Report of Geohazard Exploration – SUM-271-8.87 Summit County, Ohio PID: 103930

FINAL

Prepared for:
Ohio Department of Transportation(ODOT)-Division of Engineering

Prepared by:
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February 2, 2018

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File: 175526009

Attention: Thomas J. Powell, PE
District Design Engineer
Ohio Department of Transportation, District 4
Planning & Engineering Administration
2088 S. Arlington Road
Akron, Oh 43306

Dear Mr. Powell,

Reference: Report of Geohazard Exploration – SUM-271-8.87 – PID: 103930 - FINAL
Summit County, Ohio

The following report summarizes the exploration, testing, monitoring and analyses performed for the geohazard exploration in Summit County along Interstate Route 271. The geotechnical exploration was performed in order to characterize the current conditions of the embankment as well as install inclinometer instrumentation to continue monitoring the embankment. Based upon the results of the borings, subsequent laboratory testing, inclinometer readings and various engineering analyses, recommendations for landslide remediations were made. The report has been modified to meet ODOT Office of Geotechnical Engineering (OGE) format. We appreciate the opportunity to provide you with these services, and please do not hesitate to contact us with any questions or comments.

Regards,

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Executive Summary

The Ohio Department of Transportation (ODOT) District 4 is proposing to repair a highway embankment exhibiting signs of a slippage, located on Interstate Route 271 in Hudson, Ohio near Mile 8.87 in Summit County, Ohio. The highway embankment being investigated is located approximately 12.8 miles northwest of Akron, Ohio. The landslide area is approximately 300 feet along the road and is developing on the shoulder and within the mid to upper portion of the embankment of the southbound lanes. The extents of the slope movement were observed to be from approximately Station 465+00 to 468+00 along the IR-271 SB highway embankment. A large soil bulge was observed along the midslope of the embankment. Additional movement was discovered in the form of cracking. Tension cracking was noted along the guard rail of SB IR-271. Additional cracking was observed near the top of the embankment, but due to vegetation cover, no additional evidence of slope movement was observed. Stantec Consulting Services Inc. (Stantec) has been contracted by ODOT to provide engineering services to monitor slope stability and provide remediation alternatives.

A total of five borings were performed in this geotechnical exploration. borings B-001-0-16 and B-003-0-16 were located near or within the existing outside shoulder of I-271, boring B-002-0-16 was located along the midslope of the embankment, and borings B-001-1-16 and B-003-1-16 were located along the toe of the embankment slope. The soils encountered throughout the embankment classified as soil types A-6a, A-6b, A-1-b, and A-4b.

Amongst the five borings, slope inclinometers were installed in three borings; one near the shoulder, one near the midslope, and one near the toe. The inclinometers were grouted in place to allow for movement within the slope to be measured. Data recorded from the inclinometer measurements indicated movement within the top 10 feet of the embankment. Based upon this information, one cross section was analyzed using Slope/W software with the current geometry of the slope and with remediation alternatives.

A total of four recommended alternatives for remediation of the landslide were reviewed and analyzed. The four alternatives analyzed were as followed: a stability berm, a benched excavation embankment, soil nails, and a combination of soil nails and stability berm. Based on a review of the alternatives discussed in this report and discussions with ODOT District 4 personnel, Alternative 2 (Benched Excavation Embankment) is recommended as the most suitable design to balance cost and timely remediation while providing the minimal highway closures for repairs to the highway embankment. Additionally, implementing Alternative 2 will maintain the existing ditch line that extends at the toe of the embankment preventing any disturbance to the current hydrologic conditions.

1.0 INTRODUCTION

1.1 PROJECT LOCATION AND BACKGROUND

The Ohio Department of Transportation (ODOT) District 4 is proposing to repair a highway embankment exhibiting signs of a slippage located on Interstate Route 271 in Hudson, Ohio near Mile 8.87 in Summit County, Ohio. The highway embankment investigated is located approximately 12.8 miles north west of Akron, Ohio. The location is shown on the Site Location Map provided in Appendix A as Exhibit A-1.

Stantec Consulting Services Inc. (Stantec) has been contracted by ODOT to provide engineering services to monitor slope stability and provide remediation alternatives. This report summarizes the geotechnical exploration performed for the Summit County Interstate Route 271.

1.2 PURPOSE AND SCOPE

The purposes of this phase of the project were to evaluate the existing conditions along the southbound IR-271 highway embankment near Mile 8.87 in Summit County, Ohio and to provide recommendations and alternatives for improving the highway embankment. A general overview of the tasks are as follows:

1. Embankment Evaluation – Multiple site visits were performed to evaluate and document (via inclinometer measurements) existing conditions to help determine the mechanism of the existing instability. Geotechnical sampling and laboratory testing were performed to define subsurface conditions.

2. Preliminary Design – Perform slope stability analyses on current conditions and provide recommendations for several alternatives for upgrading the highway embankment to meet current design requirements.

1.3 DESCRIPTION OF HIGHWAY EMBANKMENT

A Site Aerial Map of the Summit IR-271 Highway Embankment area is included in Appendix A as Exhibit A-2. This exhibit shows the locations of the primary features evaluated as part of this study.

The highway embankment being investigated in Summit County, Ohio is located near Mile 8.87 between Stations 465+00 to 468+00 of IR-271 along the southbound lanes. The landslide within the highway embankment extends approximately 300 feet and has developed within the mid to upper portion of the embankment. The sliding mass has caused damage to the outside shoulder and guardrail. A typical cross section of the embankments between Stations 465+00 to 468+00 from the 1965 Construction Plans can be seen in Appendix A on Exhibit A-3.

1.4 SOURCES OF INFORMATION

Refer to Section 6.0 of this report for a list of sources referenced throughout this report.

2.0 GEOLOGY AND OBSERVATIONS OF THE PROJECT

2.1 GENERAL

The Physiographic Regions of Ohio Map (Ohio Department of Natural Resources (ODNR), 1998) indicates that the project site is located in the Glaciated Allegheny Plateaus region of Ohio. The project is in the general vicinity of the boundaries of the Killbuck-Glaciated Pittsburgh Plateau and the Akron-Canton Interlobate Plateau. This region is described as having ridges and flat uplands, generally about 1200 feet in elevation, covered with thin drift (glacial deposited soils) and dissected by steep valleys. Valley segments in this region alternate between broad drift-filled and narrow rock-walled reaches. The ground surface elevation in this physiographic region ranges from approximately 800 to 1400 feet and has a moderate relief (200 feet).

2.2 SOIL GEOLOGY

The Physiographic Regions of Ohio Map (Ohio Department of Natural Resources (ODNR), 1998) indicates thin to thick Wisconsinan-age clay to loam glacial till over Mississippian-and Pennsylvanian-age shales, sandstones, conglomerates, and coals. The mapped Quaternary Geology of Ohio, Cleveland Quadrangle (ODNR, 1994) indicates the project area consists of clayey till (Hiram till) ground moraines, flat to gently undulating from the Late Wisconsin glacial period.

Near surface soils in the project area, as shown in the Web Soil Survey (United States Department of Agriculture (USDA), 2014), consist of some Ellsworth silt loam, Cardinal-Mentor silt loams and primarily of Udorthents. Ellsworth silt loams are described as moderately well drained, and have a very low to moderately low runoff potential. Cardinal-Mentor silt loams soil types are typically found near the toe of the embankment slopes within the project vicinity and are described as well drained, and have a low to moderately high runoff potential. Udorthents are considered as fill material and are not given a typical AASHTO Group Classification; therefore, drainage and runoff for much of the soil within the embankment area could not be described from the soil survey.

2.3 BEDROCK GEOLOGY

According to the Reconnaissance Bedrock Geology of the Northfield, Ohio Quadrangle (ODNR, 1996), bedrock units from the Ohio Shale formation from the Devonian System are present within the project area. The Ohio Shale rock formation consists of carbonaceous shale with carbonate/siderite concretions. This rock unit is typically described as brownish black to greenish

gray, weathers brown in color, and is laminated to thin bedded with fissile partings and typically has a thickness of 250 to over 500 feet. Bedrock topography mapping (Shaded Bedrock Topography Map of Ohio, ODNR, 2004) indicates bedrock surfaces ranging from elevations of 400 to 900 feet. Drift thickness mapping (Shaded Drift Thickness Map of Ohio, ODNR, 2004) indicates that drift (glacially deposited soil above bedrock) ranges from 50 to 120 feet in the project vicinity.

The Ohio Karst Areas (ODNR, 2006) map indicates no probable karst areas exist within the project vicinity.

2.4 HYDROLOGY AND HYDROGEOLOGY

Due to the nature of the soils in the project vicinity being Udorthents, no Hydrologic Soil Groups could be determined since this is considered a fill material.

The Hydrogeologic Settings of the Unconsolidated Aquifers of Ohio (ODNR) indicates that the soils near the project tend to have hydrogeologic settings of Buried Valleys and Thin Upland.

According to the Ground-Water Resources of Summit County, (ODNR, 1979), the project is located in an area where yields seldom exceed 3 gallons per minute. Fine sand, silt, lacustrine clay and very thick clayey till deposits are commonly found near the surface of the shale bedrock formation. Although some thin deposits of sand and gravel may be present, yields are minimal.

2.5 GROUNDWATER CONDITIONS ENCOUNTERED

Groundwater levels were unable to be determined during exploration due to the addition of water/drilling mud throughout drilling (all borings but B-001-1-16) to advance auger casings to sufficient depths. Additional drilling fluids were added typically between a depth of 30 to 40 feet from the surface. Water was added in borings B-001-0-16, B-003-0-16 and B-002-0-16. Soils in these borings classified as A-6a. Drilling mud was added in boring B-003-1-16. Soils in boring B-003-1-16 classified as A-1-b and A-4.

2.6 FIELD OBSERVATIONS

During reconnaissance, the onsite engineer observed that, along the graded face of the slope, a large soil bulge was present. Additional movement was observed in the form of cracking. Tension cracking was noted along the guard rail of SB IR-271. Additional cracking was observed near the top of the embankment within the upper 10 feet, but due to vegetation cover, no additional evidence of slope movement was observed.

3.0 EXPLORATION

3.1 HISTORIC GEOTECHNICAL DATA

A historic information search was conducted via the Ohio Department of Transportation Geotechnical Data Management System (ODOT GeoMS) and historical documents given to Stantec by ODOT. Historical files from a geotechnical report indicated that plans for the highway embankment were created for Interstate Route 271 in Hudson, Ohio near Mile 8.87 in 1965.

Historical subsurface data from these documents identified soils between Stations 465+00 to 468+00 consisting primarily of silts, clays, gravel and stone fragments with sand, silt and clay which are graphically depicted in Appendix A as Exhibit A-3. Documents from ODOT project SUM-271-8.29 at station 465+00 indicated the following soil stratification in descending order from ground surface:

-Clay (A-7-6)

-Gravel and/or Stone Fragments with Sand, Silt and Clay (A-2-6 and A-2-7)

-Clay (A-7-6)

-Silt and Clay (A-6)

-Gravel and/or Stone Fragments With Sand (A-1-b)

3.2 PROJECT EXPLORATION PROGRAM AND SAMPLING METHODS

A total of five borings were advanced (see Exhibit A-2) with depths ranging from 40 to 60 feet. The borings were advanced with an ATV-mounted drill rig using 4.25-inch inside-diameter hollow-stem augers. Due to the fairly steep 2:1(H:V) slope of the highway embankment, the borings on the slope required the use of a winch truck (positioned at the top of the embankment) to provide anchorage during rig placement and drilling operations. Standard penetration test (SPT) samples were obtained continuously in each boring, except for selected locations where undisturbed sampling was performed. Field logs for each boring were prepared on site by the geotechnical engineer. Visual classifications were assigned to soils encountered. Final logs for each boring were prepared upon completion of all laboratory testing and are included in Appendix B.

Amongst the five borings advanced, slope inclinometers were installed in three borings, one in the shoulder boring (B-003-0-16), one in the midslope boring (B-002-0-16) and one at the toe (B-003-1-16). The inclinometers were installed in accordance with the ODOT SGE, Section 503. Protector covers were installed in accordance with the ODOT SGE Section 504. After installation,

inclinometer readings were taken to establish the baseline for further readings. Additional inclinometer readings were then taken bi-monthly.

3.3 LABORATORY TESTING

The samples were transported to Stantec's soil laboratory where a visual classification was performed and natural moisture content (MC) measured. Engineering classification testing was performed on samples reflecting the primary soil horizons. The engineering classification tests conducted on the samples include sieve and hydrometer analysis (ASTM D 422) and Atterberg Limits (ASTM D 4318). These samples were classified in accordance with the ODOT classification system.

Additionally, selected undisturbed samples for each boring were subjected to unconfined compression testing as well as consolidated-undrained triaxial compression testing. These samples were also classified in accordance with the ODOT classification system.

3.4 INCLINOMETER INSTRUMENTATION MEASUREMENTS

As previously discussed in this report, bimonthly readings of the installed inclinometers were taken to further monitor the deflections of the embankment. The inclinometer data obtained can be referenced in Appendix D. Based upon data recorded from the inclinometer measurements in the field, the zone of movement was generally found within the top 10 feet of the embankment.

4.0 FINDINGS

The locations of the borings are shown on the Proposed Plan of Exploration Map included in Appendix A. Subsurface logs of the borings performed are included in Appendix B, with a summary of the lab testing data included in Appendix C.

Based on the geotechnical exploration and laboratory findings the following subsurface information was found:

Topsoil within the majority of the borings in the project vicinity was regularly found to be composed of a medium stiff to stiff brown mottled gray, fine grained soil consisting of clays and silts that were damp to moist and visually classified as A-7-6 soils. Topsoil thicknesses ranged from 0 to 1.5 feet across the project site.

Embankment soils were encountered below the topsoil. These soils were described as fine-grained soil, brown mottled gray in color and stiff to hard. These soils were damp, with hand penetrometer recordings on average between 4.0 tsf to 4.5+ tsf. The predominant ODOT soil classifications encountered in this layer were A-6a and A-6b.

Residual soils were encountered at a wide range of depths below the embankment material over the project vicinity ranging from Elevation 732 feet to 712 feet. These soils may be described as both granular and fine-grained soils. Laboratory test results from field collected Shelby tubes indicated the presence of two different types of fine-grained materials below the embankment fill material.

Undisturbed soil samples were collected during drilling operations and subjected to unconfined compression testing as well as consolidated-undrained triaxial compression testing. Results yielded unconfined compressive strengths ranging from 2.20 to 2.99 tsf, and consolidated undrained triaxial compression testing parameters of ϕ'=29.1 deg. and c'=0.1 tsf for the embankment fill material.

5.0 ANALYSES AND RECOMMENDATIONS

5.1 ANALYSIS OF EXISTING CONDITIONS

One cross section was analyzed using Slope/W software to determine the factor of safety modeling existing conditions. Material parameters were developed for each material based on lab testing results and various geotechnical correlations using blow counts and other information obtained during drilling and testing. The embankment was modeled as a limit equilibrium state using drained conditions. A graphical representation of this model can be viewed in Appendix E Exhibit E-1.

The analysis results yielded factors of safety with regard to slope stability above the minimum required FS of 1.3. As this was inconsistent with the observed behavior, a back-calculation of stability using adjusted effective strength parameters necessary to reflect the existing equilibrium condition (i.e, FS=1) was performed, and that analysis indicated embankment material parameters of ϕ'=22.9 deg. and c'=0 psf. Table 5.1 lists the effective strength parameters for each material strata within the embankment that was incorporated into the back-analyses.

Table 5.1 Modeled Strength Parameters

Material Name	Unit Weight(lbs/ft^3)	Cohesion(lbs/ft^2)	Phi Angle(degrees)
Embankment Fill	116.6	0	22.9
Gravel and Stone Fragments with Sand, Silt and Clay	105	0	33
Gravel and Stone Fragments with Sand	130	0	39
Silt and Clay (Native)	100	0	28
Silt and Clay (Native)	107.9	270	28
Silt (Native)	100	190	32

Although the fill strengths estimate by the analyses were less than lab test results, the strength parameters utilized for the embankment fill material are consistent with residual strengths, as there is evidence that the slope is already moving consistently. Residual strength parameters for the embankment fill were based on Plasticity Index (PI) values from lab testing and correlations put forth by Bovis, 1985. Strength parameters for all other embankment materials encountered were based on correlations from NAVFAC DM 7.01 and 7.02, 1986. A graphical representation of this model can be viewed in Appendix E Exhibit E-2 with a minimum depth of slip surface of 10 feet and in Exhibit E-3. All strength correlations are referenced in Appendix F.

Based on the current geometry of the slope and the strength parameters developed, the factor of safety regarding the current stability of the embankment is at or near equilibrium. This indicates that the embankment is susceptible to continued movement. Graphical representation of this model can be viewed in Appendix E Exhibit E-3.

Preliminary options for remediation of the landslide include: 1) the installation of a rock or soil berm at the toe of the embankment; 2) soil nails imbedded to a depth past the critical slip surface; 3) reconstruction of the slope incorporating benching within the embankment; 4) or the installation of a rock or soil berm at the toe of the embankment combined with the installation of soil nails. Graphical representation of each of these alternatives may be viewed in Appendix E.

5.2 REMEDIATION ALTERNATIVES CONSIDERED

The following sections describe the remediation alternatives considered. The alternatives were analyzed assuming a target factor of safety of 1.0 for slope stability. Conceptual schematics for recommended alternatives are shown in Appendix E as Exhibit E-4 through E-8.

5.2.1 Alternative 1

Alternative 1 (Exhibit E-4) consists of constructing a berm near the toe of the highway embankment to increase the factor of safety for slope stability. To achieve this, a stability berm similar to that shown in Appendix E Exhibit E-4 is recommended. Regrading the highway embankment to original pre-slide conditions would need to be completed prior to placing the recommended stability berm. It was assumed that material similar to the existing compacted embankment would be used for the berm, therefore compacted clay embankment parameters were used to compute stability. This alternative would not require any closure of travel lines along southbound IR-271 during construction.

5.2.2 Alternative 2

Alternative 2 (Exhibit E-5) is comprised of constructing a new embankment using a bench design to increase the factor of safety for slope stability. To achieve this, a benched embankment similar to that shown in Appendix E Exhibit E-5 is recommended. It was assumed that material similar to the existing compacted embankment would be used for the new embankment, therefore compacted clay embankment parameters were used to compute stability.

This alternative requires excavation and reconstruction that encroaches the southbound IR-271 travel lanes. Maintenance of traffic would likely require crossover and significant lane restrictions.

5.2.3 Alternative 3

Alternative 3 (Exhibit E-6) consists of installing long soil anchor nails to increase the factor of safety for slope stability. To achieve this, a soil nail system similar to that shown in Appendix E Exhibit E-6 is recommended to support the upper portion of the slope. Regrading the highway embankment to original pre-slide conditions would need to be completed prior to placing soil anchor nails. Material properties values of the soil nails were chosen using the National Highway Institute (NHI) Soil Nail Walls Reference Manual (NHI Course No. 132085). This alternative would not require closure of travel lanes along southbound IR-271 during construction.

5.2.4 Alternative 4

Alternative 4 (Exhibit E-7) includes repairs consisting of a combination of short soil anchor nails and a soil berm near the toe of the highway embankment to increase the factor of safety for slope stability. To achieve this, an embankment similar to that shown in Appendix E Exhibit E-7 is recommended. Regrading the highway embankment to original pre-slide conditions would need to be completed prior to placing a stability berm and soil anchor nails. A graphical model, shown in Appendix E Exhibit E-8, verifies that a smaller stability berm without soil nails provides a factor of safety below 1.3; therefore, the use of nails in addition to the stability berm are required as shown in Appendix E Exhibit E-7. Material property values of the soil nails were assumed using the National Highway Institute (NHI) Soil Nail Walls Reference Manual (NHI Course No. 132085). This alternative would not require closure of travel lanes along southbound IR-271 during construction.

5.3 RECOMMENDATIONS AND CLOSING

Based on a review of the alternatives discussed in this report and discussions with ODOT District 4 personnel, Alternative 2 (Benched Excavation Embankment) is recommended as the most suitable design to balance cost and timely remediation while providing the minimal highway closures for repairs to the highway embankment. Additionally, implementing Alternative 2 will maintain the existing ditch line that extends at the toe of the embankment preventing any disturbance to the current hydrologic conditions.

The recommendations are based on the information discussed in this report, the interpretation of the subsurface conditions encountered at the site during the field work and the analyses performed for ODOT District 4 Interstate Route 271 project. If future design changes are made, Stantec should be notified so that such changes can be reviewed and the recommendations amended as necessary.

These conclusions and recommendations are based on data and subsurface conditions from the borings advanced during this exploration using the degree of care and skill ordinarily exercised

under similar circumstances by competent members of the engineering profession. No warranties can be made regarding the continuity of conditions.

All project related engineering design checklists have been included in the Appendix G.

6.0 REFERENCES

Ohio Department of Natural Resources. (1998). *Physiographic Regions of Ohio*. State of Ohio. Department of Natural Resources. Division of Geological Survey

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Lazarte et al., 2015 C.A. Lazarte, H. Robinson, J.E. Gómez, A. Baxter, A. Cadden, B. Ryan. *Soil Nail Walls Reference Manual, Report FHWA-NHI-14-007*. Federal Highway Administration, Washington, DC (2015)

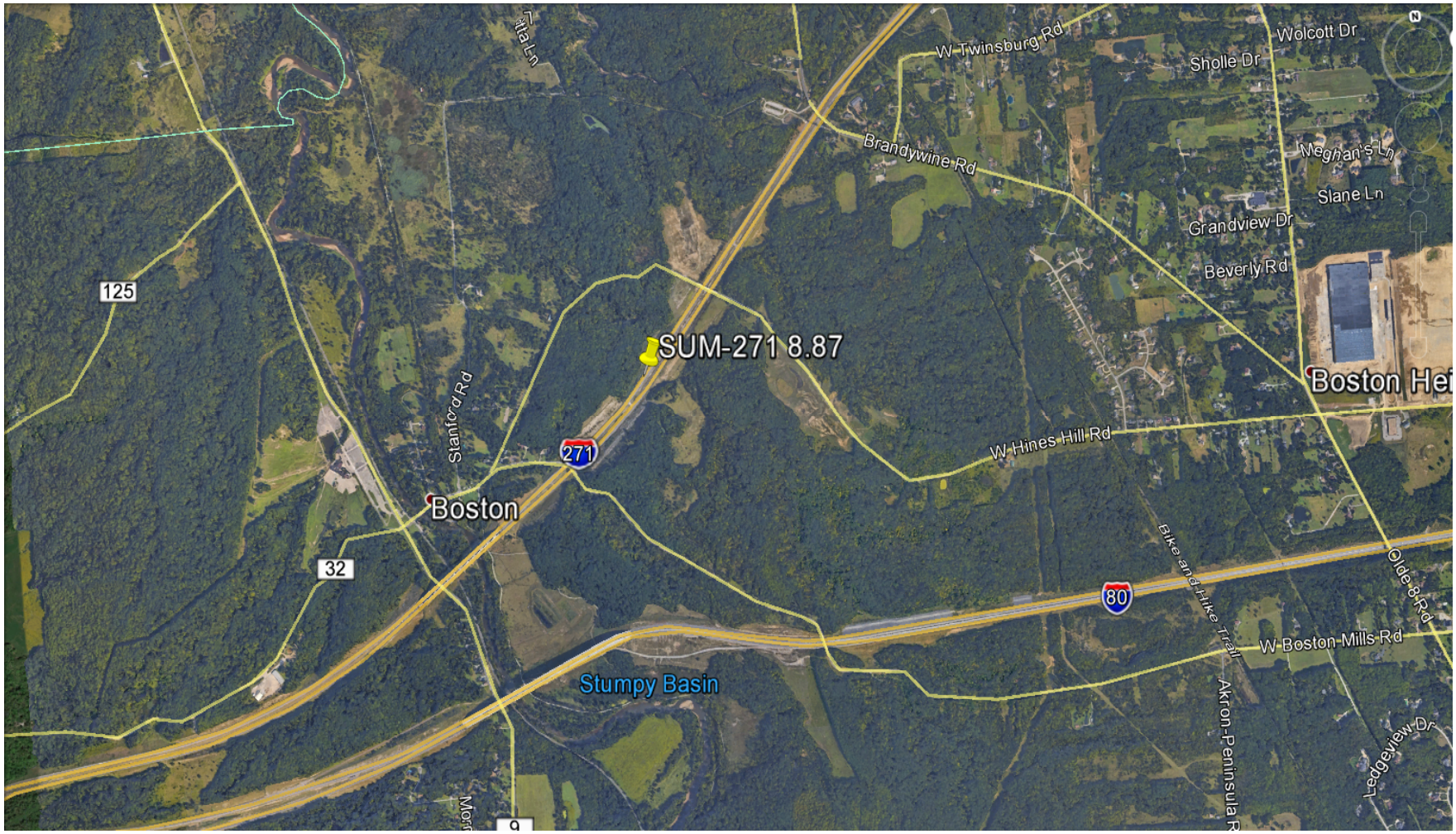
7.0 APPENDICES

Appendix A Site Profile

ATTACHMENT A – Site Location Map

- Summit County I-271, Mile Marker 8.87, SOUTH BOUND LANE SHOULDER

SUM-271-8.87



ATTACHMENT B – Proposed Plan of Exploration

- Summit County I-271, Mile Marker 8.87, SOUTH BOUND LANE SHOULDER

SUM-271-8.87

- Traffic Control TA-33 Traffic Control Method
- 5 Proposed Borings
- 3 proposed Inclinometers

SOIL PROFILE

16/52

SUMMIT COUNTY

SUM-IR 271-8.29

OHIO STATE HIGHWAY TESTING LABORATORY
1620 W. BROAD ST. COLUMBUS 23, OHIO.

Sta. 468+00

Refusal (Boulders)

11

14
22
30 Trace of organic
21
27
34

℄

Sta. 465+00

17
11
23
20
3

(Sta. 465+50)
17
15
14
23
15

(Sta. 465+35)
16
18
27
18
20
4
Refusal (Hole caved in at elev. 740.9')

18
22
24
20
29
11

Appendix B Boring Logs

PROJECT: SUM-271-08.87	DRILLING FIRM / OPERATOR: STANTEC / M.M	DRILL RIG: CME 45 TRUCK	STATION / OFFSET: 465+69, 84' LT.	EXPLORATION ID B-001-0-16
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGERS: STANTEC / P.CICHOCKI	HAMMER: CME AUTOMATIC	ALIGNMENT: I-271	
PID: 103930 SFN:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 11/29/16	ELEVATION: 772.2 (MSL) EOB: 60.5 ft.	PAGE 1 OF 2
START: 12/1/16 END: 12/5/16	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 90.2	COORD: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 772.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL	770.7	1	WOH 2 3	8	47	SS-1	1.50	-	-	-	-	-	-	-	-	15	A-7-6 (V)	
STIFF TO VERY STIFF, BROWN MOTTLED GRAY, **SILT AND CLAY**, LITTLE GRAVEL, TRACE SAND, MOIST TO DAMP		2	3 3 3	9	67	SS-2	2.50	-	-	-	-	-	-	-	-	21	A-6a (V)	
		3 4	3 4 6	15	60	SS-3	3.75	15	4	5	35	41	32	18	14	18	A-6a (10)	
		5 6	5 5 5	15	100	SS-4	3.25 - 3.75	-	-	-	-	-	-	-	-	17	A-6a (V)	
		7 8	7 9 13	33	80	SS-5	4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		9 10	7 8 9	26	100	SS-6	4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		11 12	7 8 10	27	93	SS-7	4.50	-	-	-	-	-	-	-	-	14	A-6a (V)	
		13	7 9 9	27	100	SS-8	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
	758.7	14	11 17 17	51	47	SS-9	4.50	-	-	-	-	-	-	-	-	14	A-6a (V)	
VERY STIFF TO HARD, GRAY MOTTLED BROWN, **SILT AND CLAY**, TRACE GRAVEL AND SAND, DAMP		15 16	5 7 13	30	100	SS-10	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
		17	7 9 15	36	100	SS-11	4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		18 19	13 15 19	51	87	SS-12	4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		20	8 11 13	36	100	SS-13	4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		21 22	5 11 13	36	93	SS-14	4.5+	-	-	-	-	-	-	-	-	16	A-6a (V)	
		23	15 15 20	53	80	SS-15	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
		24 25	10 11 22	50	100	SS-16	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
		26	8 10 12	33	100	SS-17	4.5+	8	4	6	35	47	33	18	15	14	A-6a (10)	
		27	4 10 19	44	93	SS-18	4.0 - 4.5	-	-	-	-	-	-	-	-	15	A-6a (V)	
		28 29	15 20 27	71	80	SS-19	4.5+	-	-	-	-	-	-	-	-	13	A-6a (V)	
			10 12 19	47	100	SS-20	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	

PID: 103930	SFN:	PROJECT: SUM-271-08.87	STATION / OFFSET: 465+69, 84' LT.	START: 12/1/16	END: 12/5/16	PG 2 OF 2	B-001-0-16

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY STIFF TO HARD, GRAY MOTTLED BROWN, **SILT AND CLAY**, TRACE GRAVEL AND SAND, DAMP *(continued)*	742.2	31	9 11 16	41	100	SS-21	4.5+	-	-	-	-	-	-	-	-	16	A-6a (V)	
		32	18 22 30	78	93	SS-22	4.5+	-	-	-	-	-	-	-	-	16	A-6a (V)	
		33	7 13 16	44	100	SS-23	2.5 - 4.5	-	-	-	-	-	-	-	-	18	A-6a (V)	
		34	9 15 16	47	100	SS-24	2.25 - 4.5	-	-	-	-	-	-	-	-	19	A-6a (V)	
		35	16 22 23	68	67	SS-25	4.5+	-	-	-	-	-	-	-	-	19	A-6a (V)	
	734.7	36																
VERY STIFF, GRAY MOTTLED BROWN, **SILTY CLAY**, TRACE SAND AND GRAVEL, DAMP TO MOIST		37	7 9 10	29	100	SS-26	2.5 - 4.0	-	-	-	-	-	-	-	-	26	A-6b (V)	
		38	7 10 10	30	100	SS-27	2.50	-	-	-	-	-	-	-	-	22	A-6b (V)	
		39			95	SS-1	-	4	2	4	38	52	39	21	18	20	A-6b (11)	
	728.2	40																
DENSE TO VERY DENSE, BROWN MOTTLED GRAY, **GRAVEL AND STONE FRAGMENTS WITH SAND**, TRACE SILE AND CLAY, DRY		41	8 10 50	90	67	SS-28	1.25	-	-	-	-	-	-	-	-	20	A-6b (V)	
		42	11 20 21	62	87	SS-29	-	-	-	-	-	-	-	-	-	3	A-1-b (V)	
		43	22 34 35	104	67	SS-30	-	-	-	-	-	-	-	-	-	4	A-1-b (V)	
		44	14 19 24	65	87	SS-31	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	
		45	16 19 22	62	100	SS-32	-	33	39	14	9	5	NP	NP	NP	6	A-1-b (0)	
		46	8 9 40	74	100	SS-33	-	-	-	-	-	-	-	-	-	10	A-1-b (V)	
		47	34 35 52	131	100	SS-34	-	-	-	-	-	-	-	-	-	14	A-1-b (V)	
		48	10 20 22	63	80	SS-35	-	-	-	-	-	-	-	-	-	10	A-1-b (V)	
	717.7	49																
HARD, BROWN AND GRAY, **SILT**, SOME CLAY, TRACE SAND, DAMP TO MOIST		50	1 13 21	51	100	SS-36	-	-	-	-	-	-	-	-	-	19	A-4b (V)	
		51	21 29 33	93	93	SS-37	-	-	-	-	-	-	-	-	-	23	A-4b (V)	
		52	9 16 25	62	100	SS-38	-	-	-	-	-	-	-	-	-	21	A-4b (V)	
		53	4 6 9	23	100	SS-39	-	0	0	6	71	23	NP	NP	NP	24	A-4b (8)	
	711.7	54	EOB															
		55																
		56																
		57																
		58																
		59																
		60																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS; PUMPED 1 BAG BENTONITE GROUT; PUMPED 3 BAGS CEMENT

PROJECT: SUM-271-08.87	DRILLING FIRM / OPERATOR: STANTEC / M.M	DRILL RIG: CME 45 TRUCK	STATION / OFFSET: 465+69, 148' LT.	EXPLORATION ID B-001-1-16
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGERS: STANTEC / P.CICHOCKI	HAMMER: CME AUTOMATIC	ALIGNMENT: I-271	
PID: 103930 SFN:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 11/29/16	ELEVATION: 743.0 (MSL) EOB: 40.0 ft.	PAGE 1 OF 2
START: 11/29/16 END: 11/29/16	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 90.2	COORD: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 743.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL	742.5																	
MEDIUM STIFF TO STIFF, BROWN MOTTLED GRAY, **SILTY CLAY**, TRACE SAND, DAMP		1	1 3 4	11	100	SS-1	3.75 - 4.25	-	-	-	-	-	-	-	-	17	A-6b (V)	
		2	5 6 8	21	60	SS-2	2.75	-	-	-	-	-	-	-	-	19	A-6b (V)	
		3	3 3 5	12	100	SS-3	3.50	-	-	-	-	-	-	-	-	18	A-6b (V)	
		4	2 3 5	12	100	SS-4	3.75	-	-	-	-	-	-	-	-	19	A-6b (V)	
	737.0	5																
STIFF TO VERY STIFF, BROWN MOTTLED GRAY, **SILTY CLAY**, TRACE SAND AND GRAVEL, DAMP		6	5 7 8	23	93	SS-5	4.00	-	-	-	-	-	-	-	-	22	A-6b (V)	
		7	3 5 8	20	100	SS-6	4.00	4	3	6	37	50	37	19	18	20	A-6b (11)	
		8	4 4 7	17	93	SS-7	3.50	-	-	-	-	-	-	-	-	20	A-6b (V)	
		9	4 7 12	29	100	SS-8	4.00	-	-	-	-	-	-	-	-	20	A-6b (V)	
		10	13 14 17	47	93	SS-9	3.5 - 4.5+	-	-	-	-	-	-	-	-	21	A-6b (V)	
		11	4 6 8	21	100	SS-10	2.50	-	-	-	-	-	-	-	-	21	A-6b (V)	
		12	5 7 13	30	100	SS-11	3.25	-	-	-	-	-	-	-	-	21	A-6b (V)	
		13	13 16 19	53	93	SS-12	4.5+	-	-	-	-	-	-	-	-	18	A-6b (V)	
		14	4 8 11	29	100	SS-13	3.25	-	-	-	-	-	-	-	-	21	A-6b (V)	
		15	5 9 10	29	100	SS-14	3.75	-	-	-	-	-	-	-	-	23	A-6b (V)	
		16	12 12 15	41	87	SS-15	-	-	-	-	-	-	-	-	-	27	A-6b (V)	
	720.5	17																
STIFF, GRAY, **SILT AND CLAY**, AND GRAVEL, SOME SAND, DAMP TO MOIST		18	4 4 6	15	100	SS-16	1.75 - 2.25	-	-	-	-	-	-	-	-	27	A-6a (V)	
		19			55	SS-1	-	36	15	11	17	21	31	18	13	11	A-6a (1)	
		20	4 5 5	15	100	SS-17	-	-	-	-	-	-	-	-	-	11	A-6a (V)	
	715.5	21																
MEDIUM DENSE, BROWN AND GRAY, **COARSE AND FINE SAND**, LITTLE SILT AND CLAY, DAMP TO MOIST	714.0	22	4 7 7	21	87	SS-18	-	-	-	-	-	-	-	-	-	14	A-3a (V)	
		23	4 5	20	100	SS-19	0.25	-	-	-	-	-	-	-	-	26	A-4b (V)	

PID: 103930	SFN:	PROJECT: SUM-271-08.87	STATION / OFFSET: 465+69, 148' LT.	START: 11/29/16	END: 11/29/16	PG 2 OF 2	B-001-1-16

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
STIFF TO VERY STIFF, BROWN AND GRAY, **SILT**, LITTLE CLAY AND SAND, VERY FINE GRAINED, MOIST TO WET *(continued)*	713.0		8															
		31	4 5 9	21	100	SS-20	>.25	-	-	-	-	-	-	-	-	23	A-4b (V)	
		32	10 14 19	50	100	SS-21	0.25	0	0	15	68	17	NP	NP	NP	25	A-4b (8)	
		33																
		34																
		35																
		36	4 4 6	15	100	SS-22	0.50	-	-	-	-	-	-	-	-	24	A-4b (V)	
		37	3 6 11	26	100	SS-23	0.75	-	-	-	-	-	-	-	-	25	A-4b (V)	
		38																
		39	5 5 7	18	100	SS-24	0.50	-	-	-	-	-	-	-	-	25	A-4b (V)	
	703.0	EOB 40																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH SOIL CUTTINGS

PROJECT: SUM-271-08.87	DRILLING FIRM / OPERATOR: STANTEC / M.M	DRILL RIG: CME 45 TRUCK	STATION / OFFSET: 466+47, 121' LT.	EXPLORATION ID B-002-0-16
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGERS: STANTEC / P.CICHOCKI	HAMMER: CME AUTOMATIC	ALIGNMENT: I-271	
PID: 103930 SFN:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 11/29/16	ELEVATION: 758.8 (MSL) EOB: 47.0 ft.	PAGE 1 OF 2
START: 12/5/16 END: 12/7/16	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 90.2	COORD: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 758.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL	757.3	1	WOH 2 2	6	67	SS-1	2.5 - 2.75	-	-	-	-	-	-	-	-	24	A-6a (V)	
STIFF TO VERY STIFF, BROWN MOTTLED GRAY, **SILT AND CLAY**, LITTLE SAND, TRACE TO LITTLE GRAVEL, DAMP		2	5 5 5	15	60	SS-2	1.75	-	-	-	-	-	-	-	-	18	A-6a (V)	
		3	6 7 7	21	100	SS-3	1.5 - 2.25	-	-	-	-	-	-	-	-	20	A-6a (V)	
		4	6 7 7	21	100	SS-4	3.75 - 4.25	-	-	-	-	-	-	-	-	16	A-6a (V)	
		5	6 7 9	24	87	SS-5	3.25 - 3.75	8	3	7	38	44	31	18	13	16	A-6a (9)	
		6	3 5 7	18	80	SS-6	2.5 - 4.25	-	-	-	-	-	-	-	-	17	A-6a (V)	
		7	4 8 10	27	100	SS-7	4.50	-	-	-	-	-	-	-	-	14	A-6a (V)	
		8	5 11 12	35	100	SS-8	4.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
		9	13 18 20	57	100	SS-9	4.50	-	-	-	-	-	-	-	-	14	A-6a (V)	
		10	6 11 13	36	93	SS-10	4.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
		11	10 11 13	36	100	SS-11	4.25 - 4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
		12	20 25 30	83	73	SS-12	4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		13	9 14 20	51	100	SS-13	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
		14	6 15 12	41	93	SS-14	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
	737.8	15	16 15 20	53	67	SS-15	4.5+	-	-	-	-	-	-	-	-	15	A-6b (V)	
STIFF TO VERY STIFF, BROWN MOTTLED GRAY, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST		16	6 12 15	41	100	SS-16	4.50	-	-	-	-	-	-	-	-	14	A-6b (V)	
		17	8 8 8	24	100	SS-17	2.75 - 3.0	-	-	-	-	-	-	-	-	17	A-6b (V)	
		18			95	SS-1	-	8	4	6	34	48	39	19	20	19	A-6b (12)	
		19	5 6 6	18	100	SS-18	2.50	-	-	-	-	-	-	-	-	19	A-6b (V)	
		20	4 6	21	93	SS-19	2.25 -	-	-	-	-	-	-	-	-	19	A-6b (V)	

PID: 103930	SFN:	PROJECT: SUM-271-08.87	STATION / OFFSET: 466+47, 121' LT.	START: 12/5/16	END: 12/7/16	PG 2 OF 2	B-002-0-16

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
STIFF TO VERY STIFF, BROWN MOTTLED GRAY, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, DAMP TO MOIST *(continued)*	728.8	31	8				2.75											
		32	3 5 7	18	87	SS-20	3.25 - 3.75	-	-	-	-	-	-	-	-	20	A-6b (V)	
		33	10 12 14	39	87	SS-21	4.50	-	-	-	-	-	-	-	-	20	A-6b (V)	
		34	8 11 22	50	100	SS-22	4.5+	-	-	-	-	-	-	-	-	19	A-6b (V)	
		35	6 9 14	35	100	SS-23	3.75 - 4.0	-	-	-	-	-	-	-	-	23	A-6b (V)	
		36	14 22 24	69	80	SS-24	4.50	-	-	-	-	-	-	-	-	19	A-6b (V)	
		37	13 16 23	59	100	SS-25	4.5+	-	-	-	-	-	-	-	-	18	A-6b (V)	
		38	11 15 18	50	100	SS-26	3.75	-	-	-	-	-	-	-	-	20	A-6b (V)	
	717.8	39																
VERY STIFF, GRAY, **SILT AND CLAY**, SOME SAND, LITTLE GRAVEL, DAMP TO MOIST		40	20 21 23	66	100	SS-27	2.75 - 3.0	-	-	-	-	-	-	-	-	24	A-6a (V)	
		41	7 10 10	30	100	SS-28	2.5 - 3.25	-	-	-	-	-	-	-	-	34	A-6a (V)	
	713.3	42	9 12 21	50	100	SS-29	1.50	17	13	15	29	26	37	22	15	19	A-6a (6)	
MEDIUM DENSE, GRAY MOTTLED BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND**, MOIST TO WET	711.8	43	26 14 10	36	87	SS-30	-	-	-	-	-	-	-	-	-	17	A-1-b (V)	
		EOB 44																
		45																
		46																
		47																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 1 BAG BENTONITE GROUT; PUMPED 5 BAGS CEMENT

PROJECT: SUM-271-08.87	DRILLING FIRM / OPERATOR: STANTEC / M.M	DRILL RIG: CME 45 TRUCK	STATION / OFFSET: 466+95, 82' LT.	EXPLORATION ID B-003-0-16
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGERS: STANTEC / P.CICHOCKI	HAMMER: CME AUTOMATIC	ALIGNMENT: I-271	
PID: 103930 SFN:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 11/29/16	ELEVATION: 775.3 (MSL) EOB: 60.5 ft.	PAGE 1 OF 2
START: 11/30/16 END: 12/1/16	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 90.2	COORD: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 775.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL	774.8																	
MEDIUM STIFF, BROWN, **SILT AND CLAY**, TRACE TO LITTLE SAND, DAMP	772.3	1	3 2 3	8	80	SS-1	3.00	-	-	-	-	-	-	-	-	17	A-6a (V)	
MEDIUM DENSE, BROWN, **GRAVEL AND STONE FRAGMENTS WITH SAND, SILT, AND CLAY**, TRACE TO LITTLE SAND, DAMP TO MOIST	771.6	2	3 4 5	14	100	SS-2A	-	43	11	12	22	12	25	16	9	18	A-2-4 (0)	
						SS-2B	4.00	-	-	-	-	-	-	-	-	19	A-6a (V)	
MEDIUM STIFF TO STIFF, BROWN MOTTLED GRAY, **SILT AND CLAY**, TRACE TO LITTLE SAND, COARSE GRAINED, MOIST	769.3	3	3 5 7	18	100	SS-3	4.00	-	-	-	-	-	-	-	-	17	A-6a (V)	
VERY STIFF TO HARD, BROWN MOTTLED GRAY, **SILT AND CLAY**, TRACE TO LITTLE GRAVEL AND SAND, DAMP TO MOIST		4	7 8 12	30	87	SS-4	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
		5	6 7 11	27	100	SS-5	4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		6	7 8 13	32	100	SS-6	4.5+	7	2	5	44	42	32	18	14	16	A-6a (10)	
		7	5 8 13	32	87	SS-7	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
		8	11 12 13	38	87	SS-8	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
		9	6 8 11	29	100	SS-9	4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		10	5 10 12	33	100	SS-10	4.5+	-	-	-	-	-	-	-	-	14	A-6a (V)	
		11	12 15 16	47	100	SS-11	4.5+	-	-	-	-	-	-	-	-	16	A-6a (V)	
		12	6 7 12	29	100	SS-12	4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)	
	755.8	13	5 9 11	30	100	SS-13	3.75 - 4.5	-	-	-	-	-	-	-	-	17	A-6b (V)	
VERY STIFF TO HARD, BROWN MOTTLED GRAY, **SILTY CLAY**, LITTLE GRAVEL, TRACE TO LITTLE SAND, DAMP TO MOIST		14	14 17 17	51	73	SS-14	4.5+	-	-	-	-	-	-	-	-	16	A-6b (V)	
		15	7 11 12	35	93	SS-15	4.5+	-	-	-	-	-	-	-	-	15	A-6b (V)	
		16	5 10 11	32	93	SS-16	4.5+	-	-	-	-	-	-	-	-	14	A-6b (V)	
		17			95	SS-1	-	13	4	6	33	44	34	18	16	15	A-6b (10)	
		18	9 11 13	36	100	SS-17	4.50	-	-	-	-	-	-	-	-	14	A-6b (V)	
		19	6 13	42	80	SS-18	4.50	-	-	-	-	-	-	-	-	14	A-6b (V)	

PID: 103930	SFN:	PROJECT: SUM-271-08.87	STATION / OFFSET: 466+95, 82' LT.	START: 11/30/16	END: 12/1/16	PG 2 OF 2	B-003-0-16

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
VERY STIFF TO HARD, BROWN MOTTLED GRAY, **SILTY CLAY**, LITTLE GRAVEL, TRACE TO LITTLE SAND, DAMP TO MOIST *(continued)*	745.3	31	15															
	743.3	31	4 9 14	35	80	SS-19	4.50	-	-	-	-	-	-	-	-	14	A-6b (V)	
HARD, BROWN MOTTLED GRAY, **SILT AND CLAY**, TRACE SAND AND GRAVEL, DAMP TO MOIST		32																
		33	18 22 28	75	93	SS-20	4.50	-	-	-	-	-	-	-	-	15	A-6a (V)	
		34	12 16 18	51	100	SS-21	4.50	-	-	-	-	-	-	-	-	16	A-6a (V)	
		35																
		36	11 17 20	56	100	SS-22	4.50	-	-	-	-	-	-	-	-	16	A-6a (V)	
		37	20 24 27	77	73	SS-23	4.50	-	-	-	-	-	-	-	-	17	A-6a (V)	
		38																
		39	14 18 24	63	100	SS-24	4.50	-	-	-	-	-	-	-	-	17	A-6a (V)	
		40	9 15 21	54	100	SS-25	3.75	5	3	5	38	49	34	19	15	18	A-6a (10)	
		41																
		42	22 28 34	93	80	SS-26	4.50	-	-	-	-	-	-	-	-	17	A-6a (V)	
		43	14 18 20	57	100	SS-27	4.50	-	-	-	-	-	-	-	-	19	A-6a (V)	
		44																
		45	11 14 17	47	100	SS-28	4.50	-	-	-	-	-	-	-	-	21	A-6a (V)	
		46	14 20 21	62	100	SS-29	4.50	-	-	-	-	-	-	-	-	19	A-6a (V)	
		47																
		48	14 24 30	81	100	SS-30	4.50	-	-	-	-	-	-	-	-	19	A-6a (V)	
		49	12 17 26	65	100	SS-31	4.00	-	-	-	-	-	-	-	-	20	A-6a (V)	
		50																
		51	11 14 18	48	100	SS-32	4.50	-	-	-	-	-	-	-	-	16	A-6a (V)	
		52	28 30 36	99	80	SS-33	4.5+	-	-	-	-	-	-	-	-	16	A-6a (V)	
		53																
		54	13 18 22	60	100	SS-34	4.5+	-	-	-	-	-	-	-	-	16	A-6a (V)	
		55	12 15 22	56	100	SS-35	4.25	-	-	-	-	-	-	-	-	19	A-6a (V)	
		56																
		57	11 16 26	63	73	SS-36	4.25	-	-	-	-	-	-	-	-	23	A-6a (V)	
		58	9 12 19	47	87	SS-37	1.00	-	-	-	-	-	-	-	-	23	A-6a (V)	
		59																
	714.8	60 EOB	9 11 18	44	100	SS-38	1.00	-	-	-	-	-	-	-	-	23	A-6a (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 1 BAG BENTONITE GROUT; PUMPED 3 BAGS CEMENT

PROJECT: SUM-271-08.87	DRILLING FIRM / OPERATOR: STANTEC / M.M	DRILL RIG: CME 45 TRUCK	STATION / OFFSET: 466+82, 170' LT.	EXPLORATION ID B-003-1-16
TYPE: LANDSLIDE	SAMPLING FIRM / LOGGERS: STANTEC / P.CICHOCKI	HAMMER: CME AUTOMATIC	ALIGNMENT: I-271	
PID: 103930 SFN:	DRILLING METHOD: 4.25" HSA	CALIBRATION DATE: 11/29/16	ELEVATION: 743.0 (MSL) EOB: 40.0 ft.	PAGE 1 OF 2
START: 11/28/16 END: 11/29/16	SAMPLING METHOD: SPT / ST	ENERGY RATIO (%): 90.2	COORD: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 743.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
TOPSOIL	742.5																	
STIFF TO VERY STIFF, BROWN MOTTLED GRAY, **SILTY CLAY**, TRACE SAND AND GRAVEL, DAMP		1	1 3 3	9	73	SS-1	2.50	-	-	-	-	-	-	-	-	15	A-6b (V)	
		2	7 7 8	23	80	SS-2	4.50	-	-	-	-	-	-	-	-	16	A-6b (V)	
		3	4 5 7	18	100	SS-3	3.75	-	-	-	-	-	-	-	-	16	A-6b (V)	
		4	4 6 8	21	100	SS-4	3.75 - 4.0	-	-	-	-	-	-	-	-	17	A-6b (V)	
		5	7 7 9	24	87	SS-5	3.25	-	-	-	-	-	-	-	-	19	A-6b (V)	
		6	7 10 11	32	100	SS-6	4.5+	3	2	4	39	52	39	21	18	18	A-6b (11)	
		7	5 9 10	29	100	SS-7	4.50	-	-	-	-	-	-	-	-	17	A-6b (V)	
		8	3 5 11	24	100	SS-8	4.50	-	-	-	-	-	-	-	-	17	A-6b (V)	
		9	15 18 26	66	100	SS-9	4.50	-	-	-	-	-	-	-	-	18	A-6b (V)	
	728.0	10	4 7 15	33	100	SS-10	4.50	-	-	-	-	-	-	-	-	19	A-6b (V)	
VERY STIFF, GRAY, **SILT AND CLAY**, TRACE SAND AND GRAVEL, DAMP TO MOIST		11	8 9 13	33	100	SS-11	3.25	-	-	-	-	-	-	-	-	19	A-6a (V)	
		12	8 13 16	44	100	SS-12	2.75	-	-	-	-	-	-	-	-	22	A-6a (V)	
		13			100	SS-1	-	1	0	2	37	60	35	20	15	21	A-6a (10)	
	722.5	14	10 14 20	51	100	SS-13A	1.75 - 2.0	-	-	-	-	-	-	-	-	20	A-6a (V)	
DENSE, BROWN AND GRAY, **GRAVEL AND STONE FRAGMENTS WITH SAND**, TRACE SILT AND CLAY, DAMP		15				SS-13B	-	-	-	-	-	-	-	-	-	4	A-1-b (V)	
		16	19 21 27	72	87	SS-14	-	-	-	-	-	-	-	-	-	4	A-1-b (V)	
		17	14 17 18	53	80	SS-15	-	43	29	15	9	4	NP	NP	NP	4	A-1-b (0)	
		18	9 11 18	44	80	SS-16	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	
		19	20 21 21	63	100	SS-17	-	-	-	-	-	-	-	-	-	5	A-1-b (V)	
		20	13 15 22	56	100	SS-18	-	-	-	-	-	-	-	-	-	8	A-1-b (V)	
		21	9 10	48	100	SS-19	-	-	-	-	-	-	-	-	-	12	A-1-b (V)	

PID: 103930	SFN:	PROJECT: SUM-271-08.87	STATION / OFFSET: 466+82, 170' LT.	START: 11/28/16	END: 11/29/16	PG 2 OF 2	B-003-1-16

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	HOLE SEALED
	713.0		22															
HARD, GRAY, **SILT**, LITTLE SAND, VERY FINE GRAINED, DAMP TO MOIST	712.5	31	15 25 41	99	80	SS-20	-	-	-	-	-	-	-	-	-	19	A-4b (V)	
		32																
		33	29 32 50	123	93	SS-21	-	-	-	-	-	-	-	-	-	20	A-4b (V)	
		34	10 21 26	71	87	SS-22	-	-	-	-	-	-	-	-	-	19	A-4b (V)	
		35																
		36	6 10 15	38	100	SS-23	-	-	-	-	-	-	-	-	-	24	A-4b (V)	
		37	7 14 24	57	73	SS-24	-	-	-	-	-	-	-	-	-	26	A-4b (V)	
		38																
	703.0	39	5 9 13	33	100	SS-25	-	-	-	-	-	-	-	-	-	29	A-4b (V)	
	EOB	40																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: PUMPED 1 BAG BENTONITE GROUT; PUMPED 3 BAGS CEMENT

Appendix C Laboratory Data

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name SUM-271 Landslides

Project Number 175526009

Tested By SKS

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-001, 0.0'-1.5'	1	12/13/16	Hom	3/8"			No	31.53	165.27	148.38	14.5
B-001, 1.5'-3.0'	2	12/13/16	Hom	3/8"			No	31.40	170.02	146.27	20.7
B-001, 3.0'-4.5'	3	12/13/16	Hom	3/4"			No	31.70	125.17	111.11	17.7
B-001, 4.5'-6.0'	4	12/13/16	Len	3/8"			No	30.18	123.99	110.72	16.5
B-001, 6.0'-7.5'	5	12/13/16	Hom	No. 4			Yes	30.06	156.54	140.86	14.2
B-001, 7.5'-9.0'	6	12/13/16	Hom	3/8"			No	30.28	168.66	151.24	14.4
B-001, 9.0'-10.5'	7	12/13/16	Len	3/8"			No	31.44	202.06	180.78	14.2
B-001, 10.5'-12.0'	8	12/13/16	Len	No. 4			Yes	29.87	167.09	148.73	15.4
B-001, 12.0'-13.5'	9	12/13/16	Len	3/8"			No	31.82	152.14	137.81	13.5
B-001, 13.5'-15.0'	10	12/13/16	Hom	No. 4			Yes	31.41	161.02	144.19	14.9
B-001, 15.0'-16.5'	11	12/13/16	Hom	No. 4			No	31.65	137.75	124.89	13.8
B-001, 16.5'-18.0'	12	12/13/16	Hom	3/4"			No	30.04	162.05	145.44	14.4
B-001, 18.0'-19.5'	13	12/13/16	Len	No. 4			Yes	30.19	160.62	144.27	14.3
B-001, 19.5'-21.0'	14	12/13/16	Len	3/8"			No	30.40	158.04	140.86	15.6
B-001, 21.0'-22.5'	15	12/13/16	Len	3/8"			No	31.13	151.24	135.48	15.1
B-001, 22.5'-24.0'	16	12/13/16	Len	3/8"			No	30.51	149.47	134.27	14.6
B-001, 24.0'-25.5'	17	12/13/16	Len	3/4"			No	30.68	108.07	98.42	14.2
B-001, 25.5'-27.0'	18	12/13/16	Hom	No. 4			Yes	30.04	159.06	142.59	14.6
B-001, 27.0'-28.5'	19	12/13/16	Len	No. 4			Yes	30.06	143.45	130.69	12.7
B-001, 28.5'-30.0'	20	12/13/16	Hom	No. 4			Yes	30.28	147.69	132.39	15.0
B-001, 30.0'-31.5'	21	12/13/16	Hom	No. 4			Yes	31.80	164.00	145.63	16.1
B-001, 31.5'-33.0'	22	12/13/16	Hom	3/8"			No	29.84	158.66	140.96	15.9
B-001, 33.0'-34.5'	23	12/13/16	Hom	3/4"			No	31.50	175.21	153.15	18.1
B-001, 34.5'-36.0'	24	12/13/16	Hom	3/8"			No	31.51	187.14	162.88	18.5
B-001, 36.0'-37.5'	25	12/13/16	Hom	3/8"			No	30.12	186.32	161.37	19.0
B-001, 37.5'-39.0'	26	12/13/16	Dist	No. 4			Yes	30.76	191.01	158.06	25.9
B-001, 39.0'-40.5'	27	12/13/16	Dist	No. 4			Yes	31.11	201.80	170.54	22.4
B-001, 42.5'-44.0'	29	12/13/16	Dist	1 1/2"			No	31.46	162.72	140.83	20.0

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name SUM-271 Landslides

Project Number 175526009

Tested By SKS

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-001, 44.0'-45.5'	30	12/13/16	Dist	1 1/2"			No	30.40	176.03	171.52	3.2
B-001, 45.5'-47.0'	31	12/13/16	Dist	1 1/2"			No	31.66	185.41	179.26	4.2
B-001, 47.0'-48.5'	32	12/13/16	Dist	3/4"			No	32.37	189.71	181.58	5.4
B-001, 48.5'-50.0'	33	12/13/16	Dist	3/4"			No	30.19	172.96	164.61	6.2
B-001, 50.0'-51.5'	34	12/13/16	Dist	3/8"			No	31.58	157.98	146.61	9.9
B-001, 51.5'-53.0'	35	12/13/16	Dist	3/8"			No	32.26	184.81	166.28	13.8
B-001, 53.0'-54.5'	36	12/13/16	Dist	No. 10			Yes	31.79	157.62	146.09	10.1
B-001, 54.5'-56.0'	37	12/13/16	Dist	No. 10			Yes	32.25	173.30	151.06	18.7
B-001, 56.0'-57.5'	38	12/13/16	Dist	No. 10			Yes	31.81	170.82	145.30	22.5
B-001, 57.5'-59.0'	39	12/13/16	Dist	No. 10			Yes	32.03	154.19	133.42	20.5
B-001, 59.0'-60.5'	40	12/13/16	Dist	3/8"			No	32.32	181.65	152.92	23.8
B-002, 1.5'-3.0'	41	12/13/16	Hom	3/8"			No	31.76	167.61	148.15	16.7
B-002, 3.0'-3.7'	42	12/13/16	Dist	3/4"			No	31.46	129.70	114.54	18.2
B-002, 3.7'-4.5'	43	12/13/16	Len	3/8"			No	31.01	155.19	135.11	19.3
B-002, 4.5'-6.0'	44	12/13/16	Len	3/8"			No	29.95	183.02	160.78	17.0
B-002, 6.0'-7.5'	45	12/13/16	Hom	3/8"			No	30.41	172.77	154.25	15.0
B-002, 7.5'-9.0'	46	12/13/16	Hom	No. 4			Yes	31.66	169.14	151.88	14.4
B-002, 9.0'-10.5'	47	12/13/16	Hom	3/4"			No	31.46	106.92	96.36	16.3
B-002, 10.5'-12.0'	48	12/13/16	Len	3/8"			No	30.05	149.80	134.35	14.8
B-002, 12.0'-13.5'	49	12/13/16	Hom	No. 4			Yes	32.26	172.40	154.54	14.6
B-002, 13.5'-15.0'	50	12/13/16	Hom	No. 4			Yes	30.17	163.01	146.24	14.4
B-002, 15.0'-16.5'	51	12/13/16	Len	No. 4			No	30.86	138.89	125.62	14.0
B-002, 16.5'-18.0'	52	12/13/16	Len	3/8"			No	30.51	177.15	157.30	15.7
B-002, 18.0'-19.5'	53	12/13/16	Len	3/8"			No	30.62	182.02	162.48	14.8
B-002, 19.5'-21.0'	54	12/13/16	Hom	3/8"			No	30.80	195.80	172.11	16.8
B-002, 21.0'-22.5'	55	12/13/16	Len	No. 4			Yes	29.92	161.75	143.63	15.9
B-002, 22.5'-24.0'	56	12/13/16	Len	No. 4			Yes	30.00	170.84	152.84	14.7
B-002, 24.0'-25.5'	57	12/13/16	Len	3/4"			No	31.52	185.81	166.47	14.3

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name SUM-271 Landslides

Project Number 175526009

Tested By SKS

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-002, 27.5'-29.0'	59	12/14/16	Hom	3/8"			No	29.95	123.46	111.78	14.3
B-002, 29.0'-30.5'	60	12/14/16	Len	No. 4			Yes	29.98	178.00	160.23	13.6
B-002, 30.5'-32.0'	61	12/14/16	Hom	No. 4			Yes	31.43	183.50	164.84	14.0
B-002, 32.0'-33.5'	62	12/14/16	Hom	No. 4			Yes	30.92	178.85	160.17	14.5
B-002, 33.5'-35.0'	63	12/14/16	Hom	3/4"			No	30.57	175.50	155.76	15.8
B-002, 35.0'-36.5'	64	12/14/16	Hom	No. 4			Yes	30.79	205.99	181.27	16.4
B-002, 36.5'-38.0'	65	12/14/16	Len	No. 4			Yes	30.17	189.07	166.50	16.6
B-002, 38.0'-39.5'	66	12/14/16	Hom	No. 4			Yes	30.28	192.24	169.23	16.6
B-002, 39.5'-41.0'	67	12/14/16	Hom	3/8"			No	30.33	191.92	167.67	17.7
B-002, 41.0'-42.5'	68	12/14/16	Len	3/8"			No	30.34	181.24	159.34	17.0
B-002, 42.5'-44.0'	69	12/14/16	Len	No. 4			Yes	30.00	176.68	153.75	18.5
B-002, 44.0'-45.5'	70	12/14/16	Len	No. 4			Yes	30.90	198.10	169.51	20.6
B-002, 45.5'-47.0'	71	12/14/16	Dist	No. 4			Yes	31.10	180.24	156.04	19.4
B-002, 47.0'-48.5'	72	12/14/16	Hom	3/4"			No	30.18	182.65	158.15	19.1
B-002, 48.5'-50.0'	73	12/14/16	Dist	3/4"			No	30.98	198.02	170.64	19.6
B-002, 50.0'-51.5'	74	12/14/16	Hom	3/8"			No	30.85	185.55	163.94	16.2
B-002, 51.5'-53.0'	75	12/14/16	Hom	3/8"			No	31.49	168.76	149.48	16.3
B-002, 53.0'-54.5'	76	12/14/16	Len	3/8"			No	30.92	176.86	156.95	15.8
B-002, 54.5'-56.0'	77	12/14/16	Len	No. 4			Yes	30.69	178.18	154.65	19.0
B-002, 56.0'-57.5'	78	12/14/16	Hom	No. 4			Yes	31.73	186.07	157.65	22.6
B-002, 57.5'-59.0'	79	12/14/16	Hom	3/4"			No	30.09	217.25	182.42	22.9
B-002, 59.0'-60.5'	80	12/14/16	Dist	3/4"			No	30.03	209.60	175.94	23.1
B-003, 0.0'-1.5'	81	12/14/16	Hom	No. 4			Yes	31.39	175.20	147.40	24.0
B-003, 1.5'-3.0'	82	12/14/16	Hom	No. 4			Yes	31.72	184.47	161.09	18.1
B-003, 3.0'-4.5'	83	12/14/16	Hom	No. 4			Yes	31.51	160.82	139.21	20.1
B-003, 4.5'-6.0'	84	12/14/16	Hom	3/8"			No	30.52	188.79	166.78	16.2
B-003, 6.0'-7.5'	85	12/14/16	Len	3/4"			No	31.48	194.43	172.11	15.9
B-003, 7.5'-9.0'	86	12/14/16	Hom	3/8"			No	30.58	189.60	165.98	17.4

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name SUM-271 Landslides

Project Number 175526009

Tested By SKS

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-003, 9.0'-10.5'	87	12/14/16	Len	3/8"			No	30.97	186.45	166.82	14.4
B-003, 10.5'-12.0'	88	12/14/16	Hom	3/8"			No	30.26	192.41	171.33	14.9
B-003, 12.0'-13.5'	89	12/14/16	Hom	No. 4			Yes	31.53	197.52	177.43	13.8
B-003, 13.5'-15.0'	90	12/14/16	Hom	3/8"			No	31.52	197.67	175.99	15.0
B-003, 15.0'-16.5'	91	12/14/16	Hom	3/8"			No	29.89	176.57	157.93	14.6
B-003, 16.5'-18.0'	92	12/14/16	Len	No. 4			Yes	31.24	190.46	171.56	13.5
B-003, 18.0'-19.5'	93	12/14/16	Hom	3/8"			No	30.97	178.85	159.92	14.7
B-003, 19.5'-21.0'	94	12/14/16	Len	3/8"			No	29.86	189.73	169.02	14.9
B-003, 21.0'-22.5'	95	12/14/16	Hom	3/8"			No	31.82	175.06	156.33	15.0
B-003, 22.5'-24.0'	96	12/14/16	Hom	No. 4			Yes	31.30	206.74	184.66	14.4
B-003, 24.0'-25.5'	97	12/14/16	Hom	No. 4			Yes	30.88	209.23	183.03	17.2
B-003, 27.5'-29.0'	99	12/14/16	Len	No. 4			Yes	31.53	177.02	153.41	19.4
B-003, 29.0'-30.5'	100	12/14/16	Hom	No. 4			Yes	30.21	194.29	168.23	18.9
B-003, 30.5'-32.0'	101	12/14/16	Len	3/8"			No	31.36	186.47	160.29	20.3
B-003, 32.0'-33.5'	102	12/14/16	Len	No. 4			Yes	31.78	206.20	176.67	20.4
B-003, 33.5'-35.0'	103	12/14/16	Len	3/8"			No	31.53	164.80	143.82	18.7
B-003, 35.0'-36.5'	104	12/14/16	Len	No. 4			Yes	31.80	180.16	152.86	22.6
B-003, 36.5'-38.0'	105	12/14/16	Dist	No. 4			Yes	30.55	215.23	186.09	18.7
B-003, 38.0'-39.5'	106	12/14/16	Len	3/8"			No	44.67	264.10	231.38	17.5
B-003, 39.5'-41.0'	107	12/14/16	Str	No. 4			Yes	44.96	229.65	198.31	20.4
B-003, 41.0'-42.5'	108	12/14/16	Hom	3/4"			No	44.45	203.15	172.51	23.9
B-003, 42.5'-44.0'	109	12/14/16	Dist	3/4"			No	44.50	218.05	174.20	33.8
B-003, 44.0'-45.5'	110	12/14/16	Dist	3/4"			No	44.83	135.78	121.16	19.2
B-003, 45.5'-47.0'	111	12/14/16	Dist	3/4"			No	43.56	221.03	195.78	16.6
B-004, 0.0'-1.5'	112	12/14/16	Len	3/4"			No	43.87	224.92	198.91	16.8
B-004, 1.5'-3.0'	113	12/14/16	Hom	No. 4			Yes	45.32	194.41	170.63	19.0
B-004, 3.0'-4.5'	114	12/14/16	Hom	No. 4			Yes	44.12	196.47	173.17	18.1
B-004, 4.5'-6.0'	115	12/14/16	Len	3/8"			No	44.63	211.31	184.93	18.8

Appendix C - Exhibit C-4

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name SUM-271 Landslides

Project Number 175526009

Tested By SKS

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-004, 6.0'-7.5'	116	12/14/16	Len	3/4"			No	48.34	192.51	166.63	21.9
B-004, 7.5'-9.0'	117	12/14/16	Hom	3/4"			No	44.99	197.01	171.89	19.8
B-004, 9.0'-10.5'	118	12/14/16	Dist	No. 4			Yes	44.98	206.80	179.83	20.0
B-004, 10.5'-12.0'	119	12/14/16	Len	No. 4			Yes	52.69	216.23	189.57	19.5
B-004, 12.0'-13.5'	120	12/14/16	Len	No. 4			Yes	47.92	215.18	185.77	21.3
B-004, 13.5'-15.0'	121	12/14/16	Len	No. 4			Yes	44.67	232.74	200.39	20.8
B-004, 15.0'-16.5'	122	12/14/16	Len	3/8"			No	43.98	205.24	176.82	21.4
B-004, 16.5'-18.0'	123	12/14/16	Len	No. 10			Yes	44.30	187.86	165.68	18.3
B-004, 18.0'-19.5'	124	12/14/16	Len	No. 4			Yes	45.03	203.48	175.50	21.4
B-004, 19.5'-21.0'	125	12/14/16	Len	No. 4			Yes	44.63	227.21	193.47	22.7
B-004, 21.0'-22.5'	126	12/15/16	Dist	No. 4			No	30.56	119.92	100.74	27.3
B-004, 22.5'-24.0'	127	12/15/16	Hom	No. 4			No	31.59	145.38	121.35	26.8
B-004, 26.0'-27.5'	129	12/15/16	Hom	No. 4			Yes	31.05	154.68	142.76	10.7
B-004, 27.5'-29.0'	130	12/15/16	Dist	3/8"			No	31.77	187.90	168.52	14.2
B-004, 29.0'-30.5'	131	12/15/16	Hom	No. 10			Yes	31.55	177.60	147.12	26.4
B-004, 30.5'-32.0'	132	12/15/16	Hom	No. 10			Yes	30.64	181.57	153.24	23.1
B-004, 32.0'-33.5'	133	12/15/16	Hom	No. 10			Yes	30.54	144.58	122.13	24.5
B-004, 35.5'-37.0'	134	12/15/16	Dist	No. 4			Yes	31.57	198.09	166.44	23.5
B-004, 37.0'-38.5'	135	12/15/16	Hom	No. 4			No	32.02	154.21	129.84	24.9
B-004, 38.5'-40.0'	136	12/15/16	Hom	No. 10			Yes	30.29	174.33	145.30	25.2
B-005, 0.0'-1.5'	137	12/15/16	Len	3/8"			No	32.14	196.74	174.91	15.3
B-005, 1.5'-3.0'	138	12/15/16	Hom	No. 4			Yes	31.54	204.89	181.53	15.6
B-005, 3.0'-4.5'	139	12/15/16	Len	3/8"			No	30.15	170.70	151.31	16.0
B-005, 4.5'-6.0'	140	12/15/16	Hom	No. 4			Yes	31.63	185.11	163.08	16.8
B-005, 6.0'-7.5'	141	12/15/16	Hom	3/8"			No	31.72	184.69	159.95	19.3
B-005, 7.5'-9.0'	142	12/15/16	Hom	3/8"			No	31.93	142.90	126.24	17.7
B-005, 9.0'-10.5'	143	12/15/16	Len	No. 4			Yes	31.60	187.83	164.74	17.3
B-005, 10.5'-12.0'	144	12/15/16	Len	3/8"			No	31.52	175.42	154.39	17.1

Stantec

Moisture Content of Soil

ASTM D 2216

Project Name SUM-271 Landslides

Project Number 175526009

Tested By SKS

Test Method ASTM

Maximum Particle Size in Sample	No. 10	No. 4	3/8"	3/4"	1 1/2"	3"
Recommended Minimum Mass (g)	20	100	500	2,500	10,000	50,000

Material Type: Stratified, Laminated, Lensed, Homogeneous, Disturbed

Source	Lab ID	Date Tested	Material Type	Maximum Particle Size	Material Excluded Amount	Material Excluded Size	Pass Min. Mass? (Y/N)	Can Weight (g)	Wet Soil & Can Weight (g)	Dry Soil & CanWeight (g)	Moisture Content (%)
B-005, 12.0'-13.5'	145	12/15/16	Hom	3/8"			No	32.12	172.27	151.08	17.8
B-005, 13.5'-15.0'	146	12/15/16	Hom	No. 4			Yes	31.74	177.00	153.66	19.1
B-005, 15.0'-16.5'	147	12/15/16	Hom	No. 4			Yes	30.78	227.64	195.73	19.3
B-005, 16.5'-18.0'	148	12/15/16	Len	No. 10			Yes	30.29	210.29	178.40	21.5
B-005, 20.0'-20.5'	150	12/15/16	Dist	No. 4			Yes	30.43	199.96	171.75	20.0
B-005, 20.5'-21.5'	151	12/15/16	Dist	No. 4			Yes	30.54	185.74	179.28	4.3
B-005, 21.5'-23.0'	152	12/15/16	Dist	3/8"			No	30.24	151.42	146.47	4.3
B-005, 23.0'-24.5'	153	12/15/16	Dist	3/4"			No	30.65	93.81	91.20	4.3
B-005, 24.5'-26.0'	154	12/15/16	Dist	3/4"			No	30.09	130.69	125.95	4.9
B-005, 26.0'-27.5'	155	12/15/16	Dist	3/8"			No	31.88	164.50	157.94	5.2
B-005, 27.5'-29.0'	156	12/15/16	Dist	No. 4			Yes	31.47	144.16	135.64	8.2
B-005, 29.0'-30.5'	157	12/15/16	Dist	No. 4			Yes	31.56	154.08	141.33	11.6
B-005, 30.5'-32.0'	158	12/15/16	Dist	No. 10			Yes	31.65	155.62	136.05	18.7
B-005, 32.0'-33.5'	159	12/15/16	Dist	No. 10			Yes	29.75	143.83	125.20	19.5
B-005, 33.5'-35.0'	160	12/15/16	Dist	No. 10			Yes	31.26	152.53	132.89	19.3
B-005, 35.0'-36.5'	161	12/15/16	Dist	No. 10			Yes	31.75	212.56	177.56	24.0
B-005, 36.5'-38.0'	162	12/15/16	Dist	No. 10			Yes	30.95	170.74	141.56	26.4
B-005, 38.5'-40.0'	163	12/15/16	Dist	No. 10			Yes	30.29	132.56	109.90	28.5

Comments

Reviewed By RJ

Appendix C - Exhibit C-6

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 3.0'-4.5'	Lab ID	3
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-7-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 17.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.7
No. 4	4.75	98.6
No. 10	2	85.4
No. 40	0.425	81.7
No. 200	0.075	76.4
	0.02	65.0
	0.005	41.4
	0.002	30.0
estimated	0.001	23.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	1.4	14.6
Coarse Sand	13.2	3.7
Medium Sand	3.7	---
Fine Sand	5.3	5.3
Silt	35.0	35.0
Clay	41.4	41.4

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	32
Plastic Limit:	18
Plasticity Index:	14
Activity Index:	0.47

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
ODOT Classification	A-6a (10)
Description:	Silt and Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 3.0'-4.5'	Lab ID	3

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-14-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.7
No. 4	98.6
No. 10	85.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

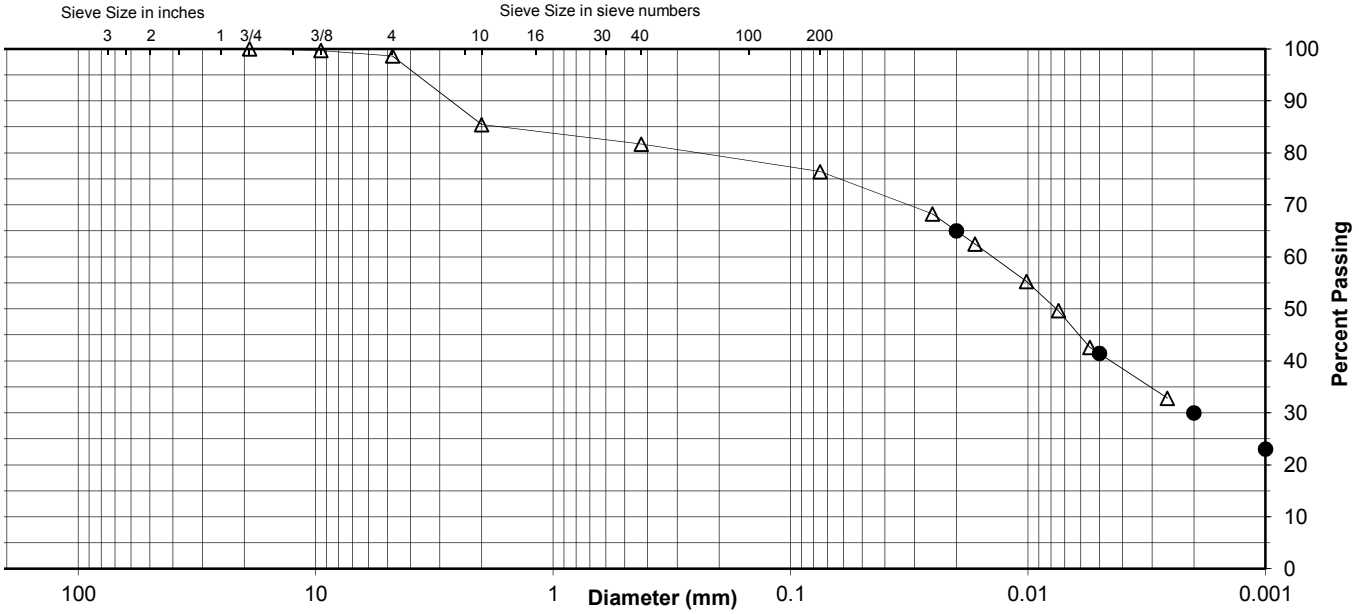
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	81.7
No. 200	76.4
0.02 mm	65.0
0.005 mm	41.4
0.002 mm	30.0
0.001 mm	23.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.4	13.2	3.7	5.3	35.0	41.4
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	14.6			3.7	5.3	46.4	30.0



Comments

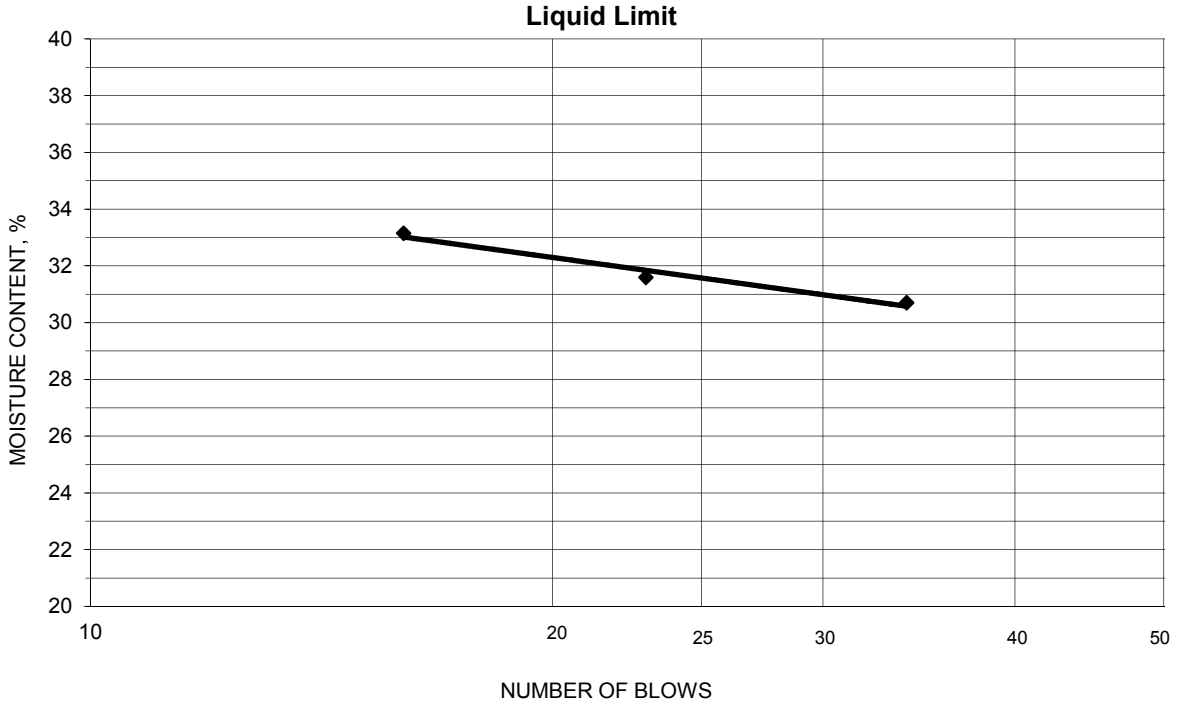
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-001, 3.0'-4.5'			Lab ID	3
				% + No. 40	18
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
20.68	18.38	11.10	23	31.6	32
20.60	18.21	11.00	16	33.1	
19.98	18.00	11.55	34	30.7	



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.77	16.73	11.06	18.3	18	14
18.09	17.04	11.20	18.0		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 24.0'-25.5'	Lab ID	17
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 14.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.4
No. 4	4.75	98.6
No. 10	2	90.7
No. 40	0.425	87.2
No. 200	0.075	81.7
	0.02	69.1
	0.005	47.2
	0.002	31.0
estimated	0.001	22.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	1.4	9.3
Coarse Sand	7.9	3.5
Medium Sand	3.5	---
Fine Sand	5.5	5.5
Silt	34.5	34.5
Clay	47.2	47.2

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	33
Plastic Limit:	18
Plasticity Index:	15
Activity Index:	0.48

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
ODOT Classification	A-6a (10)
Description:	Silt and Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 24.0'-25.5'	Lab ID	17

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-15-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.4
No. 4	98.6
No. 10	90.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

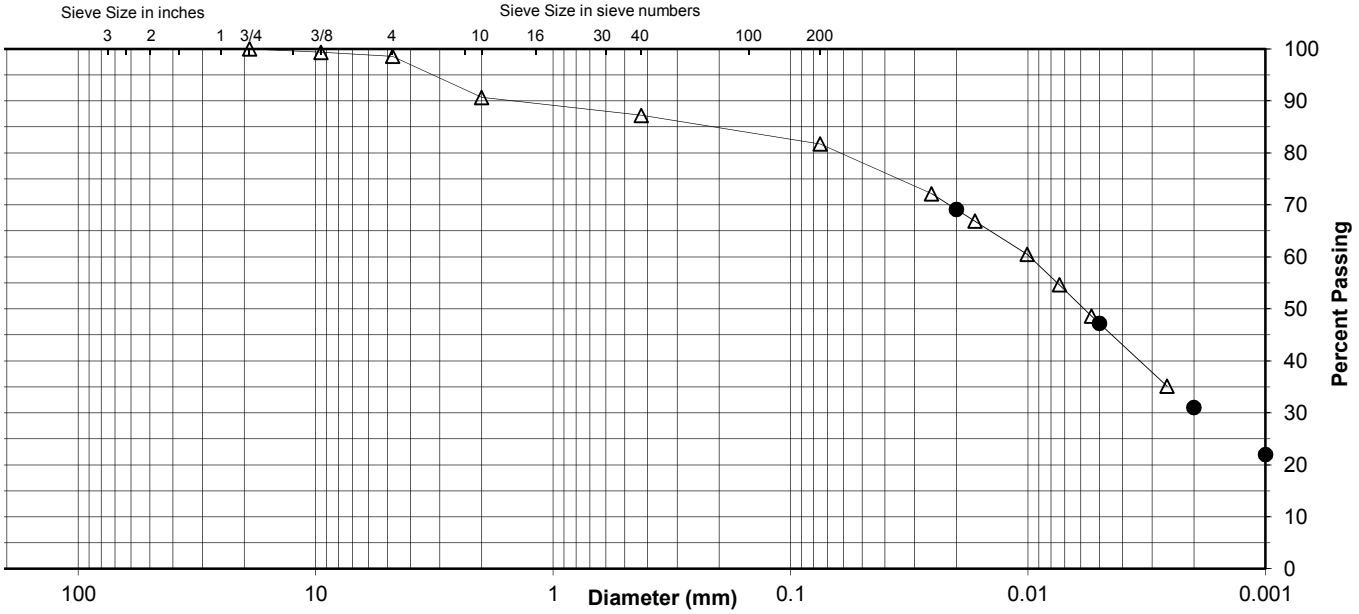
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	87.2
No. 200	81.7
0.02 mm	69.1
0.005 mm	47.2
0.002 mm	31.0
0.001 mm	22.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.4	7.9	3.5	5.5	34.5	47.2
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	9.3			3.5	5.5	50.7	31.0



Comments

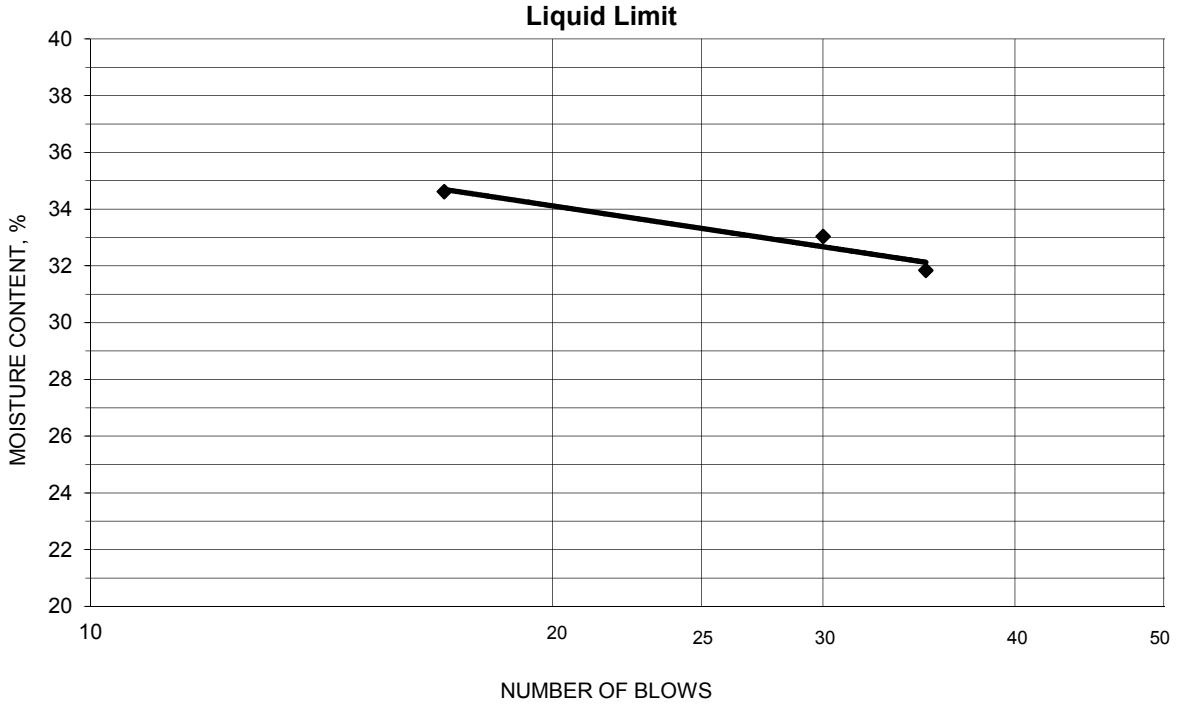
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-001, 24.0'-25.5'			Lab ID	17
				% + No. 40	13
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.75	16.90	11.09	35	31.8	
18.45	16.60	11.00	30	33.0	
20.33	17.99	11.23	17	34.6	33



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.99	17.04	11.53	17.2	18	15
17.65	16.61	11.00	18.5		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 40.5'-42.5'	Lab ID	28
Sample Type	ST	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 20.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.1
No. 4	4.75	98.9
No. 10	2	95.0
No. 40	0.425	93.5
No. 200	0.075	90.0
	0.02	73.7
	0.005	52.3
	0.002	35.0
estimated	0.001	26.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	1.1	5.0
Coarse Sand	3.9	1.5
Medium Sand	1.5	---
Fine Sand	3.5	3.5
Silt	37.7	37.7
Clay	52.3	52.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	39
Plastic Limit:	21
Plasticity Index:	18
Activity Index:	0.51

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
ODOT Classification	A-6b (11)
Description:	Silty Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 40.5'-42.5'	Lab ID	28

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-20-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.1
No. 4	98.9
No. 10	95.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

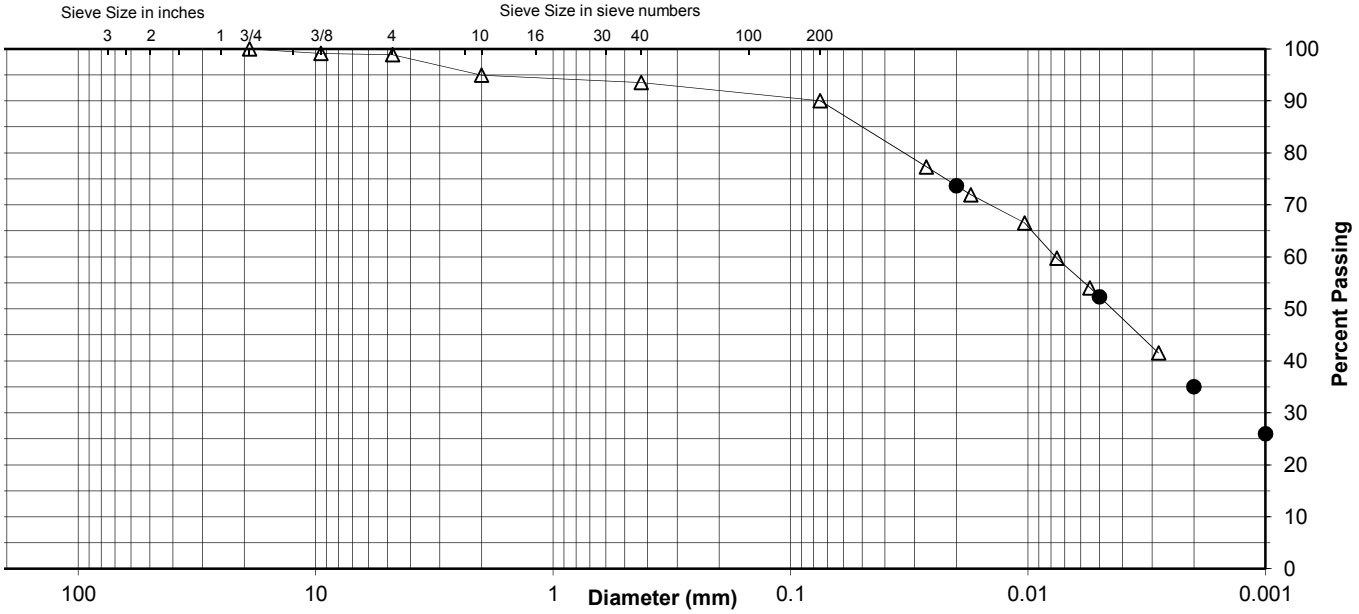
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	93.5
No. 200	90.0
0.02 mm	73.7
0.005 mm	52.3
0.002 mm	35.0
0.001 mm	26.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.1	3.9	1.5	3.5	37.7	52.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	5.0			1.5	3.5	55.0	35.0



Comments

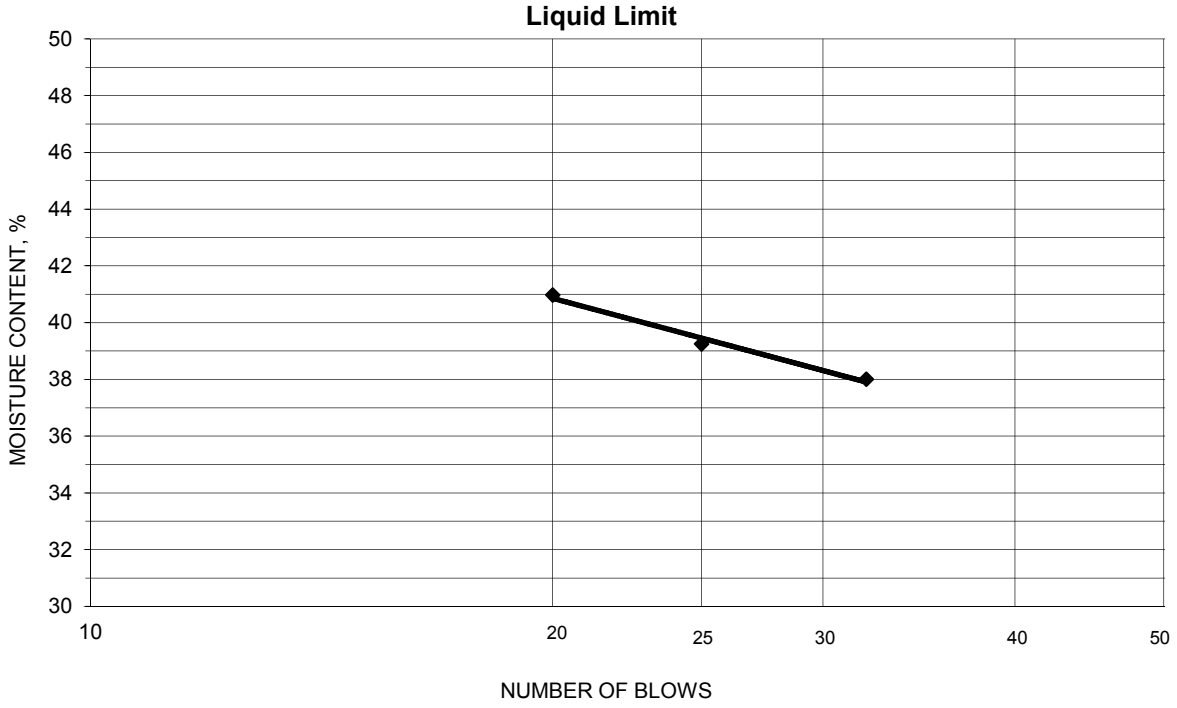
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-001, 40.5'-42.5'			Lab ID	28
				% + No. 40	6
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-21-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.73	16.44	10.85	20	41.0	
21.95	18.92	11.20	25	39.2	
18.15	16.17	10.96	32	38.0	39



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.54	16.41	11.18	21.6	21	18
17.61	16.49	11.23	21.3		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 48.5'-50.0'	Lab ID	33
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 6.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.1
No. 4	4.75	89.3
No. 10	2	66.9
No. 40	0.425	28.4
No. 200	0.075	14.0
	0.02	8.7
	0.005	4.6
	0.002	2.0
estimated	0.001	1.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	10.7	33.1
Coarse Sand	22.4	38.5
Medium Sand	38.5	---
Fine Sand	14.4	14.4
Silt	9.4	9.4
Clay	4.6	4.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	SM
Group Name:	Silty sand
ODOT Classification	A-1-b (0)
Description	Gravel and/or Stone Fragments with Sand

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 48.5'-50.0'	Lab ID	33

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-15-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.1
No. 4	89.3
No. 10	66.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

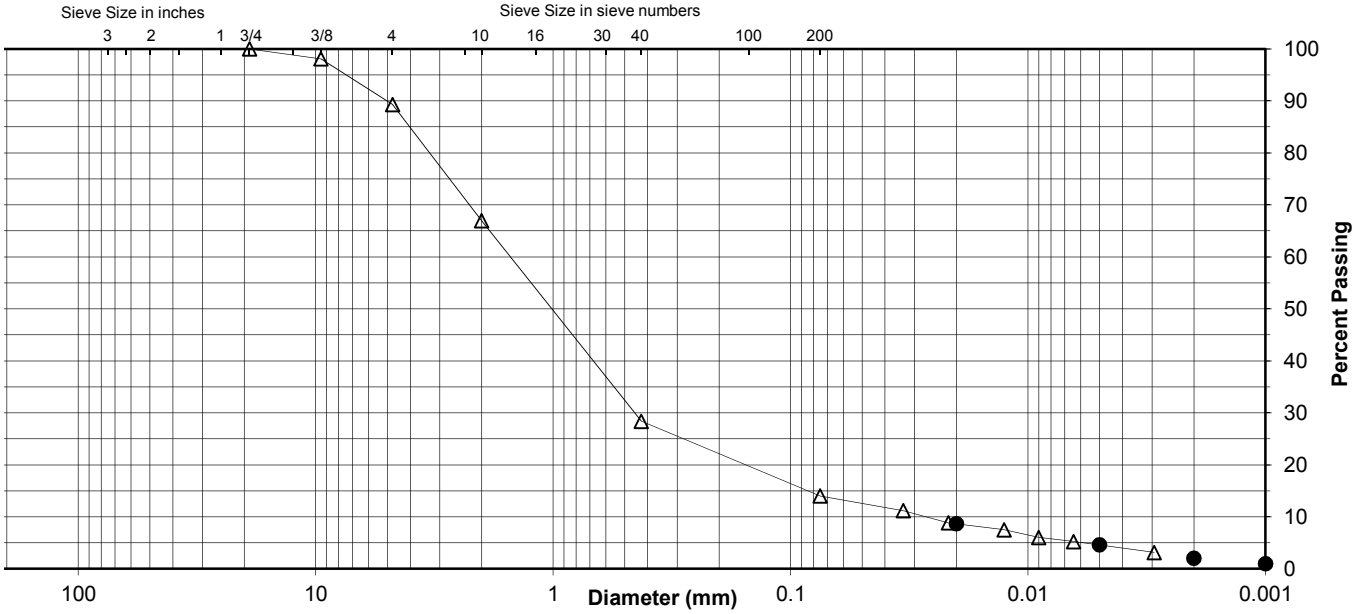
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	28.4
No. 200	14.0
0.02 mm	8.7
0.005 mm	4.6
0.002 mm	2.0
0.001 mm	1.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	10.7	22.4	38.5	14.4	9.4	4.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	33.1			38.5	14.4	12.0	2.0



Comments

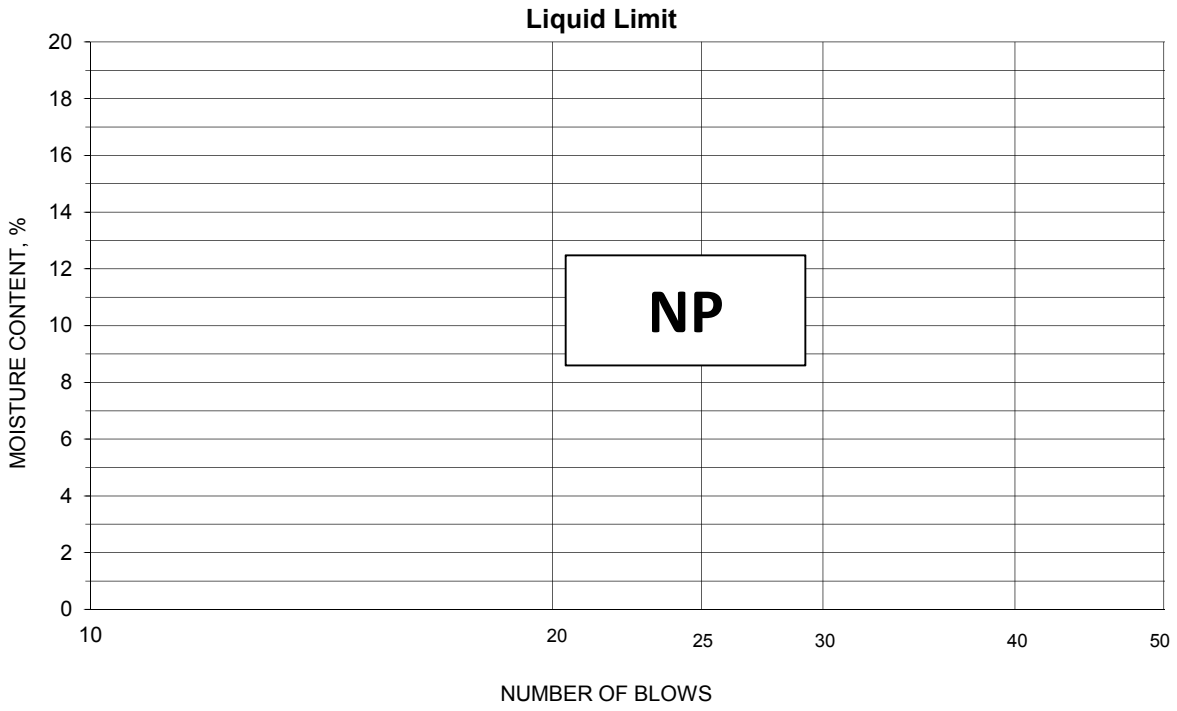
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-001, 48.5'-50.0'			Lab ID	33
				% + No. 40	72
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 59.0'-60.5'	Lab ID	40
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 23.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.9
No. 10	2	99.9
No. 40	0.425	99.2
No. 200	0.075	93.5
	0.02	51.5
	0.005	22.6
	0.002	15.0
estimated	0.001	12.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	0.1	0.1
Coarse Sand	0.0	0.7
Medium Sand	0.7	---
Fine Sand	5.7	5.7
Silt	70.9	70.9
Clay	22.6	22.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Silt
ODOT Classification	A-4b (9)
Description:	Silt

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-001, 59.0'-60.5'	Lab ID	40

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-14-2016
Date Received	12-12-2016

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.9
No. 10	99.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

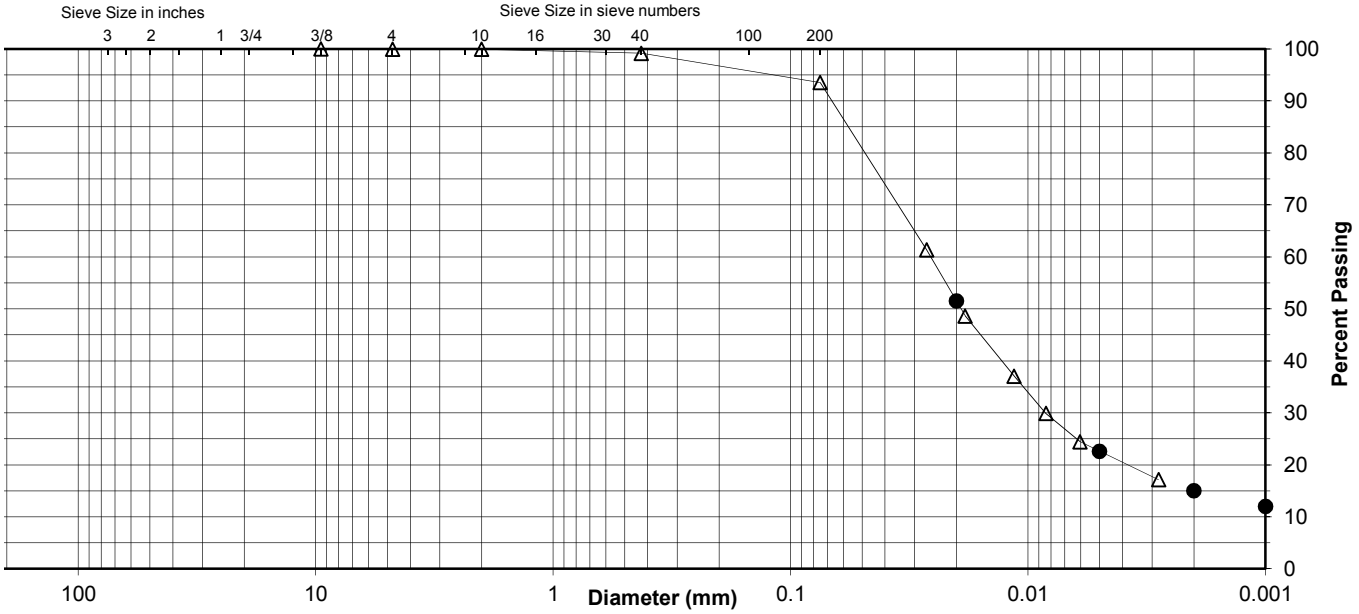
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.2
No. 200	93.5
0.02 mm	51.5
0.005 mm	22.6
0.002 mm	15.0
0.001 mm	12.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.1	0.0	0.7	5.7	70.9	22.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.1			0.7	5.7	78.5	15.0



Comments

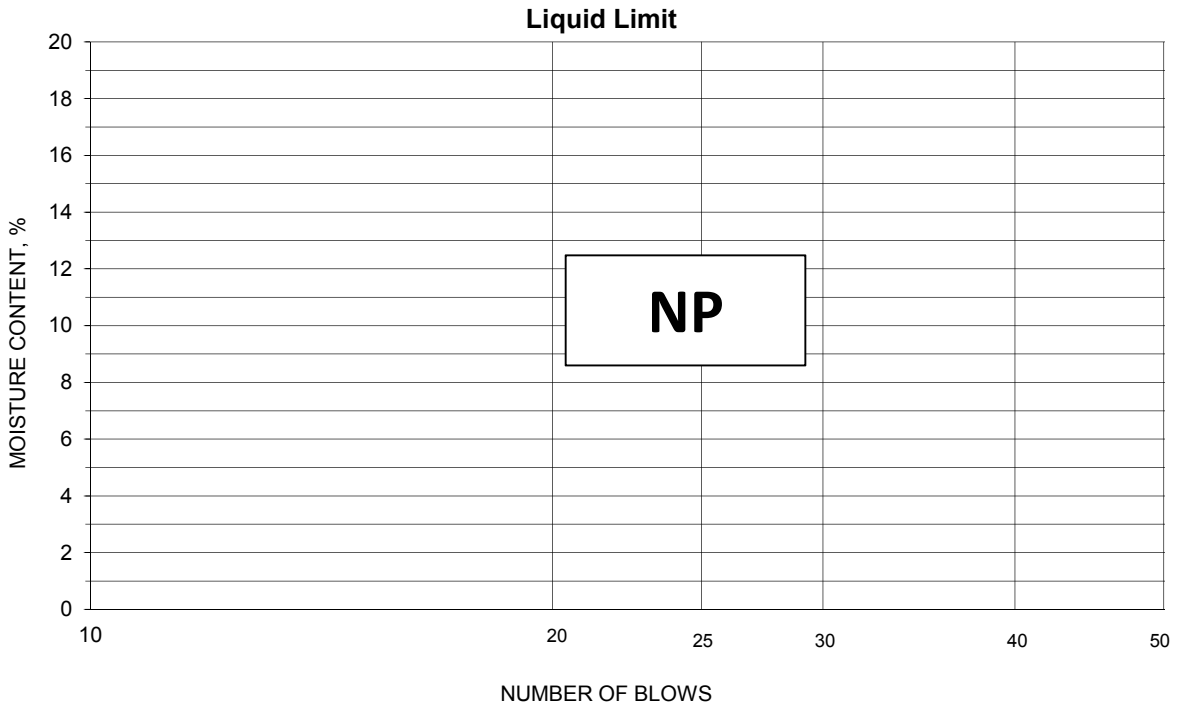
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-001, 59.0'-60.5'			Lab ID	40
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-002, 3.0'-3.7'	Lab ID	42
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	92.8
No. 4	4.75	81.3
No. 10	2	56.1
No. 40	0.425	45.3
No. 200	0.075	33.6
	0.02	21.0
	0.005	12.3
	0.002	8.0
estimated	0.001	6.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	18.7	43.9
Coarse Sand	25.2	10.8
Medium Sand	10.8	---
Fine Sand	11.7	11.7
Silt	21.3	21.3
Clay	12.3	12.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	25
Plastic Limit:	16
Plasticity Index:	9
Activity Index:	1.13

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	SC
Group Name:	Clayey sand with gravel
ODOT Classification	A-2-4 (0)
Description:	Gravel and/or Stone Fragments w/Sand and Silt

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-002, 3.0'-3.7'	Lab ID	42

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-15-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	92.8
No. 4	81.3
No. 10	56.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

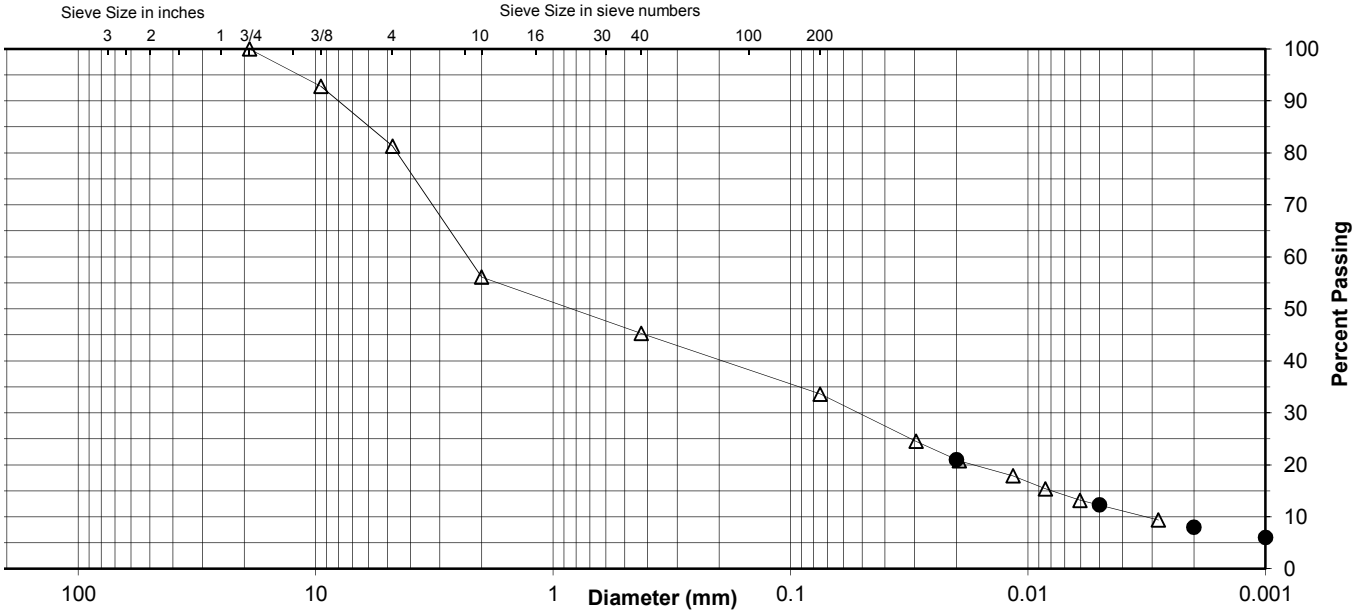
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	45.3
No. 200	33.6
0.02 mm	21.0
0.005 mm	12.3
0.002 mm	8.0
0.001 mm	6.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	18.7	25.2	10.8	11.7	21.3	12.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	43.9			10.8	11.7	25.6	8.0



Comments

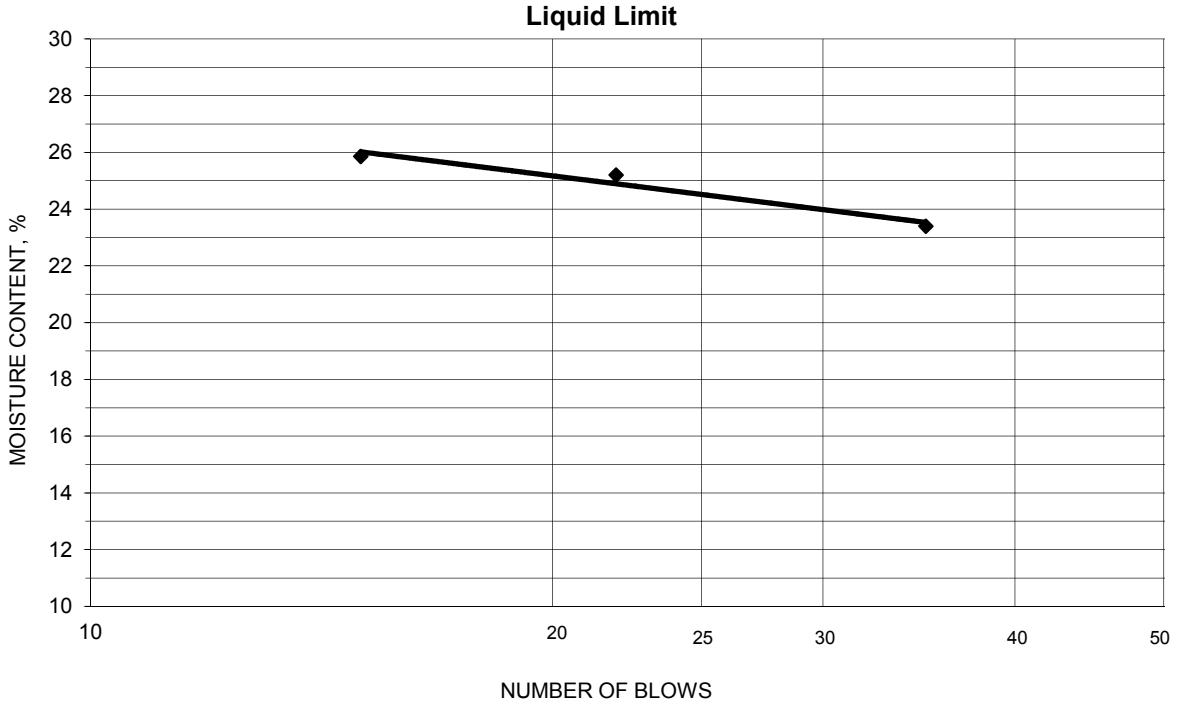
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-002, 3.0'-3.7'			Lab ID	42
				% + No. 40	55
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.81	17.99	10.95	15	25.9	
21.19	19.26	11.60	22	25.2	
20.38	18.67	11.36	35	23.4	25



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
18.11	17.18	11.48	16.3	16	9
18.86	18.01	12.76	16.2		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-002, 9.0'-10.5'	Lab ID	47
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 16.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.5
No. 4	4.75	98.4
No. 10	2	93.8
No. 40	0.425	91.5
No. 200	0.075	86.2
	0.02	68.6
	0.005	42.3
	0.002	28.0
estimated	0.001	20.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	1.6	6.2
Coarse Sand	4.6	2.3
Medium Sand	2.3	---
Fine Sand	5.3	5.3
Silt	43.9	43.9
Clay	42.3	42.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	32
Plastic Limit:	18
Plasticity Index:	14
Activity Index:	0.50

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
ODOT Classification	A-6a (10)
Description:	Silt and Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-002, 9.0'-10.5'	Lab ID	47

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-15-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.5
No. 4	98.4
No. 10	93.8

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

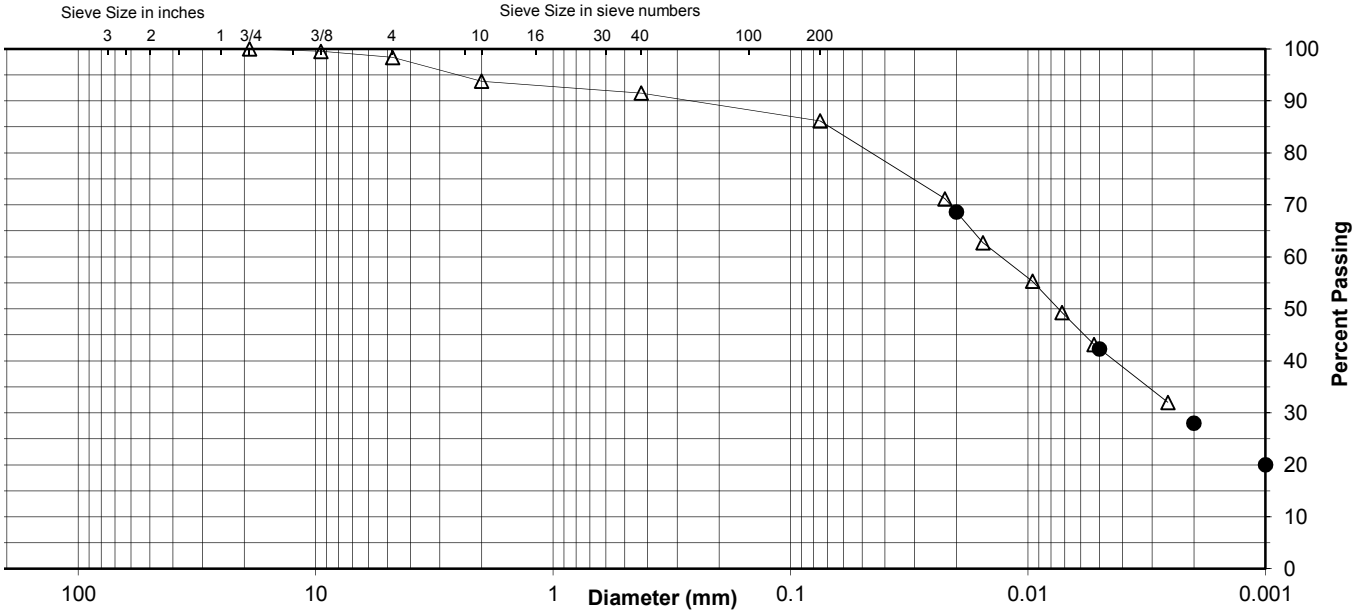
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	91.5
No. 200	86.2
0.02 mm	68.6
0.005 mm	42.3
0.002 mm	28.0
0.001 mm	20.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.6	4.6	2.3	5.3	43.9	42.3
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	6.2			2.3	5.3	58.2	28.0



Comments

Reviewed By RJ

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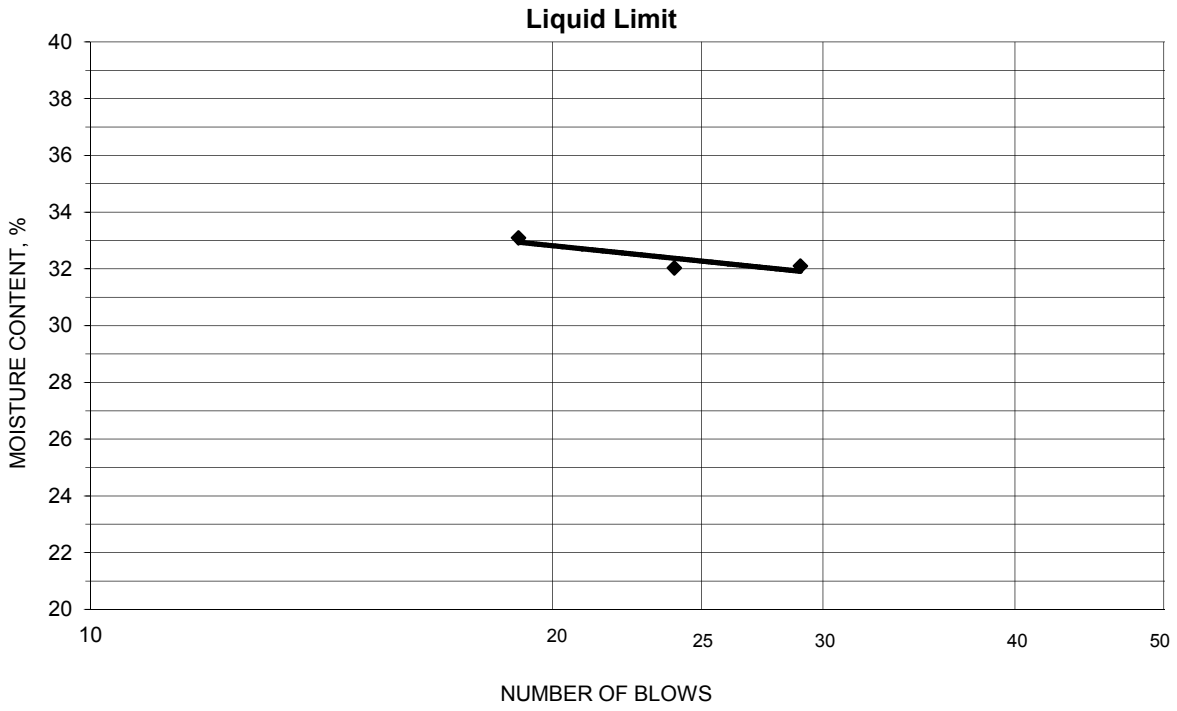
ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-002, 9.0'-10.5'			Lab ID	47
				% + No. 40	8
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.07	18.76	11.78	19	33.1	
18.63	16.91	11.54	24	32.0	
20.14	18.05	11.54	29	32.1	32



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.83	16.85	11.51	18.4	18	14
19.15	18.15	12.53	17.8		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-002, 25.5'-27.5'	Lab ID	58
Sample Type	ST	Date Received	12-12-16
		Date Reported	1-17-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 15.0

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	99.0
No. 4	4.75	97.1
No. 10	2	86.1
No. 40	0.425	82.1
No. 200	0.075	76.6
	0.02	65.8
	0.005	43.9
	0.002	31.0
estimated	0.001	23.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	2.9	13.9
Coarse Sand	11.0	4.0
Medium Sand	4.0	---
Fine Sand	5.5	5.5
Silt	32.7	32.7
Clay	43.9	43.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	34
Plastic Limit:	18
Plasticity Index:	16
Activity Index:	0.52

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
ODOT Classification	A-6b (11)
Description:	Silty Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-002, 25.5'-27.5'	Lab ID	58

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	01-11-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	99.0
No. 4	97.1
No. 10	86.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

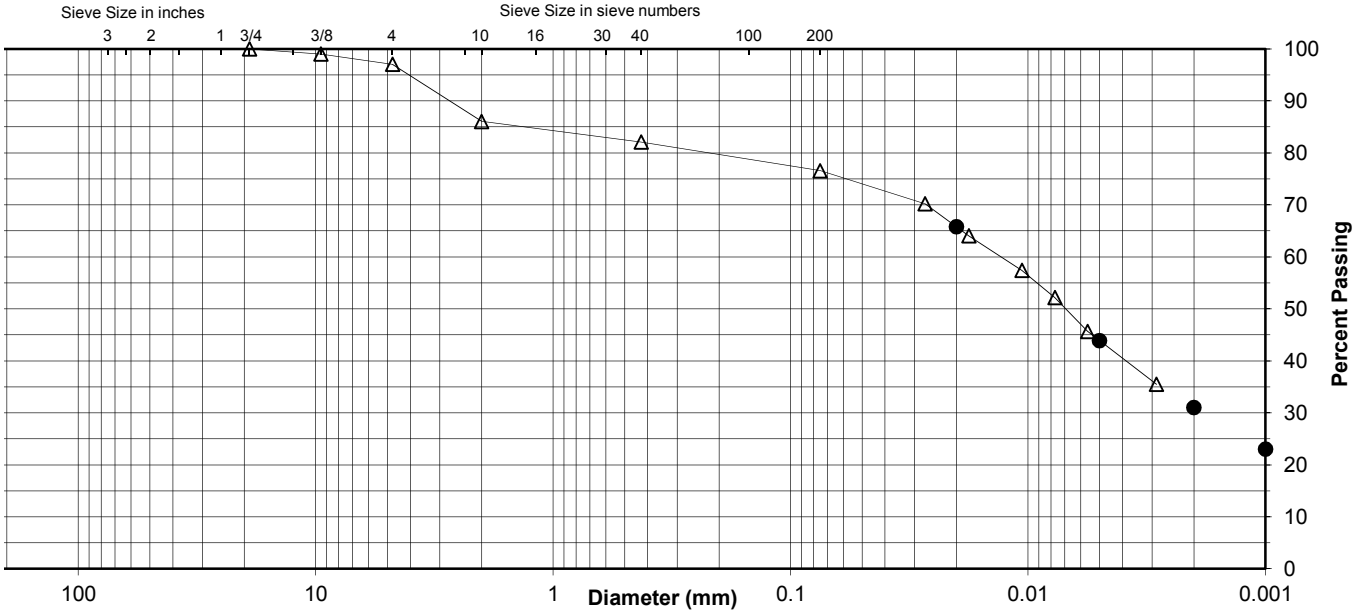
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	82.1
No. 200	76.6
0.02 mm	65.8
0.005 mm	43.9
0.002 mm	31.0
0.001 mm	23.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.9	11.0	4.0	5.5	32.7	43.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	13.9			4.0	5.5	45.6	31.0



Comments

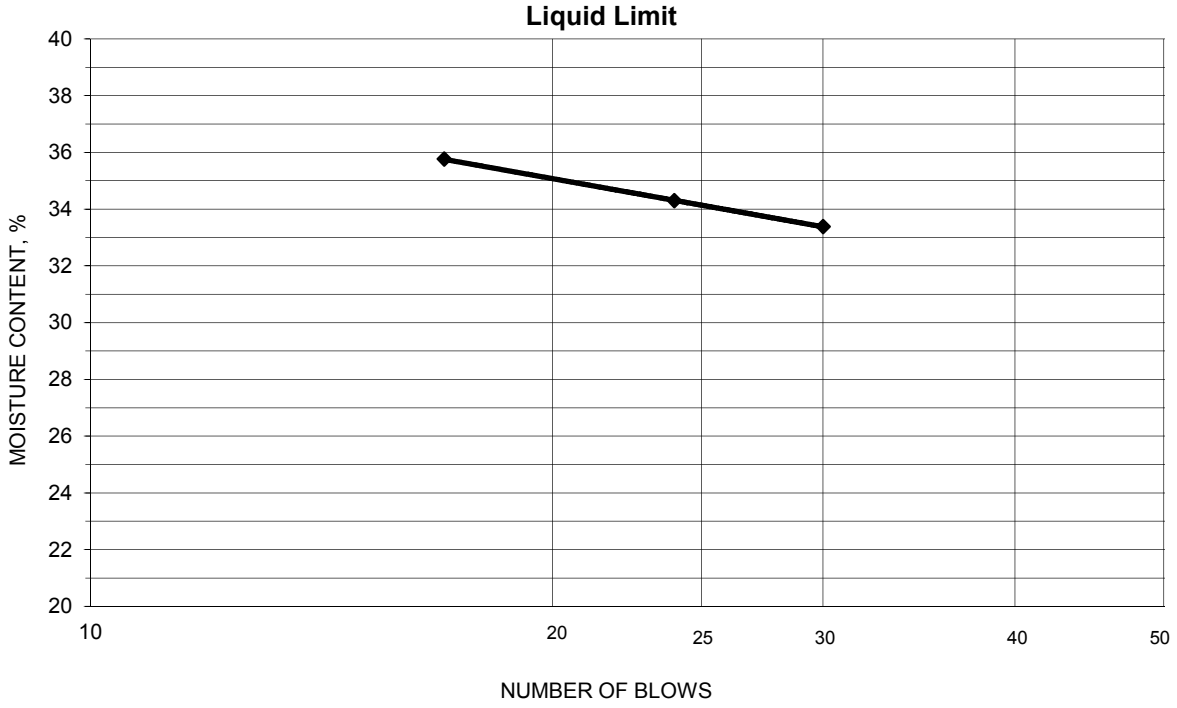
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-002, 25.5'-27.5'			Lab ID	58
				% + No. 40	18
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	01-13-2017	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.68	17.42	11.10	17	35.8	
18.64	16.63	10.77	24	34.3	
20.12	17.84	11.01	30	33.4	34



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.84	16.85	11.45	18.3	18	16
18.33	17.28	11.53	18.3		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-002, 39.5'-41.0'	Lab ID	67
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 17.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	98.4
No. 10	2	95.0
No. 40	0.425	91.8
No. 200	0.075	86.6
	0.02	75.1
	0.005	49.0
	0.002	35.0
estimated	0.001	27.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	1.6	5.0
Coarse Sand	3.4	3.2
Medium Sand	3.2	---
Fine Sand	5.2	5.2
Silt	37.6	37.6
Clay	49.0	49.0

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	34
Plastic Limit:	19
Plasticity Index:	15
Activity Index:	0.43

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
ODOT Classification	A-6a (10)
Description:	Silt and Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-002, 39.5'-41.0'	Lab ID	67

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-15-2016
Date Received	12-12-2016

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	98.4
No. 10	95.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

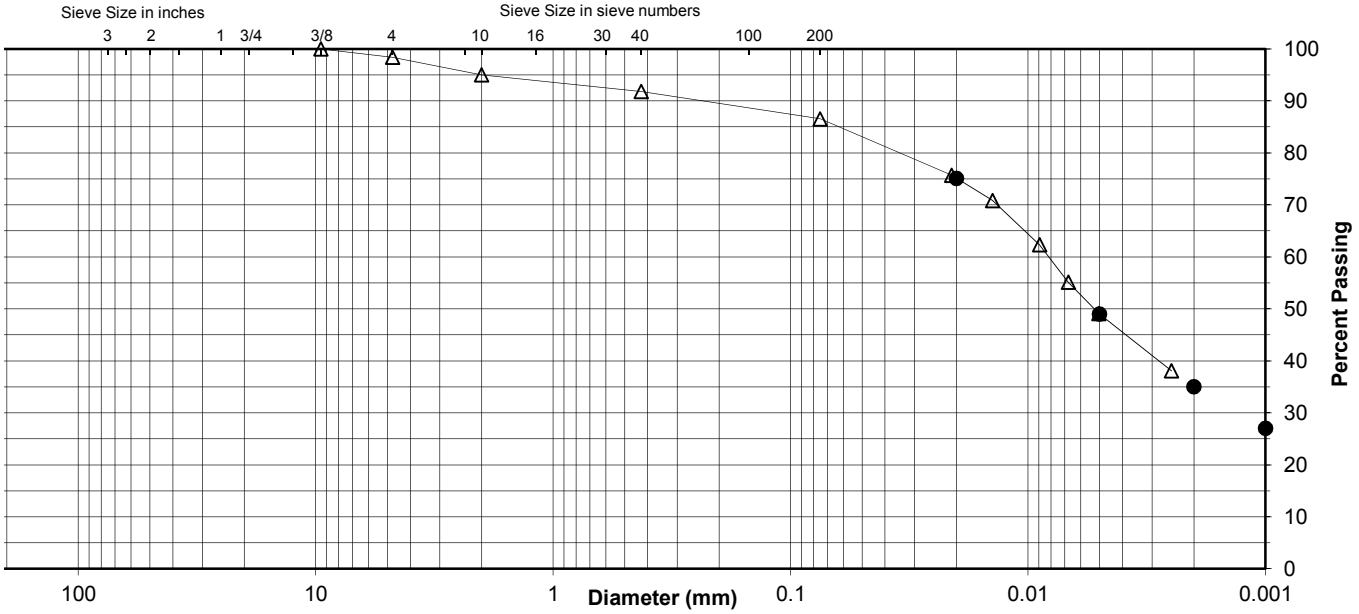
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	91.8
No. 200	86.6
0.02 mm	75.1
0.005 mm	49.0
0.002 mm	35.0
0.001 mm	27.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	1.6	3.4	3.2	5.2	37.6	49.0
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	5.0			3.2	5.2	51.6	35.0



Comments

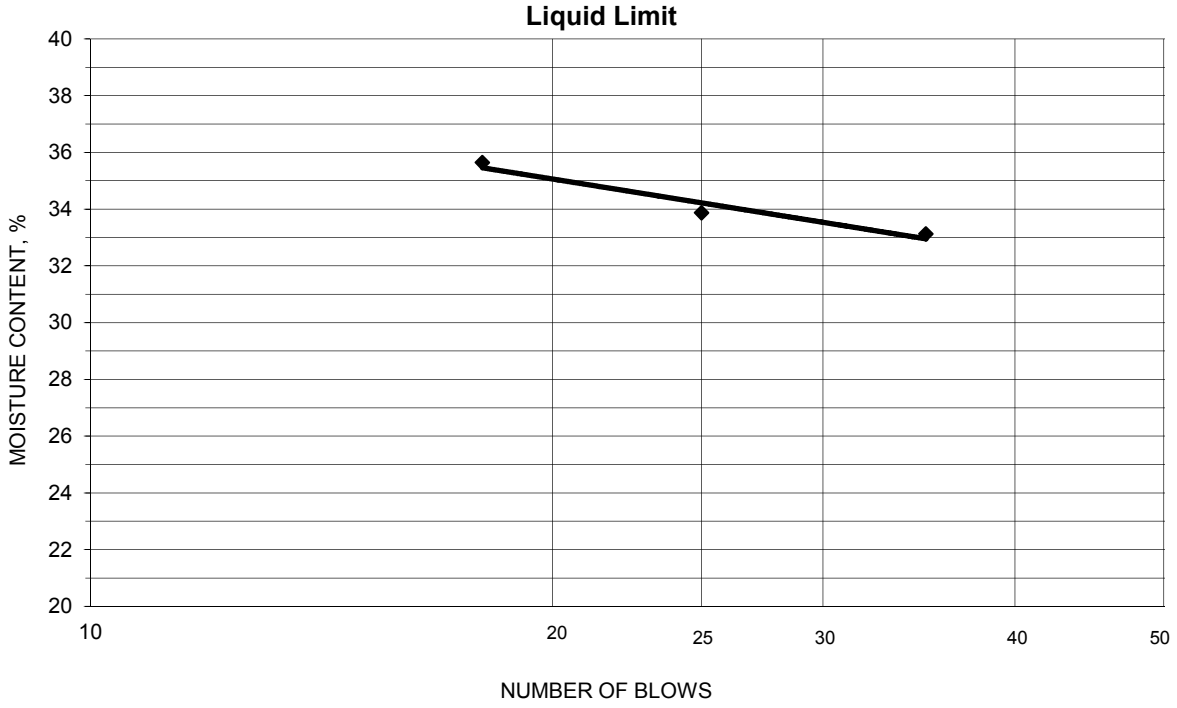
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-002, 39.5'-41.0'			Lab ID	67
				% + No. 40	8
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.23	17.09	10.63	35	33.1	
20.54	18.23	11.41	25	33.9	
19.79	17.52	11.15	18	35.6	34



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.69	16.67	11.23	18.8	19	15
18.38	17.30	11.67	19.2		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-003, 6.0'-7.5'	Lab ID	85
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 15.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.2
No. 4	4.75	97.4
No. 10	2	91.4
No. 40	0.425	88.4
No. 200	0.075	81.9
	0.02	70.2
	0.005	43.6
	0.002	30.0
estimated	0.001	23.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	2.6	8.6
Coarse Sand	6.0	3.0
Medium Sand	3.0	---
Fine Sand	6.5	6.5
Silt	38.3	38.3
Clay	43.6	43.6

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	31
Plastic Limit:	18
Plasticity Index:	13
Activity Index:	0.43

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
ODOT Classification	A-6a (9)
Description:	Silt and Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-003, 6.0'-7.5'	Lab ID	85

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-15-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.2
No. 4	97.4
No. 10	91.4

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

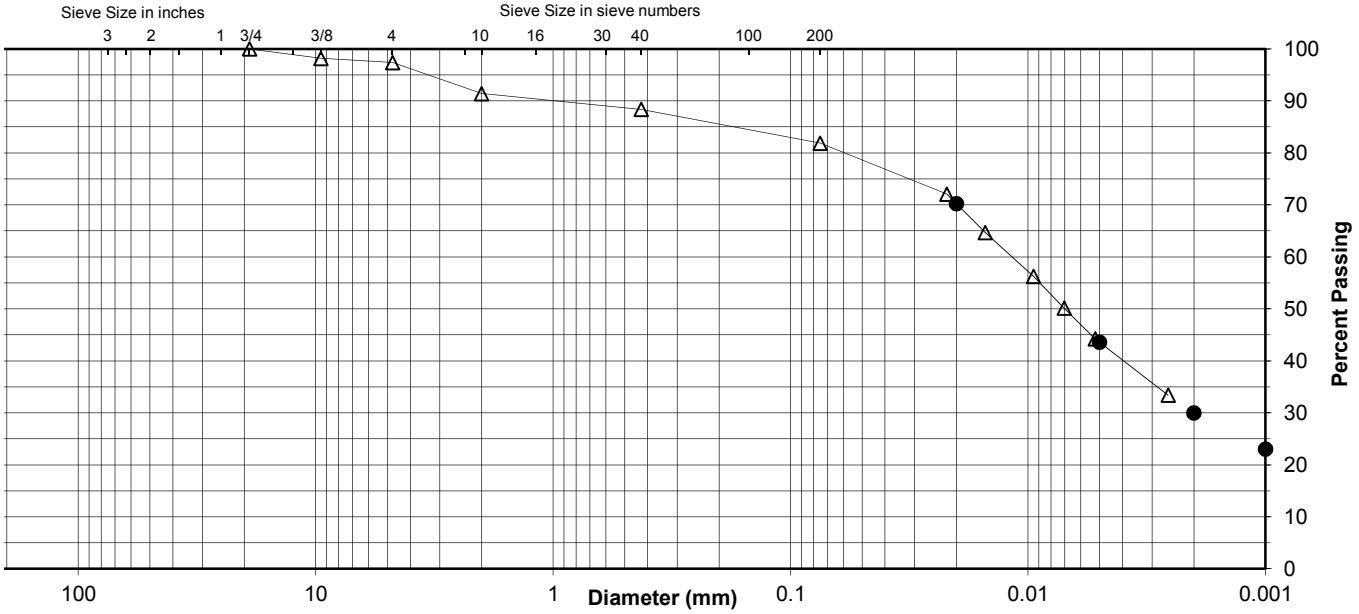
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	88.4
No. 200	81.9
0.02 mm	70.2
0.005 mm	43.6
0.002 mm	30.0
0.001 mm	23.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	2.6	6.0	3.0	6.5	38.3	43.6
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	8.6			3.0	6.5	51.9	30.0



Comments

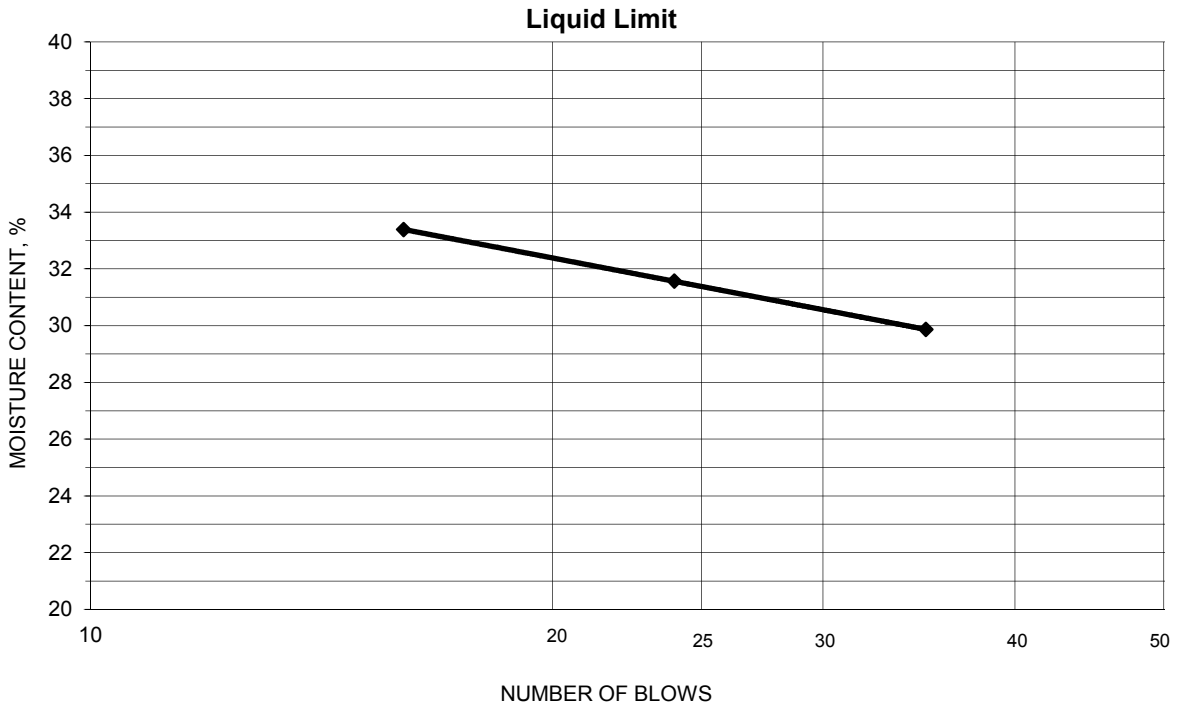
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-003, 6.0'-7.5'			Lab ID	85
				% + No. 40	12
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.13	17.01	10.66	16	33.4	
19.46	17.49	11.25	24	31.6	
19.52	17.57	11.04	35	29.9	31



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.47	16.49	11.02	17.9	18	13
18.14	17.13	11.46	17.8		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-003, 25.5'-27.5'	Lab ID	98
Sample Type	ST	Date Received	12-12-16
		Date Reported	1-17-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 18.9

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.7
No. 10	2	91.7
No. 40	0.425	88.0
No. 200	0.075	82.2
	0.02	69.3
	0.005	47.8
	0.002	34.0
estimated	0.001	25.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	0.3	8.3
Coarse Sand	8.0	3.7
Medium Sand	3.7	---
Fine Sand	5.8	5.8
Silt	34.4	34.4
Clay	47.8	47.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	39
Plastic Limit:	19
Plasticity Index:	20
Activity Index:	0.59

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay with sand
ODOT Classification	A-6b (12)
Description:	Silty Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-003, 25.5'-27.5'	Lab ID	98

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	01-11-2017
Date Received	12-12-2016

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.7
No. 10	91.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

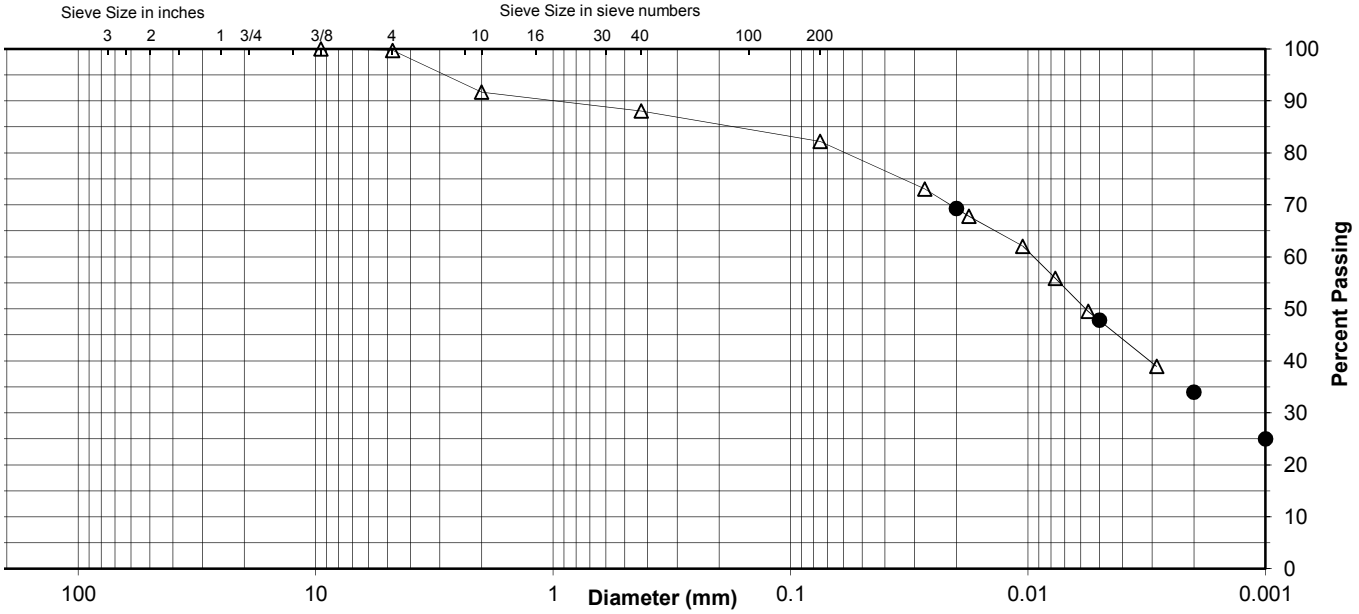
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	88.0
No. 200	82.2
0.02 mm	69.3
0.005 mm	47.8
0.002 mm	34.0
0.001 mm	25.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	0.3	8.0	3.7	5.8	34.4	47.8

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	8.3	3.7	5.8	48.2	34.0



Comments

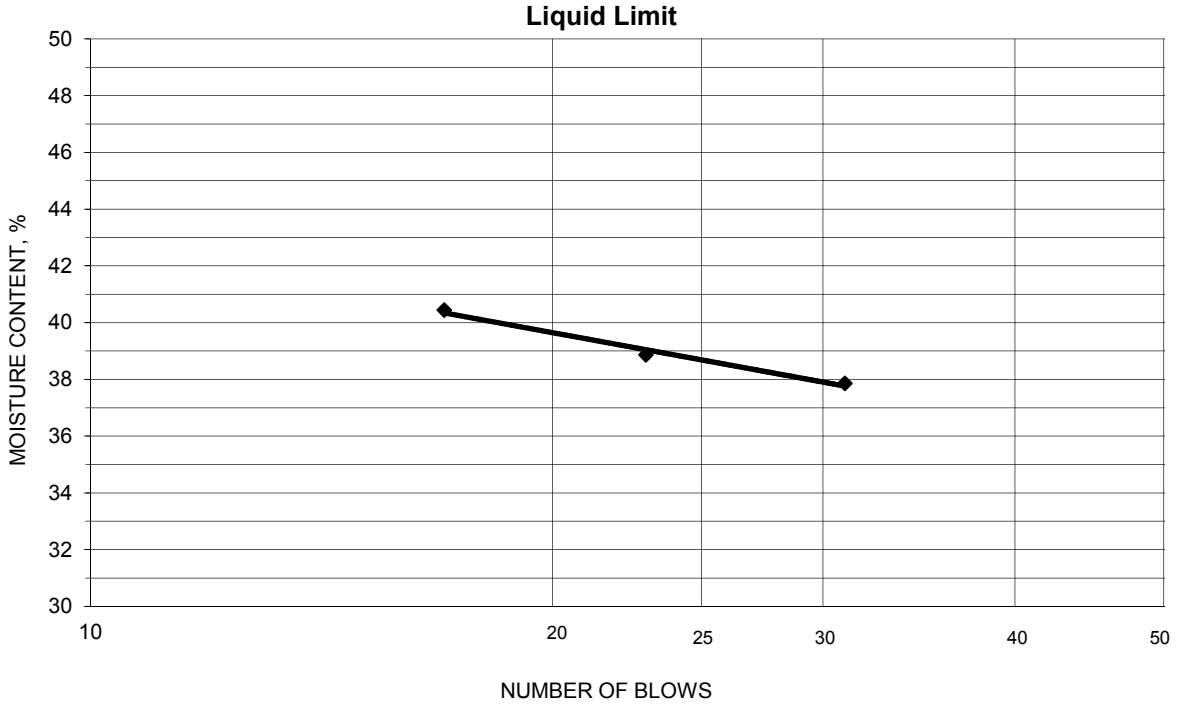
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-003, 25.5'-27.5'			Lab ID	98
				% + No. 40	12
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	01-13-2017	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.33	16.92	10.96	17	40.4	
18.60	16.49	11.06	23	38.9	
18.83	16.71	11.11	31	37.9	39



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.04	16.07	11.04	19.3	19	20
19.10	17.90	11.55	18.9		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-003, 44.0'-45.5'	Lab ID	110
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 19.2

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	96.0
No. 4	4.75	91.0
No. 10	2	82.9
No. 40	0.425	69.5
No. 200	0.075	54.7
	0.02	44.7
	0.005	25.9
	0.002	17.0
estimated	0.001	13.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	9.0	17.1
Coarse Sand	8.1	13.4
Medium Sand	13.4	---
Fine Sand	14.8	14.8
Silt	28.8	28.8
Clay	25.9	25.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	37
Plastic Limit:	22
Plasticity Index:	15
Activity Index:	0.88

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Sandy lean clay
ODOT Classification	A-6a (6)
Description:	Silt and Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-003, 44.0'-45.5'	Lab ID	110

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-15-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	96.0
No. 4	91.0
No. 10	82.9

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

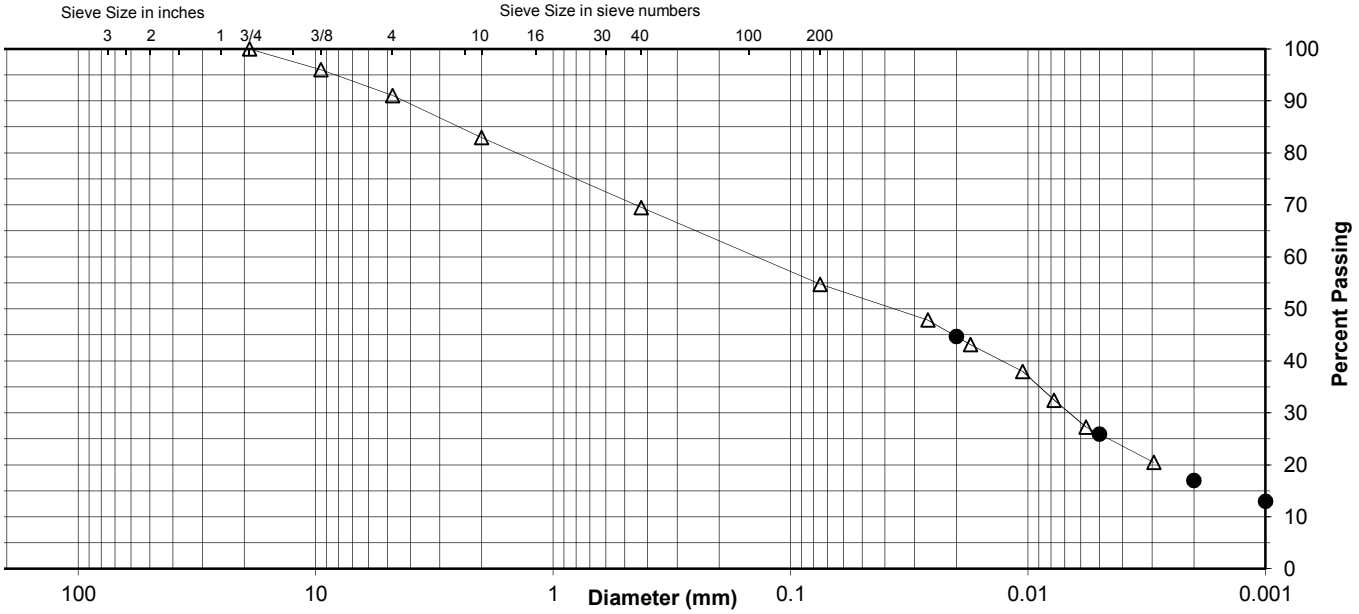
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	69.5
No. 200	54.7
0.02 mm	44.7
0.005 mm	25.9
0.002 mm	17.0
0.001 mm	13.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	9.0	8.1	13.4	14.8	28.8	25.9

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	17.1	13.4	14.8	37.7	17.0



Comments

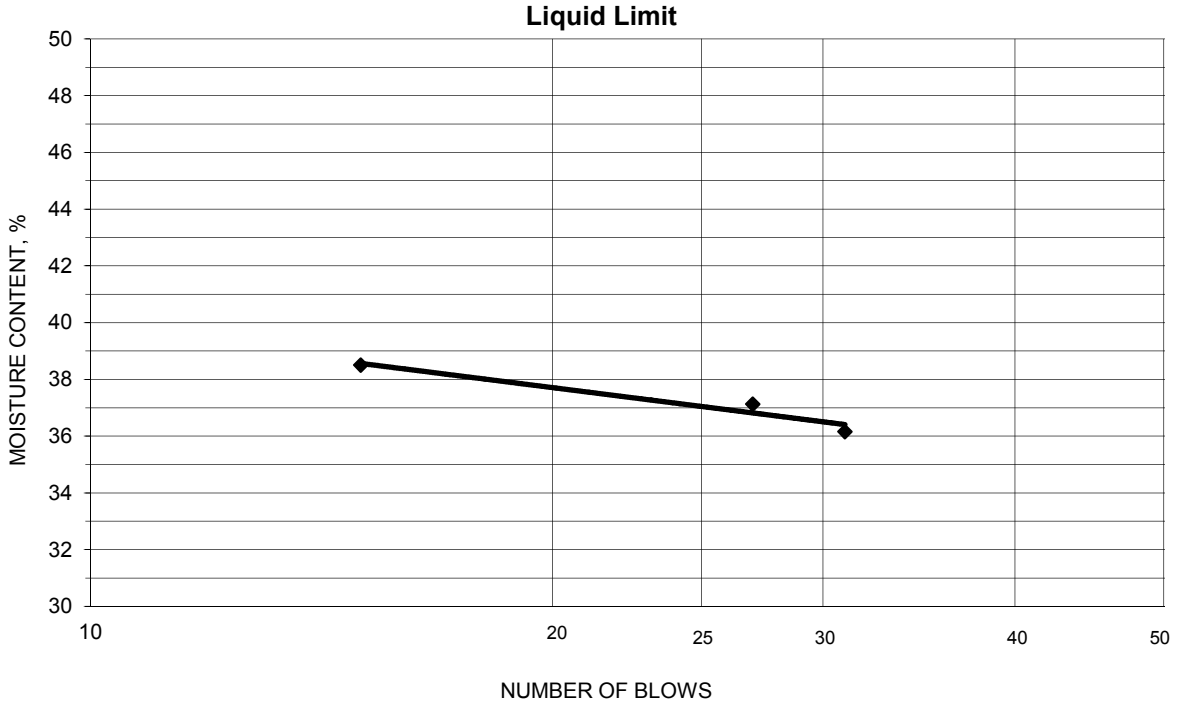
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-003, 44.0'-45.5'			Lab ID	110
				% + No. 40	31
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.43	17.21	11.07	31	36.2	
18.40	16.41	11.05	27	37.1	
18.23	16.17	10.82	15	38.5	37



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.90	16.79	11.61	21.4	22	15
17.69	16.56	11.48	22.2		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-004, 7.5'-9.0'	Lab ID	117
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 19.8

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
3/4"	19	100.0
3/8"	9.5	98.1
No. 4	4.75	97.3
No. 10	2	95.2
No. 40	0.425	92.3
No. 200	0.075	86.8
	0.02	77.3
	0.005	50.3
	0.002	35.0
estimated	0.001	25.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	2.7	4.8
Coarse Sand	2.1	2.9
Medium Sand	2.9	---
Fine Sand	5.5	5.5
Silt	36.5	36.5
Clay	50.3	50.3

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	37
Plastic Limit:	19
Plasticity Index:	18
Activity Index:	0.51

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
ODOT Classification	A-6b (11)
Description:	Silty Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-004, 7.5'-9.0'	Lab ID	117

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-15-2016
Date Received	12-12-2016

Maximum Particle size: 3/4" Sieve

Sieve Size	% Passing
3/4"	100.0
3/8"	98.1
No. 4	97.3
No. 10	95.2

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

Specific Gravity 2.7

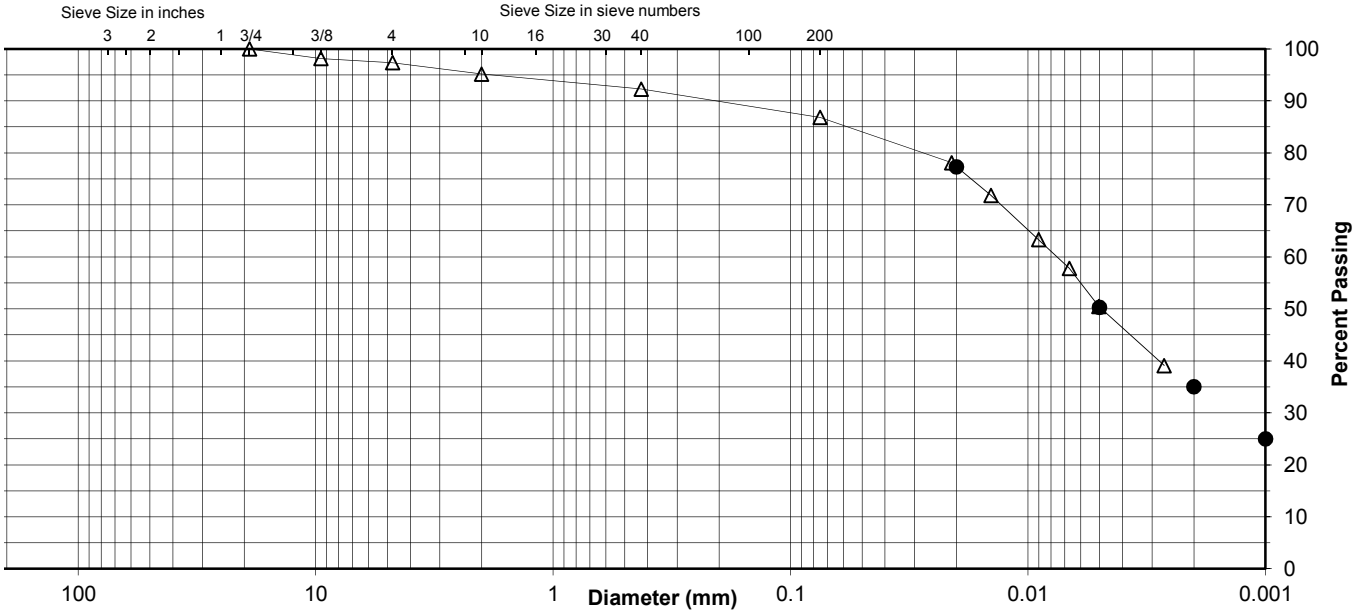
Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	92.3
No. 200	86.8
0.02 mm	77.3
0.005 mm	50.3
0.002 mm	35.0
0.001 mm	25.0

Particle Size Distribution

	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
ASTM	0.0	2.7	2.1	2.9	5.5	36.5	50.3

	Gravel	Coarse Sand	Fine Sand	Silt	Clay
AASHTO	4.8	2.9	5.5	51.8	35.0



Comments

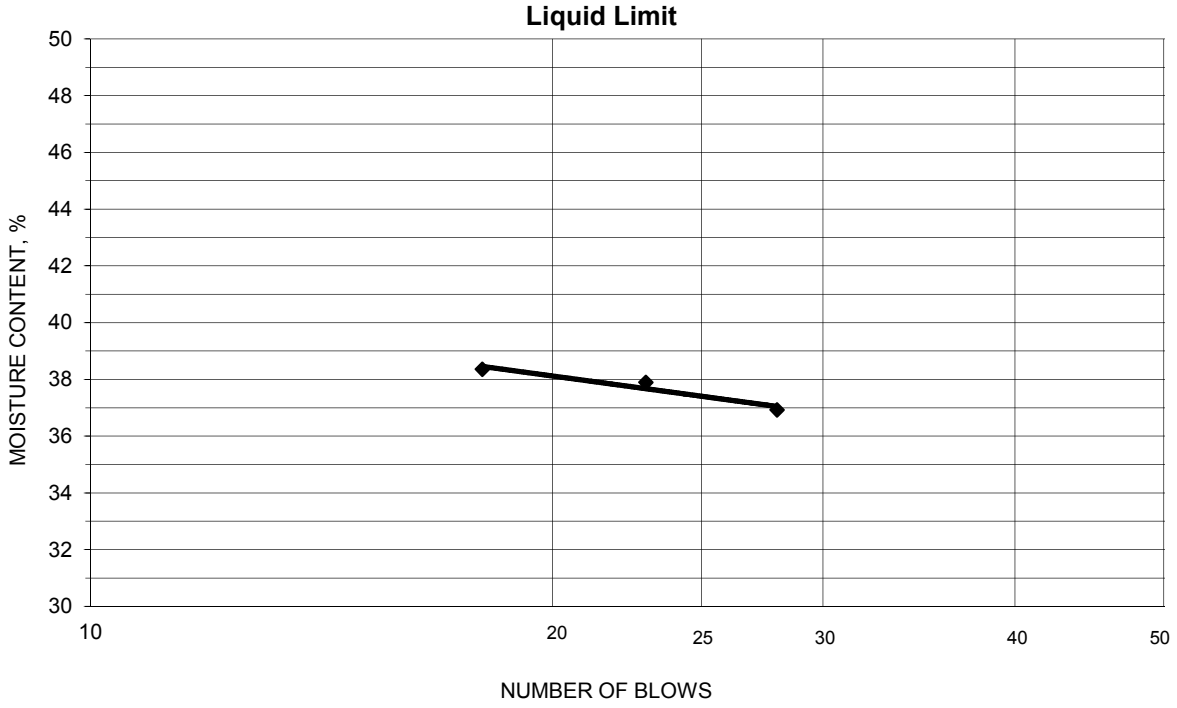
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-004, 7.5'-9.0'			Lab ID	117
				% + No. 40	8
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-16-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
21.00	18.43	11.73	18	38.4	
18.95	16.76	10.98	23	37.9	
20.33	17.93	11.43	28	36.9	37



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.95	16.90	11.45	19.3	19	18
18.07	17.00	11.43	19.2		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-004, 24.0'-26.0'	Lab ID	128
Sample Type	ST	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 10.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	90.8
3/8"	9.5	84.9
No. 4	4.75	75.4
No. 10	2	64.1
No. 40	0.425	49.4
No. 200	0.075	38.2
	0.02	33.2
	0.005	20.5
	0.002	13.0
estimated	0.001	10.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	24.6	35.9
Coarse Sand	11.3	14.7
Medium Sand	14.7	---
Fine Sand	11.2	11.2
Silt	17.7	17.7
Clay	20.5	20.5

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	31
Plastic Limit:	18
Plasticity Index:	13
Activity Index:	1.00

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	SC
Group Name:	Clayey sand with gravel
ODOT Classification	A-6a (1)
Description:	Silt and Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-004, 24.0'-26.0'	Lab ID	128

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	GW
Test Date	01-02-2016
Date Received	12-12-2016

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	90.8
3/8"	84.9
No. 4	75.4
No. 10	64.1

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

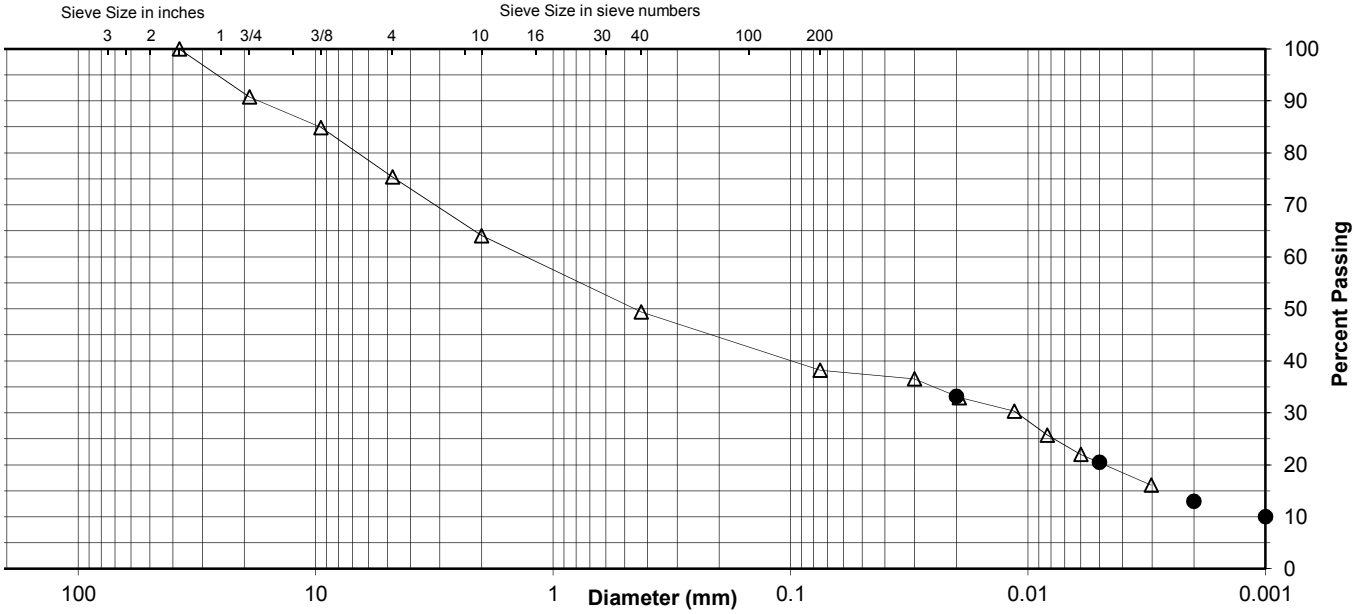
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	49.4
No. 200	38.2
0.02 mm	33.2
0.005 mm	20.5
0.002 mm	13.0
0.001 mm	10.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	9.2	15.4	11.3	14.7	11.2	17.7	20.5
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	35.9			14.7	11.2	25.2	13.0



Comments

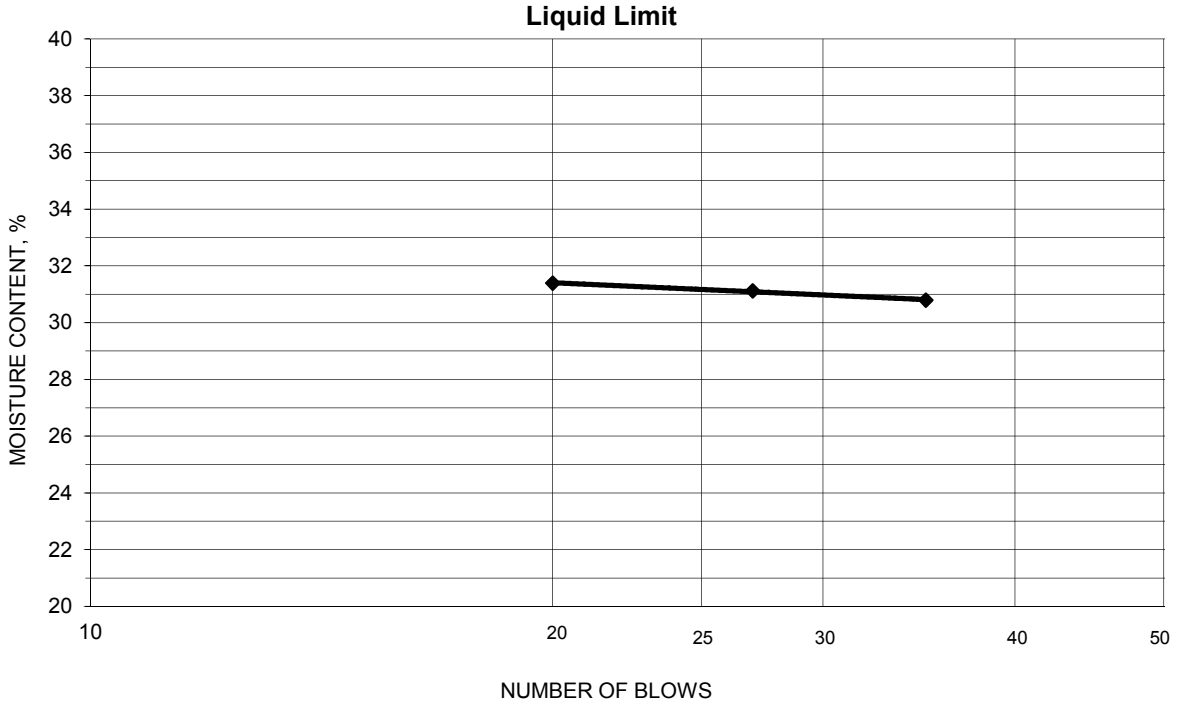
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-004, 24.0'-26.0'			Lab ID	128
				% + No. 40	51
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	01-04-2017	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.33	17.39	11.21	20	31.4	
19.81	17.75	11.13	27	31.1	
19.01	17.15	11.11	35	30.8	31



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.72	16.68	10.96	18.2	18	13
17.74	16.70	10.97	18.2		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-004, 32.0'-33.5'	Lab ID	133
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 24.5

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 10	2	100.0
No. 40	0.425	99.5
No. 200	0.075	84.7
	0.02	43.6
	0.005	16.9
	0.002	11.0
estimated	0.001	8.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	0.0	0.0
Coarse Sand	0.0	0.5
Medium Sand	0.5	---
Fine Sand	14.8	14.8
Silt	67.8	67.8
Clay	16.9	16.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	ML
Group Name:	Silt with sand
ODOT Classification	A-4b (9)
Description:	Silt

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-004, 32.0'-33.5'	Lab ID	133

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	N/A
Particle Hardness:	N/A
Tested By	JS
Test Date	12-19-2016
Date Received	12-12-2016

Maximum Particle size: No. 10 Sieve

Sieve Size	% Passing
No. 10	100.0

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

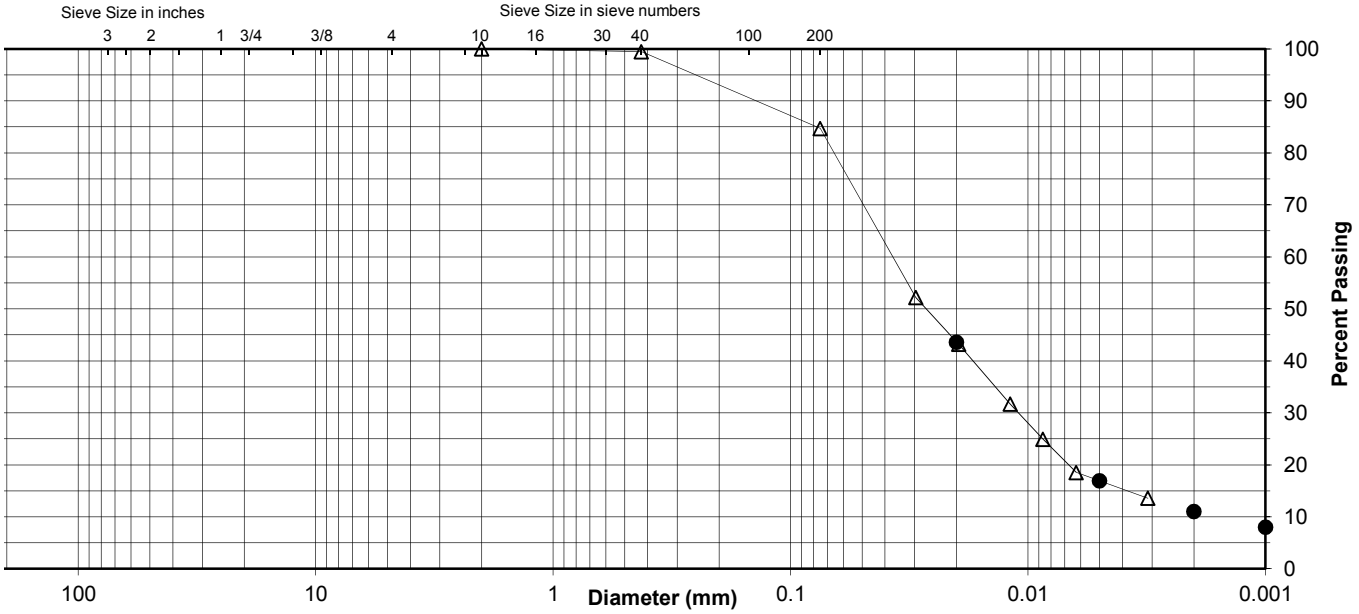
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	99.5
No. 200	84.7
0.02 mm	43.6
0.005 mm	16.9
0.002 mm	11.0
0.001 mm	8.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	0.0	0.5	14.8	67.8	16.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	0.0			0.5	14.8	73.7	11.0



Comments

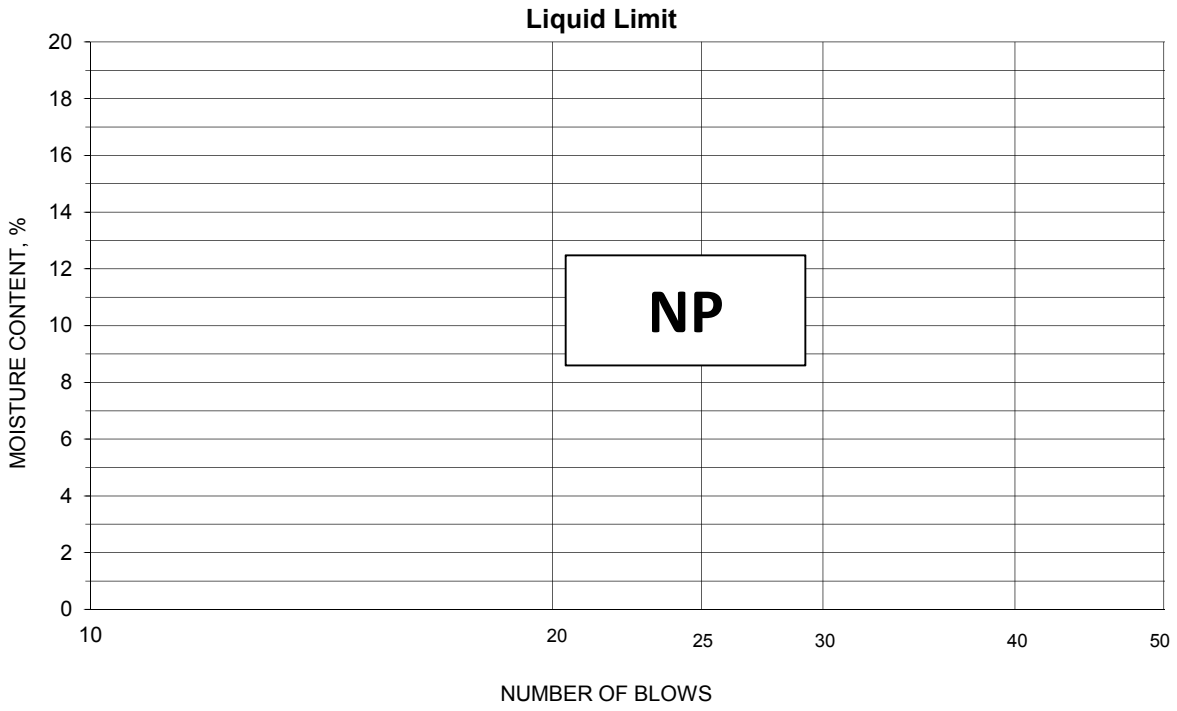
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-004, 32.0'-33.5'			Lab ID	133
				% + No. 40	1
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-21-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-005, 7.5'-9.0'	Lab ID	142
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 17.7

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
3/8"	9.5	100.0
No. 4	4.75	99.1
No. 10	2	97.3
No. 40	0.425	94.9
No. 200	0.075	91.3
	0.02	80.7
	0.005	51.9
	0.002	35.0
estimated	0.001	26.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	0.9	2.7
Coarse Sand	1.8	2.4
Medium Sand	2.4	---
Fine Sand	3.6	3.6
Silt	39.4	39.4
Clay	51.9	51.9

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	39
Plastic Limit:	21
Plasticity Index:	18
Activity Index:	0.51

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
ODOT Classification	A-6b (11)
Description:	Silty Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-005, 7.5'-9.0'	Lab ID	142

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-19-2016
Date Received	12-12-2016

Maximum Particle size: 3/8" Sieve

Sieve Size	% Passing
3/8"	100.0
No. 4	99.1
No. 10	97.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

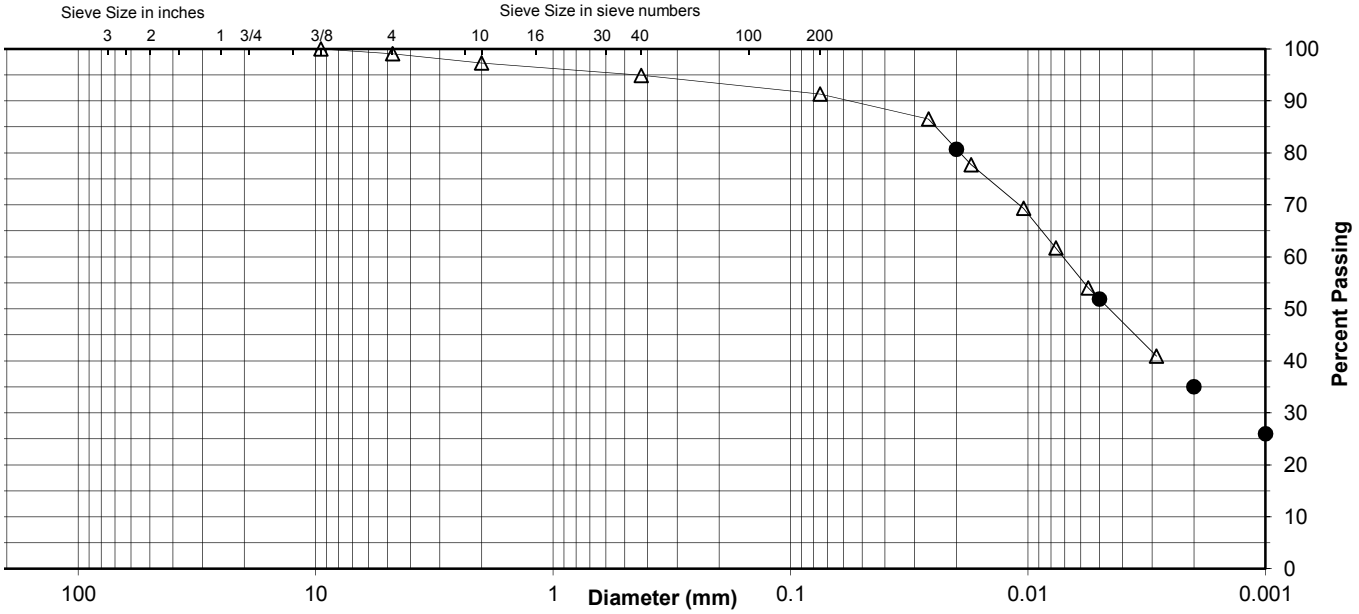
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	94.9
No. 200	91.3
0.02 mm	80.7
0.005 mm	51.9
0.002 mm	35.0
0.001 mm	26.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.9	1.8	2.4	3.6	39.4	51.9
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	2.7			2.4	3.6	56.3	35.0



Comments

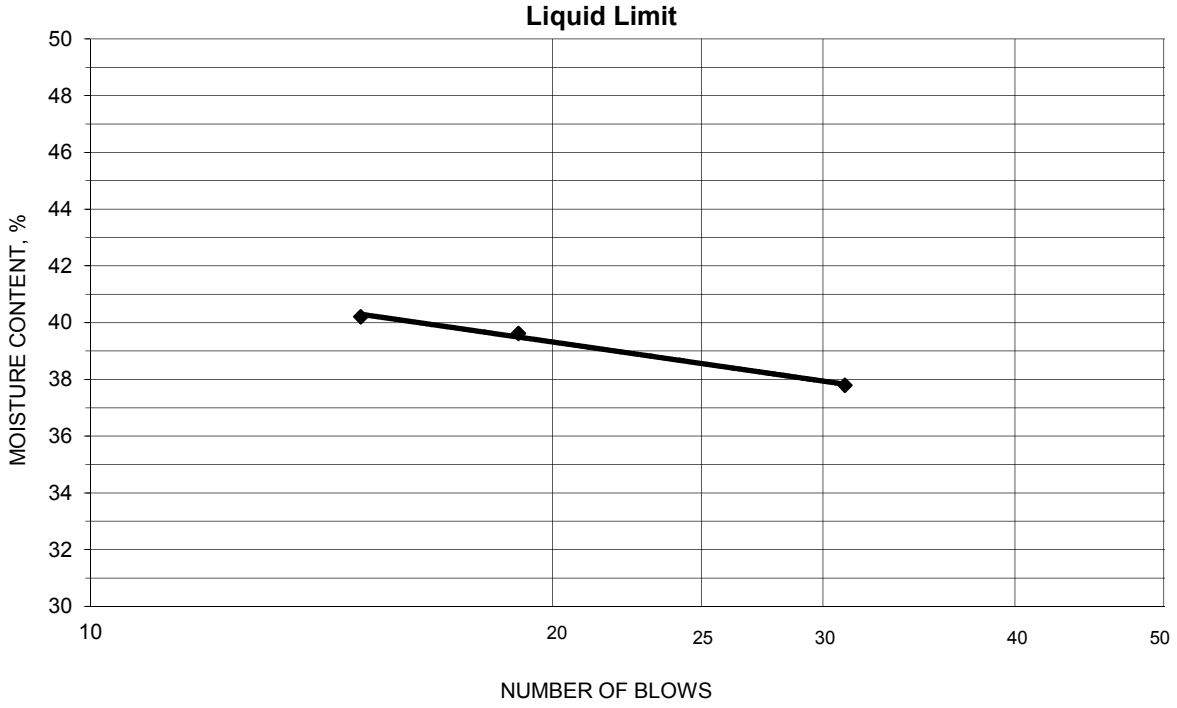
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-005, 7.5'-9.0'			Lab ID	142
				% + No. 40	5
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-21-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
19.17	16.85	11.08	15	40.2	
19.37	17.06	11.23	19	39.6	
18.95	16.80	11.11	31	37.8	39



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.73	16.59	11.13	20.9	21	18
18.03	16.87	11.27	20.7		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-005, 18.0'-20.0'	Lab ID	149
Sample Type	ST	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 21.1

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
No. 4	4.75	100.0
No. 10	2	98.7
No. 40	0.425	98.3
No. 200	0.075	96.7
	0.02	90.3
	0.005	59.8
	0.002	38.0
estimated	0.001	21.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	0.0	1.3
Coarse Sand	1.3	0.4
Medium Sand	0.4	---
Fine Sand	1.6	1.6
Silt	36.9	36.9
Clay	59.8	59.8

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	35
Plastic Limit:	20
Plasticity Index:	15
Activity Index:	0.39

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	CL
Group Name:	Lean clay
ODOT Classification	A-6a (10)
Description:	Silt and Clay

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-005, 18.0'-20.0'	Lab ID	149

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	JS
Test Date	12-20-2016
Date Received	12-12-2016

Maximum Particle size: No. 4 Sieve

Sieve Size	% Passing
No. 4	100.0
No. 10	98.7

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

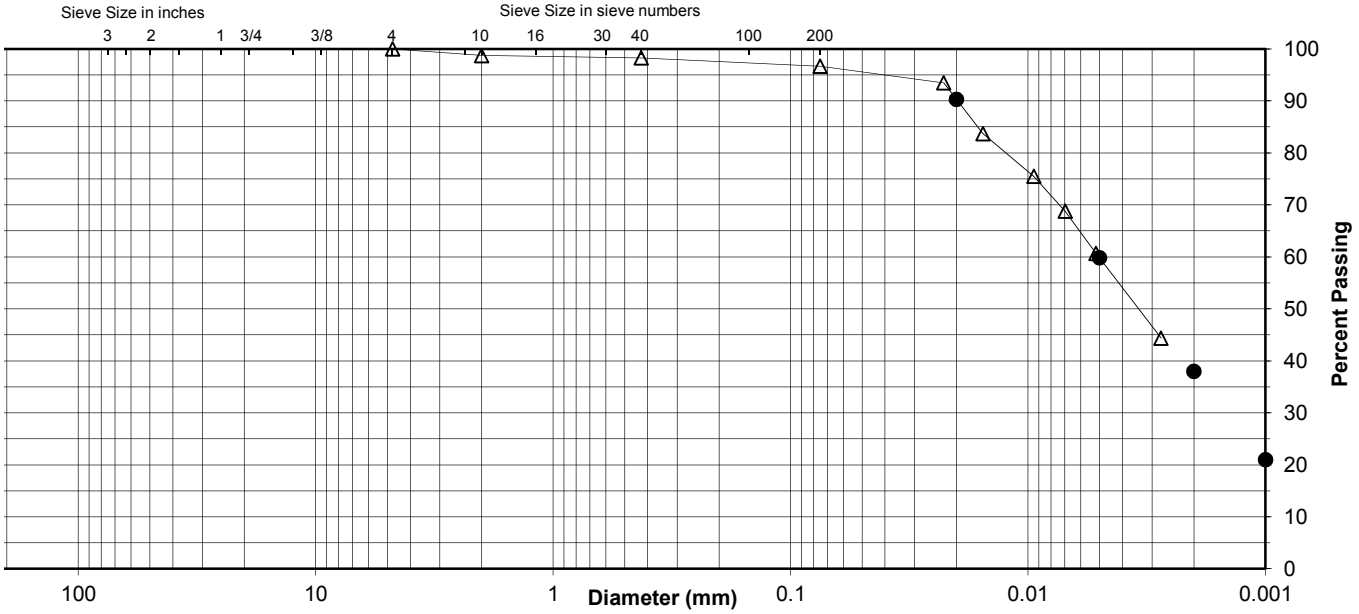
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	98.3
No. 200	96.7
0.02 mm	90.3
0.005 mm	59.8
0.002 mm	38.0
0.001 mm	21.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	0.0	0.0	1.3	0.4	1.6	36.9	59.8
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	1.3			0.4	1.6	58.7	38.0



Comments

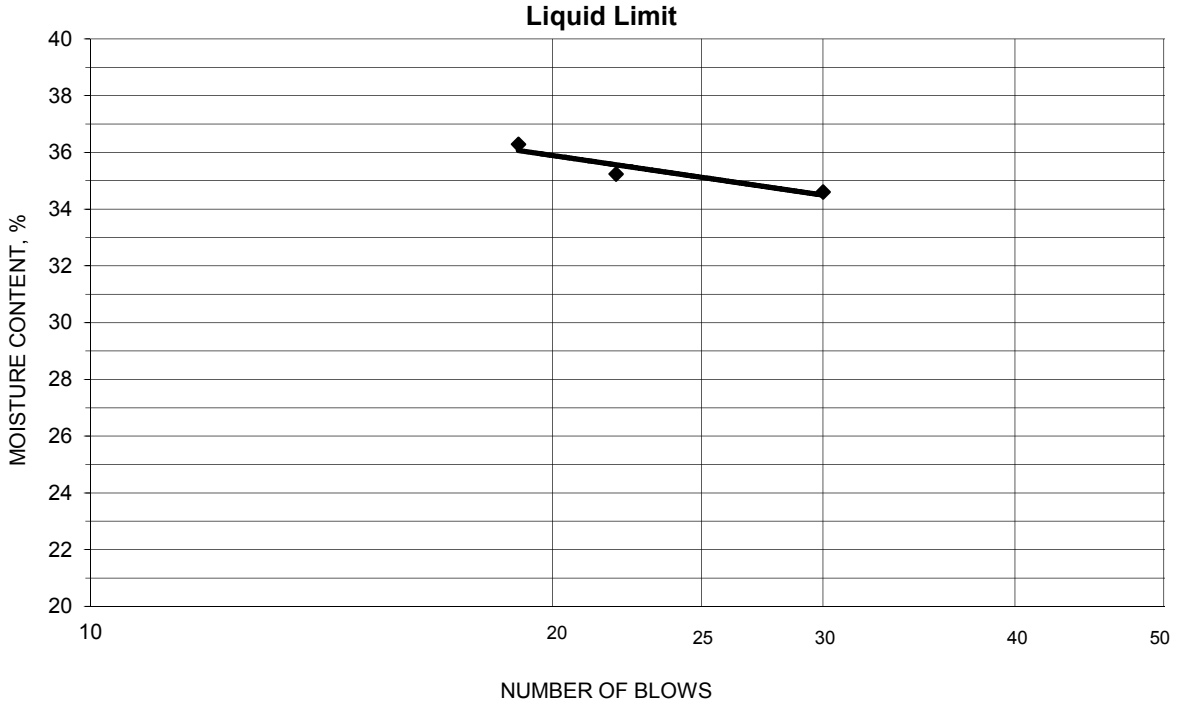
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-005, 18.0'-20.0'			Lab ID	149
				% + No. 40	2
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-21-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit
18.94	16.85	11.09	19	36.3	
19.68	17.40	10.93	22	35.2	
19.78	17.59	11.26	30	34.6	35



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index
17.98	16.91	11.41	19.5	20	15
17.43	16.31	10.72	20.0		

Remarks: _____

Reviewed By RJ

Stantec

Summary of Soil Tests

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-005, 23.0'-24.5'	Lab ID	153
Sample Type	SPT	Date Received	12-12-16
		Date Reported	1-8-17

Test Results

Natural Moisture Content

Test Method: ASTM D 2216

Moisture Content (%): 4.3

Particle Size Analysis

Preparation Method: ASTM D 421
Gradation Method: ASTM D 422
Hydrometer Method: ASTM D 422

Particle Size		%
Sieve Size	(mm)	Passing
	N/A	
	N/A	
	N/A	
1 1/2"	37.5	100.0
3/4"	19	88.5
3/8"	9.5	81.9
No. 4	4.75	73.2
No. 10	2	57.3
No. 40	0.425	28.1
No. 200	0.075	13.3
	0.02	7.9
	0.005	4.1
	0.002	2.0
estimated	0.001	1.0

Plus 3 in. material, not included: 0 (%)

	ASTM	ODOT
Range	(%)	(%)
Gravel	26.8	42.7
Coarse Sand	15.9	29.2
Medium Sand	29.2	---
Fine Sand	14.8	14.8
Silt	9.2	9.2
Clay	4.1	4.1

Atterberg Limits

Test Method: ASTM D 4318 Method A
Prepared: Dry

Liquid Limit:	NP
Plastic Limit:	NP
Plasticity Index:	NP
Activity Index:	N/A

Moisture-Density Relationship

Test Not Performed

Maximum Dry Density (lb/ft^3):	N/A
Maximum Dry Density (kg/m^3):	N/A
Optimum Moisture Content (%):	N/A
Over Size Correction %:	N/A

California Bearing Ratio

Test Not Performed

Bearing Ratio (%):	N/A
Compacted Dry Density (lb/ft^3):	N/A
Compacted Moisture Content (%):	N/A

Specific Gravity

Estimated

Particle Size:	No. 10
Specific Gravity at 20° Celsius:	2.70

Classification

Unified Group Symbol:	SM
Group Name:	Silty sand with gravel
ODOT Classification	A-1-b (0)
Description	Gravel and/or Stone Fragments with Sand

Comments:

Reviewed By RJ

Stantec

Particle-Size Analysis of Soils
ASTM D 422

Project Name	SUM-271 Landslides	Project Number	175526009
Source	B-005, 23.0'-24.5'	Lab ID	153

Sieve analysis for the Portion Coarser than the No. 10 Sieve

Test Method	ASTM D 422
Prepared using	ASTM D 421
Particle Shape	Angular
Particle Hardness:	Hard and Durable
Tested By	SKS
Test Date	12-19-2016
Date Received	12-12-2016

Maximum Particle size: 1 1/2" Sieve

Sieve Size	% Passing
1 1/2"	100.0
3/4"	88.5
3/8"	81.9
No. 4	73.2
No. 10	57.3

Analysis for the portion Finer than the No. 10 Sieve

Analysis Based on -3 inch fraction only

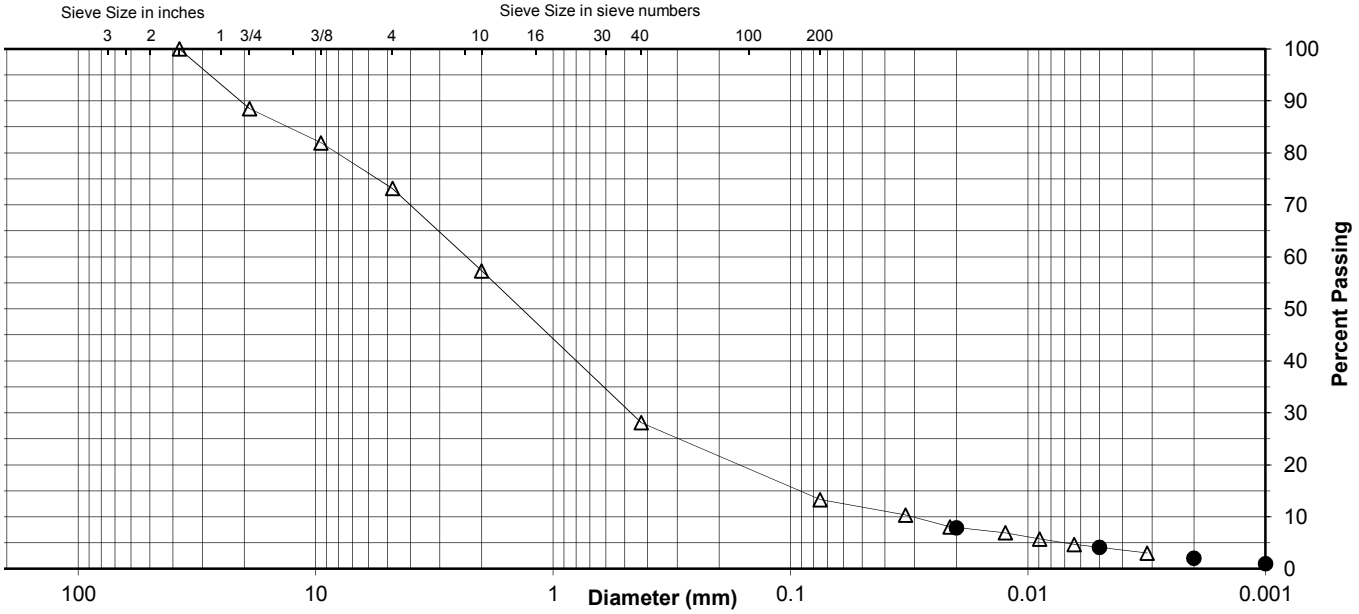
Specific Gravity 2.7

Dispersed using Apparatus A - Mechanical, for 1 minute

No. 40	28.1
No. 200	13.3
0.02 mm	7.9
0.005 mm	4.1
0.002 mm	2.0
0.001 mm	1.0

Particle Size Distribution

ASTM	Coarse Gravel	Fine Gravel	C. Sand	Medium Sand	Fine Sand	Silt	Clay
	11.5	15.3	15.9	29.2	14.8	9.2	4.1
AASHTO	Gravel			Coarse Sand	Fine Sand	Silt	Clay
	42.7			29.2	14.8	11.3	2.0



Comments

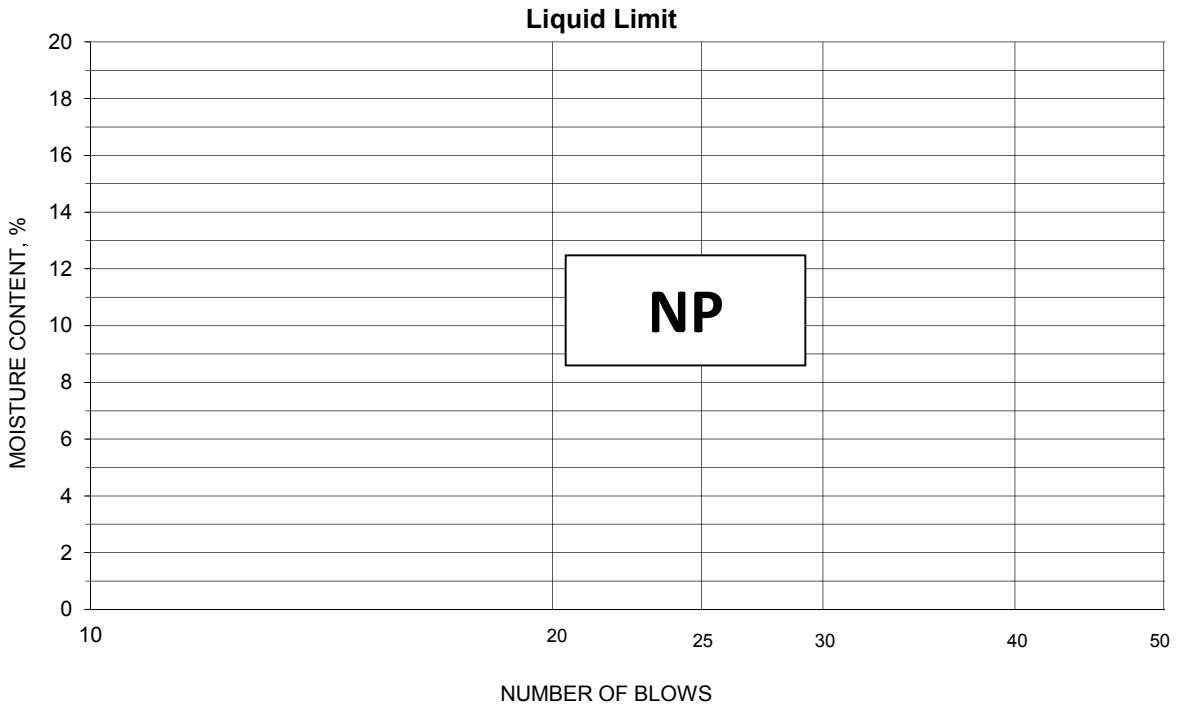
Reviewed By RJ

Stantec

ATTERBERG LIMITS

Project	SUM-271 Landslides			Project No.	175526009
Source	B-005, 23.0'-24.5'			Lab ID	153
				% + No. 40	72
Tested By	KWS	Test Method	ASTM D 4318 Method A	Date Received	12-12-2016
Test Date	12-19-2016	Prepared	Dry		

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Number of Blows	Water Content (%)	Liquid Limit



PLASTIC LIMIT AND PLASTICITY INDEX

Wet Soil and Tare Mass (g)	Dry Soil and Tare Mass (g)	Tare Mass (g)	Water Content (%)	Plastic Limit	Plasticity Index

Remarks: _____

Reviewed By RJ

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name SUM-271 Landslides | Project Number 175526009
Source B-001, 40.5'-42.5' | Lab ID 28
Visual Description Lean Clay (CL), light brown, moist, firm

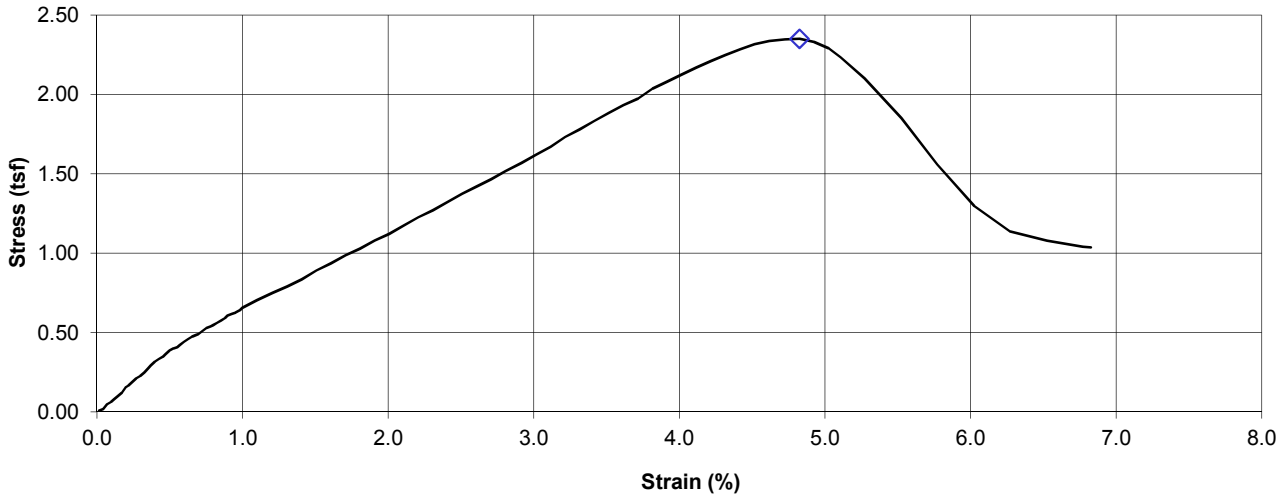
Recovered 1.8'
Test Interval 40.5' - 41.0'

Specimen Type: Undisturbed | LL 39 | PL 21 | PI 18

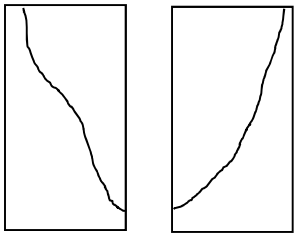
Date Extruded 12/19/2016
Date Tested 12/19/2016

Initial Wet Density (pcf)	131.0		
Initial Moisture Content (%)	20.0	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	109.2		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	2.35
Average Height (in)	6.026	Undrained Shear Strength (tsf)	1.17
Average Diameter (in)	2.864	Strain at Maximum Stress (%)	4.8
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	1.00

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments
41.0'-41.6' (28B) - rough cut
41.6'-42.2' (28C) - rough cut

Reviewed By RJ

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name SUM-271 Landslides | Project Number 175526009
Source B-004, 24.0'-26.0' | Lab ID 128
Visual Description Clayey Sand with Gravel (SC), brown, moist, firm

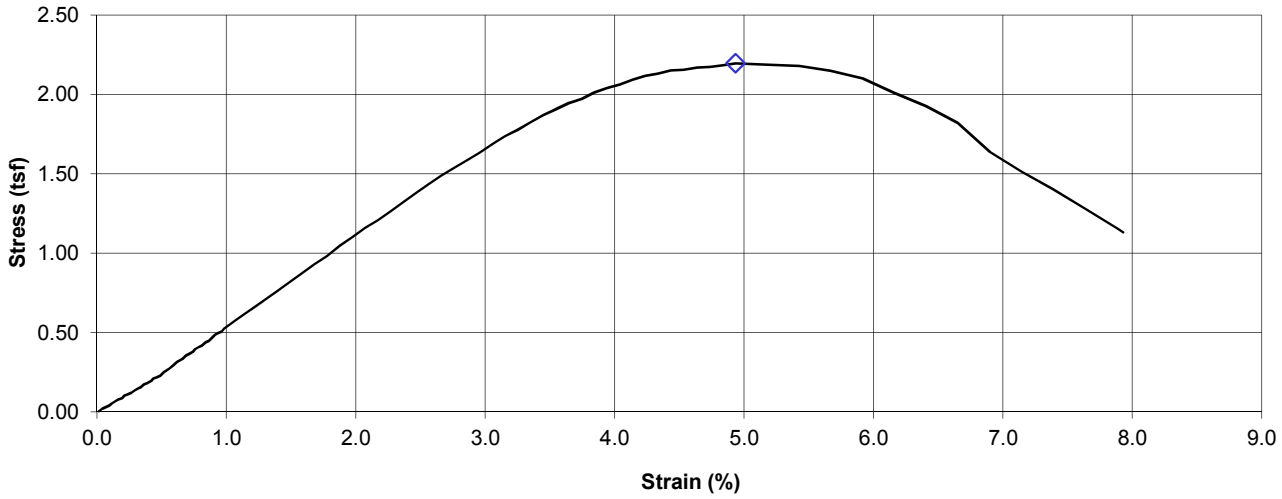
Recovered 1.1'
Test Interval 24.3' - 24.9'

Specimen Type: Undisturbed | LL 31 | PL 18 | PI 13

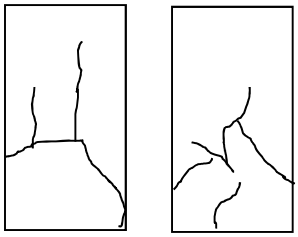
Date Extruded 12/19/2016
Date Tested 12/19/2016

Initial Wet Density (pcf)	135.2		
Initial Moisture Content (%)	10.5	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	122.4		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	2.20
Average Height (in)	6.105	Undrained Shear Strength (tsf)	1.10
Average Diameter (in)	2.886	Strain at Maximum Stress (%)	4.9
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	0.98

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments
Tube had sand lenses throughout.
Multiple rock gouges from 24.0'-24.3'
Large aggregate at 24.9'
0.1' cut from bottom. Tube damaged.

Reviewed By RJ

Stantec

Unconfined Compressive Strength of Cohesive Soil

ASTM D 2166

Project Name SUM-271 Landslides | Project Number 175526009
Source B-005, 18.0'-20.0' | Lab ID 149
Visual Description Lean Clay (CL), brown, moist, firm

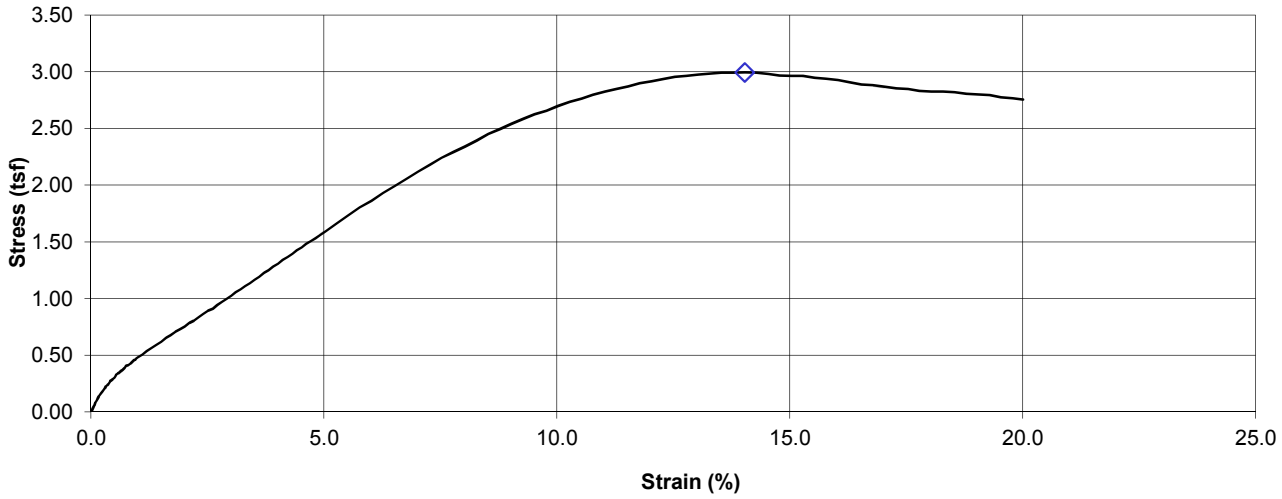
Recovered 1.7'
Test Interval 18.0' - 18.5'

Specimen Type: Undisturbed | LL 35 | PL 20 | PI 15

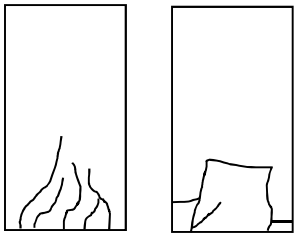
Date Extruded 12/19/2016
Date Tested 12/19/2016

Initial Wet Density (pcf)	130.7		
Initial Moisture Content (%)	21.1	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	107.9		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	2.99
Average Height (in)	6.041	Undrained Shear Strength (tsf)	1.50
Average Diameter (in)	2.869	Strain at Maximum Stress (%)	14.0
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	1.00

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments
18.5'-19.0' (149B) - rough cut
19.0'-19.7' (149C) - rough cut

Reviewed By RJ

Stantec

Unconfined Compressive Strength of Cohesive Soil

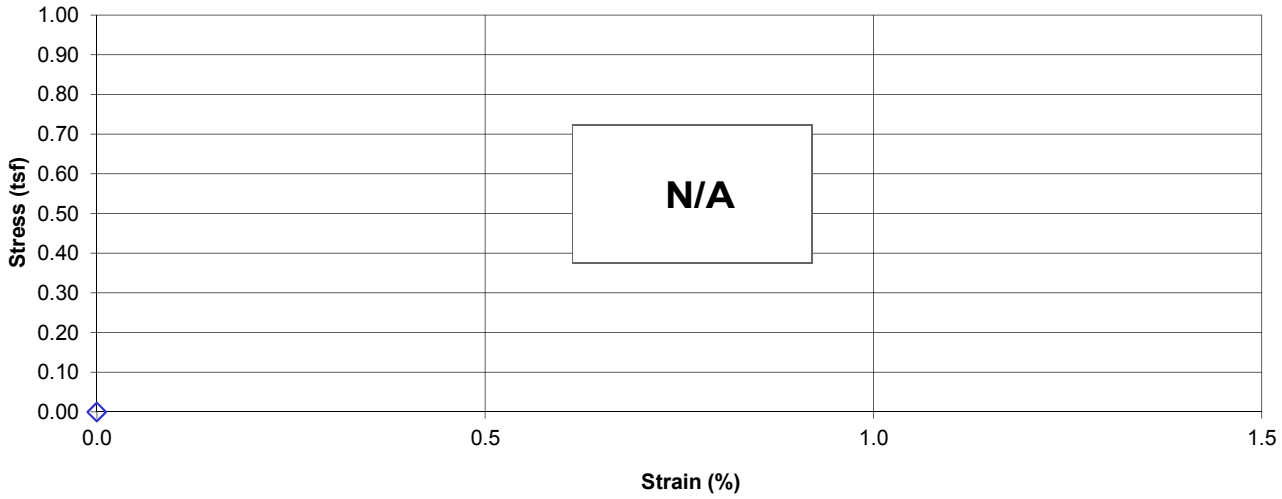
ASTM D 2166

Project Name SUM-271 Landslides | Project Number 175526009
Source B-002, 25.5'-27.5' | Lab ID 58B
Visual Description Lean Clay with Sand (CL), brown, moist, firm
Recovered 1.7'
Test Interval 26.1' - 26.6'

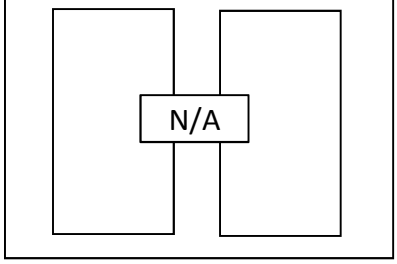
Specimen Type: Undisturbed | LL 34 | PL 18 | PI 16
Date Extruded 12/19/2016
Date Tested N/A

Initial Wet Density (pcf)	138.4		
Initial Moisture Content (%)	15.0	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	120.4		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.110	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.874	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments
25.5'-26.1' (58A) - rough cut
26.6'-27.2' (58C) - rough cut

Reviewed By RJ

Stantec

Unconfined Compressive Strength of Cohesive Soil

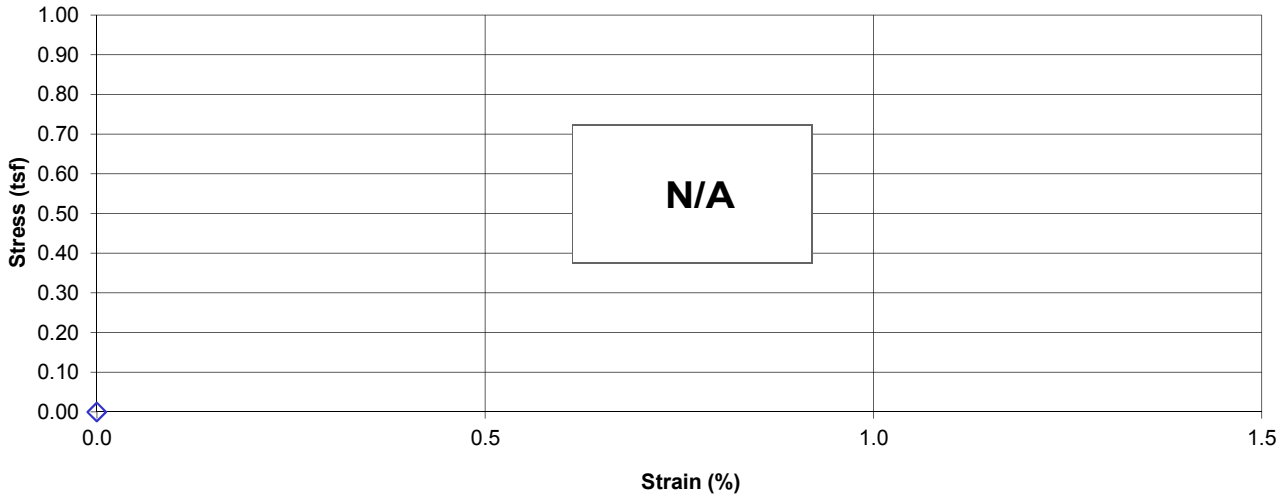
ASTM D 2166

Project Name SUM-271 Landslides | Project Number 175526009
Source B-003, 25.5'-27.5' | Lab ID 98B
Visual Description Lean Clay with Sand (CL), brown, moist, firm
Recovered 1.4'
Test Interval 26.1' - 26.6'

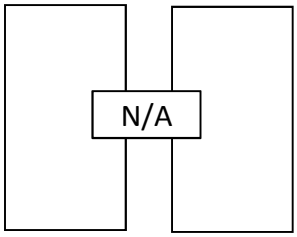
Specimen Type: Undisturbed | LL 39 | PL 19 | PI 20
Date Extruded 12/19/2016
Date Tested N/A

Initial Wet Density (pcf)	132.8		
Initial Moisture Content (%)	18.9	Initial MC Taken	Before Test, From Trimmings
Initial Dry Density (pcf)	111.7		
At Test Moisture Content (%)	N/A	At Test MC Taken	N/A
At Test Dry Density (pcf)	N/A		
Specific Gravity	N/A		
Degree of Saturation (%)	N/A	Unconfined Compressive Strength (tsf)	N/A
Average Height (in)	6.064	Undrained Shear Strength (tsf)	N/A
Average Diameter (in)	2.876	Strain at Maximum Stress (%)	N/A
Height to Diameter Ratio	2.1	Strain rate to failure (% / min.)	N/A

Stress vs. Strain



Failure Sketch



Pocket Penetrometer Reading (tsf) N/A
Torvane Reading (kg/cm^2) N/A

Comments
25.5'-26.1' (98A) - rough cut
26.6'-26.9' (98C) - short sample, bagged and saved.

Reviewed By RJ

Stantec

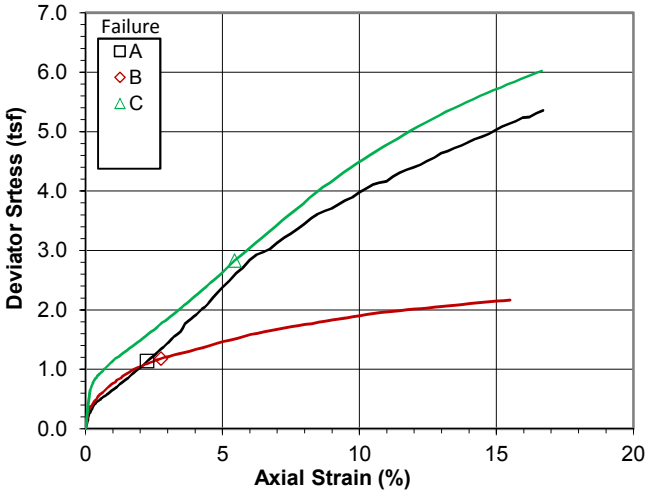
Consolidated Undrained Triaxial Compression

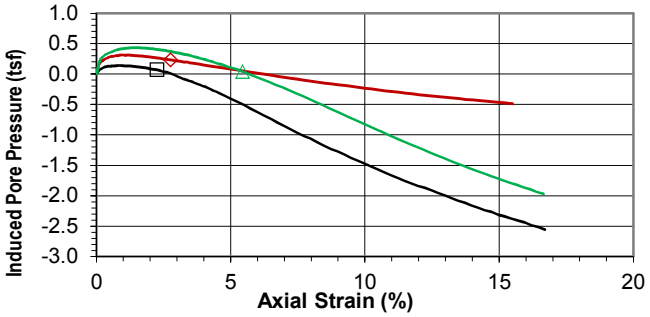
ASTM D 4767

Project Name SUM-271 Landslides

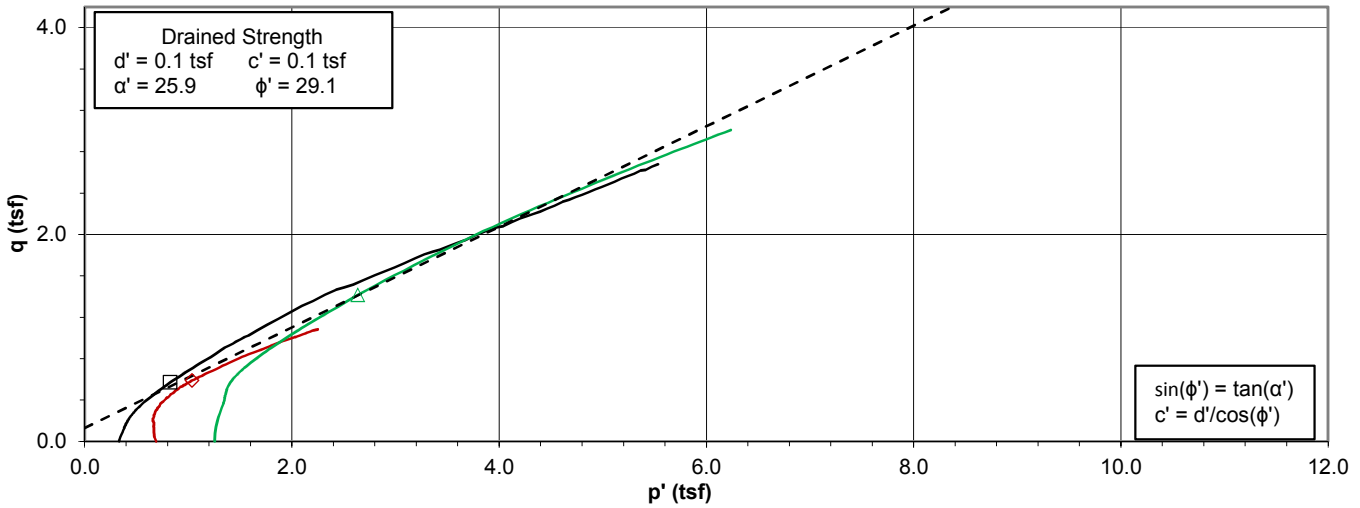
Project 175526009
Set ID 1

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	58B	B-002, 26.1'-26.6'	Lean Clay with Sand (CL), brown, moist, firm	2.73	34	18	16
B	98B	B-003, 26.1'-26.6'	Lean Clay with Sand (CL), brown, moist, firm	2.77	39	19	20
C	58A	B-002, 25.5'-26.0'	Lean Clay with Sand (CL), brown, moist, firm	2.73	34	18	16





Specimen	A	B	C		
	Initial Specimen Conditions				
Average Height (in)	6.110	6.064	6.068		
Average Diameter (in)	2.874	2.876	2.873		
Moist Unit Weight (pcf)	138.4	132.7	137.4		
Moisture Content (%)	15.1	18.4	14.5		
Dry Unit Weight (pcf)	120.2	112.1	120.0		
Void Ratio	0.415	0.540	0.418		
Degree of Saturation (%)	99.4	94.5	94.6		
	Consolidated Specimen Conditions				
Moist Unit Weight (pcf)	136.9	133.3	139.0		
Moisture Content (%)	16.3	20.0	14.9		
Dry Unit Weight (pcf)	117.7	111.2	121.0		
Void Ratio	0.445	0.553	0.406		
Degree of Saturation (%)	100.0	100.0	100.0		
Eff. Con. Stress, σ_3' (tsf)	0.333	0.689	1.254		
	At Drained Failure				
Failure Criterion	Max. Eff. Prin. Stress Ratio				
Axial Strain (%)	2.255	2.757	5.437		
Deviator Stress (tsf)	1.139	1.178	2.830		
Induced Pore Press. (tsf)	0.069	0.233	0.037		
Minor Eff. Stress, σ_3' (tsf)	0.255	0.445	1.218		
Major Eff. Stress, σ_1' (tsf)	1.394	1.623	4.049		
Eff. Stress Ratio, σ_1'/σ_3'	5.465	3.648	3.323		
p' (tsf)	0.824	1.034	2.634		
q (tsf)	0.569	0.589	1.415		



Comments

Reviewed By KG

Stantec

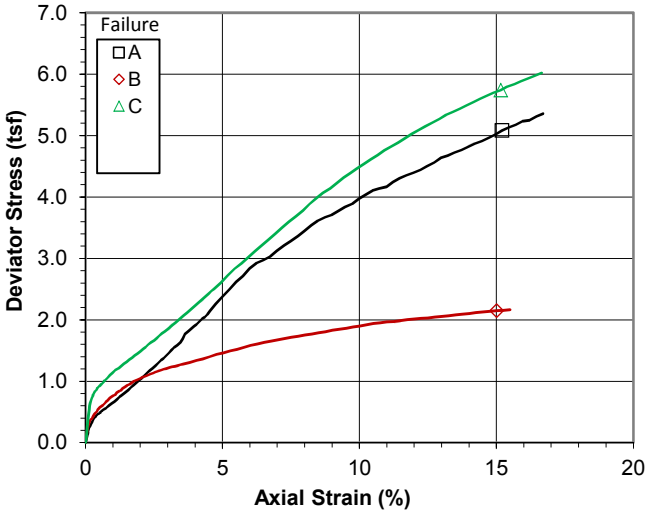
Consolidated Undrained Triaxial Compression

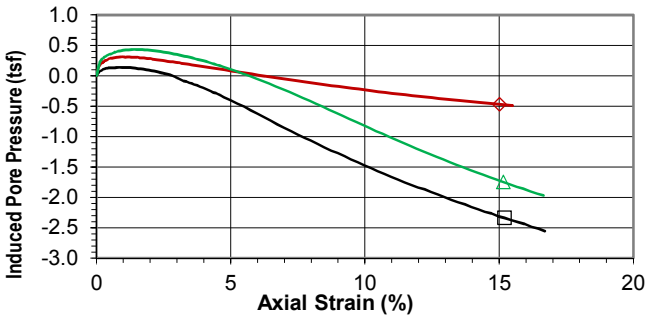
ASTM D 4767

Project Name SUM-271 Landslides

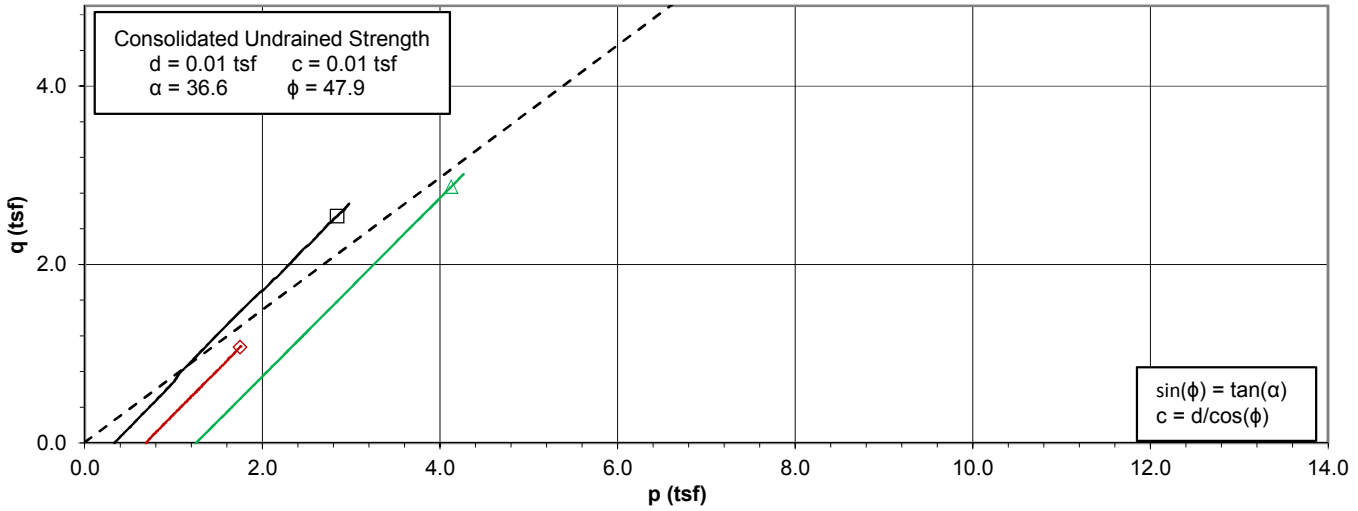
Project 175526009
Set ID 1

Test	Lab ID	Source	Description	Gs	LL	PL	PI
A	58B	B-002, 26.1'-26.6'	Lean Clay with Sand (CL), brown, moist, firm	2.73	34	18	16
B	98B	B-003, 26.1'-26.6'	Lean Clay with Sand (CL), brown, moist, firm	2.77	39	19	20
C	58A	B-002, 25.5'-26.0'	Lean Clay with Sand (CL), brown, moist, firm	2.73	34	18	16





Specimen	A	B	C		
	Initial Specimen Conditions				
Average Height (in)	6.110	6.064	6.068		
Average Diameter (in)	2.874	2.876	2.873		
Moist Unit Weight (pcf)	138.4	132.7	137.4		
Moisture Content (%)	15.1	18.4	14.5		
Dry Unit Weight (pcf)	120.2	112.1	120.0		
Void Ratio	0.415	0.540	0.418		
Degree of Saturation (%)	99.4	94.5	94.6		
	Consolidated Specimen Conditions				
Moist Unit Weight (pcf)	136.9	133.3	139.0		
Moisture Content (%)	16.3	20.0	14.9		
Dry Unit Weight (pcf)	117.7	111.2	121.0		
Void Ratio	0.445	0.553	0.406		
Degree of Saturation (%)	100.0	100.0	100.0		
Eff. Con. Stress, σ_3' (tsf)	0.333	0.689	1.254		
	At Consolidated Undrained Failure				
Failure Criterion	Max. σ_D or 15% Strain				
Axial Strain (%)	15.209	15.010	15.162		
Deviator Stress (tsf)	5.081	2.150	5.742		
Min. Prin. Stress, σ_3 (tsf)	0.302	0.675	1.254		
Maj. Prin. Stress, σ_1 (tsf)	5.383	2.825	6.996		
p (tsf)	2.842	1.750	4.125		
q (tsf)	2.541	1.075	2.871		



Comments

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name	SUM-271 Landslides	Project No.	175526009
Source	B-002, 26.1'-26.6'	Lab ID	58B
Description	Lean Clay with Sand (CL), brown, moist, firm	Test ID	1-A
Specimen Type	Intact		
Preparation	Wet Mounting	Date Received	12/12/2016
		Date Tested	01/07/2017

Specific Gravity	2.73
ASTM D 854, A	
Liquid Limit	34
Plastic Limit	18
Plasticity Index	16
ASTM D 4318	

Target Test Parameters

Nominal Chamber Pressure (psi)	90
Nominal Back Pressure (psi)	85
Nominal Consolidation Pressure (psi)	5

Saturation / Consolidation Results

Pore Pressure Parameter B	0.98
Measured Effective Consol. Stress (tsf)	0.308
Time to 50% Consolidation (min)	14.00
Actual Axial Strain Rate of Test (%/min)	0.021

Consolidated Specimen Conditions

Moist Unit Weight (pcf)	136.9
Moisture Content (%)	16.3
Dry Unit Weight (pcf)	117.7
Void Ratio	0.445
Degree of Saturation (%)	100.0

At Drained Failure

Failure Criterion: Max. Eff. Prin. Stress Ratio

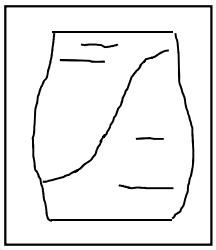
Axial Strain (%)	2.255
Deviator Stress (tsf)	1.139
Induced Pore Pressure (tsf)	0.069
Minor Effective Stress, σ_3' (tsf)	0.255
Major Effective Stress, σ_1' (tsf)	1.394
Eff. Principal Stress Ratio, σ_1'/σ_3'	5.465
p' (tsf)	0.824
q (tsf)	0.569

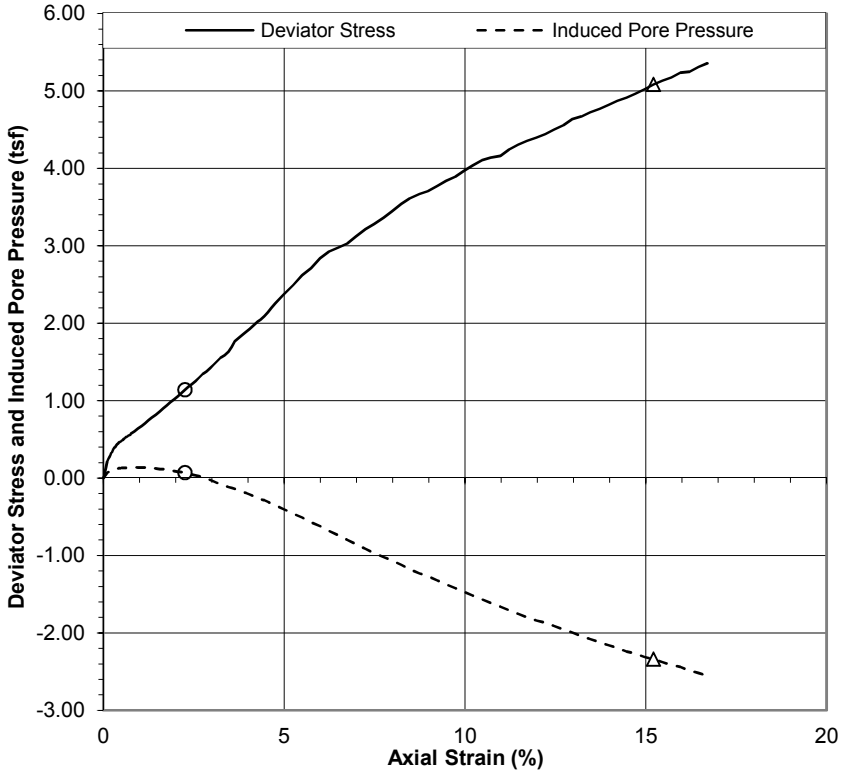
At Consolidated Undrained Failure

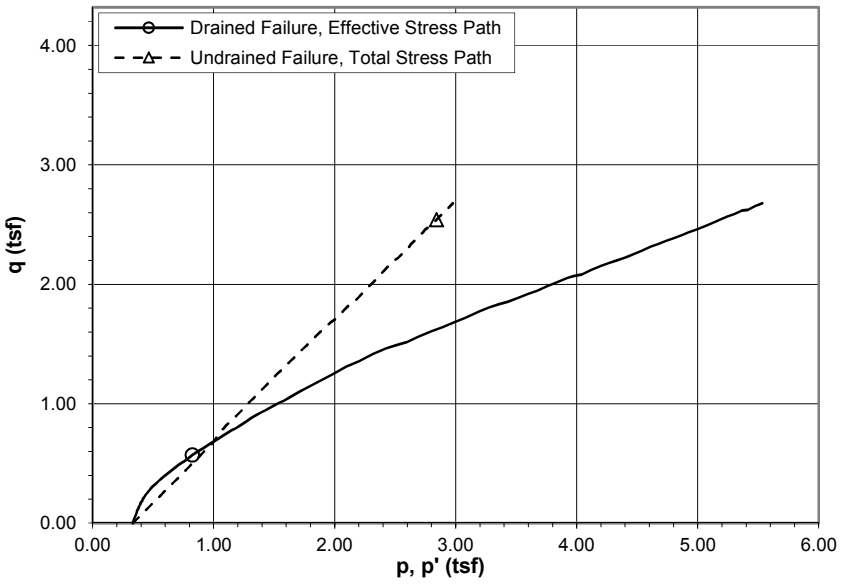
Failure Criterion: 15% Axial Strain

Axial Strain (%)	15.209
Deviator Stress (tsf)	5.081
Minor Principal Stress, σ_3 (tsf)	0.302
Major Principal Stress, σ_1 (tsf)	5.383
p (tsf)	2.842
q (tsf)	2.541

Failure Sketch







Comments

Reviewed KG

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name	SUM-271 Landslides	Project No.	175526009
Source	B-002, 26.1'-26.6'	Lab ID	58B
Description	Lean Clay with Sand (CL), brown, moist, firm	Test ID	1-A

Initial Specimen Conditions		Consolidated Specimen Conditions			
Average Height (in)	6.110	Calculated Height (in)	6.114	Specific Gravity	2.73
Average Diameter (in)	2.874	Calculated Diameter (in)	2.903	ASTM D 854, A	
Calculated Area (in^2)	6.487	Calculated Area (in^2)	6.620	Liquid Limit	34
Moist Weight (lb)	3.174	Moist Weight (lb)	3.207	Plastic Limit	18
Moist Unit Weight (pcf)	138.4	Moist Unit Weight (pcf)	136.9	Plasticity Index	16
Moisture Content (%)	15.1	Moisture Content (%)	16.3	ASTM D 4318	
Dry Weight (lb)	2.757	Dry Weight (lb)	2.757		
Dry Unit Weight (pcf)	120.2	Dry Unit Weight (pcf)	117.7	Confining Stress	
Void Ratio	0.415	Void Ratio	0.445	σ_3 (tsf)	0.333
Degree of Saturation (%)	99.4	Degree of Saturation (%)	100.0		
				Effective Consolidation Stress	
				σ_3' (tsf)	0.333

Moisture contents obtained using partial specimen.
Specimen consolidated cross-sectional area determined using method B.
Membrane corrections have been applied,where Em = 200 lbf/in and t = 0.012 in.
All other tests performed in association with this specimen are reported separately.

Project: 175526009			Source: B-002, 26.1'-26.6'								Lab ID: 58B		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
0.0	0.0	0.000	0.00	6.620	0.000	0.000	6.150	0.000	0.333	0.333	0.333	0.333	0.333	0.000	1.000
1.2	2.5	0.002	0.02	6.621	0.027	0.027	6.161	0.012	0.360	0.349	0.322	0.347	0.335	0.013	1.084
2.3	7.7	0.003	0.04	6.623	0.084	0.084	6.180	0.030	0.416	0.387	0.303	0.374	0.345	0.042	1.277
3.5	12.5	0.004	0.07	6.625	0.136	0.136	6.195	0.045	0.468	0.423	0.287	0.400	0.355	0.068	1.474
4.7	16.4	0.005	0.09	6.626	0.178	0.178	6.207	0.057	0.510	0.452	0.274	0.421	0.363	0.089	1.649
5.8	19.7	0.007	0.11	6.627	0.214	0.214	6.218	0.069	0.546	0.477	0.263	0.439	0.370	0.107	1.813
7.0	23.3	0.009	0.14	6.629	0.253	0.252	6.227	0.077	0.583	0.506	0.254	0.457	0.380	0.126	1.994
8.2	25.1	0.010	0.17	6.631	0.273	0.272	6.234	0.084	0.604	0.519	0.247	0.467	0.383	0.136	2.104
9.3	27.3	0.012	0.19	6.633	0.296	0.296	6.241	0.091	0.626	0.535	0.240	0.478	0.387	0.148	2.234
10.5	29.6	0.013	0.22	6.634	0.321	0.321	6.246	0.097	0.652	0.555	0.235	0.492	0.395	0.160	2.366
11.6	31.0	0.015	0.24	6.635	0.337	0.336	6.252	0.103	0.668	0.565	0.229	0.500	0.397	0.168	2.468
12.8	33.5	0.016	0.26	6.637	0.364	0.363	6.258	0.108	0.696	0.588	0.224	0.514	0.406	0.182	2.620
14.0	35.2	0.017	0.28	6.638	0.382	0.382	6.262	0.112	0.714	0.602	0.220	0.523	0.411	0.191	2.732
15.2	36.4	0.018	0.30	6.640	0.395	0.394	6.266	0.116	0.726	0.611	0.217	0.529	0.414	0.197	2.818
16.3	37.2	0.020	0.33	6.642	0.403	0.402	6.268	0.118	0.734	0.616	0.213	0.533	0.414	0.201	2.889
17.5	38.9	0.022	0.35	6.643	0.421	0.420	6.271	0.121	0.752	0.631	0.211	0.542	0.421	0.210	2.995
18.7	40.3	0.024	0.39	6.645	0.437	0.436	6.273	0.123	0.767	0.644	0.208	0.549	0.426	0.218	3.095
19.8	41.4	0.025	0.41	6.647	0.448	0.447	6.275	0.125	0.779	0.653	0.206	0.555	0.430	0.224	3.170
21.0	42.4	0.026	0.43	6.648	0.460	0.459	6.276	0.126	0.789	0.663	0.204	0.560	0.434	0.229	3.244
22.1	43.1	0.028	0.45	6.650	0.467	0.466	6.278	0.128	0.797	0.669	0.203	0.564	0.436	0.233	3.297
23.3	43.8	0.030	0.48	6.652	0.474	0.473	6.279	0.129	0.803	0.674	0.201	0.567	0.438	0.236	3.349
24.5	44.7	0.031	0.51	6.654	0.484	0.483	6.280	0.130	0.813	0.683	0.200	0.572	0.442	0.241	3.412
25.6	45.7	0.033	0.54	6.656	0.495	0.493	6.280	0.131	0.823	0.692	0.199	0.576	0.446	0.247	3.479
26.8	46.8	0.034	0.56	6.657	0.507	0.505	6.281	0.131	0.835	0.704	0.198	0.582	0.451	0.253	3.549
28.0	47.5	0.036	0.58	6.659	0.514	0.512	6.281	0.132	0.841	0.710	0.197	0.585	0.453	0.256	3.595
29.1	48.6	0.038	0.62	6.661	0.525	0.524	6.282	0.132	0.852	0.720	0.197	0.591	0.459	0.262	3.661
30.3	49.4	0.039	0.64	6.662	0.534	0.532	6.282	0.132	0.861	0.729	0.197	0.595	0.463	0.266	3.706
31.4	50.0	0.041	0.67	6.664	0.540	0.539	6.282	0.132	0.867	0.735	0.196	0.598	0.466	0.269	3.744
32.6	51.2	0.042	0.69	6.666	0.553	0.551	6.282	0.133	0.880	0.747	0.196	0.604	0.471	0.276	3.816
34.9	52.0	0.045	0.74	6.669	0.561	0.559	6.287	0.137	0.890	0.753	0.194	0.610	0.473	0.280	3.887
36.1	53.2	0.047	0.76	6.671	0.574	0.573	6.288	0.138	0.903	0.765	0.192	0.616	0.479	0.286	3.978
40.8	56.3	0.052	0.86	6.677	0.607	0.605	6.289	0.139	0.933	0.794	0.189	0.631	0.492	0.302	4.194
45.4	59.5	0.059	0.96	6.684	0.641	0.639	6.287	0.137	0.966	0.829	0.190	0.647	0.509	0.319	4.362
50.1	62.7	0.065	1.06	6.691	0.674	0.672	6.284	0.134	0.999	0.865	0.193	0.663	0.529	0.336	4.489
54.7	66.0	0.071	1.16	6.697	0.709	0.707	6.284	0.135	1.035	0.901	0.194	0.682	0.548	0.353	4.639
59.4	69.8	0.077	1.25	6.704	0.750	0.747	6.285	0.135	1.075	0.940	0.193	0.702	0.567	0.373	4.863
64.1	72.9	0.082	1.34	6.710	0.783	0.779	6.280	0.131	1.107	0.976	0.197	0.717	0.587	0.390	4.958
68.7	76.6	0.089	1.45	6.717	0.822	0.818	6.273	0.124	1.144	1.021	0.202	0.735	0.611	0.409	5.041
73.4	80.4	0.095	1.56	6.724	0.861	0.858	6.267	0.117	1.183	1.066	0.209	0.754	0.637	0.429	5.113

Project: 175526009			Source: B-002, 26.1'-26.6'								Lab ID: 58B		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
78.0	84.6	0.101	1.65	6.731	0.905	0.901	6.263	0.114	1.228	1.114	0.213	0.777	0.663	0.451	5.233
82.7	88.1	0.107	1.75	6.738	0.942	0.938	6.259	0.109	1.264	1.154	0.217	0.795	0.686	0.469	5.322
87.3	92.2	0.113	1.85	6.744	0.984	0.979	6.251	0.101	1.305	1.203	0.224	0.815	0.714	0.490	5.373
92.0	95.9	0.120	1.96	6.752	1.022	1.018	6.241	0.091	1.341	1.250	0.232	0.832	0.741	0.509	5.384
96.6	99.3	0.126	2.06	6.759	1.058	1.053	6.232	0.082	1.376	1.294	0.241	0.850	0.768	0.526	5.364
101.3	103.4	0.132	2.15	6.765	1.101	1.096	6.227	0.077	1.421	1.344	0.248	0.873	0.796	0.548	5.420
105.9	107.6	0.138	2.26	6.772	1.144	1.139	6.219	0.069	1.463	1.394	0.255	0.893	0.824	0.569	5.465
110.6	111.3	0.144	2.35	6.779	1.183	1.177	6.207	0.057	1.499	1.442	0.265	0.910	0.853	0.588	5.443
115.2	115.0	0.150	2.45	6.786	1.220	1.214	6.194	0.045	1.535	1.490	0.276	0.928	0.883	0.607	5.395
119.9	118.8	0.156	2.55	6.793	1.260	1.254	6.184	0.034	1.575	1.541	0.288	0.948	0.914	0.627	5.359
124.6	123.1	0.162	2.65	6.800	1.304	1.297	6.175	0.026	1.619	1.593	0.296	0.970	0.945	0.649	5.383
129.2	127.4	0.168	2.75	6.807	1.348	1.341	6.163	0.013	1.661	1.648	0.307	0.991	0.978	0.671	5.371
133.9	130.7	0.174	2.85	6.814	1.381	1.374	6.148	-0.002	1.692	1.694	0.320	1.005	1.007	0.687	5.295
138.5	135.2	0.181	2.95	6.821	1.427	1.420	6.125	-0.025	1.729	1.754	0.333	1.019	1.043	0.710	5.260
143.2	139.3	0.186	3.04	6.828	1.469	1.462	6.106	-0.043	1.764	1.807	0.345	1.033	1.076	0.731	5.231
147.8	143.9	0.192	3.14	6.835	1.516	1.508	6.087	-0.062	1.802	1.864	0.356	1.048	1.110	0.754	5.235
152.5	148.2	0.198	3.24	6.841	1.560	1.552	6.066	-0.084	1.839	1.923	0.370	1.063	1.146	0.776	5.193
157.1	151.9	0.205	3.35	6.849	1.596	1.589	6.052	-0.098	1.877	1.974	0.386	1.083	1.180	0.794	5.116
161.8	156.3	0.212	3.46	6.857	1.641	1.632	6.034	-0.115	1.919	2.034	0.402	1.103	1.218	0.816	5.061
166.4	162.1	0.217	3.55	6.863	1.701	1.692	6.023	-0.127	1.982	2.109	0.416	1.136	1.262	0.846	5.066
171.1	169.5	0.222	3.64	6.869	1.777	1.768	6.009	-0.141	2.058	2.199	0.431	1.174	1.315	0.884	5.106
175.8	174.1	0.229	3.75	6.878	1.822	1.813	5.990	-0.159	2.101	2.261	0.447	1.195	1.354	0.907	5.053
180.4	178.3	0.236	3.86	6.886	1.864	1.855	5.971	-0.179	2.142	2.321	0.466	1.214	1.394	0.928	4.981
185.1	182.1	0.242	3.96	6.893	1.902	1.893	5.954	-0.196	2.180	2.375	0.482	1.233	1.429	0.946	4.924
189.7	185.3	0.248	4.05	6.899	1.934	1.924	5.939	-0.210	2.211	2.422	0.497	1.249	1.460	0.962	4.870
194.4	190.1	0.254	4.15	6.907	1.981	1.971	5.920	-0.230	2.257	2.487	0.515	1.271	1.501	0.986	4.825
199.1	195.1	0.261	4.26	6.915	2.031	2.021	5.898	-0.252	2.304	2.556	0.535	1.294	1.545	1.010	4.777
203.7	197.7	0.266	4.35	6.921	2.057	2.047	5.877	-0.273	2.329	2.602	0.555	1.306	1.579	1.023	4.688
208.3	202.0	0.272	4.45	6.928	2.100	2.089	5.863	-0.287	2.374	2.660	0.571	1.329	1.616	1.045	4.657
213.0	207.3	0.278	4.55	6.935	2.152	2.142	5.843	-0.307	2.425	2.732	0.590	1.354	1.661	1.071	4.630
217.7	213.2	0.284	4.65	6.942	2.212	2.200	5.820	-0.329	2.481	2.811	0.610	1.381	1.710	1.100	4.606
222.3	219.0	0.290	4.75	6.950	2.269	2.258	5.797	-0.353	2.538	2.890	0.632	1.409	1.761	1.129	4.571
233.9	230.3	0.305	4.99	6.967	2.381	2.369	5.749	-0.401	2.648	3.049	0.680	1.464	1.865	1.184	4.481
245.6	242.9	0.321	5.25	6.986	2.503	2.491	5.692	-0.458	2.769	3.227	0.736	1.523	1.981	1.245	4.385
257.2	256.0	0.336	5.50	7.005	2.631	2.618	5.641	-0.509	2.897	3.406	0.788	1.588	2.097	1.309	4.324
268.8	265.8	0.351	5.75	7.023	2.725	2.711	5.581	-0.569	2.988	3.557	0.846	1.633	2.202	1.356	4.203
280.5	278.9	0.366	5.99	7.041	2.852	2.837	5.528	-0.622	3.116	3.738	0.900	1.697	2.319	1.419	4.152
292.1	288.5	0.382	6.24	7.060	2.942	2.927	5.467	-0.683	3.206	3.889	0.961	1.742	2.425	1.464	4.045
303.7	294.0	0.397	6.49	7.079	2.990	2.975	5.413	-0.736	3.254	3.991	1.016	1.767	2.503	1.487	3.928
315.3	300.2	0.412	6.74	7.098	3.045	3.029	5.351	-0.799	3.307	4.106	1.078	1.793	2.592	1.514	3.811
327.0	310.2	0.427	6.99	7.117	3.138	3.122	5.298	-0.852	3.402	4.254	1.132	1.841	2.693	1.561	3.757
338.6	320.3	0.443	7.25	7.137	3.231	3.214	5.236	-0.914	3.494	4.408	1.194	1.887	2.801	1.607	3.693
350.2	327.9	0.458	7.48	7.155	3.299	3.281	5.184	-0.966	3.563	4.529	1.248	1.923	2.889	1.641	3.629
361.9	337.2	0.474	7.75	7.176	3.383	3.365	5.128	-1.021	3.652	4.673	1.308	1.969	2.991	1.683	3.572
373.5	345.8	0.488	7.98	7.194	3.461	3.442	5.087	-1.062	3.741	4.803	1.361	2.020	3.082	1.721	3.529
385.1	356.9	0.504	8.24	7.214	3.562	3.542	5.028	-1.122	3.839	4.961	1.419	2.068	3.190	1.771	3.497
396.8	365.0	0.518	8.47	7.232	3.633	3.613	4.973	-1.177	3.906	5.083	1.470	2.100	3.276	1.807	3.458
408.4	371.7	0.535	8.74	7.254	3.689	3.668	4.916	-1.234	3.960	5.194	1.526	2.126	3.360	1.834	3.404
420.0	376.4	0.549	8.98	7.273	3.727	3.705	4.879	-1.270	4.011	5.281	1.576	2.158	3.429	1.853	3.351
431.7	384.6	0.565	9.24	7.294	3.797	3.775	4.828	-1.321	4.081	5.403	1.628	2.194	3.515	1.887	3.319
443.3	392.2	0.579	9.48	7.313	3.862	3.839	4.776	-1.374	4.142	5.516	1.676	2.222	3.596	1.920	3.290
454.9	398.7	0.595	9.73	7.334	3.915	3.891	4.728	-1.422	4.195	5.617	1.726	2.250	3.671	1.946	3.255
466.6	408.2	0.610	9.98	7.354	3.997	3.973	4.677	-1.473	4.274	5.747	1.774	2.288	3.760	1.987	3.240
478.2	415.8	0.625	10.22	7.373	4.060	4.036	4.633	-1.517	4.338	5.855	1.819	2.320	3.837	2.018	3.218
489.8	424.1	0.640	10.47	7.394	4.130	4.105	4.582	-1.568	4.404	5.972	1.867	2.351	3.919	2.053	3.199
501.4	428.5	0.655	10.71	7.414	4.161	4.136	4.537	-1.612	4.435	6.048	1.912	2.367	3.980	2.068	3.163
513.1	432.7	0.672	10.98	7.437	4.190	4.164	4.487	-1.663	4.459	6.122	1.959	2.378	4.041	2.082	3.126
524.7	442.1	0.686	11.22	7.456	4.269	4.243	4.442	-1.708	4.536	6.244	2.001	2.415	4.123	2.121	3.120
536.3	450.2	0.701	11.47	7.478	4.335	4.308	4.395	-1.755	4.599	6.354	2.046	2.445	4.200	2.154	3.105
548.0	456.5	0.716	11.72	7.498	4.383	4.356	4.352	-1.797	4.646	6.443	2.088	2.468	4.266	2.178	3.086
559.6	462.1	0.732	11.97	7.520	4.424	4.396	4.311	-1.838	4.688	6.526	2.131	2.490	4.329	2.198	3.063
571.2	468.3	0.747	12.23	7.542	4.471	4.441	4.281	-1.869	4.746	6.615	2.174	2.525	4.394	2.221	3.043
582.9	475.9	0.762	12.46	7.562	4.531	4.502	4.240	-1.910	4.805	6.715	2.214	2.554	4.465	2.251	3.034
594.5	483.5	0.778	12.73	7.585	4.590	4.560	4.194	-1.955	4.860	6.815	2.256	2.580	4.535	2.280	3.022
606.1	492.5	0.792	12.96	7.605	4.663	4.632	4.155	-1.994	4.932	6.927	2.295	2.616	4.611	2.316	3.019
617.7	498.2	0.809	13.22	7.628	4.702	4.671	4.108	-2.041	4.966	7.008	2.337	2.631	4.672	2.335	2.999
629.4	505.4	0.823	13.46	7.649	4.758	4.725	4.071	-2.079	5.021	7.100	2.375	2.659	4.737	2.363	2.990
641.0	511.5	0.839	13.72	7.673	4.800	4.767	4.031	-2.119	5.064	7.183	2.415	2.680	4.799	2.384	2.974
652.6	518.5	0.854	13.96	7.694	4.852	4.818	3.990	-2.160	5.112	7.271	2.453	2.702	4.862	2.409	2.965

Project: 175526009			Source: B-002, 26.1'-26.6'								Lab ID: 58B		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
664.3	525.7	0.869	14.21	7.716	4.906	4.872	3.954	-2.196	5.166	7.361	2.490	2.730	4.926	2.436	2.957
675.9	531.9	0.885	14.47	7.739	4.948	4.913	3.911	-2.239	5.203	7.442	2.528	2.746	4.985	2.457	2.943
687.5	538.7	0.899	14.71	7.761	4.997	4.962	3.884	-2.266	5.263	7.528	2.566	2.782	5.047	2.481	2.934
699.1	546.9	0.915	14.97	7.785	5.058	5.022	3.839	-2.310	5.316	7.626	2.604	2.805	5.115	2.511	2.929
710.8	554.9	0.930	15.21	7.807	5.118	5.081	3.812	-2.338	5.383	7.721	2.640	2.842	5.180	2.541	2.925
722.4	562.4	0.945	15.46	7.830	5.172	5.135	3.772	-2.378	5.433	7.811	2.676	2.866	5.243	2.567	2.919
734.0	568.5	0.961	15.71	7.854	5.212	5.175	3.737	-2.413	5.477	7.890	2.715	2.890	5.302	2.587	2.906
745.7	576.9	0.976	15.96	7.877	5.273	5.235	3.709	-2.440	5.543	7.984	2.748	2.926	5.366	2.618	2.905
757.3	580.0	0.991	16.21	7.900	5.286	5.247	3.663	-2.487	5.551	8.038	2.791	2.927	5.414	2.624	2.880
768.9	588.8	1.007	16.46	7.924	5.350	5.311	3.631	-2.519	5.611	8.130	2.819	2.956	5.475	2.655	2.884
780.3	595.7	1.021	16.70	7.947	5.397	5.357	3.593	-2.557	5.655	8.212	2.855	2.976	5.533	2.678	2.876

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name	SUM-271 Landslides	Project No.	175526009
Source	B-003, 26.1'-26.6'	Lab ID	98B
Description	Lean Clay with Sand (CL), brown, moist, firm	Test ID	1-B
Specimen Type	Intact		
Preparation	Wet Mounting	Date Received	12/12/2016
		Date Tested	01/07/2017

Specific Gravity	2.77
ASTM D 854, A	
Liquid Limit	39
Plastic Limit	19
Plasticity Index	20
ASTM D 4318	

Target Test Parameters

Nominal Chamber Pressure (psi)	90
Nominal Back Pressure (psi)	80
Nominal Consolidation Pressure (psi)	10

Saturation / Consolidation Results

Pore Pressure Parameter B	0.98
Measured Effective Consol. Stress (tsf)	0.681
Time to 50% Consolidation (min)	24.40
Actual Axial Strain Rate of Test (%/min)	0.011

Consolidated Specimen Conditions

Moist Unit Weight (pcf)	133.3
Moisture Content (%)	20.0
Dry Unit Weight (pcf)	111.2
Void Ratio	0.553
Degree of Saturation (%)	100.0

At Drained Failure

Failure Criteria: Max. Eff. Prin. Stress Ratio

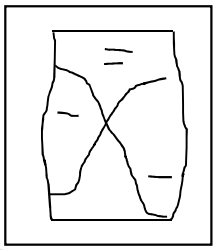
Axial Strain (%)	2.757
Deviator Stress (tsf)	1.178
Induced Pore Pressure (tsf)	0.233
Minor Effective Stress, σ_3' (tsf)	0.445
Major Effective Stress, σ_1' (tsf)	1.623
Eff. Principal Stress Ratio, σ_1'/σ_3'	3.648
p' (tsf)	1.034
q (tsf)	0.589

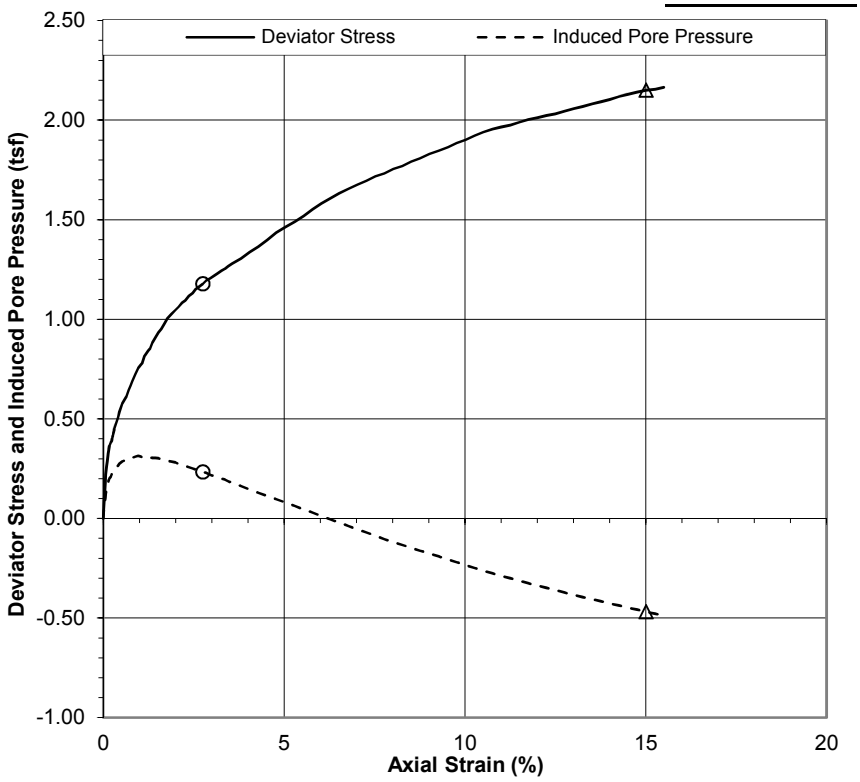
At Consolidated Undrained Failure

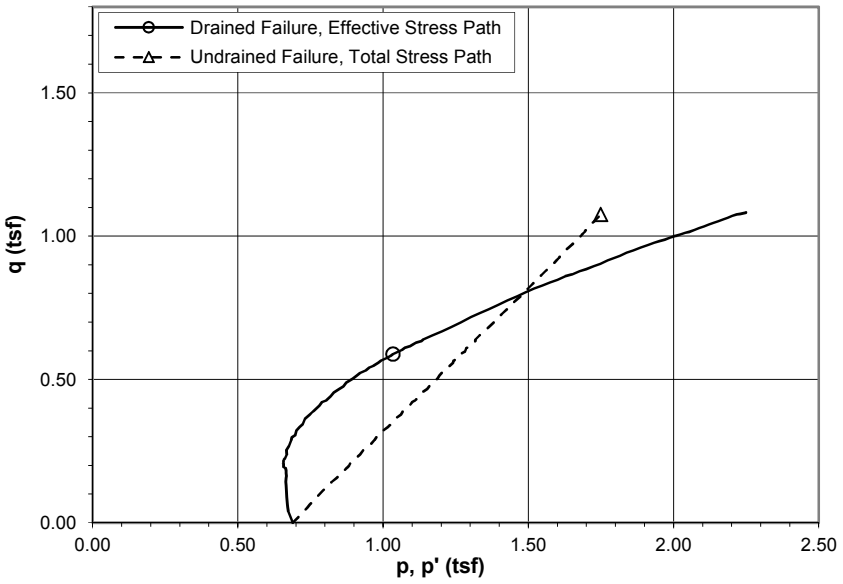
Failure Criterion: 15% Axial Strain

Axial Strain (%)	15.010
Deviator Stress (tsf)	2.150
Minor Principal Stress, σ_3 (tsf)	0.675
Major Principal Stress, σ_1 (tsf)	2.825
p (tsf)	1.750
q (tsf)	1.075

Failure Sketch







Comments

Reviewed KG

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name	SUM-271 Landslides	Project No.	175526009
Source	B-003, 26.1'-26.6'	Lab ID	98B
Description	Lean Clay with Sand (CL), brown, moist, firm	Test ID	1-B

Initial Specimen Conditions		Consolidated Specimen Conditions			
Height (in)	6.064	Height (in)	5.998	Specific Gravity	2.77
Diameter (in)	2.876	Calculated Diameter (in)	2.905	ASTM D 854, A	
Area (in^2)	6.498	Calculated Area (in^2)	6.626	Liquid Limit	39
Moist Weight (lb)	3.027	Moist Weight (lb)	3.066	Plastic Limit	19
Moist Unit Weight (pcf)	132.7	Moist Unit Weight (pcf)	133.3	Plasticity Index	20
Moisture Content (%)	18.4	Moisture Content (%)	20.0	ASTM D 4318	
Dry Weight (lb)	2.556	Dry Weight (lb)	2.556		
Dry Unit Weight (pcf)	112.1	Dry Unit Weight (pcf)	111.2	Confining Stress	
Void Ratio	0.540	Void Ratio	0.553	σ_3 (tsf)	0.689
Degree of Saturation (%)	94.5	Degree of Saturation (%)	100.0		
				Effective Consolidation Stress	
				σ_3' (tsf)	0.689

Moisture contents obtained using partial specimen.
Specimen consolidated cross-sectional area determined using method B.
Membrane corrections have been applied,where Em = 200 lbf/in and t = 0.012 in.
All other tests performed in association with this specimen are reported separately.

Project: 175526009			Source: B-003, 26.1'-26.6'								Lab ID: 98B		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
0.0	0.0	0.000	0.00	6.626	0.000	0.000	5.792	0.000	0.689	0.689	0.689	0.689	0.689	0.000	1.000
2.0	7.1	0.001	0.02	6.627	0.077	0.077	5.844	0.052	0.765	0.713	0.636	0.726	0.674	0.039	1.121
4.1	9.9	0.002	0.03	6.628	0.107	0.107	5.860	0.068	0.794	0.725	0.618	0.740	0.672	0.053	1.173
6.1	11.7	0.002	0.04	6.628	0.127	0.127	5.869	0.077	0.811	0.734	0.608	0.748	0.671	0.063	1.209
8.1	16.4	0.003	0.05	6.629	0.178	0.178	5.895	0.103	0.861	0.757	0.579	0.772	0.668	0.089	1.307
10.1	20.3	0.004	0.07	6.630	0.220	0.220	5.916	0.124	0.901	0.778	0.558	0.791	0.668	0.110	1.394
12.2	24.1	0.005	0.09	6.632	0.262	0.262	5.937	0.146	0.942	0.797	0.535	0.811	0.666	0.131	1.490
14.2	26.3	0.006	0.11	6.633	0.286	0.285	5.950	0.158	0.967	0.808	0.523	0.824	0.666	0.143	1.546
16.2	28.8	0.007	0.12	6.634	0.313	0.312	5.966	0.174	0.996	0.823	0.510	0.840	0.667	0.156	1.612
18.2	30.1	0.008	0.14	6.635	0.327	0.326	5.972	0.180	1.010	0.830	0.504	0.847	0.667	0.163	1.647
20.3	31.9	0.009	0.15	6.636	0.346	0.346	5.984	0.192	1.031	0.839	0.493	0.858	0.666	0.173	1.702
22.3	33.7	0.010	0.17	6.637	0.365	0.365	5.993	0.201	1.050	0.849	0.484	0.867	0.667	0.182	1.754
26.4	35.2	0.012	0.21	6.640	0.382	0.381	6.002	0.210	1.065	0.855	0.474	0.874	0.664	0.191	1.805
66.9	35.9	0.014	0.23	6.641	0.389	0.389	6.014	0.222	1.073	0.852	0.463	0.879	0.657	0.194	1.840
69.0	36.9	0.014	0.24	6.642	0.400	0.400	6.017	0.225	1.083	0.857	0.458	0.883	0.658	0.200	1.874
71.0	37.4	0.015	0.25	6.643	0.405	0.405	6.019	0.227	1.086	0.859	0.455	0.884	0.657	0.202	1.890
73.0	38.1	0.016	0.26	6.643	0.413	0.413	6.021	0.229	1.093	0.864	0.451	0.887	0.657	0.206	1.916
75.1	38.6	0.016	0.27	6.644	0.419	0.418	6.023	0.231	1.097	0.866	0.448	0.888	0.657	0.209	1.934
77.1	40.1	0.017	0.28	6.645	0.434	0.434	6.030	0.238	1.113	0.874	0.441	0.896	0.657	0.217	1.984
79.1	40.6	0.018	0.29	6.645	0.440	0.439	6.034	0.242	1.120	0.878	0.439	0.901	0.659	0.220	2.000
81.1	41.6	0.018	0.30	6.646	0.451	0.450	6.037	0.245	1.133	0.888	0.437	0.908	0.662	0.225	2.030
89.2	43.9	0.021	0.35	6.649	0.475	0.475	6.044	0.252	1.158	0.906	0.431	0.920	0.669	0.237	2.100
97.4	47.0	0.025	0.41	6.653	0.508	0.507	6.057	0.265	1.186	0.921	0.414	0.932	0.667	0.254	2.227
105.5	49.6	0.027	0.44	6.655	0.536	0.535	6.068	0.276	1.219	0.944	0.408	0.952	0.676	0.268	2.310
113.6	53.4	0.031	0.52	6.661	0.578	0.576	6.078	0.286	1.258	0.972	0.396	0.970	0.684	0.288	2.457
121.7	55.3	0.035	0.59	6.665	0.598	0.596	6.083	0.291	1.275	0.984	0.388	0.977	0.686	0.298	2.537
129.8	56.9	0.038	0.64	6.668	0.614	0.613	6.085	0.293	1.297	1.004	0.391	0.991	0.698	0.306	2.565
137.9	59.9	0.042	0.70	6.673	0.646	0.645	6.092	0.300	1.324	1.025	0.380	1.002	0.702	0.322	2.697
146.0	62.0	0.045	0.75	6.676	0.669	0.667	6.096	0.304	1.351	1.046	0.379	1.017	0.713	0.334	2.759
154.1	63.9	0.048	0.80	6.679	0.689	0.687	6.096	0.304	1.372	1.068	0.380	1.028	0.724	0.344	2.808
162.2	67.5	0.053	0.89	6.685	0.727	0.725	6.103	0.311	1.404	1.093	0.368	1.041	0.731	0.362	2.968
170.4	70.4	0.058	0.96	6.690	0.757	0.755	6.106	0.314	1.439	1.125	0.370	1.062	0.748	0.377	3.040
178.5	71.8	0.062	1.03	6.695	0.773	0.770	6.102	0.310	1.451	1.141	0.371	1.066	0.756	0.385	3.077
186.6	72.9	0.065	1.09	6.699	0.784	0.781	6.099	0.307	1.460	1.153	0.371	1.069	0.762	0.391	3.103
194.7	76.3	0.069	1.14	6.703	0.819	0.817	6.103	0.311	1.500	1.189	0.372	1.092	0.781	0.408	3.194
202.8	78.7	0.074	1.24	6.709	0.845	0.842	6.102	0.310	1.521	1.211	0.369	1.100	0.790	0.421	3.280
210.9	79.8	0.078	1.30	6.713	0.856	0.853	6.098	0.306	1.537	1.231	0.378	1.111	0.804	0.427	3.259
219.0	82.6	0.081	1.36	6.717	0.886	0.883	6.096	0.304	1.566	1.261	0.379	1.124	0.820	0.441	3.332
227.1	85.3	0.087	1.45	6.723	0.913	0.910	6.096	0.304	1.589	1.285	0.375	1.134	0.830	0.455	3.426

Project: 175526009			Source: B-003, 26.1'-26.6'								Lab ID: 98B		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
235.2	87.6	0.091	1.52	6.728	0.938	0.934	6.094	0.302	1.619	1.316	0.382	1.152	0.849	0.467	3.442
243.3	89.4	0.096	1.60	6.734	0.956	0.952	6.087	0.295	1.634	1.339	0.387	1.158	0.863	0.476	3.458
251.5	92.0	0.102	1.70	6.740	0.983	0.979	6.087	0.295	1.657	1.362	0.383	1.168	0.873	0.489	3.553
259.6	94.5	0.106	1.77	6.745	1.009	1.005	6.083	0.291	1.690	1.398	0.394	1.187	0.896	0.502	3.552
267.7	96.7	0.113	1.89	6.753	1.031	1.027	6.077	0.285	1.708	1.422	0.396	1.194	0.909	0.513	3.593
275.8	98.7	0.119	1.99	6.761	1.051	1.046	6.073	0.281	1.725	1.444	0.398	1.202	0.921	0.523	3.629
283.9	100.4	0.125	2.08	6.766	1.068	1.063	6.066	0.274	1.747	1.472	0.409	1.215	0.941	0.532	3.598
292.0	102.4	0.131	2.18	6.774	1.088	1.083	6.060	0.268	1.762	1.494	0.411	1.221	0.952	0.542	3.638
300.1	103.6	0.136	2.26	6.779	1.100	1.095	6.056	0.264	1.777	1.513	0.419	1.230	0.966	0.547	3.614
308.2	105.8	0.142	2.37	6.787	1.123	1.117	6.049	0.257	1.799	1.542	0.425	1.241	0.984	0.559	3.629
316.3	107.3	0.148	2.47	6.794	1.137	1.131	6.043	0.251	1.809	1.559	0.427	1.244	0.993	0.566	3.647
324.4	109.2	0.153	2.55	6.799	1.156	1.150	6.039	0.247	1.835	1.588	0.438	1.260	1.013	0.575	3.629
332.5	110.6	0.159	2.65	6.806	1.169	1.163	6.030	0.239	1.845	1.607	0.444	1.264	1.025	0.582	3.621
340.7	112.1	0.165	2.76	6.814	1.184	1.178	6.025	0.233	1.856	1.623	0.445	1.267	1.034	0.589	3.648
348.8	113.7	0.171	2.84	6.820	1.200	1.194	6.021	0.229	1.879	1.650	0.456	1.282	1.053	0.597	3.616
356.9	114.9	0.177	2.96	6.828	1.212	1.205	6.011	0.219	1.887	1.667	0.462	1.284	1.065	0.603	3.606
365.0	116.5	0.184	3.07	6.836	1.227	1.220	6.005	0.213	1.897	1.684	0.464	1.287	1.074	0.610	3.628
373.1	117.6	0.189	3.15	6.842	1.238	1.230	5.999	0.207	1.914	1.707	0.477	1.299	1.092	0.615	3.582
381.2	119.1	0.196	3.26	6.850	1.252	1.244	5.991	0.199	1.924	1.725	0.480	1.302	1.103	0.622	3.591
389.3	120.2	0.202	3.36	6.857	1.262	1.254	5.986	0.195	1.934	1.739	0.485	1.307	1.112	0.627	3.583
397.4	121.5	0.207	3.45	6.863	1.275	1.267	5.978	0.186	1.951	1.765	0.498	1.317	1.131	0.633	3.543
405.5	122.8	0.214	3.56	6.871	1.287	1.279	5.971	0.179	1.957	1.779	0.500	1.318	1.139	0.639	3.557
425.8	125.8	0.228	3.81	6.888	1.315	1.305	5.954	0.162	1.984	1.822	0.516	1.331	1.169	0.653	3.530
446.1	129.1	0.243	4.05	6.905	1.346	1.336	5.938	0.146	2.017	1.871	0.535	1.349	1.203	0.668	3.500
466.3	132.2	0.257	4.28	6.922	1.375	1.365	5.921	0.130	2.046	1.916	0.551	1.363	1.234	0.682	3.475
486.6	135.8	0.272	4.53	6.940	1.409	1.398	5.905	0.113	2.080	1.967	0.569	1.381	1.268	0.699	3.456
506.9	139.8	0.287	4.78	6.959	1.446	1.435	5.889	0.097	2.117	2.020	0.585	1.399	1.303	0.717	3.452
527.2	142.9	0.302	5.03	6.977	1.475	1.463	5.872	0.080	2.144	2.064	0.601	1.412	1.333	0.731	3.433
547.4	146.1	0.317	5.29	6.996	1.503	1.491	5.855	0.063	2.172	2.109	0.618	1.427	1.364	0.745	3.410
567.7	149.2	0.332	5.54	7.014	1.532	1.518	5.838	0.046	2.199	2.153	0.635	1.440	1.394	0.759	3.392
588.0	153.0	0.347	5.79	7.033	1.566	1.552	5.821	0.029	2.233	2.204	0.652	1.457	1.428	0.776	3.381
608.3	156.3	0.361	6.02	7.051	1.596	1.582	5.804	0.012	2.265	2.253	0.672	1.474	1.462	0.791	3.355
628.5	159.3	0.377	6.28	7.070	1.622	1.607	5.788	-0.004	2.290	2.293	0.686	1.486	1.490	0.804	3.341
648.8	162.4	0.391	6.53	7.089	1.649	1.634	5.771	-0.021	2.316	2.337	0.703	1.499	1.520	0.817	3.323
669.1	164.9	0.407	6.78	7.108	1.671	1.654	5.753	-0.039	2.336	2.375	0.721	1.509	1.548	0.827	3.296
689.3	167.6	0.421	7.03	7.127	1.694	1.677	5.736	-0.056	2.358	2.414	0.737	1.520	1.575	0.838	3.276
709.6	170.0	0.437	7.28	7.146	1.713	1.695	5.721	-0.071	2.377	2.448	0.752	1.529	1.600	0.848	3.253
729.9	172.8	0.451	7.52	7.165	1.736	1.718	5.705	-0.087	2.400	2.486	0.768	1.540	1.627	0.859	3.237
750.2	174.7	0.466	7.77	7.184	1.751	1.732	5.688	-0.104	2.414	2.517	0.785	1.548	1.651	0.866	3.207
770.4	177.5	0.481	8.01	7.203	1.774	1.755	5.674	-0.118	2.436	2.554	0.799	1.559	1.677	0.877	3.196
790.7	179.4	0.496	8.26	7.223	1.789	1.769	5.659	-0.133	2.451	2.584	0.815	1.567	1.700	0.884	3.170
811.0	182.3	0.511	8.52	7.243	1.812	1.792	5.644	-0.148	2.474	2.622	0.830	1.578	1.726	0.896	3.158
831.3	184.4	0.525	8.76	7.262	1.828	1.808	5.629	-0.163	2.489	2.652	0.844	1.586	1.748	0.904	3.141
851.5	187.3	0.541	9.02	7.282	1.852	1.831	5.616	-0.176	2.512	2.688	0.857	1.597	1.773	0.915	3.135
871.8	189.5	0.556	9.27	7.303	1.868	1.846	5.602	-0.190	2.528	2.718	0.872	1.605	1.795	0.923	3.118
892.1	191.8	0.572	9.53	7.324	1.886	1.863	5.587	-0.205	2.542	2.747	0.884	1.610	1.815	0.932	3.109
912.3	194.6	0.586	9.77	7.343	1.908	1.885	5.573	-0.219	2.562	2.781	0.897	1.620	1.839	0.942	3.102
932.6	196.8	0.601	10.02	7.364	1.925	1.901	5.557	-0.235	2.577	2.812	0.911	1.627	1.861	0.950	3.086
952.9	199.6	0.616	10.27	7.384	1.946	1.921	5.544	-0.248	2.599	2.847	0.926	1.639	1.887	0.961	3.075
973.2	202.0	0.630	10.51	7.404	1.964	1.939	5.529	-0.263	2.619	2.881	0.942	1.649	1.912	0.970	3.058
993.4	204.1	0.645	10.76	7.425	1.980	1.954	5.516	-0.276	2.634	2.910	0.956	1.657	1.933	0.977	3.043
1013.7	206.0	0.660	11.00	7.445	1.992	1.966	5.503	-0.289	2.648	2.936	0.970	1.665	1.953	0.983	3.027
1034.0	207.5	0.675	11.26	7.466	2.001	1.974	5.492	-0.300	2.657	2.957	0.982	1.669	1.970	0.987	3.010
1054.3	209.7	0.690	11.51	7.488	2.016	1.989	5.479	-0.313	2.670	2.983	0.994	1.675	1.988	0.995	3.002
1074.5	211.7	0.705	11.75	7.508	2.030	2.002	5.467	-0.325	2.682	3.007	1.006	1.681	2.006	1.001	2.991
1094.8	213.4	0.720	12.01	7.530	2.041	2.012	5.454	-0.338	2.691	3.029	1.017	1.685	2.023	1.006	2.979
1115.1	215.2	0.735	12.25	7.551	2.052	2.023	5.443	-0.349	2.702	3.051	1.029	1.691	2.040	1.011	2.966
1135.3	216.7	0.750	12.50	7.572	2.060	2.030	5.432	-0.360	2.709	3.069	1.039	1.694	2.054	1.015	2.955
1155.6	218.8	0.765	12.75	7.594	2.075	2.044	5.419	-0.373	2.721	3.094	1.049	1.699	2.071	1.022	2.948
1175.9	220.9	0.780	13.01	7.617	2.088	2.057	5.409	-0.383	2.734	3.117	1.060	1.705	2.089	1.028	2.940
1196.2	222.8	0.795	13.26	7.639	2.100	2.069	5.398	-0.394	2.745	3.139	1.071	1.711	2.105	1.034	2.932
1216.4	224.8	0.811	13.52	7.662	2.113	2.081	5.386	-0.405	2.756	3.161	1.081	1.715	2.121	1.040	2.926
1236.7	226.7	0.825	13.76	7.683	2.125	2.092	5.376	-0.416	2.766	3.183	1.091	1.720	2.137	1.046	2.918
1257.0	228.8	0.840	14.01	7.706	2.137	2.104	5.365	-0.427	2.779	3.205	1.101	1.727	2.153	1.052	2.911
1277.2	230.9	0.855	14.25	7.727	2.151	2.117	5.355	-0.437	2.792	3.229	1.112	1.734	2.171	1.059	2.904
1297.5	232.9	0.870	14.51	7.750	2.164	2.129	5.344	-0.448	2.803	3.251	1.122	1.739	2.186	1.065	2.898
1317.8	234.9	0.885	14.76	7.773	2.176	2.141	5.334	-0.458	2.815	3.273	1.132	1.744	2.202	1.070	2.891
1338.1	236.7	0.900	15.01	7.796	2.186	2.150	5.324	-0.468	2.825	3.293	1.143	1.750	2.218	1.075	2.882
1358.3	238.0	0.916	15.27	7.820	2.191	2.155	5.314	-0.478	2.830	3.307	1.152	1.752	2.230	1.078	2.871

Project: 175526009			Source: B-003, 26.1'-26.6'								Lab ID: 98B		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
1378.6	239.7	0.930	15.50	7.841	2.201	2.165	5.303	-0.489	2.843	3.331	1.167	1.760	2.249	1.082	2.855
1378.7	239.8	0.930	15.50	7.841	2.202	2.165	5.302	-0.489	2.842	3.332	1.167	1.760	2.249	1.082	2.855

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name	SUM-271 Landslides	Project No.	175526009
Source	B-002, 25.5'-26.0'	Lab ID	58A
Description	Lean Clay with Sand (CL), brown, moist, firm	Test ID	1-C
Specimen Type	Intact		
Preparation	Wet Mounting	Date Received	12/12/2016
		Date Tested	01/09/2017

Specific Gravity	2.73
ASTM D 854, A	
Liquid Limit	34
Plastic Limit	18
Plasticity Index	16
ASTM D 4318	

Target Test Parameters

Nominal Chamber Pressure (psi)	90
Nominal Back Pressure (psi)	70
Nominal Consolidation Pressure (psi)	20

Saturation / Consolidation Results

Pore Pressure Parameter B	0.96
Measured Effective Consol. Stress (tsf)	1.256
Time to 50% Consolidation (min)	13.80
Actual Axial Strain Rate of Test (%/min)	0.022

Consolidated Specimen Conditions

Moist Unit Weight (pcf)	139.0
Moisture Content (%)	14.9
Dry Unit Weight (pcf)	121.0
Void Ratio	0.406
Degree of Saturation (%)	100.0

At Drained Failure

Failure Criteria: Max. Eff. Prin. Stress Ratio

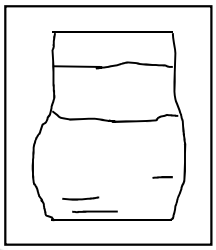
Axial Strain (%)	5.437
Deviator Stress (tsf)	2.830
Induced Pore Pressure (tsf)	0.037
Minor Effective Stress, σ_3' (tsf)	1.218
Major Effective Stress, σ_1' (tsf)	4.049
Eff. Principal Stress Ratio, σ_1'/σ_3'	3.323
p' (tsf)	2.634
q (tsf)	1.415

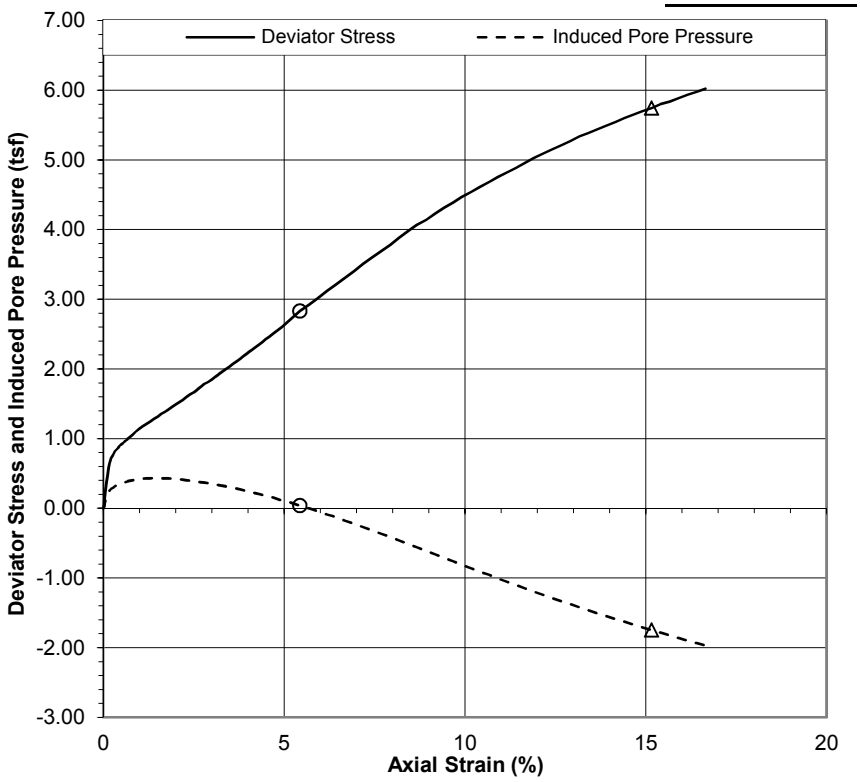
At Consolidated Undrained Failure

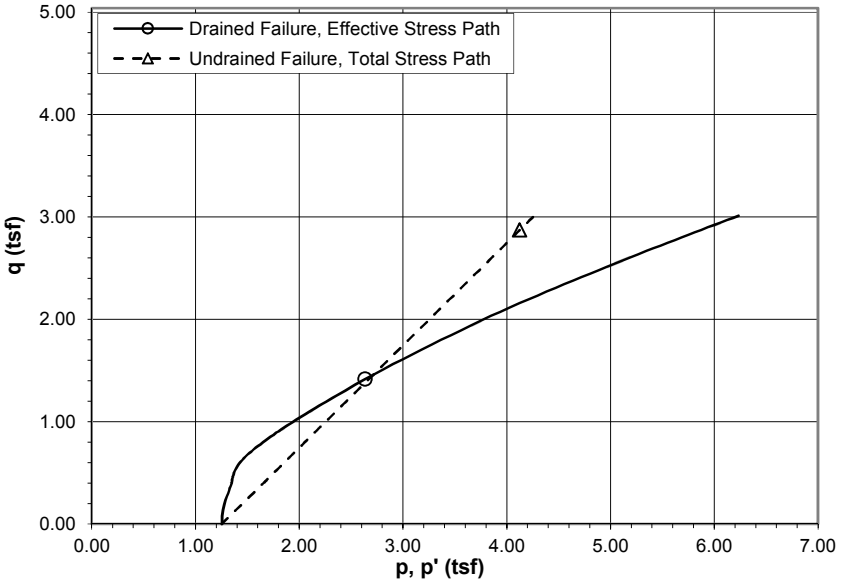
Failure Criterion: 15% Axial Strain

Axial Strain (%)	15.162
Deviator Stress (tsf)	5.742
Minor Principal Stress, σ_3 (tsf)	1.254
Major Principal Stress, σ_1 (tsf)	6.996
p (tsf)	4.125
q (tsf)	2.871

Failure Sketch







Comments

Reviewed KG

Stantec

Consolidated Undrained Triaxial Compression

ASTM D 4767

Project Name: SUM-271 Landslides
Source: B-002, 25.5'-26.0'
Description: Lean Clay with Sand (CL), brown, moist, firm

Project No.: 175526009
Lab ID: 58A
Test ID: 1-C

Initial Specimen Conditions		Consolidated Specimen Conditions	
Height (in)	6.068	Height (in)	6.003
Diameter (in)	2.873	Calculated Diameter (in)	2.876
Area (in^2)	6.481	Calculated Area (in^2)	6.497
Moist Weight (lb)	3.126	Moist Weight (lb)	3.137
Moist Unit Weight (pcf)	137.4	Moist Unit Weight (pcf)	139.0
Moisture Content (%)	14.5	Moisture Content (%)	14.9
Dry Weight (lb)	2.730	Dry Weight (lb)	2.730
Dry Unit Weight (pcf)	120.0	Dry Unit Weight (pcf)	121.0
Void Ratio	0.418	Void Ratio	0.406
Degree of Saturation (%)	94.6	Degree of Saturation (%)	100.0

Specific Gravity: 2.73
ASTM D 854, A

Liquid Limit: 34
Plastic Limit: 18
Plasticity Index: 16
ASTM D 4318

Confining Stress
σ_3 (tsf): 1.254

Effective Consolidation Stress
σ_3' (tsf): 1.254

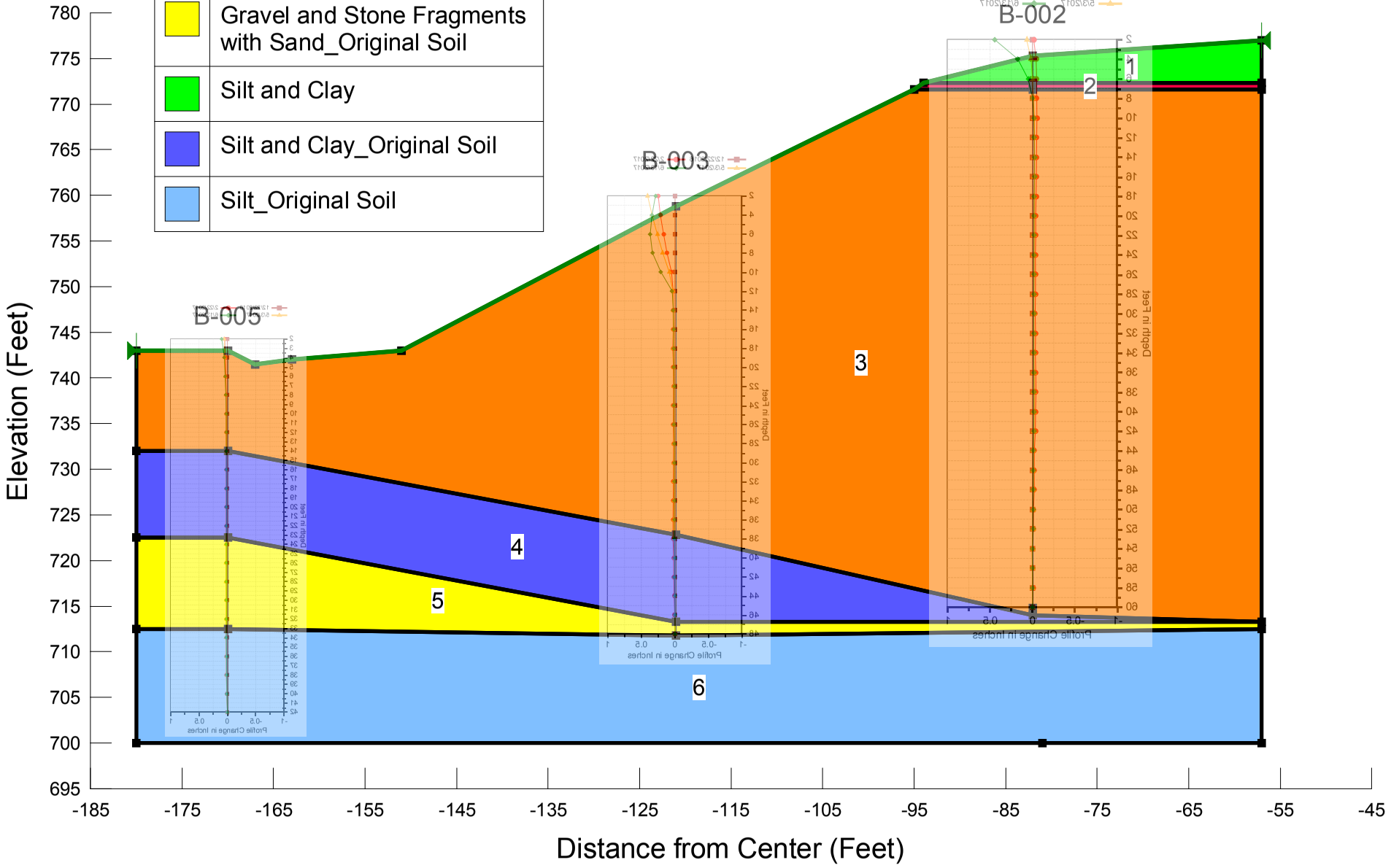
Moisture contents obtained using partial specimen.
Specimen consolidated cross-sectional area determined using method B.
Membrane corrections have been applied,where Em = 200 lbf/in and t = 0.012 in.
All other tests performed in association with this specimen are reported separately.

Project: 175526009			Source: B-002, 25.5'-26.0'								Lab ID: 58A		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
0.0	0.0	0.000	0.00	6.497	0.000	0.000	5.227	0.000	1.254	1.254	1.254	1.254	1.254	0.000	1.000
1.2	2.9	0.001	0.02	6.498	0.032	0.032	5.241	0.014	1.286	1.272	1.240	1.270	1.256	0.016	1.026
2.3	14.0	0.002	0.04	6.499	0.155	0.155	5.301	0.074	1.409	1.334	1.180	1.331	1.257	0.077	1.131
3.5	25.1	0.004	0.07	6.501	0.278	0.278	5.353	0.127	1.532	1.405	1.127	1.393	1.266	0.139	1.247
4.6	34.5	0.006	0.09	6.503	0.382	0.382	5.394	0.168	1.638	1.470	1.088	1.447	1.279	0.191	1.351
5.8	42.2	0.007	0.11	6.504	0.468	0.467	5.425	0.199	1.724	1.525	1.058	1.490	1.291	0.234	1.442
6.9	48.7	0.008	0.13	6.505	0.539	0.539	5.450	0.223	1.795	1.572	1.034	1.526	1.303	0.269	1.521
8.1	54.2	0.009	0.15	6.507	0.600	0.600	5.470	0.243	1.856	1.613	1.014	1.557	1.313	0.300	1.592
9.3	58.9	0.011	0.18	6.508	0.652	0.651	5.485	0.259	1.908	1.649	0.998	1.582	1.323	0.326	1.653
10.4	62.9	0.012	0.20	6.510	0.695	0.695	5.498	0.272	1.951	1.679	0.984	1.603	1.332	0.347	1.706
11.6	66.0	0.014	0.23	6.512	0.729	0.729	5.509	0.282	1.985	1.702	0.973	1.620	1.338	0.364	1.749
12.7	68.6	0.016	0.26	6.514	0.758	0.757	5.518	0.292	2.013	1.721	0.964	1.634	1.342	0.379	1.786
13.9	70.7	0.017	0.28	6.515	0.782	0.781	5.527	0.300	2.036	1.736	0.955	1.646	1.346	0.391	1.818
15.0	72.5	0.018	0.30	6.516	0.801	0.801	5.535	0.308	2.057	1.749	0.948	1.657	1.348	0.400	1.845
16.2	74.2	0.019	0.32	6.518	0.819	0.819	5.543	0.316	2.075	1.759	0.940	1.665	1.349	0.409	1.871
17.3	75.7	0.021	0.35	6.520	0.836	0.835	5.549	0.322	2.090	1.768	0.933	1.673	1.351	0.417	1.895
18.5	77.0	0.023	0.38	6.521	0.850	0.849	5.556	0.329	2.105	1.776	0.927	1.680	1.351	0.425	1.917
19.7	78.3	0.024	0.40	6.523	0.864	0.863	5.562	0.335	2.119	1.784	0.921	1.687	1.352	0.432	1.937
20.8	79.7	0.025	0.42	6.524	0.879	0.878	5.567	0.341	2.134	1.793	0.915	1.695	1.354	0.439	1.960
22.0	81.0	0.027	0.45	6.526	0.894	0.893	5.572	0.346	2.148	1.803	0.910	1.702	1.356	0.447	1.982
23.1	82.3	0.029	0.47	6.528	0.908	0.907	5.577	0.350	2.162	1.811	0.904	1.708	1.358	0.454	2.003
24.3	83.6	0.030	0.50	6.530	0.922	0.920	5.582	0.355	2.175	1.819	0.899	1.715	1.359	0.460	2.024
25.4	84.7	0.032	0.54	6.532	0.934	0.932	5.586	0.360	2.187	1.827	0.895	1.721	1.361	0.466	2.041
26.6	85.9	0.034	0.56	6.533	0.947	0.945	5.590	0.364	2.199	1.836	0.890	1.727	1.363	0.473	2.061
27.7	86.9	0.035	0.59	6.535	0.957	0.956	5.594	0.368	2.210	1.842	0.886	1.732	1.364	0.478	2.078
28.9	87.9	0.037	0.61	6.537	0.969	0.967	5.599	0.373	2.222	1.850	0.883	1.739	1.366	0.484	2.096
30.1	89.0	0.038	0.64	6.538	0.980	0.978	5.604	0.378	2.235	1.857	0.879	1.745	1.368	0.489	2.113
31.2	90.1	0.040	0.66	6.540	0.991	0.990	5.609	0.383	2.247	1.864	0.874	1.752	1.369	0.495	2.132
32.4	91.1	0.041	0.68	6.541	1.002	1.001	5.614	0.387	2.258	1.871	0.870	1.758	1.371	0.500	2.150
33.5	92.2	0.042	0.71	6.543	1.015	1.013	5.618	0.391	2.270	1.879	0.866	1.763	1.372	0.506	2.170
38.1	96.2	0.048	0.81	6.549	1.058	1.056	5.628	0.402	2.312	1.910	0.854	1.784	1.382	0.528	2.237
42.7	100.4	0.054	0.90	6.556	1.102	1.100	5.638	0.412	2.356	1.944	0.844	1.806	1.394	0.550	2.303
47.4	104.1	0.060	0.99	6.562	1.142	1.139	5.645	0.419	2.395	1.977	0.837	1.826	1.407	0.570	2.361
52.0	107.8	0.065	1.09	6.568	1.182	1.179	5.651	0.424	2.435	2.011	0.832	1.846	1.421	0.590	2.418
56.6	111.1	0.072	1.21	6.576	1.216	1.213	5.655	0.428	2.469	2.041	0.828	1.863	1.434	0.607	2.465
61.2	114.5	0.078	1.30	6.582	1.252	1.249	5.658	0.431	2.505	2.074	0.825	1.881	1.450	0.624	2.514
65.9	117.7	0.084	1.40	6.589	1.286	1.283	5.659	0.432	2.539	2.107	0.824	1.898	1.466	0.642	2.557
70.5	120.8	0.090	1.50	6.596	1.319	1.315	5.658	0.432	2.571	2.140	0.825	1.914	1.482	0.658	2.595
75.1	124.3	0.096	1.59	6.602	1.355	1.351	5.657	0.431	2.607	2.176	0.825	1.932	1.501	0.676	2.638

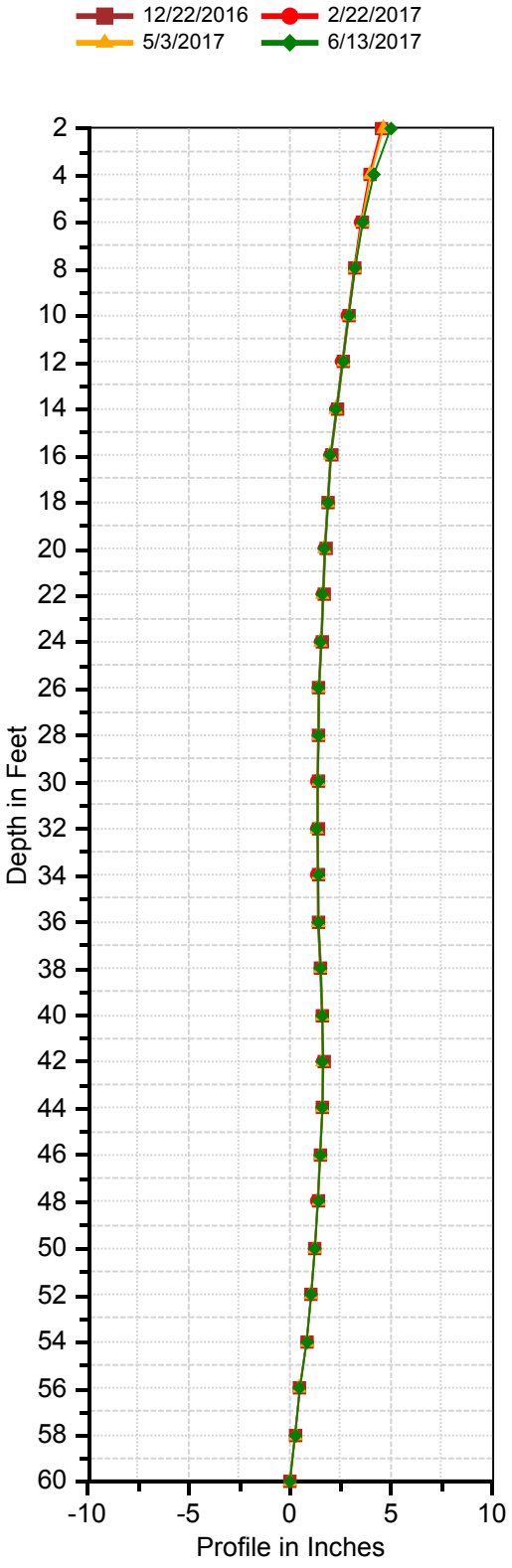
Project: 175526009			Source: B-002, 25.5'-26.0'								Lab ID: 58A		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
79.7	127.4	0.103	1.71	6.610	1.388	1.384	5.656	0.429	2.640	2.211	0.827	1.948	1.519	0.692	2.673
84.3	130.8	0.108	1.80	6.615	1.423	1.419	5.654	0.427	2.675	2.248	0.829	1.966	1.539	0.709	2.711
89.0	134.1	0.114	1.90	6.622	1.458	1.453	5.650	0.424	2.710	2.286	0.832	1.983	1.559	0.727	2.746
93.6	137.5	0.120	2.00	6.629	1.493	1.489	5.646	0.420	2.745	2.325	0.837	2.000	1.581	0.744	2.779
98.2	140.8	0.126	2.10	6.636	1.528	1.523	5.641	0.415	2.779	2.364	0.841	2.018	1.603	0.761	2.810
102.8	144.1	0.132	2.20	6.643	1.562	1.556	5.636	0.409	2.812	2.403	0.847	2.034	1.625	0.778	2.838
107.4	147.8	0.137	2.29	6.649	1.601	1.595	5.630	0.404	2.851	2.447	0.852	2.054	1.650	0.798	2.872
112.0	151.3	0.144	2.39	6.656	1.637	1.631	5.624	0.398	2.888	2.490	0.858	2.072	1.674	0.816	2.901
116.7	154.8	0.150	2.50	6.664	1.672	1.666	5.617	0.391	2.922	2.531	0.865	2.089	1.698	0.833	2.927
121.3	158.2	0.156	2.60	6.670	1.707	1.701	5.611	0.384	2.957	2.573	0.872	2.106	1.722	0.851	2.952
125.9	161.7	0.161	2.69	6.676	1.744	1.737	5.602	0.376	2.993	2.617	0.880	2.124	1.748	0.869	2.975
130.5	166.0	0.168	2.79	6.683	1.789	1.782	5.595	0.368	3.038	2.670	0.888	2.147	1.779	0.891	3.008
135.1	169.0	0.174	2.89	6.690	1.819	1.812	5.586	0.359	3.068	2.708	0.896	2.161	1.802	0.906	3.023
139.7	172.5	0.180	3.00	6.698	1.855	1.847	5.577	0.351	3.103	2.752	0.905	2.179	1.828	0.924	3.042
144.4	176.1	0.186	3.09	6.704	1.891	1.883	5.568	0.342	3.139	2.797	0.914	2.197	1.855	0.942	3.061
149.0	179.7	0.191	3.19	6.711	1.928	1.920	5.559	0.332	3.176	2.844	0.923	2.216	1.883	0.960	3.080
153.6	183.3	0.197	3.29	6.718	1.965	1.957	5.549	0.322	3.212	2.890	0.933	2.234	1.911	0.978	3.097
158.2	186.9	0.203	3.39	6.724	2.001	1.993	5.541	0.315	3.250	2.935	0.942	2.254	1.939	0.997	3.116
162.8	190.9	0.209	3.48	6.731	2.041	2.033	5.531	0.305	3.289	2.985	0.952	2.273	1.968	1.017	3.137
167.4	194.9	0.215	3.59	6.738	2.082	2.074	5.518	0.292	3.330	3.038	0.964	2.293	2.001	1.037	3.152
172.1	198.6	0.222	3.70	6.746	2.120	2.111	5.507	0.280	3.367	3.087	0.976	2.311	2.031	1.055	3.163
176.7	202.3	0.228	3.79	6.753	2.157	2.148	5.494	0.268	3.404	3.136	0.988	2.330	2.062	1.074	3.174
181.3	206.6	0.234	3.89	6.760	2.200	2.191	5.482	0.255	3.446	3.191	1.000	2.351	2.096	1.095	3.190
185.9	210.4	0.240	4.00	6.767	2.238	2.229	5.471	0.244	3.485	3.241	1.013	2.371	2.127	1.114	3.201
190.6	214.3	0.246	4.09	6.774	2.278	2.268	5.460	0.233	3.525	3.291	1.024	2.391	2.158	1.134	3.216
195.2	218.3	0.252	4.20	6.781	2.317	2.307	5.446	0.220	3.563	3.344	1.036	2.410	2.190	1.154	3.226
199.8	222.2	0.258	4.29	6.788	2.357	2.346	5.432	0.205	3.602	3.397	1.050	2.429	2.224	1.173	3.234
204.4	226.3	0.264	4.40	6.796	2.397	2.387	5.418	0.191	3.642	3.451	1.064	2.449	2.257	1.193	3.243
209.0	230.4	0.270	4.49	6.802	2.439	2.428	5.404	0.177	3.684	3.506	1.078	2.470	2.292	1.214	3.252
213.6	234.2	0.276	4.59	6.809	2.476	2.465	5.393	0.166	3.723	3.557	1.091	2.490	2.324	1.233	3.260
218.3	238.2	0.281	4.69	6.816	2.516	2.505	5.379	0.153	3.762	3.609	1.104	2.509	2.356	1.253	3.269
229.8	248.3	0.297	4.94	6.835	2.616	2.604	5.339	0.113	3.860	3.747	1.143	2.558	2.445	1.302	3.278
241.3	260.1	0.312	5.19	6.853	2.733	2.720	5.305	0.079	3.978	3.899	1.178	2.617	2.539	1.360	3.308
252.9	271.3	0.326	5.44	6.870	2.843	2.830	5.264	0.037	4.086	4.049	1.218	2.671	2.634	1.415	3.323
264.4	280.9	0.342	5.69	6.889	2.936	2.922	5.223	-0.003	4.179	4.182	1.260	2.718	2.721	1.461	3.320
276.0	290.7	0.356	5.93	6.907	3.030	3.016	5.184	-0.043	4.272	4.315	1.299	2.764	2.807	1.508	3.322
287.5	301.6	0.371	6.18	6.925	3.135	3.121	5.139	-0.087	4.377	4.464	1.344	2.816	2.904	1.560	3.323
299.1	311.3	0.386	6.43	6.943	3.228	3.213	5.098	-0.129	4.469	4.598	1.385	2.863	2.991	1.606	3.319
310.6	320.9	0.401	6.67	6.961	3.319	3.303	5.050	-0.177	4.558	4.735	1.432	2.907	3.084	1.651	3.306
322.1	331.8	0.417	6.94	6.981	3.422	3.405	5.005	-0.221	4.661	4.882	1.477	2.958	3.179	1.703	3.306
333.7	342.4	0.431	7.18	6.999	3.522	3.505	4.960	-0.266	4.762	5.028	1.523	3.009	3.276	1.753	3.301
345.2	352.3	0.446	7.42	7.018	3.614	3.596	4.913	-0.313	4.852	5.165	1.569	3.054	3.367	1.798	3.292
356.8	362.3	0.461	7.68	7.037	3.707	3.688	4.863	-0.363	4.943	5.307	1.618	3.099	3.462	1.844	3.279
368.3	372.6	0.477	7.94	7.057	3.801	3.782	4.815	-0.411	5.037	5.449	1.667	3.146	3.558	1.891	3.269
379.8	383.4	0.491	8.18	7.075	3.902	3.882	4.766	-0.461	5.137	5.598	1.715	3.196	3.657	1.941	3.263
391.4	393.8	0.505	8.42	7.094	3.997	3.976	4.718	-0.508	5.233	5.741	1.764	3.244	3.753	1.988	3.254
402.9	403.7	0.520	8.67	7.113	4.086	4.066	4.668	-0.558	5.321	5.879	1.814	3.288	3.846	2.033	3.242
414.4	412.4	0.536	8.93	7.134	4.163	4.141	4.615	-0.611	5.396	6.007	1.866	3.326	3.937	2.071	3.219
426.0	422.2	0.551	9.17	7.153	4.249	4.227	4.567	-0.659	5.483	6.142	1.915	3.369	4.029	2.114	3.208
437.5	432.1	0.566	9.42	7.173	4.338	4.315	4.515	-0.712	5.570	6.281	1.966	3.412	4.124	2.158	3.195
449.1	440.6	0.581	9.67	7.193	4.410	4.387	4.466	-0.760	5.641	6.402	2.014	3.448	4.208	2.194	3.178
460.6	449.5	0.595	9.91	7.211	4.488	4.464	4.418	-0.809	5.720	6.529	2.065	3.488	4.297	2.232	3.162
472.2	458.6	0.610	10.17	7.232	4.566	4.542	4.368	-0.859	5.796	6.655	2.114	3.525	4.384	2.271	3.149
483.7	467.2	0.625	10.42	7.252	4.639	4.614	4.317	-0.909	5.868	6.778	2.164	3.562	4.471	2.307	3.132
495.2	475.7	0.640	10.67	7.273	4.709	4.684	4.271	-0.955	5.940	6.895	2.211	3.598	4.553	2.342	3.118
506.8	484.5	0.655	10.91	7.293	4.783	4.757	4.220	-1.006	6.012	7.018	2.261	3.634	4.640	2.379	3.104
518.3	492.5	0.670	11.16	7.313	4.848	4.822	4.173	-1.054	6.077	7.131	2.310	3.666	4.720	2.411	3.088
529.9	500.3	0.685	11.41	7.333	4.912	4.884	4.125	-1.102	6.139	7.241	2.357	3.697	4.799	2.442	3.072
541.4	509.3	0.700	11.66	7.354	4.986	4.958	4.078	-1.149	6.214	7.362	2.404	3.735	4.883	2.479	3.062
552.9	517.6	0.715	11.91	7.375	5.054	5.025	4.032	-1.195	6.281	7.475	2.450	3.768	4.963	2.513	3.051
564.5	525.8	0.730	12.16	7.396	5.118	5.089	3.985	-1.242	6.344	7.586	2.497	3.800	5.041	2.544	3.038
576.0	533.7	0.745	12.41	7.417	5.181	5.151	3.939	-1.287	6.405	7.693	2.542	3.830	5.117	2.575	3.026
587.5	541.7	0.760	12.67	7.439	5.243	5.212	3.893	-1.334	6.466	7.800	2.588	3.860	5.194	2.606	3.014
599.1	549.3	0.775	12.91	7.460	5.302	5.271	3.850	-1.377	6.526	7.903	2.632	3.891	5.267	2.635	3.003
610.6	557.9	0.790	13.17	7.482	5.369	5.337	3.805	-1.421	6.592	8.014	2.676	3.924	5.345	2.669	2.994
622.2	564.6	0.805	13.41	7.503	5.418	5.386	3.763	-1.464	6.641	8.105	2.719	3.948	5.412	2.693	2.981
633.7	571.8	0.820	13.67	7.525	5.471	5.438	3.719	-1.508	6.692	8.200	2.762	3.973	5.481	2.719	2.969
645.3	579.0	0.834	13.90	7.546	5.525	5.492	3.679	-1.547	6.747	8.295	2.803	4.002	5.549	2.746	2.959
656.8	586.6	0.850	14.17	7.569	5.580	5.546	3.636	-1.591	6.801	8.391	2.845	4.028	5.618	2.773	2.949

Project: 175526009			Source: B-002, 25.5'-26.0'								Lab ID: 58A		Test ID		
Test Time (min)	Corr. Axial Load (lbf)	Axial Deform. (in)	Axial Strain (%)	Corr. Area (in^2)	Deviator Stress (tsf)	Corr. Deviator Stress (tsf)	Pore Pressure (tsf)	Induced Pore Pressure (tsf)	σ_1 (tsf)	σ_1' (tsf)	σ_3' (tsf)	p (tsf)	p' (tsf)	q (tsf)	Eff. Princ. Stress Ratio σ_1'/σ_3'
668.3	594.0	0.865	14.40	7.590	5.634	5.600	3.598	-1.629	6.856	8.484	2.885	4.056	5.685	2.800	2.941
679.9	601.2	0.880	14.66	7.613	5.686	5.651	3.556	-1.671	6.905	8.576	2.925	4.080	5.751	2.825	2.932
691.4	607.9	0.894	14.90	7.634	5.734	5.698	3.518	-1.708	6.953	8.661	2.964	4.104	5.813	2.849	2.923
703.0	614.6	0.910	15.16	7.658	5.778	5.742	3.477	-1.749	6.996	8.745	3.004	4.125	5.874	2.871	2.912
714.5	622.2	0.924	15.40	7.679	5.834	5.797	3.441	-1.785	7.053	8.838	3.041	4.154	5.940	2.899	2.906
726.0	628.5	0.940	15.66	7.703	5.874	5.837	3.401	-1.825	7.091	8.917	3.080	4.173	5.999	2.918	2.895
737.6	635.5	0.954	15.90	7.725	5.923	5.884	3.365	-1.862	7.140	9.002	3.117	4.197	6.059	2.942	2.888
749.1	642.8	0.970	16.16	7.749	5.973	5.934	3.327	-1.900	7.188	9.088	3.154	4.221	6.121	2.967	2.882
760.6	649.3	0.985	16.40	7.772	6.015	5.976	3.290	-1.937	7.230	9.167	3.191	4.242	6.179	2.988	2.873
772.0	656.1	0.999	16.65	7.794	6.060	6.020	3.256	-1.970	7.275	9.245	3.225	4.265	6.235	3.010	2.867

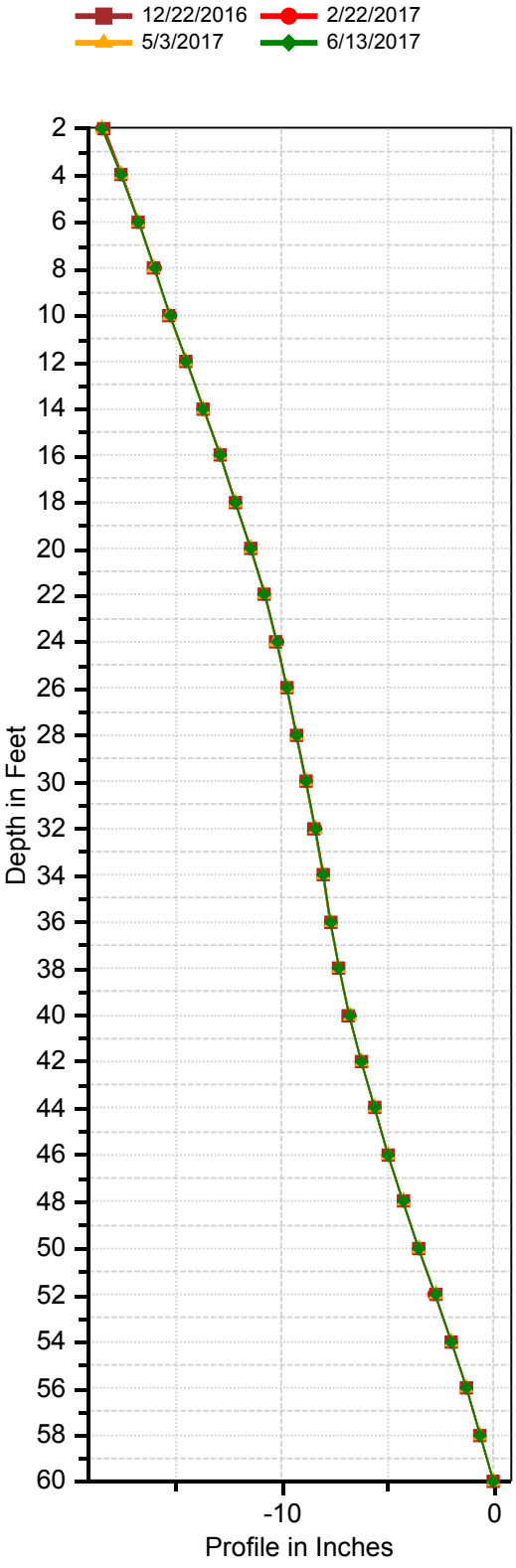
Appendix D Inclinometer Data


Embankment Fill (A-6a, A-6b)
Gravel and Stone Fragments with Sand, Silt, and Clay
Gravel and Stone Fragments with Sand_Original Soil
Silt and Clay
Silt and Clay_Original Soil
Silt_Original Soil
B-005
B-003
B-002
1
2
3
4
5
6
Elevation (Feet)
780
775
770
765
760
755
750
745
740
735
730
725
720
715
710
705
700
695
-185
-175
-165
-155
-145
-135
-125
-115
-105
-95
-85
-75
-65
-55
-45
Distance from Center (Feet)

SUM271-B002 B-002 A



SUM271-B002 B-002 B



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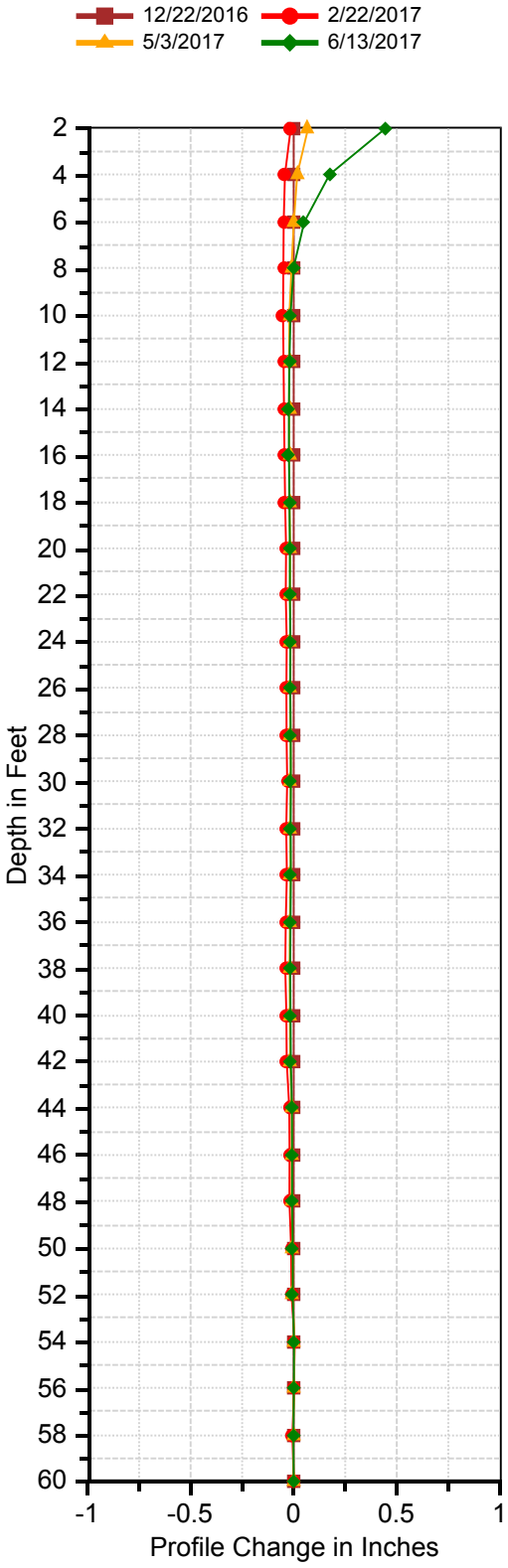
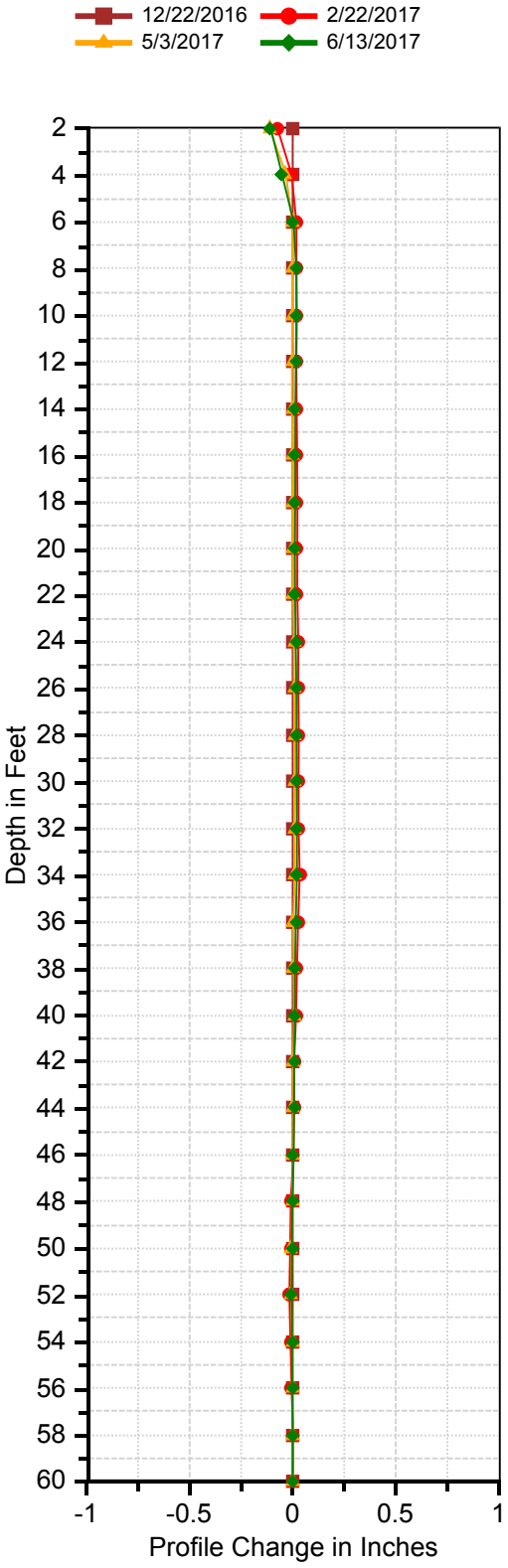


SUM271-B002 B-002 B



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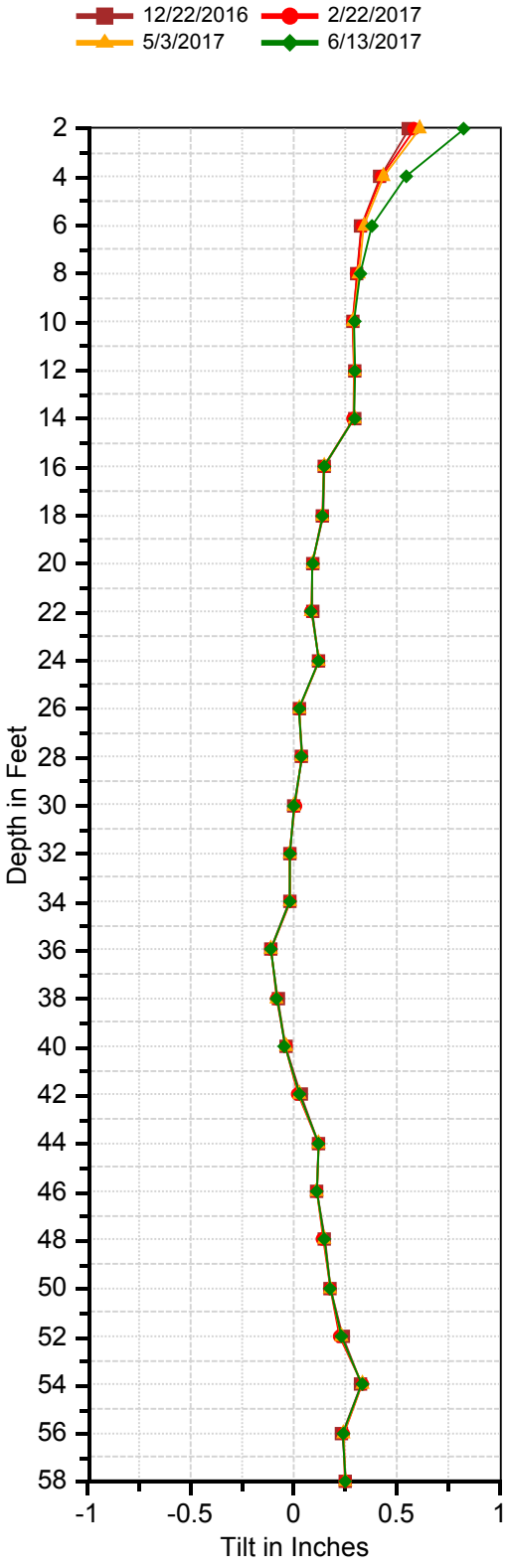

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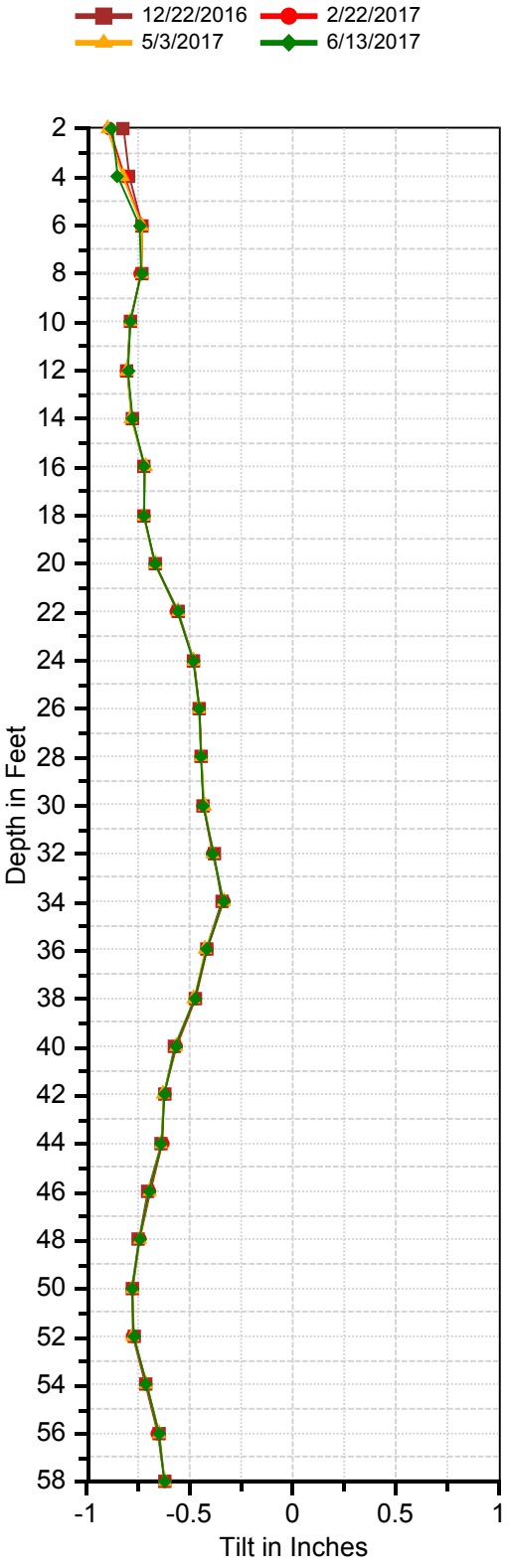

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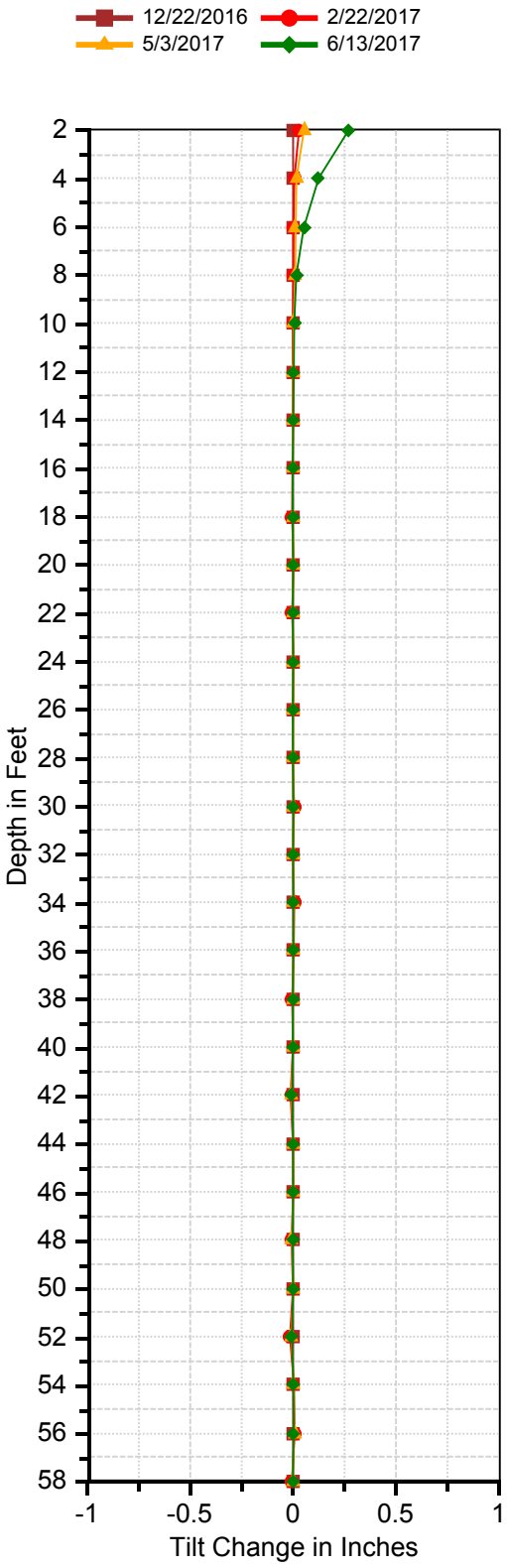

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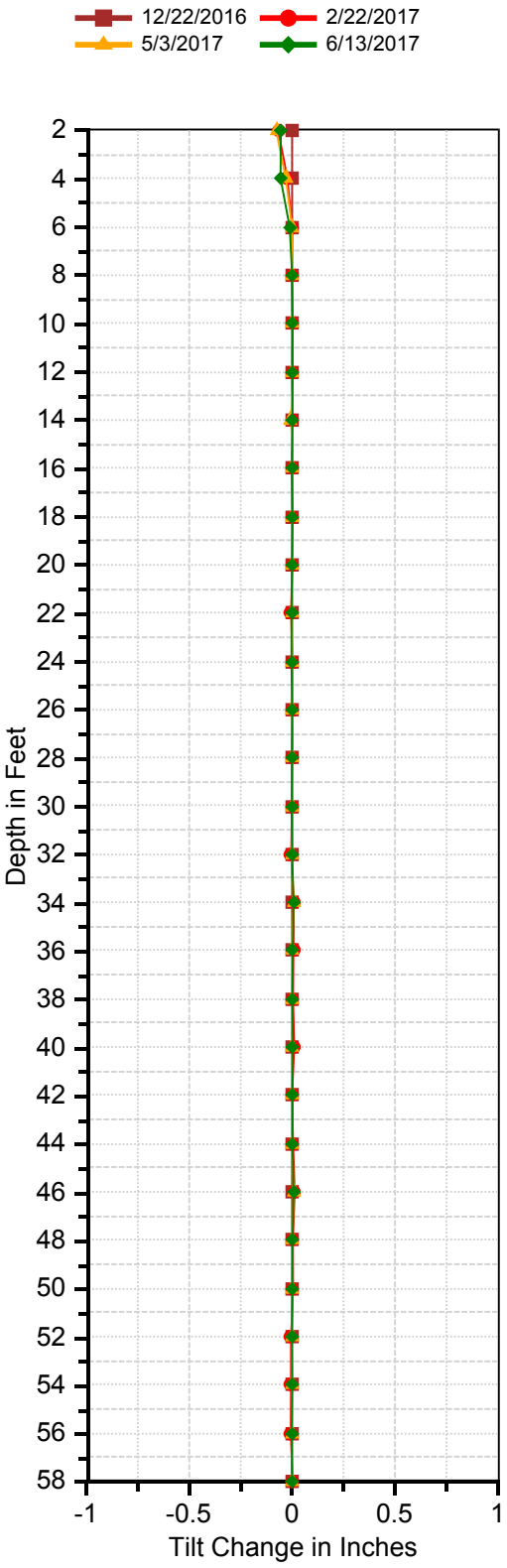

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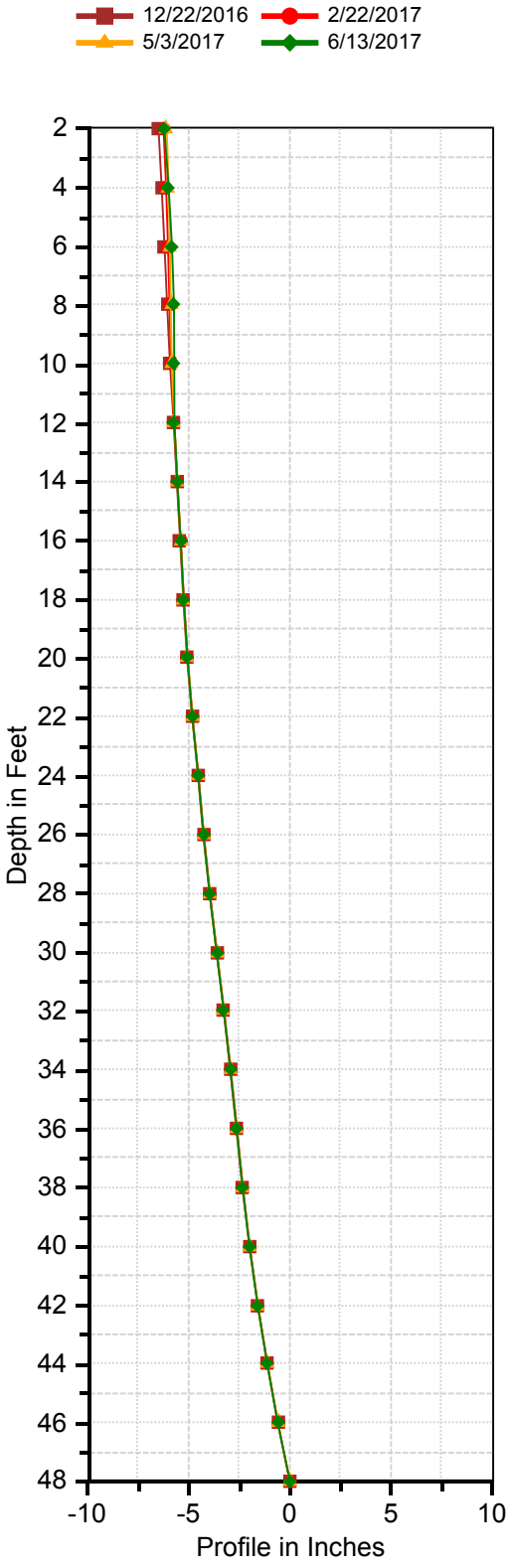

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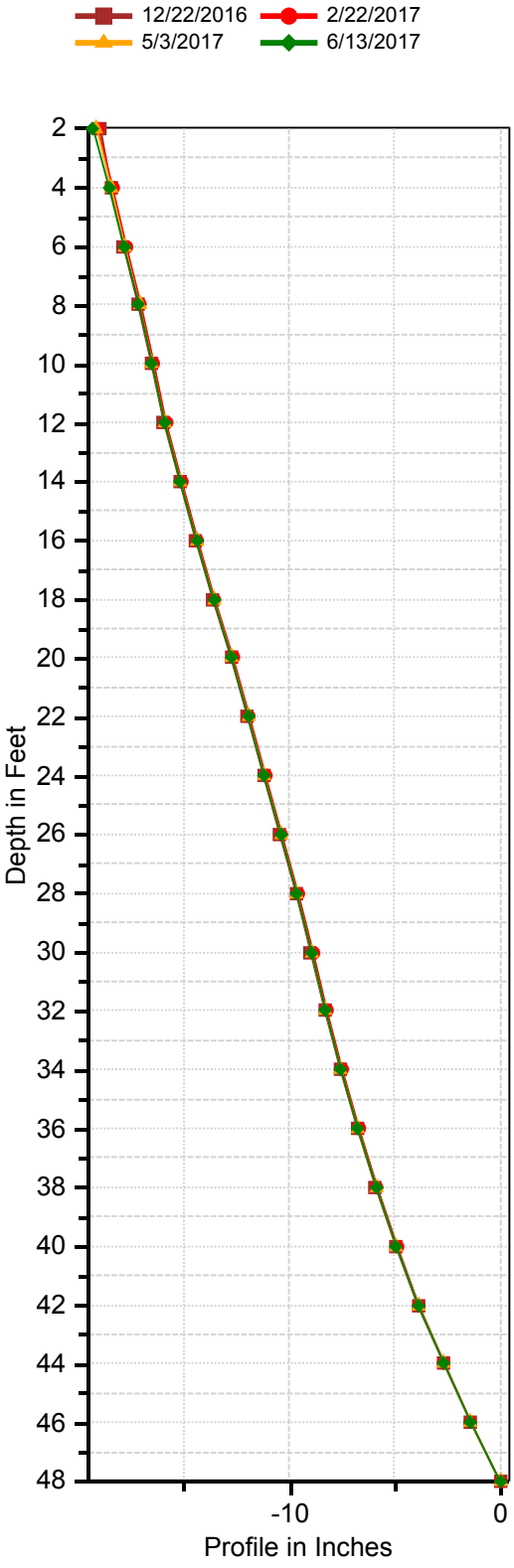

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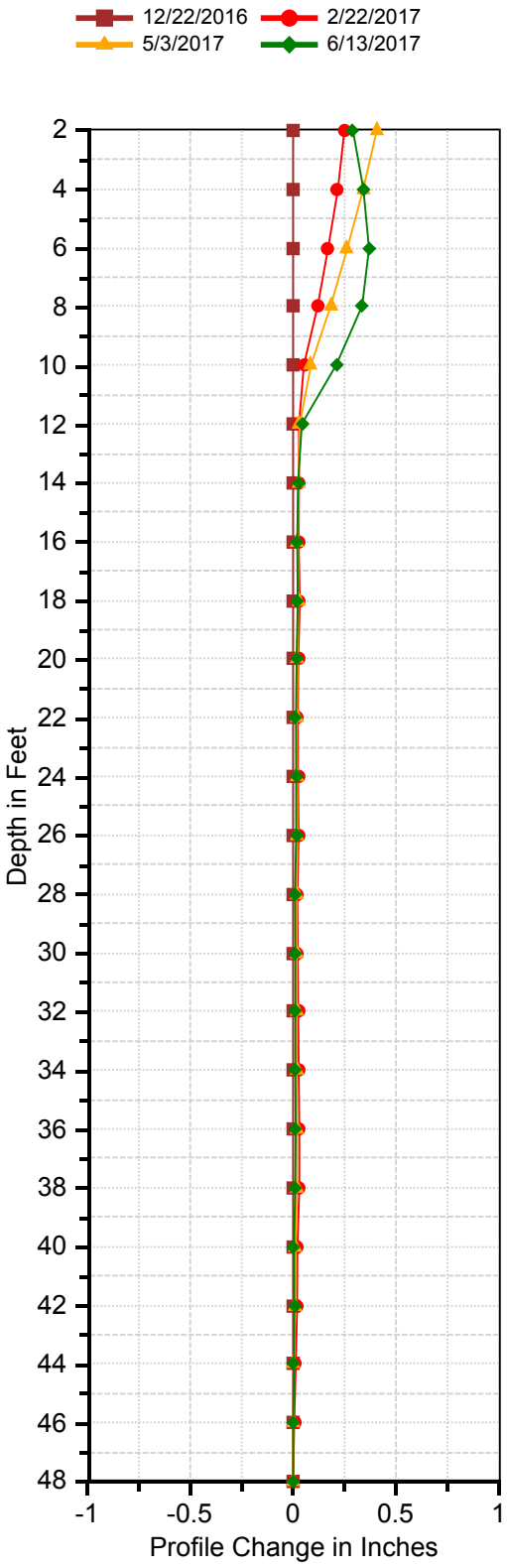

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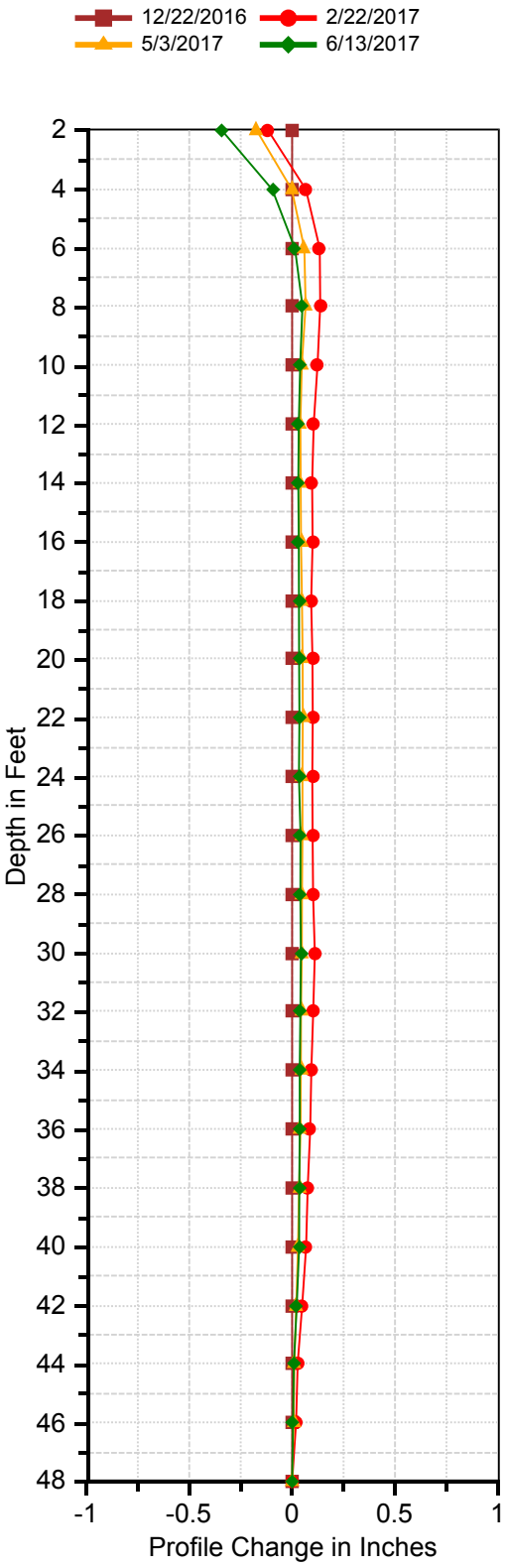

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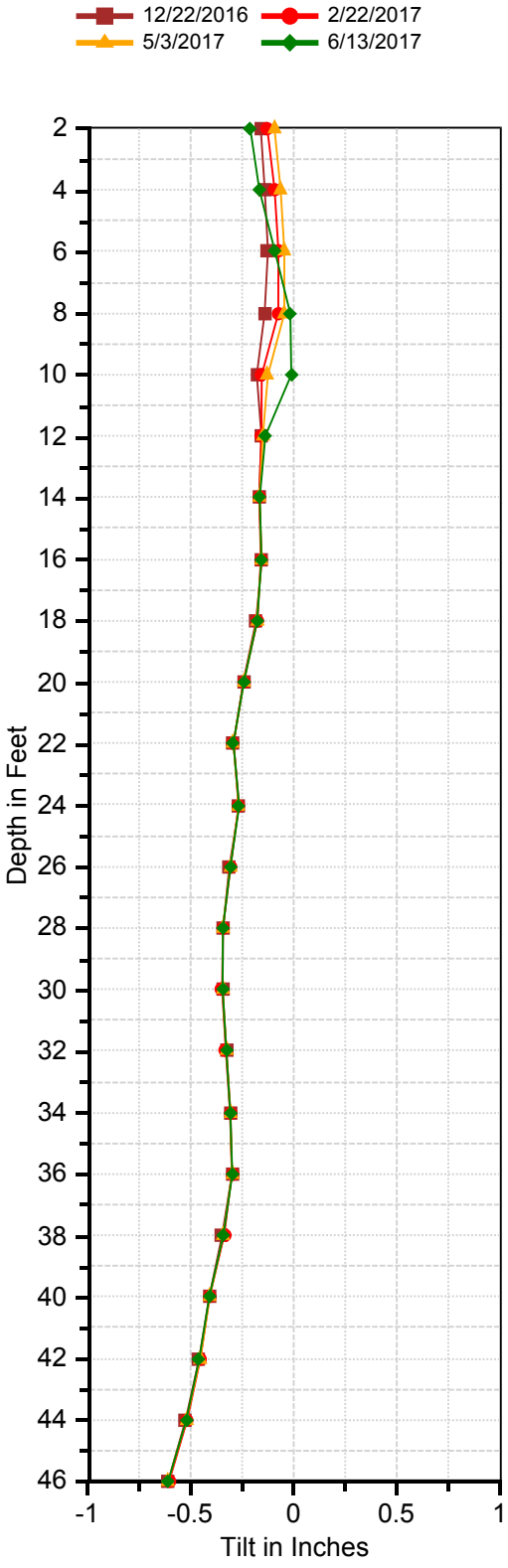

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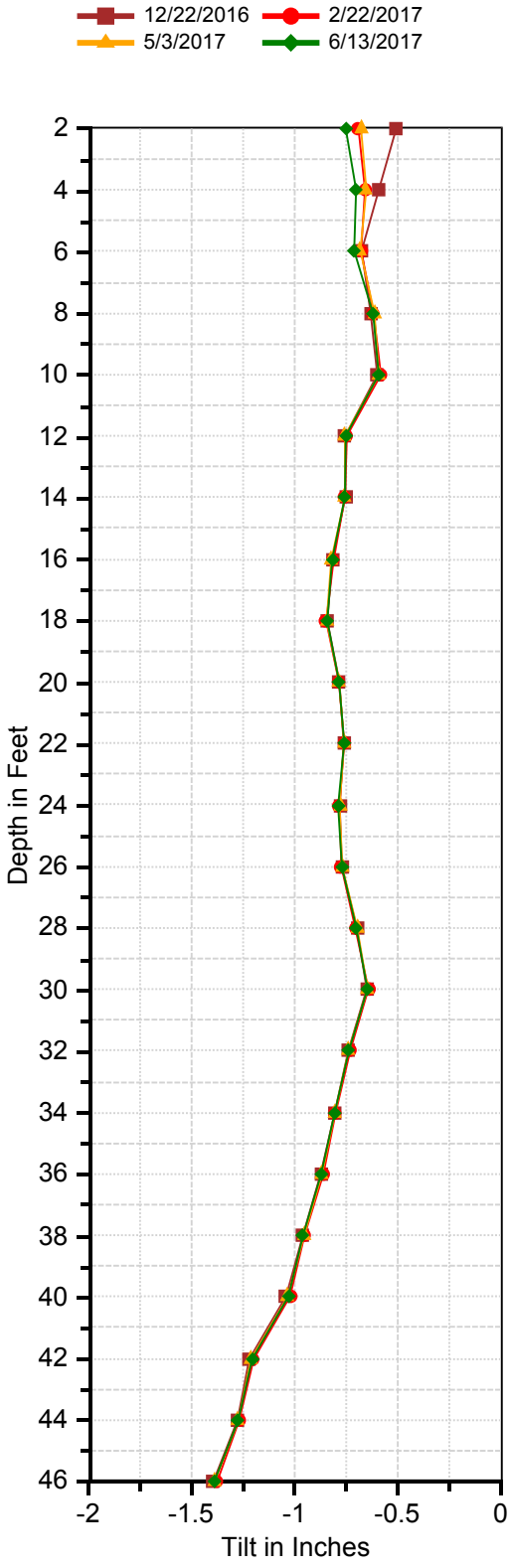

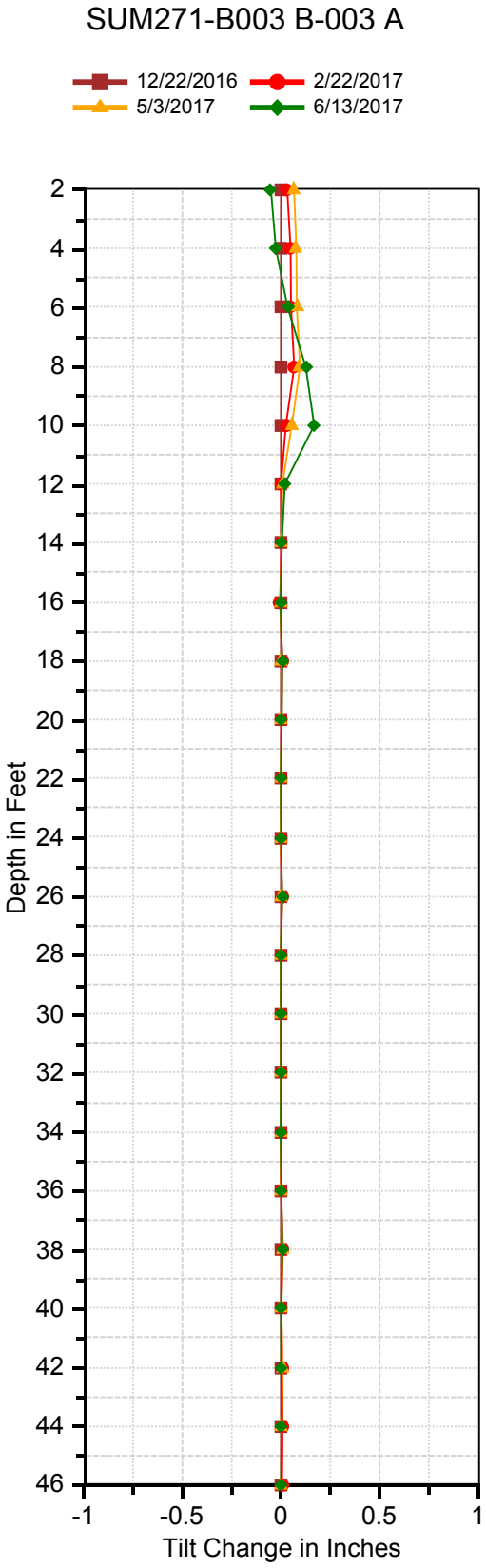
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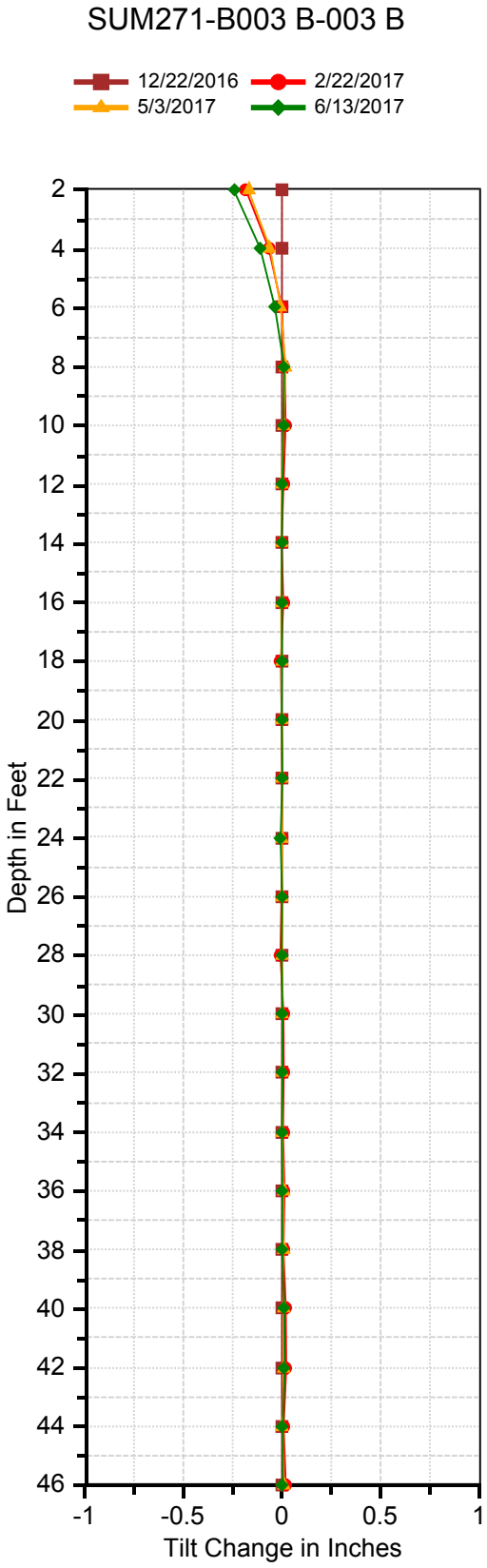
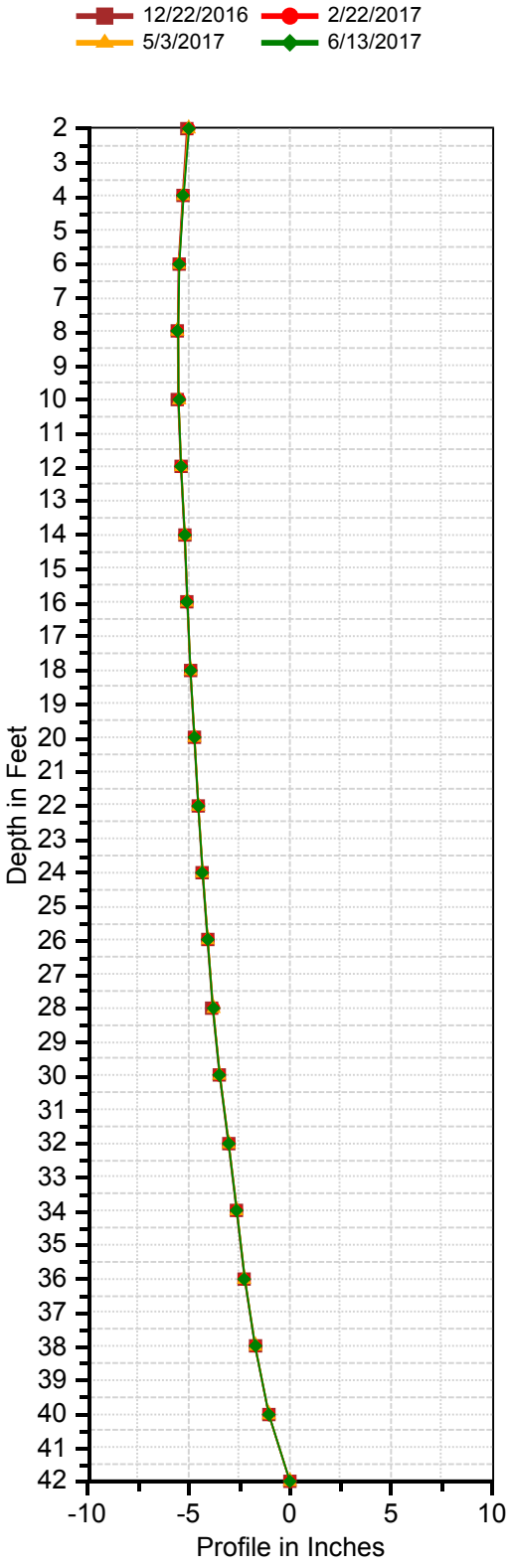
12/22/2016
2/22/2017
5/3/2017
6/13/2017
Depth in Feet
Tilt Change in Inches
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
-1
-0.5
0
0.5
1


SUM271-B003 B-003 B
12/22/2016
2/22/2017
5/3/2017
6/13/2017
Depth in Feet
Tilt Change in Inches
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
-1
-0.5
0
0.5
1

SUM271-B005 B-005 A



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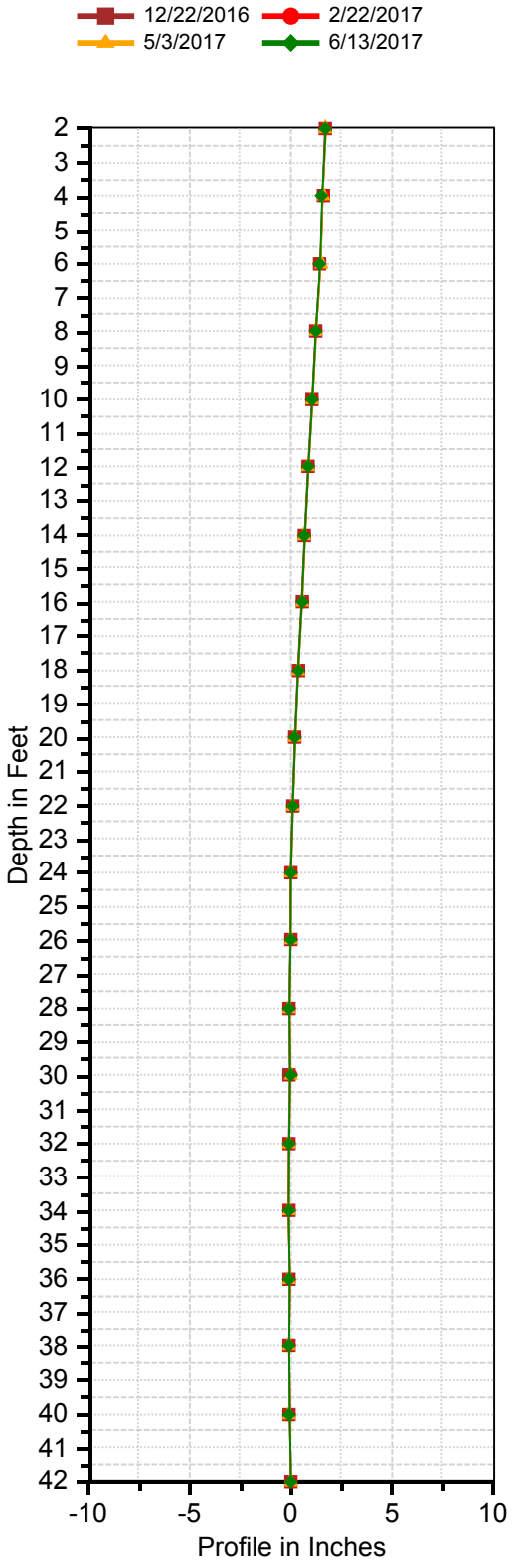

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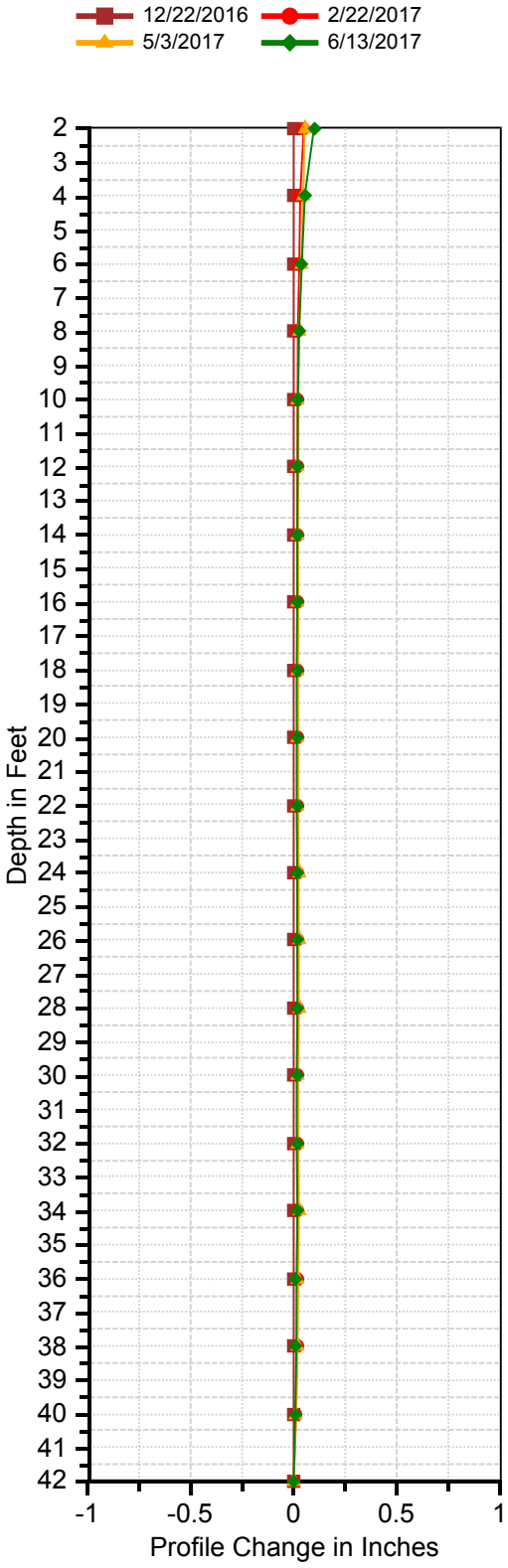

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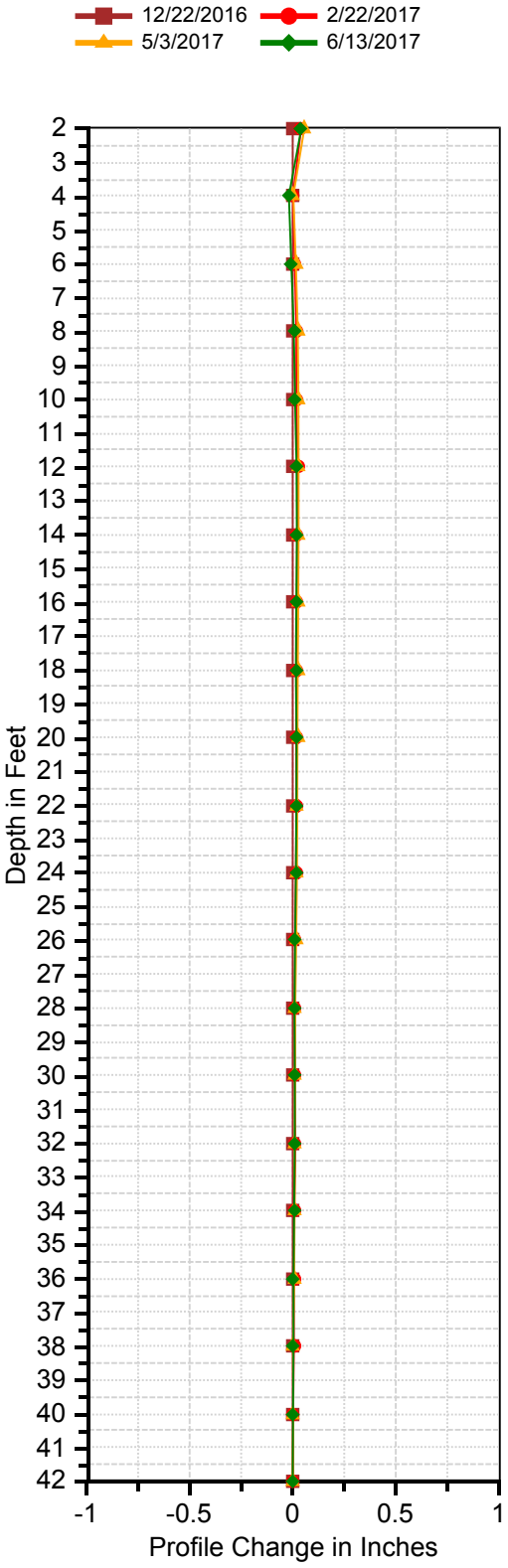

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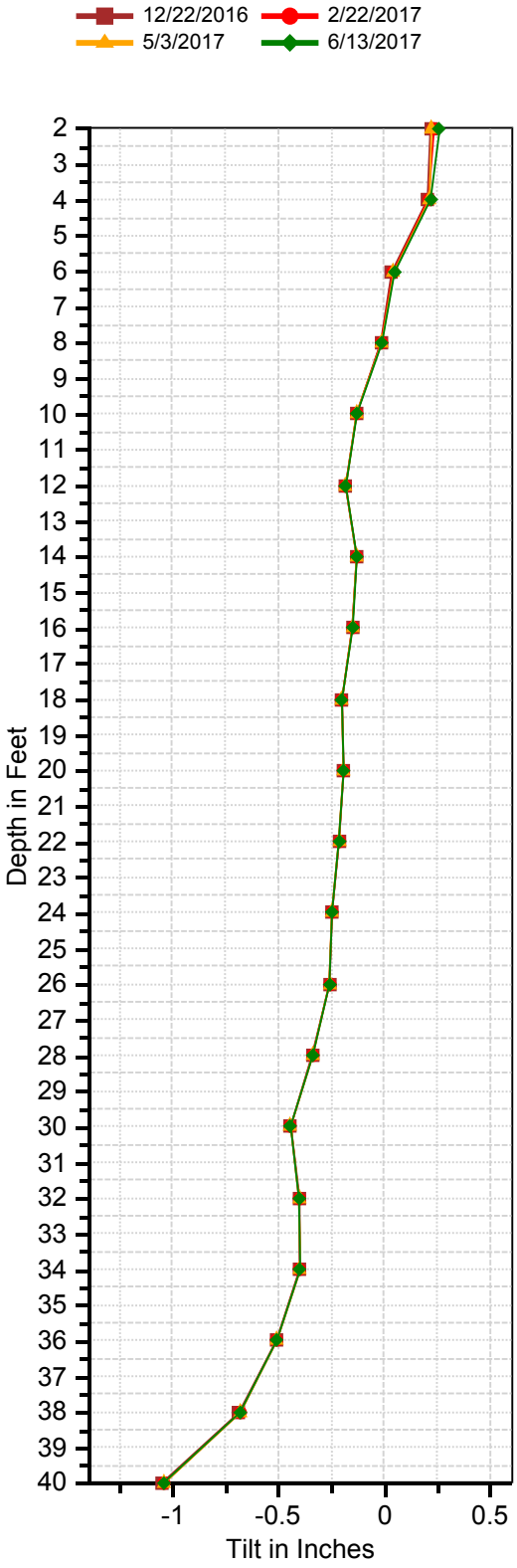

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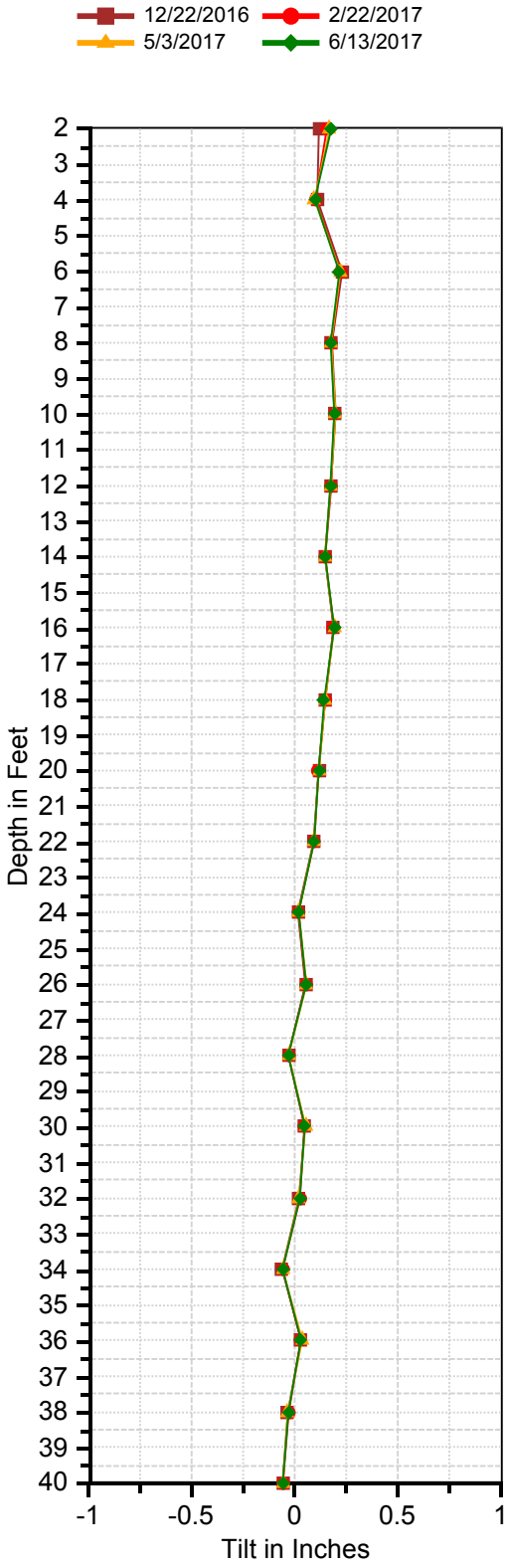

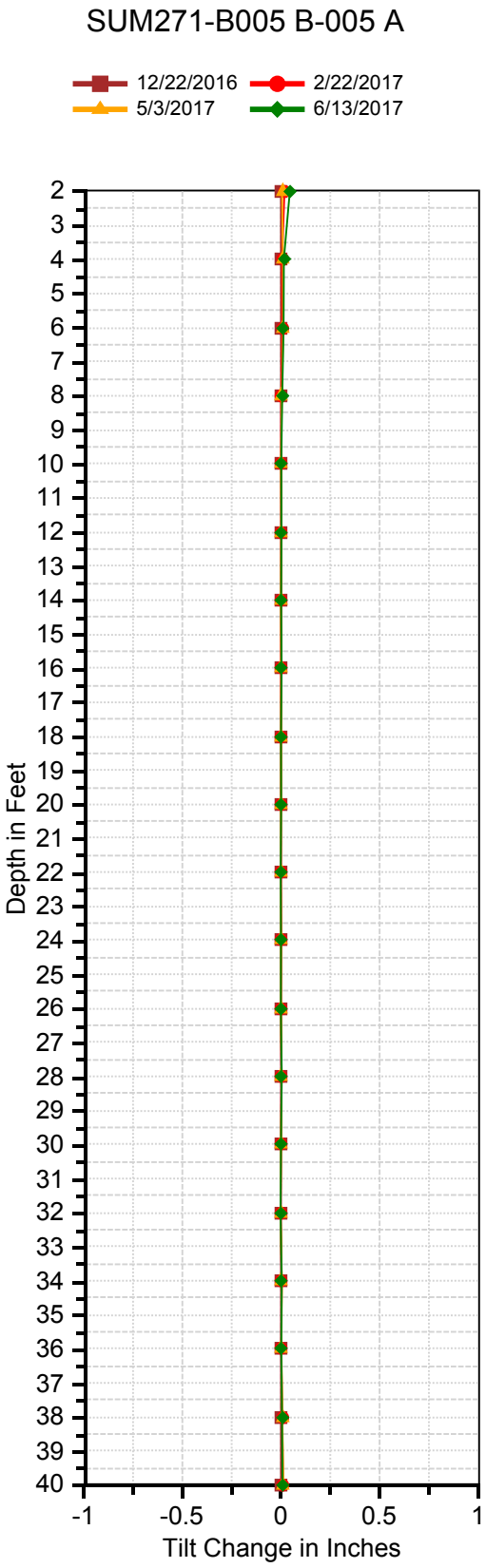
SUM271-B005 B-005 A
12/22/2016
2/22/2017
5/3/2017
6/13/2017
Depth in Feet
2
3
4
5
6
7
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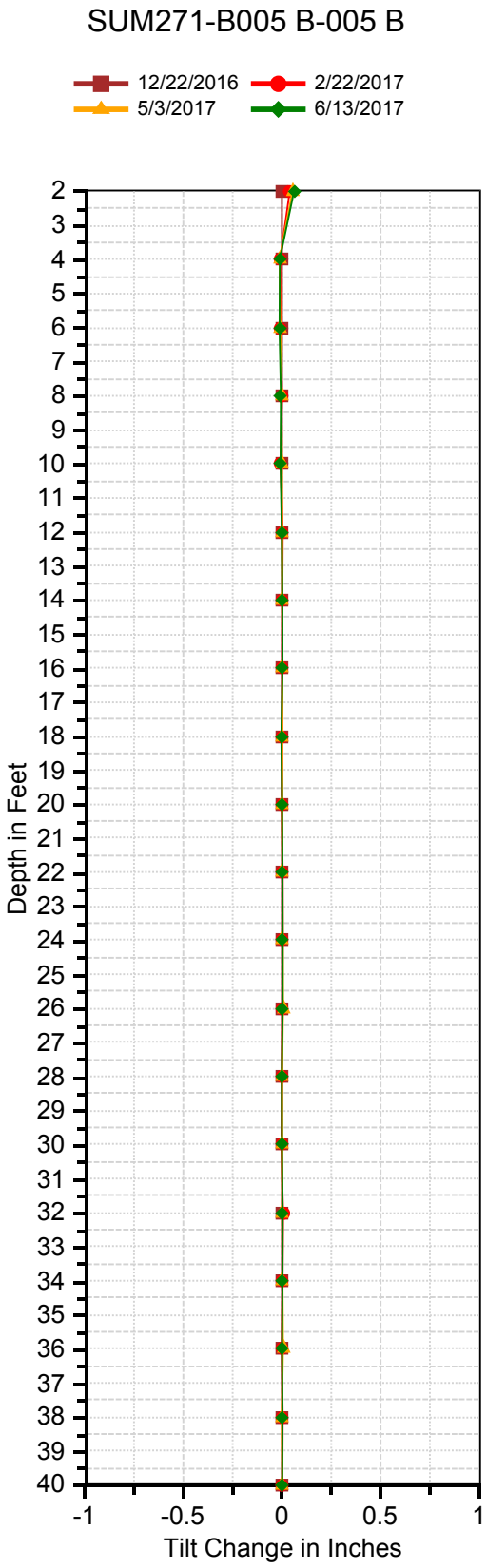
Tilt Change in Inches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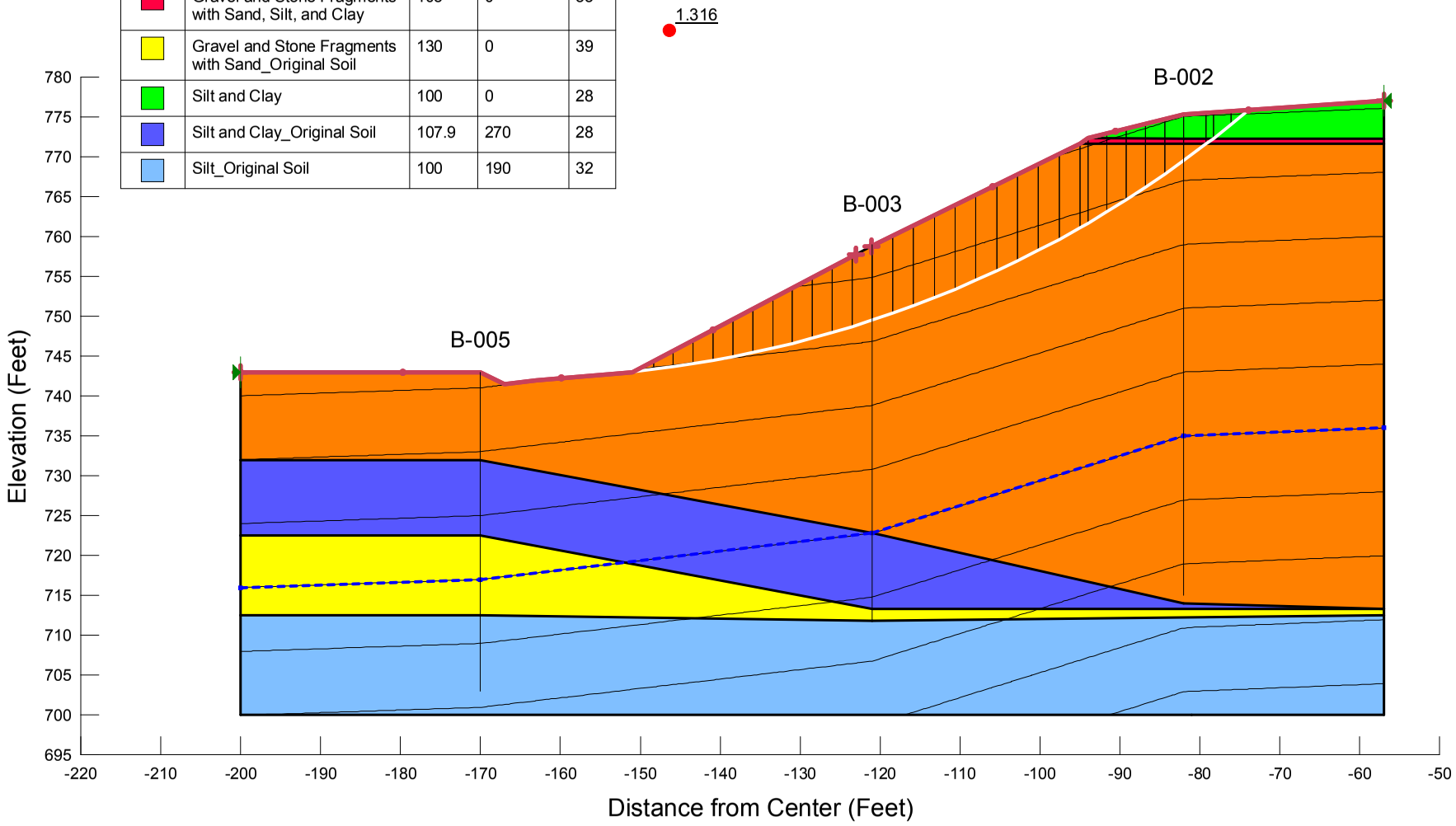
Appendix E Analysis and Alternatives

SUM 271 Landslide Investigation

Current Conditions - 10ft Slip Surface

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill (A-6a, A-6b)	116.6	0	29.1
	Gravel and Stone Fragments with Sand, Silt, and Clay	105	0	33
	Gravel and Stone Fragments with Sand_Original Soil	130	0	39
	Silt and Clay	100	0	28
	Silt and Clay_Original Soil	107.9	270	28
	Silt_Original Soil	100	190	32

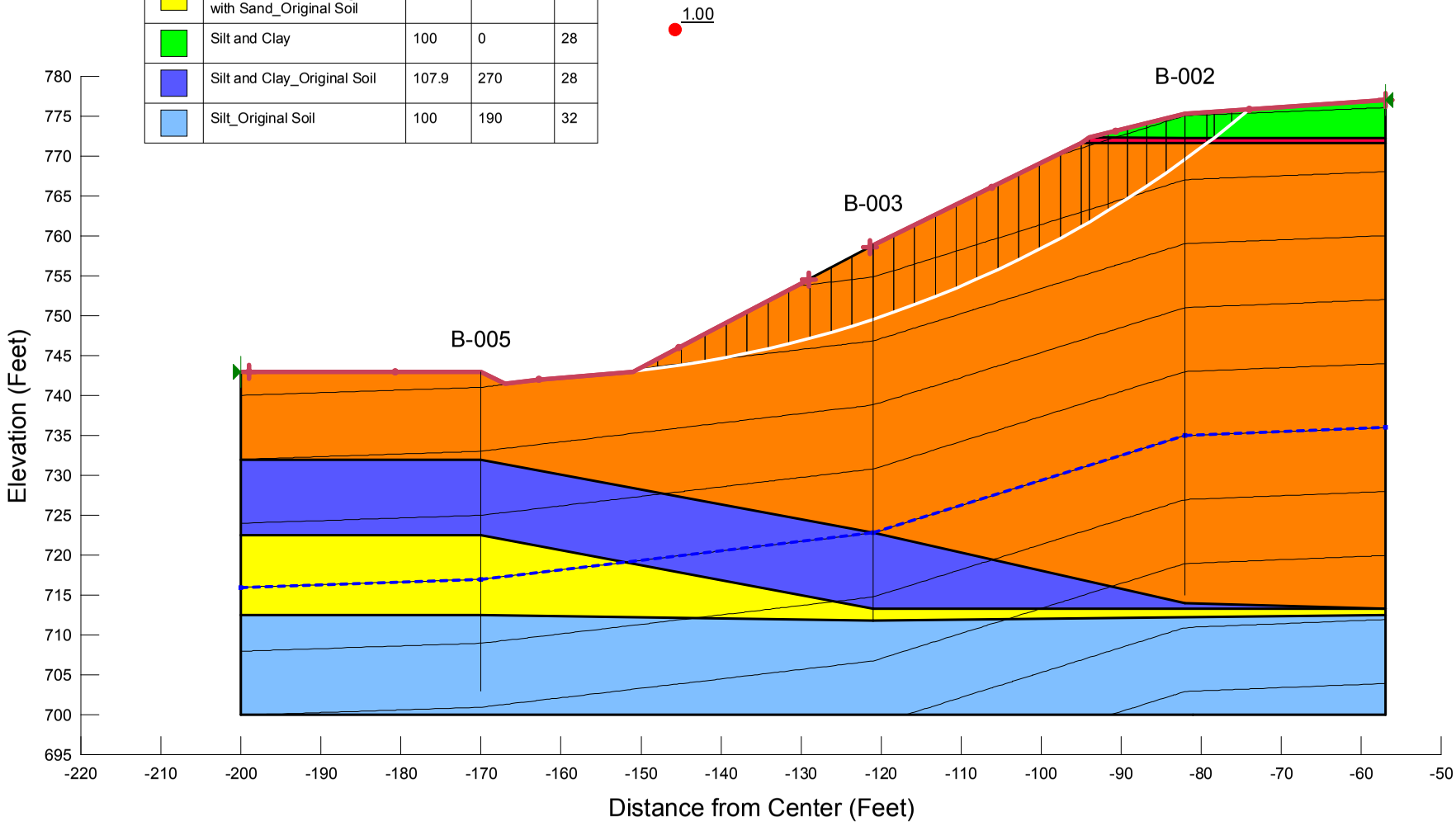


SUM 271 Landslide Investigation

FS=1.0 - 10 ft Slip Surface

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill (A-6a, A-6b)	116.6	0	22.9
	Gravel and Stone Fragments with Sand, Silt, and Clay	105	0	33
	Gravel and Stone Fragments with Sand_Original Soil	130	0	39
	Silt and Clay	100	0	28
	Silt and Clay_Original Soil	107.9	270	28
	Silt_Original Soil	100	190	32

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.

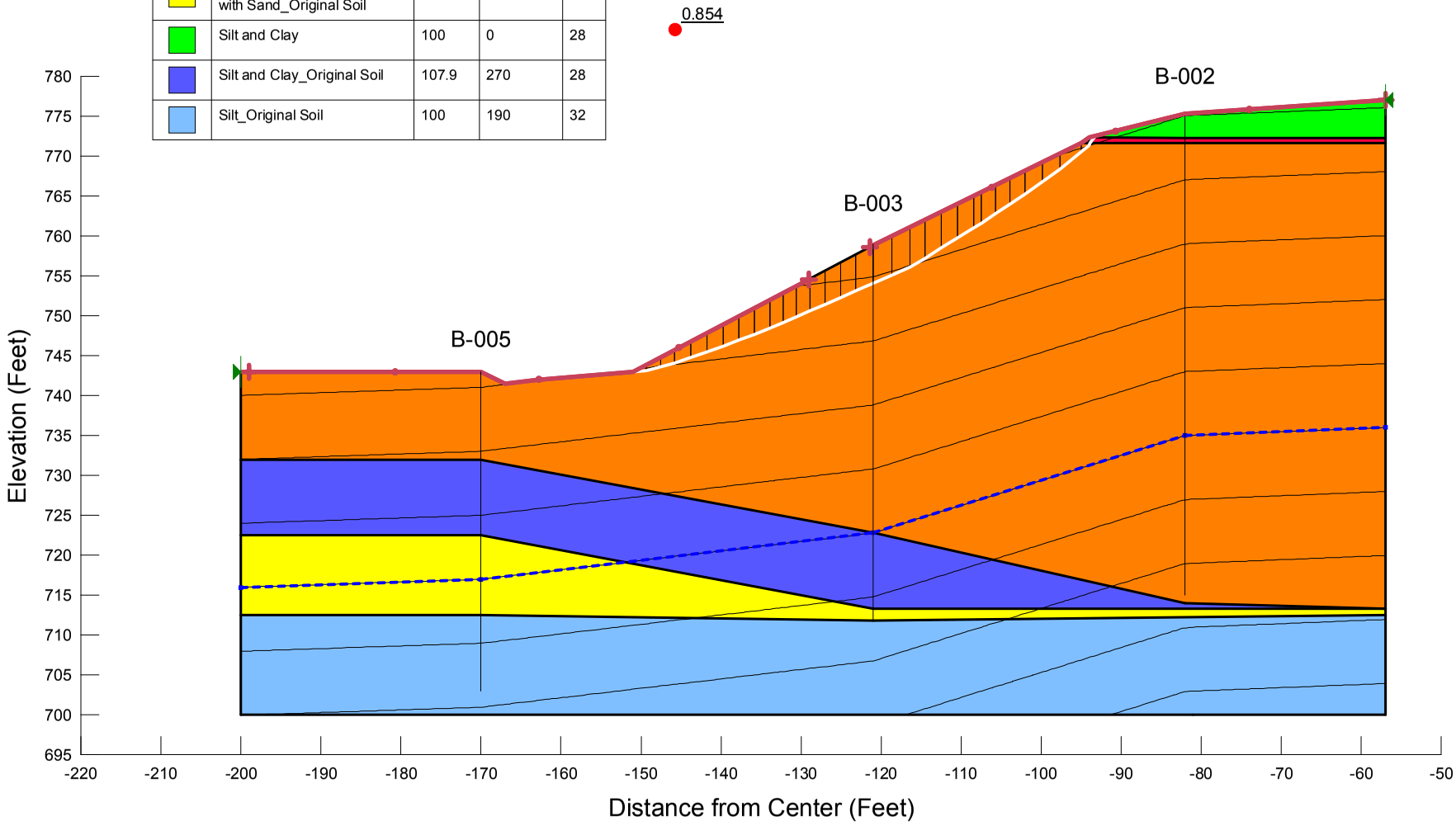


SUM 271 Landslide Investigation

5ft Slip Surface - Calibrated Model

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill (A-6a, A-6b)	116.6	0	22.9
	Gravel and Stone Fragments with Sand, Silt, and Clay	105	0	33
	Gravel and Stone Fragments with Sand_Original Soil	130	0	39
	Silt and Clay	100	0	28
	Silt and Clay_Original Soil	107.9	270	28
	Silt_Original Soil	100	190	32

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.

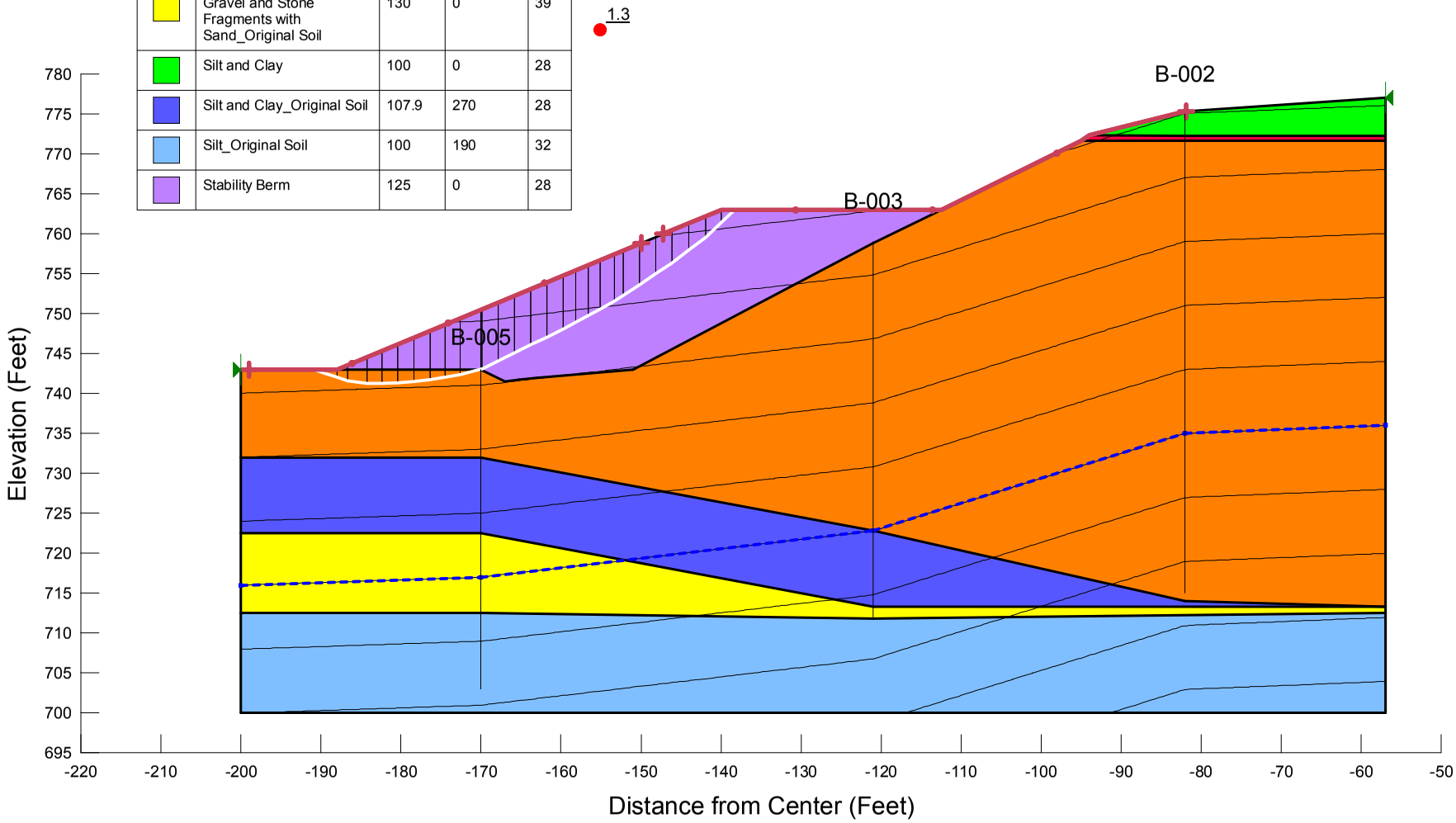


SUM 271 Landslide Investigation

Alternative 1 - Stability Berm - 5 ft Slip Surface

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill (A-6a, A-6b)	116.6	0	22.9
	Gravel and Stone Fragments with Sand, Silt, and Clay	105	0	33
	Gravel and Stone Fragments with Sand_Original Soil	130	0	39
	Silt and Clay	100	0	28
	Silt and Clay_Original Soil	107.9	270	28
	Silt_Original Soil	100	190	32
	Stability Berm	125	0	28

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.

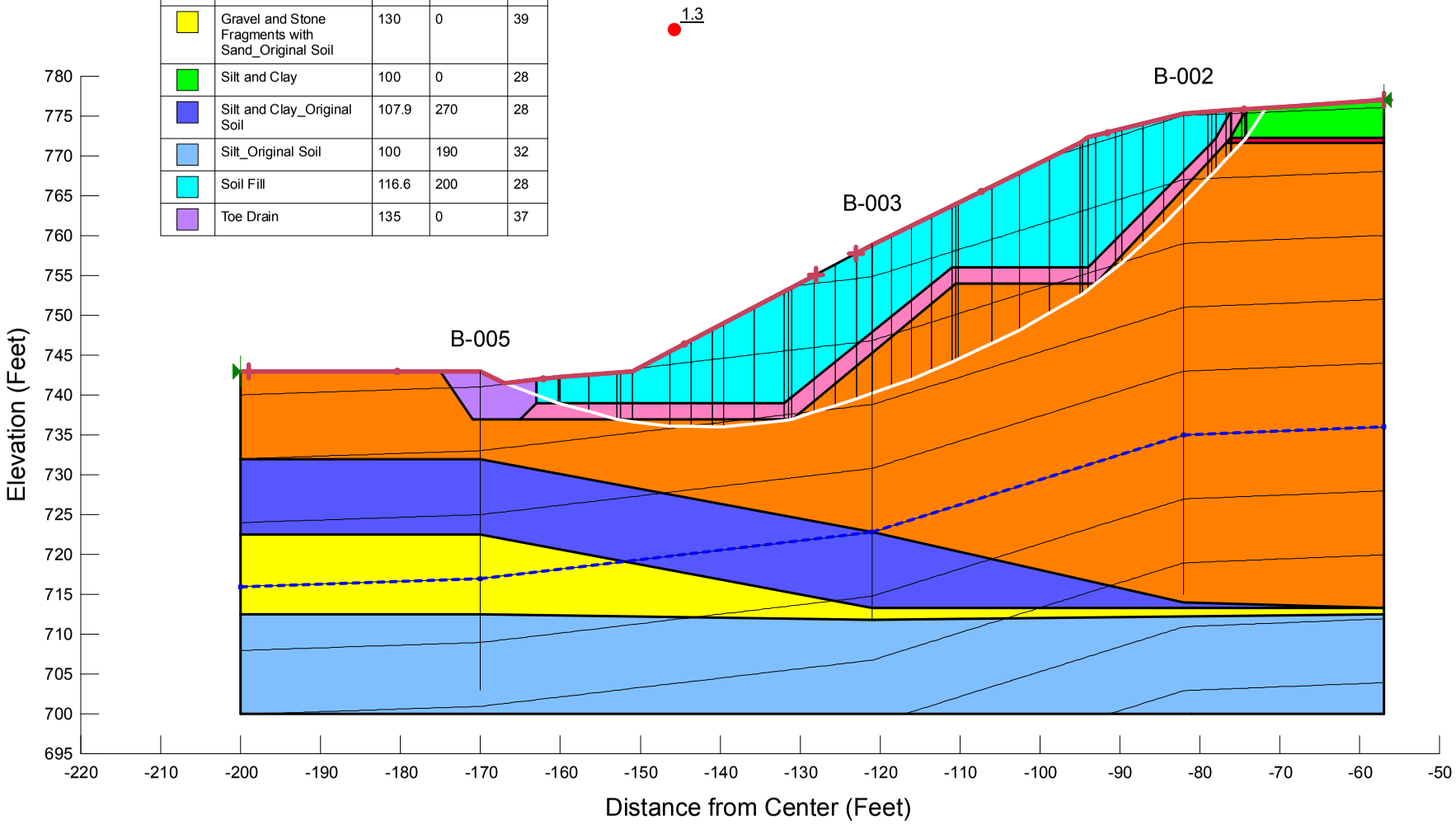


SUM 271 Landslide Investigation

Alternative 2 - Benched Soil Fill - 5 ft Slip Surface

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Drainage Aggregate	130	0	35
	Embankment Fill (A-6a, A-6b)	116.6	0	22.9
	Gravel and Stone Fragments with Sand, Silt, and Clay	105	0	33
	Gravel and Stone Fragments with Sand_Original Soil	130	0	39
	Silt and Clay	100	0	28
	Silt and Clay_Original Soil	107.9	270	28
	Silt_Original Soil	100	190	32
	Soil Fill	116.6	200	28
	Toe Drain	135	0	37

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.

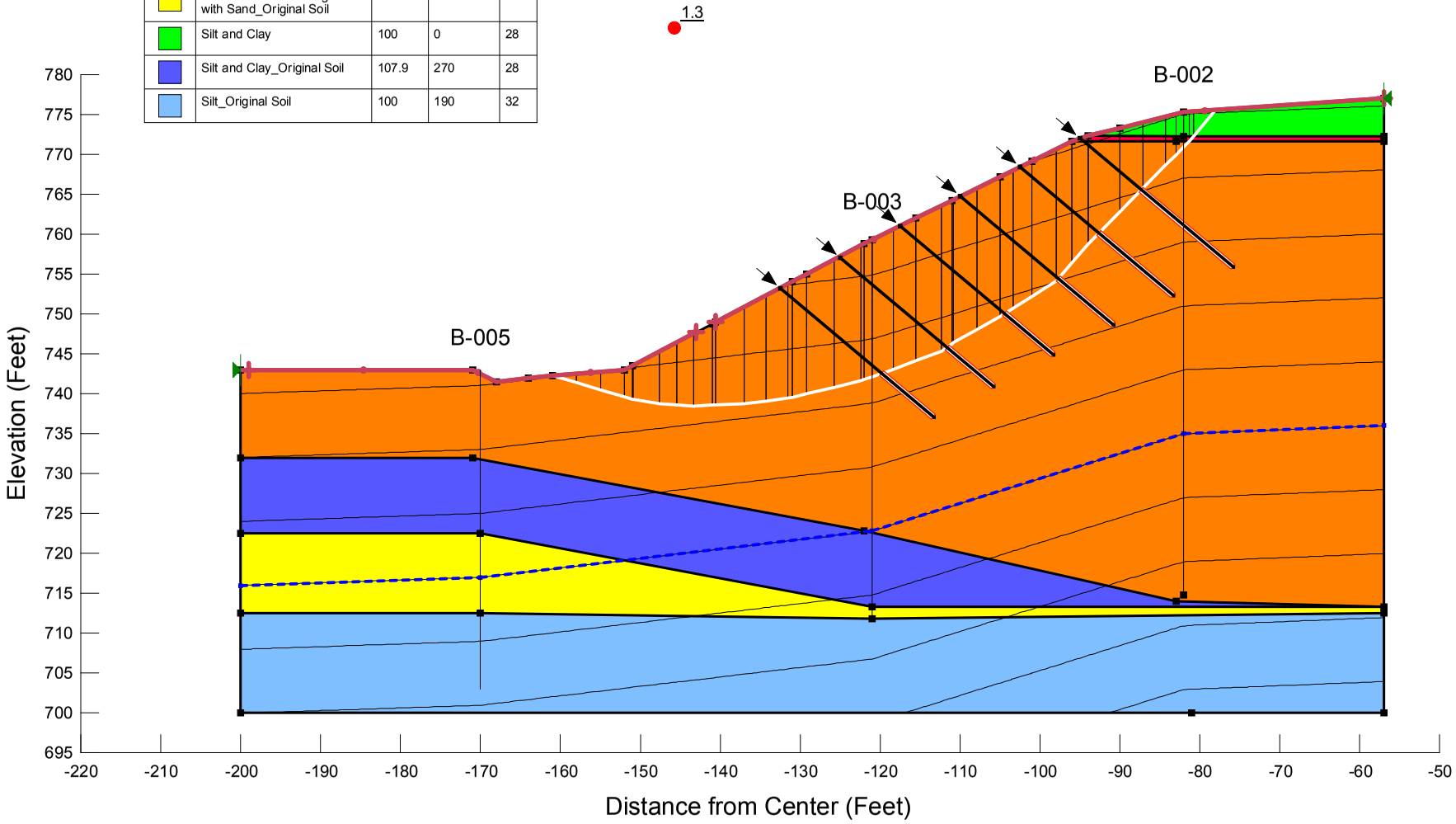


SUM 271 Landslide Investigation

Alternative 3 - Long Soil Nails - 5 ft Slip Surface

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill (A-6a, A-6b)	116.6	0	22.9
	Gravel and Stone Fragments with Sand, Silt, and Clay	105	0	33
	Gravel and Stone Fragments with Sand_Original Soil	130	0	39
	Silt and Clay	100	0	28
	Silt and Clay_Original Soil	107.9	270	28
	Silt_Original Soil	100	190	32

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.

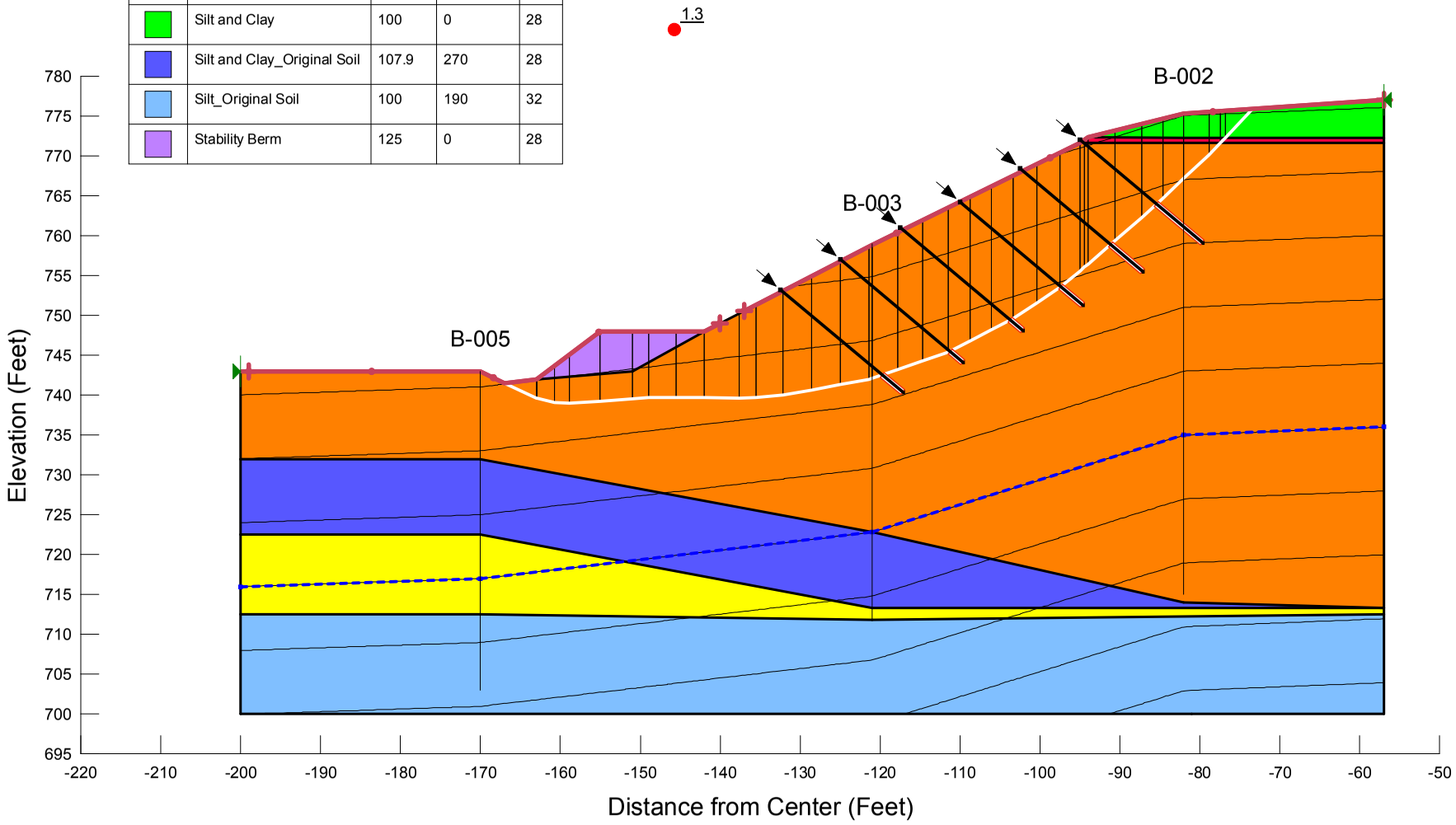


SUM 271 Landslide Investigation

Alternative 4 - Stability Berm and Nails - 5 ft Slip Surface

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill (A-6a, A-6b)	116.6	0	22.9
	Gravel and Stone Fragments with Sand, Silt, and Clay	105	0	33
	Gravel and Stone Fragments with Sand_Original Soil	130	0	39
	Silt and Clay	100	0	28
	Silt and Clay_Original Soil	107.9	270	28
	Silt_Original Soil	100	190	32
	Stability Berm	125	0	28

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.

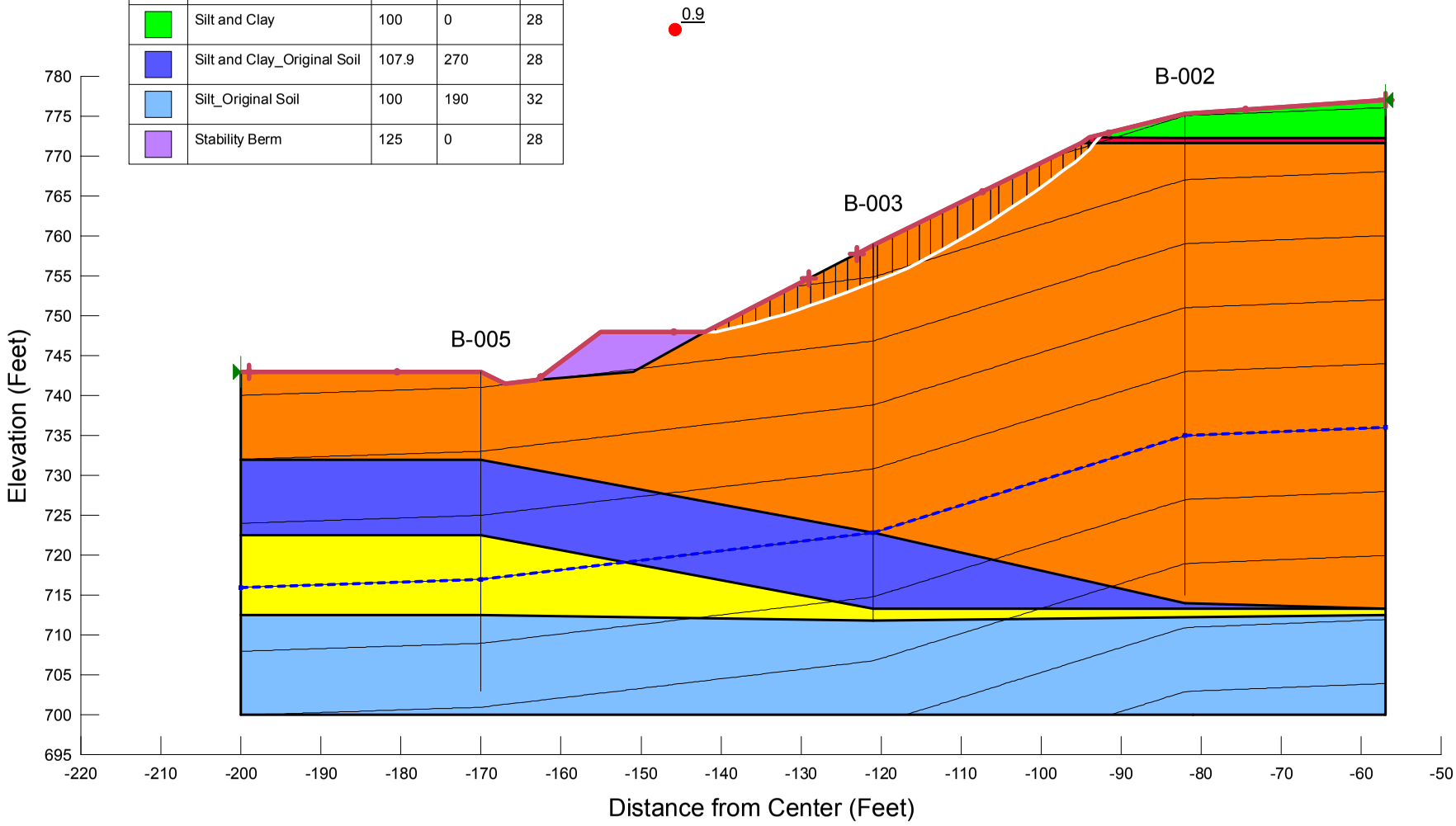


SUM 271 Landslide Investigation

Alternative 4 - Stability Berm (Only) - 5 ft Slip Surface

Color	Name	Unit Weight (pcf)	Cohesion' (psf)	Phi' (°)
	Embankment Fill (A-6a, A-6b)	116.6	0	22.9
	Gravel and Stone Fragments with Sand, Silt, and Clay	105	0	33
	Gravel and Stone Fragments with Sand_Original Soil	130	0	39
	Silt and Clay	100	0	28
	Silt and Clay_Original Soil	107.9	270	28
	Silt_Original Soil	100	190	32
	Stability Berm	125	0	28

Note: The results of the analysis shown here are based on available subsurface information, laboratory test results and approximate soil properties. The drawing depicts approximate subsurface conditions based on historical drawings or specific borings at the time of drilling.
No warranties can be made regarding the continuity of subsurface conditions.



Appendix F Analysis References

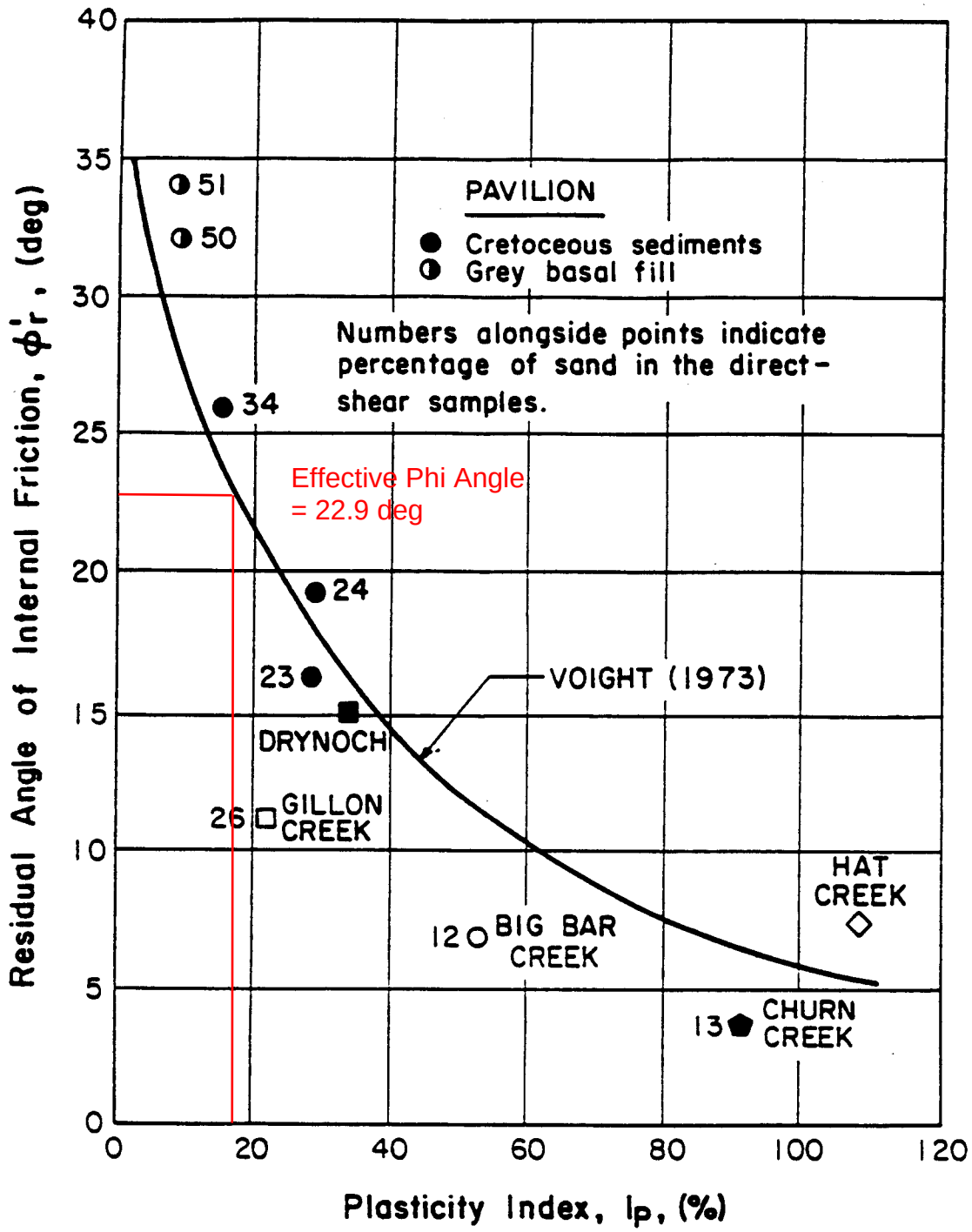


Fig.44 Relationship between Residual Angle of Internal Friction, $\phi'r$, and Plasticity Index, I_p, (After Bovis 1985).

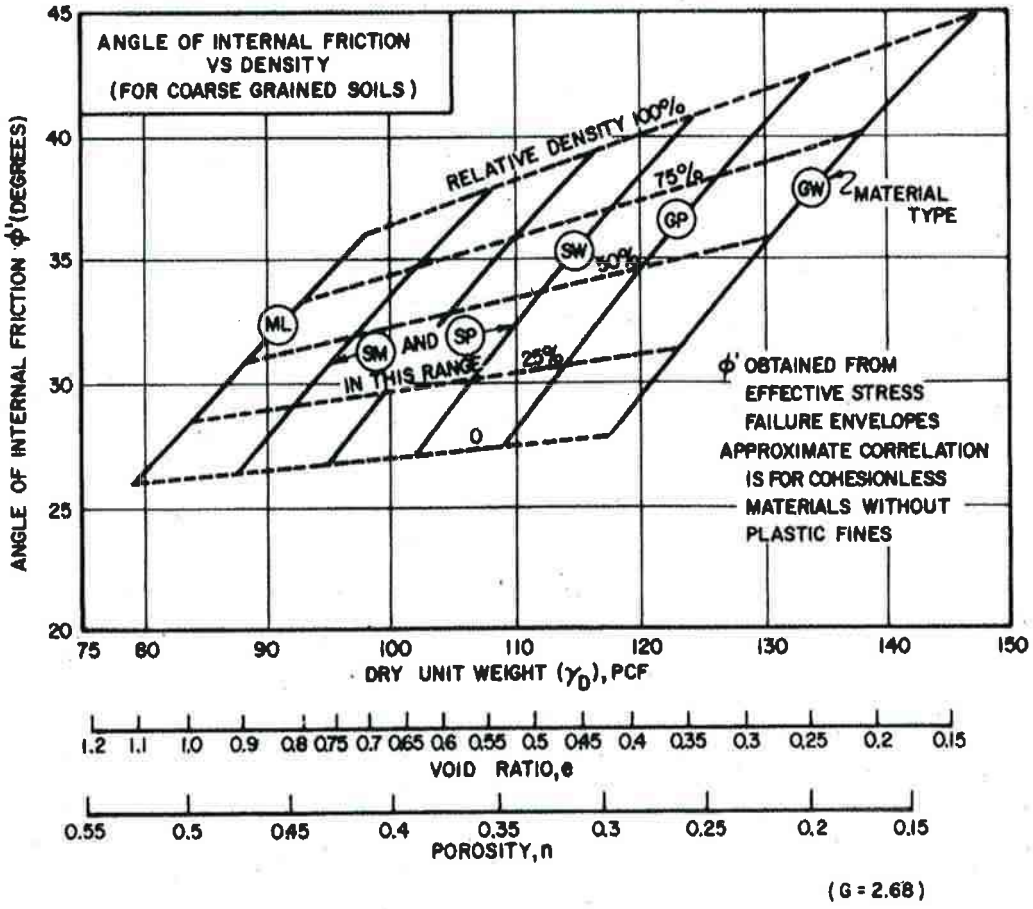
Approximate correlation among density, penetration resistance, and shear strength of normally consolidated, granular soils (after Mitchell and Katti 1981).

Description	Relative Density D_R (%)	Dry Unit Weight γ_{dry} (pcf)	Standard Penetration Test N_1 (blows/ft)	Cone Penetrometer Tip Resistance q_c (tsf)	Friction Angle ϕ' (degrees)
Very Loose	0 – 15	< 90	< 4	< 50	< 30
Loose	15 – 35	90 – 100	4 – 10	50 – 100	30 – 32
Medium Dense	35 – 65	100 – 115	10 – 30	100 – 150	32 – 35
Dense	65 – 85	115 – 127	30 – 50	150 – 200	35 – 38
Very Dense	85 – 100	> 127	> 50	> 200	> 38

Note: N_1 is the SPT blowcount normalized to 1 atmosphere (1 tsf or 100 kPa) of effective vertical stress

Gravel and Stone Fragments with Sand, Silt and Clay

Gravel and Stone Fragments with Sand



From NAVFAC DM 7.01

Figure 17. Typical values of effective stress friction angle for granular soils.

Figure 3. Typical Properties of Compacted Soils (NAVFAC DM 7.02 1986)

Group Symbol	Soil Type	Range of Maximum Dry Unit Weight, pcf	Range of Optimum Moisture, Percent	Typical Value of Compression		Typical Strength Characteristics				Typical Coefficient of Permeability ft./min.	Range of CBR Values	Range of Subgrade Modulus k lbs/cu in.
				At 1.4 tsf (20 psi)	At 3.6 tsf (50 psi)	Cohesion (as compacted) psf	Cohesion (saturated) psf	ϕ (Effective Stress Envelope Degrees)	Tan ϕ			
				Percent of Original Height								
GW	Well graded clean gravels, gravel-sand mixtures.	125 - 135	11 - 8	0.3	0.6	0	0	>38	>0.79	5×10^{-2}	40 - 80	300 - 500
GP	Poorly graded clean gravels, gravel-sand mix	115 - 125	14 - 11	0.4	0.9	0	0	>37	>0.74	10^{-1}	30 - 60	250 - 400
GM	Silty gravels, poorly graded gravel-sand-silt.	120 - 135	12 - 8	0.5	1.1	.....	.....	>34	>0.67	$>10^{-6}$	20 - 60	100 - 400
GC	Clayey gravels, poorly graded gravel-sand-clay.	115 - 130	14 - 9	0.7	1.6	.....	.....	>31	>0.60	$>10^{-7}$	20 - 40	100 - 300
SW	Well graded clean sands, gravelly sands.	110 - 130	16 - 9	0.6	1.2	0	0	38	0.79	$>10^{-3}$	20 - 40	200 - 300
SP	Poorly graded clean sands, sand-gravel mix.	100 - 120	21 - 12	0.8	1.4	0	0	37	0.74	$>10^{-3}$	10 - 40	200 - 300
SM	Silty sands, poorly graded sand-silt mix.	110 - 125	16 - 11	0.8	1.6	1050	420	34	0.67	$5 \times >10^{-5}$	10 - 40	100 - 300
SM-SC	Sand-silt clay mix with slightly plastic fines.	110 - 130	15 - 11	0.8	1.4	1050	300	33	0.66	$2 \times >10^{-6}$	5 - 30	100 - 300
SC	Clayey sands, poorly graded sand-clay-mix.	105 - 125	19 - 11	1.1	2.2	1550	230	31	0.60	$5 \times >10^{-7}$	5 - 20	100 - 300
ML	Inorganic silts and clayey silts.	95 - 120	24 - 12	0.9	1.7	1400	190	32	0.62	$>10^{-5}$	15 or less	100 - 200
ML-CL	Mixture of inorganic silt and clay.	100 - 120	22 - 12	1.0	2.2	1350	460	32	0.62	$5 \times >10^{-7}$	.....	
CL	Inorganic clays of low to medium plasticity.	95 - 120	24 - 12	1.3	2.5	1800	270	28	0.54	$>10^{-7}$	15 or less	50 - 200
OL	Organic silts and silt-clays, low plasticity.	80 - 100	33 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	50 - 100
MH	Inorganic clayey silts, elastic silts.	70 - 95	40 - 24	2.0	3.8	1500	420	25	0.47	$5 \times >10^{-7}$	10 or less	50 - 100
CH	Inorganic clays of high plasticity	75 - 105	36 - 19	2.6	3.9	2150	230	19	0.35	$>10^{-7}$	15 or less	50 - 150
OH	Organic clays and silty clays	65 - 100	45 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	25 - 100

Silt and Clay

Silt

Notes:

1. All properties are for condition of "Standard Proctor" maximum density, except values of k and CBR which are for "modified Proctor" maximum density.
2. Typical stength characteristics are for effective strength envelopes and are obtained from USBR data.
3. Compresion values are for vertical loading with complete lateral confinement.
4. (>) indicates that typical property is greater than the value shown.
   (..) indicates insufficient data available for an estimate.

Appendix G Engineering Checklists

V.A. Landslide Corrections Checklist

C-R-S: POR-76-19.90	PID: 103201	Reviewer: ENM	Date: 2/1/2018

If you do not have a landslide correction on the project, you do not have to fill out this checklist.

Investigation		
(Y) N X 1	Has a site reconnaissance been conducted to define the limits of the landslide? If yes, check the visible signs observed: ☑ cracks in pavement □ bulging toe ☑ sloughed slopes □ scarp □ stream channel pinches □ hydrophytic vegetation ☑ rotated or dropped guardrail □ bent, cracked, or crushed pipe, culvert, or other structures □ water seepage, flow from embankment, or ice □ slanted or fallen trees or power poles □ deflection of linear features □ other List other items:	
(Y) N X 2	Have a site plan and cross sections been provided to compare ground surface conditions before and after failure?	
(Y) N X 3	Has the history of the landslide area been researched, including movement history, maintenance work, pavement drainage, and past corrective measures?	
(Y) N X 4	Has a site specific geotechnical investigation been performed to investigate the landslide area?	
(Y) N X 5	Has a groundwater monitoring program been performed to identify the phreatic surface through the landslide area?	
(Y) N X 6	Has a landslide failure plane been determined from field observations or instrumentation?	

Notes:

V.A. Landslide Corrections Checklist

Analysis					
(Y)	N	X	7	Has the landslide mode of failure been determined? Check those that apply: □ rotational failure □ translational ☒ block failure □ sheet □ surface sloughing ☒ slump □ predisposed □ other List other items:	
			8	Have the subsurface conditions been identified which are the expected source of the failure mode Check those that apply: ☒ general shear strength failure of foundation soils □ loading □ along sloped rock surfaces □ erosion □ through thin, weak soil layers □ permeable materials □ surface / groundwater □ structure □ Anthropogenic disturbances □ weathering □ impeded drainage □ other List other items:	
Y	N	(X)	9	If water (static or flowing) significantly influences the stability of the landslide, has the source of water been identified, quantified, and water quality assessed?	Water isn't significantly influencing the landslide
(Y)	N	X	10	Have calculations been performed to determine the F.S. for stability? Check method used: ☒ GSTABL7, or equivalent software □ hand calculations	
			11	Have the following F.S. been met or exceeded, as determined by the calculations, for the given stability conditions:	
(Y)	N	X		a 1.30 for short term condition	
(Y)	N	X		b 1.30 for long term condition	
Y	N	(X)		c 1.10 for rapid drawdown, flood condition	
Y	N	(X)		d 1.50 for embankment supporting abutments	

V.A. Landslide Corrections Checklist

Ⓨ	N	X	12	When differing soil or loading conditions occur throughout the embankment area, have sufficient analyses been completed to evaluate the stability at locations representative of the most critical considerations?	

Notes:

V.A. Landslide Corrections Checklist

Design					
(Y)	N	X	13	Has a landslide correction method been determined? If yes, check the methods that were evaluated and circle the chosen correction: ☑ benching and regrading (See GB 2) ☑ counter berm and regrading □ flatten slope □ geotextile reinforced slope □ install surface / subsurface drainage system □ shear key (See GB 2) ☑ soil nails or tiebacks □ walls, sheeting, or drilled shafts □ soil anchoring □ relocate existing alignments □ lightweight fills □ soil removal / treatment □ chemical treatment □ dynamic compaction □ Bioengineering □ other List other items:	
Y	(N)	X	14	Based on accepted design practices, and where applicable, adhering to published guidelines and design recommendations from FHWA, were calculations performed to evaluate the effectiveness of the chosen solutions?	Plans have not been developed
Y	(N)	X	15	Has a cost comparison been performed to evaluate a recommended solution compared to others?	Was not in the scope of work

Notes:

V.A. Landslide Corrections Checklist

Plans and Contract Documents					
Y (N) X	16	Have all necessary notes, specifications, and plan details been developed?	Plans have not been developed
Y (N) X	17	Has the vertical and lateral extent of defined landslide conditions been included on the Cross Sections and Plan and Profile sheets?	Plans have not been developed
(Y) N X	18	Has the information obtained from the investigation and analysis been incorporated into the project design?	
(Y) N X	19	Have the need, location, plan notes, and monitoring schedule of instrumentation been determined?	
Y (N) X	20	Have the effects of the stability solution on the construction schedule and maintenance of traffic been accounted for in the plans?	Plans have not been developed
(Y) N X	21	Have the effects of the original failure and proposed correction on any structures (e.g., bridges, buildings, culverts, utilities) or adjacent properties been evaluated and solutions to any issues incorporated into final design?	

Notes:

VI.C. Geohazard Exploration Checklist

C-R-S: POR-76-19.90	PID: 103201	Reviewer: ENM	Date: 2/1/2018

General Presentation			
(Y) N X	1	Has a paper copy and electronic copy of all geotechnical submissions been provided to the District Geotechnical Engineer (DGE)?	
(Y) N X	2	Has the geotechnical specification (title and date) under which the work was performed been clearly identified on every submission (reports, plans, etc.)?	
(Y) N X	3	Has the first complete version of all documents being submitted been labeled as 'Draft'?	
(Y) N X	4	Subsequent to ODOT's review and approval, has the complete version of the revised documents being submitted been labeled as 'Final'?	Plans have not been developed
Y N (X)	5	Have the electronic copies of the final geotechnical plan sheets been submitted as TIFF images?	Plans have not been developed
Y N (X)	6	Have the plan sheets been prepared using the size, lettering, format, file management, and CADD standards as prescribed in the applicable sections of the ODOT CADD Engineering Standards Manual?	Plans have not been developed
Y N (X)	7	Has a scale of 1"=1' been used for cover sheets and laboratory test data sheets?	Plans have not been developed
Y N (X)	8	Based on the project length, has the correct horizontal scale been used to plot the project data? Check scale used: ☐ 1" = 20', 30', 40', or 50' for projects 1500' or less (use largest scale appropriate to present entire plan on one sheet) ☐ 1" = 50' projects greater than 1500'	Plans have not been developed
Y N (X)	9	Has a scale of 1" = 10' been utilized for the vertical scale of the project data?	Plans have not been developed
Y N (X)	10	Have the cross-sections been plotted at a scale of 1" = 10' (preferred) or 1" = 20' (for higher or wider slopes)?	Plans have not been developed

VI.C. Geohazard Exploration Checklist

Cover Sheet			
	11	Has the following general information been provided on the cover sheet	
(Y) N X		a. Brief description of the project?	
(Y) N X		b. Brief presentation of geological and topographical information? Include comments on structure and pavement conditions.	
(Y) N X		c. Brief presentation of boring and sampling methods? Include date of last calibration and drill rod energy ratio as a percent for the hammer systems used.	
(Y) N X		d. Summary of general soil, bedrock, and groundwater conditions, including a generalized interpretation of findings?	
(Y) N X		e. Statement of where original drawings and data may be inspected?	
(Y) N X		f. Statement of where soil or rock samples may be inspected, if applicable?	
(Y) N X		g. Initials of personnel and dates they performed field reconnaissance, subsurface exploration and preparation of the soil profile?	
Y N X	12	Has a Legend been provided on the cover sheet?	Plans have not been developed
	13	Have the following items been included in the Legend:	
Y N X		a. Symbols and usual descriptions for only the soil and bedrock types encountered, as per the Soil and Rock Symbology Chart in Appendix D of the SGE?	Plans have not been developed
Y N X		b. All miscellaneous symbols and acronyms, used on any of the sheets, defined?	Plans have not been developed
Y N X		c. The number of soil samples for each classification that were mechanically classified and visually described in the current exploration?	Plans have not been developed
Y N X	14	Has a Location Map, showing the beginning and end stations for the project, been shown on the cover sheet, sized per the L&D Manual?	Plans have not been developed
Y N X	15	Have the station limits for each plan and profile sheet for projects greater than 1500' been identified in a table?	Plans have not been developed
Y N X	16	Have the station limits for any cross section sheets been identified in the same table?	Plans have not been developed

VI.C. Geohazard Exploration Checklist

Plan and Profile				
		17	Has the following information been shown in a roadway plan drawing:	Plans have not been developed
Y	N X		a Existing surface features - Section 702.5.1?	Plans have not been developed
Y	N X		b Proposed construction items – Section 702.5.2?	Plans have not been developed
Y	N X		c Project and historic boring locations, with appropriate exploration targets and exploration identification numbers?	Plans have not been developed
Y	N X		d Notes regarding observations not readily shown by drawings?	Plans have not been developed
Y	N X	18	Have the existing ground surface contours been presented?	Plans have not been developed
Y	N X	19	If cross sections are to be developed for stationing covered on a plan sheet, has an index for the appropriate cross section sheets been included on the plan sheet?	Plans have not been developed
Y	N X	20	Has all the subsurface data been presented in the form of a profile along the centerline or baseline, and on cross sections where applicable?	Plans have not been developed
		21	Have the graphical boring logs been correctly shown, as follows:	Plans have not been developed
Y	N X		a. Location and depth of boring indicated by a heavy dashed vertical line?	Plans have not been developed
Y	N X		b. Exploration identification number above the boring	Plans have not been developed
Y	N X		c. Logs indicate soil and bedrock layers with symbols 0.4” wide and centered on the heavy dashed vertical line where possible?	Plans have not been developed
Y	N X		d. Bedrock exposures with 0.4” wide symbols, but without a heavy dashed vertical line.	Plans have not been developed
Y	N X		e. Soil and bedrock symbols as per ODOT Soil and Rock Symbology chart (SGE - Appendix D)?	Plans have not been developed
Y	N X		f. Historical borings shown in same manner with the exploration identification number above the boring?	Plans have not been developed
Y	N X	22	Have the proposed profile and existing groundline been shown on the profile view, according to ODOT CADD standards?	Plans have not been developed
Y	N X	23	Have the offsets from centerline or baseline been indicated above the borings in the profile view?	Plans have not been developed

VI.C. Geohazard Exploration Checklist

Y N X	24	Have borings located immediately adjacent to the centerline or baseline and considered representative of centerline or baseline subsurface conditions been referenced directly to the centerline or baseline?	Plans have not been developed
Y N X	25	Have offset borings in or near the same elevation interval of a centerline or baseline boring been plotted immediately above or below the centerline boring in a box containing an elevation scale?	Plans have not been developed
Y N X	26	Have cross-sections been developed to show subsurface conditions disclosed by a series of borings drilled transverse to centerline or baseline?	Plans have not been developed
Y N X	27	Have the existing and proposed groundlines been displayed on cross section sheets according to ODOT CADD standards?	Plans have not been developed
Y N X	28	Have bedrock exposures shown on the cross sections been plotted along the contour of the cross section?	Plans have not been developed
	29	Has the following information been provided adjacent to the graphical logs or bedrock exposure:	Plans have not been developed
(Y) N X		a. Thickness, to the nearest 0.1', of sod/topsoil or other shallow surface material written above the boring (with corresponding symbology at top of log)?	
(Y) N X		b. Moisture content, to nearest whole percent, with the text aligned with the bottom of the sample? Label this column as 'WC' at bottom of boring.	
(Y) N X		c. $N_{60,}$ aligned with bottom of sample? Label this column as 'N_{60}' at bottom of boring.	
(Y) N X		d. Free water indicated by a horizontal line with a 'w' attached, and static water indicated by a shaded equilateral triangle, point down?	
Y N (X)		e. Visual description of any uncontrolled fill or interval not defined by a graphical symbol?	
Y N (X)		f. Organic content with modifiers, per 603.5?	
(Y) N X		g. Designate a plastic soil with moisture content equal to or greater than the liquid limit minus three with a 1/8" solid black circle adjacent to the moisture content?	
(Y) N X		h. Designate a non-plastic soil with moisture content exceeding 25% or exceeding 19% but appearing wet initially, with a 1/8" open circle with a horizontal line through it adjacent to the moisture content?	
Y N (X)		i. The reason for discontinuing a boring prior to reaching the planned depth indicated immediately below the boring?	

VI.C. Geohazard Exploration Checklist

Boring Logs				
(Y) N X	30	Have the boring logs of all geohazard borings and any roadway borings drilled in the vicinity of the geohazard been shown on the sheet(s) following the plan and profile views (or cross-sections, if applicable)?	
(Y) N X	31	Has a scale of 1"=1' been used for the boring log sheets?	
(Y) N X	32	Have the boring logs been developed by integrating the driller's field logs, laboratory test data, and visual descriptions?	
	33	Has the following boring information been included in the heading of each boring log:	
(Y) N X		a. Exploration identification number?	
(Y) N X		b. Project designation (C-R-S) and PID?	
(Y) N X		c. Centerline or baseline name, station, offset, and surface elevation?	
(Y) N X		d. Coordinates?	
(Y) N X		e. Method of drilling?	
(Y) N X		f. Static and free water-level observations?	
(Y) N X		g. Date started and date completed?	
(Y) N X		h. Method and material (including quantity) used for backfilling or sealing, including type of instrumentation, if any?	
(Y) N X		i. Date of last calibration and drill rod energy ratio (ER) in percent for the hammer system(s) used?	
	34	Has the following boring information been included in each boring log:	
(Y) N X		a. A depth and elevation scale?	
(Y) N X		b. Indication of stratum change?	
(Y) N X		c. Description of material in each stratum?	
(Y) N X		d. Depth of bottom of boring?	
(Y) N X		e. Depth of boulders or cobbles, if encountered?	
(Y) N X		f. Caving depth?	
Y N (X)		g. Artesian water level and height of rise?	Didn't encounter artesian conditions
Y N (X)		h. Running sand?	Didn't encounter
(Y) N X		i. Cavities or other unusual conditions?	
(Y) N X		j. Depth interval represented by sample?	

VI.C. Geohazard Exploration Checklist

(Y)	N	X		k. Sample number and type?	
(Y)	N	X		l. Percent recovery for each sample?	
(Y)	N	X		m. Measured blow counts for each 6 inches of drive for split spoon samples?	
(Y)	N	X		n. N_{60} to the nearest whole number?	
(Y)	N	X		o. Particle-size analysis?	
(Y)	N	X		p. Liquid limit, plastic limit, plasticity index?	
(Y)	N	X		q. Water content?	
(Y)	N	X		r. ODOT soil classifications, with 'Visual' in parentheses for those samples visually classified?	
(Y)	N	X		s. Bedrock descriptions?	
(Y)	N	X		t. Run rock core percent recovery?	
(Y)	N	X		u. Run RQD?	
(Y)	N	X		v. Unit rock core percent recovery?	
(Y)	N	X		w. Unit RQD?	
Y	N	(X)		x. SDI, if applicable?	Didn't not perform SDI Testing
Y	N	(X)		y. Rock compressive strength test results, if applicable?	Didn't not perform Rock Testing
(Y)	N	X	35	Have all undisturbed test results been displayed in graphical format on the sheet(s) following the boring log sheet(s)?	

Notes:

Stage 1:

VI.D. Geotechnical Reports

C-R-S: POR-76-19.90	PID: 103201	Reviewer: ENM	Date: 2/1/2018

General		
(Y) N X 1	Has the first complete version of a geotechnical report being submitted been labeled as 'Draft'?	
(Y) N X 2	Subsequent to ODOT's review and approval, has the complete version of the revised geotechnical report being submitted been labeled 'Final'?	
(Y) N X 3	Have all geotechnical reports being submitted been titled correctly as prescribed in Section 705.1 of the SGE?	

Report Body		
(Y) N X 4	Do all geotechnical reports being submitted contain an Executive Summary as described in Section 705.2 of the SGE?	
(Y) N X 5	Do all geotechnical reports being submitted contain an Introduction as described in Section 705.3 of the SGE?	
(Y) N X 6	Do all geotechnical reports being submitted contain a section titled "Geology and Observations of the Project," as described in Section 705.4 of the SGE?	
(Y) N X 7	Do all geotechnical reports being submitted contain a section titled "Exploration," as described in Section 705.5 of the SGE?	
(Y) N X 8	Do all geotechnical reports being submitted contain a section titled "Findings," as described in Section 705.6 of the SGE?	
(Y) N X 9	Do all geotechnical reports being submitted contain a section titled "Analyses and Recommendations," as described in Section 705.7 of the SGE?	

VI.D. Geotechnical Reports

Appendices			
(Y) N X 10	Do all geotechnical reports being submitted contain all applicable Appendices as described in Section 705.8 of the SGE?		
(Y) N X 11	Do the Appendices present a site Boring Plan showing all boring locations as described in Section 705.8.1 of the SGE?		
(Y) N X 12	Do the Appendices include boring logs as described in Section 705.8.2 of the SGE?		
(Y) N X 13	Do the Appendices present reports of undisturbed test data as described in Section 705.8.3 of the SGE?		
(Y) N X 14	Do the Appendices present calculations in a logical format to support recommendations as described in Section 705.8.4 of the SGE?		

Notes: