Mr. David Block
Director of Development Services/EOC Planning Chief
City of Terrace, BC

CC: Jennifer MacIntyre, City of Terrace;
Clare Share, McElhanney;
Melissa Chappel, McElhanney
Ryan Gibbard, McElhanney

August 10, 2022

Project Number: 2022-019

RE: Geotechnical Investigation and Slope Stability Analysis (Revised)
5412, 5414 and 5416 McConnell Cres in Terrace, BC

Dear Mr. Block,

As requested, Taylor Geotechnical Ltd. (Taylor) has conducted a geotechnical investigation for the properties 5412, 5414, and 5416 McConnel Crescent in Terrace, BC as well the adjacent sloping terrain that is located between the properties and the Kalum River (hereafter referred to as the "site"). The purpose of the investigation was to gain a detailed understanding of the landslide that occurred at site. Based on Taylor's interpretation of this information, comments and recommendations pertaining to the monitoring requirements and safety of residence as pertains to the sloping terrain are provided herein.

The scope of work for this project was provided in the proposal letter (quote number 1157), dated March 21, 2022. Authorization to proceed was given by the client on April 19, 2022.

It should be noted that the scope of this report is limited to the geotechnical assessment of the identified slope. It does not include any investigation, analytical testing, or assessment of possible groundwater contamination, archeological or biological considerations, or sediment control measures. This report should be read in conjunction with the Disclaimer and Limitations which are appended following the text of this letter. The reader's attention is specifically drawn to this information as it is essential for the proper use and interpretation of this report.

1.0 PROJECT UNDERSTANDING

It is understood that an Emergency Landslide Assessment was undertaken by McElhanney following progression of a landslide event at site, with the subsequent report issued to the City of Terrace on March 11, 2021. The letter report recommended a geotechnical investigation to gain a detailed understanding of the landslide. As such, an intrusive geotechnical investigation and slope stability analysis of the slope is required.

The purpose of the geotechnical investigation is to provide a factual report of the subsurface conditions, and to provide monitoring requirements and recommendations pertaining to the safety of residents.

2.0 SITE DESCRIPTION

The project site is located within properties 5412, 5414, and 5416 McConnell Crescent in Terrace, BC. The site is bound by the McConnell Crescent properties to the east, the Kalum River to the west, and densely vegetated sloping terrain to the north and south.

The area of slope failure is a circular scarp located in the rear of the properties. The ground surface above the scarp is generally flat lying at an approximate elevation of 106 metres above sea level (masl). The approximate elevation at the toe of the slope failure is approximately 54 masl. The maximum width of the failure area is approximately 50 m wide. Table 1 below summarizes the approximate location of the crest of the slope failure relative to local site features (based on McElhanney, February 12, 2022 survey).

Table 1: Description of Site Features.

Address	Distance from Crest of Failure to Rear of House (at closest location, in m)	Distance from Crest of Failure to Edge of McConnell Cres (at closest location, in m)	Description of Impact
5412 McConnell Cres.	17.3	52.0	Significant loss of ground in rear of property. Crest of slope failure is approaching septic field.
5414 McConnell Cres.	17.4	49.3	Significant loss of ground in rear of property. Crest of slope failure has impacted septic field.
5416 McConnell Cres.	40.0	77.7	Shed relocated. Loss of ground in rear of property.

3.0 DESKTOP REVIEW

Taylor has completed a desktop review of available geological and geotechnical information pertaining to the subject site and surrounding area. The following section summarizes the results of the review including a summary of events relating to the site and slope failure; summary of nearby geotechnical reports; and a summary of the area geology.

3.1 Review of Slope Failure Events at Site

Please refer to Table 2 for notable events surrounding the slope failure at the site including changing conditions of the Kalum River.

Table 2: Desktop Review of Applicable Geotechnical Information.

Date	Event	Details	Reference Report
Sept 26, 1984	Review of slope prior to development of Kalum Lake Drive Subdivision.	Concluded the slope is stable. Recommended that no water be discharged toward the slope; vegetative cover must be maintained; and a minimum building setback of 15 ft.	Peterson Engineering Ltd. September 26, 1984. *Kalum Lake Drive Subdivision, Slope Stability.*
April 5, 1995	Engineering assessment for preliminary subdivision layout plan.	Site conditions described as a fine to medium grained sand from surface to a depth of 10 m. The sand overlies a soft to firm clay of intermittent plasticity to a depth of 21 m. Seepage was noted at the interface between the clay and sand. Recommended a minimum setback of 20 m for all buildings and septic units. A geotechnical review of the drawings and site work was also recommended.	R.E Graham Engineering Ltd. April 5, 1995. *Slope Stability Concerns, Lots 1 to 5, Part of Parcel A, D.L. 1745. Talstra Subdivision, Terrace, B.C.*
2007 to 2009	Significant channel shifting of Kalum River below site.	Westrek conducted a historic air photo review from 1938 to 2019. They found that the main channel of the Kalum River had migrated 775 m east from 2007 to 2009	Westrek Geotechnical Services Ltd. December 8, 2020. *Preliminary Landslide Assessment 5414 McConnell Crescent, Terrace, BC.*
2010 to 2013	Significant channel shifting of Kalum River below site.	From Westrek's historic air photo review, they found that the main channel of the Kalum River had migrated another 110 m from 2010 to 2013.	Westrek Geotechnical Services Ltd. December 8, 2020. *Preliminary Landslide Assessment 5414 McConnell Crescent, Terrace, BC.*
October 24, 2017	Heavy rainfall event	Two weather stations were reviewed within a 25 km radius of the City of Terrace. Terrace PPC (Climate ID: 1068131) and Terrace A (Climate ID: 1068134) at elevations of 67.00 masl and 217.30 masl respectively. Total precipitation for the month of October was recorded as 261.4 mm and 292.9 mm at the respective stations. The extreme values at both stations occurred on October 24, 2017, with daily precipitation values of 65.8 mm and 76.1 mm, respectively.	*Daily Data Report for June 2022*. Government of Canada; Environment and Natural Resources. (2022, May 25). Retrieved June 17, 2022, from https://climate.weather.gc.ca/climate_data/daily_data_e.html?StationID=51117

Date	Event	Details	Reference Report
November 7, 2017	Review of slide in the adjacent drainage located between 5416 and 5418 McConnell Crescent.	A landslide was reported between units 5416 and 5418 during a heavy rainfall event on October 24, 2017. The landslide is approximately 15 m wide with a 4 m, 60-degree scarp. McElhanney reported that the most likely cause of the landslide was the period of warm temperatures and heavy rain leading up to the event; however, did mention existing geotechnical factors that could have also contributed to the failure. McElhanney concluded that there was no immediate threat to the homes at 5416 and 5418 McConnell Crescent.	McElhanney Consulting Services Ltd. November 7, 2017. *Preliminary Geotechnical Assessment: McConnell Crescent Storm Outfall, Terrace, B.C (2017).*
April 2019	Development of slope failure on site at 5414 McConnell Cres.	Slope failure mainly confined to 5414 McConnell Cres. The crest of the scarp extended approximately 17.6 m from the existing rear property line.	Westrek Geotechnical Services Ltd. December 8, 2020. *Preliminary Landslide Assessment 5414 McConnell Crescent, Terrace, BC.* City of Terrace Terramap (Cartographer). (2019). City of Terrace 2019 Ortho [map]. Retrieved from https://gx.terrace.ca/Html5Viewer/?viewer=Terramap.
December 8, 2020	Preliminary investigation of slope failure at 5414 McConnell Crescent.	Westrek conducted a review of the 2019 slide. Westrek began monitoring the slide on June 9, 2020, and documented the observed changes over three following site visits the last of which was December 2, 2020. Westrek noted the head scarp had retrogressed 2.3 m towards 5414 McConnell Crescent. The slide had also widened by 1 m to the south and 2 m to the north. Westrek noted that seepage flowing down from the head scarp had down cut significantly through the exposed sediment and debris creating a channel within the slide.	Westrek Geotechnical Services Ltd. December 8, 2020. *Preliminary Landslide Assessment 5414 McConnell Crescent, Terrace, BC.*

Date	Event	Details	Reference Report
December 8, 2020	Preliminary investigation of slope failure at 5414 McConnell Crescent.	Westrek concluded that the most likely cause of failure was due to the loss of toe support, due to erosional scour from the lateral migration of the Kalum River. Westrek also noted that the natural instability of the steep escarpment could also be a factor in the slope instability.	Westrek Geotechnical Services Ltd. December 8, 2020. *Preliminary Landslide Assessment 5414 McConnell Crescent, Terrace, BC.*
January 24, 2022	Follow-up assessment of landslide condition at 5412 and 5414 McConnell Cres. Further loss of ground including progression to the north and south.	The purpose of the memorandum was to determine if the houses on 5412 and 5414 McConnell Crescent are at an imminent risk due to recent retrogression of the existing slide. At this time, the house on 5412 McConnell Crescent was located about 25 m from the landslide head scarp. 5414 McConnell Crescent was situated about 20 m horizontally from the head scarp. Westrek concluded that 5412 and 5414 McConnell Crescent are not at an imminent risk.	Westrek Geotechnical Services Ltd. January 26, 2022. *Technical Memorandum: Assessment of Recent Landslide Movement 5412 and 5414 McConnell Crescent Terrace, B.C.*
March 11, 2022	Emergency Landslide assessment for the City of Terrace.	A site visit was conducted by McElhanney on February 12, 2022. They noted that the crest of the slide is approximately 46m wide, and there is groundwater seepage above the clay layer which is located 8m below the crest. The crest of the slide was 17.3 m from the residence at 5412 McConnell Crescent and 17.4 m from the deck at 5414 McConnell Crescent. The upper face of the scarp exists at a slope angle of 50 – 60 degrees. In addition, McElhanney surveyed three different profiles of the slide. Further geotechnical investigation is recommended to better understand risk. In the short term, McElhanney recommends the interception of any surface or ground water for disposal off site. In addition, septic tank/field use should cease immediately. McElhanney also recommends on going monitoring of the slope.	McElhanney Ltd. March 11, 2022. *Emergency Landslide Assessment at 5412, 5414 and 5416 McConnell Crescent, Terrace, BC Revision 1.*

3.2 Geotechnical Findings

The below subsections summarize pertinent geotechnical findings taken from the review of nearby geotechnical investigation reports. The following documents were reviewed.

- McElhanney Consulting Services Ltd. January 9, 2019. *Coast Mountain College Terrace Campus Student Housing Geotechnical Assessment.*
- McElhanney Ltd. August 12, 2019. *Facilities and Storage Building Geotechnical Assessment, Coast Mountain College, Terrace, British Columbia.*
- Westrek Geotechnical Services Ltd. December 8, 2020. *Preliminary Landslide Assessment 5414 McConnell Crescent, Terrace, BC.*

3.2.1 Coast Mountain College Terrace Campus Student Housing Geotechnical Assessment

McElhanney conducted a geotechnical assessment advancing nine (9) boreholes for the student housing building on the corner of McConnell Avenue and Kalum Lake Road, approximately 230 m east of the site. Subsurface soil conditions included an upper sand layer overlying a soft clay layer, followed by a lower sand with trace to some gravel and trace silt. The clay layer existed between 9.6 mbgs to depths of 17.7 mbgs.

All boreholes were dry upon completion of drilling. Piezometers were installed in two (2) of the nine holes advanced on site (BH19-02 and BH19-05). Groundwater measurements were taken on December 5, 2019, and December 17, 2019. McElhanney noted that the piezometer BH19-02 was set above the cohesive soil layer and BH19-05 was set at an elevation below. Groundwater was measured in BH19-02 at 8.7 mbgs (elevation of 100.6 m); BH19-05 was dry which may indicate a perched groundwater condition.

As a part of this report McElhanney also provided a seismic site classification and liquefaction assessment. Based on the results of the geotechnical assessment conducted by McElhanney, it was concluded that the Site Classification for Seismic Response is Site Class “D”, “Stiff Soil”. The associated Peak Ground Acceleration (PGA) noted in this report was 0.089.

3.2.2 Coast Mountain Collage Facilities and Storage Building Geotechnical Assessment

McElhanney conducted a geotechnical assessment advancing seven (7) boreholes at the Coast Mountain College, near the intersection of McConnell Ave and Floyd St, approximately 600 m east of site. During this program, one (1) groundwater monitoring well was installed in BH19-04 to a depth of 30.6 m. Groundwater was not observed in any of the boreholes during drilling. Groundwater levels were measured on April 18, 2019 and May 15, 2019 at 30.3 m and 30.56 m respectively (elevations of 80.25 m and 79.99 m).

3.2.3 5414 McConnell Cres Preliminary Landslide Assessment

Westrek noted three wells registered within 1.2 km of the site. No static water levels were reported in these wells. Well logs from Well ID 97954 located 1 km to the northeast indicate layers of clay encountered from 3.9 to 15.8 m and 19.2 to 22.6 m.

3.3 Geology

Terrace is located in the Kalum-Kitimat Valley of British Columbia. The Kalum River joins the Skeena River as the Skeena crosses the valley, directly west-southwest of Terrace. The city is bound by the Hazelton Mountains to the east and the Kitimat Ranges of the Coast Mountains to the west. An active normal fault striking north-south intersects the area.

The valley is comprised primarily of the Bowser Lake Group of the Late Jurassic. The Bowser Lake Group is composed of sedimentary rocks, spanning sandstone, siltstone, argillite, conglomerate, and basalt (British Columbia Geologic Survey, 2022). The bedrock is primarily overlain by a veneer of glacial to glaciomarine sediments, crosscut by alluvial sediments following the trend of the Skeena River (British Columbia Geologic Survey, 2022). Glacial sourced sediment deposits formed natural terraces which have an elevation of approximately 70 masl.

4.0 FIELD AND LABORATORY WORK

The geotechnical investigation consisted of advancing boreholes at the site to determine the subsurface soil and groundwater conditions. A detailed site inspection was also carried out to investigate the slope failure.

The geotechnical investigation was carried out from May 23, 2022, to May 26, 2022. At this time, two (2) boreholes were advanced at the site to determine subsurface soil and groundwater conditions, and to collect representative soil samples for laboratory testing. Boreholes were advanced using a tracked sonic drilling rig owned and operated by Taylor from Canmore, AB. The drilling work was carried out under the supervision of Taylor staff.

Borehole 1 (BH-01) and borehole 2 (BH-02) were advanced to depths of 27.4 mbgs and 18.3 mbgs, respectively. The soils encountered in the boreholes were visually logged in the field. Representative soil samples were collected at selected depths for detailed examination. Standard Penetration Tests (SPT) with split spoon sampling were completed at select intervals to determine the in-situ density/consistency of the soil deposits and to retrieve disturbed samples. Shear vane tests were also conducted on specific samples to determine the in situ undrained shear strength of the materials. Pocket penetration testing was also carried out on selected samples. Soil samples were taken to Taylor's laboratory facility for further examination and testing.

Upon completion of BH-01, a slope inclinometer (SI) casing was installed to the full depth of 27.4 m. The SI was installed with an anchor at the base and grouted in place to reduce vertical movement of the pipe. SI casing permits monitoring of ground movements in two directions using slope inclinometer instrumentation.

Two (2) 25 mm diameter PVC standpipe piezometers were nested in BH-02. The first piezometer was installed to the full depth of BH-02, 18.3 m, to target the water level monitoring in the silty clay layer. This piezometer was backfilled with sand and cuttings to a depth of 11.0 m. A bentonite seal was placed between depths of 9.5 m and 11.0 m where the second piezometer was installed. The second piezometer was installed at a depth of 9.1 m and backfilled with sand and cuttings to a depth of 1.5 m. A bentonite seal was placed from a depth of 1.5 m to ground surface. Instrumentation installation details are also presented within the borehole logs in Appendix A. Please refer to Table 5 for the associated groundwater measurements.

The coordinates and geodetic elevation of the instrumentation was surveyed by McElhanney on June 6, 2022. The instrumentation was picked-up at the collar (or ground surface).

Laboratory testing completed for the project included the following tests summarized in Table 3 below. Testing results are presented in Appendix A.

Table 3: Summary of Laboratory Testing

Test Description	# of Samples	Laboratory
Moisture content determinations and visual identification	27	Taylor Geotechnical
Atterberg Limits	4	Taylor Geotechnical
Gradation Analysis	3	Taylor Geotechnical
Hydrometer Analysis	1	Thurber Engineering
Specific Gravity	2	Thurber Engineering
Direct Shear (Consolidated Drained)	1 (3 points)	Thurber Engineering
Consolidated Undrained Triaxial Testing	1 (3 load cycles)	Thurber Engineering

5.0 SITE CONDITIONS

The following summarizes the site conditions including the subsurface conditions and site reconnaissance observations. A site plan with borehole locations is presented in Figure 1 following the text of this report. Borehole logs with instrumentation installation details, groundwater observations, and field and laboratory test results are presented in Appendix A. Relevant photographs from site visits are presented in Appendix B.

5.1 Subsurface Conditions

The subsurface conditions observed within BH-01 and BH-02 at the time of investigation are included below and are listed in order of increasing depth beneath the existing ground surface. Boreholes were advanced in the backyard of 5412 McConnell Crescent adjacent to the failure. Please note, variation in subsurface conditions was found to exist between boreholes and with depth below ground surface. Similar or greater variation may exist across the site.

5.1.1 Topsoil (0.0 m – 1.3 m)

Immediately underlying the vegetative cover was loose, reddish brown, sandy silt with rootlets that extended to a depth of 0.76 m. Following this layer, a firm, reddish brown, silt layer with trace sand was encountered to a depth of 1.30 m. The moisture content in this layer was 30.7%.

5.1.2 Upper Sand Layer (1.3 m – 10.1 m)

Following the topsoil layer was a loose to dense, brown, sand layer containing trace to some silt and trace gravel to a depth of 10.1 m. A 0.6 m thick layer of compact to dense, grey-brown, silty sand was observed within the sand layer at a depth of 4.3 m. It was noted that the sand became coarser at 3.1 m and seepage began at a depth of 7.6 m. Moisture contents ranged from 4.8% to 16.9% with an average of 9.0%.

Direct shear testing was completed on a composite sample taken from depths of 6.1 m to 6.6 m and 7.3 m to 7.6 m below ground surface. Three remolded specimens were tested at consolidation stresses of 50 kPa, 150 kPa and 350 kPa. An effective friction angle of 42 degrees was estimated for the residual shear stress scenario.

5.1.3 Clayey Silt to Silty Clay Layer (10.1 m – 20.0 m)

The sand layer was underlain by a light brown, firm, clayey silt layer with trace gravel and trace sand to a depth of 10.5 m. The moisture content in this layer was 38.0%. This layer transitioned into a grey, soft to stiff, silty clay that extended to a depth of 20.0 m. Fine sand seams were noted at depths of 17.2 m, 18.0 m, and 18.1 m. The colour changed from brown to grey-brown at a depth of 19.5 m, and moisture contents ranged from 29.7% to 36.3% with an average of 33.6%. A 0.21 m thick layer of loose, dark grey, sand was noted at a depth of 18.75 m. This layer had a moisture content of 22.7%. Please refer to Table 4 for the associated undrained shear strength values measured in the field and Atterberg limit determinations.

Table 4: Summary of field and laboratory testing data

Depth (mbgs):	Shear Strength (kPa):	Remolded Shear Strength (kPa)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Moisture Content (%)
10.21 – 10.52	441	392	-	-	-	38.0
10.52 – 10.67	147	147	-	-	-	29.7
10.67 – 11.13*	196	172	37.1	22.2	14.9	35.8
11.58 – 11.89	270	221	-	-	-	34.6
13.11 – 13.41	216	196	38.7	22.0	16.8	33.4
14.33 – 14.63	270	196	-	-	-	31.2
17.68 – 17.98	216	118	36.5	24.0	12.5	36.3
19.66 – 19.81	490	196	43.4	25.6	17.8	33.1

** Sample taken from an STP test conducted at this interval.*

Atterberg limit test results indicate medium plastic soils with natural moisture content below the liquid limit.

Consolidated undrained triaxial testing completed on a sample taken from 10.7 m to 11.1 mbsg. Testing was completed at effective consolidation stresses of 150 kPa, 250 kPa, and 350 kPa. An effective friction angle of 31.5 degrees was estimated considering 0 kPa of cohesion.

5.1.4 Lower Sand Layer (20.0 m – 23.2 m)

Underlying the clayey silt to silty clay layer was a loose to dense, brown, sand layer with trace to some silt and trace gravel extending to a depth of 23.2 m. Moisture contents in this layer ranged from 12.4% to 19.6% with an average of 14.8%. Two compact, light brown, silty sand layers were noted within the sand at depths ranging between 21.0 m to 21.3m and 22.1 m to 22.7m. Moisture contents in these layers were 4.7% and 6.4% respectively.

5.1.5 Sandy Gravel Layer (23.2 m – 27.4 m)

Following the lower sand layer was a loose, brown, sandy gravel layer with trace silt. This layer was noted to the terminus of BH-01. Gravel particles were observed to be subrounded and moisture contents ranged from 1.7% to 4.1% with an average of 2.6%.

5.2 Groundwater

Groundwater seepage was observed at the time of drilling at 7.6 mbgs. Groundwater measurements were taken on May 27, 2022 and on a weekly basis going forward. Groundwater measurements are summarized in Table 5 below. Please note, groundwater levels are subject to seasonal variation with the highest water levels likely to occur following freshet during the late spring and early summer months.

Table 5: Piezometer readings at 5412 McConnell Crescent

Date of Monitoring	Groundwater Measurement					
	A (Shallow Piezometer)			B (Deep Piezometer)		
	Depth Below Ground Level (m)	Collar Elevation (m)	Groundwater Elevation (m)	Depth Below Ground Level (m)	Collar Elevation (m)	Groundwater Elevation (m)
27-May-22	7.63	106.034	98.404	14.69	106.018	91.328
02-Jun-22	8.52		97.514	15.99		90.028
09-Jun-22	8.45		97.584	15.98		90.038
16-Jun-22	8.57		97.464	16.16		89.858
23-Jun-22	8.58		97.454	16.22		89.798
30-Jun-22	8.58		97.454	16.22		89.798
7-Jul-22	8.57		97.464	16.22		89.798

5.3 Site Inspection

A site inspection was completed on May 26, 2022 with a City of Terrace representative present. Taylor conducted a review of the failure in its current configuration. The findings are presented below. Site photos are presented in Appendix B for reference.

- Progressive ravelling is occurring within the upper sand layer as it is over steepened and exposed to drying and wetting cycles.
- Progressive ravelling of the silty clay zone is occurring as surface soils experience drying and wetting cycles.
- Deposited silty clay observed in the lower fan.
- Concentration of seepage through the slope within the silty clay layer. This is suspected to be washing away the lower fan materials.
- Concentrated seepage is resulting in a channel forming within the failure.
- There is a relatively small volume of deposited materials within the lower fan. These materials likely get transported from surface water movement and the Kalum River.

6.0 SLOPE STABILITY ANALYSIS

Global stability analyses were undertaken using 2D numerical modelling techniques with Limit Equilibrium methods. Slide2 software from Rocscience Inc. was used. The modelling was completed using the data presented in the McElhanney report dated March 11, 2022. The existing ground was measured by UAV drone survey on February 12, 2022. Please refer to Appendix C for a visual representation of the sections measured as a part of this survey conducted by McElhanney. Section B was considered to be the critical section and was selected for analysis.

Soil parameters were based on data gathered from Taylor's intrusive geotechnical investigation. The slope can be simplified into four main layers for modelling purposes: upper sand layer, silty clay layer, lower sand layer, and sandy gravel layer. The upper sand layer extends to a depth of approximately 10.2 mbgs. The upper sand layer overlies a silty clay layer that extends from 10.2 mbgs to a depth of 20.0 mbgs. The lower sand layer extends from 20.0 mbgs to 23.2 mbgs. The lower sand layer is underlain by a sandy gravel layer which extends from a depth of 23.2 mbgs beyond the terminus of the borehole at 27.4 mbgs. The input parameters for each material type used in the Slide 2D model are summarized in Table 6.

Table 6: Material parameters for subsurface conditions at 5414 McConnel Crescent.

Material	Unit Weight (kN/m^3)	Cohesion (kPa)	Internal Angle of Friction (°)
Topsoil	15.0	5	25.0
Upper Sand	19.2	0	42.0
Silty Clay	20.5	0	31.5
Lower Sand	19.2	0	42.0
Sandy Gravel	21.0	0	40.0

Piezometer levels are based on the June 2, 2022, readings (piezometers installed as a part of Taylor's intrusive geotechnical investigation). The slope was modelled based on a perched groundwater condition. The respective depths input into the model were approximately 8.52 m and 15.99 m based on the shallow and deep piezometers readings. Groundwater levels were taken by McElhanney on June 2, 2022. A lower water table level was included based on the estimated Q200 elevation for the Kalum River with freeboard (i.e., 55.0 m).

The slope stability analysis presents failure scenarios with various factor of safety (FOS) values, where FOS is the ratio of the culmination of resisting forces (or moments) compared to the culmination of driving forces (or moments). For the slope to be considered stable in terms of global stability, the following criteria are required:

- Static Analysis – FOS ≥ 1.5
- Seismic (pseudo-static) Analysis – FOS ≥ 1.0

Earthquake loading for the seismic analyses considers the peak ground acceleration (PGA) having a probability of exceedance of 2% in 50 years (or 1:2,475 annual probability of exceedance). An adjusted PGA of 0.089 g based on input from McElhanney (2019) was deemed appropriate for use.

The results of the slope stability analysis for each zone of interest are included in Appendix C. Table 7 below summarizes modelling results for the four analyzed cases.

Table 7: Summary of Slope Stability Analysis Results, Section B

Scenario	FOS	Description	Comments
Minimum FOS (static)	0.48	Surficial failure through upper sand.	Unlikely to regress crest of existing slope.
Static FOS < 1.0	< 1.0	Unstable condition predicting relatively shallow failures through upper sand and silty clay layers.	Likely to regress crest of the existing slope by approximately 3.3 m.
Static FOS < 1.5	< 1.5	Deep seated failures predicted through lower sand and sand and gravel layers. Slope failure also anticipated along lower sand and gravel slope.	Likely to regress crest of the existing slope by approximately 14.3 m to within roughly 3.1 m of the existing residence.
Minimum FOS (pseudo-static)	0.40	Surficial failure through upper sand.	Unlikely to regress crest of existing slope.
Pseudo-Static FOS < 1.0	< 1.0	Unstable condition predicting relatively shallow failures through upper sand and silty clay layers.	Likely to regress crest of the existing slope by approximately 6.1 m.

7.0 DISCUSSION

The following section describes Taylor's interpretation of the slope stability analysis and provides commentary on the mechanism of slope failure.

7.1 Interpretation of Slope Stability Analysis

The following points discuss the results of the slope stability analysis completed on the critical section for the McConnel Cres landslide.

- Stability analysis was completed on the critical section (Section B through 5414 McConnell Cres) using the February 12, 2022. Minimal changes to the slope configuration was noted between the February 12, 2022, survey and the June 30, 2022 survey. As such, the earlier section profile was deemed appropriate for use.
- The current configuration of the landslide area is considered unstable.
- Shallow failure surfaces with FOS values less than 1.0 were predicted that pass through the upper sand and silty clay layers. These failure surfaces are relatively shallow and are likely to cause further loss of ground of approximately 3.3 m for the static case and 6.1 m for the pseudo-static (earthquake) loading case.

- Deep seated failure surfaces were calculated with FOS values less than 1.5 for static conditions. The lower extent of these surfaces pass through the lower sand and sand and gravel layers and the upper extent daylights approximately 14.3 m back from the existing crest of the slope. This is roughly 3.1 m from the rear edge of the existing residential building at 5414 McConnell Cres.
- Slope failure is also predicted along the lower slope within the sand and gravel layer as FOS values of less than 1.5 were predicated.
- Slope failure that would impact the existing structure at 5414 McConnell Cres. is not considered likely based on analysis findings on the current configuration of the slope. Reassessment of this statement is required upon material changes to the configuration of the landslide area.
- On-going slope failure that would impact the existing roadway and municipal infrastructure along McConnell Cres. is considered unlikely based on analysis findings on the current configuration of the slope. Reassessment of this statement is required upon material changes to the configuration of the landslide area.

The scope of work did not include analysis of multiple slope sections throughout the scarp, nor did it include 3D slope stability analysis of the entire failure area. However, from the analysis results of the critical section, comments pertaining to the slope performance at the site can be given based on Taylor's interpretation and experience. Table 8 below summarizes anticipated impacts to the failure area and surrounding properties.

Table 8: Potential Impacts from Slope Instability on Site

Location	Description of Likely Impact from Slope Instability	Comments
5412 McConnell Cres.	Regression of the crest of the slope likely to occur causing loss of functionality to septic field. Lateral extent of scarp may continue to widen.	Failure considered unlikely to reach existing residence but may come within 2 m to 3 m of the structure.
5414 McConnell Cres.	Regression of the crest of the slope continues to impact septic field.	Failure considered unlikely to reach existing residence but may come within 2 m to 3 m of the structure.
5416 McConnell Cres.	Regression of the crest of the slope likely to occur causing further loss of ground potentially encroaching upon the existing shed. Lateral extent of scarp may continue to widen.	Location of septic field unknown. Can not comment on potential impact. Failure considered unlikely to reach existing residence.

7.2 Mechanism of Slope Failure

The following describes Taylor's interpretation of the mechanism of slope failure that has occurred at the site.

- Initial slope failure occurred at the toe (i.e., river level) following significant channel shifting events and subsequent periods of heavy rainfall. This has resulted in several significant retrogressive failures within the overall slope.
- Progressive ravelling is occurring within both the upper sand and silty clay zones as surface soils experience drying and wetting cycles. This is resulting in oversteepening of the upper portion of the slope.
- Concentration of seepage through slope within silty clay layer is suspected to be causing the following:
    - Washing away the lower fan material (which includes material deposited from more recent shallow failures in the upper slope).
    - Formation of channel within failure.
    - Removal of lower fan material from toe appears to also be occurring from river action.
- Because of on-going loss of the toe material, natural buttressing of the landslide is unlikely to occur. As such, the toe of slope remains unstable within lower layers including the sandy gravel and lower sand.
- Upper soils are somewhat weak. As toe support is lost, larger failures are promoted within the upper slope and globally.
- With on-going loss of toe support, slope failure is likely to occur which will impact existing residences, specifically 5412 and 5414 McConnell Cres.
- Significant channelization of seepage through the silty clay layer may continue. This could widen the failure zone (to the north and south) and extend the failure zone further back towards residences beyond what has been presented in this assessment.

8.0 GEOTECHNICAL COMMENTS AND RECOMMENDATIONS

Presented herein are geotechnical comments and recommendations for the project site pertaining specifically to the anticipated extent of landslide impact; recommendations for safe building set-back distances; recommendations for on-going monitoring; and recommendations for slope stabilization.

8.1 Extent of Landslide Impact

It is Taylor's opinion that the existing landslide is in an unstable configuration. Based on the findings of the slope stability assessment as well as site observations, it is Taylor's opinion that loss of ground is likely to continue to progress beyond the current crest of the failure scarp. It is estimated that the extent of ground loss may progress an additional 14 to 15 m, or to within approximately 3 m of the eastern-most extent of the residential structures at 5412 and 5414 McConnell Cres. Similar loss of ground at 5416

McConnell Cres is considered likely. This would impact the existing shed and would leave roughly 25 m distance from the advanced crest to the existing residence.

It is also considered likely that the scarp may widen from north to south, however, analysis of the lateral slopes was not completed as part of this assessment.

8.2 Requirement for Remediation

It is Taylor's opinion that intervention is required to stabilize the toe of the landslide to mitigate the potential for deep-seated global failures, as well as on-going shallow failures which could accelerate development of further potential deep-seated failures. Additionally, slope stabilization work would limit lateral progression of the landslide to the north and south. See Section 8.5 for slope stabilization recommendations.

8.3 Building Set-Back

Taylor has considered appropriate building set-backs for the site based on two scenarios:

1. Remediation work to stabilize the slope is undertaken; and
2. The landslide area is not remediated.

If stabilization work is undertaken for the slope to limit any further loss of ground, it is considered likely that the current building locations at 5412, 5414 and 5416 McConnell Cres are adequately setback from the crest of slope. Consideration should be given to relocating septic fields on these properties if they are currently located within the 15 m from the crest of the existing failure.

If slope remediation work is not undertaken, it is Taylor's opinion that the residences at 5412 and 5414 McConnell Cres. are not adequately set-back from the crest of the slope. Taylor recommends moving these structures 10 m toward the front of the property (approximately east) and re-establishing septic features in the front yard. The residence at 5416 McConnell Cres is considered adequately set-back from the landslide area, however consideration should give given to relocating the existing shed and septic field if within 15 m of the crest of the existing failure.

8.4 On-Going Monitoring

At the time this report was prepared, weekly monitoring has been undertaken by McElhanney since March 2022. Slope monitoring has involved: taking ground measurements relative to established monitoring points; capturing site photographs at specific locations on the ground as well as using an aerial drone; and commenting on observed changes in conditions. Since Taylor's geotechnical investigation was completed in late-May, instrumentation reading has been carried out by McElhanney weekly for both piezometers and slope inclinometer. Site survey using drone is carried out approximately every 1 to 2 months.

It is Taylor's opinion that the following adjustments should be made to the monitoring program given the findings of the monitoring results and this study.

- Conduct bi-weekly site visit to visually inspect the condition of the site and slope failure.
- Undertake detailed monitoring monthly which includes the current monitoring tasks and instrumentation readings.

- Site survey to be completed on a two-month basis unless material changes occur prior to.
- Have geotechnical engineer review and interpret instrumentation results as well as site findings, and present summary report monthly.
- Continue with monthly frequency for remainder of 2022.
- Following 2022, monitoring frequency may be reduced to quarterly (or 4 times a year) if instrumentation results are stable and site observations do not present material changes. This reduction in frequency should be based on the advice of a qualified geotechnical engineer.
- Additional site monitoring should be conducted after heavy rain fall events and times of high river levels (e.g., during spring freshet).
- Further reduction in monitoring frequency (and possible elimination of monitoring) is considered feasible if slope stabilization work is undertaken.

8.5 Recommendations for Slope Stabilization

As previously indicated, Taylor recommends stabilization of the slope to mitigate possible deep-seated failure and on-going progression of landslide development. Recommendations for slope stabilization include the following:

1. Toe stabilization by establishing a buttress out of riprap to prevent further erosion and soil loss from the toe of slope from the river action. Detailed geotechnical analysis and design of the buttress is required; however, Taylor estimates that buttress construction is likely to be required up to an approximate elevation of 90 m (or above the lower sand layer). Taylor recommends that the City engage a qualified geotechnical engineer to undertake detailed analysis and design for toe stabilization.
2. Stabilize the upper portion of the slope to limit uncontrolled loss of ground. Options for stabilization of the upper slope could entail the following. We recommend that the City engage with the Engineer to discuss the options below to determine the most appropriate solution.
   - Option 1 – continue placement of slope armouring with riprap or rock fill along upper portion of slope to a stable overall configuration. Establish drainage system within silty clay layer. This option is likely to gain back a small portion of the property.
   - Option 2 – regrade upper slope above buttress by excavating to a stable angle; as well as improve slope stability by increasing drainage within the silty clay and upper sand layers, and provide surface erosion protection. This would result in significant loss of ground within backyard and require moving septic fields to the front yards.
   - Option 3 – regrade upper slope above buttress to suitable angle for application soil nailing and shotcrete (~45 to 60 degrees from horizontal). This would limit further loss ground without requiring importing of additional fill.
   - Option 4 – regrade upper slope above buttress with multi-segmental retaining wall solution. A terraced system of retaining walls could be built above the buttress for the purpose of re-establishing some or all of the backyard space. Taylor recommends

consideration of the Erdox Terra Wall system created by Betonform and distributed by Maccaferri Canada (http://www.betonform.com/en/products/erdox-r/erdox-terra/). This product is suited relatively quick deployment for landslide applications.

9.0 CLOSURE

It is trusted that this letter report meets your present requirements. Should you have any questions or need additional information, please do not hesitate to contact Heather Taylor at 403-707-5082 to discuss.

Kind Regards,

TAYLOR GEOTECHNICAL LTD.

Prepared By:

FOR
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Geotechnical Engineer in Training

EGBC Permit to Practice #: 1003788

Reviewed By:

H. A. TAYLOR
38026

2022-08-10
Heather Taylor, MSc, PEng
Principal Geotechnical Engineer

Reviewed By:

Ryan Gibbard

Ryan Gibbard, PEng
Senior Geotechnical Engineer, McElhanney

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BASIS OF THE REPORT
This report was prepared for the Client for the purpose of providing geotechnical investigation for the specific site, development, and design described to Taylor Geotechnical by the Client.

The findings, opinions and recommendations in this report are only valid to the extent that the report addresses these specifics and remain subject to the limits described herein.

The opinions and recommendations in this report are based on geotechnical investigation work carried out on site in accordance with the Standard of practice described herein.

The report does not include any investigation, analytical testing or assessment of possible soil and groundwater contamination, archeological or biological considerations or sediment control measures.

The Client should provide Taylor Geotechnical with notice any material changes to the site, development, design and objectives, and provide Taylor Geotechnical with opportunity to revise the report accordingly. Any special concerns or circumstances not contemplated at the time of the report should be communicated so that Taylor Geotechnical may conduct further investigations not otherwise within the scope of services provided.

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The interpretations of site conditions in this report are based on the conditions at sample locations on a specific site at one point in time, and the opinions and recommendations provided are only valid to that extent.

The interpretation of site conditions involves inherent and unavoidable risks. The identification and classification of soils, rocks, geological units, materials and quantities of the same is inherently judgemental in nature. The investigative practice means that some conditions may not be detected or that actual conditions may vary from sample points. Comprehensive investigations conducted according to the applicable standards by experienced personnel with appropriate equipment can still fail to locate some site conditions.

As conditions may change over time, this report is intended for immediate use. The Client should provide Taylor Geotechnical with any changes to site conditions or new information that becomes available after the date of this report and have Taylor Geotechnical re-consider its opinions and recommendations prior to the Client or Third Parties making decisions based on this report.

REGULATORY CONTEXT

This report was prepared in the context of government regulations and policies in effect and generally promulgated at the time and, unless specifically noted, does not consider any government regulations or policies that were not in effect and generally promulgated at the time it was prepared. Unless specifically stated, this report provides no advice on regulatory issues associated with the site or project.

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Opinions and recommendations in this report are based on Taylor Geotechnical's interpretations of information obtained through a limited investigation within a defined scope of services. Taylor Geotechnical is not liable for the independent conclusions, interpretations and decisions of the Client or any Third Parties based on this report. This limitation includes any decisions to purchase, sell, develop, lease or rent land or buildings.

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DESIGN AND CONSTRUCTION SERVICES

Where consented to by Taylor Geotechnical, this report may form part of design and construction documents for information purposes even though issued prior to final design. Any differences between the recommendations in this report and the final design should be reported to Taylor Geotechnical, and Taylor Geotechnical to review the final design for consistency with the recommendations prior to proceeding to construction. All recommendations remain subject to field review by Taylor Geotechnical during the construction phase, and Taylor Geotechnical should be retained to conduct such field review to confirm that the site conditions do not materially differ from the interpreted conditions at the time the report was prepared.

These further services may be necessary for Taylor Geotechnical to provide letters of assurance as required by regulatory bodies in some jurisdictions.

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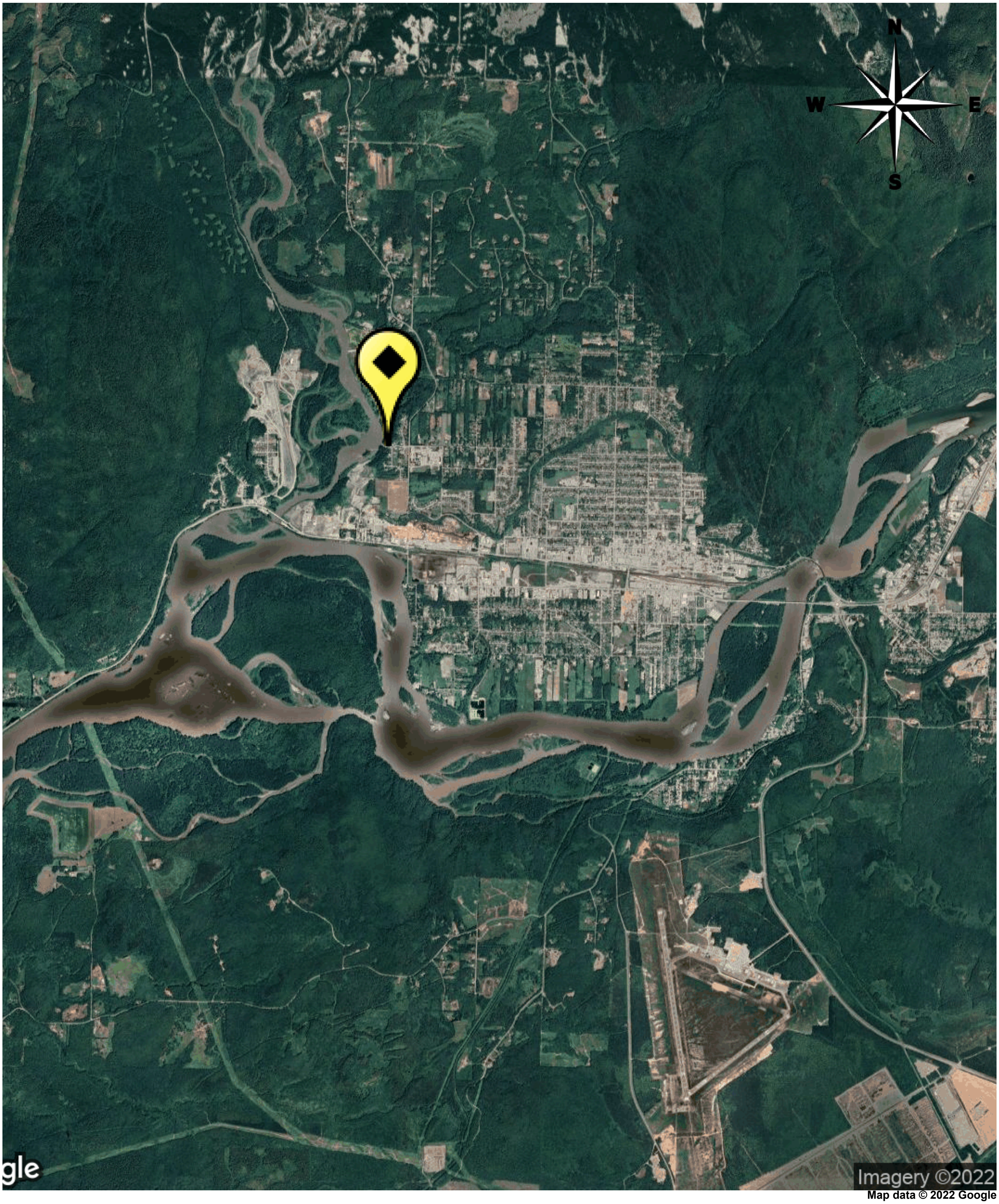

Map data © 2022 Google

Client:
City of Terrace

Figure 1: Project Location

Project:
McConnell Crescent

Project No.:
2022019

Reviewed By:
Heather Taylor

Date: 12/07/2022

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Map data © 2022 Google

Client:
City of Terrace

Figure 2: Borehole Locations

Project:
McConnell Crescent

Project No.:
2022019

Reviewed By:
Heather Taylor

Date: 12/07/2022

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RSLog / Figure 1 Project Location Template - Copy / taylor-geotechnical-ltd / admin / July 12, 2022 05:21 PM

APPENDIX A: BOREHOLE LOGS AND LAB TESTING RESULTS

TEST HOLE LOG: BH01

Project: McConnell Crescent
Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC
Client: City of Terrace
Easting: 523258.226
Northing: 6042404.259
Elevation: 106.123 m
Logged By: Heather Taylor
Reviewed By: Jon Taylor
Investigation Date: May 23, 2022

DEPTH FT	DEPTH M	LITHOLOGIC DESCRIPTION	METHOD	SAMPLES NO.	SAMPLES TYPE	MOISTURE	COMMENTS	SPT 25 50 75	PIEZOMETER
		Ground Surface EL 106.1 m							PVC Cap
0 1 2	0	**SANDY SILT (ML)** Loose, reddish brown, sandy SILT with rootlets. (TOPSOIL) 0.76 m	SRS ML Sonic Sonic (Vibratory)				Vegetative cover at ground surface.		Standpipe
3 4	1	EL 105.4 m **SILT (ML)** Firm, reddish brown, SILT, with trace sand and pore holes. 1.3 m		01	GS	30.7	PP = 49 kPa		
5 6 7	2	EL 104.8 m **SAND (SP)** Loose, brown, coarse SAND, with trace silt and trace gravel. 2.29 m		02	GS	6.7			
8 9		EL 103.8 m **SAND (SP)** Loose, brown, medium SAND. 2.74 m		03	GS	4.8			
10 11 12 13	3 4	EL 103.4 m **SAND (SW)** Compact, brown, SAND, some silt, trace gravel. 4.27 m		04	GS	7.7	Layer becomes coarser.		
14 15 16		EL 101.9 m **SILTY SAND (SM)** Compact to dense, grey-brown, silty SAND. 4.88 m		05	GS	6.9			
	5	EL 101.2 m		06	GS	12			

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Notes:
Detailed soil sampling and borehole logging completed as well as installation of Slope Indicator casing.
SI casing fully grouted in place.

TEST HOLE LOG: BH01

Project: McConnell Crescent
Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC
Client: City of Terrace
Easting: 523258.226
Northing: 6042404.259
Elevation:106.123 m
Logged By: Heather Taylor
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Investigation Date: May 23, 2022

DEPTH FT	DEPTH M	LITHOLOGIC DESCRIPTION	SYMBOL	METHOD	SAMPLES NO.	SAMPLES TYPE	MOISTURE	COMMENTS	SPT 25 50 75	PIEZOMETER
17		*(continued)* **SAND (SW)** Compact, brown, SAND, with some gravel and trace silt, with occasional 5 cm to 10 cm thick layers of silty sand. 5.64 m EL 100.5 m			06	GS				
18										
19		**SAND (SW)** Compact to dense, grey-brown, fine SAND, with some silt and trace gravel. 6.1 m EL 100 m			07	GS	7.7	PP = 441 kPa		
20	6						16.9	SPT = 15		
21		**SAND (SP)** Compact, brown, SAND, with trace gravel.			08	SS		Layer becomes increasingly coarse.		
22										
23	7									
24					09	GS	9.7			
25								Seepage noted @ 7.62		
26	8									
27										
28										
29										
30	9									
31										
32								PP = 343 kPa, SV = 441 kPa		
	10									

TAYLOR GEOTECHNICAL

Notes:
Detailed soil sampling and borehole logging completed as well as installation of Slope Indicator casing.
SI casing fully grouted in place.

TEST HOLE LOG: BH01

Project: McConnell Crescent
Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC
Client: City of Terrace
Easting: 523258.226
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Elevation:106.123 m
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DEPTH FT	DEPTH M	LITHOLOGIC DESCRIPTION	SYMBOL	METHOD	SAMPLES NO.	SAMPLES TYPE	MOISTURE	COMMENTS	SPT 25 50 75	PIEZOMETER
33		*(continued)*								
34		**SAND (SP)** Compact, brown, SAND, with trace gravel. 10.13 m EL 96 m			10	GS	38	PP = 98 kPa, SV = 147 kPa		
35		**CLAYEY SILT (ML)** Light brown, firm, clayey SILT, trace gravel, with trace sand. 10.52 m EL 95.6 m			11 12	GS SS	29.7 35.8	LL = 37.1%, PL = 22.2%, PI = 14.9%		
36	11	**SILTY CLAY (CL)** Grey, soft to firm, silty CLAY.								
37										
38					13	GS	34.6	SPT = 4, SV = 196 kPa		
39	12							PP = 49 kPa, SV = 270 kPa		
40										
41										
42								PP = 49 kPa, SV = 216 kPa, LL = 38.7%, PL = 22.0%, PI = 16.8%		
43	13				14	GS	33.4			
44										
45										
46	14									
47							31.2	PP = 49 kPa, SV = 270 kPa, LL = 36.5%, PL = 24.0%, PI = 12.5%		
48					15	GS				
49	15									

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Notes:
Detailed soil sampling and borehole logging completed as well as installation of Slope Indicator casing.
SI casing fully grouted in place.

TEST HOLE LOG: BH01

Project: McConnell Crescent
Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC
Client: City of Terrace
Easting: 523258.226
Northing: 6042404.259
Elevation:106.123 m
Logged By: Heather Taylor
Reviewed By: Jon Taylor
Investigation Date: May 23, 2022

DEPTH		LITHOLOGIC DESCRIPTION	SYMBOL	METHOD	SAMPLES		MOISTURE	COMMENTS	SPT	PIEZOMETER
FT	M				NO.	TYPE			25 50 75	
50		*(continued)* **SILTY CLAY (CL)** Grey, soft to firm, silty CLAY.								
51										
52										
	16									
53								Fine sand seam @17.22, 17.98, 18.14 m		
54										
55										
	17									
56										
57								PP = 49 kPa, SV = 216 kPa		
58					16	GS	36.3			
59	18									
60							34.9	SPT = 7		
61					17	SS		Fine sand layer (>5cm) @18.36, 18.75 m		
62		18.75 m EL 87.4 m **SAND (SP)** Loose, dark grey, fine SAND.			18	GS	22.7			
	19	18.96 m EL 87.2 m								
63		**SILTY CLAY (CL)** Firm to stiff, grey, silty CLAY with brown layers. Transitions from grey to grey-brown @ 19.51								
64										
65					19	GS	33.1	PP = 147 kPa, SV = 490 kPa, LL = 43.4%, PL =		
	20	19.96 m EL 86.2 m								

TAYLOR GEOTECHNICAL

Notes:
Detailed soil sampling and borehole logging completed as well as installation of Slope Indicator casing.
SI casing fully grouted in place.

TEST HOLE LOG: BH01

Project: McConnell Crescent
Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC
Client: City of Terrace
Easting: 523258.226
Northing: 6042404.259
Elevation: 106.123 m
Logged By: Heather Taylor
Reviewed By: Jon Taylor
Investigation Date: May 23, 2022

DEPTH FT	DEPTH M	LITHOLOGIC DESCRIPTION	SYMBOL	METHOD	SAMPLES NO.	SAMPLES TYPE	MOISTURE	COMMENTS	SPT 25 50 75	PIEZOMETER
66 67		*(continued)* **SAND (SP - SM)** Compact, brown, fine SAND, trace silt. 20.63 m EL 85.5 m								
68 69	21	**SAND (SP - SM)** Compact, brown, fine to medium sand with silty clay partings. 21.03 m EL 85.1 m			20	GS	12.5			
70		**SILTY SAND (SM)** Compact, light brown, silty SAND. 21.34 m EL 84.8 m			21	GS	4.7	Cemented.		
71 72	22	**SAND (SP)** Loose to compact, dark brown, medium to coarse SAND, some silt. 22.1 m EL 84 m			22	GS	12.4			
73 74		**SILTY SAND (SM)** Compact, light brown, silty, medium to coarse SAND interlayered with brown silty clay. 22.71 m EL 83.4 m			23	GS	6.4			
75 76	23	**SAND (SP)** Dense, brown, coarse, SAND, trace gravel. 23.16 m EL 83 m			24	SS	19.6			
77 78 79 80 81 82	24 25	**SANDY GRAVEL (GW)** Loose, brown, sandy GRAVEL, subrounded, trace silt.			25	GS	4.1			

TAYLOR GEOTECHNICAL

Notes:
Detailed soil sampling and borehole logging completed as well as installation of Slope Indicator casing.
SI casing fully grouted in place.

TEST HOLE LOG: BH01

Project: McConnell Crescent
Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC
Client: City of Terrace
Easting: 523258.226
Northing: 6042404.259
Elevation:106.123 m
Logged By: Heather Taylor
Reviewed By: Jon Taylor
Investigation Date: May 23, 2022

DEPTH FT	DEPTH M	LITHOLOGIC DESCRIPTION	SYMBOL	METHOD	SAMPLES NO.	SAMPLES TYPE	MOISTURE	COMMENTS	SPT 25 50 75	PIEZOMETER
83		*(continued)* **SANDY GRAVEL (GW)** Loose, brown, sandy GRAVEL, subrounded, trace silt.		SRS ML Sonic Sonic (Vibratory)	26	GS	1.7			
84										
85	26									
86										
87										
88	27									
89					27	GS	1.9			
90		27.43 m El 78.7 m End Of Test Hole at 27.44 (m)						Target depth achieved. 70 mm diameter Slope Indicator casing installed to full depth (reading to 24 m).		
91										
92	28									
93										
94										
95	29									
96										
97										
98	30									

TAYLOR GEOTECHNICAL

Notes:
Detailed soil sampling and borehole logging completed as well as installation of Slope Indicator casing.
SI casing fully grouted in place.

TEST HOLE LOG: BH02

Project: McConnell Crescent
Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC
Client: City of Terrace
Easting: 523257.646
Northing: 6042405.931
Elevation:106.0265 m
Logged By: Heather Taylor
Reviewed By: Jon Taylor
Investigation Date: May 26, 2022

DEPTH FT	DEPTH M	LITHOLOGIC DESCRIPTION	SYMBOL	METHOD	SAMPLES NO.	SAMPLES TYPE	MOISTURE	COMMENTS	SPT 25 50 75	PIEZOMETER
		Ground Surface EL 106 m								
0	0	**SANDY SILT (ML)** Loose, reddish brown, sandy SILT with rootlets. (TOPSOIL) 1.52 m EL 104.5 m		Sonic (Vibratory)				Vegetative cover on surface. 2 standpipe piezometers installed using 25 mm diameter schedule 40 PVC. Shallow piezometer installed 9.1 m and deep piezometer installed to 18.3 m. Installation graphically shown as one piezometer.		
5		**SAND (SW-SP)** Loose to compact, brown, SAND, trace to some silt, trace gravel.								

Depth scale: FT 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; M 0, 1, 2, 3, 4, 5

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Notes:
Piezometer installation completed within borehole. General soil logging completed.

TEST HOLE LOG: BH02

Project: McConnell Crescent
Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC
Client: City of Terrace
Easting: 523257.646
Northing: 6042405.931
Elevation:106.0265 m
Logged By: Heather Taylor
Reviewed By: Jon Taylor
Investigation Date: May 26, 2022

DEPTH FT	DEPTH M	LITHOLOGIC DESCRIPTION	SYMBOL	METHOD	SAMPLES NO.	SAMPLES TYPE	MOISTURE	COMMENTS	SPT 25 50 75	PIEZOMETER
17		*(continued)* **SAND (SW-SP)** Loose to compact, brown, SAND, trace to some silt, trace gravel.								
18								1" solid PVC pipe from 0 to 6.1 m		
19										
20	6									
21								1" slotted PVC from 6.1 to 9.14 m		
22										
23	7									
24										
25								GW @ 7.63 m on May 27, 2022		
26	8									
27										
28								GW @ 8.52 m on June 2, 2022		
29										
30	9	9.14 m EL 96.9 m								
31		**CLAYEY SILT (ML)** Light brown, firm, clayey SILT, trace gravel, trace sand.						Sand from 1.52 m to 9.45 m, bentonite seal from 9.45 to		
32	10	9.91 m EL 96.1 m								

TAYLOR GEOTECHNICAL

Notes:
Piezometer installation completed within borehole. General soil logging completed.

TEST HOLE LOG: BH02

Project: McConnell Crescent	Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC	Client: City of Terrace
Easting: 523257.646 / Northing: 6042405.931	Elevation:106.0265 m
Logged By: Heather Taylor / Reviewed By: Jon Taylor	Investigation Date: May 26, 2022

DEPTH FT	DEPTH M	LITHOLOGIC DESCRIPTION	SYMBOL	METHOD	SAMPLES NO.	SAMPLES TYPE	MOISTURE	COMMENTS	SPT 25 50 75	PIEZOMETER
33		*(continued)* **SILTY CLAY (CL)**								
34		Grey, soft to firm, silty CLAY								
35										
36	11									
37										
38								1" solid PVC pipe from 0 to 15.24 m		
39	12									
40										
41										
42										
43	13									
44										
45										
46	14									
47										
48								GW @ 14.69 on May 27, 2022		▼
49	15									

TAYLOR GEOTECHNICAL

Notes:
Piezometer installation completed within borehole. General soil logging completed.

TEST HOLE LOG: BH02

Project: McConnell Crescent
Project No.: 2022019
Site Address: 5416 McConnell Cres., Terrace, BC
Client: City of Terrace
Easting: 523257.646
Northing: 6042405.931
Elevation:106.0265 m
Logged By: Heather Taylor
Reviewed By: Jon Taylor
Investigation Date: May 26, 2022

DEPTH FT	DEPTH M	LITHOLOGIC DESCRIPTION	SYMBOL	METHOD	SAMPLES NO.	SAMPLES TYPE	MOISTURE	COMMENTS	SPT 25 50 75	PIEZOMETER
50–60	16–18.29	*(continued)* **SILTY CLAY (CL)** Grey, soft to firm, silty CLAY		Sonic (Vibratory)				GW @ 15.99 m on June 2, 2022 1" slotted PVC from 15.24 to 18.29 m Backfilled with cuttings from 10.97 to 15.2 m, sand from 15.2 to 18.29 m		
60–65	18.29–20	18.29 m El 87.7 m End Of Test Hole at 18.29 (m)						Target depth achieved.		

TAYLOR GEOTECHNICAL

Notes:
Piezometer installation completed within borehole. General soil logging completed.

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT LOGS

Terminology describing common soil genesis:	
Rootmat	Vegetation, roots and mass 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 decaying organic matter.
Till	Unstratified glacial deposit which may range from clay to boulders.
Fill	Material below the surface identified as placed by humans.

Terminology describing soil types:

Major Divisions			Group Symbols	Typical Names
Coarse-grained Soils: More than half material is larger than No. 200 sieve size.	Gravels: More than half coarse fraction is larger than No. 4 sieve size.	Clean Gravels (little or no fines)	GW	Well-graded gravels, gravel sand mixtures, little or no fines.
			GP	Poorly-graded gravels or gravel sand mixtures, little or no fines.
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	Sands: More than half of coarse fraction is smaller than No. 4 sieve size.	Clean Sands (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.
			SP	Poorly-graded sands or gravelly sands, little or no fines.
		Sands with fines	SM	Silty sands , sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
Fine-grained Soils: More than half of material is smaller than No. 200 sieve size.	Silts and Clays: Liquid limit is less than 50.		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity. Quick to slow dilatancy.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. None to slow dilatancy.
			OL	Organic silts and organic silty clays of low plasticity. Slow to no dilatancy.
	Silts and Clays: Liquid limit is greater than 50.		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays and silts of medium to high plasticity.
Highly Organic Soils			Pt	Peat and other highly organic soils.

Coarse Grain Soils Particle Sizes

Constituent		Particle Sizes	
		(mm)	Inches & Sieve Size
Boulders		>300	>12"
Cobbles		60 – 300	3" – 12"
Gravel	Coarse	20 – 60	3/4" – 3"
	Medium	6 – 20	No 4. – 3/4"
	Fine	2 – 6	No.8 – No. 4
Sand	Coarse	0.6 – 2	No. 20 – No. 8
	Medium	0.2 – 0.6	No. 60 – No. 20
	Fine	0.06 – 0.2	No.200 – No. 60.
Silt		Not visible to naked eye	

NOTES: Cobbles and Boulders are individually noted and recorded at the depth which they occur. Dimensions of boulders should be recorded if possible.

Classification Terminology	
AND	35% – 50%
Adjective (.....Y)	20% – 35%
SOME	10% – 20%
TRACE	1% – 10%

Plasticity

A qualitative measure of the effect that water has on the consistency of the material in question. It can be estimated on the field as low, medium or high. High plastic clays are also referred to as swelling clays. It can be quantitatively determined using the Atterberg Limit test procedure in lab (ASTM D4318).

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT LOGS

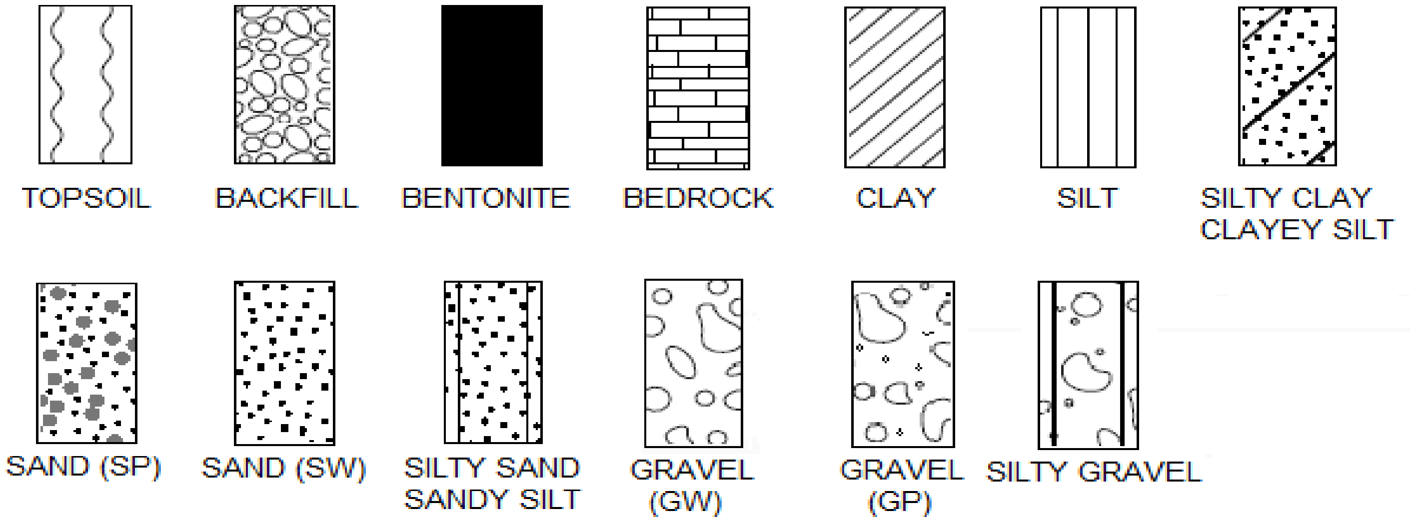
Terminology describing the compactness of soils

Non-Cohesive Soils		Cohesive Soils		
Description	**N-Value**	**Description**	**Undrained Shear Strength (kPa)**	**N-Value**
Very Loose	0 – 4	Very Soft	< 12.5	0 – 2
Loose	4 – 10	Soft	12.5 – 25	2 – 4
Compact	10 – 30	Firm	25 – 50	4 – 8
Dense	30 – 50	Stiff	50 – 100	8 – 15
Very Dense	> 50	Very Stiff	100 – 200	15 – 30
		Hard	> 200	>30

N Value

N-Value numbers are the field results of the Standard Penetration Test (SPT). N-Value represents the number of blows a 140 lb. (63.5kg) hammer falling 30 inches (300mm) required to drive a 2 inch (50.8mm) O.D. split spoon sampler one foot (300m) into the soil. The N-Value equals the number to drive the sampler over the interval of 6 to 18 inches (300 to 610mm).

GRAPHIC LOG/STRATA PLOT SYMBOLS



SAMPLE TYPE

GRAB	Grab sample off augers or samples taken while test pitting.
SPT	Split spoon sample from standard penetration test.
BS	Bulk sample.
ST	Shelby tube.
DP	Direct push sample.

WATER LEVEL MEASUREMENT

▽ 1	• Measured in standpipe, piezometer, well or observed while drilling or test pitting. • Number denotes successive readings.

GRAIN SIZE DISTRIBUTION (SIEVE ANALYSIS)

TAYLOR GEOTECHNICAL

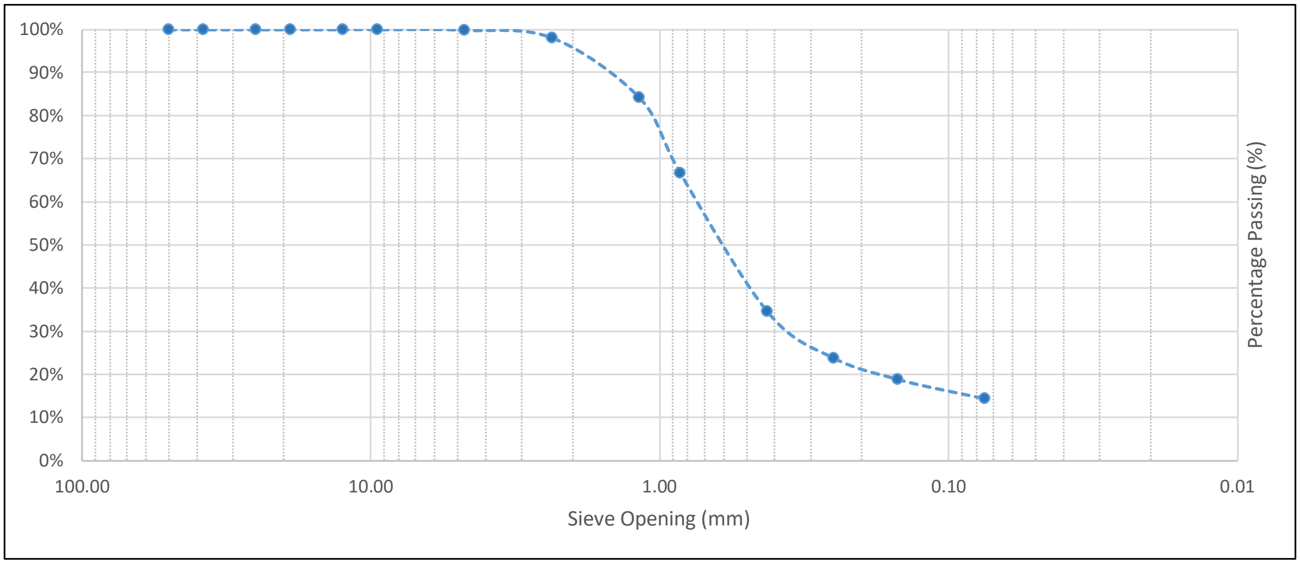
ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

1400 Railway Ave, Canmore, AB, T1W 1P6 T: 888-484-2444 www.taylorgeotechnical.com

Project Number:	2022-019	Received By:	LW	Date:	2022-05-31
Project Name:	McConnell Cres	Tested By:	LW	Date:	2022-06-01
TGL Sample Number:	1902	Reviewed By:	HT	Date:	2022-06-06
Material Description:	BH01 SA4				

USCS SOIL CLASSIFICATION:	Sand, some silt, trace gravel (SW)

Sieve No.	Diameter (mm)	Soil Retained (g)	Cumulative Mass (g)	Soil Retained (%)	Percent Passing (%)
4"	101.6	0.0	0.0	0.0%	100.0%
2"	50.00	0.0	0.0	0.0%	100.0%
1.5"	38.10	0.0	0.0	0.0%	100.0%
1"	25.00	0.0	0.0	0.0%	100.0%
3/4"	19.00	0.0	0.0	0.0%	100.0%
1/2"	12.50	0.0	0.0	0.0%	100.0%
3/8"	9.50	0.0	0.0	0.0%	100.0%
No. 4	4.75	1.8	1.8	0.2%	99.8%
No. 8	2.36	19.6	21.4	1.8%	98.0%
No. 16	1.180	149.0	170.3	13.8%	84.2%
No. 20	0.850	189.4	359.8	17.5%	66.7%
No. 40	0.425	347.4	707.2	32.2%	34.5%
No. 60	0.250	115.7	822.9	10.7%	23.8%
No. 100	0.150	53.6	876.5	5.0%	18.8%
No. 200	0.075	48.6	925.1	4.5%	14.3%
Pan		155.0	1080.1	14.3%	0.0%
	TOTAL	1080.1			
	FIDELITY	99.77%			



GRAIN SIZE ANALYSIS					
% Gravel (4.75 mm to 75 mm):	0.2%	D10 (mm)	-	Cu	-
% Sand (0.075 mm to 4.75 mm):	85.5%	D30 (mm)	0.380	Cc	-
% Silt and Clay (< 0.075 mm):	14.3%	D60 (mm)	0.750		

Comments: Mechanical shaker SS14-00079 used for 8 min, hand shake for 1 min.

GRAIN SIZE DISTRIBUTION (SIEVE ANALYSIS)

TAYLOR GEOTECHNICAL

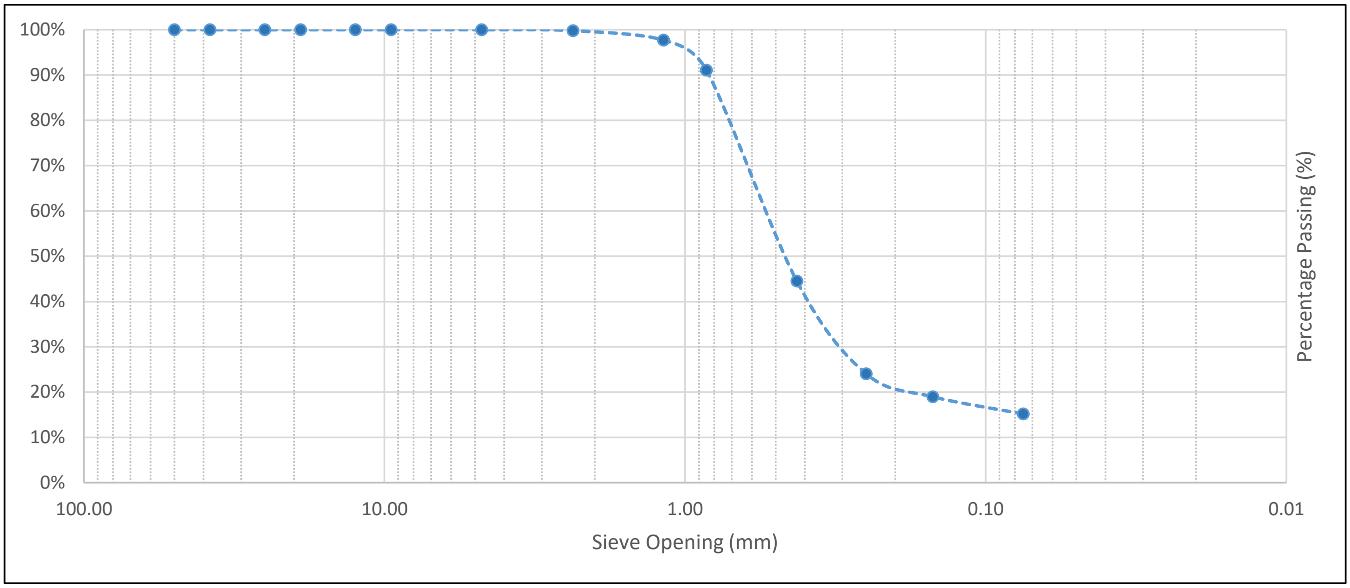
ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

1400 Railway Ave, Canmore, AB, T1W 1P6 T: 888-484-2444 www.taylorgeotechnical.com

Project Number:	2022-019	Received By:	LW	Date:	2022-05-31
Project Name:	McConnell Cres	Tested By:	LW	Date:	2022-06-01
TGL Sample Number:	1920	Reviewed By:	HT	Date:	2022-06-06
Material Description:	BH01 SA22				

USCS SOIL CLASSIFICATION:	Sand, some silt (SP)

Sieve No.	Diameter (mm)	Soil Retained (g)	Cumulative Mass (g)	Soil Retained (%)	Percent Passing (%)
4"	101.6	0.0	0.0	0.0%	100.0%
2"	50.00	0.0	0.0	0.0%	100.0%
1.5"	38.10	0.0	0.0	0.0%	100.0%
1"	25.00	0.0	0.0	0.0%	100.0%
3/4"	19.00	0.0	0.0	0.0%	100.0%
1/2"	12.50	0.0	0.0	0.0%	100.0%
3/8"	9.50	0.0	0.0	0.0%	100.0%
No. 4	4.75	0.0	0.0	0.0%	100.0%
No. 8	2.36	2.2	2.2	0.2%	99.8%
No. 16	1.180	23.6	25.8	2.1%	97.7%
No. 20	0.850	74.5	100.3	6.6%	91.1%
No. 40	0.425	523.2	623.5	46.6%	44.5%
No. 60	0.250	229.9	853.4	20.5%	24.1%
No. 100	0.150	57.4	910.8	5.1%	19.0%
No. 200	0.075	42.2	953.0	3.8%	15.2%
Pan		170.9	1123.9	15.2%	0.0%
	TOTAL	1123.9			
	FIDELITY	100.02%			



GRAIN SIZE ANALYSIS					
% Gravel (4.75 mm to 75 mm):	0.0%	D10 (mm)	-	Cu	-
% Sand (0.075 mm to 4.75 mm):	84.8%	D30 (mm)	0.200	Cc	-
% Silt and Clay (< 0.075 mm):	15.2%	D60 (mm)	0.550		

Comments: Mechanical shaker SS14-00079 used for 8 min, hand shake for 1 min.

GRAIN SIZE DISTRIBUTION (SIEVE ANALYSIS)

TAYLOR GEOTECHNICAL

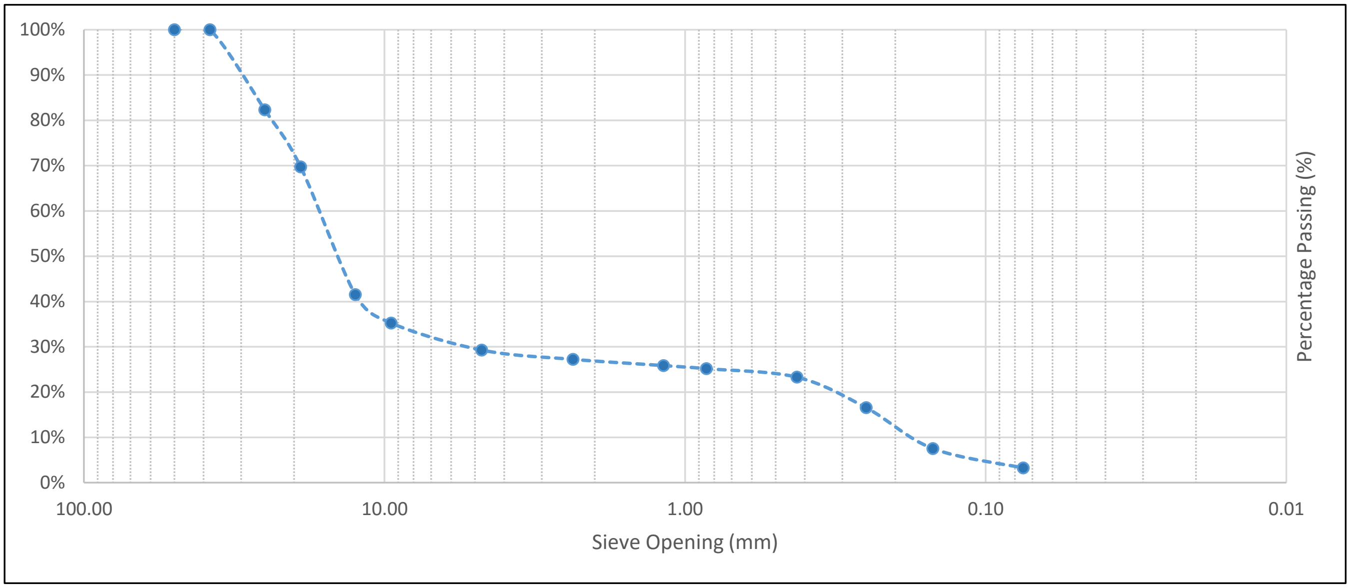
ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

1400 Railway Ave, Canmore, AB, T1W 1P6   T: 888-484-2444   www.taylorgeotechnical.com

Project Number:	2022-019	Received By:	LW	Date:	2022-05-31
Project Name:	McConnell Cres	Tested By:	LW	Date:	2022-06-01
TGL Sample Number:	1924	Reviewed By:	HT	Date:	2022-06-06
Material Description:	BH01 SA26				

USCS SOIL CLASSIFICATION:	Sandy Gravel, trace silt (GP)

Sieve No.	Diameter (mm)	Soil Retained (g)	Cumulative Mass (g)	Soil Retained (%)	Percent Passing (%)
4"	101.6	0.0	0.0	0.0%	100.0%
2"	50.00	0.0	0.0	0.0%	100.0%
1.5"	38.10	0.0	0.0	0.0%	100.0%
1"	25.00	265.3	265.3	17.7%	82.3%
3/4"	19.00	189.4	454.7	12.6%	69.7%
1/2"	12.50	423.0	877.7	28.2%	41.5%
3/8"	9.50	94.3	972.0	6.3%	35.3%
No. 4	4.75	89.5	1061.5	6.0%	29.3%
No. 8	2.36	31.1	1092.6	2.1%	27.2%
No. 16	1.180	20.3	1112.9	1.4%	25.9%
No. 20	0.850	10.5	1123.4	0.7%	25.2%
No. 40	0.425	28.0	1151.4	1.9%	23.3%
No. 60	0.250	101.2	1252.6	6.7%	16.6%
No. 100	0.150	135.5	1388.1	9.0%	7.5%
No. 200	0.075	63.9	1452.0	4.3%	3.3%
Pan		49.2	1501.2	3.3%	0.0%
	TOTAL	1501.2			
	FIDELITY	100.06%			



GRAIN SIZE ANALYSIS					
% Gravel (4.75 mm to 75 mm):	70.7%	D10 (mm)	0.180	Cu	91.7
% Sand (0.075 mm to 4.75 mm):	26.0%	D30 (mm)	5.000	Cc	8.42
% Silt and Clay (< 0.075 mm):	3.3%	D60 (mm)	16.500		

Comments: Mechanical shaker SS14-00079 used for 8 min, hand shake for 1 min.

ATTERBERG LIMITS

TAYLOR GEOTECHNICAL

ASTM 4318 - (Liquid Limitm Plastic Limit and Plasticity Index of Soils)

1400 Railway Ave, Canmore, AB, T1W 1P6   T: 888-484-2444   www.taylorgeotechnical.com

Project Number:	2022-019
Project Name:	McConnell Cres (BH01 SA12)
Sample ID:	1910

Method A (nearest percent):	Yes
Method B (One decimal):	

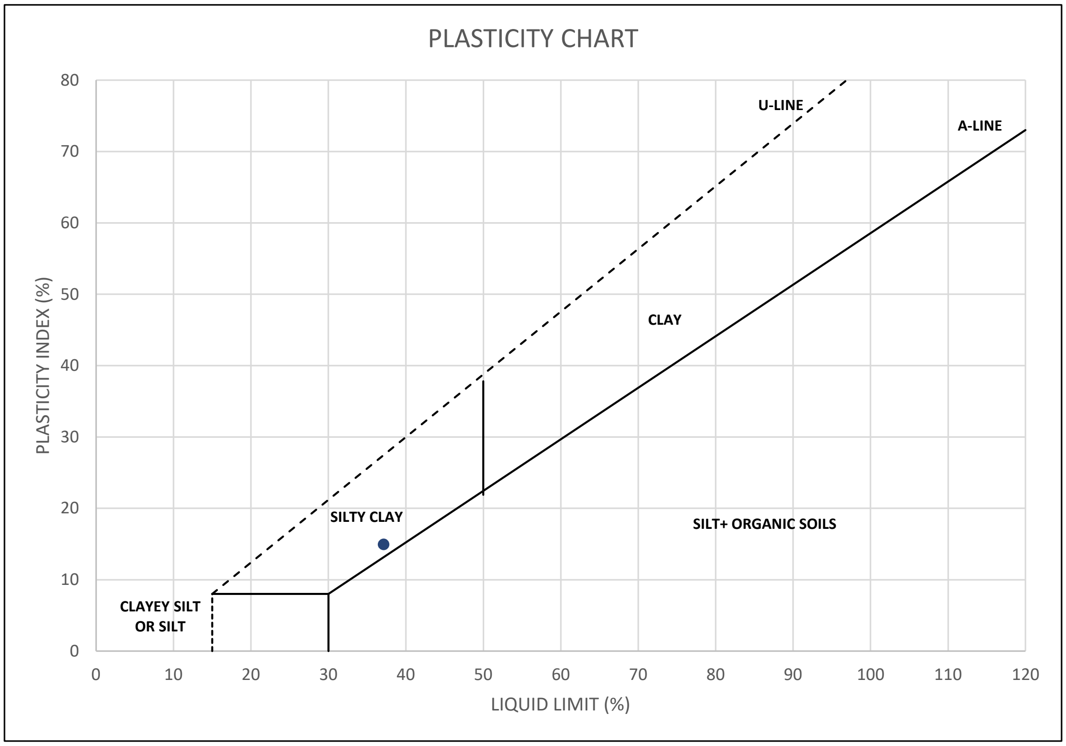
LIQUID LIMIT DETERMINATION

Sample	**Measured**			**Calculated**			**# of Blows**	**Liquid Limit**
				Mw=Mcms-Mcds	Ms=Mcds-Mc	w=Mw/Ms		
Cup Number	Mc	Mcms	Mcds	Mass of Water (g)	Mass of Solids (g)	**Water Content (%)**		
T7	4.3	18.0	14.3	3.8	10.0	**38%**	**24**	37.5%
T4	4.3	19.4	15.3	4.1	11.0	**37%**	**20**	36.2%
T3	4.3	21.7	16.9	4.7	12.6	**37%**	**27**	37.8%

PLASTIC LIMIT DETERMINATION

Sample	**Measured**			**Calculated**		
				Mw=Mcms-Mcds	Ms=Mcds-Mc	w=Mw/Ms
Cup Number	Mc	Mcms	Mcds	Mass of Water (g)	Mass of Solids (g)	**Water Content (%)**
B13	4.3	5.94	5.64	0.3	1.34	**22%**
T2	4.34	6.04	5.77	0.27	1.43	**19%**
T4	4.26	24.28	20.4	3.85	16.17	**24%**
B13	4.31	27.06	22.7	4.37	18.38	**24%**

Average Liquid Limit, LL (%):	**37.1**	**Plasticity Index, PI (%):**	**14.9**
Average Plastic Limit, PL (%):	**22.2**	**USCS Description:**	**Silty Clay**



Comments: More information available on request

ATTERBERG LIMITS

TAYLOR GEOTECHNICAL

ASTM 4318 - (Liquid Limitm Plastic Limit and Plasticity Index of Soils)

1400 Railway Ave, Canmore, AB, T1W 1P6   T: 888-484-2444   www.taylorgeotechnical.com

Project Number:	2022-019
Project Name:	McConnell Cres (BH01, SA14)
Sample ID:	1912

Method A (nearest percent):	Yes
Method B (One decimal):	

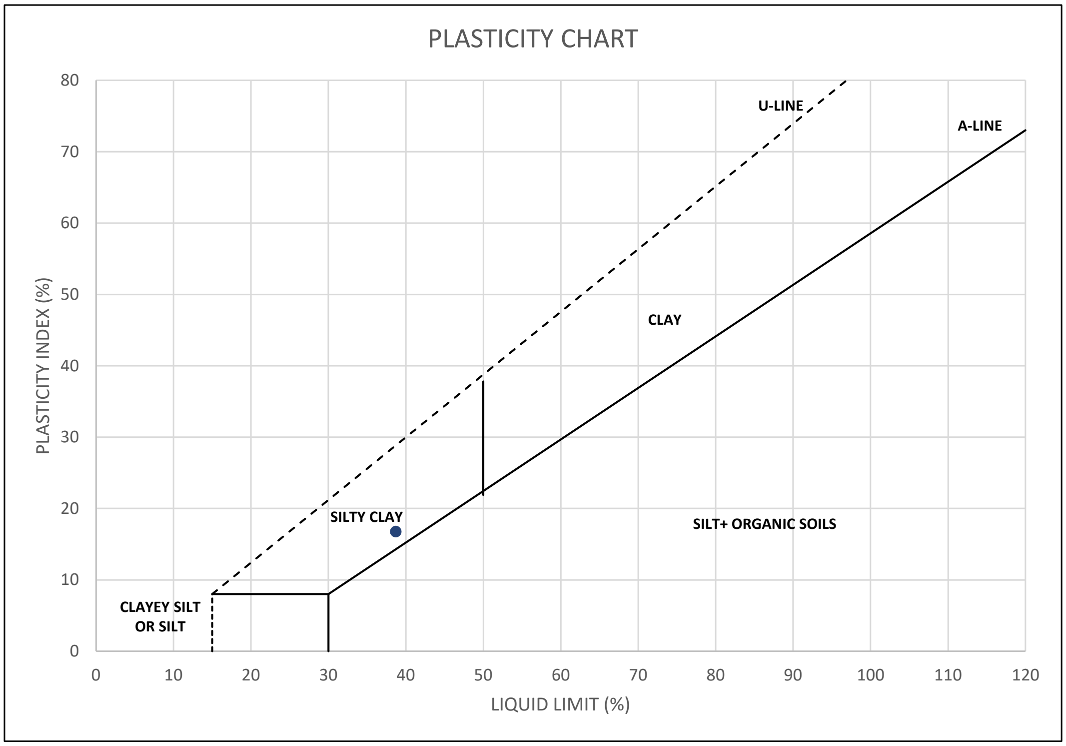
LIQUID LIMIT DETERMINATION

Sample	**Measured**			**Calculated**			**# of Blows**	**Liquid Limit**
				Mw=Mcms-Mcds	Ms=Mcds-Mc	w=Mw/Ms		
Cup Number	Mc	Mcms	Mcds	Mass of Water (g)	Mass of Solids (g)	**Water Content (%)**		
MC6	19.7	38.2	33.0	5.2	13.3	**39%**	**25**	38.8%
MC16	19.7	26.9	24.9	2.0	5.2	**39%**	**24**	38.5%
MC8	20.0	28.9	26.4	2.5	6.4	**38%**	**28**	38.8%

PLASTIC LIMIT DETERMINATION

Sample	**Measured**			**Calculated**		
				Mw=Mcms-Mcds	Ms=Mcds-Mc	w=Mw/Ms
Cup Number	Mc	Mcms	Mcds	Mass of Water (g)	Mass of Solids (g)	**Water Content (%)**
MC17	19.93	22.86	22.3	0.53	2.40	**22%**
MC18	19.95	22.41	22	0.44	2.02	**22%**
MC15	19.84	22.28	21.8	0.44	2.00	**22%**

Average Liquid Limit, LL (%):	**38.7**	**Plasticity Index, PI (%):**	**16.8**
Average Plastic Limit, PL (%):	**22.0**	**USCS Description:**	**Silty Clay**



Comments: More information available on request

ATTERBERG LIMITS

TAYLOR GEOTECHNICAL

ASTM 4318 - (Liquid Limitm Plastic Limit and Plasticity Index of Soils)

1400 Railway Ave, Canmore, AB, T1W 1P6 T: 888-484-2444 www.taylorgeotechnical.com

Project Number:	2022-019
Project Name:	McConnell Cres (BH01 SA15)
Sample ID:	1913

Method A (nearest percent):	Yes
Method B (One decimal):	

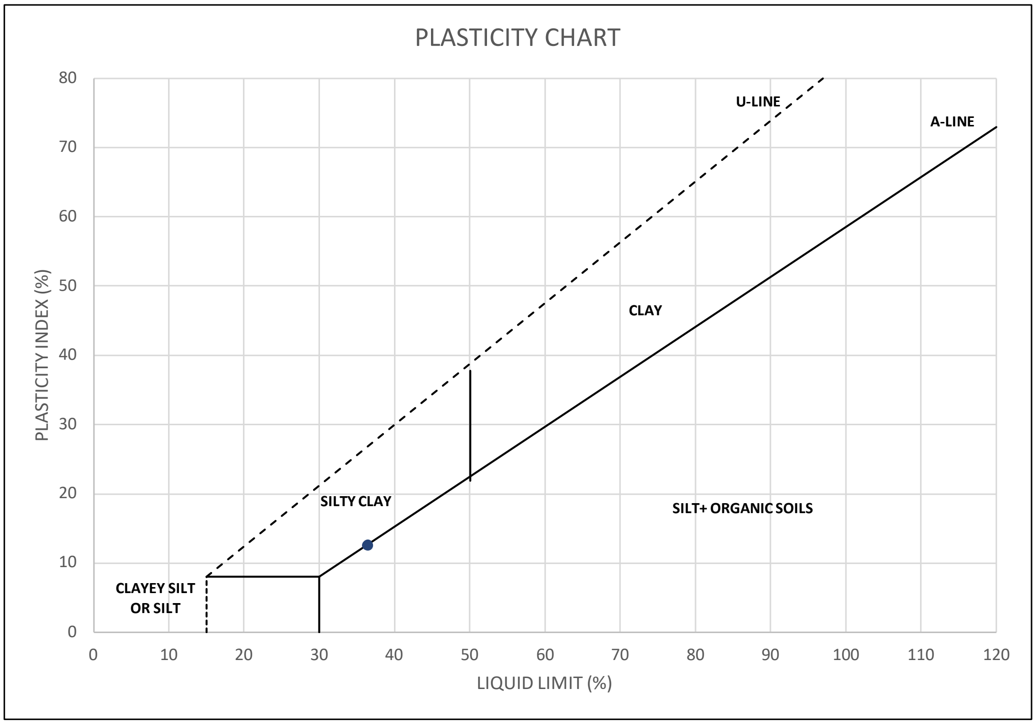
LIQUID LIMIT DETERMINATION

Sample	Measured			Calculated			# of Blows	Liquid Limit
				Mw=Mcms-Mcds	Ms=Mcds-Mc	w=Mw/Ms		
Cup Number	Mc	Mcms	Mcds	Mass of Water (g)	Mass of Solids (g)	**Water Content (%)**		
B12	4.3	20.0	15.8	4.2	11.5	**37%**	**24**	36.6%
B2	4.3	17.8	14.1	3.6	9.9	**37%**	**20**	35.8%
B7	19.8	34.0	30.2	3.8	10.4	**37%**	**27**	37.1%

PLASTIC LIMIT DETERMINATION

Sample	Measured			Calculated		
				Mw=Mcms-Mcds	Ms=Mcds-Mc	w=Mw/Ms
Cup Number	Mc	Mcms	Mcds	Mass of Water (g)	Mass of Solids (g)	**Water Content (%)**
T7	4.29	16.02	13.8	2.27	9.46	**24%**
T2	4.33	14.13	12.3	1.88	7.92	**24%**
T3	4.27	17.71	15.1	2.62	10.82	**24%**

Average Liquid Limit, LL (%):	**36.5**	**Plasticity Index, PI (%):**	**12.5**
Average Plastic Limit, PL (%):	**24.0**	**USCS Description:**	**Silty Clay**



Comments: More information available on request

ATTERBERG LIMITS

TAYLOR GEOTECHNICAL

ASTM 4318 - (Liquid Limitm Plastic Limit and Plasticity Index of Soils)

1400 Railway Ave, Canmore, AB, T1W 1P6   T: 888-484-2444   www.taylorgeotechnical.com

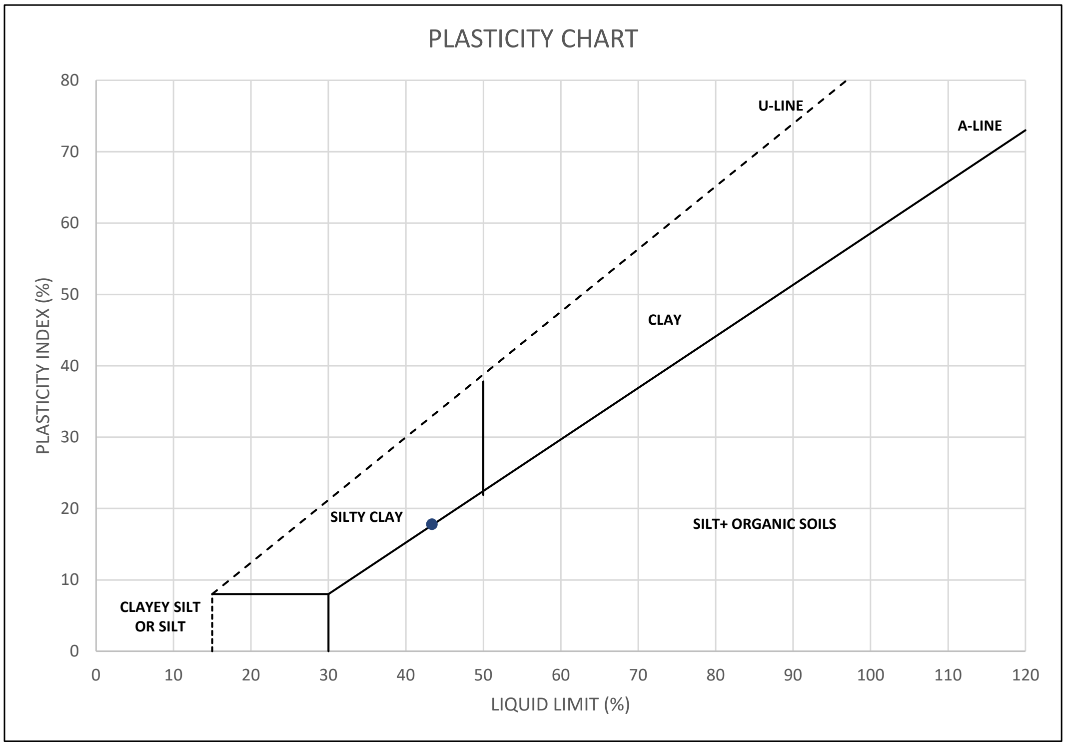
Project Number:	2022-019
Project Name:	McConnell Cres (BH01 SA19)
Sample ID:	1917

Method A (nearest percent):	Yes
Method B (One decimal):	

LIQUID LIMIT DETERMINATION								
Sample	**Measured**			**Calculated**			**# of Blows**	**Liquid Limit**
				Mw=Mcms-Mcds	Ms=Mcds-Mc	w=Mw/Ms		
Cup Number	Mc	Mcms	Mcds	Mass of Water (g)	Mass of Solids (g)	**Water Content (%)**		
MC18	20.0	36.8	31.7	5.1	11.7	**44%**	**27**	44.0%
MC8	20.0	30.9	27.6	3.2	7.6	**43%**	**30**	43.7%
MC17	19.9	29.3	26.5	2.8	6.6	**43%**	**23**	42.4%

PLASTIC LIMIT DETERMINATION						
Sample	**Measured**			**Calculated**		
				Mw=Mcms-Mcds	Ms=Mcds-Mc	w=Mw/Ms
Cup Number	Mc	Mcms	Mcds	Mass of Water (g)	Mass of Solids (g)	**Water Content (%)**
MC7	20.1	31.91	29.5	2.42	9.39	**26%**
MC6	19.72	27.64	26.1	1.59	6.33	**25%**
MC16	19.71	27.4	25.8	1.58	6.11	**26%**

Average Liquid Limit, LL (%):	**43.4**	**Plasticity Index, PI (%):**	**17.8**
Average Plastic Limit, PL (%):	**25.6**	**USCS Description:**	**Silty Clay**



Comments: More information available on request

SPECIFIC GRAVITY TEST REPORT

Client:	Taylor Engineering				
Project No.:	20840				
Project Name:	Taylor Engineering Lab Testing				
Test date:	2022-06-08	Tested by:	WG	Reviewed by:	EJW

Sample Information

Sample Name:	1906&1907	Notes:
Sample Date:	N/A	
Northing:	N/A	
Easting:	N/A	

Test Data

Method (A or B) =	A				
De-air method =	Heat+vacuum				
Test No.	1	2	3	4	5
Pyconometer No. =	5				
Weight of pync. + soil + water (g) =	735.57				
Temperature (°C) =	23.8				
Weight of pync. + water at test temperature (g) =	681.5				
Tare No. =	S104				
Tare weight (g) =	188.24				
Tare + dry soil weight (g) =	273.47				
Weight of dry soil (g) =	85.23				
Specific gravity at test temperature =	2.73				
Specific gravity at 20°C =	2.73				
Average specific gravity at 20°C =	2.73				

Standard/Reference: ASTM D854-14

Revised: 2020-06-02

THURBER ENGINEERING LTD.

SPECIFIC GRAVITY TEST REPORT

Client:	Taylor Engineering				
Project No.:	20840				
Project Name:	Taylor Engineering Lab Testing				
Test date:	2022-06-08	Tested by:	WG	Reviewed by:	EJW

Sample Information

Sample Name:	1911	Notes:
Sample Date:	N/A	
Northing:	N/A	
Easting:	N/A	

Test Data

Method (A or B) =	A				
De-air method =	Heat+vacuum				
Test No.	1	2	3	4	5
Pyconometer No. =	2				
Weight of pync. + soil + water (g) =	723.41				
Temperature (°C) =	24				
Weight of pync. + water at test temperature (g) =	688.1				
Tare No. =	S74				
Tare weight (g) =	190.66				
Tare + dry soil weight (g) =	246.2				
Weight of dry soil (g) =	55.54				
Specific gravity at test temperature =	2.74				
Specific gravity at 20°C =	2.74				
Average specific gravity at 20°C =	2.74				

Standard/Reference: ASTM D854-14

Revised: 2020-06-02

THURBER ENGINEERING LTD.

SIEVE AND HYDROMETER TEST REPORT

Client:	Taylor Engineering				
Project No.:	20840				
Project Name:	Taylor Engineering Lab Testing				
Test date:	2022-06-08	Tested by:	WG	Reviewed by:	EJW

Sample Information

Sample Name:	1911	Notes:
Sample Date:	N/A	
Northing:	N/A	
Easting:	N/A	

Hydrometer and 45 Micron Wet Sieve

Menicus correction, F_m =	0.88	Sample treatment notes:
Zero correction, F_Z =	6.5	
Soil specific gravity =	2.74	
Specific gravity correction, a =	0.98	
Dispersant name =	NaPO3	
Dispersant concentration (%) =	5	
Volume of dispossant added (mL) =	125	
Type of water used =	Distilled	
Hydromter type =	152H	
Hydrometer ID =	L	
Sample wet mass (g) =	48.71	
Measured solids content (%) =	76.14	
Sample dry mass (g) =	37.1	

Time (HH:MM)	Elapsed time (minutes)	Hydrometer reading, R	Temperature (°C)	Water viscosity (g/cm.s)	Temperature correction, F_T	Corrected hydrometer reading for percent finer, Rcp = R+F_T-F_Z	Corrected hydrometer reading for effective length, RcL = R+F_m	Effective length, L (cm)	Particle size (mm)	Percent finer (%)
10:25	0	-	-	-	-	-	-	-	-	-
10:26	1	42.00	25.0	0.00891	1.00	36.50	42.9	9.41	0.0384	96.5
10:27	2	41.00	25.0	0.00891	1.00	35.50	41.9	9.57	0.0274	93.9
10:30	5	39.00	25.0	0.00891	1.00	33.50	39.9	9.90	0.0176	88.6
10:40	15	36.00	24.9	0.00893	0.98	30.48	36.9	10.39	0.0104	80.6
10:55	30	33.70	24.8	0.00895	0.96	28.16	34.6	10.77	0.0075	74.4
11:25	60	31.00	24.4	0.00903	0.88	25.38	31.9	11.21	0.0055	67.1
15:21	296	25.50	23.6	0.00921	0.72	19.72	26.4	12.12	0.0026	52.1
13:53	1648	20.00	23.8	0.00916	0.76	14.26	20.9	13.02	0.0011	37.7

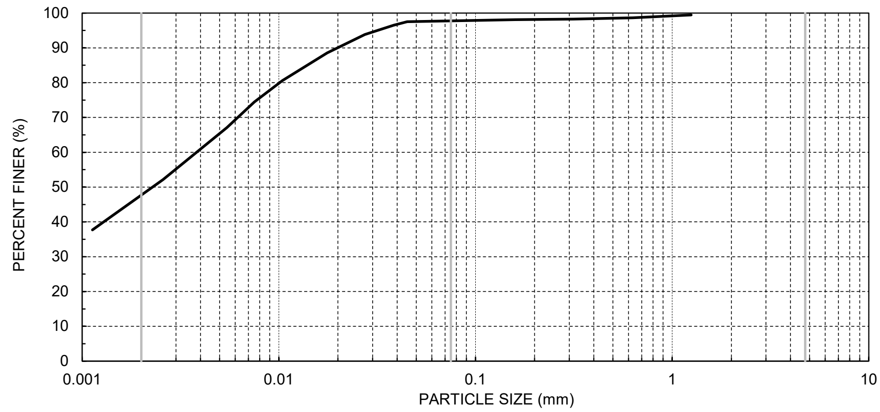
Sieve size (mm)	Tare weight (g)	Weight of tare + dry soil (g)	Weight of dry soil (g)	Percent finer (%)
0.045	45.89	46.82	0.93	97.5

Sieve of Dry Coarse Fraction (> 45 micron)

Sieve size (mm)	Weight of sieve (g)	Weight of seive +dry soil (g)	Weight of dry soil (g)	Percent finer (%)
1.250	654.730	654.930	0.200	99.5
0.630	608.510	608.810	0.300	98.7
0.315	545.780	545.920	0.140	98.3
0.160	534.630	534.700	0.070	98.1
0.080	481.030	481.150	0.120	97.8
PAN	481.33	481.54	0.210	-

Particle Size Distribution

Particle size (mm)	Percent finer (%)
1.25	99.5
0.63	98.7
0.315	98.3
0.16	98.1
0.08	97.8
0.045	97.5
0.0384	96.5
0.0274	93.9
0.0176	88.6
0.0104	80.6
0.0075	74.4
0.0055	67.1
0.0026	52.1
0.0011	37.7



Particle Size Information

Clay content < 2 um (%)	43.6
Fines content < 45 um (%)	97.5

Standards: AASHTO T-88-10

Revised: 2018-05-01

Direct Shear Test

Consolidated Drained Conditions

Project No.:	20840	Project name:	Taylor Lab Testing
Client:	Taylor Engineering	Test dates:	5/25/2022-5/30/2022
Sample ID:	1906&1907	Depth:	NA
Location:	Calgary	Elevation:	NA
Tested by:	WG	Shear box size:	60x60 mm
Checked by:	EJW	Reviewed by:	SAP
Description:	Sand, well-graded, trace gravel, trace silt, brown		

Test Sequence:		1	2	3
Test ID:		20840-DST-349	20840-DST-350	20840-DST-351
Initial	Sample Height (mm):	20.02	20.02	20.02
	Sample Width (mm):	59.98	59.98	59.98
	Dry Mass (g)	121.33	125.81	124.10
	Moisture Content:	8.7%	8.4%	8.9%
	Bulk Density (g/cm^3):	1.83	1.89	1.88
	Dry Density (g/cm^3):	1.68	1.75	1.72
	Void Ratio:	0.62	0.56	0.58
	Saturation (2):	0.38	0.41	0.41
	Type of Specimen:	Remolded	Remolded	Remolded
Consolid.	Consolidation Stress (kPa):	50	150	350
	Consolidation Strain (mm):	0.5	0.9	1.4
	Consolidation duration (hours):	2.2	3.5	5.9
Pre-Shear	Void Ratio:	0.58	0.50	0.48
	Moisture Content(3):	16.0%	14.6%	11.8%
	Bulk Density (g/cm^3):	1.85	1.93	1.94
	Dry Density (g/cm^3):	1.73	1.83	1.85
	Saturation (2)(3):	0.75	0.80	0.68
Shear	Shear Rate (%/hour):	5.14	5.15	5.13
	Vertical Stress (kPa):	50	150	350
	Shear Stress at Peak (kPa):	87.2	225.7	393.3
	Shear Strain at Peak (mm):	3.7	3.3	3.9
	Residual Shear Stress (kPa):	51.3	150.5	312.0
	Residual Shear Strain (mm):	7.4	9.6	9.3

Liquid Limit (%):	-	Gravel (%):	-
Plastic Limit (%):	-	Sand (%):	-
Plastic Index (%):	-	Fines (%):	-

Notes:

(1) Particles with diameter greater than 2 mm (13.15%) were removed.

(2) Saturation was estimated based on specific gravity of 2.73.

(3) Pre-shear moisture content and saturation were back calculated from final measurement and might not be reliable.

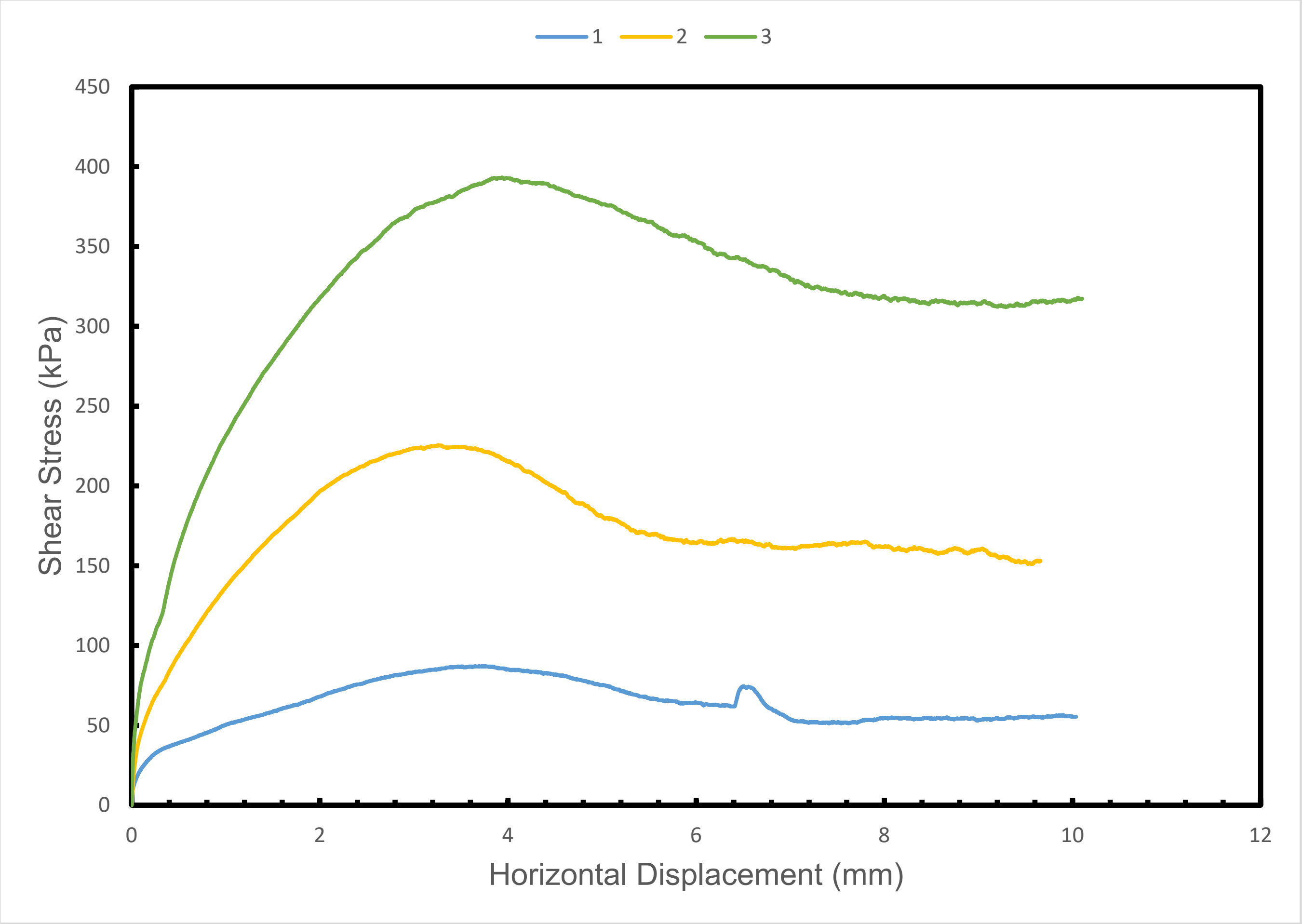
THURBER ENGINEERING LTD.

Direct Shear Test

Consolidated Drained Conditions

Project No.:	20840	Project name:	Taylor Lab Testing
Client:	Taylor Engineering	Sample ID:	1906&1907

Shear Stress vs. Horizontal Displacement



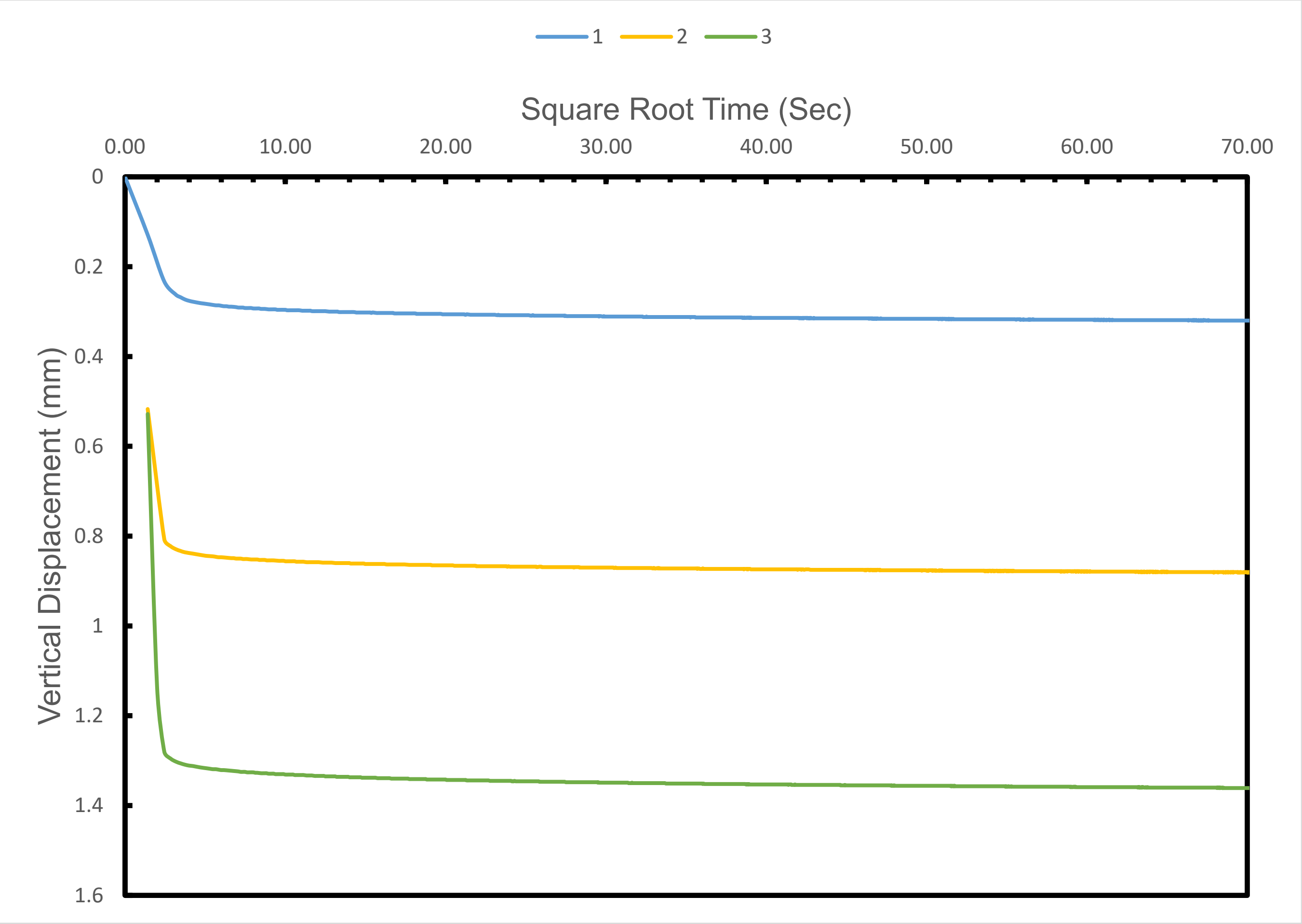
Notes:

Direct Shear Test

Consolidated Drained Conditions

Project No.:	20840	Project name:	Taylor Lab Testing
Client:	Taylor Engineering	Sample ID:	1906&1907

Deformation vs. Square Root of Time



Notes:

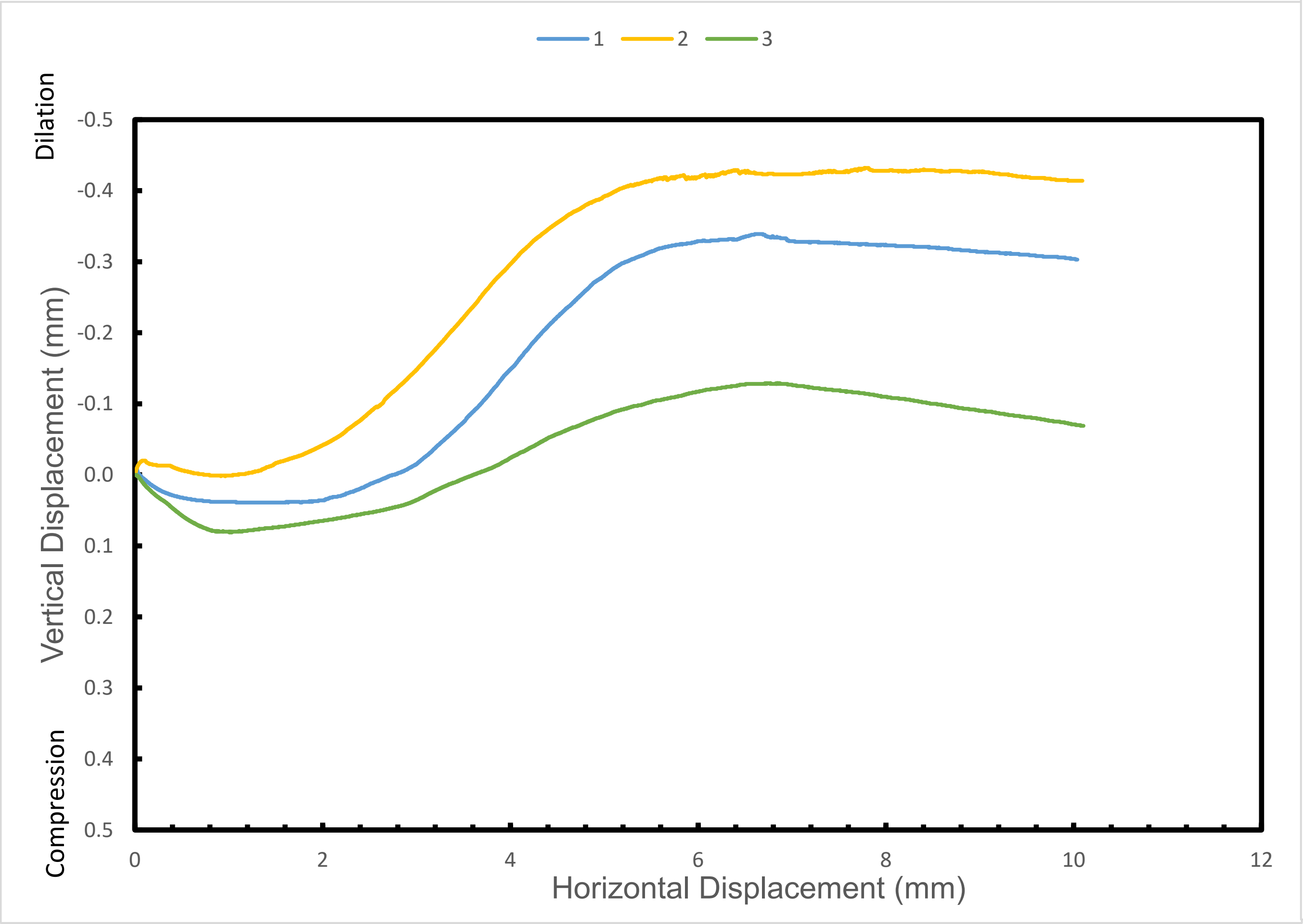
THURBER ENGINEERING LTD.

Direct Shear Test

Consolidated Drained Conditions

Project No.:	20840	Project name:	Taylor Lab Testing
Client:	Taylor Engineering	Sample ID:	1906&1907

Vertical Displacement vs. Horizontal Displacement



Notes:

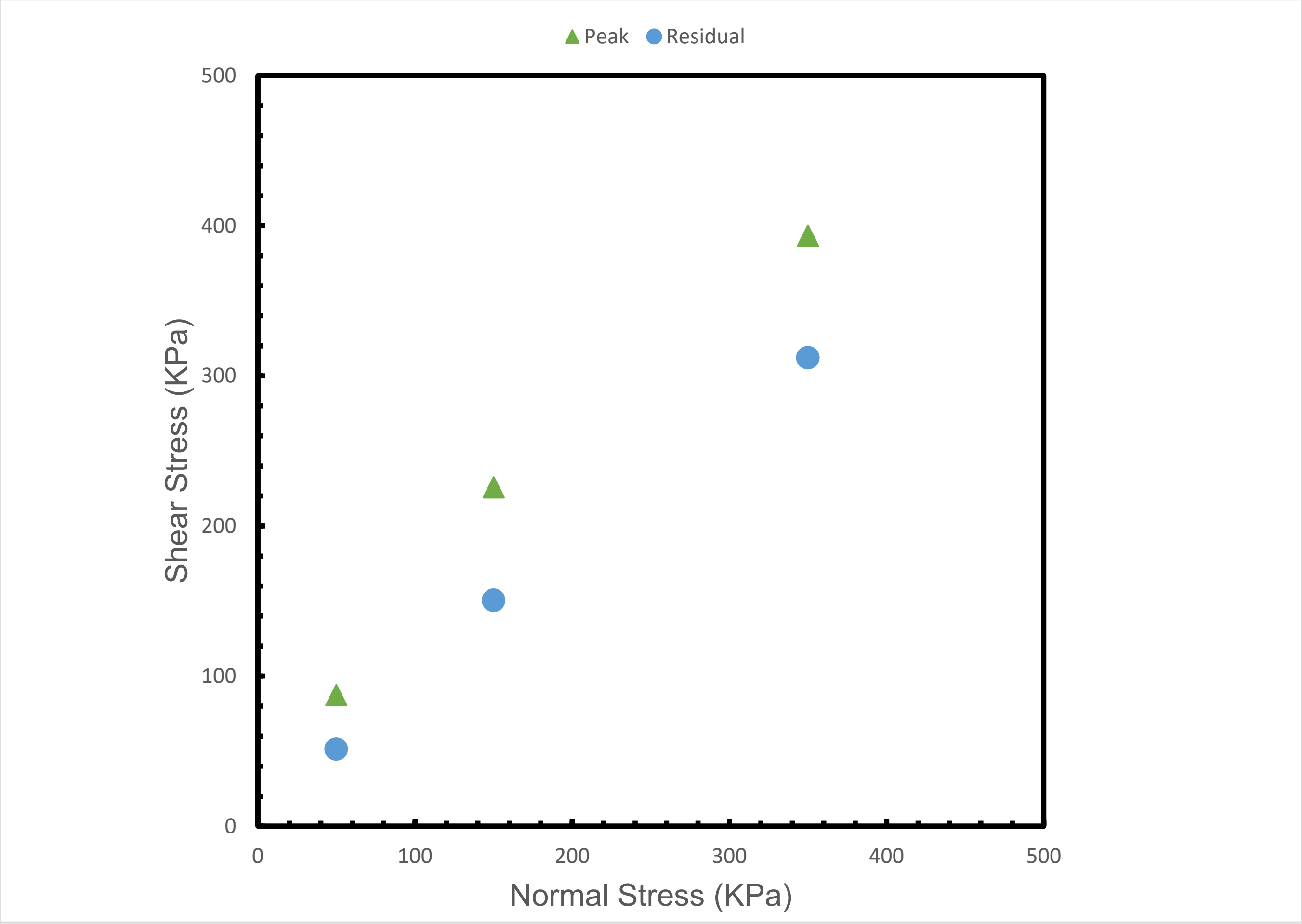
THURBER ENGINEERING LTD.

Direct Shear Test

Consolidated Drained Conditions

Project No.:	20840	Project name:	Taylor Lab Testing
Client:	Taylor Engineering	Sample ID:	1906&1907

Shear Strength vs. Normal Stress



Notes:

THURBER ENGINEERING LTD.

Consolidated Undrained Triaxial Test

Test Summary

ASTM D4767-11

Project No:	20840	Client:	Taylor Engineering
Project:	Taylor Lab Testing	Tested by:	WG
Checked by:	EJW	Reviewed by:	SAP
Material Description:	Clay, silty, medium plastic, wet, grey		

Test Summary

Test ID	Test Sequence:	1	2	3
	Test No:	20840-TRI-348	20840-TRI-348	20840-TRI-348
	Test Date:	6/3/2022-6/11/2022	6/11/2022-6/16/2022	6/16/2022-6/28/2022
Location	Sample ID:	BH-01 SA10:1911	BH-01 SA10:1911	BH-01 SA10:1911
	Depth (m):	38-39 ft	38-39 ft	38-39 ft
	Elevation (m):	NA	NA	NA
	Location:	BH-01	BH-01	BH-01
Characterization	Soil type (USCS):	CI	CI	CI
	Sample condition:	Intact	Intact	Intact
	Specific gravity$^{(1)}$:	2.74	2.74	2.74
Initial specimen	Diameter (mm):	51.2	48.0	47.7
	Height (mm):	97.3	90.3	86.8
	Average Water Content (%):	34.3	22.6	19.4
	Void ratio:	0.98	0.62	0.53
	Bulk Density (g/cm^3):	1.855	2.072	2.134
	Dry density (g/cm^3):	1.381	1.690	1.786
	Saturation (%):	95.5	99.8	99.8
Specimen after consolidation	Diameter (mm):	47.3	46.8	45.9
	Height (mm):	93.2	90.1	86.8
	Average Water Content (%):	22.6	19.4	15.4
	Void ratio:	0.62	0.53	0.42
	Bulk Density (g/cm^3):	2.072	2.134	2.222
	Dry density (g/cm^3):	1.690	1.786	1.925
	Saturation (%):	99.8	99.8	99.7
Shear stage$^{(2)}$	Effec. Consolid. stress (kPa):	150	250	350
	Total back pressure (kPa):	520	550	800
	Time to 50% prim. Consolid. (sec):	2040	690	1000
	Deviator stress at failure (kPa):	143.3	292.1	516.1
	Axial strain at failure (%):	3.91	4.95	8.06
	Rate of strain (%/min):	0.005	0.023	0.010

Notes:

(1) Specific gravity value was measured.

(2) Failure was determined at maximum stress ratio (σ_1'/σ_3').

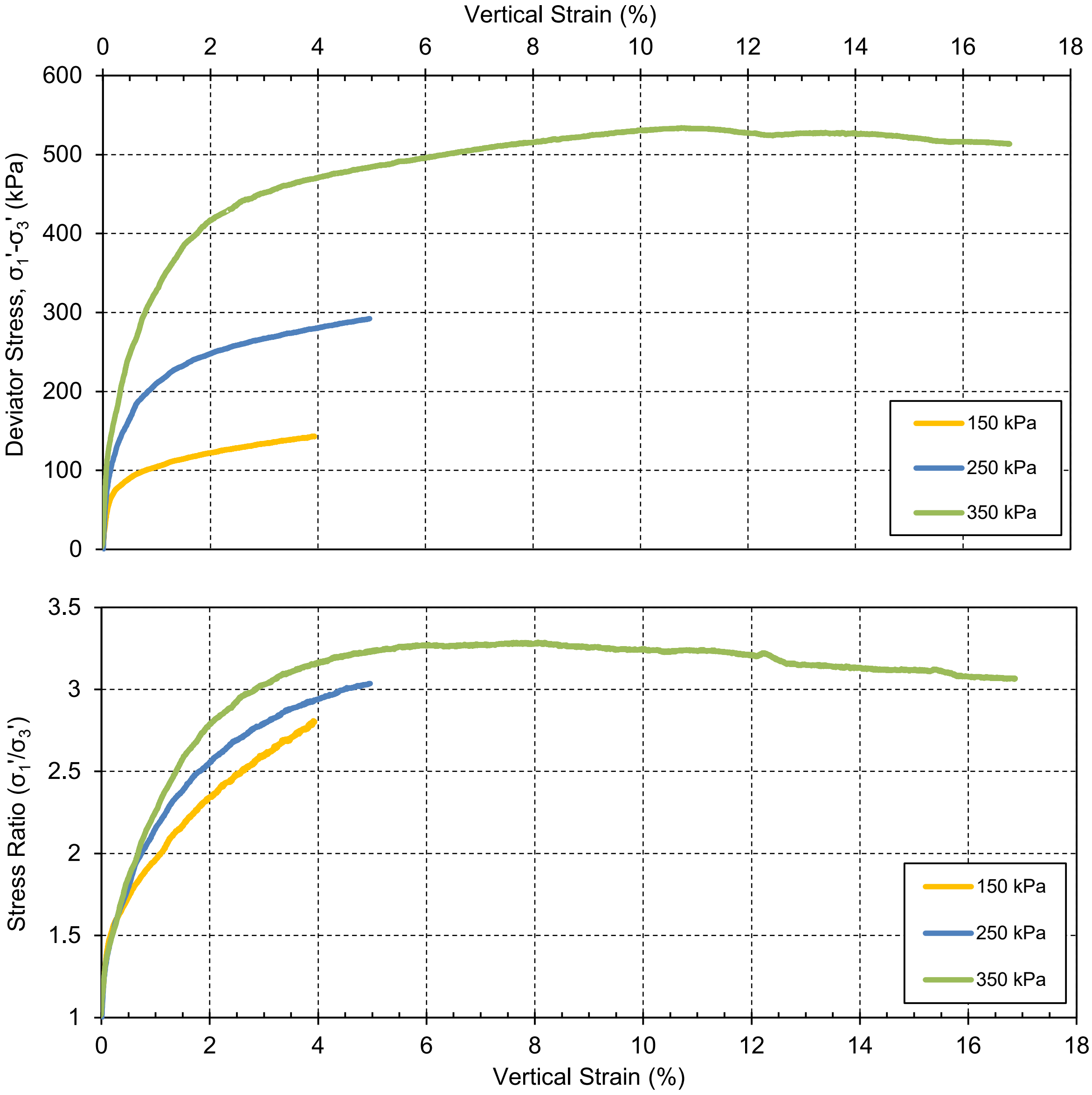
THURBER ENGINEERING LTD.

Consolidated Undrained Triaxial Test

Deviator Stress and Stress Ratio

Project No:	20840	Client:	Taylor Engineering
Project:	Taylor Lab Testing	Tested by:	WG
Checked by:	EJW	Reviewed by:	SAP

Isotropically Consolidated Undrained Triaxial Test Results



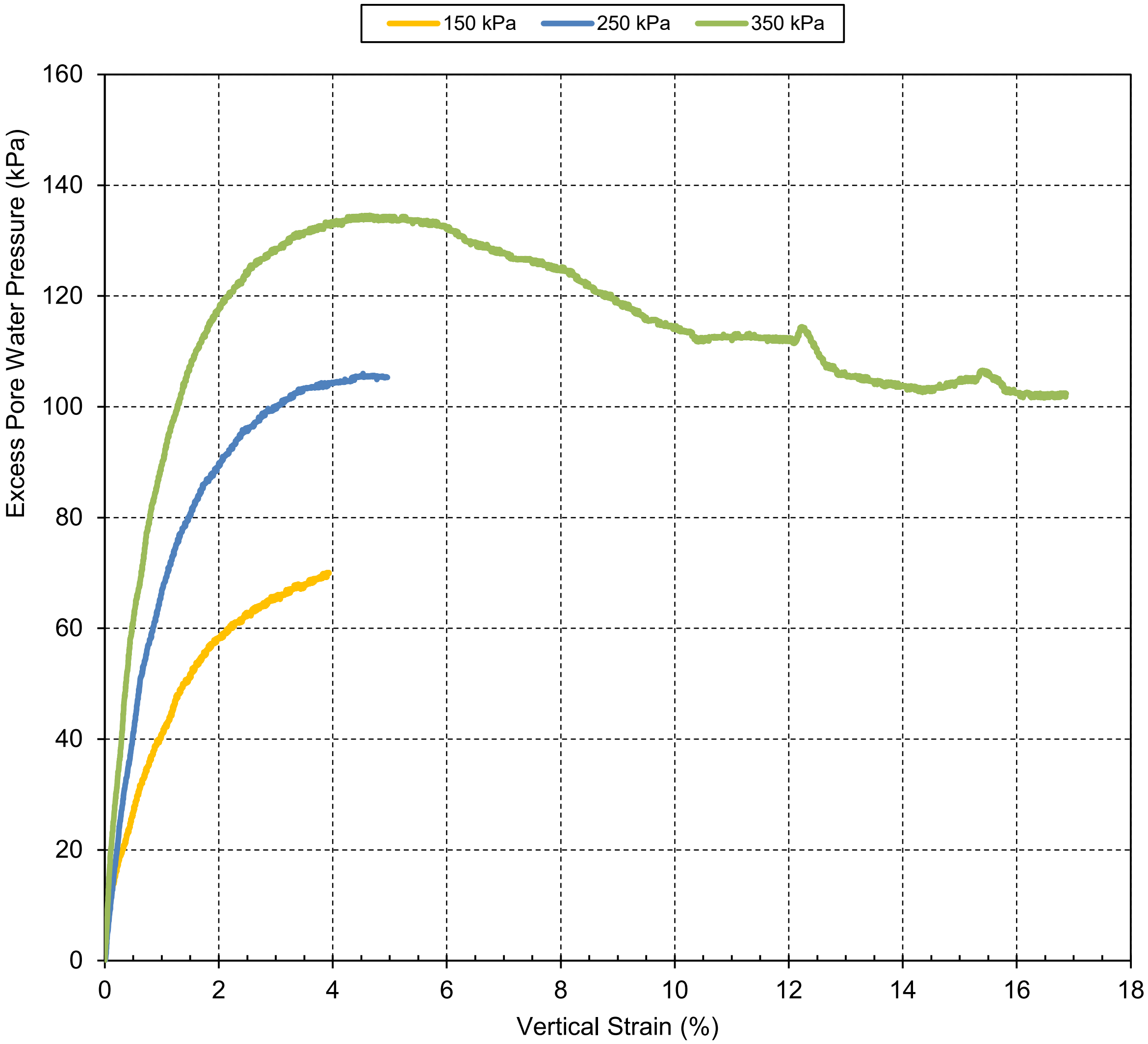
THURBER ENGINEERING LTD.

Consolidated Undrained Triaxial Test

Excess Pore Pressure

Project No:	20840	Client:	Taylor Engineering
Project:	Taylor Lab Testing	Tested by:	WG
Checked by:	EJW	Reviewed by:	SAP

Isotropically Consolidated Undrained Triaxial Test Results

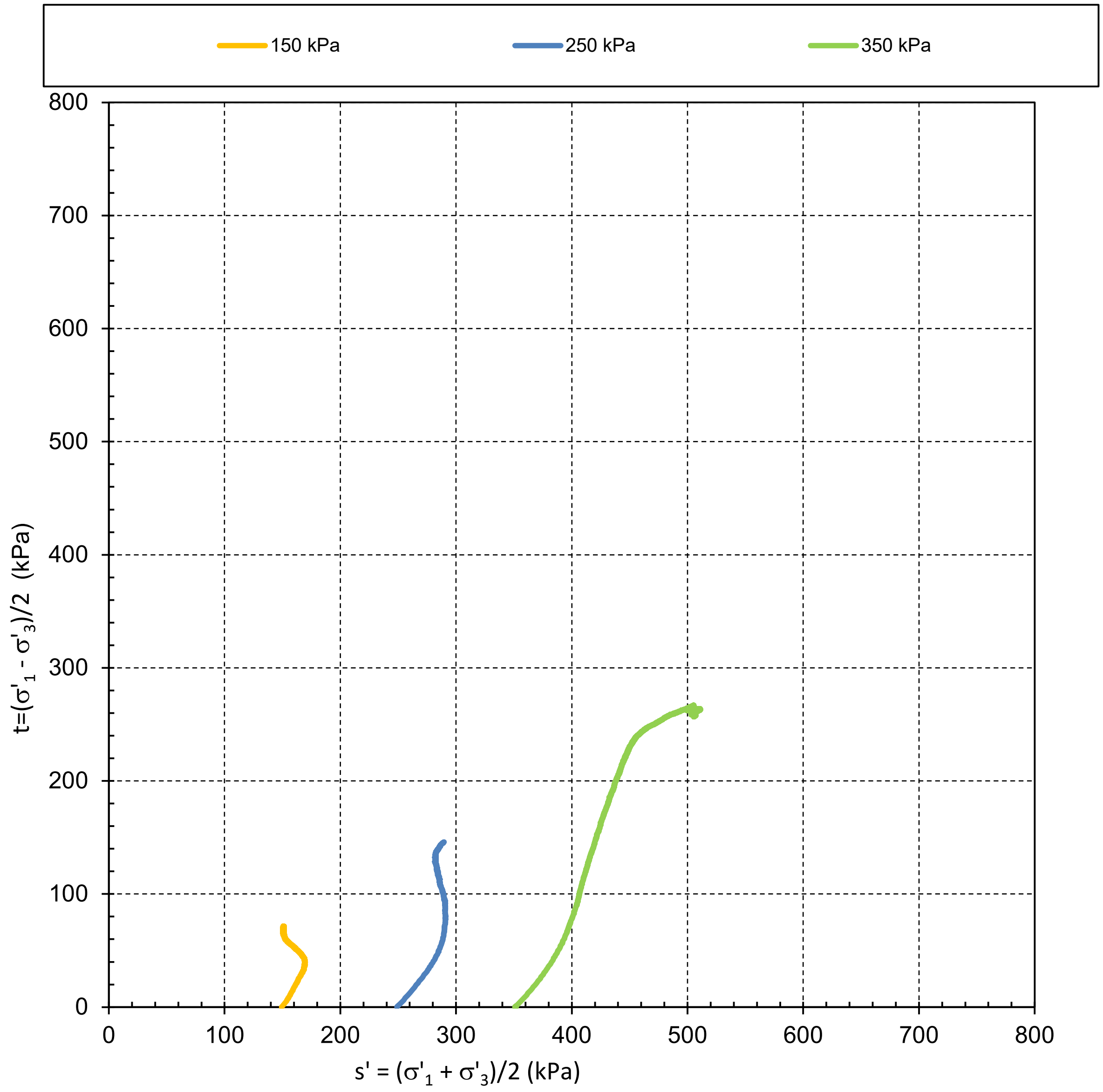


Consolidated Undrained Triaxial Test

Stress Paths

Project No:	20840	Client:	Taylor Engineering
Project:	Taylor Lab Testing	Tested by:	WG
Checked by:	EJW	Reviewed by:	SAP

Isotropically Consolidated Undrained Triaxial Test Results

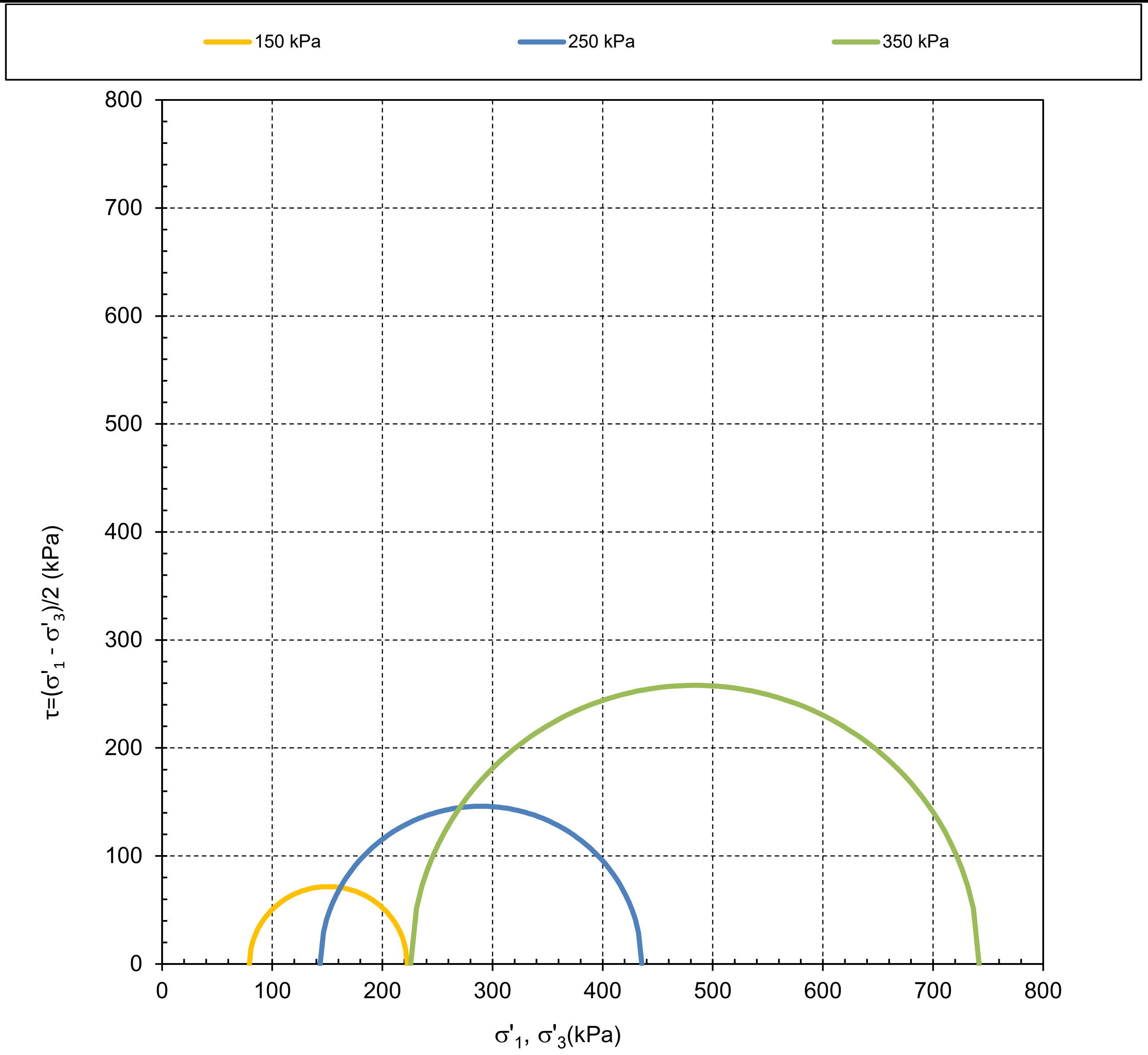


Consolidated Undrained Triaxial Test

Mohr Circles

Project No:	20840	Client:	Taylor Engineering
Project:	Taylor Lab Testing	Tested by:	WG
Checked by:	EJW	Reviewed by:	SAP

Isotropically Consolidated Undrained Triaxial Test Results



Consolidated Undrained Triaxial Test

Photos

Project No:	20840	Client:	Taylor Engineering
Project:	Taylor Lab Testing	Tested by:	WG
Checked by:	EJW	Reviewed by:	SAP

Isotropically Consolidated Undrained Triaxial Test Results

APPENDIX B: SITE INSPECTION PHOTOS

Photo 1: Looking north towards the site at 5412 McConnell Crescent.

Photo 2: Drilling rig set up and drilling BH-02. Note: The blue pipe installed is the slope inclinometer

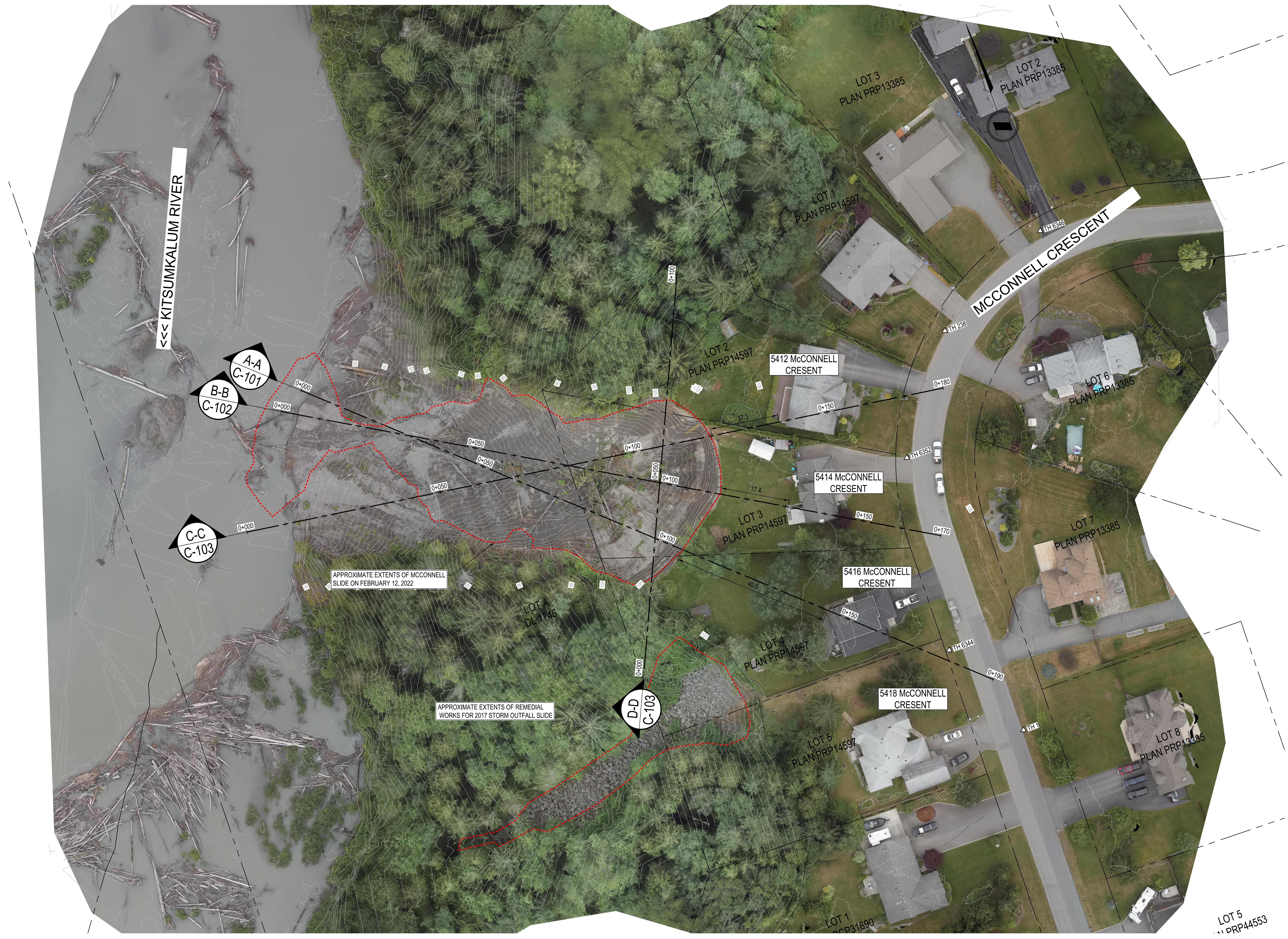
Photo 3: Looking east towards the toe of the landslide.

Note: seepage from above has formed a stream which can be seen exiting at the toe if the failure.

Photo 4: Looking north up the Kalum River from the toe of the landslide.

	Photo 5: Silty clay soil sample taken during the drilling program.
	Photo 6: Sandy gravel soil sample taken during the drilling program.

APPENDIX C: SLOPE STABILITY ANALYSIS



NOTES:

1. SITE SURVEY, ORTHOPHOTO, AND DRONE FLIGHT PERFORMED FEBRUARY 12, 2022, MARCH 10, 2022, JUNE 30, 2022 BY McELHANNEY LTD.
2. SITE COORDINATES/ELEVATIONS DERIVED FROM GPS TIES TO INTEGRATED MONUMENT 95H1887.
   N: 6042389.089m
   E: 524306.273m
   ELEV. 112.053m
3. THIS DRAWING IS METRIC DISPLAYED IN NAD83 UTM ZONE 9.
4. ELEVATIONS ARE IN METRES, BASED ON GEODETIC DATUM CVD28, ESTABLISHED BY GNSS TIES TO INTEGRATED MONUMENT 95H1887 USING GEIOD MODEL HT 2.0.
5. CONTOUR INTERVAL: MAJOR 5.0m MINOR 1.0m.
6. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE NOTED.

NOTE:
ORTHO PHOTO AND CONTOURS ARE FROM JUNE 30, 2022

SURVEY CONTROL TABLE

DESCRIPTION	NORTHING	EASTING	ELEVATION
MON 95H1887	6042389.089	524306.273	112.053
MON 95H1888	6042392.794	523507.133	109.596
TH 1	6042296.593	523300.846	107.417
TH 2	6042299.615	523462.416	109.669
TH 238	6042398.455	523316.200	107.692
TH 239	6042407.557	523512.416	109.486
TH 6344	6042321.997	523289.961	107.581
TH 6346	6042414.134	523347.463	107.875
TH 6350	6042387.001	523553.262	110.225
TH 6352	6042371.471	523296.291	107.620

Rev	Date	Description	Drawn	Design	App'd
PC	2022-06-30	REVISED FOR JUNE 30, 2022 DRONE FLIGHT	JMD	-	CJH
PC	2022-04-10	REVISED FOR MARCH 10, 2022 DRONE FLIGHT	JMD	-	CJH
PA	2022-02-23	ISSUED FOR INFORMATION	JMD	-	CJH

INFORMATION ON EXISTING UNDERGROUND FACILITIES MAY NOT BE COMPLETE OR ACCURATE. McELHANNEY, ITS EMPLOYEES AND DIRECTORS ARE NOT RESPONSIBLE NOR LIABLE FOR THE LOCATION OF ANY UNDERGROUND CONDUITS, PIPES, CABLES OR OTHER FACILITIES WHETHER SHOWN OR OMITTED FROM THIS PLAN. PRIOR TO CONSTRUCTION CONTRACTOR SHALL EXPOSE LOCATIONS OF ALL EXISTING FACILITIES BY HAND DIGGING OR HYDROVAC AND ADVISE THE ENGINEER OF POTENTIAL CONFLICTS.

0 1:500 25

ORIGINAL DWG SIZE: ANSI D (22" x 34")

McElhanney

Suite 1
5008 Pohle Avenue
Terrace BC
Canada V8G 4S8
T 250 635 7163

PRELIMINARY
NOT FOR CONSTRUCTION

THIS DRAWING HAS NOT BEEN APPROVED AND MAY CONTAIN ERRORS AND OMISSIONS

CITY OF TERRACE
5003 GRAHAM AVENUE, TERRACE, BC ,V8G 1B3

EMERGENCY LANDSLIDE ASSESSMENT AT 5412, 5414 AND 5416 MCCONNELL CRESCENT, TERRACE, BC PLAN VIEW

Drawing No.
C-100

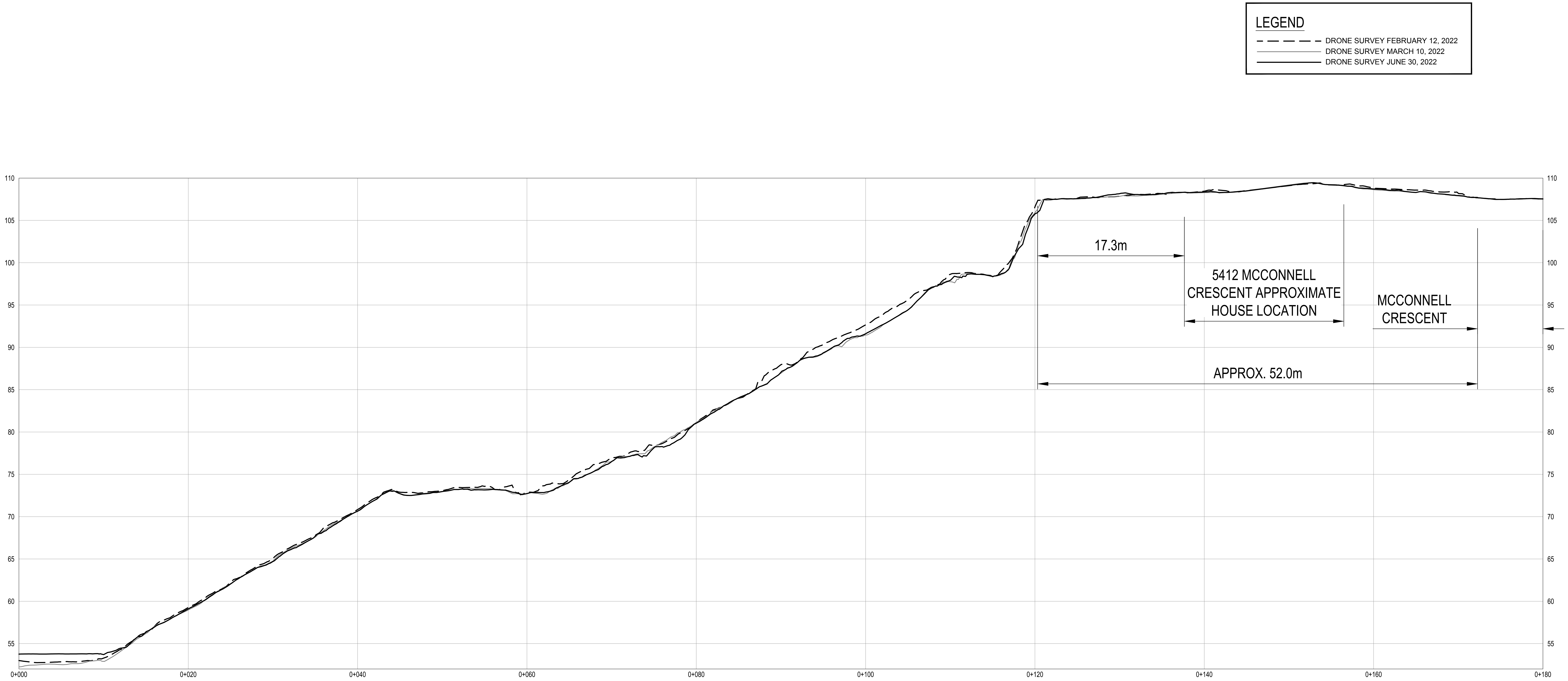
Project Number
2321-22486-00

Rev.
PC

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

DATE: 2022-07-05, 09:08 FILE: X:\2321\02100's\02106-00 McConnell Slide Slope Monitoring\10.0 Drawings\10.3 Engineering\10.3.1 Sheets\C-100.dwg

McElhanney ANSI D - 2018-09-11



- C-101 SECTION A-A
SCALE H 1:250

DATE: 2022-07-05, 09:08 FILE: X:\2321\02100's\02106-00 McConnell Slide Slope Monitoring\10.0 Drawings\10.3 Engineering\10.3.1 Sheets\C-100.dwg

Rev	Date	Description	Drawn	Design	App'd
PC	2022-04-10	REVISED FOR MARCH 10, 2022 DRONE FLIGHT	JMD	-	CJH
PA	2022-02-23	ISSUED FOR INFORMATION	JMD	-	CJH

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0 H1:250 10
0 V1:250 10

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EMERGENCY LANDSLIDE ASSESSMENT
AT 5412, 5414 AND 5416 MCCONNELL
CRESCENT, TERRACE, BC
SECTION A-A

Drawing No.
C-101

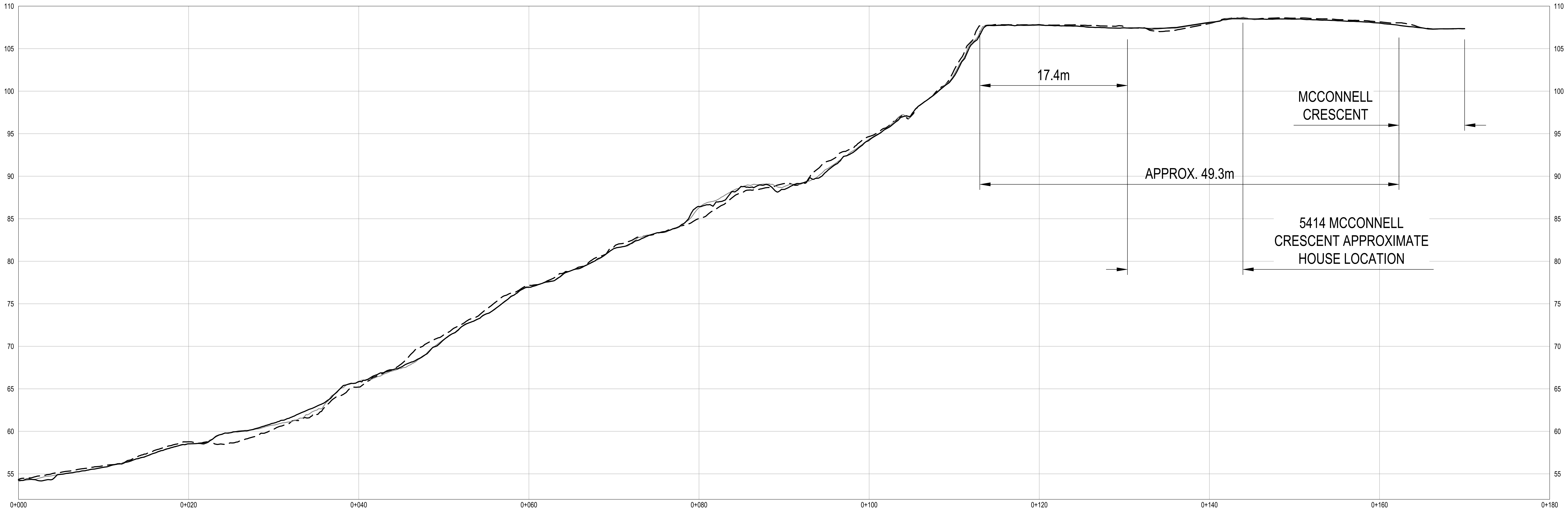
Project Number
2321-22486-00

Rev.
PC

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

LEGEND

— — — DRONE SURVEY FEBRUARY 12, 2022
——— DRONE SURVEY MARCH 10, 2022
——— DRONE SURVEY JUNE 30, 2022



- / C-101 SECTION B-B
SCALE H 1:250

Rev	Date	Description	Drawn	Design	App'd
PC	2022-04-10	REVISED FOR MARCH 10, 2022 DRONE FLIGHT	JMD	-	CJH
PA	2022-02-23	ISSUED FOR INFORMATION	JMD	-	CJH

0 H1:250 10
0 V1:250 10

ORIGINAL DWG SIZE: ANSI D (22" x 34")

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CITY OF TERRACE
5003 GRAHAM AVENUE, TERRACE, BC ,V8G 1B3

EMERGENCY LANDSLIDE ASSESSMENT
AT 5412, 5414 AND 5416 MCCONNELL
CRESCENT, TERRACE, BC
SECTION B-B

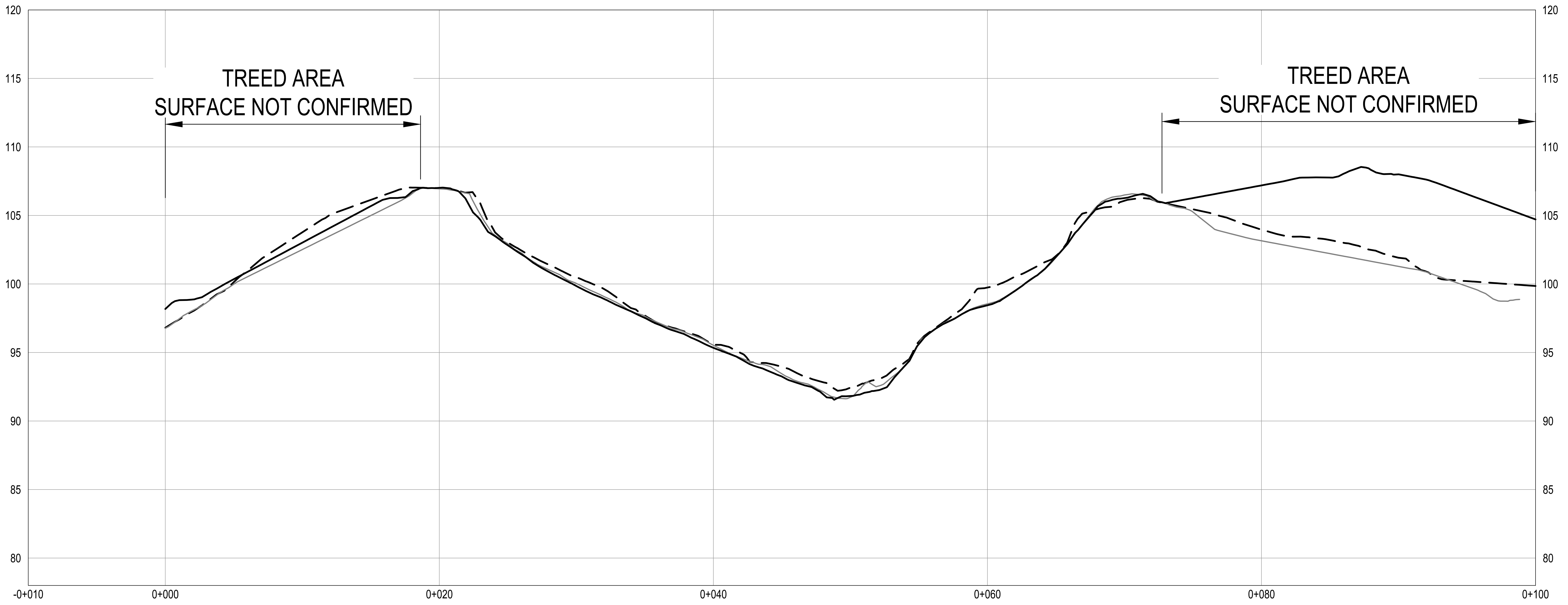
Drawing No.
C-102

Project Number
2321-22486-00

Rev.
PC

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

-
C-101
SECTION C-C
SCALE H 1:250



-
C-101
SECTION D-D
SCALE H 1:250

LEGEND
- – – – DRONE SURVEY FEBRUARY 12, 2022
- —— DRONE SURVEY MARCH 10, 2022
- —— DRONE SURVEY JUNE 30, 2022

Rev	Date	Description	Drawn	Design	App'd
PC	2022-04-10	REVISED FOR MARCH 10, 2022 DRONE FLIGHT	JMD	-	CJH
PA	2022-02-23	ISSUED FOR INFORMATION	JMD	-	CJH

0 H1:250 10
0 V1:250 10

ORIGINAL DWG SIZE: ANSI D (22" x 34")

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CITY OF TERRACE
5003 GRAHAM AVENUE, TERRACE, BC ,V8G 1B3

EMERGENCY LANDSLIDE ASSESSMENT AT 5412, 5414 AND 5416 MCCONNELL CRESCENT, TERRACE, BC SECTION C-C , SECTION D-D

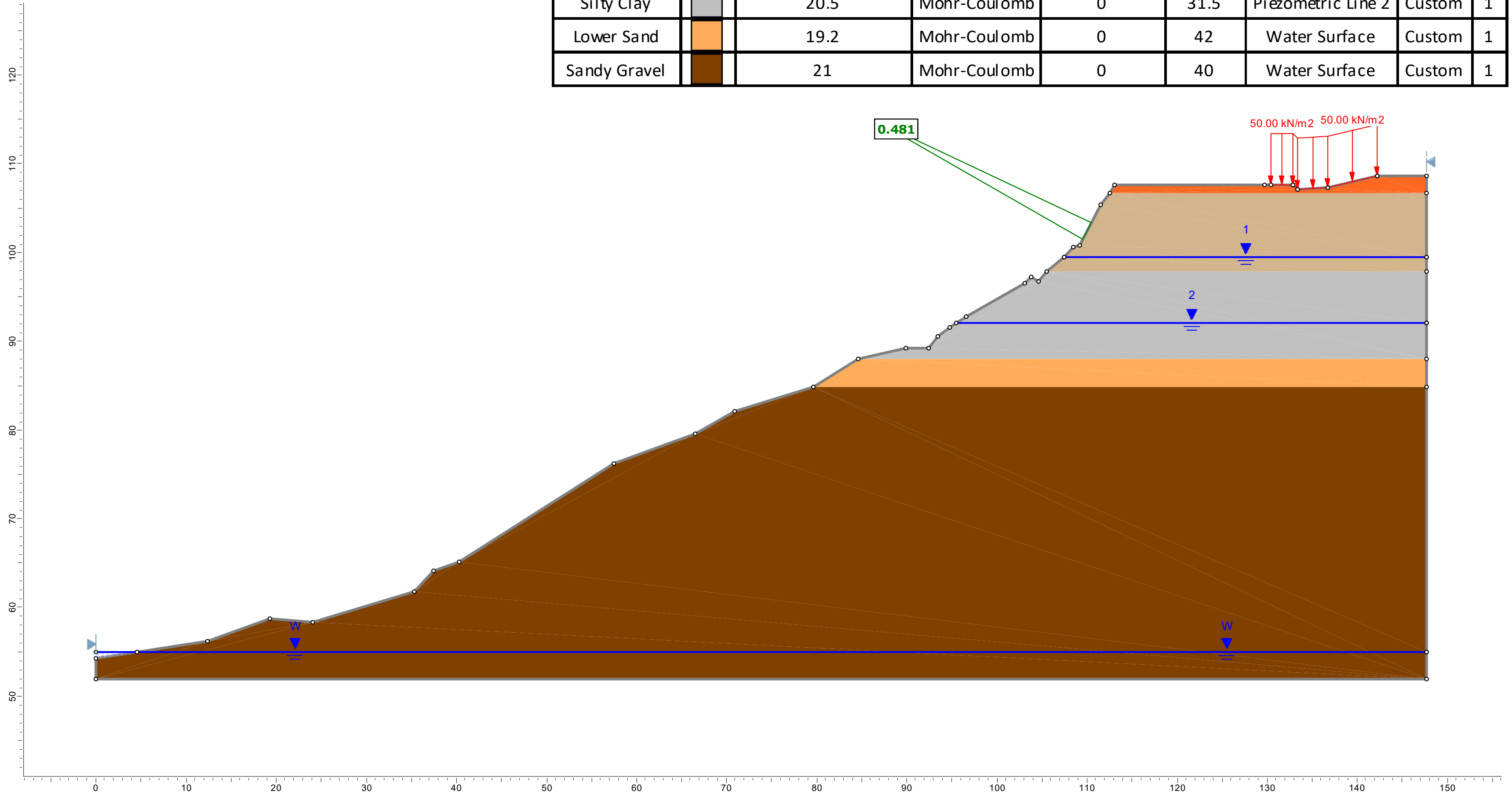
Drawing No.
C-103

Project Number: 2321-22486-00
Rev.: PC

DESTROY ALL PRINTS BEARING PREVIOUS REVISION

DATE: 2022-07-05, 09:08 FILE: X:\2321\02100's\02106-00 McConnell Slide Slope Monitoring\10.0 Drawings\10.3 Engineering\10.3.1 Sheets\C-100.dwg

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu
Topsoil	🟧	15	Mohr-Coulomb	5	25	Water Surface	Custom	1
Upper Sand	🟨	19.2	Mohr-Coulomb	0	42	Piezometric Line 1	Custom	1
Silty Clay	⬜	20.5	Mohr-Coulomb	0	31.5	Piezometric Line 2	Custom	1
Lower Sand	🟧	19.2	Mohr-Coulomb	0	42	Water Surface	Custom	1
Sandy Gravel	🟫	21	Mohr-Coulomb	0	40	Water Surface	Custom	1



DATE: 2022-07-12
DRAWN: HT
DESIGNED: HT
CHECKED: JT
APPROVED: JT

TAYLOR GEOTECHNICAL

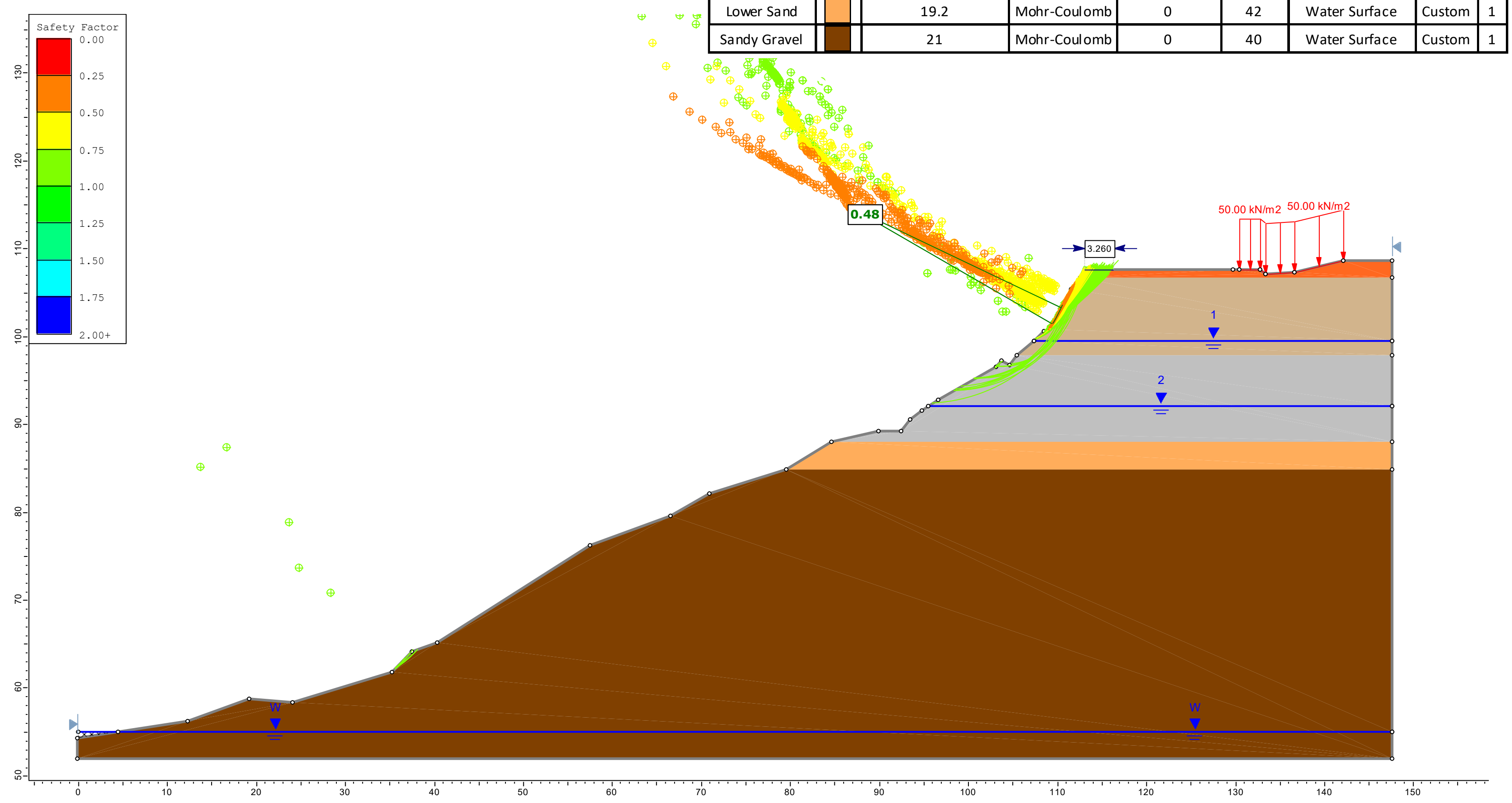
CLIENT: **City of Terrace**

PROJECT: **McConnel Cres Site Investigation**

CASE: **Minimum FOS (Static)**

PROJECT #: 2022-019
FIGURE: **C1**
REV.: 0

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu
Topsoil	🟧	15	Mohr-Coulomb	5	25	Water Surface	Custom	1
Upper Sand	🟫	19.2	Mohr-Coulomb	0	42	Piezometric Line 1	Custom	1
Silty Clay	⬜	20.5	Mohr-Coulomb	0	31.5	Piezometric Line 2	Custom	1
Lower Sand	🟧	19.2	Mohr-Coulomb	0	42	Water Surface	Custom	1
Sandy Gravel	🟫	21	Mohr-Coulomb	0	40	Water Surface	Custom	1



DATE: 2022-07-12
DRAWN: HT
DESIGNED: HT
CHECKED: JT
APPROVED: JT

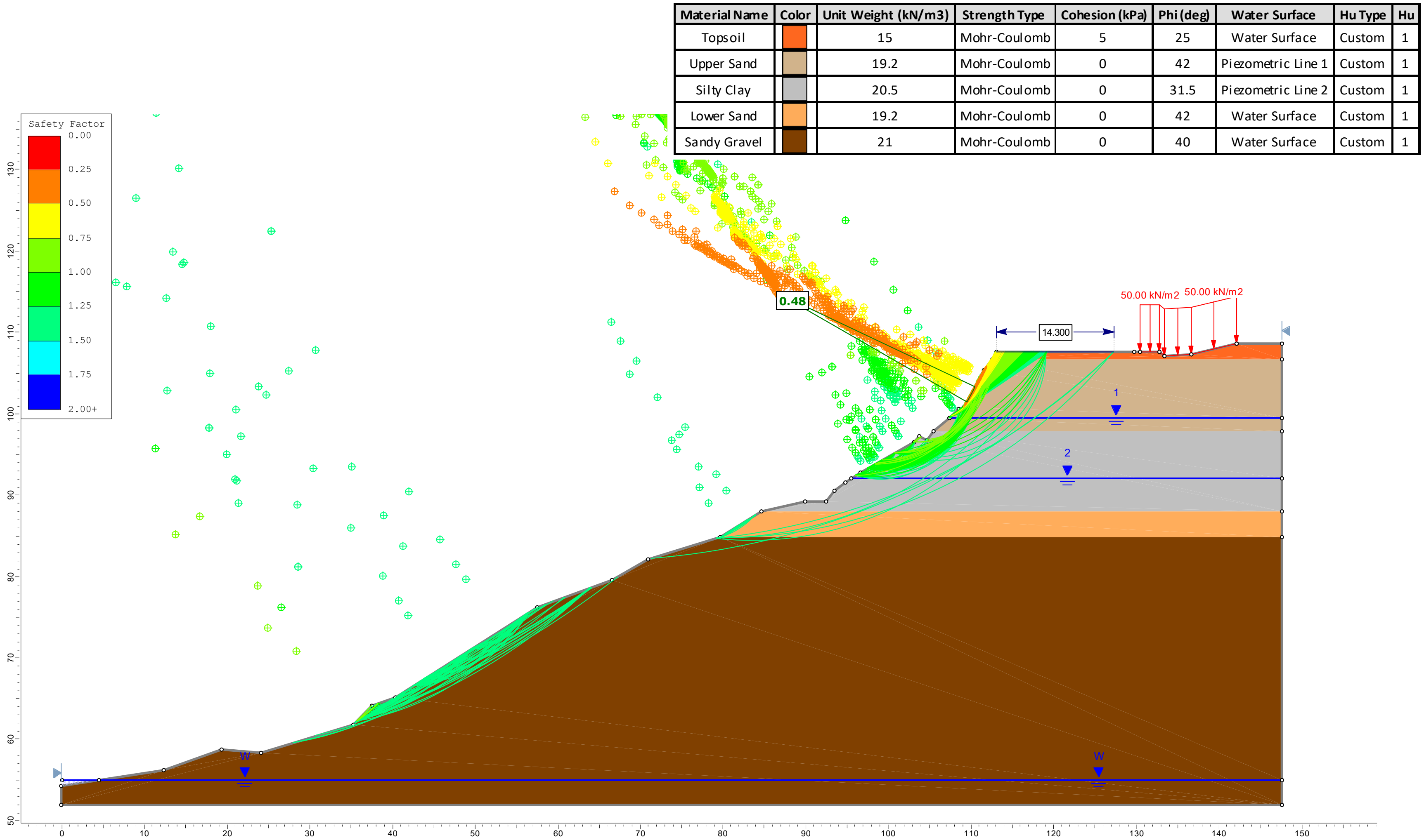
TAYLOR GEOTECHNICAL

CLIENT: **City of Terrace**

PROJECT: **McConnel Cres Site Investigation**

CASE: **FOS < 1 (Static)**

PROJECT #: 2022-019
FIGURE: **C2**
REV.: 0



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu
Topsoil	🟧	15	Mohr-Coulomb	5	25	Water Surface	Custom	1
Upper Sand	🟫	19.2	Mohr-Coulomb	0	42	Piezometric Line 1	Custom	1
Silty Clay	⬜	20.5	Mohr-Coulomb	0	31.5	Piezometric Line 2	Custom	1
Lower Sand	🟧	19.2	Mohr-Coulomb	0	42	Water Surface	Custom	1
Sandy Gravel	🟫	21	Mohr-Coulomb	0	40	Water Surface	Custom	1

DATE:	2022-07-12
DRAWN:	HT
DESIGNED:	HT
CHECKED:	JT
APPROVED:	JT

TAYLOR GEOTECHNICAL

CLIENT:
City of Terrace

PROJECT:
McConnel Cres Site Investigation

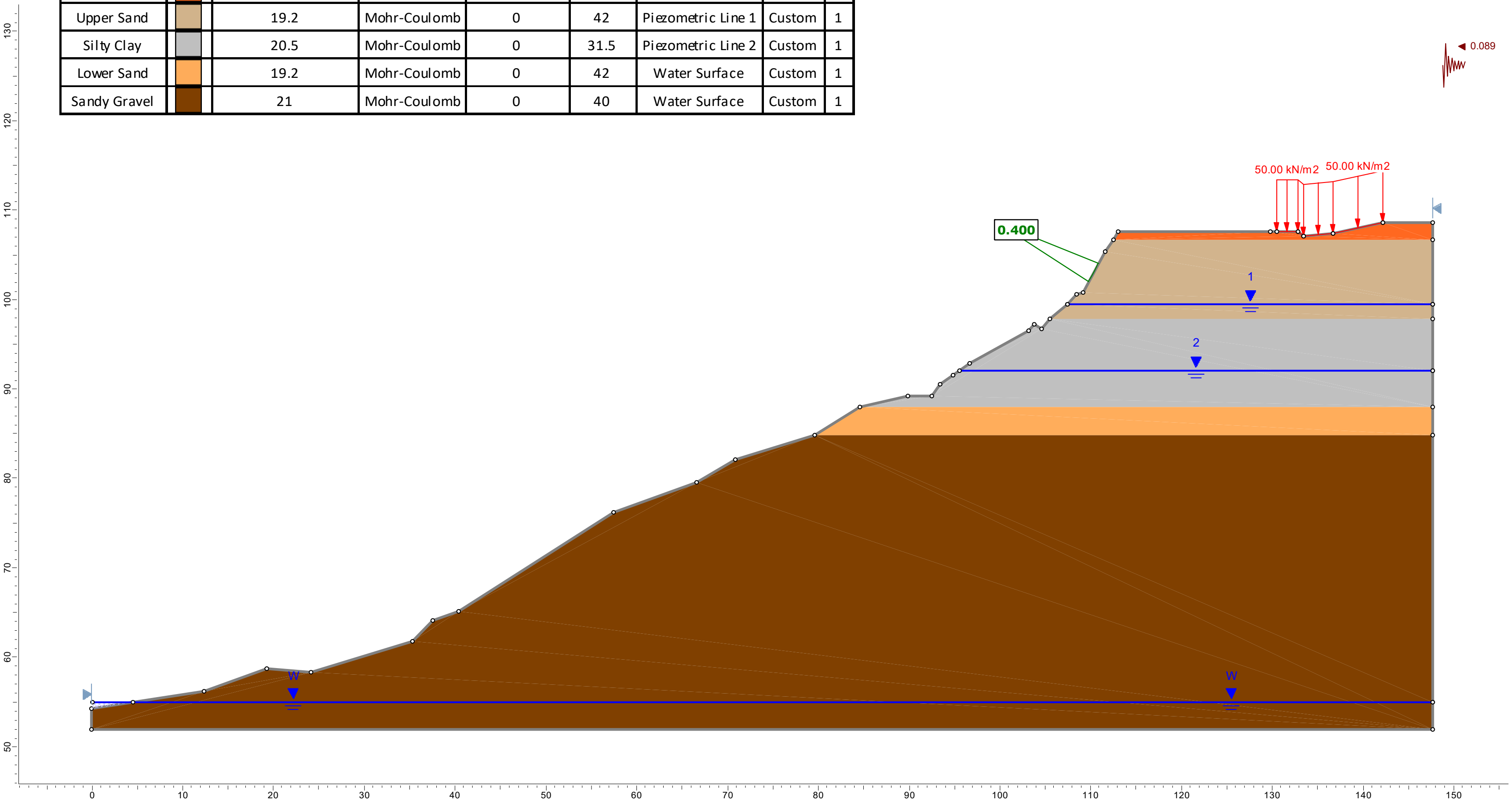
CASE:
FOS < 1.5 (Static)

PROJECT #: 2022-019

FIGURE: C3

REV.: 0

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu
Topsoil	▨	15	Mohr-Coulomb	5	25	Water Surface	Custom	1
Upper Sand	▨	19.2	Mohr-Coulomb	0	42	Piezometric Line 1	Custom	1
Silty Clay	▨	20.5	Mohr-Coulomb	0	31.5	Piezometric Line 2	Custom	1
Lower Sand	▨	19.2	Mohr-Coulomb	0	42	Water Surface	Custom	1
Sandy Gravel	▨	21	Mohr-Coulomb	0	40	Water Surface	Custom	1



DATE: 2022-07-12
DRAWN: HT
DESIGNED: HT
CHECKED: JT
APPROVED: JT

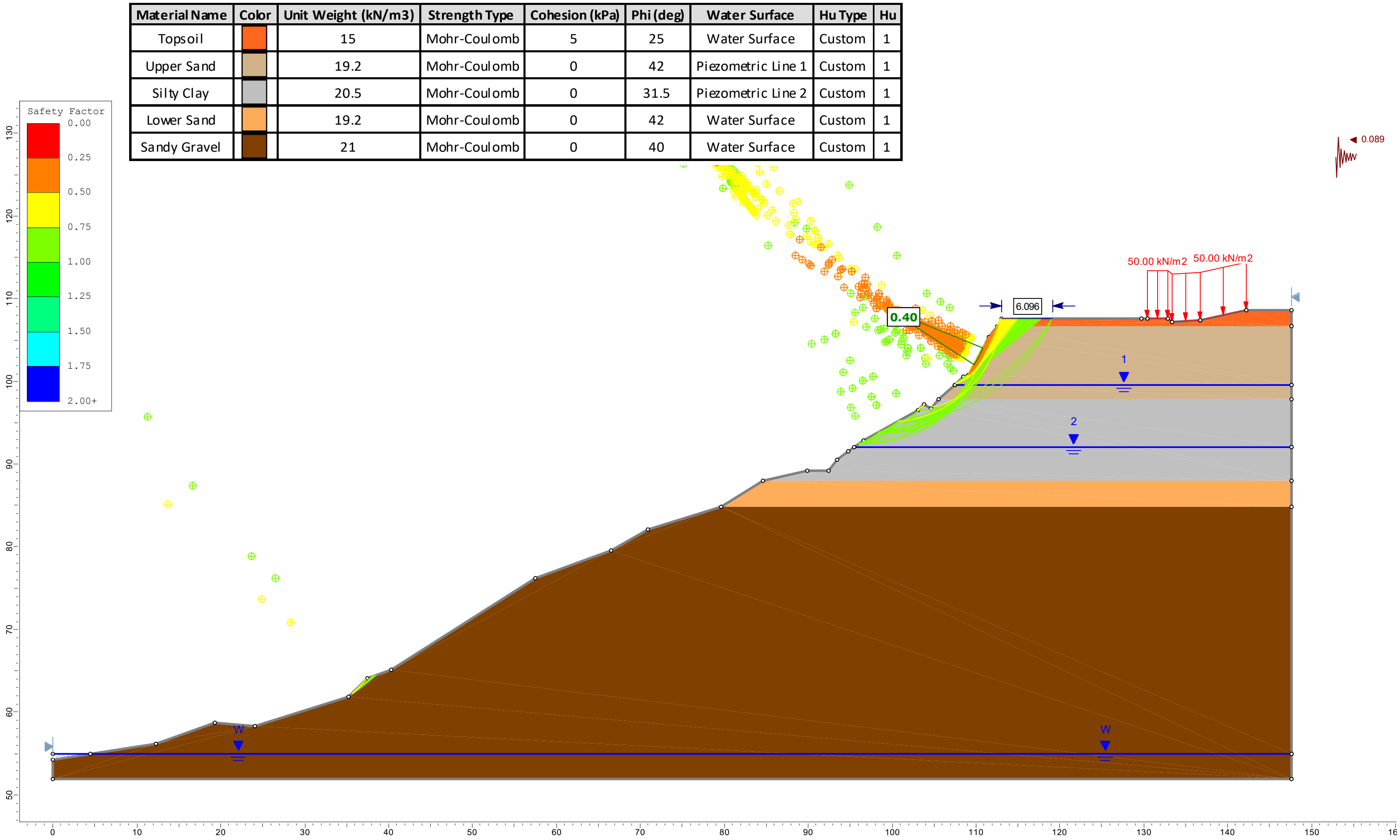
TAYLOR GEOTECHNICAL

CLIENT:
City of Terrace

PROJECT:
McConnel Cres Site Investigation

CASE:
Minimum FOS (Pseduo-Static)

PROJECT #: 2022-019
FIGURE: **C4**
REV.: 0



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Water Surface	Hu Type	Hu
Topsoil	🟧	15	Mohr-Coulomb	5	25	Water Surface	Custom	1
Upper Sand	🟫	19.2	Mohr-Coulomb	0	42	Piezometric Line 1	Custom	1
Silty Clay	⬜	20.5	Mohr-Coulomb	0	31.5	Piezometric Line 2	Custom	1
Lower Sand	🟧	19.2	Mohr-Coulomb	0	42	Water Surface	Custom	1
Sandy Gravel	🟫	21	Mohr-Coulomb	0	40	Water Surface	Custom	1

DATE: 2022-07-12
DRAWN: HT
DESIGNED: HT
CHECKED: JT
APPROVED: JT

TAYLOR GEOTECHNICAL

CLIENT: **City of Terrace**

PROJECT: **McConnel Cres Site Investigation**

CASE: **FOS less than 1.5 (Pseduo-Static)**

PROJECT #: 2022-019
FIGURE: **C5**
REV.: 0