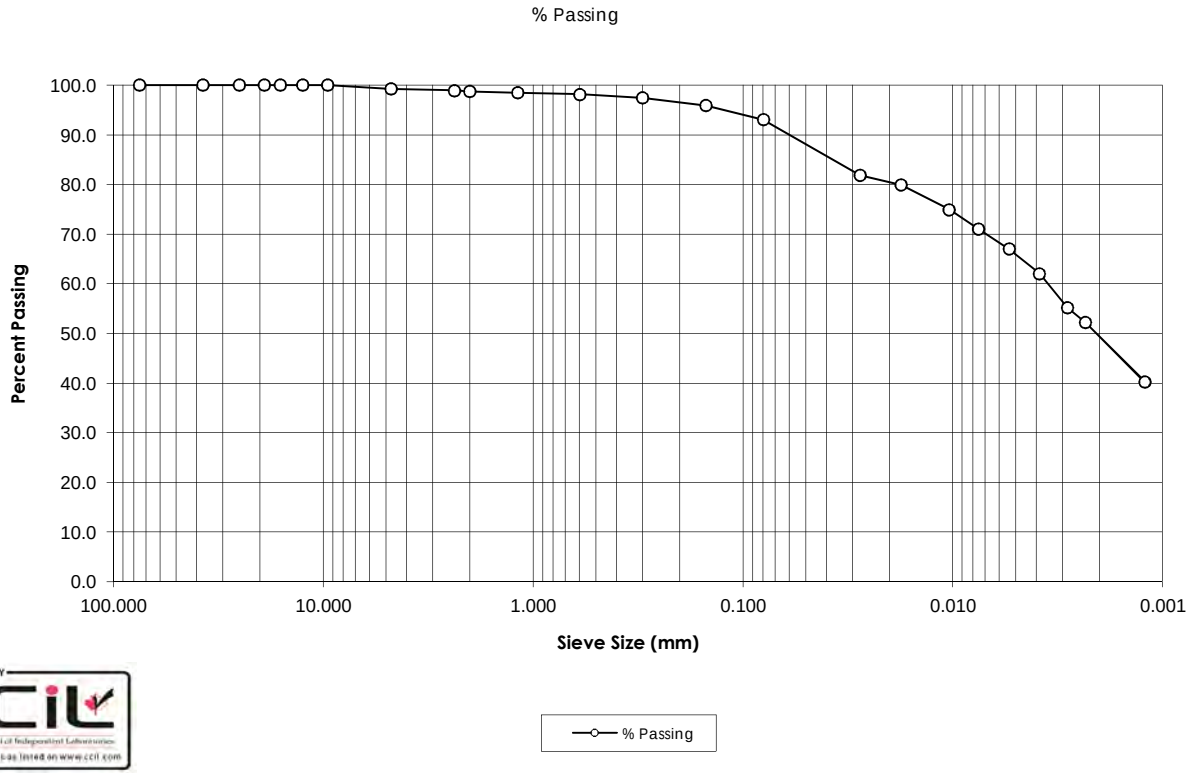
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: ST4
SOURCE: GW5
TESTED BY: B. Pelkey

DATE TESTED: August 25, 2016
DATE RECEIVED: June 9, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0054 | 67.0 |
| 37.5 | 100.0 | 0.0039 | 62.1 |
| 25.0 | 100.0 | 0.0028 | 55.1 |
| 19.0 | 100.0 | 0.0023 | 52.2 |
| 16.0 | 100.0 | 0.0012 | 40.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.2 | | |
| 2.36 | 98.9 | | |
| 2.00 | 98.8 | | |
| 1.18 | 98.5 | | |
| 0.600 | 98.2 | | |
| 0.300 | 97.5 | | |
| 0.150 | 95.9 | | |
| 0.080 | 93.1 | | |
| 0.0275 | 81.9 | | |
| 0.0176 | 79.9 | | |
| 0.0104 | 75.0 | | |
| 0.0075 | 71.0 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.8% | $D_{10}$: | - |
| Sand: | 6.1% | $D_{30}$: | - |
| Silt: | 43.7% | $D_{60}$: | 0.0036 |
| Clay: | 49.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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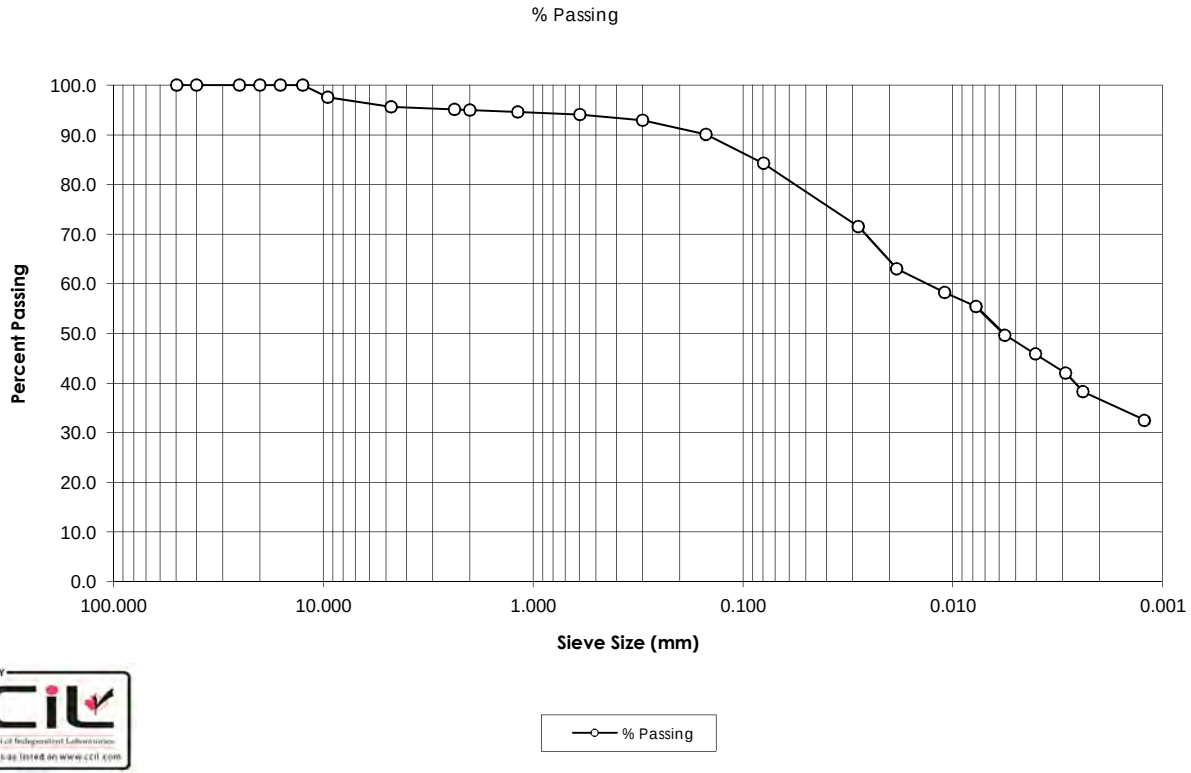
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS1
SOURCE: GW8
TESTED BY: M. Boudreau

DATE TESTED: August 12, 2016
DATE RECEIVED: May 25, 2016
SAMPLE DESCRIPTION: Clay (CI) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0056 | 49.7 |
| 40.0 | 100.0 | 0.0040 | 45.9 |
| 25.0 | 100.0 | 0.0029 | 42.1 |
| 20.0 | 100.0 | 0.0024 | 38.3 |
| 16.0 | 100.0 | 0.0012 | 32.6 |
| 12.5 | 100.0 | | |
| 9.5 | 97.5 | | |
| 4.75 | 95.6 | | |
| 2.36 | 95.1 | | |
| 2.00 | 95.0 | | |
| 1.18 | 94.6 | | |
| 0.600 | 94.1 | | |
| 0.300 | 92.9 | | |
| 0.150 | 90.1 | | |
| 0.080 | 84.3 | | |
| 0.0281 | 71.6 | | |
| 0.0185 | 63.0 | | |
| 0.0109 | 58.3 | | |
| 0.0078 | 55.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 4.4% | $D_{10}$: | - |
| Sand: | 11.3% | $D_{30}$: | - |
| Silt: | 47.6% | $D_{60}$: | 0.0138 |
| Clay: | 36.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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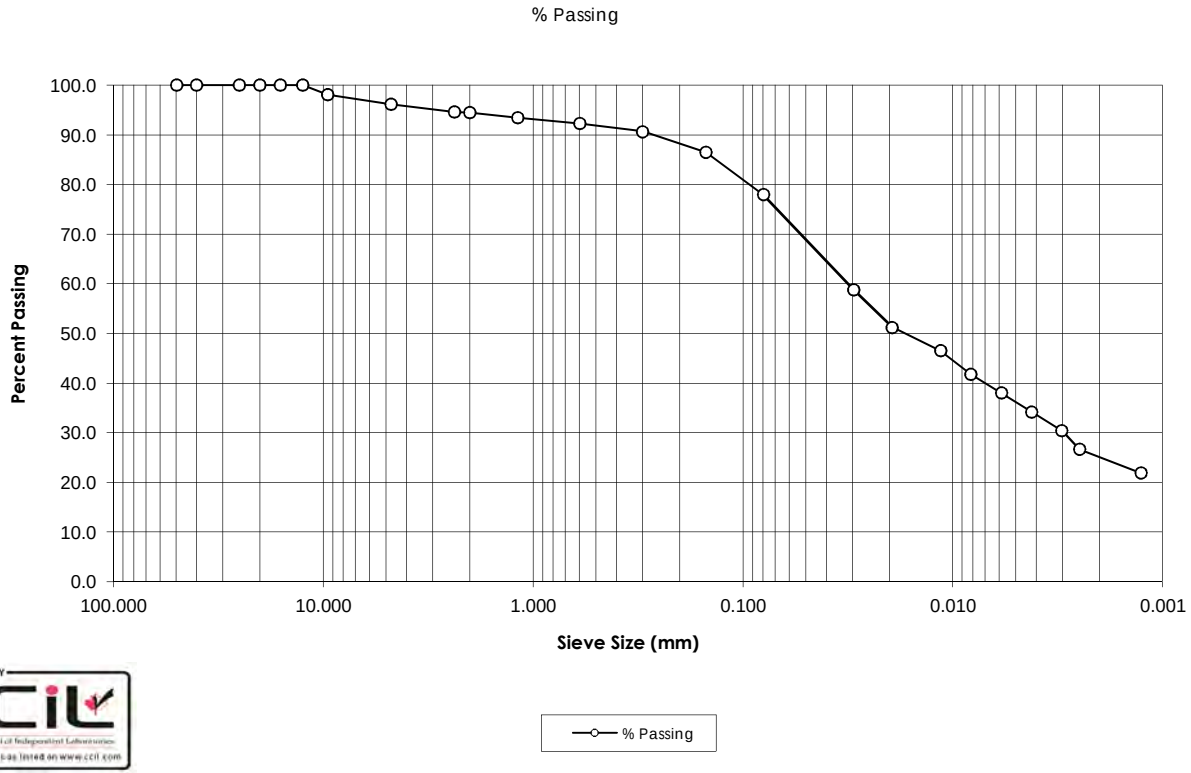
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS2
SOURCE: GW8
TESTED BY: M. Boudreau

DATE TESTED: August 12, 2016
DATE RECEIVED: May 25, 2016
SAMPLE DESCRIPTION: Clay (CL) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 38.0 |
| 40.0 | 100.0 | 0.0042 | 34.2 |
| 25.0 | 100.0 | 0.0030 | 30.4 |
| 20.0 | 100.0 | 0.0025 | 26.7 |
| 16.0 | 100.0 | 0.0013 | 21.9 |
| 12.5 | 100.0 | | |
| 9.5 | 98.0 | | |
| 4.75 | 96.1 | | |
| 2.36 | 94.6 | | |
| 2.00 | 94.5 | | |
| 1.18 | 93.4 | | |
| 0.600 | 92.3 | | |
| 0.300 | 90.7 | | |
| 0.150 | 86.4 | | |
| 0.080 | 78.0 | | |
| 0.0296 | 58.8 | | |
| 0.0194 | 51.2 | | |
| 0.0114 | 46.5 | | |
| 0.0082 | 41.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.9% | $D_{10}$: | - |
| Sand: | 18.1% | $D_{30}$: | 0.0030 |
| Silt: | 52.9% | $D_{60}$: | 0.0332 |
| Clay: | 25.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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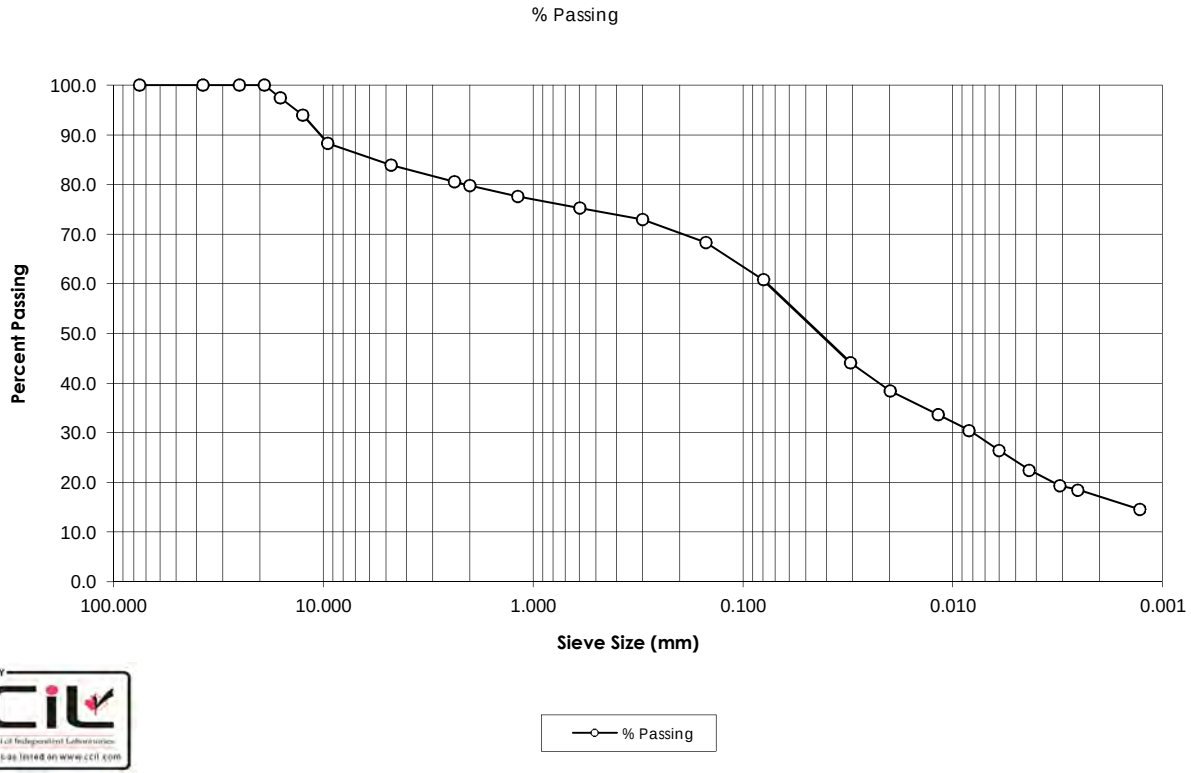
SAMPLE No.: BS8
SOURCE: GW8
TESTED BY: M. Boudreau

DATE TESTED: August 12, 2016
DATE RECEIVED: May 25, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL) Some Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0060 | 26.5 |
| 37.5 | 100.0 | 0.0043 | 22.5 |
| 25.0 | 100.0 | 0.0031 | 19.3 |
| 19.0 | 100.0 | 0.0025 | 18.5 |
| 16.0 | 97.5 | 0.0013 | 14.5 |
| 12.5 | 93.9 | | |
| 9.5 | 88.3 | | |
| 4.75 | 83.9 | | |
| 2.36 | 80.5 | | |
| 2.00 | 79.8 | | |
| 1.18 | 77.6 | | |
| 0.600 | 75.3 | | |
| 0.300 | 73.0 | | |
| 0.150 | 68.3 | | |
| 0.080 | 60.8 | | |
| 0.0306 | 44.1 | | |
| 0.0198 | 38.5 | | |
| 0.0117 | 33.7 | | |
| 0.0084 | 30.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 16.1% | $D_{10}$: | - |
| Sand: | 23.1% | $D_{30}$: | 0.0081 |
| Silt: | 43.7% | $D_{60}$: | 0.0780 |
| Clay: | 17.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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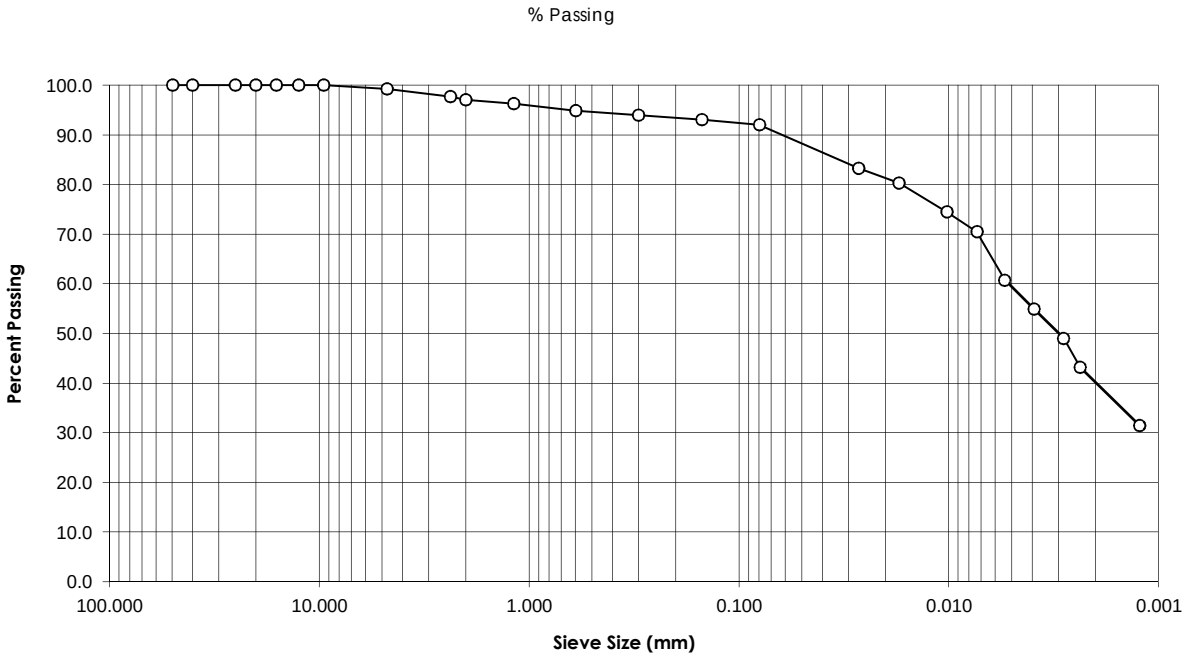
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS9
SOURCE: GW8
TESTED BY: M. Boudreau

DATE TESTED: August 12, 2016
DATE RECEIVED: May 25, 2016
SAMPLE DESCRIPTION: Clay (CI) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0054 | 60.8 |
| 40.0 | 100.0 | 0.0039 | 54.9 |
| 25.0 | 100.0 | 0.0028 | 49.1 |
| 20.0 | 100.0 | 0.0024 | 43.2 |
| 16.0 | 100.0 | 0.0012 | 31.5 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 99.3 | | |
| 2.36 | 97.7 | | |
| 2.00 | 97.1 | | |
| 1.18 | 96.2 | | |
| 0.600 | 94.9 | | |
| 0.300 | 93.9 | | |
| 0.150 | 93.0 | | |
| 0.080 | 92.0 | | |
| 0.0269 | 83.3 | | |
| 0.0172 | 80.3 | | |
| 0.0102 | 74.5 | | |
| 0.0073 | 70.5 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.7% | $D_{10}$: | - |
| Sand: | 7.2% | $D_{30}$: | - |
| Silt: | 51.8% | $D_{60}$: | 0.0052 |
| Clay: | 40.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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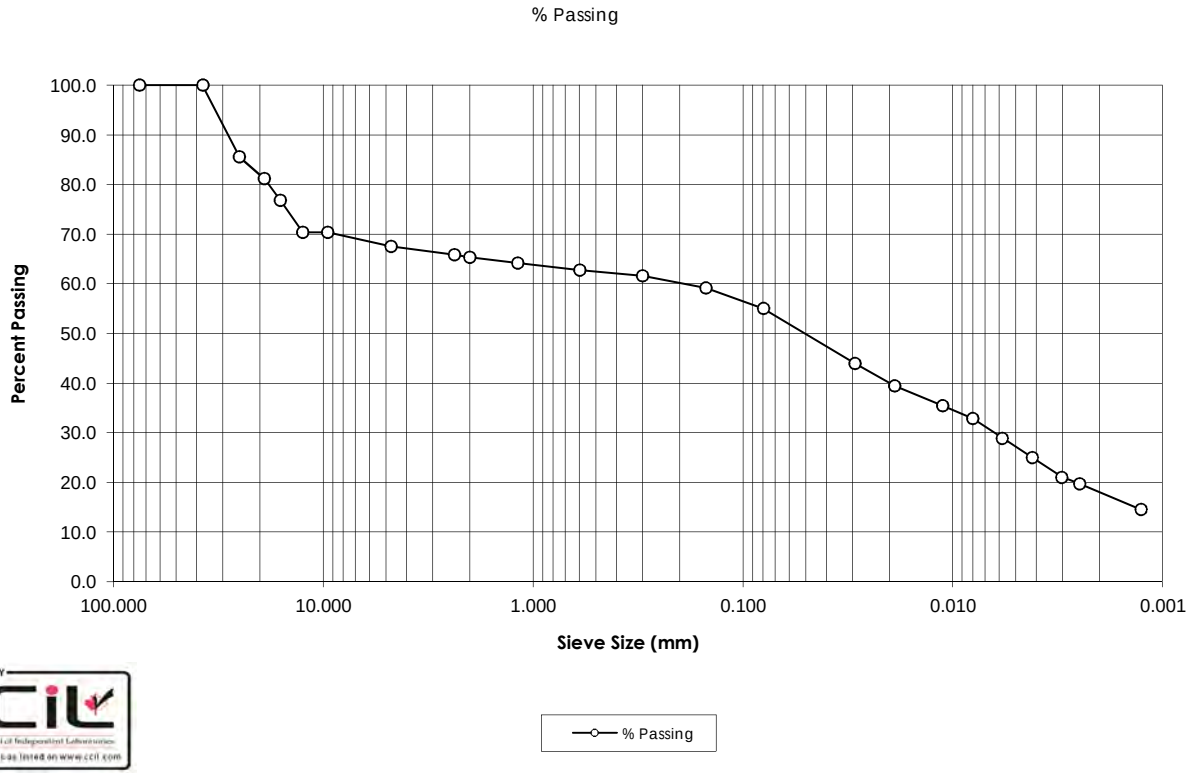
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: SS6
SOURCE: GW8
TESTED BY: M. Boudreau

DATE TESTED: August 12, 2016
DATE RECEIVED: May 25, 2016
SAMPLE DESCRIPTION: Gravelley Clay (CL-CI) Some Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0058 | 28.9 |
| 37.5 | 100.0 | 0.0042 | 25.0 |
| 25.0 | 85.6 | 0.0030 | 21.1 |
| 19.0 | 81.2 | 0.0025 | 19.8 |
| 16.0 | 76.8 | 0.0013 | 14.5 |
| 12.5 | 70.4 | | |
| 9.5 | 70.4 | | |
| 4.75 | 67.6 | | |
| 2.36 | 65.9 | | |
| 2.00 | 65.3 | | |
| 1.18 | 64.2 | | |
| 0.600 | 62.8 | | |
| 0.300 | 61.6 | | |
| 0.150 | 59.2 | | |
| 0.080 | 55.0 | | |
| 0.0292 | 44.0 | | |
| 0.0189 | 39.4 | | |
| 0.0112 | 35.5 | | |
| 0.0080 | 32.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 32.4% | $D_{10}$: | - |
| Sand: | 12.6% | $D_{30}$: | 0.0064 |
| Silt: | 36.9% | $D_{60}$: | 0.2028 |
| Clay: | 18.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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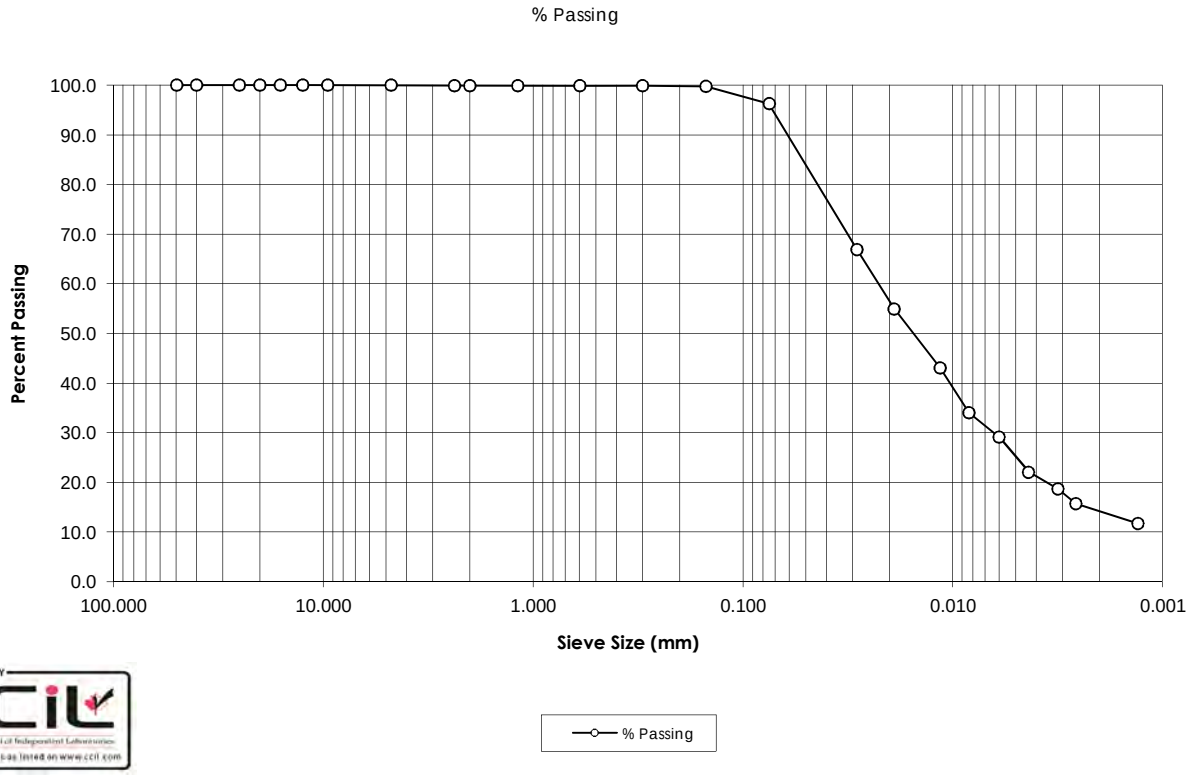
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS22
SOURCE: GW11
TESTED BY: B. Pelkey

DATE TESTED: August 16, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Silty Clay (CL-ML) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0060 | 29.1 |
| 40.0 | 100.0 | 0.0044 | 22.1 |
| 25.0 | 100.0 | 0.0031 | 18.7 |
| 20.0 | 100.0 | 0.0026 | 15.7 |
| 16.0 | 100.0 | 0.0013 | 11.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.9 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.8 | | |
| 0.150 | 99.7 | | |
| 0.075 | 96.3 | | |
| 0.0286 | 66.9 | | |
| 0.0190 | 55.0 | | |
| 0.0115 | 43.0 | | |
| 0.0084 | 34.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 3.7% | $D_{30}$: | 0.0065 |
| Silt: | 82.1% | $D_{60}$: | 0.0232 |
| Clay: | 14.2% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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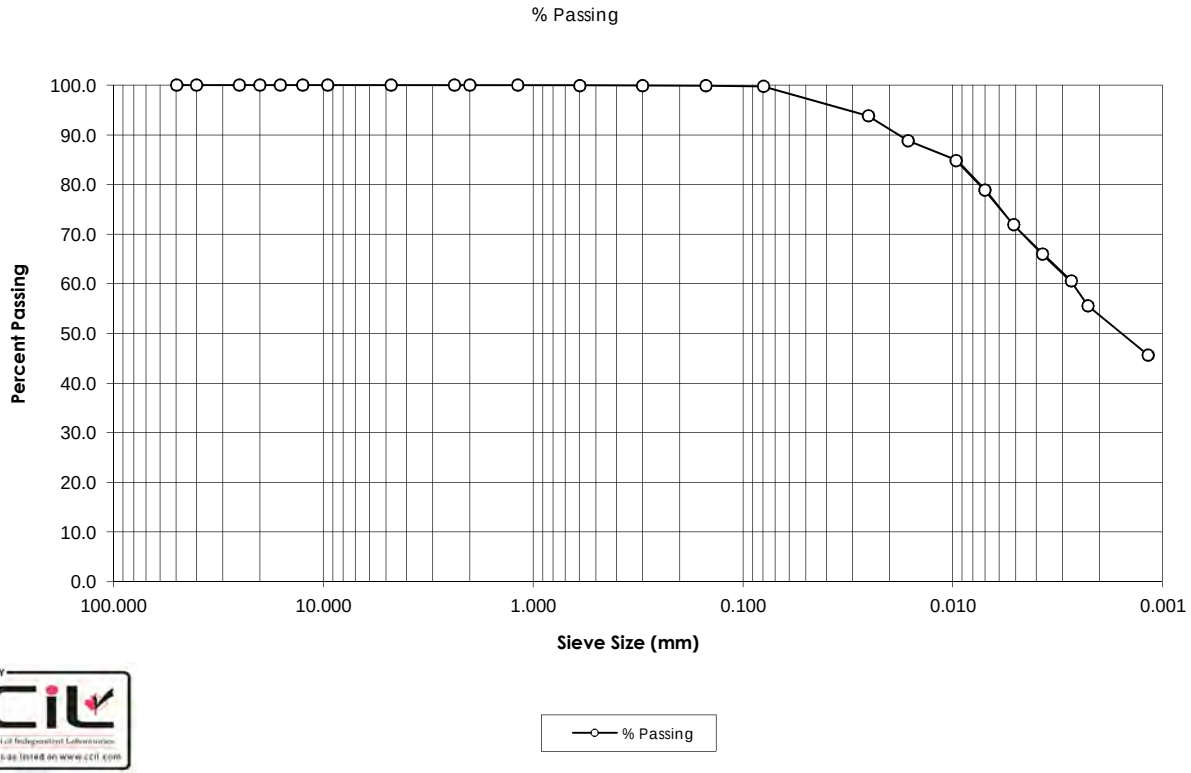
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: SS9
SOURCE: GW11
TESTED BY: B. Pelkey

DATE TESTED: August 16, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 71.9 |
| 40.0 | 100.0 | 0.0037 | 66.0 |
| 25.0 | 100.0 | 0.0027 | 60.6 |
| 20.0 | 100.0 | 0.0023 | 55.6 |
| 16.0 | 100.0 | 0.0012 | 45.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 99.9 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.7 | | |
| 0.0253 | 93.8 | | |
| 0.0163 | 88.9 | | |
| 0.0096 | 84.9 | | |
| 0.0070 | 78.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.3% | $D_{30}$: | - |
| Silt: | 46.0% | $D_{60}$: | 0.0027 |
| Clay: | 53.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



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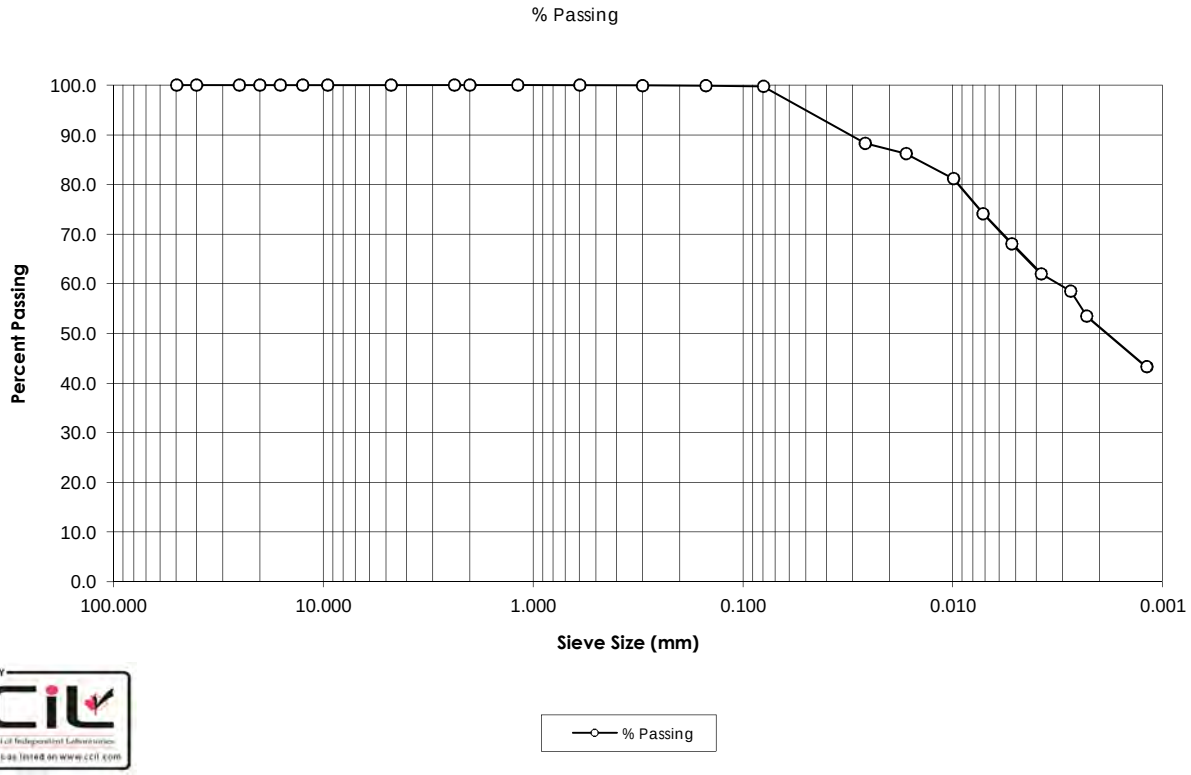
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: SS11
SOURCE: GW11
TESTED BY: B. Pelkey

DATE TESTED: August 16, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (Cl)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 68.0 |
| 40.0 | 100.0 | 0.0038 | 62.0 |
| 25.0 | 100.0 | 0.0027 | 58.5 |
| 20.0 | 100.0 | 0.0023 | 53.5 |
| 16.0 | 100.0 | 0.0012 | 43.3 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 100.0 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.8 | | |
| 0.0261 | 88.3 | | |
| 0.0167 | 86.3 | | |
| 0.0099 | 81.2 | | |
| 0.0072 | 74.1 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.2% | $D_{30}$: | - |
| Silt: | 48.5% | $D_{60}$: | 0.0032 |
| Clay: | 51.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

Stantec

# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

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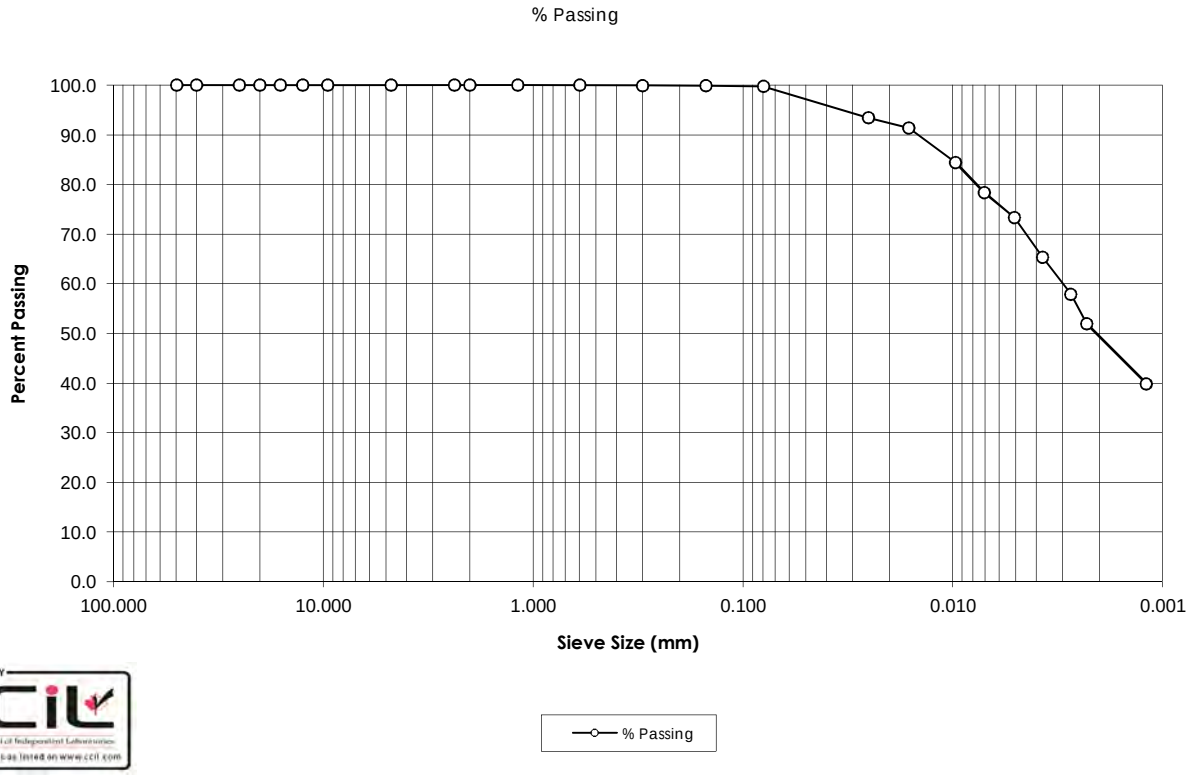
SAMPLE No.: SS13
SOURCE: GW11
TESTED BY: B. Pelkey

DATE TESTED: August 16, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CH-Cl)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0051 | 73.4 |
| 40.0 | 100.0 | 0.0037 | 65.4 |
| 25.0 | 100.0 | 0.0027 | 58.0 |
| 20.0 | 100.0 | 0.0023 | 51.9 |
| 16.0 | 100.0 | 0.0012 | 39.9 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 100.0 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.7 | | |
| 0.0253 | 93.4 | | |
| 0.0162 | 91.4 | | |
| 0.0097 | 84.4 | | |
| 0.0071 | 78.4 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.3% | $D_{30}$: | - |
| Silt: | 50.4% | $D_{60}$: | 0.0030 |
| Clay: | 49.3% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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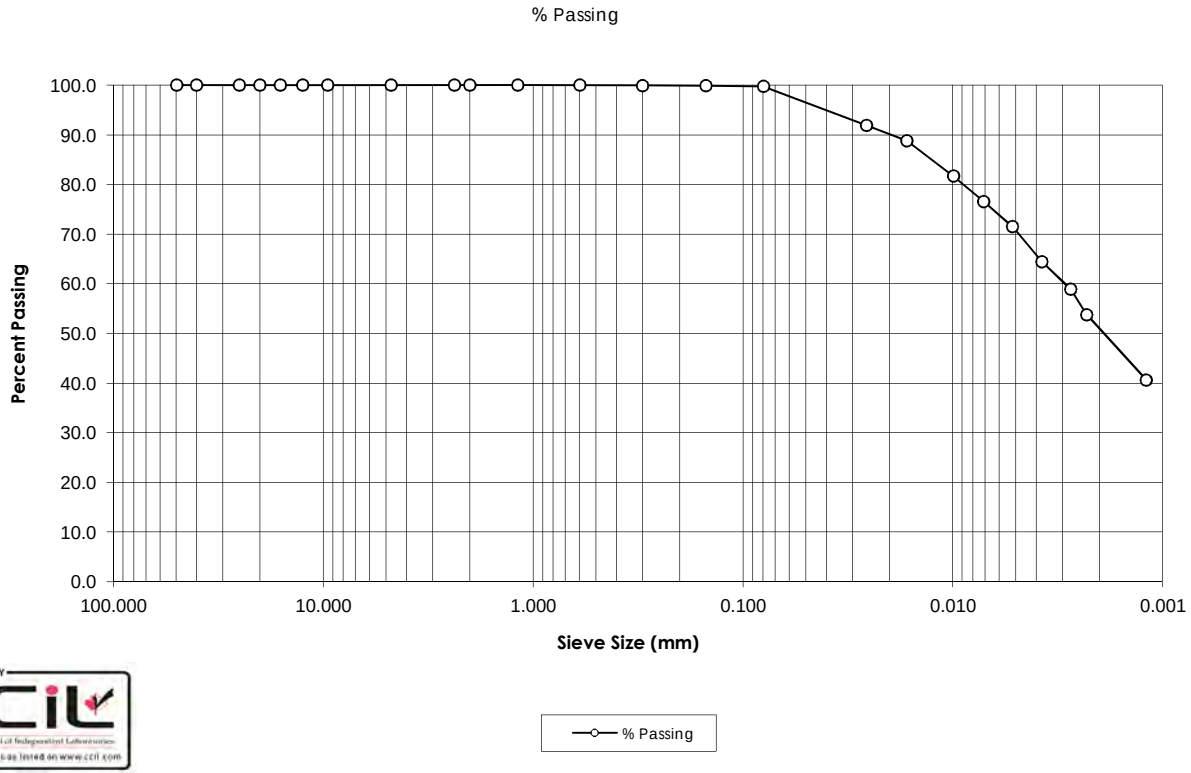
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: SS15
SOURCE: GW11
TESTED BY: M. Pilkington

DATE TESTED: August 16, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CH-Cl)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0052 | 71.5 |
| 40.0 | 100.0 | 0.0038 | 64.4 |
| 25.0 | 100.0 | 0.0027 | 58.9 |
| 20.0 | 100.0 | 0.0023 | 53.8 |
| 16.0 | 100.0 | 0.0012 | 40.6 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 100.0 | | |
| 0.600 | 100.0 | | |
| 0.300 | 100.0 | | |
| 0.150 | 99.9 | | |
| 0.080 | 99.8 | | |
| 0.0258 | 91.9 | | |
| 0.0165 | 88.9 | | |
| 0.0099 | 81.7 | | |
| 0.0071 | 76.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.2% | $D_{30}$: | - |
| Silt: | 48.9% | $D_{60}$: | 0.0030 |
| Clay: | 50.9% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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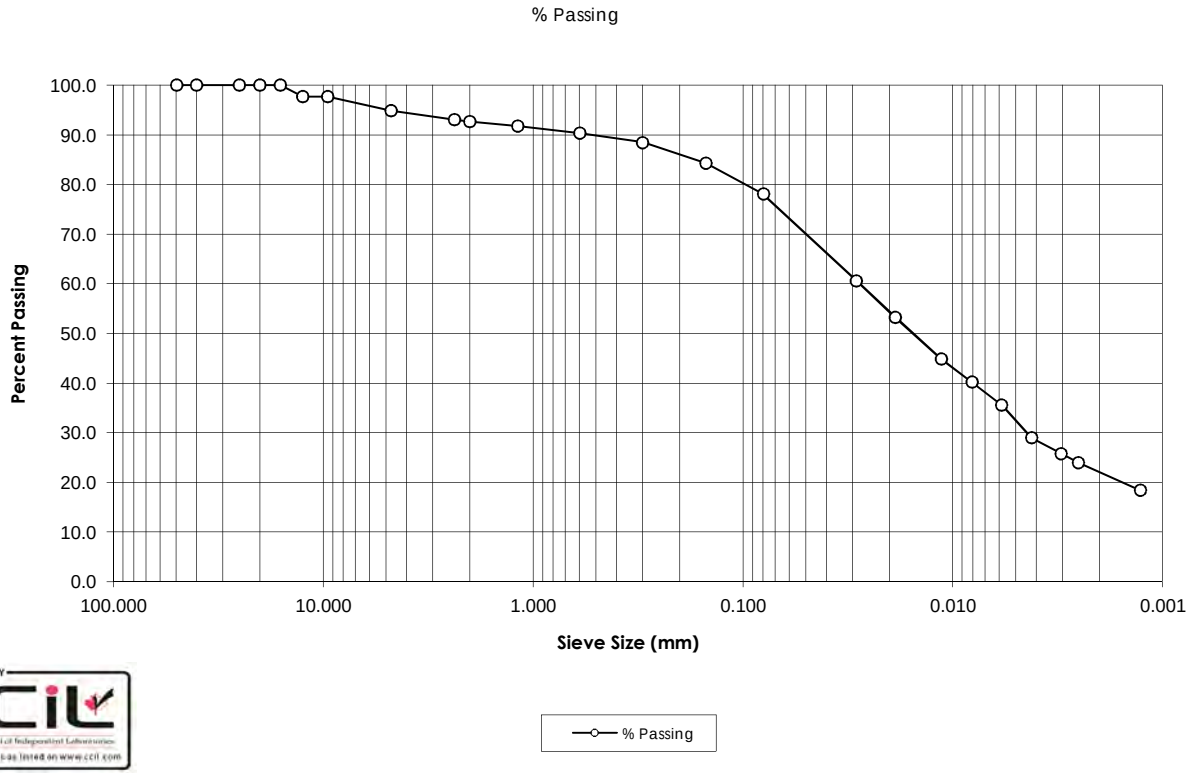
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: SS21
SOURCE: GW11
TESTED BY: M. Pilkington

DATE TESTED: August 16, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CL) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0058 | 35.5 |
| 40.0 | 100.0 | 0.0042 | 29.0 |
| 25.0 | 100.0 | 0.0031 | 25.9 |
| 20.0 | 100.0 | 0.0025 | 24.0 |
| 16.0 | 100.0 | 0.0013 | 18.4 |
| 12.5 | 97.8 | | |
| 9.5 | 97.8 | | |
| 4.75 | 94.9 | | |
| 2.36 | 93.1 | | |
| 2.00 | 92.7 | | |
| 1.18 | 91.8 | | |
| 0.600 | 90.3 | | |
| 0.300 | 88.5 | | |
| 0.150 | 84.3 | | |
| 0.080 | 78.2 | | |
| 0.0289 | 60.7 | | |
| 0.0188 | 53.2 | | |
| 0.0113 | 44.8 | | |
| 0.0081 | 40.2 | | |

| | | | |
|---|---|---|---|
| Gravel: | 5.1% | $D_{10}$: | - |
| Sand: | 16.8% | $D_{30}$: | 0.0045 |
| Silt: | 56.1% | $D_{60}$: | 0.0280 |
| Clay: | 22.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reviewed by:

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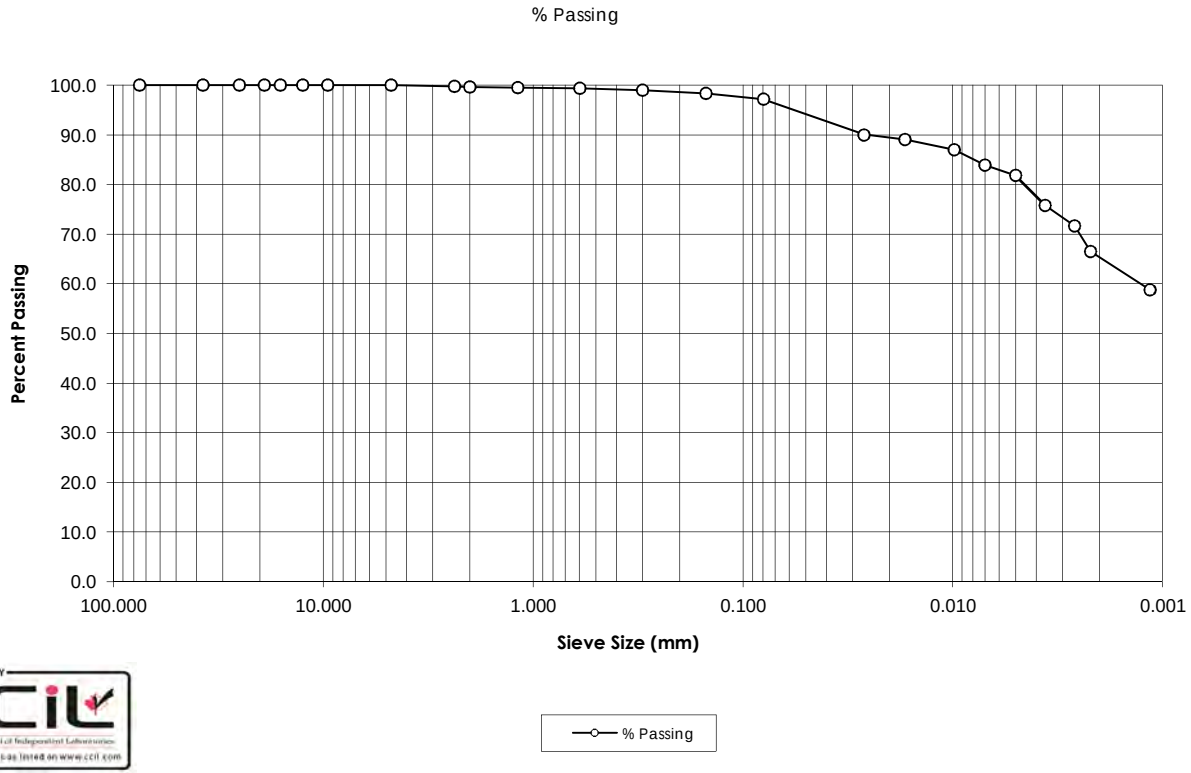
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: ST2
SOURCE: GW11
TESTED BY: C. Oost

DATE TESTED: August 24, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CH) Trace Sand




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0050 | 81.9 |
| 37.5 | 100.0 | 0.0036 | 75.7 |
| 25.0 | 100.0 | 0.0026 | 71.7 |
| 19.0 | 100.0 | 0.0022 | 66.6 |
| 16.0 | 100.0 | 0.0011 | 58.8 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 99.8 | | |
| 2.00 | 99.6 | | |
| 1.18 | 99.5 | | |
| 0.600 | 99.4 | | |
| 0.300 | 99.0 | | |
| 0.150 | 98.3 | | |
| 0.080 | 97.2 | | |
| 0.0264 | 90.0 | | |
| 0.0169 | 89.0 | | |
| 0.0098 | 87.0 | | |
| 0.0070 | 83.9 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 2.8% | $D_{30}$: | - |
| Silt: | 31.7% | $D_{60}$: | 0.0013 |
| Clay: | 65.4% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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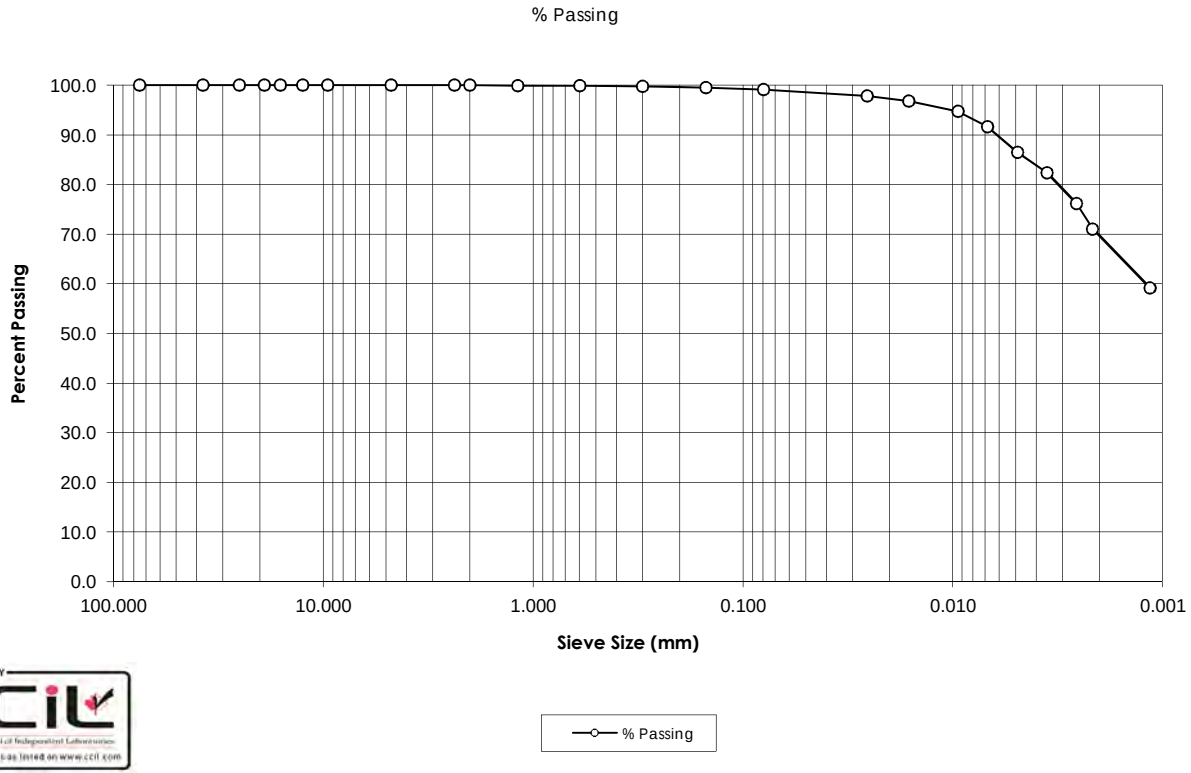
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: ST5
SOURCE: GW11
TESTED BY: C. Oost

DATE TESTED: August 24, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0049 | 86.5 |
| 37.5 | 100.0 | 0.0036 | 82.4 |
| 25.0 | 100.0 | 0.0026 | 76.2 |
| 19.0 | 100.0 | 0.0022 | 71.1 |
| 16.0 | 100.0 | 0.0011 | 59.2 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 100.0 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.9 | | |
| 0.300 | 99.8 | | |
| 0.150 | 99.5 | | |
| 0.080 | 99.1 | | |
| 0.0256 | 97.8 | | |
| 0.0162 | 96.8 | | |
| 0.0095 | 94.7 | | |
| 0.0068 | 91.6 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.9% | $D_{30}$: | - |
| Silt: | 29.4% | $D_{60}$: | 0.0012 |
| Clay: | 69.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

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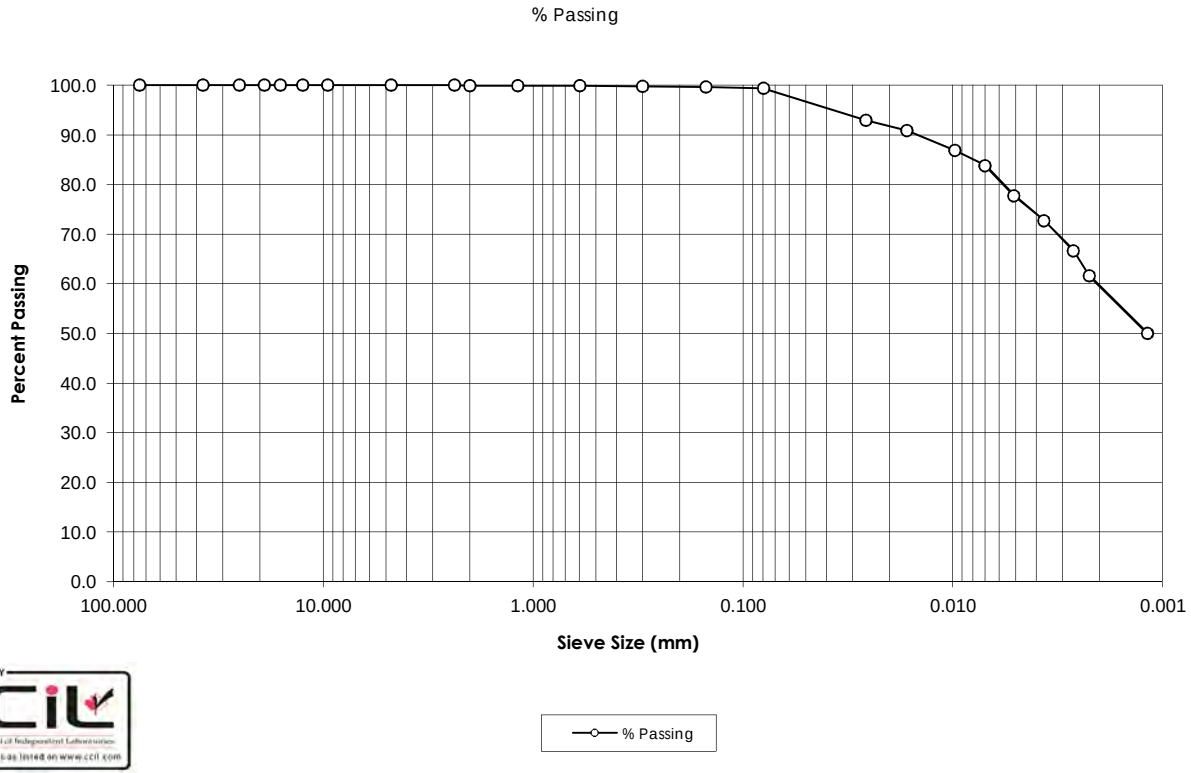
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: ST7
SOURCE: GW11
TESTED BY: C. Oost

DATE TESTED: August 24, 2016
DATE RECEIVED: June 30, 2016
SAMPLE DESCRIPTION: Clay (CH)




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 75.0 | 100.0 | 0.0051 | 77.8 |
| 37.5 | 100.0 | 0.0037 | 72.8 |
| 25.0 | 100.0 | 0.0027 | 66.7 |
| 19.0 | 100.0 | 0.0022 | 61.7 |
| 16.0 | 100.0 | 0.0012 | 50.0 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 100.0 | | |
| 2.36 | 100.0 | | |
| 2.00 | 99.9 | | |
| 1.18 | 99.9 | | |
| 0.600 | 99.8 | | |
| 0.300 | 99.8 | | |
| 0.150 | 99.6 | | |
| 0.080 | 99.3 | | |
| 0.0259 | 92.9 | | |
| 0.0165 | 90.9 | | |
| 0.0098 | 86.9 | | |
| 0.0070 | 83.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 0.7% | $D_{30}$: | - |
| Silt: | 39.7% | $D_{60}$: | 0.0021 |
| Clay: | 59.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results

Reporting of these test results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request. The data presented above is for the sole use of the client stipulated above. Stantec is not responsible, nor can be held liable, for the use of this report by any other party, with or without the knowledge of Stantec.

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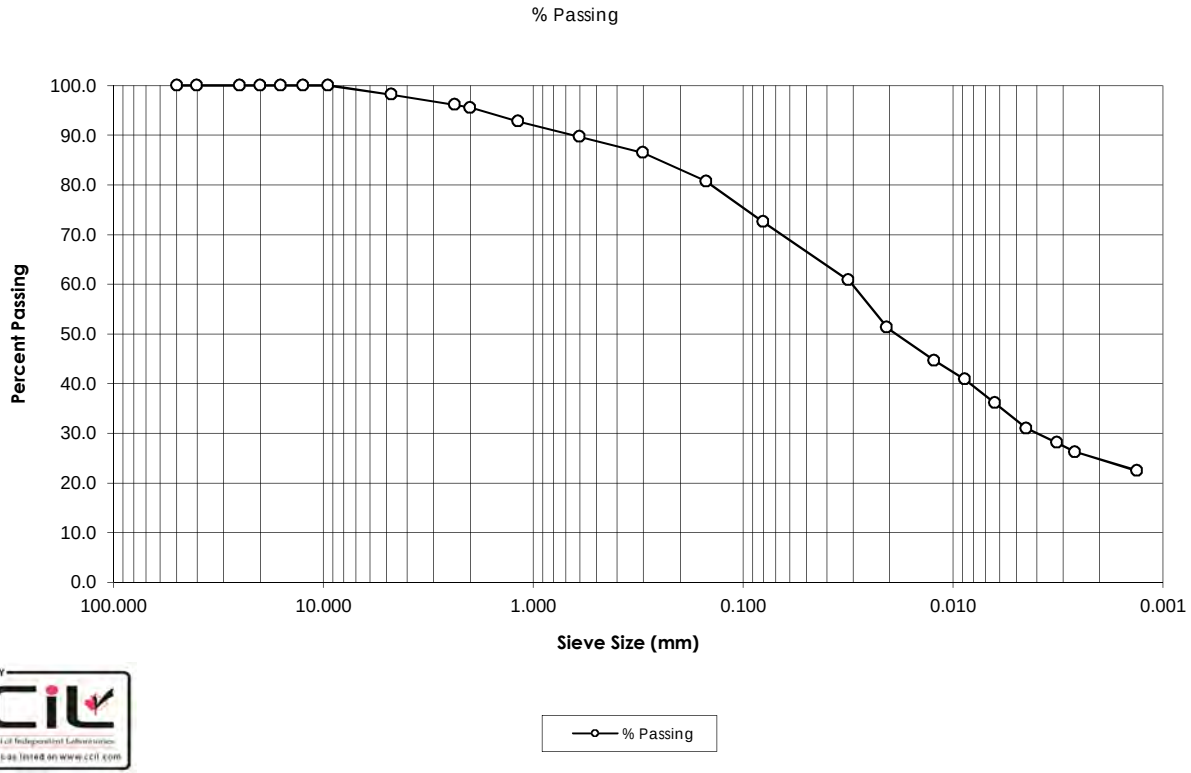
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transoprtation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS7
SOURCE: GW12
TESTED BY: B. Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Sandy Clay (CL), Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0063 | 36.1 |
| 40.0 | 100.0 | 0.0045 | 31.0 |
| 25.0 | 100.0 | 0.0032 | 28.1 |
| 20.0 | 100.0 | 0.0026 | 26.2 |
| 16.0 | 100.0 | 0.0013 | 22.4 |
| 12.5 | 100.0 | | |
| 9.5 | 100.0 | | |
| 4.75 | 98.2 | | |
| 2.36 | 96.1 | | |
| 2.00 | 95.6 | | |
| 1.18 | 92.8 | | |
| 0.600 | 89.7 | | |
| 0.300 | 86.5 | | |
| 0.150 | 80.7 | | |
| 0.080 | 72.5 | | |
| 0.0314 | 60.8 | | |
| 0.0206 | 51.3 | | |
| 0.0123 | 44.6 | | |
| 0.0088 | 40.8 | | |

| | | | |
|---|---|---|---|
| Gravel: | 1.8% | $D_{10}$: | - |
| Sand: | 25.6% | $D_{30}$: | 0.0041 |
| Silt: | 47.8% | $D_{60}$: | 0.0306 |
| Clay: | 24.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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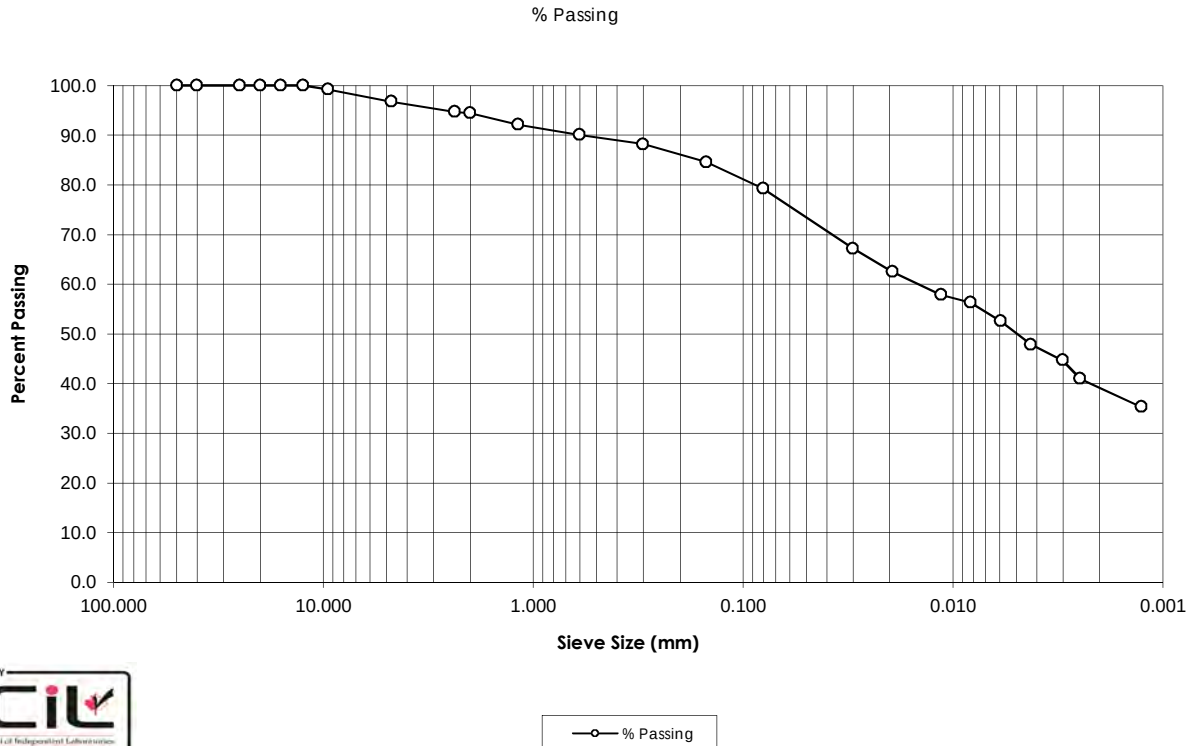
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: BS9
SOURCE: GW12
TESTED BY: B. Pelkey

DATE TESTED: October 21, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Clay (CI), Some Sand, Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 52.6 |
| 40.0 | 100.0 | 0.0043 | 47.9 |
| 25.0 | 100.0 | 0.0030 | 44.7 |
| 20.0 | 100.0 | 0.0025 | 40.9 |
| 16.0 | 100.0 | 0.0013 | 35.3 |
| 12.5 | 100.0 | | |
| 9.5 | 99.3 | | |
| 4.75 | 96.8 | | |
| 2.36 | 94.7 | | |
| 2.00 | 94.4 | | |
| 1.18 | 92.1 | | |
| 0.600 | 90.0 | | |
| 0.300 | 88.2 | | |
| 0.150 | 84.6 | | |
| 0.080 | 79.3 | | |
| 0.0300 | 67.2 | | |
| 0.0194 | 62.5 | | |
| 0.0114 | 57.8 | | |
| 0.0082 | 56.3 | | |

| | | | |
|---|---|---|---|
| Gravel: | 3.2% | $D_{10}$: | - |
| Sand: | 17.5% | $D_{30}$: | - |
| Silt: | 40.2% | $D_{60}$: | 0.0152 |
| Clay: | 39.1% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



Reviewed by:

Stantec

## Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702

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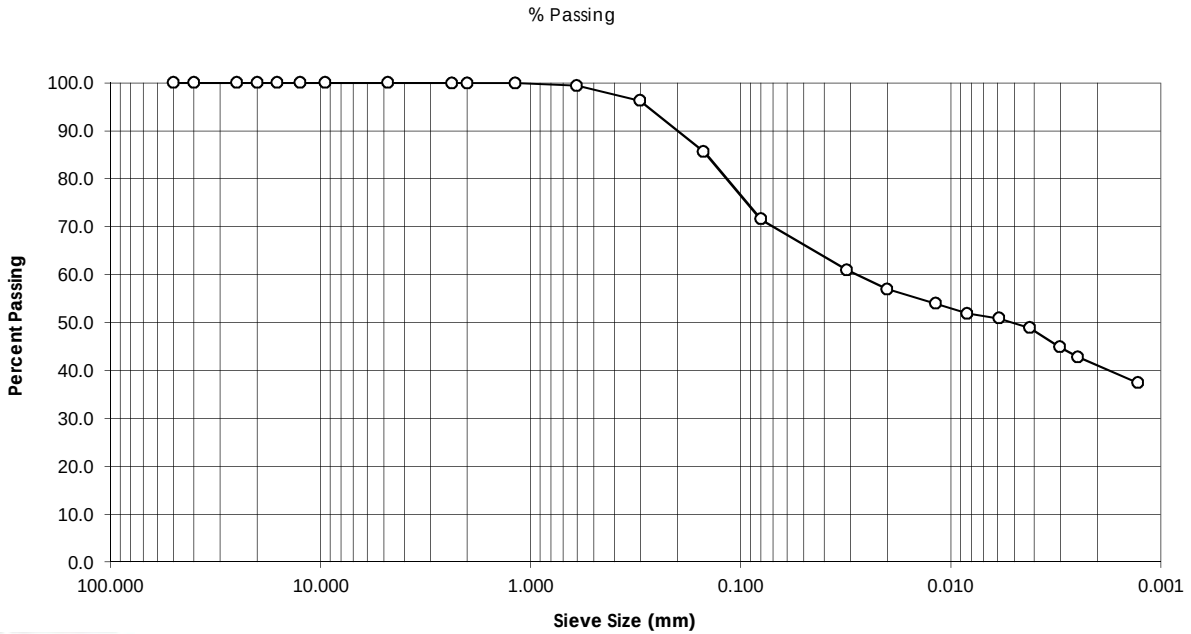
SAMPLE No.: ST2
SOURCE: GW12
TESTED BY: C.Oost

DATE TESTED: September 20, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Sandy Clay (CI)




CERTIFIED BY CCIL

| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| **50.0** | **100.0** | **0.0059** | **50.9** |
| **40.0** | **100.0** | **0.0042** | **48.8** |
| **25.0** | **100.0** | **0.0030** | **44.8** |
| **20.0** | **100.0** | **0.0025** | **42.8** |
| **16.0** | **100.0** | **0.0013** | **37.3** |
| **12.5** | **100.0** | | |
| **9.5** | **100.0** | | |
| **4.75** | **100.0** | | |
| **2.36** | **99.9** | | |
| **2.00** | **99.9** | | |
| **1.18** | **99.9** | | |
| **0.600** | **99.4** | | |
| **0.300** | **96.3** | | |
| **0.150** | **85.7** | | |
| **0.080** | **71.5** | | |
| **0.0311** | **61.0** | | |
| **0.0200** | **56.9** | | |
| **0.0117** | **53.9** | | |
| **0.0083** | **51.9** | | |

| | | | |
|---|---|---|---|
| Gravel: | 0.0% | $D_{10}$: | - |
| Sand: | 28.5% | $D_{30}$: | - |
| Silt: | 30.5% | $D_{60}$: | 0.0285 |
| Clay: | 41.0% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from both the Grain Size and Atterberg Limit test results.



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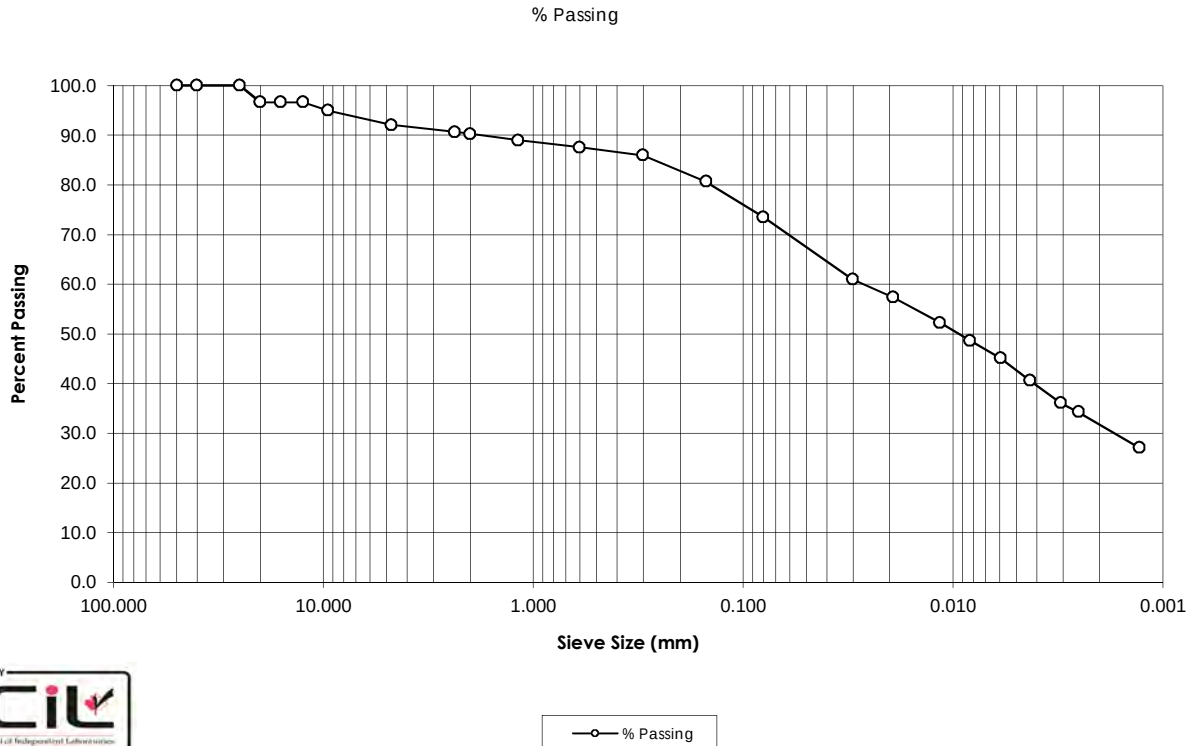
# Grain Size Analysis

Hydrometer Report
ASTM D422
CANFEM

Client: Alberta Transportation
Project Name: SR1
Project No: 110773396.302.702.240

SAMPLE No.: ST4
SOURCE: GW12
TESTED BY: C. Oost

DATE TESTED: September 7, 2016
DATE RECEIVED: August 19, 2016
SAMPLE DESCRIPTION: Clay (CI-CL) Some Sand Trace Gravel




| Sieve (mm) | Sample % Passing | Sieve (mm) | Sample % Passing |
|---|---|---|---|
| 50.0 | 100.0 | 0.0059 | 45.1 |
| 40.0 | 100.0 | 0.0043 | 40.6 |
| 25.0 | 100.0 | 0.0031 | 36.0 |
| 20.0 | 96.6 | 0.0025 | 34.2 |
| 16.0 | 96.6 | 0.0013 | 27.0 |
| 12.5 | 96.6 | | |
| 9.5 | 95.0 | | |
| 4.75 | 92.1 | | |
| 2.36 | 90.6 | | |
| 2.00 | 90.3 | | |
| 1.18 | 89.0 | | |
| 0.600 | 87.6 | | |
| 0.300 | 86.0 | | |
| 0.150 | 80.7 | | |
| 0.080 | 73.5 | | |
| 0.0300 | 60.9 | | |
| 0.0192 | 57.3 | | |
| 0.0116 | 52.3 | | |
| 0.0083 | 48.7 | | |

| | | | |
|---|---|---|---|
| Gravel: | 7.9% | $D_{10}$: | - |
| Sand: | 18.6% | $D_{30}$: | 0.0018 |
| Silt: | 41.8% | $D_{60}$: | 0.0273 |
| Clay: | 31.7% | $C_u$: | - |
| | | $C_c$: | - |

**Comments:** Sample description (MUSCS) derived from Atterberg and Grain Size test results



Reviewed by:

Stantec

# Flexible Wall Hydraulic Conductivity Test ASTM D5084

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Tel: (403) 253-7876

Tested by: C. Oost

| | | | |
|---|---|---|---|
| **CLIENT:** | Alberta Transportation | **PROJECT No.:** | 110773396.302.702.240 |
| **PROJECT TITLE:** | SR1 | **DATE:** | August 16, 2016 |
| **SAMPLE DESCRIPTION:** | Brown Clay | **SAMPLE No.:** | GW11 ST5 |

**INITIAL SAMPLE DATA**

| | |
|---|---|
| Length (cm) | 11.25 |
| Diameter (cm) | 7.26 |
| Area (cm ²) | 41.40 |
| Total Mass (g) | 898.3 |
| Volume (cm³) | 465.7 |
| Water Content (%) | 28.9 |
| Degree of Saturation (%) | 97 |
| Wet Density (g/cm³) | 1.929 |
| Dry Density(g/cm³) | 1.496 |
| Assumed Specific Gravity | 2.70 |

**FINAL SAMPLE DATA**

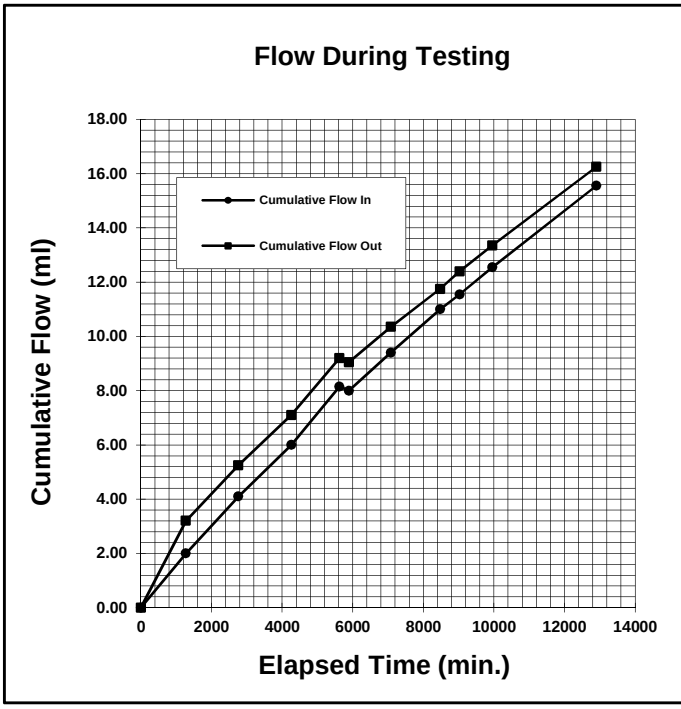
| | |
|---|---|
| Length (cm) | 11.32 |
| Diameter (cm) | 7.27 |
| Area (cm ²) | 41.51 |
| Total Mass (g) | 907.6 |
| Volume (cm³) | 469.9 |
| Water Content (%) | 27.4 |
| Beta Saturation (%) | 98 |
| Wet Density (g/cm³) | 1.931 |
| Dry Density(g/cm³) | 1.516 |

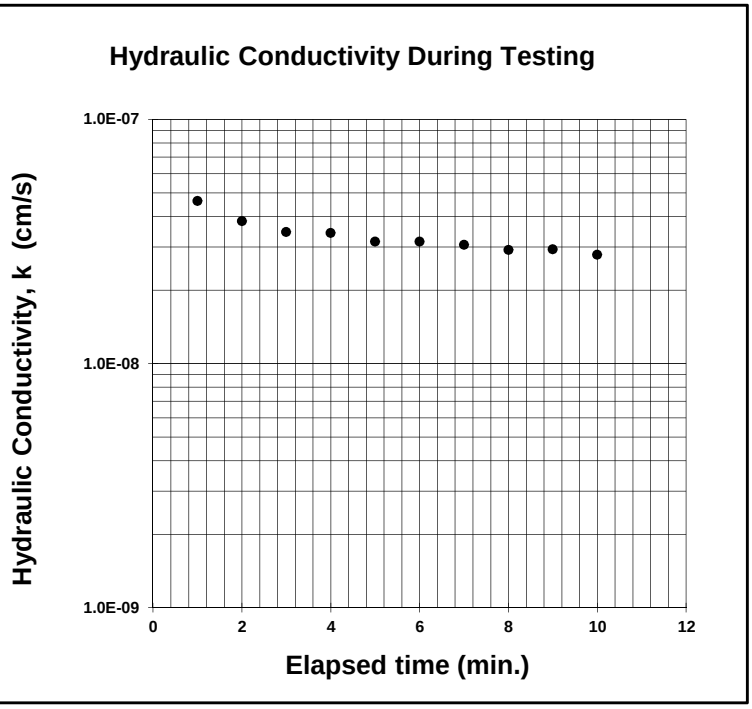
**CONSOLIDATION PHASE**

| | |
|---|---|
| Cell Pressure(kPa) | 130 |
| Top Cap Pressure(kPa) | 110 |
| Bottom Cap Pressure(kPa) | 110 |
| Consolidation Pressure(kPa) | 20 |

**HYDRAULIC CONDUCTIVITY PHASE**

| | |
|---|---|
| Cell Pressure (kPa) | 150 |
| Top Cap Pressure (kPa) | 130 |
| Bottom Cap Pressure(kPa) | 110 |
| Hydraulic Gradient | 18.1 |




**Hydraulic Conductivity (cm/s) = 3.2E-08**

Reviewed by:

Stantec

## Moisture - Density Relationship Report

☑ ASTM Designation: D698
☐ ASTM Designation: D1557

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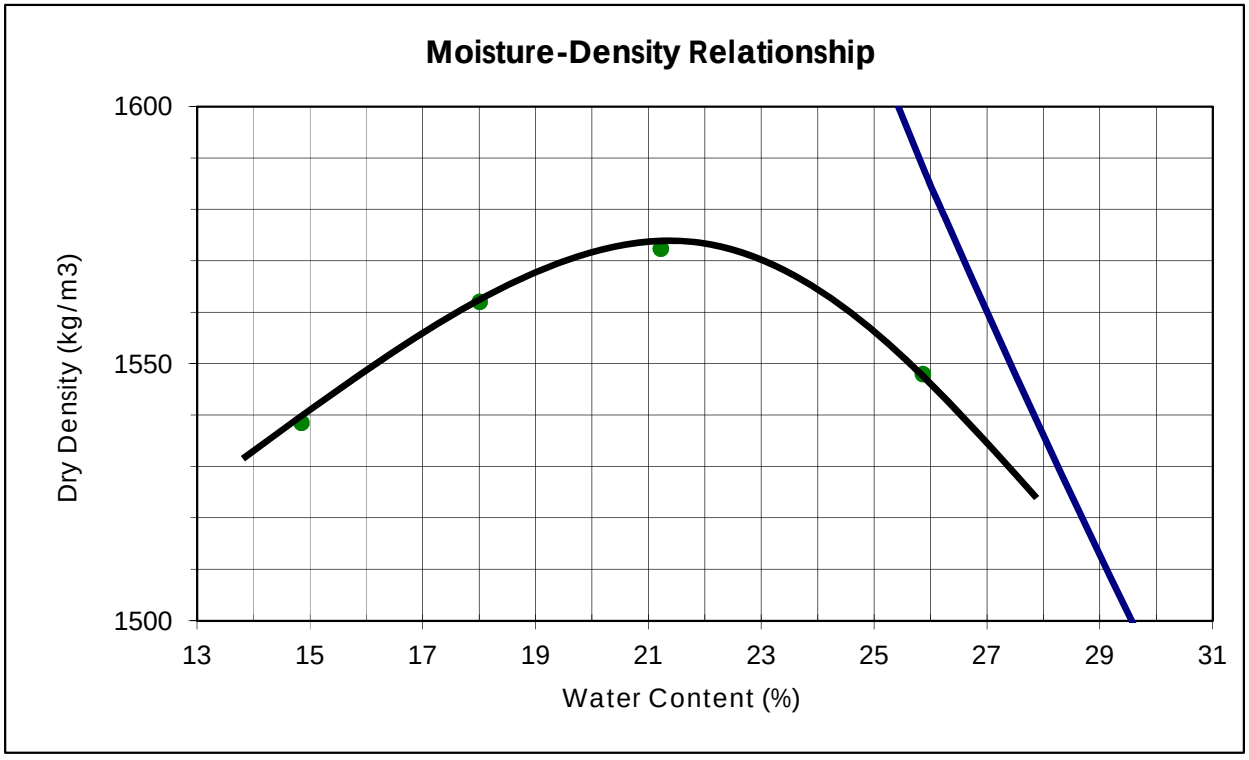
Tel: (403) 253-7876
Fax: (403) 253-0021

Client: Alberta Transportation
Project Name: SR1
Project No.: 110773396.302.702.240

Date Sampled: June 8, 2016
Date Tested: August 16, 2016
Tested By: M.Boudreau

| TRIAL No. | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| DRY DENSITY (kg/m3) | 1538 | 1562 | 1572 | 1548 |
| MOISTURE CONTENT (%) | 14.9 | 18.0 | 21.2 | 25.9 |

**Source of Sample:** GW5 BSA
**Visual Soil Description:** Brown Clay (CH)
**Maximum Dry Density (kg/m3):** 1575kg/m3
**Optimum M.C. (%):** 21.5%
**Natural M.C.(%):** 22.0%






Reviewed by:

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

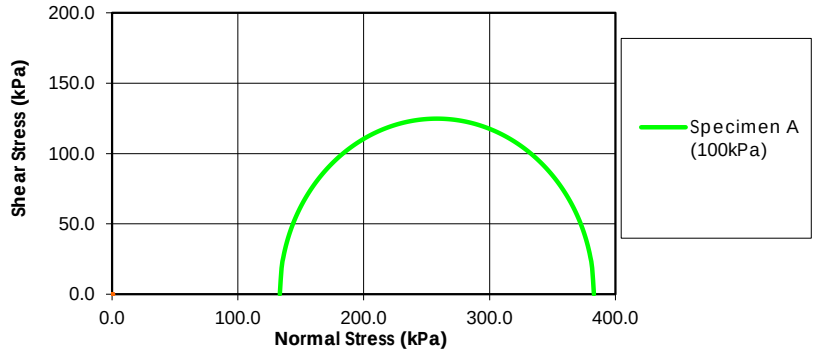
Stantec

Reviewed By C. Lamoureux

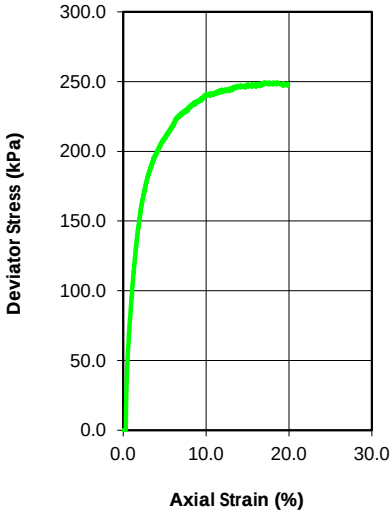
Date: 17-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 19.5 | | | |
| Dry Density (g/cm3) | 1.792 | | | |
| Saturation (%) | 103.86 | | | |
| Void Ratio | 0.507 | | | |
| Diameter (mm) | 72.000 | | | |
| Height (mm) | 145.500 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.98 | | | |
| Water Content (%) | 18.5 | | | |
| Dry Density (g/cm3) | 1.865 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.448 | | | |
| Effective Stress (kPa) | 99.0 | | | |
| Back Press. (kPa) | 131.0 | | | |
| Rate of Strain | 0.02 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

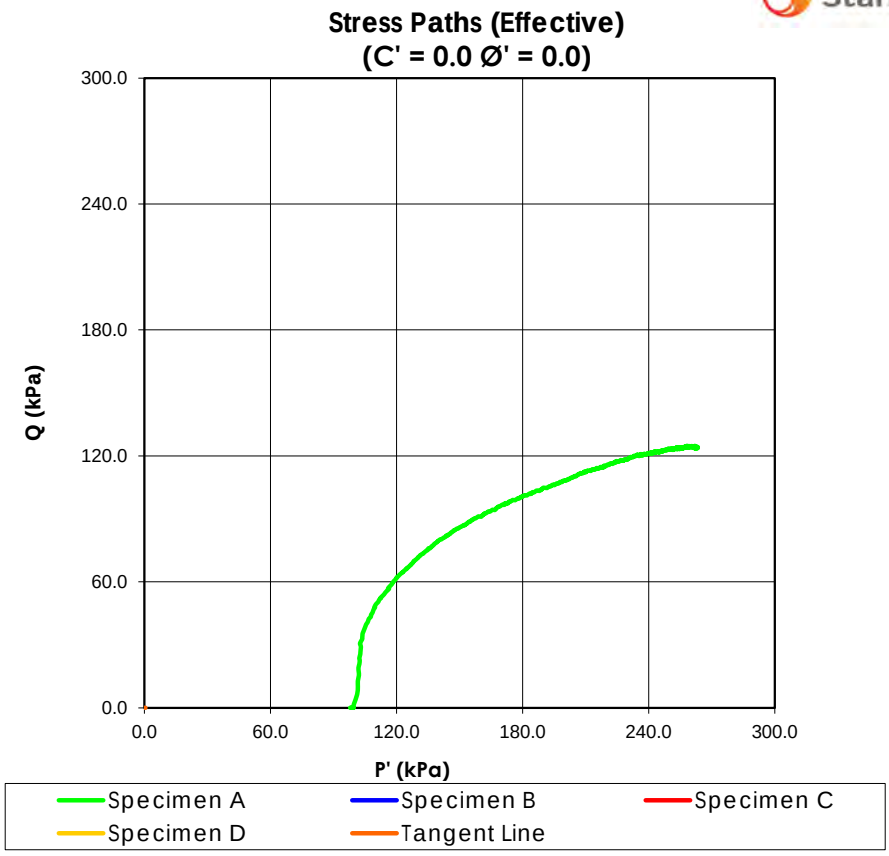
| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 382.89 | | | |
| σ'3 at Failure (kPa) | 133.33 | | | |
| | | | | |
| | | | | |

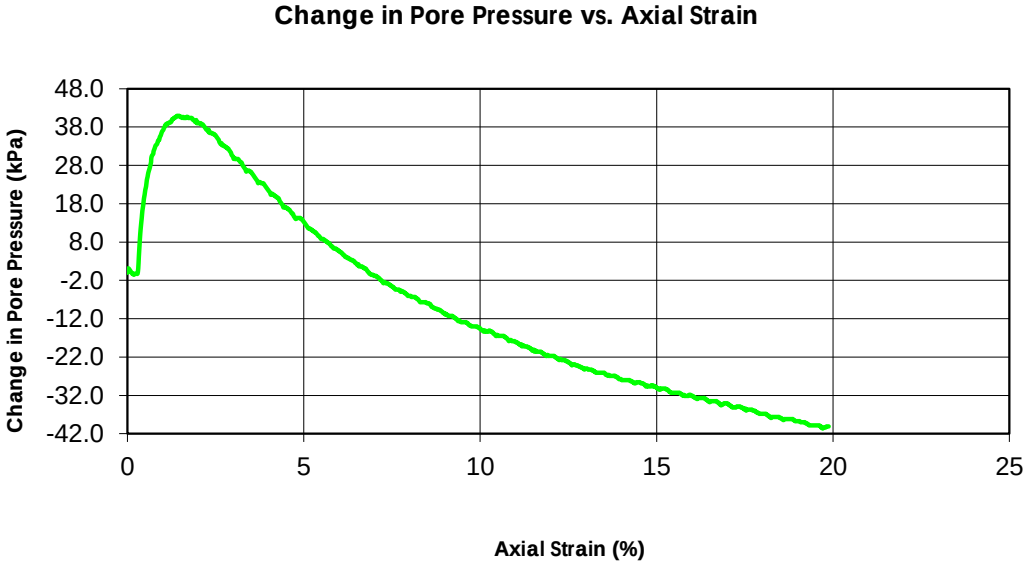
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.240 |
| **Boring Number:** | - |
| **Sample Number:** | GW5 ST4 |
| **Depth:** | 3.00-3.45m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brpwm Clay, trace sand, trace gravel |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

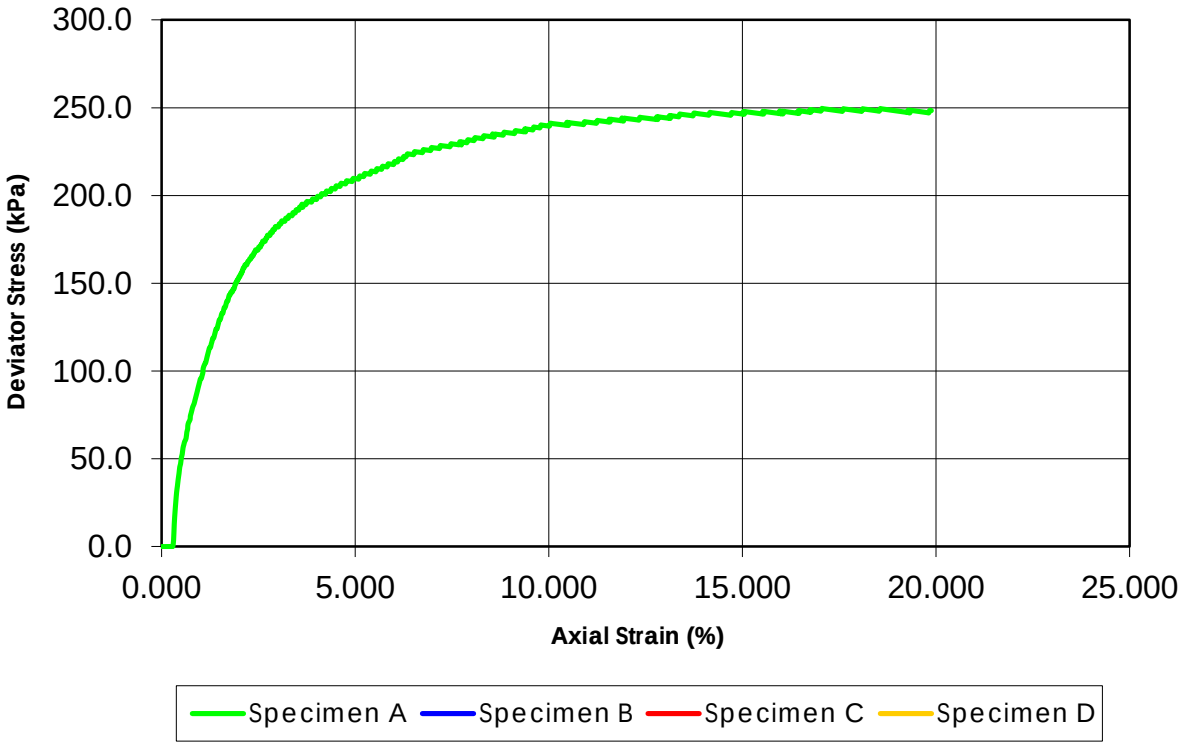
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

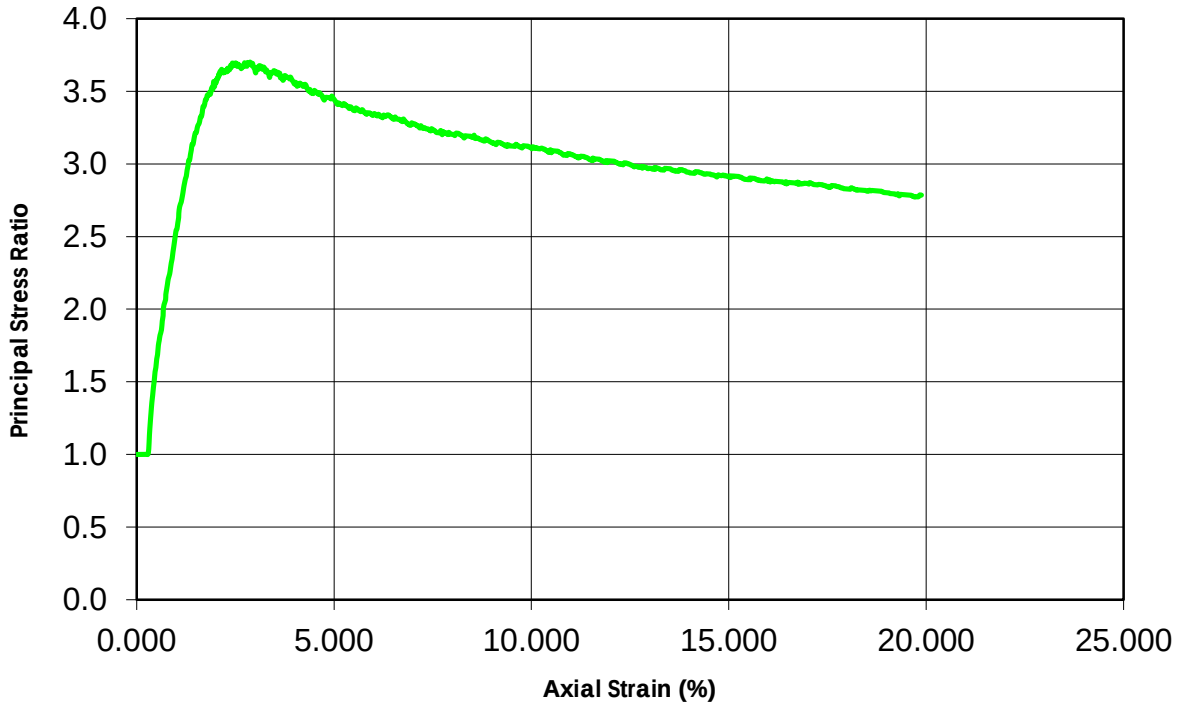


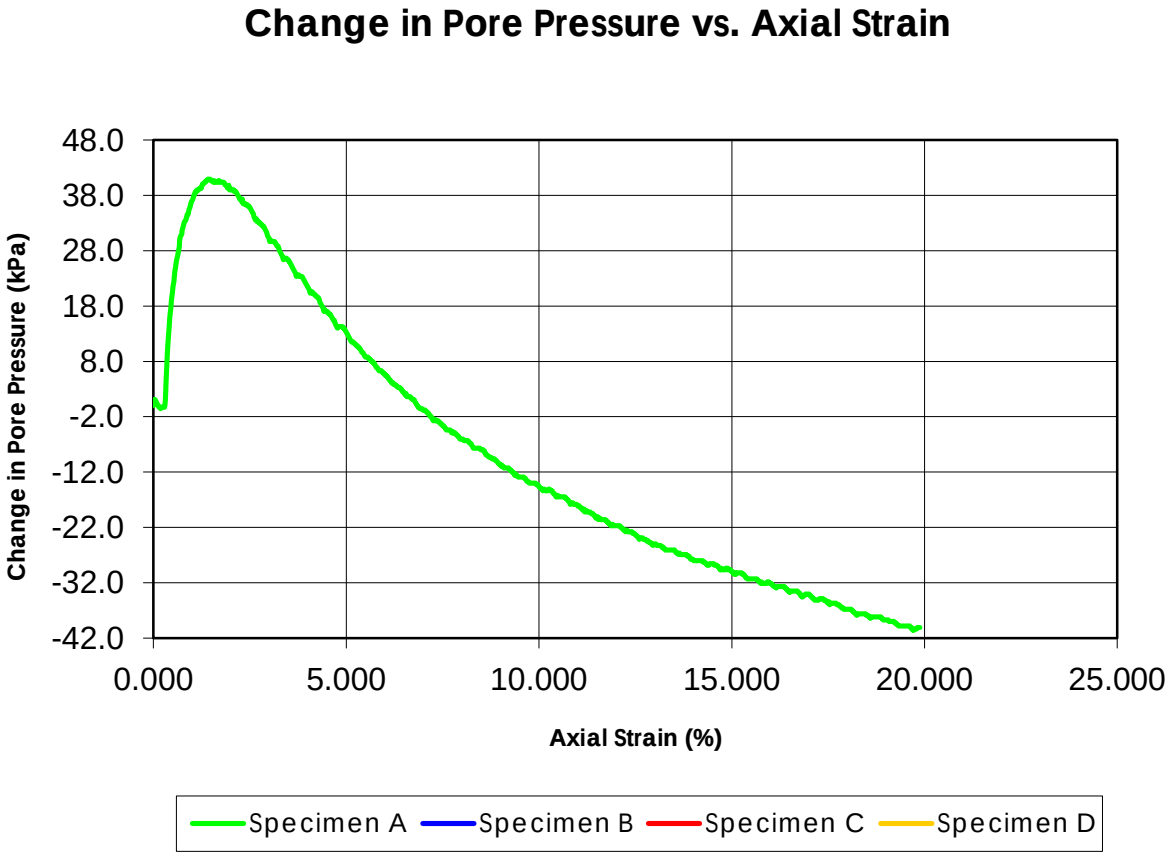



## Deviator Stress vs. Axial Strain



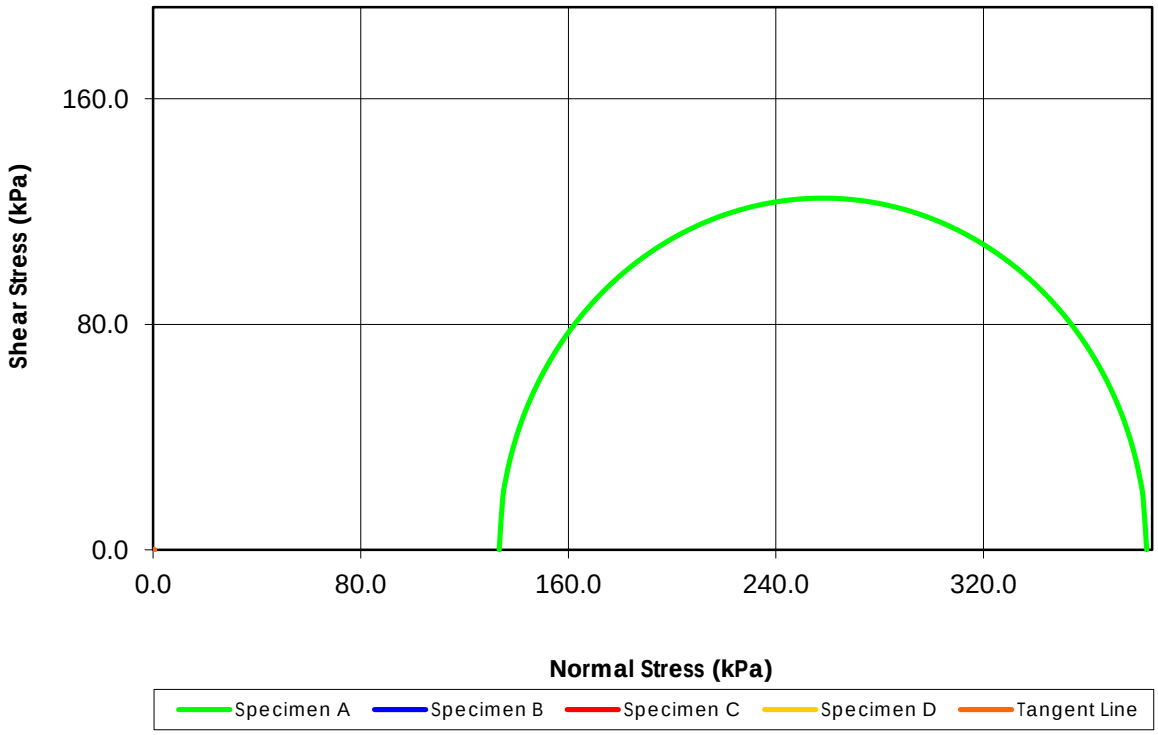

## Principal Stress Ratio vs. Axial Strain



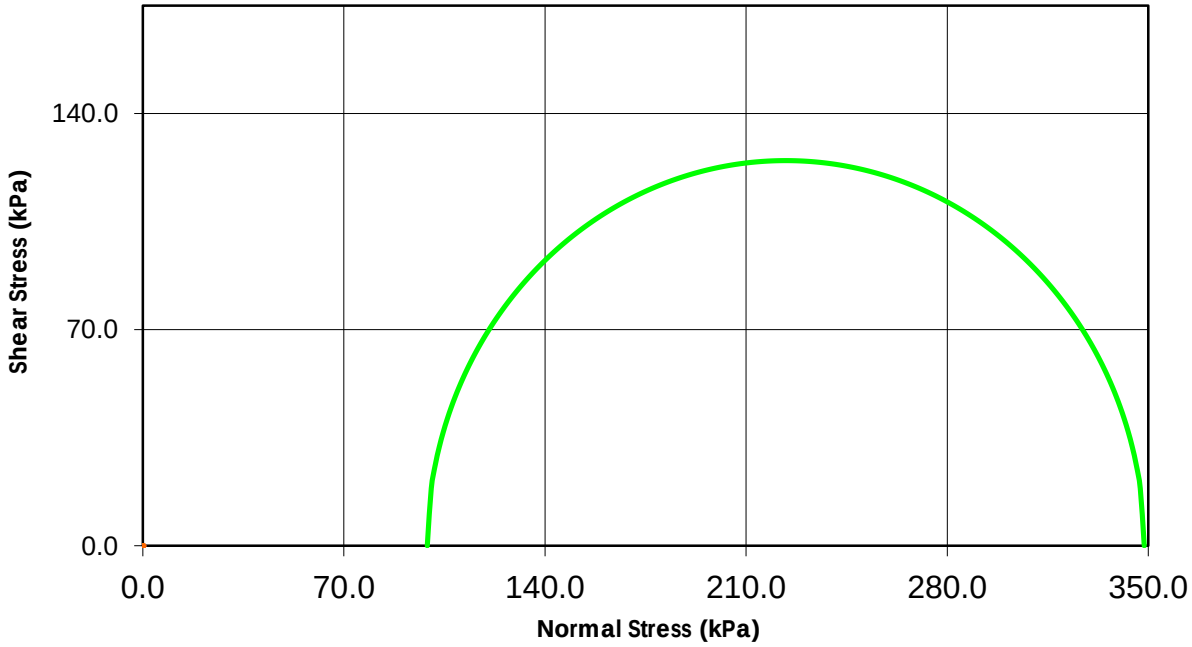

Change in Pore Pressure vs. Axial Strain
Change in Pore Pressure (kPa)
48.0
38.0
28.0
18.0
8.0
-2.0
-12.0
-22.0
-32.0
-42.0
0.000
5.000
10.000
15.000
20.000
25.000
Axial Strain (%)
Specimen A
Specimen B
Specimen C
Specimen D

## Mohr Stress Circles at Maximum Deviator Stress Criterion

### Effective Stress
### (C' = 0.0 Ø' = 0.0)

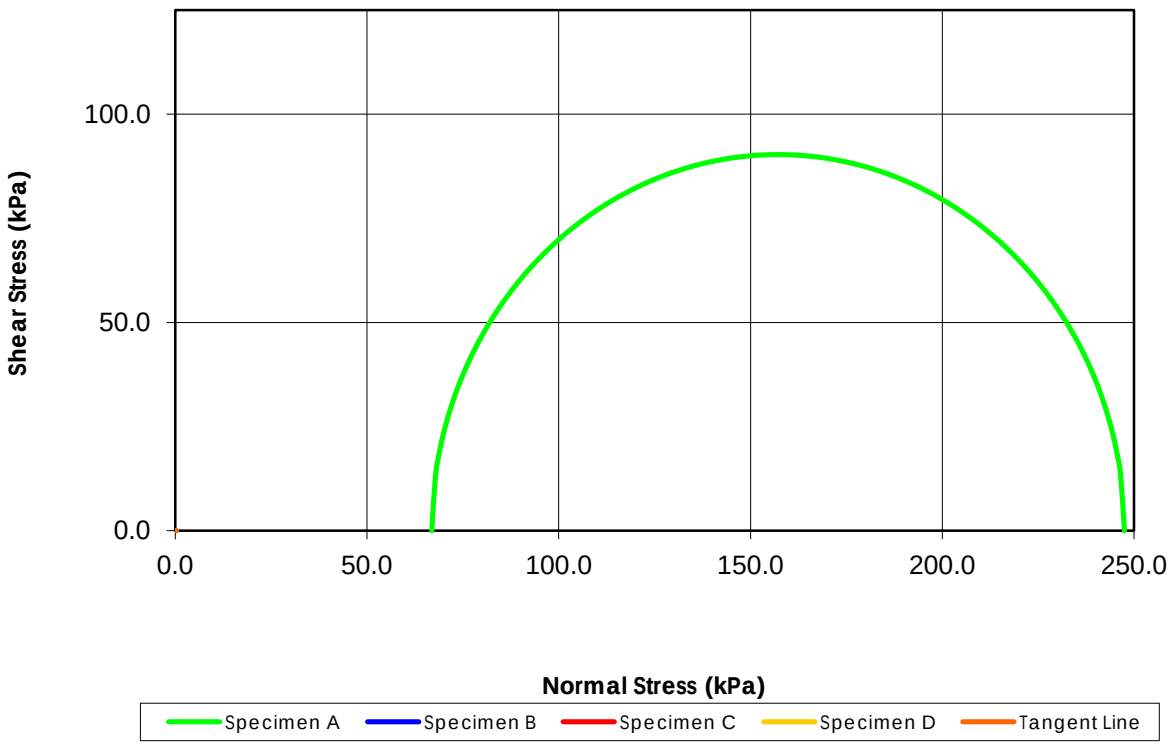



### Total Stress
### (C = 0.0 Ø = 0.0)

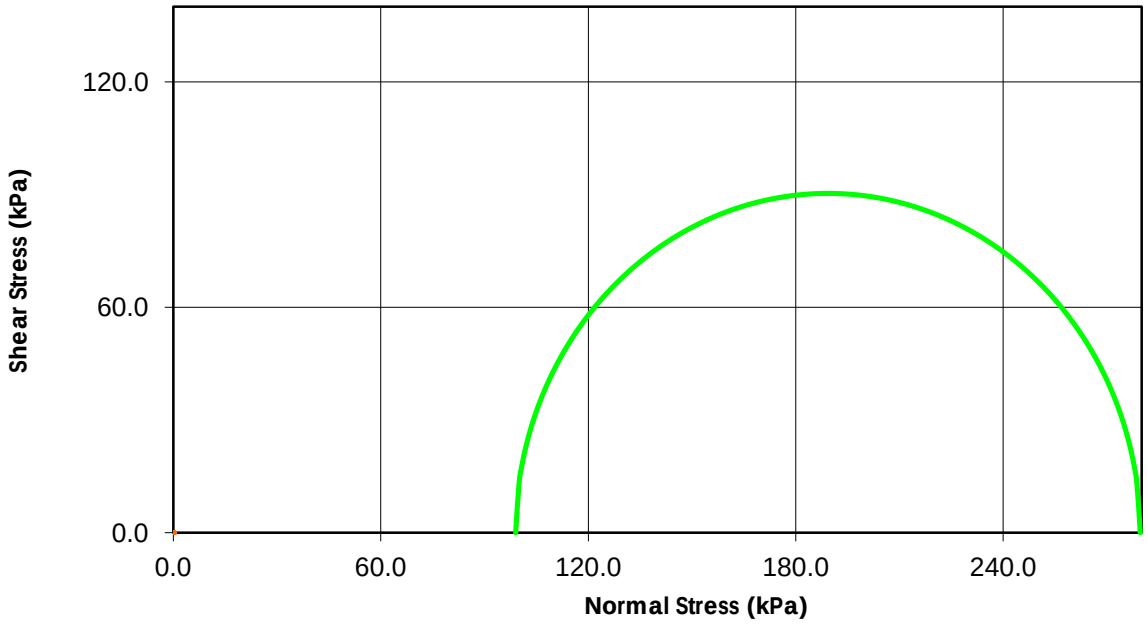


# Mohr Stress Circles at Maximum Principal Stress Ratio Criterion

## Effective Stress
## (C' = 0.0 Ø' = 0.0)

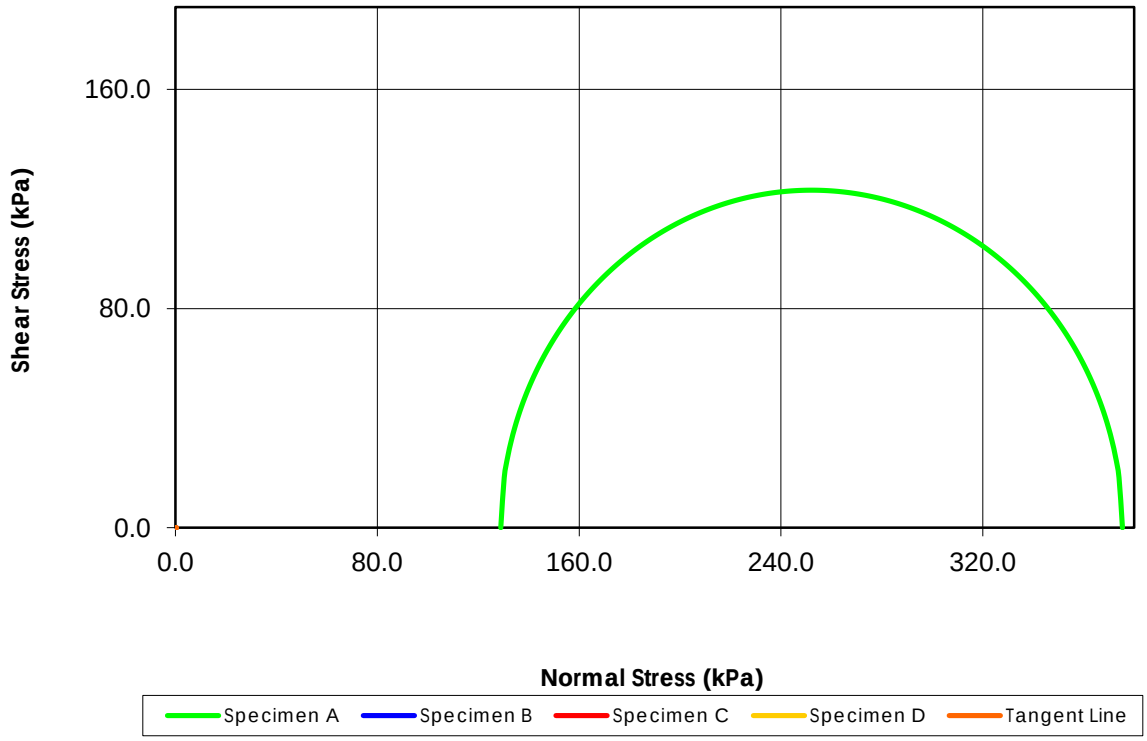



## Total Stress
## (C = 0.0 Ø = 0.0)

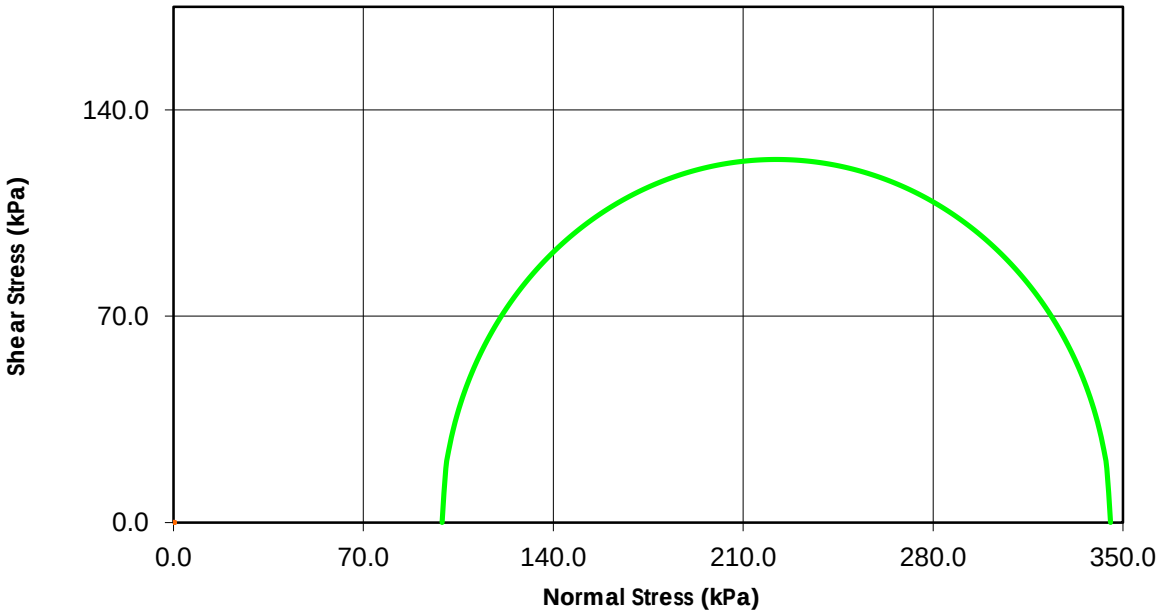


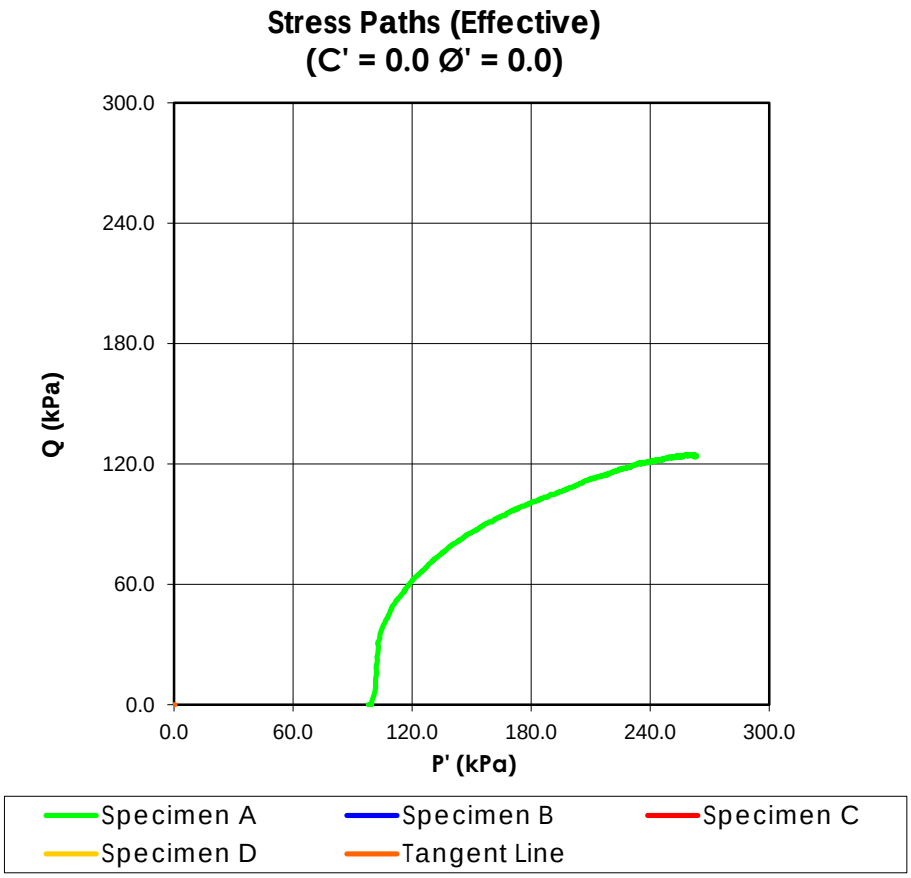
# Mohr Stress Circles at 15% Axial Strain Criterion

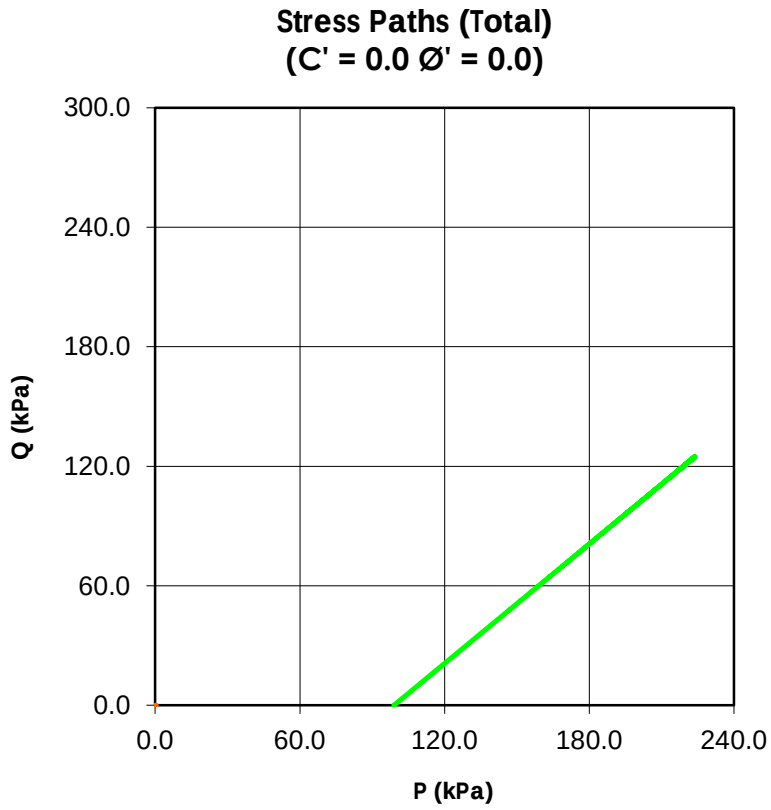
## Effective Stress
## (C' = 0.0 Ø' = 0.0)




## Total Stress
## (C = 0.0 Ø = 0.0)

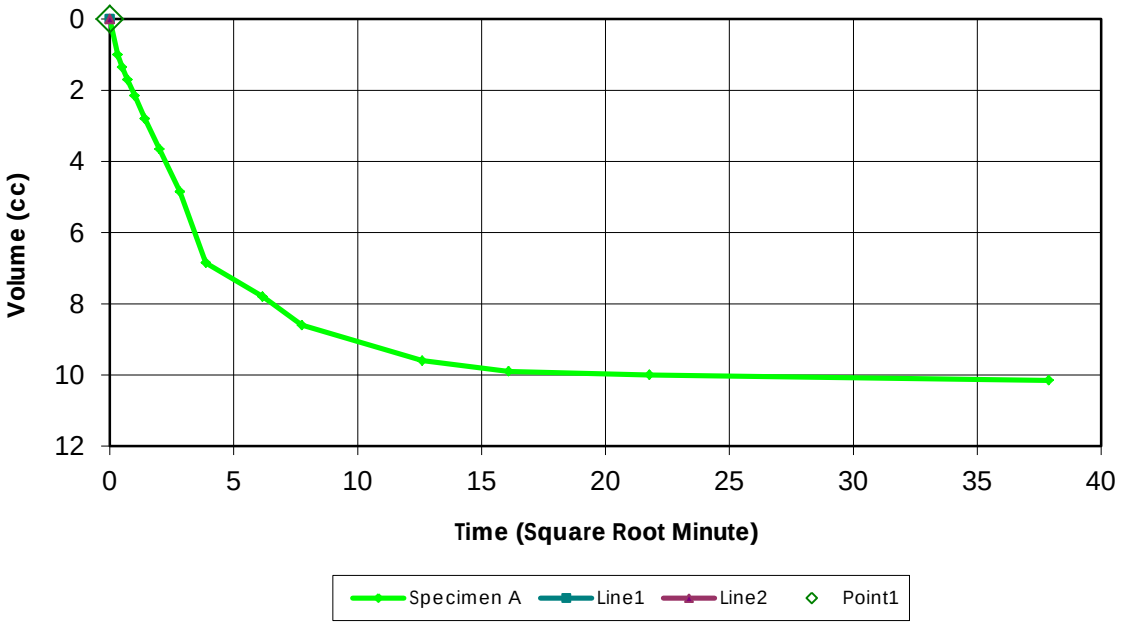



Stress Paths (Effective)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
300.0
P' (kPa)
Specimen A
Specimen B
Specimen C
Specimen D
Tangent Line

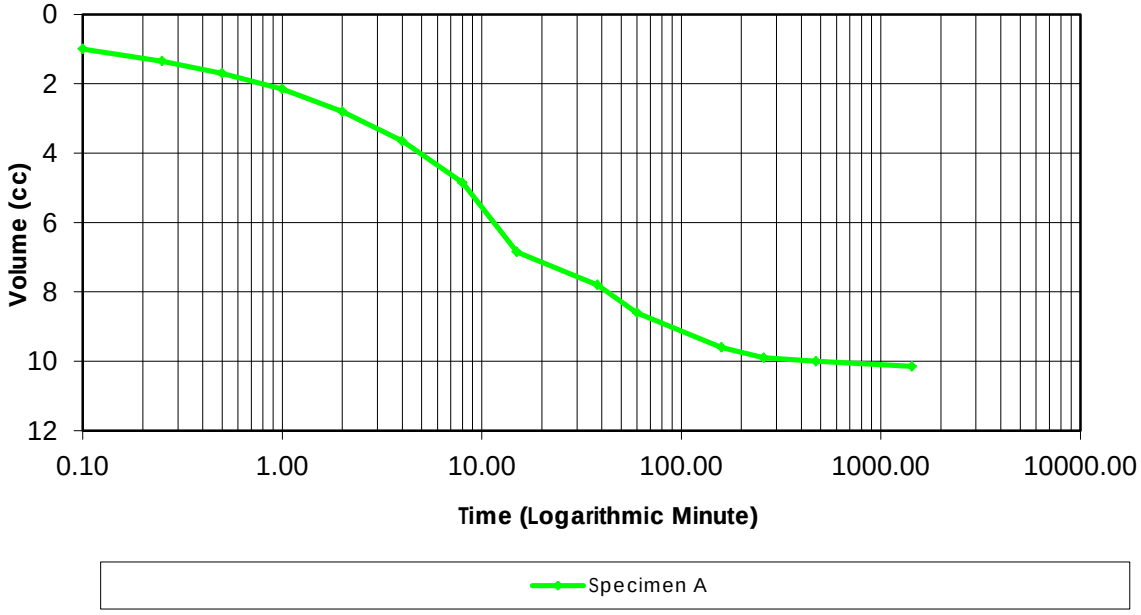

Stress Paths (Total)
(C' = 0.0 Ø' = 0.0)
300.0
240.0
180.0
120.0
60.0
0.0
Q (kPa)
0.0
60.0
120.0
180.0
240.0
P (kPa)

# Specimen A Consolidation Graphs

## Consolidation Graph (Square Root Time)




## Consolidation Graph (Logarithmic Time)



# B-Value Calculations - Specimen A
## CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.7

Project Name: SR1

Project Location:

Hole No. 0  B-Value: 0.98

| Reading No. | Sample Pressure (kPa) | Chamber Pressure (kPa) | Pore Pressure Change (kPa) | Chamber Pressure Change (kPa) | B-Value |
|---|---|---|---|---|---|
| 0 | 80.0 | 60.0 | N/A | N/A | N/A |
| 1 | 80.0 | 60.0 | 0.0 | 0.0 | |
| 2 | 150.0 | 60.0 | 70.0 | 0.0 | 89.00 |
| 3 | 150.0 | 130.0 | 0.0 | 70.0 | |
| 4 | 150.0 | 130.0 | 0.0 | 0.0 | |
| 5 | 220.0 | 130.0 | 70.0 | 0.0 | 98.00 |
| | | | | | |

Laboratory Supervisor

# Consolidation Calculations Specimen A

CU Triaxial Test

Stantec Consulting Ltd.

Client: Alberta Transportation  Project No. 110773396.302.702.240

Project Name: SR1

Project Location:

Hole No. 0  Depth: 3.00-3.45m

| | |
|---|---|
| Cell Pressure (kPa) | 230 |
| Back Pressure (kPa) | 130 |
| Effective Pressure (kPa) | 100 |

Test Type = CU

| | |
|---|---|
| Initial Sample Diameter (mm) | 72 |
| Initial Sample Height (mm) | 145.5 |
| Initial Sample Area (cm2) | 40.72 |
| Initial Volume (cm3) | 592.4 |

Burrette Reading at Start of Test (cc)= 0

| Time | Burrette Reading (cc) | Volume Change (cc) |
|---|---|---|
| 00:00:00 | 44.60 | N/A |
| 00:00:06 | 43.60 | 1.000 |
| 00:00:15 | 43.25 | 1.350 |
| 00:00:30 | 42.90 | 1.700 |
| 00:01:00 | 42.45 | 2.150 |
| 00:02:00 | 41.80 | 2.800 |
| 00:04:00 | 40.95 | 3.650 |
| 00:08:00 | 39.75 | 4.850 |
| 00:15:00 | 37.75 | 6.850 |
| 00:38:00 | 36.80 | 7.800 |
| 01:00:00 | 36.00 | 8.600 |
| 02:39:00 | 35.00 | 9.600 |
| 04:19:00 | 34.70 | 9.900 |
| 07:54:00 | 34.60 | 10.000 |
| 23:56:00 | 34.45 | 10.150 |
| | | |

Laboratory Supervisor

## Stantec Consulting Ltd.

### Consolidated Undrained Triaxial Test (ASTM D4767)

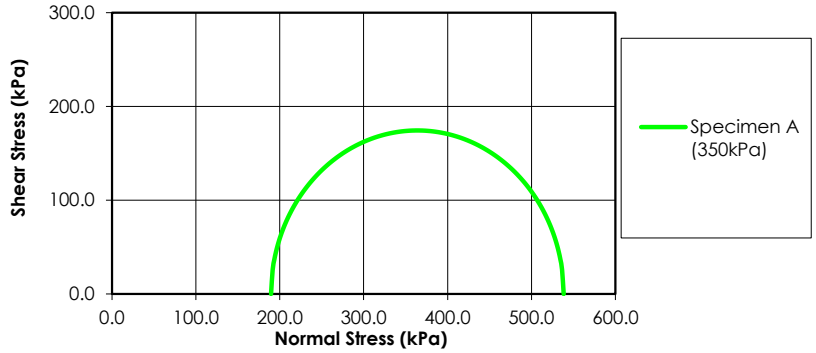
Stantec

Reviewed By C. Lamoureux

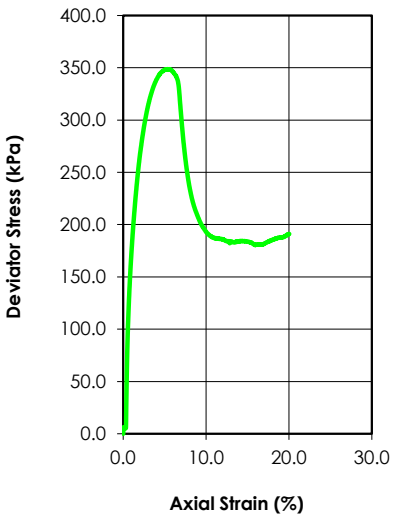
Date: 19-Aug-16

Tested By: C. Oost

**Effective Stress at Maximum Deviator Stress Criterion**




**Deviator Stress Vs. Axial Strain**




| Initial | Specimen A | B | C | D |
|---|---|---|---|---|
| Water Content (%) | 27.5 | | | |
| Dry Density (g/cm3) | 1.567 | | | |
| Saturation (%) | 102.86 | | | |
| Void Ratio | 0.723 | | | |
| Diameter (mm) | 71.500 | | | |
| Height (mm) | 152.300 | | | |
| Specific Gravity | 2.70 | | | |
| Liquid Limit | - | | | |
| Plastic Limit | - | | | |
| **After Consolidation** | **A** | **B** | **C** | **D** |
| B-Value | 0.95 | | | |
| Water Content (%) | 23.7 | | | |
| Dry Density (g/cm3) | 1.686 | | | |
| Saturation (%) | 100.00 | | | |
| Void Ratio | 0.602 | | | |
| Effective Stress (kPa) | 341.1 | | | |
| Back Press. (kPa) | 88.9 | | | |
| Rate of Strain | 0.021 | | | |

| Maximium Deviator Stress Criterion | |
|---|---|
| C (kPa) | 0.0 |
| C' (kPa) | 0.0 |
| Ø (deg) | 0.0 |
| Ø' (deg) | 0.0 |

| After Shear | A | B | C | D |
|---|---|---|---|---|
| σ'1 at Failure (kPa) | 538.37 | | | |
| σ'3 at Failure (kPa) | 189.61 | | | |
| | | | | |
| | | | | |

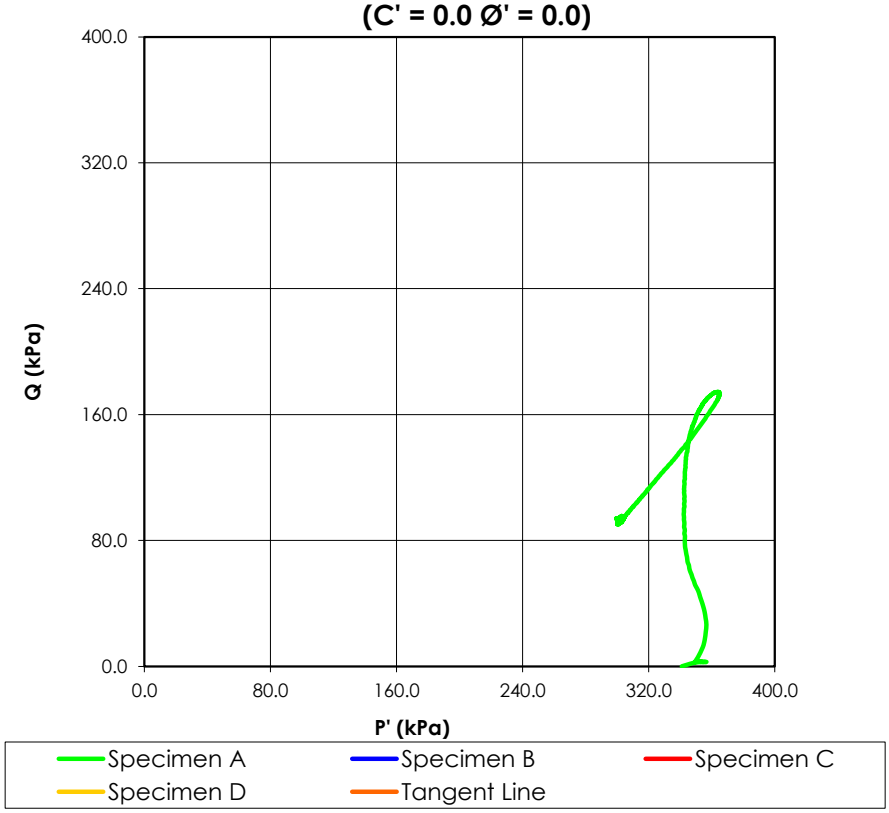
| | |
|---|---|
| **Project:** | SR1 |
| **Location:** | - |
| **Project Number:** | 110773396.302.702.240 |
| **Boring Number:** | - |
| **Sample Number:** | GW11 ST7 |
| **Depth:** | 2.70-3.15m |
| **Sample Type:** | Undisturbed |
| **Description:** | Brown Clay |
| **Test Type** | Consolidated Undrained |
| **Remarks** | |

**Stantec Consulting Ltd.**

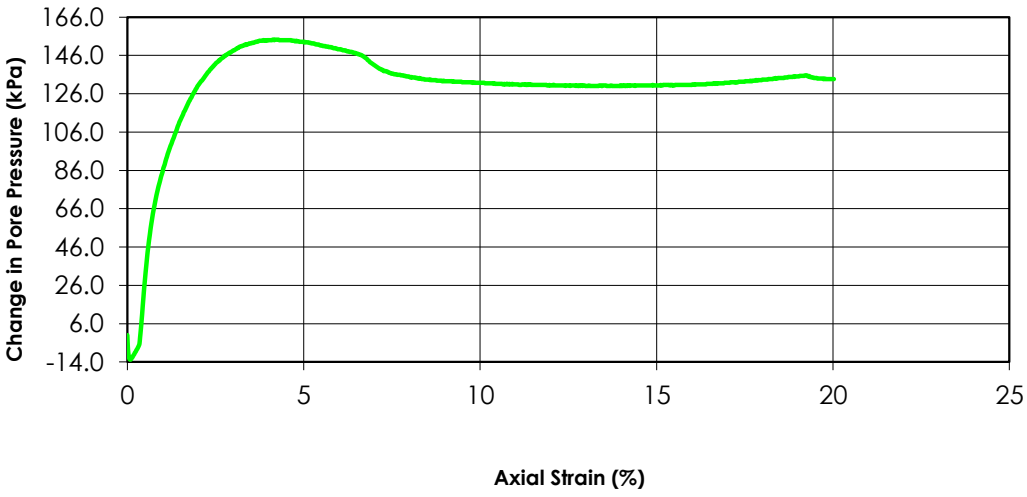
**Consolidated Undrained Triaxial Test (ASTM D4767)**

Stantec

## Stress Paths (Effective)
## (C' = 0.0 Ø' = 0.0)




## Change in Pore Pressure vs. Axial Strain



# E. 8

## Project Unit Weight Summary

Stantec

# Project Unit Weight Summary

| Borehole | Sample | Depth (m) | Insitu Density ($kg/m^3$) | Dry Density ($kg/m^3$) | Unit Weight ($kN/m^2$) |
|---|---|---|---|---|---|
| DC1 | ST3 | 3.0-3.3 | 1731 | 1479 | 17.0 |
| DC2 | ST4 | 3.0-3.5 | 1853 | 1681 | 18.2 |
| DC4 | ST3 | 1.5-2.0 | 1842 | 1643 | 18.1 |
| DC8 | ST2 | 1.5-2.1 | 1693 | 1413 | 16.6 |
| DC8 | ST5 | 3.0-3.6 | 1596 | 1420 | 15.7 |
| DC14 | ST2 | 1.5-1.95 | 1737 | 1388 | 17.0 |
| DC14 | ST4 | 3.0-3.45 | 1825 | 1454 | 17.9 |
| DC15 | ST4 | 3.0-3.5 | 1777 | 1423 | 17.4 |
| DC18 | ST2 | 1.5-2.1 | 1708.9 | 2264.3 | 16.8 |
| DC18 | ST5 | 3.0-3.6 | 1985 | 1721 | 19.5 |
| DC19 | ST2 | 1.5-2.0 | 1713 | 1320 | 16.8 |
| DC19 | ST5 | 3.0-3.5 | 1810 | 1449 | 17.8 |
| DC21 | ST2 | 1.5-2.1 | 1724 | 1348 | 16.9 |
| DC21 | ST5 | 3.0-3.5 | 1852 | 1625 | 18.2 |
| DC22 | ST5 | 3.0-3.5 | 1809 | 1403 | 17.7 |
| DC24 | ST6 | 2.7-3.2 | 1746 | 1559 | 17.1 |
| DC25 | ST2 | 1.5-2.1 | 1773 | 1423 | 17.4 |
| DC25 | ST05 | 3.0-3.6 | 1665 | 1276 | 16.3 |
| DC27 | ST2 | 1.5-2.1 | 1870 | 1603 | 18.3 |
| DC27 | ST5 | 3.0-3.6 | 2001 | 1743 | 19.6 |
| DC30 | ST3 | 3.0-3.45 | 2002 | 1692 | 19.6 |
| DC32 | ST4 | 3.0-3.15 | 1961 | 1757 | 19.2 |
| DC33 | ST8 | 4.6-5.2 | 1960 | 1674 | 19.2 |
| DC34 | ST2 | 1.5-2.1 | 1653 | 1269 | 16.2 |
| DC34 | ST5 | 3.0-3.6 | 1774 | 1371 | 17.4 |
| DC34 | ST8 | 4.6-5.2 | 1813 | 1434 | 17.8 |

# Project Unit Weight Summary

| Borehole | Sample | Depth (m) | Insitu Density ($kg/m^3$) | Dry Density ($kg/m^3$) | Unit Weight ($kN/m^2$) |
|---|---|---|---|---|---|
| D2 | ST4 | 1.5-1.95 | 1763 | 1369 | 17.3 |
| D3 | ST2 | 0.9-1.35 | 1561 | 1308 | 15.3 |
| D3 | ST4 | 1.8-2.25 | 1747 | 1474 | 17.1 |
| D3 | ST6 | 2.7-3.15 | 1339 | 1208 | 13.1 |
| D5 | ST10 | 4.6-4.9 | 1603 | 1391 | 15.7 |
| D7 | ST6 | 2.3-2.8 | 1697 | 1356 | 16.6 |
| D8 | ST4 | 1.8-2.3 | 1717 | 1417 | 16.8 |
| D10 | ST8 | 3.0-3.5 | 1827 | 1487 | 17.9 |
| D11 | ST3 | 1.6-1.9 | 2549 | 2025 | 25.0 |
| D11 | ST8 | 4.3-4.8 | 1884 | 1444 | 18.5 |
| D11 | ST11 | 6.1-6.5 | 1909 | 1648 | 18.7 |
| D12 | ST6 | 2.7-3.2 | 1849 | 1448 | 18.1 |
| D12 | ST8 | 3.6-4.1 | 1942 | 1521 | 19.1 |
| D13 | ST4 | 1.5-2.11 | 1998 | 1609 | 19.6 |
| D13 | ST7 | 3.0-3.6 | 1694 | 1347 | 16.6 |
| D13 | ST14 | 6.1-6.7 | 1832 | 1433 | 18.0 |
| D13 | ST21 | 9.1-9.7 | 1919 | 1672 | 18.8 |
| D14 | ST11 | 4.6-5.1 | 1869 | 1462 | 18.3 |
| D16 | ST3 | 3.0-3.45 | 1848 | 1483 | 18.1 |
| D16 | ST5 | 4.6-5.0 | 1902 | 1505 | 18.7 |
| D17 | ST2 | 0.9-1.35 | 1808 | 1428 | 17.7 |
| D17 | ST4 | 1.8-2.25 | 1914 | 1516 | 18.8 |
| D17 | ST8 | 3.6-4.05 | 1880 | 1490 | 18.4 |
| D17 | ST10 | 4.5-4.95 | 1876 | 1466 | 18.4 |
| D17 | ST20 | 10.7-11.15 | 2081 | 1757 | 20.4 |
| D18 | ST14 | 6.4-6.85 | 1910 | 1530 | 18.7 |

# Project Unit Weight Summary

| Borehole | Sample | Depth (m) | Insitu Density ($kg/m^3$) | Dry Density ($kg/m^3$) | Unit Weight ($kN/m^2$) |
|---|---|---|---|---|---|
| D19 | ST6 | 3.0-3.5 | 1721 | 1351 | 16.9 |
| D19 | ST12 | 6.1-6.6 | 1758 | 1429 | 17.2 |
| D19 | ST21 | 9.9-10.3 | 2041 | 1979 | 20.0 |
| D19 | ST28 | 12.2-12.7 | 1864 | 1621 | 18.3 |
| D20 | ST6 | 2.7-3.2 | 2010 | 1563 | 19.7 |
| D20 | ST8 | 3.6-4.1 | 1818 | 1378 | 17.8 |
| D20 | ST10 | 4.5-5.0 | 1816 | 1430 | 17.8 |
| D20 | ST12 | 5.4-6.0 | 2079 | 1647 | 20.4 |
| D27 | ST4 | 1.7-2.03 | 1805 | 1478 | 17.7 |
| D27 | ST8 | 3.5-3.94 | 1888 | 1523 | 18.5 |
| D27 | ST10 | 4.40-4.71 | 1882 | 1494 | 18.5 |
| D27 | ST17 | 9.10-9.56 | 1815 | 1451 | 17.8 |
| D27 | ST22 | 12.2-12.7 | 1906 | 1575 | 18.7 |
| D28 | ST4 | 1.7-2.2 | 1952 | 1536 | 19.1 |
| D28 | ST6 | 2.6-3.03 | 1770 | 1419 | 17.4 |
| D28 | ST8 | 3.5-3.92 | 1724 | 1422 | 16.9 |
| D28 | ST10 | 4.4-4.87 | 1724 | 1378 | 16.9 |
| D28 | ST15 | 9.1-9.63 | 1901 | 1512 | 18.6 |
| D30 | ST2 | 0.80-1.25 | 1822 | 1472 | 17.9 |
| D30 | ST4 | 1.70-2.15 | 1787 | 1503 | 17.5 |
| D30 | ST6 | 2.6-3.1 | 1921 | 1609 | 18.8 |
| D30 | ST8 | 3.50-3.95 | 1925 | 1594 | 18.9 |
| D30 | ST10 | 4.40-4.85 | 1811 | 1505 | 17.8 |
| D30 | ST15 | 7.60-8.05 | 1586 | 1303 | 15.6 |

# Project Unit Weight Summary

| Borehole | Sample | Depth (m) | Insitu Density ($kg/m^3$) | Dry Density ($kg/m^3$) | Unit Weight ($kN/m^2$) |
|---|---|---|---|---|---|
| D36 | ST2 | 0.9-1.35 | 1721 | 1353 | 16.9 |
| D36 | ST4 | 1.8-2.3 | 1778 | 1457 | 17.4 |
| D36 | ST6 | 2.70-3.15 | 1914 | 1508 | 18.8 |
| D36 | ST8 | 3.60-4.05 | 1815 | 1433 | 17.8 |
| D36 | ST10 | 4.50-4.95 | 2425 | 2002 | 23.8 |
| D42 | ST2 | 0.8-1.3 | 1342 | 1071 | 13.2 |
| D42 | ST4 | 1.8-2.3 | 2508 | 2045 | 24.6 |
| D42 | ST6 | 2.8-3.3 | 1795 | 1473 | 17.6 |
| D42 | ST8 | 3.8-4.2 | 1895 | 1613 | 18.6 |
| D45 | ST2 | 0.9-1.35 | 1765 | 1365 | 17.3 |
| D46 | ST4 | 1.8-2.1 | 1876 | 1673 | 18.4 |
| D48 | ST2 | 3.8-4.3 | 1731 | 1526 | 17.0 |
| D48 | ST11 | 7.60-7.85 | 1608 | 1445 | 15.8 |
| D51 | ST6 | 2.70-3.15 | 1810 | 1530 | 17.8 |
| D51 | ST8 | 3.6-4.2 | 1655 | 1397 | 16.2 |
| D52 | ST2 | 0.8-1.2 | 1650 | 1456 | 16.2 |
| D53 | ST2 | 1.5-2.1 | 1849 | 1499 | 18.1 |
| D53 | ST5 | 3.0-3.6 | 1758 | 1380 | 17.2 |
| D28 | ST2 | 1.5-2.1 | 2561 | 2096 | 25.1 |
| D58 | ST5 | 3.0-3.6 | 1927 | 1542 | 18.9 |
| D58 | ST21 | 13.7-14.3 | 1635 | 1338 | 16.0 |
| D59 | ST2 | 0.8-1.4 | 1772 | 1456 | 17.4 |
| D59 | ST4 | 1.60-1.94 | 1782 | 1452 | 17.5 |
| D59 | ST6 | 2.40-2.89 | 1655 | 1358 | 16.2 |
| D59 | ST8 | 3.40-3.81 | 1782 | 1432 | 17.5 |
| D59 | ST10 | 4.30-4.77 | 1887 | 1512 | 18.5 |
| D59 | ST13 | 6.1-6.5 | 1832 | 1490 | 18.0 |
| D59 | ST16 | 7.6-8.1 | 1736 | 1407 | 17.0 |

# Project Unit Weight Summary

| Borehole | Sample | Depth (m) | Insitu Density ($kg/m^3$) | Dry Density ($kg/m^3$) | Unit Weight ($kN/m^2$) |
|---|---|---|---|---|---|
| D60 | ST4 | 1.7-2.2 | 1705 | 1364 | 16.7 |
| D60 | ST6 | 2.6-3.05 | 1823 | 1400 | 17.9 |
| D60 | ST8 | 3.5-4.0 | 1811 | 1420 | 17.8 |
| D60 | ST10 | 4.40-4.85 | 1906 | 1635 | 18.7 |
| D62 | ST2 | 1.50-1.95 | 1867 | 1589 | 18.3 |
| D62 | ST4 | 3.00-3.45 | 1625 | 1289 | 15.9 |
| D62 | ST6 | 4.60-5.15 | 2019 | 1760 | 19.8 |
| D62 | ST10 | 7.60-7.80 | 1755 | 1529 | 17.2 |
| D68 | ST2 | 0.80-1.25 | 1604 | 1254 | 15.7 |
| D68 | ST6 | 2.60-3.05 | 1818 | 1489 | 17.8 |
| D68 | ST10 | 4.40-4.85 | 2008 | 1740 | 19.7 |
| D68 | ST15 | 7.6-8.1 | 2059 | 1735 | 20.2 |
| GW12 | ST2 | 1.50-1.95 | 1784 | 1536 | 17.5 |
| GW12 | ST4 | 3.00-3.45 | 1727 | 1509 | 16.9 |
| BS1 | ST2 | 1.50-1.95 | 1873 | 1545 | 18.4 |
| H12 | ST5 | 3.5-4.0 | 1887 | 1519 | 18.5 |
| H13 | ST6 | 4.60-5.05 | 1663 | 1304 | 16.3 |
| H13 | ST11 | 7.6-8.1 | 1662 | 1325 | 16.3 |

# E. 9

## Chemical Analysis Testing Summary

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Your C.O.C. #: 1 of 1

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/05/02**
Report #: R2170585
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B631524**
**Received: 2016/04/27, 08:40**

Sample Matrix: Soil
# Samples Received: 2

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Moisture (1) | 1 | 2016/05/02 | 2016/05/02 | BBY8SOP-00017 | BC MOE Lab Manual |
| pH @25C (Soluble) | 1 | 2016/04/28 | 2016/04/29 | AB SOP-00033 / AB SOP-00006 | SM 22 4500 H+B m |
| Soluble Paste | 1 | 2016/04/28 | 2016/04/29 | AB SOP-00033 | Carter 2nd ed 15.2 m |
| Sulfide (AVS) (soil) (1) | 1 | 2016/04/29 | 2016/04/29 | BBY6SOP-00006 | SM 22 4500 S2- D m |
| Total Organic Carbon LECO Method | 1 | 2016/04/29 | 2016/04/29 | CAL SOP-00243 | LECO 203-821-165 m |

**Remarks:**

All Blank values are reported. Associated data are not blank corrected.
'MDL' = Method Detection Limit, '<' = Less than MDL, '---' Not Analyzed
Solids results are based on dry weight except Biota Analyses & Special Waste Oil & Grease
Organic analyses are not corrected for extraction recovery standards except for Isotope Dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)
All CCME results met required criteria unless otherwise stated in the report. All data on final reports are validated by technical personnel. Signature on file at the laboratory. Deviations from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method:
F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction
All Groundwater samples except BTEX/VOC's or Purgeable Hydrocarbons are decanted and/or filtered prior to analysis unless otherwise mandated by regulatory agency
All analysis data reported was generated when the analytical methods were in statistical control and criteria for spike recoveries, reference material recoveries, method blanks data and duplicate precision were met unless otherwise stated
This report shall not be reproduced except in full, without the written approval of the laboratory

Methods used by Maxxam are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', 22nd Edition, published by the American Public Health Association, or on US EPA, protocols found in the ' Test Methods for Evaluating Solid Waste, Physical/Chemical Method, SW846, 3rd Edition. Other procedures are based on the methodologies accepted by the appropriate regulatory agency. Methodology briefs are available by written request.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at Maxxam for a period of 60 days from receipt of data or as per contract.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Vancouver

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Your C.O.C. #: 1 of 1

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/05/02**
Report #: R2170585
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B631524**
**Received: 2016/04/27, 08:40**

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Wendy Sears, Project manager
Email: WSears@maxxam.ca
Phone# (403)735-2277

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



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Maxxam Job #: B631524
Report Date: 2016/05/02

STANTEC GEO-MATERIALS LABORATORY

## RESULTS OF CHEMICAL ANALYSES OF SOIL

| Maxxam ID | | ON2413 | ON2413 | ON2414 | | |
|---|---|---|---|---|---|---|
| Sampling Date | | | | | | |
| COC Number | | 1 of 1 | 1 of 1 | 1 of 1 | | |
| | UNITS | DC3 ST5 | DC3 ST5 Lab-Dup | DC3 SS6 | RDL | QC Batch |
| **MISCELLANEOUS** | | | | | | |
| Sulphide | ug/g | N/A | N/A | <0.50 | 0.50 | 8255756 |
| **Soluble Parameters** | | | | | | |
| Soluble pH | pH | 7.71 | 7.72 | N/A | N/A | 8255625 |
| Saturation % | % | 64 | 66 | N/A | N/A | 8254655 |

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable



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Maxxam Job #: B631524
Report Date: 2016/05/02

STANTEC GEO-MATERIALS LABORATORY

## PHYSICAL TESTING (SOIL)

| Maxxam ID | | ON2414 | | |
|---|---|---|---|---|
| Sampling Date | | | | |
| COC Number | | 1 of 1 | | |
| | UNITS | DC3 SS6 | RDL | QC Batch |
| **Physical Properties** | | | | |
| Moisture | % | 11 | 0.30 | 8257439 |
| RDL = Reportable Detection Limit | | | | |



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Maxxam Job #: B631524
Report Date: 2016/05/02

STANTEC GEO-MATERIALS LABORATORY

## MISCELLANEOUS (SOIL)

| Maxxam ID | | ON2413 | | |
|---|---|---|---|---|
| Sampling Date | | | | |
| COC Number | | 1 of 1 | | |
| | UNITS | DC3 ST5 | RDL | QC Batch |
| **Misc. Inorganics** | | | | |
| Total Organic Carbon (C) | % | 0.84 | 0.020 | 8255320 |
| RDL = Reportable Detection Limit | | | | |



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Maxxam Job #: B631524
Report Date: 2016/05/02

STANTEC GEO-MATERIALS LABORATORY

## GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|---|---|
| Package 1 | 15.3°C |

Sulphide samples submitted in bags. Possible loss of sulphide due to sampling container.

**Results relate only to the items tested.**



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Maxxam Job #: B631524
Report Date: 2016/05/02

## QUALITY ASSURANCE REPORT

STANTEC GEO-MATERIALS LABORATORY

| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | | QC Standard | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits | % Recovery | QC Limits |
| 8254655 | Saturation % | 2016/04/29 | | | | | | | 0.031 | 12 | 101 | 75 - 125 |
| 8255320 | Total Organic Carbon (C) | 2016/04/29 | | | 95 | 75 - 125 | <0.020 | % | NC | 35 | 100 | 75 - 125 |
| 8255625 | Soluble pH | 2016/04/29 | | | 99 | 97 - 103 | | | 0.13 | N/A | 98 | 98 - 102 |
| 8255756 | Sulphide | 2016/04/29 | 60 (1) | 75 - 125 | 101 | 75 - 125 | <0.50 | ug/g | NC | 30 | | |
| 8257439 | Moisture | 2016/05/02 | | | | | <0.30 | % | NC | 20 | | |

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



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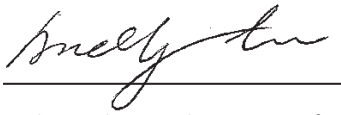
Maxxam Job #: B631524
Report Date: 2016/05/02

STANTEC GEO-MATERIALS LABORATORY

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist

Harry (Peng) Liang, Senior Analyst

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Your Project #: 110773396
Your C.O.C. #: 1 of 1

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/05/17**
Report #: R2182346
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B635608**
**Received: 2016/05/10, 08:40**

Sample Matrix: Soil
# Samples Received: 2

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Total Organic Carbon LECO Method | 2 | 2016/05/13 | 2016/05/14 | CAL SOP-00243 | LECO 203-821-165 m |

**Remarks:**

All Blank values are reported. Associated data are not blank corrected.
'MDL' = Method Detection Limit, '<' = Less than MDL, '---' Not Analyzed
Solids results are based on dry weight except Biota Analyses & Special Waste Oil & Grease
Organic analyses are not corrected for extraction recovery standards except for Isotope Dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)
All CCME results met required criteria unless otherwise stated in the report. All data on final reports are validated by technical personnel. Signature on file at the laboratory. Deviations from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method:
F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction
All Groundwater samples except BTEX/VOC's or Purgeable Hydrocarbons are decanted and/or filtered prior to analysis unless otherwise mandated by regulatory agency
All analysis data reported was generated when the analytical methods were in statistical control and criteria for spike recoveries, reference material recoveries, method blanks data and duplicate precision were met unless otherwise stated
This report shall not be reproduced except in full, without the written approval of the laboratory

Methods used by Maxxam are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', 22nd Edition, published by the American Public Health Association, or on US EPA, protocols found in the ' Test Methods for Evaluating Solid Waste, Physical/Chemical Method, SW846, 3rd Edition. Other procedures are based on the methodologies accepted by the appropriate regulatory agency. Methodology briefs are available by written request.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at Maxxam for a period of 60 days from receipt of data or as per contract.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.



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Your Project #: 110773396
Your C.O.C. #: 1 of 1

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/05/17**
Report #: R2182346
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B635608**
**Received: 2016/05/10, 08:40**

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Wendy Sears, Project manager
Email: WSears@maxxam.ca
Phone# (403)735-2277

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Success Through Science®

Maxxam Job #: B635608
Report Date: 2016/05/17

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396
Sampler Initials: CT

## MISCELLANEOUS (SOIL)

| Maxxam ID | | OP2989 | OP2990 | | |
|---|---|---|---|---|---|
| Sampling Date | | | | | |
| COC Number | | 1 of 1 | 1 of 1 | | |
| | UNITS | D6-RC25 | DC6-RC26 | RDL | QC Batch |
| **Misc. Inorganics** | | | | | |
| Total Organic Carbon (C) | % | 14 (1) | 7.2 (1) | 0.20 | 8268672 |

RDL = Reportable Detection Limit
(1) Detection limits raised based on sample weight used for analysis.



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Maxxam Job #: B635608
Report Date: 2016/05/17

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396
Sampler Initials: CT

## GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|---|---|
| Package 1 | 17.0°C |

**Results relate only to the items tested.**



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Maxxam Job #: B635608
Report Date: 2016/05/17

## QUALITY ASSURANCE REPORT

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396
Sampler Initials: CT

| | | | Spiked Blank | | Method Blank | | RPD | | QC Standard | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits | % Recovery | QC Limits |
| 8268672 | Total Organic Carbon (C) | 2016/05/14 | 95 | 75 - 125 | <0.020 | % | 6.3 | 35 | 111 | 75 - 125 |

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.



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Success Through Science®

Maxxam Job #: B635608
Report Date: 2016/05/17

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396
Sampler Initials: CT

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Harry (Peng) Liang, Senior Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



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Your Project #: B653854
Your C.O.C. #: 006

**Attention:Wendy Sears**

Maxxam Analytics
2021 41st Ave NE
Calgary, AB
T2E 6P2

**Report Date: 2016/07/19**
Report #: R4072583
Version: 3 - Revision

# CERTIFICATE OF ANALYSIS – REVISED REPORT

**MAXXAM JOB #: B6D9868**
**Received: 2016/07/07, 17:04**

Sample Matrix: Soil
# Samples Received: 2

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Reference |
|---|---|---|---|---|---|
| Oxidation-Reduction Potential (1) | 2 | 2016/07/07 | 2016/07/08 | SLA SOP-00101 | In house |

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Oxidation-Reduction Potential (ORP) values are determined using a Ag/AgCl reference electrode.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division
Email: GSison@maxxam.ca
Phone# (905) 569-7599
==========
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



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Success Through Science®

Maxxam Job #: B6D9868
Report Date: 2016/07/19

Maxxam Analytics
Client Project #: B653854

## RESULTS OF ANALYSES OF SOIL

| Maxxam ID | | CQX247 | CQX298 | |
|---|---|---|---|---|
| Sampling Date | | | | |
| COC Number | | 006 | 006 | |
| | UNITS | OY7112-02R\DC12 BS8 + SS9 | OY7113-02R\D2 ST4 | QC Batch |
| **Subcontracted Analysis** | | | | |
| Oxidation-Reduction Potential | mV | +102 | +103 | 4569431 |
| QC Batch = Quality Control Batch | | | | |



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Maxxam Job #: B6D9868
Report Date: 2016/07/19

Maxxam Analytics
Client Project #: B653854

## GENERAL COMMENTS

**Results relate only to the items tested.**



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Maxxam Job #: B6D9868
Report Date: 2016/07/19

Maxxam Analytics
Client Project #: B653854

## QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| 4569431 | PD1 | QC Standard | Oxidation-Reduction Potential | 2016/07/11 | | +248 | % | 238 - 248 |
| 4569431 | PD1 | Method Blank | Oxidation-Reduction Potential | 2016/07/11 | +94 | | mV | |
| 4569431 | PD1 | RPD [CQX298-01] | Oxidation-Reduction Potential | | 0 | | % | 20 |

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.



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Your Project #: 110773396
Your C.O.C. #: N/A

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/07/19**
Report #: R2218287
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B653854**
**Received: 2016/07/04, 09:53**

Sample Matrix: Soil
# Samples Received: 2

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Chloride (Soluble) | 1 | 2016/07/07 | 2016/07/08 | AB SOP-00033 / AB SOP-00020 | SM 22-4500-Cl G m |
| Resistivity | 2 | N/A | 2016/07/08 | AB WI-00065 | Auto Calc |
| Conductivity @25C (Soluble) | 2 | 2016/07/07 | 2016/07/08 | AB SOP-00033 / AB SOP-00004 | SM 22 2510 B m |
| Moisture (1) | 1 | 2016/07/07 | 2016/07/08 | BBY8SOP-00017 | BC MOE Lab Manual |
| pH @25C (Soluble) | 2 | 2016/07/07 | 2016/07/07 | AB SOP-00033 / AB SOP-00006 | SM 22 4500 H+B m |
| Soluble Ions | 2 | 2016/07/07 | 2016/07/11 | AB SOP-00033 / AB SOP-00042 | EPA 200.7 CFR 2012 m |
| Soluble Paste | 2 | 2016/07/07 | 2016/07/07 | AB SOP-00033 | Carter 2nd ed 15.2 m |
| Soluble Ions Calculation | 2 | N/A | 2016/07/07 | AB WI-00065 | Auto Calc |
| Sulfide (AVS) (soil) (1) | 1 | 2016/07/07 | 2016/07/08 | BBY6SOP-00006 | SM 22 4500 S2- D m |
| Total Organic Carbon LECO Method | 2 | 2016/07/07 | 2016/07/12 | CAL SOP-00243 | LECO 203-821-165 m |

**Remarks:**

All Blank values are reported. Associated data are not blank corrected.
'MDL' = Method Detection Limit, '<' = Less than MDL, '---' Not Analyzed
Solids results are based on dry weight except Biota Analyses & Special Waste Oil & Grease
Organic analyses are not corrected for extraction recovery standards except for Isotope Dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)
All CCME results met required criteria unless otherwise stated in the report. All data on final reports are validated by technical personnel. Signature on file at the laboratory. Deviations from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method:
F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction
All Groundwater samples except BTEX/VOC's or Purgeable Hydrocarbons are decanted and/or filtered prior to analysis unless otherwise mandated by regulatory agency
All analysis data reported was generated when the analytical methods were in statistical control and criteria for spike recoveries, reference material recoveries, method blanks data and duplicate precision were met unless otherwise stated
This report shall not be reproduced except in full, without the written approval of the laboratory

Methods used by Maxxam are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', 22nd Edition, published by the American Public Health Association, or on US EPA, protocols found in the ' Test Methods for Evaluating Solid Waste, Physical/Chemical Method, SW846, 3rd Edition. Other procedures are based on the methodologies accepted by the appropriate regulatory agency. Methodology briefs are available by written request.



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Your Project #: 110773396
Your C.O.C. #: N/A

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/07/19**
Report #: R2218287
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B653854**
**Received: 2016/07/04, 09:53**

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at Maxxam for a period of 60 days from receipt of data or as per contract.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Vancouver

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Wendy Sears, Project manager
Email: WSears@maxxam.ca
Phone# (403)735-2277

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



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Maxxam Job #: B653854
Report Date: 2016/07/19

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396

## RESULTS OF CHEMICAL ANALYSES OF SOIL

| Maxxam ID | | OY7112 | | OY7112 | OY7113 | | |
|---|---|---|---|---|---|---|---|
| Sampling Date | | | | | | | |
| | UNITS | DC12 BS8 + SS9 | RDL | DC12 BS8 + SS9 Lab-Dup | D2 ST4 | RDL | QC Batch |
| **Calculated Parameters** | | | | | | | |
| Resistivity @ 25 °C | ohm-m | 3.1 | 0.050 | N/A | 34 | 0.050 | 8318834 |
| Calculated Sulphate (SO4) | mg/kg | 1300 | 3.1 | N/A | 35 | 4.4 | 8318502 |
| **MISCELLANEOUS** | | | | | | | |
| Sulphide | ug/g | <0.50 | 0.50 | N/A | N/A | N/A | 8322195 |
| **Soluble Parameters** | | | | | | | |
| Soluble Chloride (Cl) | mg/L | <5.0 | 5.0 | N/A | N/A | N/A | 8324095 |
| Soluble Conductivity | dS/m | 3.2 | 0.020 | N/A | 0.30 | 0.020 | 8323846 |
| Soluble pH | pH | 7.69 | N/A | 7.66 | 8.06 | N/A | 8322689 |
| Saturation % | % | 62 | N/A | 64 | 87 | N/A | 8320949 |
| Soluble Sulphate (SO4) | mg/L | 2100 | 5.0 | N/A | 40 | 5.0 | 8323099 |

RDL = Reportable Detection Limit
Lab-Dup = Laboratory Initiated Duplicate
N/A = Not Applicable



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Maxxam Job #: B653854
Report Date: 2016/07/19

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396

## PHYSICAL TESTING (SOIL)

| Maxxam ID | | OY7112 | | |
|---|---|---|---|---|
| Sampling Date | | | | |
| | UNITS | DC12 BS8 + SS9 | RDL | QC Batch |
| **Physical Properties** | | | | |
| Moisture | % | 11 | 0.30 | 8323066 |
| RDL = Reportable Detection Limit | | | | |



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Maxxam Job #: B653854
Report Date: 2016/07/19

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396

## MISCELLANEOUS (SOIL)

| Maxxam ID | | OY7112 | OY7113 | | |
|---|---|---|---|---|---|
| Sampling Date | | | | | |
| | UNITS | DC12 BS8 + SS9 | D2 ST4 | RDL | QC Batch |
| **Misc. Inorganics** | | | | | |
| Total Organic Carbon (C) | % | 0.80 | 0.64 | 0.020 | 8322034 |
| RDL = Reportable Detection Limit | | | | | |



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Maxxam Job #: B653854
Report Date: 2016/07/19

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396

## GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|---|---|
| Package 1 | 19.0°C |

Sulphide samples submitted in bags. Possible loss of sulphide due to sampling container.
Redox results are attached. Maxxam Sladeview reference number B6D9868

**Results relate only to the items tested.**



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Maxxam Job #: B653854
Report Date: 2016/07/19

## QUALITY ASSURANCE REPORT

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396

| | | | Matrix Spike | | Spiked Blank | | Method Blank | | RPD | | QC Standard | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits | % Recovery | QC Limits |
| 8320949 | Saturation % | 2016/07/07 | | | | | | | 3.3 | 12 | 104 | 75 - 125 |
| 8322034 | Total Organic Carbon (C) | 2016/07/12 | | | 94 | 75 - 125 | 0.034, RDL=0.020 | % | 20 | 35 | 110 | 75 - 125 |
| 8322195 | Sulphide | 2016/07/08 | 14 (1) | 75 - 125 | 87 | 75 - 125 | <0.50 | ug/g | NC | 30 | | |
| 8322689 | Soluble pH | 2016/07/07 | | | 100 | 97 - 103 | | | 0.39 | N/A | 100 | 98 - 102 |
| 8323066 | Moisture | 2016/07/08 | | | | | <0.30 | % | 8.6 | 20 | | |
| 8323099 | Soluble Sulphate (SO4) | 2016/07/11 | | | | | <5.0 | mg/L | 12 | 35 | 95 | 75 - 125 |
| 8323846 | Soluble Conductivity | 2016/07/08 | | | 99 | 90 - 110 | <0.020 | dS/m | 7.4 | 35 | 93 | 75 - 125 |
| 8324095 | Soluble Chloride (Cl) | 2016/07/08 | NC | 75 - 125 | 109 | 75 - 125 | <5.0 | mg/L | 9.9 | 35 | 91 | 75 - 125 |

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



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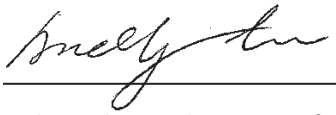
Maxxam Job #: B653854
Report Date: 2016/07/19

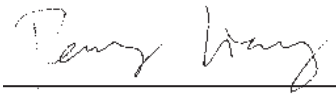
STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Andy Lu, Ph.D., P.Chem., Scientific Specialist



Harry (Peng) Liang, Senior Analyst

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Your Project #: B659107

**Attention:Wendy Sears**

Maxxam Analytics
2021 41st Ave NE
Calgary, AB
T2E 6P2

**Report Date: 2016/07/28**
Report #: R4085308
Version: 2 - Revision

# CERTIFICATE OF ANALYSIS – REVISED REPORT

**MAXXAM JOB #: B6F6088**
**Received: 2016/07/26, 14:56**

Sample Matrix: Soil
# Samples Received: 1

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Reference |
|---|---|---|---|---|---|
| Oxidation-Reduction Potential (1) | 1 | 2016/07/26 | 2016/07/27 | SLA SOP-00101 | In house |

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Oxidation-Reduction Potential (ORP) values are determined using a Ag/AgCl reference electrode.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Grace Sison, B.Sc., C.Chem, Senior Project Manager - Petroleum Division
Email: GSison@maxxam.ca
Phone# (905) 569-7599
==========
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Maxxam Job #: B6F6088
Report Date: 2016/07/28

Maxxam Analytics
Client Project #: B659107

## RESULTS OF ANALYSES OF SOIL

| **Maxxam ID** | | CTS968 | CTS968 | |
|---|---|---|---|---|
| **Sampling Date** | | | | |
| | **UNITS** | **PB3511-02R\DC27 SS14** | **PB3511-02R\DC27 SS14 Lab-Dup** | **QC Batch** |
| **Subcontracted Analysis** | | | | |
| Oxidation-Reduction Potential | mV | +198 | +197 | 4594614 |

QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate



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Maxxam Job #: B6F6088
Report Date: 2016/07/28

Maxxam Analytics
Client Project #: B659107

## TEST SUMMARY

**Maxxam ID:** CTS968
**Sample ID:** PB3511-02R\DC27 SS14
**Matrix:** Soil

**Collected:**
**Shipped:**
**Received:** 2016/07/26

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Oxidation-Reduction Potential | PH | 4594614 | 2016/07/26 | 2016/07/27 | Bruce Reynolds |

**Maxxam ID:** CTS968 Dup
**Sample ID:** PB3511-02R\DC27 SS14
**Matrix:** Soil

**Collected:**
**Shipped:**
**Received:** 2016/07/26

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Oxidation-Reduction Potential | PH | 4594614 | 2016/07/26 | | Bruce Reynolds |



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Maxxam Job #: B6F6088
Report Date: 2016/07/28

Maxxam Analytics
Client Project #: B659107

## GENERAL COMMENTS

**Results relate only to the items tested.**



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Maxxam Job #: B6F6088
Report Date: 2016/07/28

Maxxam Analytics
Client Project #: B659107

## QUALITY ASSURANCE REPORT

| QA/QC Batch | Init | QC Type | Parameter | Date Analyzed | Value | Recovery | UNITS | QC Limits |
|---|---|---|---|---|---|---|---|---|
| 4594614 | EF | QC Standard | Oxidation-Reduction Potential | 2016/07/27 | | +244 | % | 238 - 248 |
| 4594614 | EF | Method Blank | Oxidation-Reduction Potential | 2016/07/27 | +71 | | mV | |
| 4594614 | EF | RPD [CTS968-01] | Oxidation-Reduction Potential | | 0.51 | | % | 20 |

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.



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Your Project #: 110773396.302.702.220
Your C.O.C. #: 1OF1

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/07/28**
Report #: R2224827
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B659107**
**Received: 2016/07/19, 08:38**

Sample Matrix: Soil
# Samples Received: 1

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Resistivity | 1 | N/A | 2016/07/22 | AB WI-00065 | Auto Calc |
| Conductivity @25C (Soluble) | 1 | 2016/07/22 | 2016/07/22 | AB SOP-00033 / AB SOP-00004 | SM 22 2510 B m |
| pH @25C (Soluble) | 1 | 2016/07/21 | 2016/07/22 | AB SOP-00033 / AB SOP-00006 | SM 22 4500 H+B m |
| Soluble Paste | 1 | 2016/07/21 | 2016/07/21 | AB SOP-00033 | Carter 2nd ed 15.2 m |

**Remarks:**

All Blank values are reported. Associated data are not blank corrected.
'MDL' = Method Detection Limit, '<' = Less than MDL, '---' Not Analyzed
Solids results are based on dry weight except Biota Analyses & Special Waste Oil & Grease
Organic analyses are not corrected for extraction recovery standards except for Isotope Dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)
All CCME results met required criteria unless otherwise stated in the report. All data on final reports are validated by technical personnel. Signature on file at the laboratory. Deviations from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method:
F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction
All Groundwater samples except BTEX/VOC's or Purgeable Hydrocarbons are decanted and/or filtered prior to analysis unless otherwise mandated by regulatory agency
All analysis data reported was generated when the analytical methods were in statistical control and criteria for spike recoveries, reference material recoveries, method blanks data and duplicate precision were met unless otherwise stated
This report shall not be reproduced except in full, without the written approval of the laboratory

Methods used by Maxxam are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', 22nd Edition, published by the American Public Health Association, or on US EPA, protocols found in the ' Test Methods for Evaluating Solid Waste, Physical/Chemical Method, SW846, 3rd Edition. Other procedures are based on the methodologies accepted by the appropriate regulatory agency. Methodology briefs are available by written request.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at Maxxam for a period of 60 days from receipt of data or as per contract.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.



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Your Project #: 110773396.302.702.220
Your C.O.C. #: 1OF1

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/07/28**
Report #: R2224827
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B659107**
**Received: 2016/07/19, 08:38**

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Wendy Sears, Project manager
Email: WSears@maxxam.ca
Phone# (403)735-2277
==========
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Maxxam Job #: B659107
Report Date: 2016/07/28

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396.302.702.220
Sampler Initials: .

## RESULTS OF CHEMICAL ANALYSES OF SOIL

| Maxxam ID | | PB3511 | | |
|---|---|---|---|---|
| Sampling Date | | 2016/07/15 | | |
| COC Number | | 1OF1 | | |
| | UNITS | DC27 SS14 | RDL | QC Batch |
| **Calculated Parameters** | | | | |
| Resistivity @ 25 °C | ohm-m | 5.3 | 0.050 | 8335409 |
| **Soluble Parameters** | | | | |
| Soluble Conductivity | dS/m | 1.9 | 0.020 | 8338276 |
| Soluble pH | pH | 7.93 | N/A | 8337512 |
| Saturation % | % | 40 | N/A | 8336594 |

RDL = Reportable Detection Limit
N/A = Not Applicable



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Maxxam Job #: B659107
Report Date: 2016/07/28

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396.302.702.220
Sampler Initials: .

## GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|---|---|
| Package 1 | 19.3°C |

Redox results are attached. Maxxam Sladeview reference number B6F6088

**Results relate only to the items tested.**



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Maxxam Job #: B659107
Report Date: 2016/07/28

## QUALITY ASSURANCE REPORT

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396.302.702.220
Sampler Initials: .

| | | | Spiked Blank | | Method Blank | | RPD | | QC Standard | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits | % Recovery | QC Limits |
| 8336594 | Saturation % | 2016/07/21 | | | | | 2.4 | 12 | 100 | 75 - 125 |
| 8337512 | Soluble pH | 2016/07/22 | 100 | N/A | | | 0.88 | N/A | 101 | 98 - 102 |
| 8338276 | Soluble Conductivity | 2016/07/22 | 100 | 90 - 110 | <0.020 | dS/m | 4.0 | 35 | 103 | 75 - 125 |

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.



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Maxxam Job #: B659107
Report Date: 2016/07/28

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396.302.702.220
Sampler Initials: .

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Harry (Peng) Liang, Senior Analyst

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



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Your Project #: 110773396.302.702.230
Your C.O.C. #: 1 of 1

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/08/24**
Report #: R2245406
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B668884**
**Received: 2016/08/16, 08:50**

Sample Matrix: Soil
# Samples Received: 3

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Total Organic Carbon LECO Method | 2 | 2016/08/18 | 2016/08/18 | CAL SOP-00243 | LECO 203-821-165 m |
| Total Organic Carbon LECO Method | 1 | 2016/08/18 | 2016/08/22 | CAL SOP-00243 | LECO 203-821-165 m |

**Remarks:**

All Blank values are reported. Associated data are not blank corrected.
'MDL' = Method Detection Limit, '<' = Less than MDL, '---' Not Analyzed
Solids results are based on dry weight except Biota Analyses & Special Waste Oil & Grease
Organic analyses are not corrected for extraction recovery standards except for Isotope Dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)
All CCME results met required criteria unless otherwise stated in the report. All data on final reports are validated by technical personnel. Signature on file at the laboratory. Deviations from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method:
F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction
All Groundwater samples except BTEX/VOC's or Purgeable Hydrocarbons are decanted and/or filtered prior to analysis unless otherwise mandated by regulatory agency
All analysis data reported was generated when the analytical methods were in statistical control and criteria for spike recoveries, reference material recoveries, method blanks data and duplicate precision were met unless otherwise stated
This report shall not be reproduced except in full, without the written approval of the laboratory

Methods used by Maxxam are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', 22nd Edition, published by the American Public Health Association, or on US EPA, protocols found in the ' Test Methods for Evaluating Solid Waste, Physical/Chemical Method, SW846, 3rd Edition. Other procedures are based on the methodologies accepted by the appropriate regulatory agency. Methodology briefs are available by written request.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at Maxxam for a period of 60 days from receipt of data or as per contract.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.



Maxxam Analytics International Corporation o/a Maxxam Analytics Calgary: 2021 - 41st Avenue N.E. T2E 6P2 Telephone (403) 291-3077 Fax (403) 291-9468

Success Through Science®

Your Project #: 110773396.302.702.230
Your C.O.C. #: 1 of 1

**Attention:BOBBI PELKEY**

STANTEC GEO-MATERIALS LABORATORY
10830 46TH ST SE
CALGARY, AB
CANADA T2C 1G4

**Report Date: 2016/08/24**
Report #: R2245406
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**MAXXAM JOB #: B668884**
**Received: 2016/08/16, 08:50**

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Wendy Sears, Project manager
Email: WSears@maxxam.ca
Phone# (403)735-2277

==========

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Maxxam Job #: B668884
Report Date: 2016/08/24

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396.302.702.230

## MISCELLANEOUS (SOIL)

| Maxxam ID | | PG7560 | | PG7561 | | PG7562 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | | | | | | | |
| COC Number | | 1 of 1 | | 1 of 1 | | 1 of 1 | | |
| | UNITS | D41 RC19 @ 15.90-16.03 M | RDL | D41 RC19 @ 16.16-16.24 M | RDL | D41 RC22 @ 20.52-20.57 M | RDL | QC Batch |
| **Misc. Inorganics** | | | | | | | | |
| Total Organic Carbon (C) | % | 11 (1) | 0.20 | 0.28 | 0.020 | 6.1 (1) | 0.040 | 8365718 |

RDL = Reportable Detection Limit
(1) Detection limits raised based on sample weight used for analysis.



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Maxxam Job #: B668884
Report Date: 2016/08/24

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396.302.702.230

## GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|---|---|
| Package 1 | 18.0°C |

**Results relate only to the items tested.**



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Maxxam Job #: B668884
Report Date: 2016/08/24

## QUALITY ASSURANCE REPORT

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396.302.702.230

| | | | Spiked Blank | | Method Blank | | RPD | | QC Standard | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits | % Recovery | QC Limits |
| 8365718 | Total Organic Carbon (C) | 2016/08/18 | 105 | 75 - 125 | <0.020 | % | 4.6 | 35 | 107 | 75 - 125 |

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.



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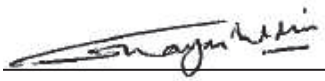
Maxxam Job #: B668884
Report Date: 2016/08/24

STANTEC GEO-MATERIALS LABORATORY
Client Project #: 110773396.302.702.230

## VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

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# CERTIFICATE OF ANALYSIS


| | | | |
|---|---|---|---|
| **REPORTED TO** | Stantec Consulting Ltd. (Calgary)<br>200 325 25th Street SE<br>Calgary, AB T2A 7H8 | **TEL**<br>**FAX** | (403) 629-5691<br>(403) 716-8039 |
| **ATTENTION** | Bobbi Pelkey | | |


| | | | |
|---|---|---|---|
| **WORK ORDER** | 6101851 | | |
| **PO NUMBER** | | **RECEIVED / TEMP** | 2016-10-26 09:35 / 22°C |
| **PROJECT** | 110773396.302.702.260 | **REPORTED** | 2016-11-04 |
| **PROJECT INFO** | | | |

**General Comments:**

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Authorized By: **Michelle LaBonte, B.Sc., P.Chem.**
Lab Manager, Edmonton

***If you have any questions or concerns, please contact your Account Manager:***
***Bryan Shaw, Ph.D. (bshaw@caro.ca)***

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|---|---|---|---|
| **REPORTED TO** | Stantec Consulting Ltd. (Calgary) | **WORK ORDER** | 6101851 |
| **PROJECT** | 110773396.302.702.260 | **REPORTED** | 2016-11-04 |

# ANALYSIS INFORMATION

| | | | |
|---|---|---|---|
| **REPORTED TO** | Stantec Consulting Ltd. (Calgary) | **WORK ORDER** | 6101851 |
| **PROJECT** | 110773396.302.702.260 | **REPORTED** | 2016-11-04 |

| Analysis Description | Method Reference | Technique | Location |
|---|---|---|---|
| Sulfate, Water-Soluble (CSA A23.2) in Soil | CSA A23.2-3B / CSA A23.2-2B | Extraction (HCl) / Gravimetry (Barium Sulfate Precipitation) | Richmond |

**Method Reference Descriptions:**

| | |
|---|---|
| CSA | Canadian Standards Association Chemical Test Methods |

**Glossary of Terms:**

| | |
|---|---|
| MRL | Method Reporting Limit |
| < | Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences |
| % | Percent |

CARO ANALYTICAL SERVICES

# SAMPLE ANALYTICAL DATA

**REPORTED TO** Stantec Consulting Ltd. (Calgary)
**PROJECT** 110773396.302.702.260

**WORK ORDER** 6101851
**REPORTED** 2016-11-04

| Analyte | Result / *Recovery* | MRL / *Limits* | Units | Prepared | Analyzed | Notes |
|---|---|---|---|---|---|---|
| **Sample ID: H13 ST6 (6101851-01) [Soil] Sampled: 2016-10-25 00:00** | | | | | | |
| ***General Parameters*** | | | | | | |
| Sulfate, Water-Soluble | **0.17** | 0.05 | % | 2016-10-31 | 2016-11-04 | |
| **Sample ID: H1 BS1 (6101851-02) [Soil] Sampled: 2016-10-25 00:00** | | | | | | |
| ***General Parameters*** | | | | | | |
| Sulfate, Water-Soluble | < 0.05 | 0.05 | % | 2016-10-31 | 2016-11-04 | |
| **Sample ID: H4 SS4 & BS5 (6101851-03) [Soil] Sampled: 2016-10-25 00:00** | | | | | | |
| ***General Parameters*** | | | | | | |
| Sulfate, Water-Soluble | < 0.05 | 0.05 | % | 2016-10-31 | 2016-11-04 | |

# APPENDIX 1: QUALITY CONTROL DATA

| | | | |
|---|---|---|---|
| **REPORTED TO** | Stantec Consulting Ltd. (Calgary) | **WORK ORDER** | 6101851 |
| **PROJECT** | 110773396.302.702.260 | **REPORTED** | 2016-11-04 |

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in “batches” and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup)**: Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method’s precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS)**: A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method’s accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM)**: A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

| Analyte | Result | MRL | Units | Spike Level | Source Result | % REC | REC Limit | % RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| ***General Parameters, Batch B6J2063*** | | | | | | | | | | |
| **Blank (B6J2063-BLK1)** | | | | Prepared: 2016-10-31, Analyzed: 2016-11-04 | | | | | | |
| Sulfate, Water-Soluble | < 0.05 | 0.05 | % | | | | | | | |
| **Duplicate (B6J2063-DUP1)** | | **Source: 6101851-03** | | Prepared: 2016-10-31, Analyzed: 2016-11-04 | | | | | | |
| Sulfate, Water-Soluble | < 0.05 | 0.05 | % | | < 0.05 | | | | 20 | |
| **Matrix Spike (B6J2063-MS1)** | | **Source: 6101851-01** | | Prepared: 2016-10-31, Analyzed: 2016-11-04 | | | | | | |
| Sulfate, Water-Soluble | 0.59 | 0.05 | % | 0.664 | 0.17 | 63 | 70-130 | | | SPK1 |

**QC Qualifiers:**

SPK1 The recovery of this analyte was outside of established control limits. The data was accepted based on performance of other batch QC.

# APPENDIX 2: ANALYTICAL SUMMARY

**REPORTED TO** Stantec Consulting Ltd. (Calgary)
**PROJECT** 110773396.302.702.260

**WORK ORDER** 6101851
**REPORTED** 2016-11-04

| | | 6101851-01 | 6101851-02 | 6101851-03 |
|---|---|---|---|---|
| | | **Soil** | **Soil** | **Soil** |
| | | **2016-10-25** | **2016-10-25** | **2016-10-25** |
| | | **H13 ST6** | **H1 BS1** | **H4 SS4 & BS5** |
| General Parameters | Sulfate, Water-Soluble (%) | 0.17 | < 0.05 | < 0.05 |

# Appendix F
Advanced Rock Testing

Stantec


# TRICAN GEOLOGICAL SOLUTIONS

# GEOMECHANICAL ANALYSIS REPORT

## Springbank Dam Project

**Stantec Inc.**
200-325 25th Street SE
Calgary, AB. T2A 7H8

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# LIST OF TABLES

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# 1. EXECUTIVE SUMMARY

Trican Geological Solutions conducted a series UCS and Direct Shear tests on core samples from the Springbank dam project for Stantec Inc. A total of 17 samples were selected for analysis, including 7 UCS and 10 direct shear samples, of which only 5 direct shear and 5 UCS samples were successfully prepared and tested. A summary of UCS data is provided in Table 1-1and direct shear data is provided in Table 1-2.

**Table 1-1: UCS test results**

| Sample ID | Depth (m) | Axial Strain at Failure (%) | Compressive Strength (MPa) | Residual Strength (MPa) | Static Young's Modulus (GPa) | Static Poisson's Ratio | Static Bulk Modulus (GPa) | Static Shear Modulus (GPa) |
|---|---|---|---|---|---|---|---|---|
| DS10-RC2 | 13'5" | Not Suitable for testing | | | | | | |
| DS1-RC5 | 17'0" | 0.475 | 33.48 | 21.59 | 8.22 | 0.287 | 6.42 | 3.20 |
| DS2-RC1 | NA | 0.634 | 37.41 | 8.33 | 7.36 | 0.374 | 9.71 | 2.68 |
| DS3 | NA | Not Suitable for testing | | | | | | |
| DS3-RC4 | NA | 0.654 | 31.39 | 0.00 | 7.42 | 0.354 | 8.44 | 2.74 |
| DS5-RC3 | 18'1" | 0.445 | 2.62 | 2.29 | 1.29 | 0.001 | 0.43 | 0.64 |
| DS6-RC27 | NA | 0.665 | 1.22 | 1.17 | 1.11 | 0.000 | 0.37 | 0.56 |
| DS9-RC2 | 13'0" | Not Suitable for testing | | | | | | |

**Table 1-2: Direct Shear test results**

| Sample ID | Elevation (ft' Inch") | Stage # | Normal Stress (kPa) | Peak Shear Stress (kPa) | Residual Shear Stress (kPa) | Peak Friction Coefficient | Residual Fiction Coefficient |
|---|---|---|---|---|---|---|---|
| DS10-RC2 DSNF | 15'0" | Not Suitable for specified testing. Potential for intact direct shear. (Irregular shear surface area) | | | | | |
| DS10-RC2 DSINT | 12' 9" | 1 | 70 | 167 | 148 | 0.83 | 0.79 |
| | | 2 | 140 | 211 | 205 | | |
| | | 3 | 210 | 226 | 201 | | |
| DS1-RC3 DSSS | 11'0" | 1 | 70 | 165 | 159 | 0.57 | 0.45 |
| | | 2 | 140 | 193 | 181 | | |
| | | 3 | 210 | 241 | 225 | | |
| DS2-RC2 DSNF | Not Given | 1 | 210 | 183 | 166 | 0.50 | 0.41 |
| | | 2 | 70 | 194 | 186 | | |
| | | 3 | 140 | 150 | 133 | | |
| DS3-RC4 DSNF | Not Given | Not Suitable for specified testing. Potential for intact direct shear. (Natural fractured pieces do not align) | | | | | |
| DS5-RC3 DSNF | 15'9" | Not Suitable for specified testing. Potential for intact direct shear. (Natural fractured pieces do not align) | | | | | |
| DS6-RC23 DSNF | 15'9" | Not Suitable for specified testing. Potential for intact direct shear. (Natural fractured pieces do not align) | | | | | |
| DS6-RC28 DSINT | 109'10" | 1 | 70 | 210 | 122 | 0.81 | 0.81 |
| | | 2 | 140 | 222 | 191 | | |
| | | 3 | 210 | 195 | 187 | | |
| DS9-RC2 DSSS | 13' 9" | 1 | 140 | 228 | 224 | 0.83 | 0.80 |
| | | 2 | 70 | 155 | 141 | | |
| | | 3 | 210 | 269 | 222 | | |

# 2. INTRODUCTION

Trican Geological Solutions prepared and tested samples from the Springbank Dam project for Stantec Inc. Direct Shear and UCS tests were conducted to characterize strength and mechanical properties of the cores.

Initial testing program consisted of eight UCS tests and nine direct shear tests. However, after evaluating the sample quality, it was determined that only five UCS and five direct shear samples were suitable for the proposed testing. All testing was done at “as received” moisture condition on full diameter cores.

A summary of the received samples along with the designated tests are provided in Table 2-1.

**Table 2-1: Received Samples with designated test type.**

| Hole ID | Elevation | Test Type | Description |
|---|---|---|---|
| DS10-RC2 | 15'0" | Direct Shear on pre-existing fracture | Grey mudstone |
| DS10-RC2 | 11'9" | Direct Shear on pre-existing fracture | Grey mudstone |
| DS10-RC2 | 13'5" | UCS | Greenish grey, silty mudstone. |
| DS10-RC2 | 12'9" | Direct Shear on intact sample | Greenish grey, silty mudstone. |
| DS1-RC3 | 11'0" | Direct Shear on saw cut sample | Inter-bedded dark grey mudstone and greenish grey siltstone |
| DS1-RC5 | 17'0" | UCS | Grey-greenish grey very fine sandstone. Well laminated |
| DS2-RC2 | | Direct Shear on pre-existing fracture | Grey mudstone |
| DS3 | | UCS | Greenish grey, fine sandstone |
| DS3-RC4 | | Direct Shear on pre-existing fracture and UCS | Mottled greenish grey-dark grey mudstone. |
| DS5-RC3 | 15'9" | Direct Shear on pre-existing fracture | Dark grey, carbonaceous mudstone. |
| DS5-RC3 | 18'1" | UCS | Dark grey, carbonaceous mudstone. |
| DS6-RC23 | 84'8" | Direct Shear on pre-existing fracture | Dark grey-black carbonaceous mudstone with coal. |
| DS6-RC27 | | UCS | Black, carbonaceous shale. |
| DS6-RC28 | 109'10" | Direct Shear on intact sample | Dark grey mudstone. |
| DS9-RC2 | 13'9" | Direct Shear saw cut sample | Greenish grey-dark grey siltstone. Well laminated |

# 3. GEOMECHANICAL CHARACTERIZATION OF SAMPLES

In determining the static elastic constants as well as the shear strength properties of the selected samples, the following geomechanical testing was conducted:

- Unconfined Compressive Strength Testing
- Direct Shear Testing

The results of the testing are provided in the following sections, while more detailed descriptions of the methodologies and data analyses are provided in Appendix A.

## 3.1 UNCONFINED COMPRESSIVE STRENGTH TESTING

Samples tested using the unconfined compressive strength testing method were subjected to a constant axial strain rate (1.0%/hr) controlled by varying application of the axial load until failure and beyond to residual strength where possible. During the loading process, the axial and circumferential displacements and the deviatoric load were recorded for mechanical property analysis. Pore pressure was not monitored and all samples were tested at “as received” condition and ambient temperature.

The unconfined compressive strength testing results are summarized in Table 3-1.

**Table 3-1: Unconfined Compressive Strength Testing Results**

| Sample ID | Depth (m) | Axial Strain at Failure (%) | Compressive Strength (MPa) | Residual Strength (MPa) | Static Young’s Modulus (GPa) | Static Poisson’s Ratio | Static Bulk Modulus (GPa) | Static Shear Modulus (GPa) |
|---|---|---|---|---|---|---|---|---|
| DS10-RC2 | 13'5" | Not Suitable for testing | | | | | | |
| DS1-RC5 | 17'0" | 0.475 | 33.48 | 21.59 | 8.22 | 0.287 | 6.42 | 3.20 |
| DS2-RC1 | NA | 0.634 | 37.41 | 8.33 | 7.36 | 0.374 | 9.71 | 2.68 |
| DS3 | NA | Not Suitable for testing | | | | | | |
| DS3-RC4 | NA | 0.654 | 31.39 | 0.00 | 7.42 | 0.354 | 8.44 | 2.74 |
| DS5-RC3 | 18'1" | 0.445 | 2.62 | 2.29 | 1.29 | 0.001 | 0.43 | 0.64 |
| DS6-RC27 | NA | 0.665 | 1.22 | 1.17 | 1.11 | 0.000 | 0.37 | 0.56 |
| DS9-RC2 | 13'0" | Not Suitable for testing | | | | | | |

## 3.2 DIRECT SHEAR TESTING

The direct shear test is typically performed to directly determine the shear strength of intact rock under consolidated and drained conditions. The test is well-suited for direct measurement of the shear strength of discrete planes of weakness within a comparatively strong rock. All tests were executed on a servo-controlled Direct/Residual Shear machine utilizing hydraulic loading for both normal and shear loads. Shear and normal strains are measured throughout the testing. For test procedures see Appendix A.3.

Ten samples were originally selected for direct shear testing, however only six were determined to be suitable for testing. Three normal stresses were used in all testing (70, 140 and 210 kPa), though the order in which the stresses were applied varied from sample to sample as required by Stantec. The peak and residual strengths for each sample at each normal stress is presented in Table 3-2.

**Table 3-2: Direct Shear Results**

| Sample ID | Elevation (ft' Inch") | Stage # | Normal Stress (kPa) | Peak Shear Stress (kPa) | Residual Shear Stress (kPa) | Peak Friction Coefficient | Residual Fiction Coefficient |
|---|---|---|---|---|---|---|---|
| DS10-RC2 DSNF | 15'0" | Not Suitable for specified testing. Potential for intact direct shear. (Irregular shear surface area) | | | | | |
| DS10-RC2 DSINT | 12' 9" | 1 | 70 | 253 | 231 | 0.54 | 0.43 |
| | | 2 | 140 | 305 | 296 | | |
| | | 3 | 210 | 329 | 291 | | |
| DS1-RC3 DSSS | 11'0" | 1 | 70 | 165 | 159 | 0.54 | 0.47 |
| | | 2 | 140 | 193 | 181 | | |
| | | 3 | 210 | 241 | 225 | | |
| DS2-RC2 DSNF | Not Given | 1 | 210 | 330 | 297 | 0.43 | 0.25 |
| | | 2 | 70 | 270 | 261 | | |
| | | 3 | 140 | 270 | 247 | | |
| DS3-RC4 DSNF | Not Given | Not Suitable for specified testing. Potential for intact direct shear. (Natural fractured pieces do not align) | | | | | |
| DS5-RC3 DSNF | 15'9" | Not Suitable for specified testing. Potential for intact direct shear. (Natural fractured pieces do not align) | | | | | |
| DS6-RC23 DSNF | 15'9" | Not Suitable for specified testing. Potential for intact direct shear. (Natural fractured pieces do not align) | | | | | |
| DS6-RC28 DSINT | 109'10" | 1 | 70 | 294 | 166 | 0.34 | 1.16 |
| | | 2 | 140 | 258 | 222 | | |
| | | 3 | 210 | 342 | 328 | | |
| DS9-RC2 DSSS | 13' 9" | 1 | 140 | 228 | 224 | 0.82 | 0.58 |
| | | 2 | 70 | 155 | 141 | | |
| | | 3 | 210 | 269 | 222 | | |

# APPENDIX A TESTING METHODOLOGY AND DATA ANALYSIS

## A.1 SAMPLE PRESERVATION AND PREPARATION

Samples preserved by Trican Geological Solutions personnel are compliant with the standard methods suggested by ASTM International – ASTM D5079: *"Standard Practices for Preserving and Transporting Rock Core Samples"*.

Samples prepared for geomechanical testing by Trican Geological Solutions personnel are compliant with the standard methods suggested by ASTM International – ASTM D4543: *"Standard Practices for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerances".*

## A.2 MECHANICAL COMPRESSION TESTING AND STATIC ELASTIC PROPERTIES

All geomechanical compression tests and associated data analyses performed by Trican Geological Solutions personnel are carried out in accordance with the standard methods suggested by ASTM International (ASTM D7012: *"Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens Under Varying States of Stress and Temperatures"*) and the International Society for Rock Mechanics (*"Suggested Methods for Determining the Strength of Rock Materials in Triaxial Compression"*). Note that all stresses discussed here are effective stresses unless explicitly stated otherwise.

The axial and radial strains are directly measured by the instrumentation and calculated by the testing system software using the standard relationships (ASTM International D7012) as the test progresses for incremental deviatoric stress.

The axial strain is calculated using the average of the displacements of the two axial LVDTs, which monitor the axial deformation, and the initial measured length of the sample as follows:

$$\varepsilon_a = \frac{\Delta L}{L_i}$$

Where:

- $\varepsilon_a$ = Axial strain
- $\Delta L$ = Change in length of sample
- $L_i$ = Initial measured length of sample

The radial strain is calculated using the displacement of the radial LVDT, which monitors the circumferential deformation, and the initial measured diameter of the sample as follows:

$$\varepsilon_r = \frac{\Delta D}{D_i}$$

Where:

- $\varepsilon_r$ = Radial strain
- $\Delta D$ = Change in diameter of sample
- $D_i$ = Initial measured diameter of sample

Volumetric strain is calculated as a function of the measured axial and radial strains as follows:

$$\varepsilon_v = 2\varepsilon_r + \varepsilon_a$$

Where:

- $\varepsilon_v$ = Volumetric strain

The axial stress is determined by dividing the measured load by the initial measured cross-sectional area of the specimen.

Deviatoric or differential stress is calculated using the axial stress and confining stress as follows:

$$\sigma_d = \sigma_a - \sigma_c$$

Where:

- $\sigma_d$ = Deviatoric or differential stress
- $\sigma_a$ = Axial stress
- $\sigma_c$ = Confining stress

Deviatoric or differential axial stresses are plotted against both axial strain and radial strain. For the sign conventions, compressive stress and contraction (shortening) are considered positive. Therefore, a positive axial strain indicates a shortening of the specimen length and a negative radial strain indicates an increase of the specimen diameter during the test.

The ultimate compressive strength of the specimen is defined as the maximum total stress at failure, which in turn is defined as the sum of the deviatoric/differential and confining stresses.

Static Young's modulus is determined by the linear-least-square slope of the linear (elastic) segment of the differential stress versus the axial strain curve around 50% or less of the peak deviatoric stress value of a given sample (i.e. tangent modulus as per ASTM D7012).

Static Poisson's ratio is determined by the linear-least-square slope of the radial strain versus the axial strain curve at the same interval where the static Young's modulus was determined.

After the static Young's modulus and Poisson's ratio values have been determined, the static bulk modulus and static shear modulus values are calculated from the determined Young's modulus and Poisson's ratio values as follows:

$$K = \frac{E}{3(1-2\nu)}$$

Where:

- K = Bulk modulus
- E = Young's modulus
- v = Poisson's ratio

$$G = \frac{E}{2(1+\upsilon)}$$

Where:

- G = Shear modulus
- E = Young's modulus
- v = Poisson's Ratio

## A.3 DIRECT SHEAR TESTING

In a direct shear test a sample encased in a cementing compound is loaded into a shear box and is then subjected to normal and shear forces. The shear box is affixed with four normally oriented linear variable differential transducers (LVDT) and one shear oriented LVDT, which measure the displacements of the shear box as forces are applied.

All testing conducted with the GCTS RDS-300 Direct Shear machine, which is servo-controlled, are carried out following the standard methods suggested by ASTM International (ASTM D5607: “Standard Test Method for Performing Laboratory Direct Shear Strength Tests of Rock Specimens Under Constant Normal Force”).

Stress is calculated by the GCTS software as force is applied to the sample as follows:

$$\sigma = \frac{F}{A}$$

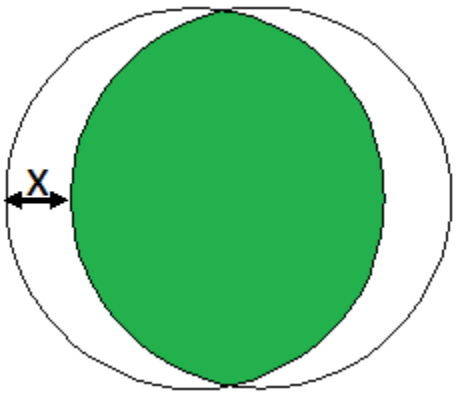
Where:

- σ = Stress
- F = Force
- A = Area

Normal stress is external load per unit area acting perpendicular to the shear plane. It is calculated by dividing the externally applied load by the nominal area.

Shear stress is external load per unit area acting parallel to the shear plane. It is calculated by dividing the externally applied load by the nominal area.

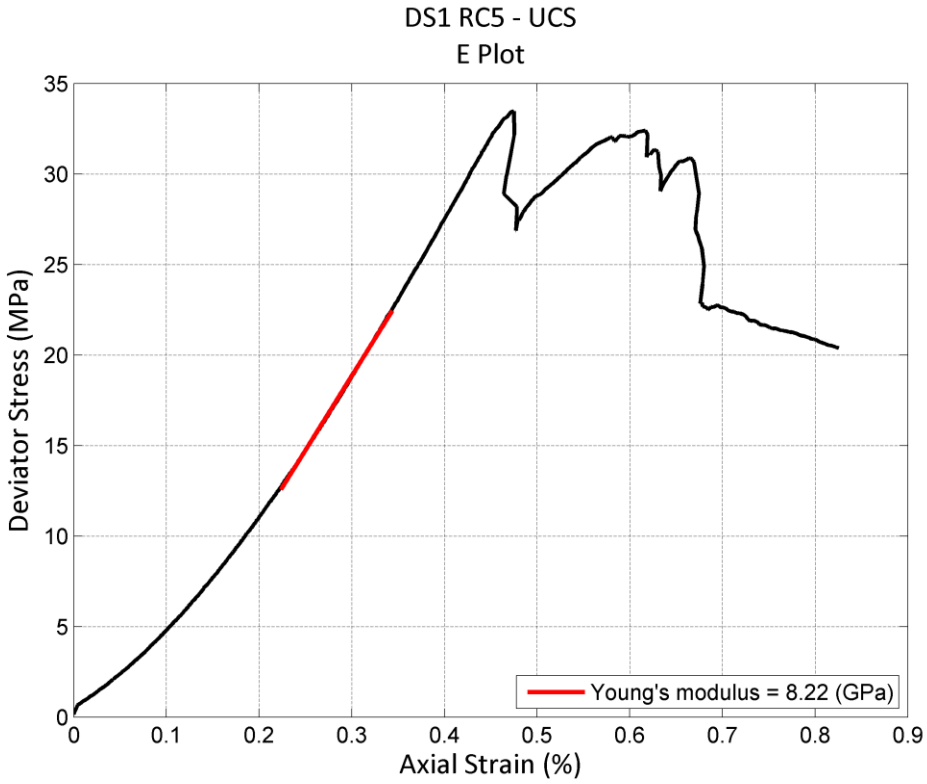
Nominal area is the cross-sectional area of the shear plane. It is calculated after its relevant cross-sectional dimension is determined, based on shear displacement and sample dimensions. The below figure shows an example of nominal area, in green, for a vertical cylinder area after “X” amount of shear displacement.

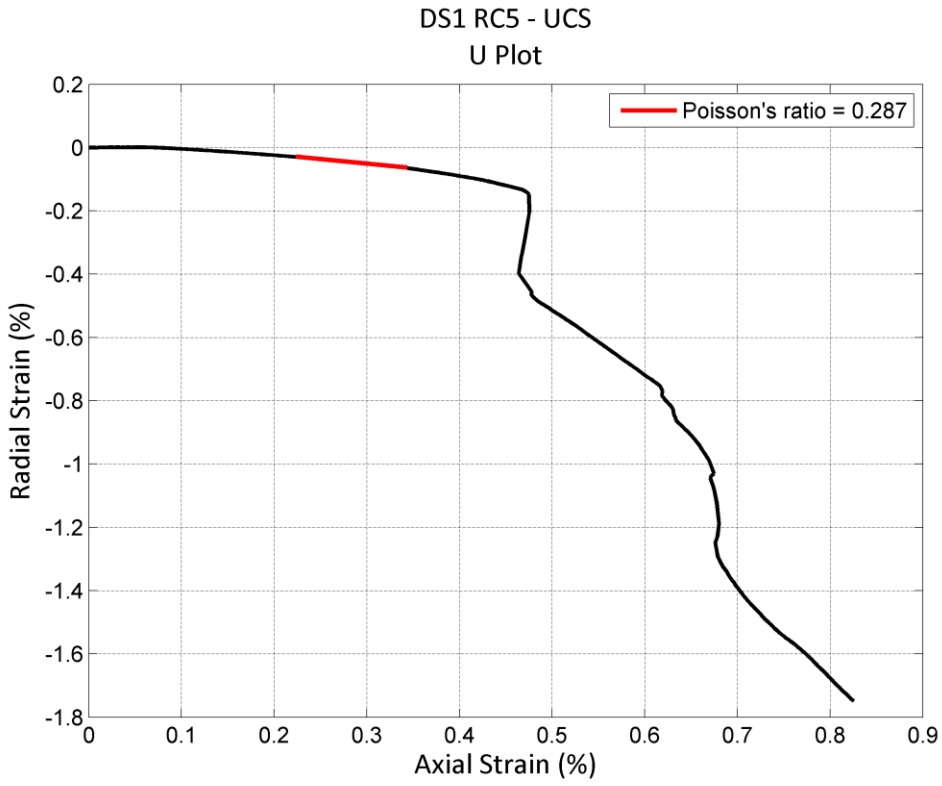


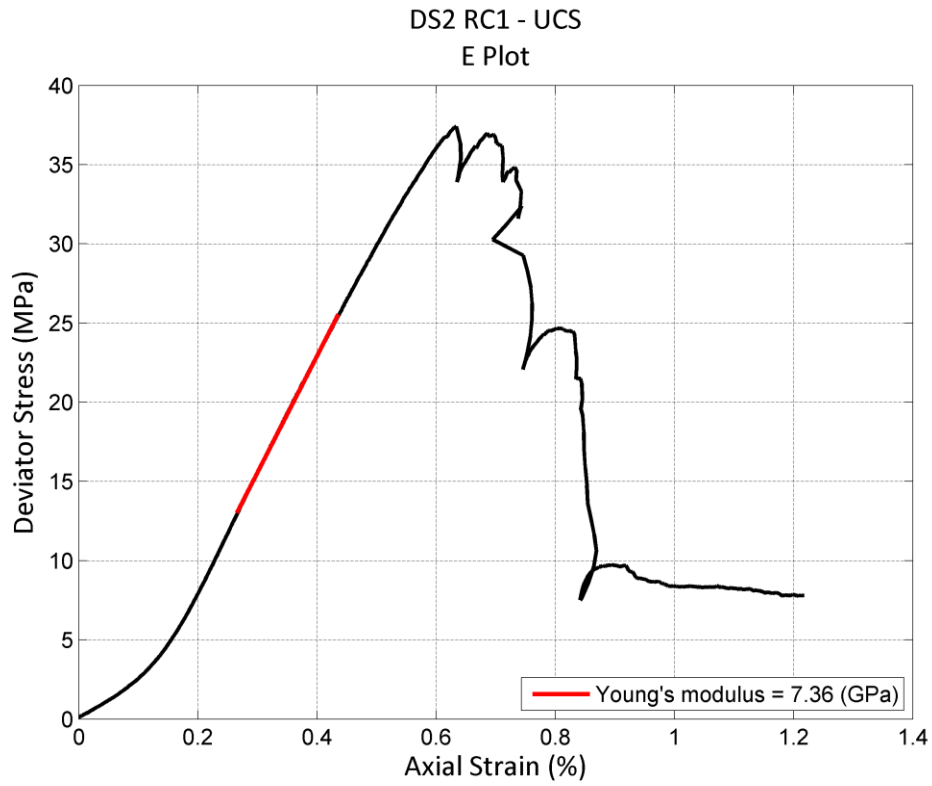

**Nominal area (green) after X amount of shear displacement**

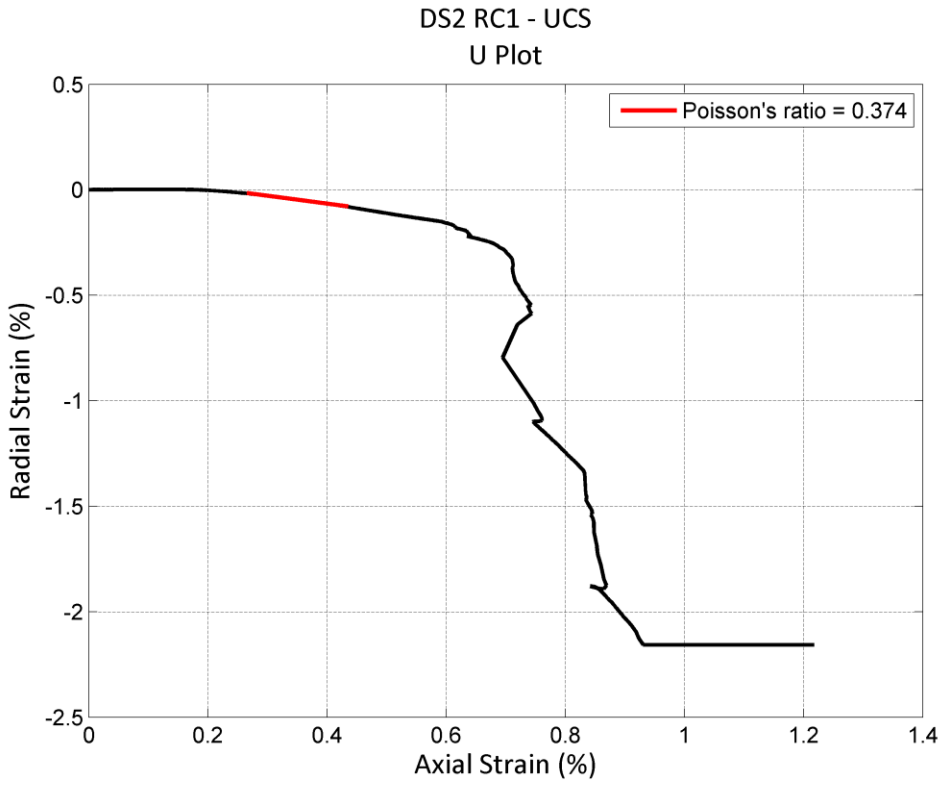
# APPENDIX B TRIAXIAL LOADING PLOTS

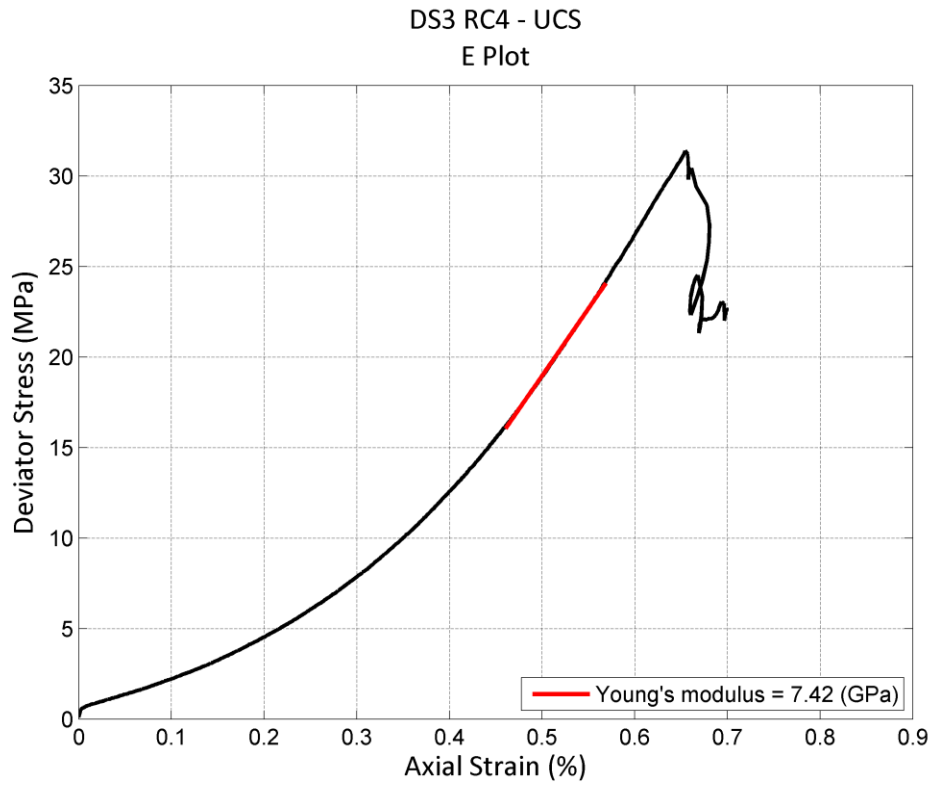
This appendix contains plots representing the determination of static Poisson's ratio (bottom) and static Young's modulus (top) during triaxial loading for each sample within the testing program.

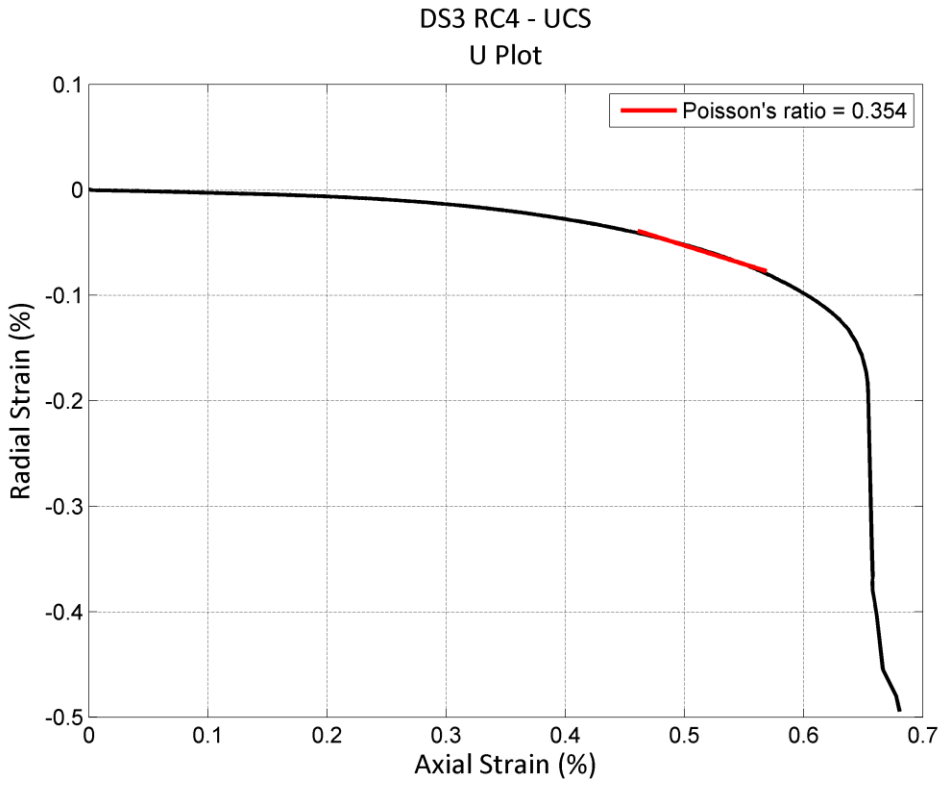

DS1 RC5 - UCS
E Plot
Deviator Stress (MPa)
Axial Strain (%)
Young's modulus = 8.22 (GPa)
0
5
10
15
20
25
30
35
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

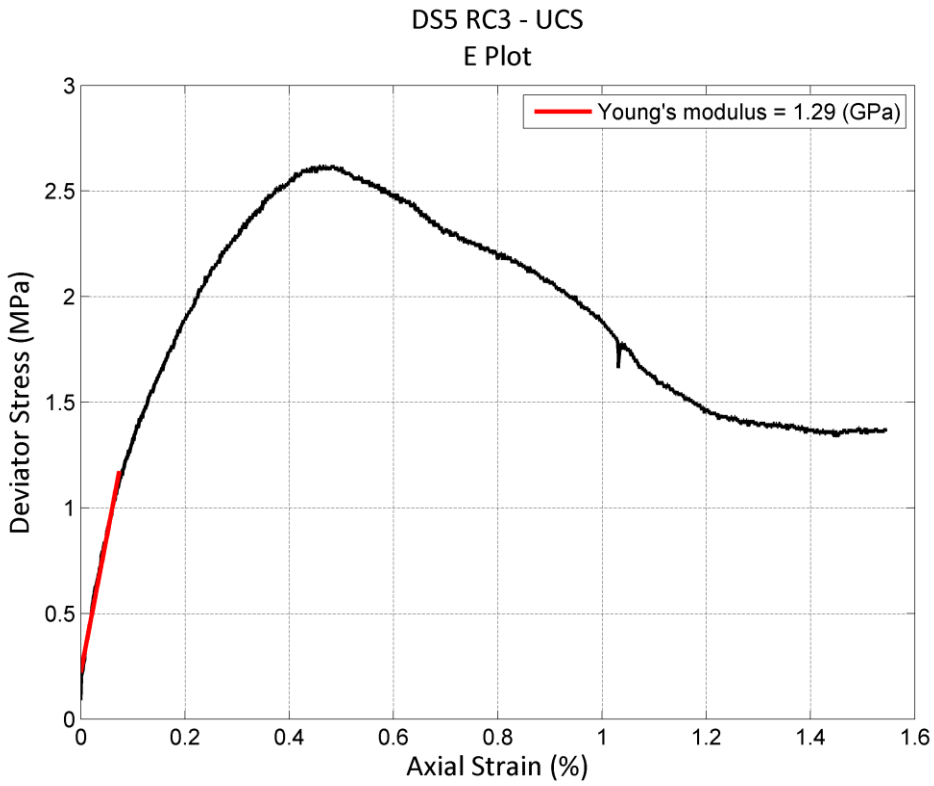

DS1 RC5 - UCS
U Plot
Radial Strain (%)
Axial Strain (%)
Poisson's ratio = 0.287
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9

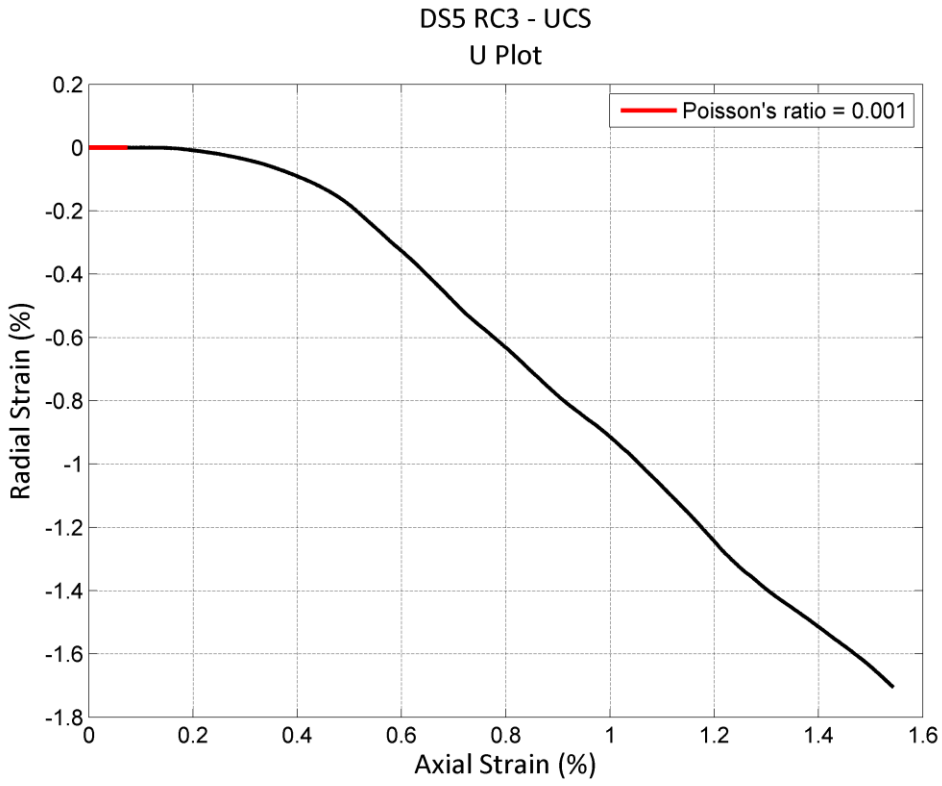

DS2 RC1 - UCS
E Plot
Deviator Stress (MPa)
Axial Strain (%)
Young's modulus = 7.36 (GPa)
0
5
10
15
20
25
30
35
40
0
0.2
0.4
0.6
0.8
1
1.2
1.4

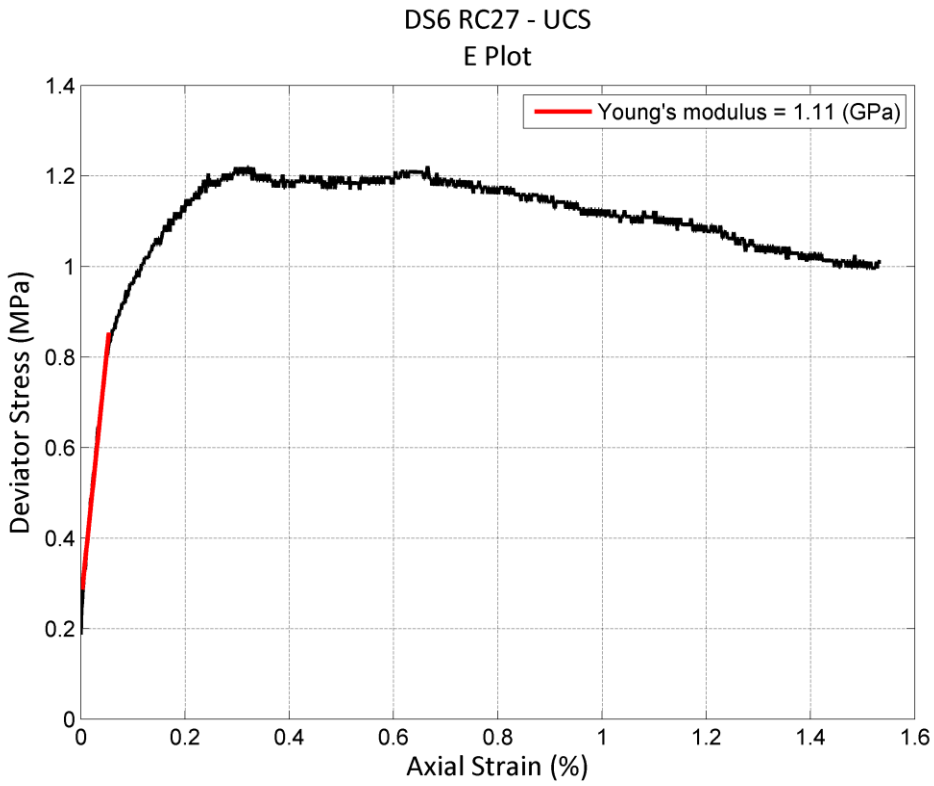

DS2 RC1 - UCS
U Plot
Radial Strain (%)
Axial Strain (%)
Poisson's ratio = 0.374
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
0.2
0.4
0.6
0.8
1
1.2
1.4

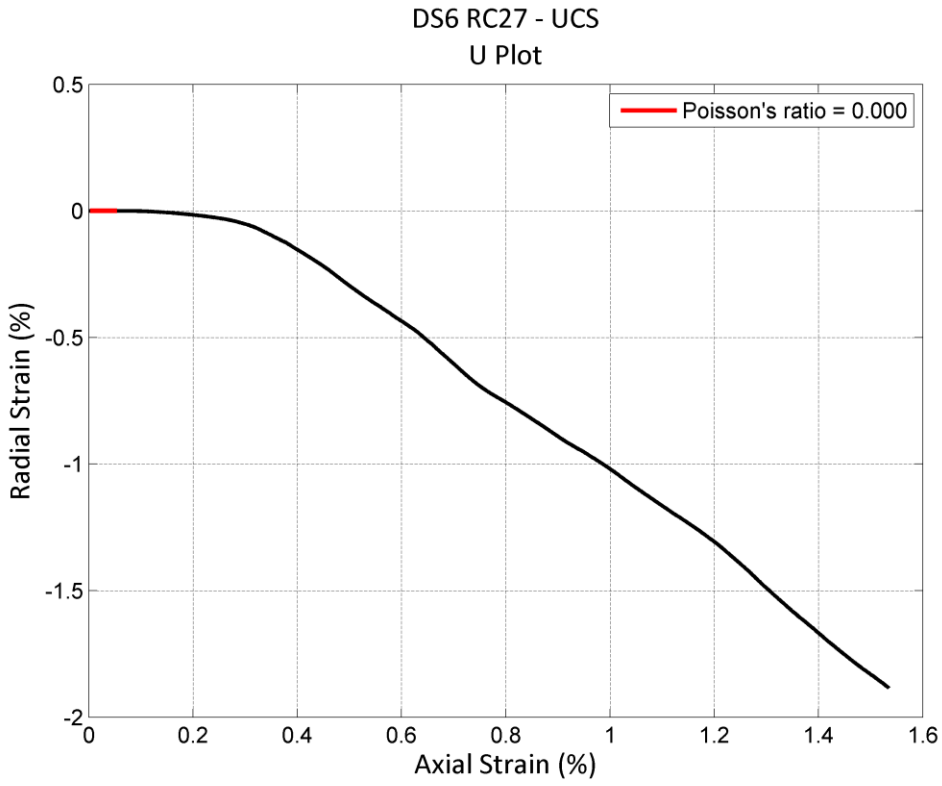

DS3 RC4 - UCS
E Plot
Deviator Stress (MPa)
Axial Strain (%)
Young's modulus = 7.42 (GPa)
0
5
10
15
20
25
30
35
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9


DS3 RC4 - UCS
U Plot
Radial Strain (%)
Axial Strain (%)
Poisson's ratio = 0.354
0.1
0
-0.1
-0.2
-0.3
-0.4
-0.5
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7


DS5 RC3 - UCS
E Plot
Young's modulus = 1.29 (GPa)
Deviator Stress (MPa)
Axial Strain (%)
0
0.5
1
1.5
2
2.5
3
0.2
0.4
0.6
0.8
1.2
1.4
1.6


DS5 RC3 - UCS
U Plot
Poisson's ratio = 0.001
Radial Strain (%)
Axial Strain (%)
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
-1.6
-1.8
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6

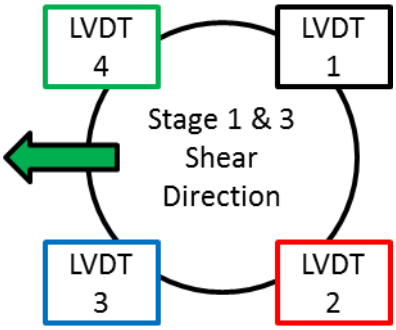

DS6 RC27 - UCS
E Plot
Young's modulus = 1.11 (GPa)
Deviator Stress (MPa)
Axial Strain (%)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6

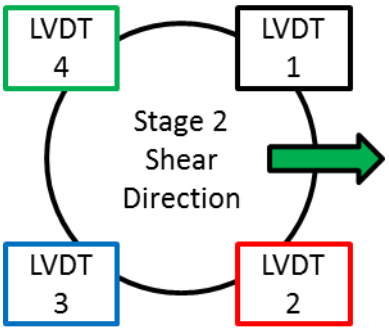

DS6 RC27 - UCS
U Plot
Poisson's ratio = 0.000
Radial Strain (%)
Axial Strain (%)
0.5
0
-0.5
-1
-1.5
-2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6

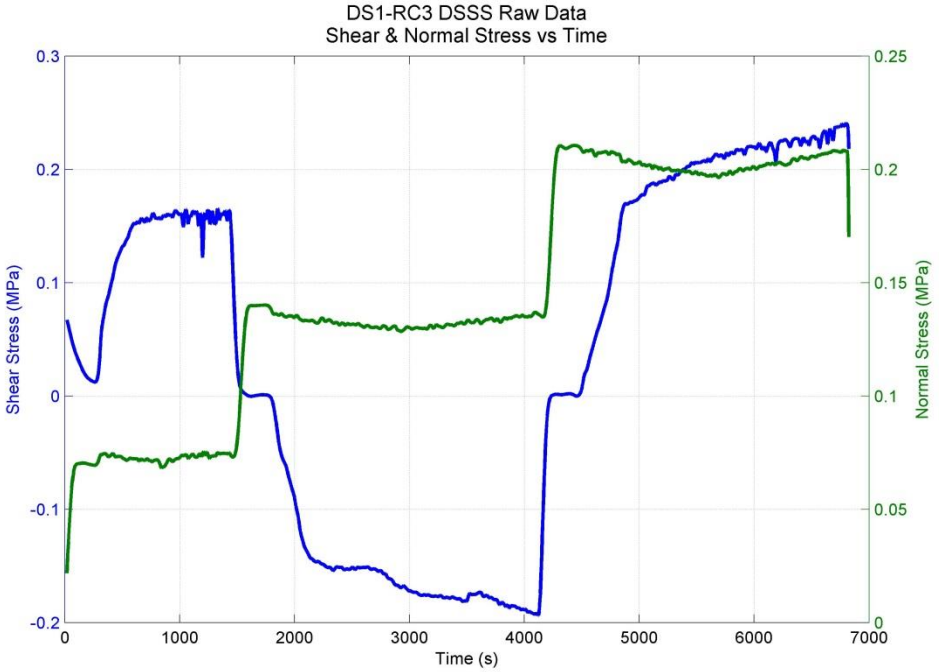
# APPENDIX C SHEAR LOADING PLOTS

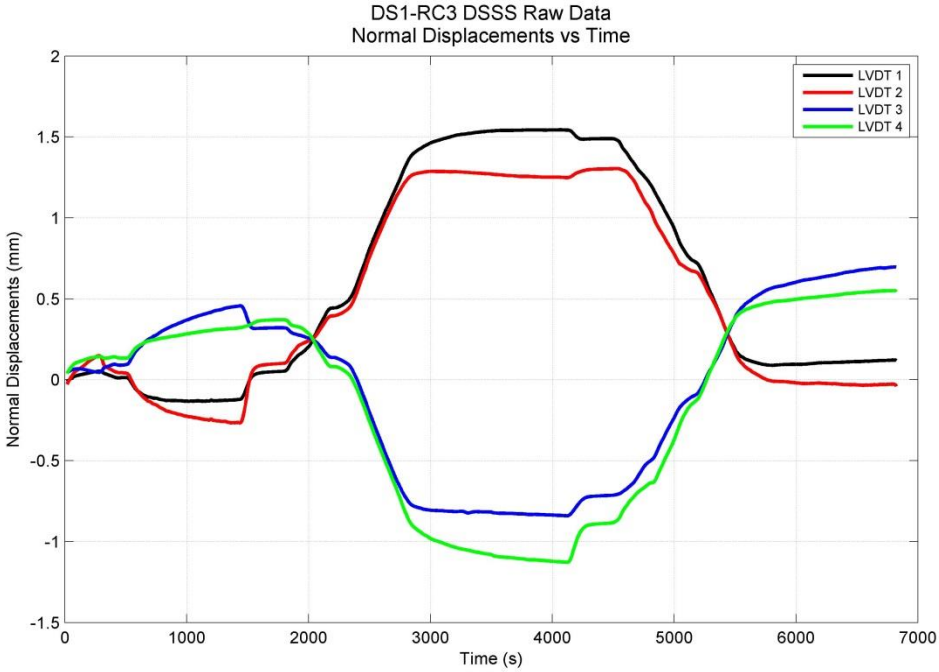
This appendix contains four plots per sample, Shear and normal stress vs time, normal displacements vs time, shear load vs shear displacement for each stage of testing as well as residual and peak shear stresses vs normal stress.

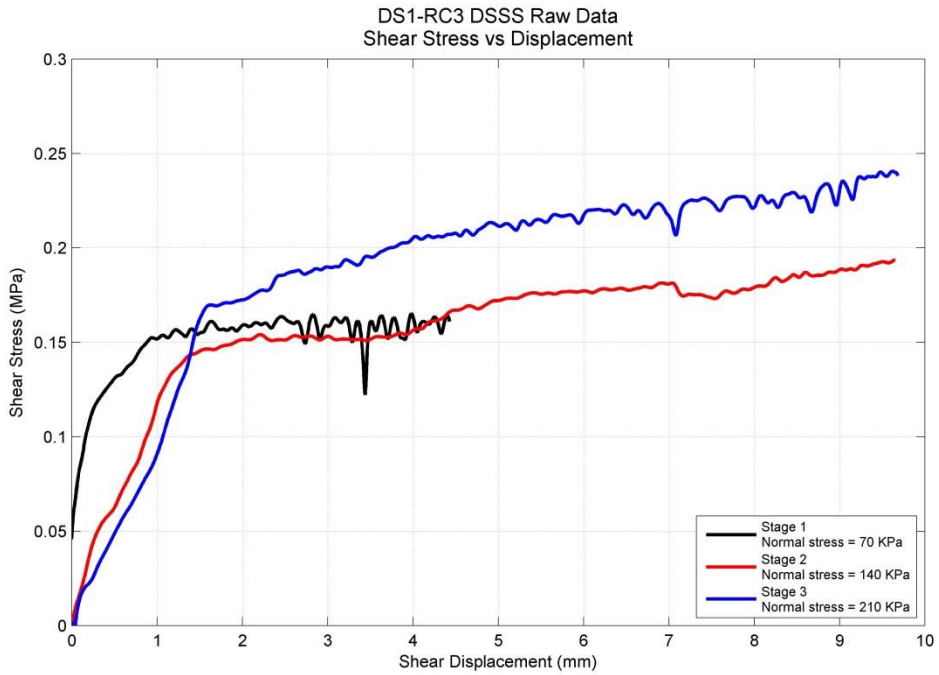
Normal displacement of the shear box was measured with four LVDTs (Linear Variable Differential Transformer) in the configuration shown below. Negative displacement represents a lifting of the shear box.

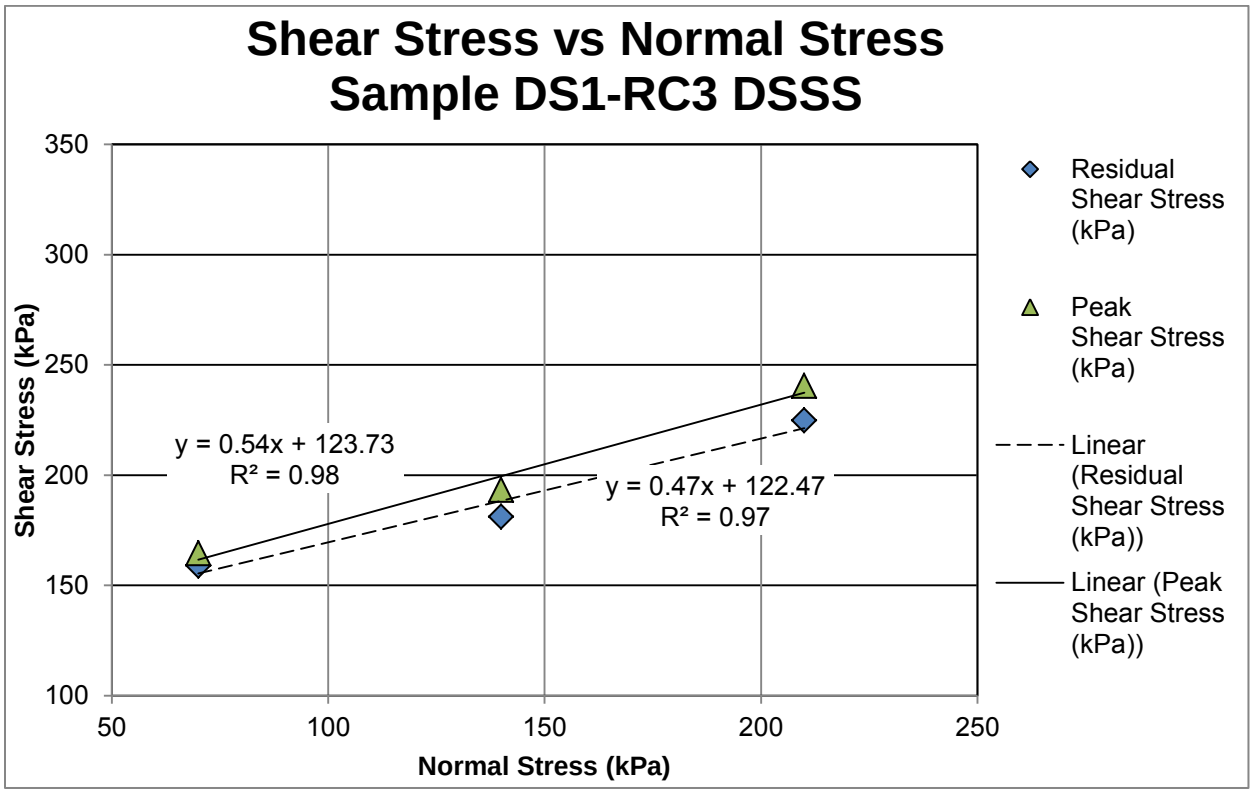


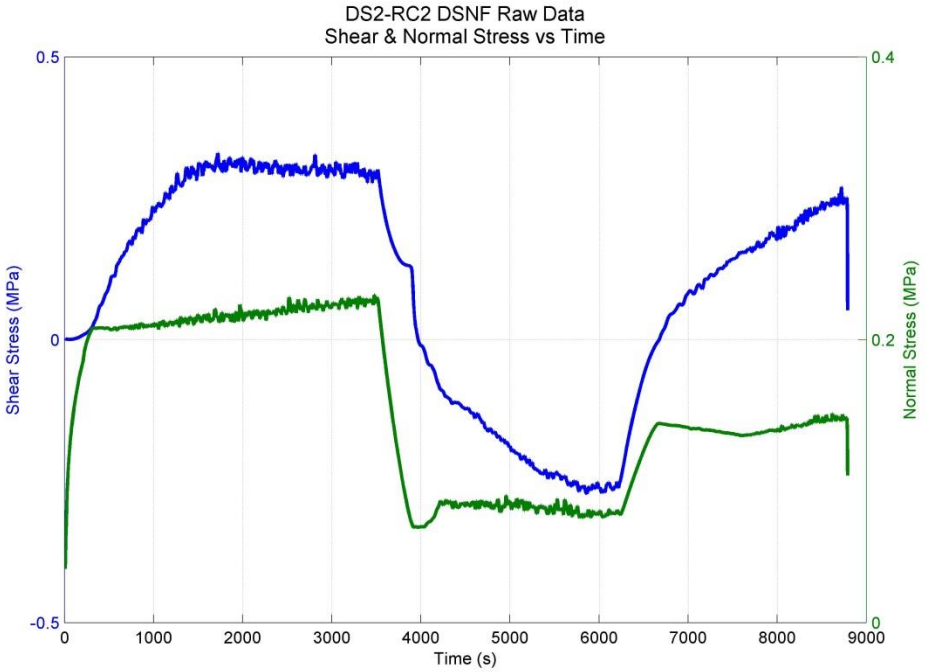



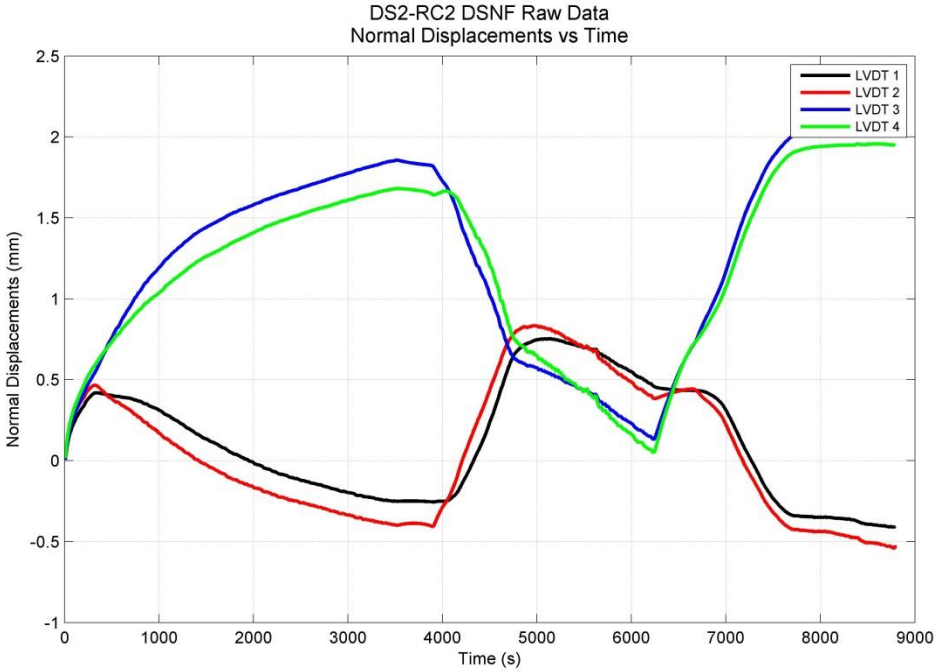

DS1-RC3 DSSS Raw Data
Shear & Normal Stress vs Time
Shear Stress (MPa)
Normal Stress (MPa)
Time (s)
0.3
0.2
0.1
0
-0.1
-0.2
0.25
0.2
0.15
0.1
0.05
0
0
1000
2000
3000
4000
5000
6000
7000

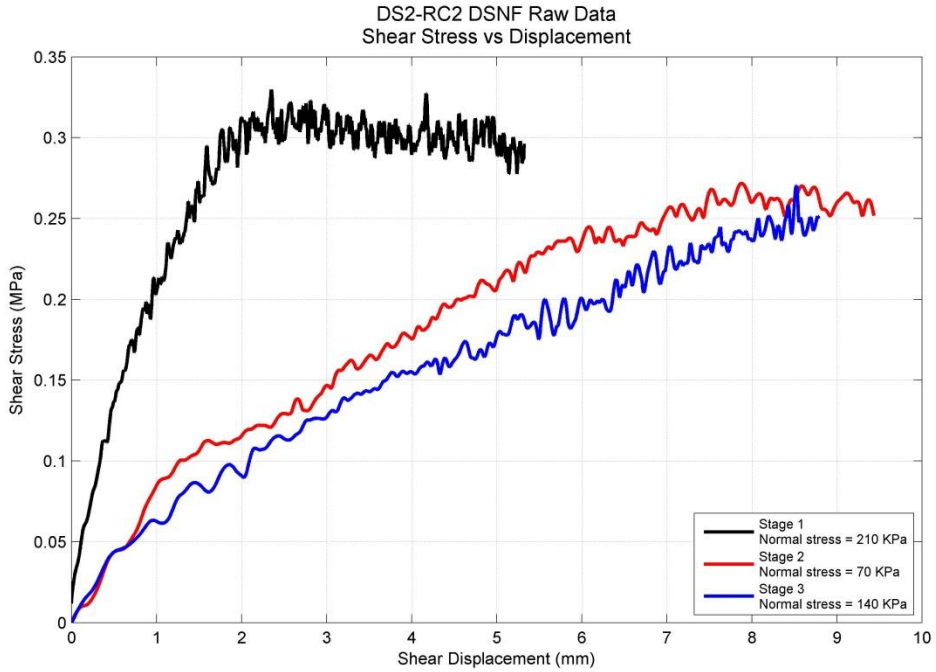

DS1-RC3 DSSS Raw Data
Normal Displacements vs Time
LVDT 1
LVDT 2
LVDT 3
LVDT 4
Normal Displacements (mm)
Time (s)
2
1.5
1
0.5
0
-0.5
-1
-1.5
0
1000
2000
3000
4000
5000
6000
7000

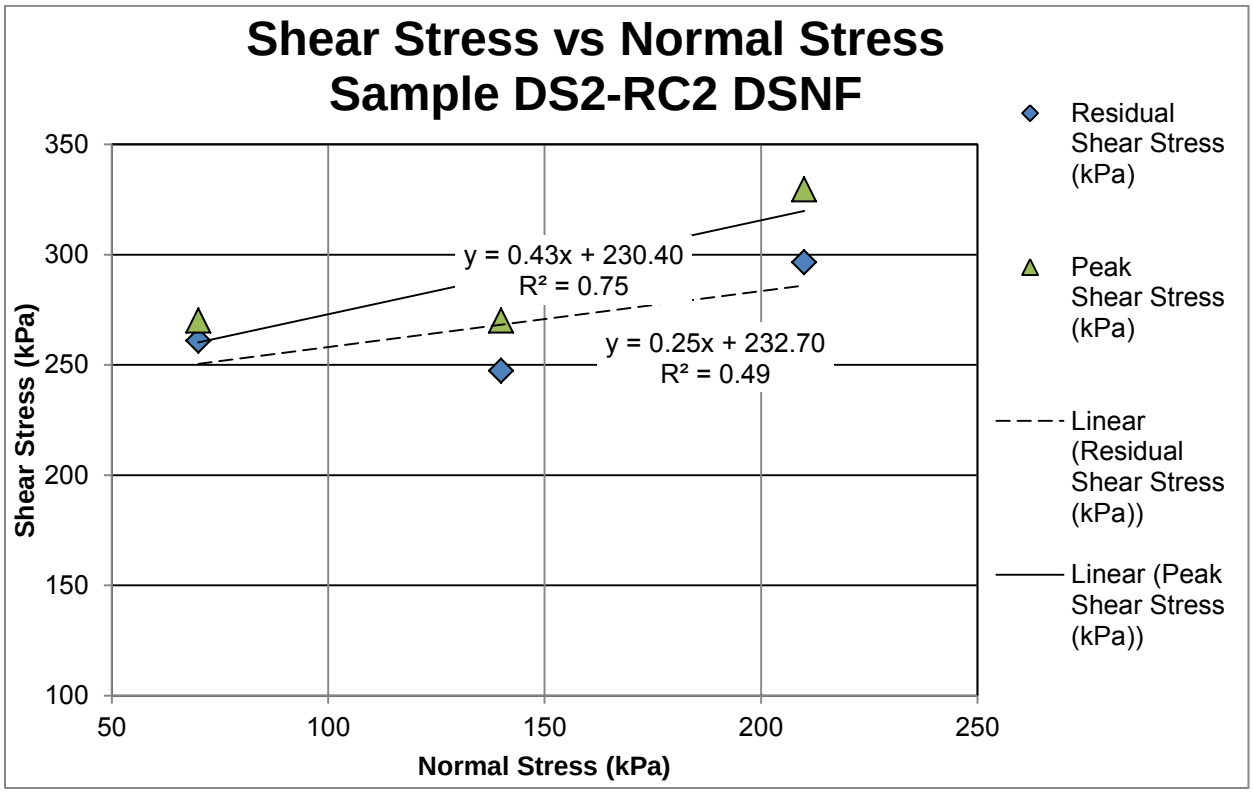

DS1-RC3 DSSS Raw Data
Shear Stress vs Displacement
Shear Stress (MPa)
Shear Displacement (mm)
0.3
0.25
0.2
0.15
0.1
0.05
0
0
1
2
3
4
5
6
7
8
9
10
Stage 1
Normal stress = 70 KPa
Stage 2
Normal stress = 140 KPa
Stage 3
Normal stress = 210 KPa

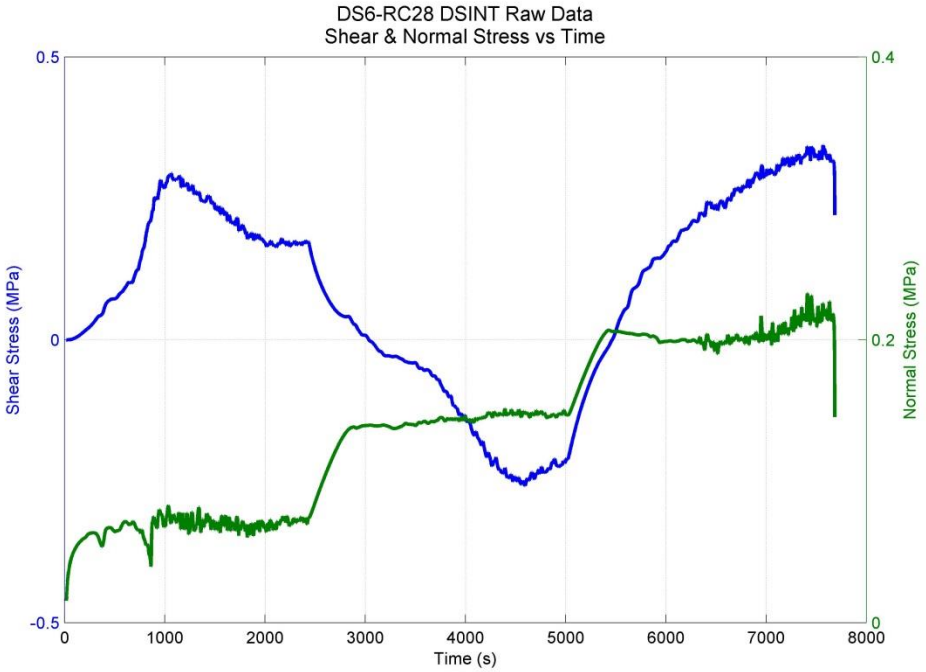

Shear Stress vs Normal Stress
Sample DS1-RC3 DSSS
Shear Stress (kPa)
Normal Stress (kPa)
350
300
250
200
150
100
50
100
150
200
250
y = 0.54x + 123.73
R² = 0.98
y = 0.47x + 122.47
R² = 0.97
Residual Shear Stress (kPa)
Peak Shear Stress (kPa)
Linear (Residual Shear Stress (kPa))
Linear (Peak Shear Stress (kPa))

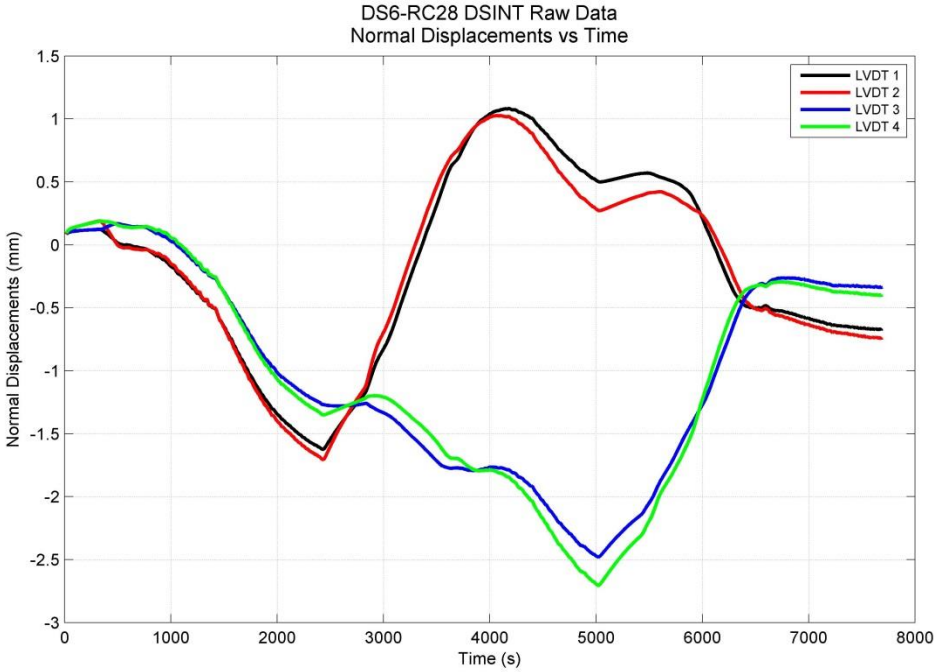

DS2-RC2 DSNF Raw Data
Shear & Normal Stress vs Time
Shear Stress (MPa)
Normal Stress (MPa)
Time (s)
0.5
0
-0.5
0.4
0.2
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000

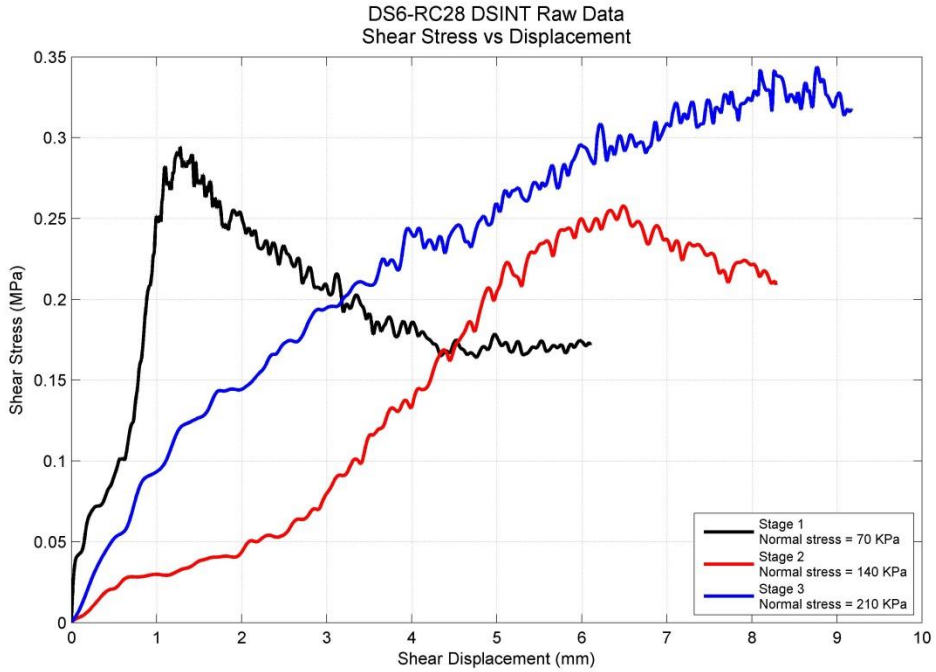

DS2-RC2 DSNF Raw Data
Normal Displacements vs Time
Normal Displacements (mm)
Time (s)
LVDT 1
LVDT 2
LVDT 3
LVDT 4
2.5
2
1.5
1
0.5
0
-0.5
-1
0
1000
2000
3000
4000
5000
6000
7000
8000
9000

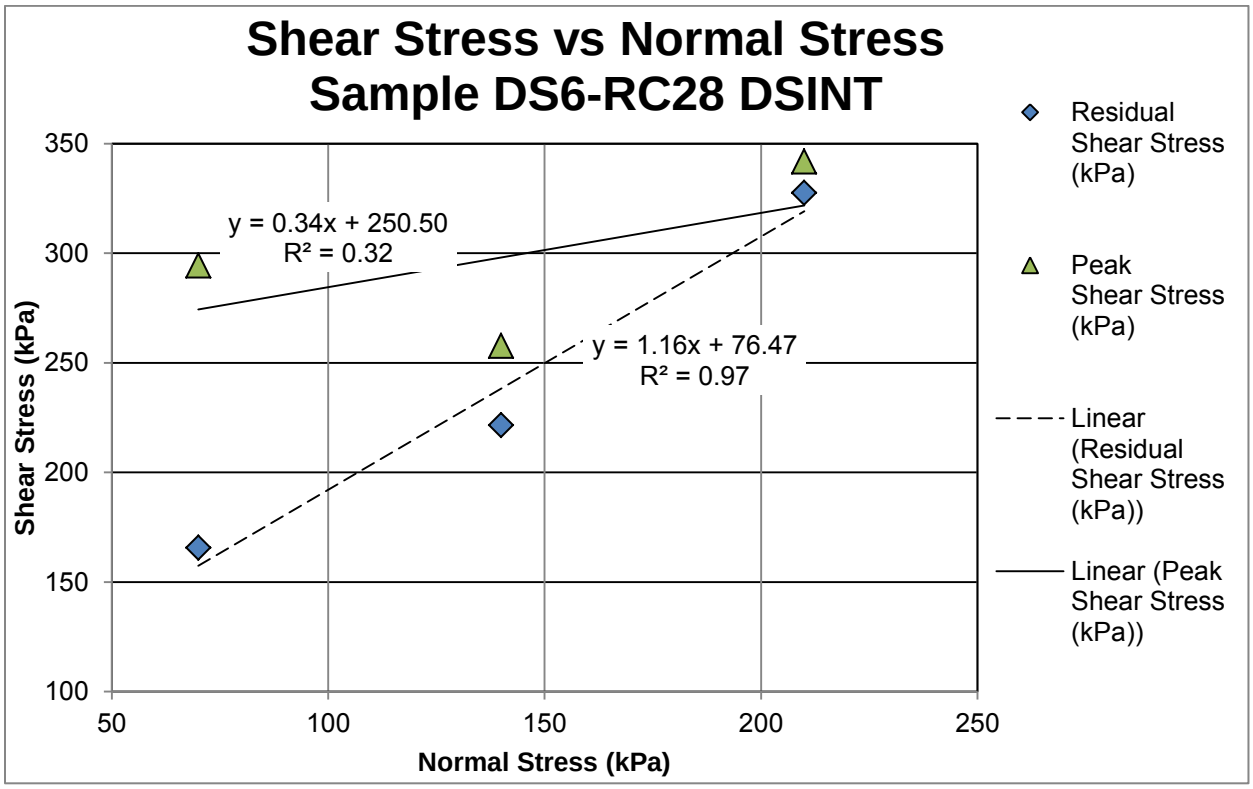

DS2-RC2 DSNF Raw Data
Shear Stress vs Displacement
Shear Stress (MPa)
Shear Displacement (mm)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
1
2
3
4
5
6
7
8
9
10
Stage 1
Normal stress = 210 KPa
Stage 2
Normal stress = 70 KPa
Stage 3
Normal stress = 140 KPa

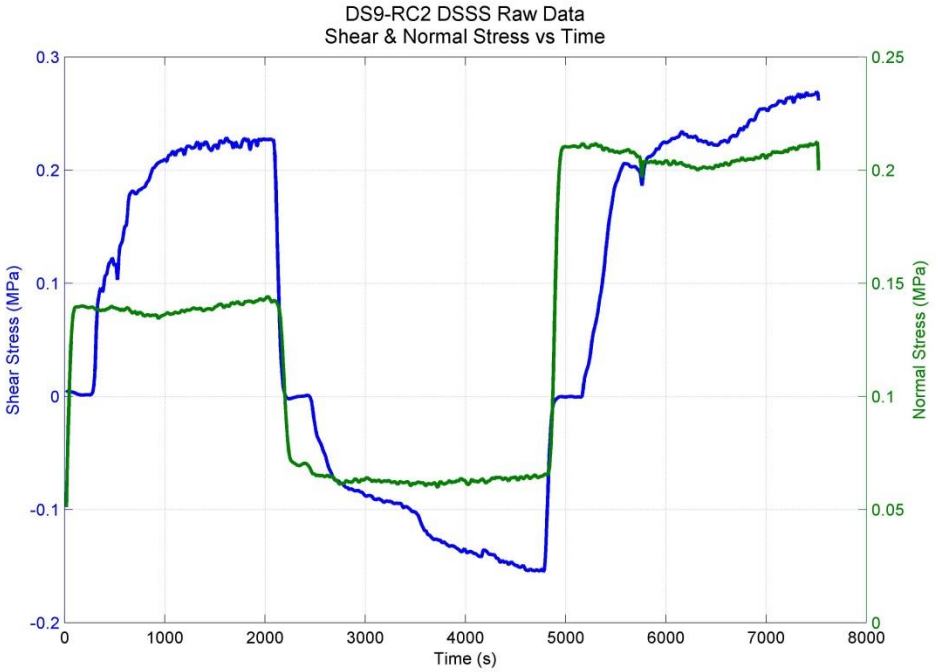

Shear Stress vs Normal Stress
Sample DS2-RC2 DSNF
Shear Stress (kPa)
Normal Stress (kPa)
350
300
250
200
150
100
50
100
150
200
250
y = 0.43x + 230.40
R² = 0.75
y = 0.25x + 232.70
R² = 0.49
Residual Shear Stress (kPa)
Peak Shear Stress (kPa)
Linear (Residual Shear Stress (kPa))
Linear (Peak Shear Stress (kPa))

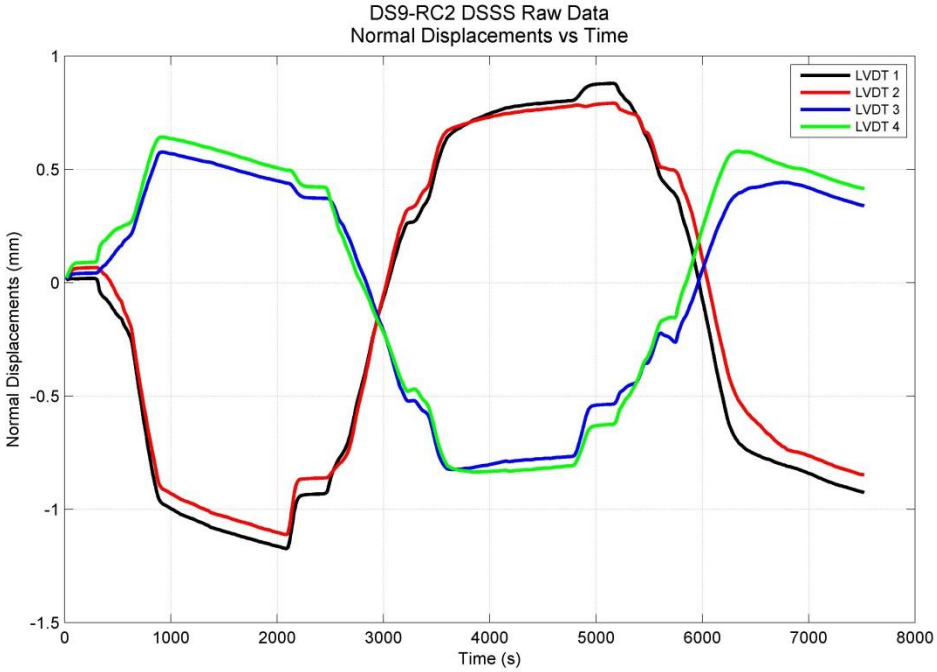

DS6-RC28 DSINT Raw Data
Shear & Normal Stress vs Time
Shear Stress (MPa)
Normal Stress (MPa)
Time (s)
0.5
0
-0.5
0.4
0.2
0
0
1000
2000
3000
4000
5000
6000
7000
8000

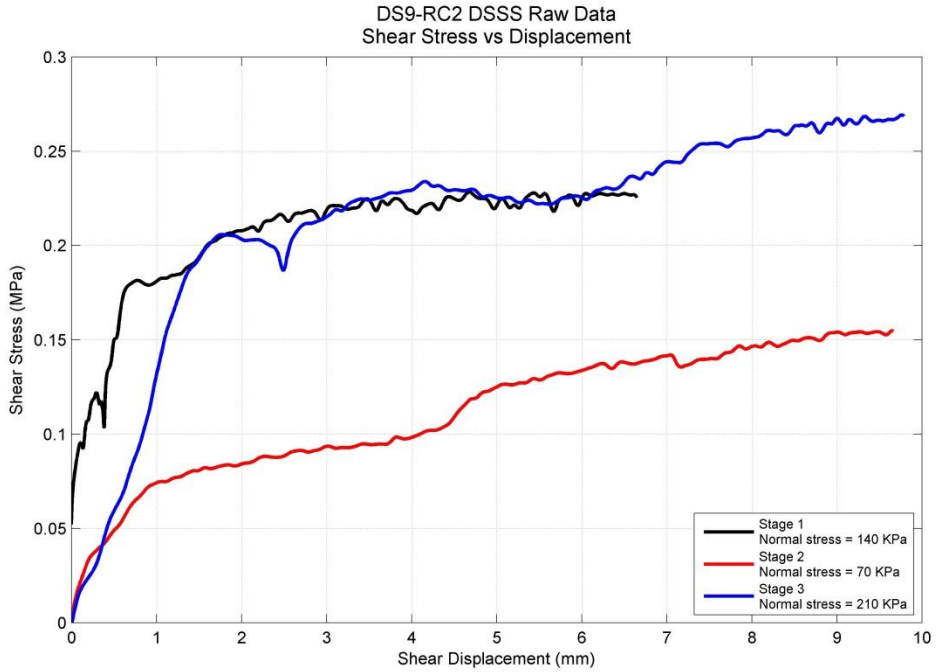

DS6-RC28 DSINT Raw Data
Normal Displacements vs Time
Normal Displacements (mm)
Time (s)
LVDT 1
LVDT 2
LVDT 3
LVDT 4
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
0
1000
2000
3000
4000
5000
6000
7000
8000

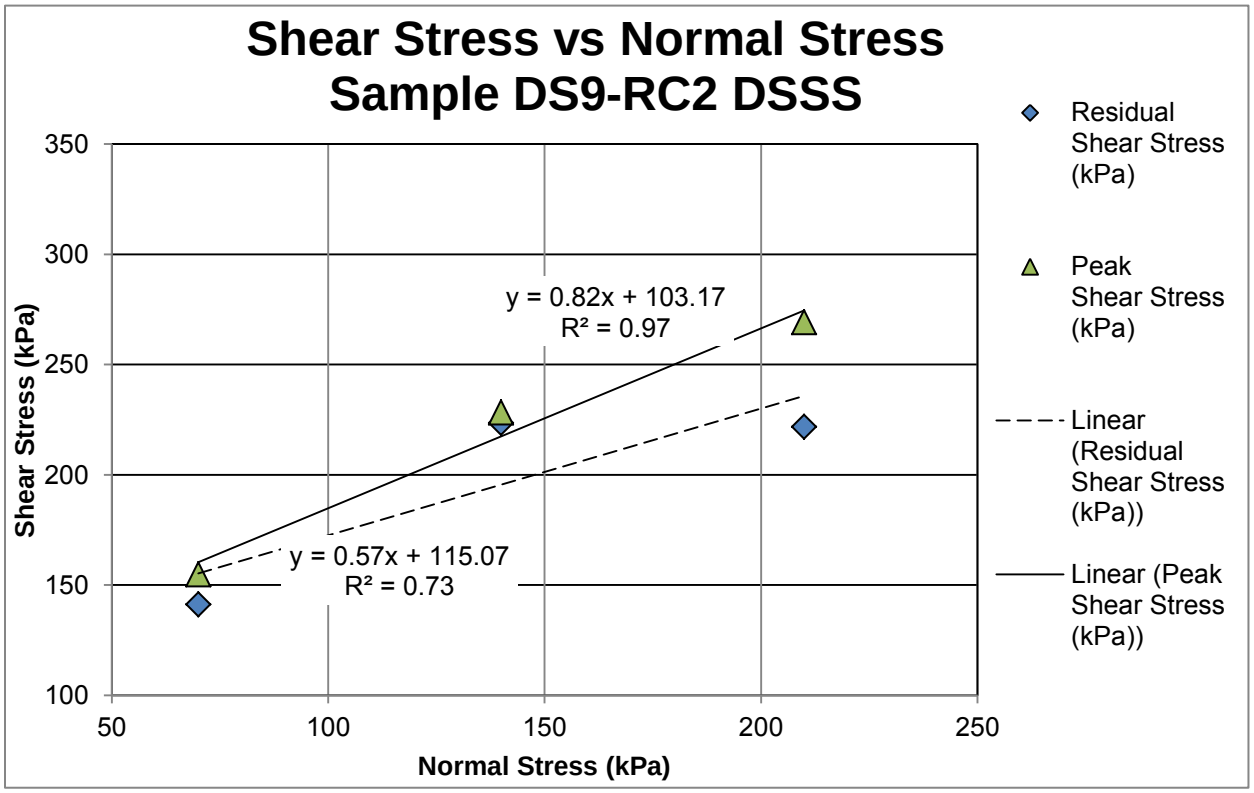

DS6-RC28 DSINT Raw Data
Shear Stress vs Displacement
Shear Stress (MPa)
Shear Displacement (mm)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
1
2
3
4
5
6
7
8
9
10
Stage 1
Normal stress = 70 KPa
Stage 2
Normal stress = 140 KPa
Stage 3
Normal stress = 210 KPa

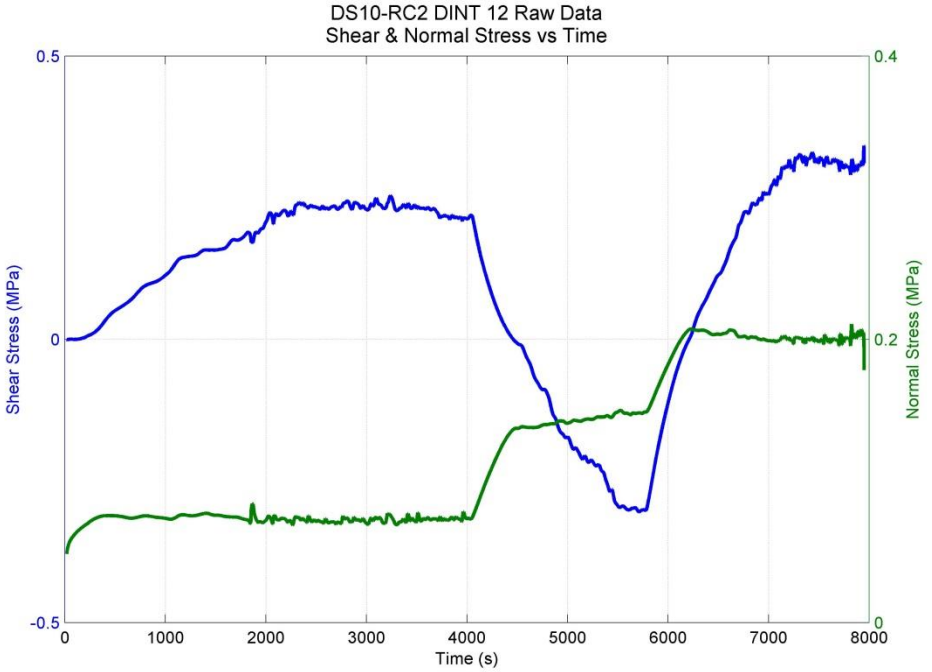

Shear Stress vs Normal Stress
Sample DS6-RC28 DSINT
Shear Stress (kPa)
Normal Stress (kPa)
350
300
250
200
150
100
50
100
150
200
250
y = 0.34x + 250.50
R² = 0.32
y = 1.16x + 76.47
R² = 0.97
Residual Shear Stress (kPa)
Peak Shear Stress (kPa)
Linear (Residual Shear Stress (kPa))
Linear (Peak Shear Stress (kPa))

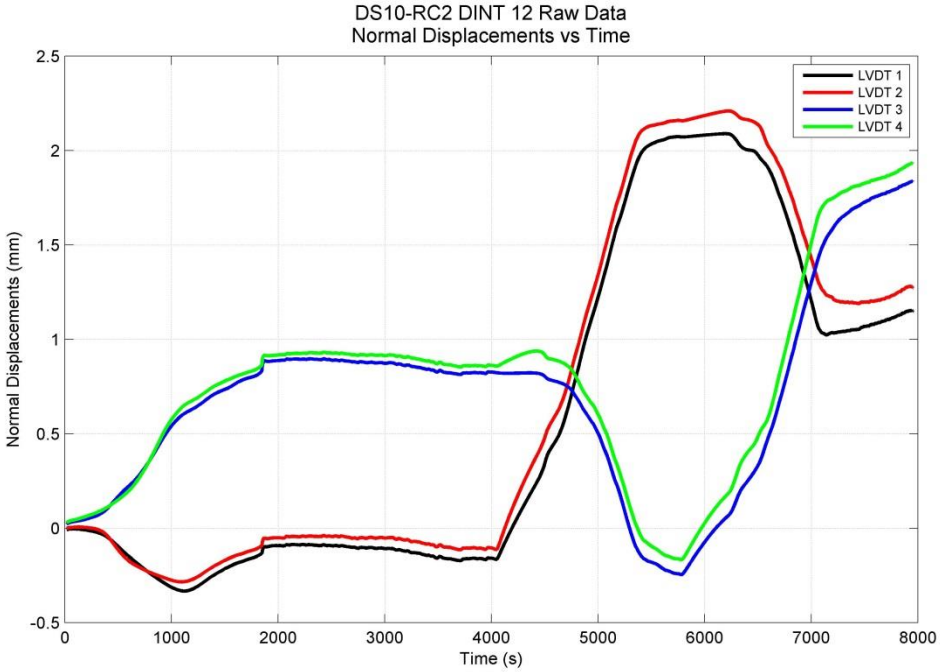

DS9-RC2 DSSS Raw Data
Shear & Normal Stress vs Time
Shear Stress (MPa)
Normal Stress (MPa)
Time (s)
0.3
0.2
0.1
0
-0.1
-0.2
0.25
0.2
0.15
0.1
0.05
0
0
1000
2000
3000
4000
5000
6000
7000
8000

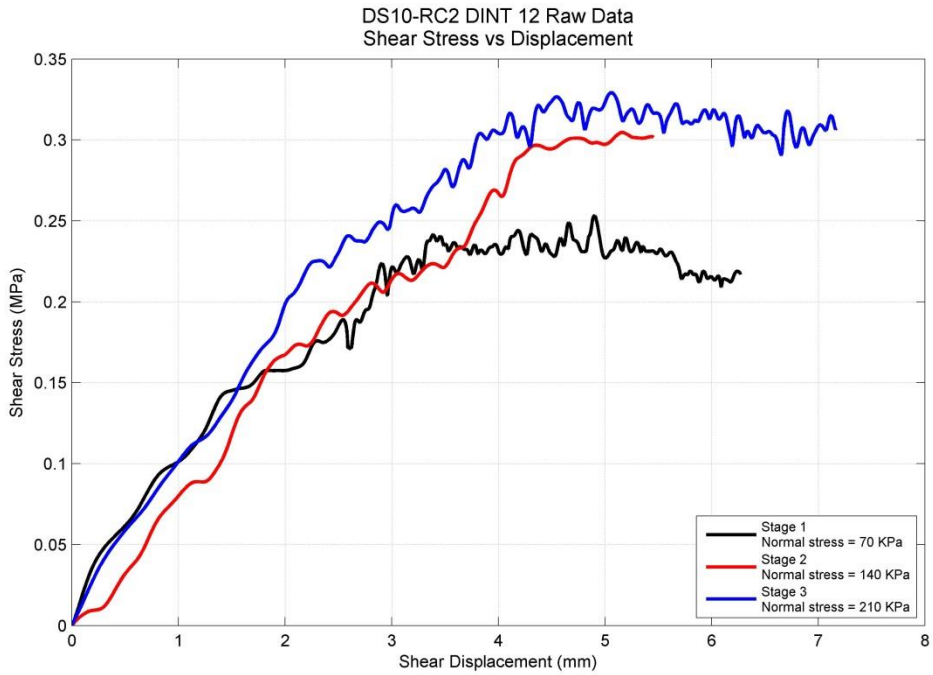

DS9-RC2 DSSS Raw Data
Normal Displacements vs Time
Normal Displacements (mm)
Time (s)
LVDT 1
LVDT 2
LVDT 3
LVDT 4
1
0.5
0
-0.5
-1
-1.5
0
1000
2000
3000
4000
5000
6000
7000
8000

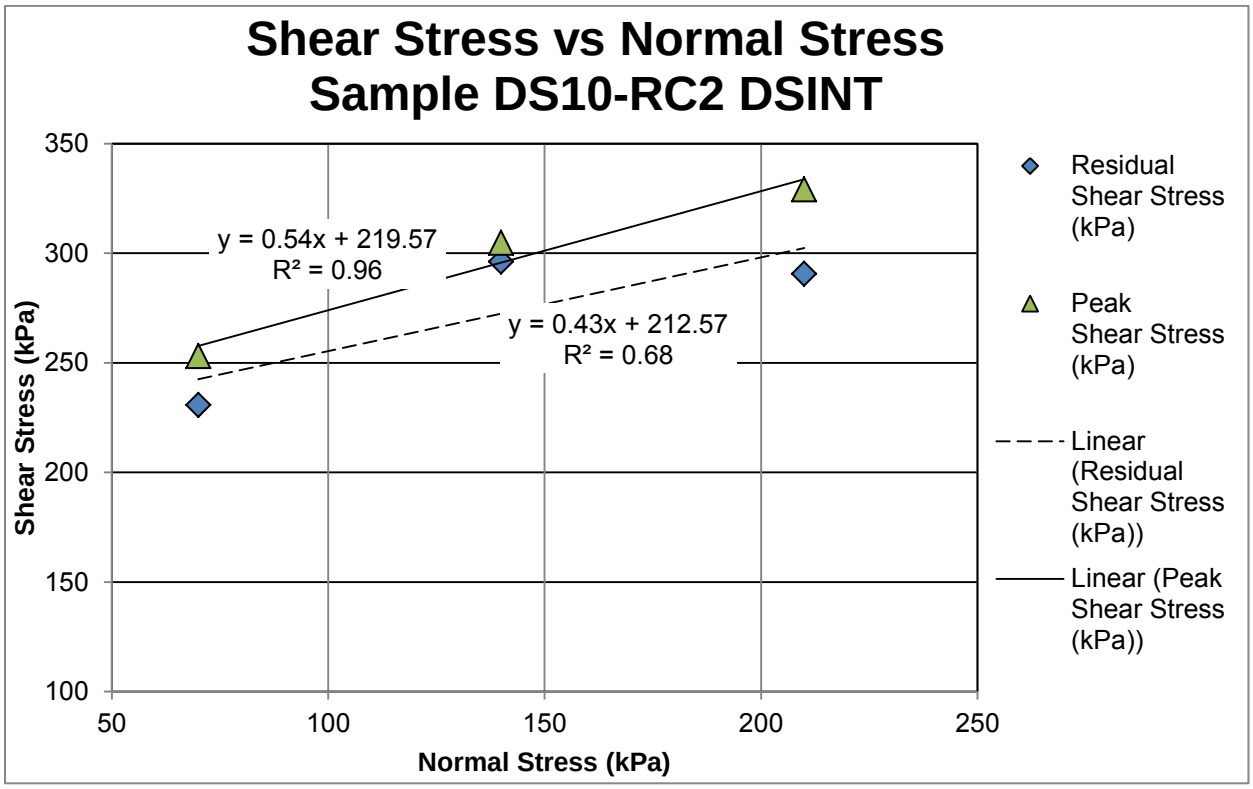

DS9-RC2 DSSS Raw Data
Shear Stress vs Displacement
Shear Stress (MPa)
Shear Displacement (mm)
0.3
0.25
0.2
0.15
0.1
0.05
0
0
1
2
3
4
5
6
7
8
9
10
Stage 1
Normal stress = 140 KPa
Stage 2
Normal stress = 70 KPa
Stage 3
Normal stress = 210 KPa


Shear Stress vs Normal Stress
Sample DS9-RC2 DSSS
Shear Stress (kPa)
Normal Stress (kPa)
350
300
250
200
150
100
50
100
150
200
250
y = 0.82x + 103.17
R² = 0.97
y = 0.57x + 115.07
R² = 0.73
Residual Shear Stress (kPa)
Peak Shear Stress (kPa)
Linear (Residual Shear Stress (kPa))
Linear (Peak Shear Stress (kPa))


DS10-RC2 DINT 12 Raw Data
Shear & Normal Stress vs Time
Shear Stress (MPa)
Normal Stress (MPa)
Time (s)
0.5
0
-0.5
0.4
0.2
0
0
1000
2000
3000
4000
5000
6000
7000
8000


DS10-RC2 DINT 12 Raw Data
Normal Displacements vs Time
Normal Displacements (mm)
Time (s)
LVDT 1
LVDT 2
LVDT 3
LVDT 4
2.5
2
1.5
1
0.5
0
-0.5
0
1000
2000
3000
4000
5000
6000
7000
8000


DS10-RC2 DINT 12 Raw Data
Shear Stress vs Displacement
Shear Stress (MPa)
Shear Displacement (mm)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
1
2
3
4
5
6
7
8
Stage 1
Normal stress = 70 KPa
Stage 2
Normal stress = 140 KPa
Stage 3
Normal stress = 210 KPa


Shear Stress vs Normal Stress
Sample DS10-RC2 DSINT
Shear Stress (kPa)
Normal Stress (kPa)
350
300
250
200
150
100
50
100
150
200
250
y = 0.54x + 219.57
R² = 0.96
y = 0.43x + 212.57
R² = 0.68
Residual Shear Stress (kPa)
Peak Shear Stress (kPa)
Linear (Residual Shear Stress (kPa))
Linear (Peak Shear Stress (kPa))

# APPENDIX D REFERENCE DOCUMENTS


| No. | Title |
|---|---|
| 1 | Agbogun, H.M.D., T.A. Al, and E.M.A. Hussein. *Three Dimensional Imaging of Porosity and Tracer Concentration Distributions in a Dolostone Sample During Diffusion Experiments Using X-ray Micro-CT*, 2013. |
| 2 | American Petroleum Institute (API). *Recommended Practices for Core Analysis, Recommended Practice 40 (2nd Ed.)*, 1998. |
| 3 | ASTM International A956. *Standard Test Method for Leeb Hardness Testing of Steel Products*, 2012. |
| 4 | ASTM International D2845. *Standard Test Method for Laboratory Determination of Pulse Velocities and Ultrasonic Elastic Constants of Rock*, 2008. |
| 5 | ASTM International D3967. *Standard Test Method for Splitting Tensile Strength of Intact Rock Core Specimens*, 2008. |
| 6 | ASTM International D4543. *Standard Practices for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerances*, 2008. |
| 7 | ASTM International D5079. *Standard Practices for Preserving and Transporting Rock Core Samples*, 2008. |
| 8 | ASTM International D7012. *Standard Test Method for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperature*, 2013. |
| 9 | Clausnitzer, V., and J.W. Hopman. *Pore-scale Measurements of Solute Breakthrough Using Microfocus X-ray Computed Tomography*, 2000. |
| 10 | Espitalie et al. *Rock-Eval Pyrolysis and its Applications (Part Two)*, 1985. |
| 11 | International Society for Rock Mechanics (ISRM). *Suggested Methods for Determining the Strength of Rock Materials in Triaxial Compression: Revised Version*, 1977. |
| 12 | Ketcham, R.A., and W.D. Carlson. *Acquisition, Optimization and Interpretation of X-ray Computed Tomographic Imagery: Applications to the Geosciences*, 2001. |
| 13 | Tissot, B., B. Durand, J. Espitalie, and A. Combaz. *Influence of the Nature and Diagenesis of Organic Matter in the Formation of Petroleum*, 1974. |
| 14 | Yao, Y., D. Liu, Y. Che, D. Tang, S. Tang, and W.Huang. *Non-destructive Characterization of Coal Samples from China Using Microfocus X-ray Computed Tomography*, 2009. |

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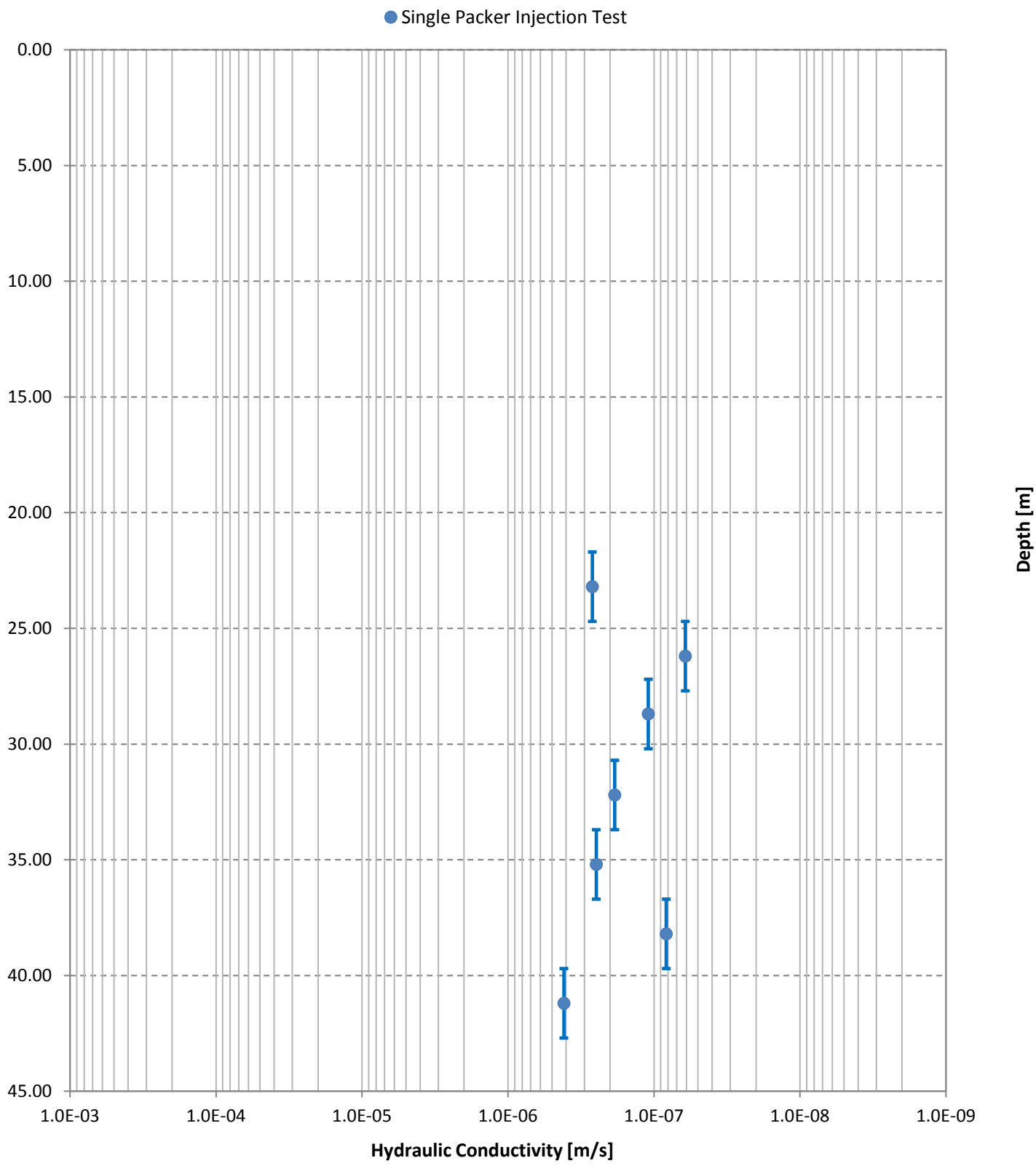
# Appendix G
Packer Testing

Stantec

**Title**

# Summary Plot of D29 Packer Testing




| | | | |
|---|---|---|---|
| **Project** SR1 - Off Stream Reservoir | | **Scale** N/A | **Date** 23/11/2016 |
| **Client** Alberta Transportation | | **Drawn** JNW | **Checked** |
| **Project Number** 110773396.302.702.230 | | **Drawing No.** | |

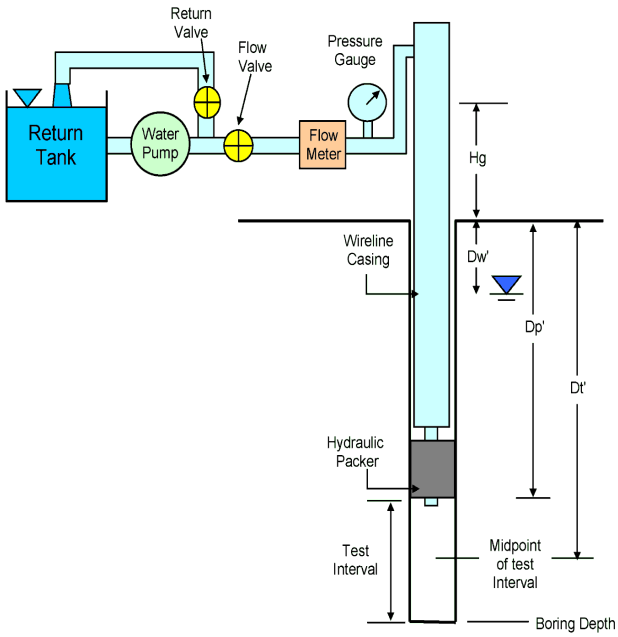
Stantec

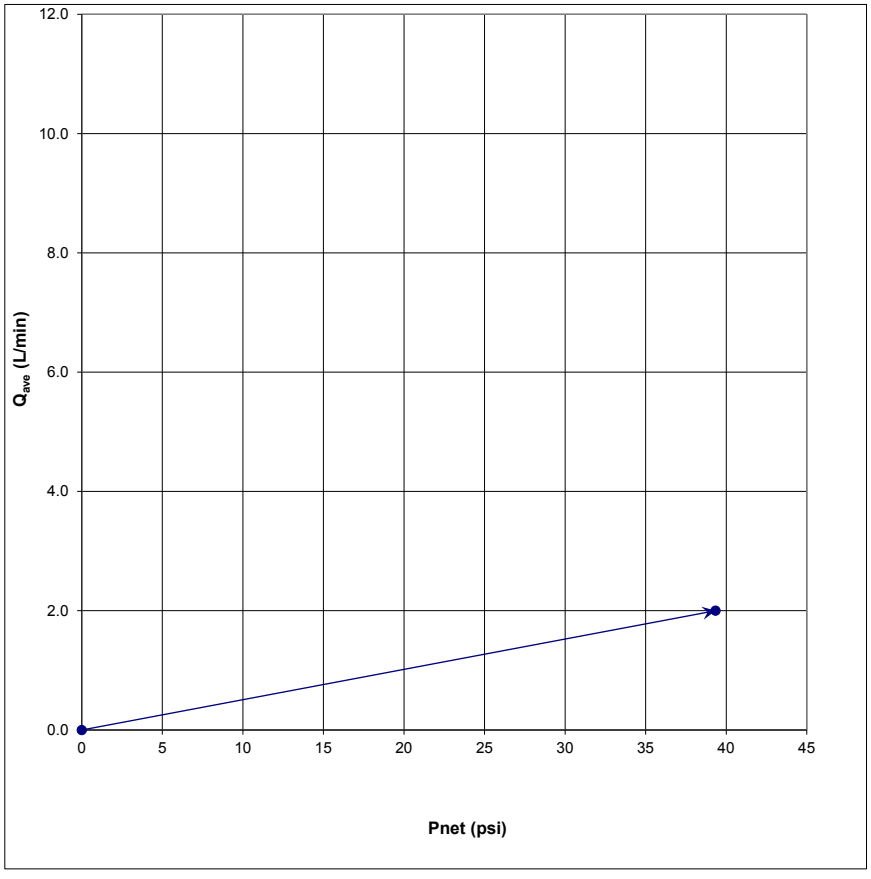
# SINGLE PACKER INJECTION TEST

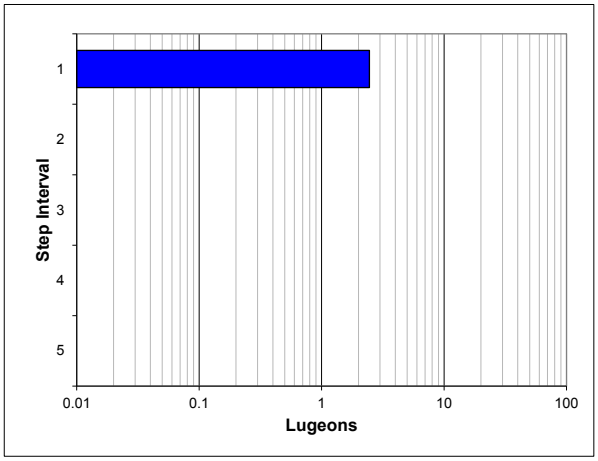
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D29 |
| | | Test Nº: | 1 |
| | Project Nº: 110773396 Test Interval (m): 21.7 to 24.7 | GS Elev. (m): | 1191.0 |
| | | Supervisor: | RH |

| | | | | | |
|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 2.1 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 18.6 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **21.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **23.2** m | f | Friction factor | **0.033** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **2.1** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **21.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **23.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 35 | | | | |
| 1 | 3.00 | | | | |
| 2 | 2.00 | | | | |
| 3 | 2.00 | | | | |
| 4 | 2.00 | | | | |
| 5 | 2.00 | | | | |
| 6 | 1.00 | | | | |
| 7 | 2.00 | | | | |
| 8 | 2.00 | | | | |
| $Q_{avg}$ (L/min) | 2.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 39.3 | | | | |
| K (m/min) | 1.6E-05 | | | | |
| K (m/sec) | 2.6E-07 | | | | |
| Lugeons | 2.5 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.

- Based on limited data, **$K_{avg}$ is estimated as $2.6 \times 10^{-7}$ m/sec**

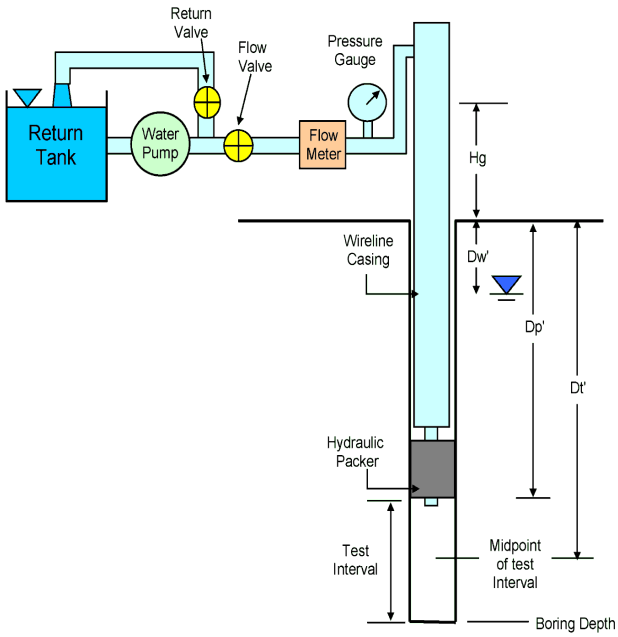
- For all intervals, the vertical graphical scale is set from 0 - 12.0 L/min

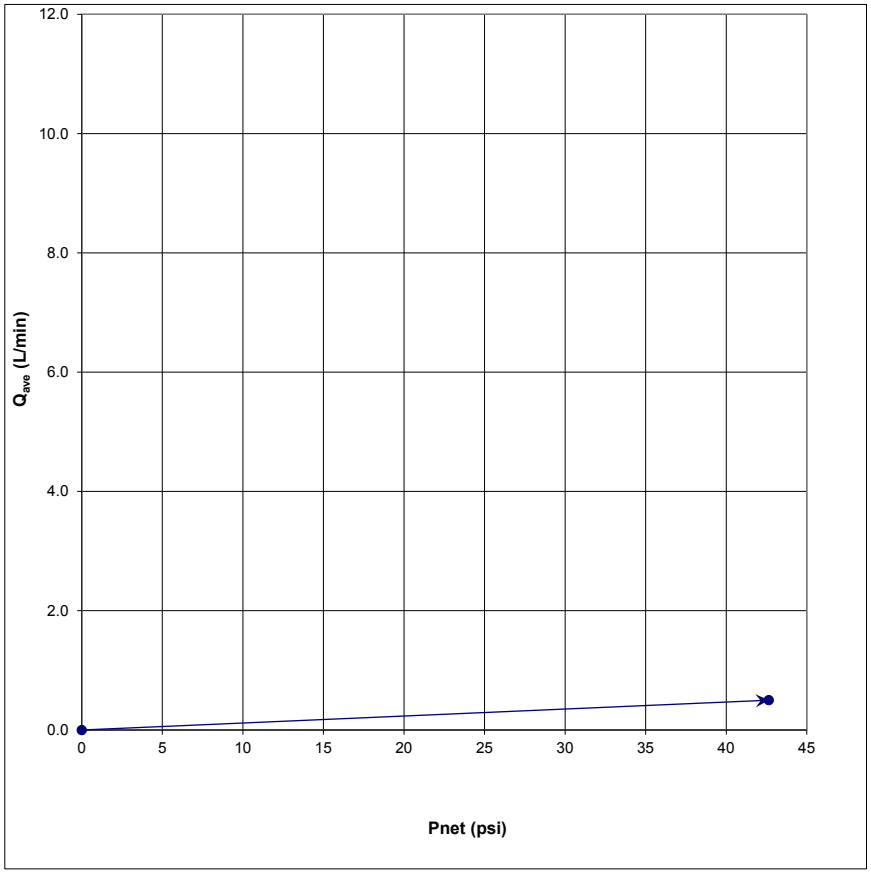
# SINGLE PACKER INJECTION TEST

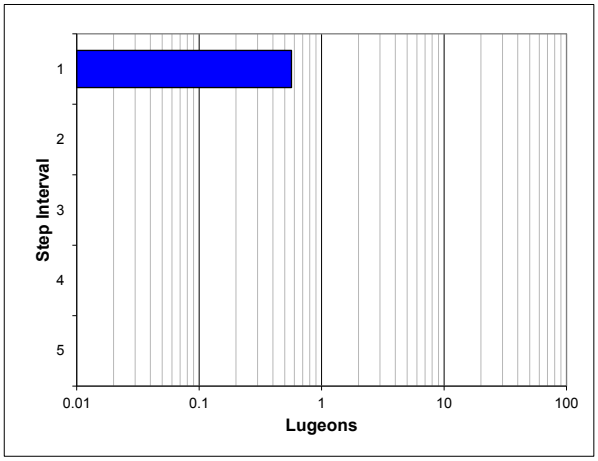
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D29 |
| | | Test Nº: | 2 |
| Project Nº: 110773396 | Test Interval (m): 24.7 to 27.7 | GS Elev. (m): | 1191.0 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 3.0 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 18.6 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **24.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **26.2** m | f | Friction factor | **0.038** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **3.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **24.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **26.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 37 | | | | |
| 1 | 0.50 | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 0.50 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 42.6 | | | | |
| K (m/min) | 3.7E-06 | | | | |
| K (m/sec) | 6.1E-08 | | | | |
| Lugeons | 0.6 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- No flow recorded after first time increment during testing at this interval. Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 6.1x10$^{-8}$ m/sec**

- For all intervals, the vertical graphical scale is set from 0 - 12.0 L/min

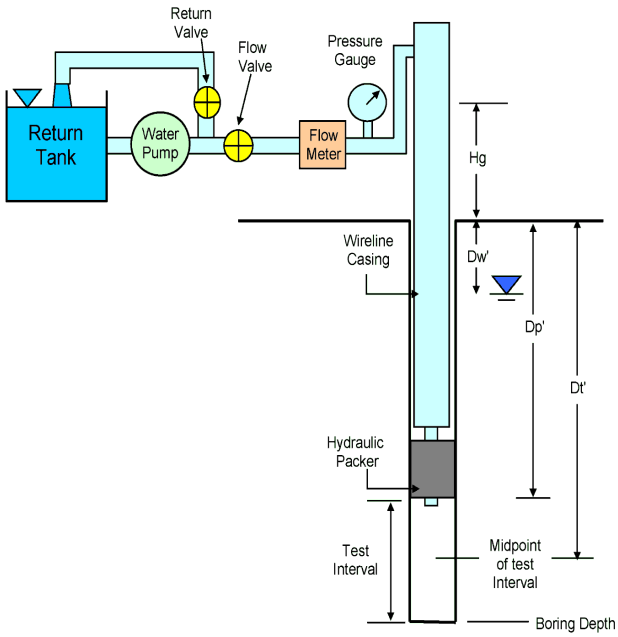
# SINGLE PACKER INJECTION TEST

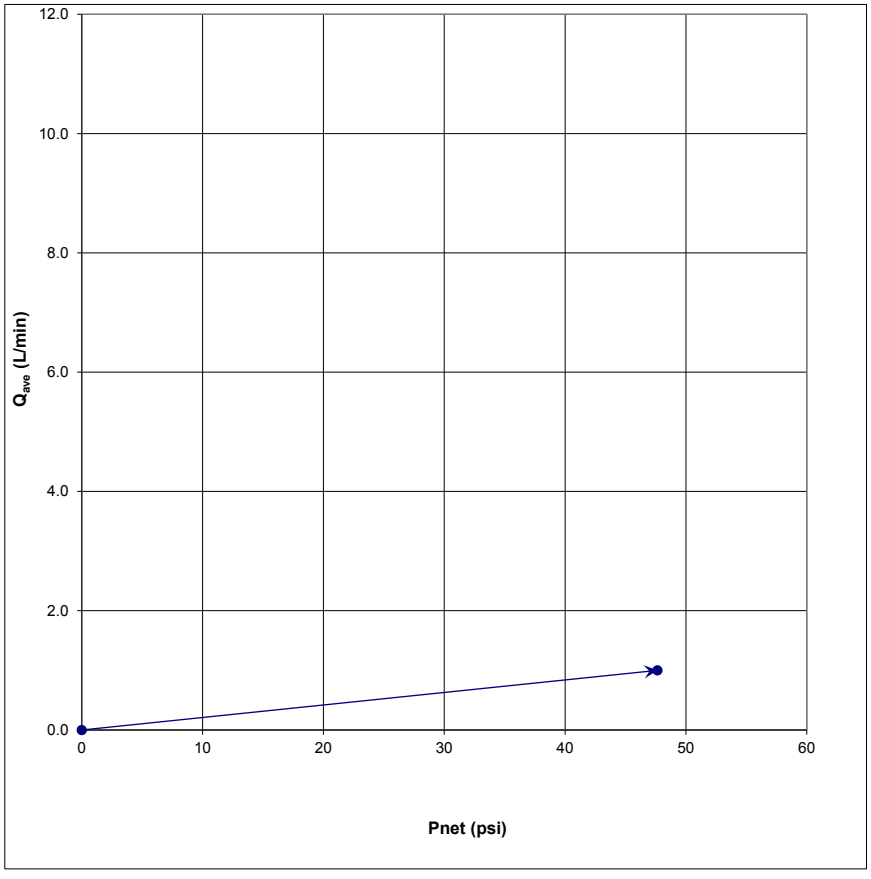
Stantec

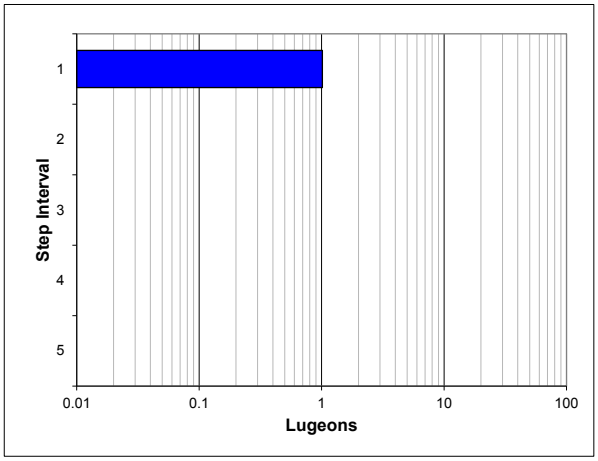
| | | | |
|---|---|---|---|
| Project Name: SR1 - Off Stream Reservoir | | BH Nº: | D29 |
| | | Test Nº: | 3 |
| Project Nº: 110773396 | Test Interval (m): 27.2 to 30.2 | GS Elev. (m): | 1191.0 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 3.0 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 18.6 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **27.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **28.7** m | f | Friction factor | **0.045** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **3.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **27.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **28.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 42 | | | | |
| 1 | 1.00 | | | | |
| 2 | 1.00 | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | 1.00 | | | | |
| 6 | | | | | |
| 7 | 1.00 | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 47.6 | | | | |
| K (m/min) | 6.6E-06 | | | | |
| K (m/sec) | 1.1E-07 | | | | |
| Lugeons | 1.0 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- No flow recorded at time increments 3, 4, 6, and 8. Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 1.1x10$^{-7}$ m/sec**

- For all intervals, the vertical graphical scale is set from 0 - 12.0 L/min

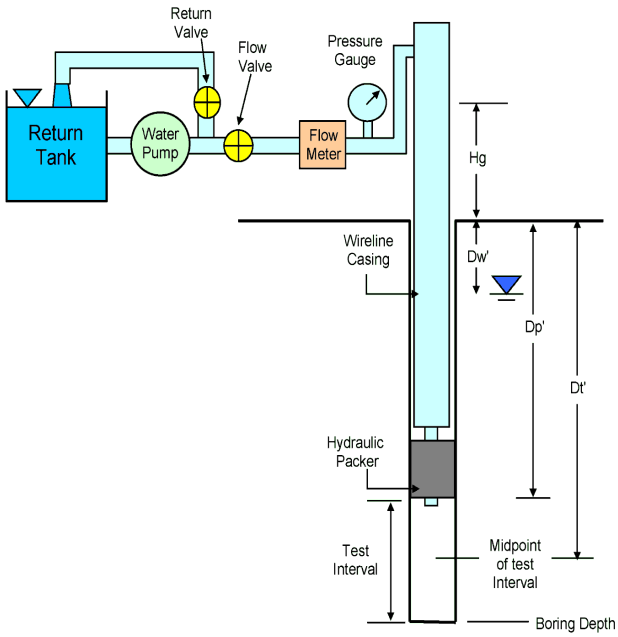
# SINGLE PACKER INJECTION TEST

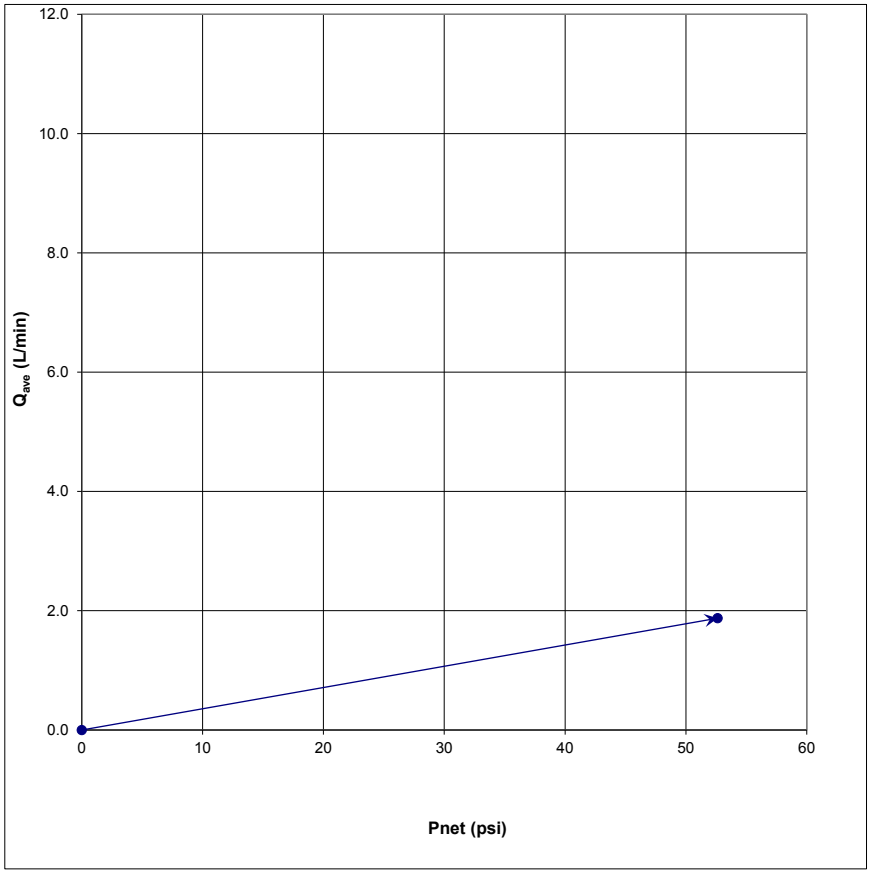
Stantec

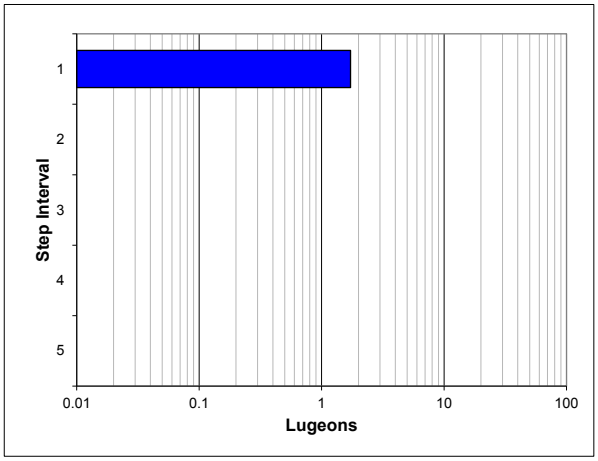
| | | | |
|---|---|---|---|
| Project Name: SR1 - Off Stream Reservoir | | BH Nº: | D29 |
| | | Test Nº: | 4 |
| Project Nº: 110773396 | Test Interval (m): 30.7 to 33.7 | GS Elev. (m): | 1191.0 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 3.0 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 18.6 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **30.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **32.2** m | f | Friction factor | **0.068** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **3.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **30.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **32.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 47 | | | | |
| 1 | 2.00 | | | | |
| 2 | 2.00 | | | | |
| 3 | 2.00 | | | | |
| 4 | 2.00 | | | | |
| 5 | 2.00 | | | | |
| 6 | 2.00 | | | | |
| 7 | 1.00 | | | | |
| 8 | 2.00 | | | | |
| $Q_{avg}$ (L/min) | 1.88 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 52.6 | | | | |
| K (m/min) | 1.1E-05 | | | | |
| K (m/sec) | 1.9E-07 | | | | |
| Lugeons | 1.7 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor.Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 1.9x10$^{-7}$ m/sec**

- For all intervals, the vertical graphical scale is set from 0 - 12.0 L/min

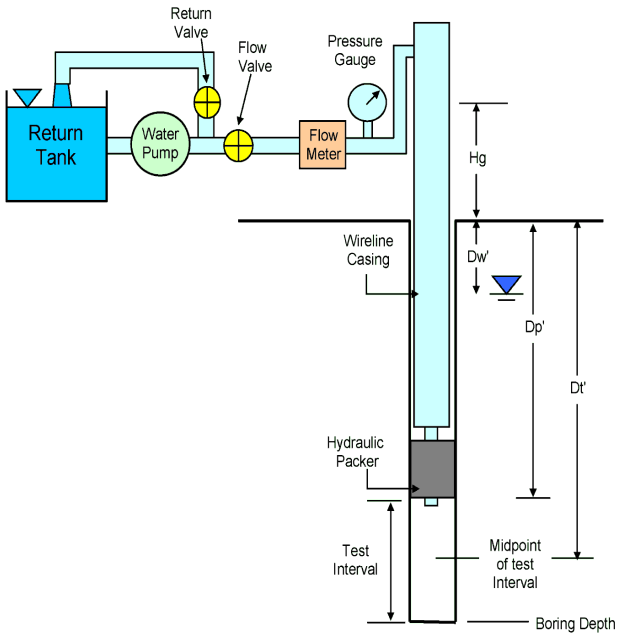
# SINGLE PACKER INJECTION TEST

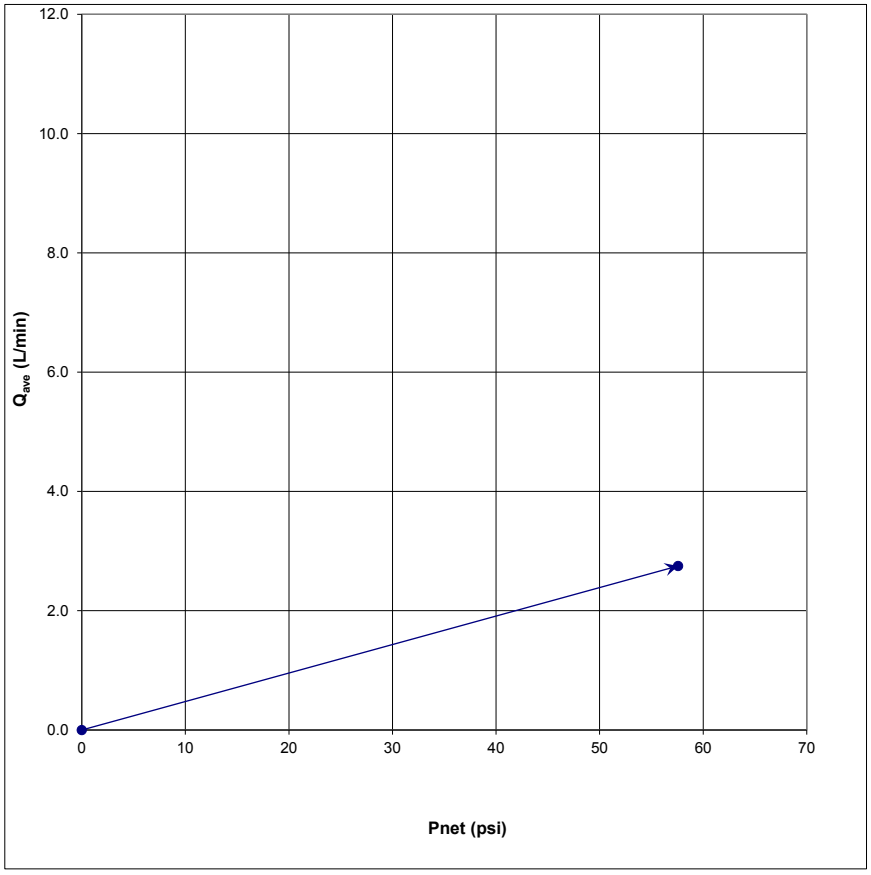
Stantec

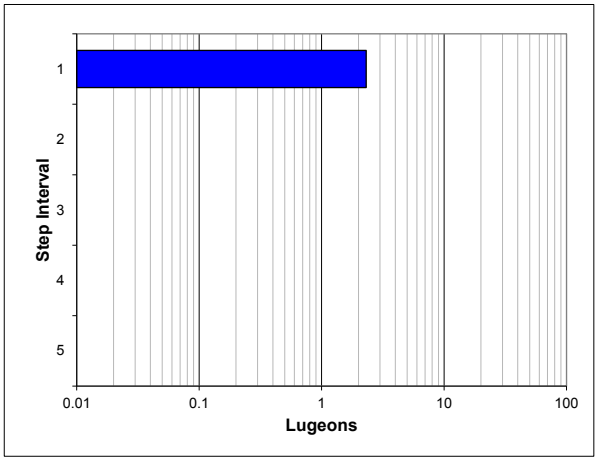
| | | | |
|---|---|---|---|
| Project Name: SR1 - Off Stream Reservoir | | BH Nº: | D29 |
| | | Test Nº: | 5 |
| Project Nº: 110773396 | Test Interval (m): 33.7 to 36.7 | GS Elev. (m): | 1191.0 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 3.0 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 18.6 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **33.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **35.2** m | f | Friction factor | **0.096** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **3.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **33.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **35.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 52 | | | | |
| 1 | 3.00 | | | | |
| 2 | 3.00 | | | | |
| 3 | 2.00 | | | | |
| 4 | 3.00 | | | | |
| 5 | 3.00 | | | | |
| 6 | 2.00 | | | | |
| 7 | 3.00 | | | | |
| 8 | 3.00 | | | | |
| $Q_{avg}$ (L/min) | 2.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 57.6 | | | | |
| K (m/min) | 1.5E-05 | | | | |
| K (m/sec) | 2.5E-07 | | | | |
| Lugeons | 2.3 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 2.5x10$^{-7}$ m/sec**

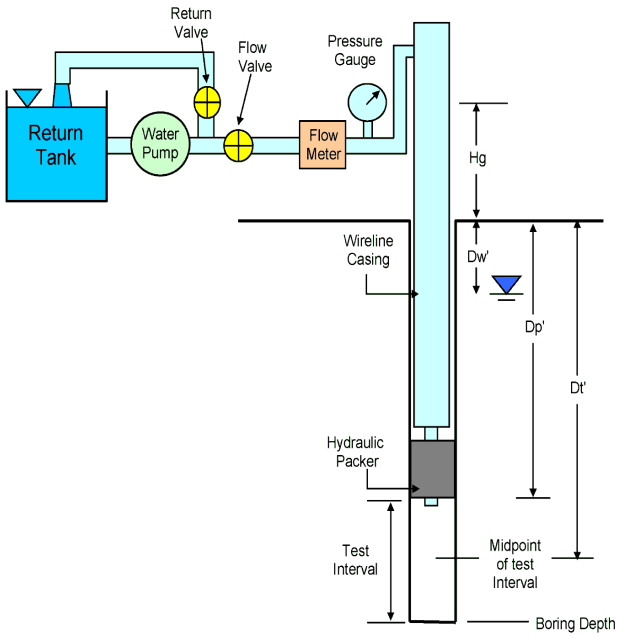
- For all intervals, the vertical graphical scale is set from 0 - 12.0 L/min

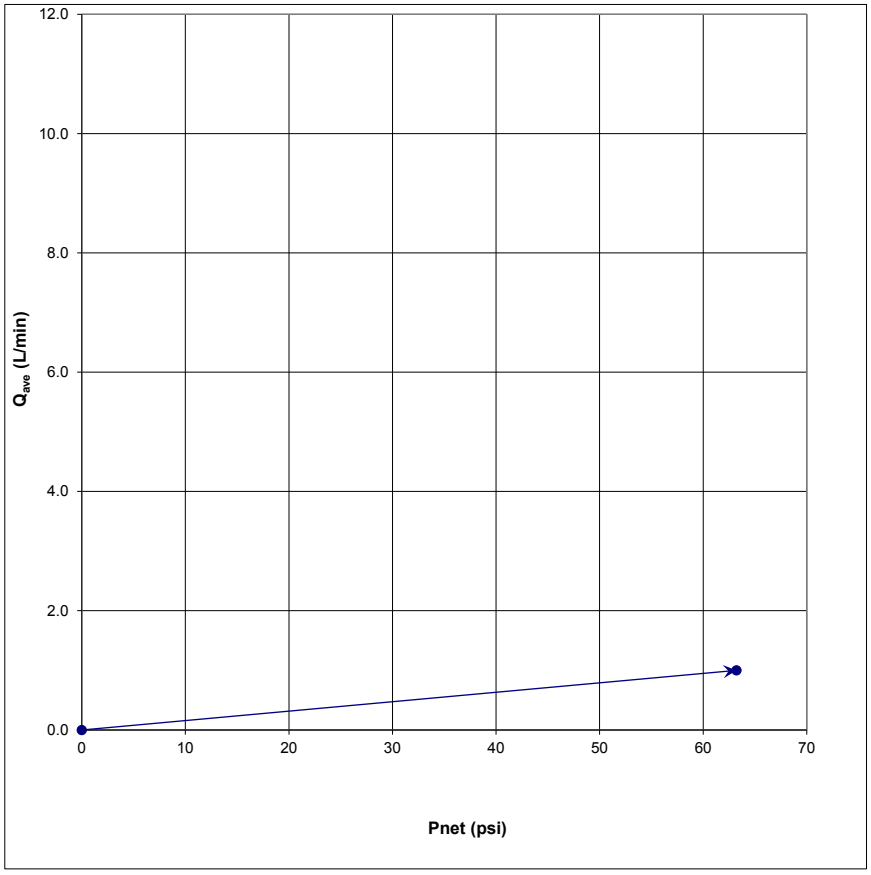
# SINGLE PACKER INJECTION TEST

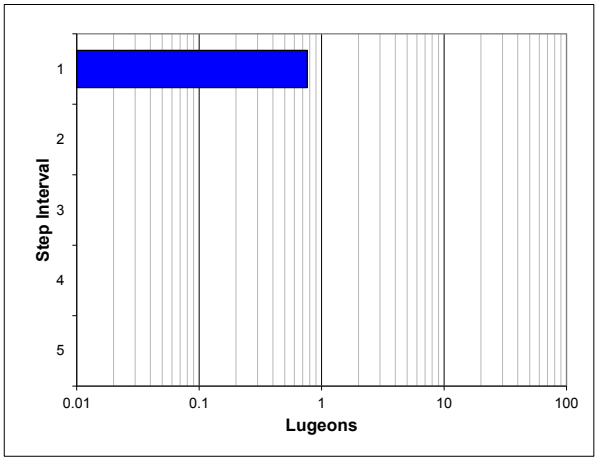
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D29 |
| | | Test Nº: | 6 |
| | Project Nº: 110773396 Test Interval (m): 36.7 to 39.7 | GS Elev. (m): | 1191.0 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 3.0 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 18.6 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **36.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **38.2** m | f | Friction factor | **0.077** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **3.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **36.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **38.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 58 | | | | |
| 1 | 1.00 | | | | |
| 2 | 1.00 | | | | |
| 3 | 1.00 | | | | |
| 4 | 1.00 | | | | |
| 5 | 1.00 | | | | |
| 6 | 1.00 | | | | |
| 7 | | | | | |
| 8 | 1.00 | | | | |
| $Q_{avg}$ (L/min) | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 63.2 | | | | |
| K (m/min) | 4.9E-06 | | | | |
| K (m/sec) | 8.2E-08 | | | | |
| Lugeons | 0.8 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 8.2x10$^{-8}$ m/sec**

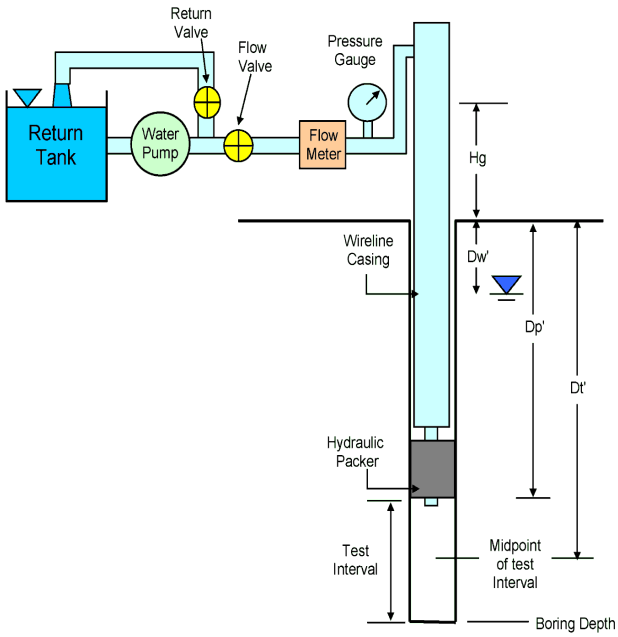
- For all intervals, the vertical graphical scale is set from 0 - 12.0 L/min

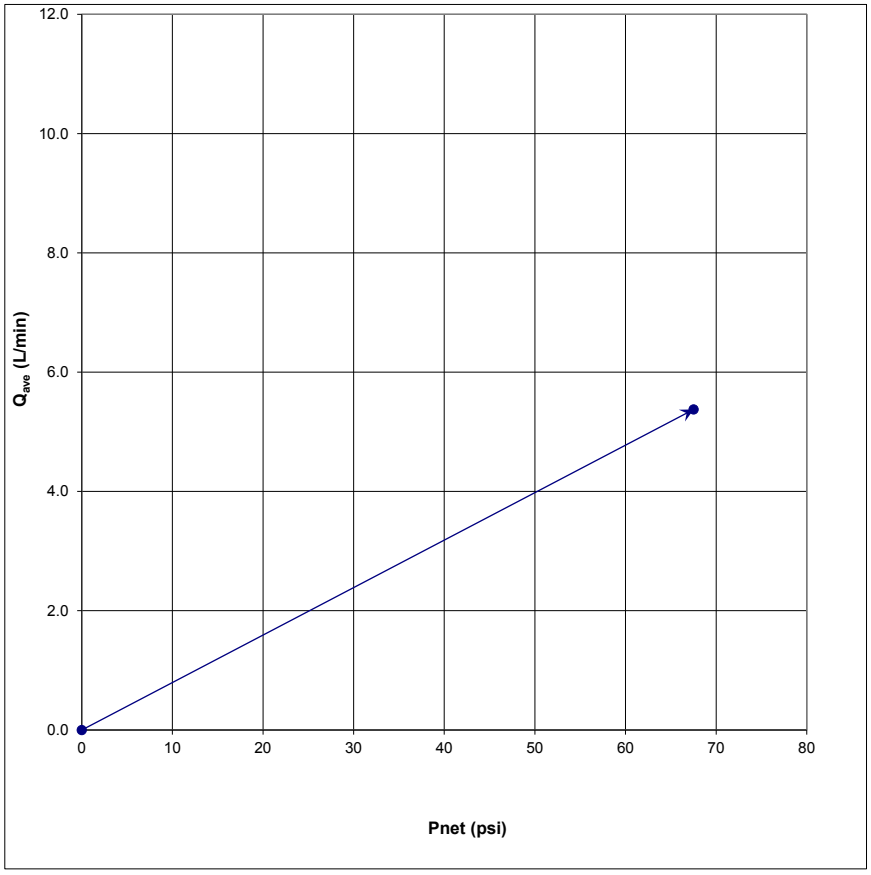
# SINGLE PACKER INJECTION TEST

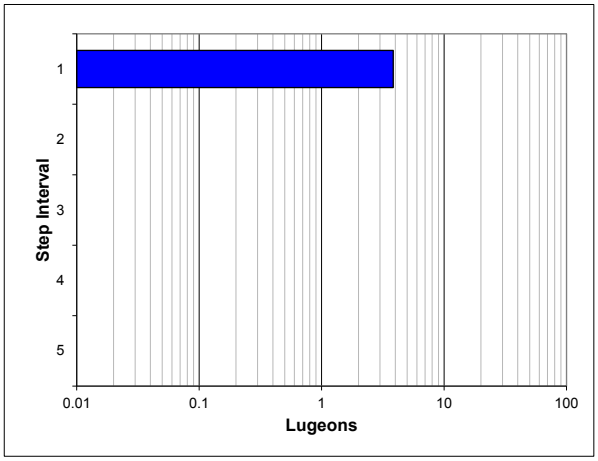
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D29 |
| | | Test Nº: | 7 |
| | Project Nº: 110773396 Test Interval (m): 39.7 to 42.7 | GS Elev. (m): | 1191.0 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 3.0 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 18.6 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **39.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **41.2** m | f | Friction factor | **0.064** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **3.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **39.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **41.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 62 | | | | |
| 1 | 6.00 | | | | |
| 2 | 5.00 | | | | |
| 3 | 5.00 | | | | |
| 4 | 6.00 | | | | |
| 5 | 5.00 | | | | |
| 6 | 5.00 | | | | |
| 7 | 6.00 | | | | |
| 8 | 5.00 | | | | |
| $Q_{avg}$ (L/min) | 5.38 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 67.5 | | | | |
| K (m/min) | 2.5E-05 | | | | |
| K (m/sec) | 4.1E-07 | | | | |
| Lugeons | 3.9 | | | | |




## Comments

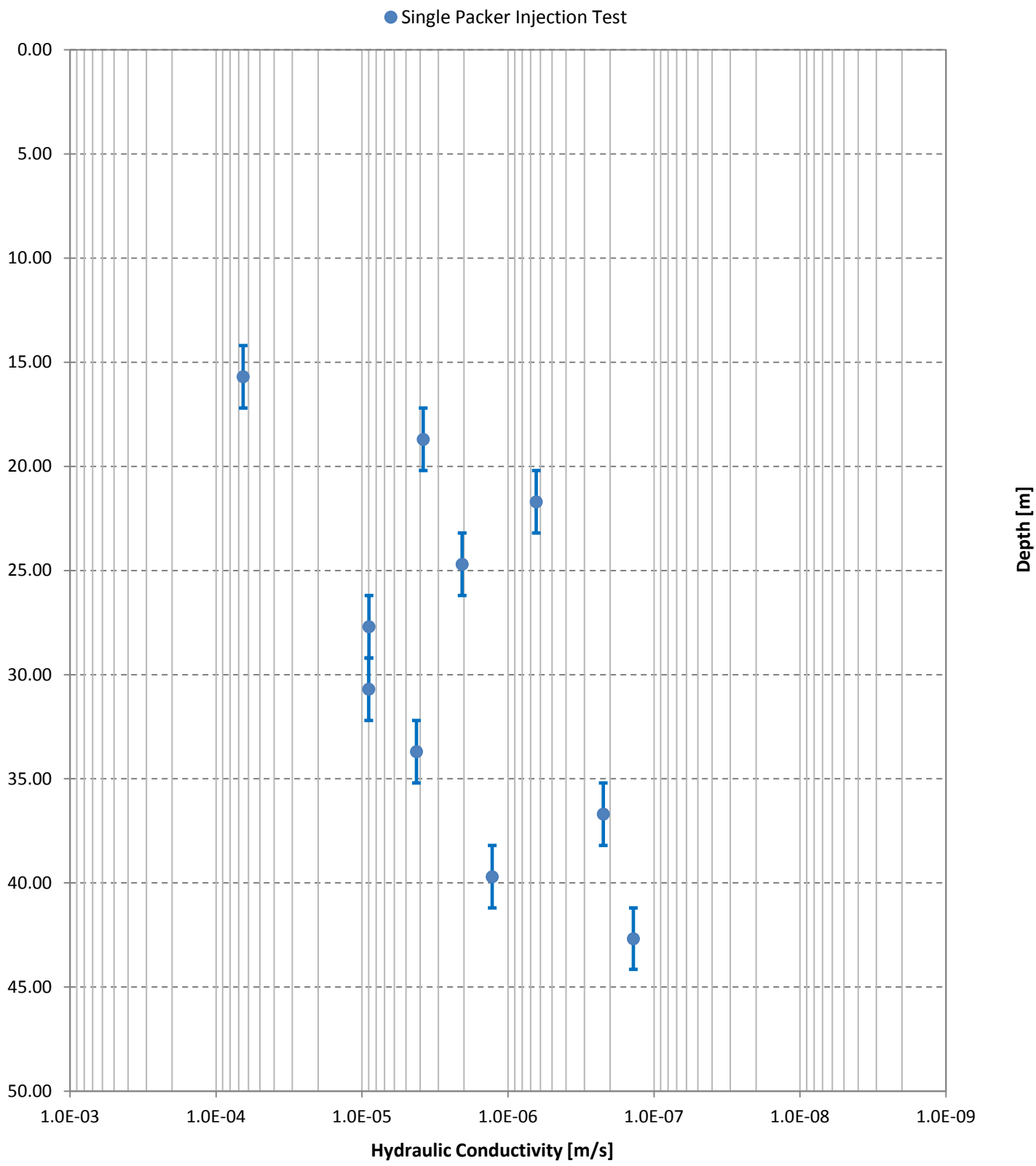
- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 4.1x10$^{-7}$ m/sec**

- For all intervals, the vertical graphical scale is set from 0 - 12.0 L/min

**Title**

# Summary Plot of D35 Packer Testing



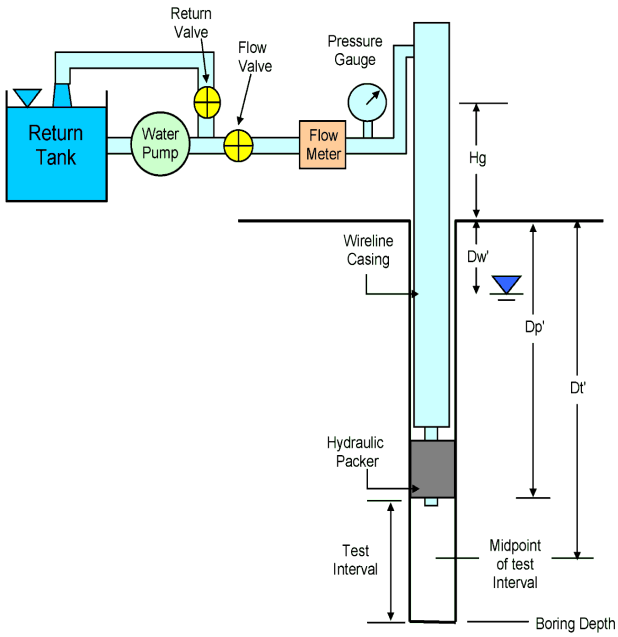

| | | | |
|---|---|---|---|
| **Project** SR1 - Off Stream Reservoir | | **Scale** N/A | **Date** 23/11/2016 |
| **Client** Alberta Transportation | | **Drawn** JNW | **Checked** |
| **Project Number** 110773396.302.702.230 | | **Drawing No.** | Stantec |

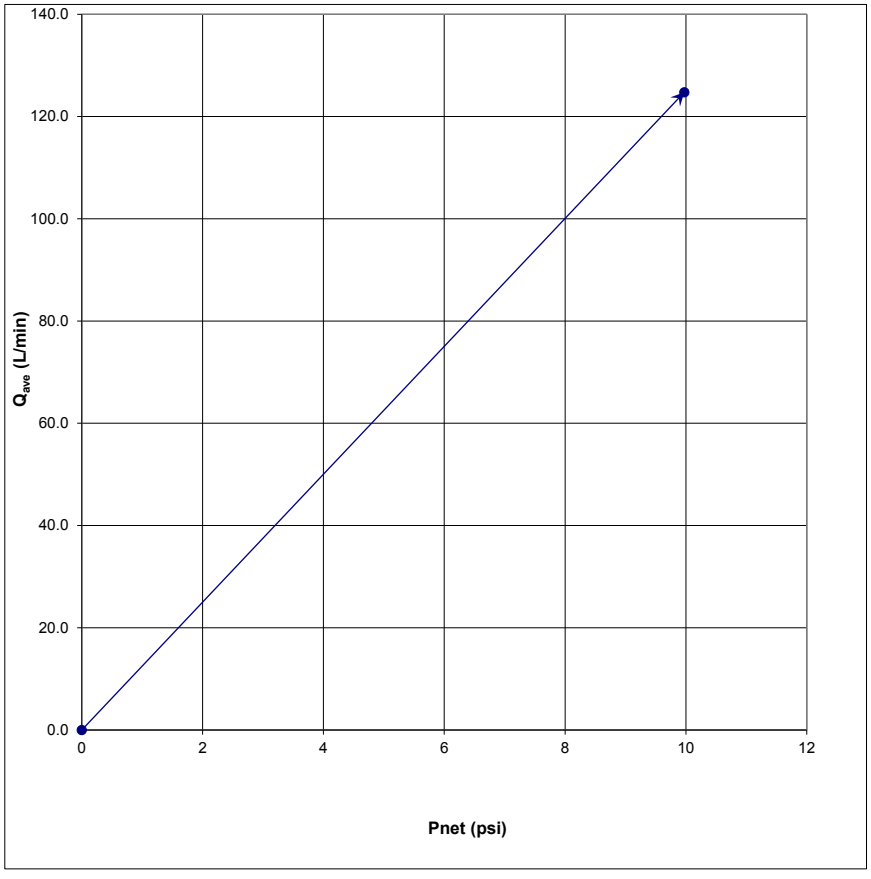
# SINGLE PACKER INJECTION TEST

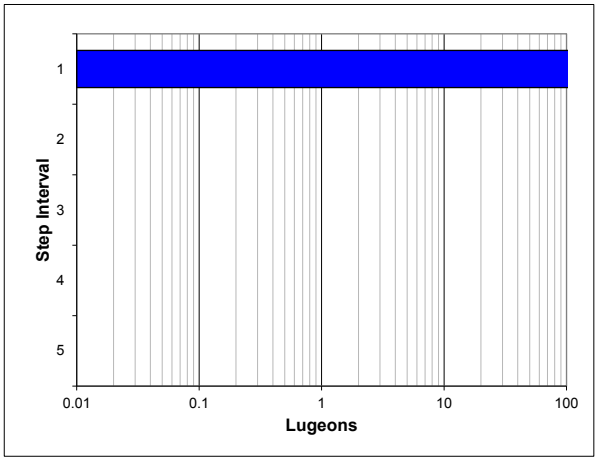
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D35 |
| | | Test Nº: | 1 |
| | Project Nº: 110773396 Test Interval (m): 14.2 to 17.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **14.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **15.7** m | f | Friction factor | **0.033** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **14.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **15.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 25 | | | | |
| 1 | 121.00 | | | | |
| 2 | 127.00 | | | | |
| 3 | 125.00 | | | | |
| 4 | 125.00 | | | | |
| 5 | 126.00 | | | | |
| 6 | 124.00 | | | | |
| 7 | 124.00 | | | | |
| 8 | 126.00 | | | | |
| $Q_{avg}$ (L/min) | 124.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 16.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 10.0 | | | | |
| K (m/min) | 3.9E-03 | | | | |
| K (m/sec) | 6.5E-05 | | | | |
| Lugeons | 605.2 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time incremen

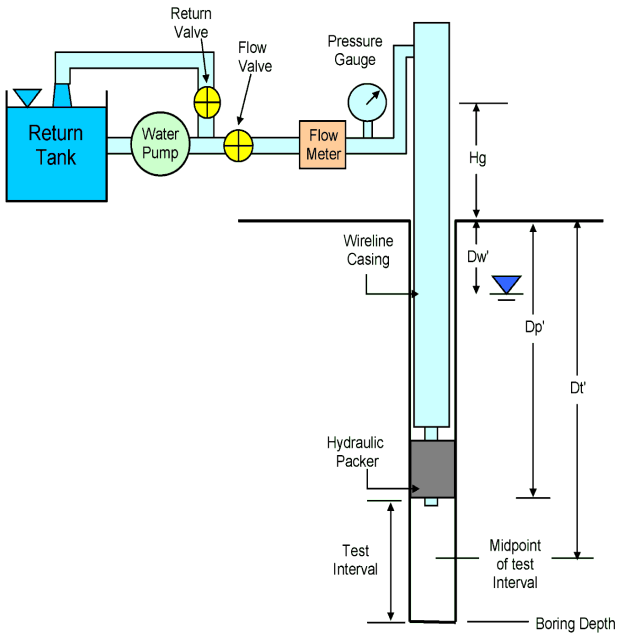
- Based on limited data, **$K_{avg}$ is estimated as 6.5x10$^{-5}$ m/sec**

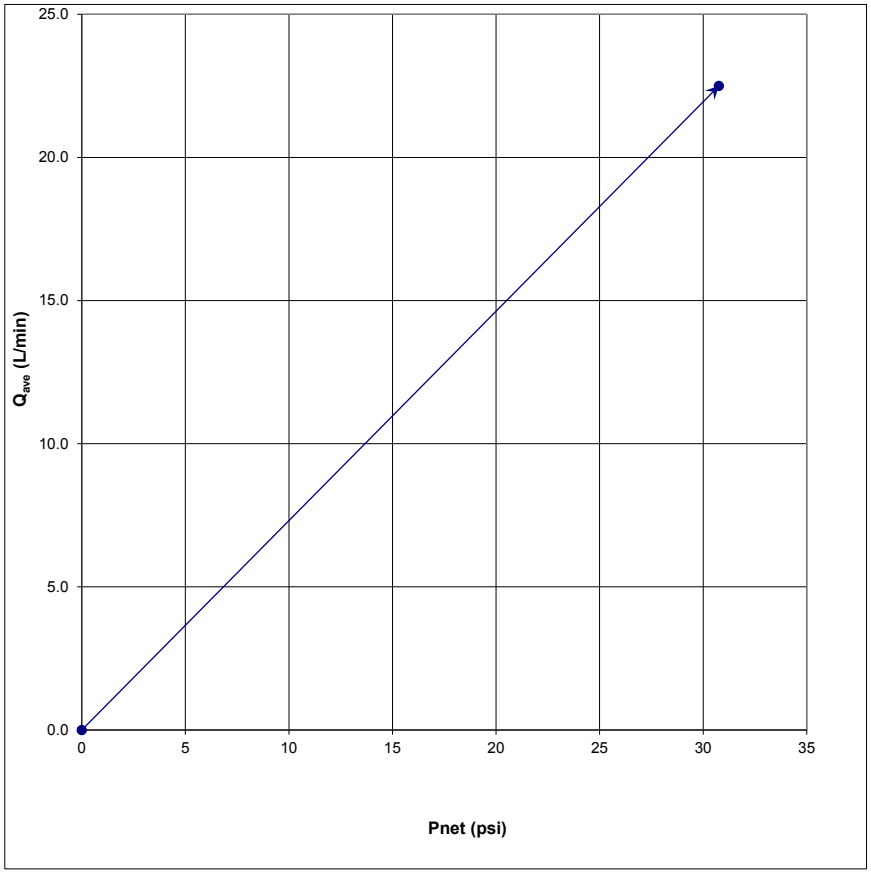
# SINGLE PACKER INJECTION TEST

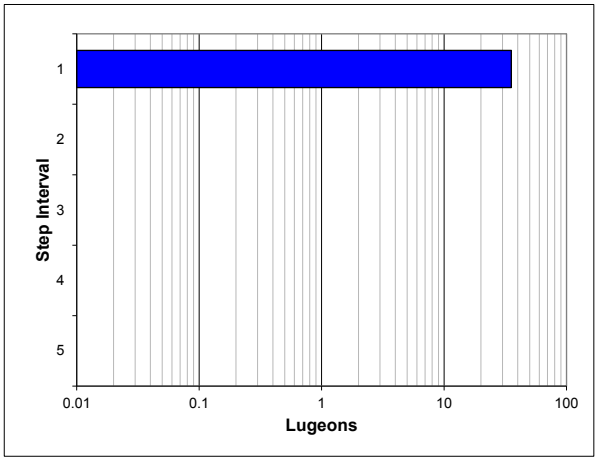
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D35 |
| | | Test Nº: | 2 |
| | Project Nº: 110773396 Test Interval (m): 17.2 to 20.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | 17.2 m | L | Length of test section | 3.0 m |
| Dt | Measured depth to midpoint of test | 18.7 m | f | Friction factor | 0.036 √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | 0.0 m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | 17.2 m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | 18.7 m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 30 | | | | |
| 1 | 25.00 | | | | |
| 2 | 23.00 | | | | |
| 3 | 22.00 | | | | |
| 4 | 22.00 | | | | |
| 5 | 22.00 | | | | |
| 6 | 21.00 | | | | |
| 7 | 23.00 | | | | |
| 8 | 22.00 | | | | |
| $Q_{avg}$ (L/min) | 22.50 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 30.8 | | | | |
| K (m/min) | 2.3E-04 | | | | |
| K (m/sec) | 3.8E-06 | | | | |
| Lugeons | 35.4 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

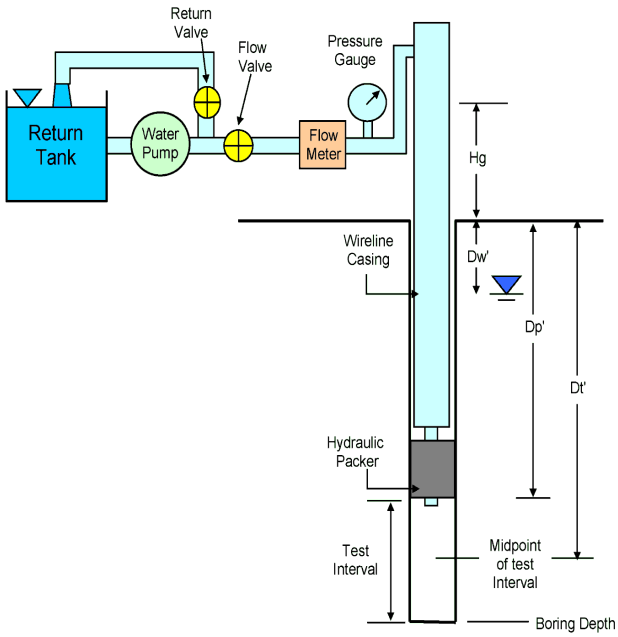
- Based on limited data from , **$K_{avg}$ is estimated as $3.8 \times 10^{-6}$ m/sec**

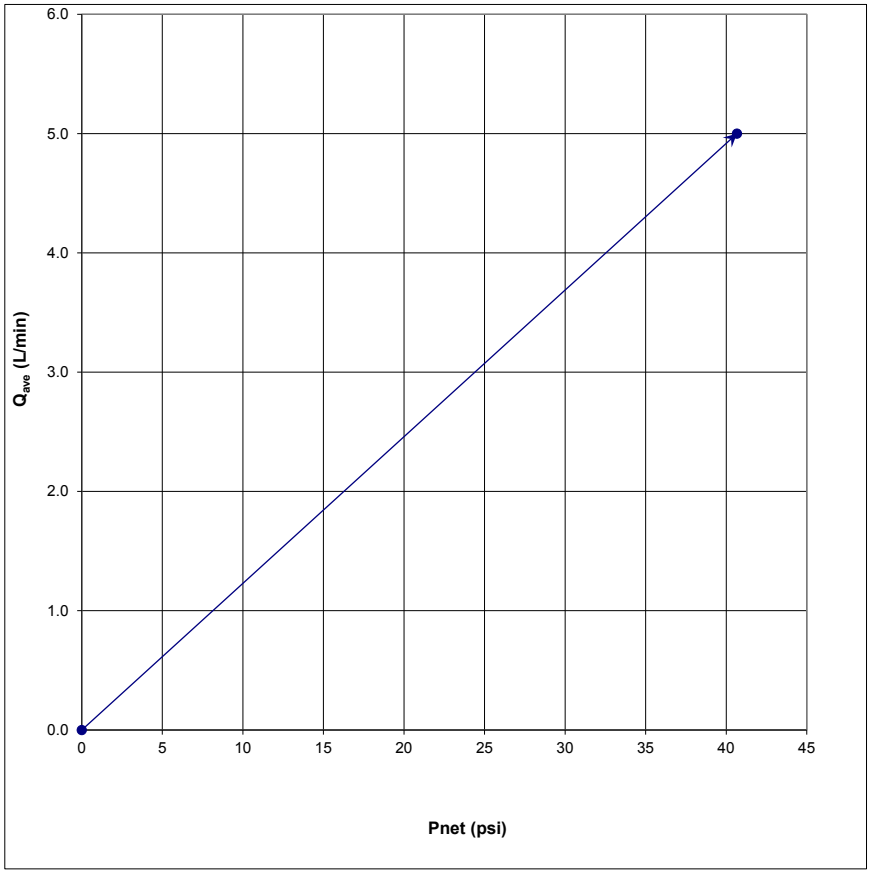
# SINGLE PACKER INJECTION TEST

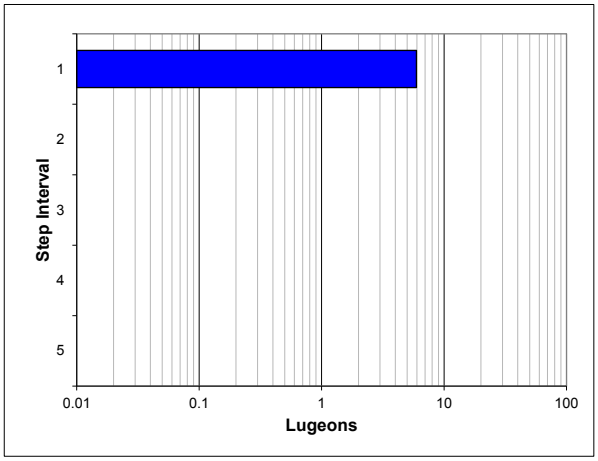
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D35 |
| | | Test Nº: | 3 |
| | Project Nº: 110773396 Test Interval (m): 20.2 to 23.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | |
|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 3.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **20.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **21.7** m | f | Friction factor | **0.049** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **3.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **20.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **21.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 35 | | | | |
| 1 | 6.00 | | | | |
| 2 | 4.00 | | | | |
| 3 | 5.00 | | | | |
| 4 | 5.00 | | | | |
| 5 | 5.00 | | | | |
| 6 | 5.00 | | | | |
| 7 | 5.00 | | | | |
| 8 | 5.00 | | | | |
| $Q_{avg}$ (L/min) | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 40.7 | | | | |
| K (m/min) | 3.8E-05 | | | | |
| K (m/sec) | 6.4E-07 | | | | |
| Lugeons | 5.9 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- No flow recorded at time increments Step 1 and 5. Blank cells indicate flow of zero during time increment

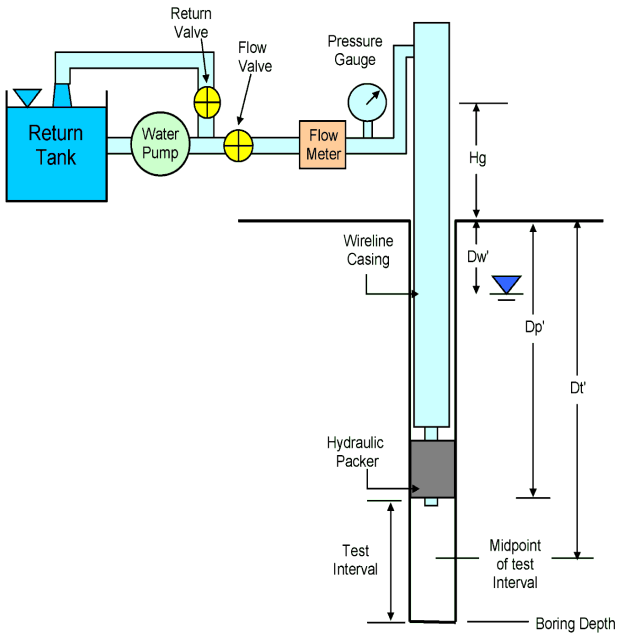
- Based on limited data from , **$K_{avg}$ is estimated as 6.4x10$^{-7}$ m/sec**

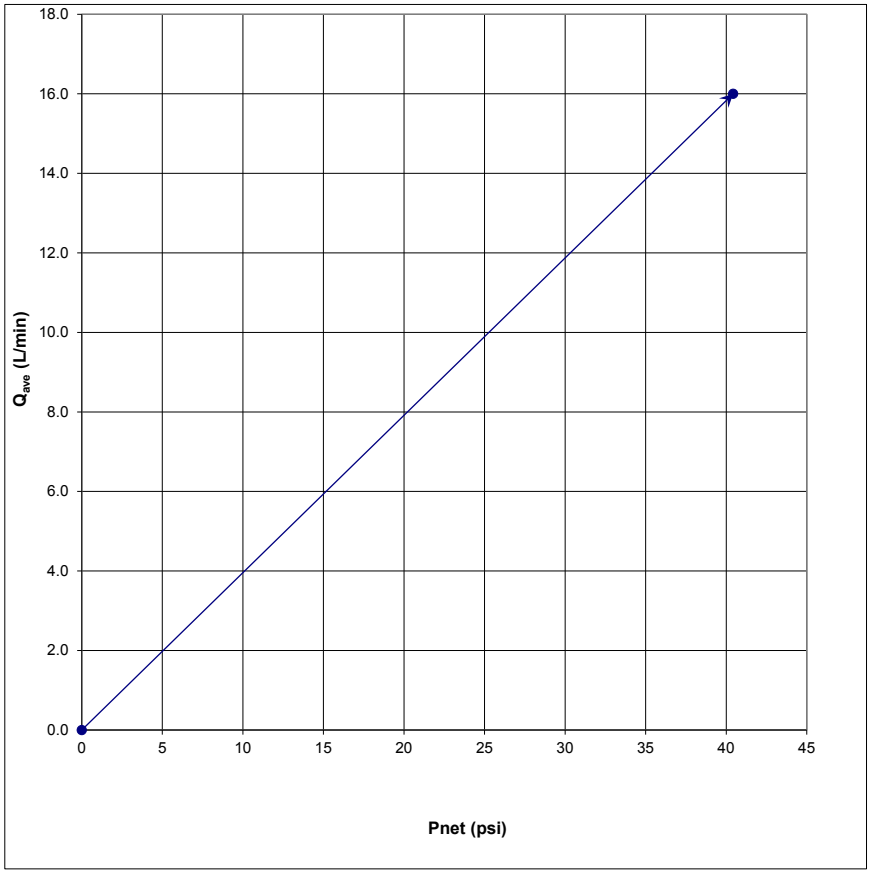
# SINGLE PACKER INJECTION TEST

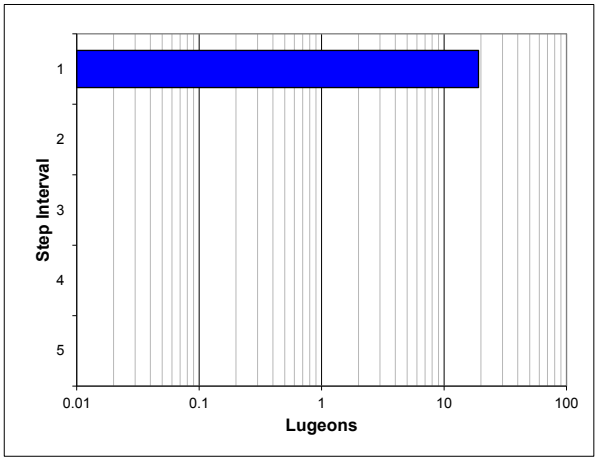
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D35 |
| | | Test Nº: | 4 |
| | Project Nº: 110773396 Test Interval (m): 23.2 to 26.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | 23.2 m | L | Length of test section | 3.0 m |
| Dt | Measured depth to midpoint of test | 24.7 m | f | Friction factor | 0.061 √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | 0.0 m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | 23.2 m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | 24.7 m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 40 | | | | |
| 1 | 20.00 | | | | |
| 2 | 18.00 | | | | |
| 3 | 18.00 | | | | |
| 4 | 16.00 | | | | |
| 5 | 15.00 | | | | |
| 6 | 14.00 | | | | |
| 7 | 14.00 | | | | |
| 8 | 13.00 | | | | |
| $Q_{avg}$ (L/min) | 16.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 40.4 | | | | |
| K (m/min) | 1.2E-04 | | | | |
| K (m/sec) | 2.1E-06 | | | | |
| Lugeons | 19.1 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor.Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

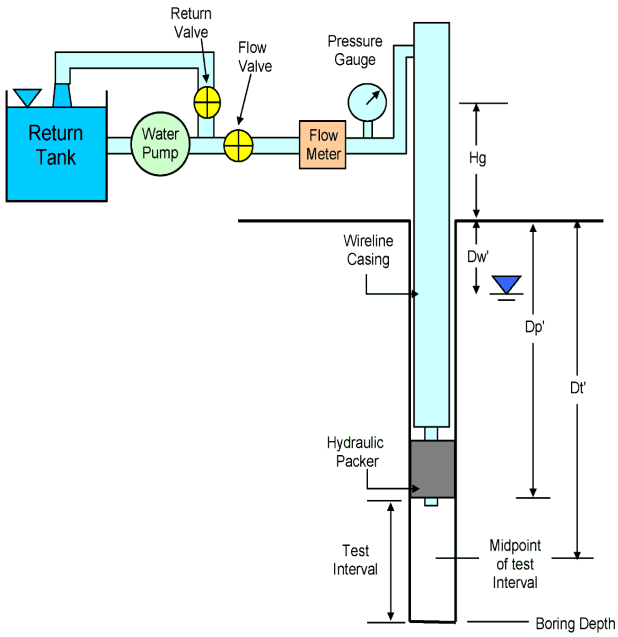
- Based on limited data from , **$K_{avg}$ is estimated as 2.1x10$^{-6}$ m/sec**

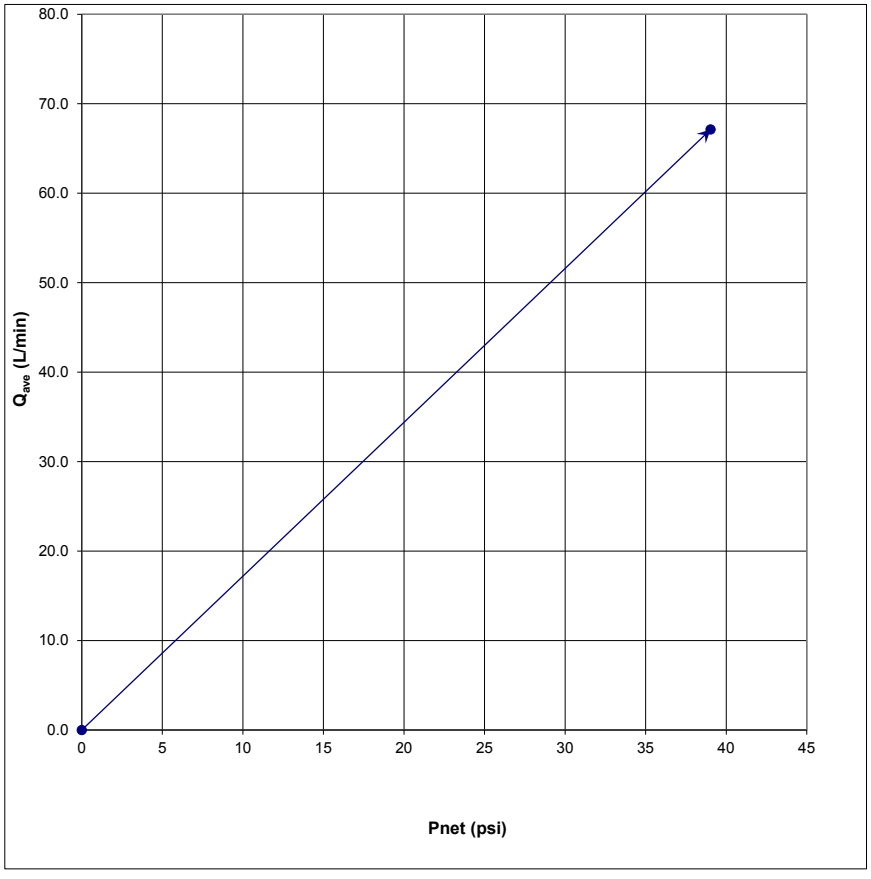
# SINGLE PACKER INJECTION TEST

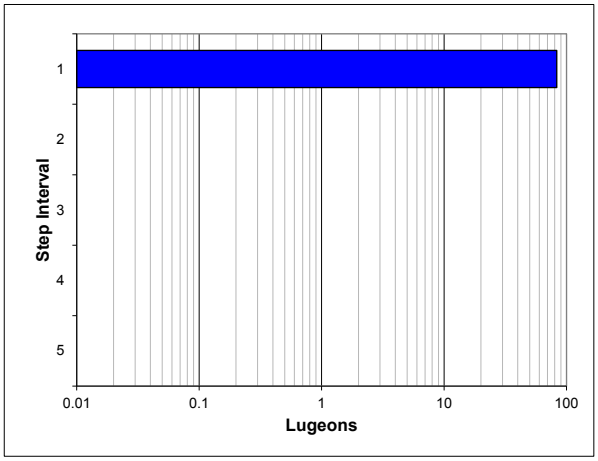
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D35 |
| | | Test Nº: | 5 |
| | Project Nº: 110773396 Test Interval (m): 26.2 to 29.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **26.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **27.7** m | f | Friction factor | **0.040** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **26.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **27.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 45 | | | | |
| 1 | 69.00 | | | | |
| 2 | 59.00 | | | | |
| 3 | 67.00 | | | | |
| 4 | 69.00 | | | | |
| 5 | 70.00 | | | | |
| 6 | 74.00 | | | | |
| 7 | 65.00 | | | | |
| 8 | 64.00 | | | | |
| $Q_{avg}$ (L/min) | 67.12 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 7.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 39.0 | | | | |
| K (m/min) | 5.4E-04 | | | | |
| K (m/sec) | 9.0E-06 | | | | |
| Lugeons | 83.2 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

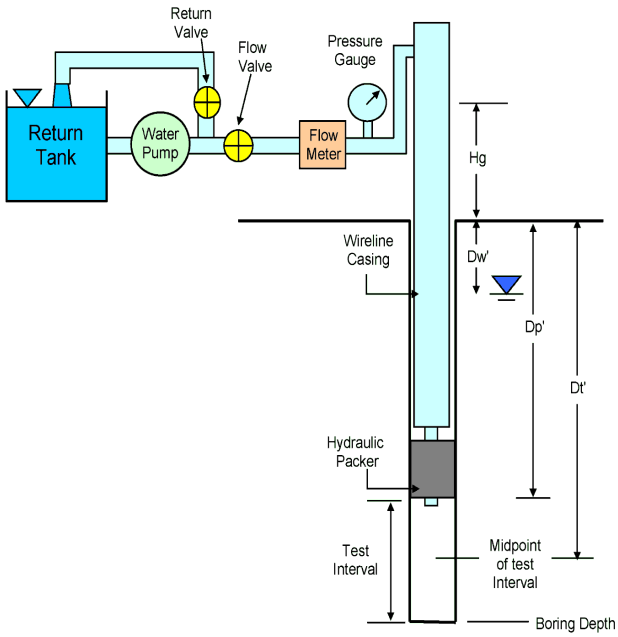
- Based on limited data from , **$K_{avg}$ is estimated as 9.0x10$^{-6}$ m/sec**

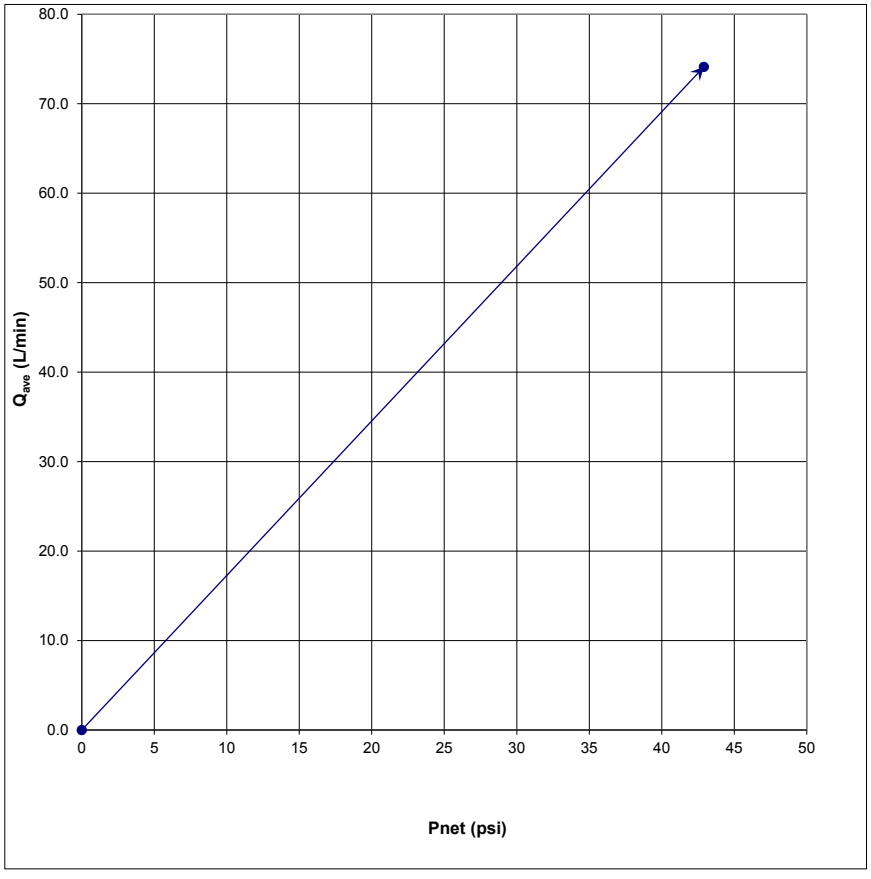
# SINGLE PACKER INJECTION TEST

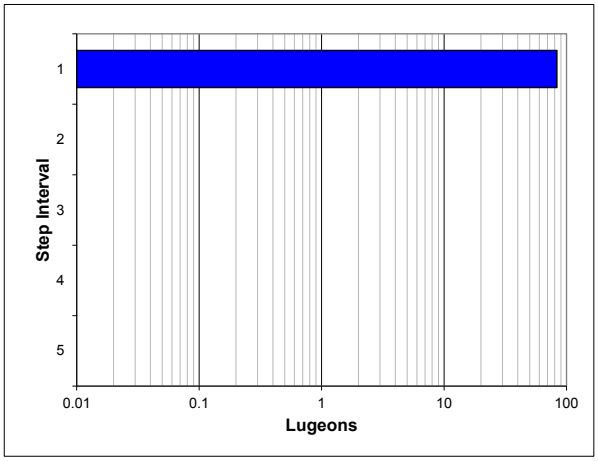
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D35 |
| | | Test Nº: | 6 |
| | Project Nº: 110773396 Test Interval (m): 29.2 to 32.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **29.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **30.7** m | f | Friction factor | **0.039** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **29.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **30.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 50 | | | | |
| 1 | 74.00 | | | | |
| 2 | 73.00 | | | | |
| 3 | 71.00 | | | | |
| 4 | 78.00 | | | | |
| 5 | 76.00 | | | | |
| 6 | 75.00 | | | | |
| 7 | 73.00 | | | | |
| 8 | 73.00 | | | | |
| $Q_{avg}$ (L/min) | 74.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 42.9 | | | | |
| K (m/min) | 5.4E-04 | | | | |
| K (m/sec) | 9.0E-06 | | | | |
| Lugeons | 83.6 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 9.0x10$^{-6}$ m/sec**

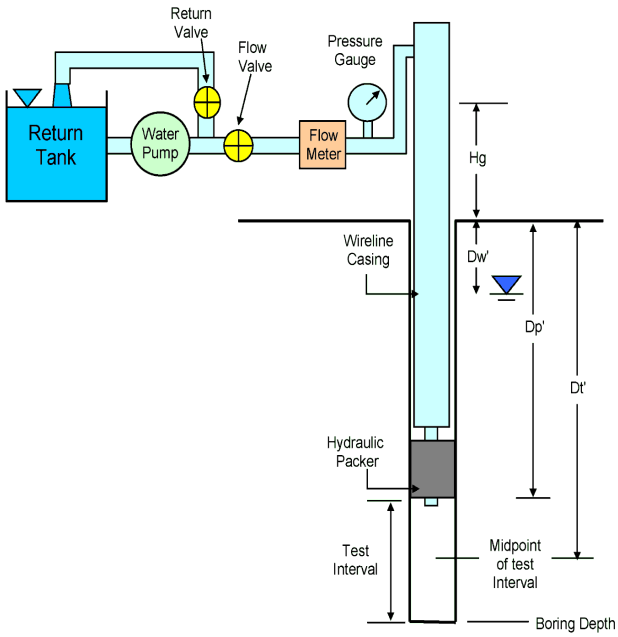
# SINGLE PACKER INJECTION TEST

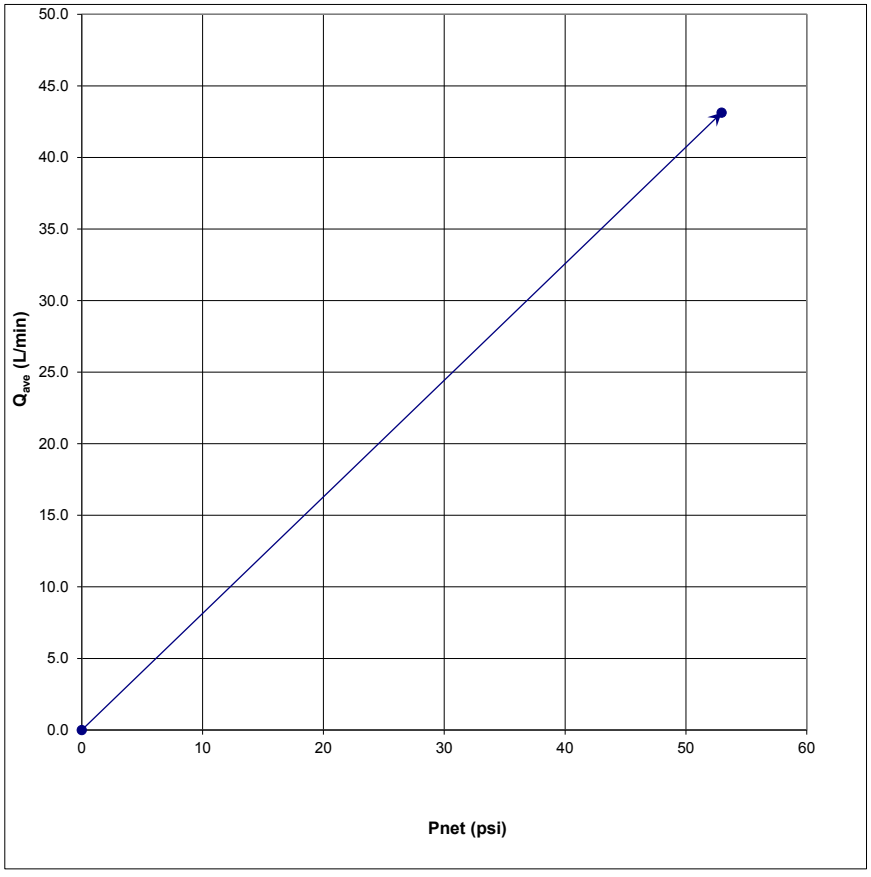
Stantec

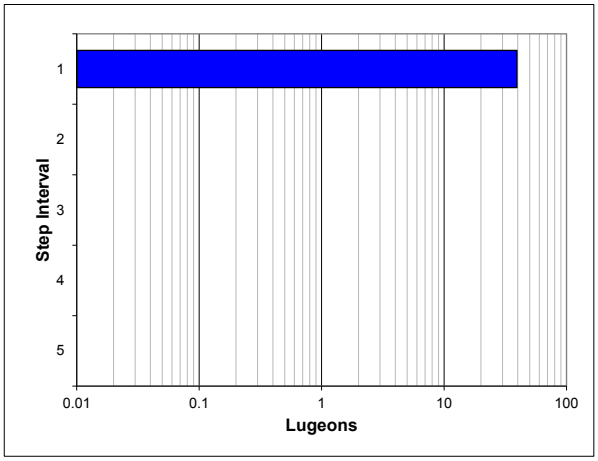
| | | | |
|---|---|---|---|
| Project Name: SR1 - Off Stream Reservoir | | BH Nº: | D35 |
| | | Test Nº: | 7 |
| Project Nº: 110773396 | Test Interval (m): 32.2 to 35.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | |
|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **32.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **33.7** m | f | Friction factor | **0.043** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **32.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **33.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 55 | | | | |
| 1 | 46.00 | | | | |
| 2 | 44.00 | | | | |
| 3 | 44.00 | | | | |
| 4 | 42.00 | | | | |
| 5 | 42.00 | | | | |
| 6 | 43.00 | | | | |
| 7 | 40.00 | | | | |
| 8 | 44.00 | | | | |
| $Q_{avg}$ (L/min) | 43.12 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 53.0 | | | | |
| K (m/min) | 2.5E-04 | | | | |
| K (m/sec) | 4.2E-06 | | | | |
| Lugeons | 39.4 | | | | |




## Comments

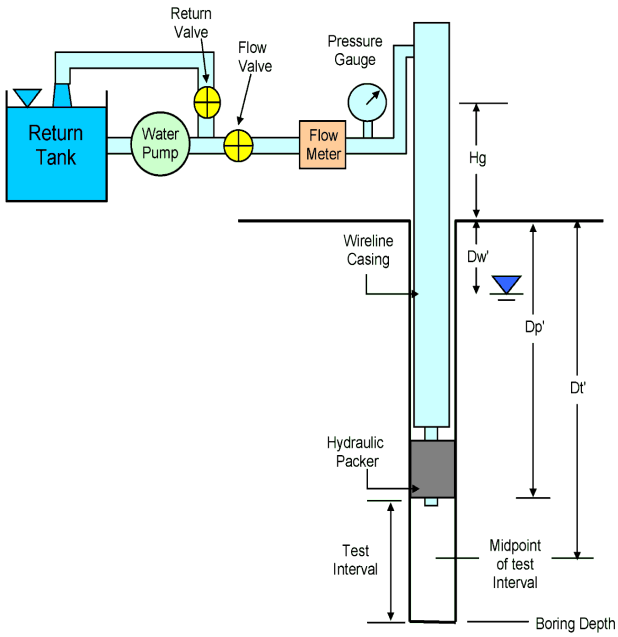
- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment
- Based on limited data from , **$K_{avg}$ is estimated as 4.2x10$^{-6}$ m/sec**
- Pressure fluctuated approx. ±2 psi during testing

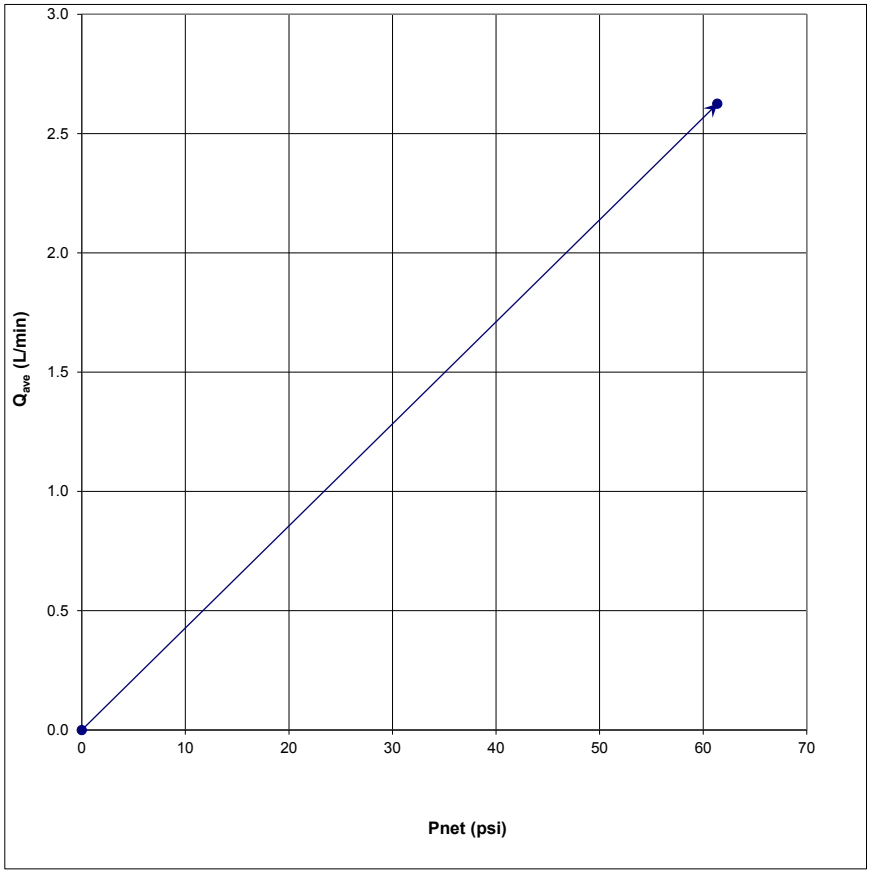
# SINGLE PACKER INJECTION TEST

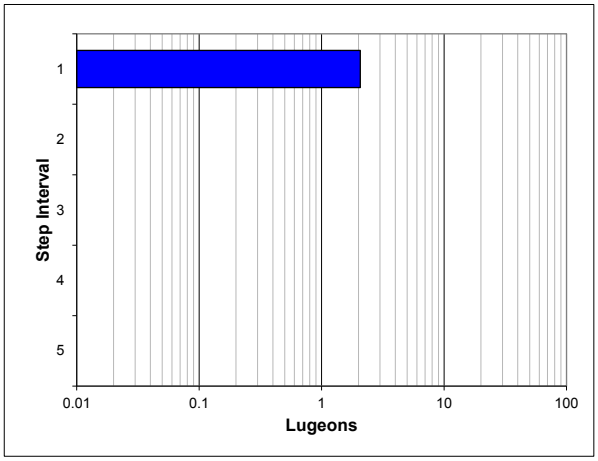
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D35 |
| | | Test Nº: | 8 |
| | Project Nº: 110773396 Test Interval (m): 35.2 to 38.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **35.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **36.7** m | f | Friction factor | **0.054** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **35.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **36.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 60 | | | | |
| 1 | 3.00 | | | | |
| 2 | 3.00 | | | | |
| 3 | 2.00 | | | | |
| 4 | 3.00 | | | | |
| 5 | 2.00 | | | | |
| 6 | 3.00 | | | | |
| 7 | 2.00 | | | | |
| 8 | 3.00 | | | | |
| $Q_{avg}$ (L/min) | 2.63 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 61.4 | | | | |
| K (m/min) | 1.3E-05 | | | | |
| K (m/sec) | 2.2E-07 | | | | |
| Lugeons | 2.1 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

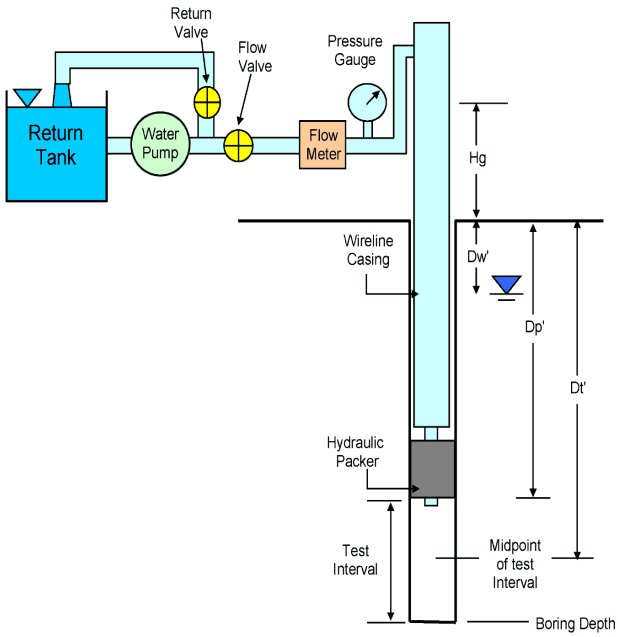
- Based on limited data from , **$K_{avg}$ is estimated as 2.2x10$^{-7}$ m/sec**

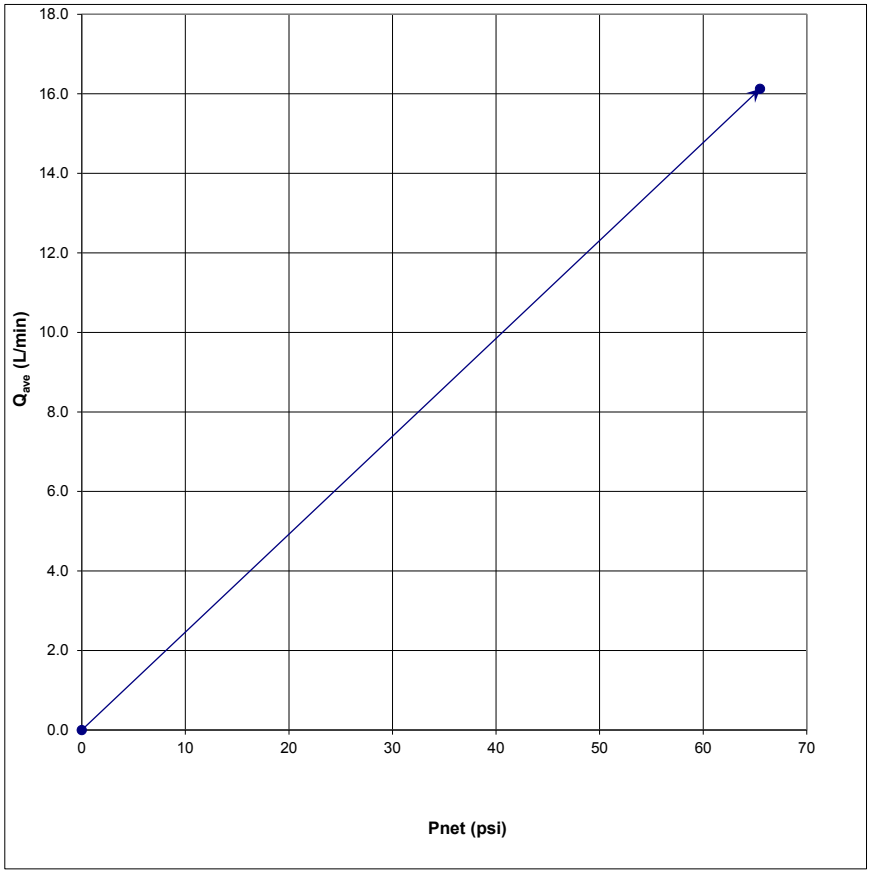
# SINGLE PACKER INJECTION TEST

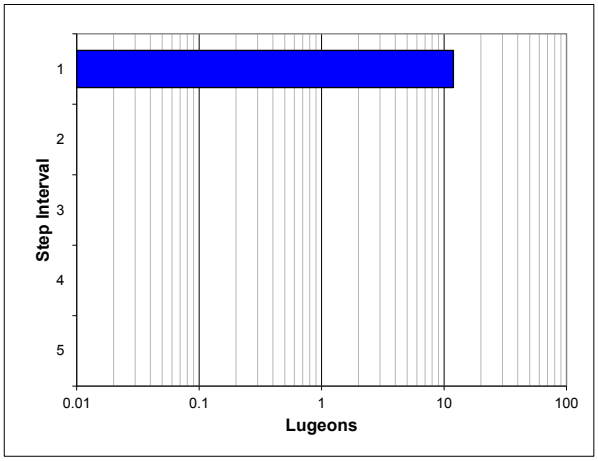
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D35 |
| | | Test Nº: | 9 |
| | Project Nº: 110773396 Test Interval (m): 38.2 to 41.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **38.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **39.7** m | f | Friction factor | **0.059** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **38.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **39.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 65 | | | | |
| 1 | 18.00 | | | | |
| 2 | 17.00 | | | | |
| 3 | 16.00 | | | | |
| 4 | 15.00 | | | | |
| 5 | 15.00 | | | | |
| 6 | 16.00 | | | | |
| 7 | 16.00 | | | | |
| 8 | 16.00 | | | | |
| $Q_{avg}$ (L/min) | 16.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 65.5 | | | | |
| K (m/min) | 7.7E-05 | | | | |
| K (m/sec) | 1.3E-06 | | | | |
| Lugeons | 11.9 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 1.3x10$^{-6}$ m/sec**

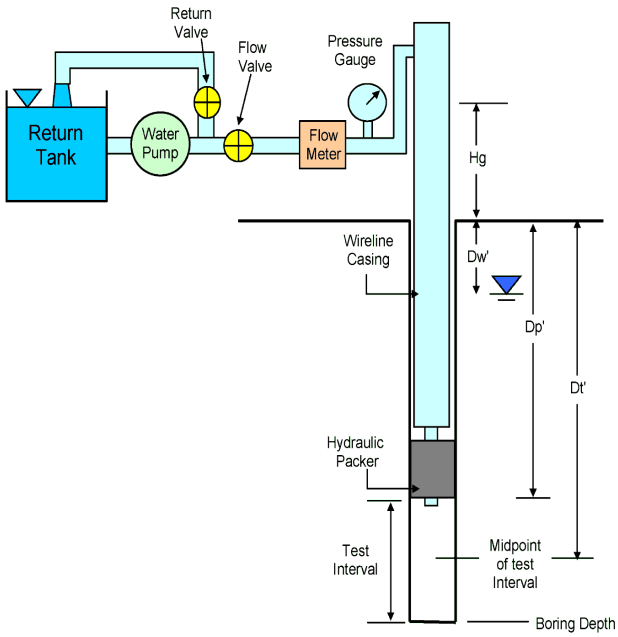
- For all intervals, the vertical graphical scale is set from 0 - 12.0 L/min

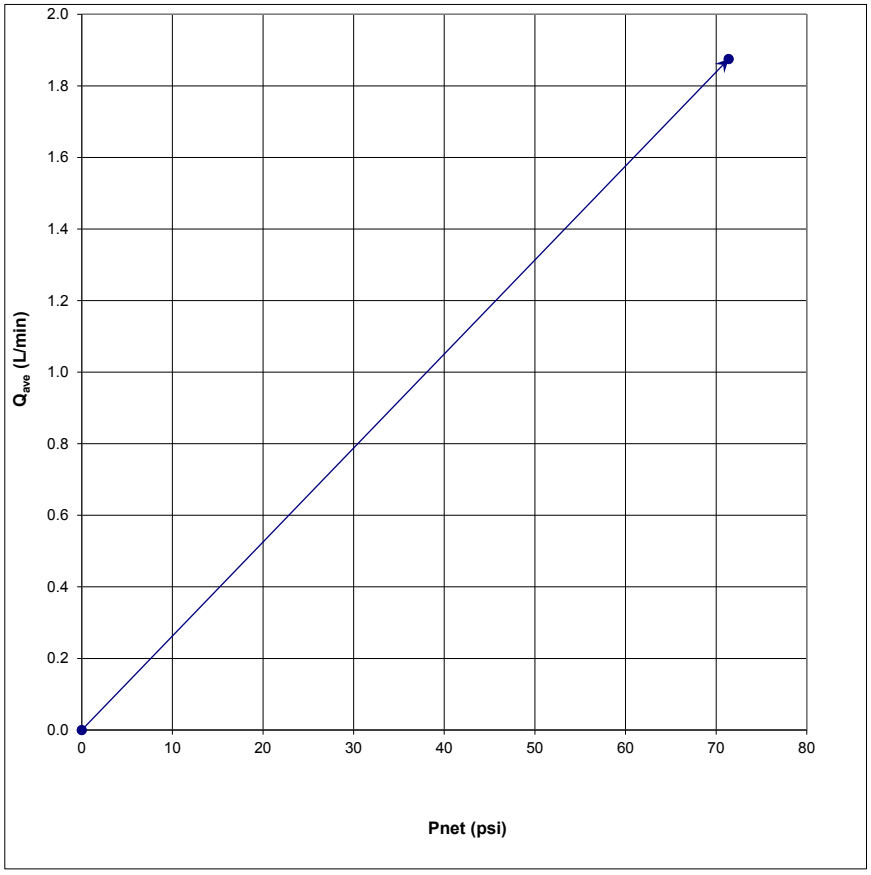
# SINGLE PACKER INJECTION TEST

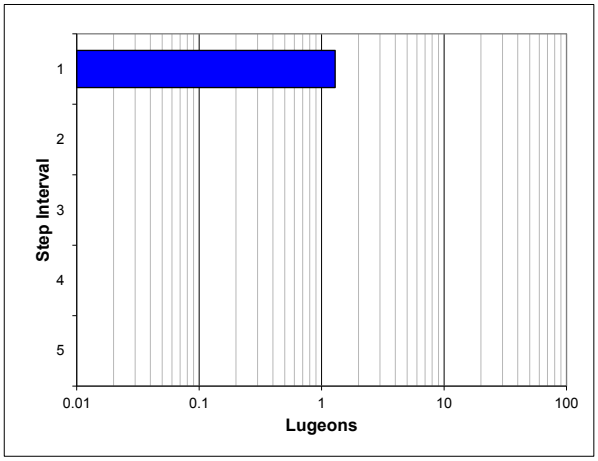
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D35 |
| | | Test Nº: | 10 |
| | Project Nº: 110773396 Test Interval (m): 41.2 to 44.2 | GS Elev. (m): | 1190.6 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **41.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **42.7** m | f | Friction factor | **0.054** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **41.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **42.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 70 | | | | |
| 1 | 1.50 | | | | |
| 2 | 1.50 | | | | |
| 3 | 2.00 | | | | |
| 4 | 2.00 | | | | |
| 5 | 2.00 | | | | |
| 6 | 2.00 | | | | |
| 7 | 2.00 | | | | |
| 8 | 2.00 | | | | |
| $Q_{avg}$ (L/min) | 1.88 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 71.4 | | | | |
| K (m/min) | 8.3E-06 | | | | |
| K (m/sec) | 1.4E-07 | | | | |
| Lugeons | 1.3 | | | | |



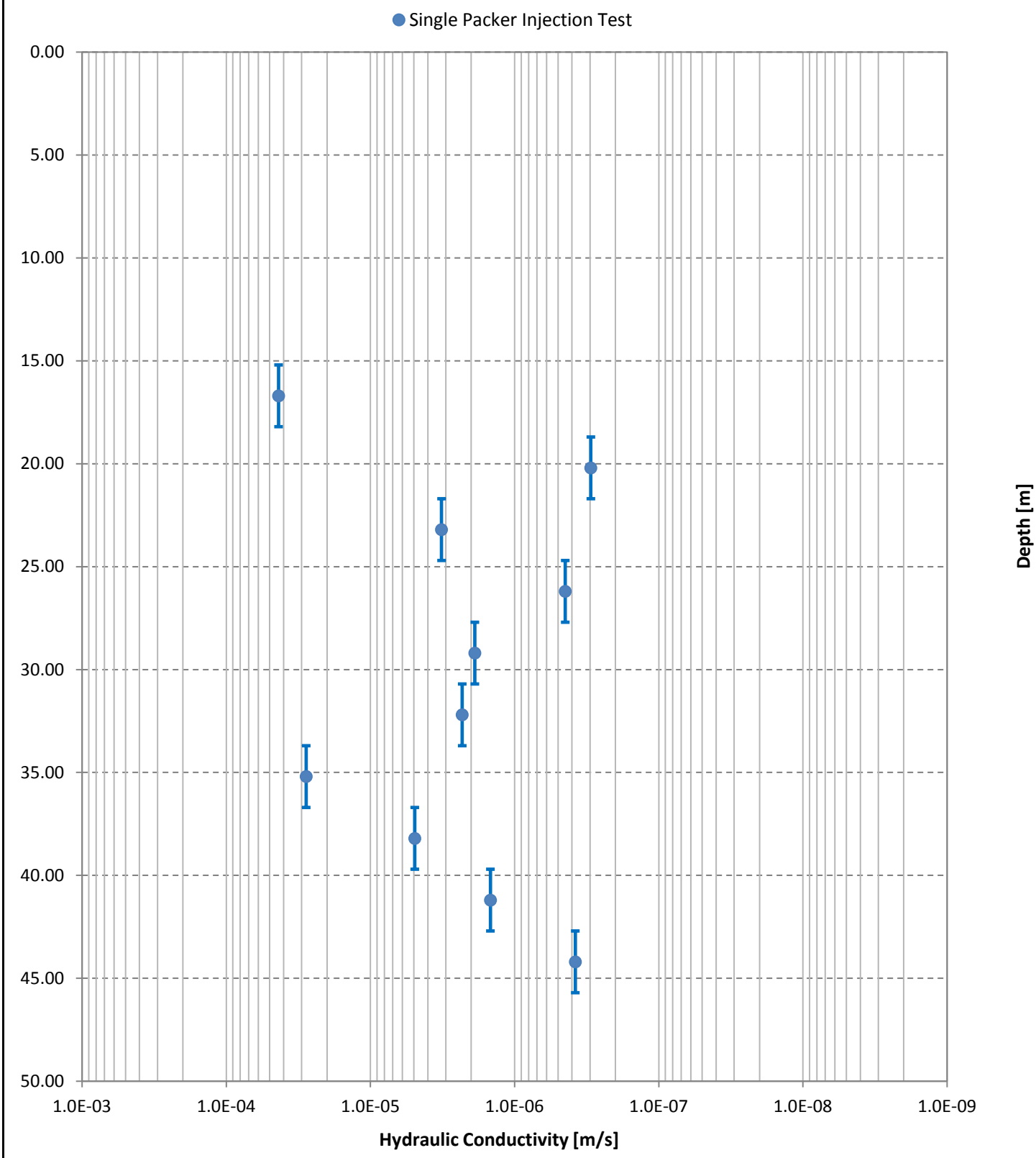

## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 1.4x10$^{-7}$ m/sec**

**Title**

# Summary Plot of D38 Packer Testing



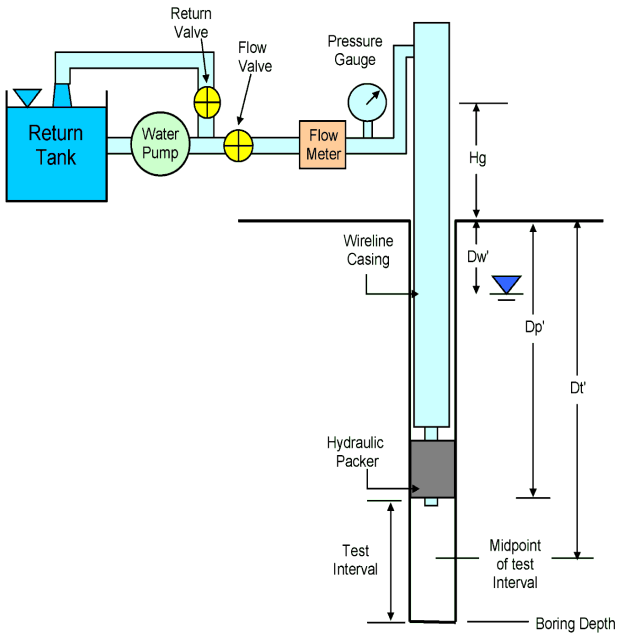

| | | | |
|---|---|---|---|
| **Project** SR1 - Off Stream Reservoir | | **Scale** N/A | **Date** 23/11/2016 |
| **Client** Alberta Transportation | | **Drawn** JNW | **Checked** |
| **Project Number** 110773396.302.702.230 | | **Drawing No.** | Stantec |

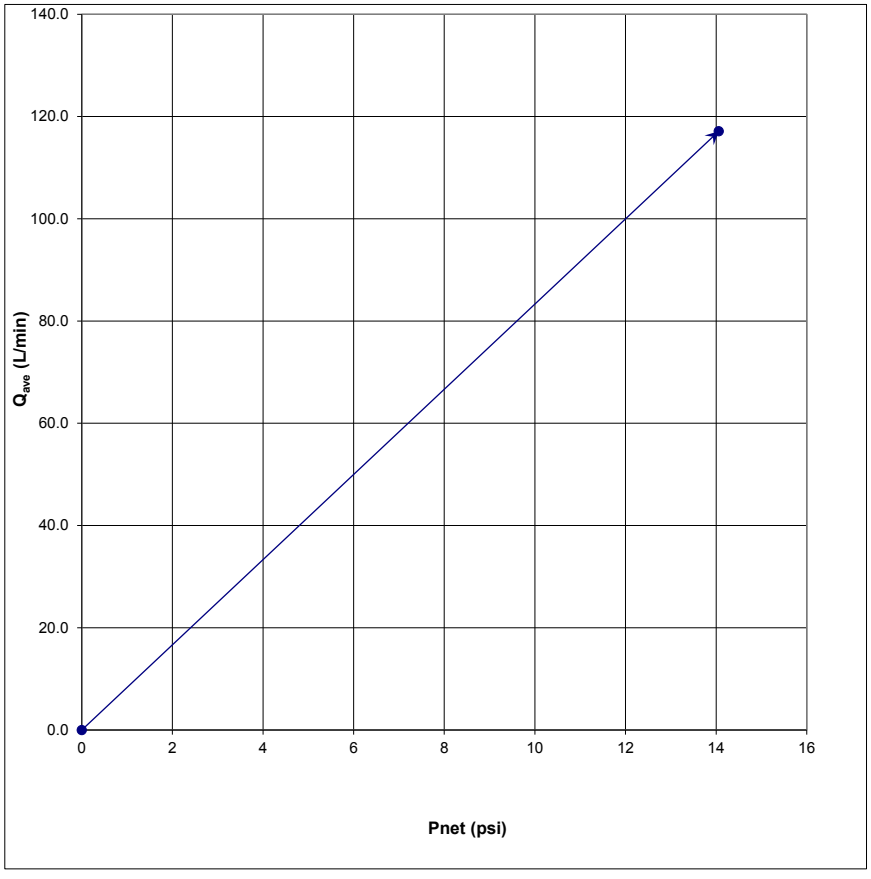
# SINGLE PACKER INJECTION TEST

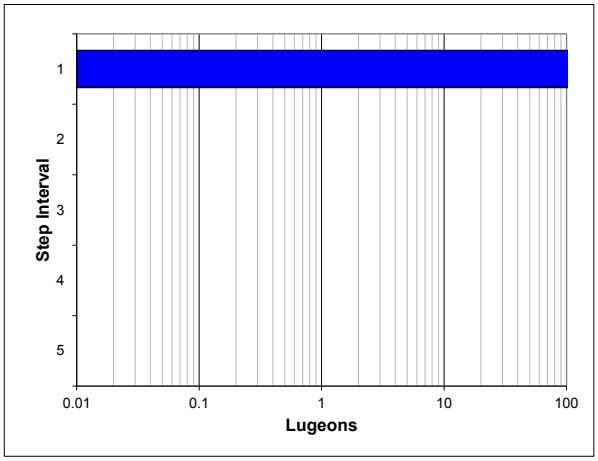
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 1 |
| | Project Nº: 110773396 Test Interval (m): 15.2 to 18.2 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 1.8 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **15.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **16.7** m | f | Friction factor | **0.033** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **1.8** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **15.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **16.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 25 | | | | |
| 1 | 120.00 | | | | |
| 2 | 120.00 | | | | |
| 3 | 118.00 | | | | |
| 4 | 116.00 | | | | |
| 5 | 117.00 | | | | |
| 6 | 115.00 | | | | |
| 7 | 116.00 | | | | |
| 8 | 115.00 | | | | |
| $Q_{avg}$ (L/min) | 117.13 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 14.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 14.1 | | | | |
| K (m/min) | 2.6E-03 | | | | |
| K (m/sec) | 4.3E-05 | | | | |
| Lugeons | 403.1 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time incremen

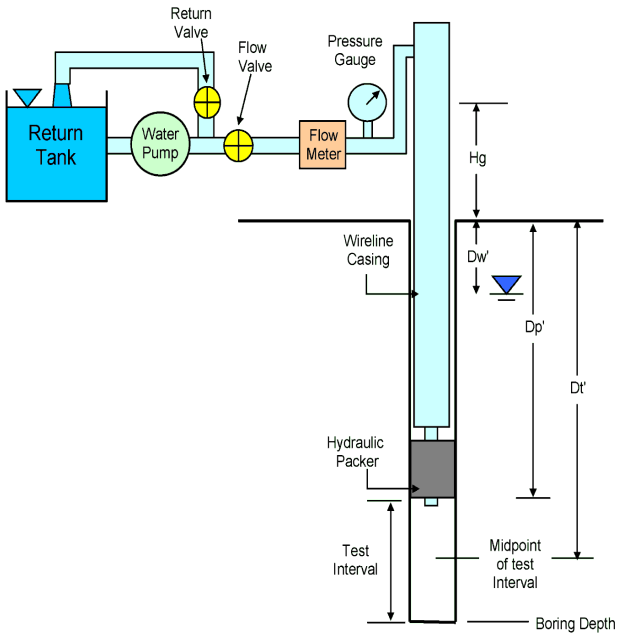
- Based on limited data, **$K_{avg}$ is estimated as $4.3 \times 10^{-5}$ m/sec**

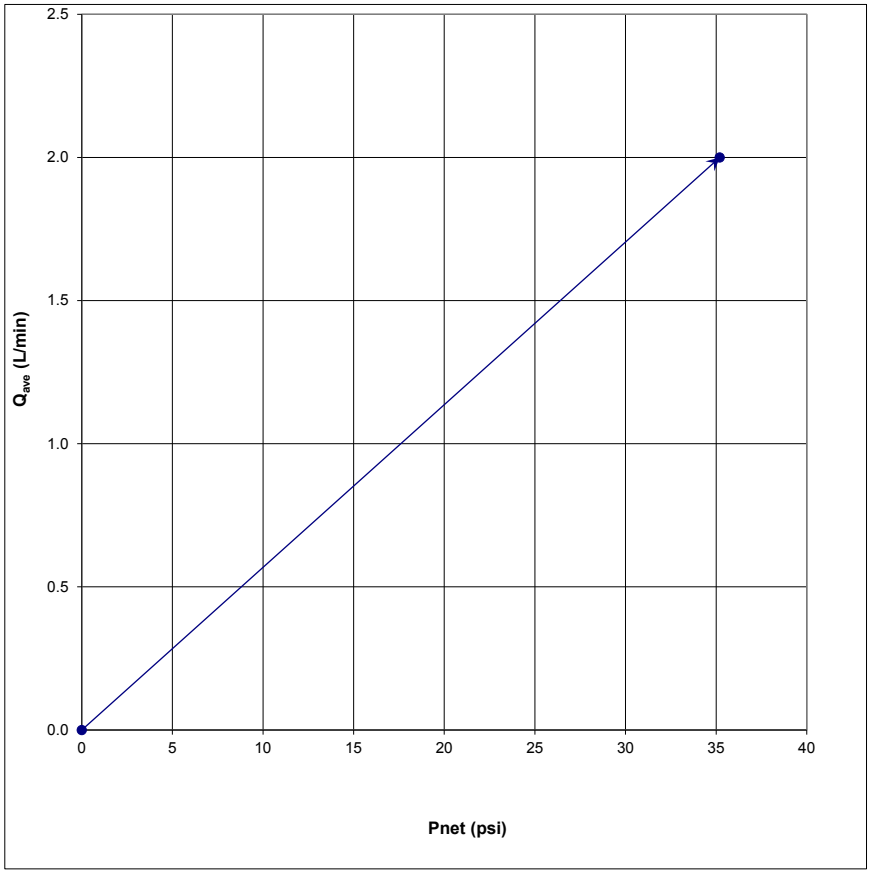
# SINGLE PACKER INJECTION TEST

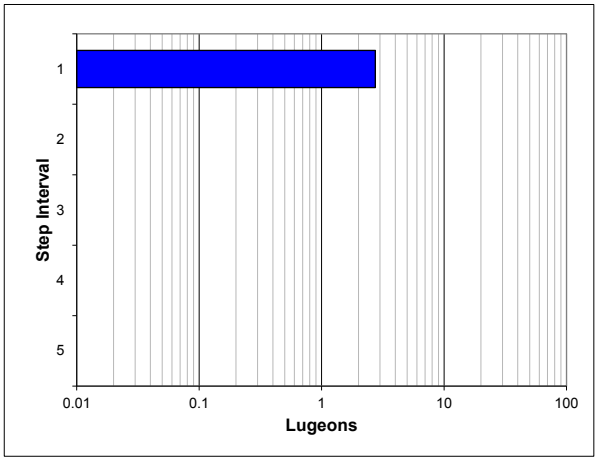
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 2 |
| | Project Nº: 110773396 Test Interval (m): 18.7 to 21.7 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 2.7 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **18.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **20.2** m | f | Friction factor | **0.049** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **2.7** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **18.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **20.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 30 | | | | |
| 1 | 2.00 | | | | |
| 2 | 2.00 | | | | |
| 3 | 2.00 | | | | |
| 4 | 2.00 | | | | |
| 5 | 2.00 | | | | |
| 6 | 2.00 | | | | |
| 7 | 2.00 | | | | |
| 8 | 2.00 | | | | |
| $Q_{avg}$ (L/min) | 2.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 35.2 | | | | |
| K (m/min) | 1.8E-05 | | | | |
| K (m/sec) | 3.0E-07 | | | | |
| Lugeons | 2.7 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

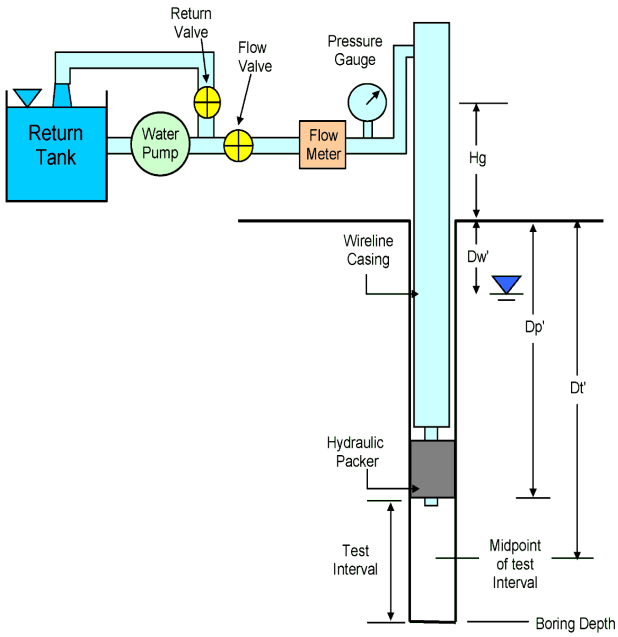
- Based on limited data from , **$K_{avg}$ is estimated as 3.0x10$^{-7}$ m/sec**

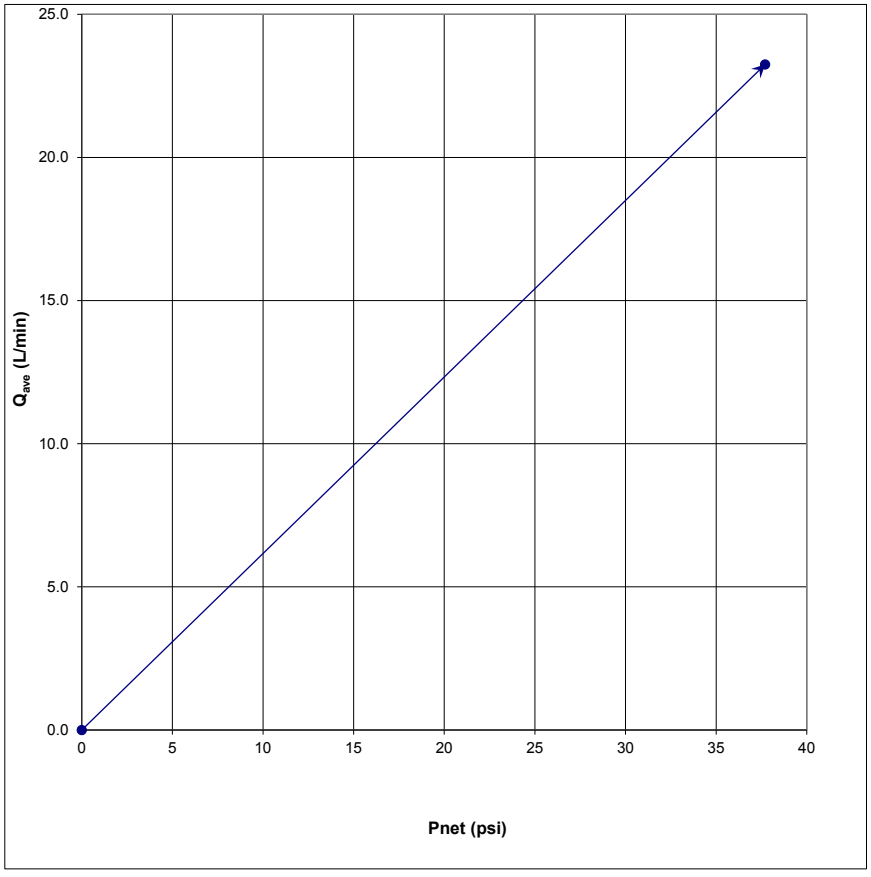
# SINGLE PACKER INJECTION TEST

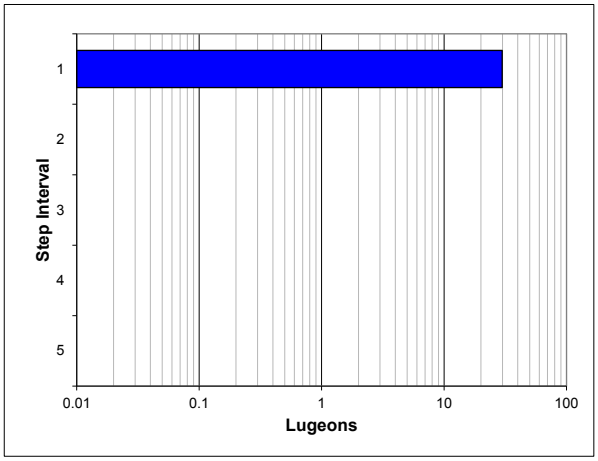
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 3 |
| | Project Nº: 110773396 Test Interval (m): 21.7 to 24.7 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 1.8 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **21.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **23.2** m | f | Friction factor | **0.047** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **1.8** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **21.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **23.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 35 | | | | |
| 1 | 24.00 | | | | |
| 2 | 24.00 | | | | |
| 3 | 23.00 | | | | |
| 4 | 23.00 | | | | |
| 5 | 23.00 | | | | |
| 6 | 24.00 | | | | |
| 7 | 22.00 | | | | |
| 8 | 23.00 | | | | |
| $Q_{avg}$ (L/min) | 23.25 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 37.7 | | | | |
| K (m/min) | 1.9E-04 | | | | |
| K (m/sec) | 3.2E-06 | | | | |
| Lugeons | 29.8 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- No flow recorded at time increments Step 1 and 5. Blank cells indicate flow of zero during time increment

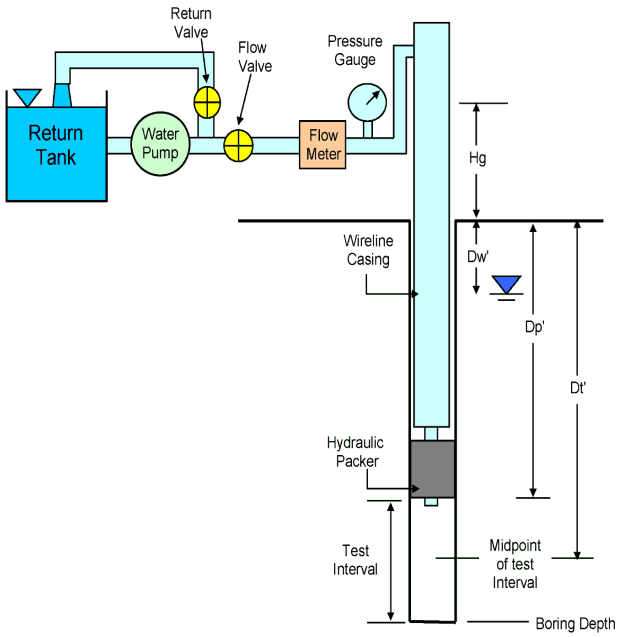
- Based on limited data from , **$K_{avg}$ is estimated as 3.2x10$^{-6}$ m/sec**

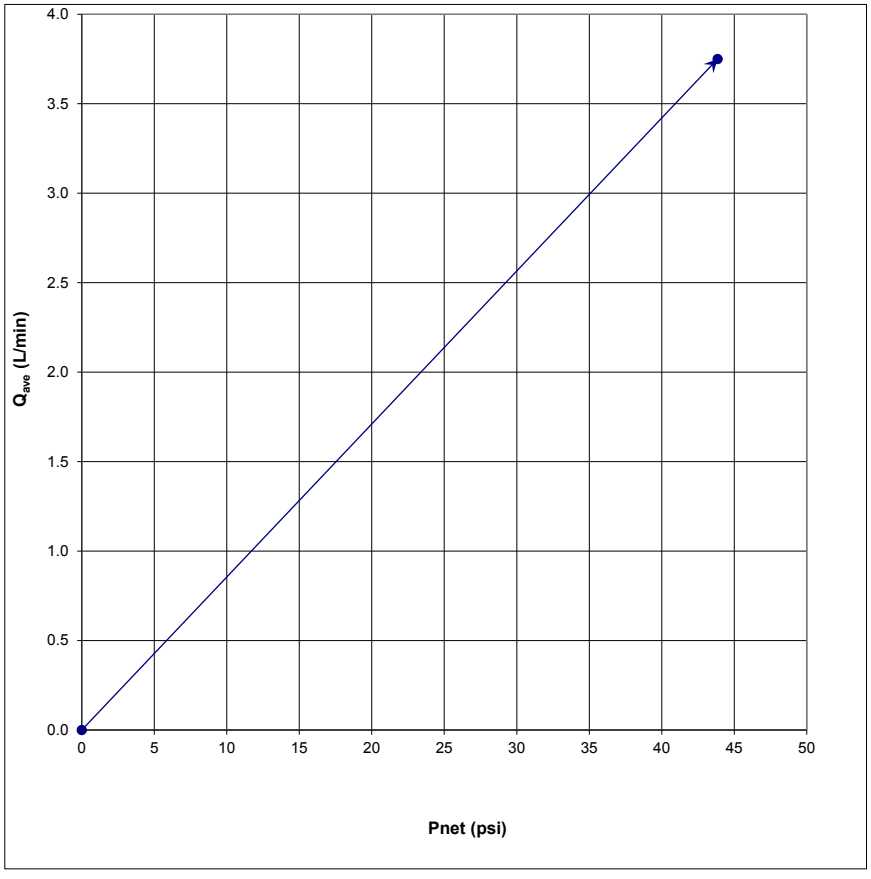
# SINGLE PACKER INJECTION TEST

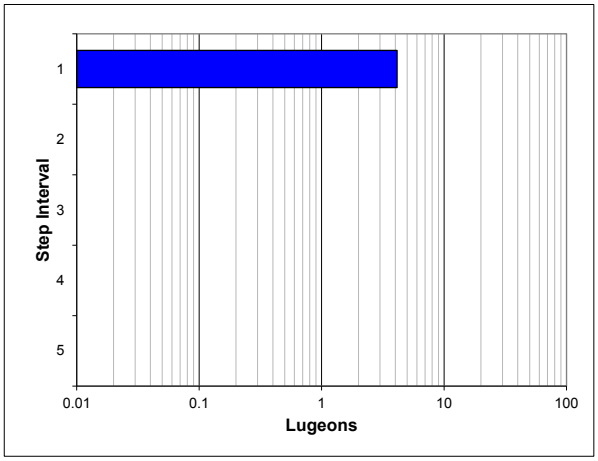
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 4 |
| | Project Nº: 110773396 Test Interval (m): 24.7 to 27.7 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 1.8 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **24.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **26.2** m | f | Friction factor | **0.064** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **1.8** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **24.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **26.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 40 | | | | |
| 1 | 4.00 | | | | |
| 2 | 4.00 | | | | |
| 3 | 5.00 | | | | |
| 4 | 4.00 | | | | |
| 5 | 4.00 | | | | |
| 6 | 4.00 | | | | |
| 7 | 4.00 | | | | |
| 8 | 1.00 | | | | |
| $Q_{avg}$ (L/min) | 3.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 43.8 | | | | |
| K (m/min) | 2.7E-05 | | | | |
| K (m/sec) | 4.5E-07 | | | | |
| Lugeons | 4.1 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor.Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

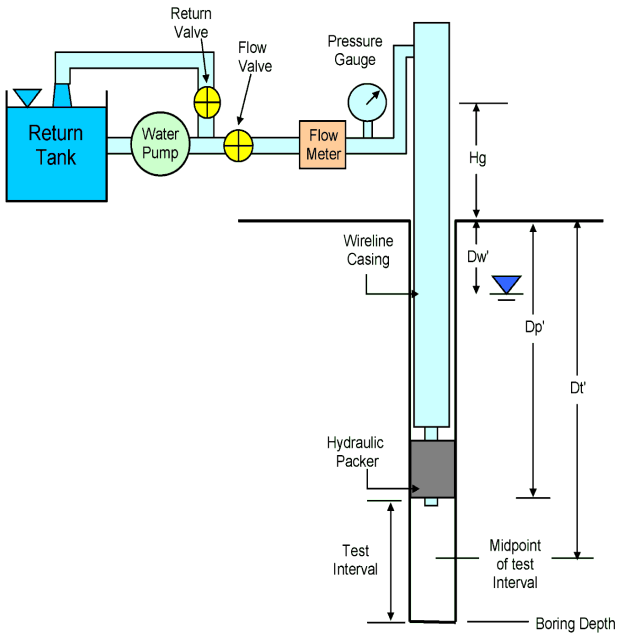
- Based on limited data from , **$K_{avg}$ is estimated as $4.5 \times 10^{-7}$ m/sec**

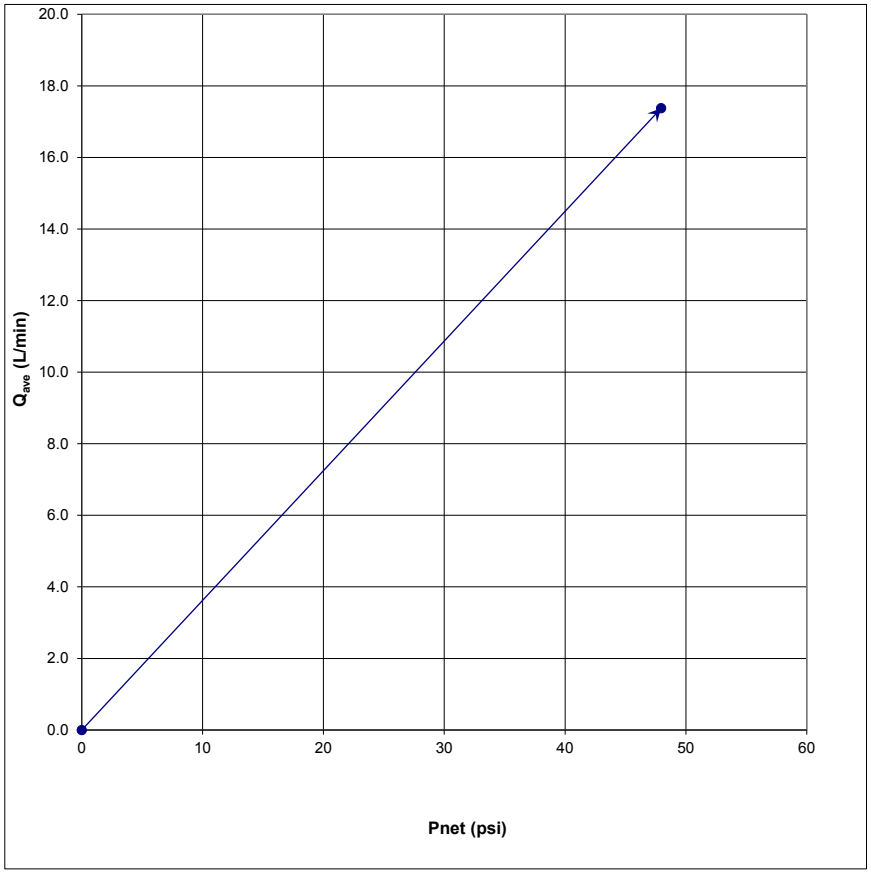
# SINGLE PACKER INJECTION TEST

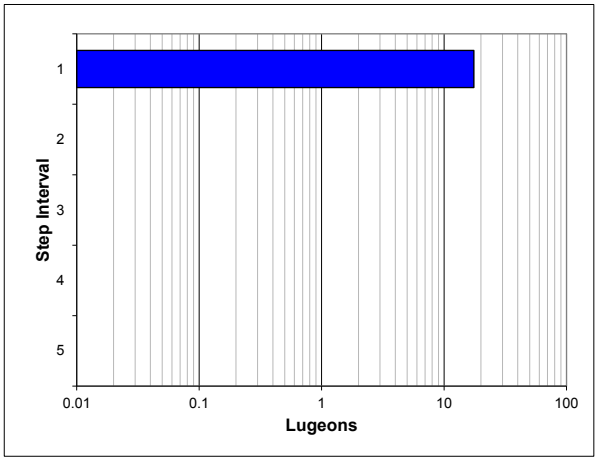
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 5 |
| | Project Nº: 110773396 Test Interval (m): 27.7 to 30.7 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 1.8 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **27.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **29.2** m | f | Friction factor | **0.056** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **1.8** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **27.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **29.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 45 | | | | |
| 1 | 50.00 | | | | |
| 2 | -11.00 | | | | |
| 3 | 18.00 | | | | |
| 4 | 18.00 | | | | |
| 5 | 17.00 | | | | |
| 6 | 16.00 | | | | |
| 7 | 16.00 | | | | |
| 8 | 15.00 | | | | |
| $Q_{avg}$ (L/min) | 17.37 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 47.9 | | | | |
| K (m/min) | 1.1E-04 | | | | |
| K (m/sec) | 1.9E-06 | | | | |
| Lugeons | 17.5 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

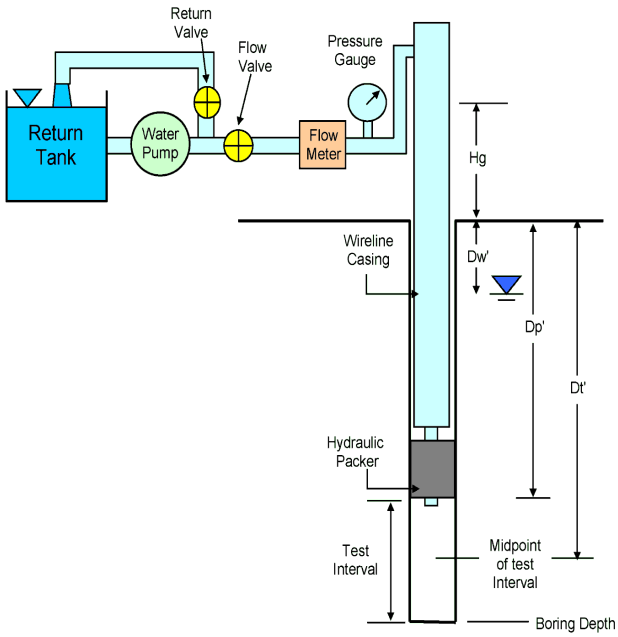
- Based on limited data from , **$K_{avg}$ is estimated as 1.9x10$^{-6}$ m/sec**

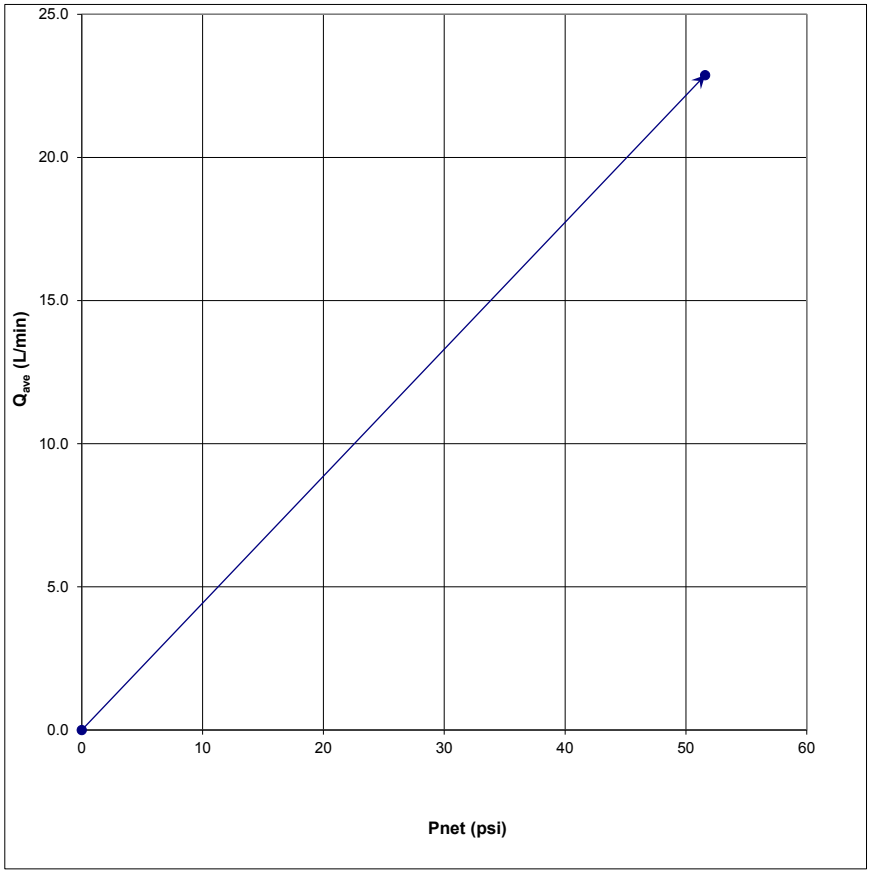
# SINGLE PACKER INJECTION TEST

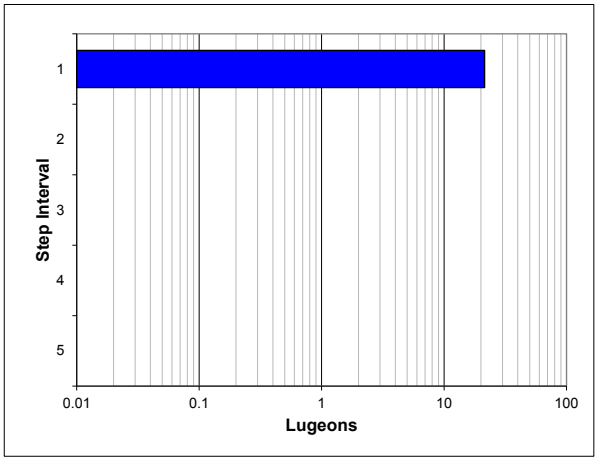
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 6 |
| | Project Nº: 110773396 Test Interval (m): 30.7 to 33.7 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 1.8 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **30.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **32.2** m | f | Friction factor | **0.067** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **1.8** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **30.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **32.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 50 | | | | |
| 1 | 25.00 | | | | |
| 2 | 23.00 | | | | |
| 3 | 25.00 | | | | |
| 4 | 23.00 | | | | |
| 5 | 22.00 | | | | |
| 6 | 22.00 | | | | |
| 7 | 21.00 | | | | |
| 8 | 22.00 | | | | |
| $Q_{avg}$ (L/min) | 22.88 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 51.6 | | | | |
| K (m/min) | 1.4E-04 | | | | |
| K (m/sec) | 2.3E-06 | | | | |
| Lugeons | 21.5 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

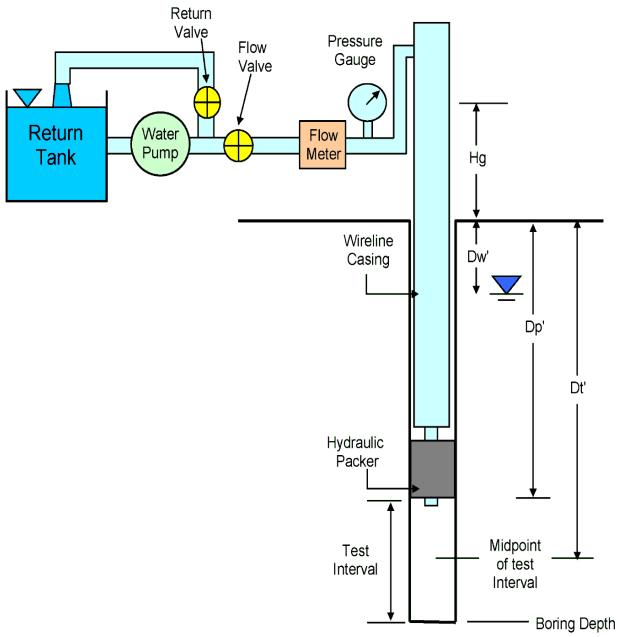
- Based on limited data from , **$K_{avg}$ is estimated as 2.3x10$^{-6}$ m/sec**

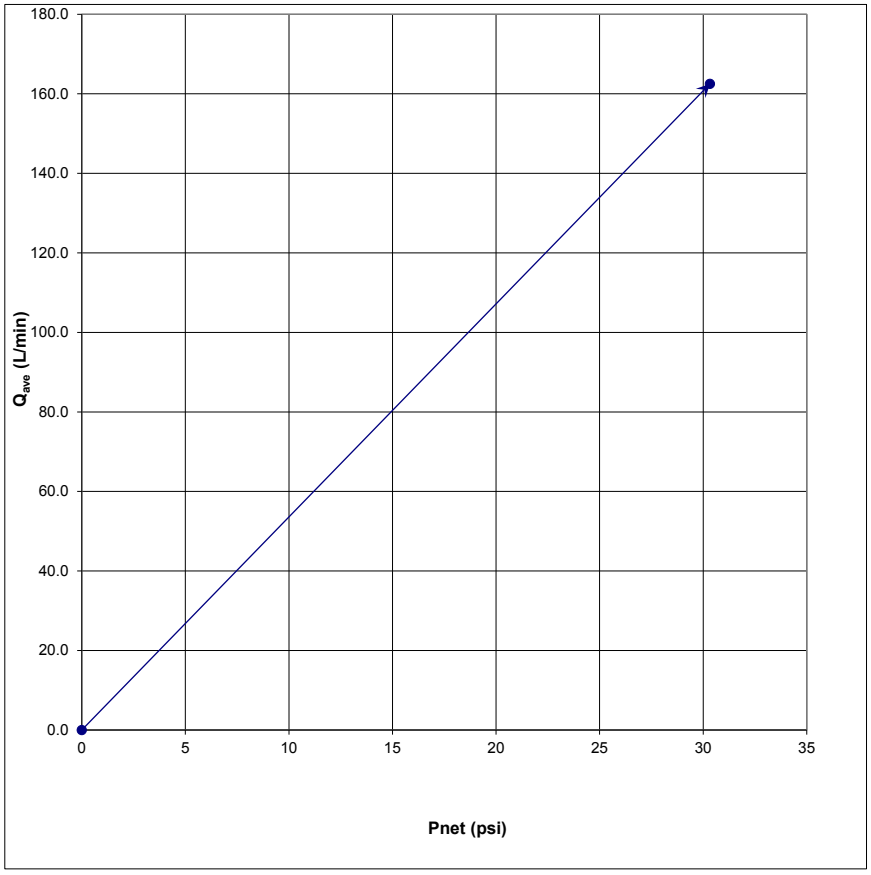
# SINGLE PACKER INJECTION TEST

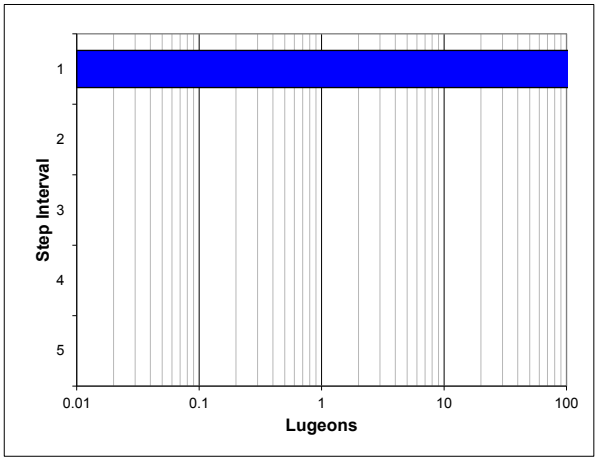
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 7 |
| | Project Nº: 110773396 Test Interval (m): 33.7 to 36.7 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 1.8 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **33.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **35.2** m | f | Friction factor | **0.033** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **1.8** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **33.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **35.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 55 | | | | |
| 1 | 167.00 | | | | |
| 2 | 166.00 | | | | |
| 3 | 164.00 | | | | |
| 4 | 165.00 | | | | |
| 5 | 162.00 | | | | |
| 6 | 168.00 | | | | |
| 7 | 151.00 | | | | |
| 8 | 157.00 | | | | |
| $Q_{avg}$ (L/min) | 162.50 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 28.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 30.3 | | | | |
| K (m/min) | 1.7E-03 | | | | |
| K (m/sec) | 2.8E-05 | | | | |
| Lugeons | 259.3 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

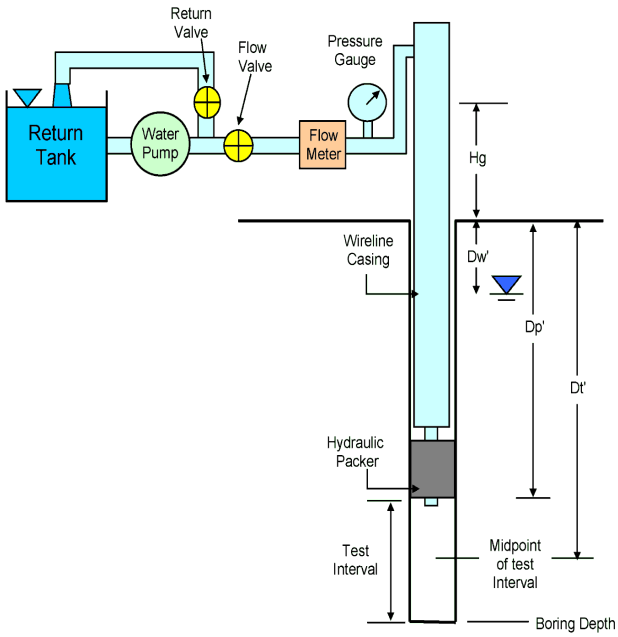
- Based on limited data from , **$K_{avg}$ is estimated as 2.8x10$^{-5}$ m/sec**

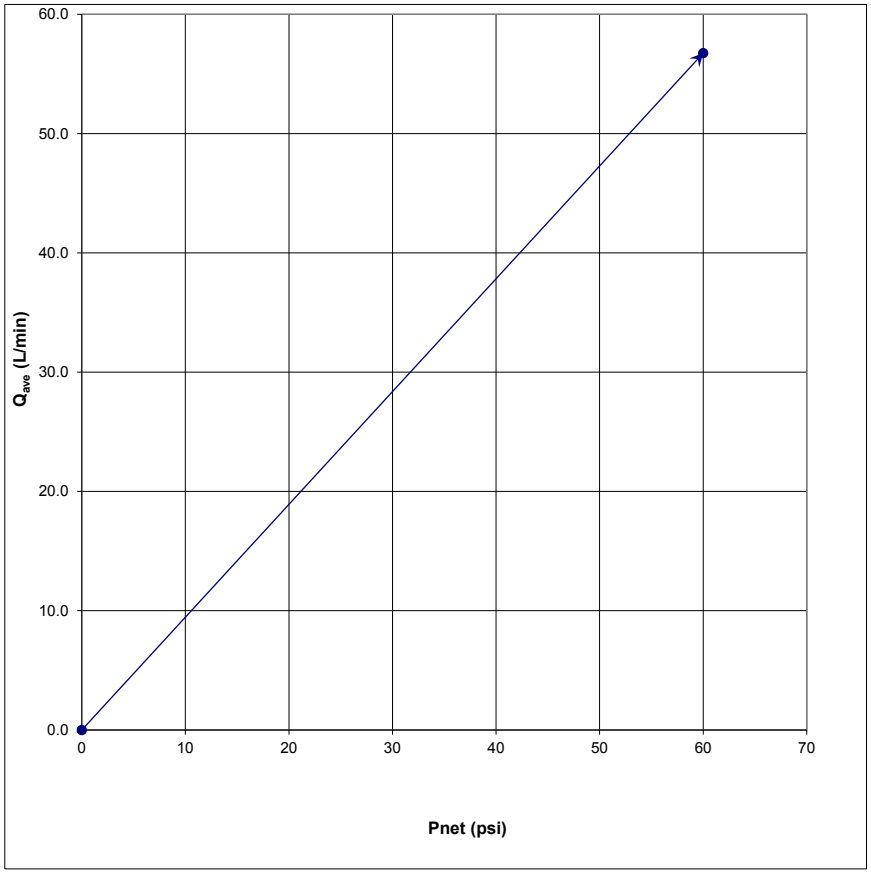
# SINGLE PACKER INJECTION TEST

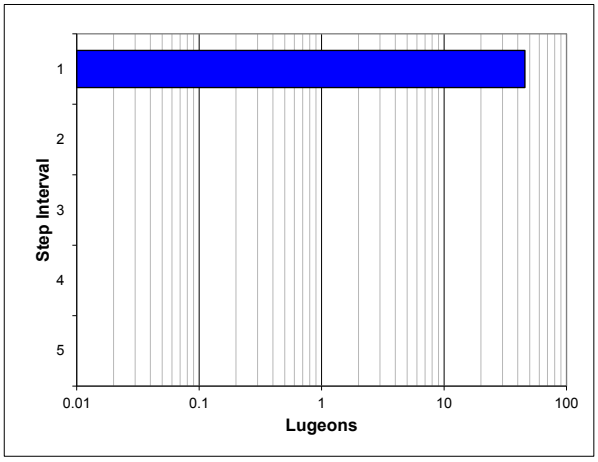
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 8 |
| | Project Nº: 110773396 Test Interval (m): 36.7 to 39.7 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 1.8 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **36.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **38.2** m | f | Friction factor | **0.035** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **1.8** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **36.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **38.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 60 | | | | |
| 1 | 56.00 | | | | |
| 2 | 56.00 | | | | |
| 3 | 55.00 | | | | |
| 4 | 58.00 | | | | |
| 5 | 55.00 | | | | |
| 6 | 59.00 | | | | |
| 7 | 58.00 | | | | |
| 8 | 57.00 | | | | |
| $Q_{avg}$ (L/min) | 56.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 3.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 60.0 | | | | |
| K (m/min) | 3.0E-04 | | | | |
| K (m/sec) | 4.9E-06 | | | | |
| Lugeons | 45.8 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

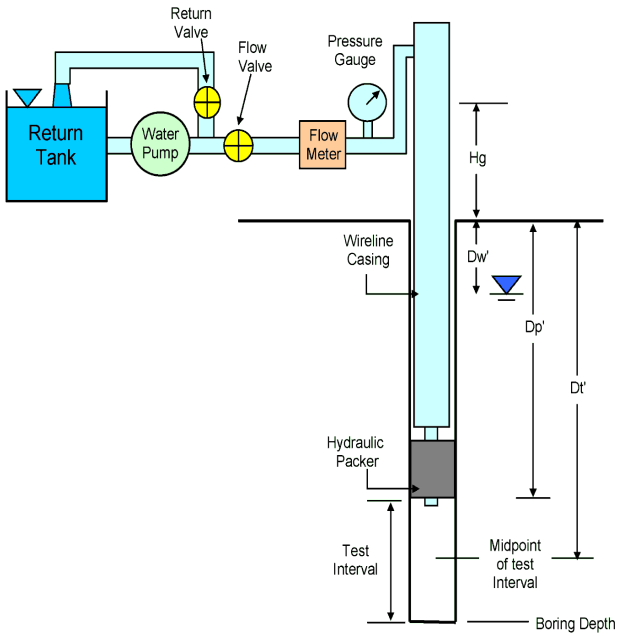
- Based on limited data from , **$K_{avg}$ is estimated as $4.9 \times 10^{-6}$ m/sec**

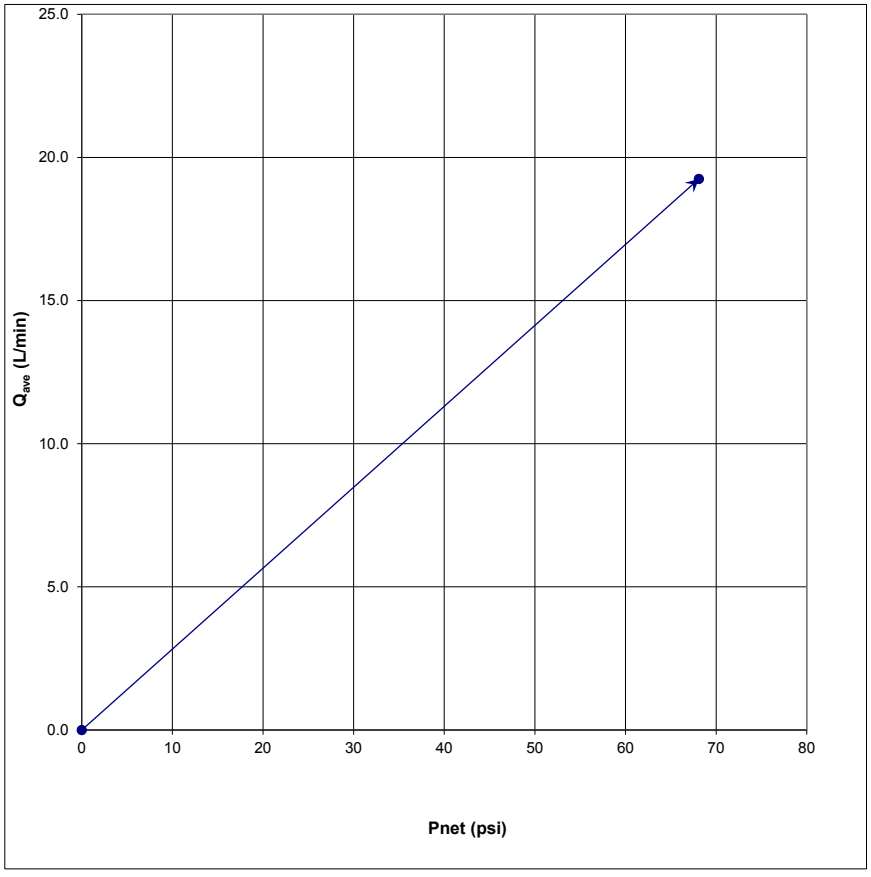
# SINGLE PACKER INJECTION TEST

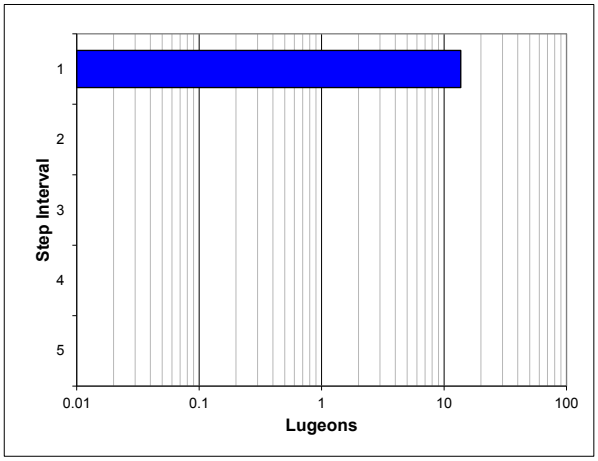
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 9 |
| | Project Nº: 110773396 Test Interval (m): 39.7 to 42.7 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 1.8 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **39.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **41.2** m | f | Friction factor | **0.047** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **1.8** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **39.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **41.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 65 | | | | |
| 1 | 21.00 | | | | |
| 2 | 20.00 | | | | |
| 3 | 19.00 | | | | |
| 4 | 20.00 | | | | |
| 5 | 19.00 | | | | |
| 6 | 20.00 | | | | |
| 7 | 18.00 | | | | |
| 8 | 17.00 | | | | |
| $Q_{avg}$ (L/min) | 19.25 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 68.1 | | | | |
| K (m/min) | 8.8E-05 | | | | |
| K (m/sec) | 1.5E-06 | | | | |
| Lugeons | 13.7 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

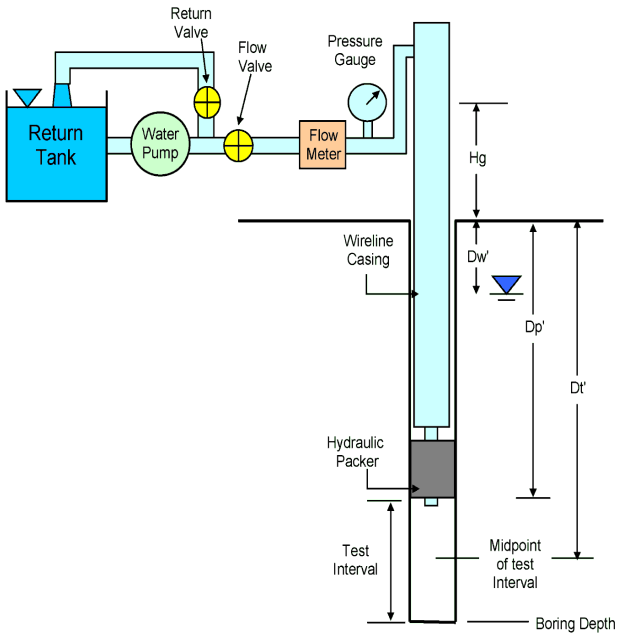
- Based on limited data from , **$K_{avg}$ is estimated as 1.5x10$^{-6}$ m/sec**

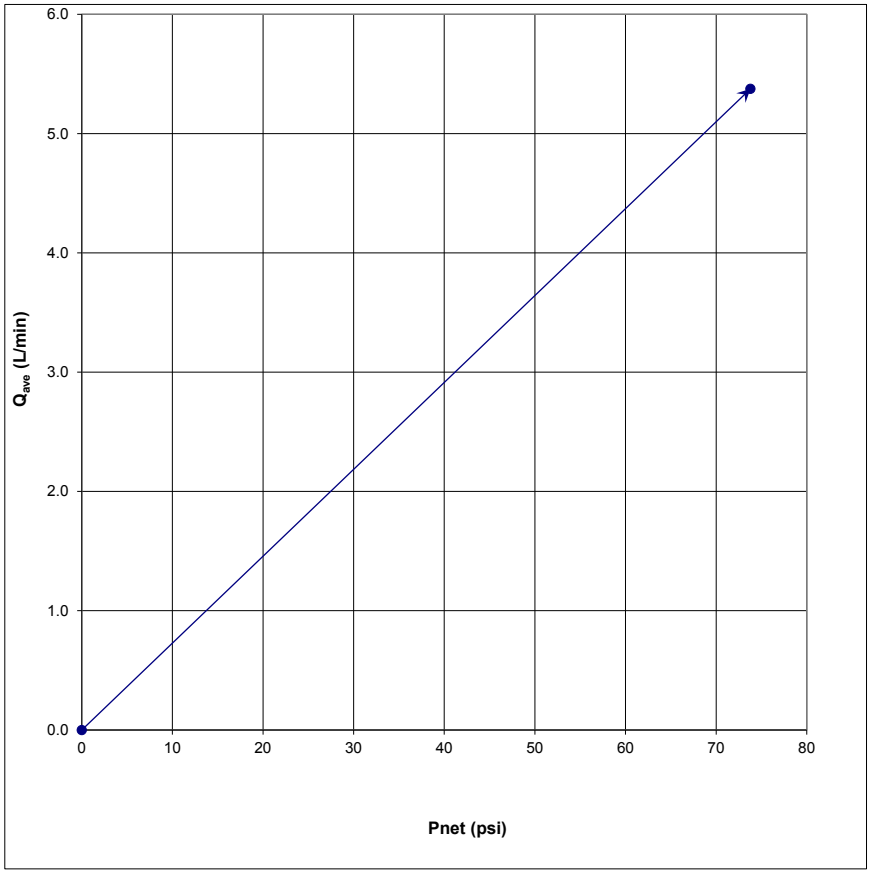
# SINGLE PACKER INJECTION TEST

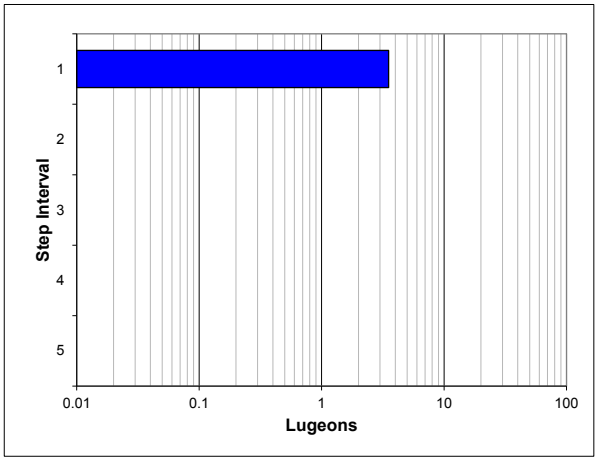
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D38 |
| | | Test Nº: | 10 |
| | Project Nº: 110773396 Test Interval (m): 42.7 to 45.7 | GS Elev. (m): | 1190.8 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 1.8 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 15.1 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **42.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **44.2** m | f | Friction factor | **0.064** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **1.8** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **42.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **44.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 70 | | | | |
| 1 | 6.00 | | | | |
| 2 | 5.00 | | | | |
| 3 | 6.00 | | | | |
| 4 | 5.00 | | | | |
| 5 | 5.00 | | | | |
| 6 | 6.00 | | | | |
| 7 | 5.00 | | | | |
| 8 | 5.00 | | | | |
| $Q_{avg}$ (L/min) | 5.37 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 73.8 | | | | |
| K (m/min) | 2.3E-05 | | | | |
| K (m/sec) | 3.8E-07 | | | | |
| Lugeons | 3.5 | | | | |



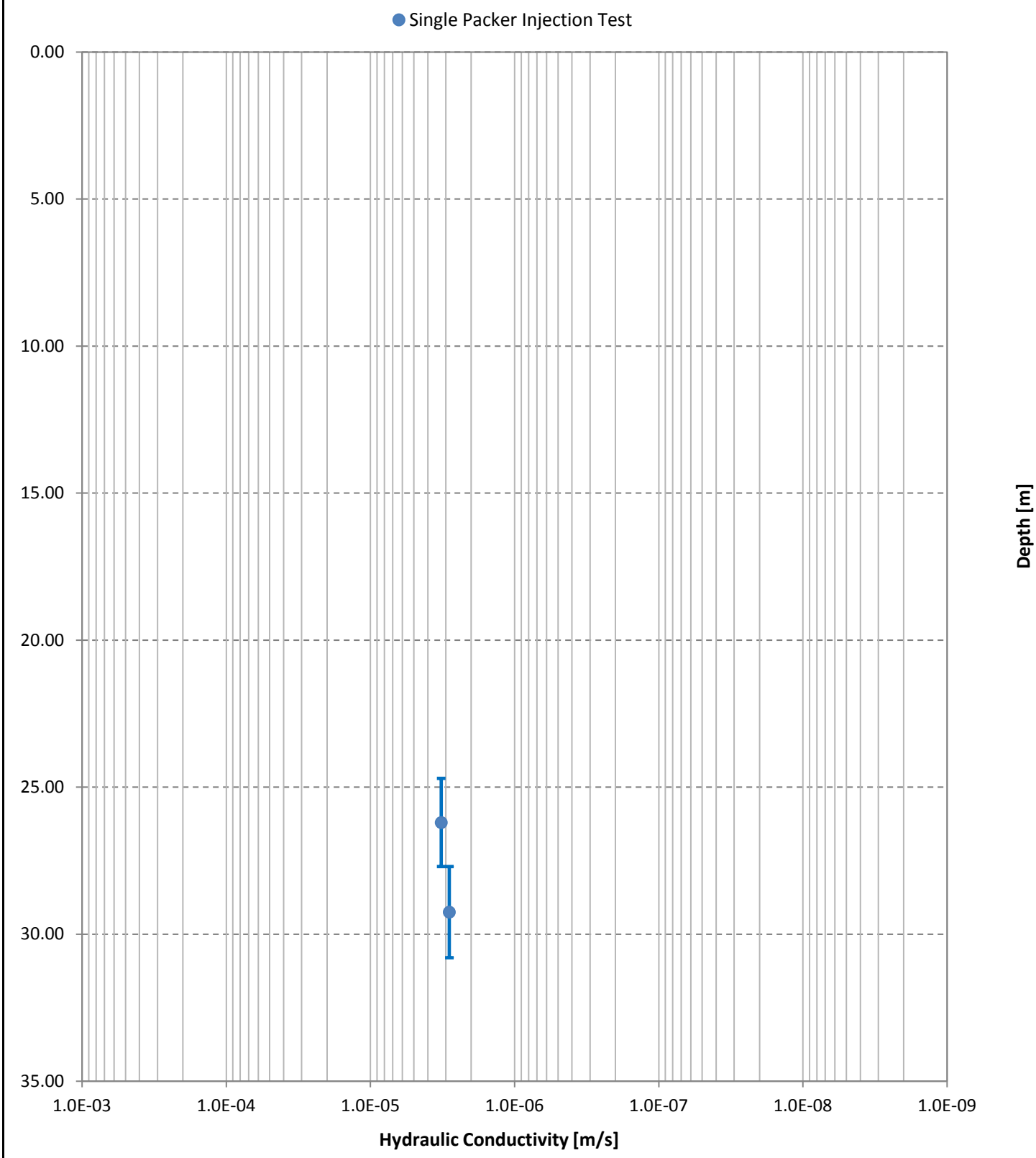

## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as $3.8 \times 10^{-7}$ m/sec**

**Title**

# Summary Plot of D51 Packer Testing




| | | | |
|---|---|---|---|
| **Project** SR1 - Off Stream Reservoir | | **Scale** N/A | **Date** 23/11/2016 |
| **Client** Alberta Transportation | | **Drawn** JNW | **Checked** |
| **Project Number** 110773396.302.702.230 | | **Drawing No.** | |

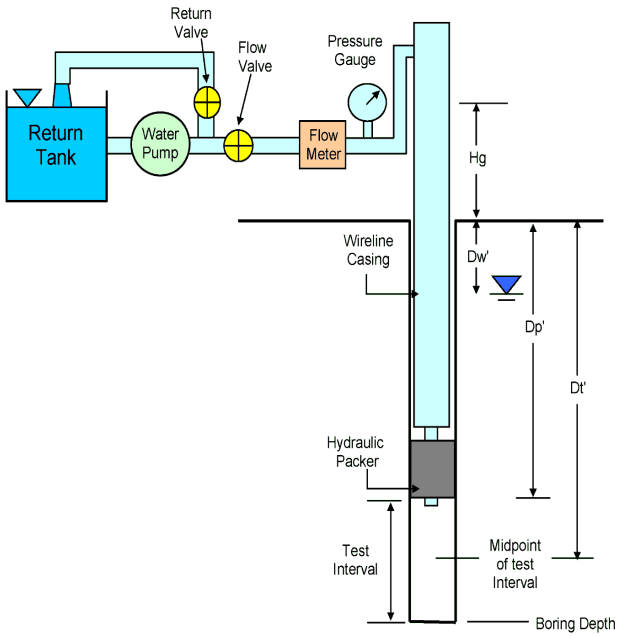
Stantec

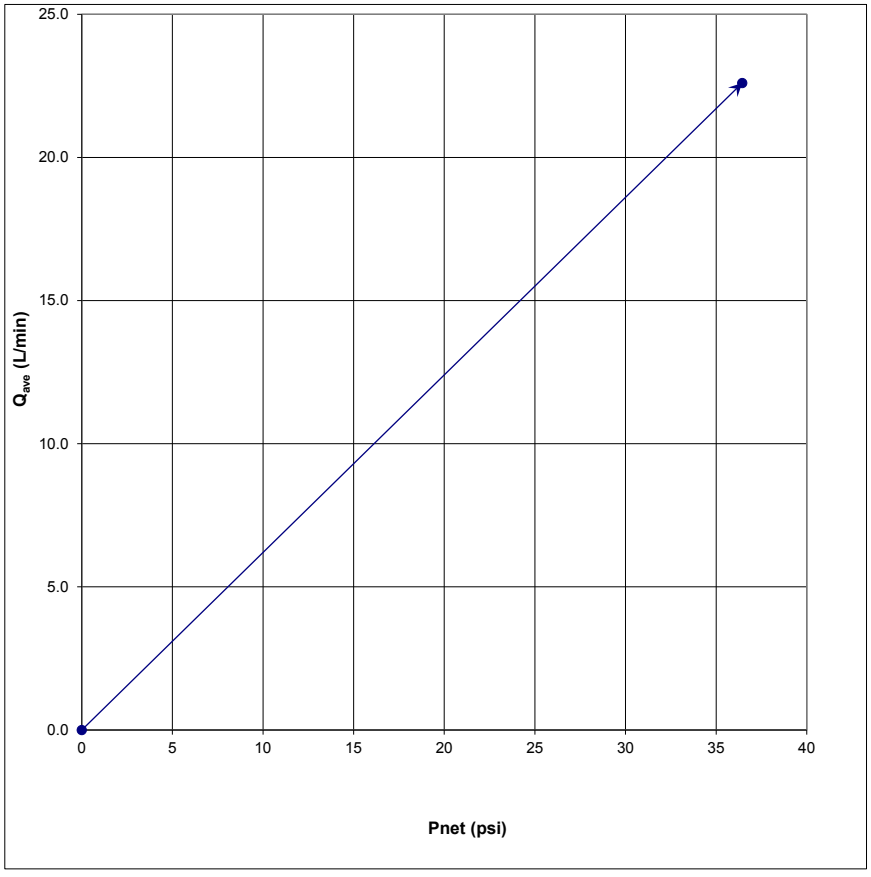
# SINGLE PACKER INJECTION TEST

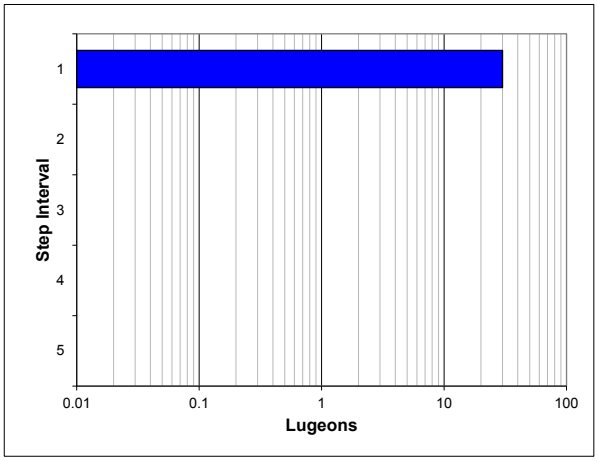
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D51 |
| | | Test Nº: | 1 |
| | Project Nº: 110773396 Test Interval (m): 24.7 to 27.7 | GS Elev. (m): | 1194.4 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 11.6 m | Hg | Gauge height | 0.8 m |
| Dbr | Measured depth to bedrock | 14.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **24.7** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **26.2** m | f | Friction factor | **0.110** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **11.6** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **24.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **26.2** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 25 | | | | |
| 1 | 22.00 | | | | |
| 2 | 23.00 | | | | |
| 3 | 22.00 | | | | |
| 4 | 22.00 | | | | |
| 5 | 24.00 | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 22.60 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 6.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 36.4 | | | | |
| K (m/min) | 1.9E-04 | | | | |
| K (m/sec) | 3.2E-06 | | | | |
| Lugeons | 30.0 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time incremen

- Based on limited data, **$K_{avg}$ is estimated as $3.2 \times 10^{-6}$ m/sec**

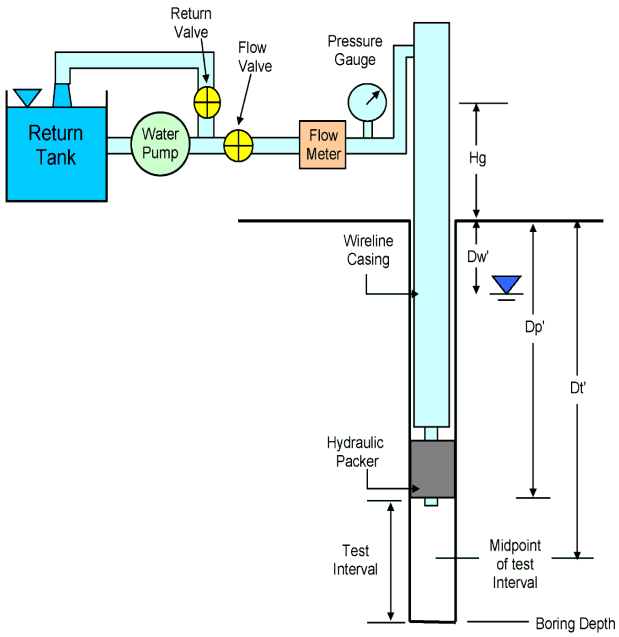
# SINGLE PACKER INJECTION TEST

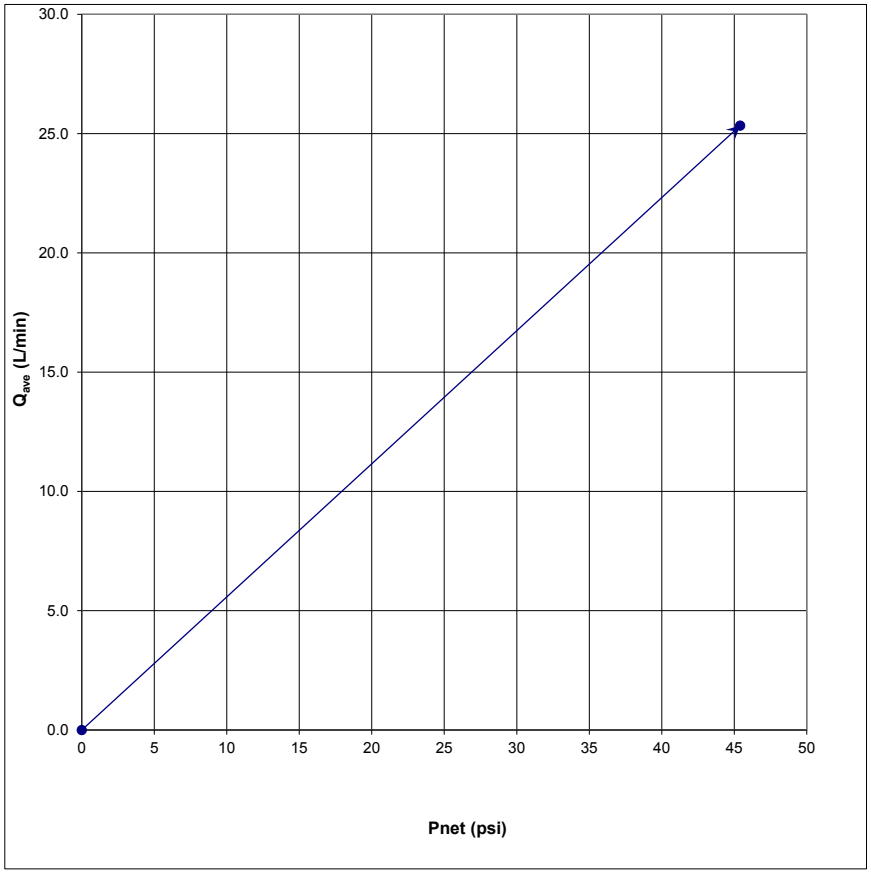
Stantec

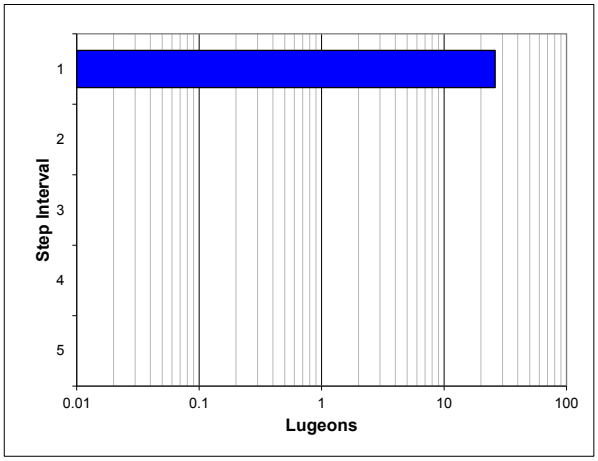
| | | | |
|---|---|---|---|
| Project Name: SR1 - Off Stream Reservoir | | BH Nº: | D51 |
| | | Test Nº: | 2 |
| Project Nº: 110773396 | Test Interval (m): 27.7 to 30.8 | GS Elev. (m): | 1194.4 |
| | | Supervisor: | RH |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 11.6 m | Hg | Gauge height | 0.8 m |
| Dbr | Measured depth to bedrock | 14.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **27.7** m | L | Length of test section | **3.1** m |
| Dt | Measured depth to midpoint of test | **29.3** m | f | Friction factor | **0.058** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **11.6** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **27.7** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **29.3** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 30 | | | | |
| 1 | 32.00 | | | | |
| 2 | 29.00 | | | | |
| 3 | 24.00 | | | | |
| 4 | 24.00 | | | | |
| 5 | 22.00 | | | | |
| 6 | 21.00 | | | | |
| 7 | | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 25.33 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 2.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 45.4 | | | | |
| K (m/min) | 1.7E-04 | | | | |
| K (m/sec) | 2.8E-06 | | | | |
| Lugeons | 26.1 | | | | |



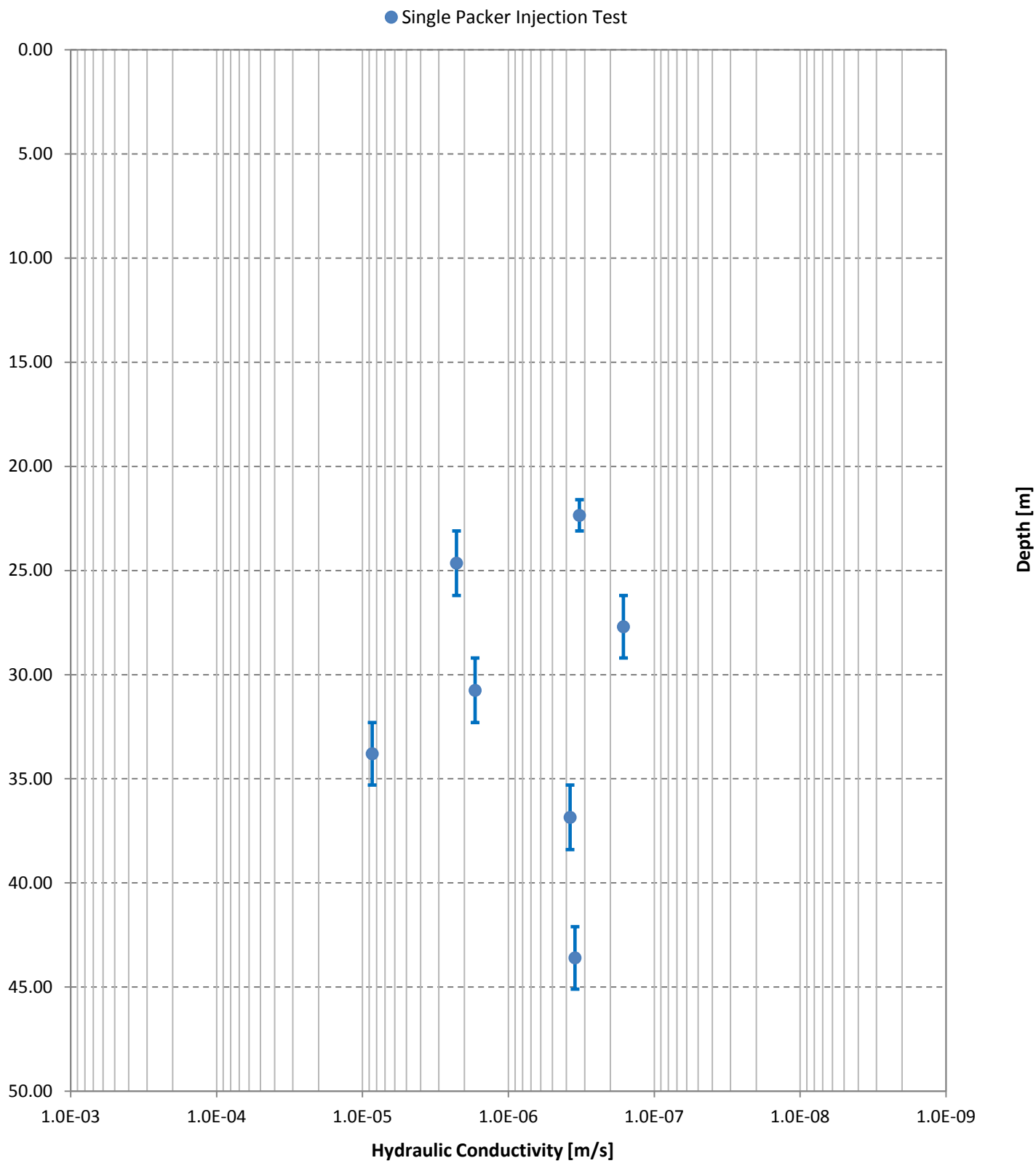

## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 2.8x10$^{-6}$ m/sec**

**Title**

# Summary Plot of D60 Packer Testing



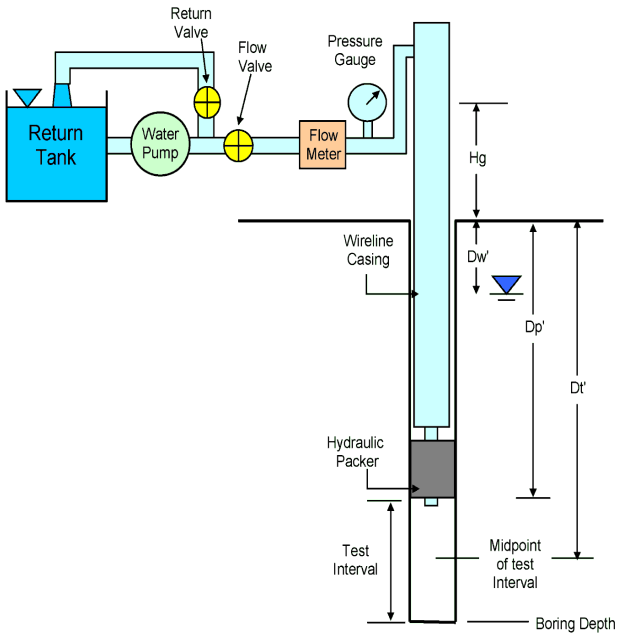

| | | | |
|---|---|---|---|
| **Project** SR1 - Off Stream Reservoir | | **Scale** N/A | **Date** 23/11/2016 |
| **Client** Alberta Transportation | | **Drawn** JNW | **Checked** |
| **Project Number** 110773396.302.702.230 | | **Drawing No.** | Stantec |

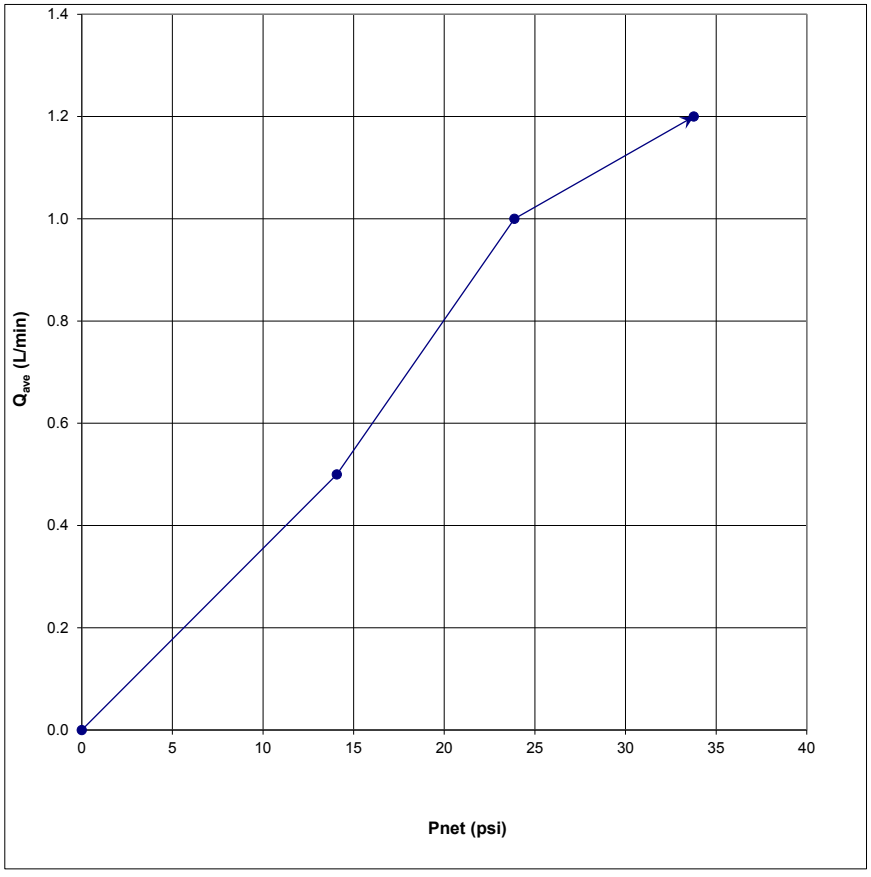
# SINGLE PACKER INJECTION TEST

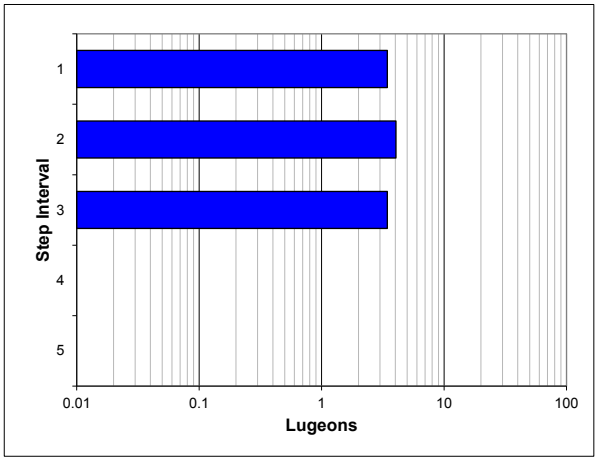
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D60 |
| | | Test Nº: | 1 |
| | Project Nº: 110773396 Test Interval (m): 21.6 to 23.1 | GS Elev. (m): | 1191.7 |
| | | Supervisor: | CK |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 2.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **21.6** m | L | Length of test section | **1.5** m |
| Dt | Measured depth to midpoint of test | **22.4** m | f | Friction factor | **0.041** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **2.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **21.6** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **22.4** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 10 | 20 | 30 | | |
| 1 | 0.50 | 1.50 | 1.00 | | |
| 2 | 0.50 | 0.50 | 2.00 | | |
| 3 | 0.50 | 1.00 | 0.50 | | |
| 4 | | | 1.50 | | |
| 5 | | 1.00 | 1.00 | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 0.50 | 1.00 | 1.20 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 14.1 | 23.9 | 33.8 | | |
| K (m/min) | 1.8E-05 | 2.2E-05 | 1.8E-05 | | |
| K (m/sec) | 3.1E-07 | 3.6E-07 | 3.1E-07 | | |
| Lugeons | 3.4 | 4.1 | 3.4 | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data, **$K_{avg}$ is estimated as $3.3 \times 10^{-7}$ m/sec**

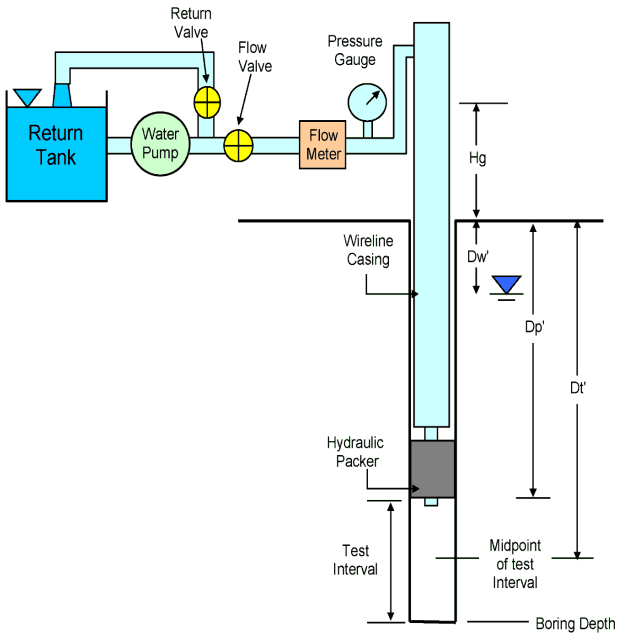
# SINGLE PACKER INJECTION TEST

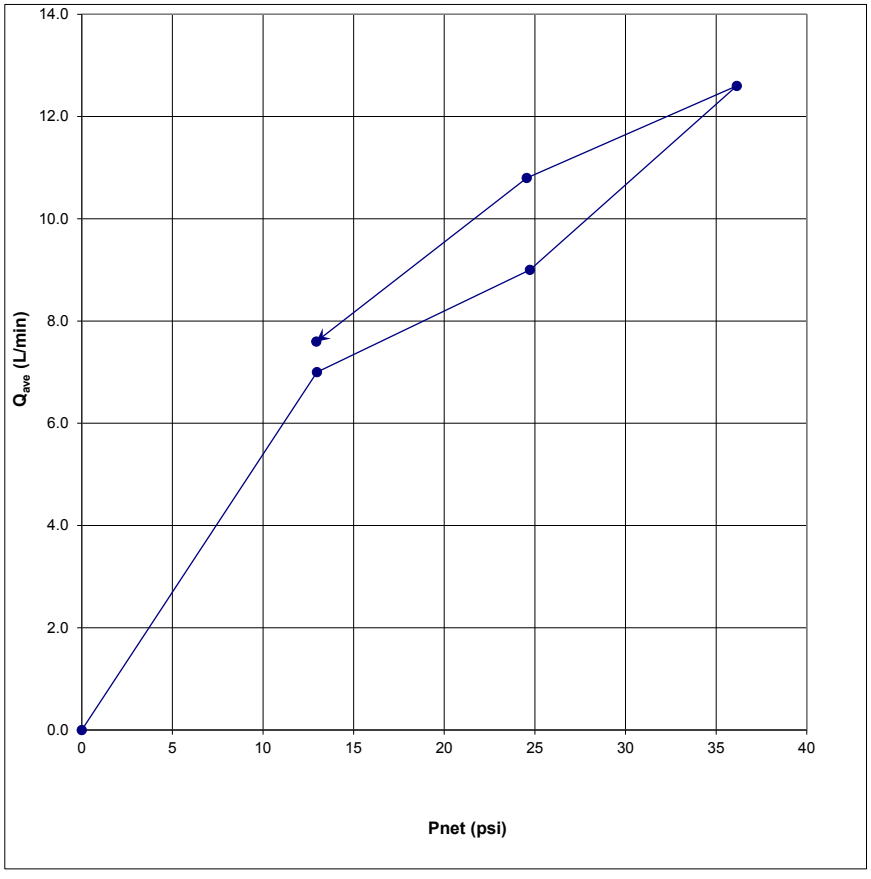
Stantec

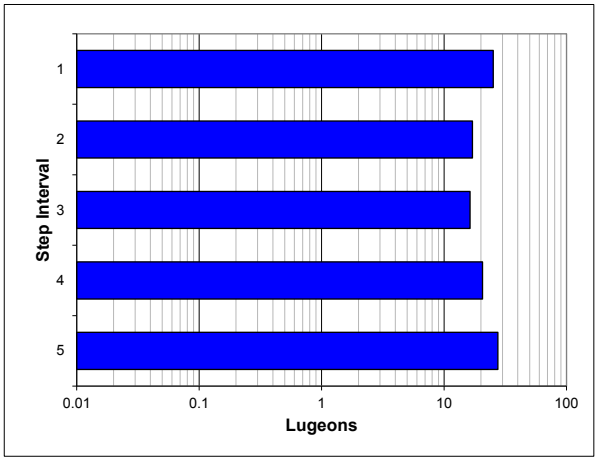
| | | | |
|---|---|---|---|
| Project Name: SR1 - Off Stream Reservoir | | BH Nº: | D60 |
| | | Test Nº: | 2 |
| Project Nº: 110773396 | Test Interval (m): 23.1 to 26.2 | GS Elev. (m): | 1191.7 |
| | | Supervisor: | CK |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 1.0 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **23.1** m | L | Length of test section | **3.1** m |
| Dt | Measured depth to midpoint of test | **24.7** m | f | Friction factor | **0.070** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **23.1** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **24.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 12 | 24 | 36 | 24 | 12 |
| 1 | 7.00 | 9.00 | 13.00 | 11.00 | 7.00 |
| 2 | 7.00 | 9.00 | 14.00 | 11.00 | 8.00 |
| 3 | 7.00 | 9.00 | 12.00 | 11.00 | 8.00 |
| 4 | 7.00 | 9.00 | 12.00 | 10.00 | 7.00 |
| 5 | 7.00 | 9.00 | 12.00 | 11.00 | 8.00 |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 7.00 | 9.00 | 12.60 | 10.80 | 7.60 |
| Pf (psi) | 0.2 | 0.4 | 0.8 | 0.6 | 0.3 |
| Pnet (psi) | 13.0 | 24.7 | 36.1 | 24.5 | 12.9 |
| K (m/min) | 1.6E-04 | 1.1E-04 | 1.1E-04 | 1.3E-04 | 1.8E-04 |
| K (m/sec) | 2.7E-06 | 1.8E-06 | 1.8E-06 | 2.2E-06 | 3.0E-06 |
| Lugeons | 25.2 | 17.0 | 16.3 | 20.6 | 27.5 |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

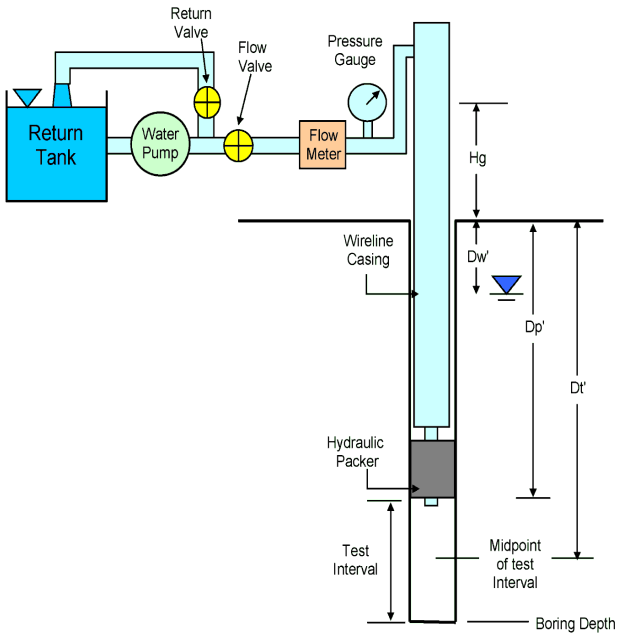
- Based on limited data from , **$K_{avg}$ is estimated as 2.3x10$^{-6}$ m/sec**

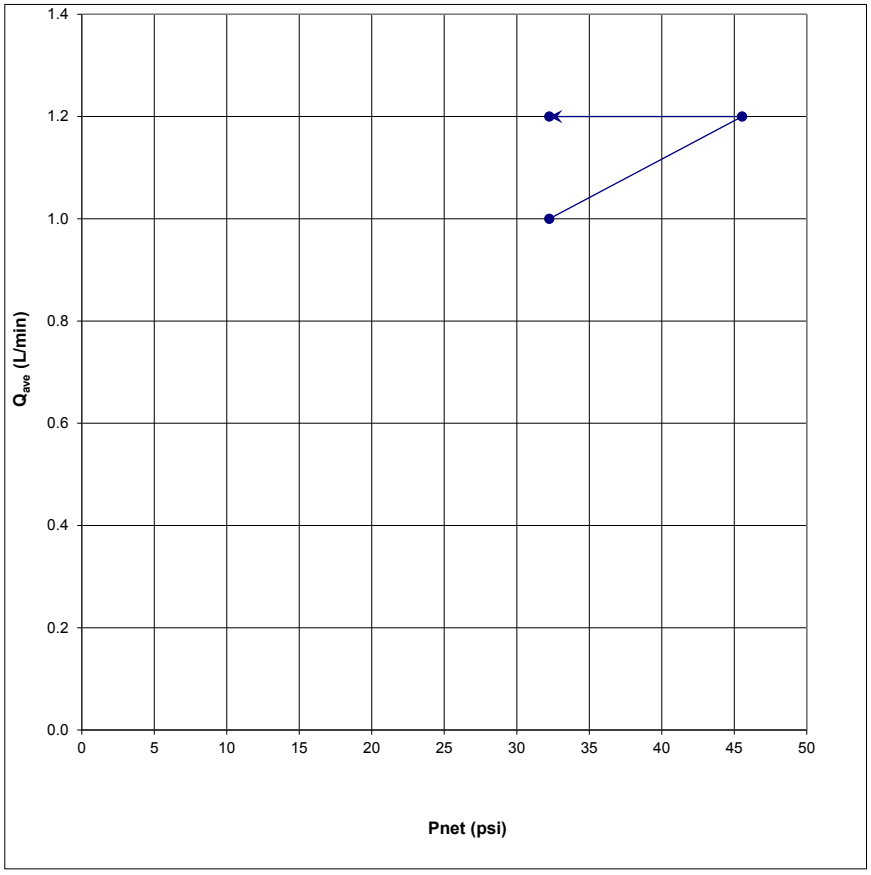
# SINGLE PACKER INJECTION TEST

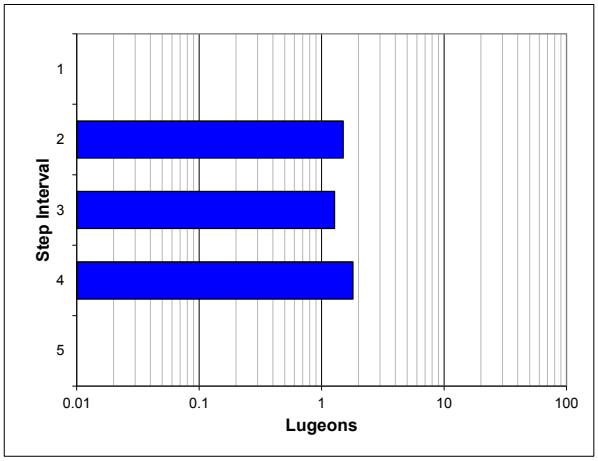
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D60 |
| | | Test Nº: | 3 |
| Project Nº: 110773396 | Test Interval (m): 26.2 to 29.2 | GS Elev. (m): | 1191.7 |
| | | Supervisor: | CK |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 3.0 m | Hg | Gauge height | 0.9 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **26.2** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **27.7** m | f | Friction factor | **0.042** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **3.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **26.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **27.7** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 13 | 27 | 40 | 27 | 13 |
| 1 | | 1.00 | 1.00 | 2.00 | |
| 2 | | 1.00 | 1.00 | 1.00 | |
| 3 | | 1.00 | 1.00 | 1.00 | |
| 4 | | 1.00 | 2.00 | 1.00 | |
| 5 | | 1.00 | 1.00 | 1.00 | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 0.00 | 1.00 | 1.20 | 1.20 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | | 32.2 | 45.5 | 32.2 | |
| K (m/min) | | 9.7E-06 | 8.2E-06 | 1.2E-05 | |
| K (m/sec) | | 1.6E-07 | 1.4E-07 | 1.9E-07 | |
| Lugeons | | 1.5 | 1.3 | 1.8 | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- No flow recorded at time increments Step 1 and 5. Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as $1.6 \times 10^{-7}$ m/sec**

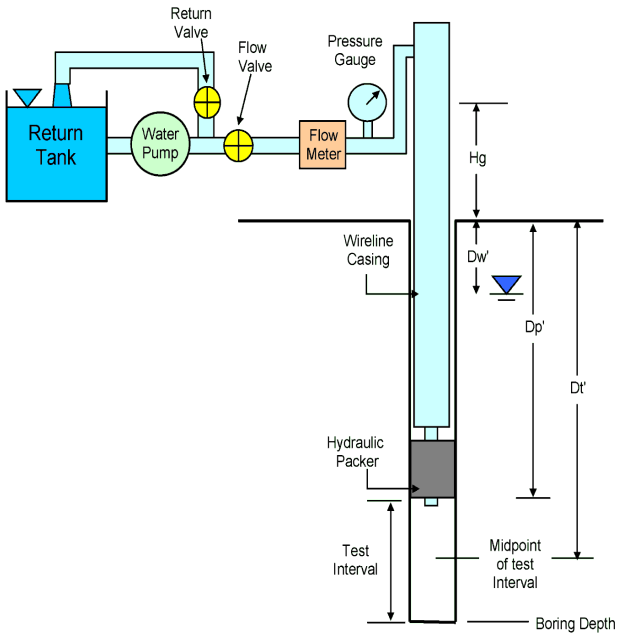
# SINGLE PACKER INJECTION TEST

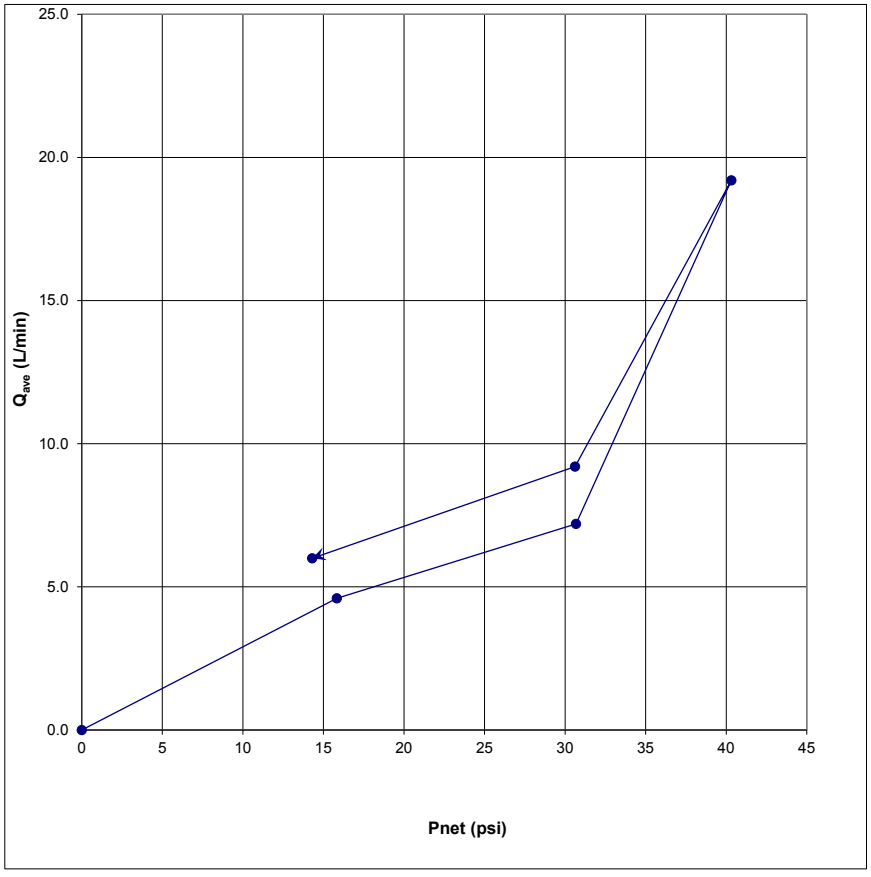
Stantec

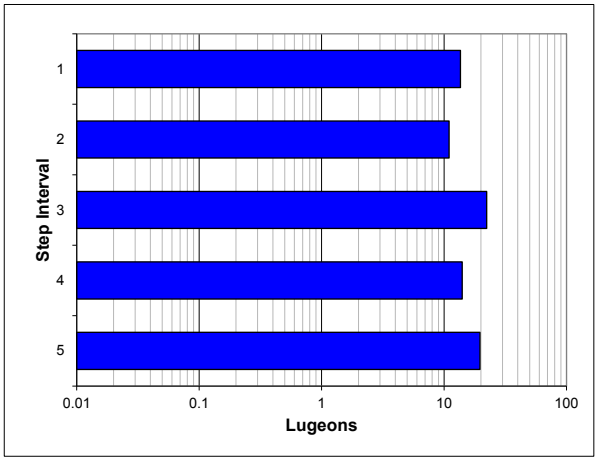
| | | | |
|---|---|---|---|
| Project Name: SR1 - Off Stream Reservoir | | BH Nº: | D60 |
| | | Test Nº: | 4 |
| Project Nº: 110773396 | Test Interval (m): 29.2 to 32.3 | GS Elev. (m): | 1191.7 |
| | | Supervisor: | CK |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 0.8 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **29.2** m | L | Length of test section | **3.1** m |
| Dt | Measured depth to midpoint of test | **30.8** m | f | Friction factor | **0.042** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **29.2** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **30.8** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 15 | 30 | 40 | 30 | 13 |
| 1 | 7.00 | 7.00 | 20.00 | 10.00 | 6.00 |
| 2 | 5.00 | 7.00 | 20.00 | 9.00 | 6.00 |
| 3 | 5.00 | 8.00 | 20.00 | 9.00 | 6.00 |
| 4 | 3.00 | 7.00 | 18.00 | 9.00 | 6.00 |
| 5 | 3.00 | 7.00 | 18.00 | 9.00 | 6.00 |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 4.60 | 7.20 | 19.20 | 9.20 | 6.00 |
| Pf (psi) | 0.0 | 0.1 | 0.7 | 0.1 | 0.1 |
| Pnet (psi) | 15.8 | 30.7 | 40.3 | 30.6 | 14.3 |
| K (m/min) | 8.9E-05 | 7.2E-05 | 1.5E-04 | 9.2E-05 | 1.3E-04 |
| K (m/sec) | 1.5E-06 | 1.2E-06 | 2.4E-06 | 1.5E-06 | 2.1E-06 |
| Lugeons | 13.6 | 11.0 | 22.3 | 14.1 | 19.6 |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor.Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

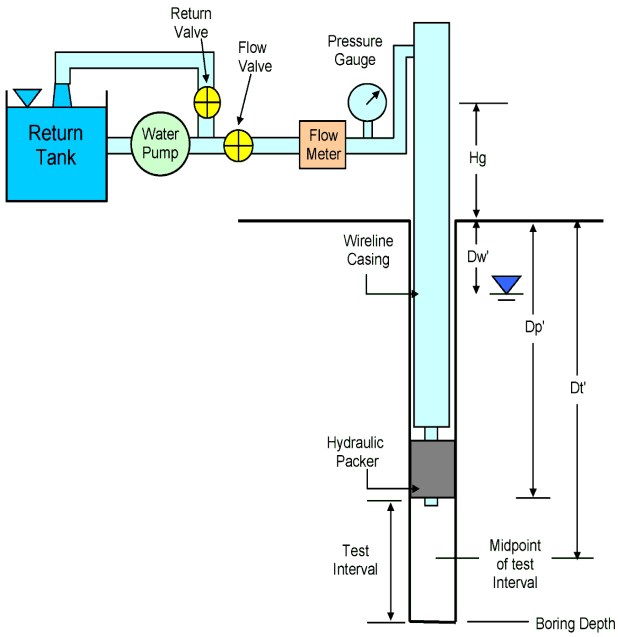
- Based on limited data from , **$K_{avg}$ is estimated as 1.7x10$^{-6}$ m/sec**

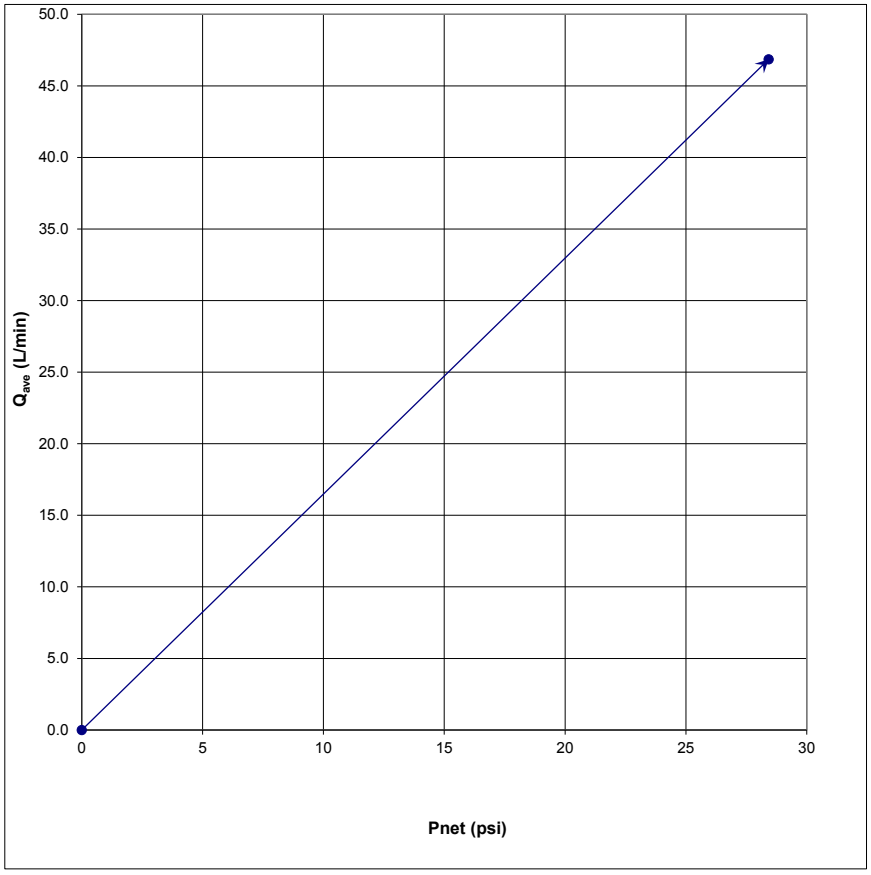
# SINGLE PACKER INJECTION TEST

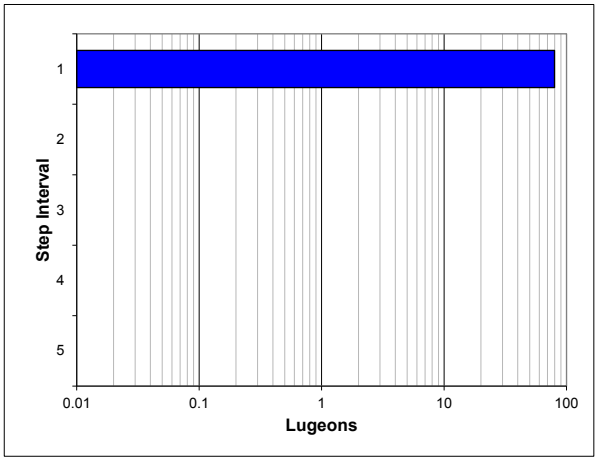
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D60 |
| | | Test Nº: | 5 |
| | Project Nº: 110773396 Test Interval (m): 32.3 to 35.3 | GS Elev. (m): | 1191.7 |
| | | Supervisor: | CK |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 0.8 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **32.3** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **33.8** m | f | Friction factor | **0.059** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **32.3** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **33.8** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 35 | | | | |
| 1 | 57.00 | | | | |
| 2 | 38.00 | | | | |
| 3 | 46.00 | | | | |
| 4 | 43.00 | | | | |
| 5 | 51.00 | | | | |
| 6 | 47.00 | | | | |
| 7 | 46.00 | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 46.86 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 7.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 28.4 | | | | |
| K (m/min) | 5.1E-04 | | | | |
| K (m/sec) | 8.6E-06 | | | | |
| Lugeons | 79.8 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

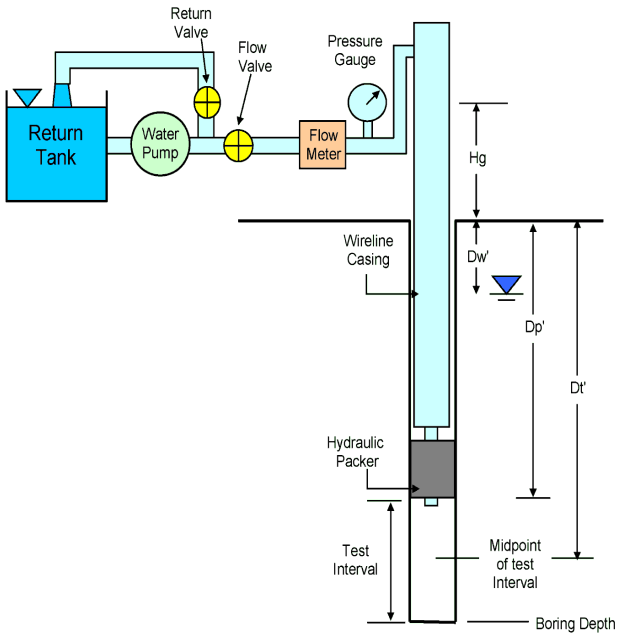
- Based on limited data from , **$K_{avg}$ is estimated as 8.6x10$^{-6}$ m/sec**

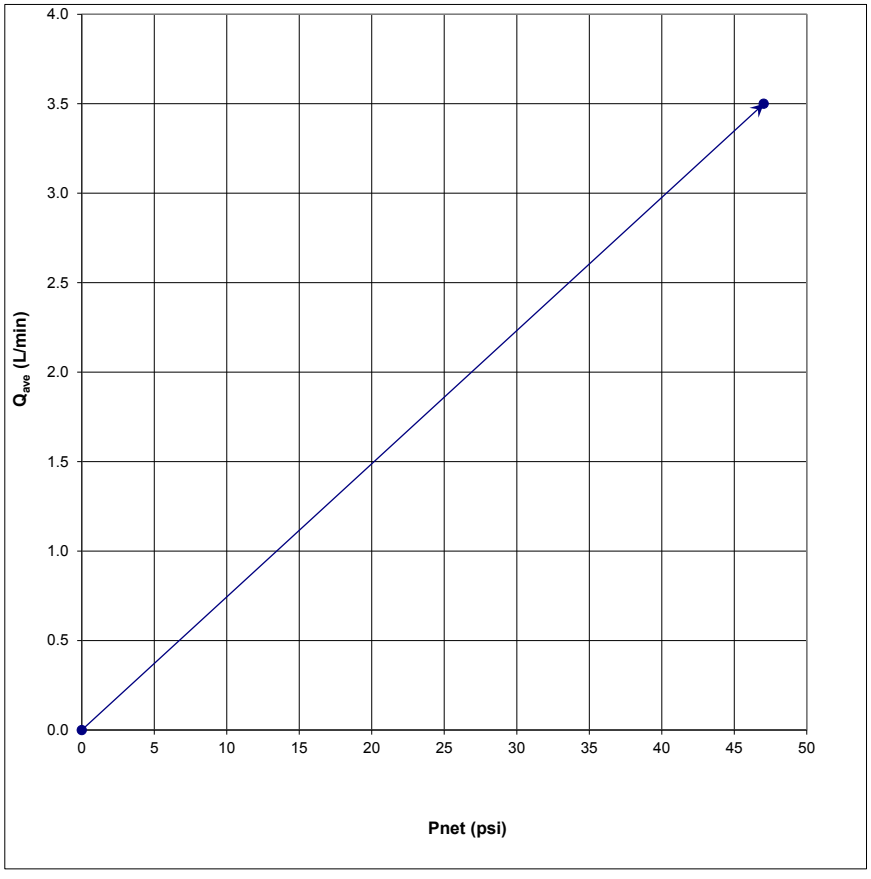
# SINGLE PACKER INJECTION TEST

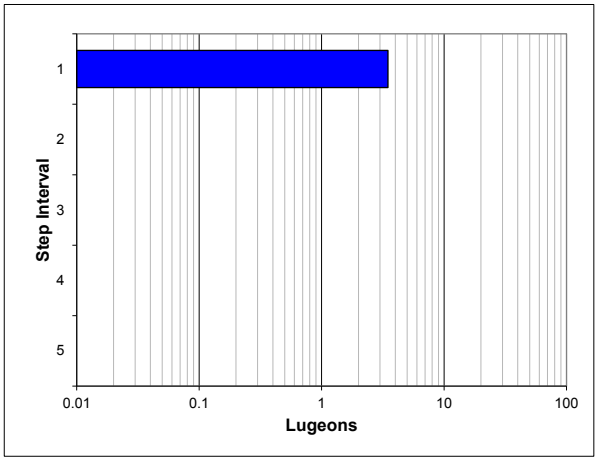
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D60 |
| | | Test Nº: | 6 |
| Project Nº: 110773396 | Test Interval (m): 35.3 to 38.4 | GS Elev. (m): | 1191.7 |
| | | Supervisor: | CK |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 0.8 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | 35.3 m | L | Length of test section | 3.1 m |
| Dt | Measured depth to midpoint of test | 36.9 m | f | Friction factor | 0.050 √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | 0.0 m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | 35.3 m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | 36.9 m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 46 | | | | |
| 1 | 7.00 | | | | |
| 2 | 3.00 | | | | |
| 3 | 3.00 | | | | |
| 4 | 2.00 | | | | |
| 5 | 3.00 | | | | |
| 6 | 3.00 | | | | |
| 7 | | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 3.50 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 47.0 | | | | |
| K (m/min) | 2.3E-05 | | | | |
| K (m/sec) | 3.8E-07 | | | | |
| Lugeons | 3.5 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

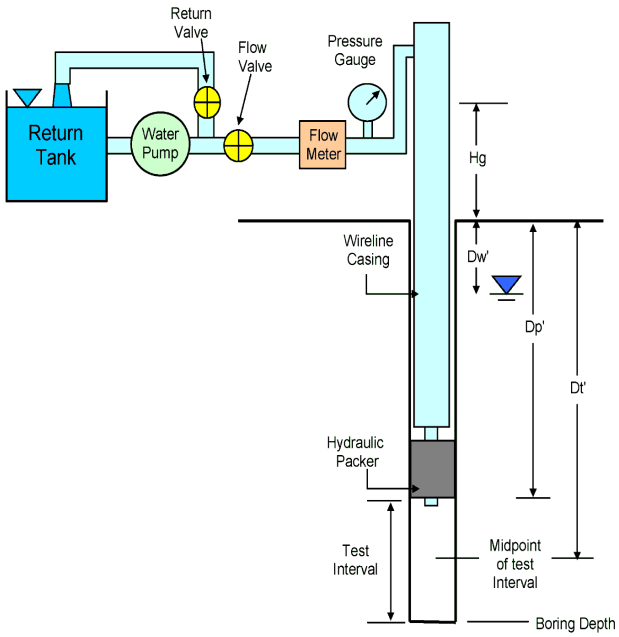
- Based on limited data from , **$K_{avg}$ is estimated as $3.8 \times 10^{-7}$ m/sec**

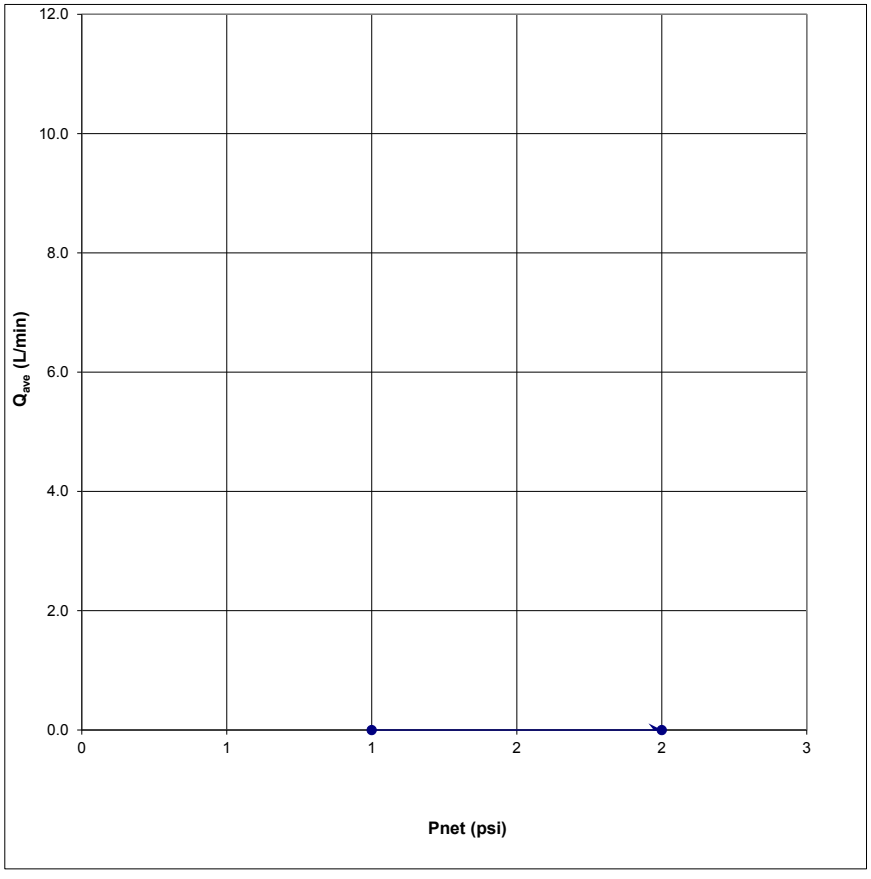
# SINGLE PACKER INJECTION TEST

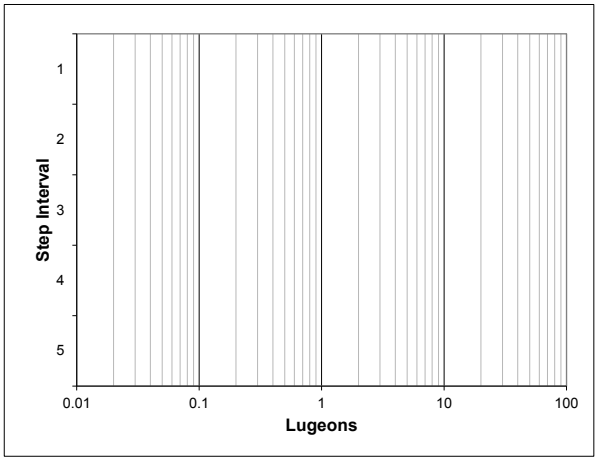
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D60 |
| | | Test Nº: | 7 |
| | Project Nº: 110773396 Test Interval (m): 38.4 to 41.4 | GS Elev. (m): | 1191.7 |
| | | Supervisor: | CK |

| | | | | | |
|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 0.0 m | Hg | Gauge height | 0.8 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **38.4** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **39.9** m | f | Friction factor | **0.062** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **0.0** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **38.4** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **39.9** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| 1 | | | | | |
| 2 | | | | | |
| 3 | | | | | |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | | | | | |
| K (m/min) | | | | | |
| K (m/sec) | | | | | |
| Lugeons | | | | | |




## Comments

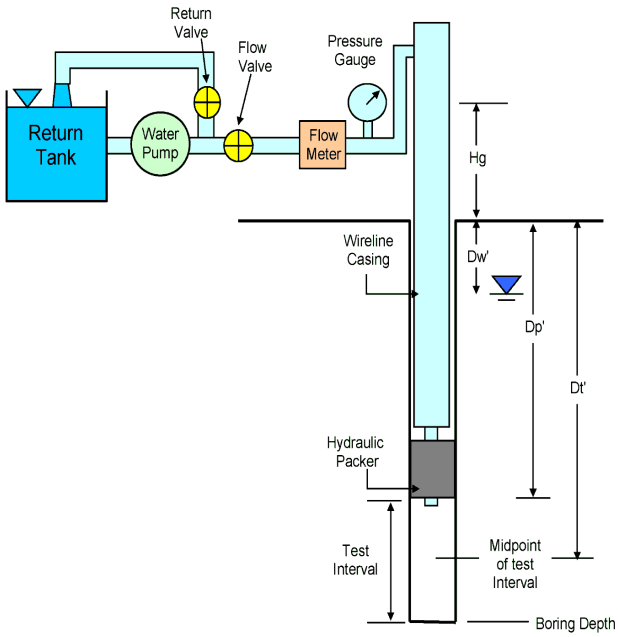
- Testing data not obtained, test failed.

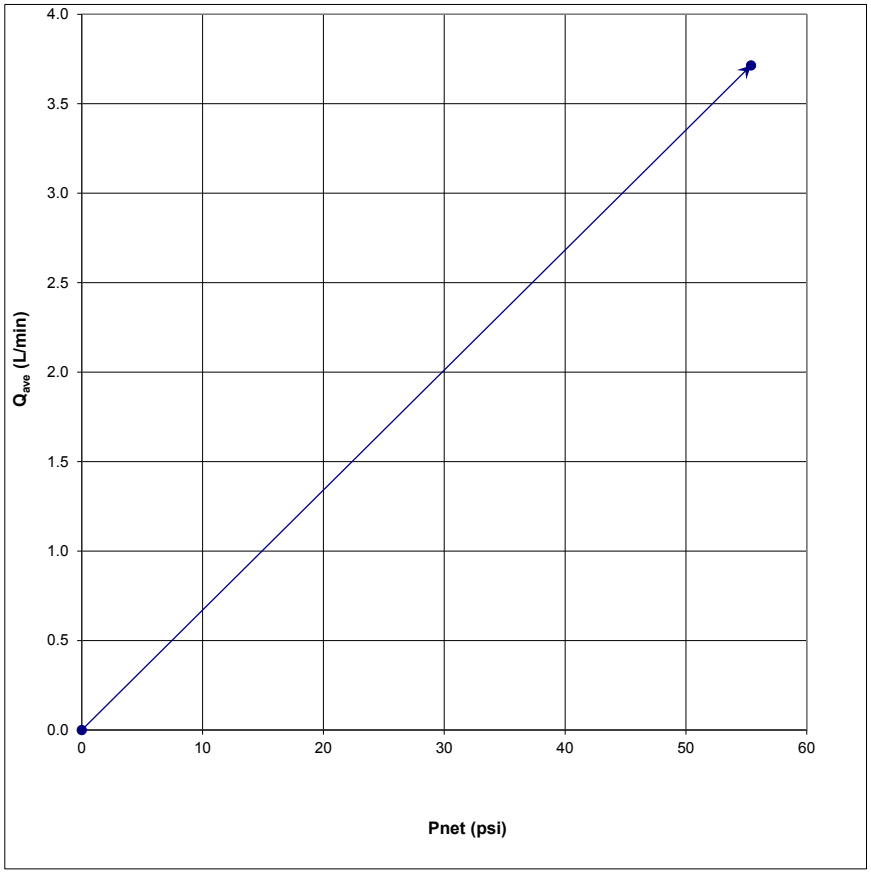
# SINGLE PACKER INJECTION TEST

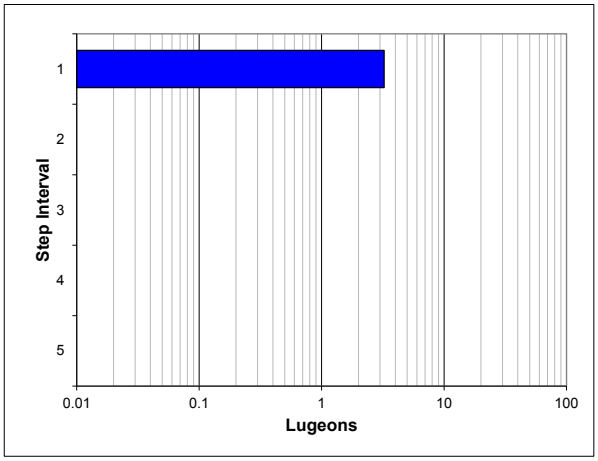
| | | | |
|---|---|---|---|
| Stantec | Project Name: SR1 - Off Stream Reservoir | BH Nº: | D60 |
| | | Test Nº: | 8 |
| | Project Nº: 110773396 Test Interval (m): 42.1 to 45.1 | GS Elev. (m): | 1191.7 |
| | | Supervisor: | CK |

| | | | | | | |
|---|---|---|---|---|---|---|
| Dw | Measured depth of static water level (1) | 5.2 m | Hg | Gauge height | 0.8 m |
| Dbr | Measured depth to bedrock | 19.8 m | rb | Borehole radius (HQ=0.048m, NQ=0.038m) | 0.048 m |
| Dp | Measured depth to packer | **42.1** m | L | Length of test section | **3.0** m |
| Dt | Measured depth to midpoint of test | **43.6** m | f | Friction factor | **0.064** √psi/L/min |
| ß | Average inclination from horiz. (degrees) | 90.0 ° | Pf | Friction pressure loss | |
| Dw' | Vertical depth to static water level | **5.2** m | Pg | Gauge pressure | |
| Dp' | Vertical depth to packer | **42.1** m | Pnet | Net injection pressure at midpoint of test | |
| Dt' | Vertical depth to midpoint of test | **43.6** m | K | Hydraulic conductivity | |

| Measurement (minutes) | Q (Litres/minute) | | | | |
|---|---|---|---|---|---|
| | Pg (psi) Step 1 | Pg (psi) Step 2 | Pg (psi) Step 3 | Pg (psi) Step 4 | Pg (psi) Step 5 |
| | 47 | | | | |
| 1 | 5.00 | | | | |
| 2 | 3.50 | | | | |
| 3 | 3.50 | | | | |
| 4 | 3.50 | | | | |
| 5 | 3.50 | | | | |
| 6 | 3.50 | | | | |
| 7 | 3.50 | | | | |
| 8 | | | | | |
| $Q_{avg}$ (L/min) | 3.71 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pf (psi) | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Pnet (psi) | 55.4 | | | | |
| K (m/min) | 2.1E-05 | | | | |
| K (m/sec) | 3.5E-07 | | | | |
| Lugeons | 3.2 | | | | |




## Comments

- Test completed using double pneumatic packer system provided by drill contractor. Packer test was completed using 1 packer to seal off casing and one packer to seal off bedrock above test location, testing between packer and bottom of hole.
- Blank cells indicate flow of zero during time increment

- Based on limited data from , **$K_{avg}$ is estimated as 3.5x10$^{-7}$ m/sec**

# Appendix H
Cone Penetration Testing

Stantec

# PRESENTATION OF SITE INVESTIGATION RESULTS

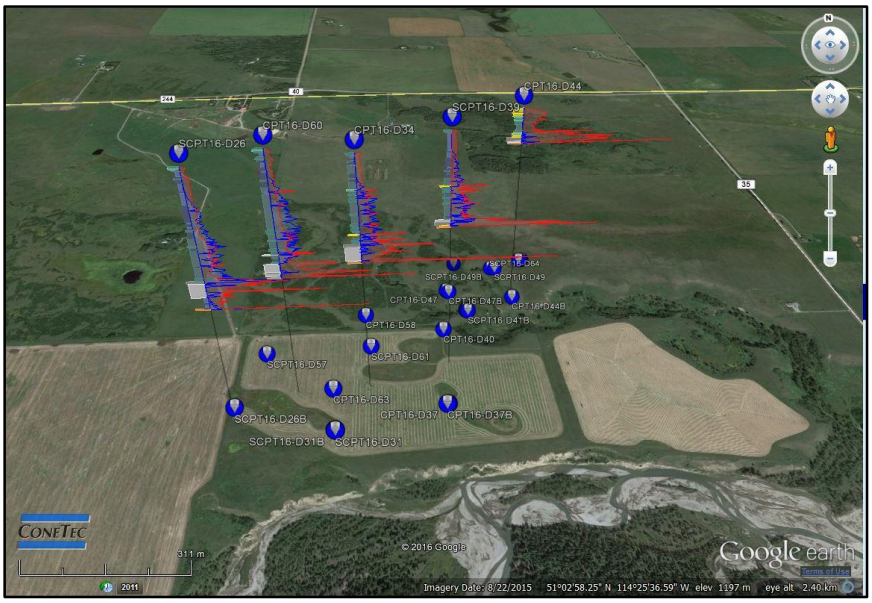
## Springbank Off-Stream Reservoir

*Prepared for*:

Stantec Consulting Ltd.

ConeTec Job No: 16-03023

Project Start Date: 20-Jun-2016
Project End Date: 27-Jun-2016
Report Date: 30-Jun-2016




*Prepared by:*

ConeTec Investigations Ltd.
12140 Vulcan Way
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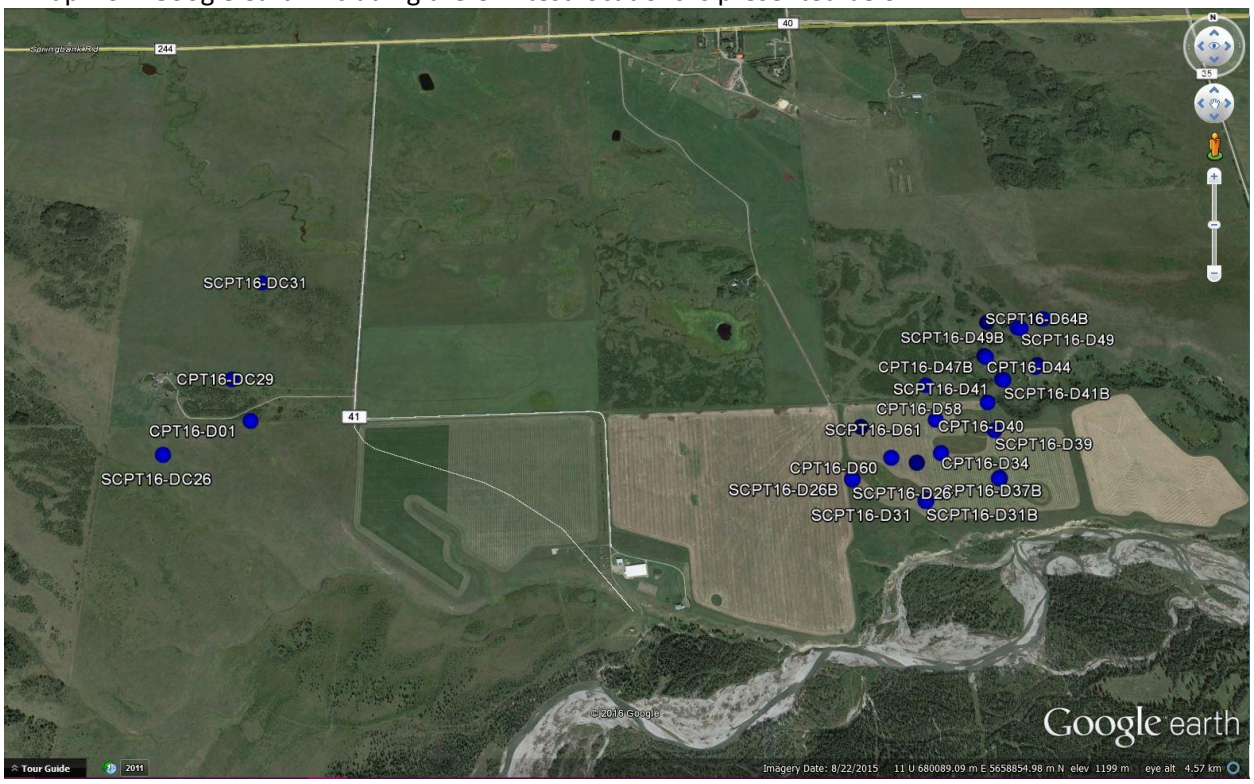
Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec Investigations Ltd. for Stantec Consulting Ltd. near Springbank Road & Cowboy Trail in Calgary, Alberta. The program consisted of 13 cone penetration tests (CPT) and 16 seismic cone penetration tests (SCPT).

Project Information

| Project | |
|---|---|
| Client | Stantec Consulting Ltd. |
| Project | Springbank Off-Stream Reservoir |
| ConeTec project number | 16-03023 |

A map from Google earth including the CPT test locations is presented below.




| Rig Description | Deployment System | Test Type |
|---|---|---|
| CPT track rig (TC4) | 30 ton rig cylinder | CPT, SCPT |

| Coordinates | | | |
|---|---|---|---|
| Test Type | Collection Method | EPSG Number | Comments |
| CPT, SCPT | Consumer grade GPS | 32611 | Elevations were provided by the client. |

| Cone Penetration Test (CPT) | |
|---|---|
| Depth reference | Depths are referenced to the existing ground surface at the time of each test. |
| Tip and sleeve data offset | 0.1 meter<br>This has been accounted for in the CPT data files. |
| Additional plots | Alternate range standard plots, advanced plots and seismic CPT plots are included in the data release package. |
| Additional comments | The shear wave velocities for sounding SCPT16-DC31 were collected from an adjacent borehole located approximately 1m away.<br>Seismic data was not collected for soundings SCPT16-D26B, SCPT16-D31B, SCPT16-D41B, SCPT16-D49B, and SCPT16-D64B. Shear wave velocities collected from adjacent soundings were presented on the seismic plots. |

| Cone Penetrometers Used for this Project | | | | | | |
|---|---|---|---|---|---|---|
| Cone Description | Cone Number | Cross Sectional Area ($cm^2$) | Sleeve Area ($cm^2$) | Tip Capacity (bar) | Sleeve Capacity (bar) | Pore Pressure Capacity (psi) |
| 322:T1500F15U500 | 322 | 15 | 225 | 1500 | 15 | 500 |
| 340:T1500F15U500 | 340 | 15 | 225 | 1500 | 15 | 500 |
| 388:T1500F15U500 | 388 | 15 | 225 | 1500 | 15 | 500 |
| The CPT summary indicates which cone was used for each sounding. | | | | | | |

| Interpretation Tables | |
|---|---|
| Additional information | The Soil Behaviour Type (SBT) classification chart (Robertson et al., 1986 presented by Lunne, Robertson and Powell, 1997) was used to classify the soil for this project. A detailed set of CPT interpretations were generated and are provided in Excel format files in the release folder. The CPT interpretations are based on values of corrected tip ($q_t$), sleeve friction ($f_s$) and pore pressure ($u_2$) averaged over a user specified interval of 20 cm.<br><br>Soils were classified as either drained or undrained based on the Soil Behaviour Type (SBT) classification chart (Robertson et al., 1986 presented by Lunne, Robertson and Powell, 1997). Calculations for both drained and undrained parameters were included for materials that classified as silt (zone 6). Calculations for undrained parameters were included for materials that classified as undefined (zone 0). |

Limitations

This report has been prepared for the exclusive use of Stantec Consulting Ltd. (Client) for the project titled "Springbank Off-Stream Reservoir". The report's contents may not be relied upon by any other party without the express written permission of ConeTec Investigations Ltd. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 $cm^2$ and 15 $cm^2$ tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 $cm^2$ penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 $cm^2$ piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "$u_2$" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

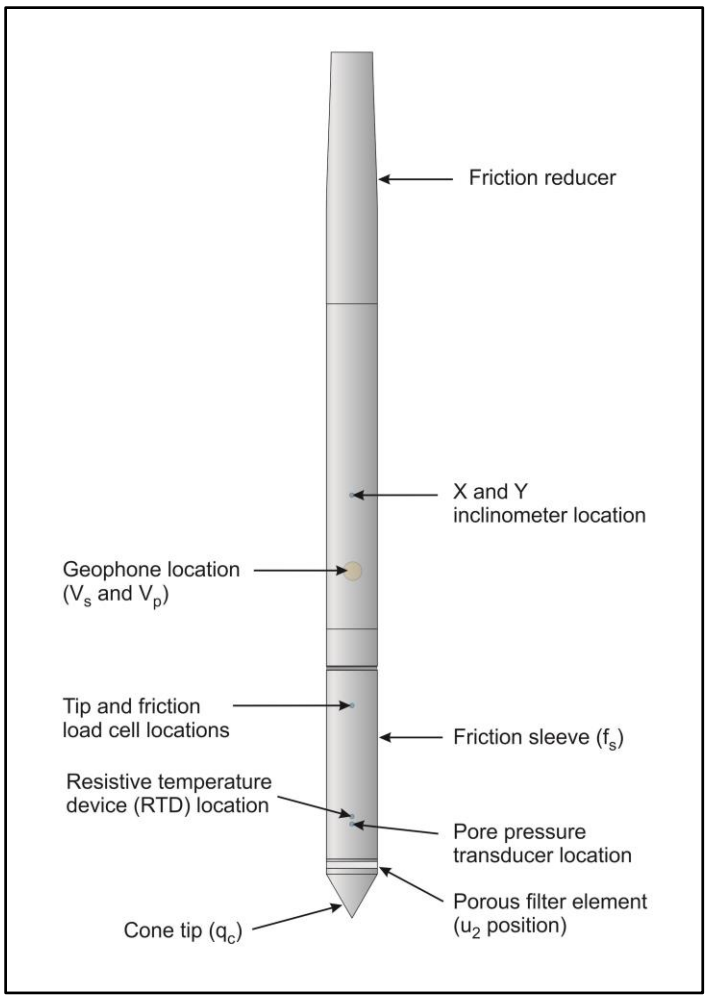



Figure CPTu. Piezocone Penetrometer (15 $cm^2$)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance ($q_c$)
- Sleeve friction ($f_s$)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerine or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerine under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance ($q_t$), sleeve friction ($f_s$) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behaviour type.

The recorded tip resistance ($q_c$) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance ($q_t$) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1\text{-}a) \bullet u_2$$

where: $q_t$ is the corrected tip resistance
$q_c$ is the recorded tip resistance
$u_2$ is the recorded dynamic pore pressure behind the tip ($u_2$ position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction ($f_s$) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high

friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (Vp) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

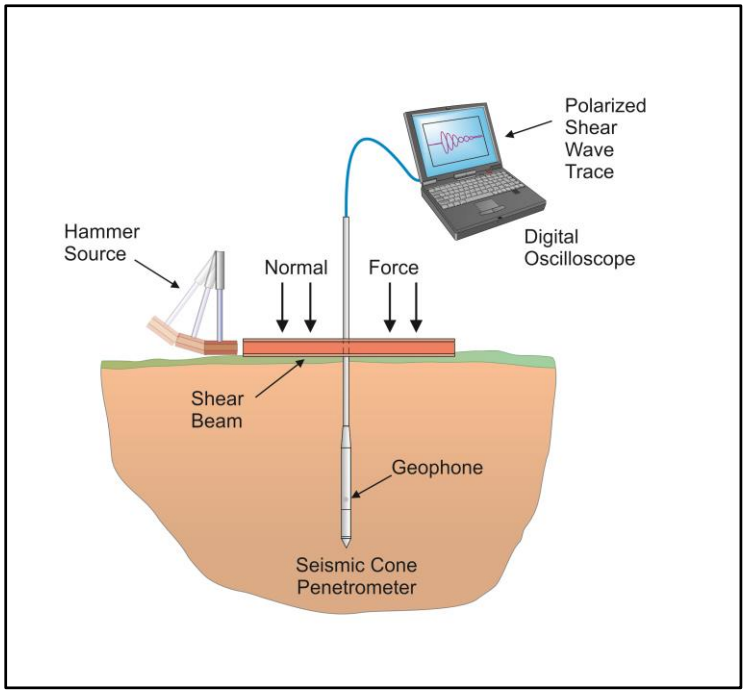



Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

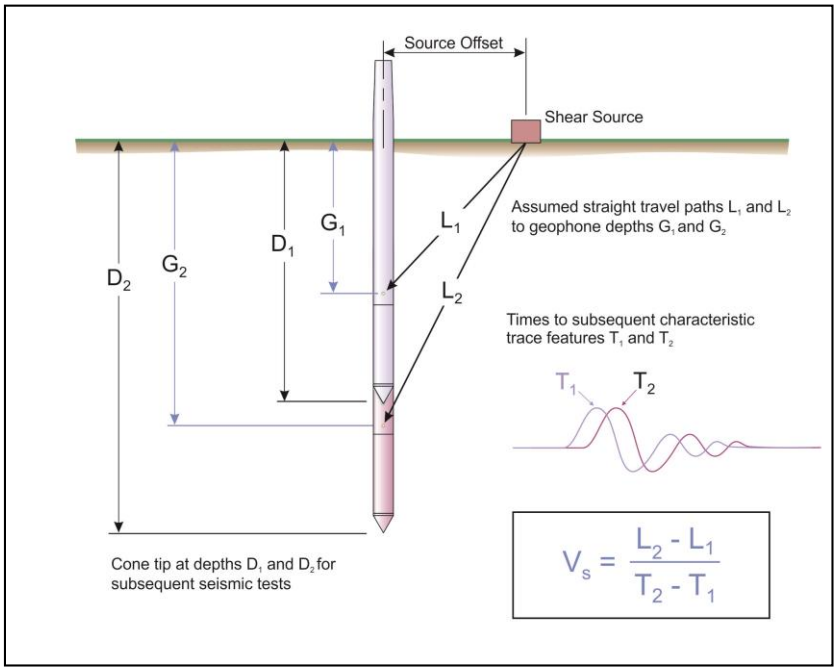



Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 30 meters ($V_{s30}$) has been calculated and provided for all applicable soundings using an equation presented in Crow et al., 2012.

$$V_{s30} = \frac{total\ thickness\ of\ all\ layers\ (30m)}{\sum(layer\ traveltimes)}$$

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

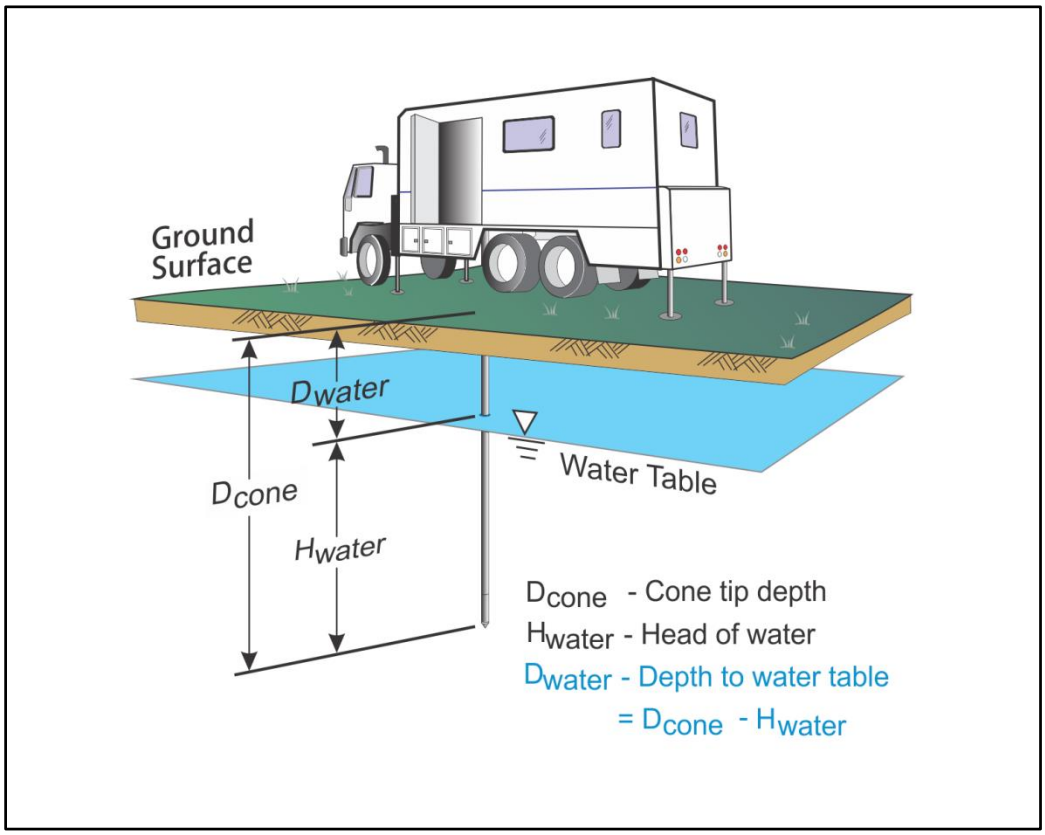



Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behaviour.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

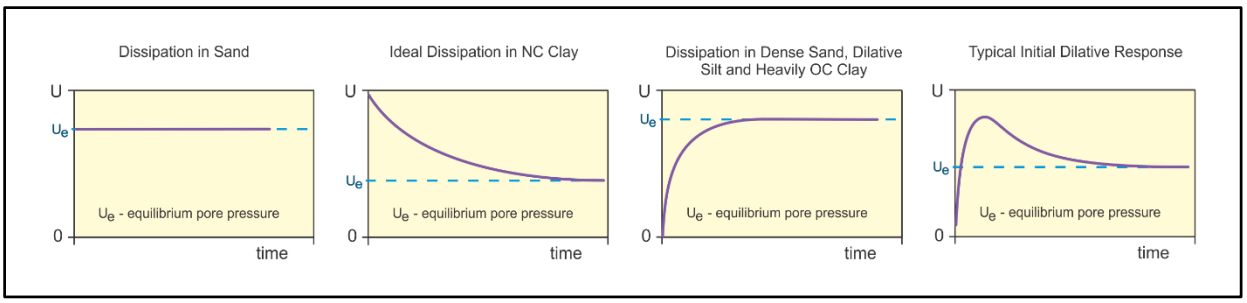



Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure ($u_{eq}$) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as $t_{100}$. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to $t_{100}$. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation ($c_h$) at various degrees of dissipation resulting in the expression for $c_h$ shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
$I_r$ is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby, 1991)

| Degree of Dissipation (%) | 20 | 30 | 40 | 50 | 60 | 70 | 80 |
|---|---|---|---|---|---|---|---|
| T* ($u_2$) | 0.038 | 0.078 | 0.142 | 0.245 | 0.439 | 0.804 | 1.60 |

The coefficient of consolidation is typically analyzed using the time ($t_{50}$) corresponding to a degree of dissipation of 50% ($u_{50}$). In order to determine $t_{50}$, dissipation tests must be taken to a pressure less than $u_{50}$. The $u_{50}$ value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as $u_{100}$. To estimate $u_{50}$, both the initial maximum pore pressure and $u_{100}$ must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at $t_{100}$) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly ($u_{100}$), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of $c_h$ (Teh and Houlsby, 1991), $t_{50}$ values are estimated from the corresponding pore pressure dissipation curve and a rigidity index ($I_r$) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining $t_{50}$. In cases where the time to peak is excessive, $t_{50}$ values are not calculated.

Due to possible inherent uncertainties in estimating $I_r$, the equilibrium pore pressure and the effect of an initial dilatory response on calculating $t_{50}$, other methods should be applied to confirm the results for $c_h$.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

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APPENDICES

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Standard Cone Penetration Test Plots – Alternate Range
- Advanced Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Seismic Cone Penetration Test Plots
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

# Cone Penetration Test Summary and Standard Cone Penetration Test Plots

Job No: 16-03023
Client: Stantec Consulting Ltd.
Project: Springbank Off-Stream Reservoir
Start Date: 20-Jun-2016
End Date: 27-Jun-2016

## CONE PENETRATION TEST SUMMARY

| Sounding ID | File Name | Date From | Date To | Cone | Assumed Phreatic Surface[1] (m) | Final Depth (m) | Northing[2] (m) | Easting (m) | Elevation[3] (m) | Refer to Notation Number |
|---|---|---|---|---|---|---|---|---|---|---|
| CPT16-D01 | 16-03023_CPD01 | 20-Jun-2016 | 20-Jun-2016 | 322:T1500F15U500 | 2.5 | 7.50 | 5658731 | 678831 | 1209.77 | 4 |
| SCPT16-D26 | 16-03023_SPD26 | 23-Jun-2016 | 23-Jun-2016 | 322:T1500F15U500 | 3.0 | 18.75 | 5658520 | 680837 | 1192.03 | 5 |
| SCPT16-D26B | 16-03023_SPD26B | 24-Jun-2016 | 24-Jun-2016 | 388:T1500F15U500 | 3.0 | 11.00 | 5658519 | 680838 | 1192.03 | 5, 6 |
| SCPT16-D31 | 16-03023_SPD31 | 24-Jun-2016 | 25-Jun-2016 | 388:T1500F15U500 | 4.6 | 20.75 | 5658444 | 681072 | 1191.00 | |
| SCPT16-D31B | 16-03023_SPD31B | 25-Jun-2016 | 27-Jun-2016 | 388:T1500F15U500 | 4.6 | 5.75 | 5658445 | 681072 | 1191 | 4, 6, 7 |
| CPT16-D34 | 16-03023_CPD34 | 27-Jun-2016 | 27-Jun-2016 | 388:T1500F15U500 | 3.0 | 14.65 | 5658610 | 681142 | 1190.89 | 5 |
| CPT16-D37 | 16-03023_CPD37 | 23-Jun-2016 | 23-Jun-2016 | 322:T1500F15U500 | 3.2 | 13.50 | 5658520 | 681325 | 1190.70 | 5 |
| CPT16-D37B | 16-03023_CPD37B | 23-Jun-2016 | 23-Jun-2016 | 322:T1500F15U500 | 3.2 | 14.65 | 5658520 | 681322 | 1191 | 5, 7 |
| SCPT16-D39 | 16-03023_SPD39 | 23-Jun-2016 | 23-Jun-2016 | 322:T1500F15U500 | 2.8 | 13.05 | 5658690 | 681332 | 1191.43 | 5 |
| CPT16-D40 | 16-03023_CPD40 | 23-Jun-2016 | 23-Jun-2016 | 322:T1500F15U500 | 3.0 | 15.80 | 5658792 | 681323 | 1191.05 | 5 |
| SCPT16-D41 | 16-03023_SPD41 | 21-Jun-2016 | 21-Jun-2016 | 340:T1500F15U500 | 3.6 | 5.40 | 5658881 | 681387 | 1186.66 | |
| SCPT16-D41B | 16-03023_SPD41B | 21-Jun-2016 | 21-Jun-2016 | 340:T1500F15U500 | 3.6 | 5.40 | 5658878 | 681392 | 1187 | 6, 7 |
| CPT16-D44 | 16-03023_CPD44 | 22-Jun-2016 | 22-Jun-2016 | 340:T1500F15U500 | 3.6 | 5.10 | 5658924 | 681508 | 1188.50 | 4 |
| CPT16-D44B | 16-03023_CPD44B | 22-Jun-2016 | 22-Jun-2016 | 340:T1500F15U500 | 3.6 | 8.00 | 5658933 | 681516 | 1189 | 4, 7 |
| CPT16-D47 | 16-03023_CPD47 | 22-Jun-2016 | 22-Jun-2016 | 340:T1500F15U500 | 4.5 | 6.30 | 5658970 | 681337 | 1187.42 | |
| CPT16-D47B | 16-03023_CPD47B | 22-Jun-2016 | 22-Jun-2016 | 340:T1500F15U500 | 4.5 | 5.70 | 5658964 | 681344 | 1187 | 4, 7 |
| SCPT16-D49 | 16-03023_SPD49 | 22-Jun-2016 | 22-Jun-2016 | 340:T1500F15U500 | | 6.80 | 5659075 | 681481 | 1187.24 | 8 |
| SCPT16-D49B | 16-03023_SPD49B | 22-Jun-2016 | 22-Jun-2016 | 340:T1500F15U500 | | 6.05 | 5659077 | 681469 | 1187 | 6, 7, 8 |
| SCPT16-D50 | 16-03023_SPD50 | 21-Jun-2016 | 21-Jun-2016 | 340:T1500F15U500 | 3.6 | 11.75 | 5659098 | 681364 | | 4, 9 |
| SCPT16-D57 | 16-03023_SPD57 | 27-Jun-2016 | 27-Jun-2016 | 388:T1500F15U500 | 2.0 | 15.55 | 5658705 | 680883 | 1191.58 | 5 |
| CPT16-D58 | 16-03023_CPD58 | 27-Jun-2016 | 27-Jun-2016 | 388:T1500F15U500 | 3.6 | 16.60 | 5658857 | 681120 | 1190.20 | 4 |
| CPT16-D60 | 16-03023_CPD60 | 27-Jun-2016 | 27-Jun-2016 | 388:T1500F15U500 | 3.6 | 17.25 | 5658594 | 680974 | 1191.99 | 4 |
| SCPT16-D61 | 16-03023_SPD61 | 27-Jun-2016 | 27-Jun-2016 | 388:T1500F15U500 | 3.0 | 17.80 | 5658730 | 681139 | 1190.36 | 5 |
| CPT16-D63 | 16-03023_CPD63 | 27-Jun-2016 | 27-Jun-2016 | 388:T1500F15U500 | 5.6 | 18.55 | 5658576 | 681057 | 1191.66 | |
| SCPT16-D64 | 16-03023_SPD64 | 22-Jun-2016 | 22-Jun-2016 | 340:T1500F15U500 | 3.6 | 10.05 | 5659109 | 681555 | 1193.60 | 4 |
| SCPT16-D64B | 16-03023_SPD64B | 22-Jun-2016 | 22-Jun-2016 | 340:T1500F15U500 | 3.6 | 9.85 | 5659109 | 681563 | 1194 | 4, 6, 7 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Start Date: | 20-Jun-2016 |
| End Date: | 27-Jun-2016 |

## CONE PENETRATION TEST SUMMARY

| Sounding ID | File Name | Date From | Date To | Cone | Assumed Phreatic Surface[1] (m) | Final Depth (m) | Northing[2] (m) | Easting (m) | Elevation[3] (m) | Refer to Notation Number |
|---|---|---|---|---|---|---|---|---|---|---|
| SCPT16-DC26 | 16-03023_SPDC26 | 20-Jun-2016 | 20-Jun-2016 | 322:T1500F15U500 | 2.5 | 10.80 | 5658614 | 678554 | 1203.84 | |
| CPT16-DC29 | 16-03023_CPDC29 | 21-Jun-2016 | 21-Jun-2016 | 340:T1500F15U500 | 2.5 | 3.60 | 5658883 | 678748 | 1213.98 | 4 |
| SCPT16-DC31 | 16-03023_SPDC31 | 20-Jun-2016 | 20-Jun-2016 | 340:T1500F15U500 | 2.5 | 11.10 | 5659261 | 678799 | 1207.38 | 4, 6 |

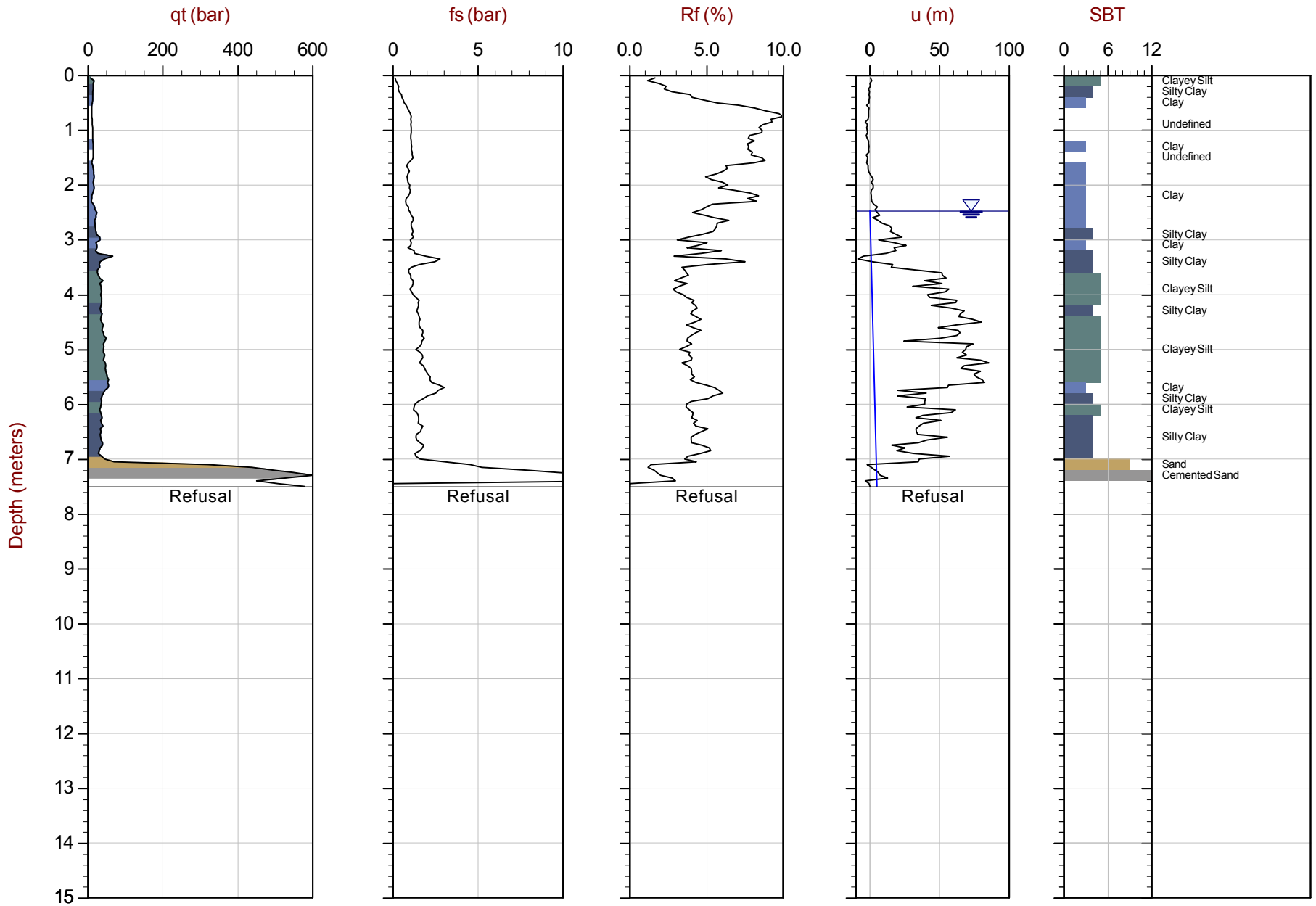
1. Assumed phreatic surface was based on pore pressure dissipation tests, unless otherwise noted. Hydrostatic conditions were assumed for interpretation tables.
2. Coordinates were acquired using consumer grade GPS equipment, datum: WGS 1984 / UTM Zone 11 North. Elevations were provided by the client.
3. Elevations are referenced to the existing ground surface at the time of testing.
4. The assumed phreatic surface was based on a nearby sounding.
5. The assumed phreatic surface was based on the dynamic pore pressure response.
6. Shear wave velocities were collected from an adjacent borehole.
7. The elevation was approximated from an adjacent sounding.
8. A phreatic surface was not detected.
9. An elevation was not available for this location at the time of release.

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 13:26
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D01
Cone: 322:T1500F15U500




Max Depth: 7.500 m / 24.61 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD01.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658731m E: 678831m Elev: 1209.77m
Sheet No: 1 of 1

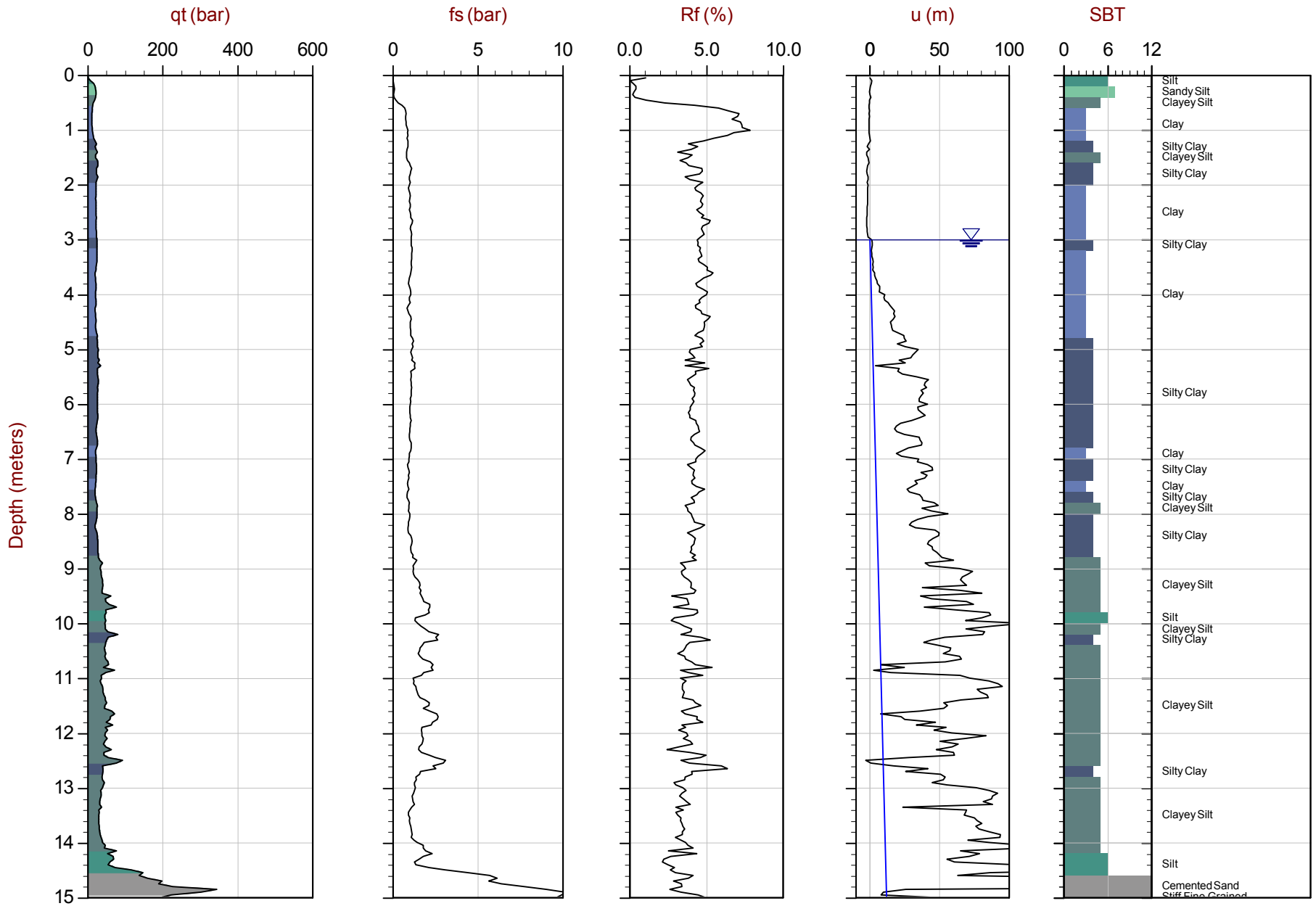
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 16:35
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26
Cone: 322:T1500F15U500




Max Depth: 18.750 m / 61.52 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 680837m Elev: 1192.03m
Sheet No: 1 of 2

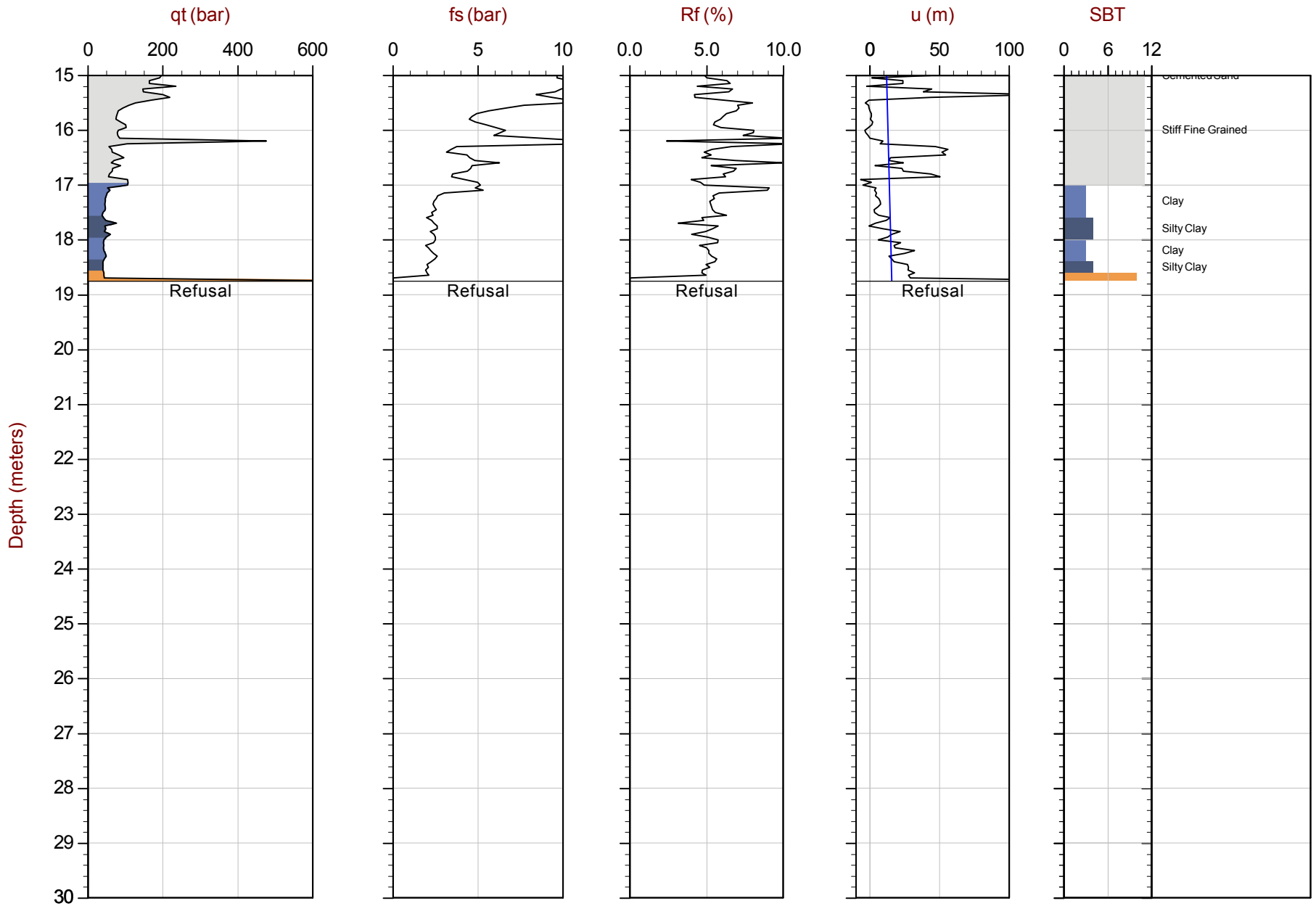
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

# Stantec

Job No: 16-03023
Date: 2016/06/23 16:35
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26
Cone: 322:T1500F15U500




Max Depth: 18.750 m / 61.52 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 680837m Elev: 1192.03m
Sheet No: 2 of 2

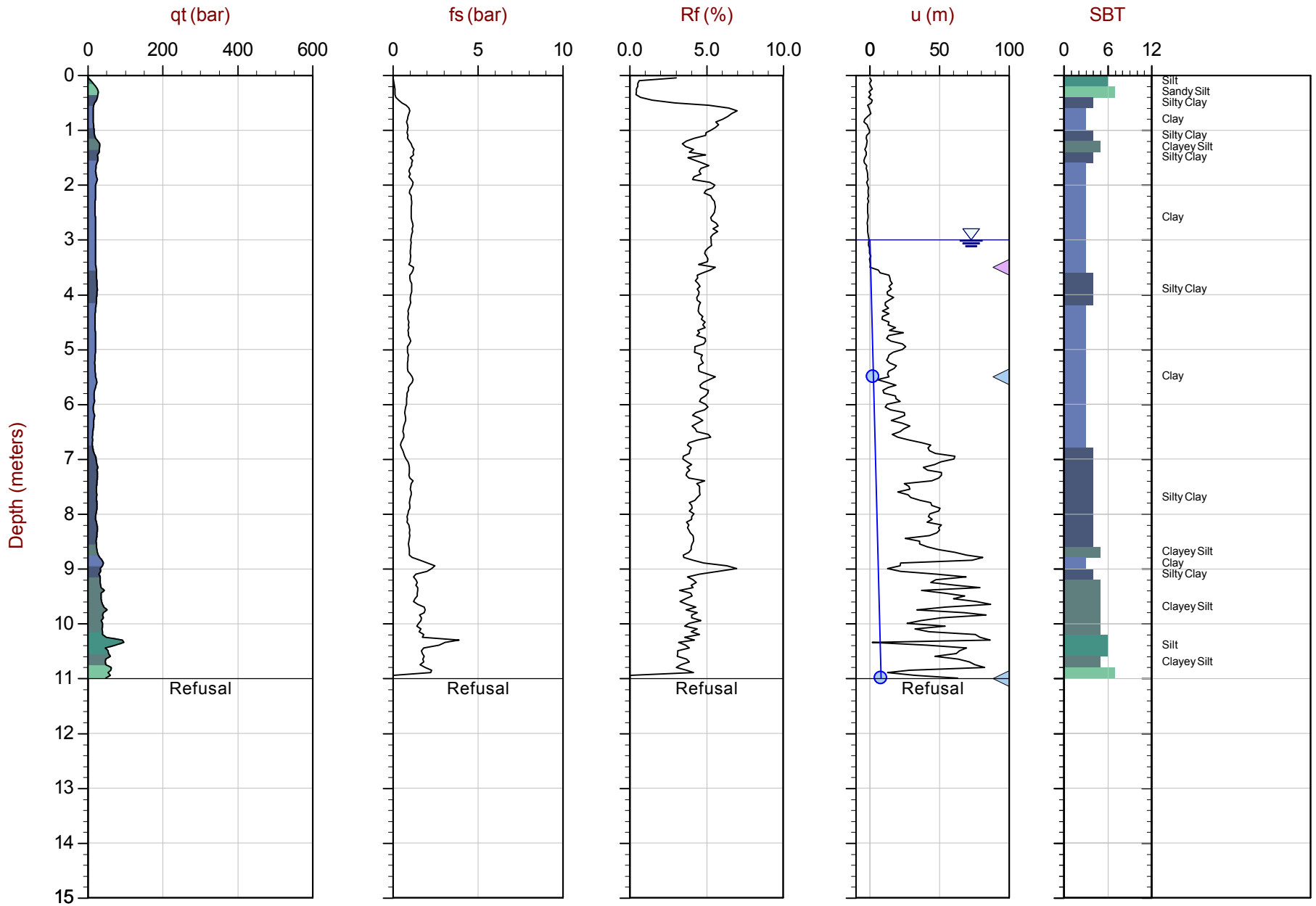
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 09:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26B
Cone: 388:T1500F15U500




Max Depth: 11.000 m / 36.09 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD26B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658519m E: 680838m Elev: 1192.03m
Sheet No: 1 of 1

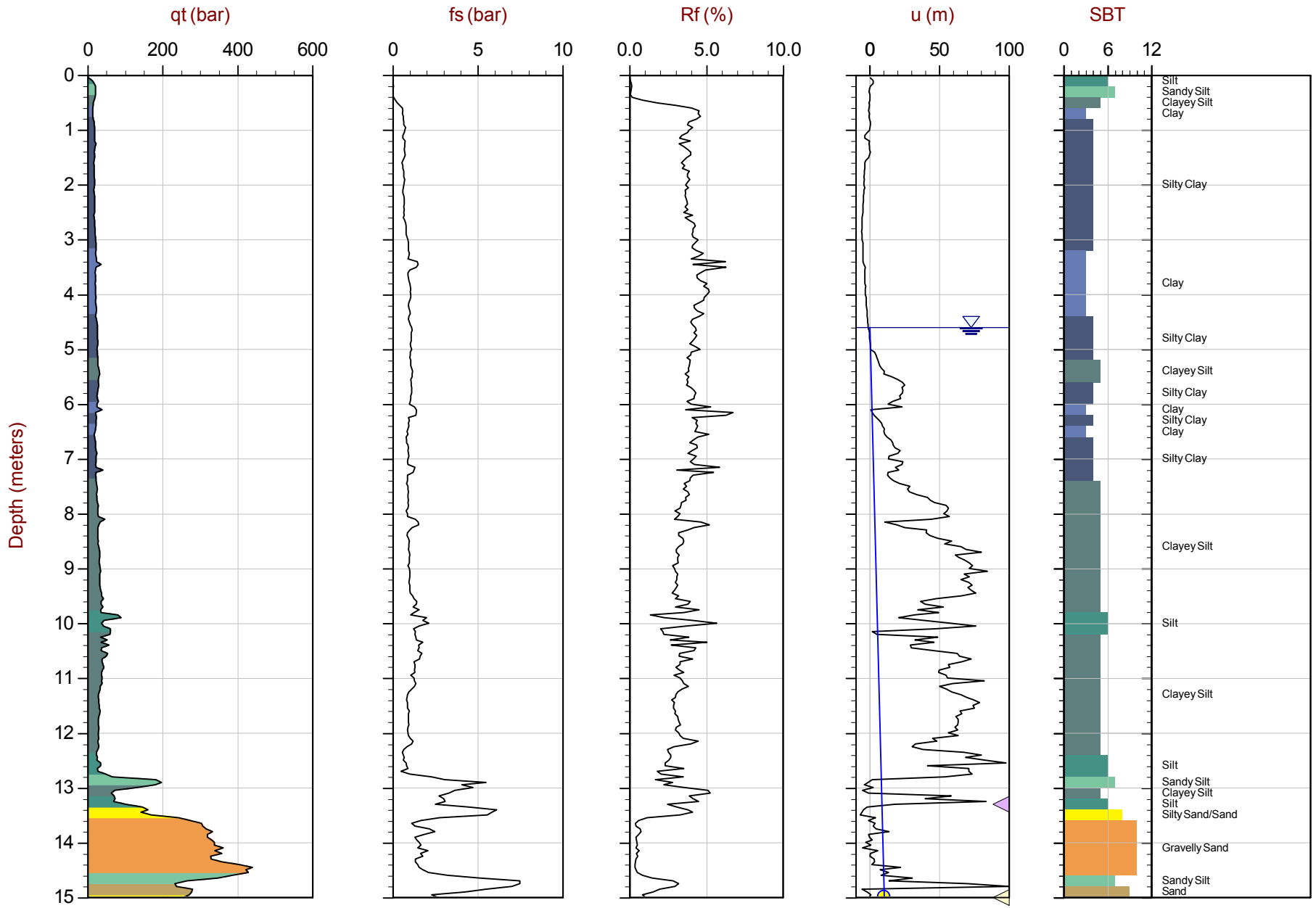
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500




Max Depth: 20.750 m / 68.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD31.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658444m E: 681072m Elev: 1191.00m
Sheet No: 1 of 2

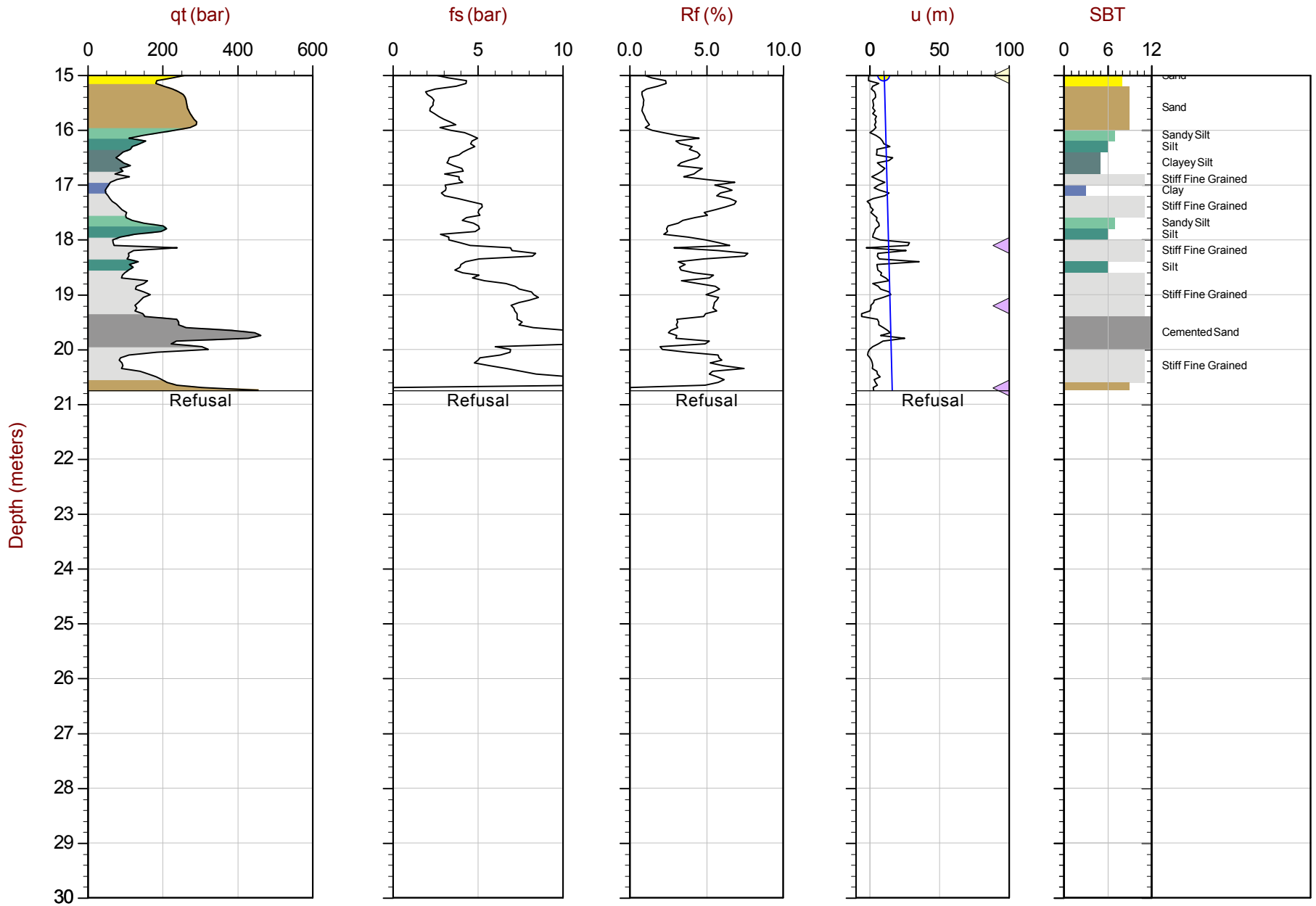
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500




Max Depth: 20.750 m / 68.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD31.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658444m E: 681072m Elev: 1191.00m
Sheet No: 2 of 2

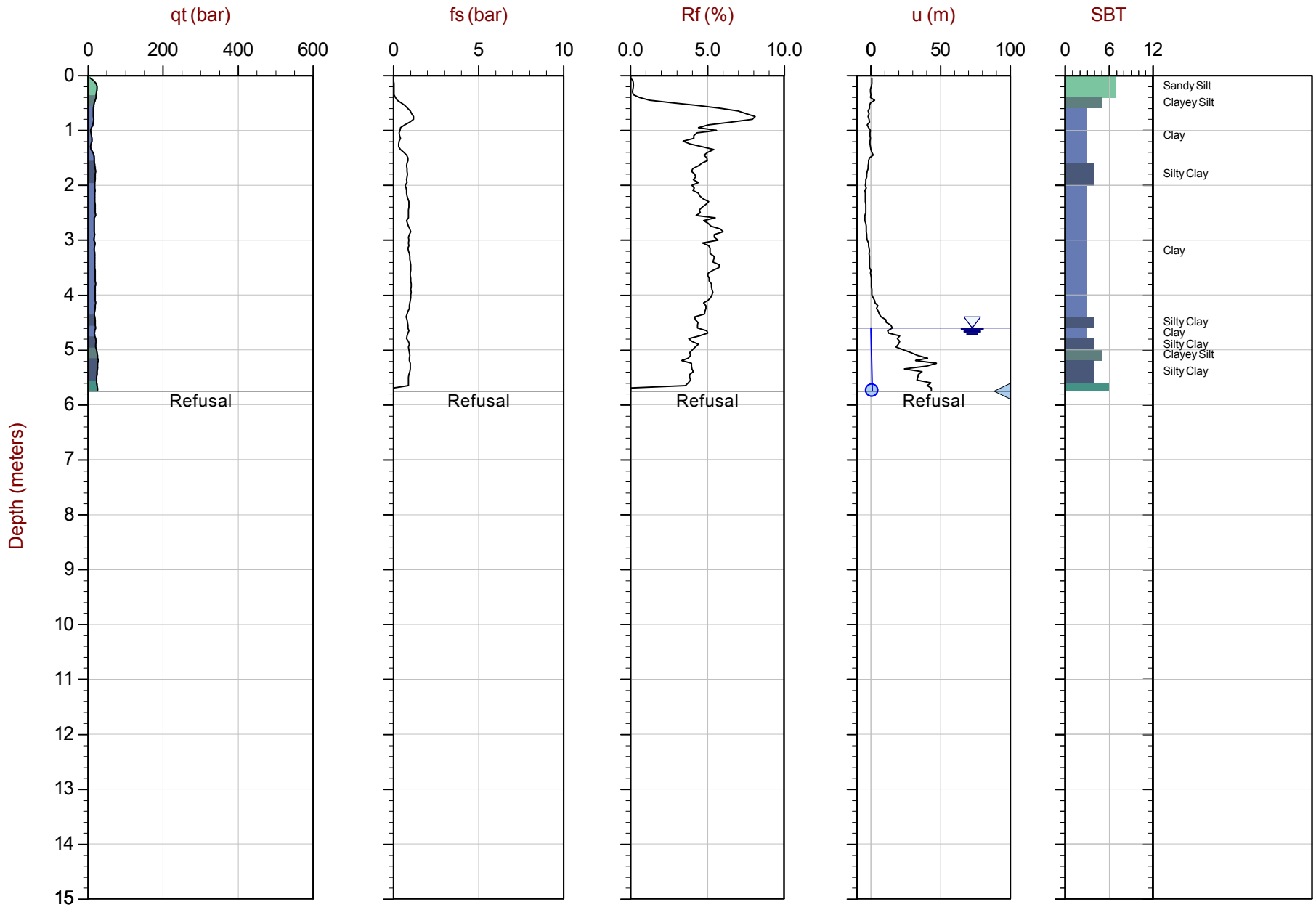
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/25 10:12
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31B
Cone: 388:T1500F15U500




Max Depth: 5.750 m / 18.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD31B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658445m E: 681072m Elev: 1191.00m
Sheet No: 1 of 1

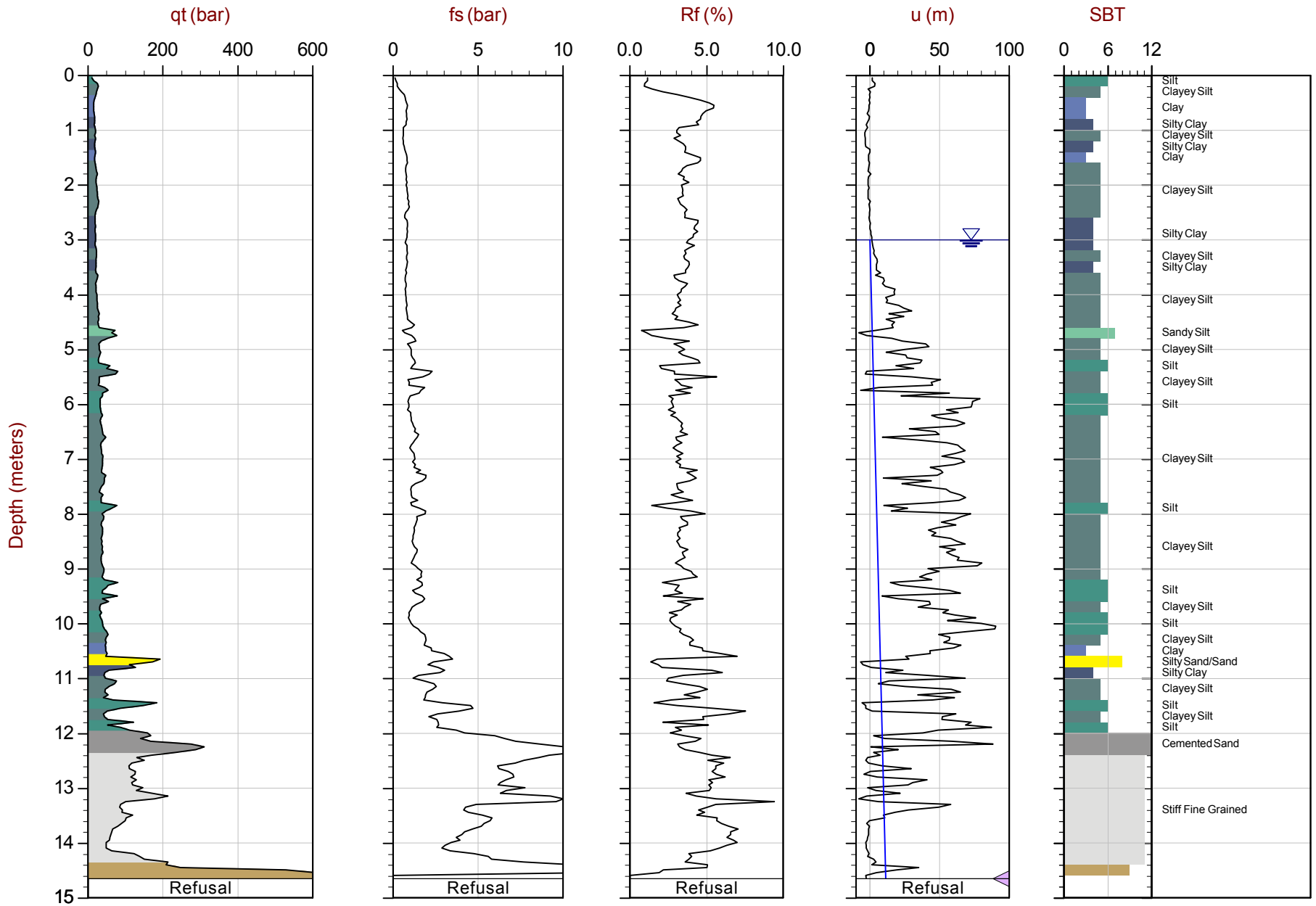
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 13:17
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D34
Cone: 388:T1500F15U500




Max Depth: 14.650 m / 48.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD34.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658610m E: 681142m Elev: 1190.89m
Sheet No: 1 of 1

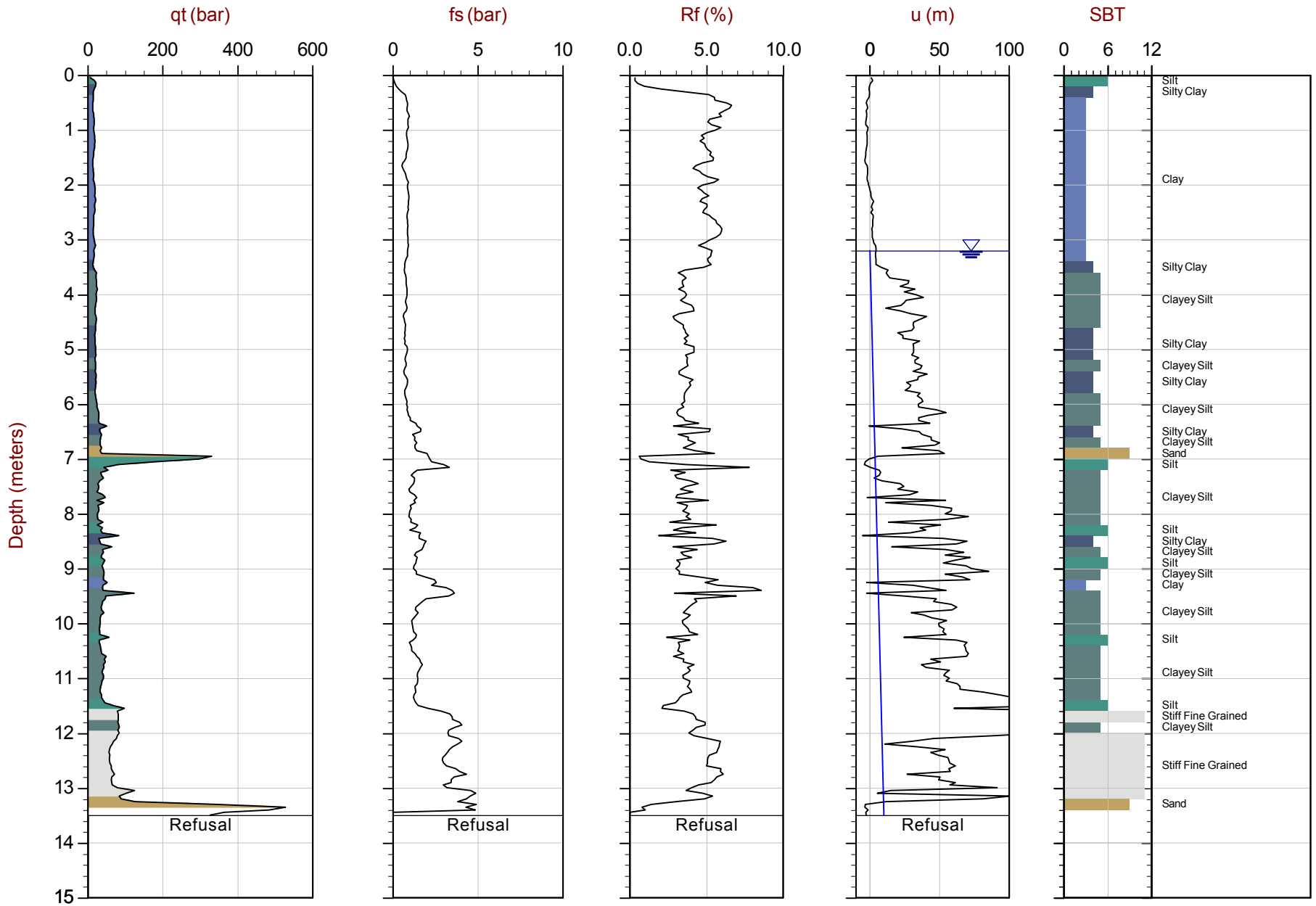
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 14:49
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D37
Cone: 322:T1500F15U500




Max Depth: 13.500 m / 44.29 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD37.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 681325m Elev: 1190.70m
Sheet No: 1 of 1

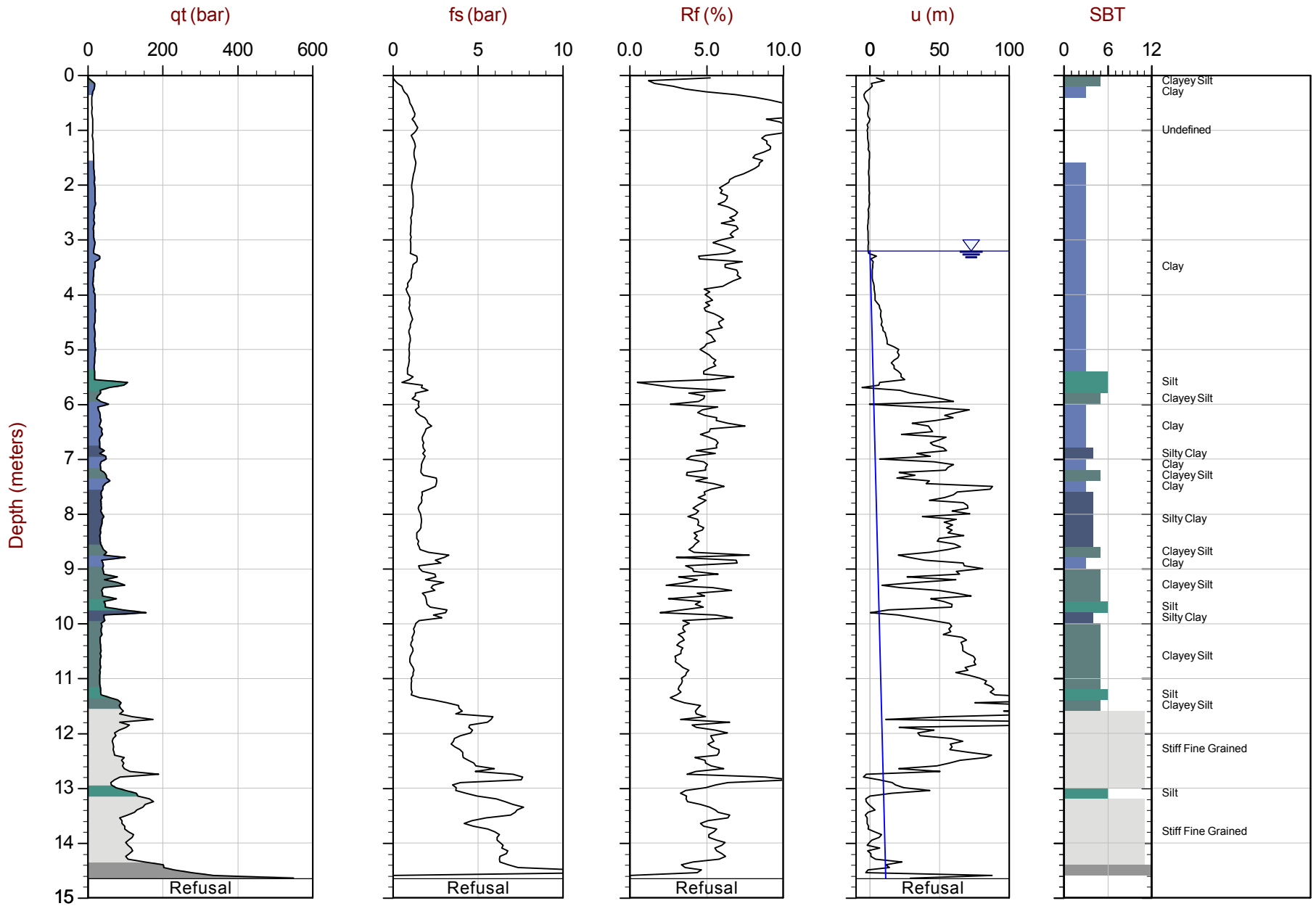
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 15:36
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D37B
Cone: 322:T1500F15U500




Max Depth: 14.650 m / 48.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD37B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 681322m Elev: 1191.00m
Sheet No: 1 of 1

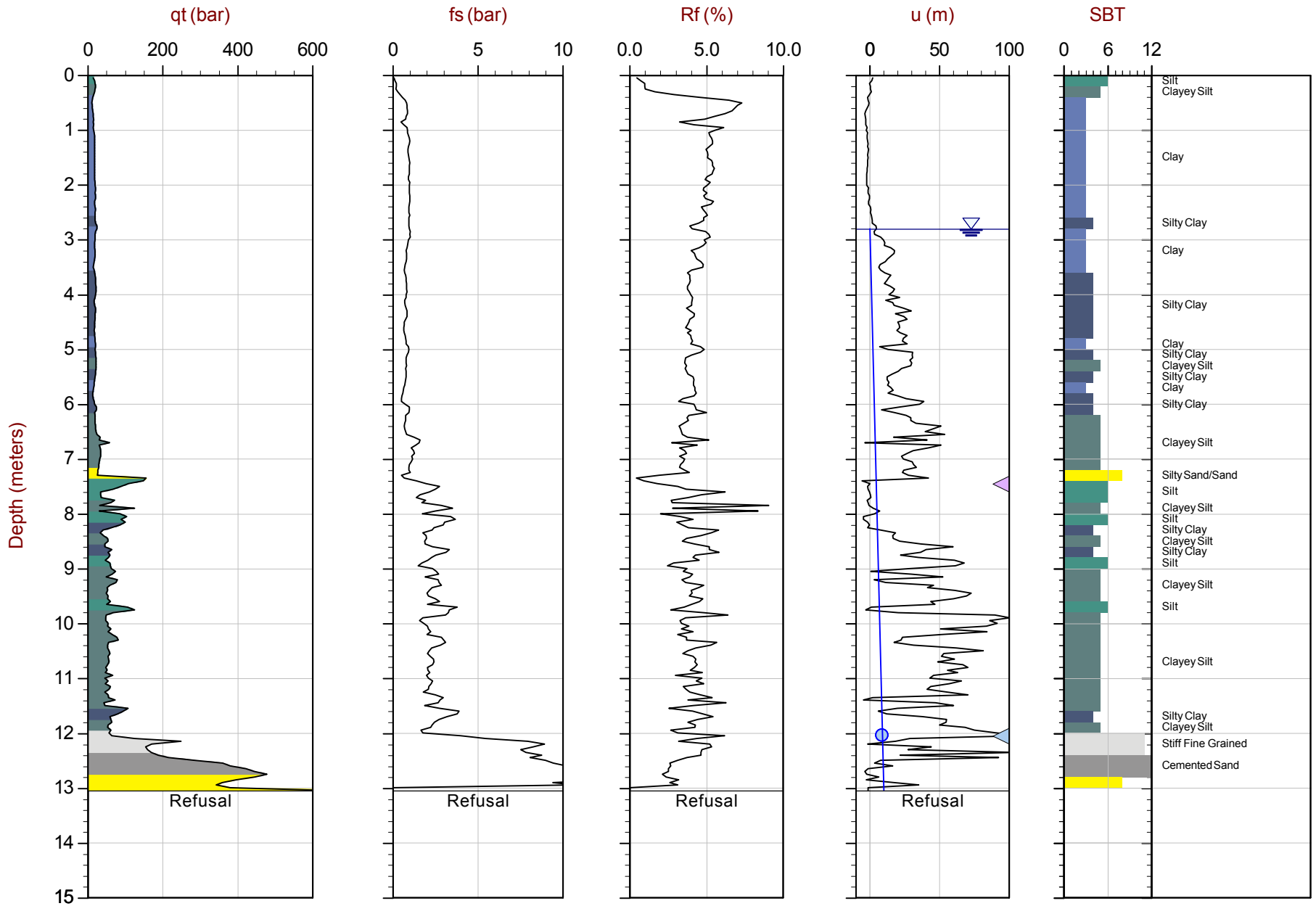
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 12:42
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D39
Cone: 322:T1500F15U500




Max Depth: 13.050 m / 42.81 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD39.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658690m E: 681332m Elev: 1191.43m
Sheet No: 1 of 1

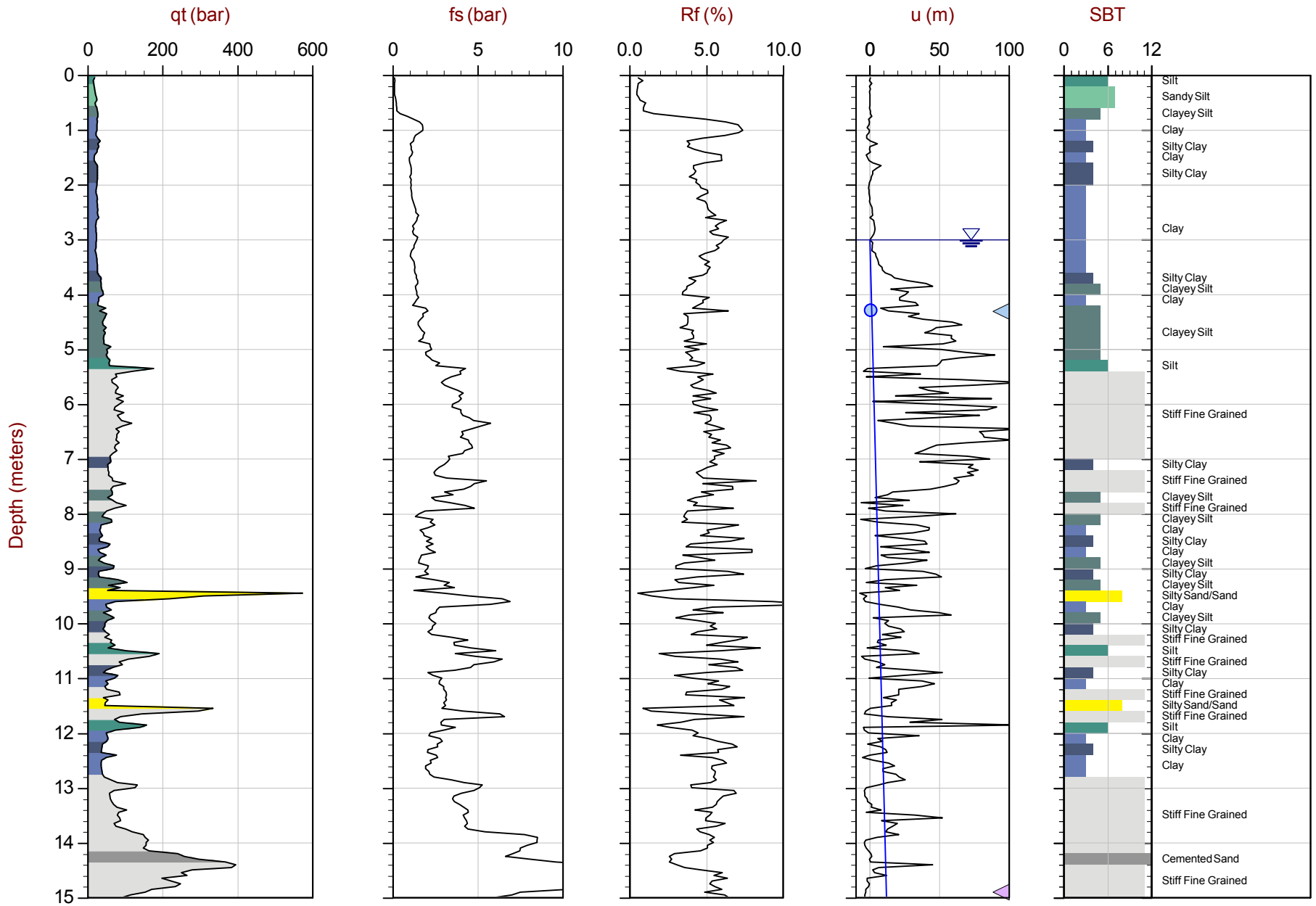
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 08:57
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D40
Cone: 322:T1500F15U500




Max Depth: 15.800 m / 51.84 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD40.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658792m E: 681323m Elev: 1191.05m
Sheet No: 1 of 2

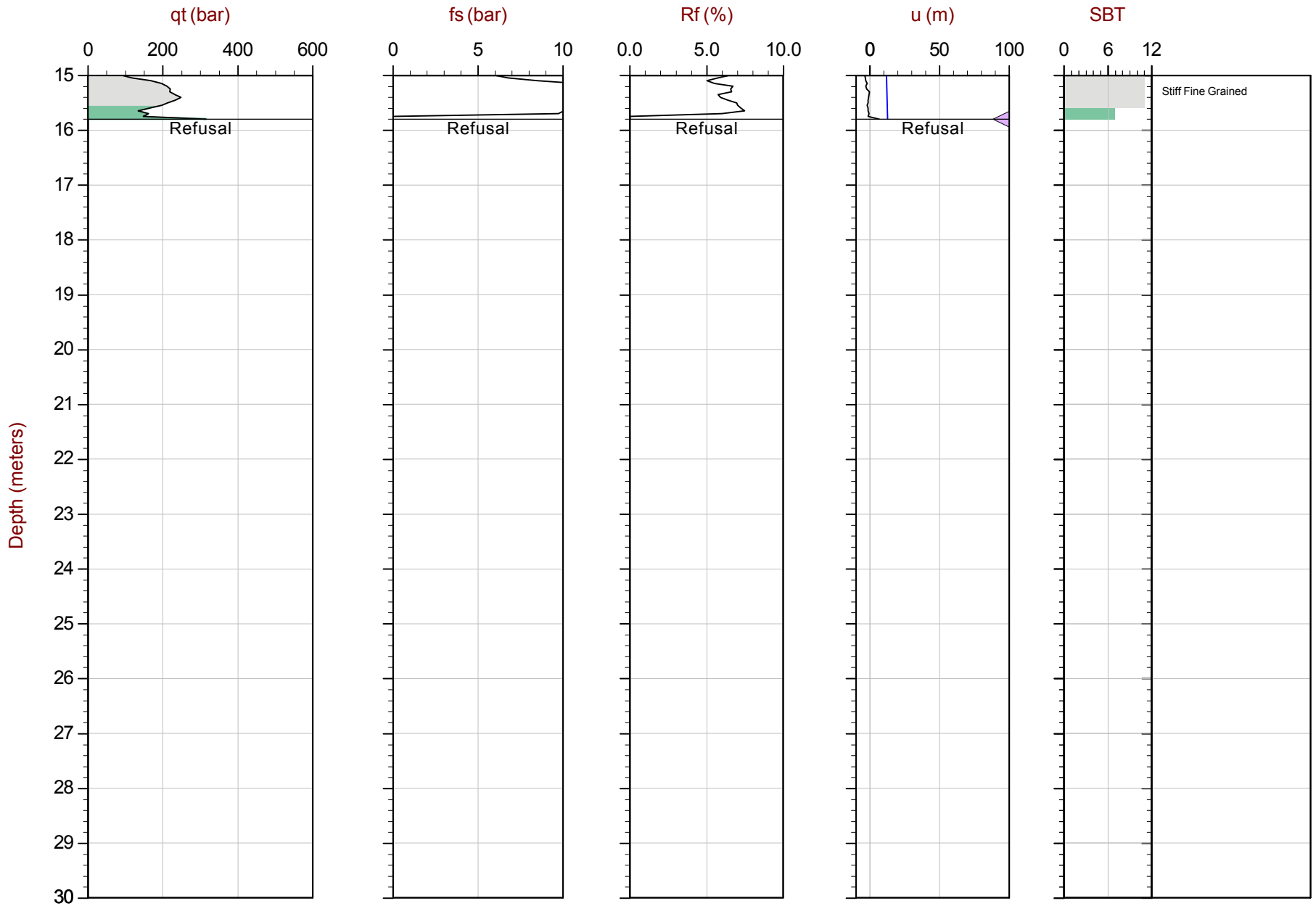
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 08:57
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D40
Cone: 322:T1500F15U500




Max Depth: 15.800 m / 51.84 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD40.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658792m E: 681323m Elev: 1191.05m
Sheet No: 2 of 2

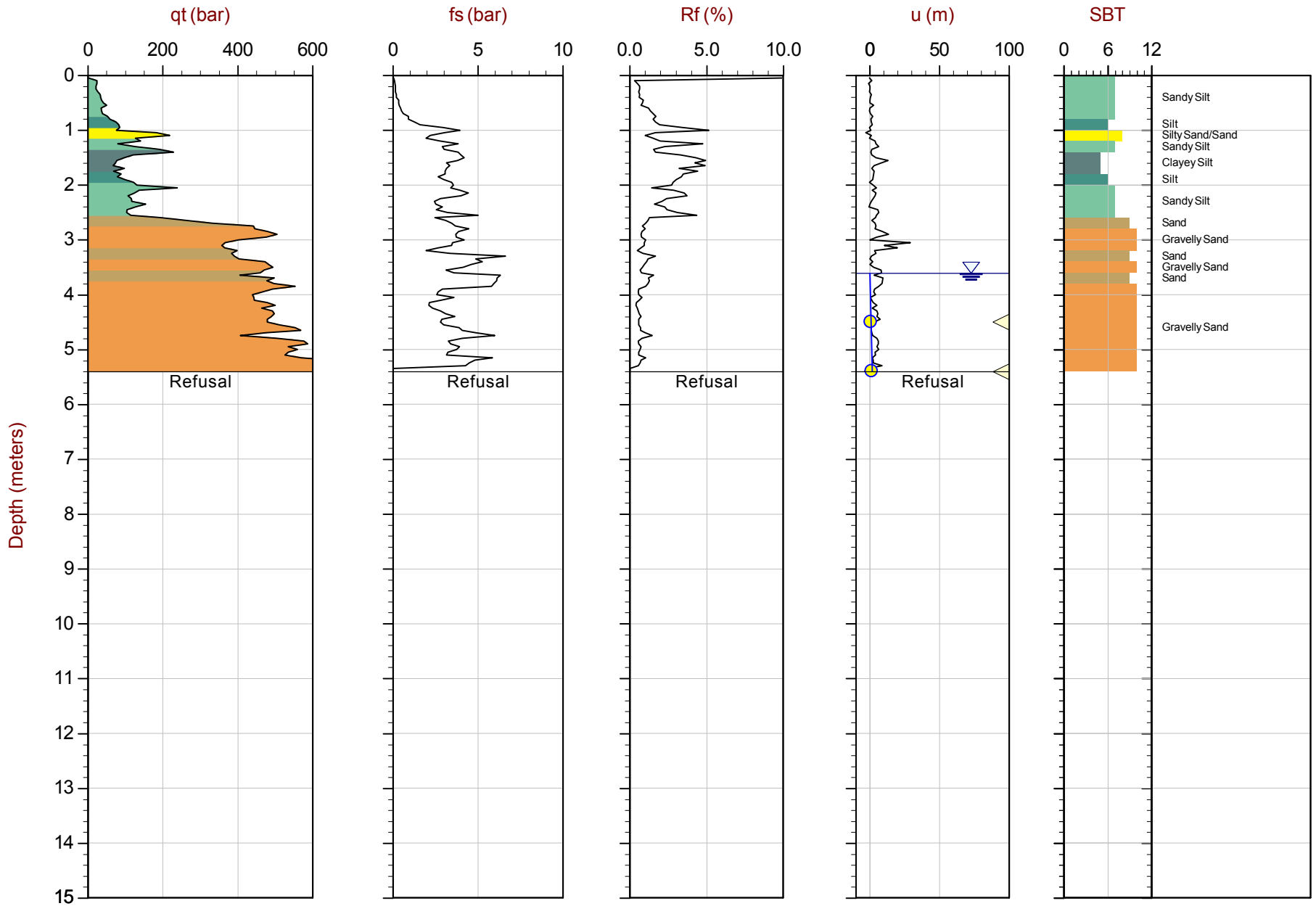
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 14:52
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41
Cone: 340:T1500F15U500




Max Depth: 5.400 m / 17.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD41.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658881m E: 681387m Elev: 1186.66m
Sheet No: 1 of 1

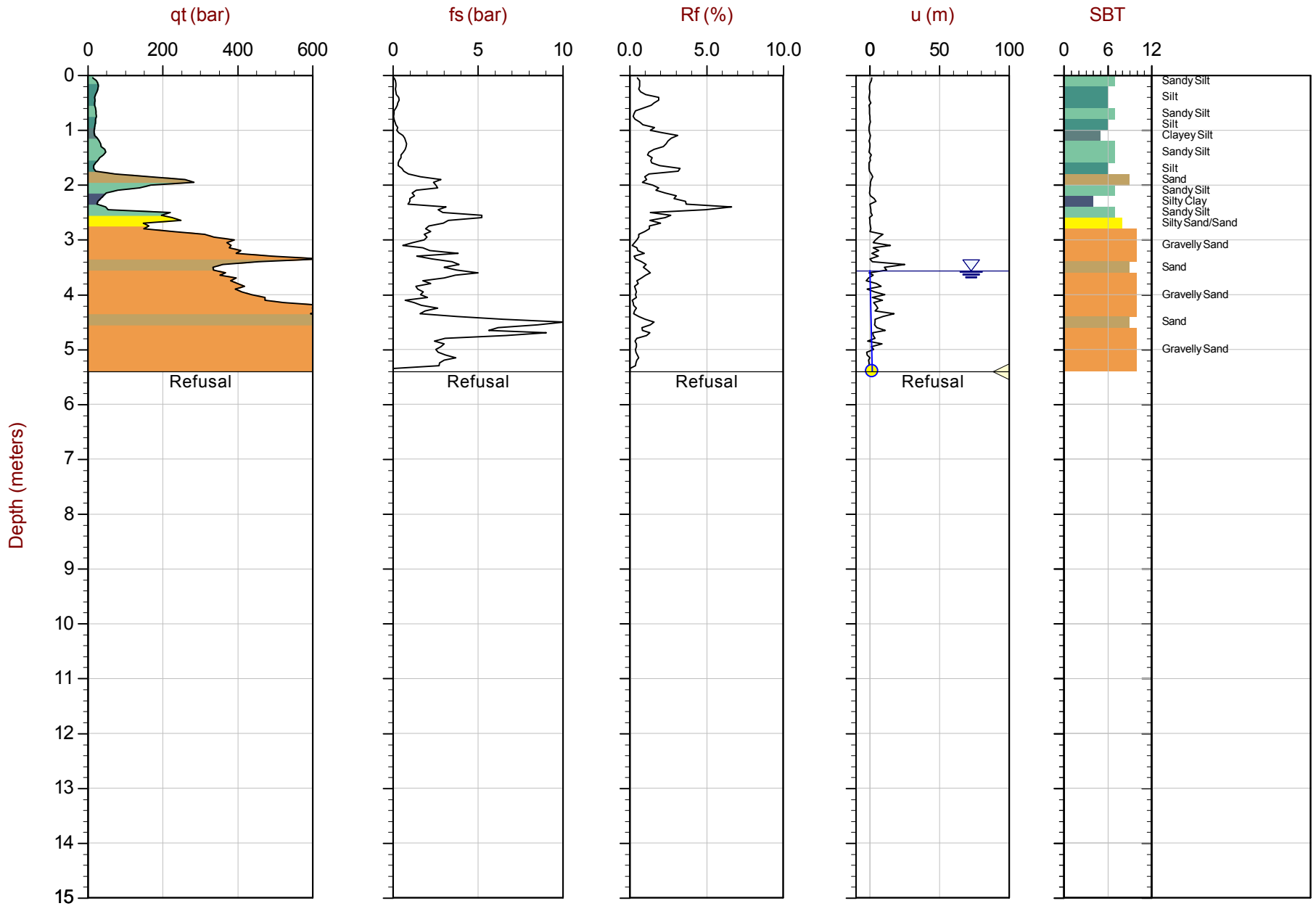
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 16:10
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41B
Cone: 340:T1500F15U500




Max Depth: 5.400 m / 17.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD41B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658878m E: 681392m Elev: 1187.00m
Sheet No: 1 of 1

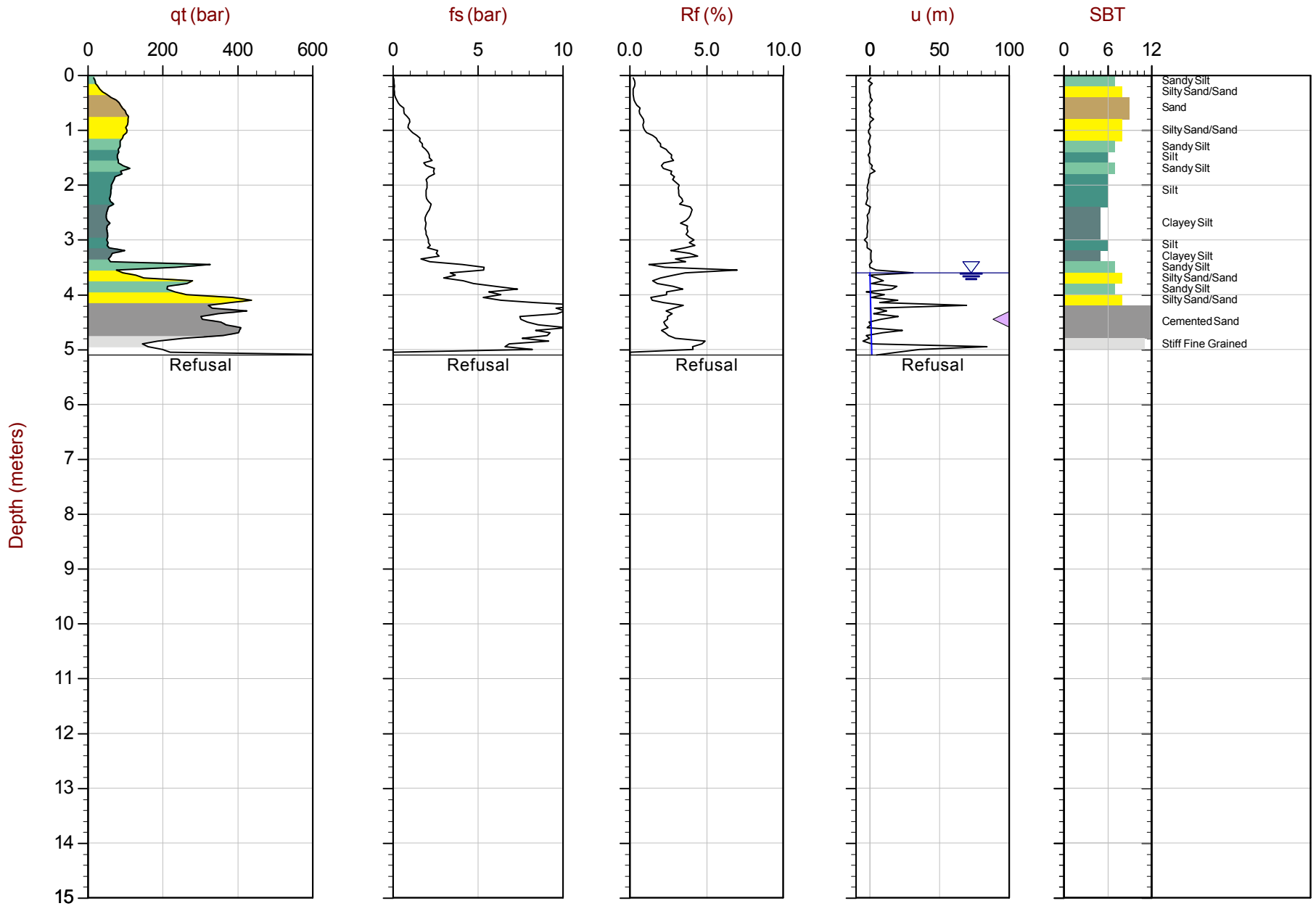
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 16:05
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D44
Cone: 340:T1500F15U500




Max Depth: 5.100 m / 16.73 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD44.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658924m E: 681508m Elev: 1188.50m
Sheet No: 1 of 1

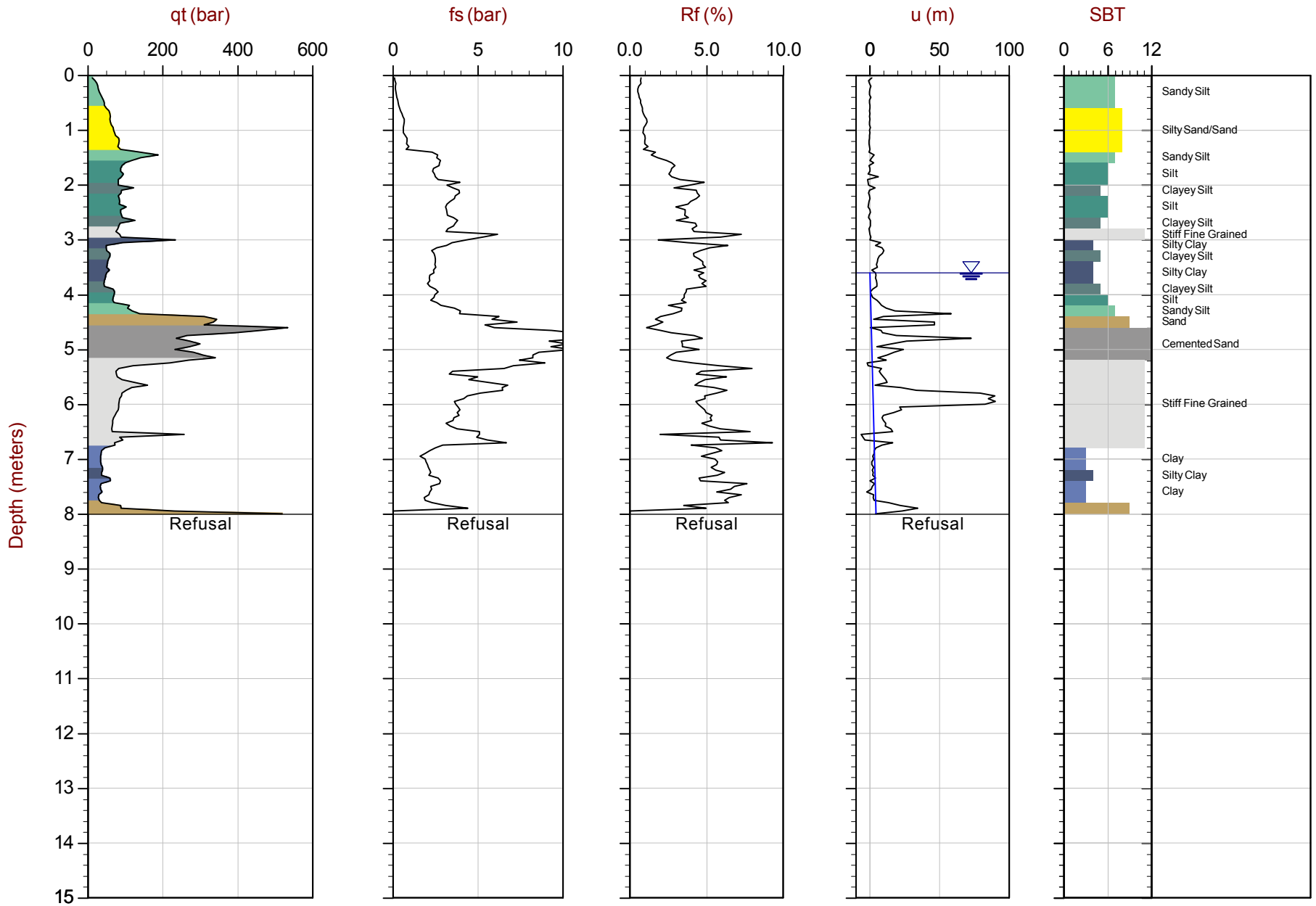
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 16:45
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D44B
Cone: 340:T1500F15U500




Max Depth: 8.000 m / 26.25 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD44B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658933m E: 681516m Elev: 1189.00m
Sheet No: 1 of 1

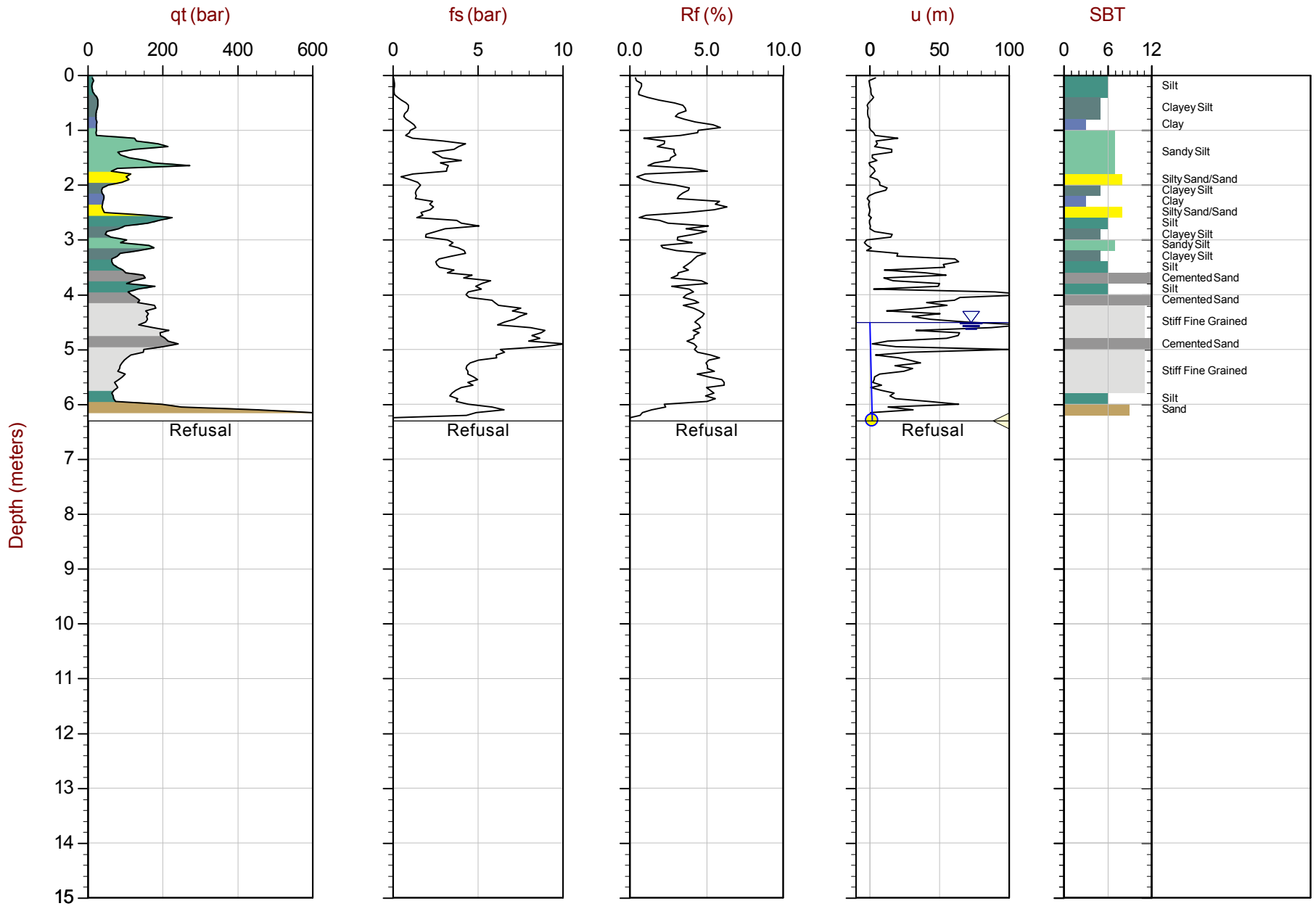
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

# Stantec

Job No: 16-03023
Date: 2016/06/22 09:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D47
Cone: 340:T1500F15U500




Max Depth: 6.300 m / 20.67 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD47.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658970m E: 681337m Elev: 1187.42m
Sheet No: 1 of 1

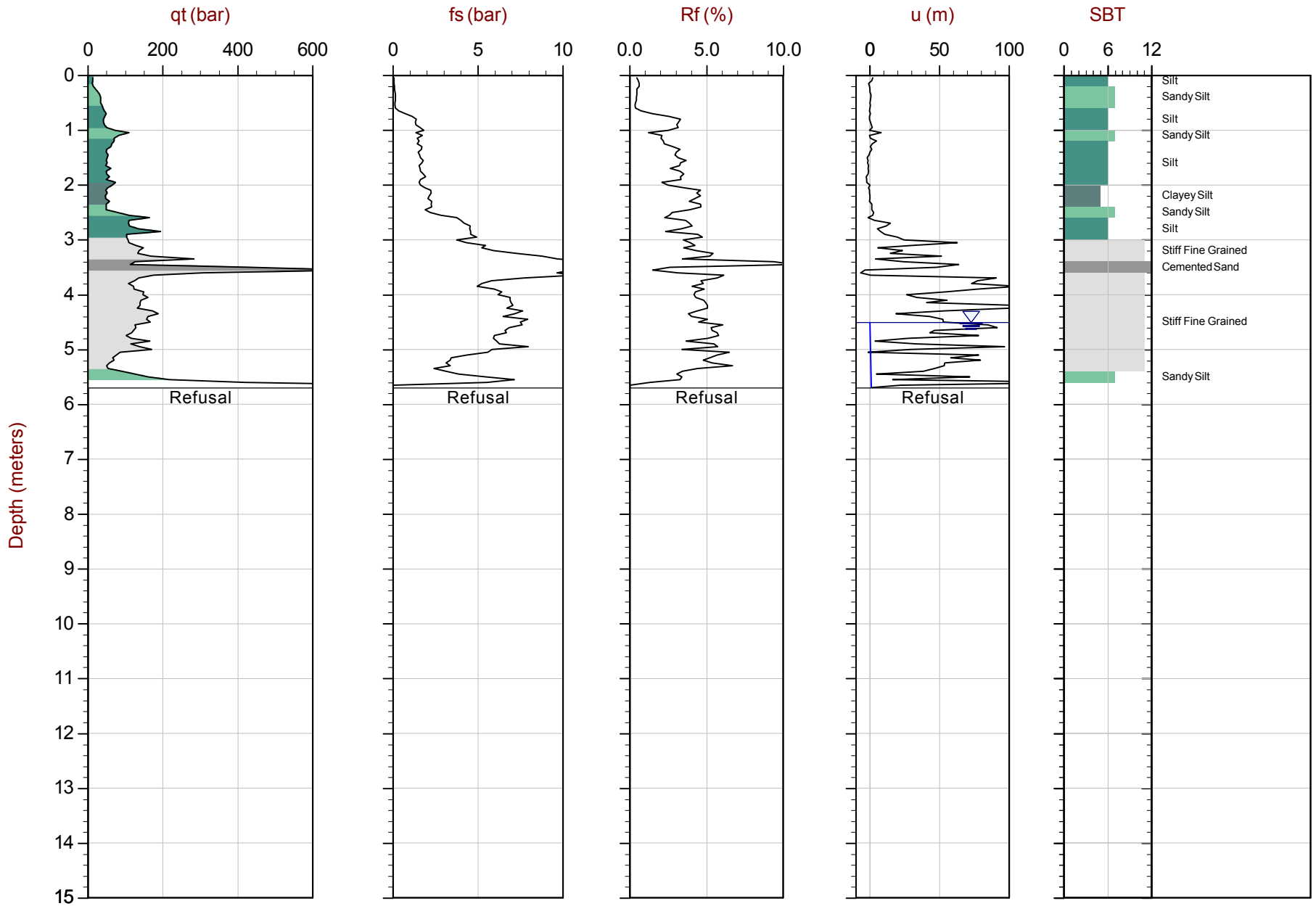
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 09:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D47B
Cone: 340:T1500F15U500




Max Depth: 5.700 m / 18.70 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD47B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658964m E: 681344m Elev: 1187.00m
Sheet No: 1 of 1

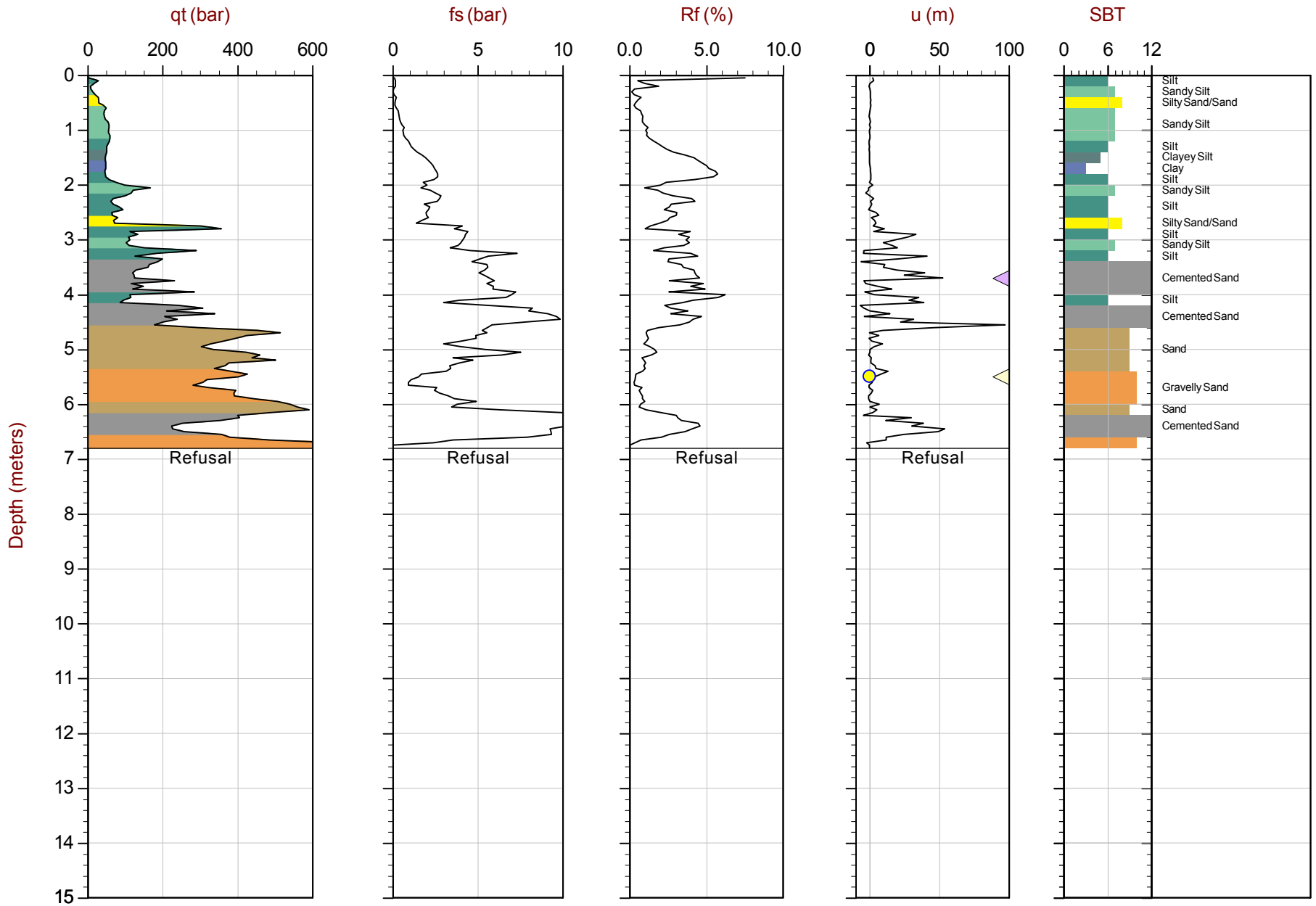
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 10:44
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49
Cone: 340:T1500F15U500




Max Depth: 6.800 m / 22.31 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD49.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659075m E: 681481m Elev: 1187.24m
Sheet No: 1 of 1

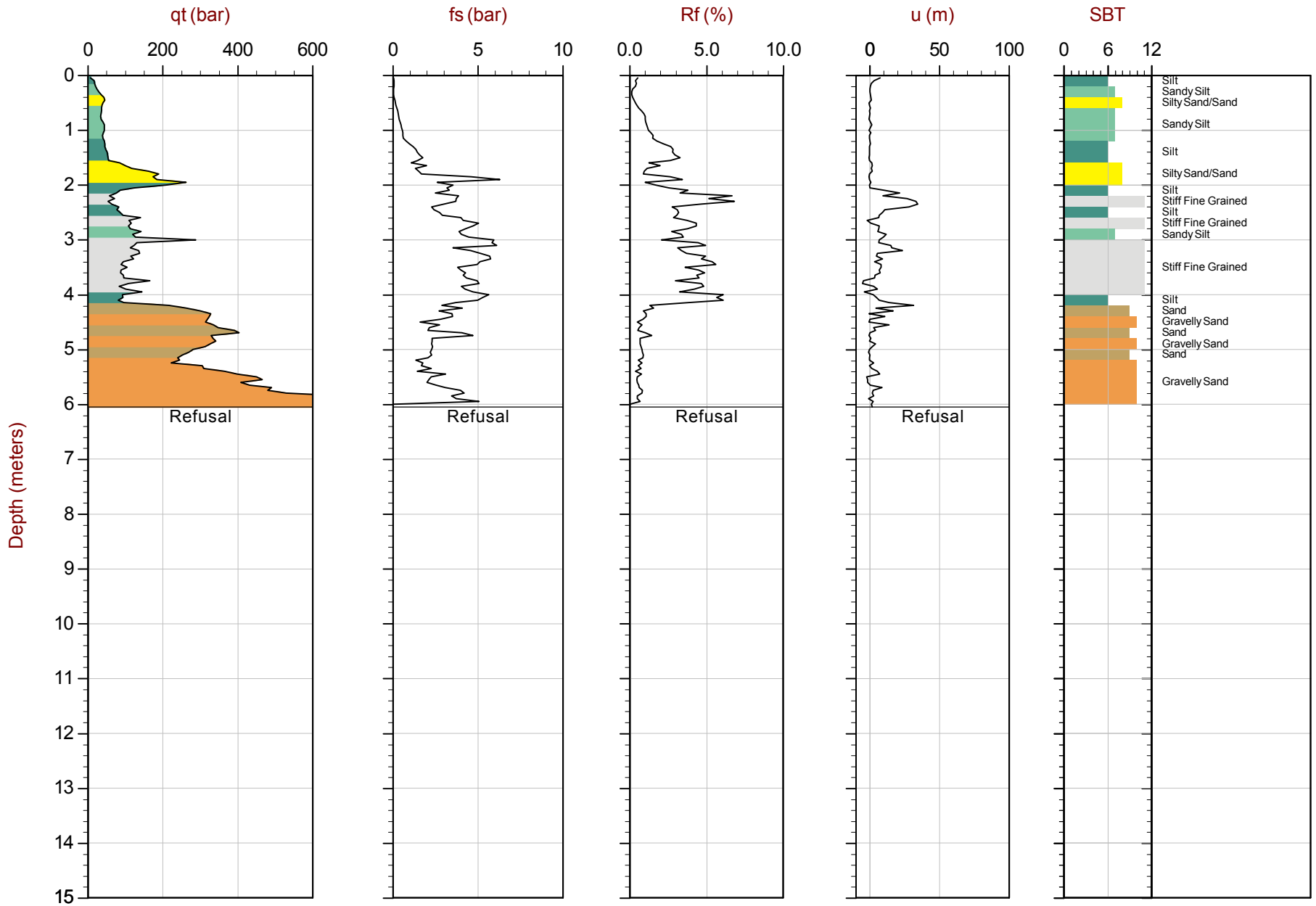
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

# Stantec

Job No: 16-03023
Date: 2016/06/22 15:20
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49B
Cone: 340:T1500F15U500




Max Depth: 6.050 m / 19.85 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD49B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659077m E: 681469m Elev: 1187.00m
Sheet No: 1 of 1

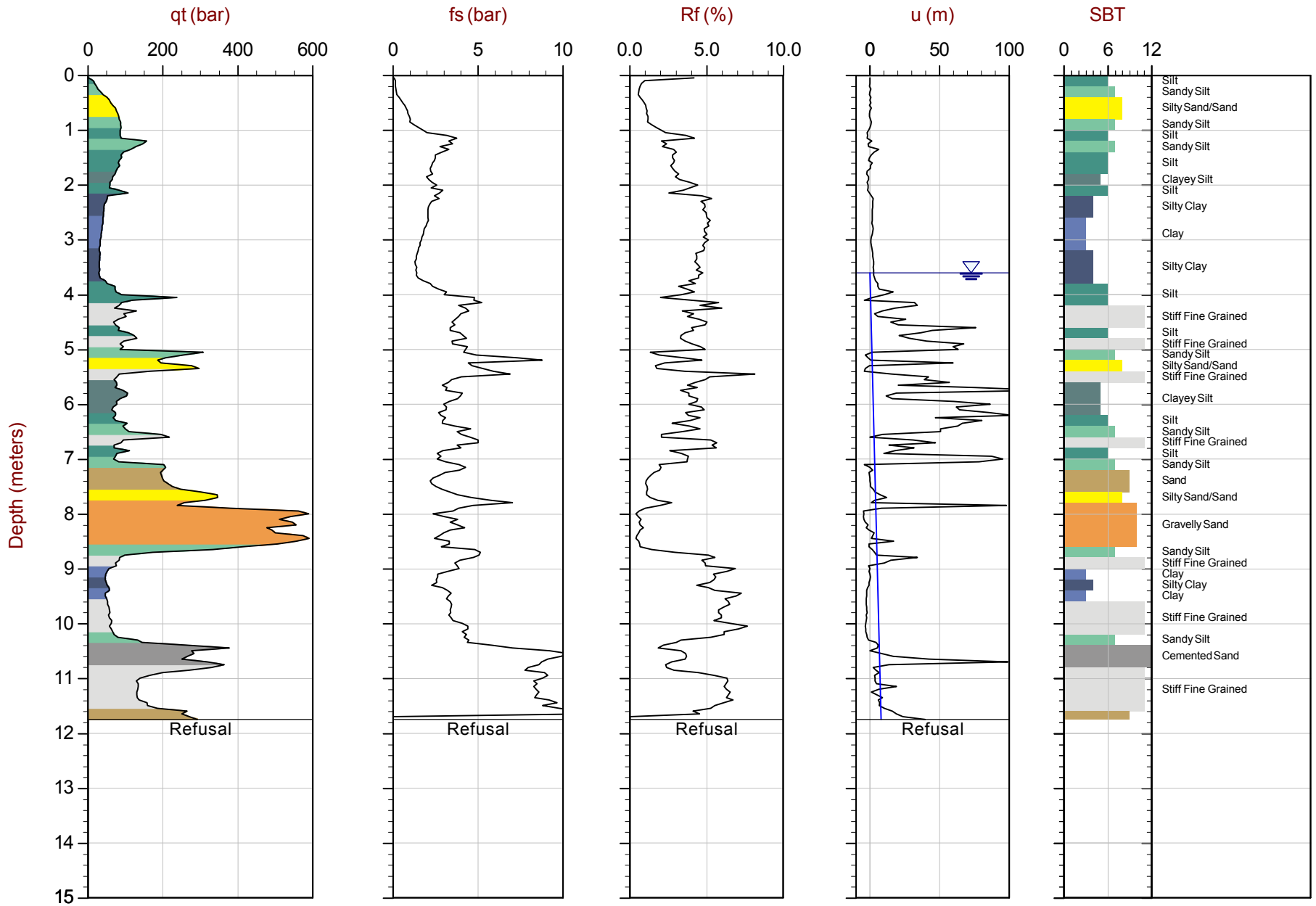
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 17:17
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D50
Cone: 340:T1500F15U500




Max Depth: 11.750 m / 38.55 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD50.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659098m E: 681364m Elev: N/Am
Sheet No: 1 of 1

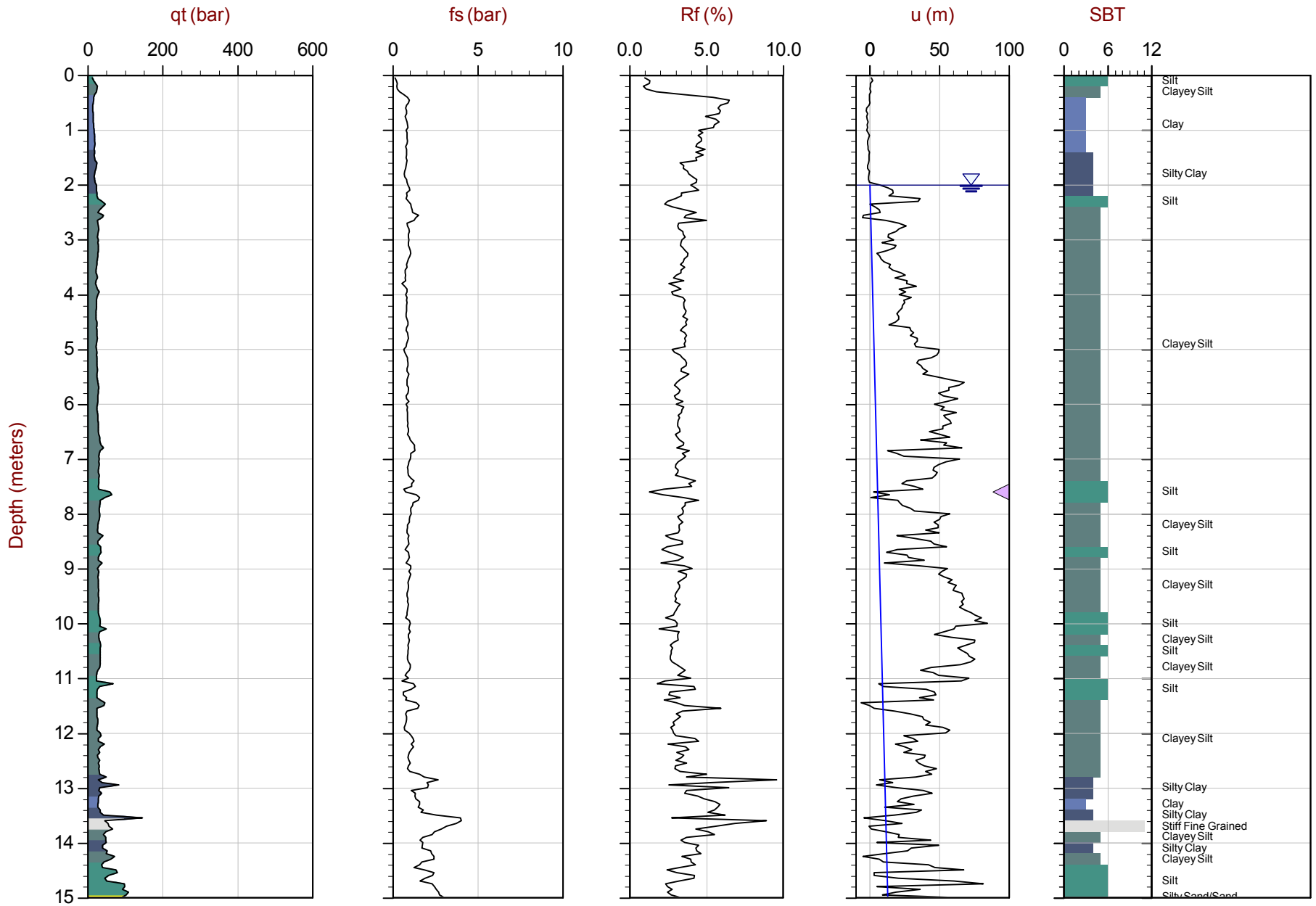
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 17:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D57
Cone: 388:T1500F15U500




Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD57.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658705m E: 680883m Elev: 1191.58m
Sheet No: 1 of 2

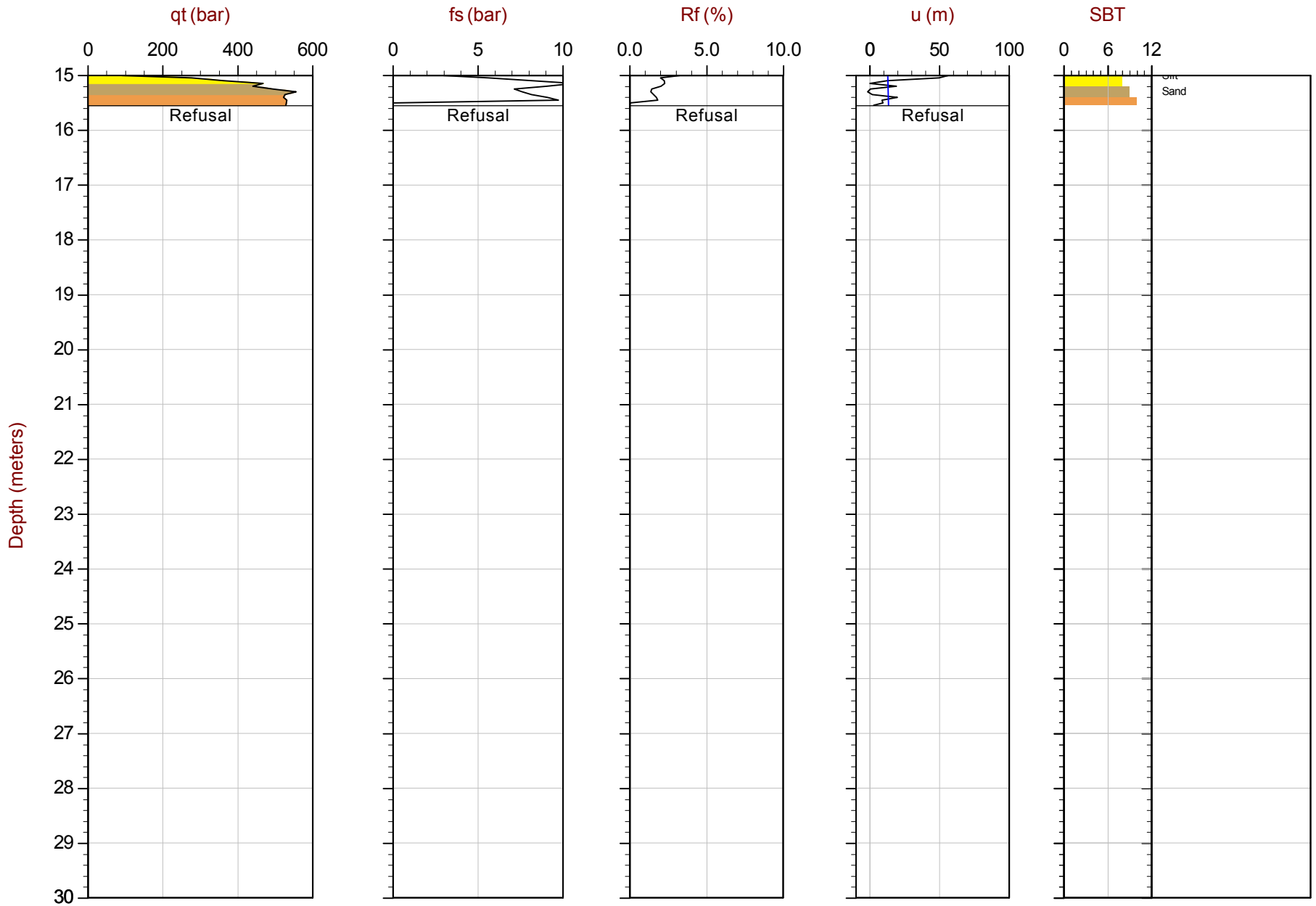
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 17:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D57
Cone: 388:T1500F15U500




Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD57.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658705m E: 680883m Elev: 1191.58m
Sheet No: 2 of 2

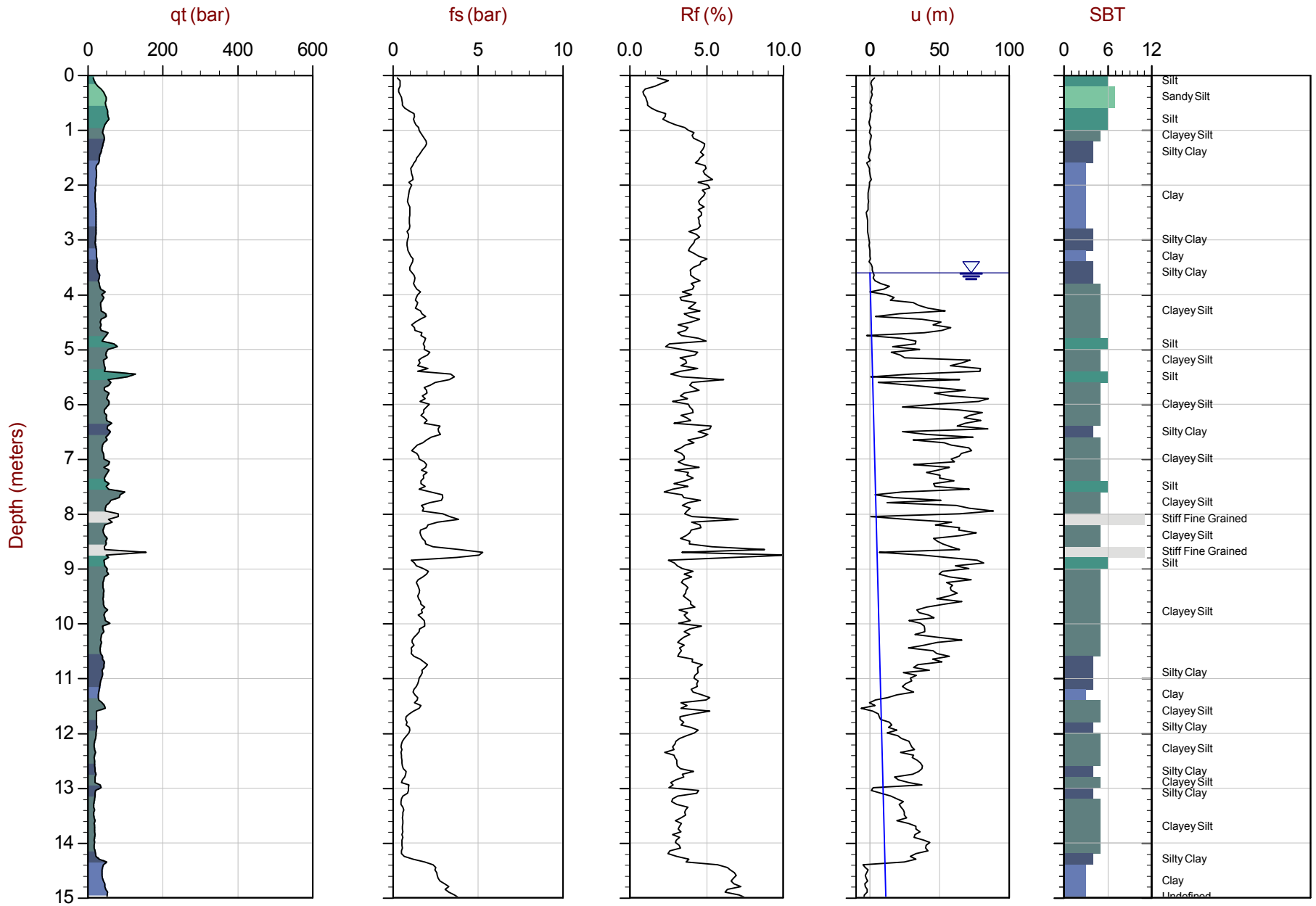
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 18:18
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D58
Cone: 388:T1500F15U500




Max Depth: 16.600 m / 54.46 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD58.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658857m E: 681120m Elev: 1190.20m
Sheet No: 1 of 2

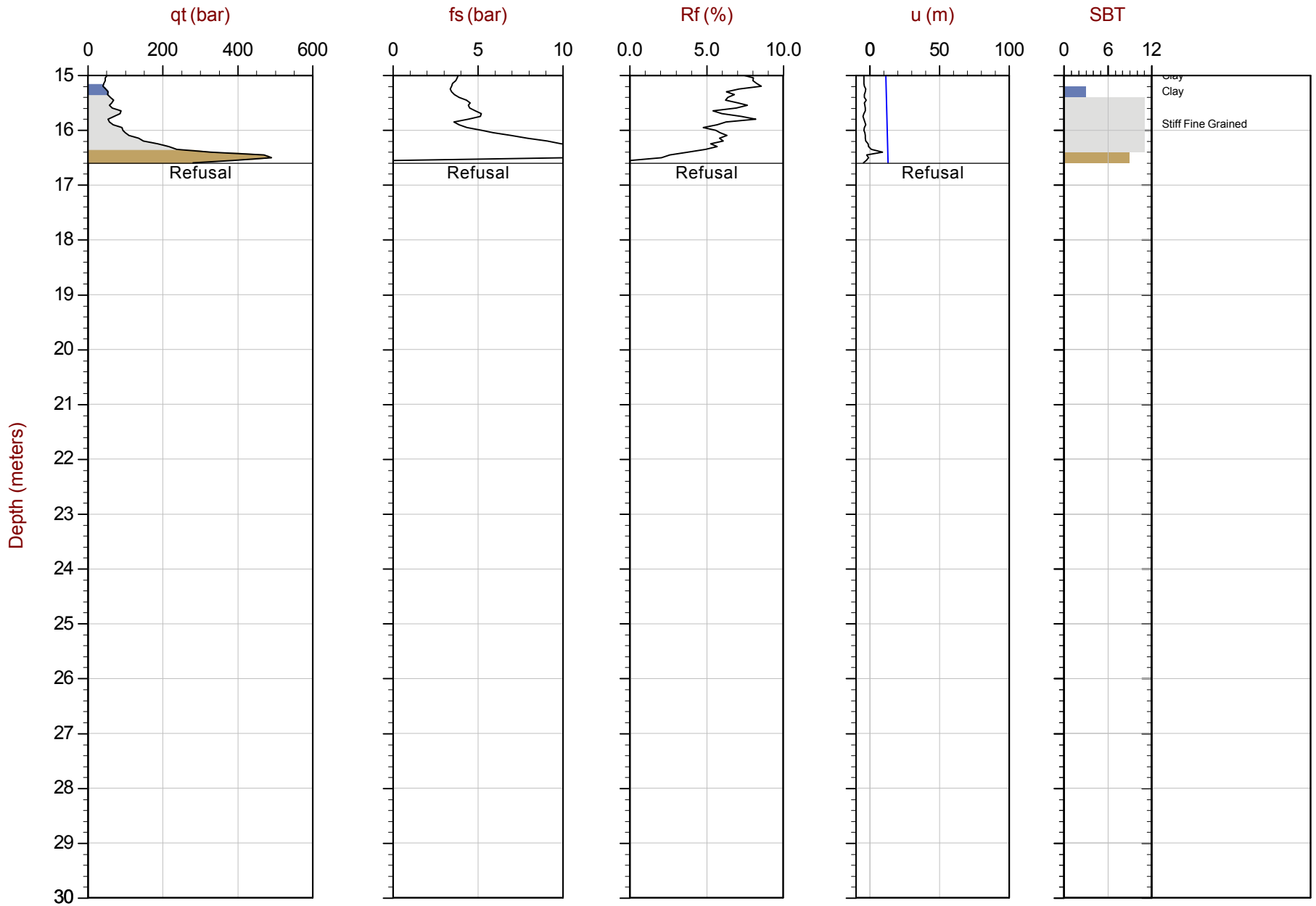
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 18:18
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D58
Cone: 388:T1500F15U500




Max Depth: 16.600 m / 54.46 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD58.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658857m E: 681120m Elev: 1190.20m
Sheet No: 2 of 2

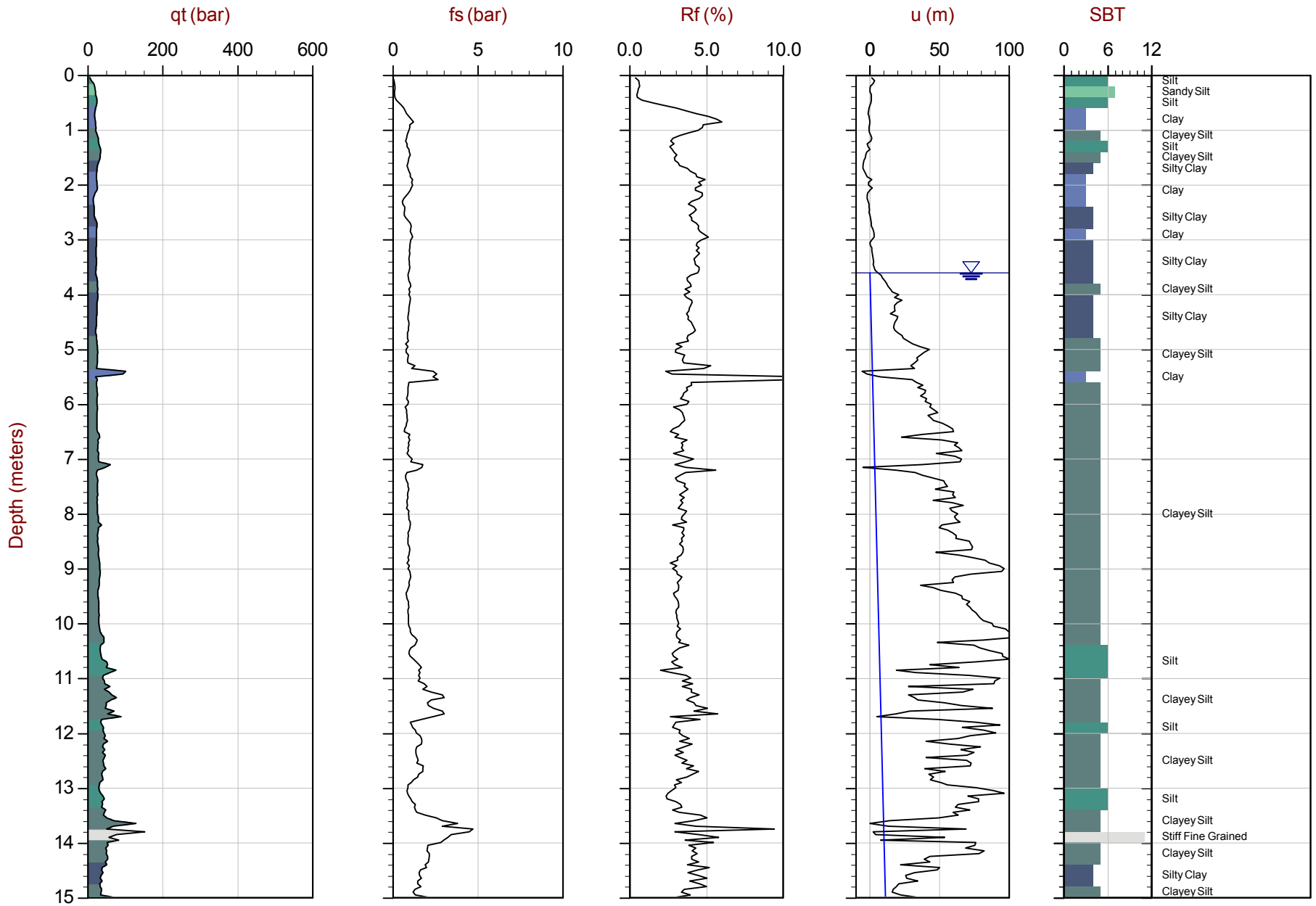
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 15:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D60
Cone: 388:T1500F15U500




Max Depth: 17.250 m / 56.59 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD60.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658594m E: 680974m Elev: 1191.99m
Sheet No: 1 of 2

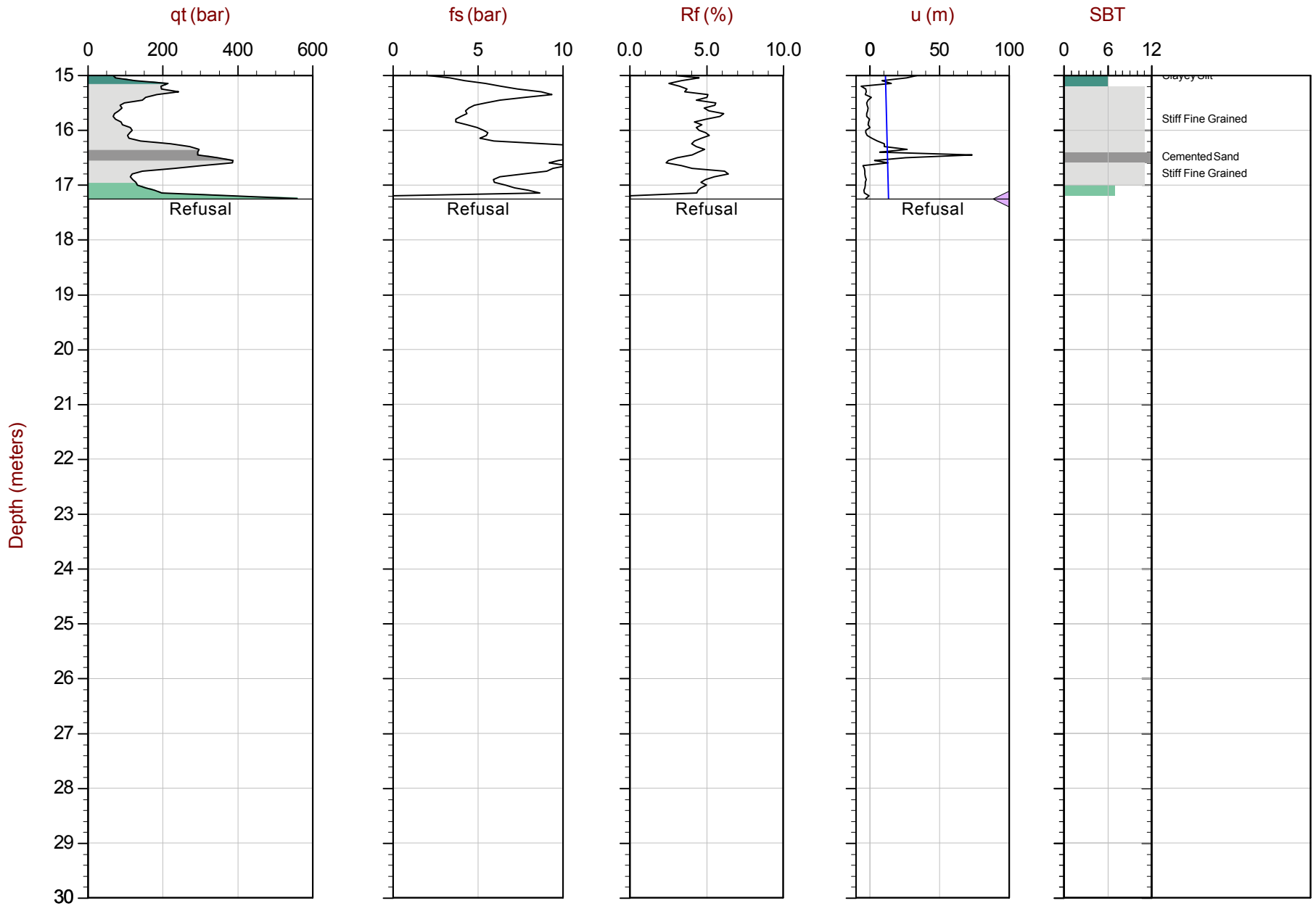
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 15:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D60
Cone: 388:T1500F15U500




Max Depth: 17.250 m / 56.59 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD60.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658594m E: 680974m Elev: 1191.99m
Sheet No: 2 of 2

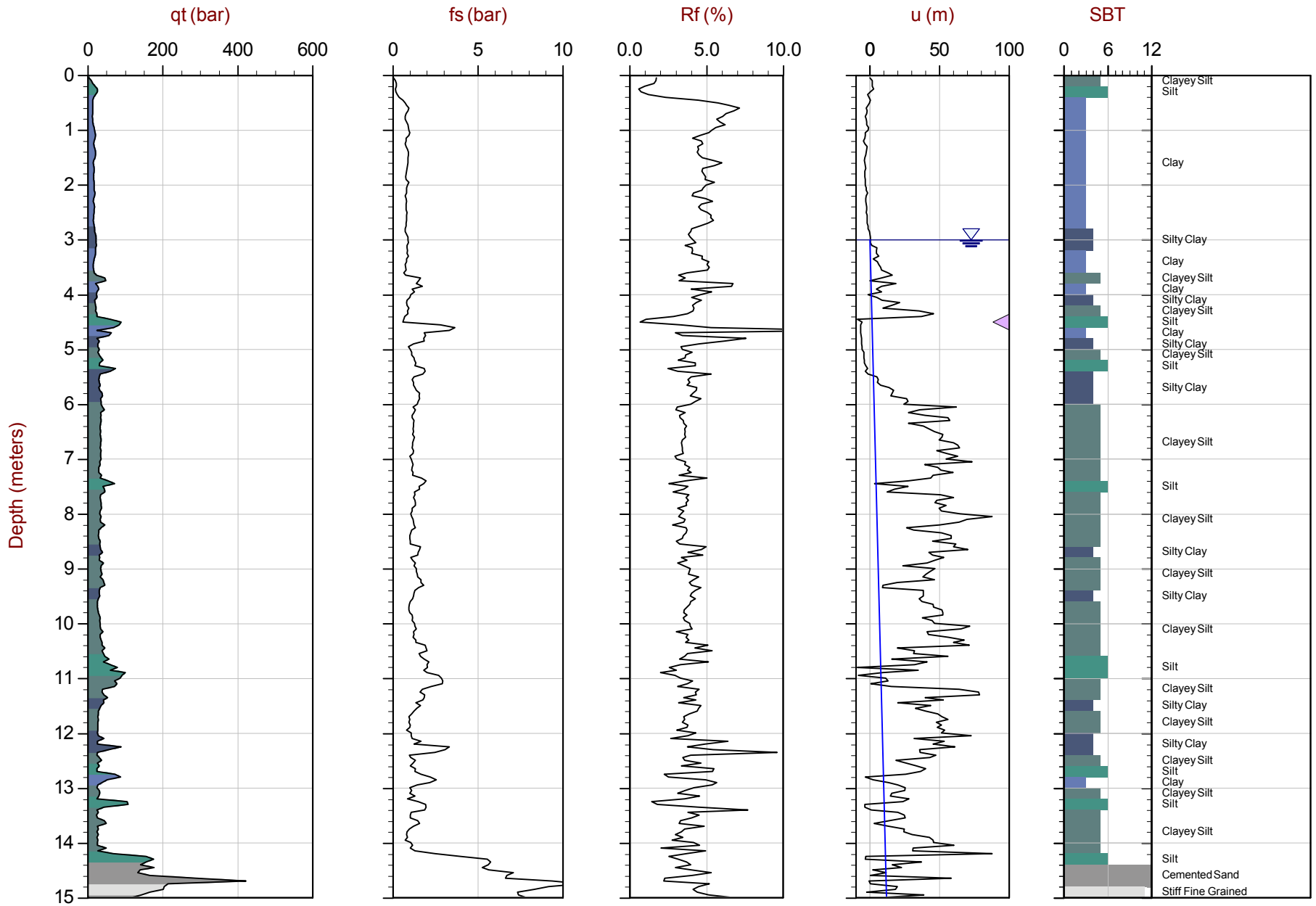
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 14:22
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D61
Cone: 388:T1500F15U500




Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD61.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658730m E: 681139m Elev: 1190.36m
Sheet No: 1 of 2

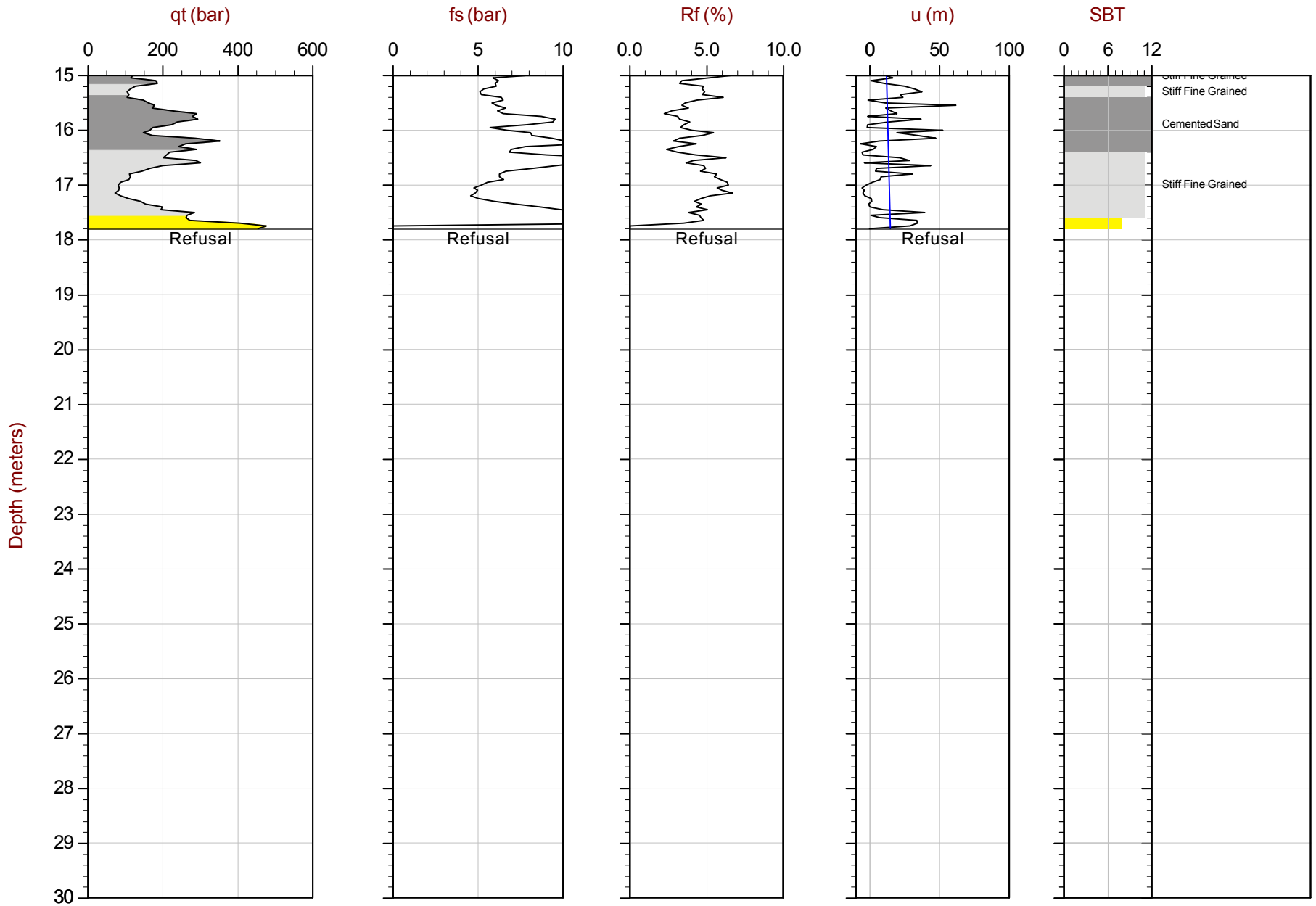
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 14:22
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D61
Cone: 388:T1500F15U500




Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD61.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658730m E: 681139m Elev: 1190.36m
Sheet No: 2 of 2

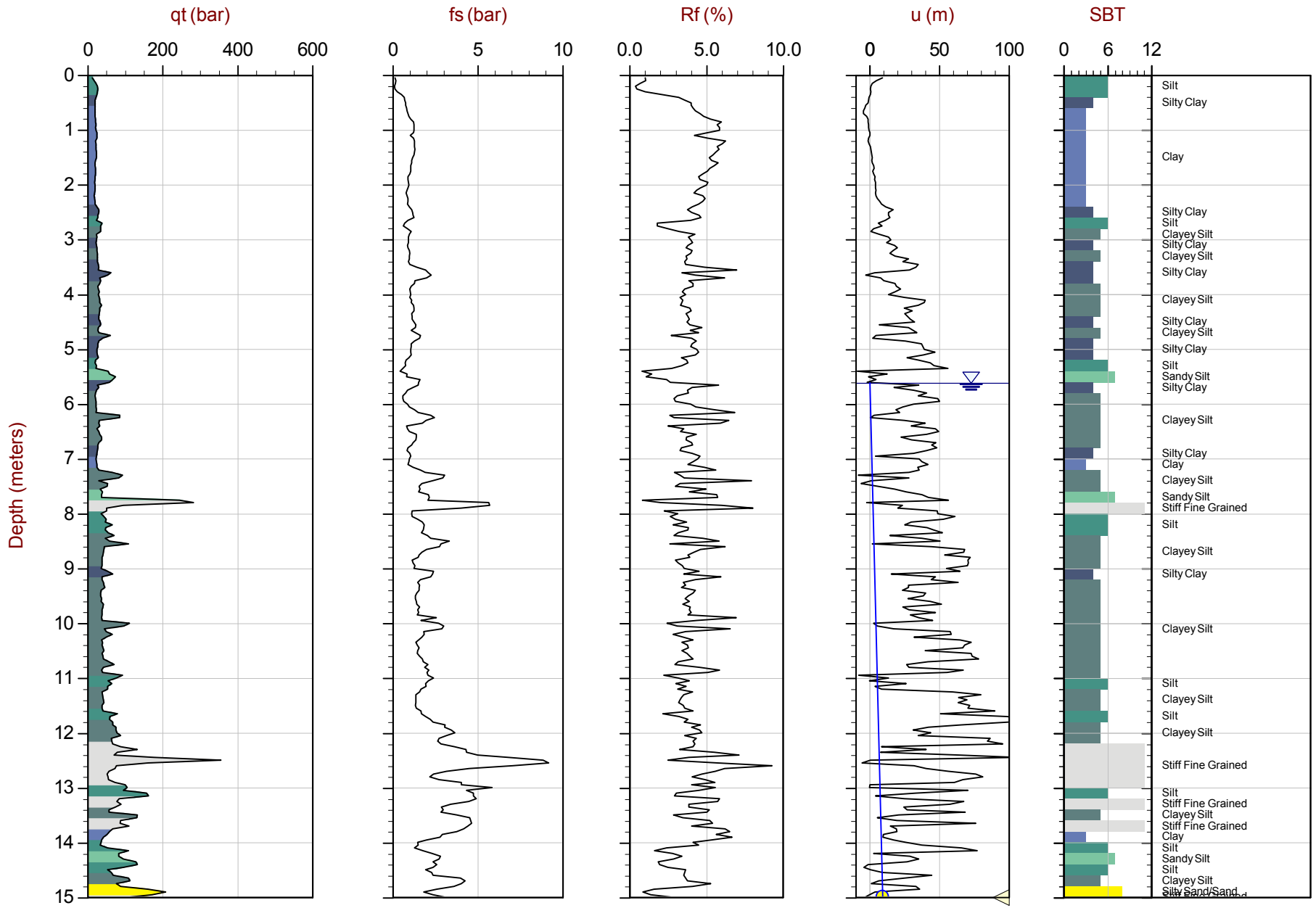
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 12:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D63
Cone: 388:T1500F15U500




Max Depth: 18.550 m / 60.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD63.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658576m E: 681057m Elev: 1191.66m
Sheet No: 1 of 2

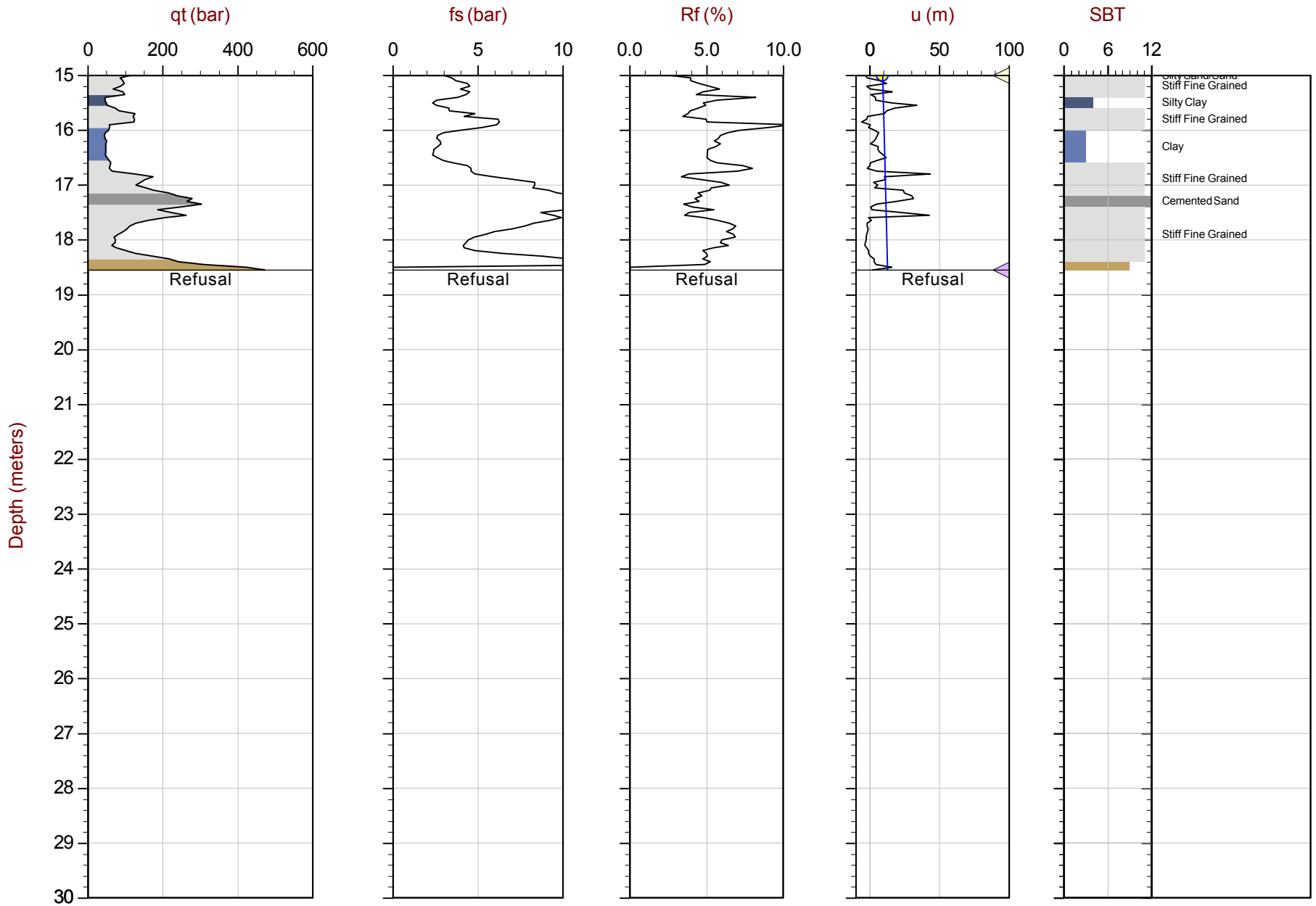
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 12:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D63
Cone: 388:T1500F15U500




Max Depth: 18.550 m / 60.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD63.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658576m E: 681057m Elev: 1191.66m
Sheet No: 2 of 2

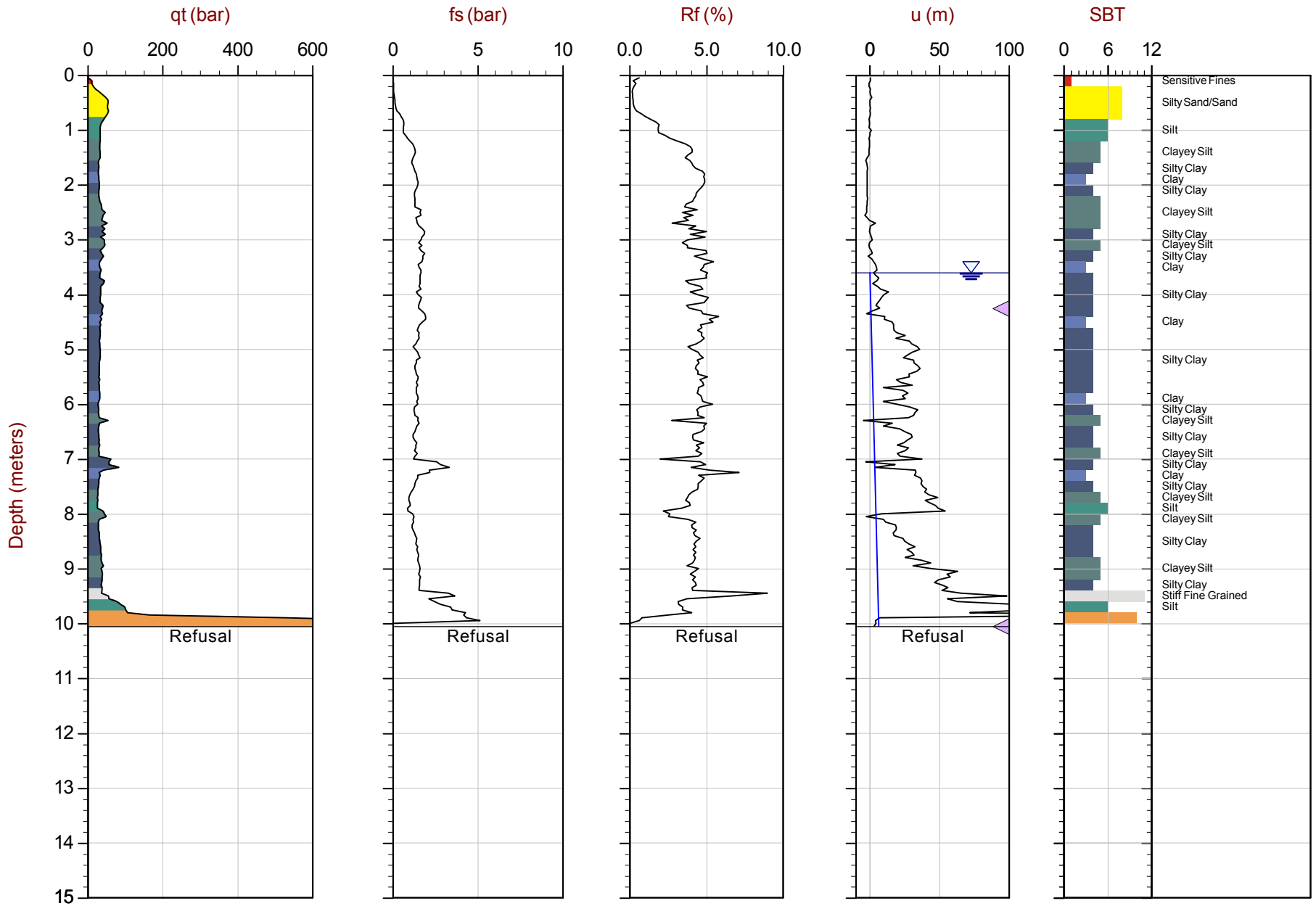
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 12:45
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64
Cone: 340:T1500F15U500




Max Depth: 10.050 m / 32.97 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD64.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659109m E: 681555m Elev: 1193.60m
Sheet No: 1 of 1

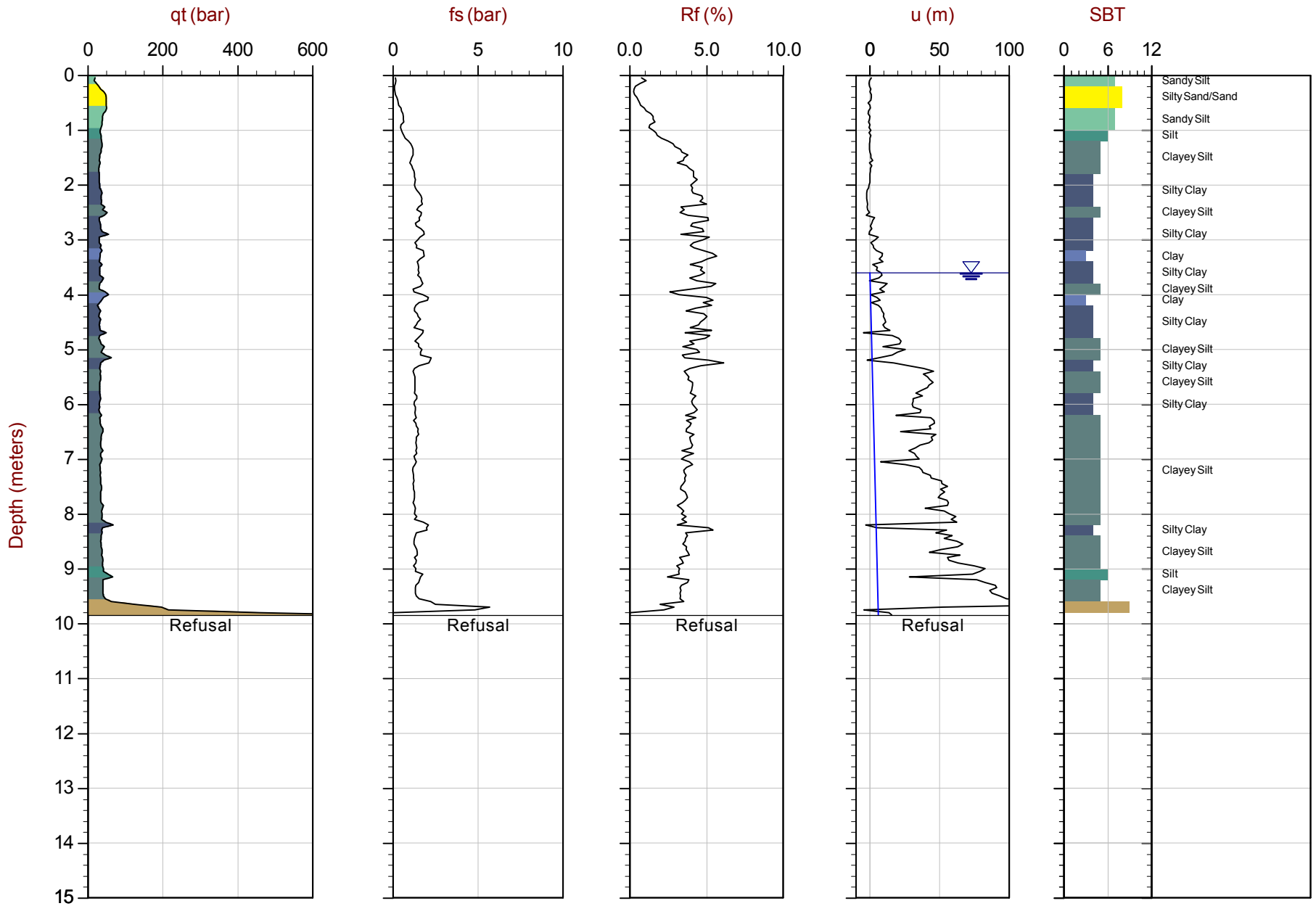
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 14:30
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64B
Cone: 340:T1500F15U500




Max Depth: 9.850 m / 32.32 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD64B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659109m E: 681563m Elev: 1194.00m
Sheet No: 1 of 1

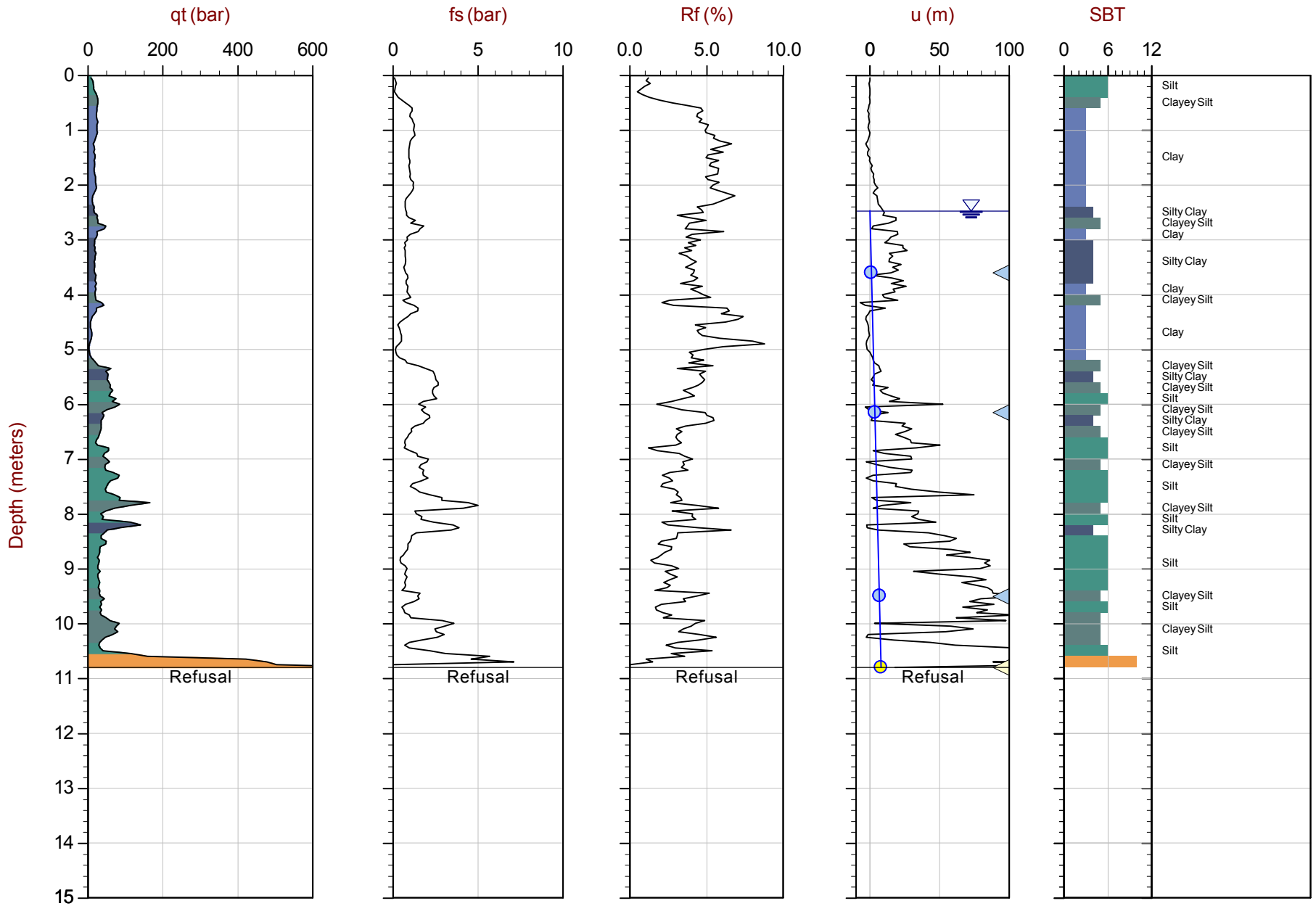
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 11:03
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC26
Cone: 322:T1500F15U500




Max Depth: 10.800 m / 35.43 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPDC26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658614m E: 678554m Elev: 1203.84m
Sheet No: 1 of 1

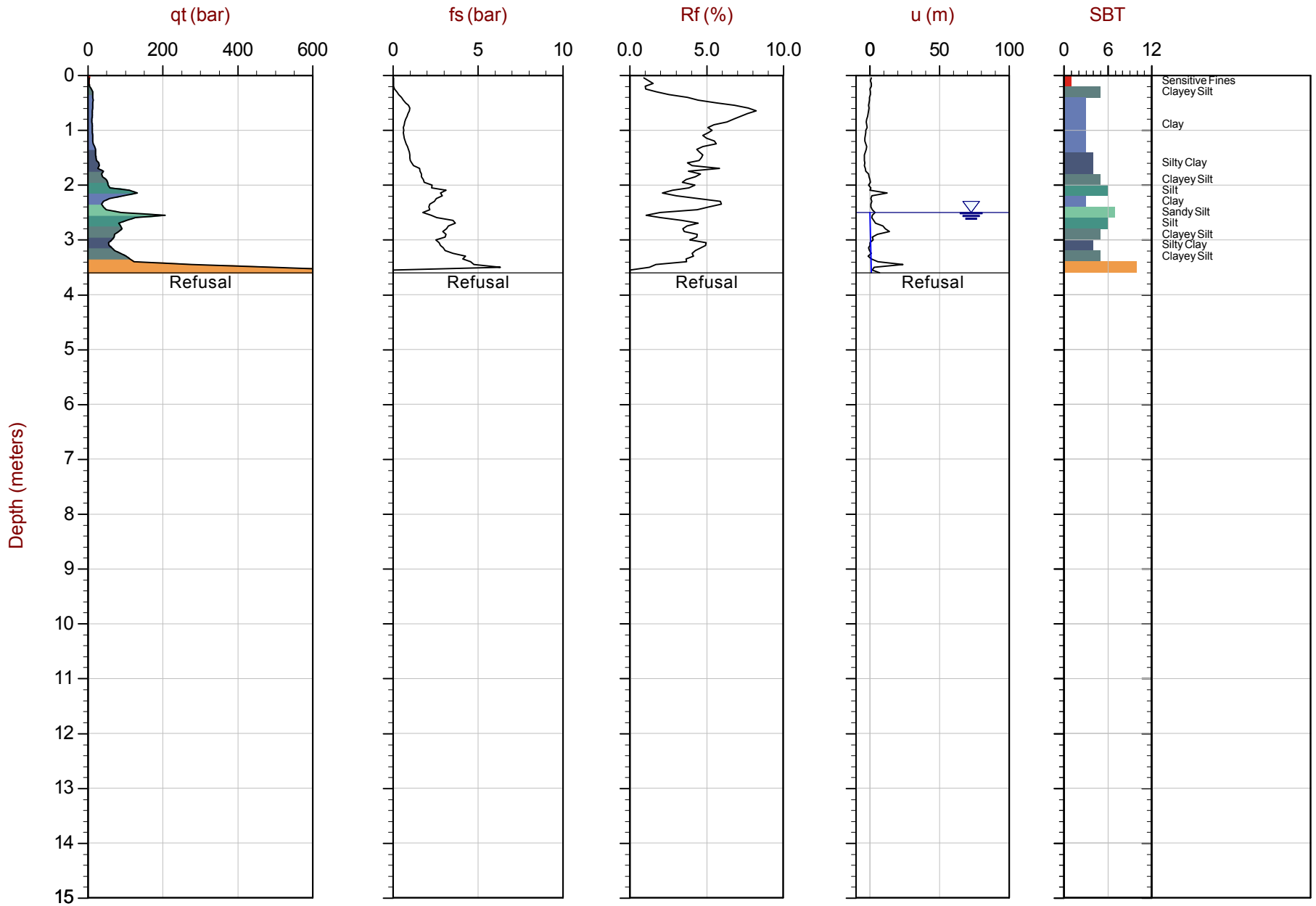
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 08:48
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-DC29
Cone: 340:T1500F15U500




Max Depth: 3.600 m / 11.81 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPDC29.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658883m E: 678748m Elev: 1213.98m
Sheet No: 1 of 1

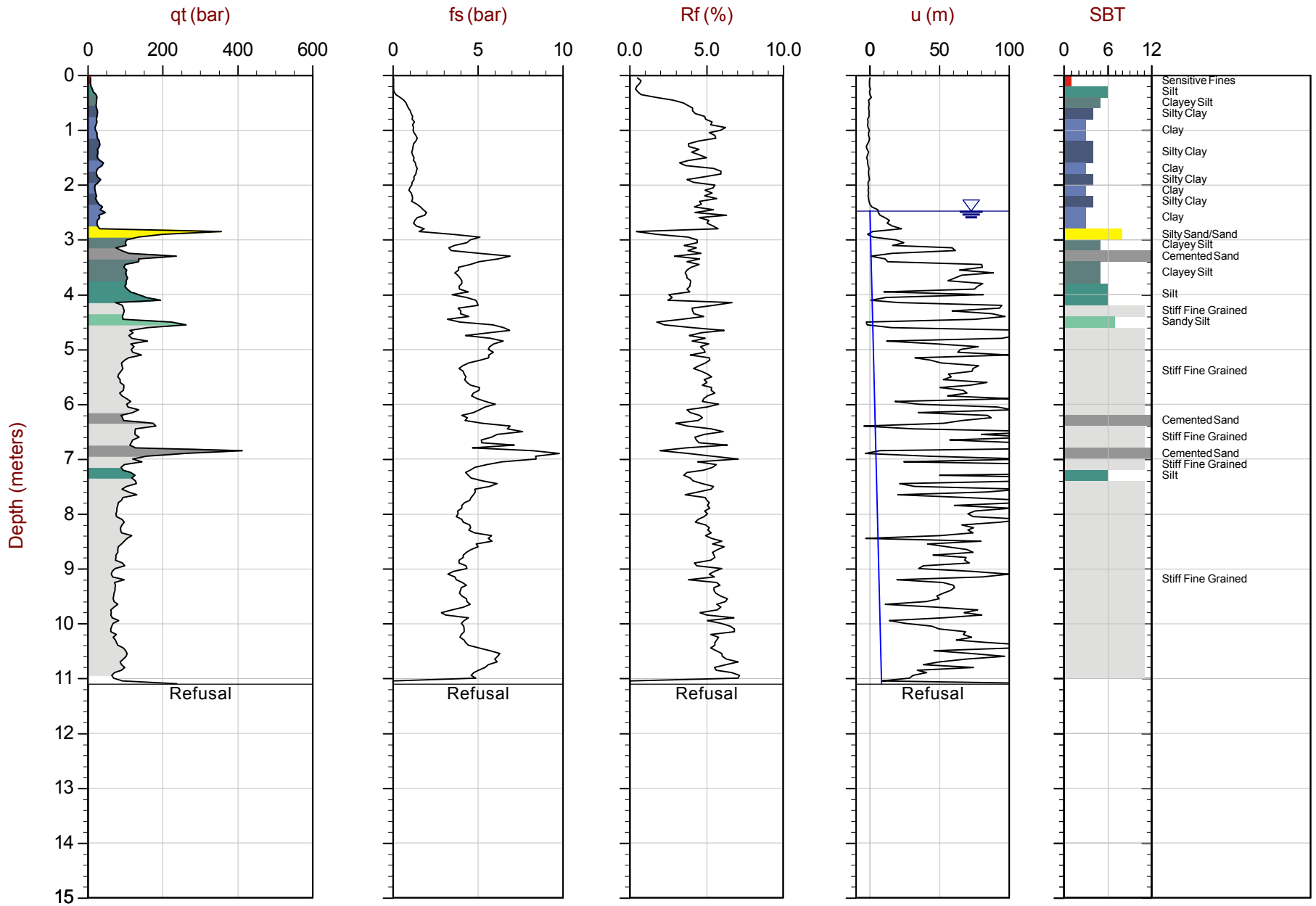
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 17:27
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC31
Cone: 340:T1500F15U500




Max Depth: 11.100 m / 36.42 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPDC31.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659261m E: 678799m Elev: 1207.38m
Sheet No: 1 of 1

Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

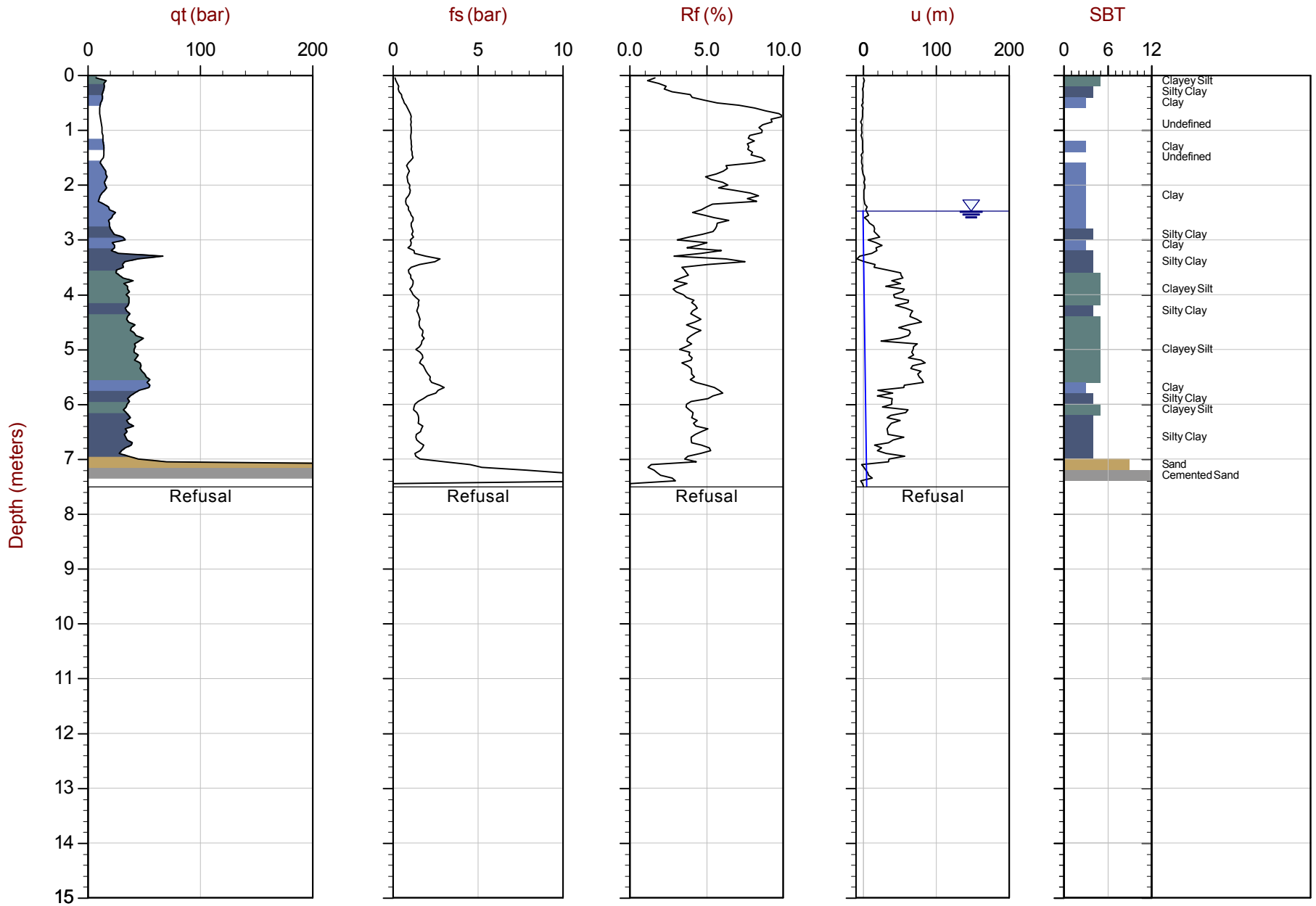
# Standard Cone Penetration Test Plots – Alternate Range

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 13:26
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D01
Cone: 322:T1500F15U500




Max Depth: 7.500 m / 24.61 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD01.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658731m E: 678831m Elev: 1209.77m
Sheet No: 1 of 1

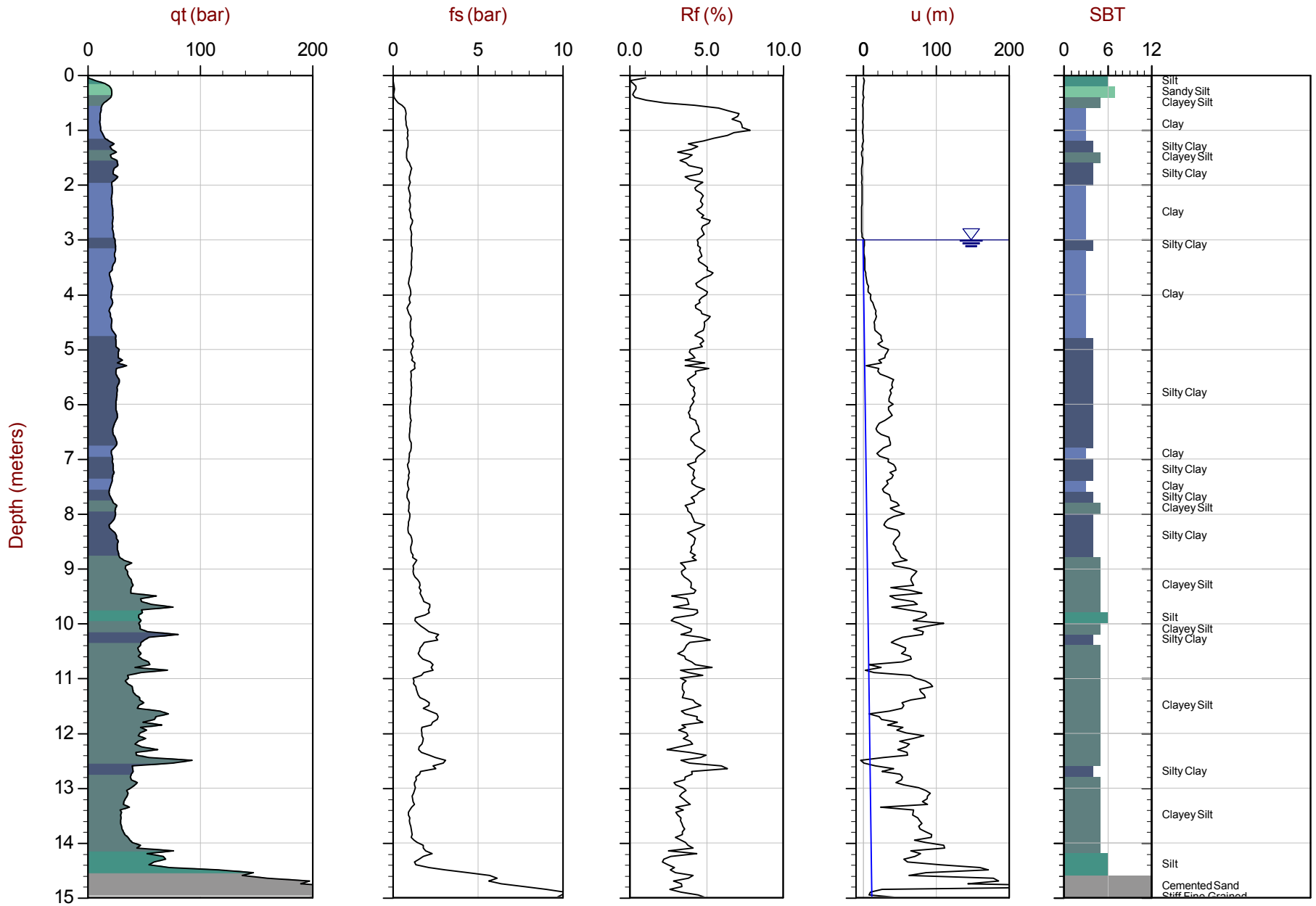
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 16:35
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26
Cone: 322:T1500F15U500




Max Depth: 18.750 m / 61.52 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 680837m Elev: 1192.03m
Sheet No: 1 of 2

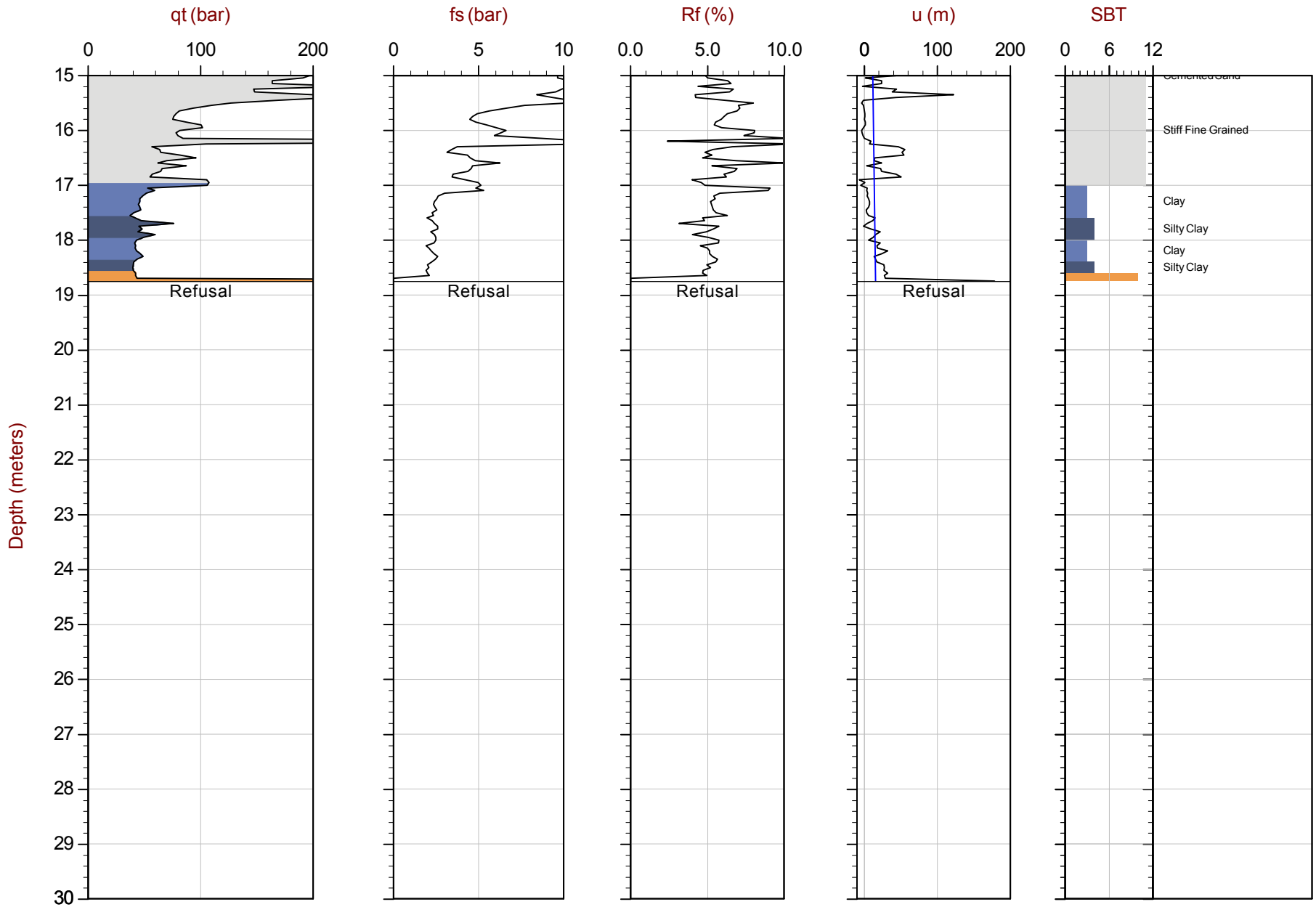
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 16:35
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26
Cone: 322:T1500F15U500




Max Depth: 18.750 m / 61.52 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 680837m Elev: 1192.03m
Sheet No: 2 of 2

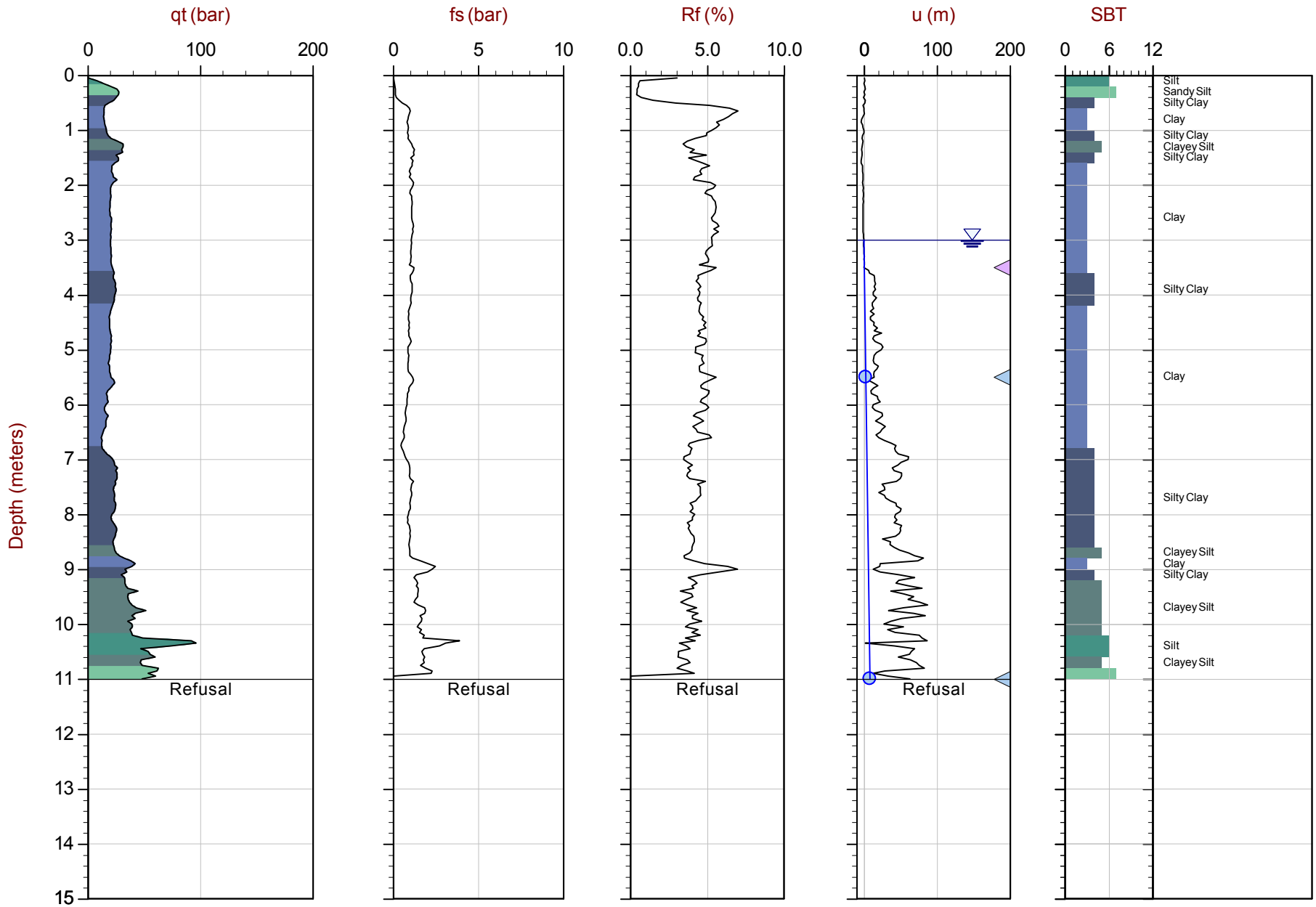
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 09:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26B
Cone: 388:T1500F15U500




Max Depth: 11.000 m / 36.09 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD26B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658519m E: 680838m Elev: 1192.03m
Sheet No: 1 of 1

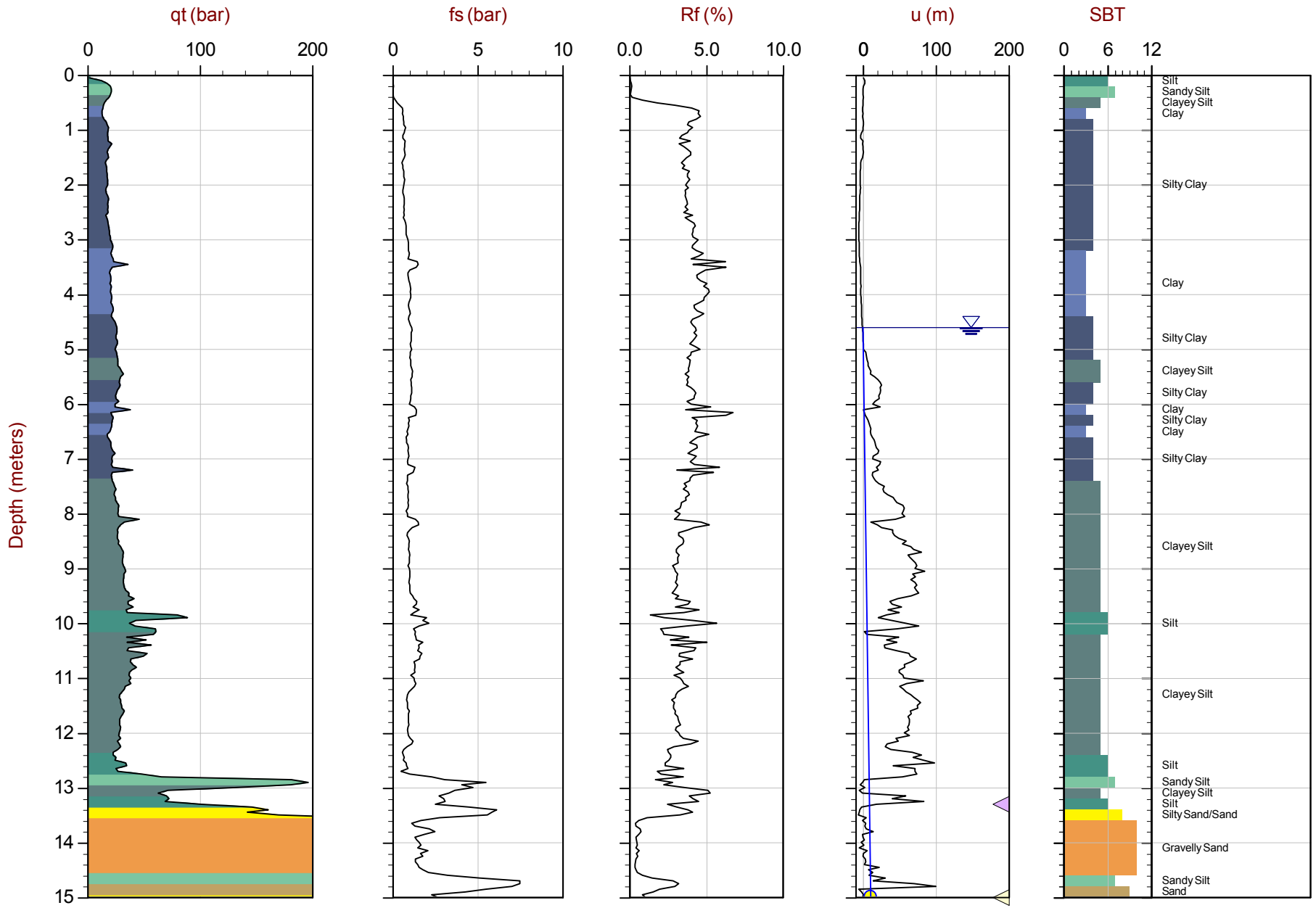
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500




Max Depth: 20.750 m / 68.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD31.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658444m E: 681072m Elev: 1191.00m
Sheet No: 1 of 2

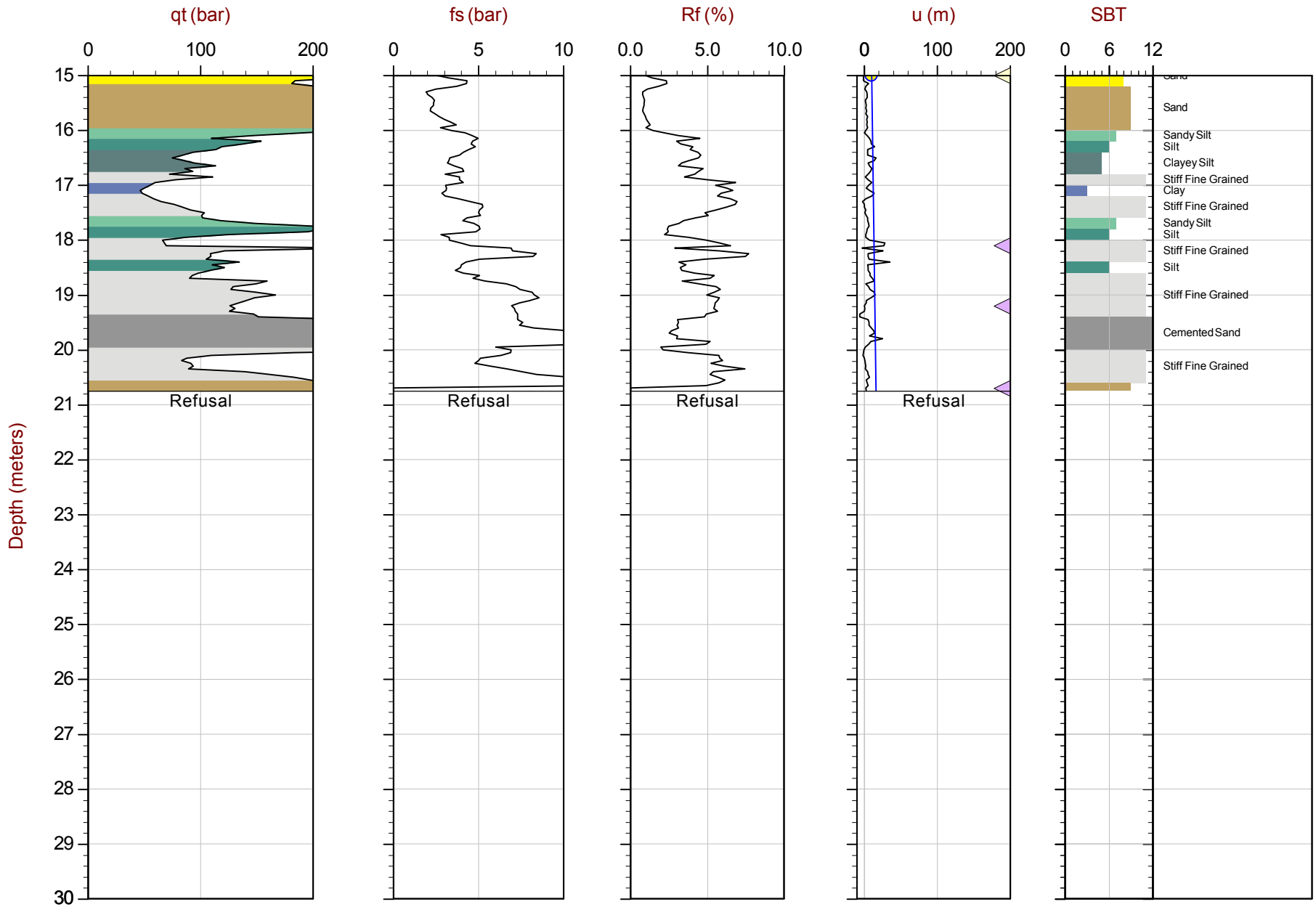
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500




Max Depth: 20.750 m / 68.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD31.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658444m E: 681072m Elev: 1191.00m
Sheet No: 2 of 2

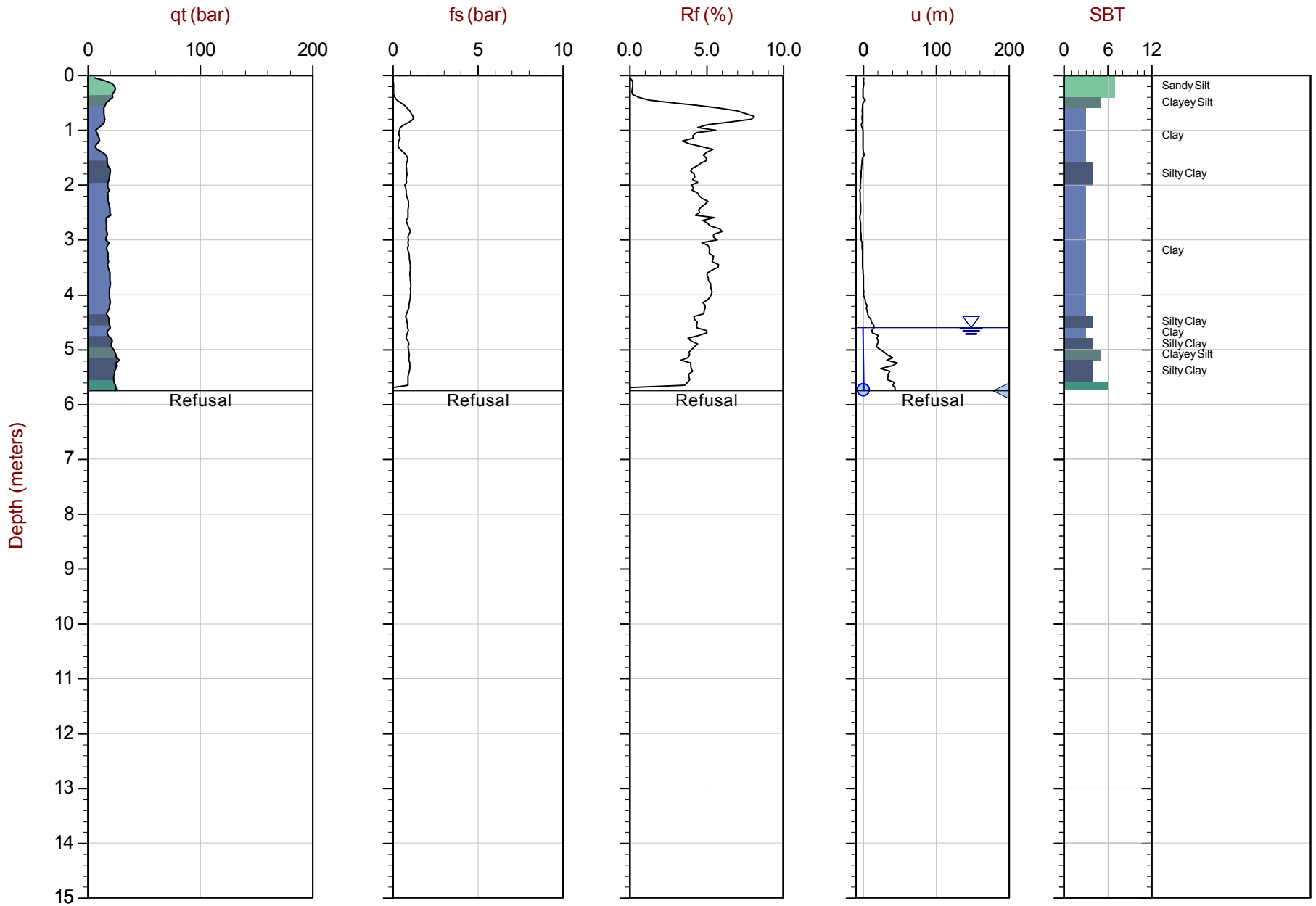
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/25 10:12
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31B
Cone: 388:T1500F15U500




Max Depth: 5.750 m / 18.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD31B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658445m E: 681072m Elev: 1191.00m
Sheet No: 1 of 1

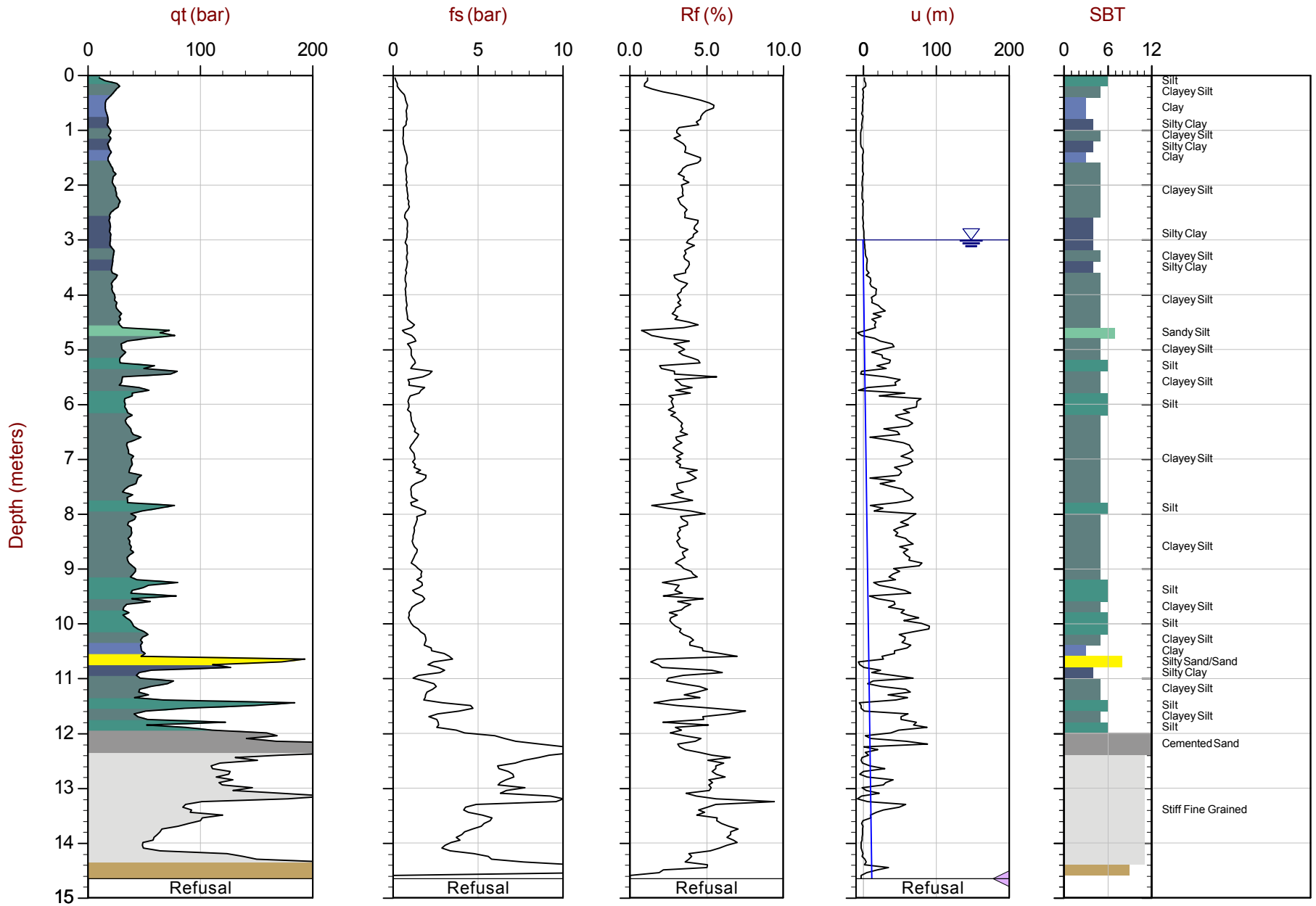
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 13:17
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D34
Cone: 388:T1500F15U500




Max Depth: 14.650 m / 48.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD34.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658610m E: 681142m Elev: 1190.89m
Sheet No: 1 of 1

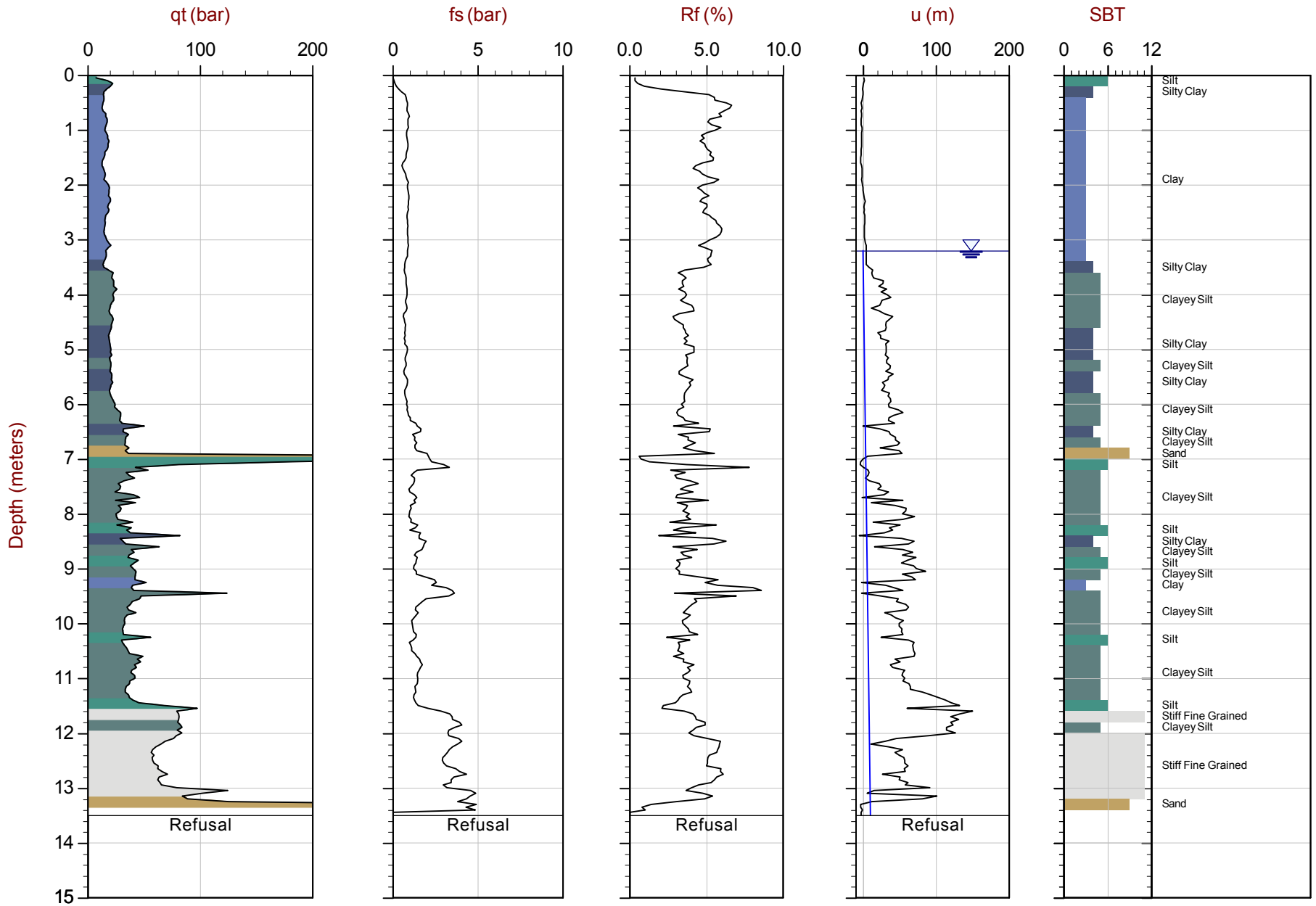
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 14:49
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D37
Cone: 322:T1500F15U500




Max Depth: 13.500 m / 44.29 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD37.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 681325m Elev: 1190.70m
Sheet No: 1 of 1

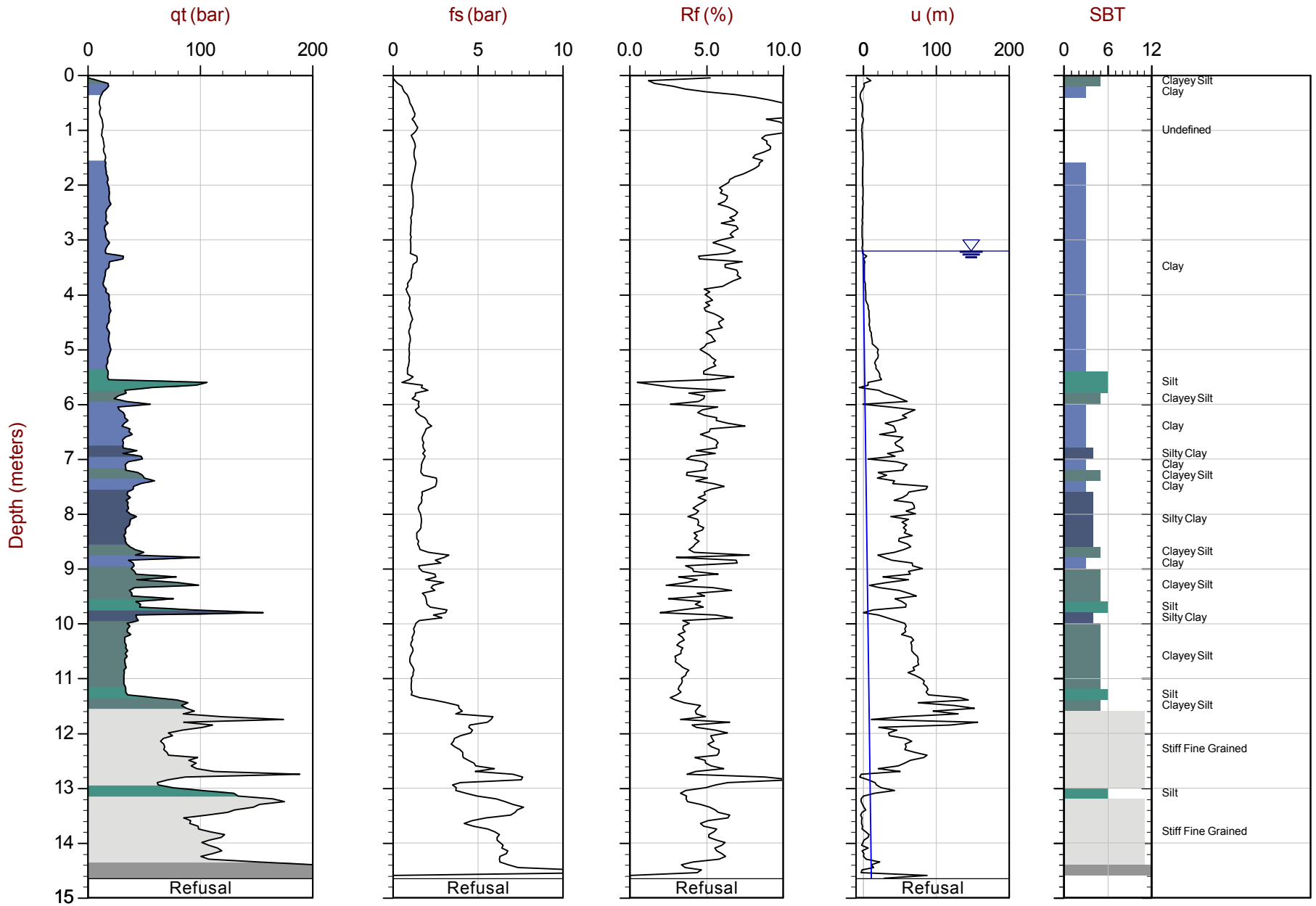
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 15:36
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D37B
Cone: 322:T1500F15U500




Max Depth: 14.650 m / 48.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD37B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 681322m Elev: 1191.00m
Sheet No: 1 of 1

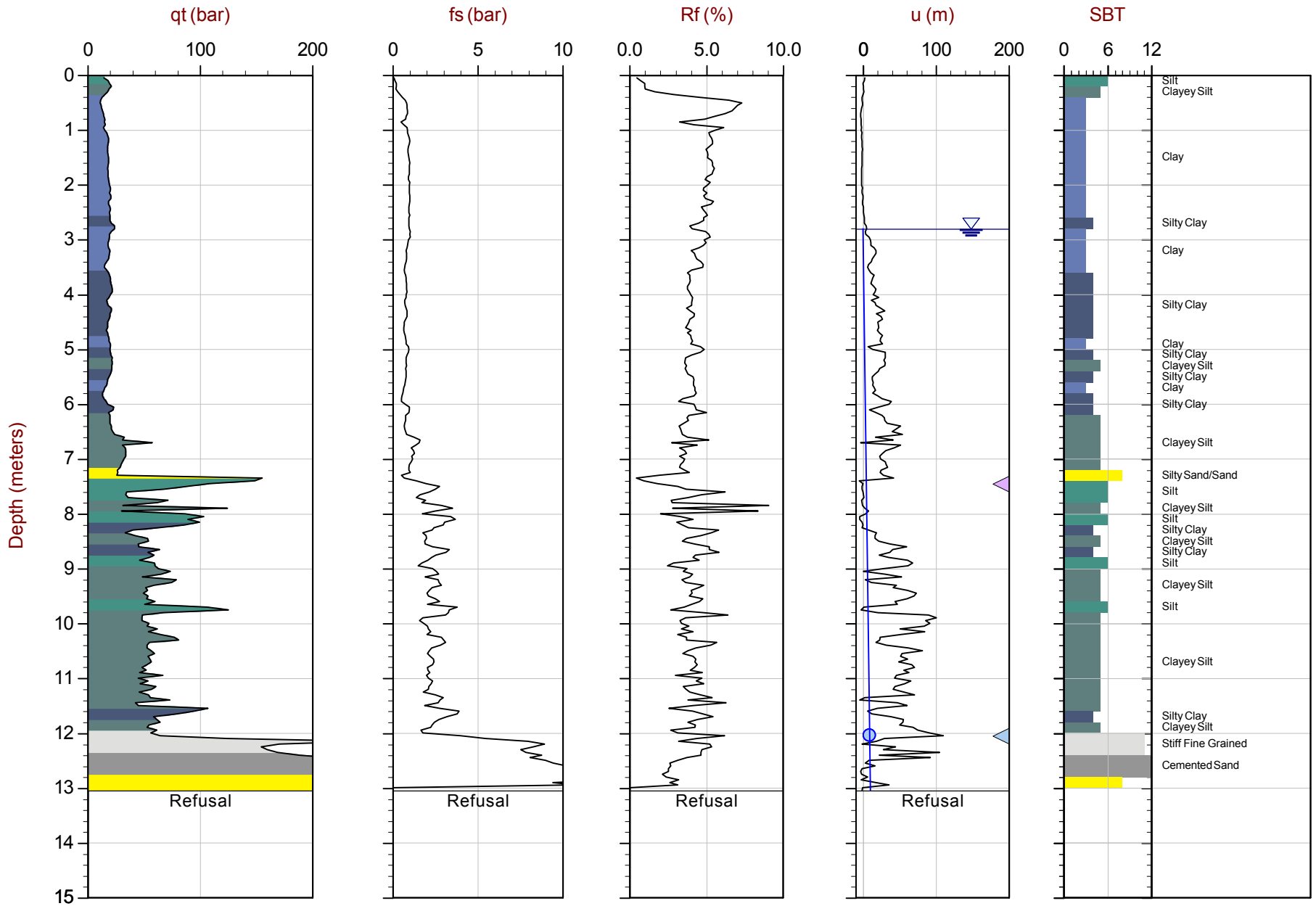
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 12:42
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D39
Cone: 322:T1500F15U500




Max Depth: 13.050 m / 42.81 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD39.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658690m E: 681332m Elev: 1191.43m
Sheet No: 1 of 1

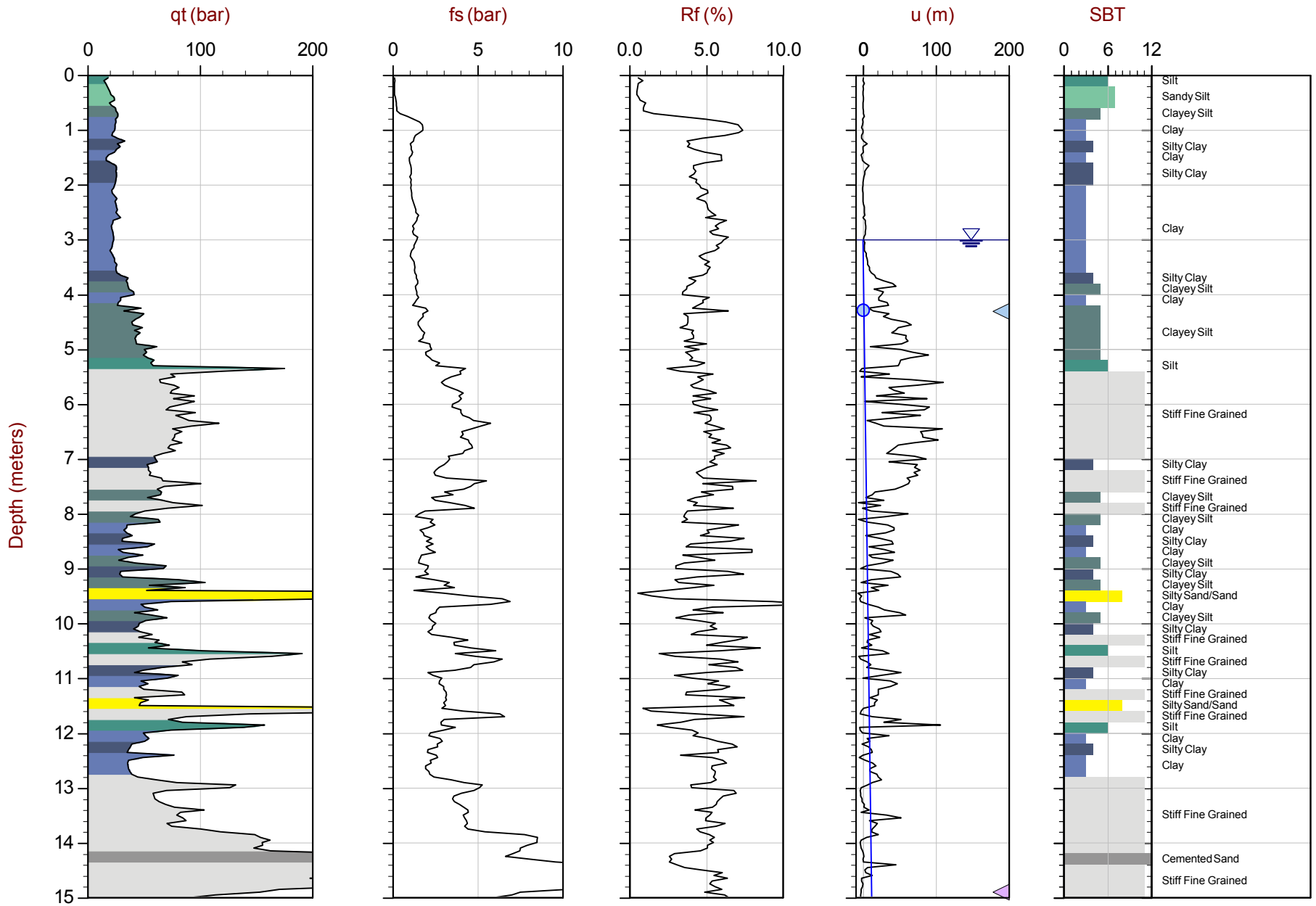
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 08:57
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D40
Cone: 322:T1500F15U500




Max Depth: 15.800 m / 51.84 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD40.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658792m E: 681323m Elev: 1191.05m
Sheet No: 1 of 2

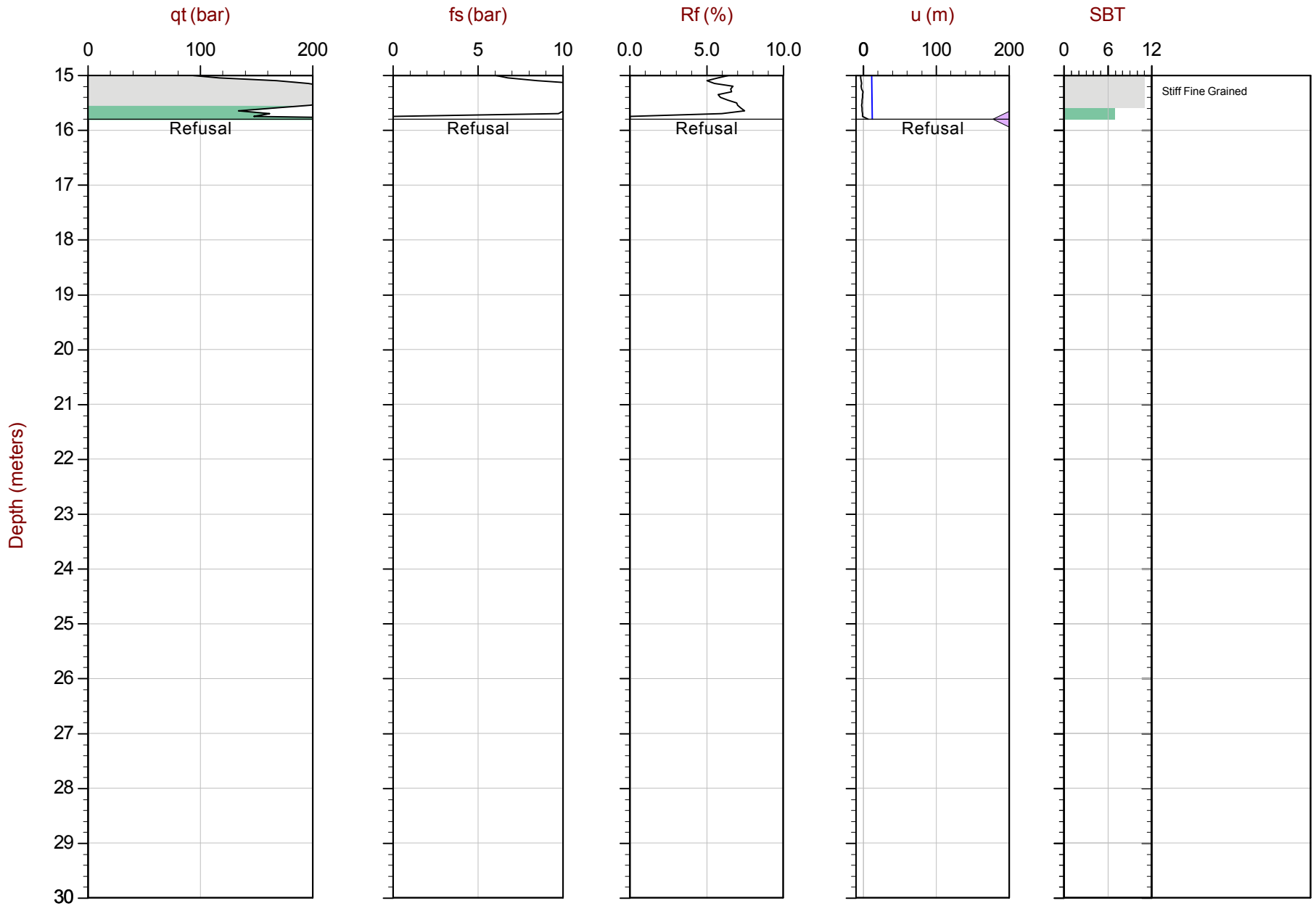
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 08:57
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D40
Cone: 322:T1500F15U500




Max Depth: 15.800 m / 51.84 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD40.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658792m E: 681323m Elev: 1191.05m
Sheet No: 2 of 2

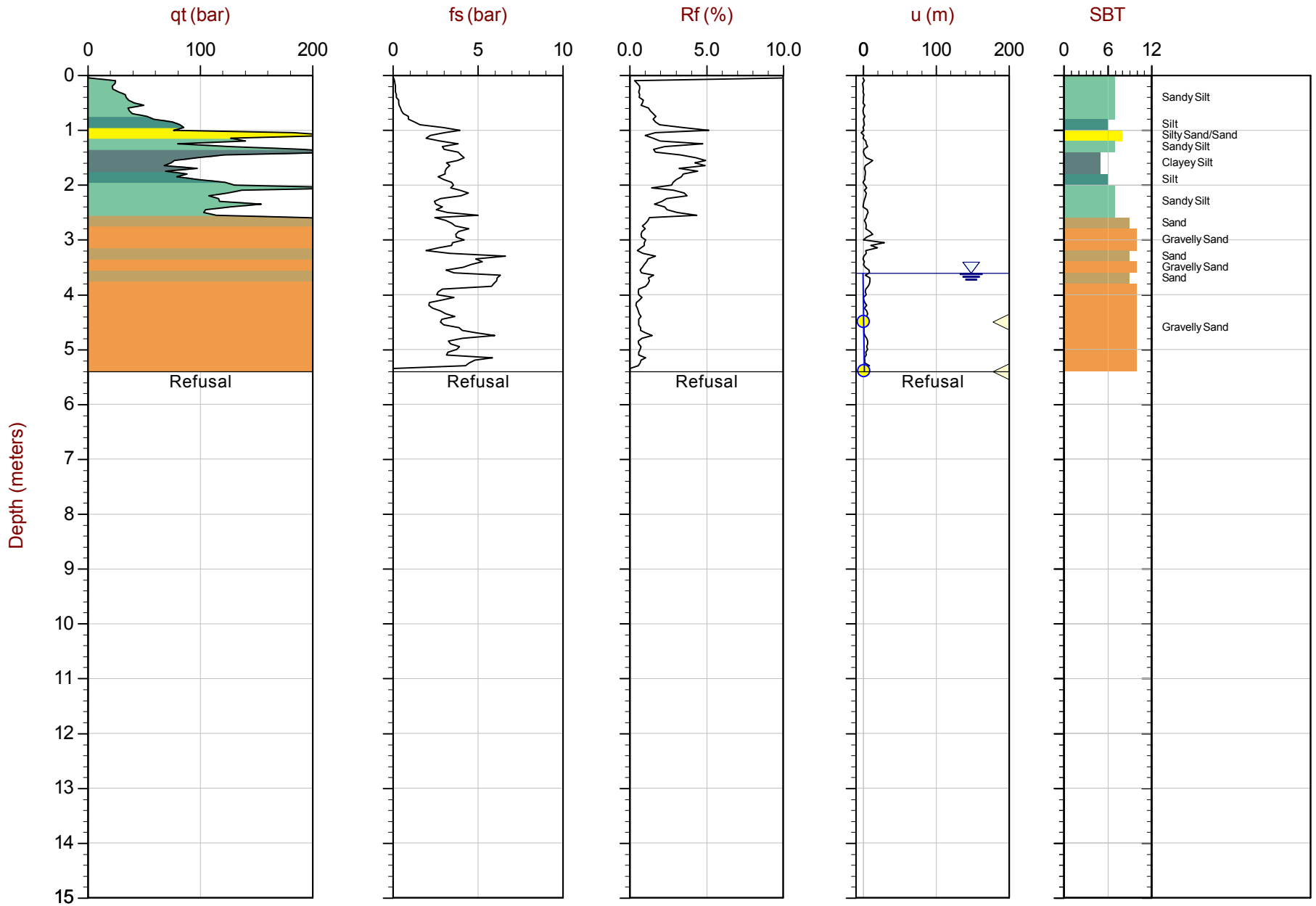
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 14:52
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41
Cone: 340:T1500F15U500




Max Depth: 5.400 m / 17.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD41.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658881m E: 681387m Elev: 1186.66m
Sheet No: 1 of 1

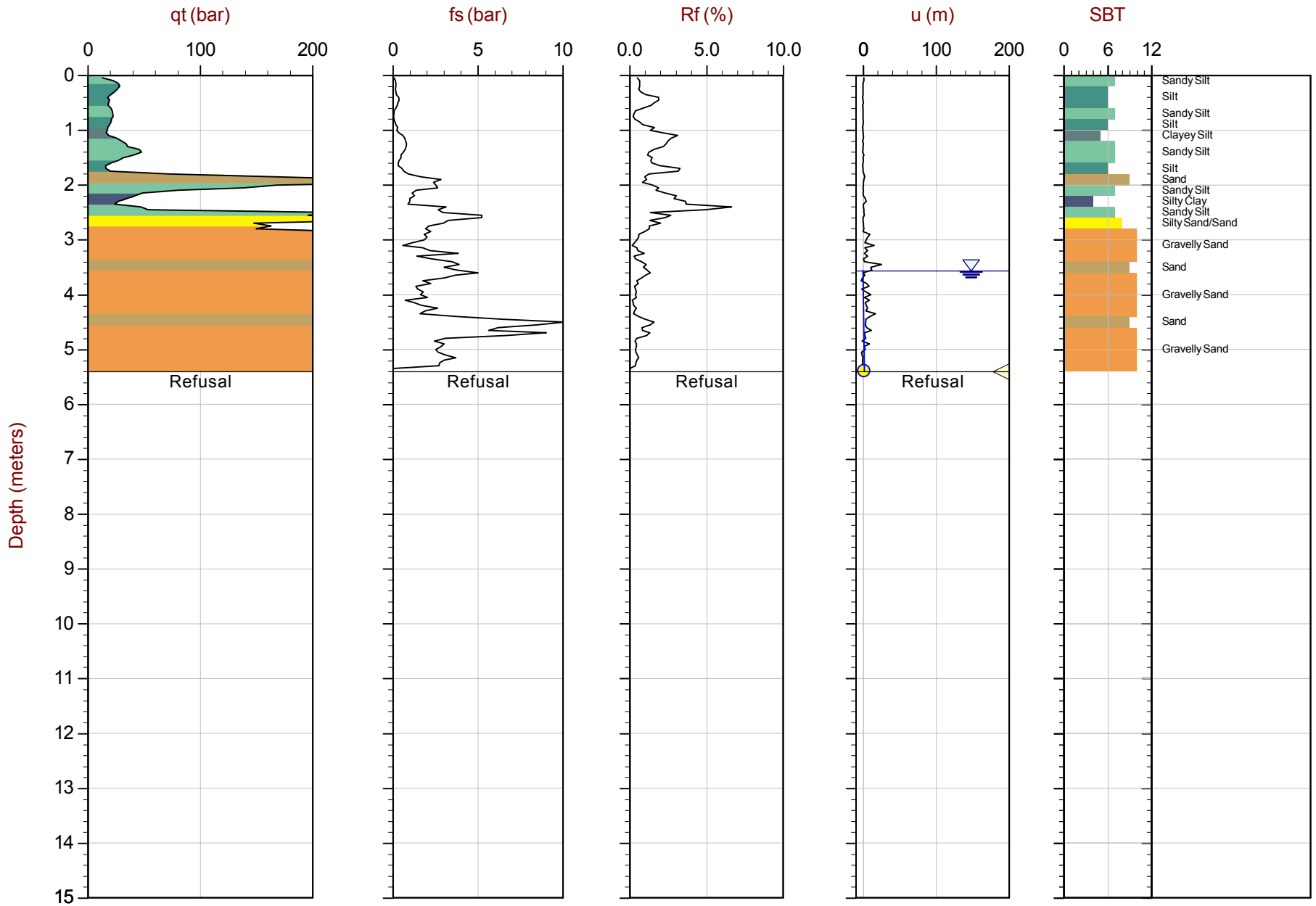
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 16:10
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41B
Cone: 340:T1500F15U500




Max Depth: 5.400 m / 17.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD41B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658878m E: 681392m Elev: 1187.00m
Sheet No: 1 of 1

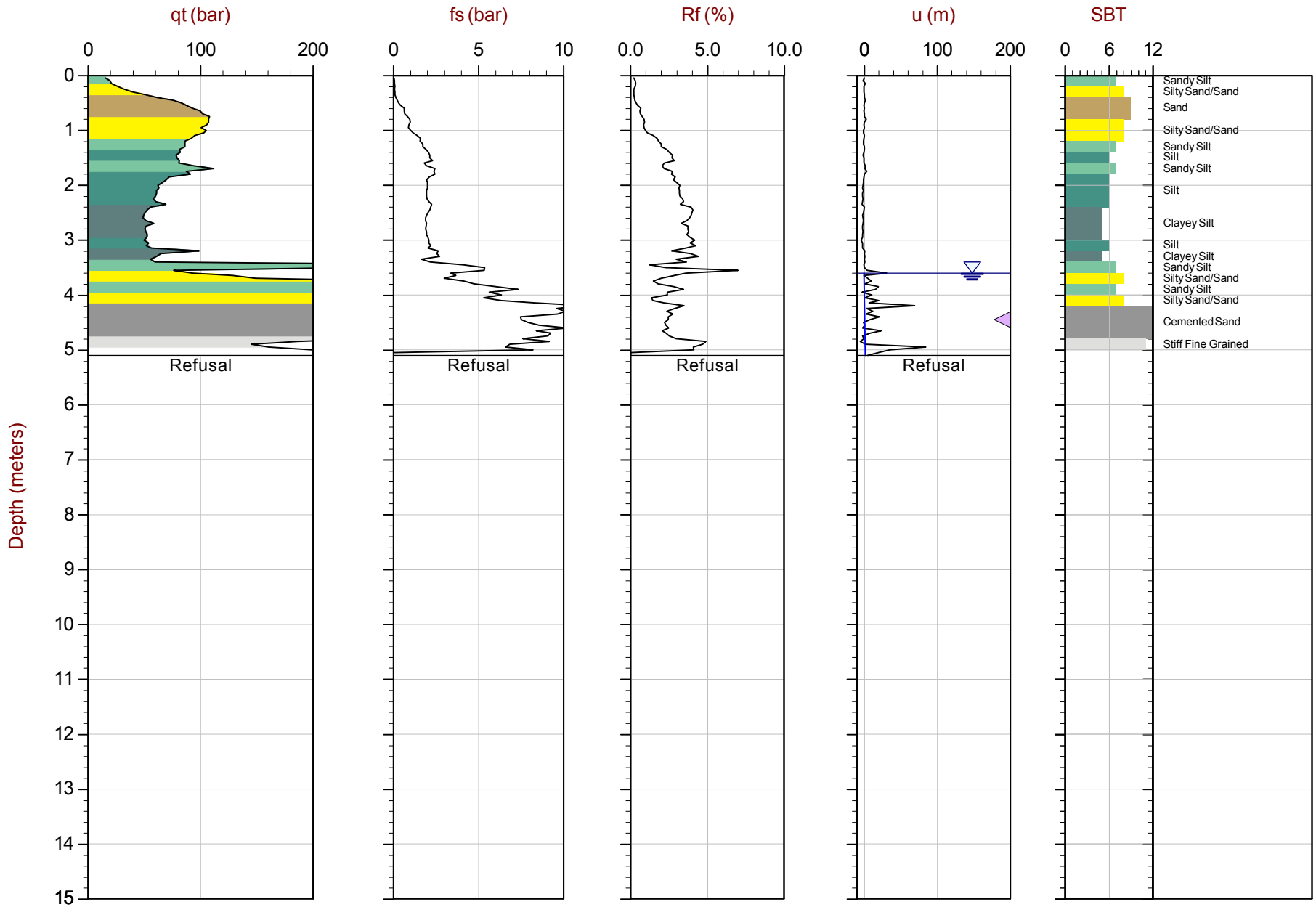
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 16:05
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D44
Cone: 340:T1500F15U500




Max Depth: 5.100 m / 16.73 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD44.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658924m E: 681508m Elev: 1188.50m
Sheet No: 1 of 1

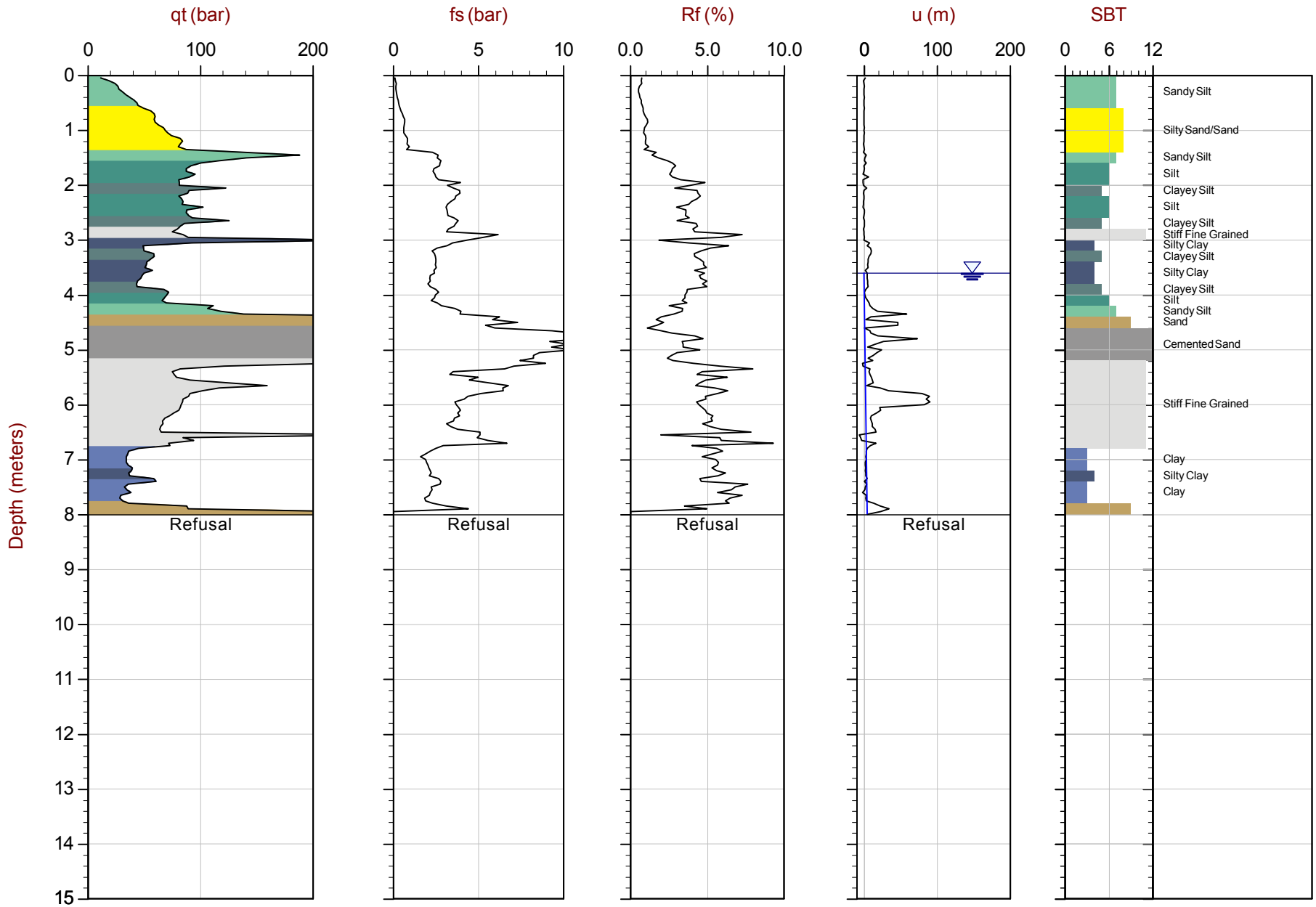
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 16:45
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D44B
Cone: 340:T1500F15U500




Max Depth: 8.000 m / 26.25 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD44B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658933m E: 681516m Elev: 1189.00m
Sheet No: 1 of 1

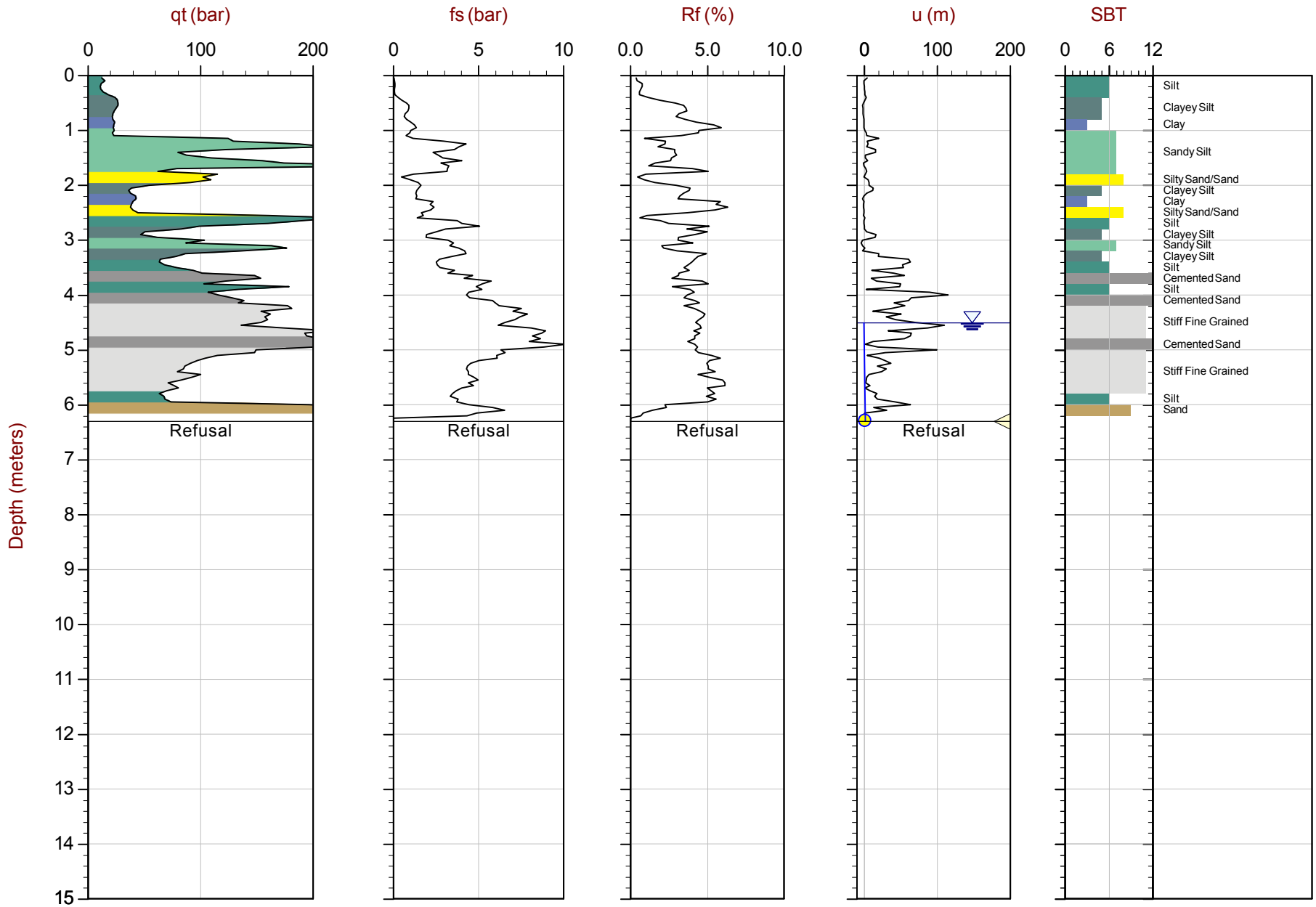
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 09:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D47
Cone: 340:T1500F15U500




Max Depth: 6.300 m / 20.67 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD47.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658970m E: 681337m Elev: 1187.42m
Sheet No: 1 of 1

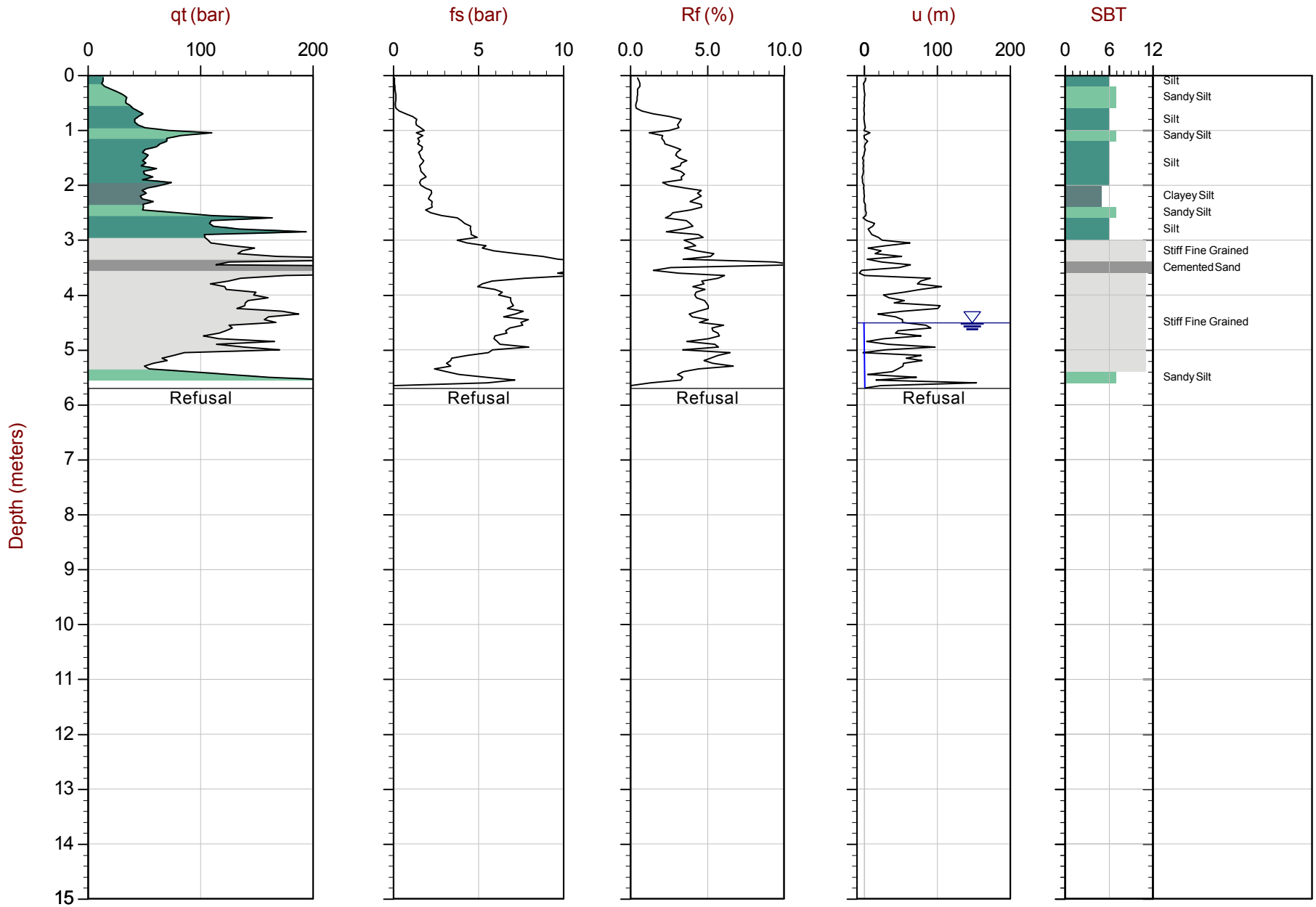
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 09:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D47B
Cone: 340:T1500F15U500




Max Depth: 5.700 m / 18.70 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD47B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658964m E: 681344m Elev: 1187.00m
Sheet No: 1 of 1

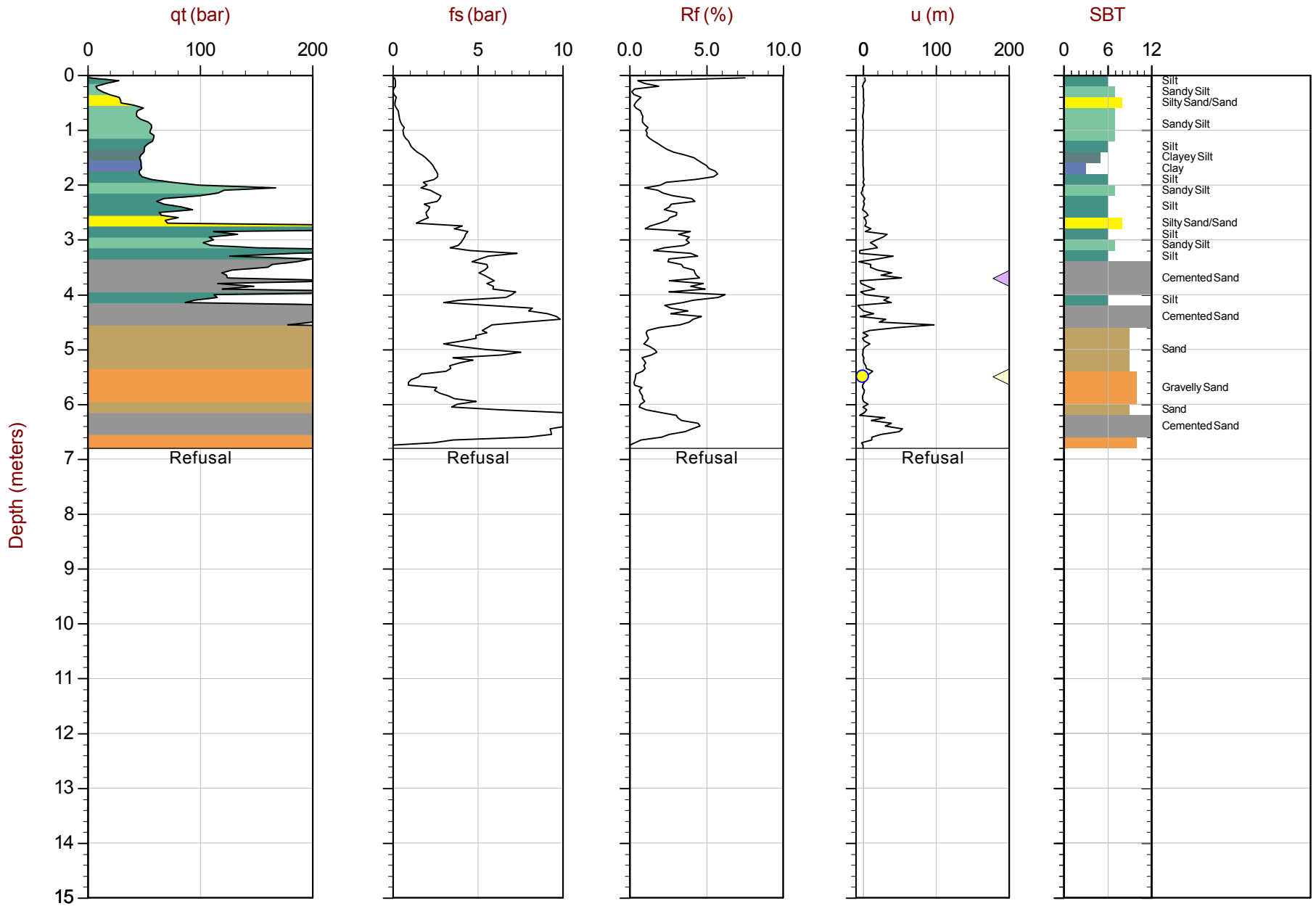
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 10:44
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49
Cone: 340:T1500F15U500




Max Depth: 6.800 m / 22.31 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD49.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659075m E: 681481m Elev: 1187.24m
Sheet No: 1 of 1

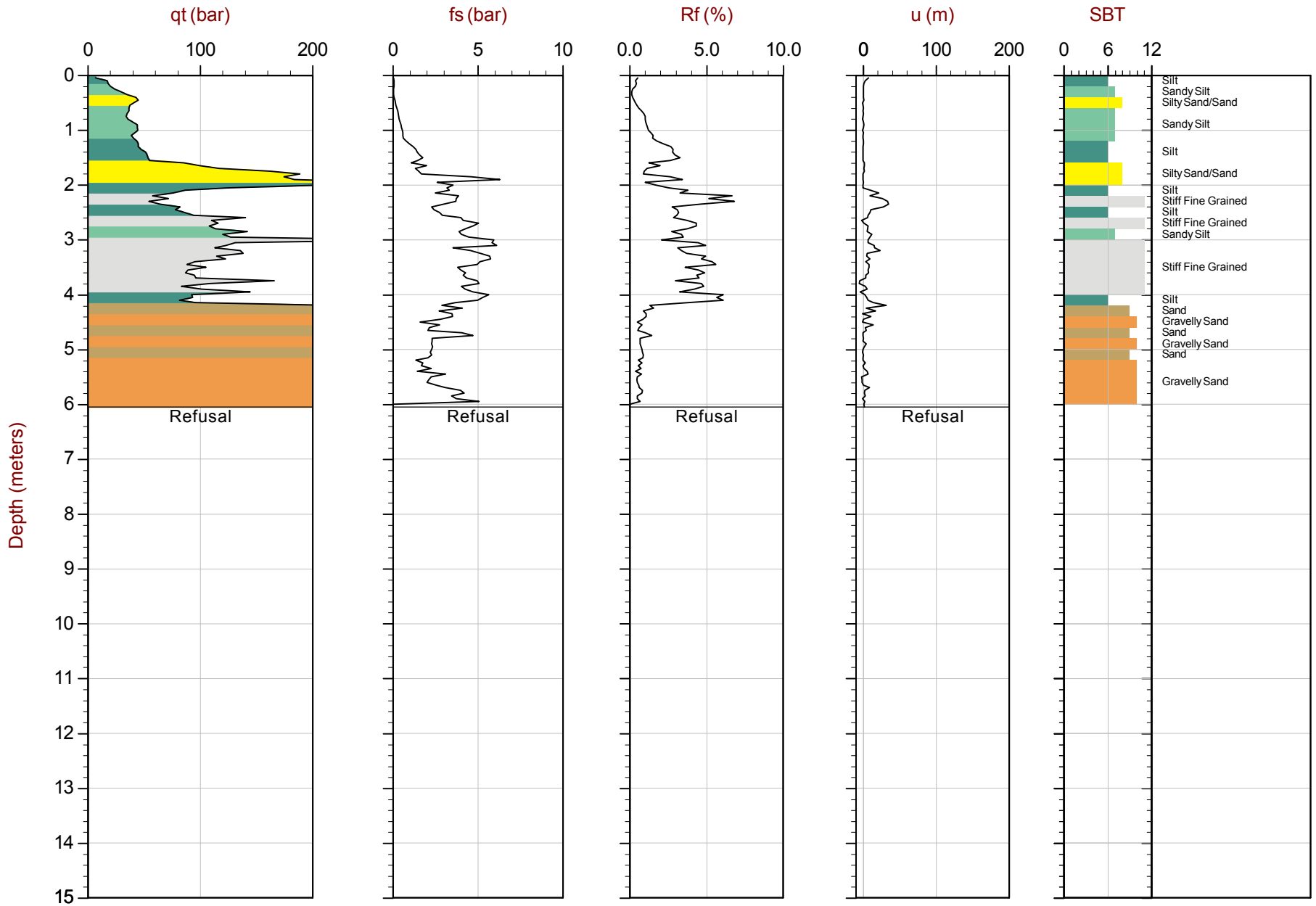
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 15:20
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49B
Cone: 340:T1500F15U500




Max Depth: 6.050 m / 19.85 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD49B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659077m E: 681469m Elev: 1187.00m
Sheet No: 1 of 1

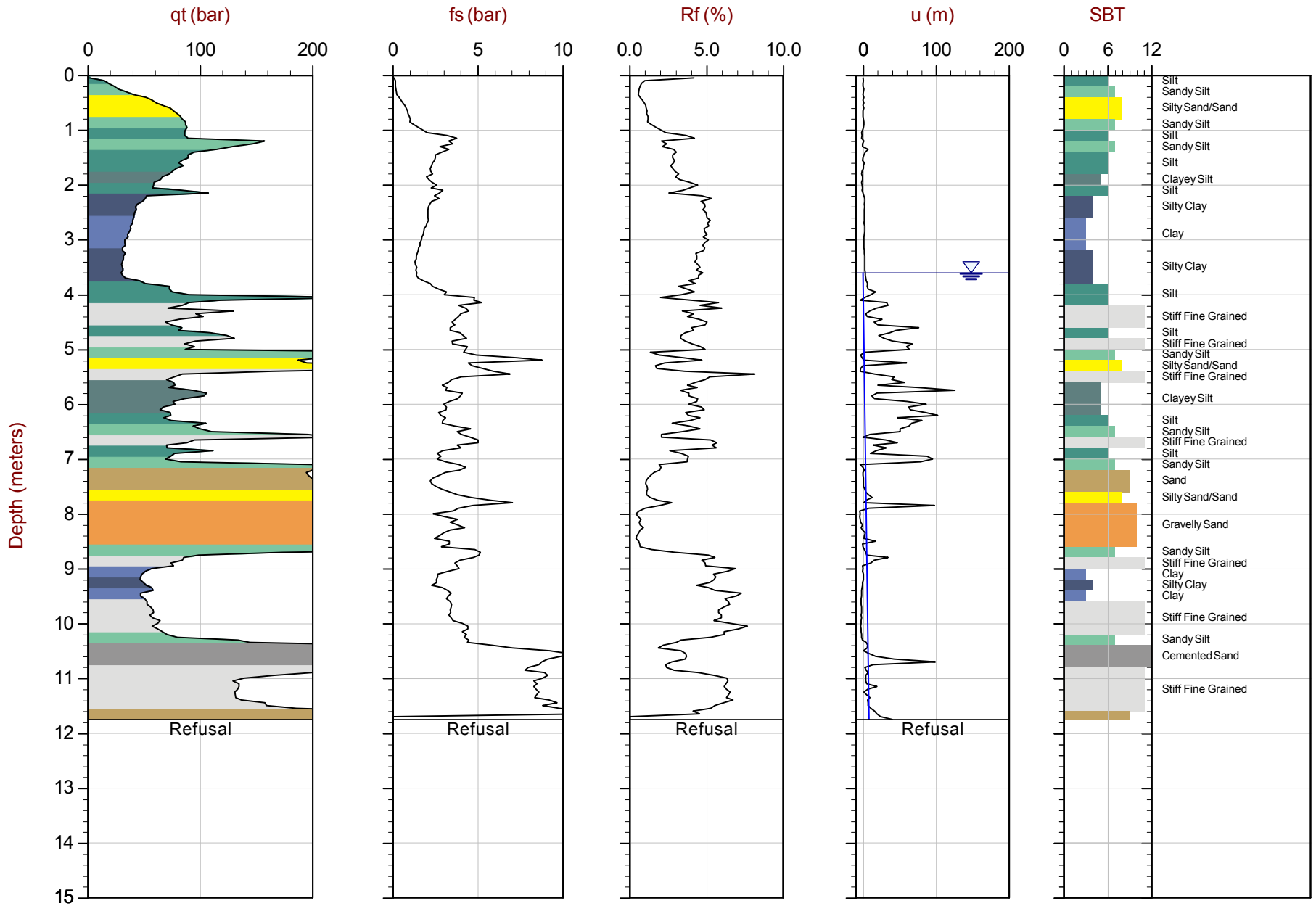
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 17:17
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D50
Cone: 340:T1500F15U500




Max Depth: 11.750 m / 38.55 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD50.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659098m E: 681364m Elev: N/Am
Sheet No: 1 of 1

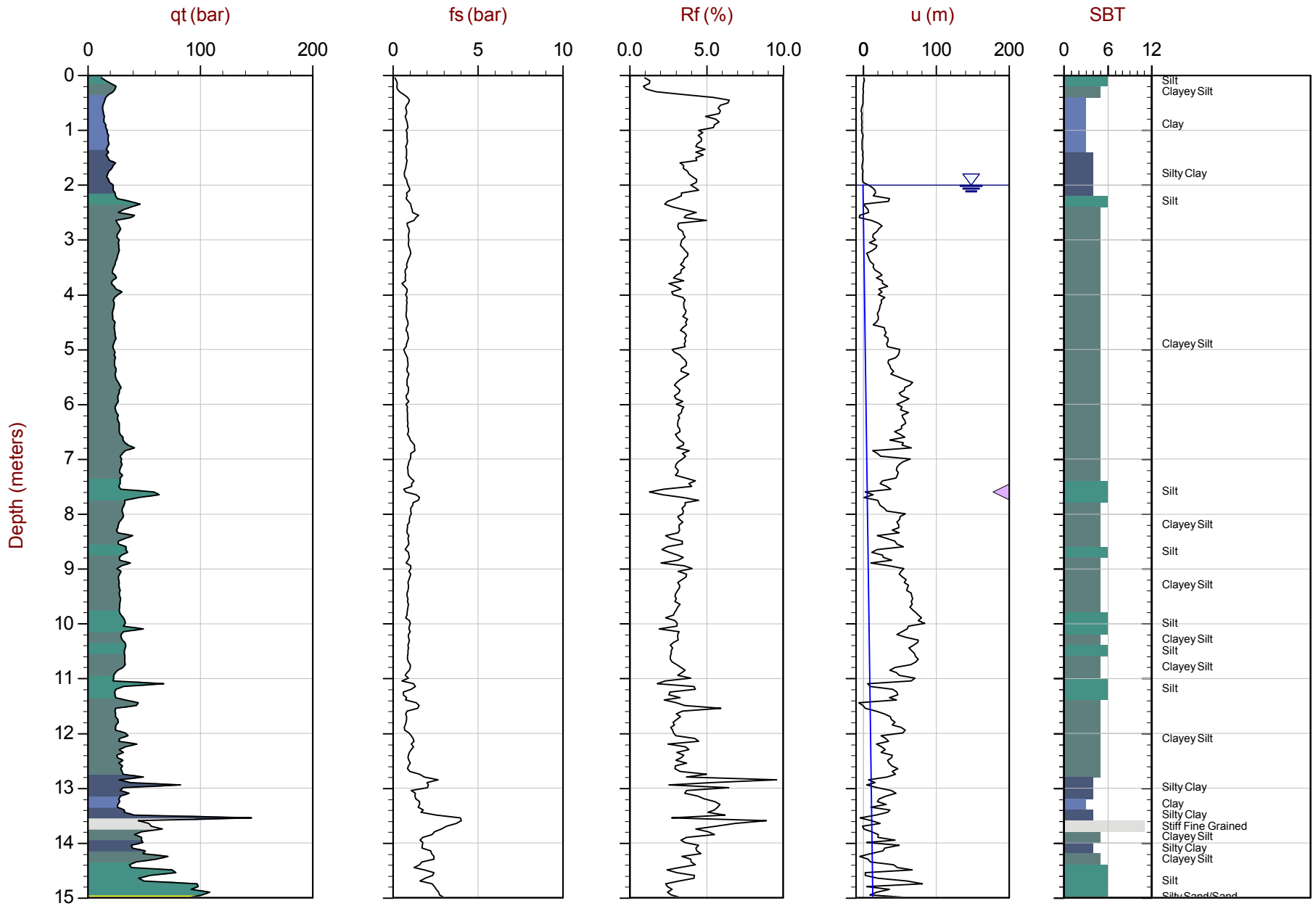
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 17:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D57
Cone: 388:T1500F15U500




Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD57.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658705m E: 680883m Elev: 1191.58m
Sheet No: 1 of 2

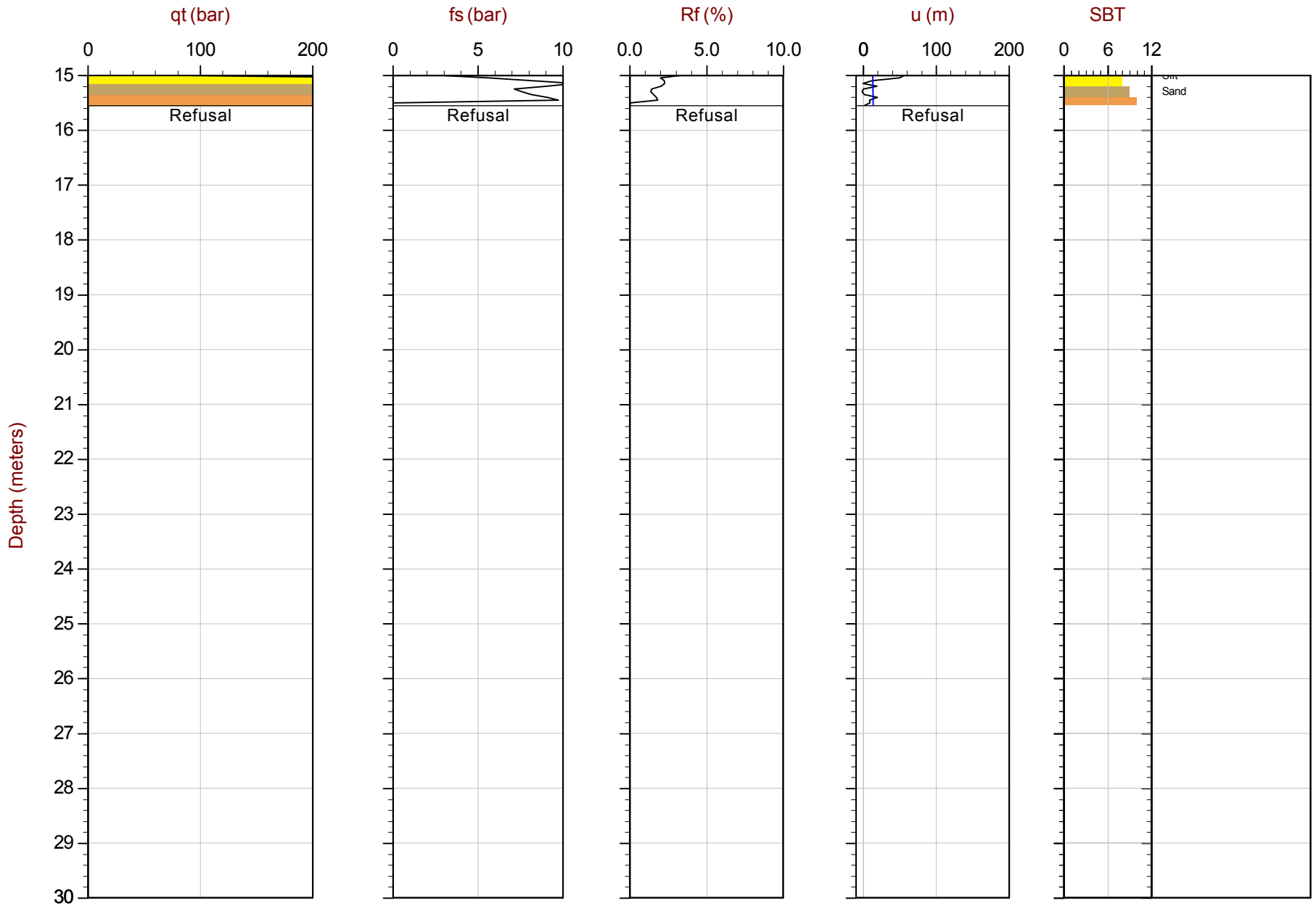
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 17:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D57
Cone: 388:T1500F15U500




Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD57.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658705m E: 680883m Elev: 1191.58m
Sheet No: 2 of 2

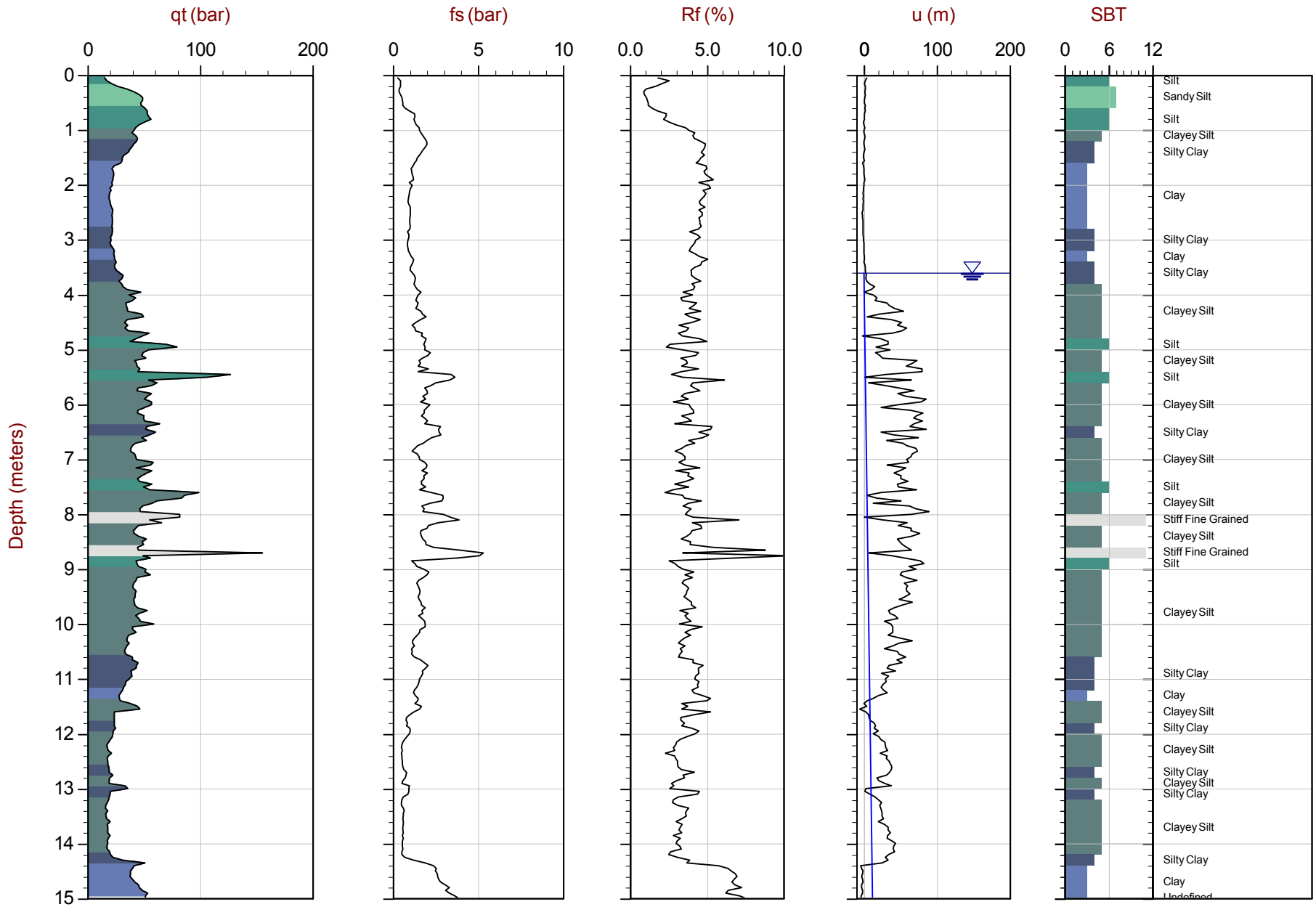
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 18:18
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D58
Cone: 388:T1500F15U500




Max Depth: 16.600 m / 54.46 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD58.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658857m E: 681120m Elev: 1190.20m
Sheet No: 1 of 2

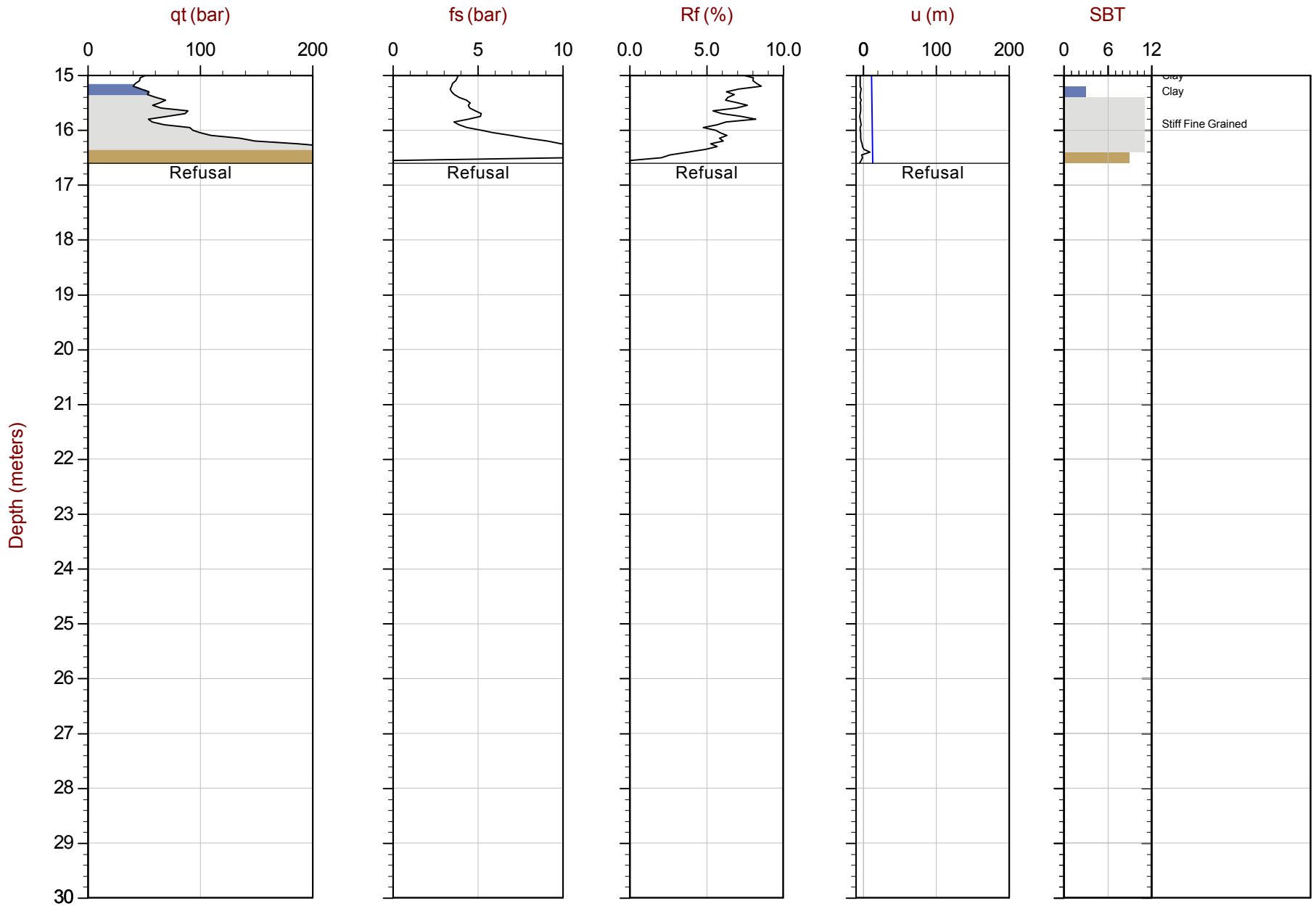
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 18:18
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D58
Cone: 388:T1500F15U500




Max Depth: 16.600 m / 54.46 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD58.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658857m E: 681120m Elev: 1190.20m
Sheet No: 2 of 2

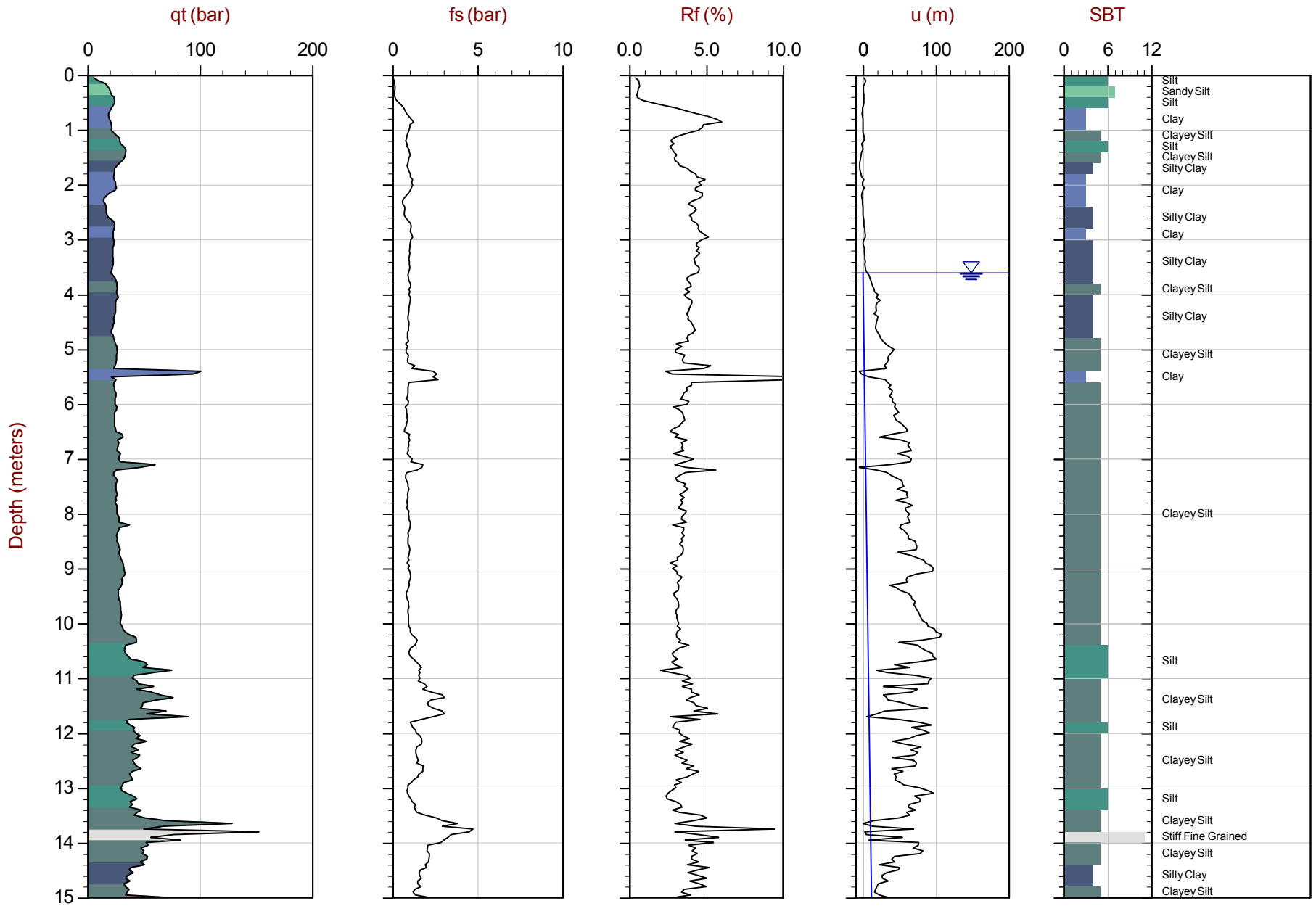
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 15:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D60
Cone: 388:T1500F15U500




Max Depth: 17.250 m / 56.59 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD60.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658594m E: 680974m Elev: 1191.99m
Sheet No: 1 of 2

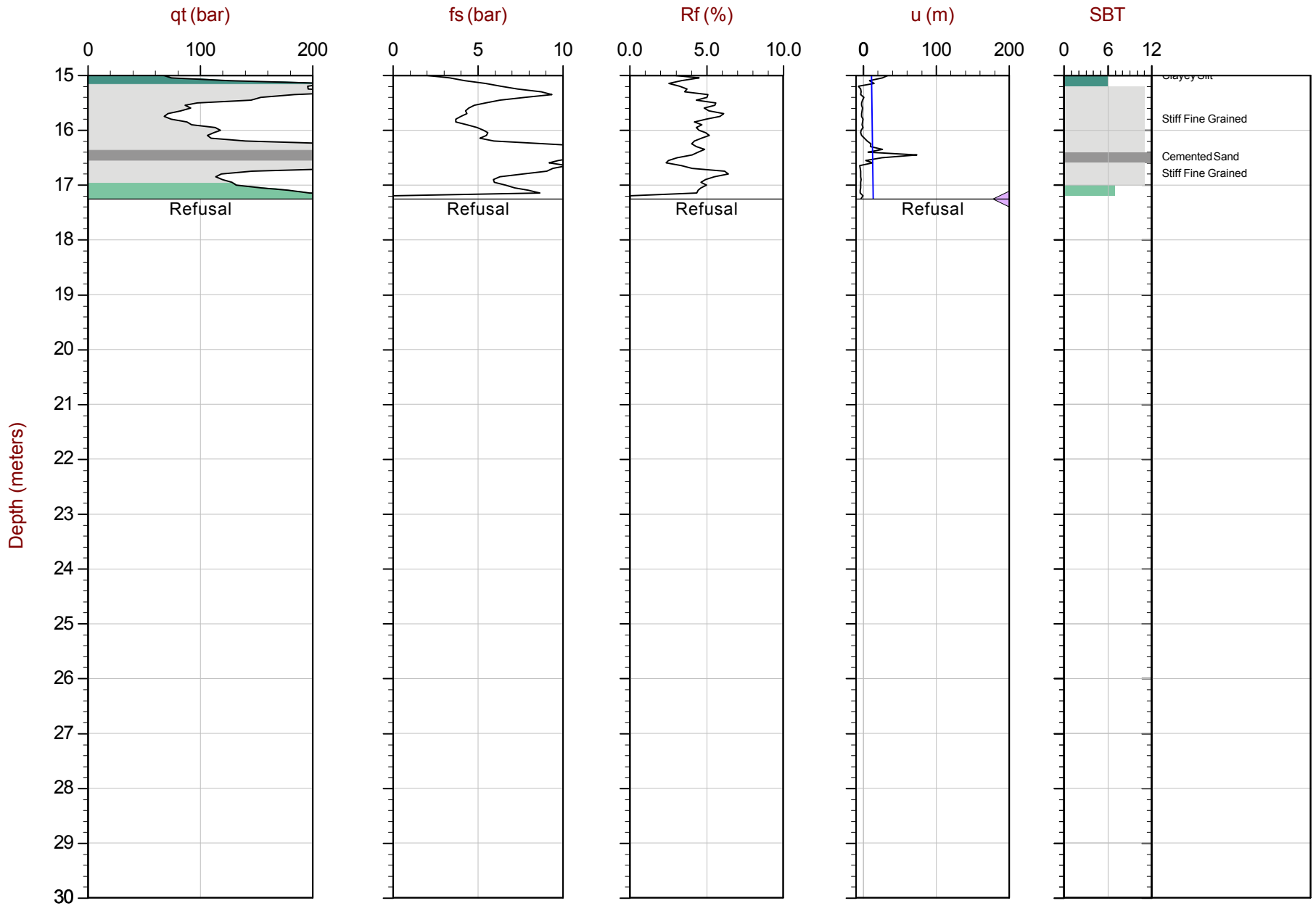
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 15:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D60
Cone: 388:T1500F15U500




Max Depth: 17.250 m / 56.59 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD60.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658594m E: 680974m Elev: 1191.99m
Sheet No: 2 of 2

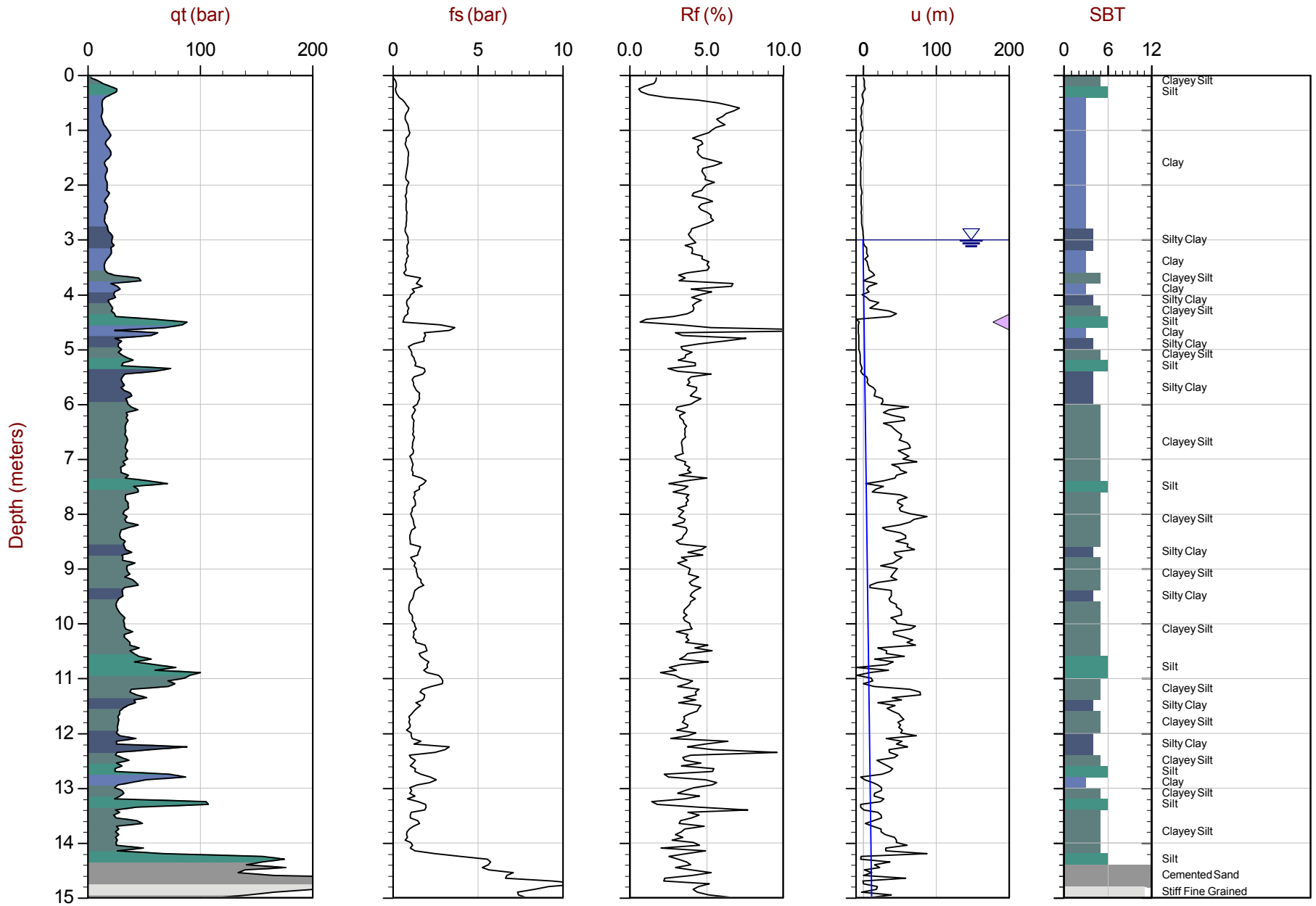
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

# Stantec

Job No: 16-03023
Date: 2016/06/27 14:22
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D61
Cone: 388:T1500F15U500




Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD61.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658730m E: 681139m Elev: 1190.36m
Sheet No: 1 of 2

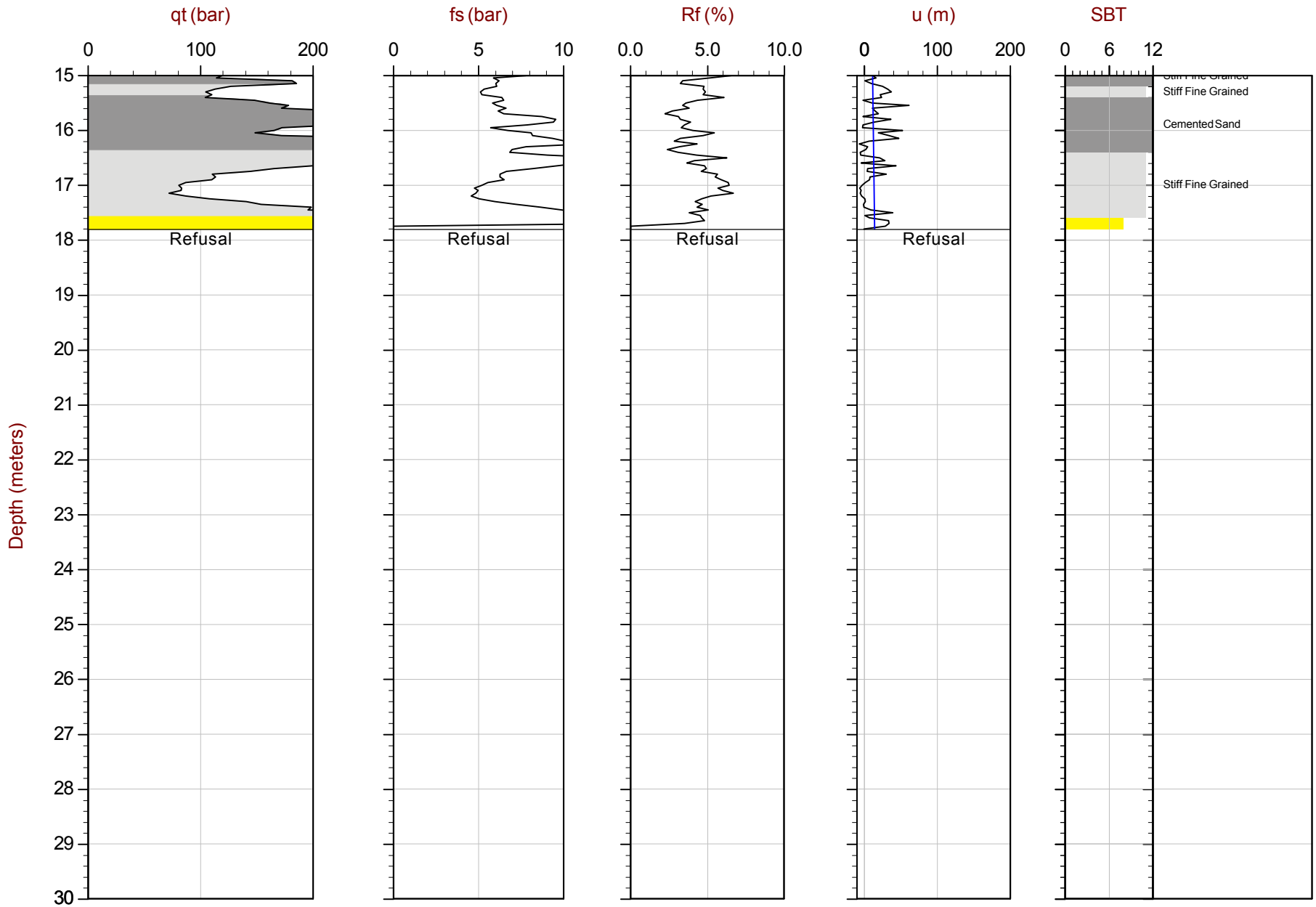
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 14:22
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D61
Cone: 388:T1500F15U500




Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD61.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658730m E: 681139m Elev: 1190.36m
Sheet No: 2 of 2

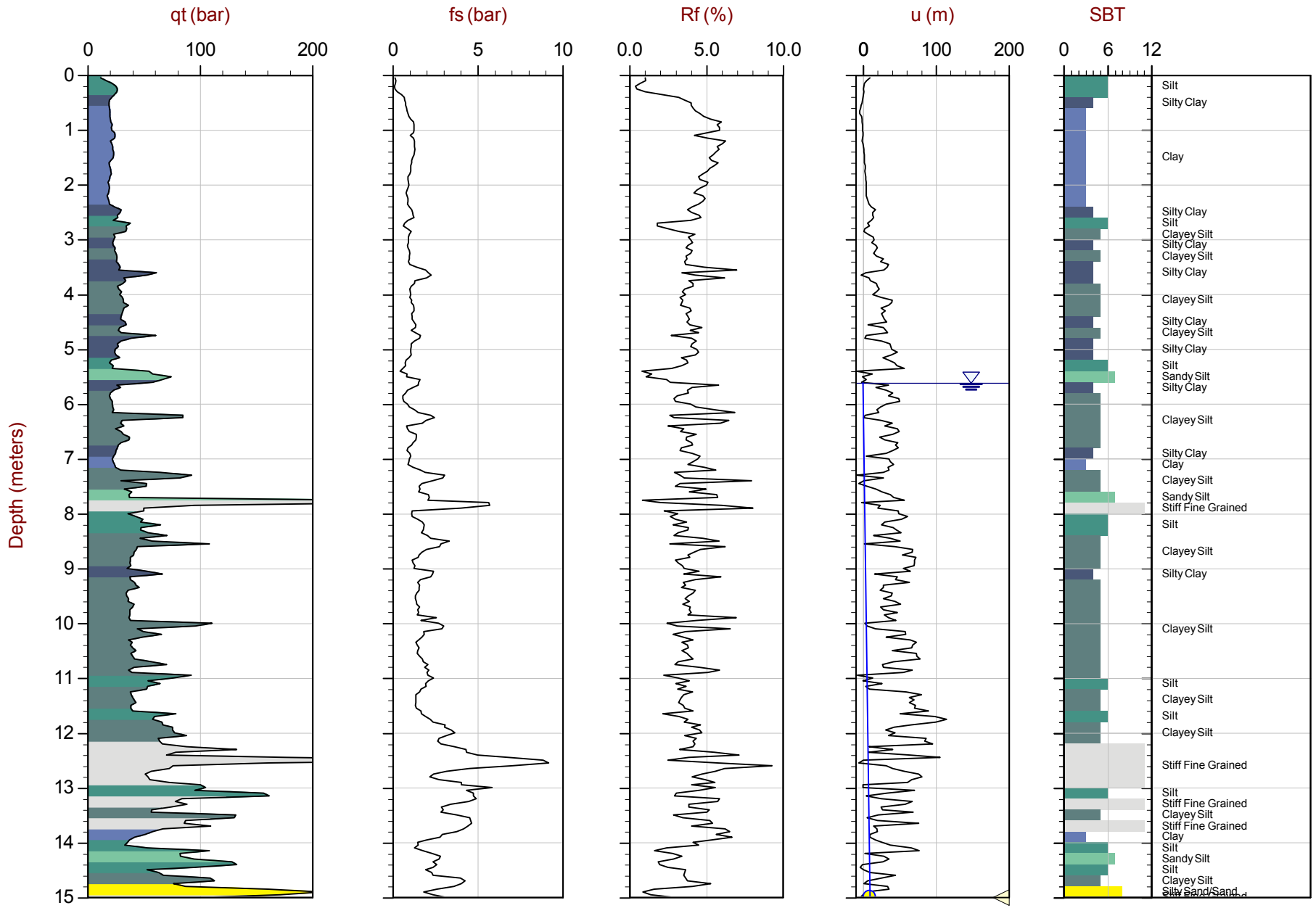
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

# Stantec

Job No: 16-03023
Date: 2016/06/27 12:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D63
Cone: 388:T1500F15U500




Max Depth: 18.550 m / 60.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD63.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658576m E: 681057m Elev: 1191.66m
Sheet No: 1 of 2

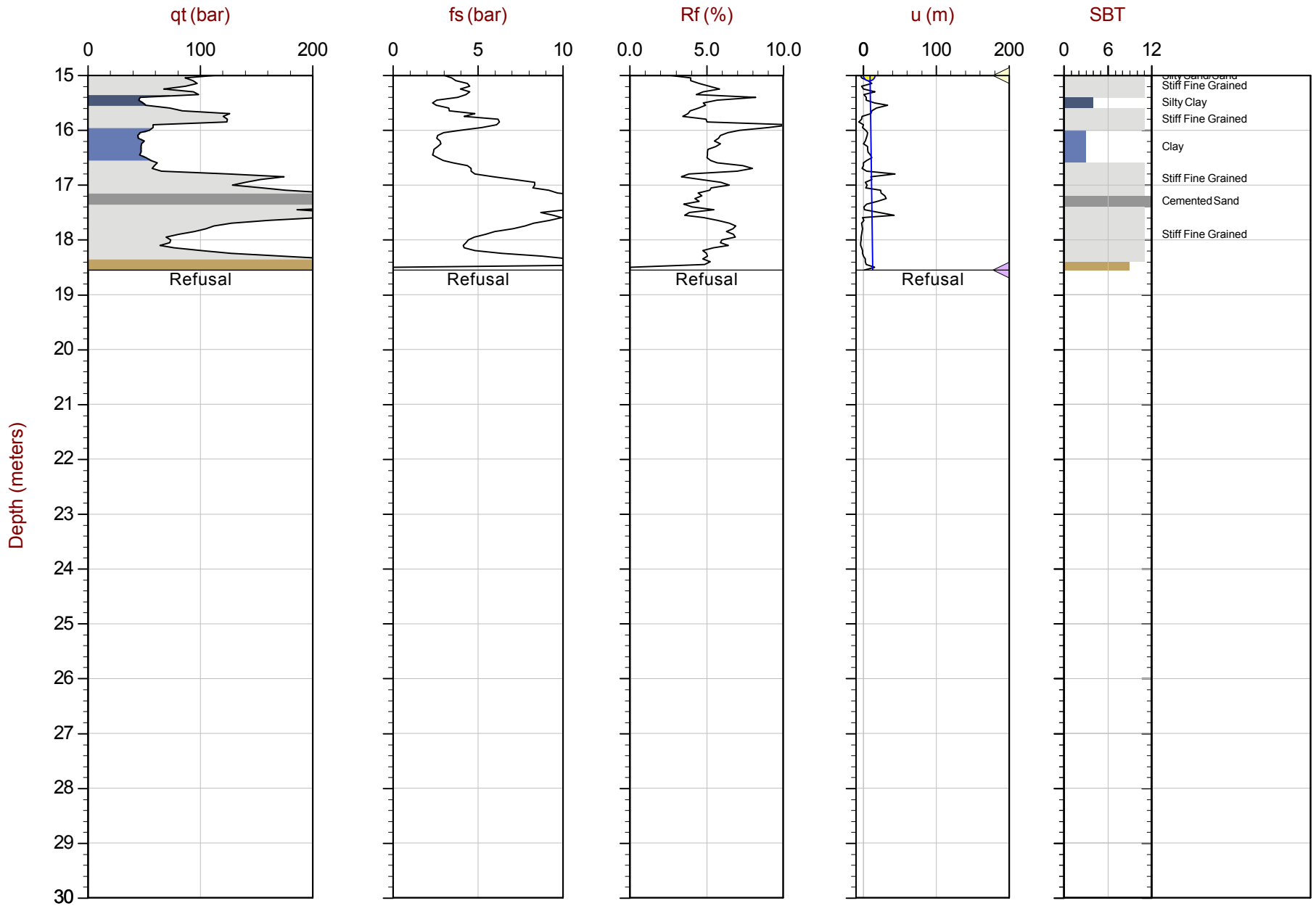
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 12:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D63
Cone: 388:T1500F15U500




Max Depth: 18.550 m / 60.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD63.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658576m E: 681057m Elev: 1191.66m
Sheet No: 2 of 2

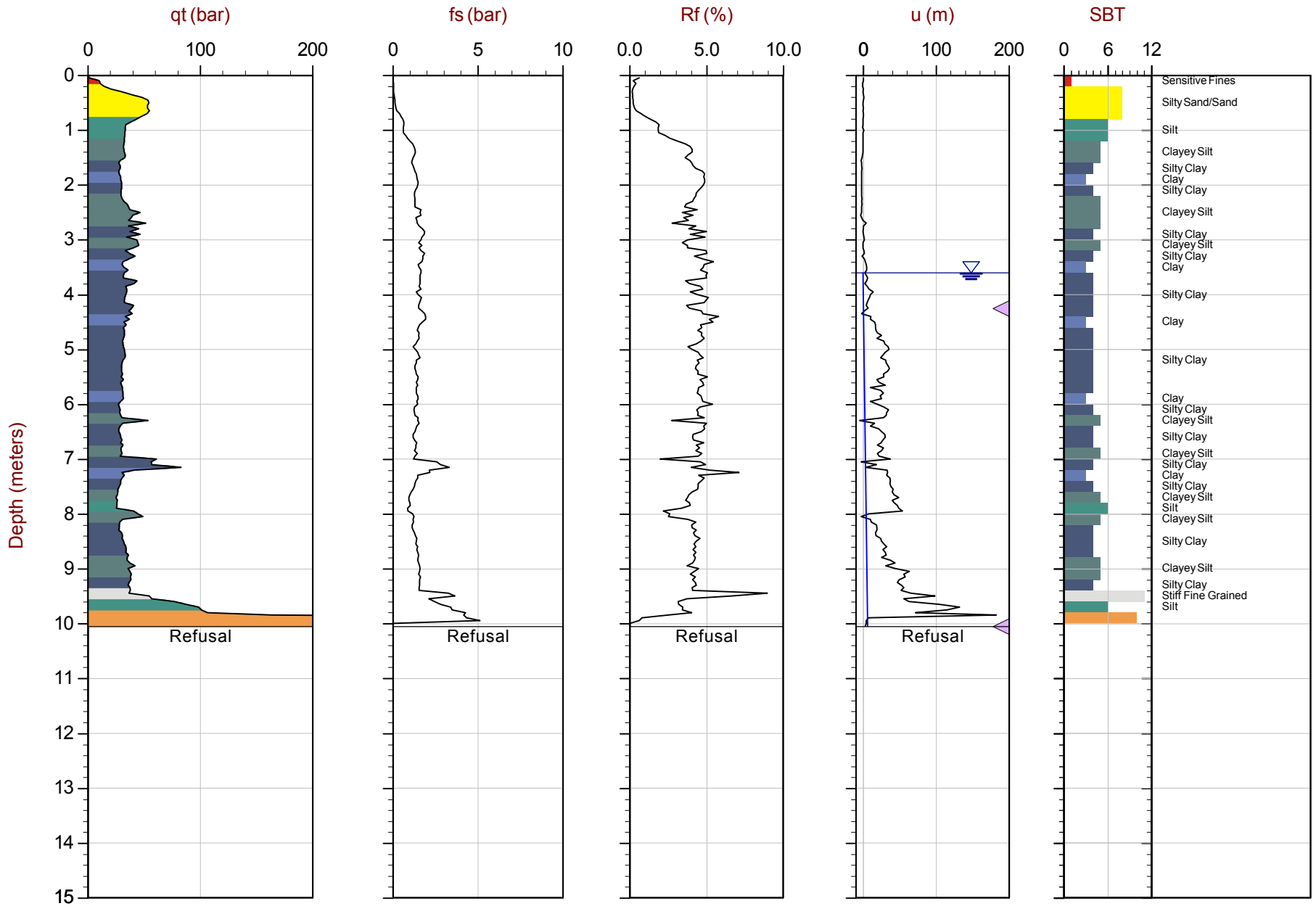
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 12:45
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64
Cone: 340:T1500F15U500




Max Depth: 10.050 m / 32.97 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD64.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659109m E: 681555m Elev: 1193.60m
Sheet No: 1 of 1

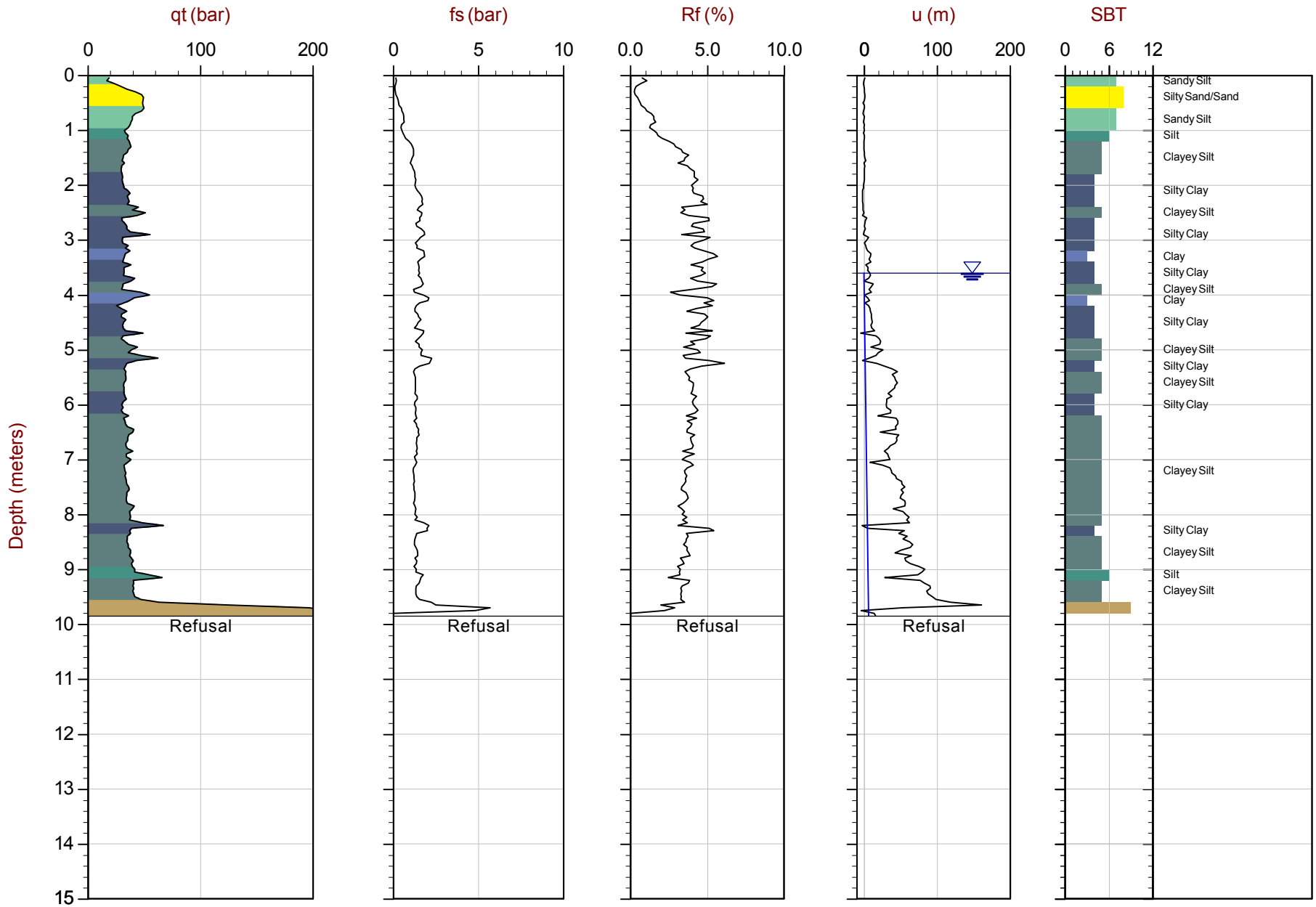
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 14:30
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64B
Cone: 340:T1500F15U500




Max Depth: 9.850 m / 32.32 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD64B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659109m E: 681563m Elev: 1194.00m
Sheet No: 1 of 1

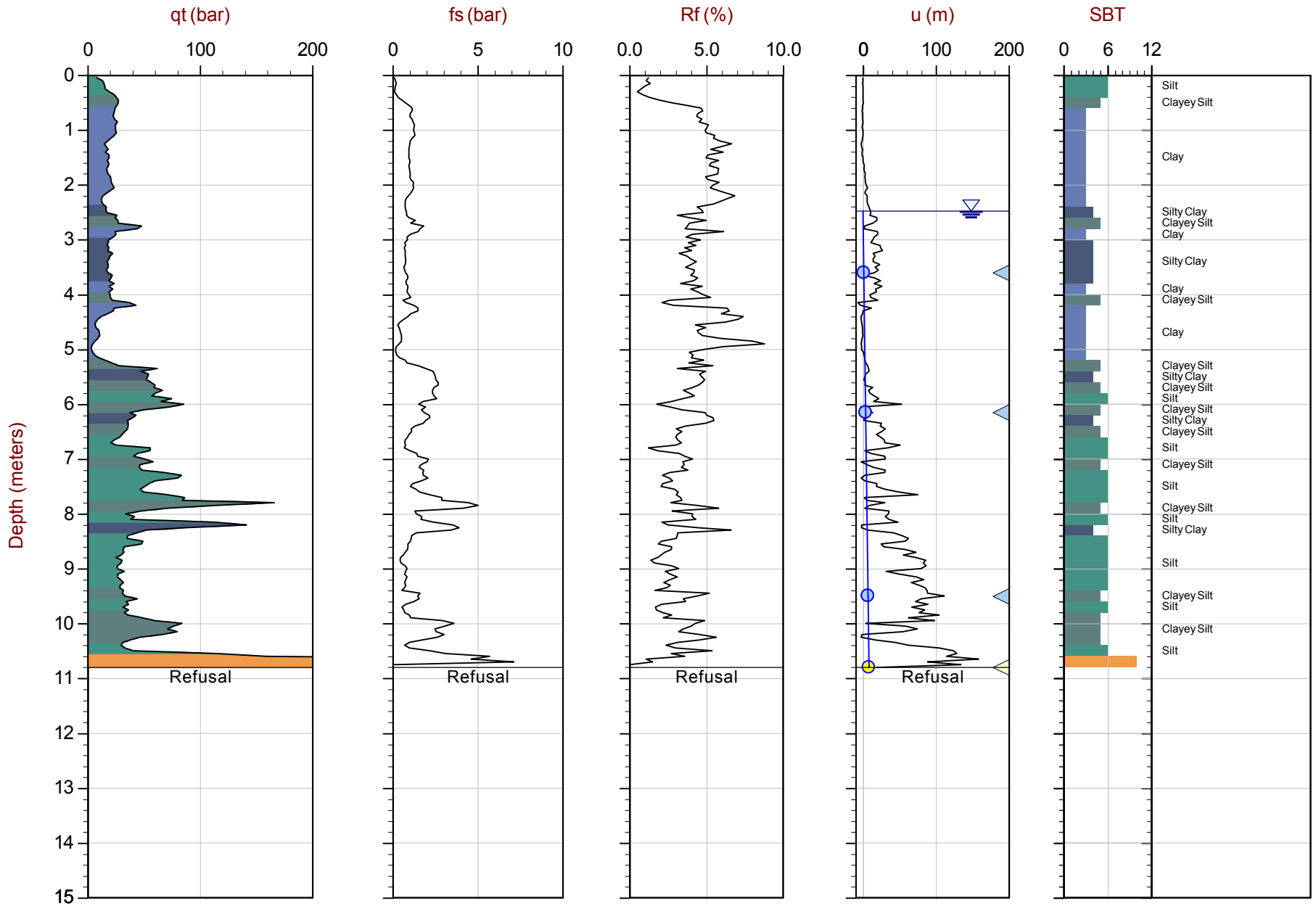
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 11:03
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC26
Cone: 322:T1500F15U500




Max Depth: 10.800 m / 35.43 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPDC26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658614m E: 678554m Elev: 1203.84m
Sheet No: 1 of 1

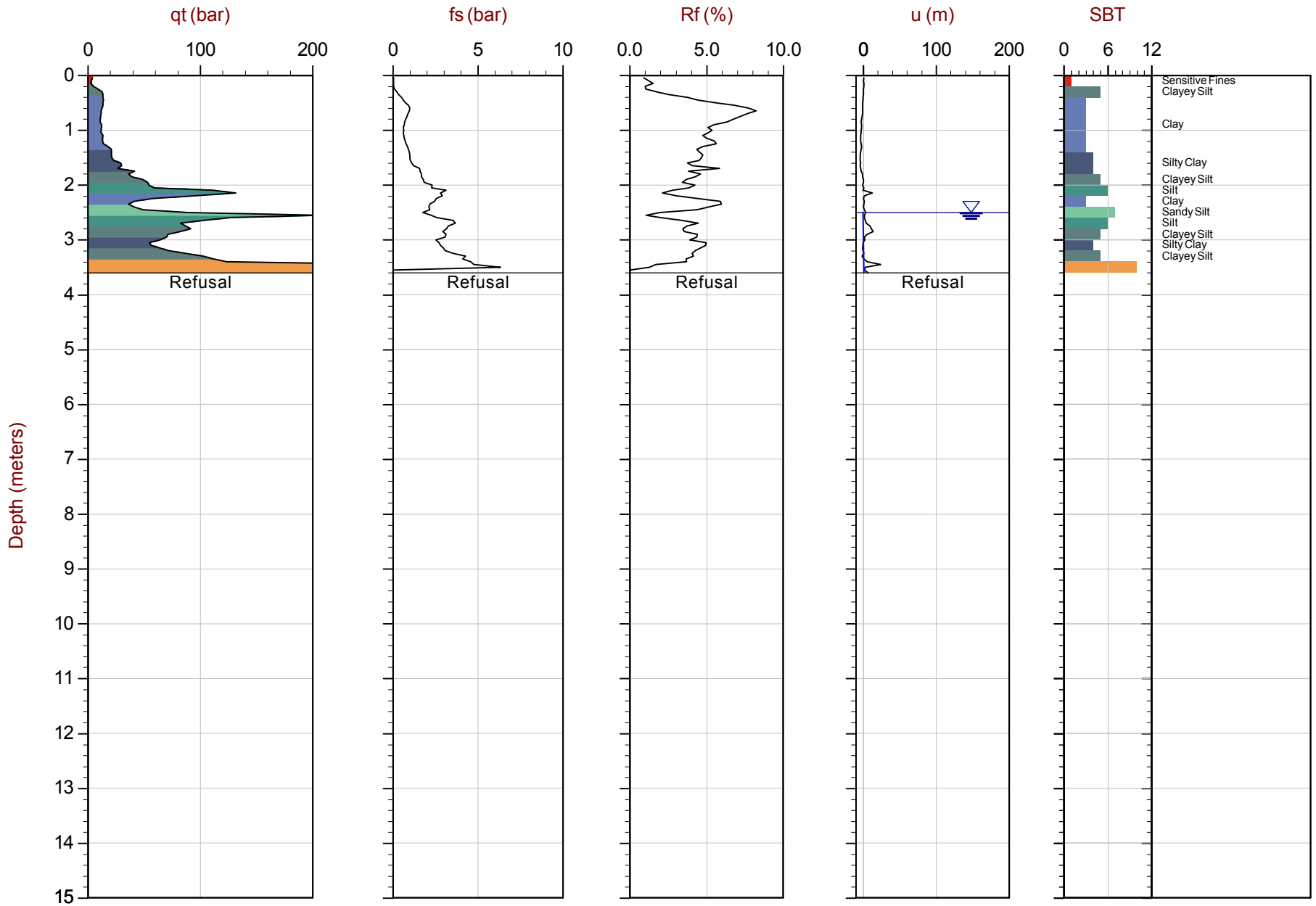
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 08:48
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-DC29
Cone: 340:T1500F15U500




Max Depth: 3.600 m / 11.81 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPDC29.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658883m E: 678748m Elev: 1213.98m
Sheet No: 1 of 1

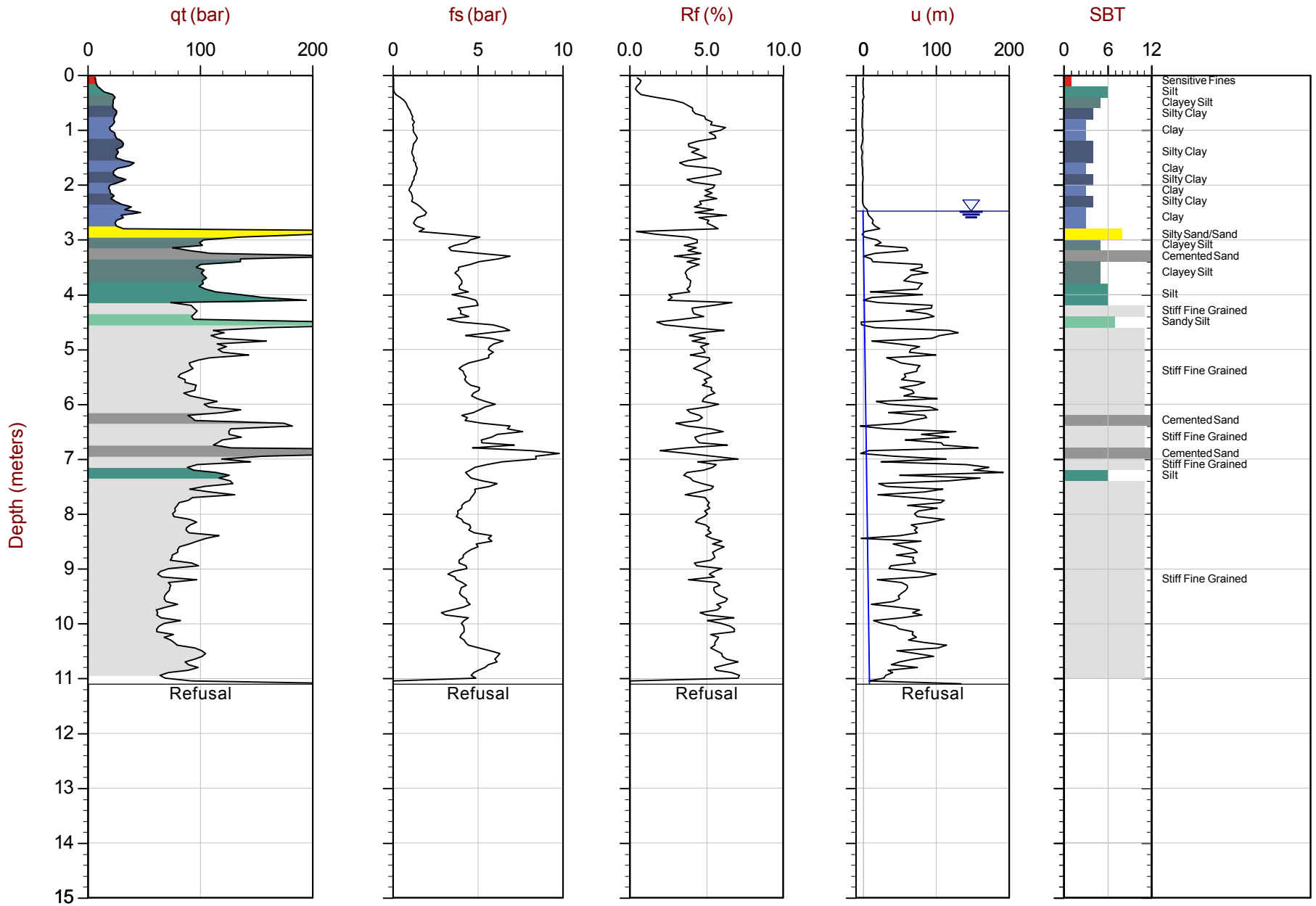
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 17:27
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC31
Cone: 340:T1500F15U500




Max Depth: 11.100 m / 36.42 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPDC31.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659261m E: 678799m Elev: 1207.38m
Sheet No: 1 of 1

Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

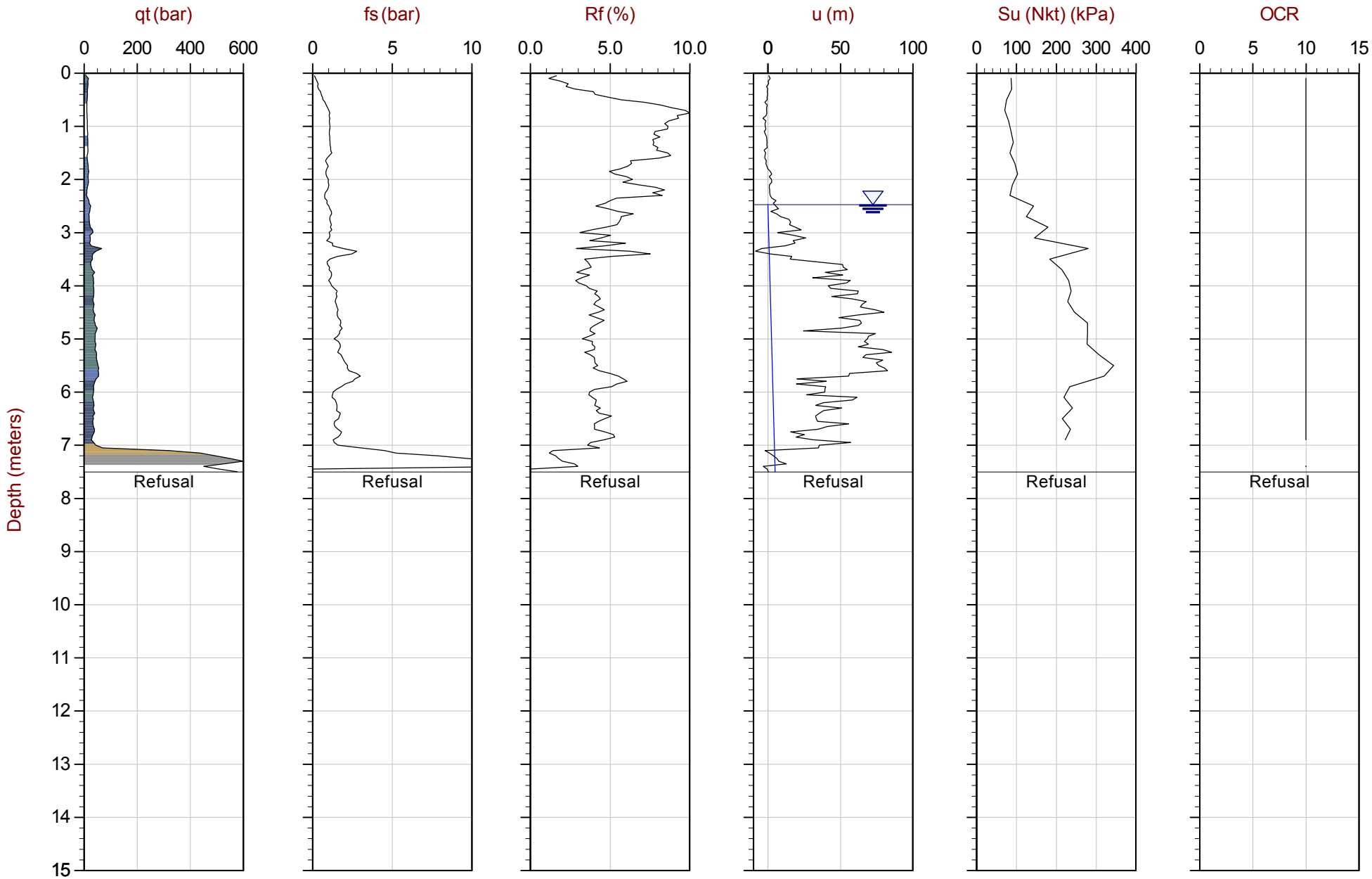
# Advanced Cone Penetration Test Plots

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 13:26
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D01
Cone: 322:T1500F15U500




Max Depth: 7.500 m / 24.61 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD01.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658731m E: 678831m Elev: 1209.77m
Sheet No: 1 of 1

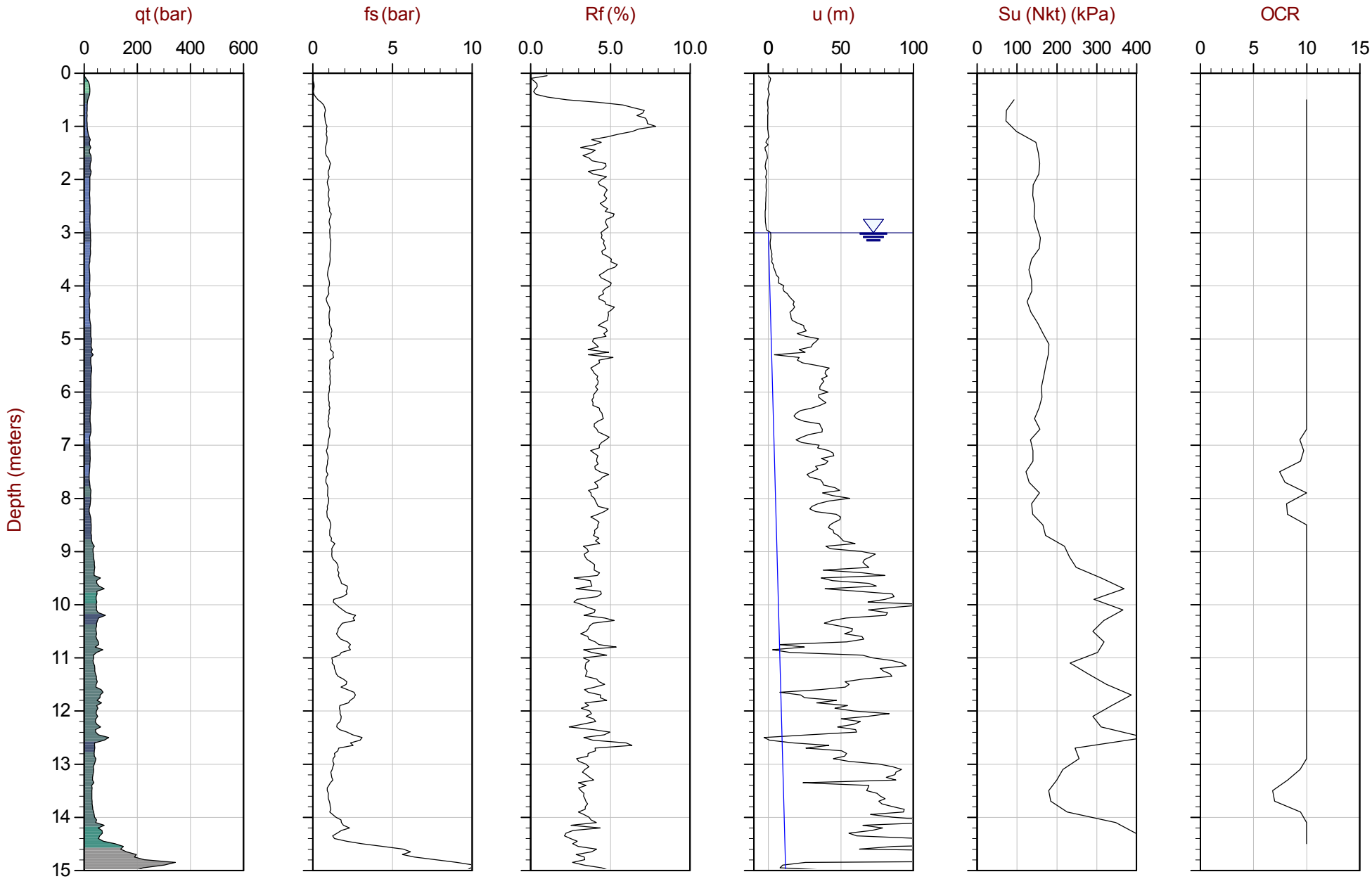
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 16:35
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26
Cone: 322:T1500F15U500




Max Depth: 18.750 m / 61.52 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:
Assumed Ueq
Ueq

File: 16-03023_SPD26.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

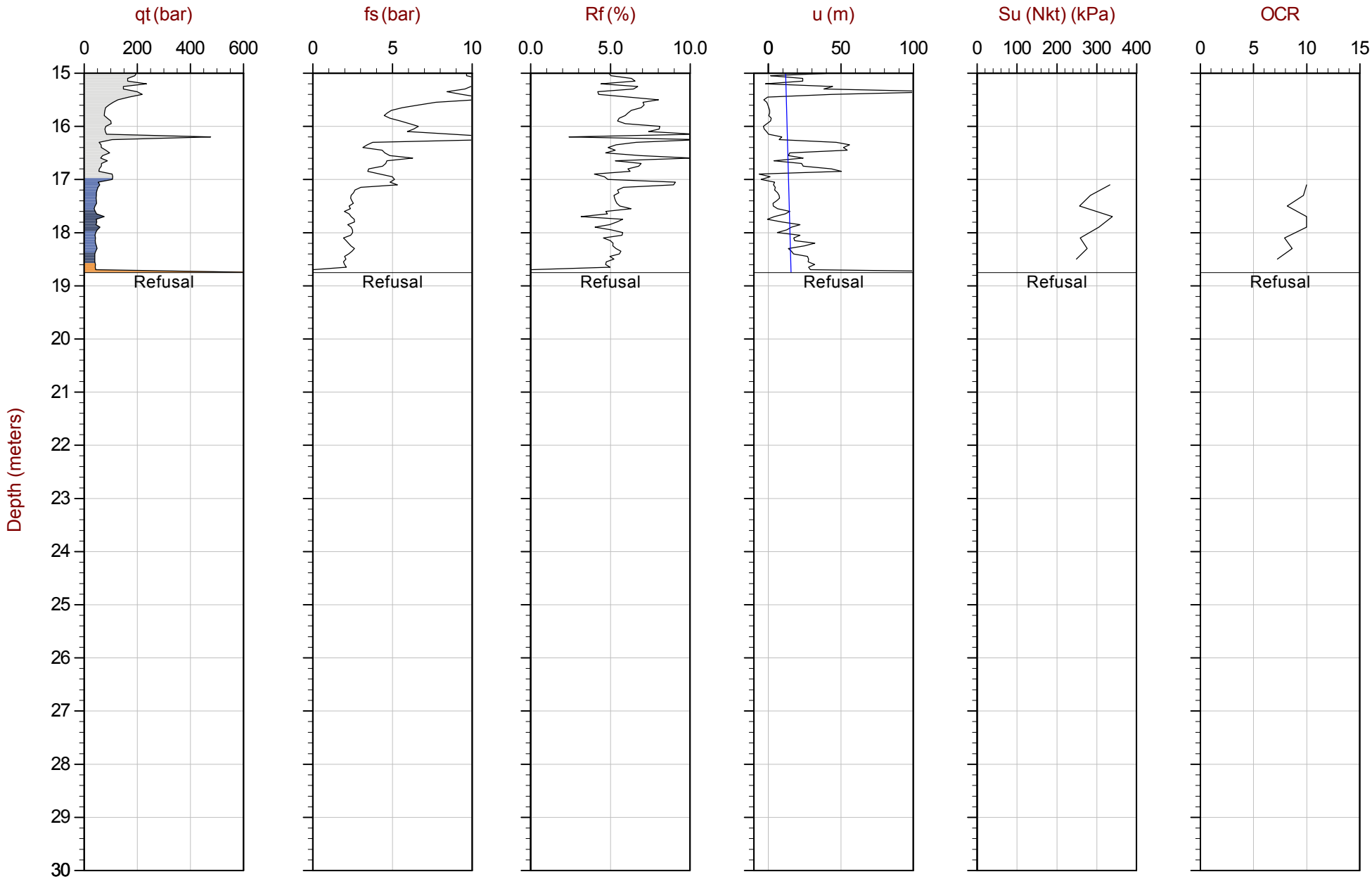
SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 680837m Elev: 1192.03m
Sheet No: 1 of 2

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 16:35
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26
Cone: 322:T1500F15U500




Max Depth: 18.750 m / 61.52 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD26.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 680837m Elev: 1192.03m
Sheet No: 2 of 2

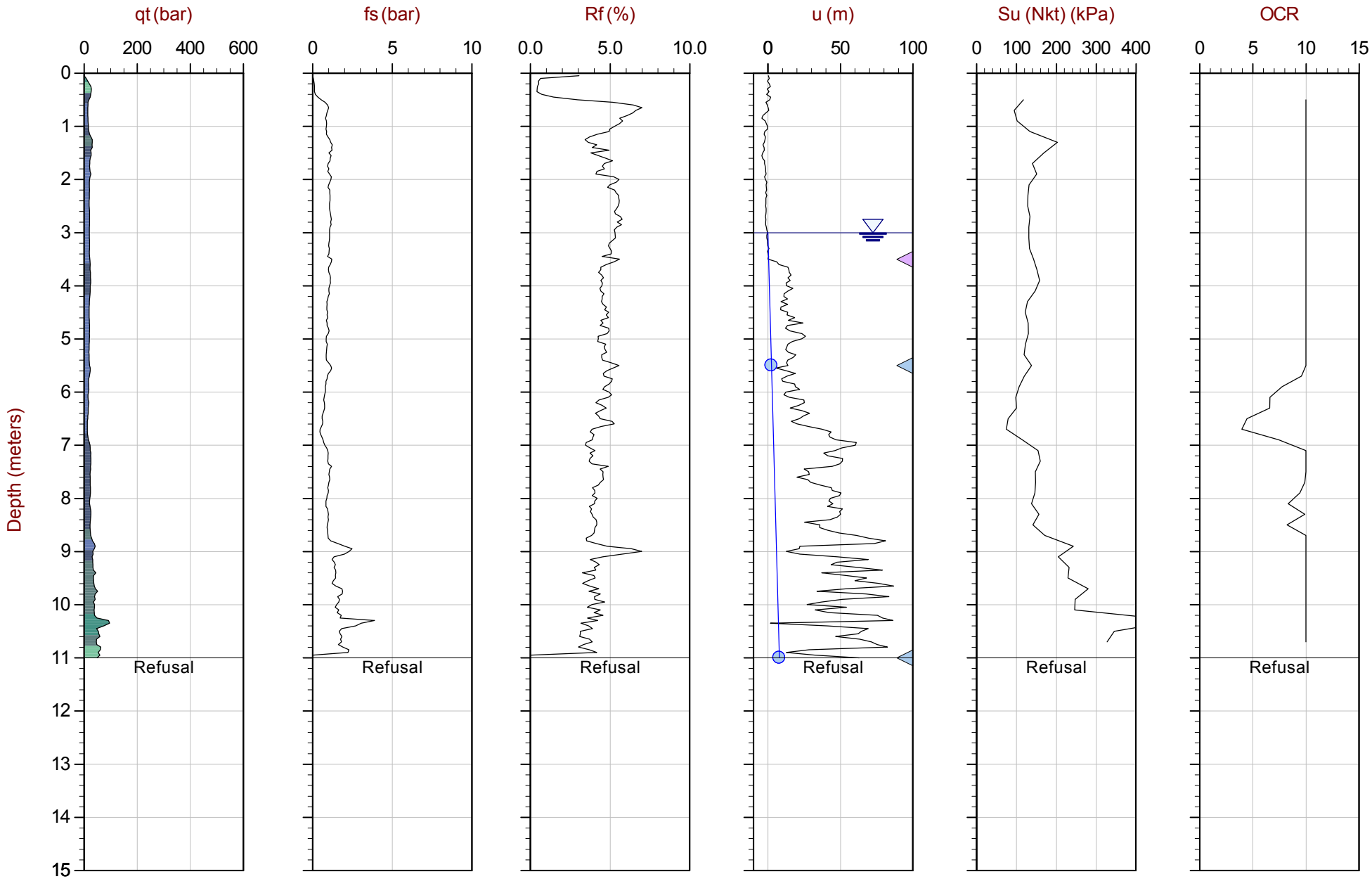
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 09:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26B
Cone: 388:T1500F15U500




Max Depth: 11.000 m / 36.09 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD26B.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658519m E: 680838m Elev: 1192.03m
Sheet No: 1 of 1

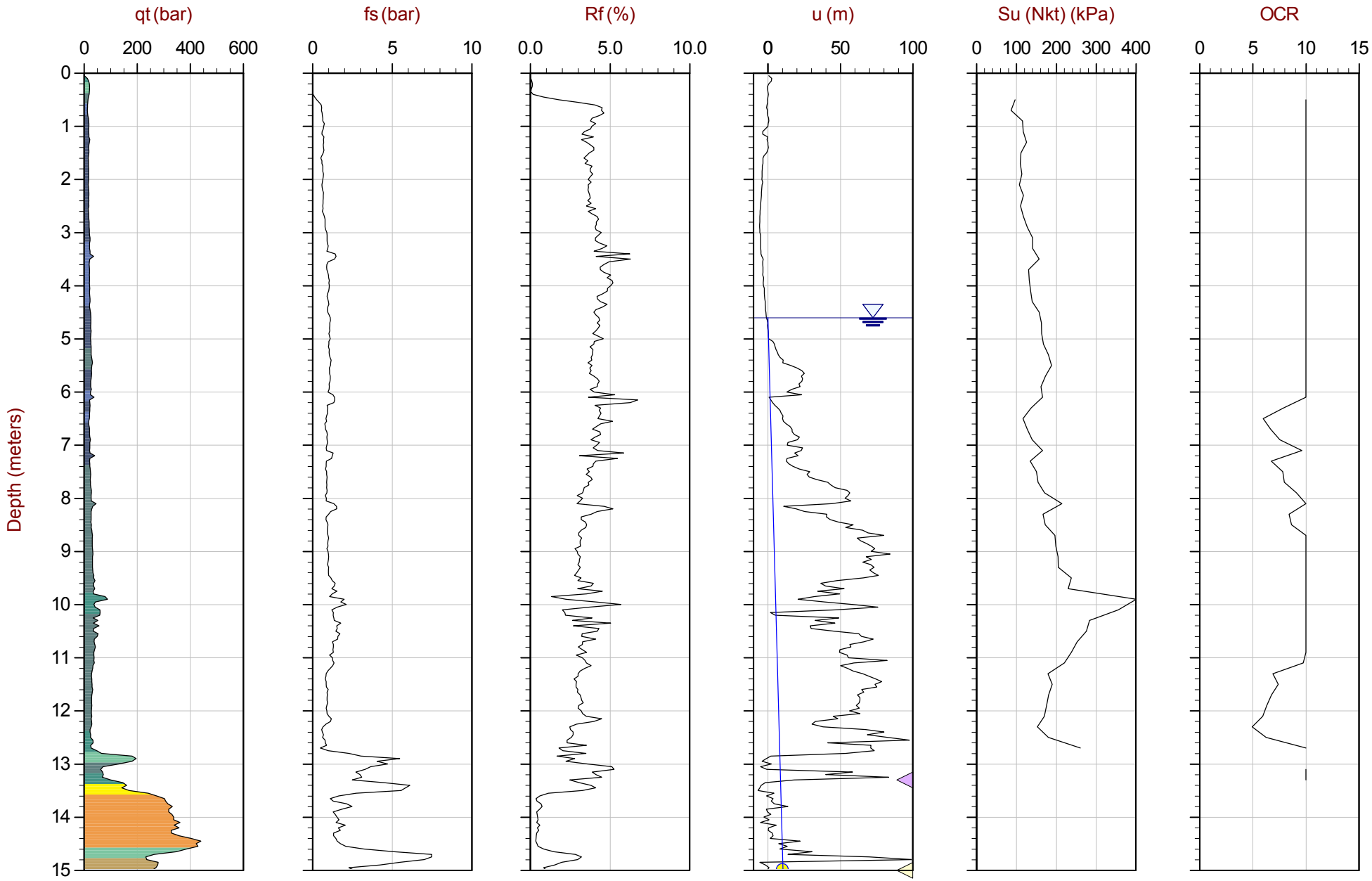
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500




Max Depth: 20.750 m / 68.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD31.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658444m E: 681072m Elev: 1191.00m
Sheet No: 1 of 2

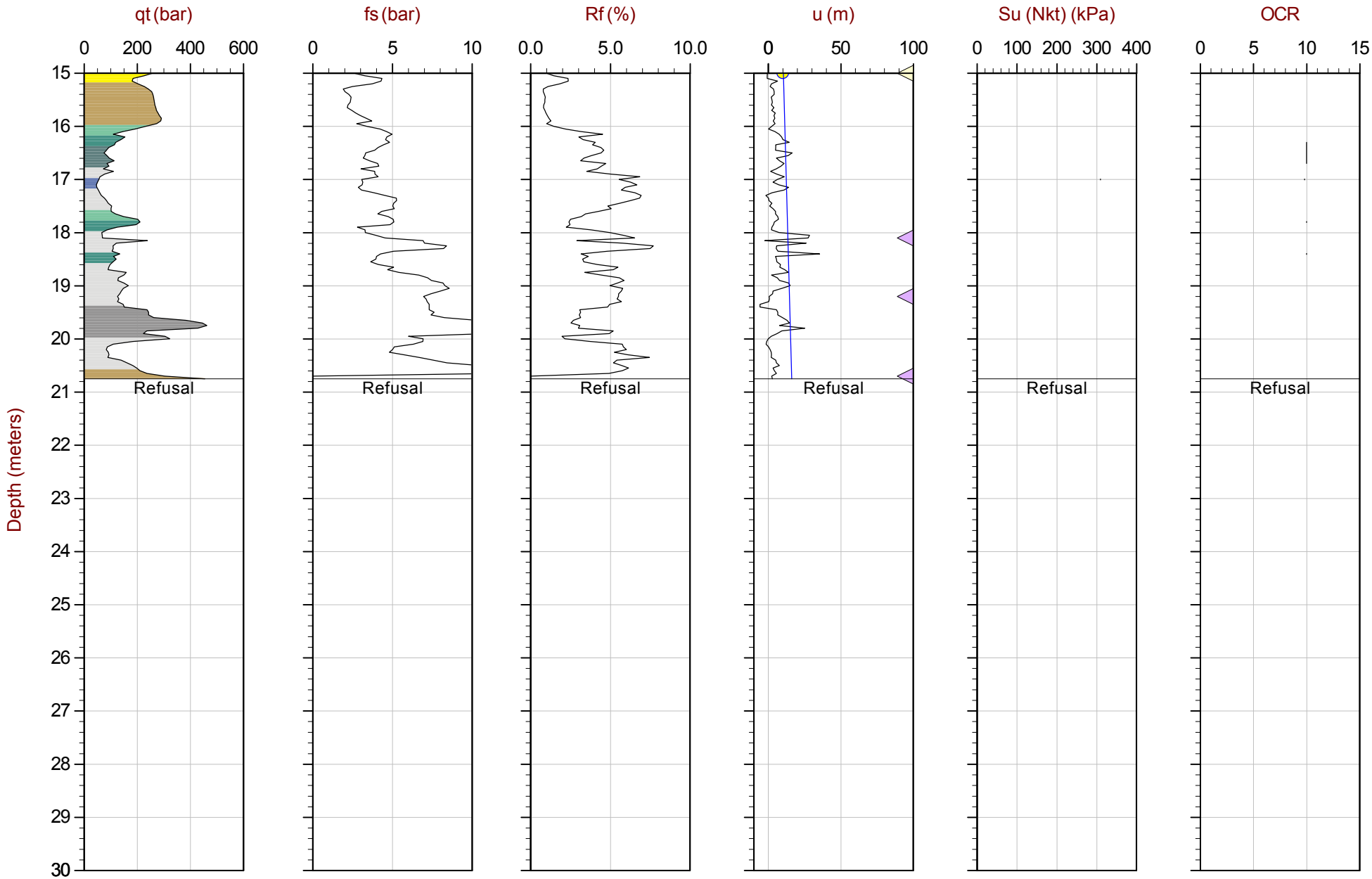
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500




Max Depth: 20.750 m / 68.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD31.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658444m E: 681072m Elev: 1191.00m
Sheet No: 2 of 2

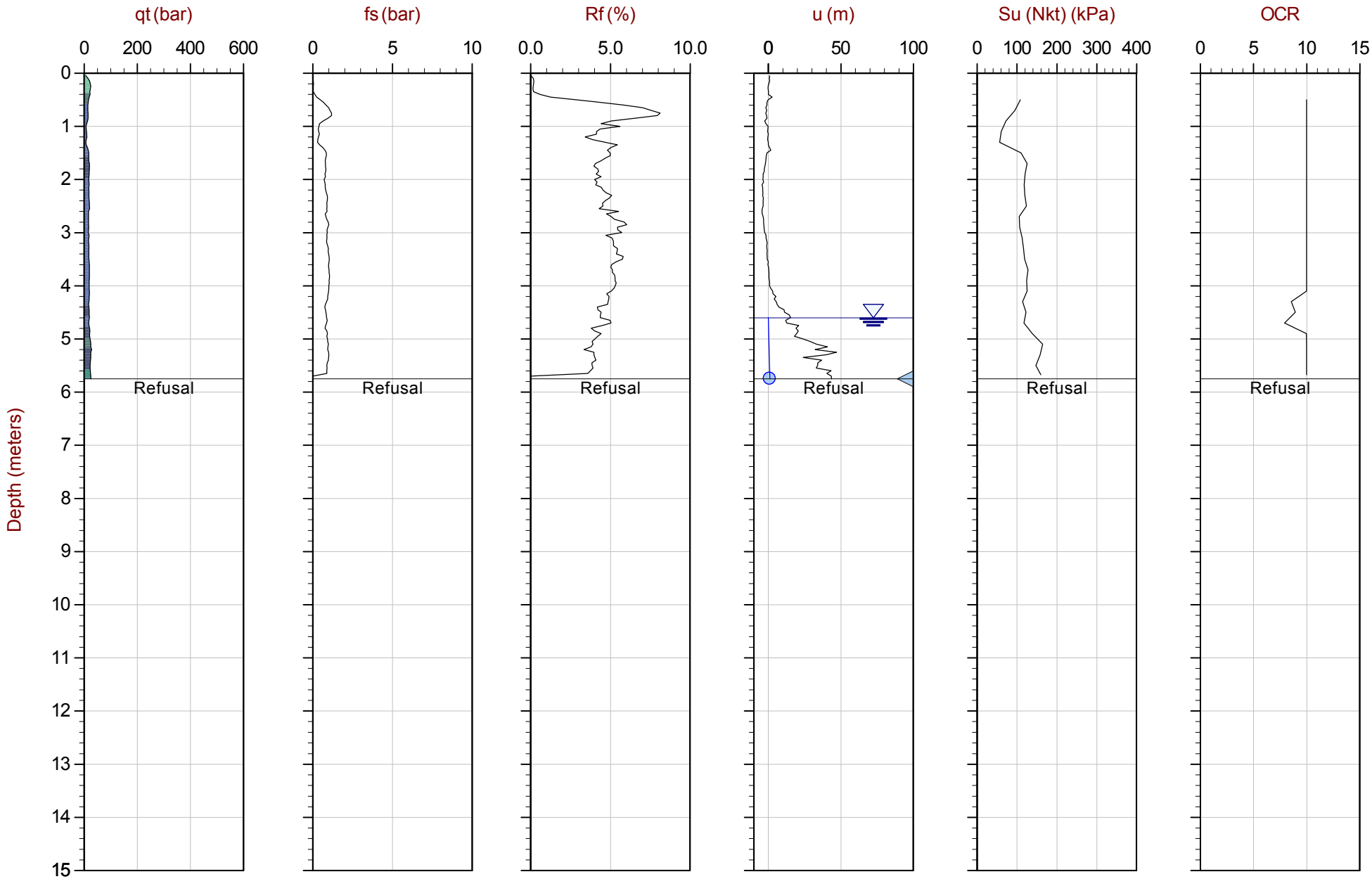
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/25 10:12
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31B
Cone: 388:T1500F15U500




Max Depth: 5.750 m / 18.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD31B.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658445m E: 681072m Elev: 1191.00m
Sheet No: 1 of 1

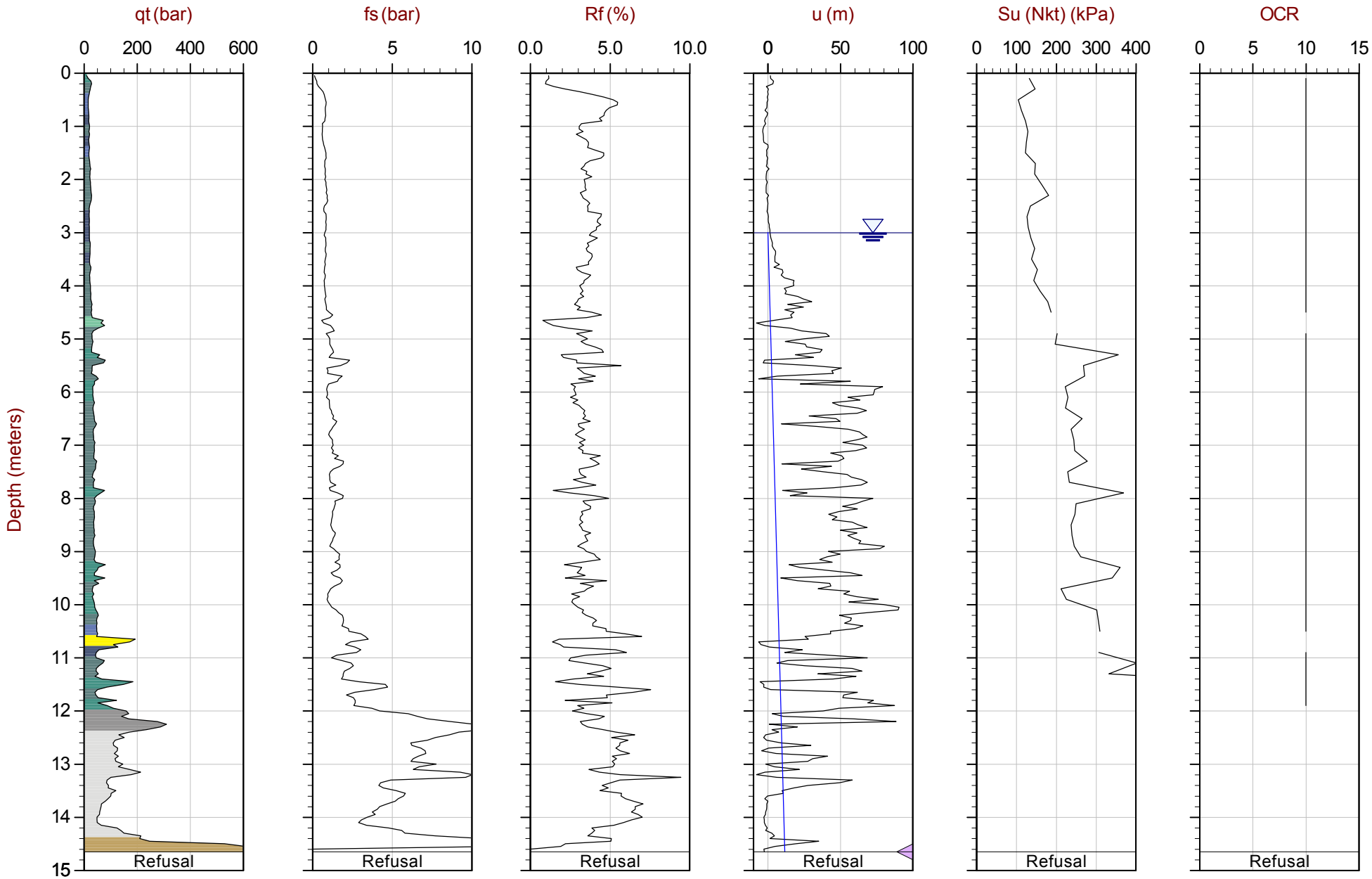
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 13:17
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D34
Cone: 388:T1500F15U500




Max Depth: 14.650 m / 48.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD34.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658610m E: 681142m Elev: 1190.89m
Sheet No: 1 of 1

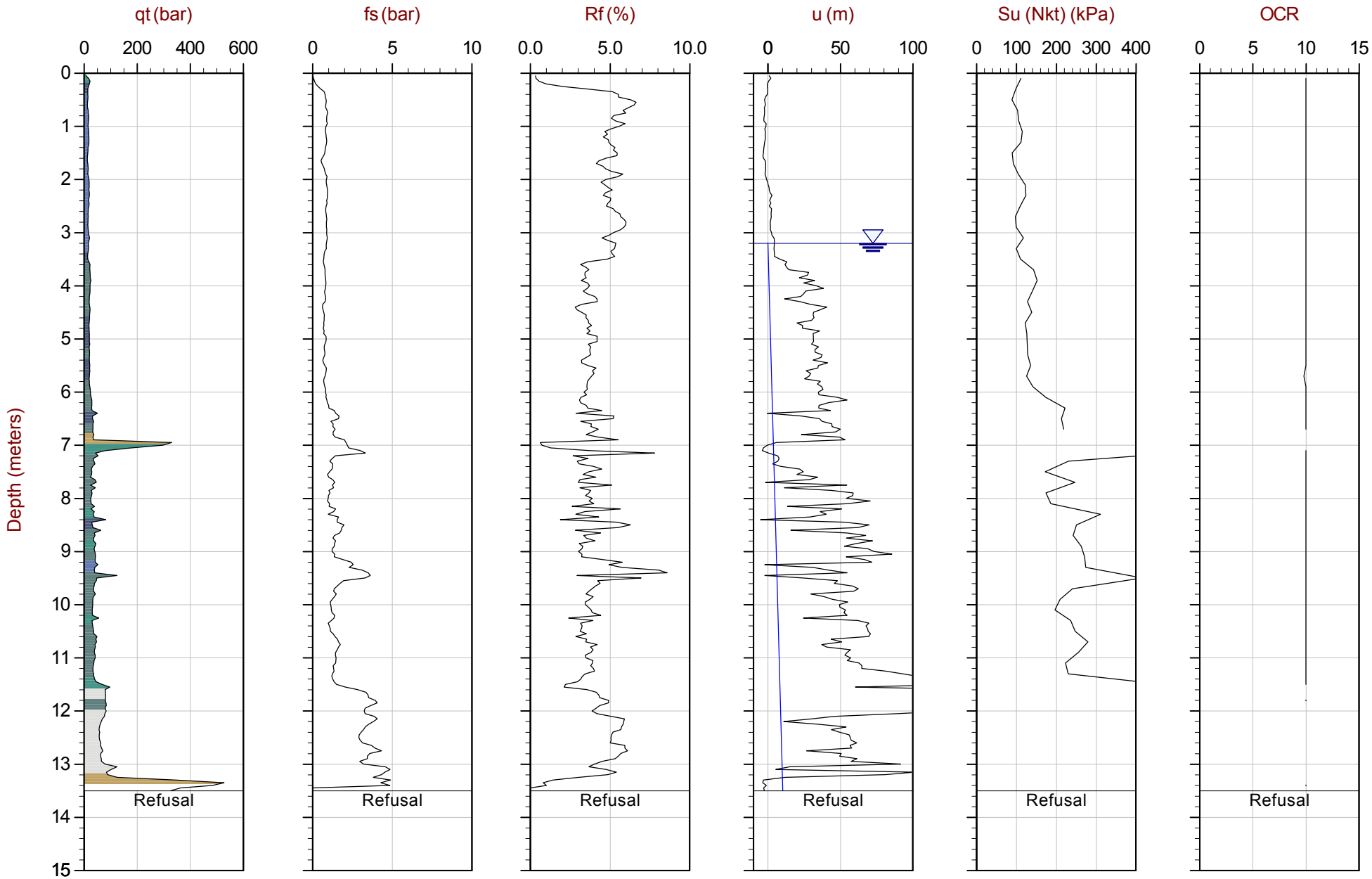
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 14:49
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D37
Cone: 322:T1500F15U500




Max Depth: 13.500 m / 44.29 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD37.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 681325m Elev: 1190.70m
Sheet No: 1 of 1

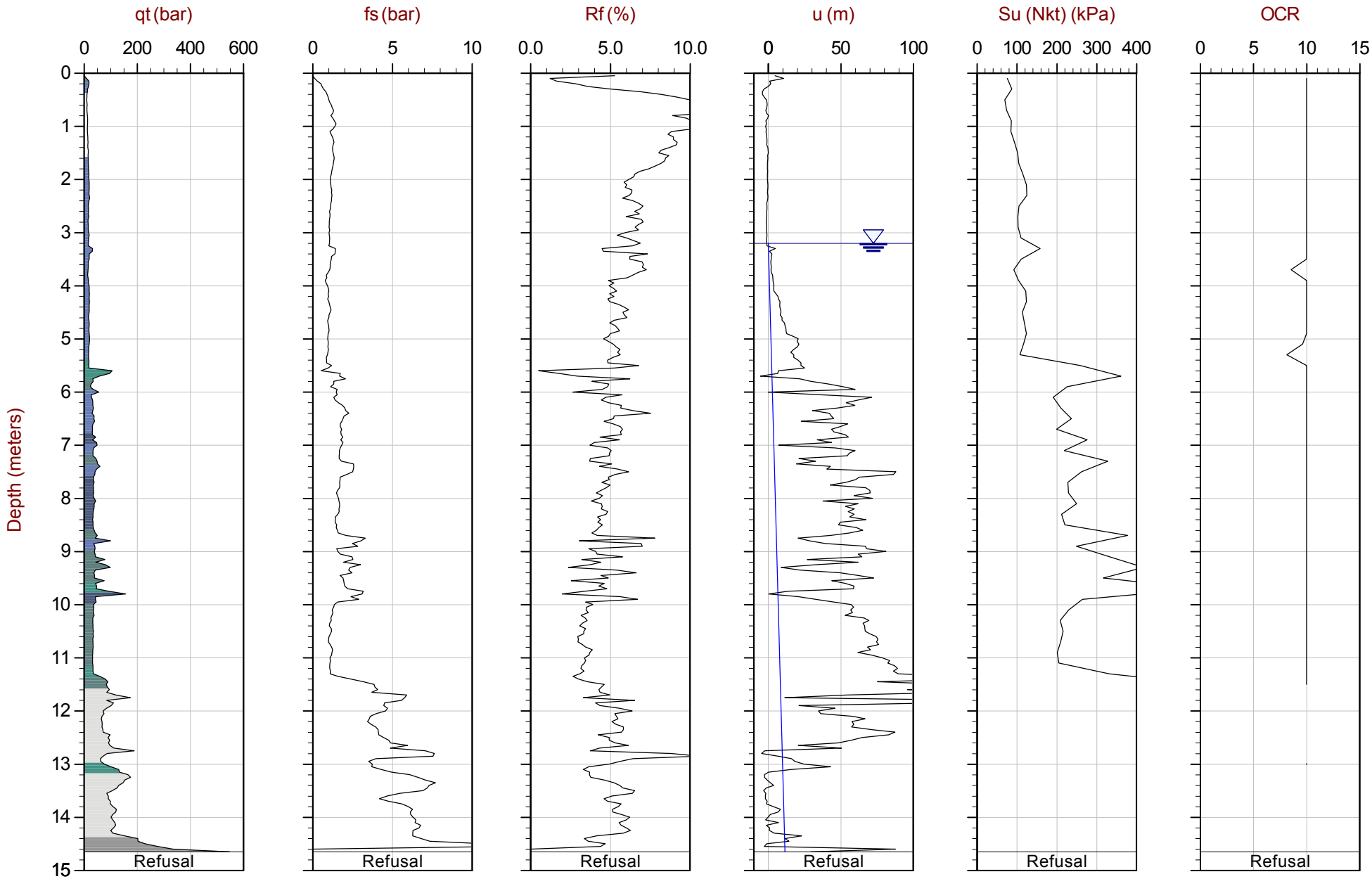
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 15:36
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D37B
Cone: 322:T1500F15U500




Max Depth: 14.650 m / 48.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD37B.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 681322m Elev: 1191.00m
Sheet No: 1 of 1

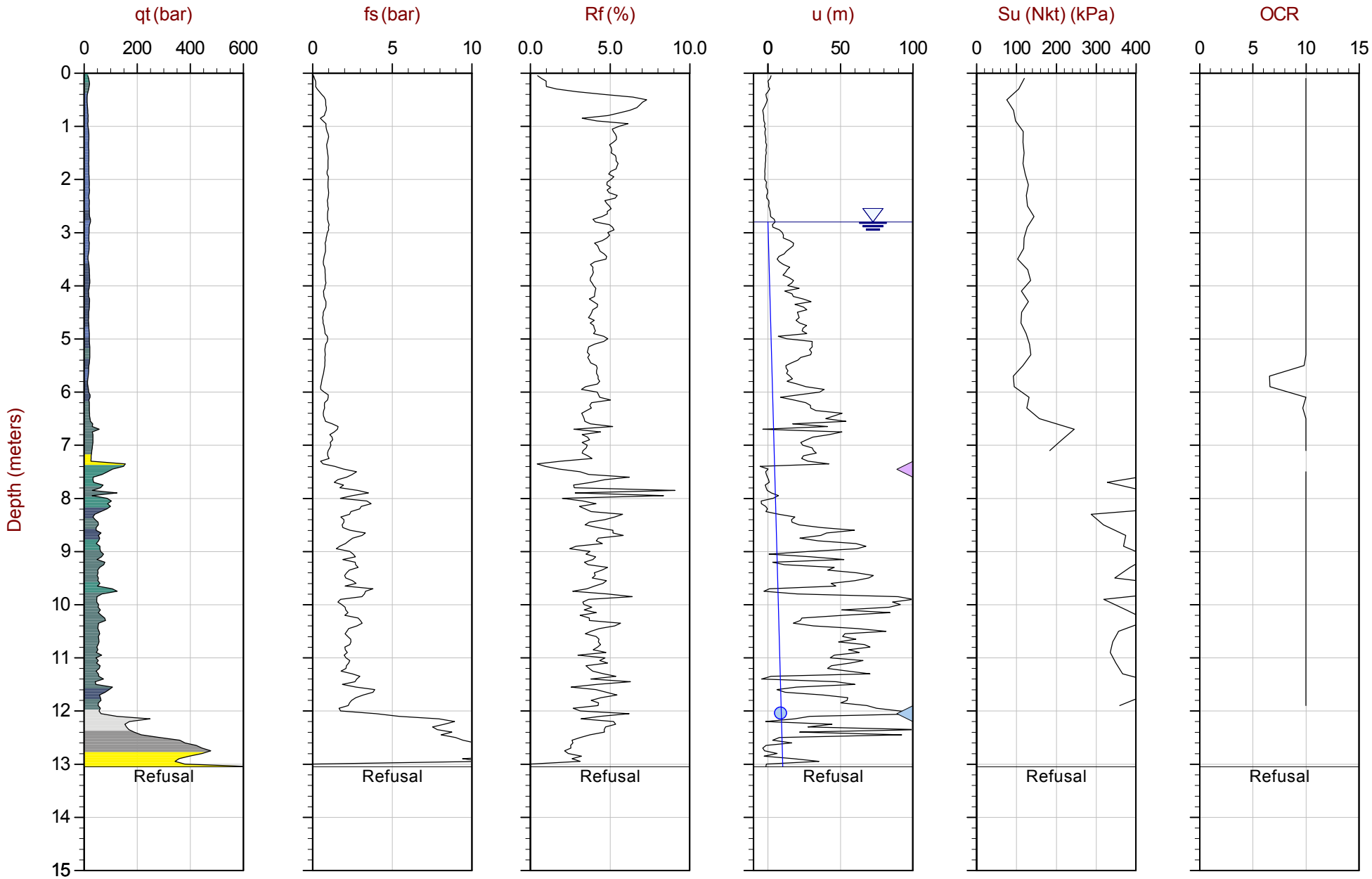
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 12:42
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D39
Cone: 322:T1500F15U500




Max Depth: 13.050 m / 42.81 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD39.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658690m E: 681332m Elev: 1191.43m
Sheet No: 1 of 1

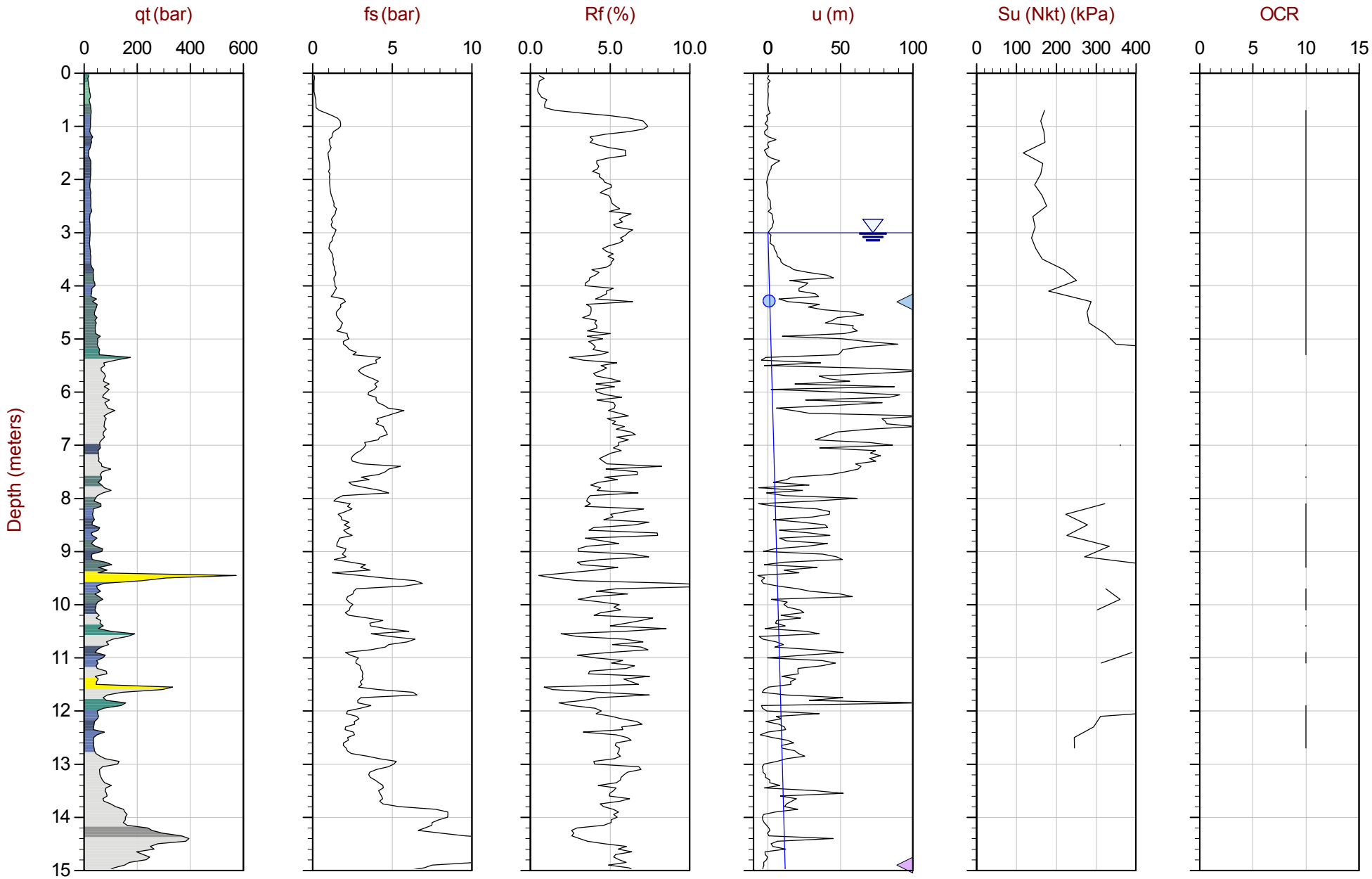
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 08:57
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D40
Cone: 322:T1500F15U500




Max Depth: 15.800 m / 51.84 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:
Assumed Ueq
Ueq

File: 16-03023_CPD40.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

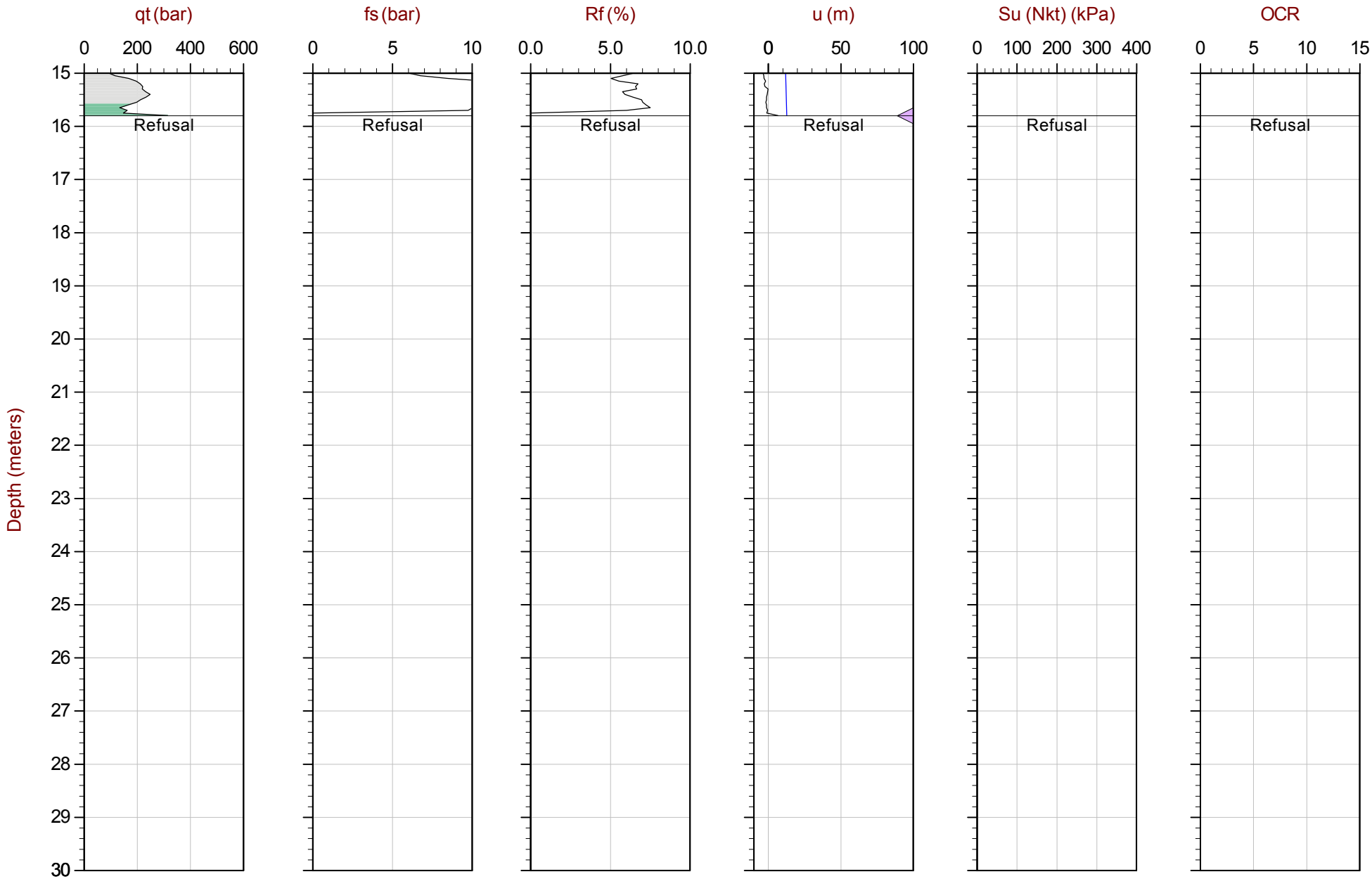
SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658792m E: 681323m Elev: 1191.05m
Sheet No: 1 of 2

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 08:57
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D40
Cone: 322:T1500F15U500




Max Depth: 15.800 m / 51.84 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD40.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658792m E: 681323m Elev: 1191.05m
Sheet No: 2 of 2

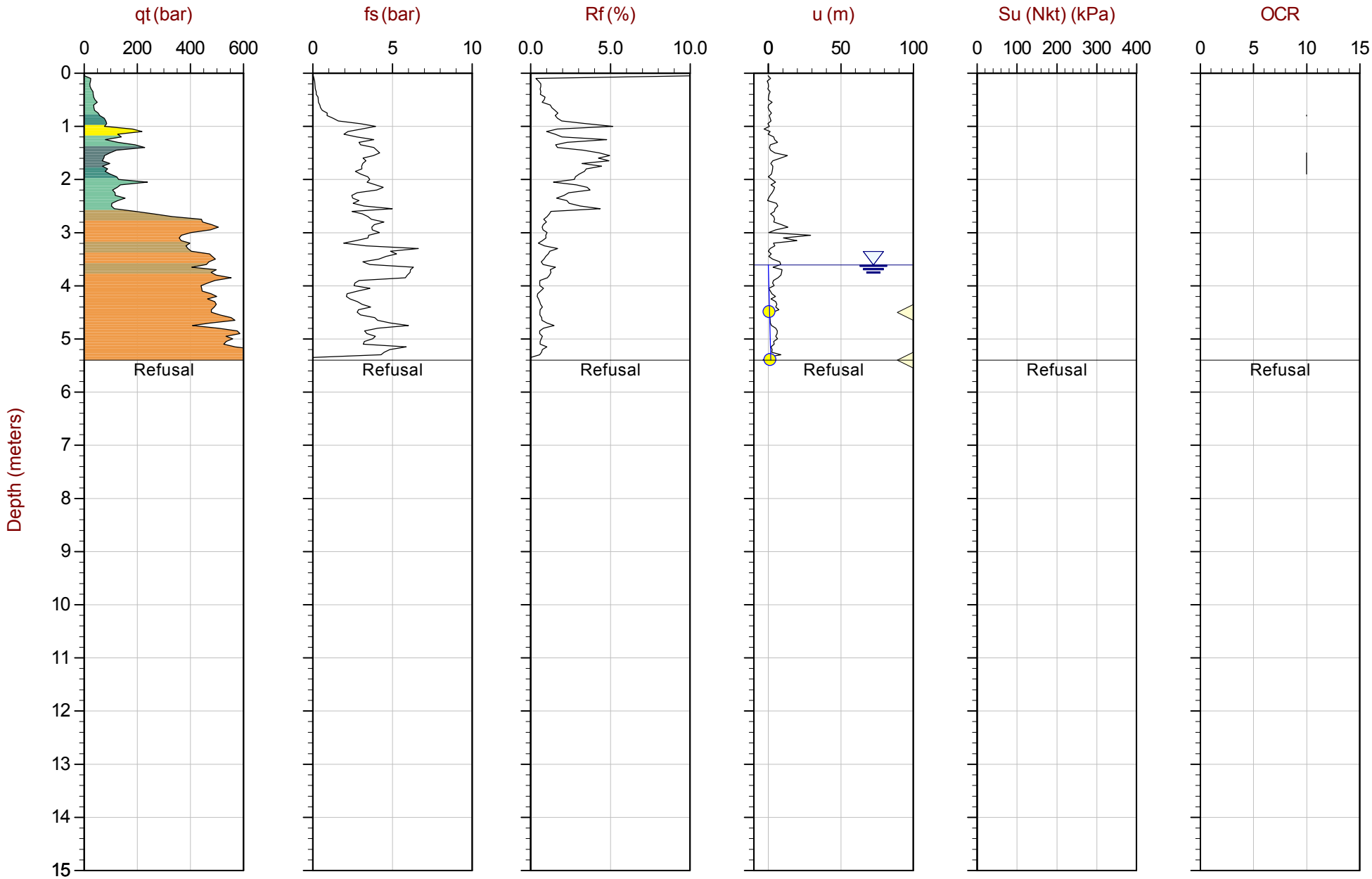
Overplot Item:
- Assumed Ueq
- Ueq
- Dissipation, equilibrium assumed
- Dissipation, equilibrium achieved
- Hydrostatic Line
- Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 14:52
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41
Cone: 340:T1500F15U500




Max Depth: 5.400 m / 17.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD41.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658881m E: 681387m Elev: 1186.66m
Sheet No: 1 of 1

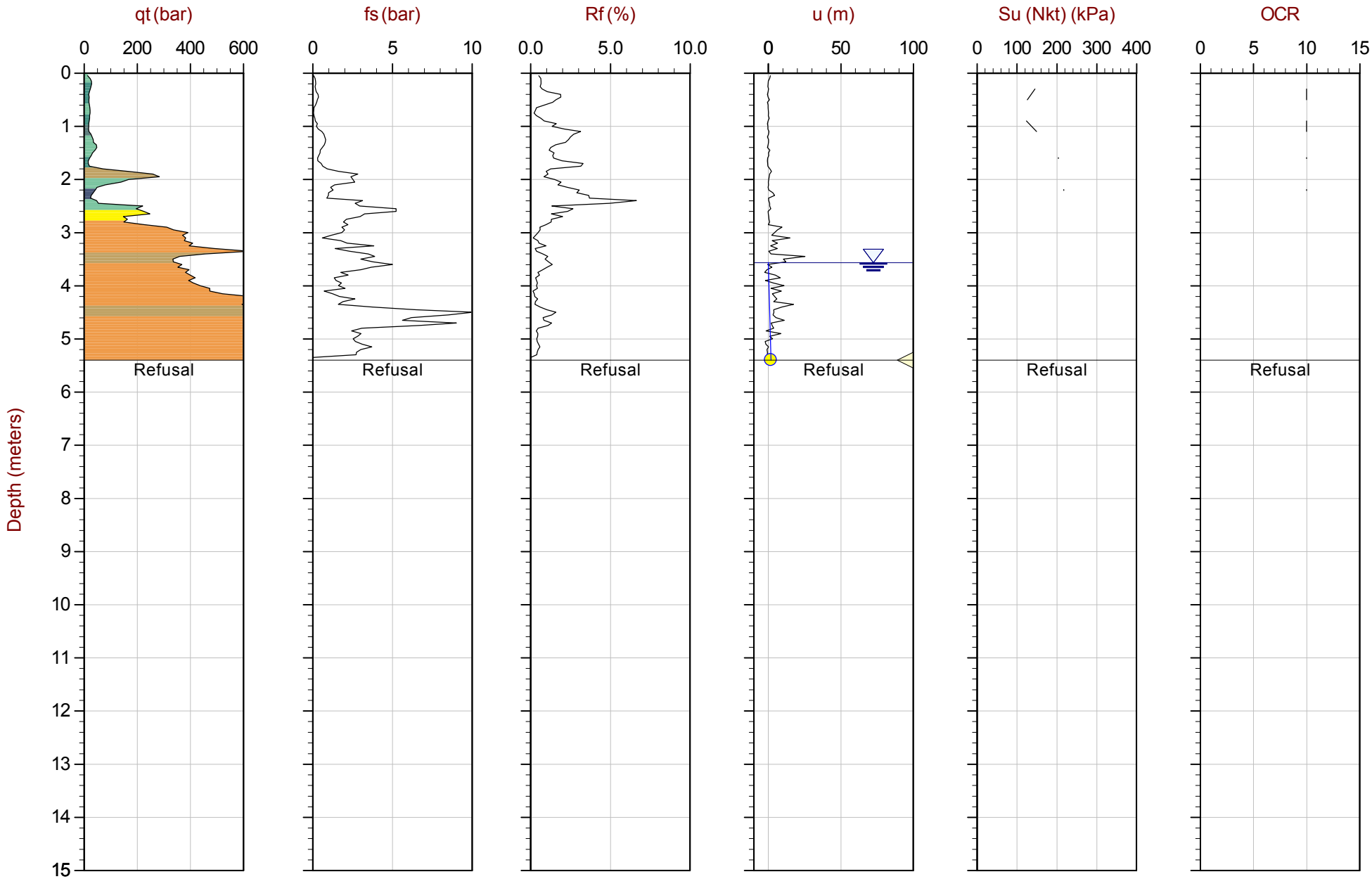
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 16:10
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41B
Cone: 340:T1500F15U500




Max Depth: 5.400 m / 17.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD41B.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658878m E: 681392m Elev: 1187.00m
Sheet No: 1 of 1

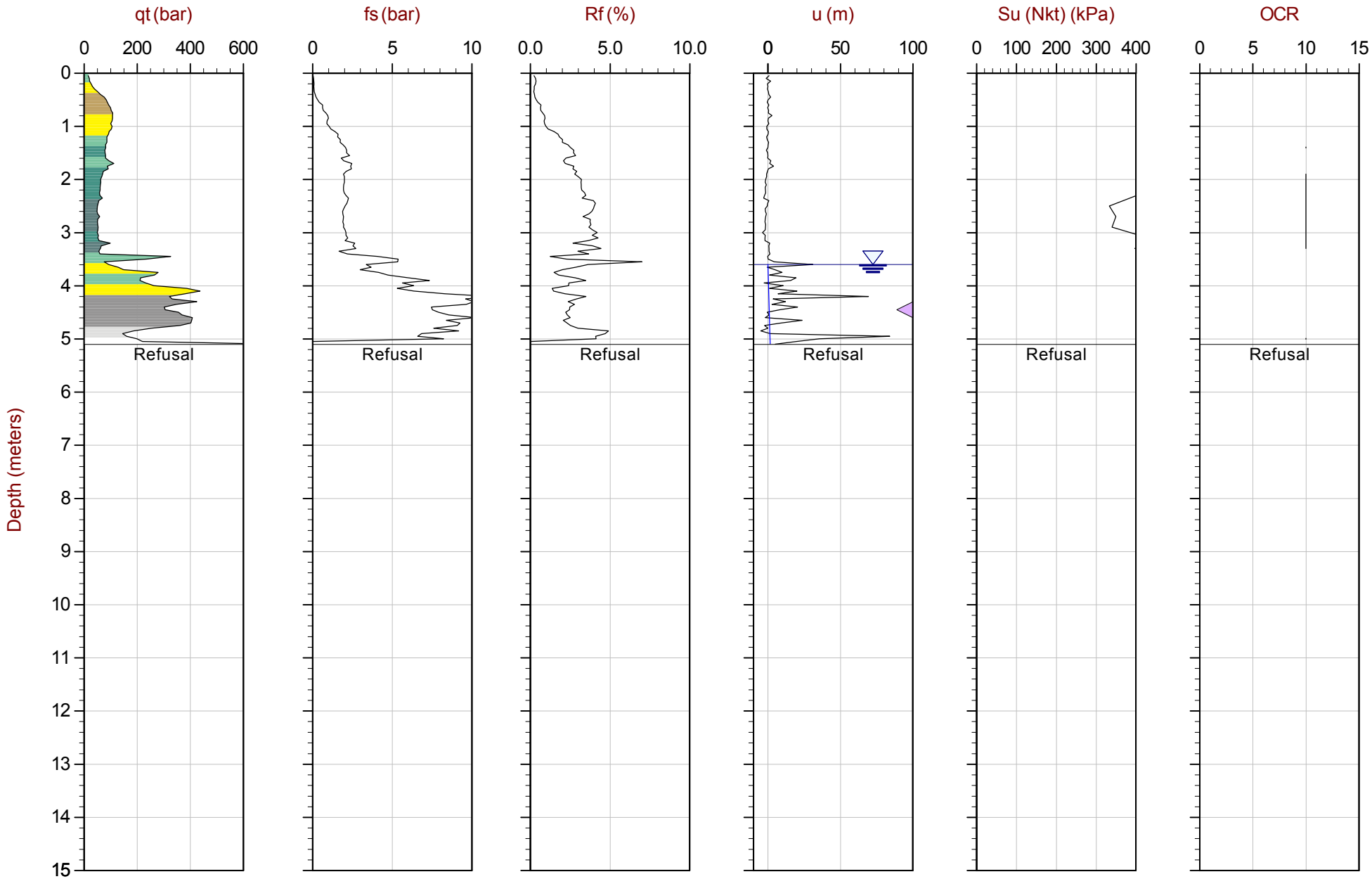
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 16:05
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D44
Cone: 340:T1500F15U500




Max Depth: 5.100 m / 16.73 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD44.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658924m E: 681508m Elev: 1188.50m
Sheet No: 1 of 1

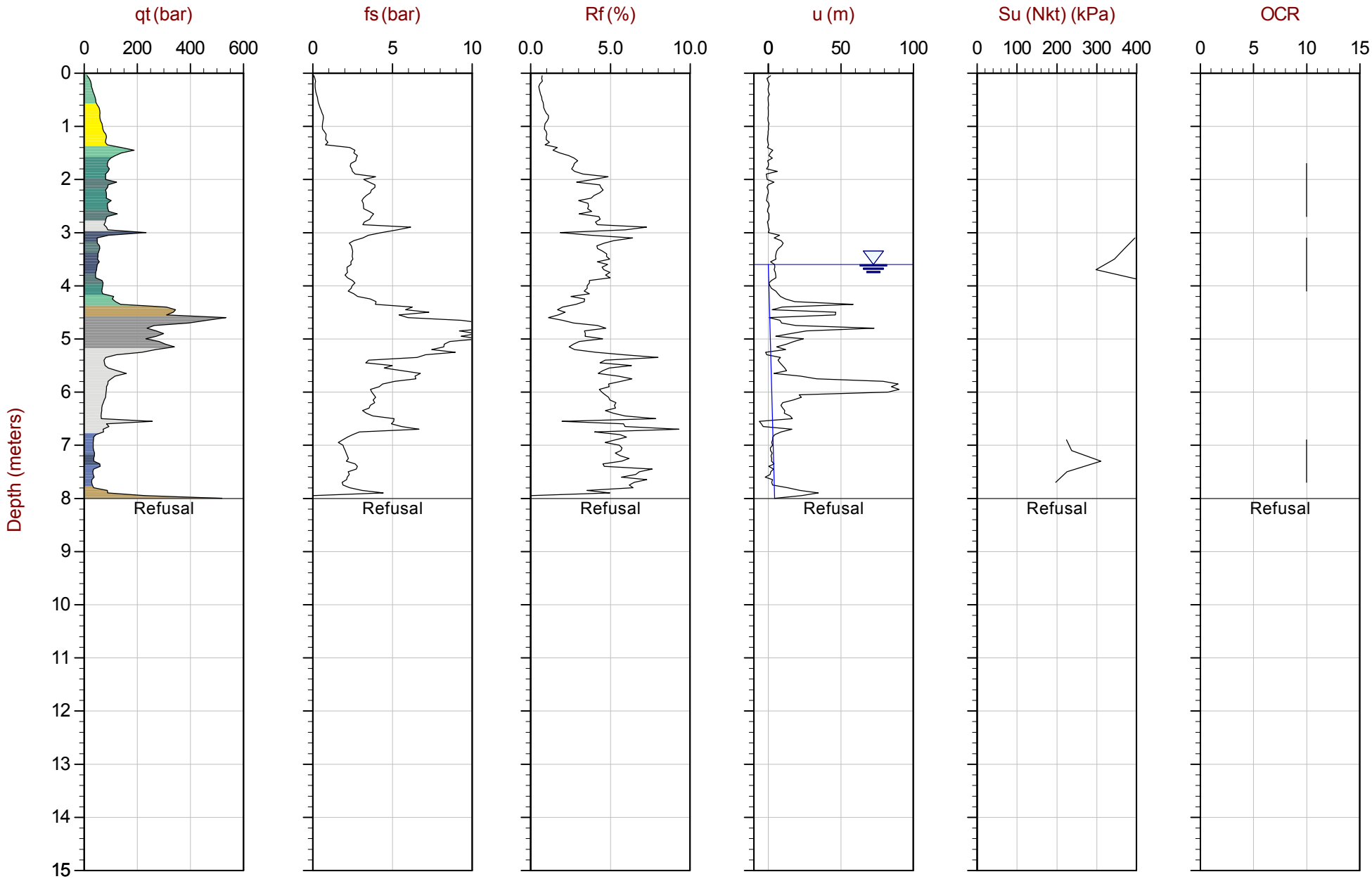
Overplot Item:
- Assumed Ueq
- Ueq
- Dissipation, equilibrium assumed
- Dissipation, equilibrium achieved
- Hydrostatic Line
- Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 16:45
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D44B
Cone: 340:T1500F15U500




Max Depth: 8.000 m / 26.25 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD44B.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658933m E: 681516m Elev: 1189.00m
Sheet No: 1 of 1

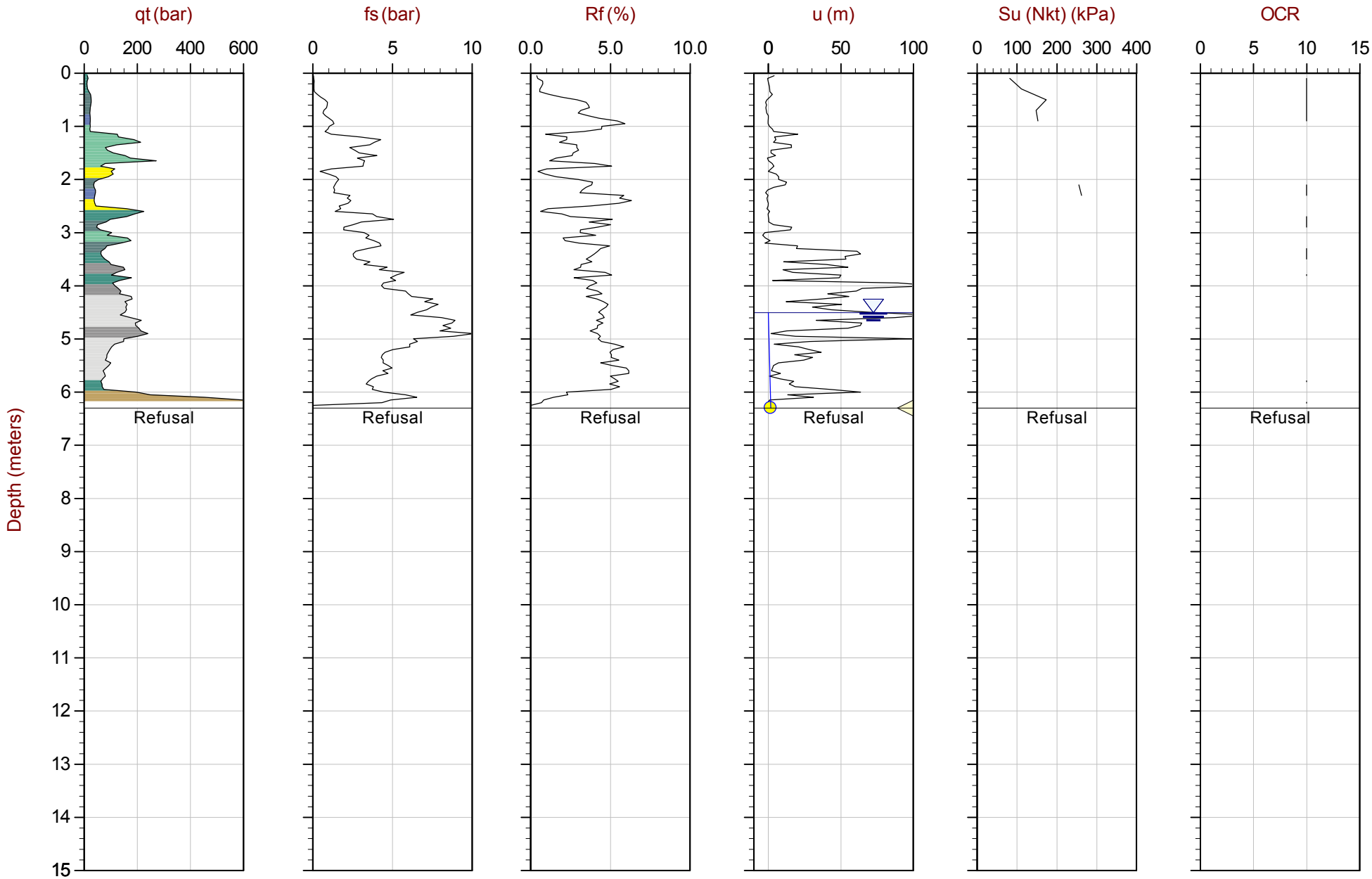
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

# Stantec

Job No: 16-03023
Date: 2016/06/22 09:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D47
Cone: 340:T1500F15U500




Max Depth: 6.300 m / 20.67 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD47.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658970m E: 681337m Elev: 1187.42m
Sheet No: 1 of 1

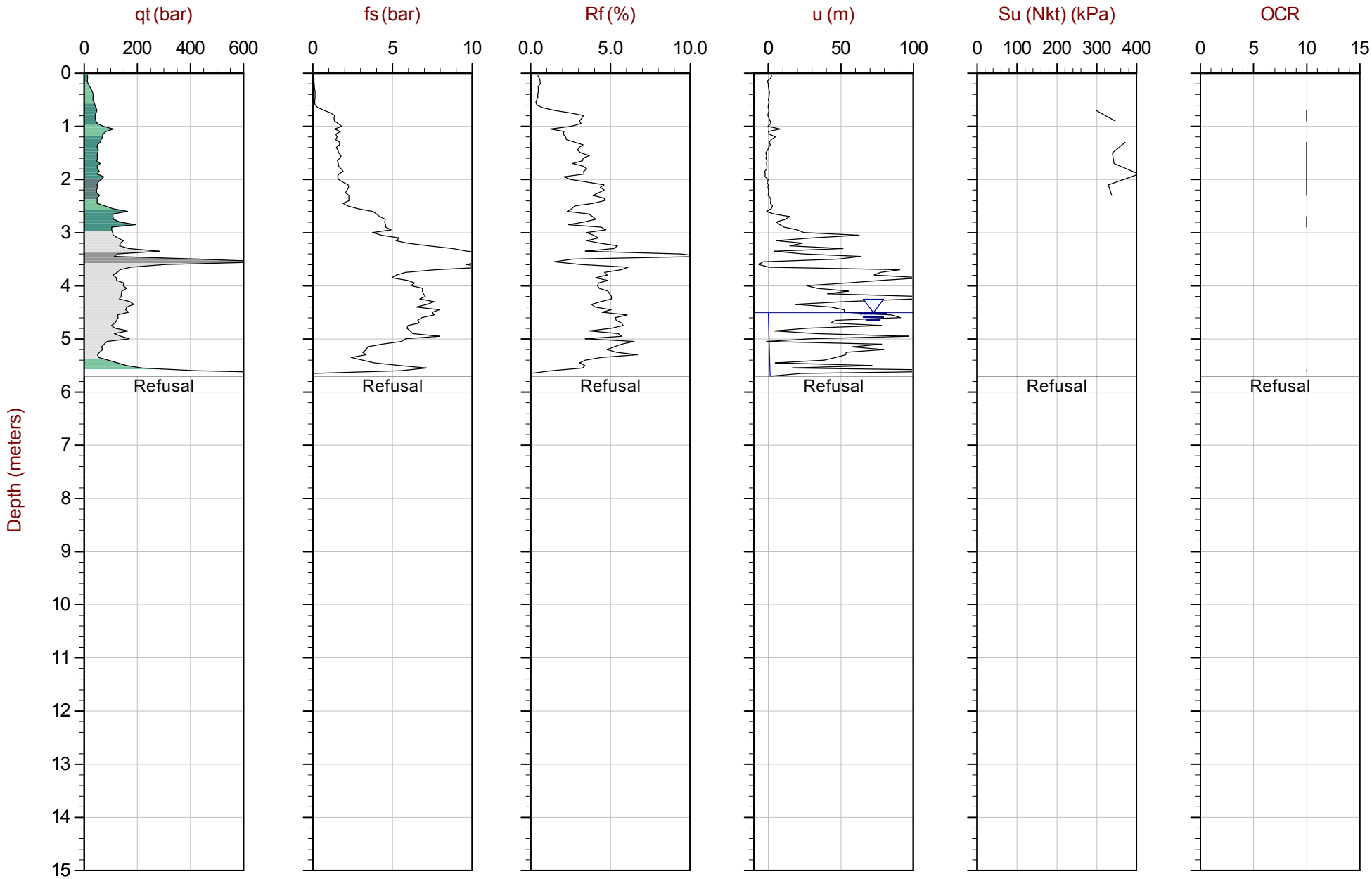
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 09:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D47B
Cone: 340:T1500F15U500




Max Depth: 5.700 m / 18.70 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD47B.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658964m E: 681344m Elev: 1187.00m
Sheet No: 1 of 1

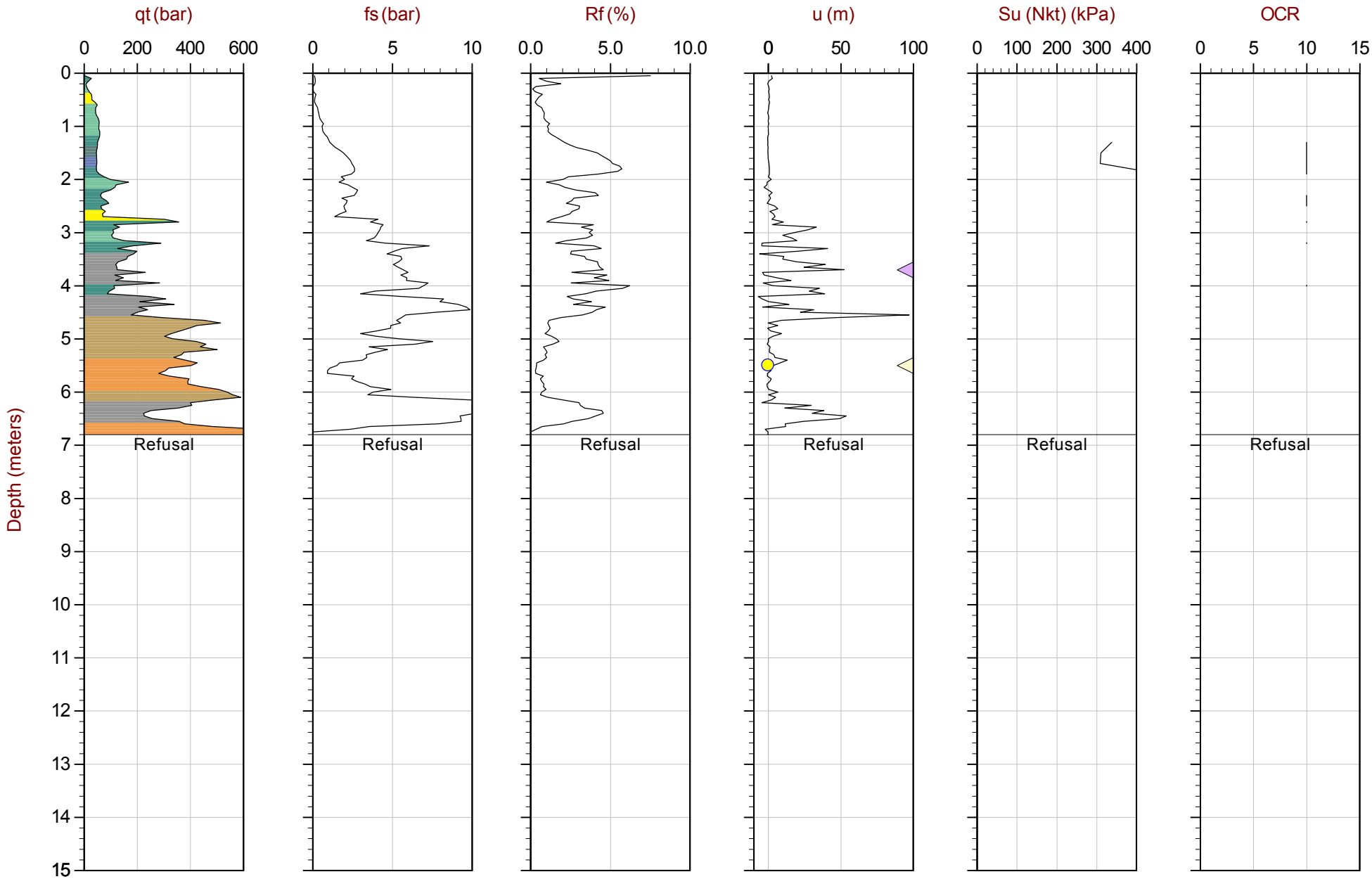
Overplot Item:
- Assumed Ueq
- Ueq
- Dissipation, equilibrium assumed
- Dissipation, equilibrium achieved
- Hydrostatic Line
- Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 10:44
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49
Cone: 340:T1500F15U500




Max Depth: 6.800 m / 22.31 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD49.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659075m E: 681481m Elev: 1187.24m
Sheet No: 1 of 1

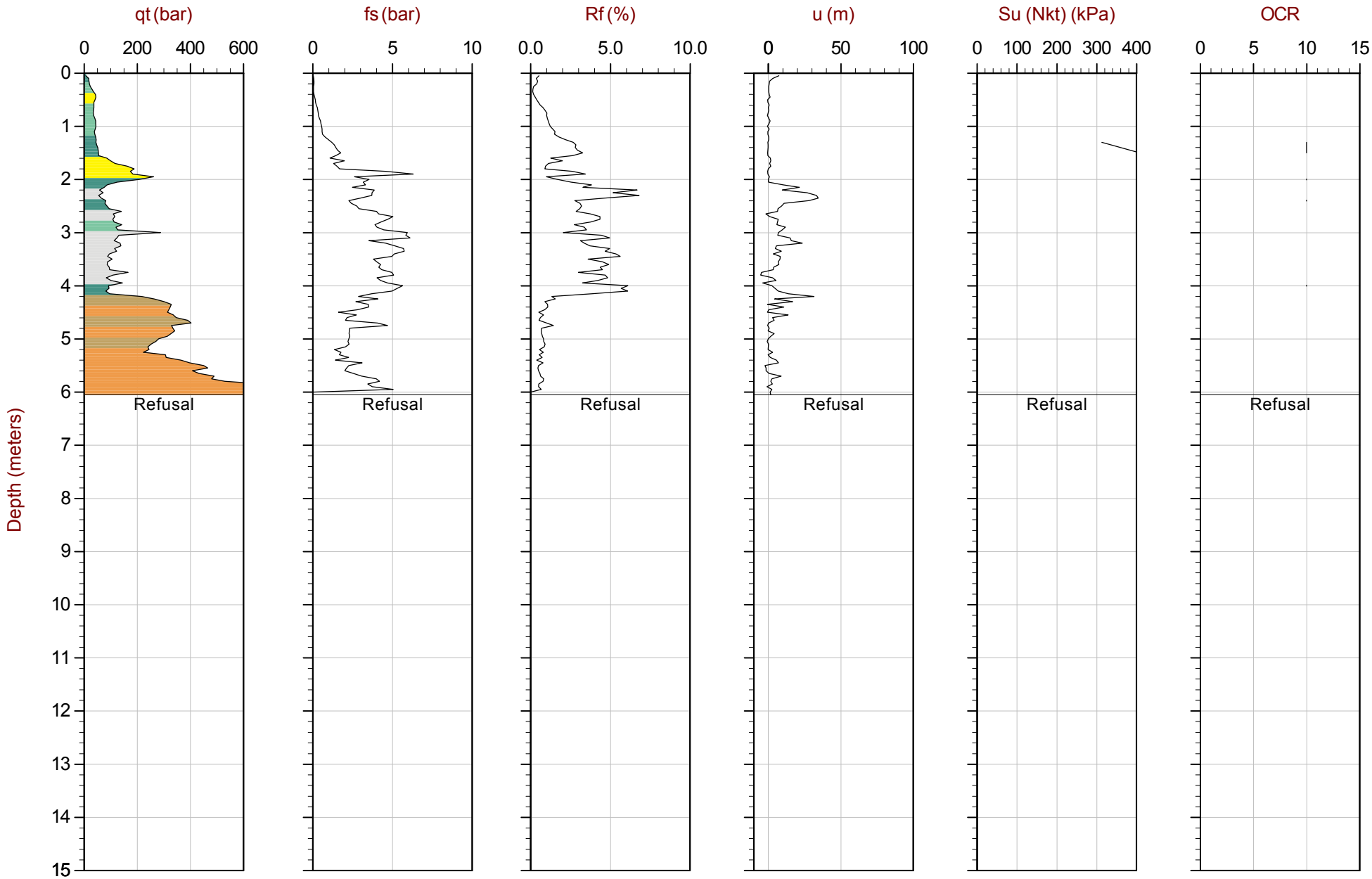
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 15:20
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49B
Cone: 340:T1500F15U500




Max Depth: 6.050 m / 19.85 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD49B.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659077m E: 681469m Elev: 1187.00m
Sheet No: 1 of 1

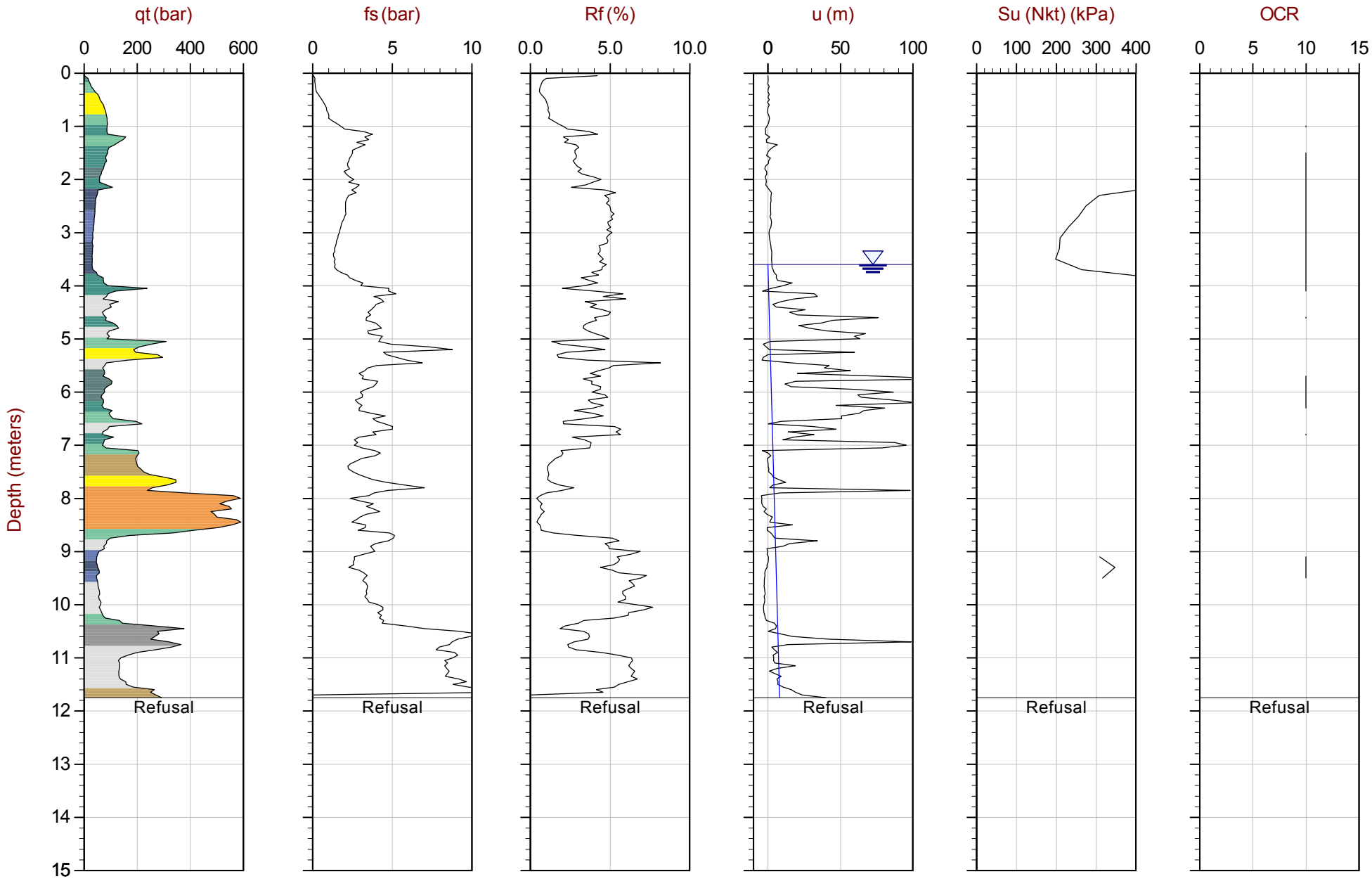
Overplot Item:
- Assumed Ueq
- Ueq
- Dissipation, equilibrium assumed
- Dissipation, equilibrium achieved
- Hydrostatic Line
- Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 17:17
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D50
Cone: 340:T1500F15U500




Max Depth: 11.750 m / 38.55 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD50.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659098m E: 681364m Elev: N/Am
Sheet No: 1 of 1

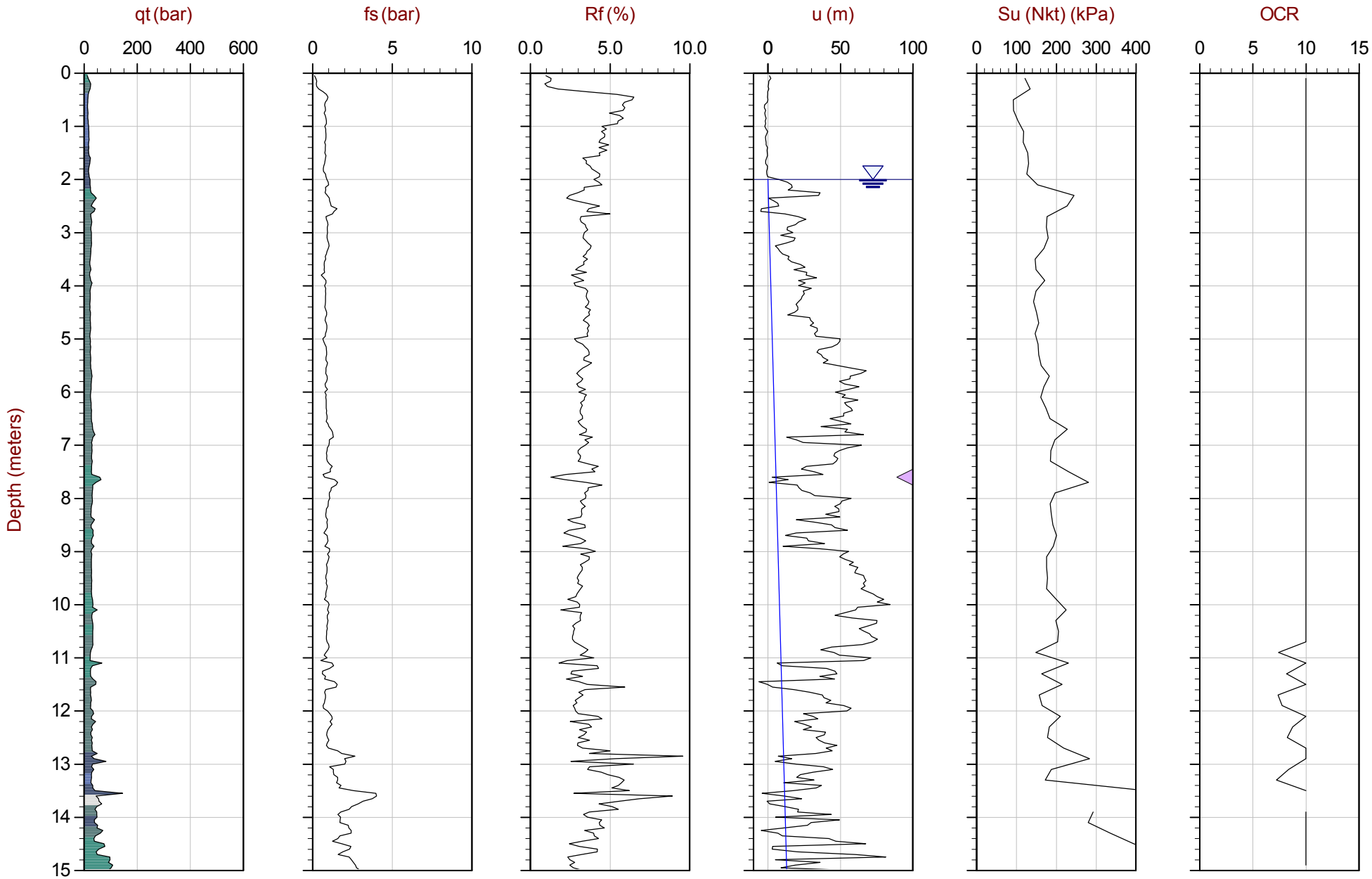
Overplot Item:
- Assumed Ueq
- Ueq
- Dissipation, equilibrium assumed
- Dissipation, equilibrium achieved
- Hydrostatic Line
- Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 17:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D57
Cone: 388:T1500F15U500




Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:
Assumed Ueq
Ueq

File: 16-03023_SPD57.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

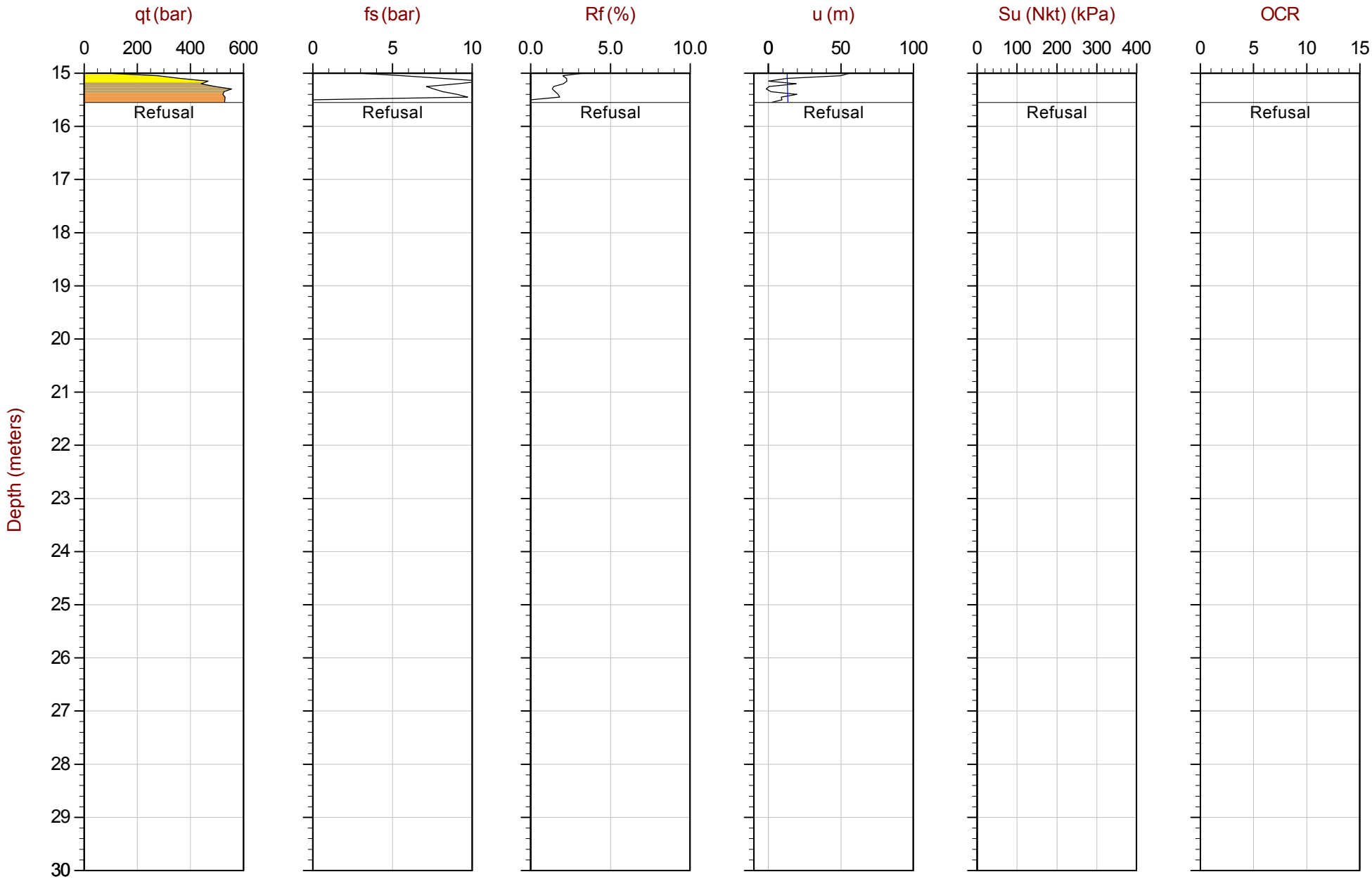
SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658705m E: 680883m Elev: 1191.58m
Sheet No: 1 of 2

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 17:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D57
Cone: 388:T1500F15U500




Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD57.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658705m E: 680883m Elev: 1191.58m
Sheet No: 2 of 2

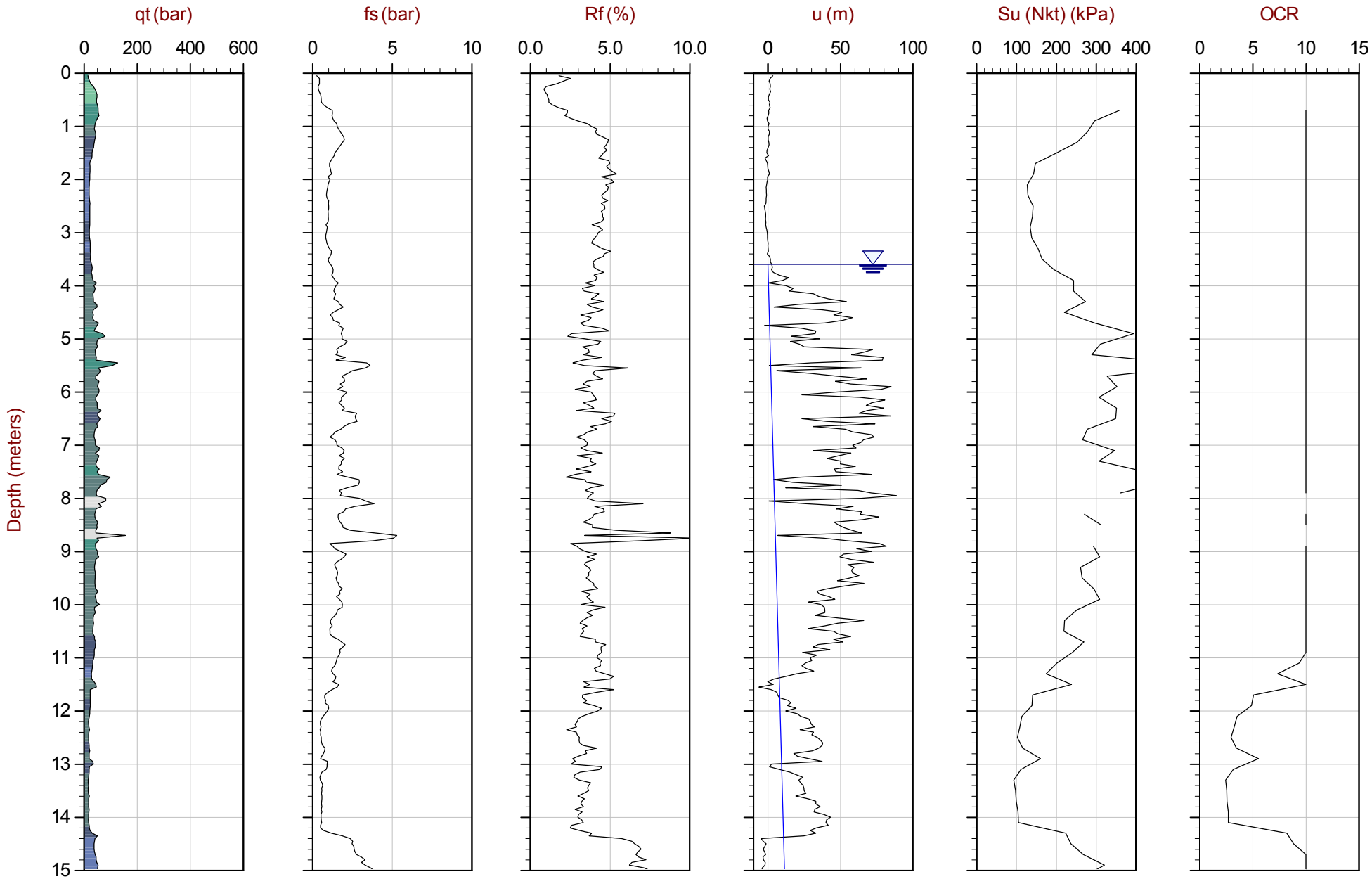
Overplot Item:
- Assumed Ueq
- Ueq
- Dissipation, equilibrium assumed
- Dissipation, equilibrium achieved
- Hydrostatic Line
- Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 18:18
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D58
Cone: 388:T1500F15U500




Max Depth: 16.600 m / 54.46 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:
Assumed Ueq
Ueq

File: 16-03023_CPD58.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

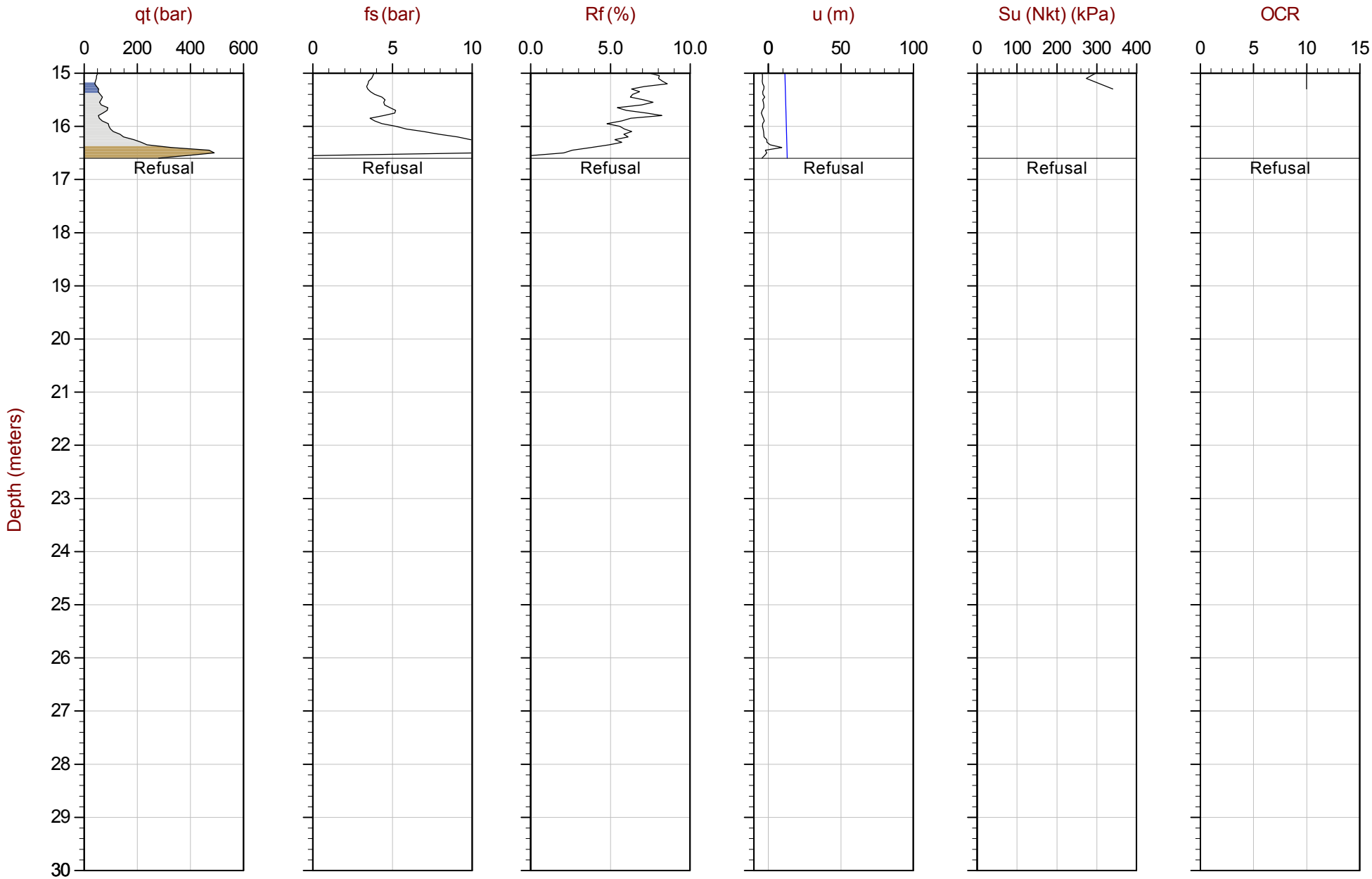
SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658857m E: 681120m Elev: 1190.20m
Sheet No: 1 of 2

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 18:18
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D58
Cone: 388:T1500F15U500




Max Depth: 16.600 m / 54.46 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD58.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658857m E: 681120m Elev: 1190.20m
Sheet No: 2 of 2

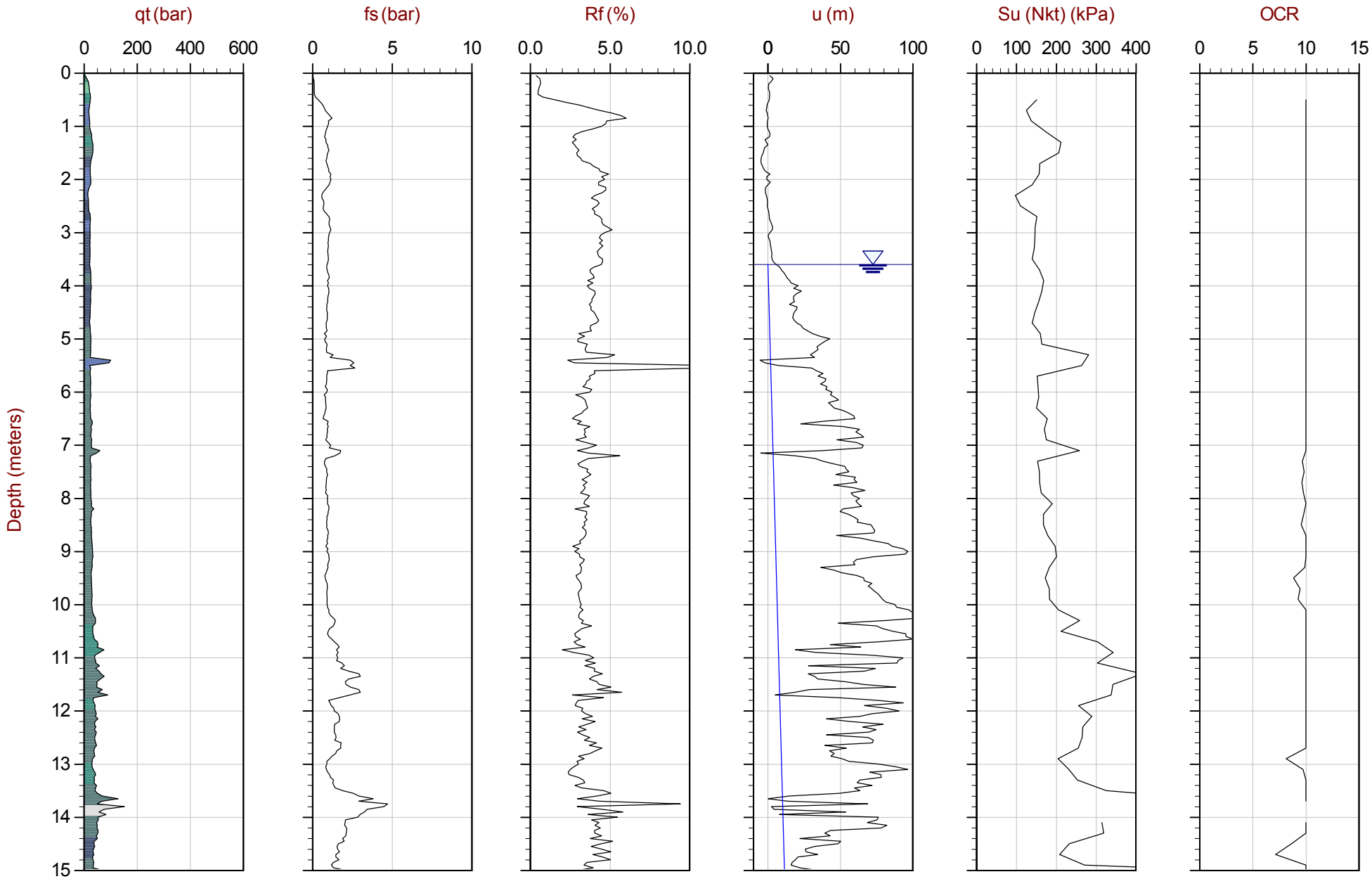
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 15:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D60
Cone: 388:T1500F15U500




Max Depth: 17.250 m / 56.59 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:
Assumed Ueq
Ueq

File: 16-03023_CPD60.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

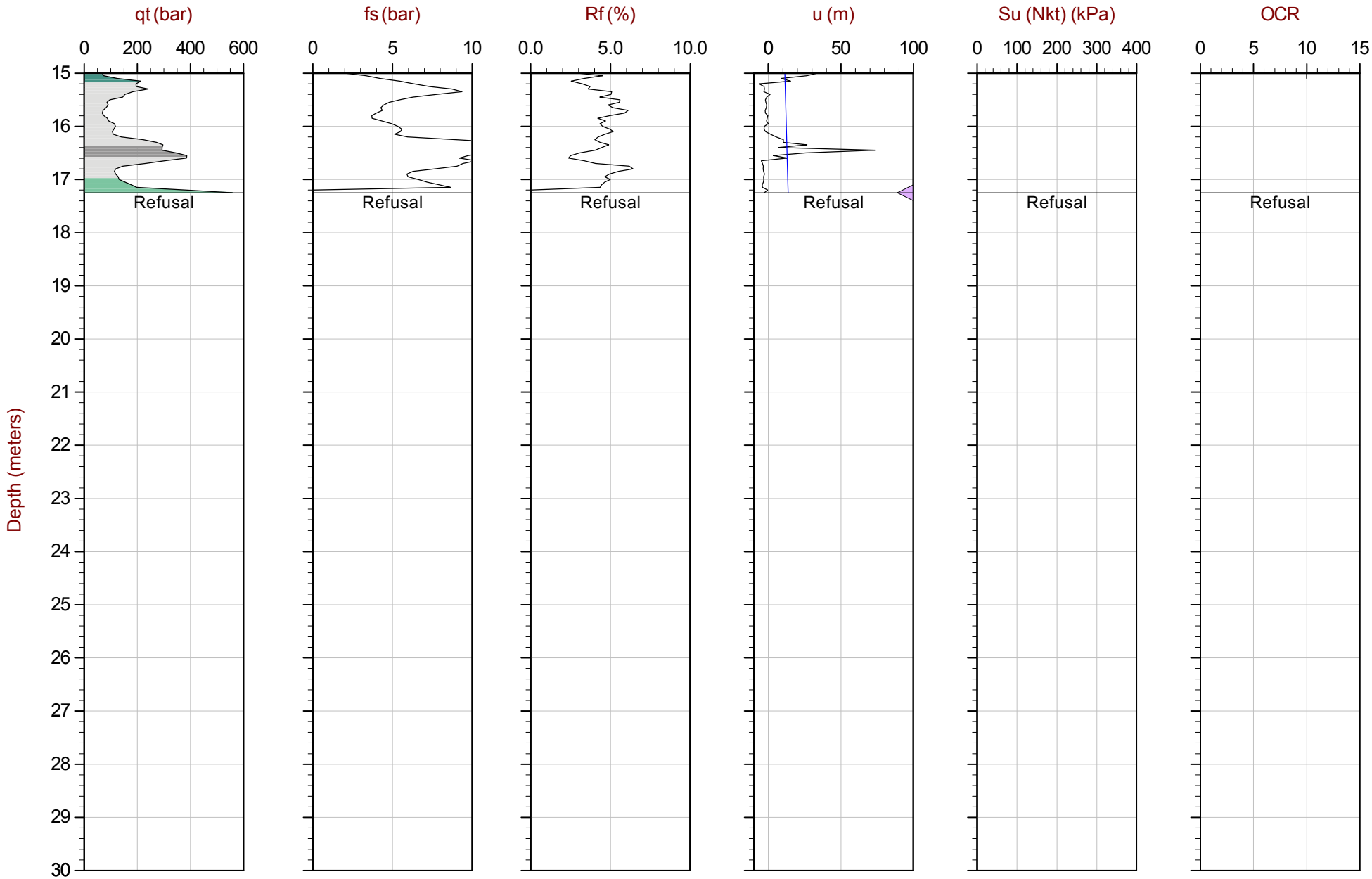
SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658594m E: 680974m Elev: 1191.99m
Sheet No: 1 of 2

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 15:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D60
Cone: 388:T1500F15U500




Max Depth: 17.250 m / 56.59 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD60.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658594m E: 680974m Elev: 1191.99m
Sheet No: 2 of 2

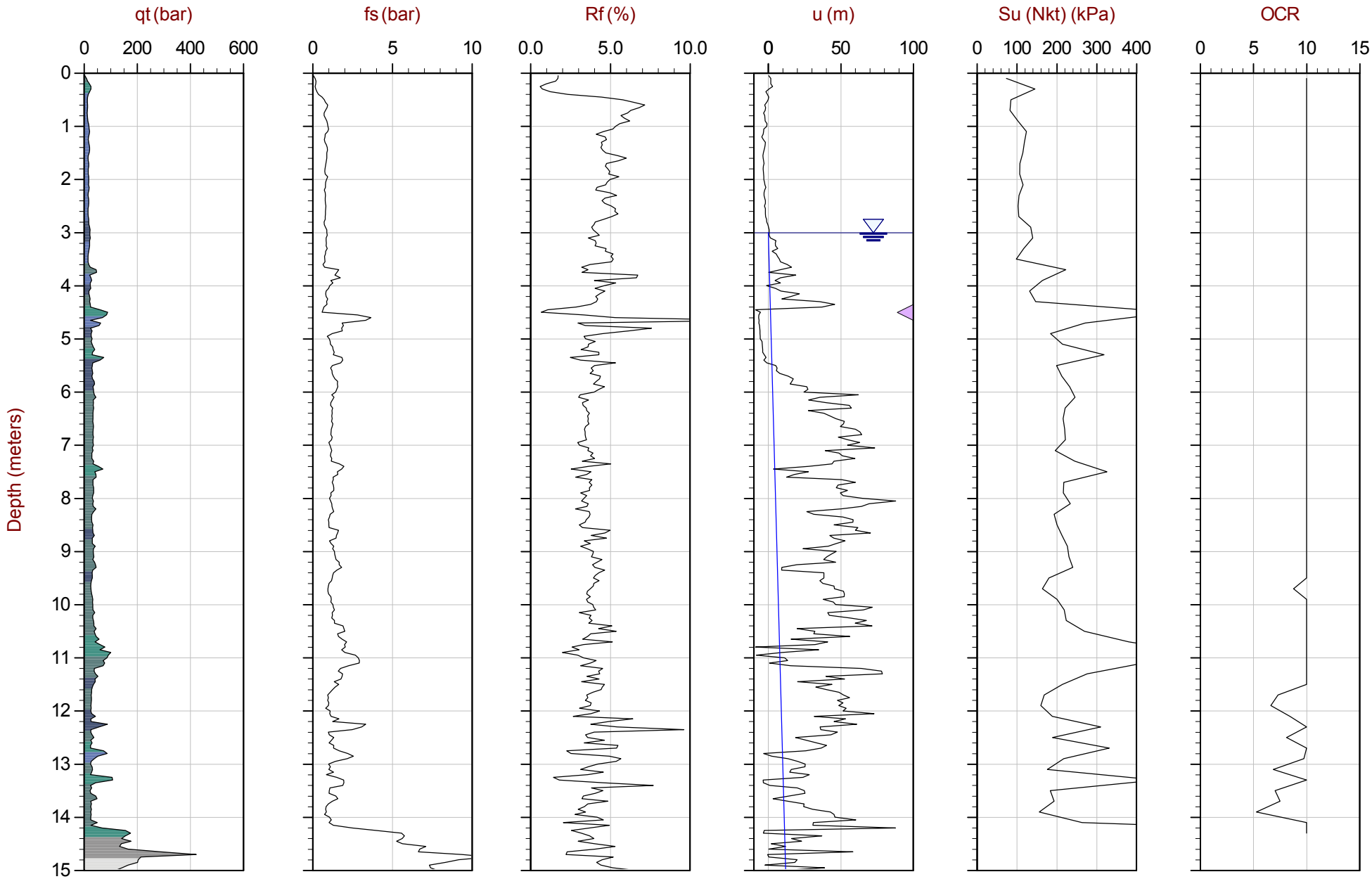
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 14:22
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D61
Cone: 388:T1500F15U500




Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD61.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658730m E: 681139m Elev: 1190.36m
Sheet No: 1 of 2

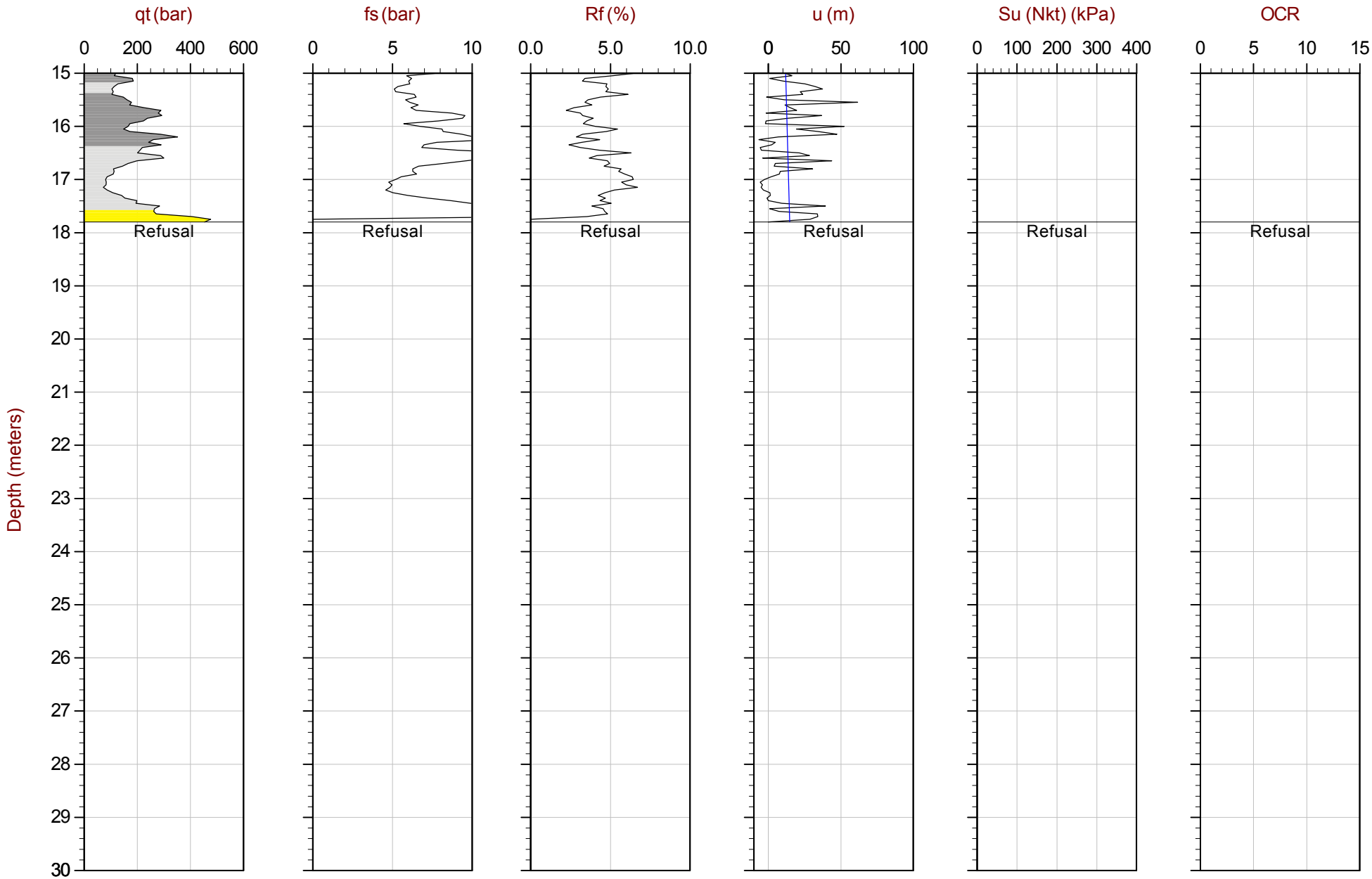
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 14:22
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D61
Cone: 388:T1500F15U500




Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD61.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658730m E: 681139m Elev: 1190.36m
Sheet No: 2 of 2

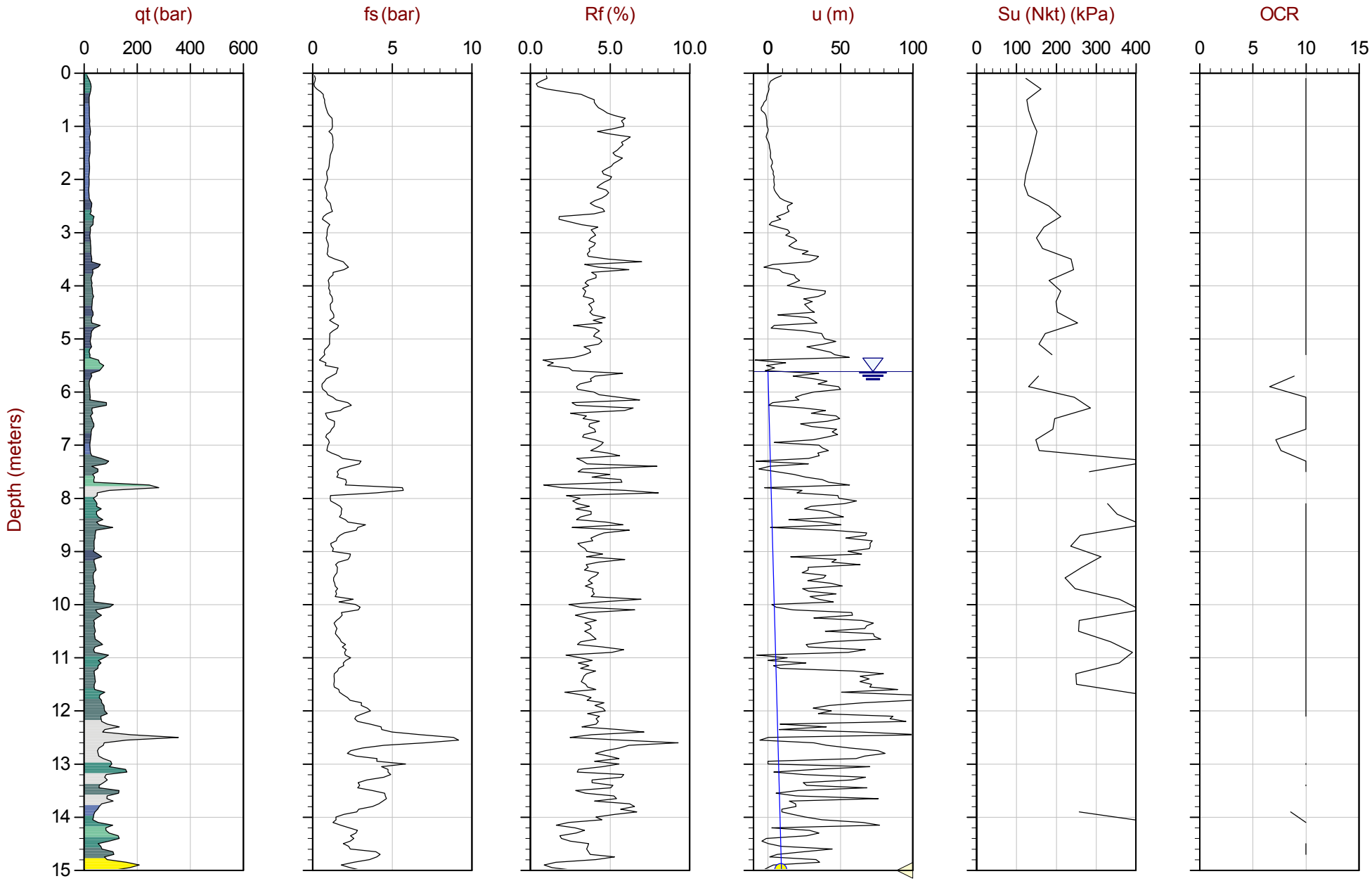
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 12:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D63
Cone: 388:T1500F15U500




Max Depth: 18.550 m / 60.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_CPD63.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658576m E: 681057m Elev: 1191.66m
Sheet No: 1 of 2

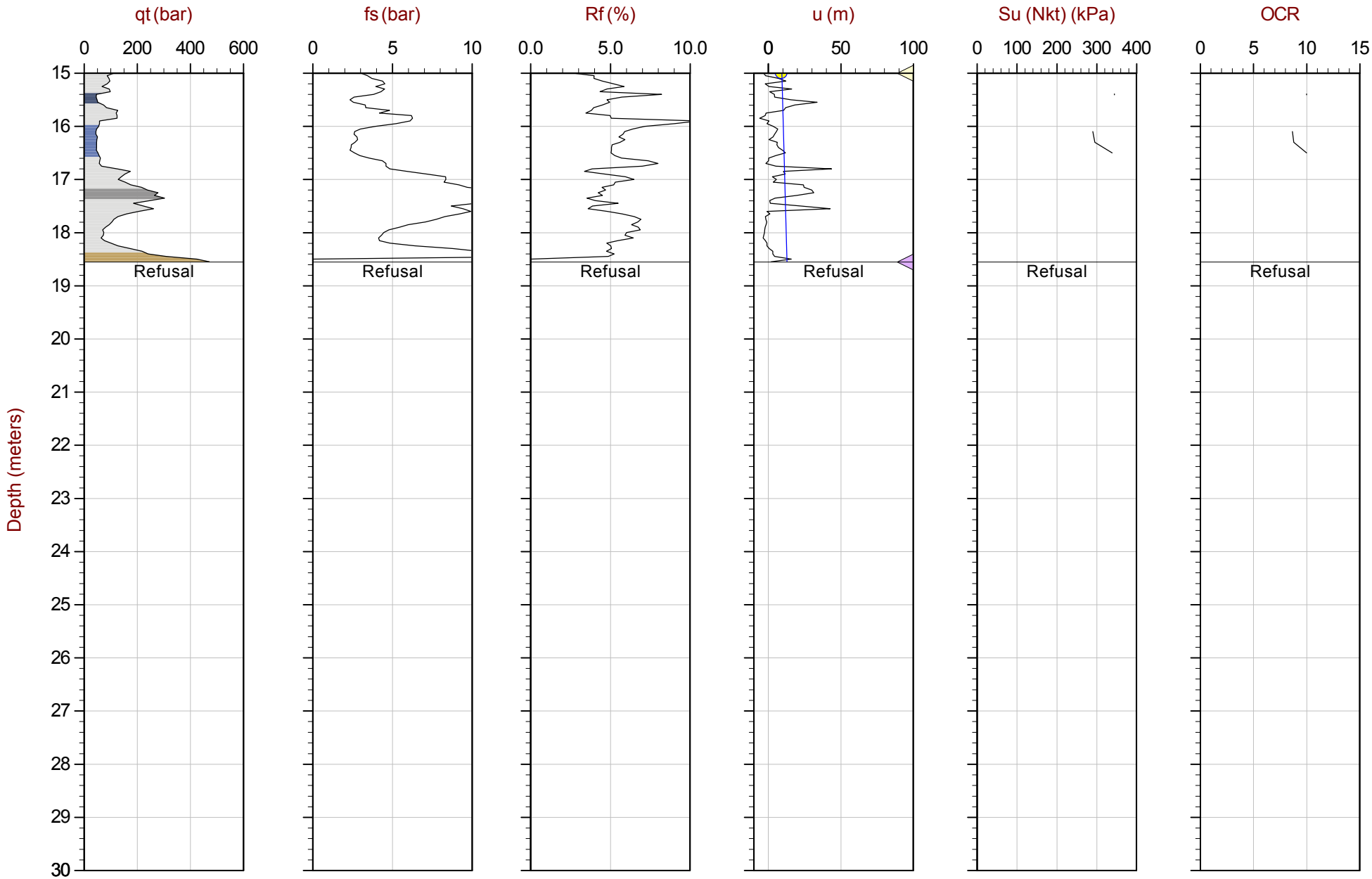
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 12:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D63
Cone: 388:T1500F15U500




Max Depth: 18.550 m / 60.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPD63.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658576m E: 681057m Elev: 1191.66m
Sheet No: 2 of 2

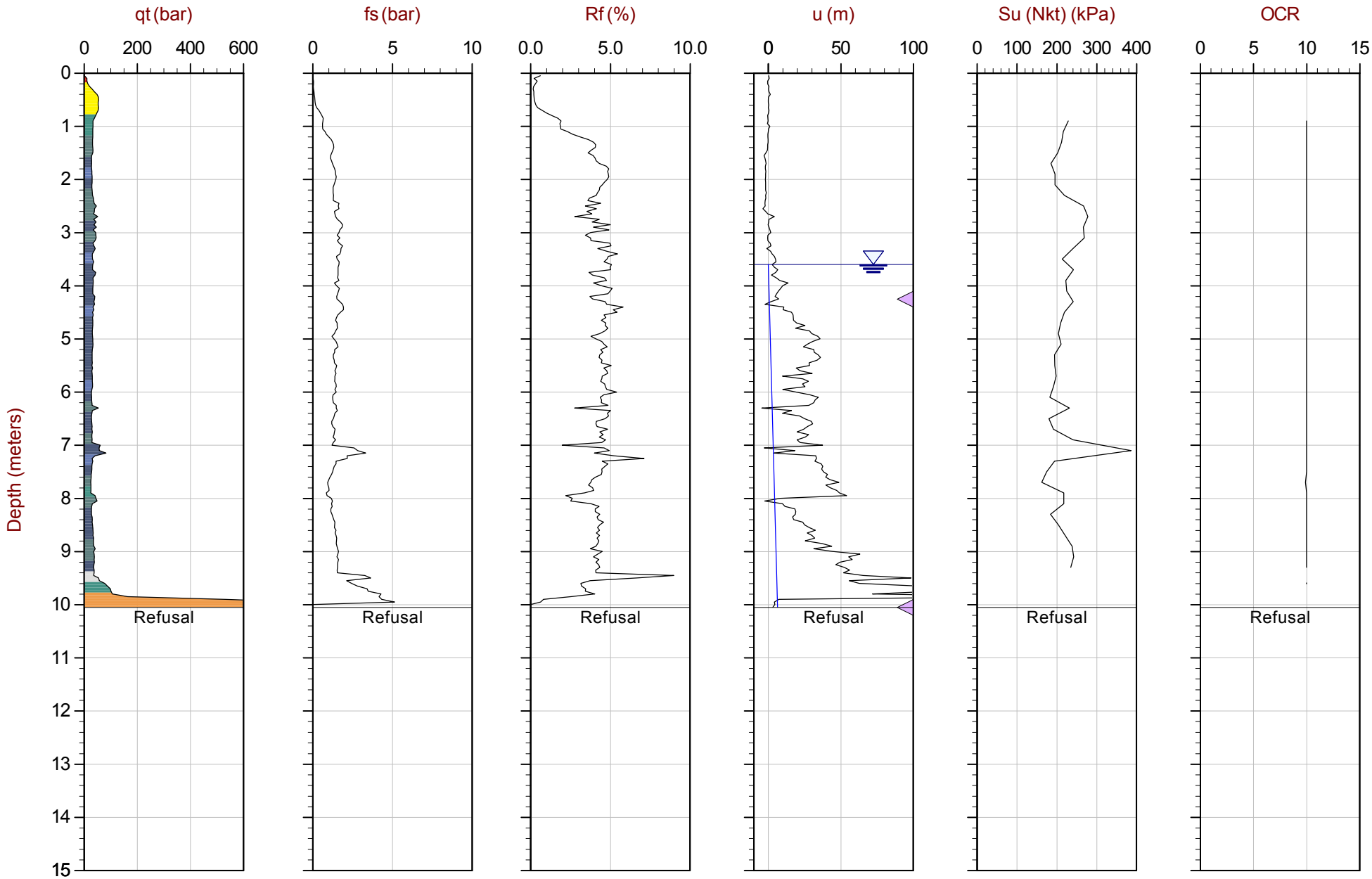
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 12:45
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64
Cone: 340:T1500F15U500




Max Depth: 10.050 m / 32.97 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD64.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659109m E: 681555m Elev: 1193.60m
Sheet No: 1 of 1

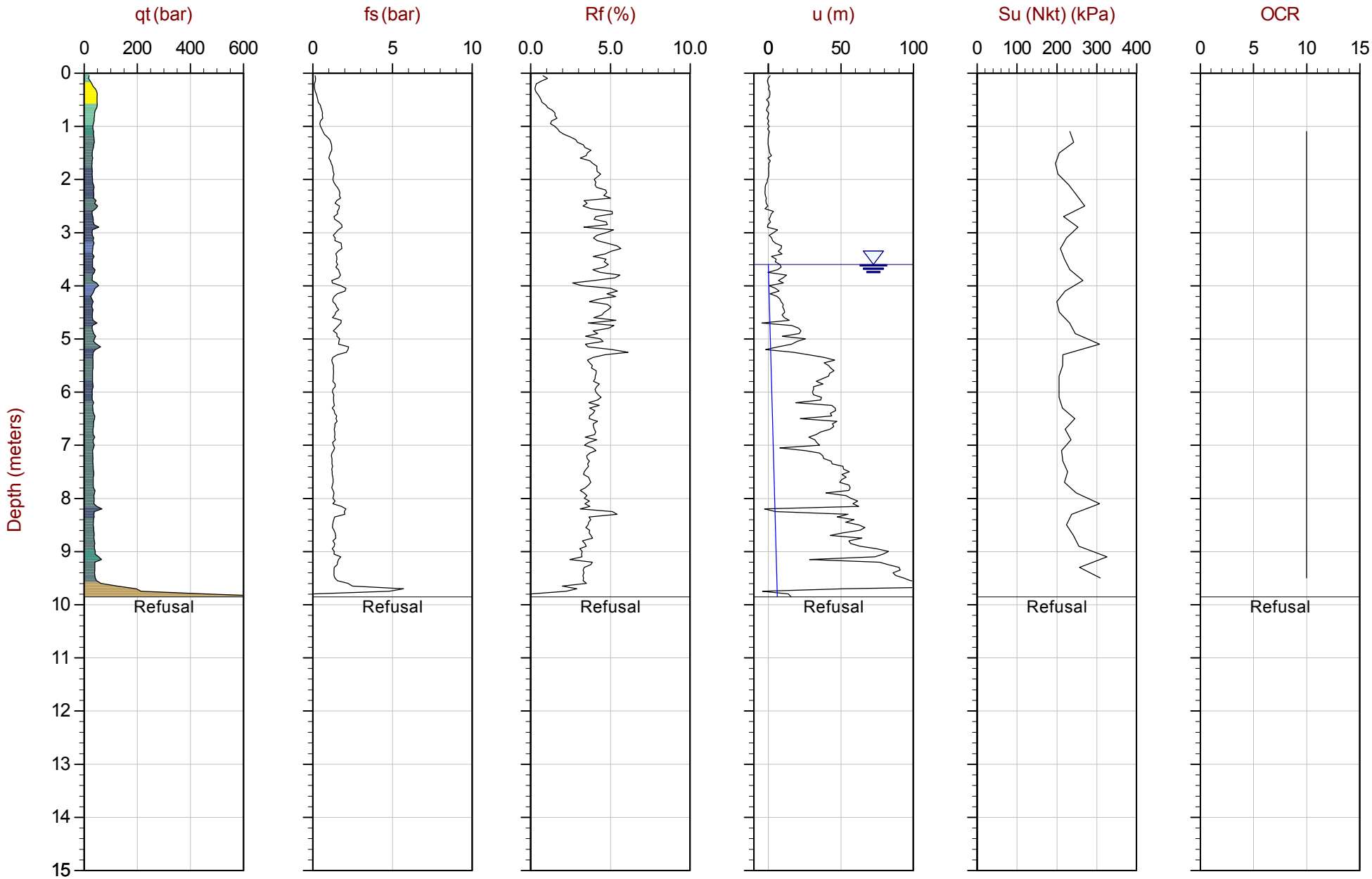
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 14:30
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64B
Cone: 340:T1500F15U500




Max Depth: 9.850 m / 32.32 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD64B.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659109m E: 681563m Elev: 1194.00m
Sheet No: 1 of 1

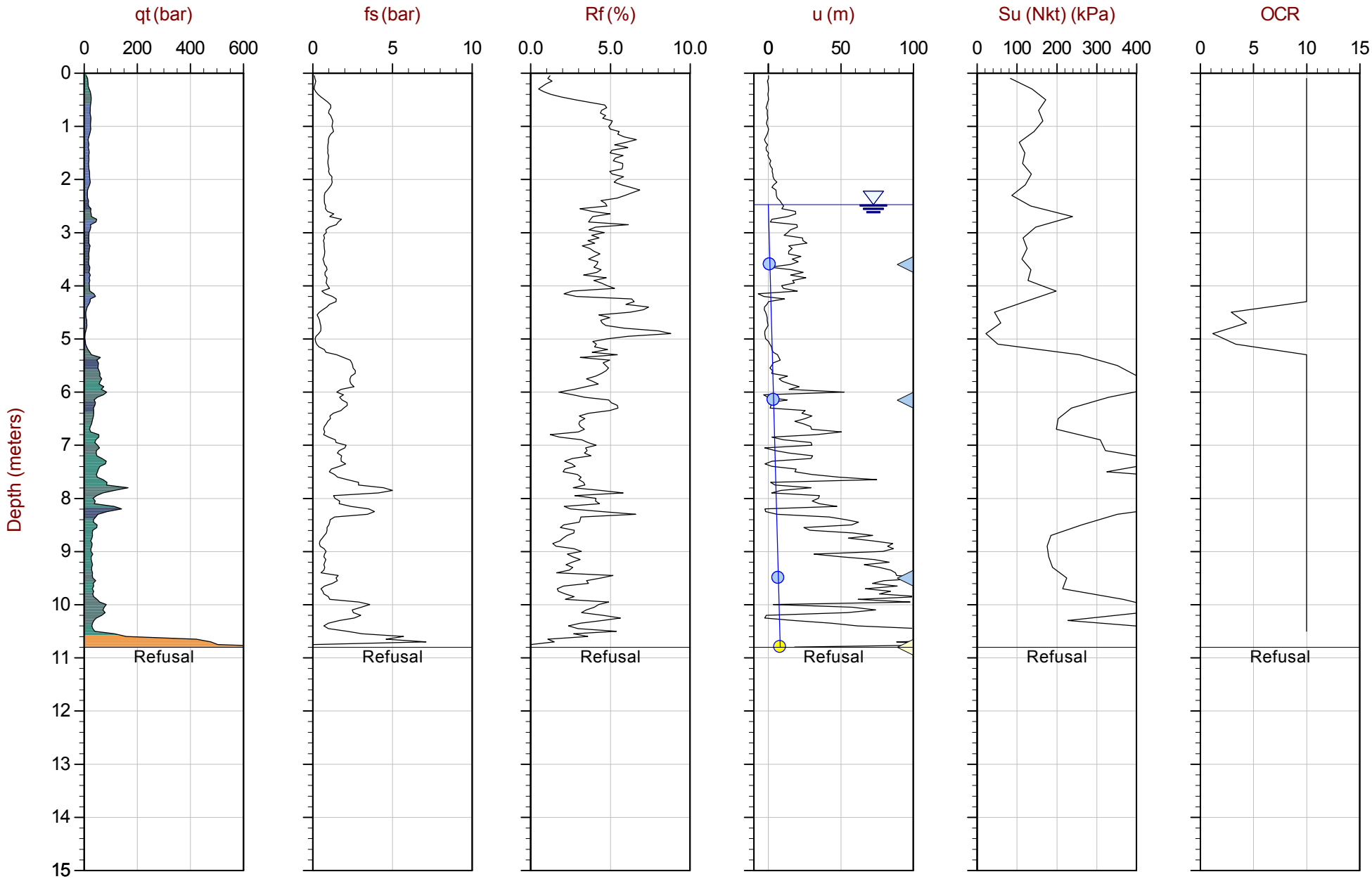
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

# Stantec

Job No: 16-03023
Date: 2016/06/20 11:03
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC26
Cone: 322:T1500F15U500




Max Depth: 10.800 m / 35.43 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPDC26.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658614m E: 678554m Elev: 1203.84m
Sheet No: 1 of 1

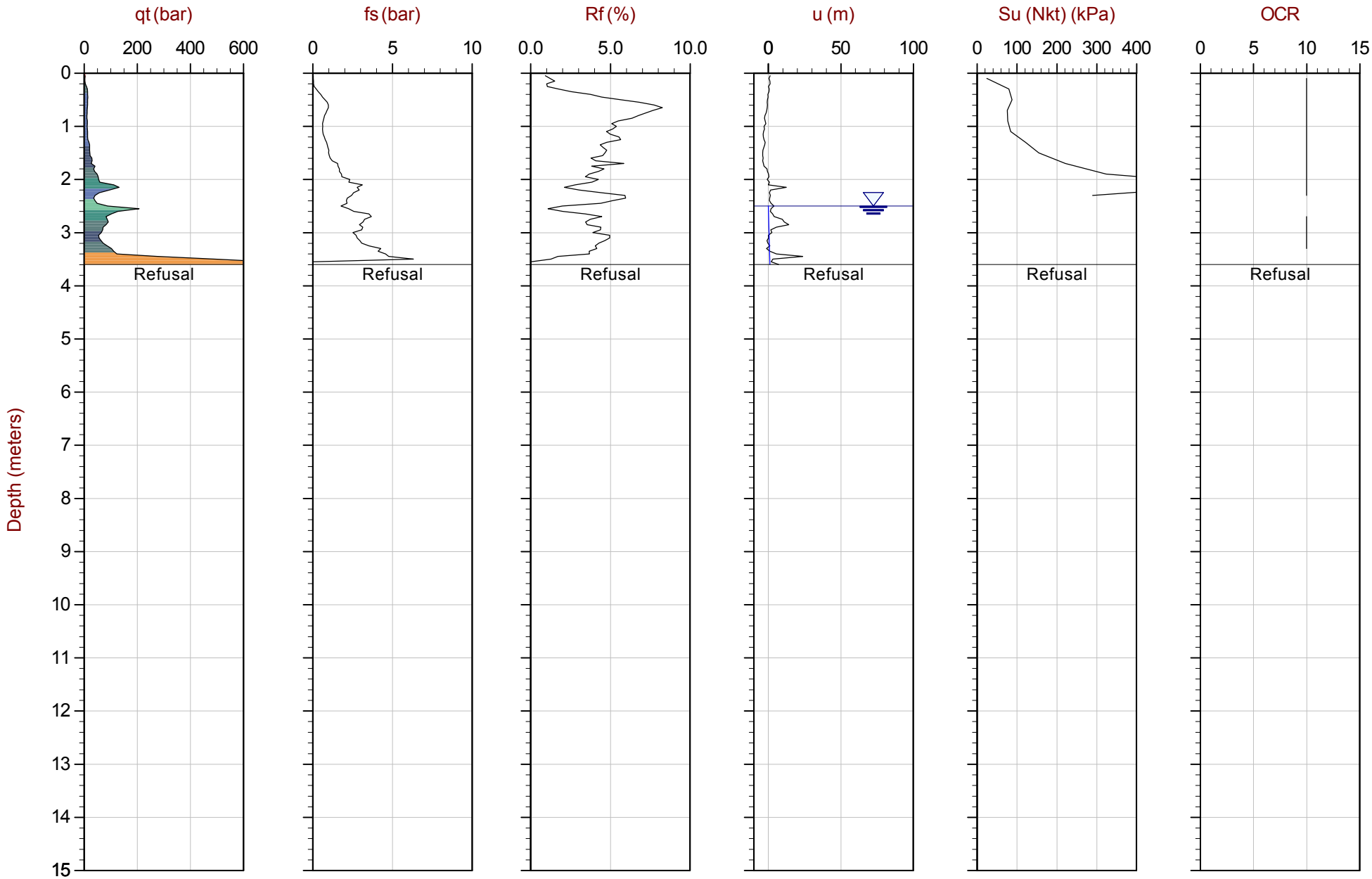
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 08:48
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-DC29
Cone: 340:T1500F15U500




Max Depth: 3.600 m / 11.81 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_CPDC29.COR
Unit Wt: SBT Zones
Su Nkt: 15.0

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658883m E: 678748m Elev: 1213.98m
Sheet No: 1 of 1

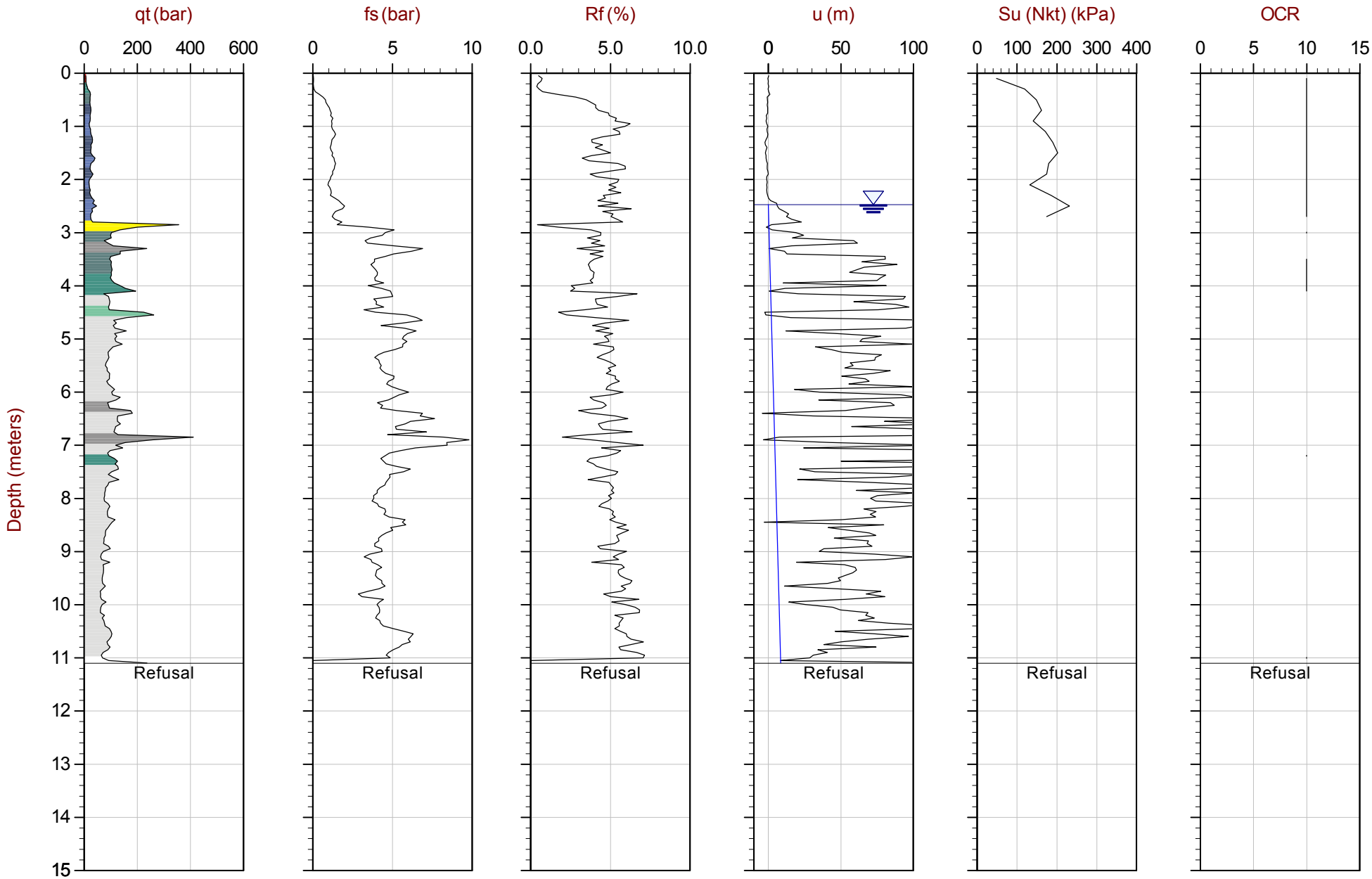
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 17:27
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC31
Cone: 340:T1500F15U500




Max Depth: 11.100 m / 36.42 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:
Assumed Ueq
Ueq

File: 16-03023_SPDC31.COR
Unit Wt: SBT Zones
Su Nkt: 15.0
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659261m E: 678799m Elev: 1207.38m
Sheet No: 1 of 1

# Seismic Cone Penetration Test Tabular Results

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-D26 |
| Date: | 23-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.50 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 0.95 | 0.75 | 0.90 | | | |
| 1.95 | 1.75 | 1.82 | 0.92 | 6.43 | 143 |
| 2.95 | 2.75 | 2.80 | 0.98 | 6.78 | 144 |
| 3.95 | 3.75 | 3.78 | 0.99 | 6.41 | 154 |
| 4.95 | 4.75 | 4.78 | 0.99 | 6.21 | 160 |
| 5.95 | 5.75 | 5.77 | 1.00 | 5.63 | 177 |
| 6.95 | 6.75 | 6.77 | 1.00 | 5.24 | 190 |
| 7.95 | 7.75 | 7.77 | 1.00 | 4.82 | 207 |
| 8.95 | 8.75 | 8.76 | 1.00 | 4.66 | 214 |
| 9.95 | 9.75 | 9.76 | 1.00 | 3.37 | 296 |
| 10.95 | 10.75 | 10.76 | 1.00 | 2.88 | 347 |
| 11.95 | 11.75 | 11.76 | 1.00 | 2.91 | 344 |
| 12.95 | 12.75 | 12.76 | 1.00 | 3.00 | 333 |
| 13.95 | 13.75 | 13.76 | 1.00 | 3.26 | 306 |
| 14.95 | 14.75 | 14.76 | 1.00 | 2.68 | 373 |
| 15.95 | 15.75 | 15.76 | 1.00 | 2.08 | 480 |
| 16.95 | 16.75 | 16.76 | 1.00 | 2.53 | 396 |
| 17.95 | 17.75 | 17.76 | 1.00 | 2.77 | 361 |
| 18.70 | 18.50 | 18.51 | 0.75 | 2.20 | 340 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-D31 |
| Date: | 24-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.55 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 1.00 | 0.80 | 0.97 | | | |
| 2.00 | 1.80 | 1.88 | 0.91 | 7.37 | 124 |
| 3.00 | 2.80 | 2.85 | 0.97 | 6.71 | 145 |
| 4.00 | 3.80 | 3.84 | 0.99 | 6.96 | 142 |
| 5.00 | 4.80 | 4.83 | 0.99 | 5.04 | 197 |
| 6.00 | 5.80 | 5.83 | 0.99 | 4.86 | 205 |
| 7.00 | 6.80 | 6.82 | 1.00 | 5.19 | 192 |
| 8.00 | 7.80 | 7.82 | 1.00 | 4.62 | 216 |
| 9.00 | 8.80 | 8.82 | 1.00 | 3.88 | 257 |
| 10.00 | 9.80 | 9.82 | 1.00 | 3.14 | 318 |
| 11.00 | 10.80 | 10.81 | 1.00 | 2.93 | 341 |
| 12.00 | 11.80 | 11.81 | 1.00 | 2.87 | 348 |
| 14.00 | 13.80 | 13.81 | 2.00 | 5.18 | 386 |
| 15.00 | 14.80 | 14.81 | 1.00 | 2.10 | 475 |
| 16.00 | 15.80 | 15.81 | 1.00 | 2.05 | 488 |
| 17.00 | 16.80 | 16.81 | 1.00 | 2.68 | 373 |
| 18.00 | 17.80 | 17.81 | 1.00 | 2.88 | 347 |
| 19.00 | 18.80 | 18.81 | 1.00 | 2.90 | 344 |
| 20.00 | 19.80 | 19.81 | 1.00 | 2.90 | 344 |
| 20.75 | 20.55 | 20.56 | 0.75 | 2.35 | 319 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-D39 |
| Date: | 23-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.50 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 1.00 | 0.80 | 0.94 | | | |
| 2.00 | 1.80 | 1.87 | 0.92 | 7.41 | 125 |
| 3.00 | 2.80 | 2.84 | 0.98 | 6.49 | 150 |
| 4.00 | 3.80 | 3.83 | 0.99 | 6.32 | 156 |
| 5.00 | 4.80 | 4.83 | 0.99 | 5.87 | 169 |
| 6.00 | 5.80 | 5.82 | 1.00 | 5.86 | 170 |
| 7.00 | 6.80 | 6.82 | 1.00 | 4.75 | 210 |
| 8.00 | 7.80 | 7.82 | 1.00 | 3.03 | 329 |
| 9.00 | 8.80 | 8.81 | 1.00 | 2.49 | 401 |
| 10.00 | 9.80 | 9.81 | 1.00 | 2.46 | 406 |
| 11.00 | 10.80 | 10.81 | 1.00 | 2.38 | 420 |
| 12.00 | 11.80 | 11.81 | 1.00 | 2.25 | 443 |
| 12.95 | 12.75 | 12.76 | 0.95 | 1.81 | 525 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-D41 |
| Date: | 21-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.40 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 1.00 | 0.80 | 0.89 | | | |
| 2.00 | 1.80 | 1.84 | 0.95 | 3.91 | 243 |
| 3.00 | 2.80 | 2.83 | 0.98 | 2.87 | 343 |
| 4.00 | 3.80 | 3.82 | 0.99 | 2.25 | 442 |
| 5.00 | 4.80 | 4.82 | 1.00 | 2.01 | 495 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-D49 |
| Date: | 22-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.45 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 1.05 | 0.85 | 0.96 | | | |
| 2.05 | 1.85 | 1.90 | 0.94 | 4.88 | 193 |
| 3.05 | 2.85 | 2.89 | 0.98 | 2.81 | 349 |
| 4.05 | 3.85 | 3.88 | 0.99 | 2.25 | 440 |
| 5.05 | 4.85 | 4.87 | 0.99 | 2.26 | 441 |
| 6.05 | 5.85 | 5.87 | 1.00 | 2.12 | 470 |
| 6.80 | 6.60 | 6.62 | 0.75 | 2.30 | 325 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-D50 |
| Date: | 21-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 1.00 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 1.90 | 1.70 | 1.97 | | | |
| 2.90 | 2.70 | 2.88 | 0.91 | 4.62 | 197 |
| 3.90 | 3.70 | 3.83 | 0.95 | 3.42 | 279 |
| 4.90 | 4.70 | 4.81 | 0.97 | 2.44 | 398 |
| 5.90 | 5.70 | 5.79 | 0.98 | 2.27 | 432 |
| 6.90 | 6.70 | 6.77 | 0.99 | 2.23 | 443 |
| 7.90 | 7.70 | 7.76 | 0.99 | 2.11 | 469 |
| 8.90 | 8.70 | 8.76 | 0.99 | 2.02 | 492 |
| 9.90 | 9.70 | 9.75 | 0.99 | 2.99 | 333 |
| 10.90 | 10.70 | 10.75 | 1.00 | 3.10 | 322 |
| 11.75 | 11.55 | 11.59 | 0.85 | 2.55 | 332 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-D57 |
| Date: | 27-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.60 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 0.95 | 0.75 | 0.96 | | | |
| 1.95 | 1.75 | 1.85 | 0.89 | 6.25 | 142 |
| 2.95 | 2.75 | 2.81 | 0.96 | 5.85 | 165 |
| 3.95 | 3.75 | 3.80 | 0.98 | 5.19 | 190 |
| 4.95 | 4.75 | 4.79 | 0.99 | 4.98 | 199 |
| 5.95 | 5.75 | 5.78 | 0.99 | 4.27 | 233 |
| 6.95 | 6.75 | 6.78 | 1.00 | 4.27 | 233 |
| 7.95 | 7.75 | 7.77 | 1.00 | 3.91 | 255 |
| 8.95 | 8.75 | 8.77 | 1.00 | 3.86 | 258 |
| 9.95 | 9.75 | 9.77 | 1.00 | 4.12 | 242 |
| 10.95 | 10.75 | 10.77 | 1.00 | 3.95 | 253 |
| 11.95 | 11.75 | 11.77 | 1.00 | 4.12 | 243 |
| 12.95 | 12.75 | 12.76 | 1.00 | 3.56 | 281 |
| 13.95 | 13.75 | 13.76 | 1.00 | 2.70 | 370 |
| 14.95 | 14.75 | 14.76 | 1.00 | 2.74 | 364 |
| 15.55 | 15.35 | 15.36 | 0.60 | 1.58 | 380 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-D61 |
| Date: | 27-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.50 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 1.00 | 0.80 | 0.94 | | | |
| 2.00 | 1.80 | 1.87 | 0.92 | 6.97 | 133 |
| 3.00 | 2.80 | 2.84 | 0.98 | 7.57 | 129 |
| 4.00 | 3.80 | 3.83 | 0.99 | 6.64 | 149 |
| 5.00 | 4.80 | 4.83 | 0.99 | 4.38 | 227 |
| 6.00 | 5.80 | 5.82 | 1.00 | 4.18 | 238 |
| 7.00 | 6.80 | 6.82 | 1.00 | 3.09 | 322 |
| 8.00 | 7.80 | 7.82 | 1.00 | 2.98 | 334 |
| 9.00 | 8.80 | 8.81 | 1.00 | 2.94 | 339 |
| 10.00 | 9.80 | 9.81 | 1.00 | 2.87 | 348 |
| 11.00 | 10.80 | 10.81 | 1.00 | 2.81 | 356 |
| 12.00 | 11.80 | 11.81 | 1.00 | 2.79 | 357 |
| 13.00 | 12.80 | 12.81 | 1.00 | 2.81 | 356 |
| 14.00 | 13.80 | 13.81 | 1.00 | 2.80 | 357 |
| 15.00 | 14.80 | 14.81 | 1.00 | 2.60 | 384 |
| 16.00 | 15.80 | 15.81 | 1.00 | 2.33 | 430 |
| 17.00 | 16.80 | 16.81 | 1.00 | 2.49 | 402 |
| 17.80 | 17.60 | 17.61 | 0.80 | 2.81 | 285 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-D64 |
| Date: | 22-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.35 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 1.00 | 0.80 | 0.87 | | | |
| 2.00 | 1.80 | 1.83 | 0.96 | 5.26 | 183 |
| 3.00 | 2.80 | 2.82 | 0.99 | 4.99 | 198 |
| 4.00 | 3.80 | 3.82 | 0.99 | 4.04 | 246 |
| 5.00 | 4.80 | 4.81 | 1.00 | 3.94 | 253 |
| 6.00 | 5.80 | 5.81 | 1.00 | 4.02 | 248 |
| 7.00 | 6.80 | 6.81 | 1.00 | 3.88 | 257 |
| 8.00 | 7.80 | 7.81 | 1.00 | 3.82 | 262 |
| 9.00 | 8.80 | 8.81 | 1.00 | 3.78 | 264 |
| 10.00 | 9.80 | 9.81 | 1.00 | 2.63 | 380 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-DC26 |
| Date: | 20-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.55 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 1.00 | 0.80 | 0.97 | | | |
| 2.00 | 1.80 | 1.88 | 0.91 | 5.90 | 154 |
| 3.00 | 2.80 | 2.85 | 0.97 | 6.86 | 142 |
| 4.00 | 3.80 | 3.84 | 0.99 | 5.04 | 196 |
| 5.00 | 4.80 | 4.83 | 0.99 | 4.84 | 205 |
| 6.00 | 5.80 | 5.83 | 0.99 | 4.24 | 234 |
| 7.00 | 6.80 | 6.82 | 1.00 | 3.46 | 288 |
| 8.00 | 7.80 | 7.82 | 1.00 | 3.10 | 322 |
| 9.00 | 8.80 | 8.82 | 1.00 | 2.92 | 341 |
| 10.00 | 9.80 | 9.82 | 1.00 | 2.83 | 352 |
| 10.80 | 10.60 | 10.61 | 0.80 | 2.17 | 368 |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Sounding ID: | SCPT16-DC31 |
| Date: | 20-Jun-2016 |

| | |
|---|---|
| Seismic Source: | Beam |
| Source Offset (m): | 0.35 |
| Source Depth (m): | 0.00 |
| Geophone Offset (m): | 0.20 |

## *SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs*

| Tip Depth (m) | Geophone Depth (m) | Ray Path (m) | Ray Path Difference (m) | Travel Time Interval (ms) | Interval Velocity (m/s) |
|---|---|---|---|---|---|
| 0.95 | 0.75 | 0.83 | | | |
| 1.95 | 1.75 | 1.78 | 0.96 | 6.59 | 145 |
| 2.95 | 2.75 | 2.77 | 0.99 | 4.79 | 206 |
| 3.95 | 3.75 | 3.77 | 0.99 | 2.52 | 395 |
| 4.95 | 4.75 | 4.76 | 1.00 | 2.22 | 450 |
| 5.95 | 5.75 | 5.76 | 1.00 | 2.20 | 454 |
| 6.95 | 6.75 | 6.76 | 1.00 | 2.16 | 463 |
| 7.95 | 7.75 | 7.76 | 1.00 | 2.14 | 468 |
| 8.95 | 8.75 | 8.76 | 1.00 | 2.17 | 461 |
| 9.95 | 9.75 | 9.76 | 1.00 | 2.19 | 457 |
| 10.95 | 10.75 | 10.76 | 1.00 | 2.09 | 479 |

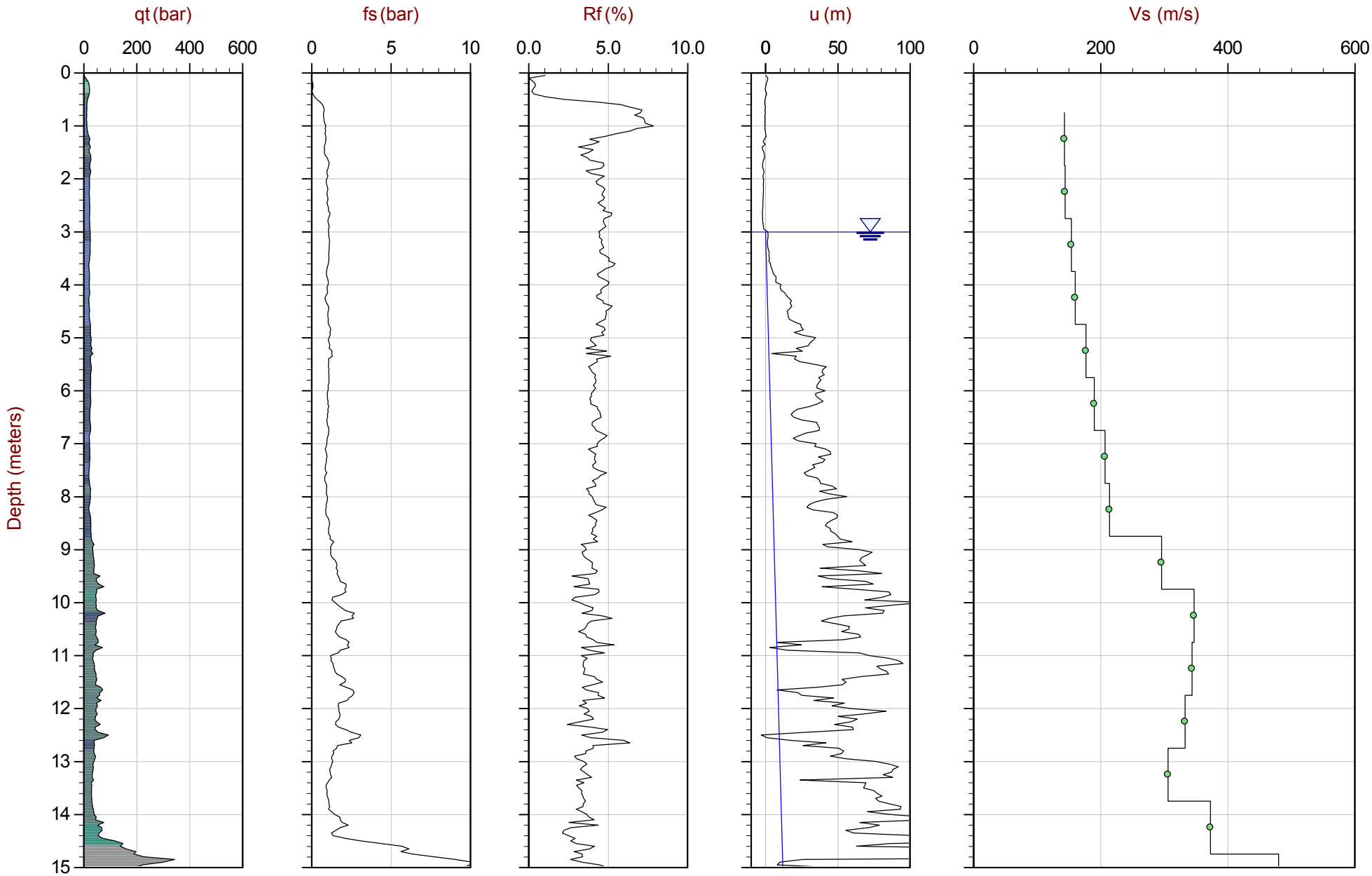
# Seismic Cone Penetration Test Plots

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 16:35
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26
Cone: 322:T1500F15U500




Max Depth: 18.750 m / 61.52 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 680837m Elev: 1192.03m
Sheet No: 1 of 2

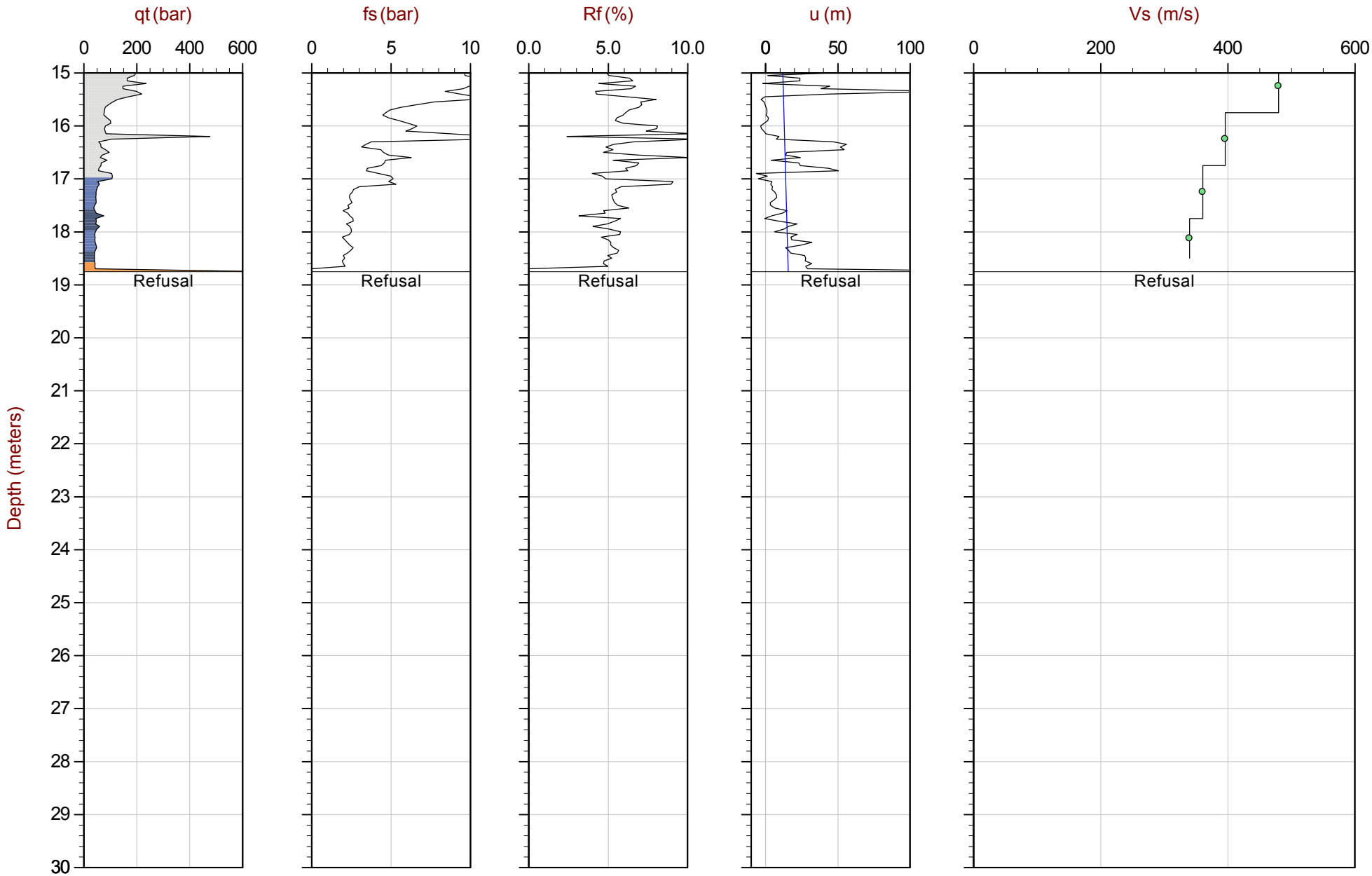
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 16:35
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26
Cone: 322:T1500F15U500




Max Depth: 18.750 m / 61.52 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658520m E: 680837m Elev: 1192.03m
Sheet No: 2 of 2

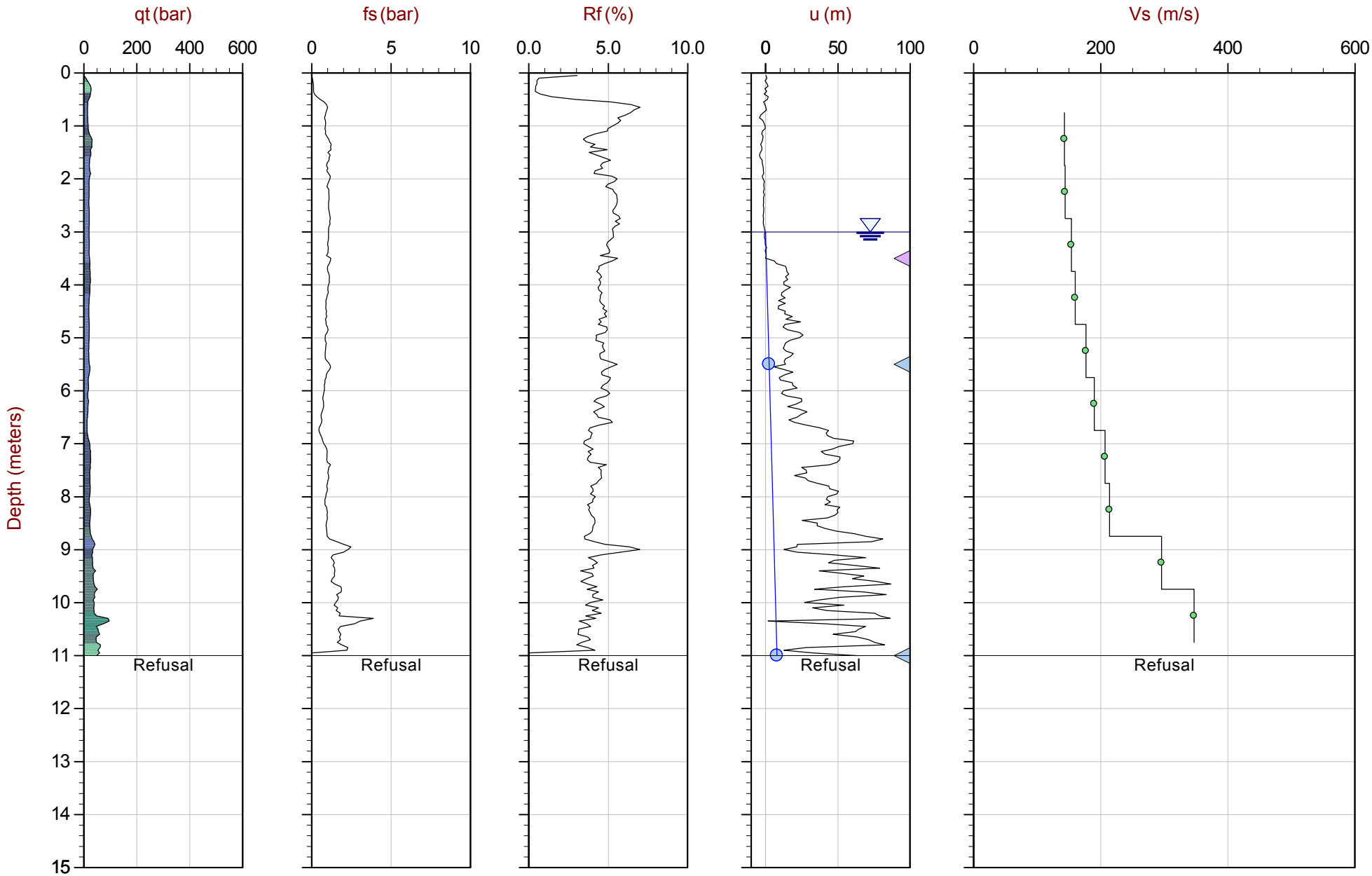
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 09:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26B
Cone: 388:T1500F15U500




Max Depth: 11.000 m / 36.09 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m
Overplot Item:

File: 16-03023_SPD26B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658519m E: 680838m Elev: 1192.03m
Sheet No: 1 of 1

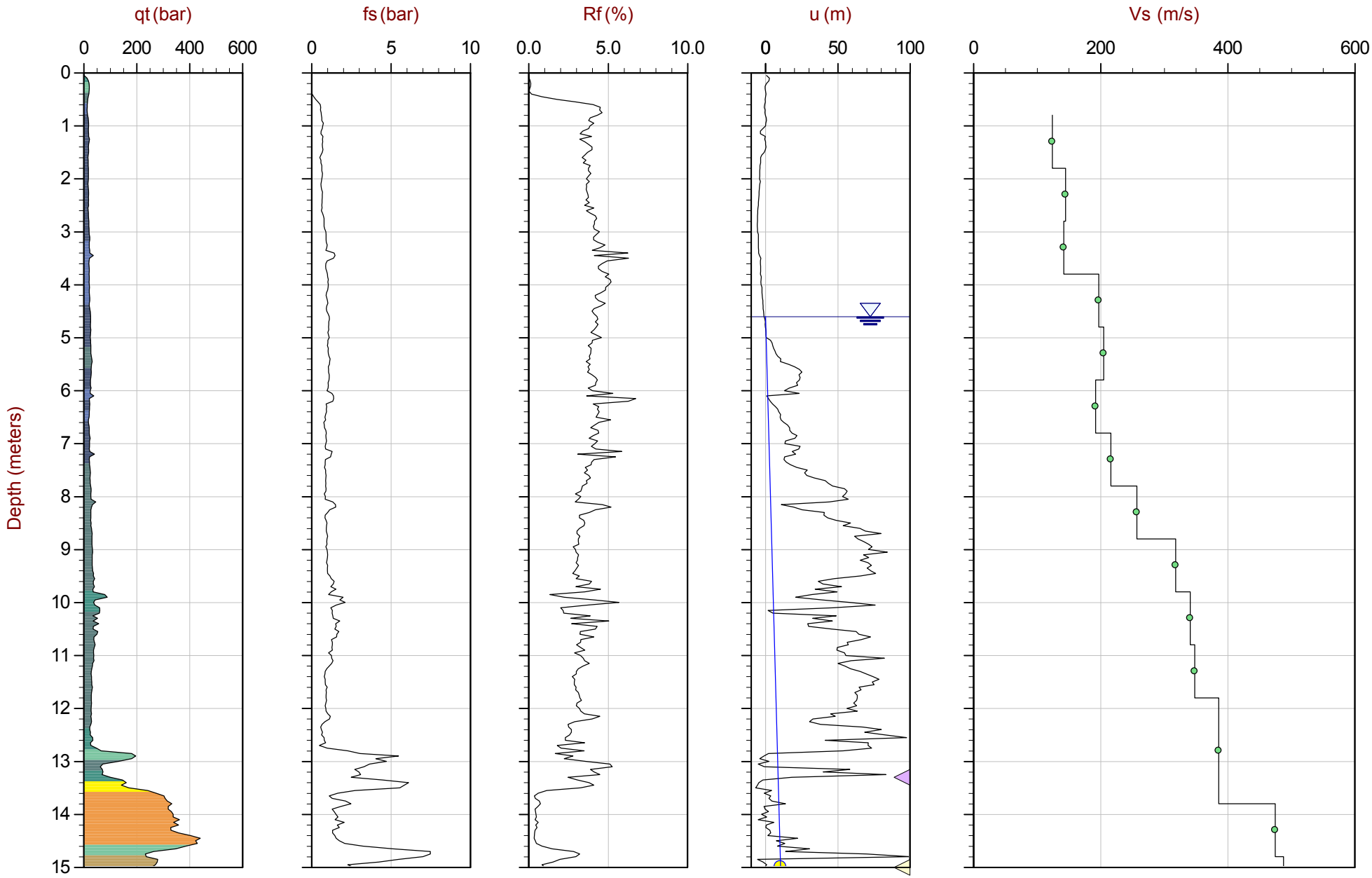
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500




Max Depth: 20.750 m / 68.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD31.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658444m E: 681072m Elev: 1191.00m
Sheet No: 1 of 2

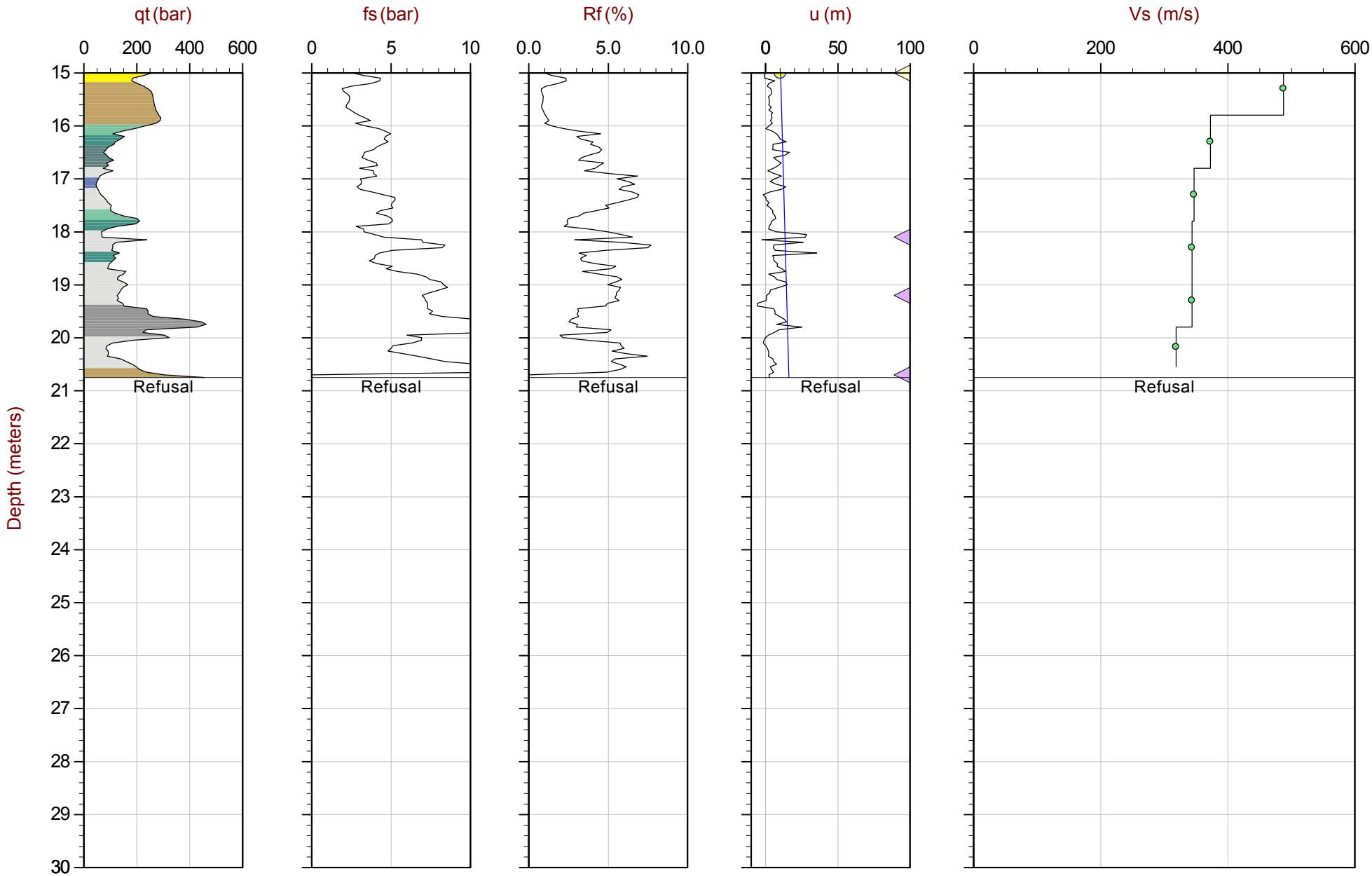
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/24 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500




Max Depth: 20.750 m / 68.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD31.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658444m E: 681072m Elev: 1191.00m
Sheet No: 2 of 2

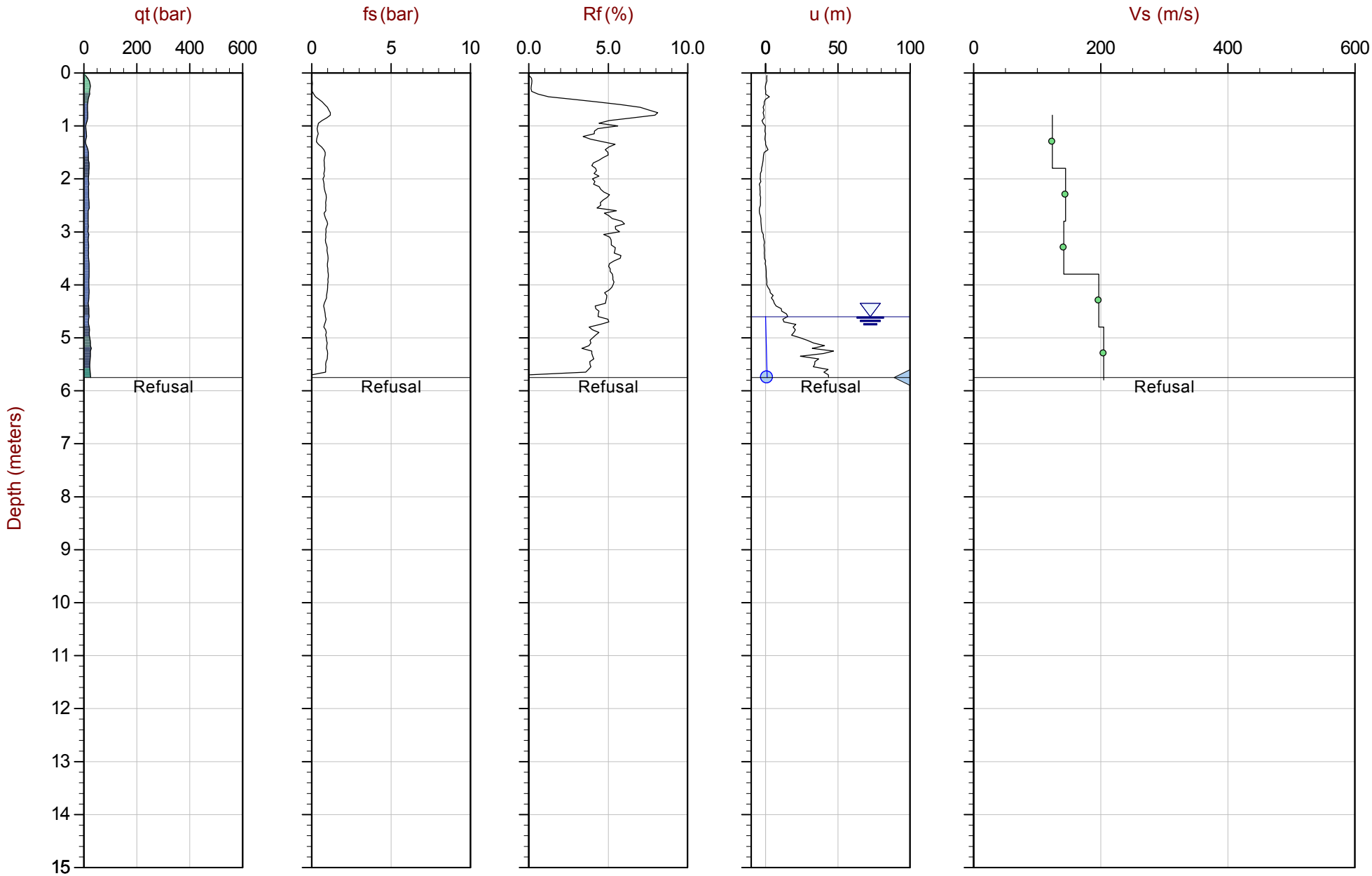
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/25 10:12
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31B
Cone: 388:T1500F15U500




Max Depth: 5.750 m / 18.86 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD31B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658445m E: 681072m Elev: 1191.00m
Sheet No: 1 of 1

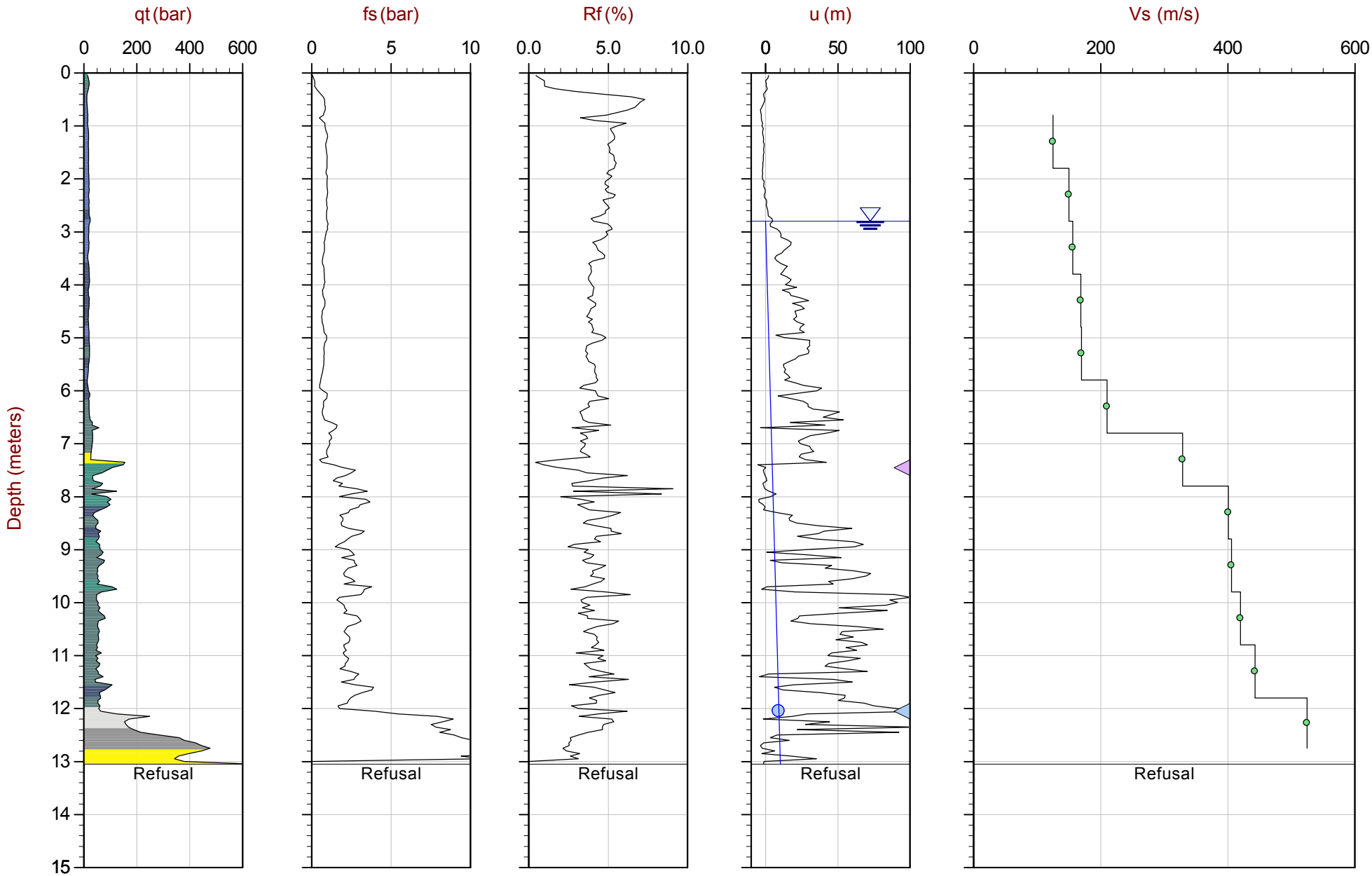
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/23 12:42
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D39
Cone: 322:T1500F15U500




Max Depth: 13.050 m / 42.81 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD39.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658690m E: 681332m Elev: 1191.43m
Sheet No: 1 of 1

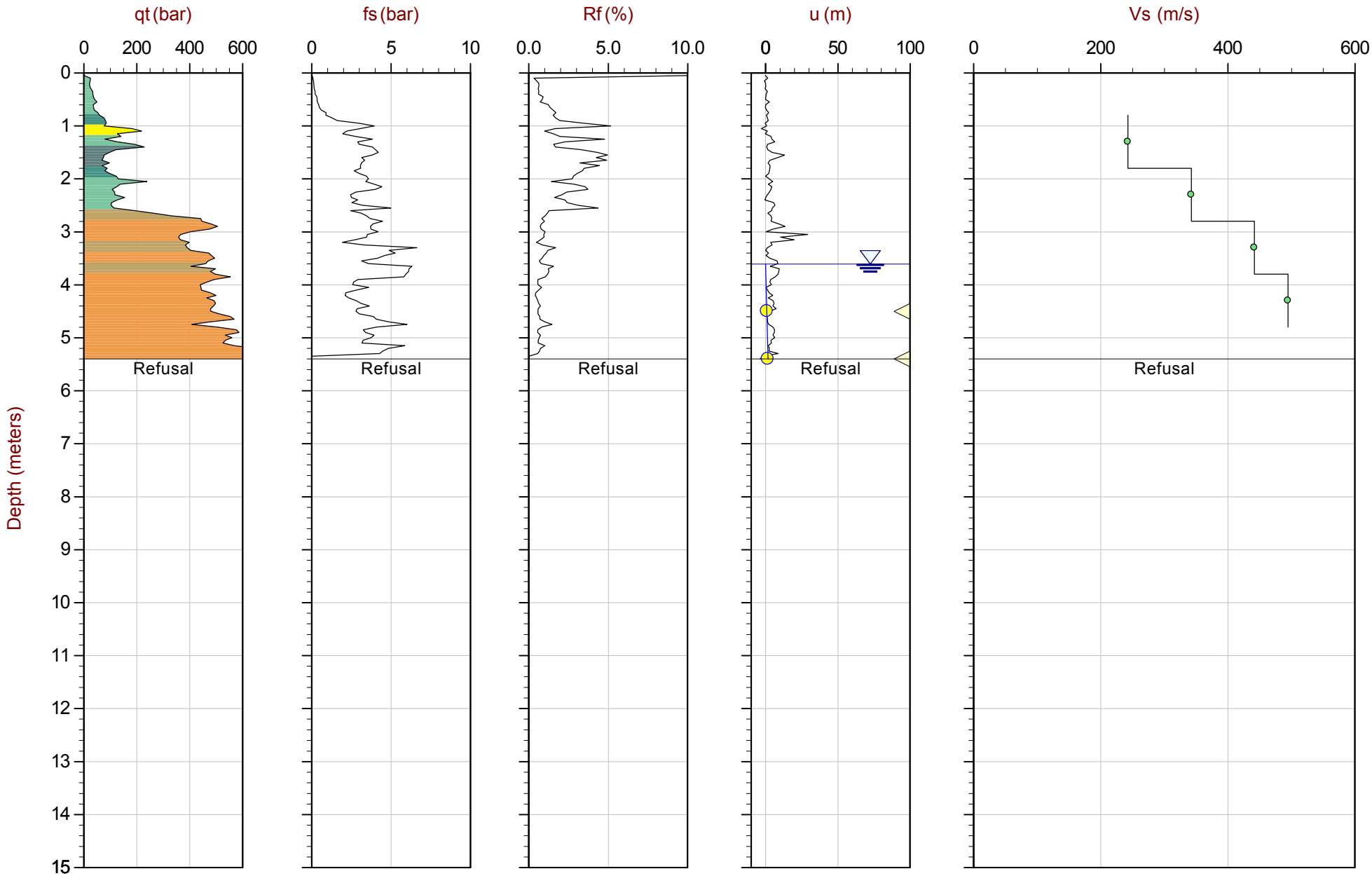
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 14:52
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41
Cone: 340:T1500F15U500




Max Depth: 5.400 m / 17.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD41.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658881m E: 681387m Elev: 1186.66m
Sheet No: 1 of 1

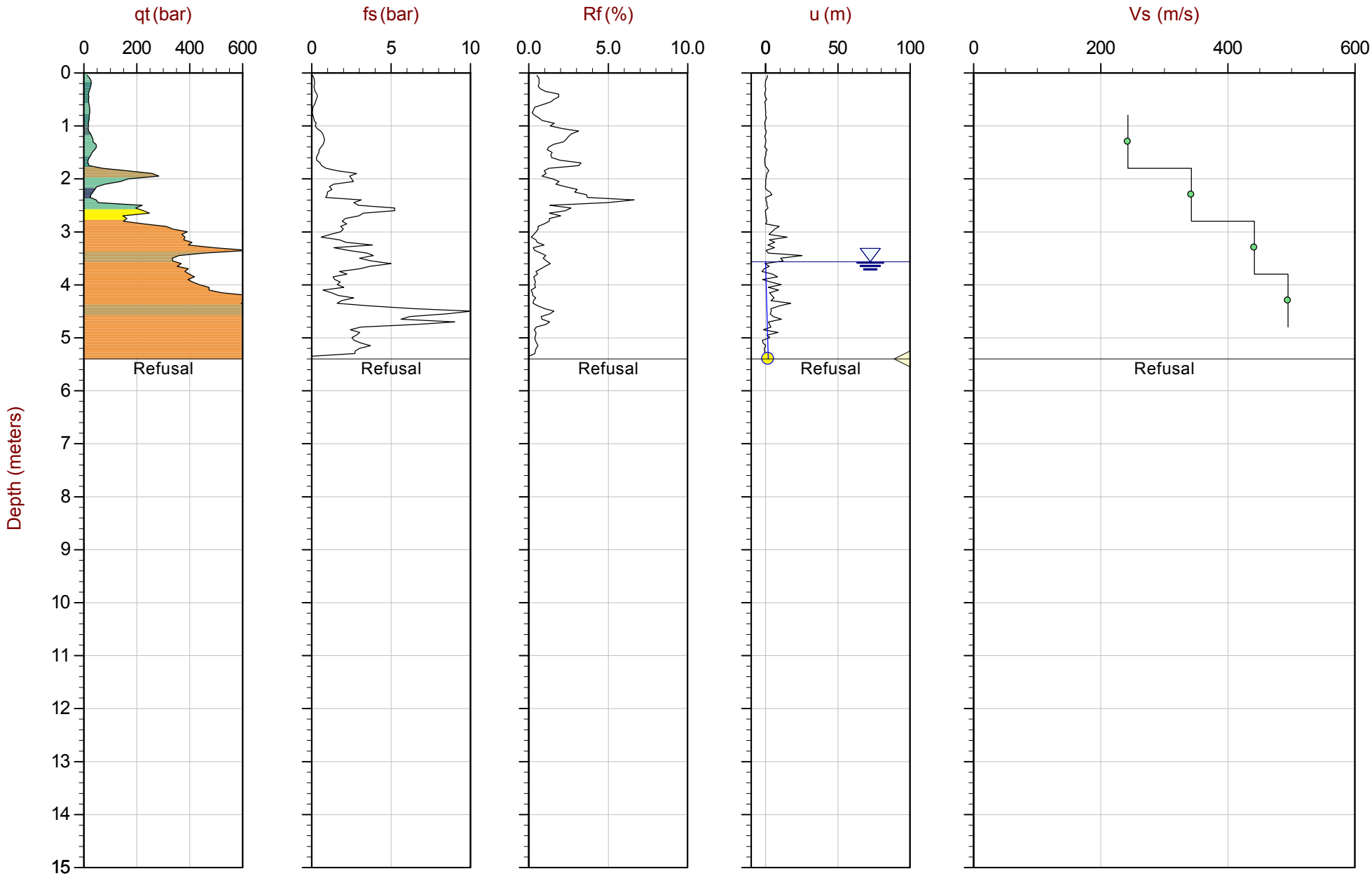
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 16:10
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41B
Cone: 340:T1500F15U500




Max Depth: 5.400 m / 17.72 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD41B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658878m E: 681392m Elev: 1187.00m
Sheet No: 1 of 1

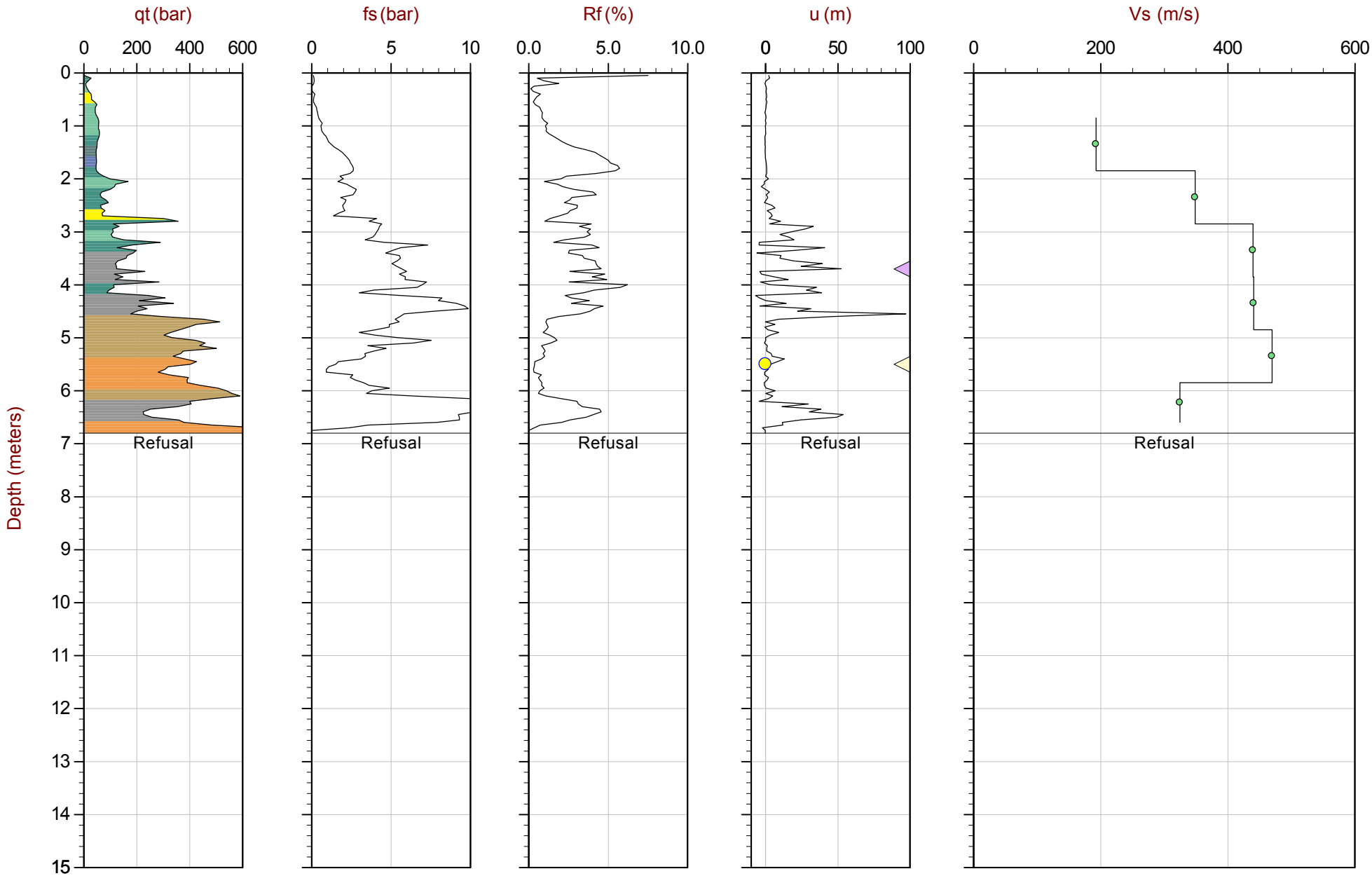
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 10:44
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49
Cone: 340:T1500F15U500




Max Depth: 6.800 m / 22.31 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD49.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659075m E: 681481m Elev: 1187.24m
Sheet No: 1 of 1

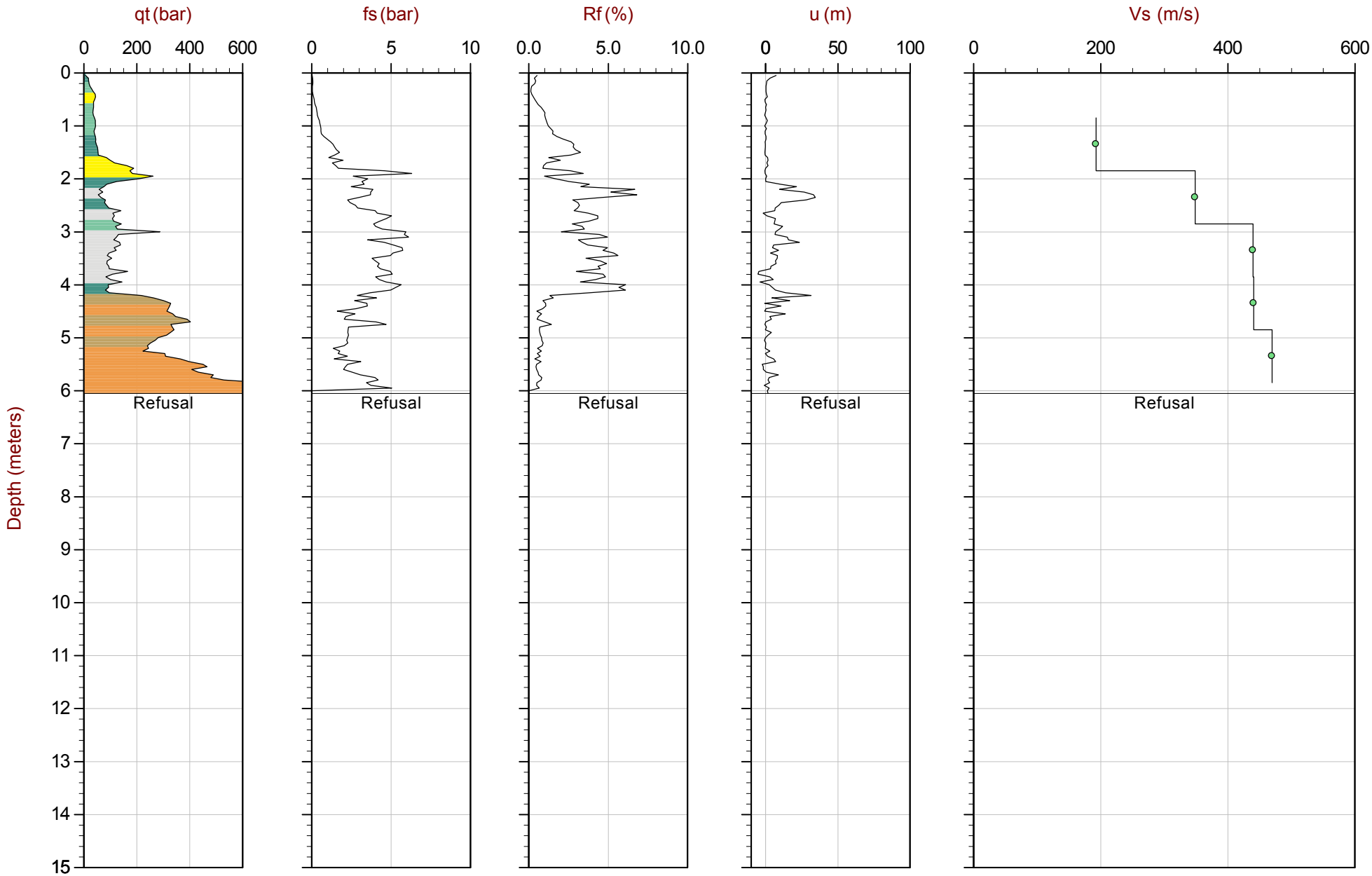
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 15:20
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49B
Cone: 340:T1500F15U500




Max Depth: 6.050 m / 19.85 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD49B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659077m E: 681469m Elev: 1187.00m
Sheet No: 1 of 1

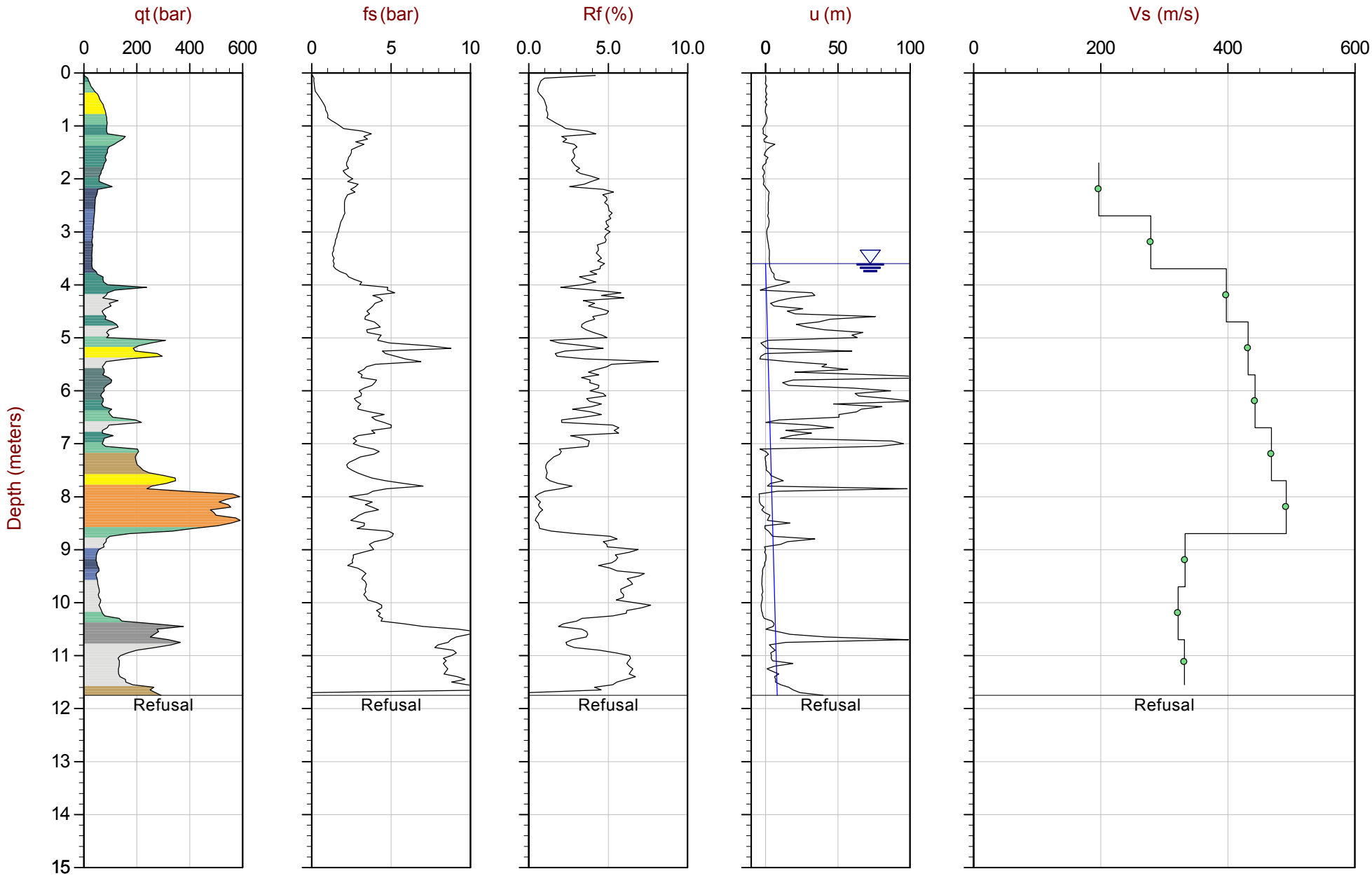
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/21 17:17
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D50
Cone: 340:T1500F15U500




Max Depth: 11.750 m / 38.55 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD50.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659098m E: 681364m Elev: N/Am
Sheet No: 1 of 1

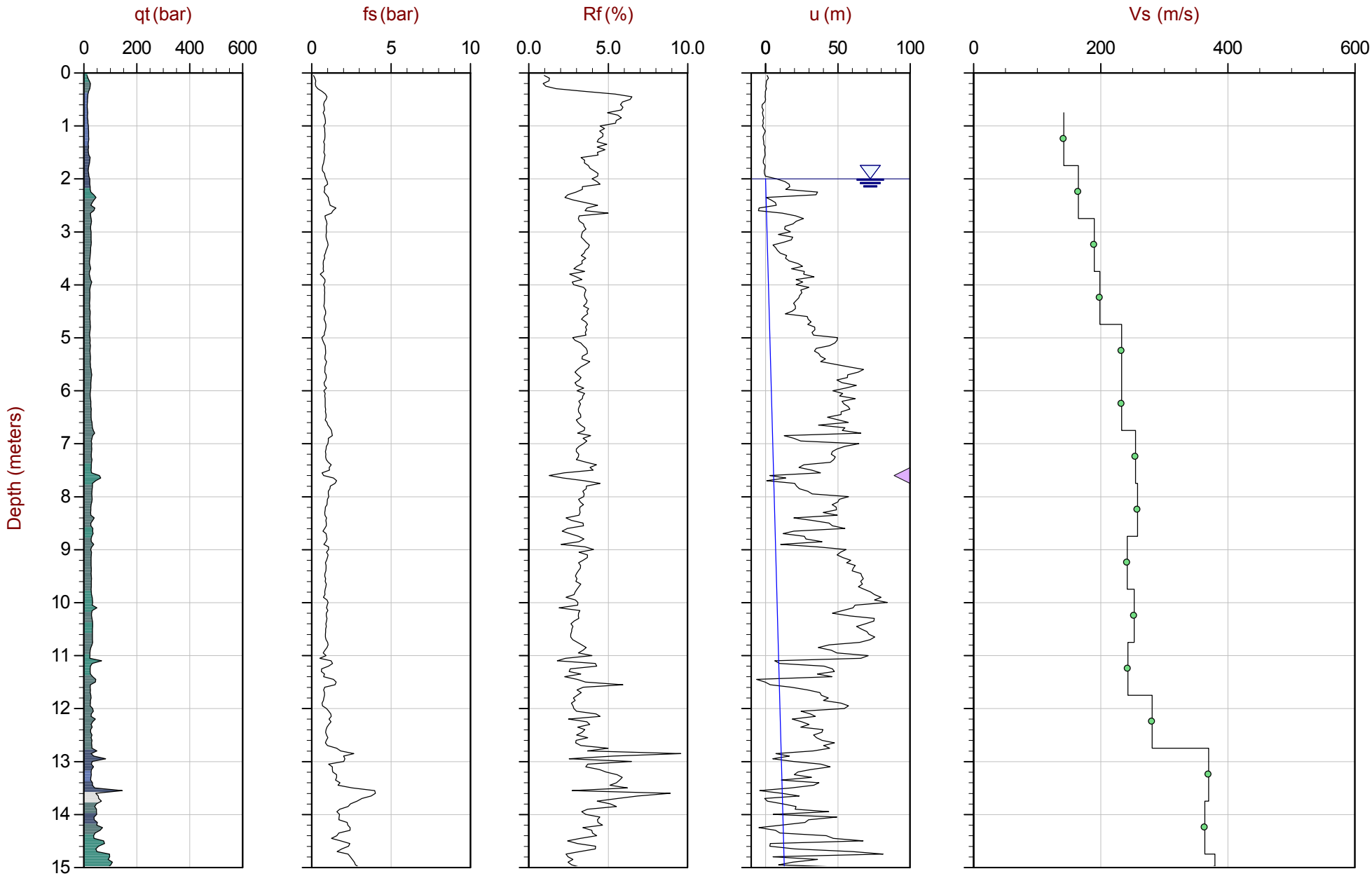
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 17:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D57
Cone: 388:T1500F15U500




Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD57.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658705m E: 680883m Elev: 1191.58m
Sheet No: 1 of 2

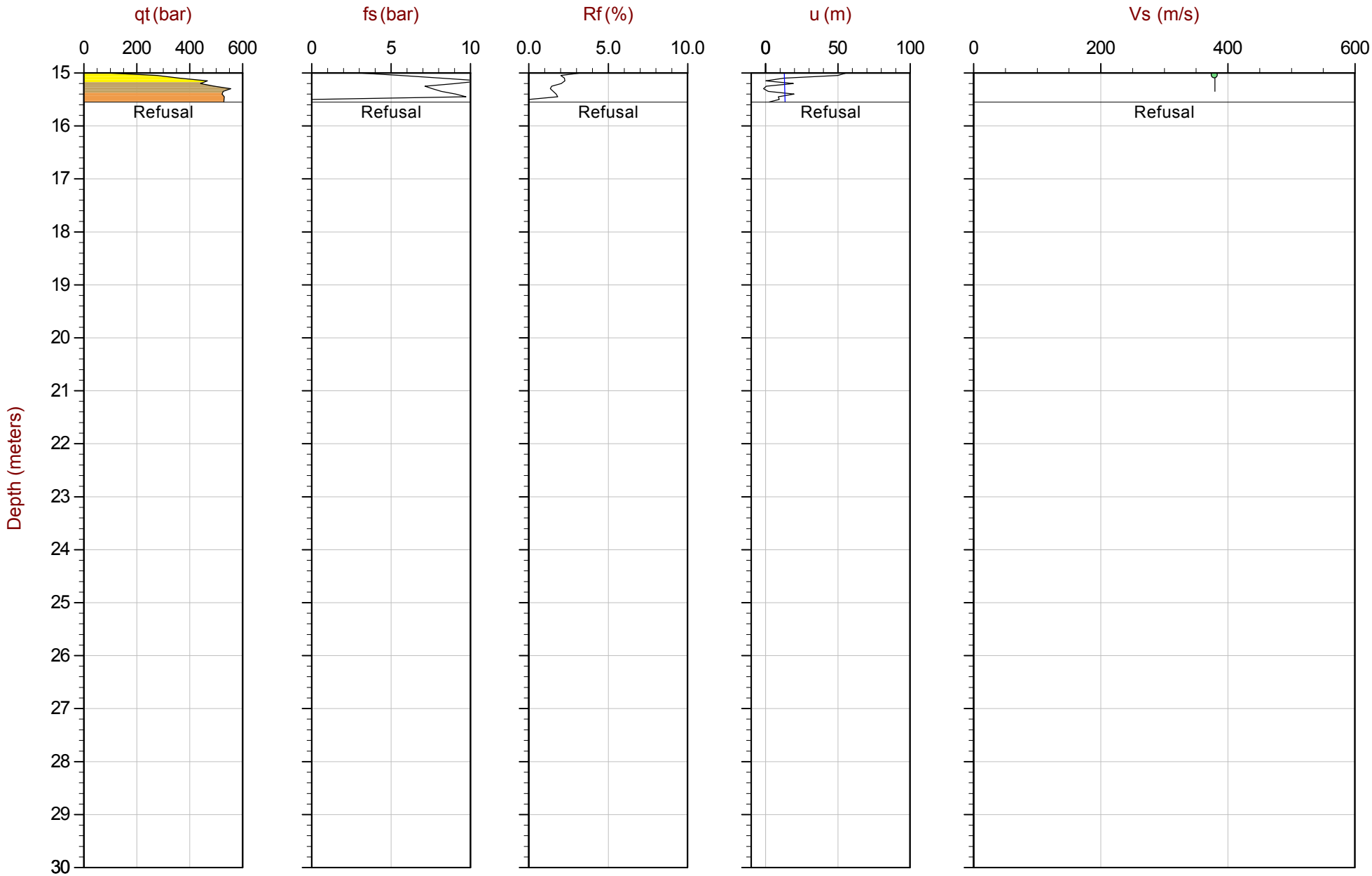
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 17:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D57
Cone: 388:T1500F15U500




Max Depth: 15.550 m / 51.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD57.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658705m E: 680883m Elev: 1191.58m
Sheet No: 2 of 2

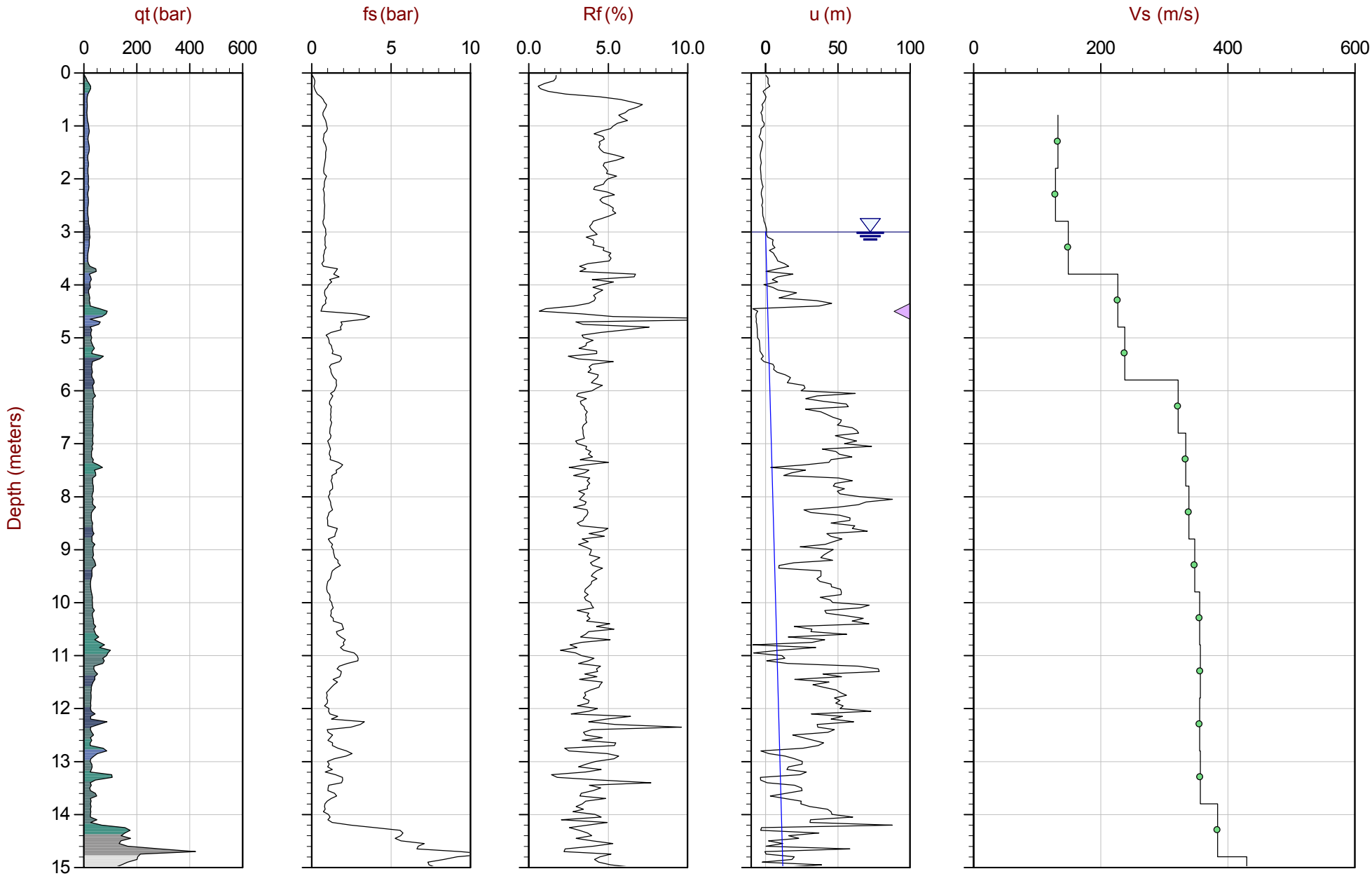
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 14:22
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D61
Cone: 388:T1500F15U500




Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD61.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658730m E: 681139m Elev: 1190.36m
Sheet No: 1 of 2

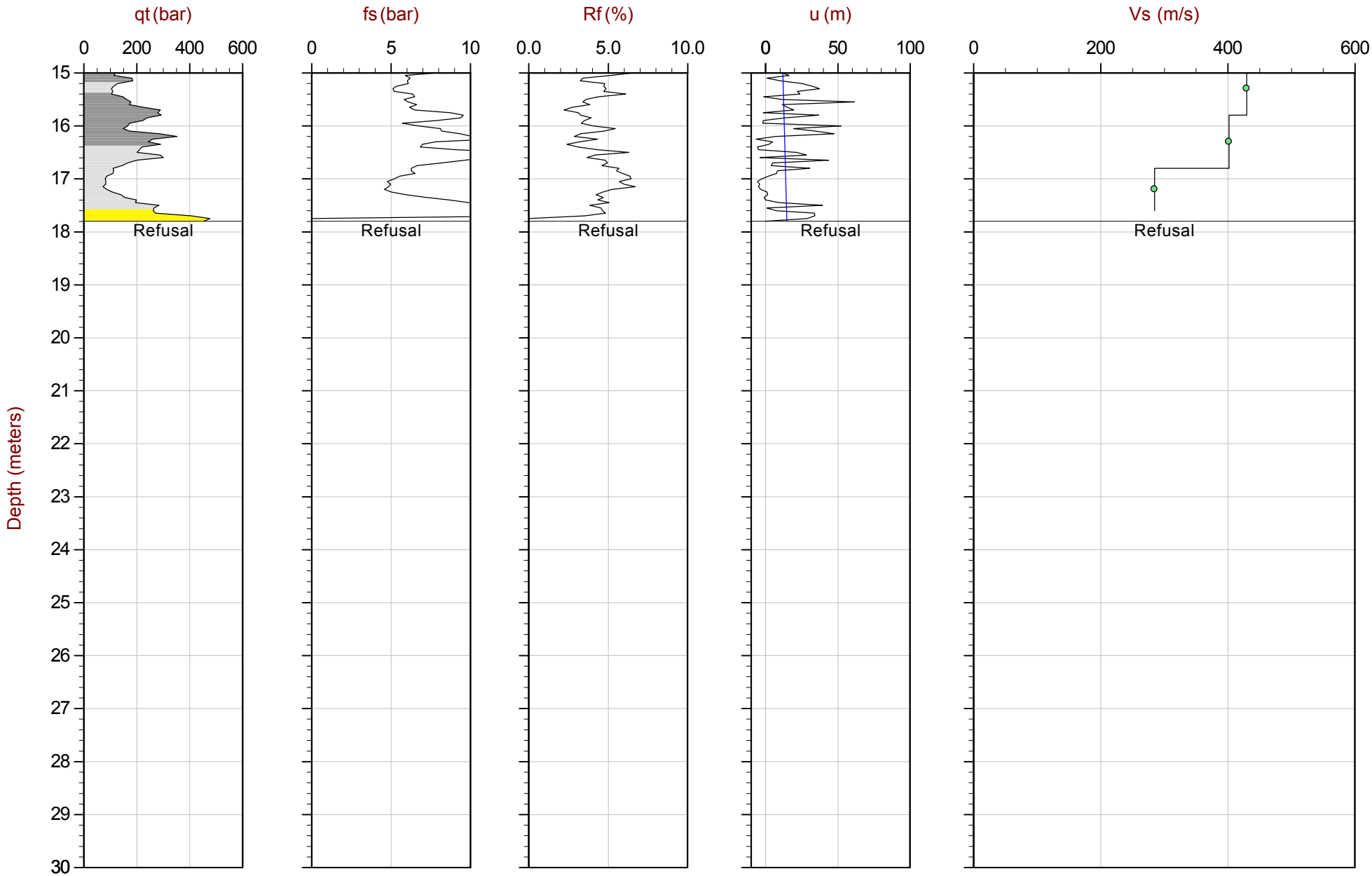
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/27 14:22
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D61
Cone: 388:T1500F15U500




Max Depth: 17.800 m / 58.40 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD61.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658730m E: 681139m Elev: 1190.36m
Sheet No: 2 of 2

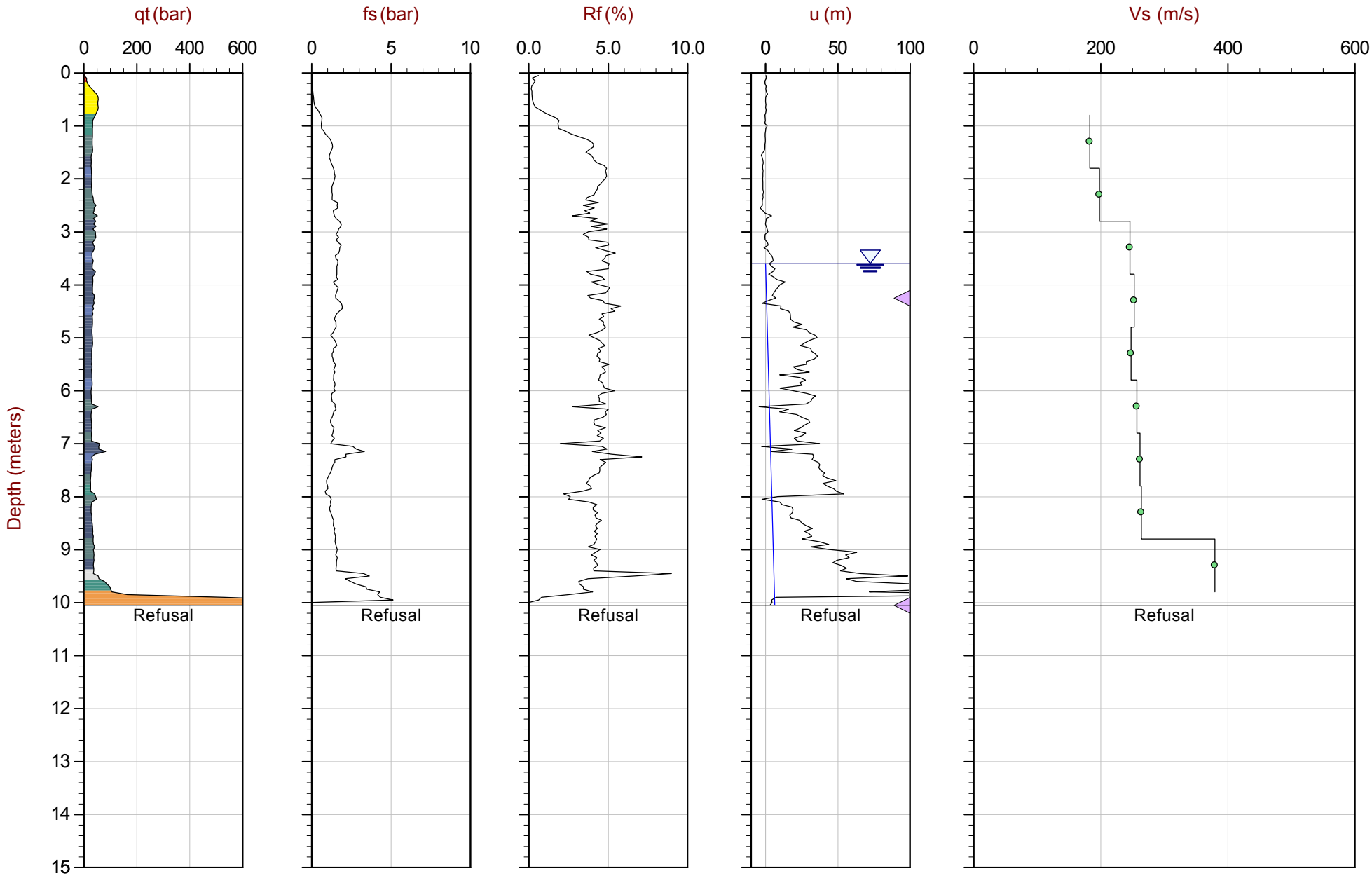
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 12:45
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64
Cone: 340:T1500F15U500




Max Depth: 10.050 m / 32.97 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD64.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659109m E: 681555m Elev: 1193.60m
Sheet No: 1 of 1

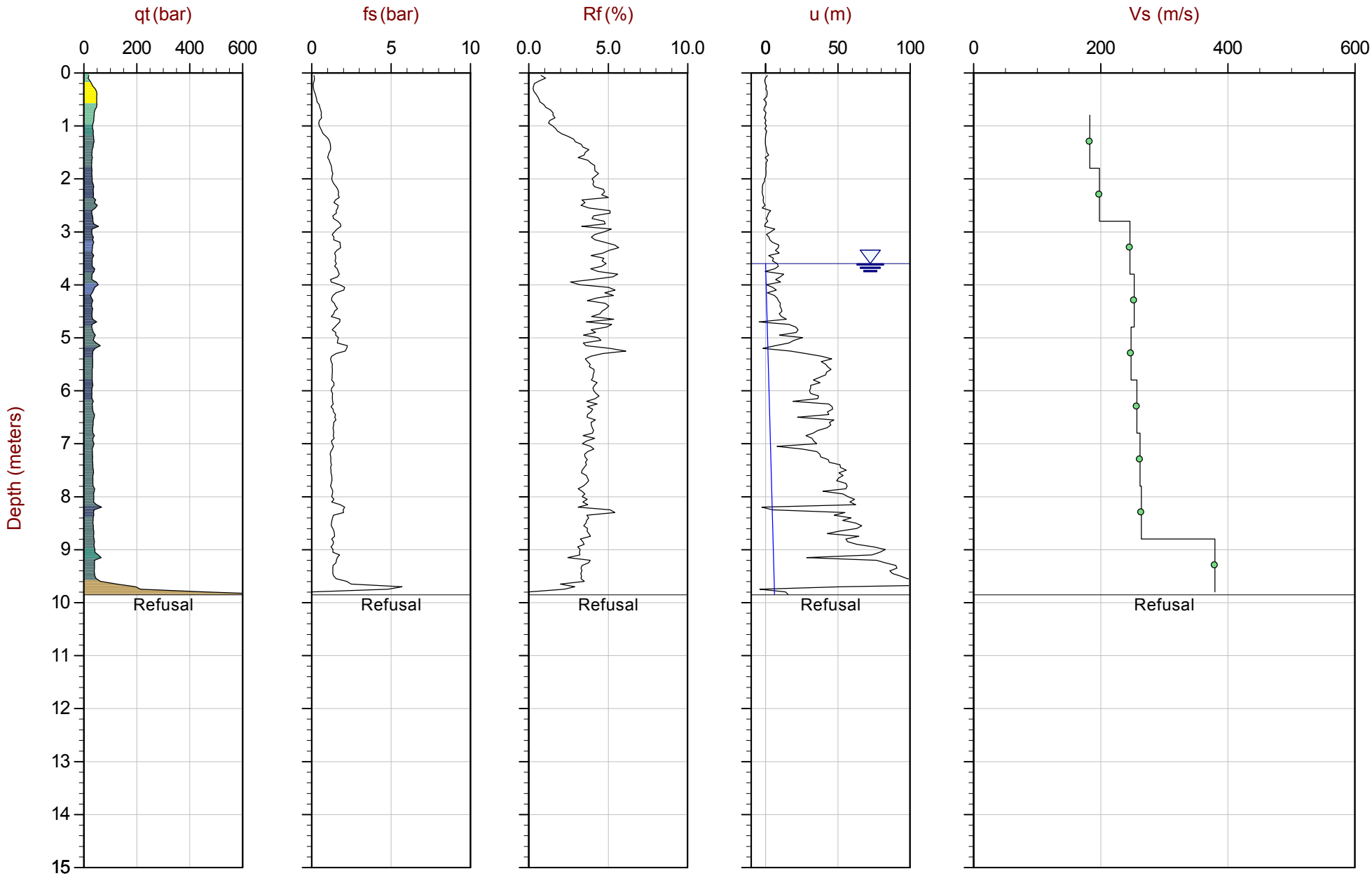
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/22 14:30
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64B
Cone: 340:T1500F15U500




Max Depth: 9.850 m / 32.32 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPD64B.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659109m E: 681563m Elev: 1194.00m
Sheet No: 1 of 1

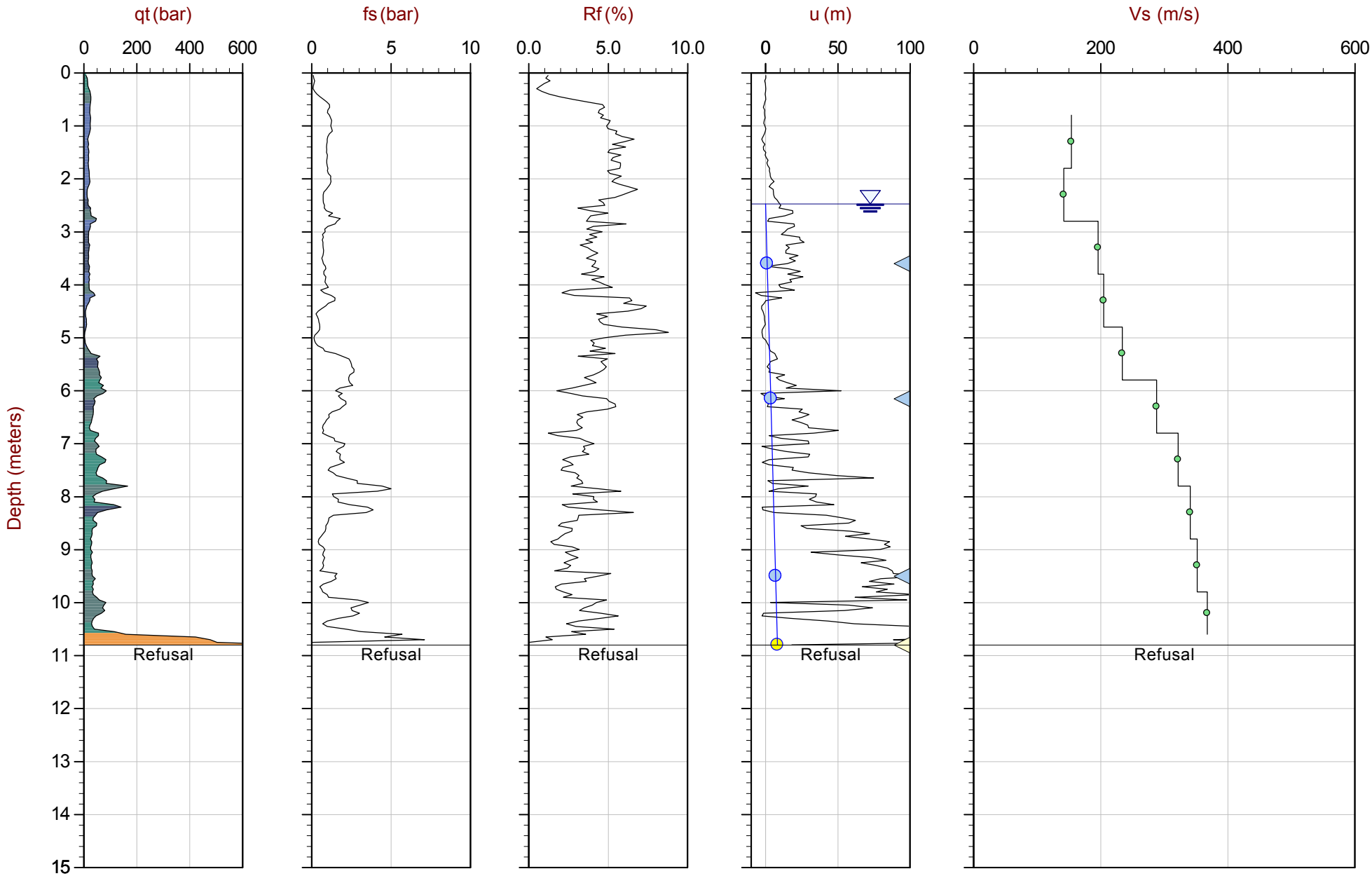
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 11:03
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC26
Cone: 322:T1500F15U500




Max Depth: 10.800 m / 35.43 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPDC26.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5658614m E: 678554m Elev: 1203.84m
Sheet No: 1 of 1

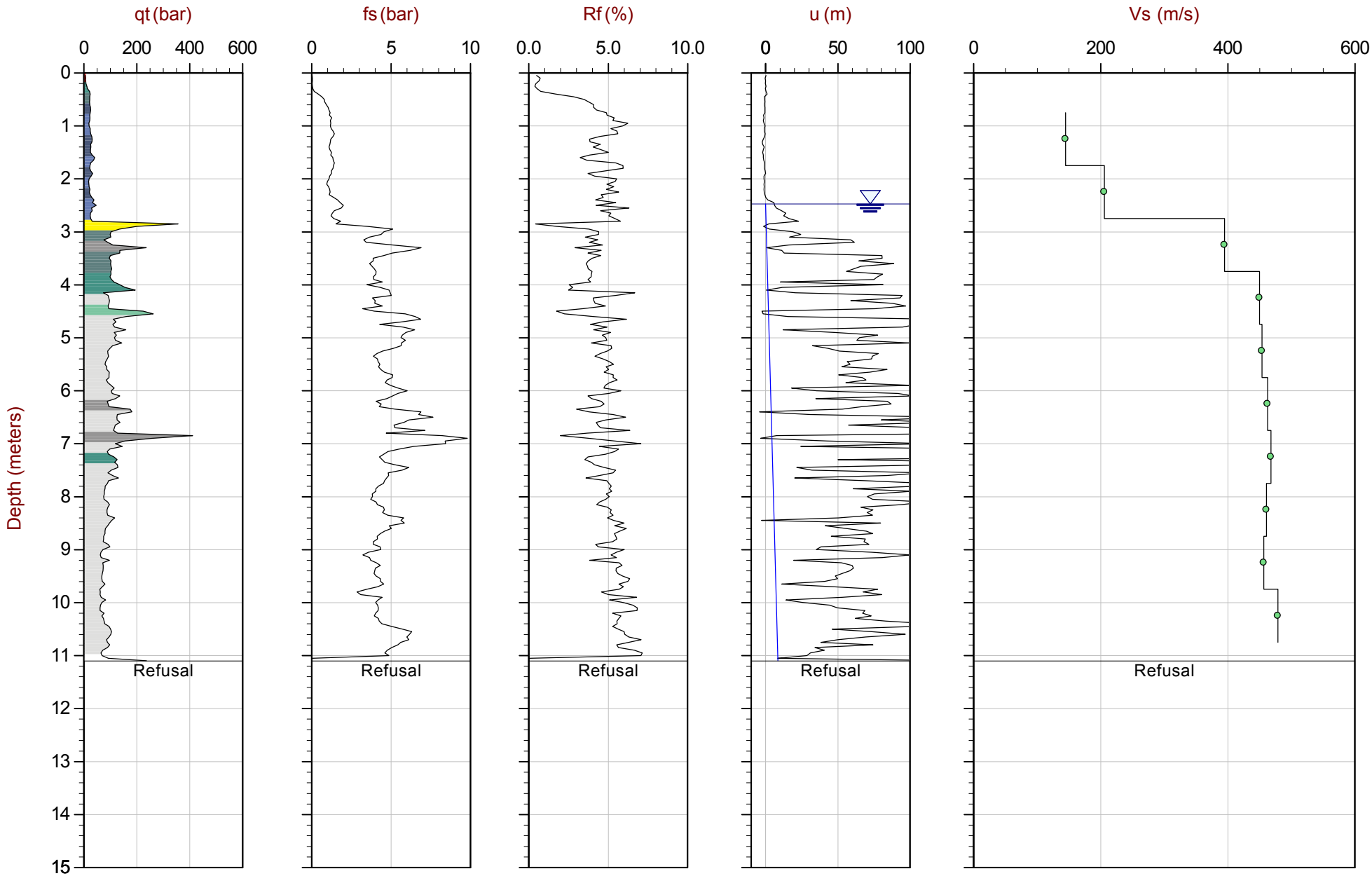
Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

CONETEC

Stantec

Job No: 16-03023
Date: 2016/06/20 17:27
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC31
Cone: 340:T1500F15U500




Max Depth: 11.100 m / 36.42 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.200 m

File: 16-03023_SPDC31.COR
Unit Wt: SBT Zones

SBT: Robertson and Campanella, 1986
Coords: UTM 11N N: 5659261m E: 678799m Elev: 1207.38m
Sheet No: 1 of 1

Overplot Item:
Assumed Ueq
Ueq
Dissipation, equilibrium assumed
Dissipation, equilibrium achieved
Hydrostatic Line
Dissipation, equilibrium not achieved

# Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Start Date: | 20-Jun-2016 |
| End Date: | 27-Jun-2016 |

## *CPTu PORE PRESSURE DISSIPATION SUMMARY*

| Sounding ID | File Name | Cone Area ($cm^2$) | Duration (s) | Test Depth (m) | Estimated Equilibrium Pore Pressure $U_{eq}$ (m) | Calculated Phreatic Surface (m) | Estimated Phreatic Surface (m) | $t_{50}$ [a] (s) | Assumed Rigidity Index ($I_r$) | $c_h$ [b] ($cm^2$/min) |
|---|---|---|---|---|---|---|---|---|---|---|
| SCPT16-D26B | 16-03023_SPD26B | 15 | 390 | 3.50 | Not Achieved | | | | | |
| SCPT16-D26B | 16-03023_SPD26B | 15 | 8200 | 5.50 | 2.5 | | 3.0 | 6491 | 100 | 0.1 |
| SCPT16-D26B | 16-03023_SPD26B | 15 | 5400 | 11.00 | 8.0 | | 3.0 | 4394 | 100 | 0.2 |
| SCPT16-D31 | 16-03023_SPD31 | 15 | 500 | 13.30 | Not Achieved | | | | | |
| SCPT16-D31 | 16-03023_SPD31 | 15 | 620 | 15.00 | 10.4 | 4.6 | | | | |
| SCPT16-D31 | 16-03023_SPD31 | 15 | 265 | 18.10 | Not Achieved | | | | | |
| SCPT16-D31 | 16-03023_SPD31 | 15 | 150 | 19.20 | Not Achieved | | | | | |
| SCPT16-D31 | 16-03023_SPD31 | 15 | 160 | 20.70 | Not Achieved | | | | | |
| SCPT16-D31B | 16-03023_SPD31B | 15 | 86395 | 5.75 | 1.2 | | 4.6 | 8145 | 100 | 0.1 |
| CPT16-D34 | 16-03023_CPD34 | 15 | 300 | 14.65 | Not Achieved | | | | | |
| SCPT16-D39 | 16-03023_SPD39 | 15 | 305 | 7.45 | Not Achieved | | | | | |
| SCPT16-D39 | 16-03023_SPD39 | 15 | 3600 | 12.05 | 9.3 | | 2.8 | 2993 | 100 | 0.2 |
| CPT16-D40 | 16-03023_CPD40 | 15 | 9600 | 4.30 | 1.3 | | 3.0 | 7687 | 100 | 0.1 |
| CPT16-D40 | 16-03023_CPD40 | 15 | 170 | 14.90 | Not Achieved | | | | | |
| CPT16-D40 | 16-03023_CPD40 | 15 | 145 | 15.80 | Not Achieved | | | | | |
| SCPT16-D41 | 16-03023_SPD41 | 15 | 300 | 4.50 | 0.9 | 3.6 | | | | |
| SCPT16-D41 | 16-03023_SPD41 | 15 | 305 | 5.40 | 1.6 | 3.8 | | | | |
| SCPT16-D41B | 16-03023_SPD41B | 15 | 400 | 5.40 | 1.8 | 3.6 | | | | |
| CPT16-D44 | 16-03023_CPD44 | 15 | 300 | 4.45 | Not Achieved | | | | | |

| | |
|---|---|
| Job No: | 16-03023 |
| Client: | Stantec Consulting Ltd. |
| Project: | Springbank Off-Stream Reservoir |
| Start Date: | 20-Jun-2016 |
| End Date: | 27-Jun-2016 |

## *CPTu PORE PRESSURE DISSIPATION SUMMARY*

| Sounding ID | File Name | Cone Area ($cm^2$) | Duration (s) | Test Depth (m) | Estimated Equilibrium Pore Pressure $U_{eq}$ (m) | Calculated Phreatic Surface (m) | Estimated Phreatic Surface (m) | $t_{50}$ [a] (s) | Assumed Rigidity Index ($I_r$) | $c_h$ [b] ($cm^2$/min) |
|---|---|---|---|---|---|---|---|---|---|---|
| CPT16-D47 | 16-03023_CPD47 | 15 | 500 | 6.30 | 1.8 | 4.5 | | | | |
| SCPT16-D49 | 16-03023_SPD49 | 15 | 3600 | 3.70 | Not Achieved | | | | | |
| SCPT16-D49 | 16-03023_SPD49 | 15 | 165 | 5.50 | 0.0 | | | | | |
| SCPT16-D57 | 16-03023_SPD57 | 15 | 245 | 7.60 | Not Achieved | | | | | |
| CPT16-D60 | 16-03023_CPD60 | 15 | 200 | 17.25 | Not Achieved | | | | | |
| SCPT16-D61 | 16-03023_SPD61 | 15 | 205 | 4.50 | Not Achieved | | | | | |
| CPT16-D63 | 16-03023_CPD63 | 15 | 300 | 15.00 | 9.4 | 5.6 | | | | |
| CPT16-D63 | 16-03023_CPD63 | 15 | 300 | 18.55 | Not Achieved | | | | | |
| SCPT16-D64 | 16-03023_SPD64 | 15 | 3500 | 4.25 | Not Achieved | | | | | |
| SCPT16-D64 | 16-03023_SPD64 | 15 | 275 | 10.05 | Not Achieved | | | | | |
| SCPT16-DC26 | 16-03023_SPDC26 | 15 | 1800 | 3.60 | 1.1 | | 2.5 | 1339 | 100 | 0.5 |
| SCPT16-DC26 | 16-03023_SPDC26 | 15 | 950 | 6.15 | 3.7 | | 2.5 | 648 | 100 | 1.1 |
| SCPT16-DC26 | 16-03023_SPDC26 | 15 | 300 | 9.50 | 7.0 | | 2.5 | 70 | 100 | 10.0 |
| SCPT16-DC26 | 16-03023_SPDC26 | 15 | 320 | 10.80 | 8.3 | 2.5 | | | | |

a. Time is relative to where umax occurred

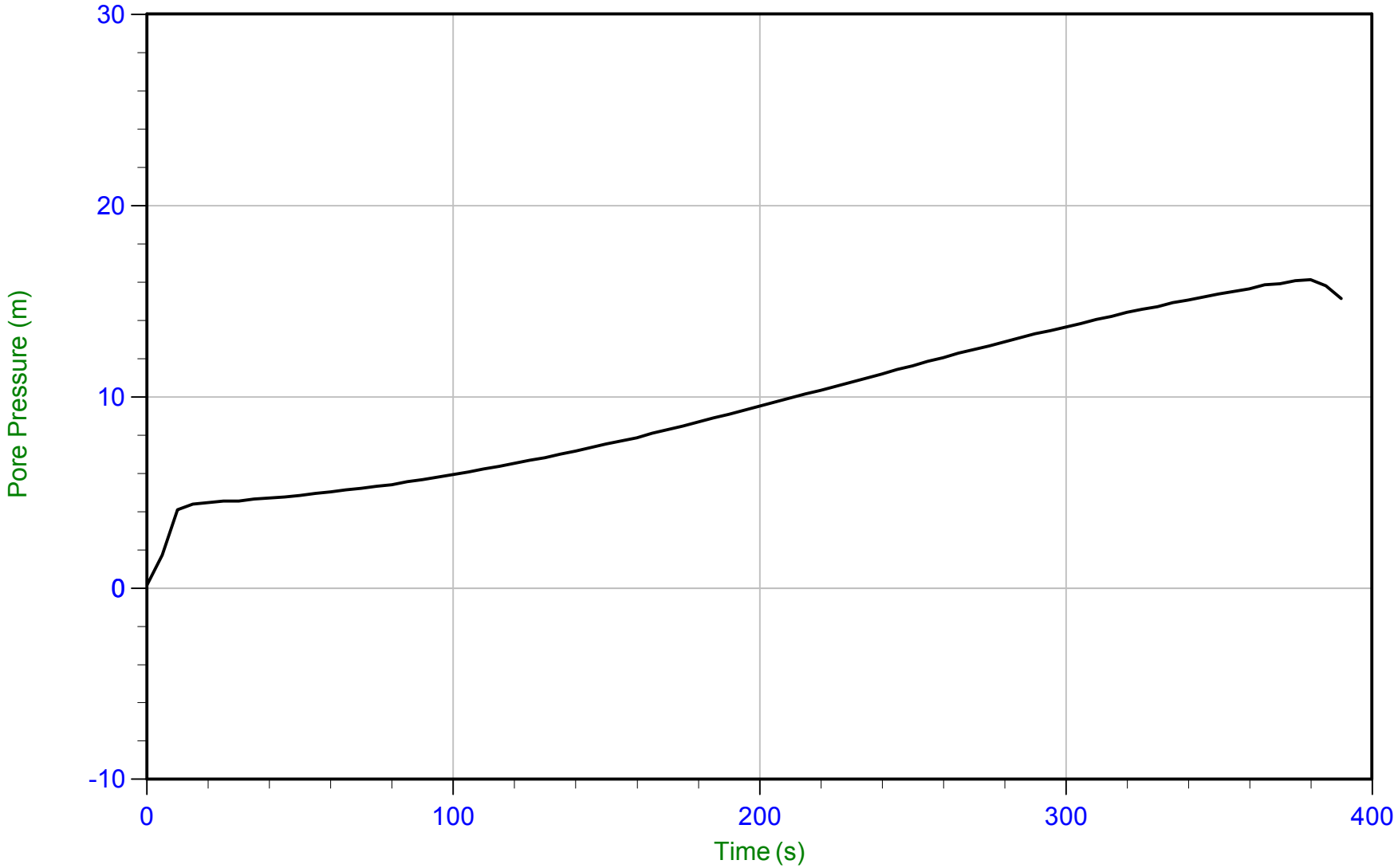
b. Houlsby and Teh, 1991

CONETEC

Stantec

Job No: 16-03023
Date: 06/24/2016 09:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26B
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD26B.PPF
Depth: 3.500 m / 11.483 ft
Duration: 390.0 s

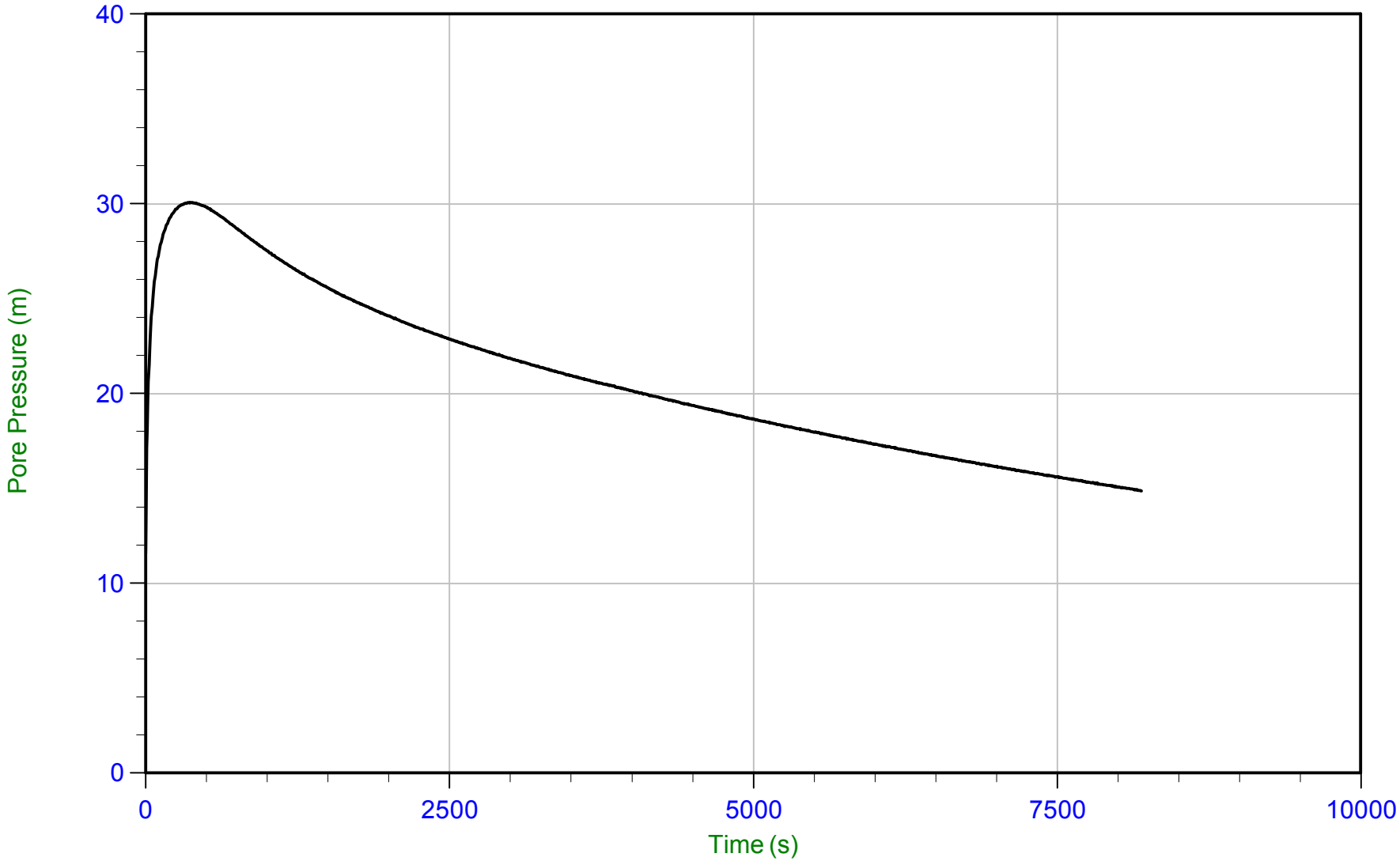
U Min: 0.1 m
U Max: 16.1 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/24/2016 09:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26B
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD26B.PPF
Depth: 5.500 m / 18.044 ft
Duration: 8200.0 s

U Min: 11.6 m
U Max: 30.1 m

WT: 3.000 m / 9.842 ft
Ueq: 2.5 m
U(50): 16.29 m

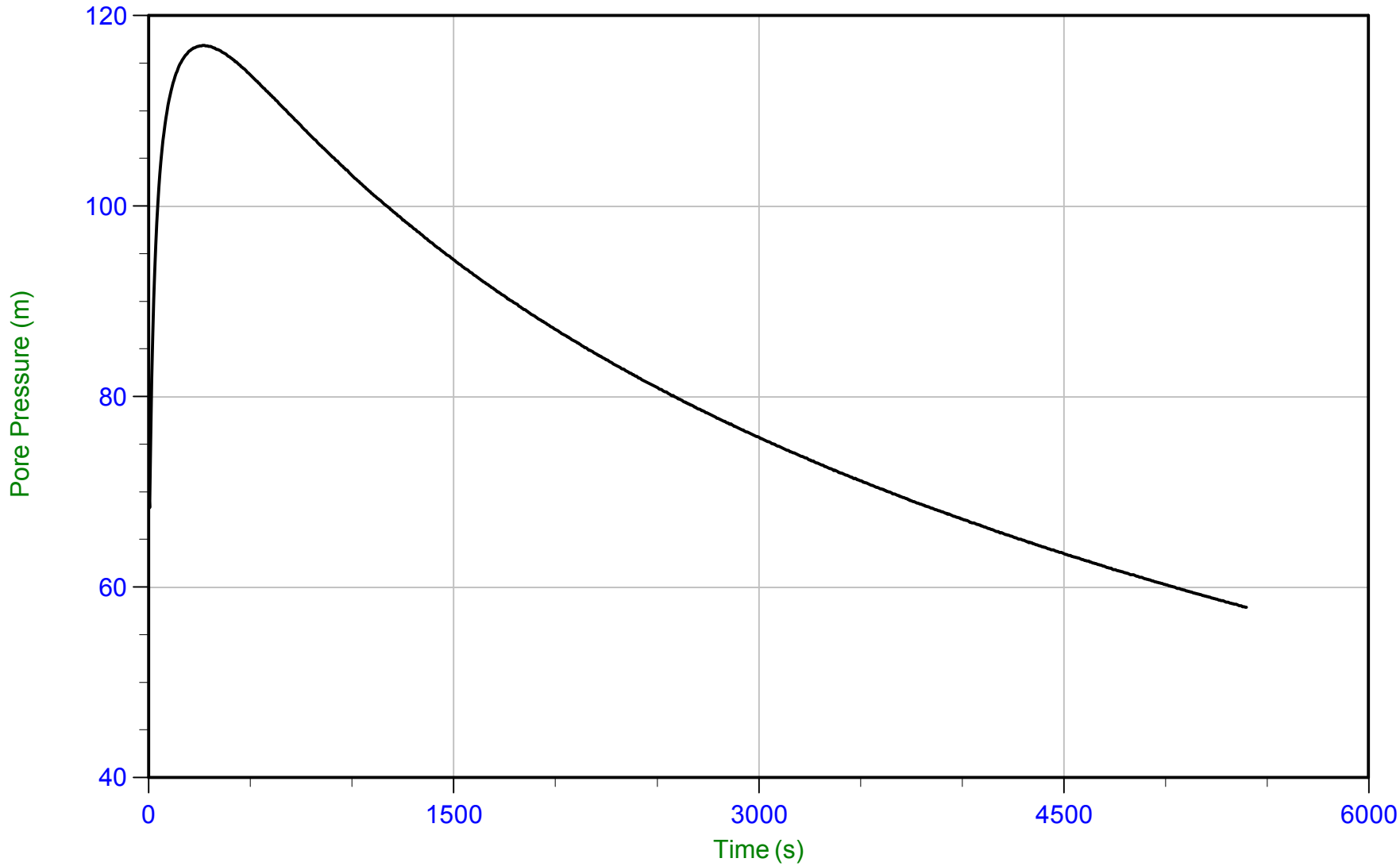
T(50): 6490.7 s
Ir: 100
Ch: 0.1 sq cm/min

CONETEC

Stantec

Job No: 16-03023
Date: 06/24/2016 09:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D26B
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD26B.PPF
Depth: 11.000 m / 36.089 ft
Duration: 5400.0 s

U Min: 57.9 m
U Max: 116.9 m

WT: 3.000 m / 9.842 ft
Ueq: 8.0 m
U(50): 62.43 m

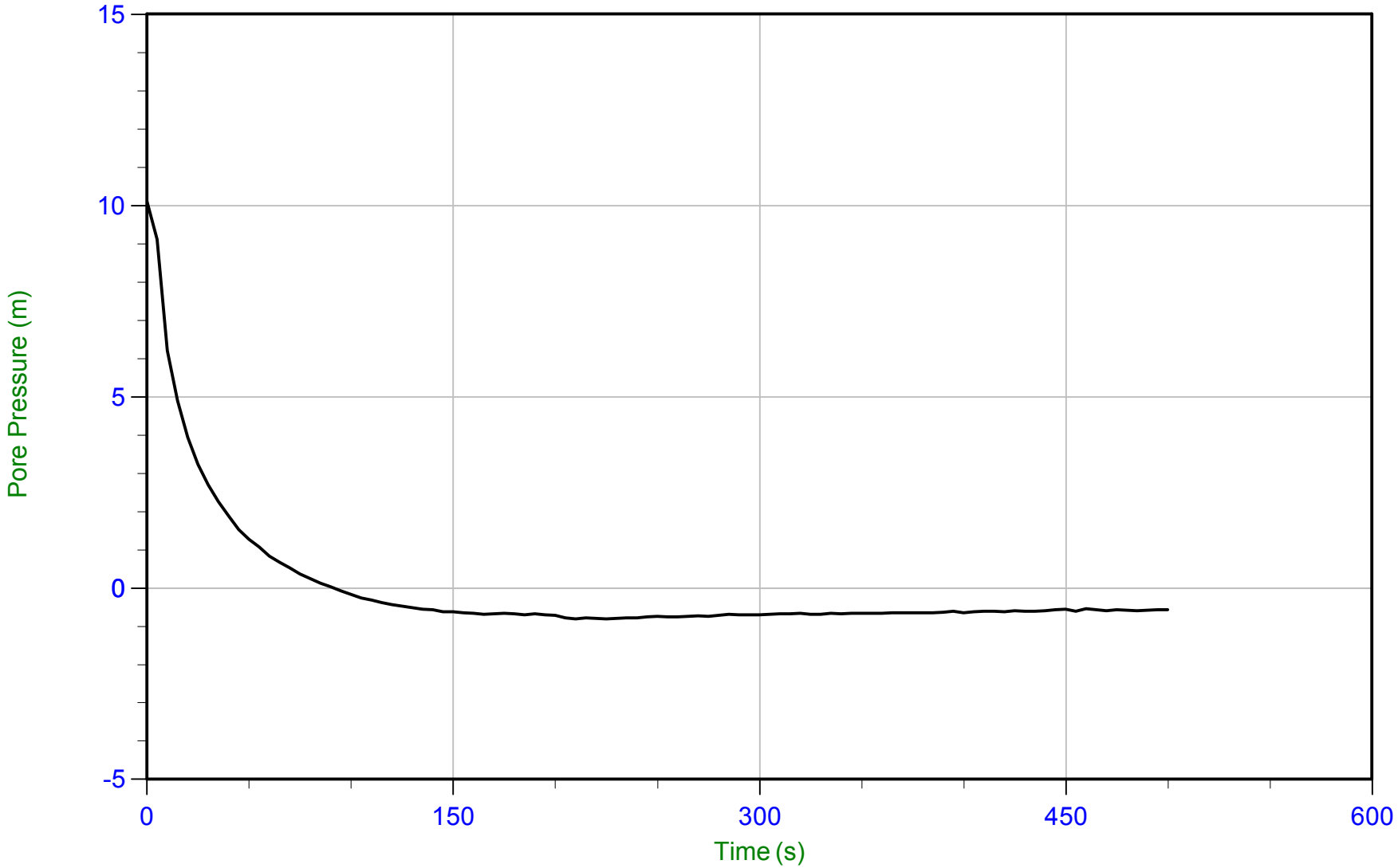
T(50): 4393.6 s
Ir: 100
Ch: 0.2 sq cm/min

CONETEC

Stantec

Job No: 16-03023
Date: 06/24/2016 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD31.PPF
Depth: 13.300 m / 43.635 ft
Duration: 500.0 s

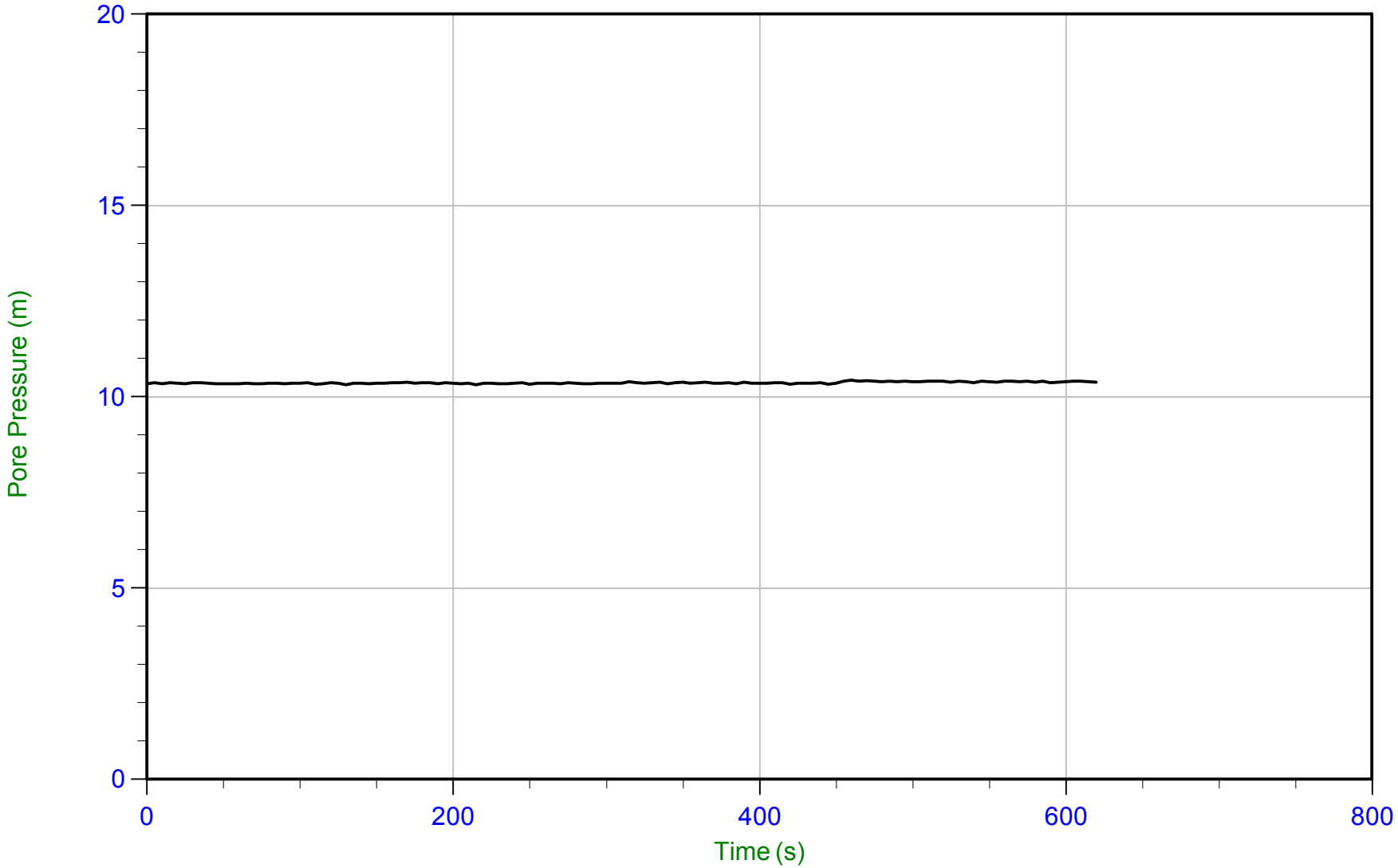
U Min: -0.8 m
U Max: 10.1 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/24/2016 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD31.PPF
Depth: 15.000 m / 49.212 ft
Duration: 620.0 s

U Min: 10.3 m
U Max: 10.4 m

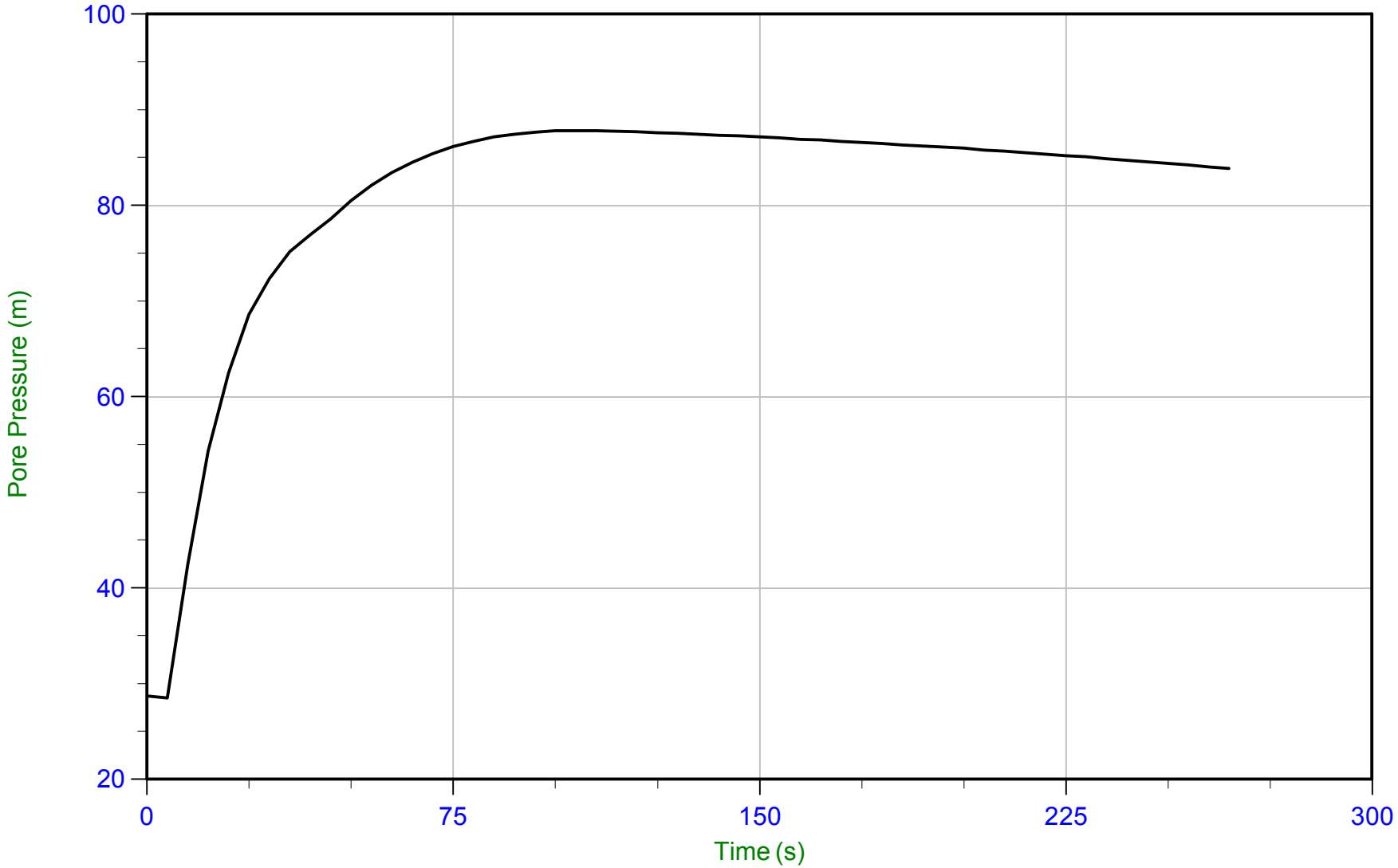
WT: 4.600 m / 15.092 ft
Ueq: 10.4 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/24/2016 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD31.PPF
Depth: 18.100 m / 59.382 ft
Duration: 265.0 s

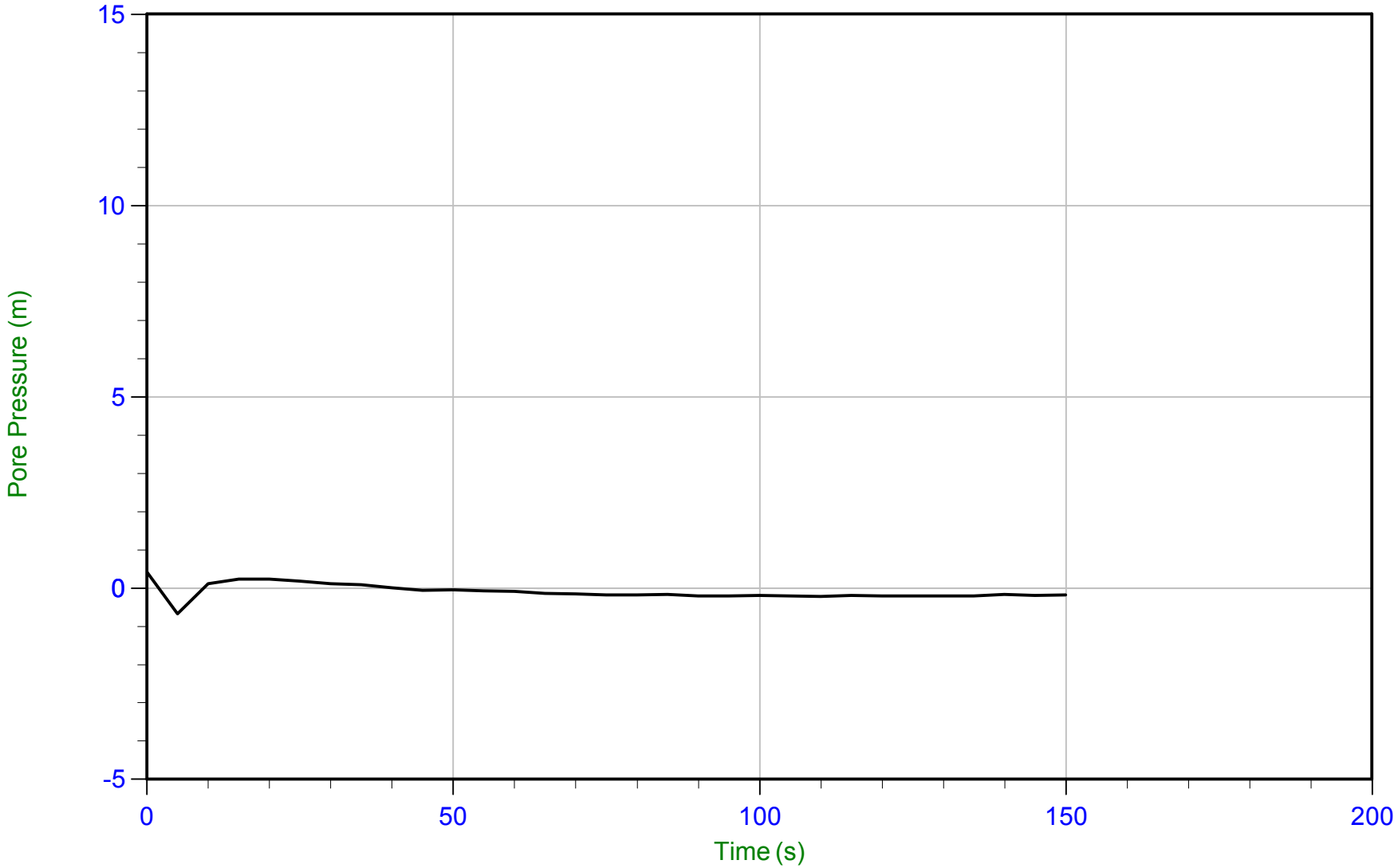
U Min: 28.5 m
U Max: 87.8 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/24/2016 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD31.PPF
Depth: 19.200 m / 62.991 ft
Duration: 150.0 s

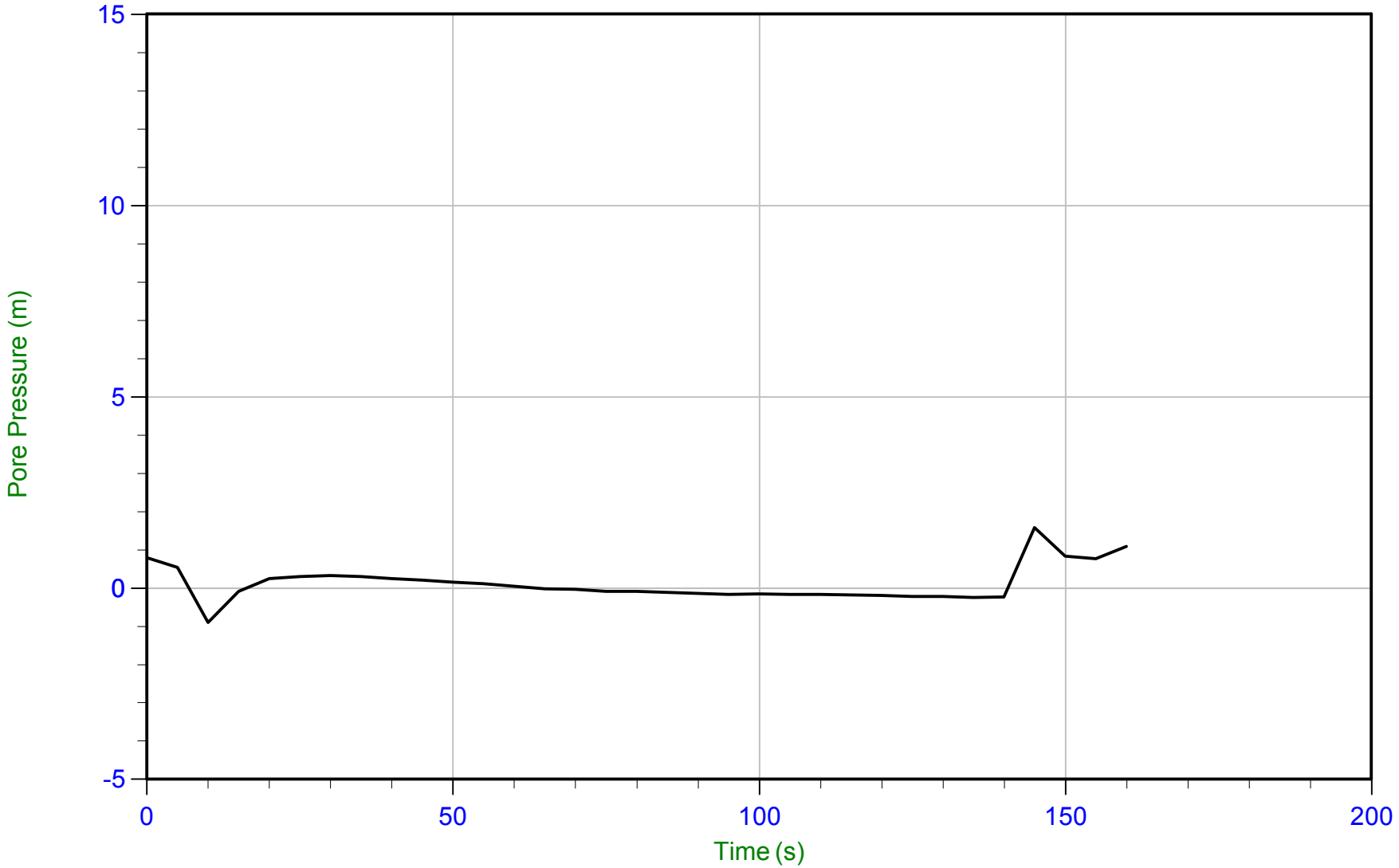
U Min: -0.7 m
U Max: 0.4 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/24/2016 13:38
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD31.PPF
Depth: 20.700 m / 67.913 ft
Duration: 160.0 s

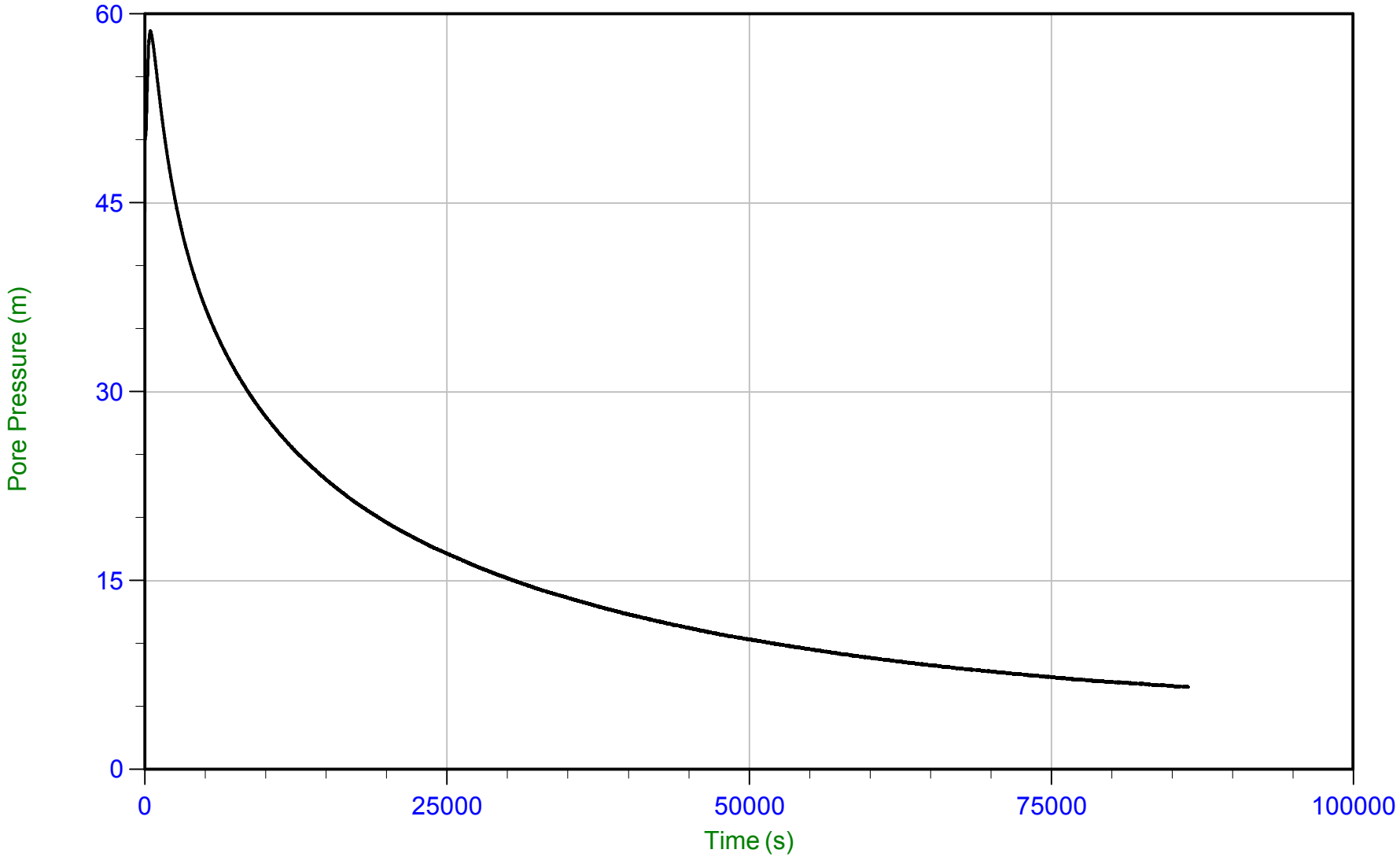
U Min: -0.9 m
U Max: 1.6 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/25/2016 10:12
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D31B
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD31B.PPF
Depth: 5.750 m / 18.865 ft
Duration: 86395.0 s

U Min: 6.5 m
U Max: 58.7 m

WT: 4.600 m / 15.092 ft
Ueq: 1.1 m
U(50): 29.90 m

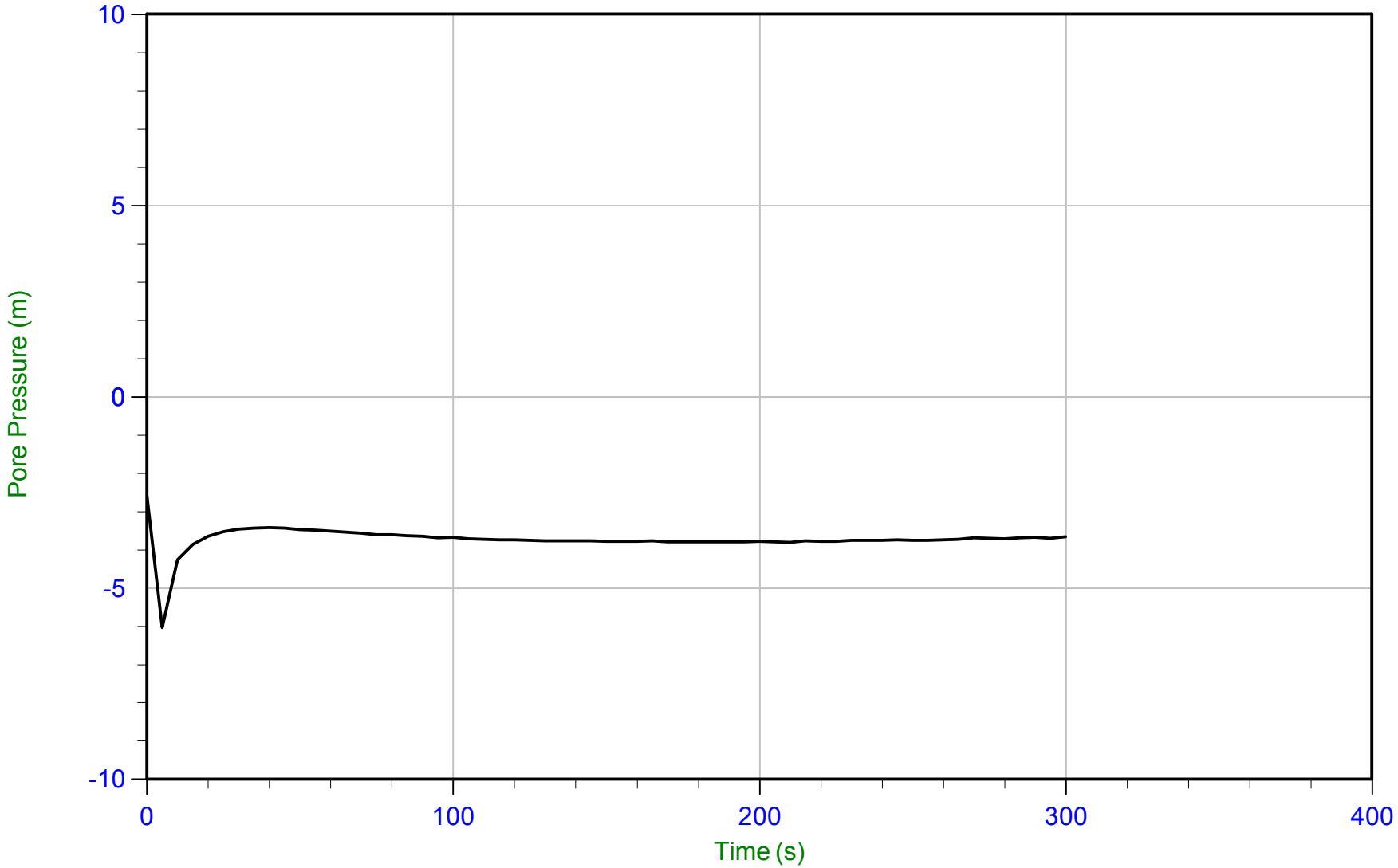
T(50): 8144.6 s
Ir: 100
Ch: 0.1 sq cm/min

CONETEC

Stantec

Job No: 16-03023
Date: 06/27/2016 13:17
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D34
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_CPD34.PPF
Depth: 14.650 m / 48.064 ft
Duration: 300.0 s

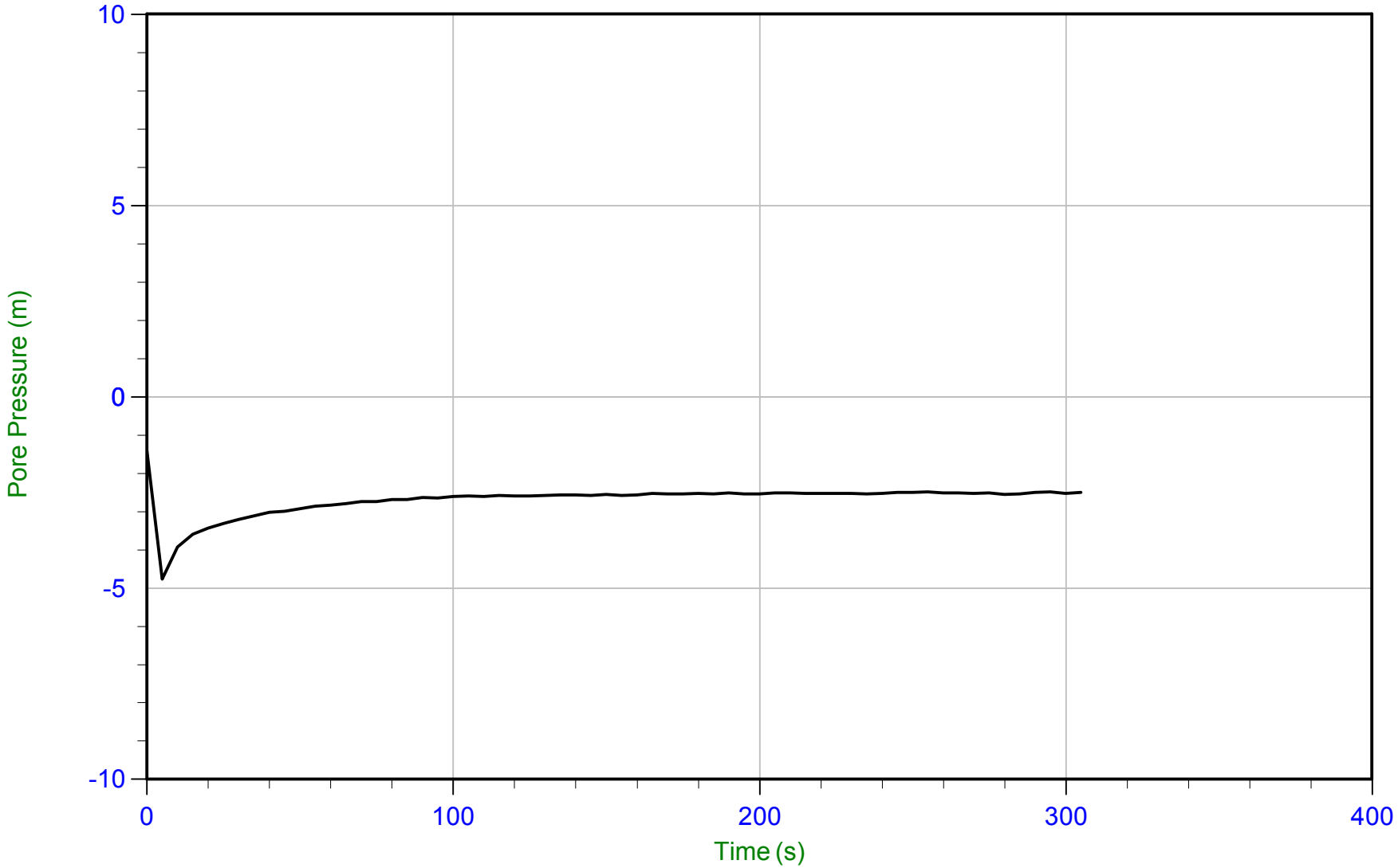
U Min: -6.0 m
U Max: -2.6 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/23/2016 12:42
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D39
Cone: 322:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD39.PPF
Depth: 7.450 m / 24.442 ft
Duration: 305.0 s

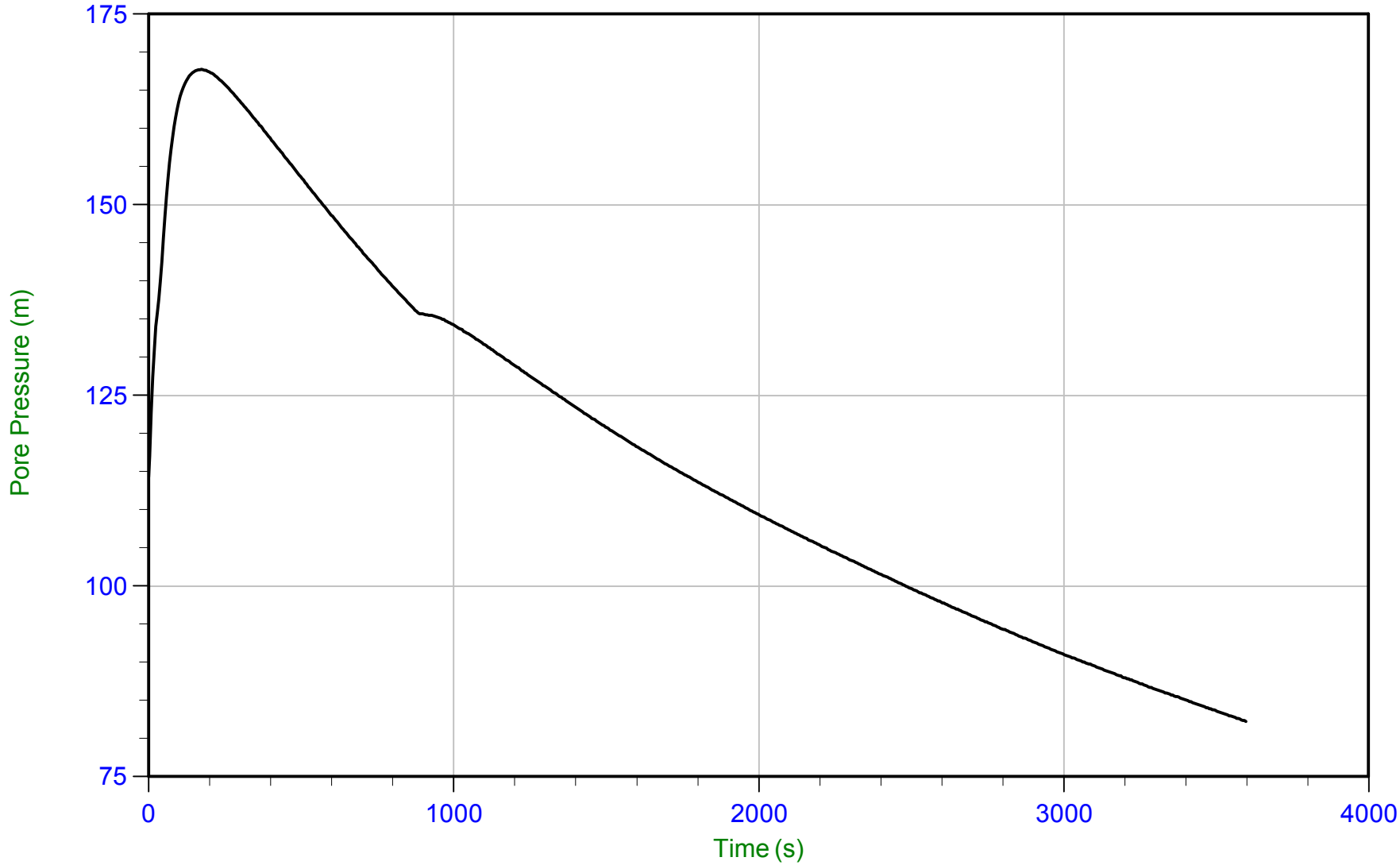
U Min: -4.8 m
U Max: -1.4 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/23/2016 12:42
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D39
Cone: 322:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD39.PPF
Depth: 12.050 m / 39.534 ft
Duration: 3600.0 s

U Min: 82.3 m
U Max: 167.8 m

WT: 2.800 m / 9.186 ft
Ueq: 9.2 m
U(50): 88.50 m

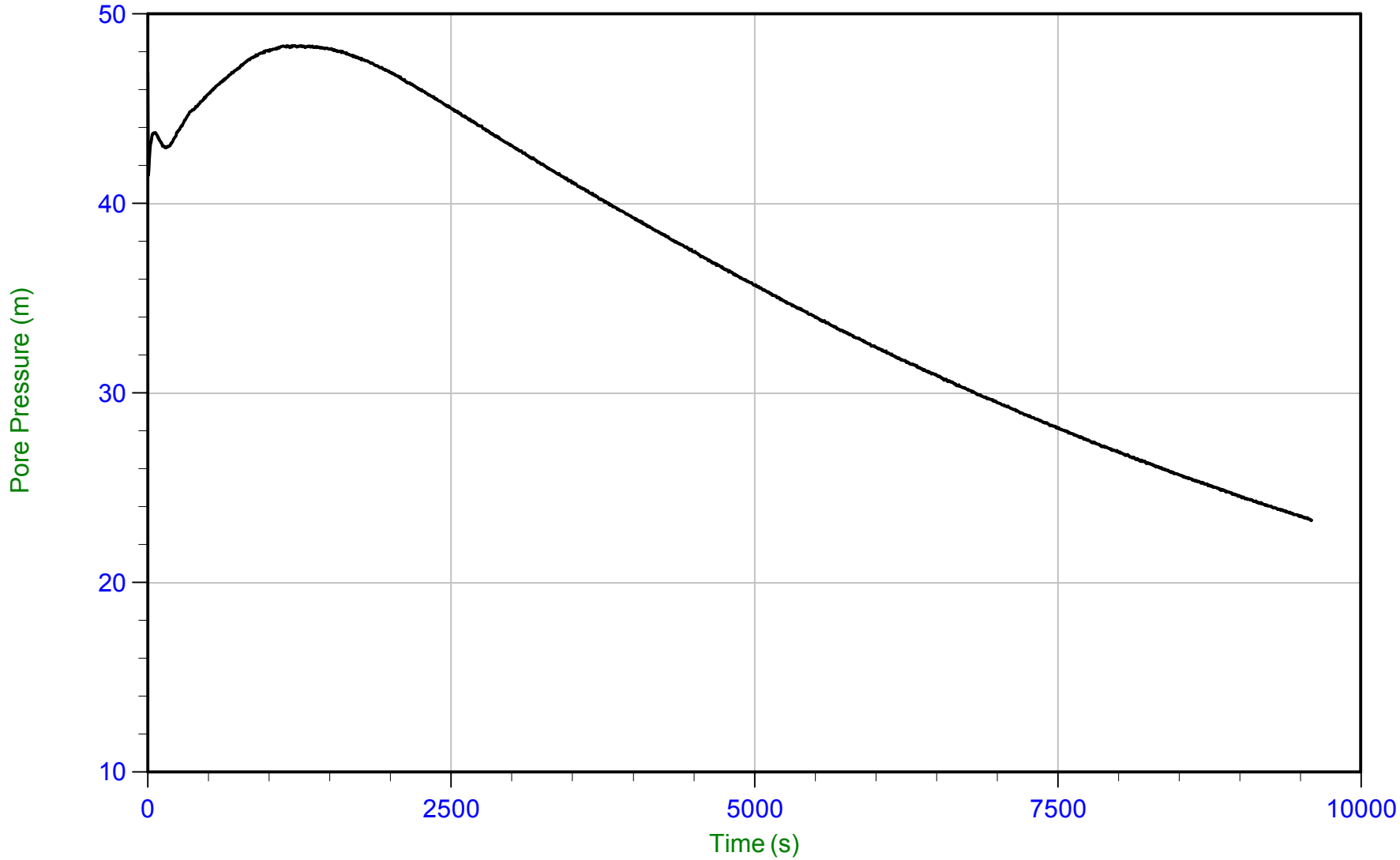
T(50): 2993.3 s
Ir: 100
Ch: 0.2 sq cm/min

CONETEC

Stantec

Job No: 16-03023
Date: 06/23/2016 08:57
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D40
Cone: 322:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_CPD40.PPF
Depth: 4.300 m / 14.107 ft
Duration: 9600.0 s

U Min: 23.3 m
U Max: 48.3 m

WT: 3.000 m / 9.842 ft
Ueq: 1.3 m
U(50): 24.82 m

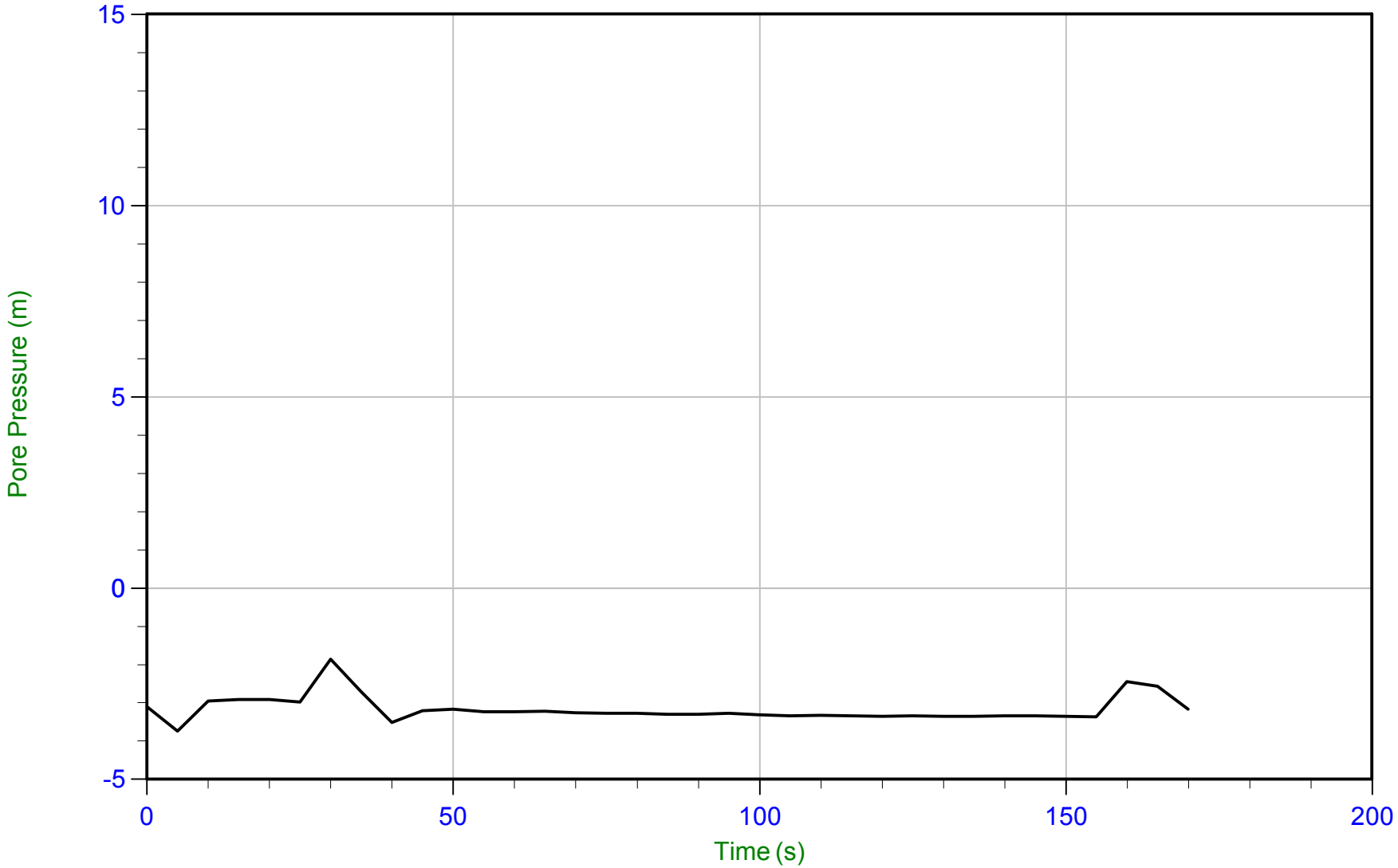
T(50): 7687.4 s
Ir: 100
Ch: 0.1 sq cm/min

CONETEC

Stantec

Job No: 16-03023
Date: 06/23/2016 08:57
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D40
Cone: 322:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_CPD40.PPF
Depth: 14.900 m / 48.884 ft
Duration: 170.0 s

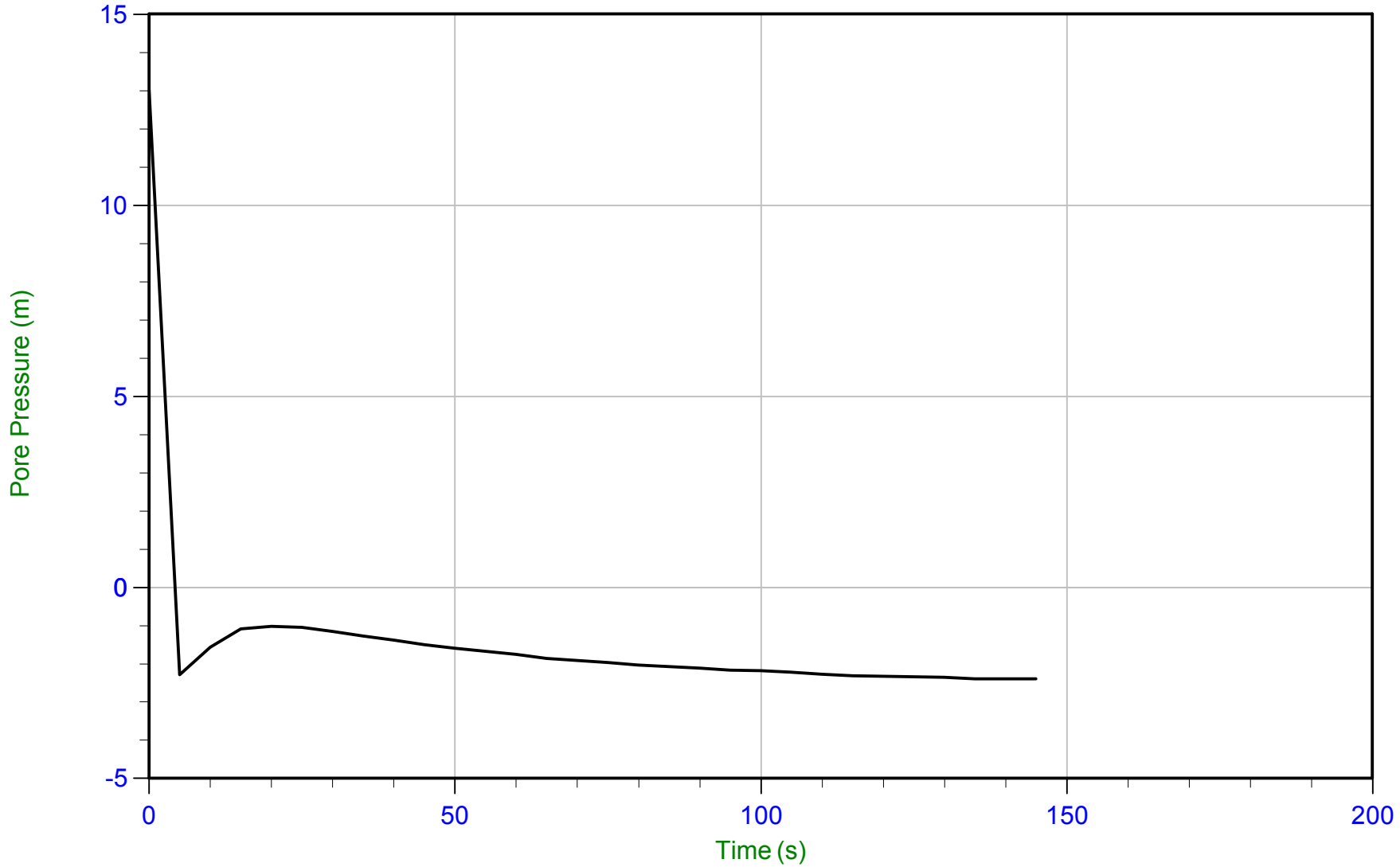
U Min: -3.7 m
U Max: -1.9 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/23/2016 08:57
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D40
Cone: 322:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_CPD40.PPF
Depth: 15.800 m / 51.837 ft
Duration: 145.0 s

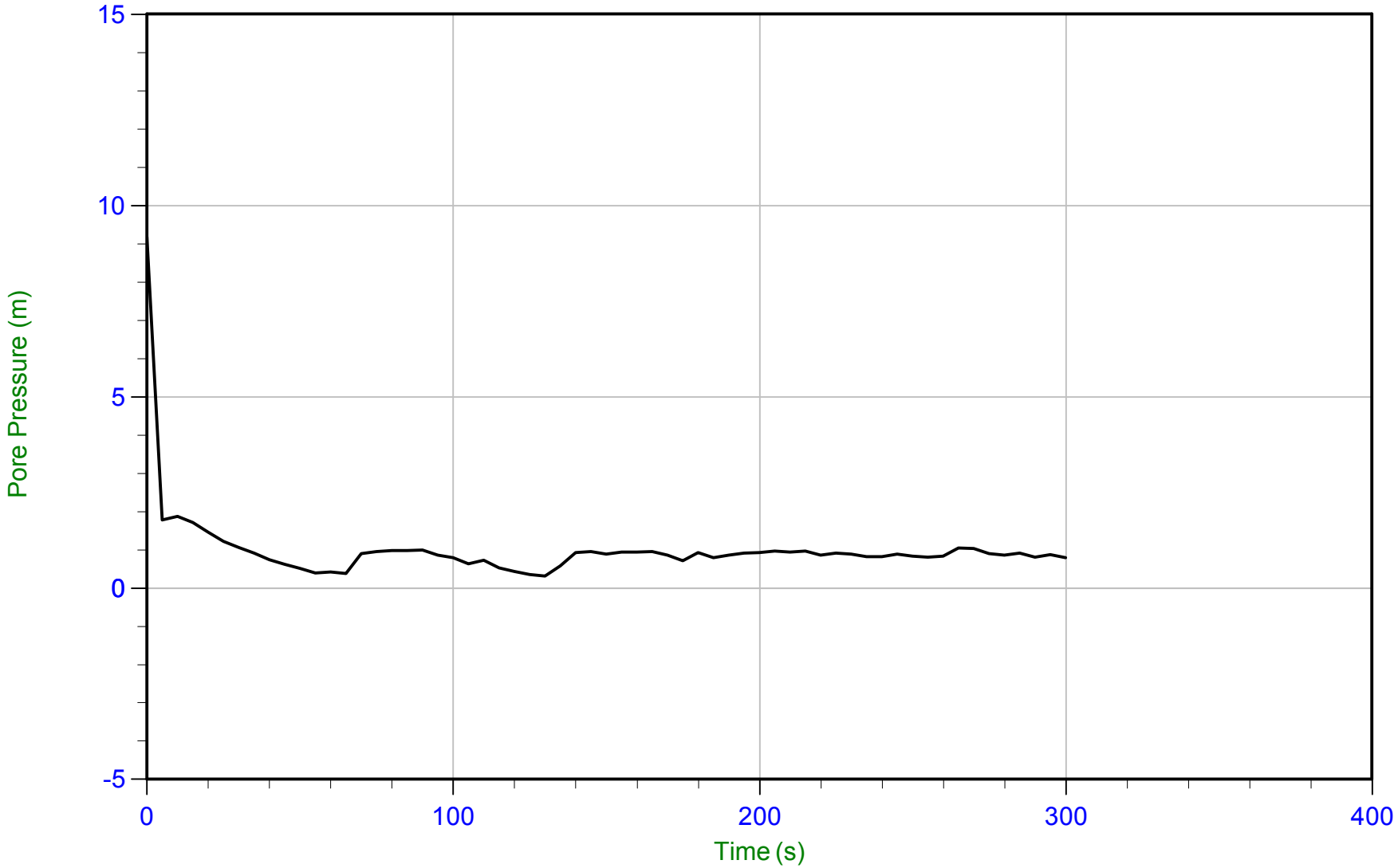
U Min: -2.4 m
U Max: 13.0 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/21/2016 14:52
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41
Cone: 340:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD41.PPF
Depth: 4.500 m / 14.764 ft
Duration: 300.0 s

U Min: 0.3 m
U Max: 9.2 m

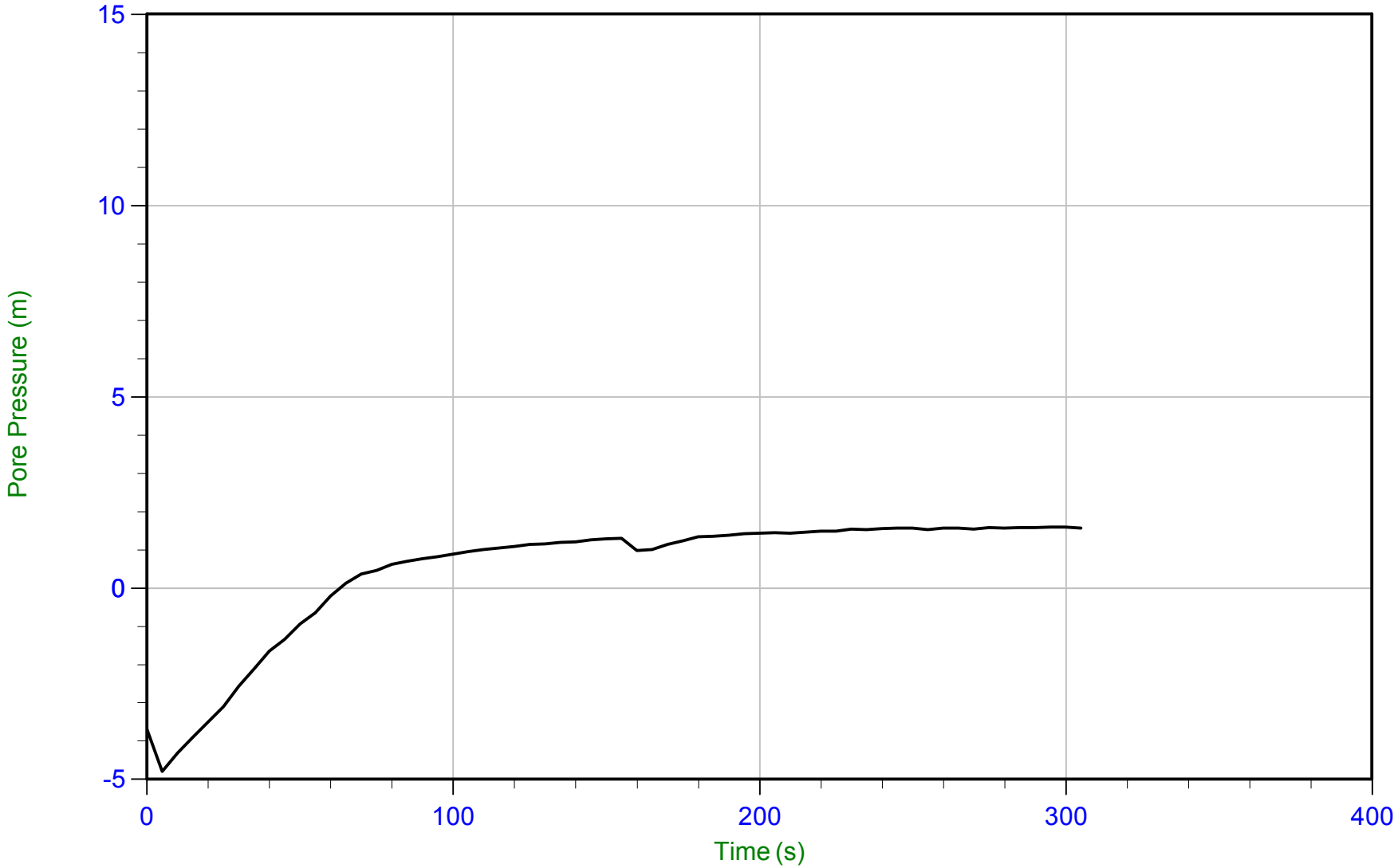
WT: 3.609 m / 11.840 ft
Ueq: 0.9 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/21/2016 14:52
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41
Cone: 340:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD41.PPF
Depth: 5.400 m / 17.716 ft
Duration: 305.0 s

U Min: -4.8 m
U Max: 1.6 m

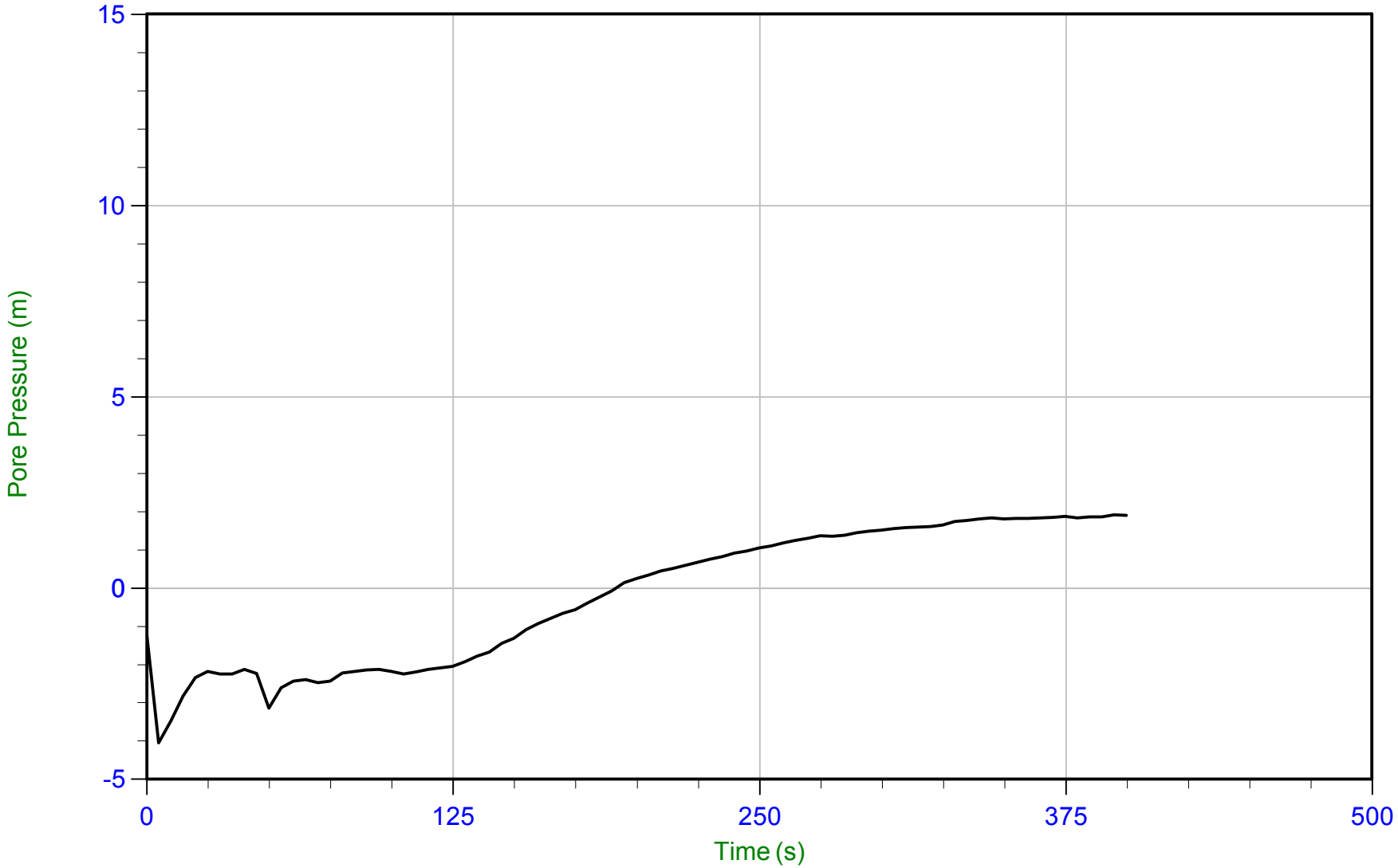
WT: 3.782 m / 12.408 ft
Ueq: 1.6 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/21/2016 16:10
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D41B
Cone: 340:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD41B.PPF
Depth: 5.400 m / 17.716 ft
Duration: 400.0 s

U Min: -4.0 m
U Max: 1.9 m

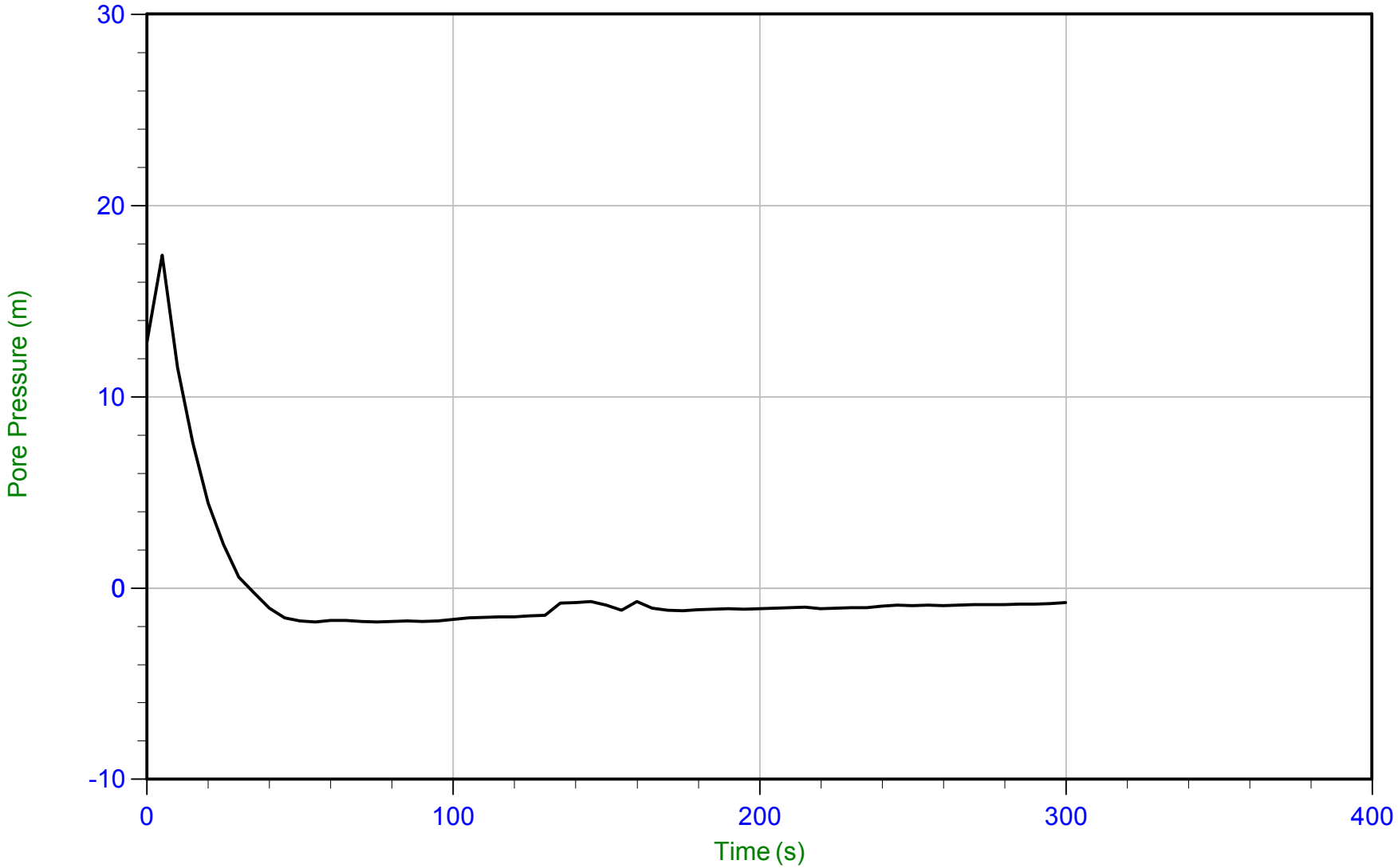
WT: 3.564 m / 11.693 ft
Ueq: 1.8 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/22/2016 16:05
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D44
Cone: 340:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_CPD44.PPF
Depth: 4.450 m / 14.600 ft
Duration: 300.0 s

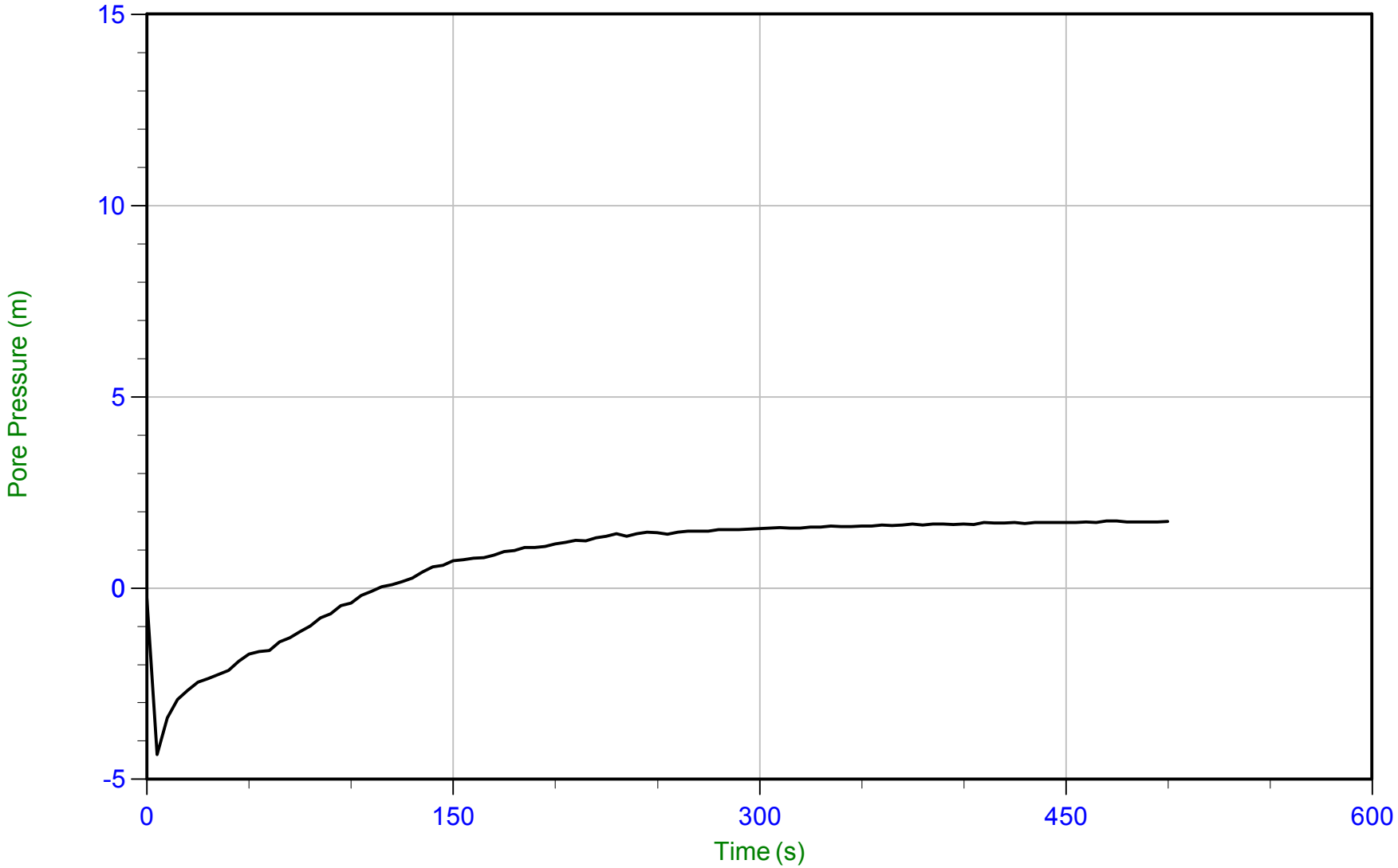
U Min: -1.8 m
U Max: 17.4 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/22/2016 09:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D47
Cone: 340:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_CPD47.PPF
Depth: 6.300 m / 20.669 ft
Duration: 500.0 s

U Min: -4.3 m
U Max: 1.7 m

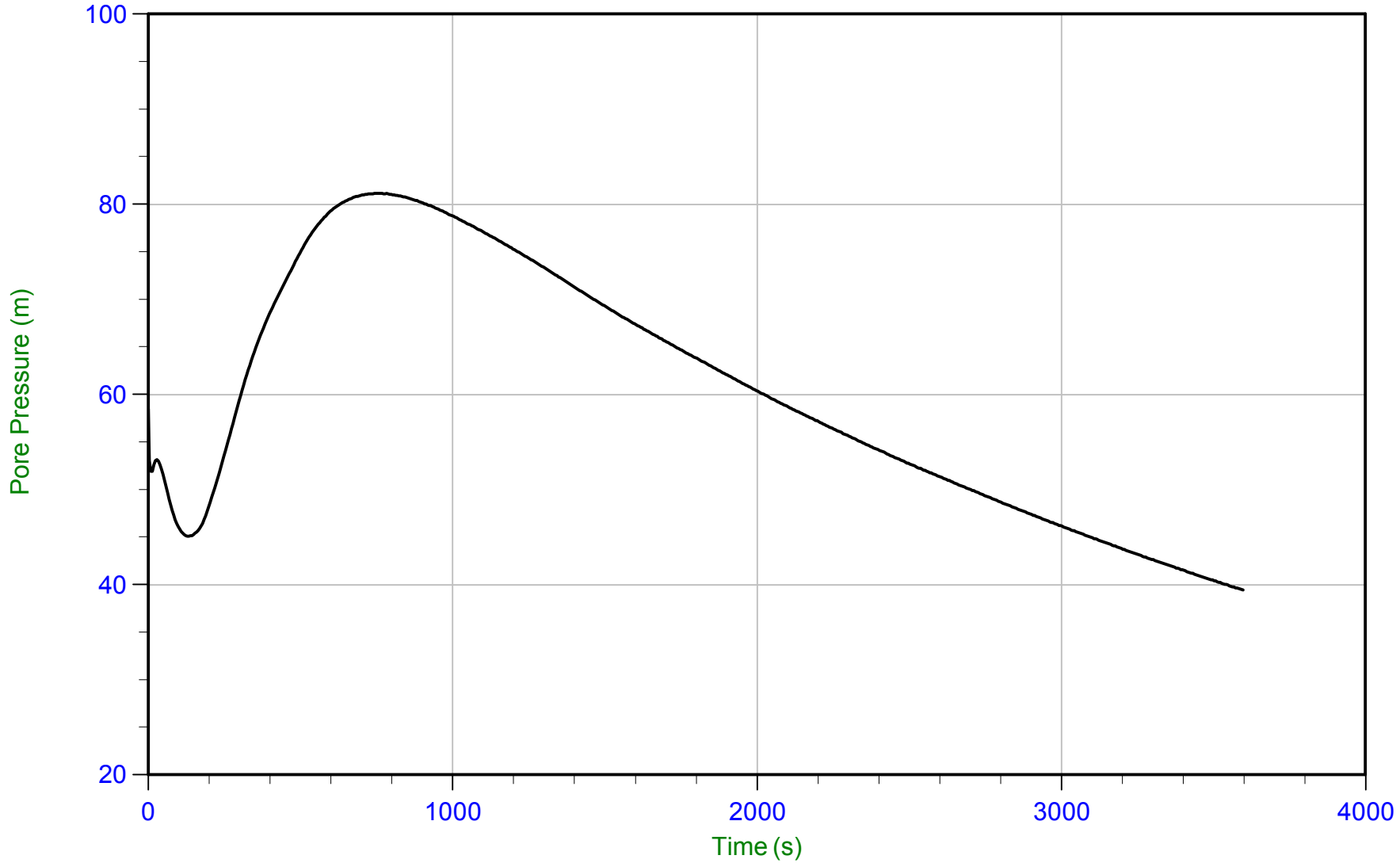
WT: 4.506 m / 14.783 ft
Ueq: 1.8 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/22/2016 10:44
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49
Cone: 340:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD49.PPF
Depth: 3.700 m / 12.139 ft
Duration: 3600.0 s

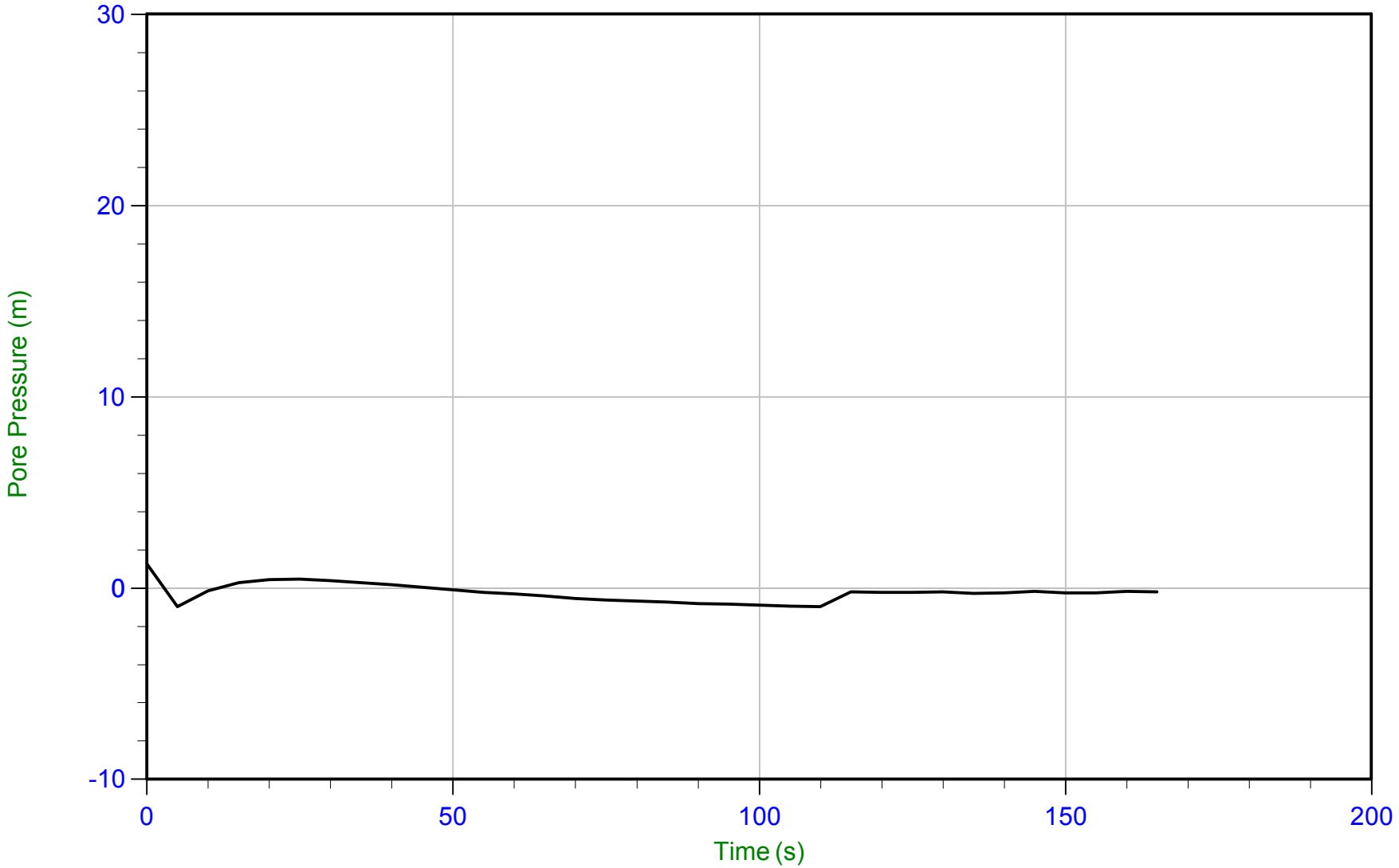
U Min: 39.4 m
U Max: 81.2 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/22/2016 10:44
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D49
Cone: 340:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD49.PPF
Depth: 5.500 m / 18.044 ft
Duration: 165.0 s

U Min: -1.0 m
U Max: 1.3 m

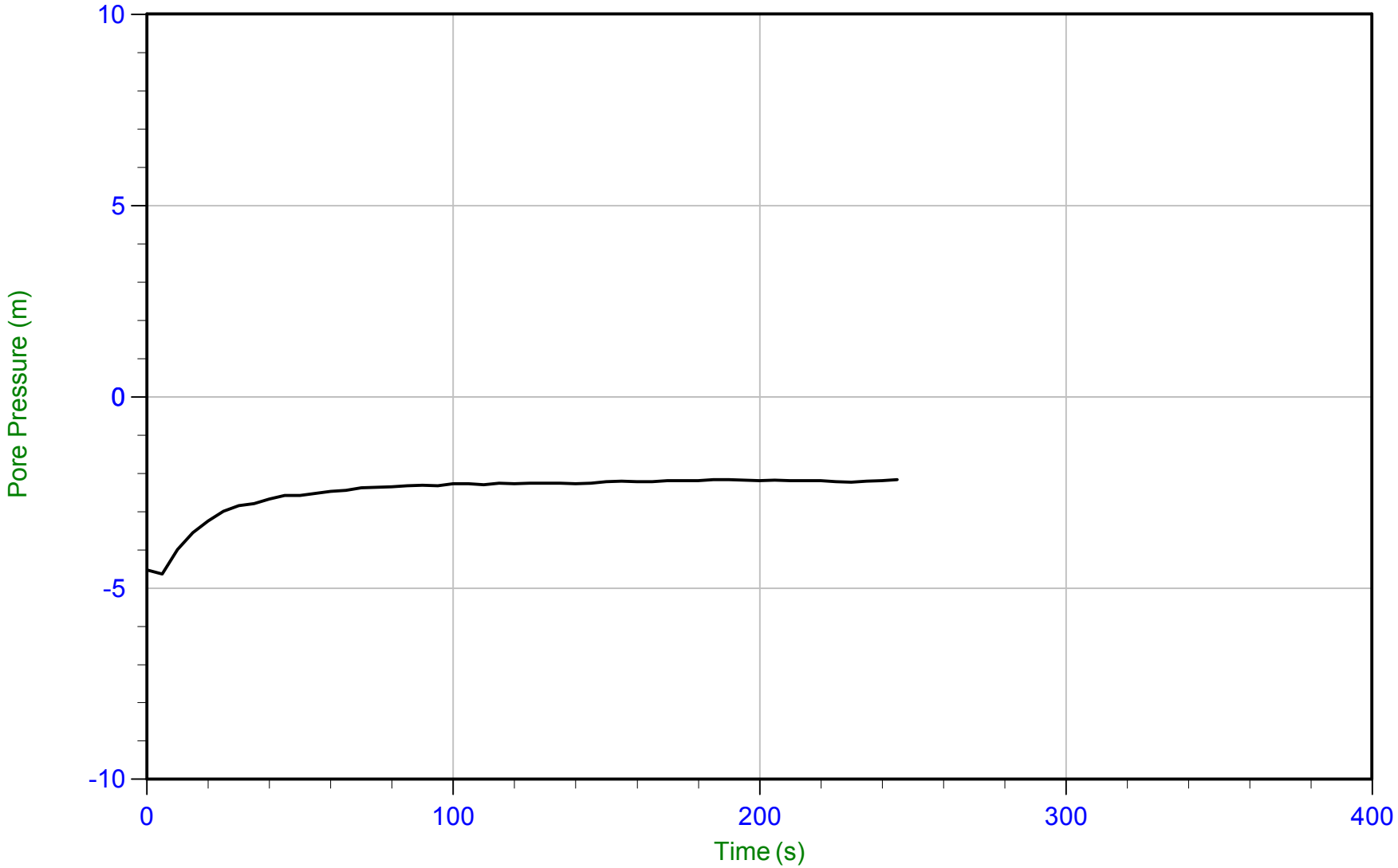
WT: 5.500 m / 18.044 ft
Ueq: 0.0 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/27/2016 17:04
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D57
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD57.PPF
Depth: 7.600 m / 24.934 ft
Duration: 245.0 s

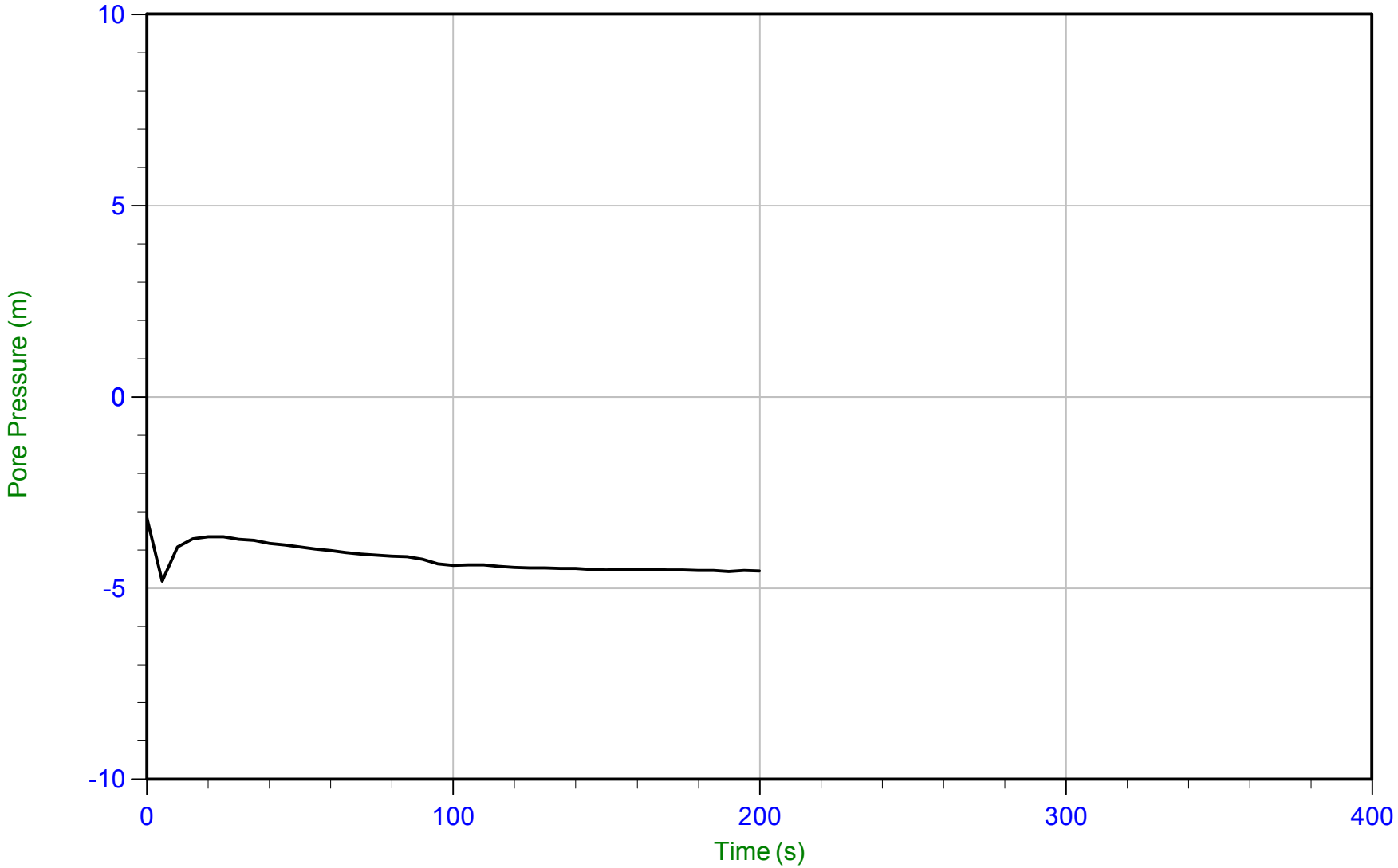
U Min: -4.6 m
U Max: -2.2 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/27/2016 15:55
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D60
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_CPD60.PPF
Depth: 17.250 m / 56.594 ft
Duration: 200.0 s

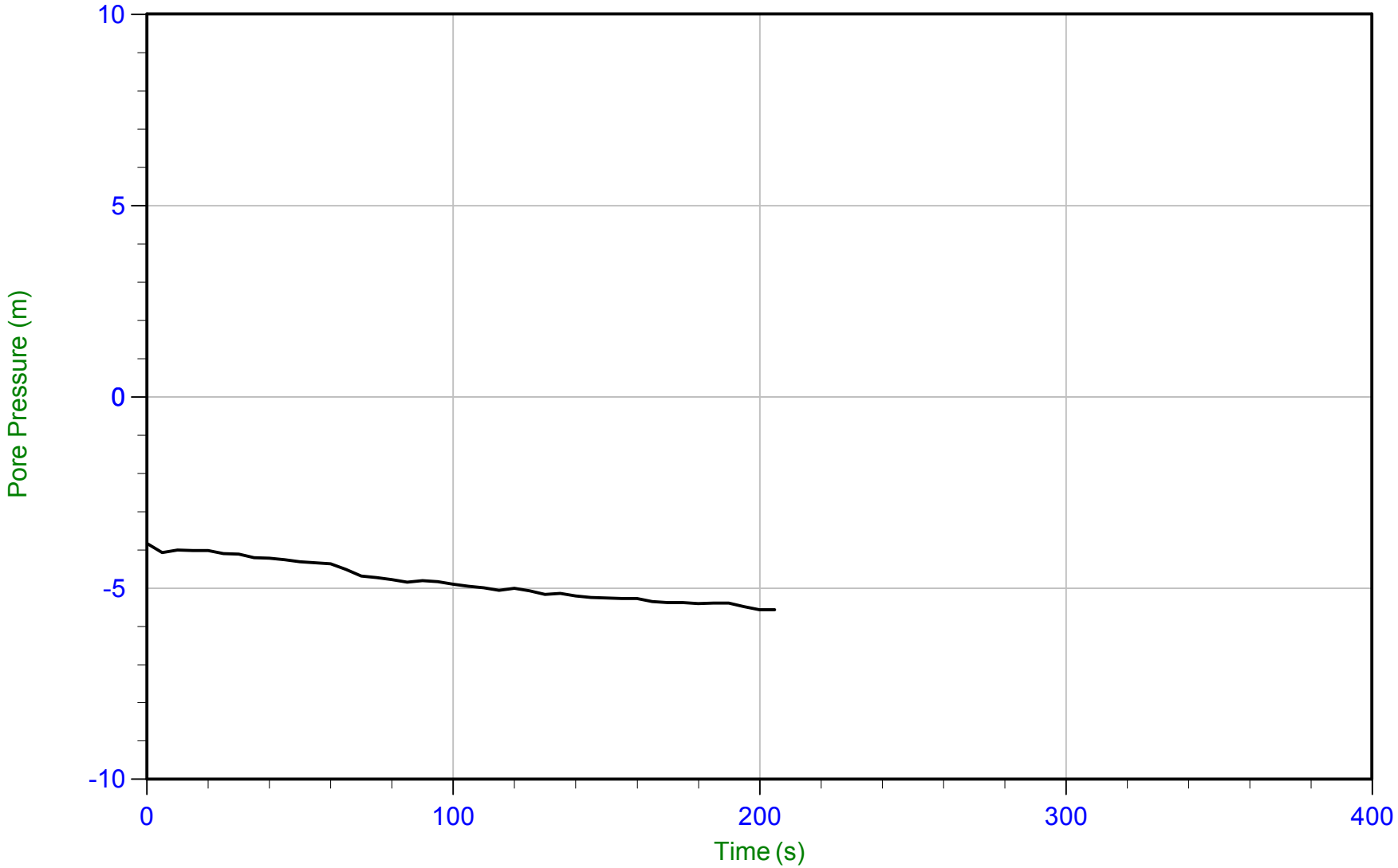
U Min: -4.8 m
U Max: -3.2 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/27/2016 14:22
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D61
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD61.PPF
Depth: 4.500 m / 14.764 ft
Duration: 205.0 s

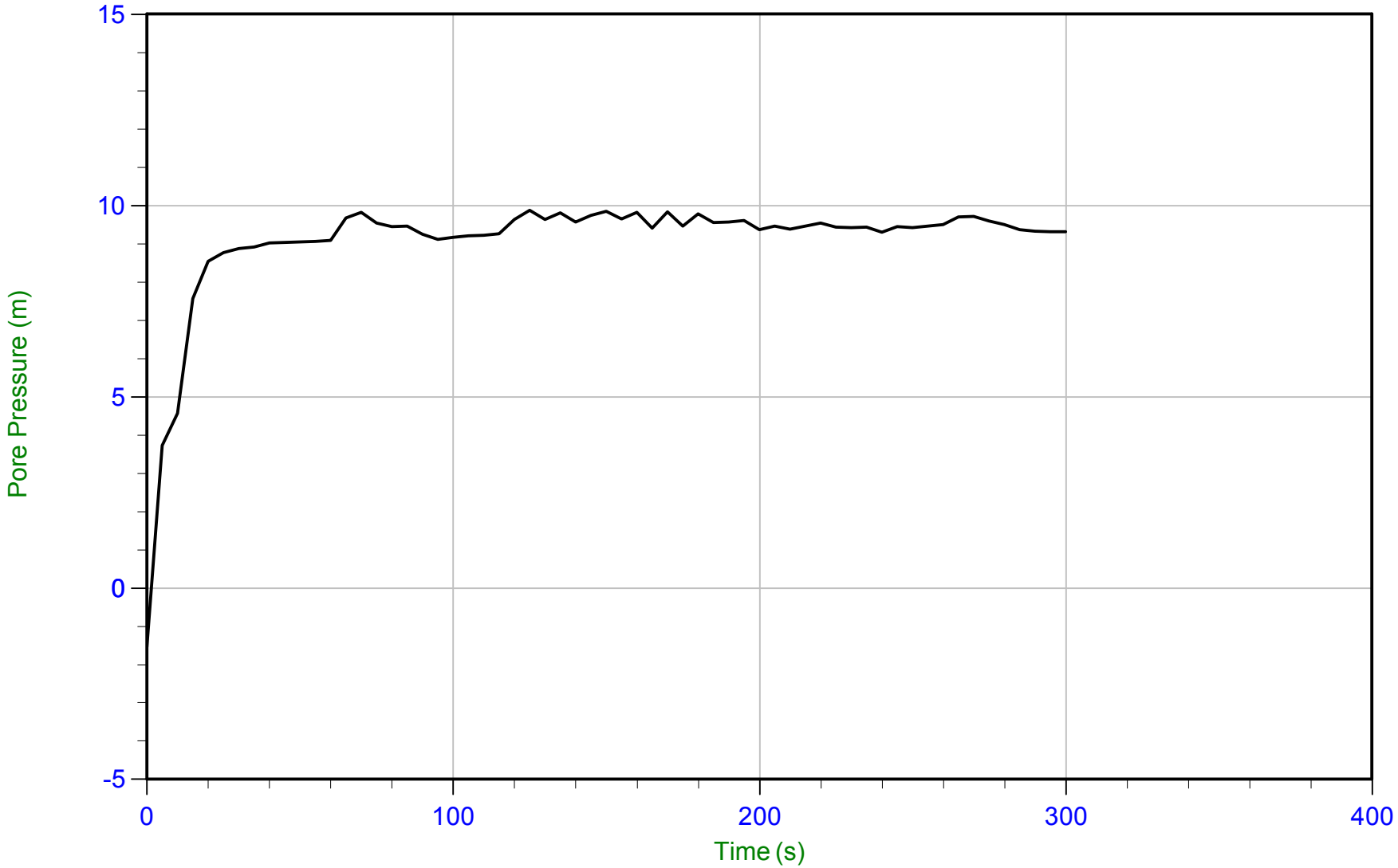
U Min: -5.6 m
U Max: -3.8 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/27/2016 12:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D63
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_CPD63.PPF
Depth: 15.000 m / 49.212 ft
Duration: 300.0 s

U Min: -1.5 m
U Max: 9.9 m

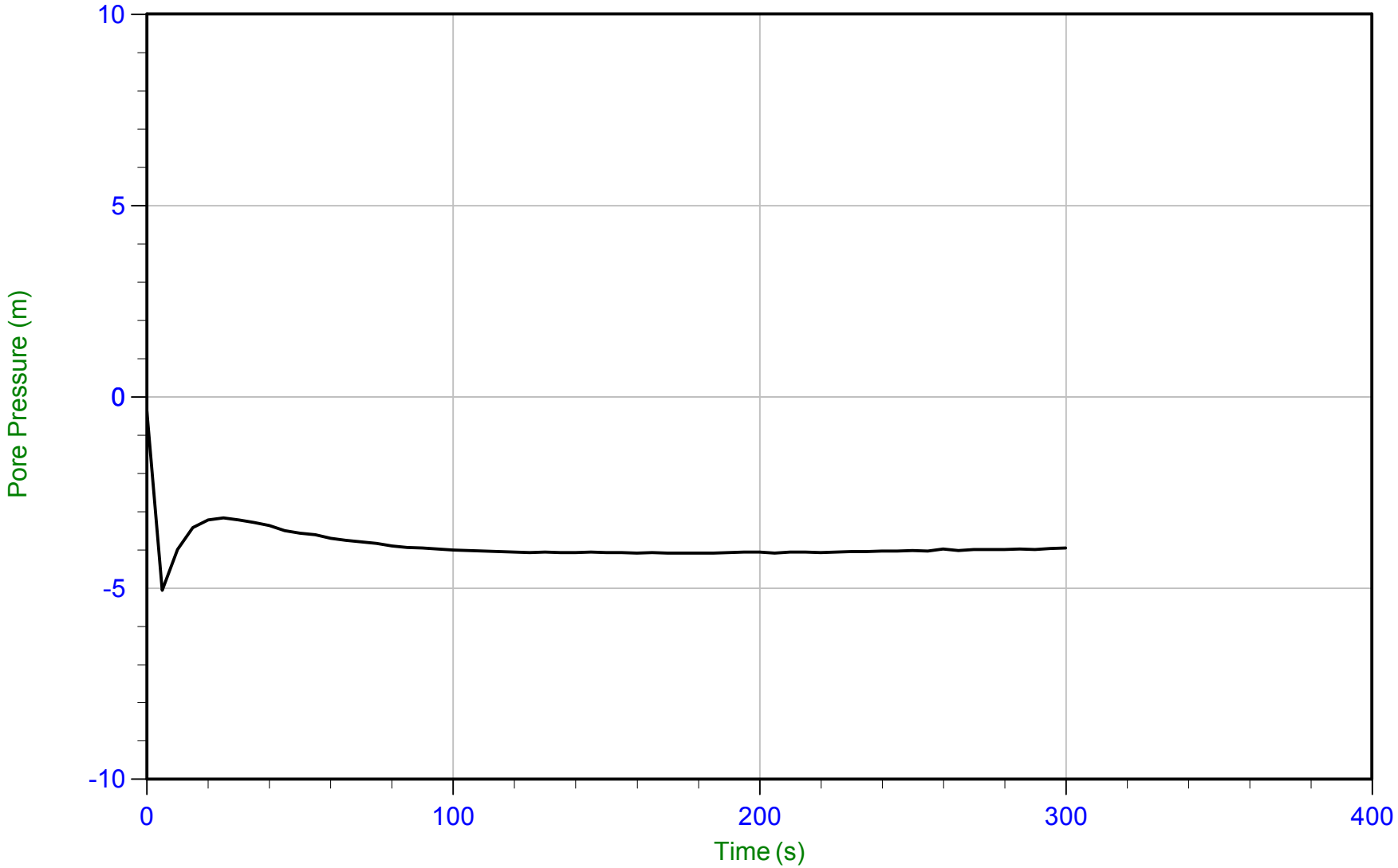
WT: 5.614 m / 18.418 ft
Ueq: 9.4 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/27/2016 12:02
Site: Springbank Off-Stream Reservoir

Sounding: CPT16-D63
Cone: 388:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_CPD63.PPF
Depth: 18.550 m / 60.859 ft
Duration: 300.0 s

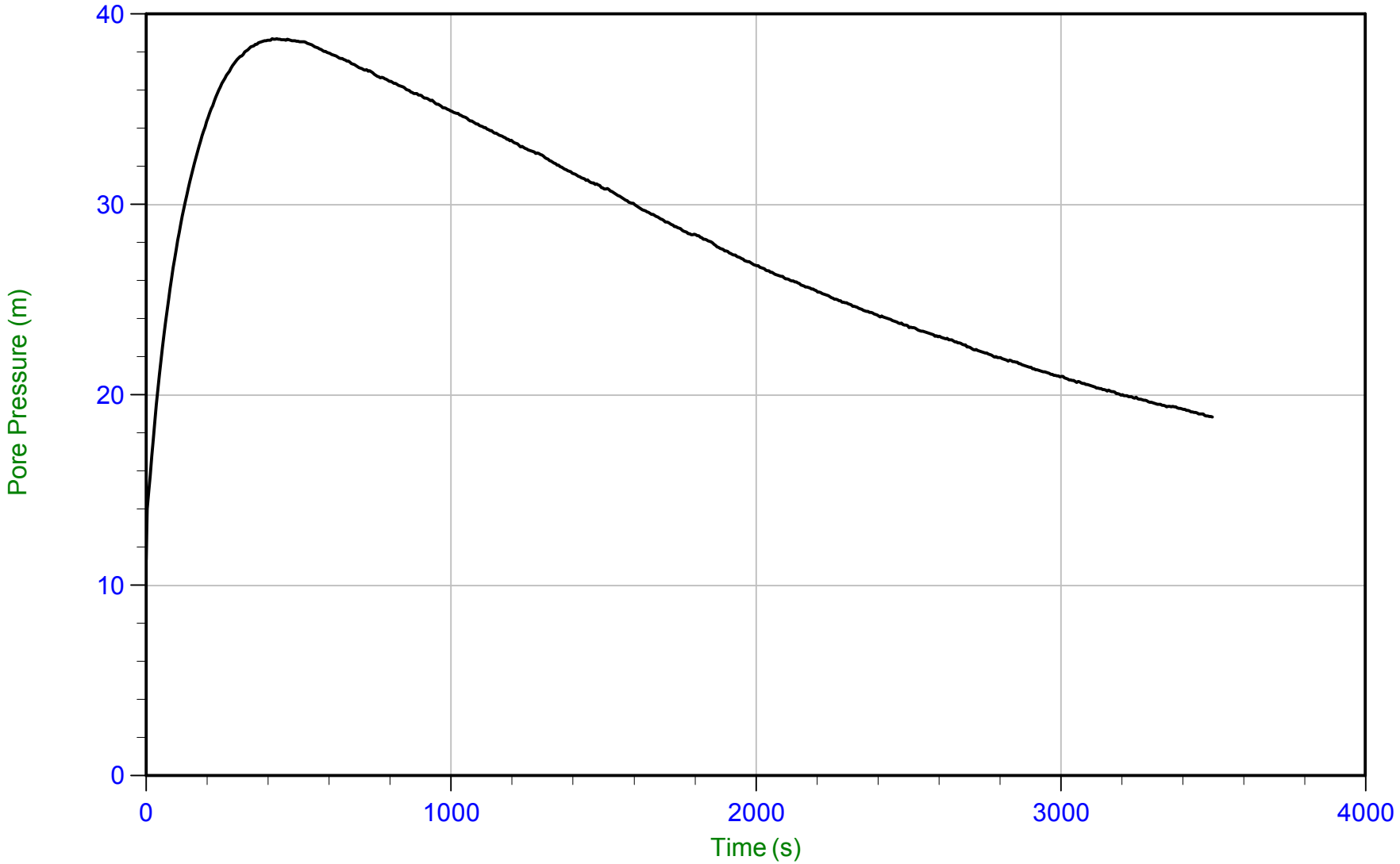
U Min: -5.1 m
U Max: -0.4 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/22/2016 12:45
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64
Cone: 340:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD64.PPF
Depth: 4.250 m / 13.943 ft
Duration: 3500.0 s

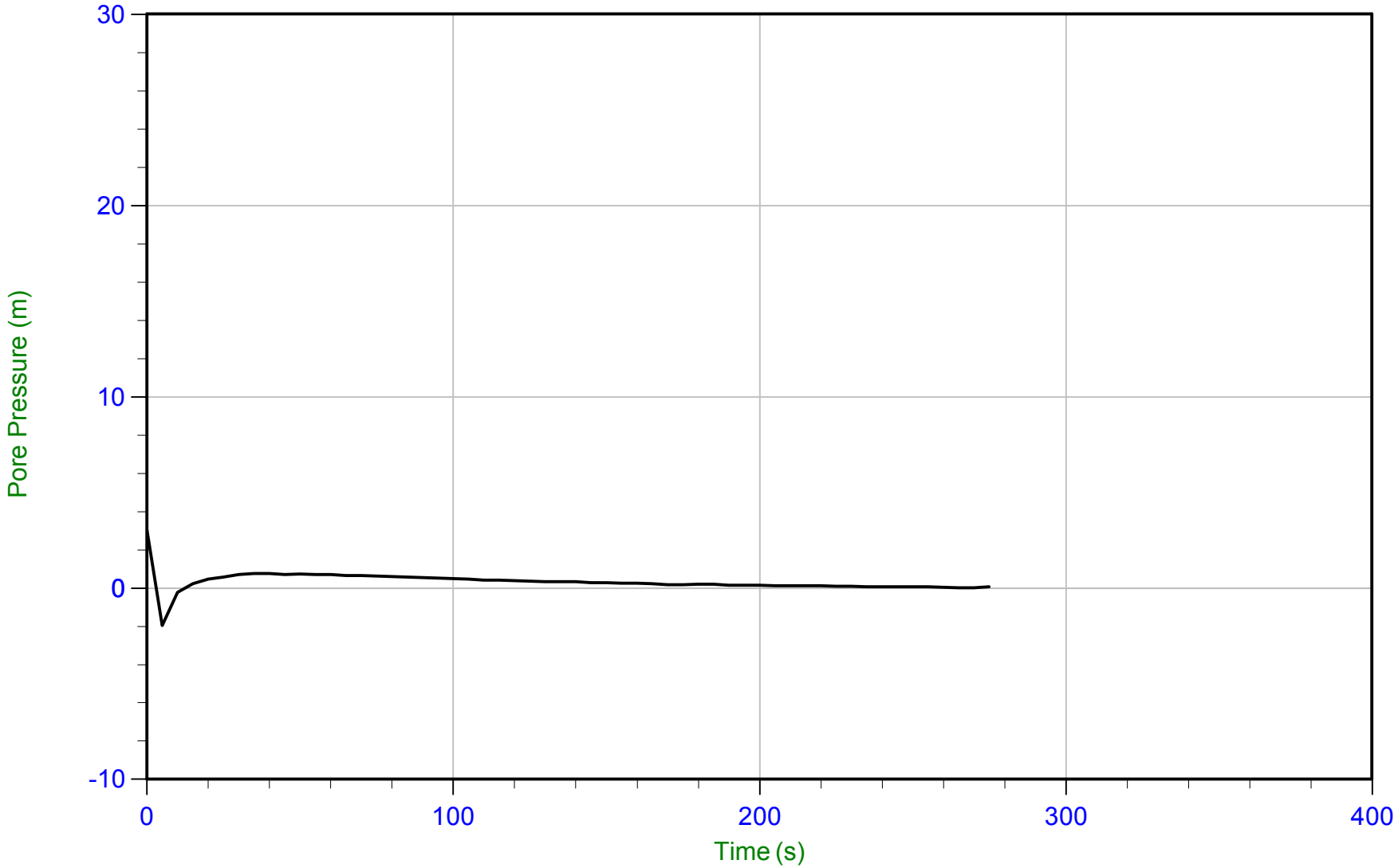
U Min: 11.3 m
U Max: 38.7 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/22/2016 12:45
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-D64
Cone: 340:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPD64.PPF
Depth: 10.050 m / 32.972 ft
Duration: 275.0 s

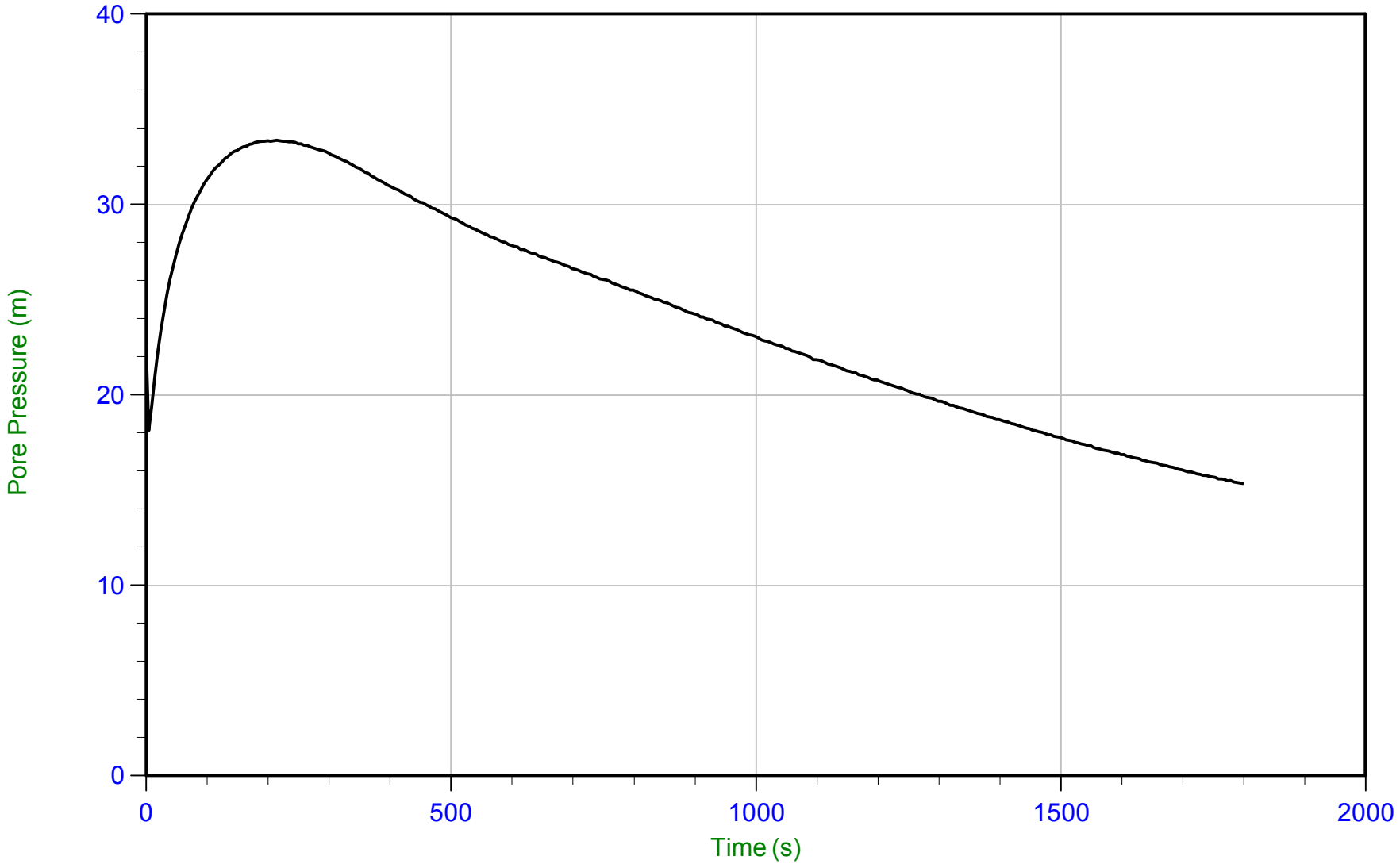
U Min: -2.0 m
U Max: 3.0 m

CONETEC

Stantec

Job No: 16-03023
Date: 06/20/2016 11:03
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC26
Cone: 322:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPDC26.PPF
Depth: 3.600 m / 11.811 ft
Duration: 1800.0 s

U Min: 15.3 m
U Max: 33.4 m

WT: 2.473 m / 8.113 ft
Ueq: 1.1 m
U(50): 17.25 m

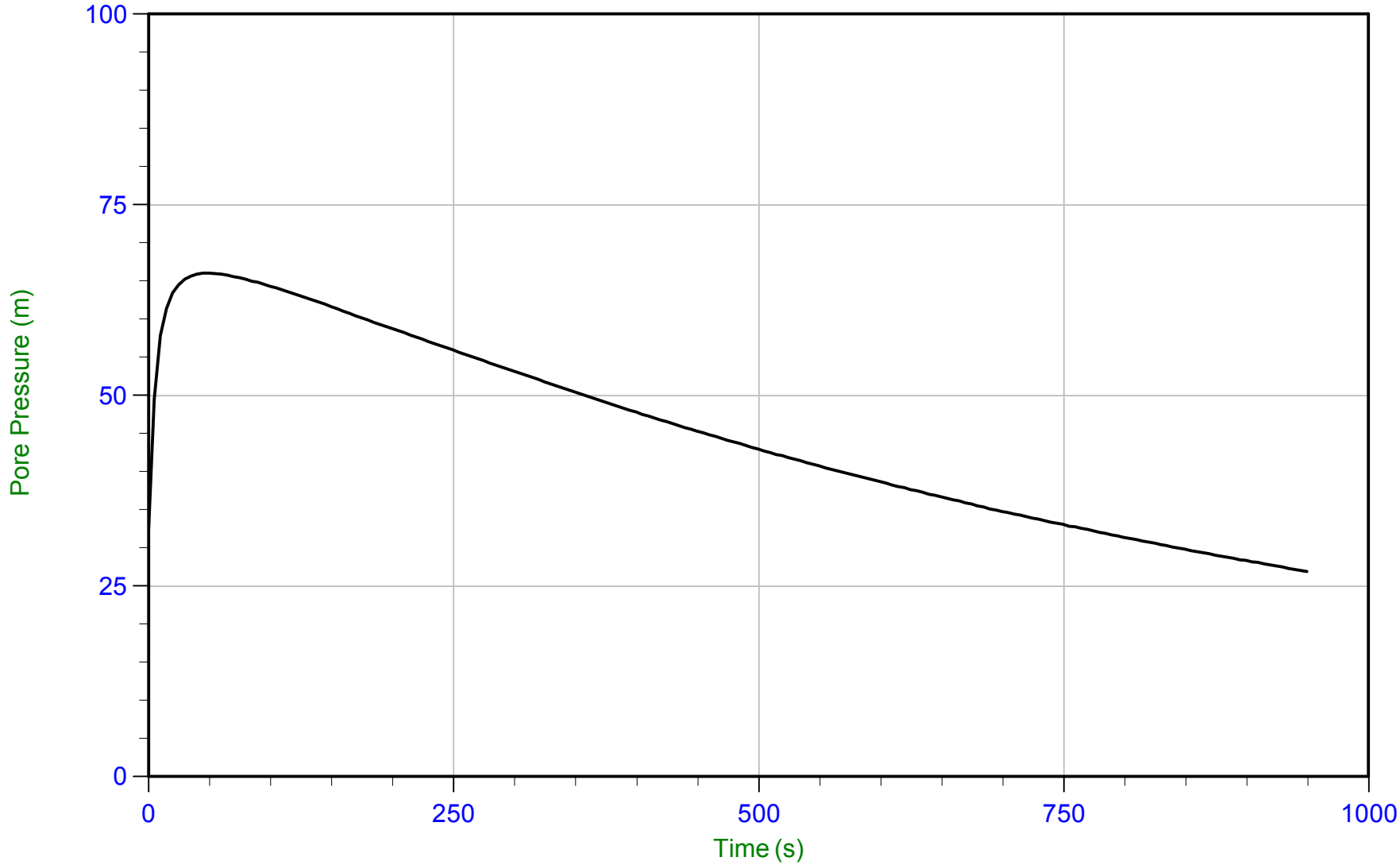
T(50): 1339.5 s
Ir: 100
Ch: 0.5 sq cm/min

CONETEC

Stantec

Job No: 16-03023
Date: 06/20/2016 11:03
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC26
Cone: 322:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPDC26.PPF
Depth: 6.150 m / 20.177 ft
Duration: 950.0 s

U Min: 26.9 m
U Max: 66.0 m

WT: 2.473 m / 8.113 ft
Ueq: 3.7 m
U(50): 34.85 m

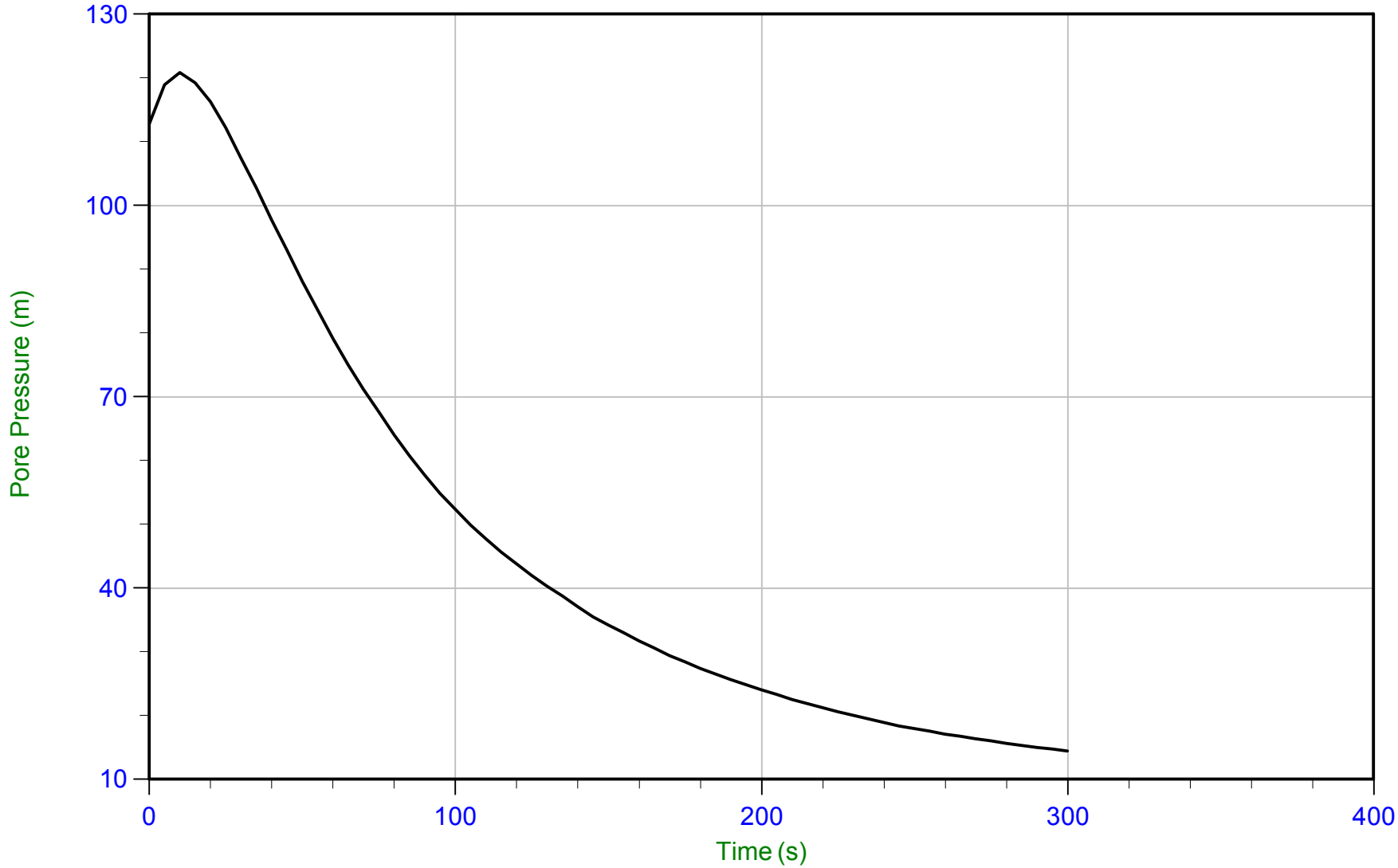
T(50): 648.3 s
Ir: 100
Ch: 1.1 sq cm/min

CONETEC

Stantec

Job No: 16-03023
Date: 06/20/2016 11:03
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC26
Cone: 322:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPDC26.PPF
Depth: 9.500 m / 31.168 ft
Duration: 300.0 s

U Min: 14.4 m
U Max: 120.8 m

WT: 2.473 m / 8.113 ft
Ueq: 7.0 m
U(50): 63.92 m

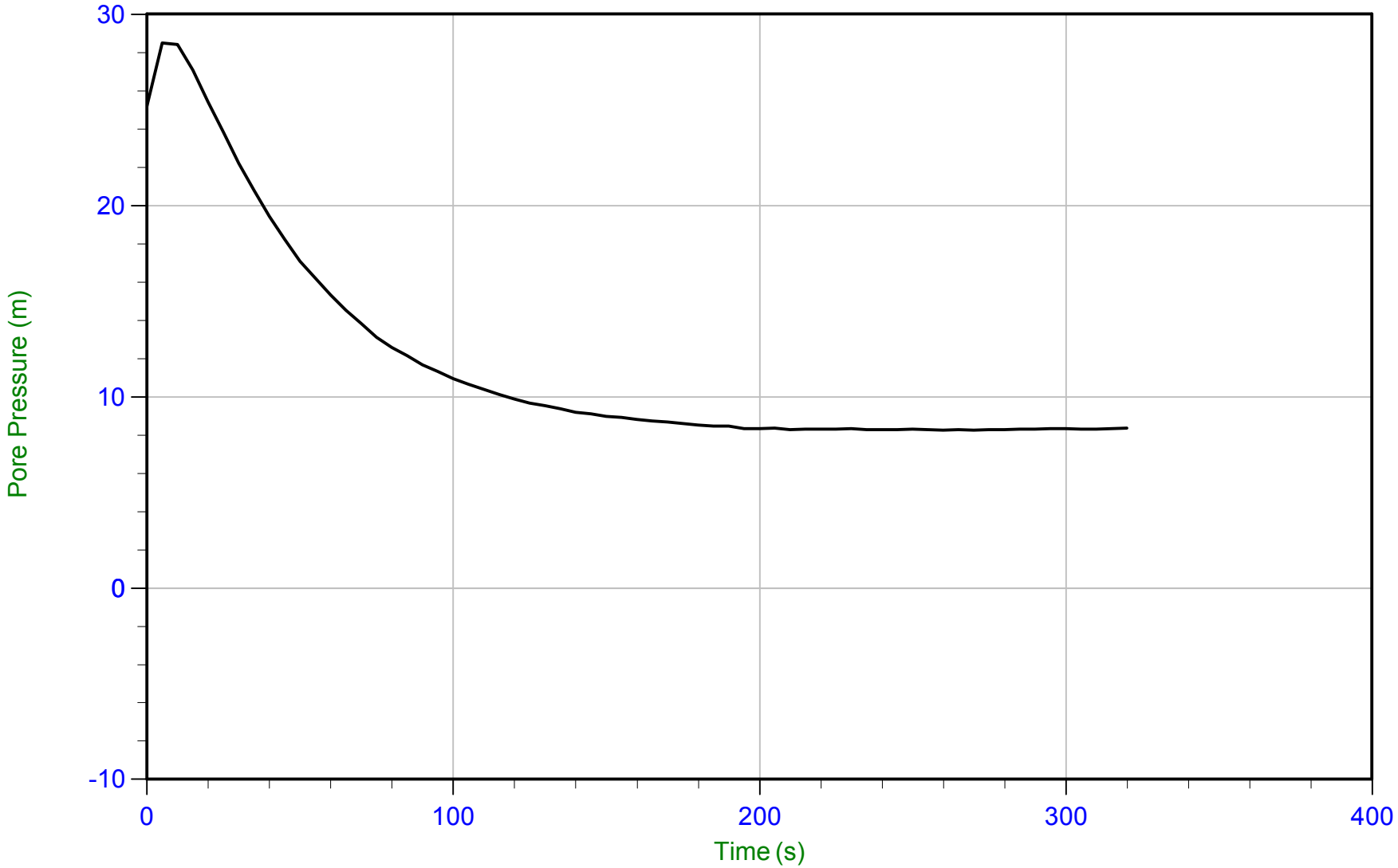
T(50): 70.2 s
Ir: 100
Ch: 10.0 sq cm/min

CONETEC

Stantec

Job No: 16-03023
Date: 06/20/2016 11:03
Site: Springbank Off-Stream Reservoir

Sounding: SCPT16-DC26
Cone: 322:T1500F15U500
Cone Area: 15 sq cm




Trace Summary:

Filename: 16-03023_SPDC26.PPF
Depth: 10.800 m / 35.433 ft
Duration: 320.0 s

U Min: 8.3 m
U Max: 28.5 m

WT: 2.473 m / 8.113 ft
Ueq: 8.3 m

# Appendix I

Geophysical Survey Results

Stantec

# Seismic Refraction & MASW Survey

## SR1 - Springbank

Effective Date: August 26, 2016
Issue Date: August 26, 2016
File Number: CGAA.316

Prepared for:

**Stantec**

Prepared by:

**DMT Geosciences Ltd.**
**Calgary, AB, Canada**
**(APEGA Permit P-09454)**

# TABLE OF CONTENTS



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# 1.0 INTRODUCTION

In accordance with the DMT Geosciences Ltd. proposal DMTP1284 to Stantec Consulting, a geophysical investigation was conducted by DMT Geosciences Ltd. over seven sites approximately 40 km west of Calgary, AB from July 18th to 20th. The surveys were completed in order to estimate seismic properties at the location of a future diversion structure and outlet structure of a dam. To complete this objective, seismic refraction and Multichannel Analysis of Surface Waves (MASW) surveys were conducted at each site.

## 1.1 Site Description

Surveys were conducted over or as close as possible to the following exisiting borehole locations:

- DS1
- DS3
- DS4
- DS5
- DS7
- DS10
- D46

Six sites were located at the diversion structure (Figure 1-1); one site was located at the outlet structure (See Figure 1-2). An overview of site in relation to Calgary is shown in Figure 1-3.

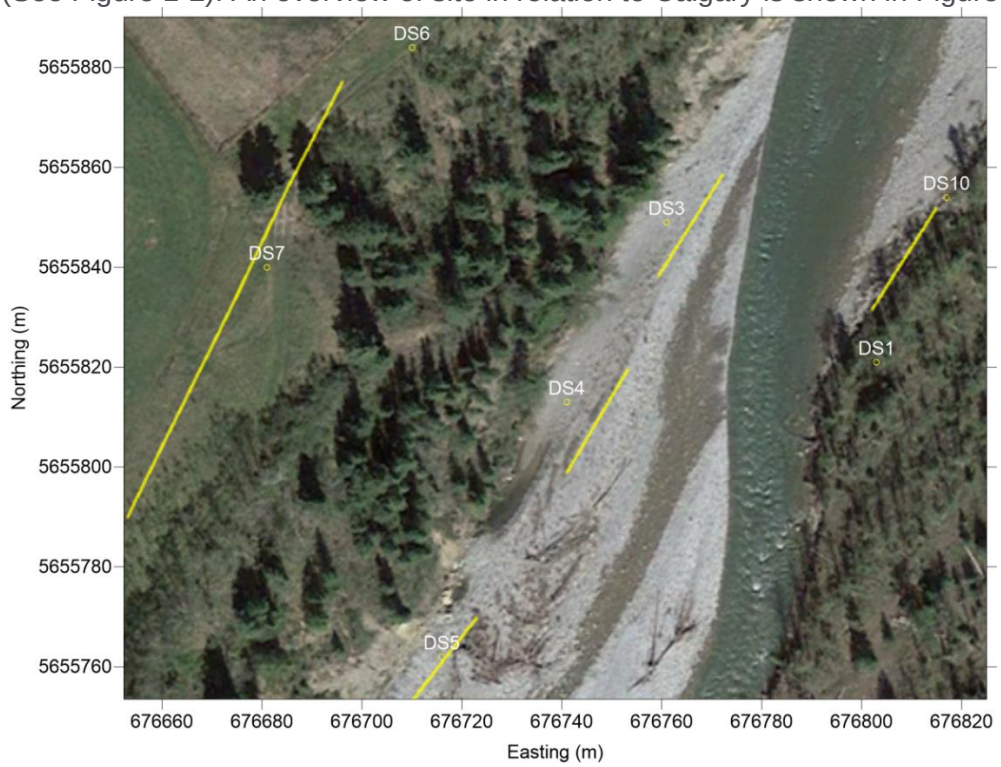


**Figure 1-1: Locations of seismic refraction and MASW arrays (yellow lines) in relation to borehole locations (yellow circles) at the diversion structure.**

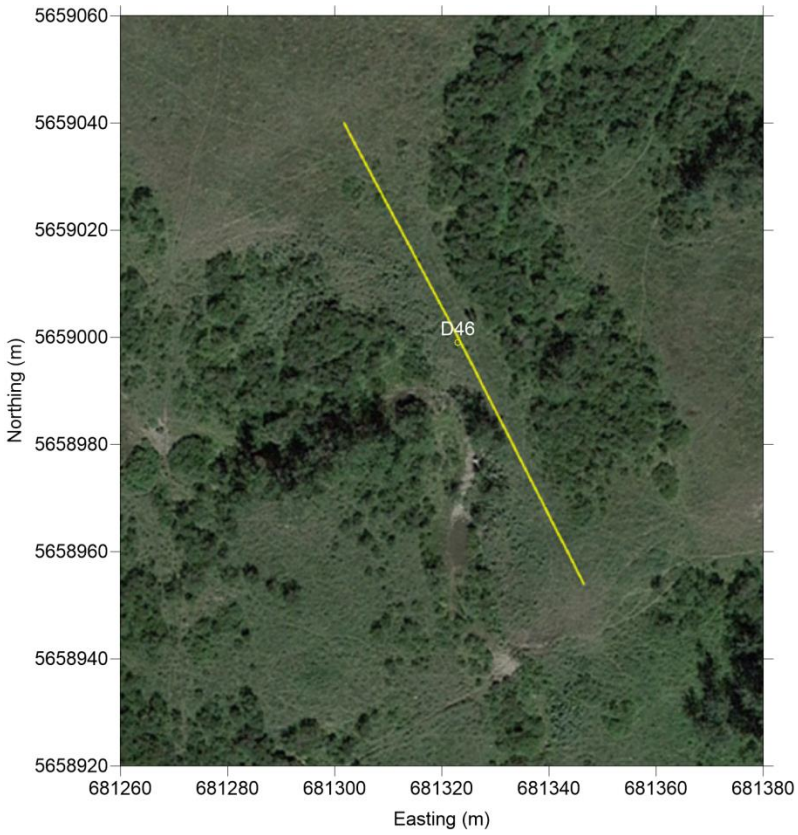


**Figure 1-2: Location of seismic refraction and MASW arrays in relation to borehole D46 near the outlet structure.**


**Figure 1-3: The approximate locations of diversion structure (red dot) and outlet structure (yellow dot) for the future Springbank dam in relation to Calgary, AB.**

# 2.0 METHODS

## 2.1 Multichannel Analysis of Surface Waves (MASW) Seismic Method

The MASW method evaluates the elastic properties (rigidity) of the near surface (<30 metres) using surface waves, also known as seismic shear waves. Upon analysis of the propagation of the surface waves, the variations in the shear wave velocity ($v_s$) can be calculated below the survey area. The shear wave velocity is generally a direct indicator of the rigidity of the ground and therefore can be used to determine load bearing capacity for use in geotechnical and engineering applications. National Building Code (NBC) Site Classification values are derived by calculating the average shear wave velocity response from the top 30 metres of an MASW sounding. These values, called $V_s30$ values, are used to assign an NBC Site Class between A and F.

Setup and acquisition of the MASW is similar to the refraction and/or reflection seismic method, but the raw data are processed and interpreted differently. A series of 24 or 48 seismic energy (vibration) sensing devices known as geophones are planted in the ground at a consistent spacing. The recording device (seismograph) records the vibrational signals from each geophone and the amplitudes are then plotted at regular spacing which is known as a shot record.

Seismic energy is imparted into the ground in one of two ways: Actively and Passively.

1. “Active MASW” is acquired by intentionally imparting seismic activity into the ground via means of a single point source (“seismic shot” or simply “shot”). In this case, a sledgehammer striking a metal plate on the ground was used. This type of surface wave travels through relatively shallow ground depths (see Figure 2-1).

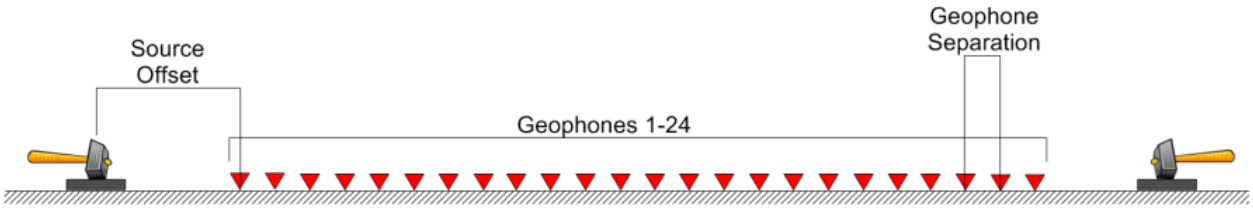


**Figure 2-1: MASW Survey setup.**

For this survey, two profiles were acquired, each with two straight lines at different geophone separations of 0.5 and 2 metres. The lines have the same centre point and trend (north-south). A total of 24 geophones were used for both geophone separations. For the 0.5 metre and 2 metre geophone intervals, shots were acquired at 4 and 10 metres off either end of the line. Each survey was carried out according to the parameters outlined in the Geological Survey of Canada’s (GSC) *Shear Wave Velocity Measurement Guidelines for Canadian Seismic Site Characterization in Soil and Rock* document.

As ground vibrations travel farther from the shot location, they lose energy, or disperse. Computer software is used to analyze this dispersion. Through an inversion process (see Figure 2-2) of the raw data, a best fit of the field data is obtained. It begins with the field shot record

which is used to create a measured dispersion curve. By means of an initial model, it generates a theoretical dispersion curve to fit the data. This iterative process is performed until the RMS error is reduced sufficiently while maintaining a realistic dispersion curve/earth model. The optimal dispersion curve is then converted into the final $v_s$ model. The resulting shear wave data is plotted at the centre of the geophone array, and is referred to as a "1-D" (one-dimensional) MASW sounding.

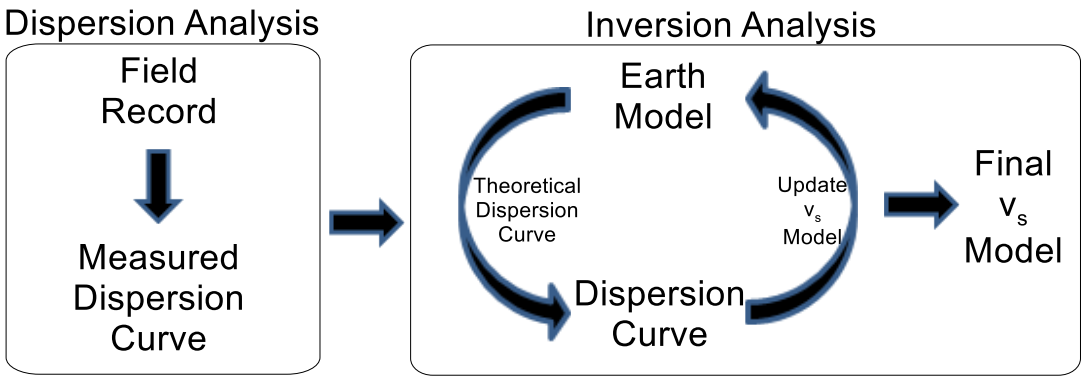


**Figure 2-2: Basic MASW inversion process.**

A summary of the survey parameters used in this investigation is shown in Table 1.

**Table 2.1: MASW Survey Parameters.**

| Active MASW Readings | DS1,DS3,DS4,DS5, DS10 | DS7, D46 |
|---|---|---|
| Geophone spacing | 0.5 metre | 2 metres |
| # of Geophones | 48 | 48 |
| Geophone Frequency | 4.5 Hz | 4.5 Hz |
| Sampling Interval | 0.25 milliseconds | 0.25 milliseconds |
| Record Length | 0.25 seconds | 0.25 seconds |
| Stacks | 5 | 5 |

## 2.2 Seismic Refraction Imaging

The seismic refraction method is commonly used to map the depth to bedrock. Variations in acoustic velocity of the subsurface enables the mapping of earth layering by measuring refracted seismic waves with respect to the known geometry of the seismic wave path. The seismic refraction method is illustrated in Figure 2.1. A seismic event is produced by a seismic source, usually a sledge-hammer, blank shotgun shell or small explosive charge activated at shallow depth. The source for this survey was a sledge-hammer. The arrival times of the resulting seismic waves are recorded at receiver sites (geophones) located at known distances from the seismic source.

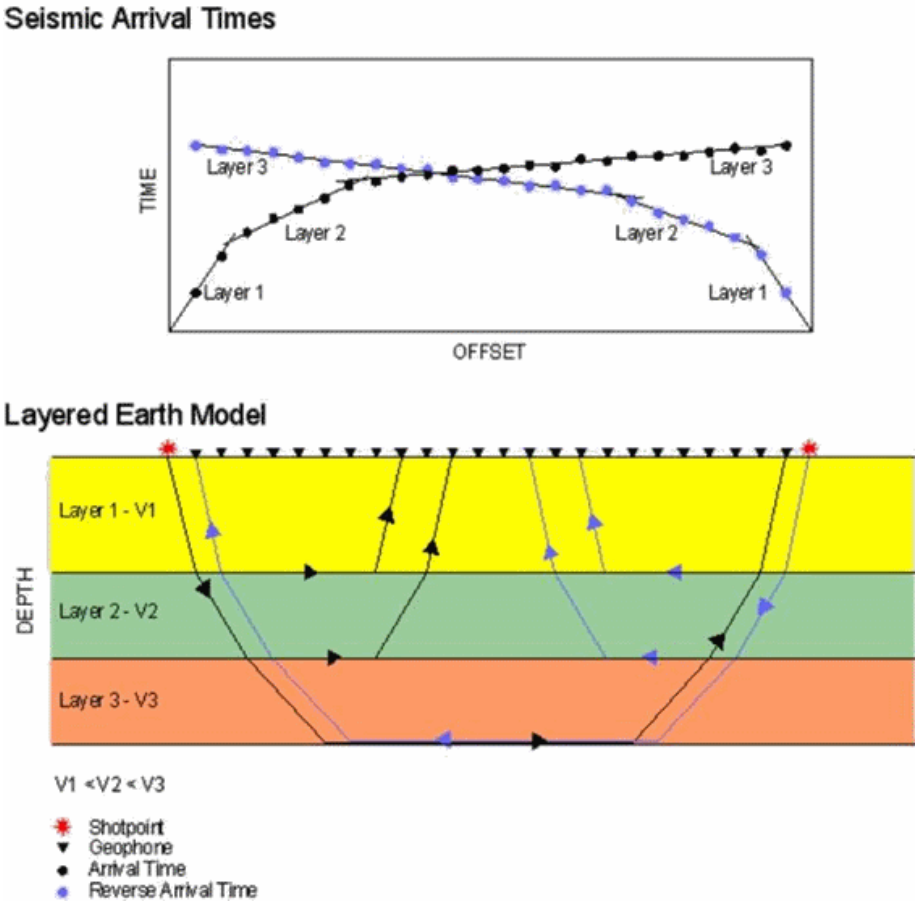


**Figure 2-3: An illustration of the principles of seismic refraction. The top image displays the relationship between arrival time, and the distance of the geophone from the shot location.**

In Figure 2.3, travel time curves for two separate shots are shown in the top half of the figure. The black circles indicate the time required for a sound wave, created at the left edge of the geophone array, to arrive at each individual geophone. Similarly, light blue circles indicate travel times for a shot taken at a later time at the right edge of the array. Arrows show the travel paths followed by the sound waves. Waves in the bedrock travel much more quickly than those in the overburden, and therefore eventually overtake waves that travel only through the overburden. The overtake point is referred to as the crossover distance, and is related to the depth of the bedrock. The shapes of the travel time curves are used to calculate overburden velocity, bedrock depth and topography, and bedrock velocity.

The depth of investigation in seismic refraction studies is largely a function of source energy strength and receiver geometry. Under normal circumstances, the depth of investigation is approximately 1/4 of the geophone array length.

The success of the method is dependent upon the degree of contrast in material density and/or acoustic velocity between target layers. The seismic refraction method also requires that density/velocity increase with depth. Density/velocity reversals may result in layers being “hidden” and thus undetectable by the seismic refraction method, or yield depth estimates that are erroneous.

The seismic acquisition parameters used for this project are presented in Table 2-2.

**Table 2-2: Seismic Acquisition Parameters**

| | |
|---|---|
| **Instrument** | Geometrics Geode Seismographs (2) |
| **Geophone Type** | 4.5-Hz geophone receiver |
| **Geophone Spacing** | 0.5/2 metres |
| **Receiver Channels** | 48 |
| **Source Spacing** | 0.5/2 metres |
| **Array Length** | 23.5/94 metres |
| **Source Type** | 16lb Sledge Hammer |
| **Record Length** | 2.0s |
| **Sample Interval** | 0.125ms |

# 3.0 RESULTS

Seismic velocities used for design parameters (Lamé constant λ, shear modulus μ, and bulk modulus κ) values were calculated using the following formulas:

**Lame Constant λ**

$\lambda = \rho(V_P^2 - 2V_S^2)$

**Shear Modulus μ**

$\mu = \rho V_S^2$ where ρ is density; $V_P$ is P wave velocity and $V_S$ is S wave velocity

**Bulk Modulus κ**

$\kappa = \lambda + \frac{2}{3}\mu$

Density values (provided by Stantec) were assigned to lithological units based on Table 3 and were used to calculate dynamic moduli for both the outlet structure and diversion structure. Calculated dynamic moduli values for each site are listed in Appendix A.

| Hole | Structure | Depth Range (m) | Density (kg/m3) | Lithology |
|---|---|---|---|---|
| D46 | Low Level Outlet | 10.5 – 11.1 | 2158 | Sandstone |
| D46 | Low Level Outlet | 15.6 – 17.1 | 2496 | Mudstone |
| D46 | Low Level Outlet | 18.6 – 20.1 | 2249 | Sandstone/Shale/Siltstone/Mudstone |
| D46 | Low Level Outlet | 21.6 – 23.1 | 2487 | Sandstone |

**Table 3: A table of densities for specific lithological units for the outlet structure.**

The bulk modulus values were plotted with the refraction results (Figure 3-1) and the shear modulus values were plotted with MASW results (Figure 3-2). Calculated bulk and shear modulus values are applicable to only the location of the borehole due to lithological variations across the seismic array.

## 3.1 D46 (Figure 3-1 and 3-2)

Seismic refraction and MASW arrays for D46 were collected using a 48 channel geophone array and 2m geophone spacing. Notable changes in the bulk and shear modulus values occur at approximately 1180m and 1160m elevations. These elevations correlate with critical boundaries

in refraction and MASW values. Borehole D46 was located on the seismic array at geophone 24 of 48 (46m of a 94m array).

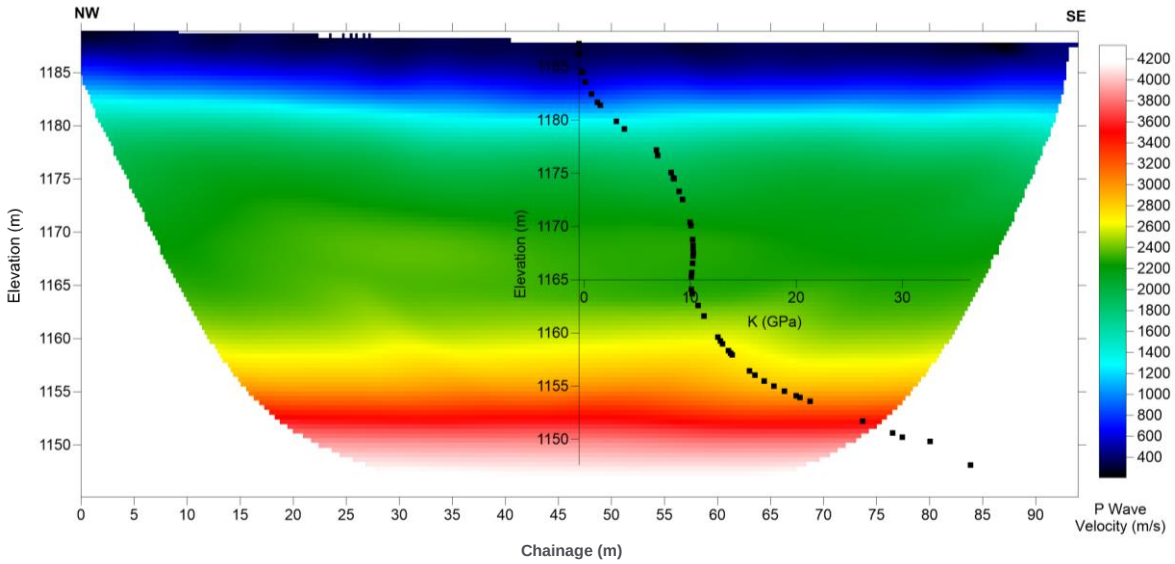


**Figure 3-1: Bulk modulus (K) values in GPa for borehole D46 plotted over seismic refraction results. The location of the borehole corresponds with the location of the y-axis of the bulk modulus plot. Abrupt shifts in bulk modulus values occur at approximately 1180m and 1160m.**

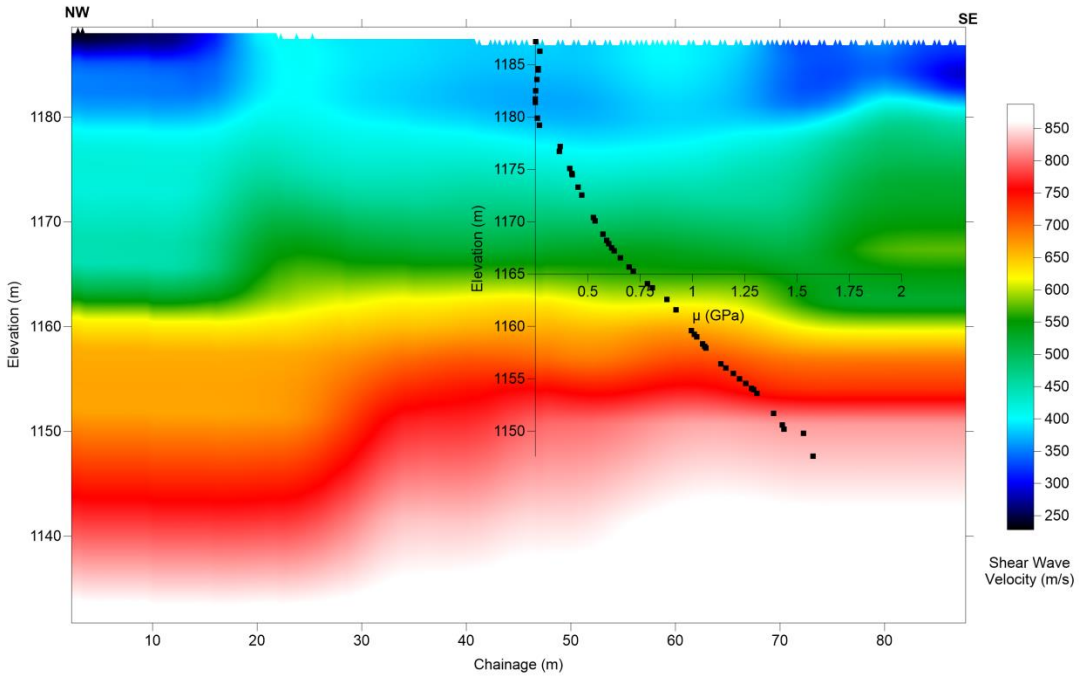


**Figure 3-2: Shear modulus (u) values in GPa for borehole D46 plotted over MASW results. The location of the borehole corresponds with the location of the y-axis of the shear modulus plot. Shear modulus values increase relatively linear with depth. Changes in the shear modulus values occur at approximately 1180m and 1160m.**

## 3.2 DS3 (Figure 3-3 and 3-4)

Seismic refraction and MASW arrays were collected with a 48 channel geophone array with 0.5m spacing. Depth of investigation for seismic refraction was approximately 5.5m due to shallow bedrock depth. The bulk modulus values remain relatively consistent below 1209m elevation. Low shear modulus values in the upper 2m correspond with a gravel layer identified in the borehole logs. Shear modulus values increase gradually between 1210m to 1202m elevation and then remain relatively constant to bottom of the borehole (approximately 1195.0m).

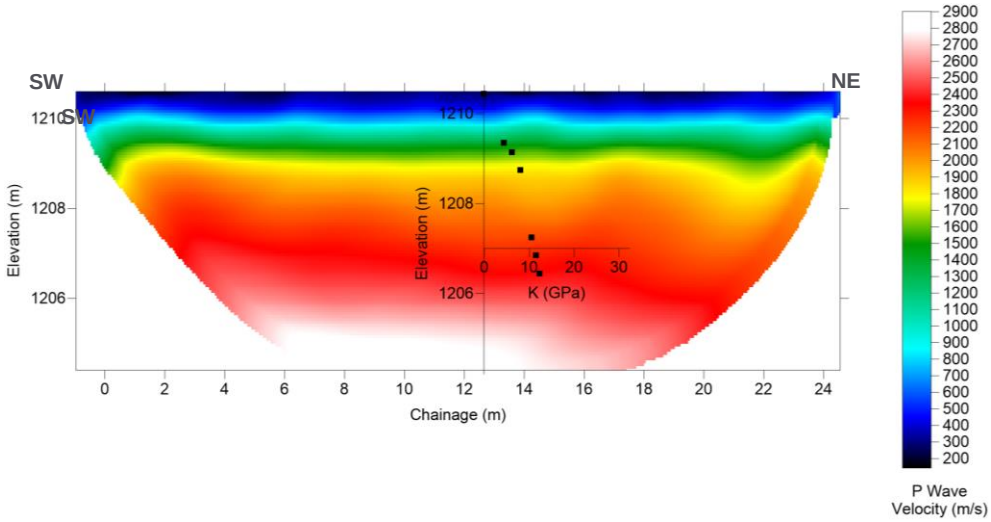


**Figure 3-3: Bulk modulus (K) values in GPa for borehole DS3 (3m NW of array) plotted over seismic refraction results. The location of the borehole corresponds with the location of the y-axis of the bulk modulus plot. Depth of investigation is approximately 5.5m due to bedrock near the surface (approximately 2m in depth). Bulk modulus values gradually increasing with depth indicating increasing bedrock competency as indicated by increasing velocity.**

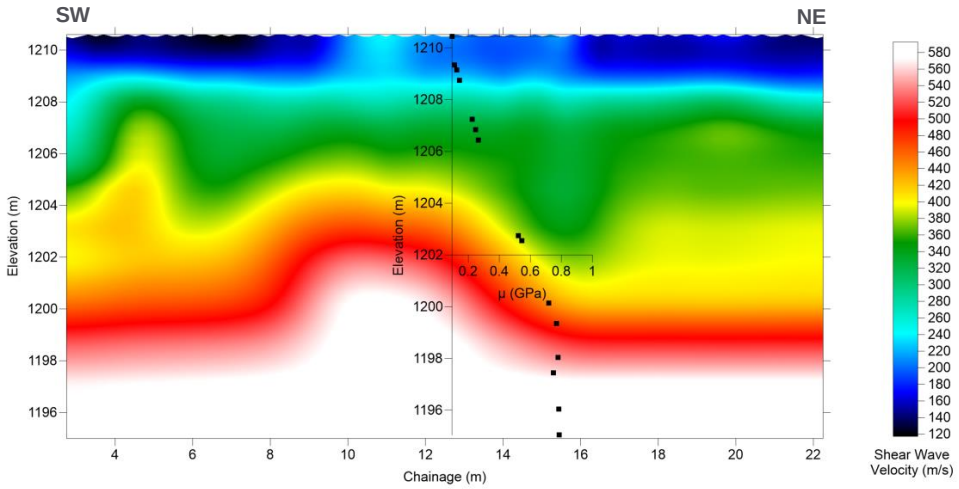


**Figure 3-4: Shear modulus (u) values in GPa for borehole DS3 plotted over MASW results. The location of the borehole corresponds with the location of the y-axis of the shear modulus plot. Shear modulus values increase from 1210m to 1202m elevation. From 1200m to 1196m elevation shear modulus values remain relatively constant.**

## 3.3 DS4 (Figure 3-5 and 3-6)

Seismic refraction and MASW arrays for DS4 were collected approximately 20m southwest of the DS3 arrays. Bulk modulus values closely match results at DS3 where values increase linearly until 1209m elevation and remain relatively constant from 1209m to 1206m. Results for shear modulus remained consistent from 1209m to 1205m and increased linearly from 1205m to 1202m. The low shear modulus values in the upper metre correspond to unconsolidated gravel (from borehole log DS4).

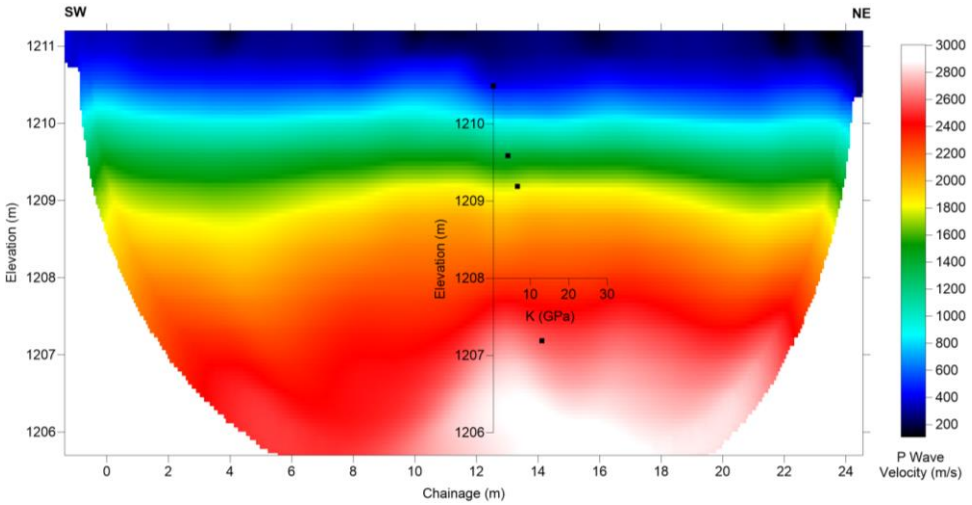


**Figure 3-5: Bulk modulus (K) values in GPa for borehole DS4 (approximately 7m NW of array) plotted over seismic refraction results. The location of the borehole corresponds with the location of the y-axis of the bulk modulus plot. Depth of investigation is approximately 5.5m due to bedrock near surface (approximately 2m). Bulk modulus values remain relatively constant below 1209m elevation.**

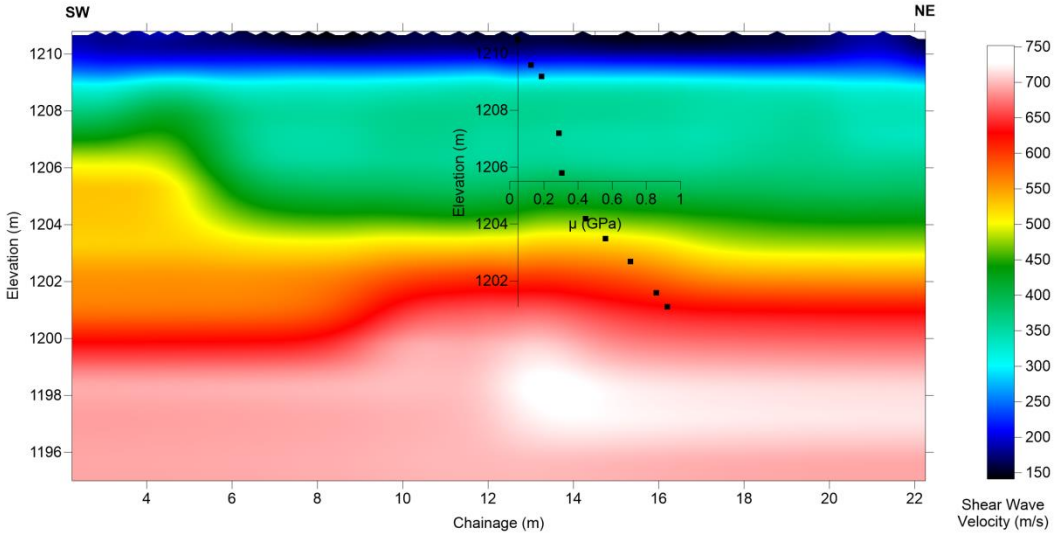


**Figure 3-6: Shear modulus (u) values in GPa for borehole DS4 (approximately 7m NW of array) plotted over MASW results. The location of the borehole corresponds with the y-axis of the shear modulus plot. Shear modulus values remain constant from 1209m to 1205m. From 1205m to 1202m shear modulus values increase linearly.**

## 3.4 DS5 (Figure 3-7 and 3-8)

Seismic refraction and MASW arrays were collected approximately 40m southwest of the DS4 array. Borehole DS5 was located on line in the centre of the array. In Figure 3-7 a sharp increase in bulk moduli values can be seen at 1210m elevation; values then increase with depth. Shear modulus values also increase with depth.

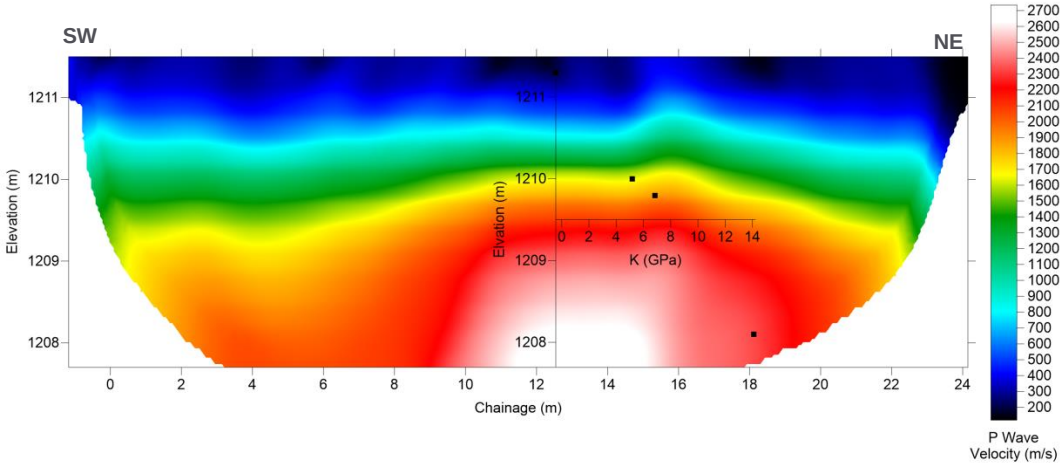


**Figure 3-7: Bulk modulus (K) values in GPa for borehole DS5 plotted over seismic refraction results. The location of the borehole corresponds with the location of the y-axis of the bulk modulus plot. Bulk modulus values increase with depth and an increase in values at 1210m is observed.**

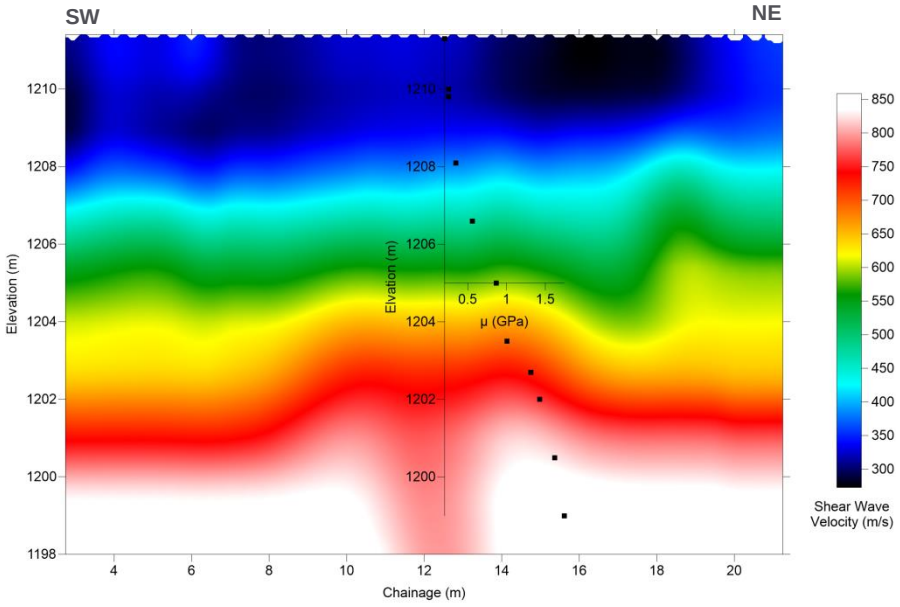


**Figure 3-8: Shear modulus (u) values in GPa for borehole DS5 plotted over MASW results. The location of the borehole corresponds with the location of the y-axis of the shear modulus plot. Values increase over the depth of the borehole.**

## 3.5 DS7 (Figure 3-9 and 3-10)

Seismic refraction and MASW arrays for DS7 were collect using a 48 channel geophone array and 2m spacing. Borehole DS7 was located approximately 3m southeast of seismic array at 61m chainage (Figure 3-9). Bulk modulus values remain relatively constant from surface to 1220m elevation and then increase with depth as reflected in the increase of seismic velocity with depth. Shear modulus values follow the same general trend with an increase in values at 1220m elevation; values then remain constant at approximately 1.5 GPa from 1215m to 1200m.

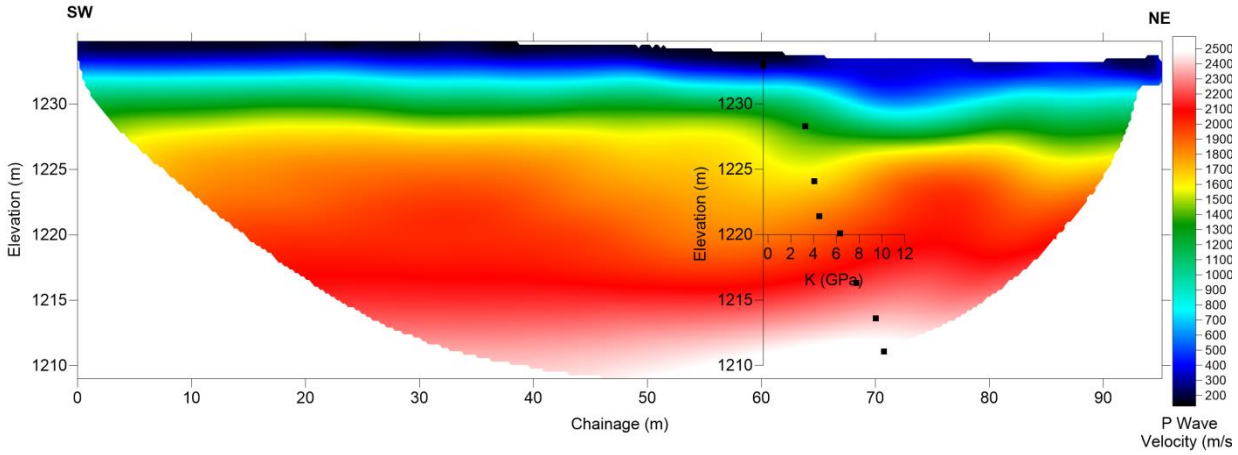


**Figure 3-9: Bulk modulus (K) values in GPa for borehole DS7 (approximately 3m SE of array) plotted over seismic refraction results. The location of the borehole corresponds with the location of the y-axis of the bulk modulus plot. Constant until 1220m elevation, bulk modulus values then increase with depth as reflected in the increase of seismic velocity with depth from 1220m to 1210m.**

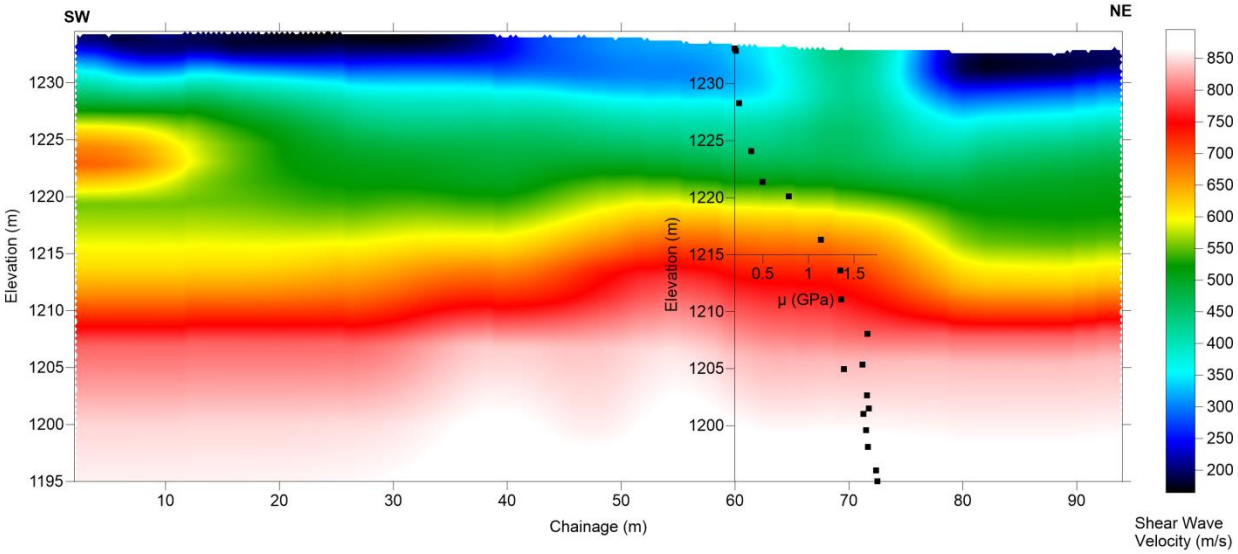


**Figure 3-10: Shear modulus (u) values in GPa for borehole DS4 (approximately 3m SE of array) plotted over MASW results. The location of the borehole corresponds with the location of the y-axis of the shear modulus plot. Shear modulus values increase until 1208m elevation and then remain constant at approximately 1.5GPa to bottom of the borehole.**

## 3.6 DS10 (Figure 3-11 and 3-12)

Initially, the location of the seismic refraction and MASW array for DS10 was to be located at DS1; however, do to site conditions, geophones could not be planted at or near the borehole. The array location was then moved approximately 15m north towards DS10. Furthermore, due to significant rainfall, the increased water level of the Elbow River required that the array to be re-located 3m south of DS10. Density values from DS10 were applied to a theoretical borehole at the center of the array (under permission from Stantec) and used to calculate bulk modulus values, which may or may not accurately represent actual values. An increase in bulk modulus values as depth increases is observed similar to the values calculated for DS3, DS4, and DS5.

Rain and turbulent river near the seismic array may have contributed to noisy data resulting in high velocities in the inversion.

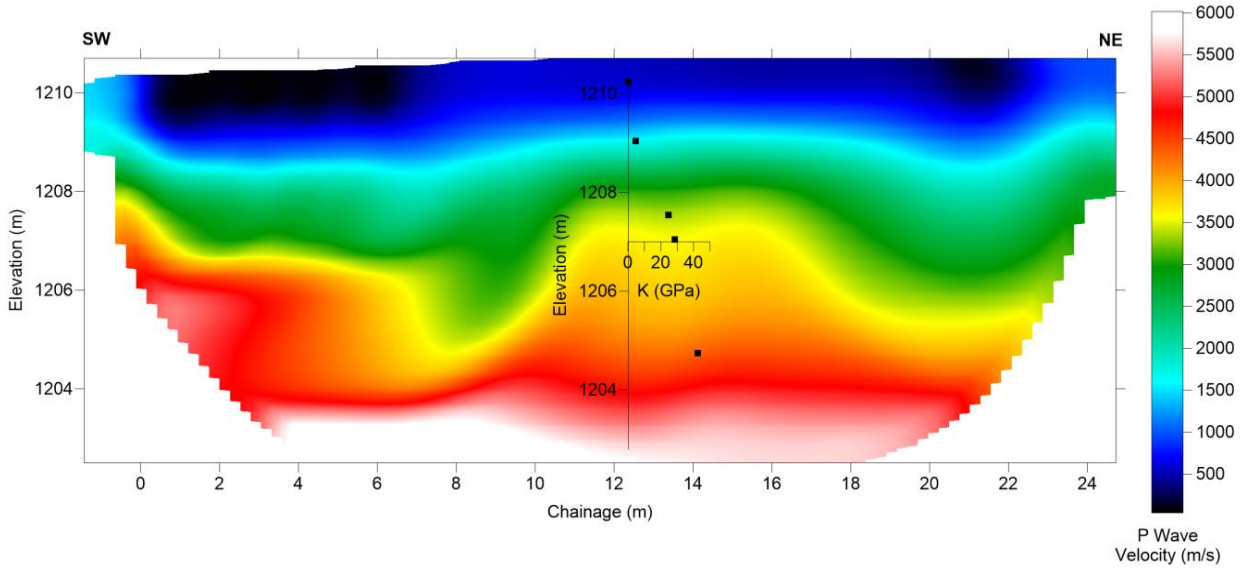


**Figure 3-11: Bulk modulus values overlain on seismic refraction results. Y-axis of bulk modulus values does not correspond to actual borehole location (DS10 is approximately 3m northeast of last geophone). Density values from DS10 were applied to a theoretical borehole at the center of the array and used to calculate bulk modulus values, which may or may not accurately represent actual values. Bulk modulus values increase with depth.**

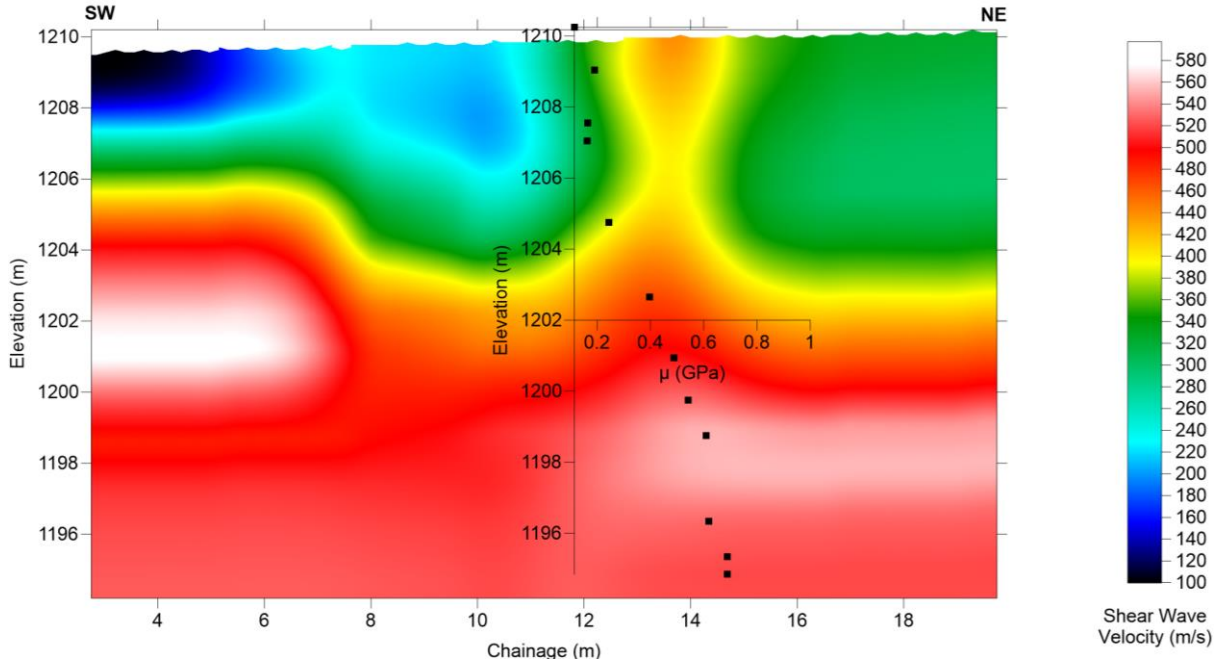


**Figure 3-12: Shear modulus values overlain on MASW results. Y-axis of bulk modulus values does not correspond to actual borehole location (DS10 is approximately 3m northeast of last geophone). Density values from DS10 were applied to a theoretical borehole at the center of the array and used to calculate shear modulus values, which may or may not accurately represent actual values. Shear modulus values are observed to increase from surface to bottom of borehole.**

# 4.0 CONCLUSION

A seismic refraction and MASW survey was conducted for the potential SR1 Springbank Dam between July 18th and 20th. 5 surveys were completed at the future dam's diversion structure near boreholes DS3, DS4, DS5, DS7, and DS10; 1 survey was completed near the future location of dam's outlet structure by borehole D46. Calculated dynamic moduli tie correlate well with both seismic refraction and MASW results.

The results of seismic refraction and MASW surveys combined with approximate borehole density profiles provided by Stantec allowed for the determination of bulk and shear modulus values at the location of DS3, DS4, DS5, DS7, and DS10 borehole.

# 5.0 Appendix A

**Table 4: Calculated dynamic moduli values and seismic velocities at borehole D46. The number of sample points at each elevation was determined by information given in borehole logs.**

| Chainage | Elevation | P-Wave Velocity | S-Wave Velocity | Density | Lame Constant | Shear Modulus | Bulk Modulus |
|---|---|---|---|---|---|---|---|
| (m) | (m) | (m/s) | (m/s) | (kg/m3) | (Gpa) | (Gpa) | (Gpa) |
| 46 | 1187.184 | 325.5622 | 384.2281 | 1700 | -0.32176 | 0.250973 | -0.48908 |
| 46 | 1186.284 | 356.1909 | 382.6296 | 1850 | -0.30699 | 0.27085 | -0.48755 |
| 46 | 1184.584 | 509.259 | 377.0993 | 1850 | -0.04637 | 0.263077 | -0.22175 |
| 46 | 1184.484 | 521.637 | 376.7136 | 1850 | -0.02168 | 0.262539 | -0.19671 |
| 46 | 1183.584 | 651.9944 | 372.6865 | 1850 | 0.272517 | 0.256956 | 0.101212 |
| 46 | 1182.484 | 853.6172 | 368.2787 | 1850 | 0.846197 | 0.250914 | 0.678921 |
| 46 | 1181.684 | 1022.662 | 366.89 | 1850 | 1.436749 | 0.249025 | 1.270733 |
| 46 | 1181.384 | 1089.01 | 366.4051 | 1850 | 1.697258 | 0.248367 | 1.531679 |
| 46 | 1179.884 | 1419.665 | 373.8831 | 1850 | 3.211363 | 0.258609 | 3.038957 |
| 46 | 1179.184 | 1560.67 | 380.4537 | 1850 | 3.970472 | 0.267778 | 3.791953 |
| 46 | 1177.184 | 1862.454 | 404.3767 | 2249 | 7.065672 | 0.367758 | 6.820501 |
| 46 | 1176.684 | 1913.884 | 410.2144 | 2158 | 7.178371 | 0.363139 | 6.936278 |
| 46 | 1175.084 | 2032.677 | 428.3579 | 2249 | 8.467022 | 0.41267 | 8.191909 |
| 46 | 1174.584 | 2059.936 | 433.8881 | 2249 | 8.696474 | 0.423394 | 8.414212 |
| 46 | 1174.484 | 2065.101 | 434.9941 | 2249 | 8.740066 | 0.425555 | 8.456362 |
| 46 | 1173.284 | 2124.641 | 448.7359 | 2249 | 9.246479 | 0.452867 | 8.944568 |
| 46 | 1172.534 | 2161.561 | 457.5451 | 2249 | 9.566465 | 0.470823 | 9.252583 |
| 46 | 1170.384 | 2250.022 | 483.4753 | 2249 | 10.33439 | 0.5257 | 9.983923 |
| 46 | 1170.084 | 2258.73 | 487.1362 | 2249 | 10.4067 | 0.533692 | 10.05091 |
| 46 | 1168.784 | 2285.989 | 504.4903 | 2249 | 10.60792 | 0.572394 | 10.22632 |
| 46 | 1168.204 | 2294.513 | 512.576 | 2249 | 10.65873 | 0.590889 | 10.2648 |
| 46 | 1167.904 | 2298.258 | 516.7583 | 2249 | 10.67806 | 0.600571 | 10.27768 |
| 46 | 1167.504 | 2302.494 | 522.3346 | 2249 | 10.69582 | 0.613602 | 10.28676 |
| 46 | 1167.204 | 2304.882 | 527.3067 | 2249 | 10.69709 | 0.62534 | 10.28019 |
| 46 | 1166.554 | 2307.911 | 539.7966 | 2249 | 10.66856 | 0.655314 | 10.23169 |
| 46 | 1165.684 | 2310.566 | 556.8296 | 2249 | 10.61212 | 0.697323 | 10.14724 |
| 46 | 1165.284 | 2312.723 | 564.6608 | 2249 | 10.59504 | 0.717075 | 10.11699 |
| 46 | 1164.084 | 2328.017 | 590.4973 | 2249 | 10.62043 | 0.784197 | 10.09763 |
| 46 | 1163.684 | 2342.361 | 599.5581 | 2249 | 10.7226 | 0.808448 | 10.18363 |
| 46 | 1162.584 | 2412.65 | 624.4752 | 2249 | 11.33708 | 0.877041 | 10.75238 |
| 46 | 1161.584 | 2471.874 | 640.1208 | 2249 | 11.89868 | 0.921538 | 11.28432 |
| 46 | 1159.584 | 2603.463 | 665.2624 | 2249 | 13.25307 | 0.995349 | 12.58951 |
| 46 | 1159.244 | 2628.388 | 669.8145 | 2249 | 13.51901 | 1.009017 | 12.84633 |
| 46 | 1158.984 | 2648.004 | 673.43 | 2249 | 13.72994 | 1.019939 | 13.04998 |
| 46 | 1158.334 | 2699.076 | 682.4688 | 2249 | 14.28899 | 1.047503 | 13.59065 |
| 46 | 1158.084 | 2719.592 | 685.9453 | 2249 | 14.51761 | 1.058201 | 13.81215 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 46 | 1157.934 | 2732.175 | 688.0311 | 2249 | 14.659 | 1.064647 | 13.94924 |
| 46 | 1156.434 | 2875.489 | 710.7132 | 2249 | 16.32372 | 1.136 | 15.56639 |
| 46 | 1156.034 | 2921.715 | 718.2708 | 2249 | 16.87783 | 1.160288 | 16.1043 |
| 46 | 1155.484 | 2993.203 | 728.7497 | 2249 | 17.76061 | 1.19439 | 16.96435 |
| 46 | 1154.984 | 3067.642 | 738.276 | 2249 | 18.71241 | 1.225821 | 17.8952 |
| 46 | 1154.534 | 3143.265 | 746.8497 | 2249 | 19.71146 | 1.254457 | 18.87515 |
| 46 | 1154.084 | 3225.909 | 755.4233 | 2249 | 20.83734 | 1.283424 | 19.98173 |
| 46 | 1153.944 | 3252.327 | 758.0907 | 2249 | 21.20408 | 1.292504 | 20.34241 |
| 46 | 1153.584 | 3320.307 | 762.9995 | 2249 | 22.17537 | 1.309297 | 21.30251 |
| 46 | 1151.684 | 3651.132 | 785.6727 | 2249 | 27.20435 | 1.388266 | 26.27884 |
| 46 | 1150.584 | 3823.556 | 797.1802 | 2249 | 30.02098 | 1.429231 | 29.06816 |
| 46 | 1150.184 | 3877.182 | 799.5406 | 2249 | 30.93277 | 1.437707 | 29.9743 |
| 46 | 1149.784 | 3925.499 | 801.7527 | 2381 | 33.62907 | 1.530524 | 32.60872 |
| 46 | 1147.584 | 4131.01 | 813.9192 | 2381 | 37.47768 | 1.577328 | 36.42613 |

**Table 5: Calculated dynamic moduli values and seismic velocities at borehole DS3. The number of sample points at each elevation was determined by information given in borehole logs.**

| Chainage (m) | Elevation (m) | P-Wave Velocity (m/s) | S-Wave Velocity (m/s) | Density (kg/m3) | Lame Constant (Gpa) | Shear Modulus (Gpa) | Bulk Modulus (Gpa) |
|---|---|---|---|---|---|---|---|
| 11.5 | 1210.443 | 305.9116 | 223.9443 | 1900 | -0.01277 | 0.095287 | -0.07629 |
| 11.5 | 1209.343 | 1443.138 | 221.8661 | 2249 | 4.462461 | 0.110706 | 4.388657 |
| 11.5 | 1209.143 | 1610.062 | 224.4471 | 2496 | 6.218903 | 0.12574 | 6.135076 |
| 11.5 | 1208.743 | 1839.762 | 239.8413 | 2496 | 8.161114 | 0.143579 | 8.065394 |
| 11.5 | 1207.243 | 2223.742 | 316.089 | 2249 | 10.67196 | 0.224703 | 10.52216 |
| 11.5 | 1206.843 | 2322.283 | 331.3806 | 2249 | 11.63491 | 0.24697 | 11.47027 |
| 11.5 | 1206.443 | 2401.954 | 343.3711 | 2249 | 12.44501 | 0.265165 | 12.26823 |
| 11.5 | 1202.743 | 3049.824 | 482.339 | 2249 | 19.87245 | 0.523232 | 19.52363 |
| 11.5 | 1202.543 | 3072.291 | 492.0744 | 2249 | 20.13911 | 0.544567 | 19.77606 |
| 11.5 | 1200.143 | 3341.885 | 577.7079 | 2158 | 22.66052 | 0.720225 | 22.18037 |
| 11.5 | 1199.343 | 3431.75 | 584.2467 | 2249 | 24.9509 | 0.767683 | 24.43911 |
| 11.5 | 1198.043 | 3577.78 | 588.7628 | 2249 | 27.22916 | 0.779597 | 26.70943 |
| 11.5 | 1197.443 | 3645.179 | 588.9386 | 2158 | 27.17706 | 0.748499 | 26.67806 |
| 11.5 | 1196.043 | 3802.443 | 590.1504 | 2249 | 30.95077 | 0.783276 | 30.42859 |
| 11.5 | 1195.043 | 3914.774 | 590.9405 | 2249 | 32.89619 | 0.785375 | 32.37261 |

**Table 6: Calculated dynamic moduli values and seismic velocities at borehole DS4. The number of sample points at each elevation was determined by information given in borehole logs.**

| Chainage (m) | Elevation (m) | P-Wave Velocity (m/s) | S-Wave Velocity (m/s) | Density (kg/m3) | Lame Constant (Gpa) | Shear Modulus (Gpa) | Bulk Modulus (Gpa) |
|---|---|---|---|---|---|---|---|
| 11.5 | 1210.487 | 546.3709 | 159.0285 | 1900 | 0.471088 | 0.048051 | 0.439054 |
| 11.5 | 1209.587 | 1424.889 | 235.0969 | 2249 | 4.317556 | 0.124303 | 4.234687 |
| 11.5 | 1209.187 | 1790.334 | 288.2782 | 2249 | 6.834906 | 0.186902 | 6.710305 |
| 11.5 | 1207.187 | 2478.567 | 358.0083 | 2249 | 13.23976 | 0.288254 | 13.04759 |
| 11.5 | 1205.787 | 2779.112 | 367.8128 | 2249 | 16.76155 | 0.304259 | 16.55871 |
| 11.5 | 1204.187 | 3037.784 | 444.917 | 2249 | 19.86368 | 0.445192 | 19.56688 |
| 11.5 | 1203.487 | 3157.983 | 498.9349 | 2249 | 21.30924 | 0.559857 | 20.936 |
| 11.5 | 1202.687 | 3295.299 | 560.4116 | 2249 | 23.00924 | 0.706323 | 22.53836 |
| 11.5 | 1201.587 | 3484.016 | 630.4598 | 2158 | 24.47908 | 0.857761 | 23.90724 |
| 11.5 | 1201.087 | 3569.761 | 654.2593 | 2158 | 25.65232 | 0.923743 | 25.03649 |

**Table 7: Calculated dynamic moduli values and seismic velocities at borehole DS5. The number of sample points at each elevation was determined by information given in borehole logs.**

| Chainage (m) | Elevation (m) | P-Wave Velocity (m/s) | S-Wave Velocity (m/s) | Density (kg/m3) | Lame Constant (Gpa) | Shear Modulus (Gpa) | Bulk Modulus (Gpa) |
|---|---|---|---|---|---|---|---|
| 10.5 | 1211.296 | 229.5987 | 325.9433 | 1900 | -0.30355 | 0.201854 | -0.43812 |
| 10.5 | 1209.996 | 1531.288 | 319.0719 | 2496 | 5.344512 | 0.25411 | 5.175105 |
| 10.5 | 1209.796 | 1736.447 | 319.3265 | 2496 | 7.017028 | 0.254516 | 6.847351 |
| 10.5 | 1208.096 | 2454.208 | 372.7665 | 2496 | 14.34009 | 0.346831 | 14.10887 |
| 10.5 | 1206.596 | 2510.225 | 474.6065 | 2496 | 14.60341 | 0.562227 | 14.2286 |
| 10.5 | 1204.996 | 2526.939 | 588.9158 | 2496 | 14.20667 | 0.865667 | 13.62956 |
| 10.5 | 1203.496 | 2542.608 | 682.2886 | 2158 | 11.94198 | 1.004587 | 11.27225 |
| 10.5 | 1202.696 | 2550.964 | 726.1819 | 2496 | 13.61004 | 1.316241 | 12.73254 |
| 10.5 | 1201.996 | 2558.276 | 756.4867 | 2496 | 13.47898 | 1.428391 | 12.52672 |
| 10.5 | 1200.496 | 2573.945 | 805.9727 | 2496 | 13.29372 | 1.621382 | 12.2128 |
| 10.5 | 1198.996 | 2589.614 | 835.7694 | 2496 | 13.25147 | 1.743482 | 12.08915 |

**Table 8: Calculated dynamic moduli values and seismic velocities at borehole DS7. The number of sample points at each elevation was determined by information given in borehole logs.**

| Chainage | Elevation | P-Wave Velocity | S-Wave Velocity | Density | Lame Constant | Shear Modulus | Bulk Modulus |
|---|---|---|---|---|---|---|---|
| (m) | (m) | (m/s) | (m/s) | (kg/m3) | (Gpa) | (Gpa) | (Gpa) |
| 60 | 1233.096 | 231.0356 | 333.1262 | 1700 | -0.28657 | 0.188654 | -0.41234 |
| 60 | 1232.896 | 276.1428 | 332.3184 | 1850 | -0.26754 | 0.204306 | -0.40374 |
| 60 | 1228.296 | 1452.83 | 357.7031 | 1850 | 3.431405 | 0.23671 | 3.273598 |
| 60 | 1224.096 | 1654.936 | 447.9329 | 1850 | 4.324421 | 0.371191 | 4.076961 |
| 60 | 1221.396 | 1777.032 | 518.4581 | 1850 | 4.847454 | 0.497278 | 4.515935 |
| 60 | 1220.096 | 1835.508 | 560.949 | 2496 | 6.838448 | 0.785401 | 6.314847 |
| 60 | 1216.296 | 2081.031 | 676.2777 | 2487 | 8.495557 | 1.137433 | 7.737268 |
| 60 | 1213.596 | 2291.269 | 736.2304 | 2487 | 10.36045 | 1.348042 | 9.461752 |
| 60 | 1211.046 | 2476.676 | 777.538 | 2249 | 11.07586 | 1.359668 | 10.16941 |
| 60 | 1208.046 | 2618.8 | 814.2951 | 2487 | 13.75799 | 1.649071 | 12.65861 |
| 60 | 1205.346 | 2728.052 | 841.1612 | 2249 | 13.55509 | 1.591285 | 12.49423 |
| 60 | 1204.946 | 2744.136 | 843.1115 | 1955 | 11.94233 | 1.389686 | 11.01587 |
| 60 | 1202.666 | 2835.4 | 854.2283 | 2249 | 14.7986 | 1.641109 | 13.70453 |
| 60 | 1201.486 | 2882.356 | 859.9819 | 2249 | 15.35806 | 1.66329 | 14.2492 |
| 60 | 1201.006 | 2901.403 | 862.3222 | 2158 | 14.95697 | 1.604688 | 13.88718 |
| 60 | 1199.606 | 2956.779 | 869.1484 | 2158 | 15.60602 | 1.630194 | 14.51922 |
| 60 | 1198.106 | 3015.815 | 874.5961 | 2158 | 16.32593 | 1.650694 | 15.22547 |
| 60 | 1196.076 | 3095.226 | 880.4829 | 2249 | 18.0593 | 1.743537 | 16.89694 |
| 60 | 1195.096 | 3133.362 | 883.3247 | 2249 | 18.57097 | 1.754811 | 17.4011 |

**Table 9: Calculated dynamic moduli values and seismic velocities at borehole DS10. The number of sample points at each elevation was determined by information given in borehole logs.**

| Chainage | Elevation | P-Wave Velocity | S-Wave Velocity | Density | Lame Constant | Shear Modulus | Bulk Modulus |
|---|---|---|---|---|---|---|---|
| (m) | (m) | (m/s) | (m/s) | (kg/m3) | (Gpa) | (Gpa) | (Gpa) |
| 11.5 | 1210.242 | 563.5996 | 245.6817 | 1900 | 0.374158 | 0.114683 | 0.297703 |
| 11.5 | 1209.042 | 1529.045 | 290.8635 | 2249 | 4.877576 | 0.190269 | 4.75073 |
| 11.5 | 1207.542 | 3346.206 | 270.3754 | 2249 | 24.85345 | 0.164408 | 24.74385 |
| 11.5 | 1207.042 | 3592.857 | 268.2714 | 2249 | 28.70778 | 0.161859 | 28.59987 |
| 11.5 | 1204.742 | 4383.758 | 328.965 | 2249 | 42.73302 | 0.243382 | 42.57077 |
| 11.5 | 1202.642 | 5789.599 | 419.6489 | 2249 | 74.59313 | 0.396061 | 74.32909 |
| 11.5 | 1200.942 | 6364.5 | 465.5853 | 2249 | 90.1249 | 0.487515 | 89.79989 |
| 11.5 | 1199.742 | 6762.1 | 500.7424 | 2158 | 97.5945 | 0.541103 | 97.23376 |
| 11.5 | 1198.742 | 7093.434 | 520.367 | 2249 | 111.9445 | 0.608988 | 111.5385 |
| 11.5 | 1196.342 | 7888.634 | 524.4689 | 2249 | 138.7192 | 0.618627 | 138.3068 |
| 11.5 | 1195.342 | 8219.967 | 525.2361 | 2496 | 167.2722 | 0.688579 | 166.8132 |
| 11.5 | 1194.842 | 8385.634 | 525.5826 | 2496 | 174.1369 | 0.689488 | 173.6772 |