Geotechnical Investigation
Cobabe Ranch Development
Eden, Utah

March 9, 2022

Prepared by:

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Geotechnical Investigation
Cobabe Ranch Development
Approximately 2720 North 5100 East
Eden, Utah
CG Project No.: 133-015

Prepared by:

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Principal

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March 9, 2022

TABLE OF CONTENTS

ATTACHED PLATES

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation that was performed for the proposed Cobabe Ranch Development which is to be located at approximately 2720 North 5100 East in Eden, Utah. The general location of the project is indicated on the Project Vicinity Map, Plate 1. In general, the purposes of this investigation were to evaluate the subsurface conditions and the nature and engineering properties of the subsurface soils, and to provide recommendations for general site grading and for the design and construction of floor slabs, pavements, and foundations. This investigation included subsurface exploration, representative soil sampling, field and laboratory testing, engineering analysis, and preparation of this report. Prior to the completion of our report, the Geologic Hazards Evaluation for the development by Western Geologic, dated February 28, 2022, was reviewed to assist in our assessments.

The work performed for this report was authorized by Mr. Eric Householder and was conducted in accordance with the Christensen Geotechnical proposal dated November 1, 2021.

1.2 PROJECT DESCRIPTION

Based on a concept plan provided to us by Lewis Homes, we understand that the proposed development is to consist of a 176.7-acre residential subdivision which is to be developed with 56 townhomes and 48 single-family residences. The development will also include access roads, associated utilities, and landscaping. The structural loads for the proposed buildings are anticipated to be on the order of 3 to 5 klf for walls and 150 psf for floors. If the actual structural loads are different from those anticipated, Christensen Geotechnical should be notified in order to reevaluate our recommendations.

2.0 METHODS OF STUDY

2.1 FIELD INVESTIGATION

The subsurface conditions at the site were explored by excavating 35 test pits to depths of 10 to 14 feet below the existing site grade. The approximate test pit locations are shown on the Exploration Location Map, Plate 2. The subsurface conditions as encountered in the test pits were recorded at the time of excavation and are presented on the attached Test Pit Logs, Plates 3 to 37. A key to the symbols and terms used on the Test Pit Logs may be found on Plate 38.

The test pit excavations were accomplished with a tracked excavator. Disturbed and undisturbed soil samples were collected from the test pit sidewalls at the time of excavation. The disturbed samples were collected and placed in bags and buckets. The undisturbed samples consisted of block samples which were placed in bags. The samples were visually classified in the field and portions of each sample were packaged and transported to our laboratory for testing. The classifications for the individual soil units are shown on the attached Test Pit Logs.

2.2 LABORATORY TESTING

Of the soils collected during the field investigation, representative samples were selected for testing in the laboratory in order to evaluate the pertinent engineering properties. The laboratory testing included moisture content and density determinations, Atterberg limits evaluations, gradation analyses, one-dimensional swell/consolidation tests, and a direct shear test. A summary of our laboratory testing is presented in the table below:

Table No. 1: Laboratory Test Results

Test Hole No.	Depth (ft.)	Dry Density (pcf)	Moisture Content (%)	Atterberg Limits		Silt/Clay (- #200)	Swell with 1000 psf Load (%)	Direct Shear		Soil Type
				LL	PI			Friction Angle	Cohesion (psf)	
TP-1	10		6.7			16.3				GC
TP-2	3		19.8	44	25	84.0				CL
TP-3	4		18.8	44	12	69.2				ML
TP-4	3		15.5	54	32	91.3				CH
TP-5	3		13.0	43	24	54.5				CL
TP-6	8		11.1			20.3				SM
TP-7	11		21.1			49.0				
TP-8	4		15.0			47.5				
TP-9	3		8.0			39.6				

Test Hole No.	Depth (ft.)	Dry Density (pcf)	Moisture Content (%)	Atterberg Limits		Silt/Clay (- #200)	Swell with 1000 psf Load (%)	Direct Shear		Soil Type
				LL	PI			Friction Angle	Cohesion (psf)	
TP-10	10	74.3	42.8	80	34	94.4	2.2			MH
TP-11	5		16.5			65.2				CL
TP-12	9		3.3			12.0				GC
TP-13	3		17.7	53	31	82.6				CH
TP-14	8		63.1			49.2				SM
TP-15	8		4.6			10.1				GP-GM
TP-16	2		9.4			20.7				GC
TP-17	5		22.0	44	21	46.4				SC
TP-18	8		12.5			34.6				GC
TP-19	4		46.6	73	27	84.1				MH
TP-20	10		41.4	65	22	92.4		33	105	MH
TP-21	4					17.1				GC
TP-22	2		29.5	65	38	71.6				CH
TP-23	9	68.4	51.7	80	40	99.4	0.6			MH
TP-24	6		42.1	55	23	95.4				MH
TP-25	3	90.7	26.8	74	48	83.5	2.9			CH
TP-26	10		11.4			35.7				GC
TP-27	12		47.8	63	25	85.5				MH
TP-28	7		42.8	69	21	87.1				MH
TP-29	3	90.6	27.0	70	45	83.2	1.9			CH
TP-30	4		32.9	80	53	77.6				CH
TP-32	4	84.2	44.6	76	39	99.2	3.7			MH
TP-33	3		18.4	52	32	92.0				CH
TP-34	10		29.3	42	24	91.4				CL
TP-35	4	105.9	19.4	49	27	94.1	2.6			CL

The results of our laboratory tests are also presented on the Test Pit Logs, Plates 3 through 37, and more detailed laboratory results are presented on the laboratory testing plates, Plates 39 through 53.

The samples will be retained in our laboratory for 30 days following the date of this report, at which time they will be disposed of unless a written request for additional holding time is received prior to the disposal date.

3.0 GENERAL SITE CONDITIONS

3.1 SURFACE CONDITIONS

At the time of our investigation, the subject site was undeveloped pasture land. The property generally sloped down to the south with grades of 5 to 20 percent. The vegetation at the site generally consisted of common grasses and weeds with a few pockets of oak brush.

3.2 SUBSURFACE CONDITIONS

3.2.1 Soils

Based on the 35 test pits that were completed for this investigation, the site is covered with 1 to 3 feet of topsoil. The native soils below the topsoil generally consisted of zones of Lean CLAY (CL) with varying amounts of sand and gravel, Fat CLAY (CH) with varying amounts of sand and gravel, Elastic SILT (MH), Clayey GRAVEL with sand (GC), and Sandy SILT (ML). In many of the test pits, claystone, siltstone, sandstone, and conglomerate bedrock were encountered below the native soils. Where encountered, the bedrock was encountered at depths of 3 to 8½ feet below existing site grade. Although we classified the material as bedrock, the bedrock was generally in a weak and highly weathered to weathered condition with a consistency similar to a stiff soil.

3.2.2 Groundwater

Groundwater was encountered within test pits TP-34 and TP-35 at depths of 8 feet below existing site grade. It should be understood that groundwater is likely below its seasonal high and may fluctuate in response to seasonal changes, precipitation, and irrigation.

4.0 GEOLOGIC CONDITIONS

4.1 SEISMIC DESIGN CRITERIA

The State of Utah and Utah municipalities have adopted the 2018 International Building Code (IBC) for seismic design. The IBC seismic design is based on seismic hazard maps which depict probabilistic ground motions and spectral response; the maps, ground motions, and spectral response having been developed by the United States Geological Survey (USGS). Seismic design values, including the design spectral response, may be calculated for a specific site using the web-based application by the Applied Technology Council (ATC), the project site's approximate latitude and longitude, and its Site Class. Based on our field exploration, it is our opinion that this location is best described as a Site Class D. Since a deep boring was not completed, we recommend that Site Class D default values be used. The spectral acceleration values obtained from the ATC's web-based application are shown below.

Table 2: IBC Seismic Response Spectrum Values

Site Location: 41.313999º N -111.815894º W	
Name	**Response Spectral Value**
S_S	**0.918**
S_1	**0.325**
S_{MS}	**1.101**
S_{M1}	**See ASCE Section 11.4.8**
S_{DS}	**0.734**
S_{D1}	**See ASCE Section 11.4.8**
PGA	**0.406**
PGA_M	**0.488**

4.2 LIQUEFACTION

Certain areas in the intermountain west possess a potential for liquefaction. Liquefaction is a phenomenon in which soils lose their intergranular strength due to an increase of pore pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain-size distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No. 200 sieve), 3) the relative density of the soils, 4) earthquake strength (magnitude) and duration, 5) overburden pressures, and 6) the depth to groundwater.

The map “Special Study Areas, Wasatch Front and Nearby Areas, Utah” (Christenson et al., 2008) indicates that the subject site is located in an area designated as having a very low potential for liquefaction. A site-specific liquefaction assessment was outside the scope of our services for this project. If a liquefaction assessment for this development is desired, Christensen Geotechnical should be contacted to discuss the additional work required.

5.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

5.1 GENERAL CONCLUSIONS

Based on the results of our field and laboratory investigations, it is our opinion that the subject site is suitable for the proposed construction provided that the recommendations contained in this report are incorporated into the design and construction of the project.

5.2 EARTHWORK

5.2.1 General Site Preparation and Grading

Prior to site grading operations, all vegetation, topsoil, undocumented fill soils, and loose or disturbed soils should be stripped (removed) from the building pad, flatwork concrete, and pavement areas. Following the stripping operations, the exposed soils should be proof rolled to a firm, unyielding condition. Site grading may then be conducted to bring the site to design grade.

Based on the test pits excavated at the site, the site is covered with 1 to 3 feet of topsoil. This topsoil should be removed from below footings, concrete flatwork, and pavements. Where over-excavation is required, the excavation should extend at least 1 foot laterally for every foot of over-excavation. A Christensen Geotechnical representative should observe the site grading operations.

5.2.2 Soft Soil Stabilization

Once exposed through excavation, all subgrade soils should be proof rolled with a relatively large, wheeled vehicle to a firm, unyielding condition. Due to the fine-grained nature of much of the near-surface soil at the site, soft soils are likely to be encountered. Where encountered, these localized soft areas should be removed and replaced with granular structural fill. If soft areas extend more than 18 inches deep, or where large areas are encountered, stabilization may be considered. The use of stabilization should be approved by the geotechnical engineer, but would likely consist of over-excavating the area by at least 18 inches and then placing a geofabric (such as Mirafi RS280i) at the bottom of the excavation. Over this, a stabilizing fill, consisting of angular coarse gravel with cobbles, would be placed to the design subgrade.

5.2.3 Temporary Construction Excavations

Based on OSHA requirements and the soil conditions encountered during our field investigation, we anticipate that temporary construction excavations at the site that have vertical walls that extend to depths of up to 5 feet may be occupied without shoring; however, where groundwater or fill

soils are encountered, flatter slopes may be required. Excavations that extend to more than 5 feet in depth should be sloped or shored in accordance with OSHA regulations for a type C soil. The stability of construction excavations is the contractor's responsibility. If the stability of an excavation becomes questionable, the excavation should be evaluated immediately by qualified personnel.

5.2.4 Structural Fill and Compaction

All fill that is placed for the support of structures, concrete flatwork and pavements should consist of structural fill. The native gravel soils may be used as structural fill once particles large than 4 inches in diameter are removed. The native clay and silt soils and claystone and siltstone bedrock should not be used as structural fill below structures due to their swell potential, but they may be used below the exterior flatwork concrete and roadways. It should be understood that if used, the clay and silt soils and the claystone and siltstone may be difficult to moisture-condition and compact. Imported structural fill, if required, should consist of a relatively well-graded granular soil with a maximum particle size of 4 inches, with a maximum of 50 percent passing the No. 4 sieve and with a maximum of 30 percent passing the No. 200 sieve. The liquid limit of the fines (material passing the No. 200 sieve) should not exceed 35 and the plasticity index should be less than 15. Additionally, all structural fill, whether native soils or imported material, should be free of topsoil, vegetation, frozen material, particles larger than 4 inches in diameter, and any other deleterious materials. Any imported materials should be approved by the geotechnical engineer prior to importing.

The structural fill should be placed in loose lifts that are a maximum of 8 inches thick. The moisture content should be within 3 percent of optimum and the fill should be compacted to at least 95 percent of the maximum density as determined by ASTM D 1557. Where the fill heights exceed 5 feet, the level of compaction should be increased to 98 percent.

5.2.5 Excavatability

As indicated earlier, many of our test pits encountered bedrock. Where encountered, the bedrock was encountered at depths of 3 to 8½ feet below existing site grade. Although we classified the material as bedrock, the bedrock was generally in a weak and highly weathered to weathered condition with a consistency similar to a stiff soil. We anticipate that most of the bedrock can be excavated with standard excavation equipment; however, some harder areas may require a heavy excavator with a ripper tooth or a hoe-ram. Prior to bidding, the contractor should be provided

with this report in order to be made aware of the subsurface conditions so that they can assess the type of equipment that will be best suited for these conditions.

5.2.6 Permanent Cut and Fill Slopes

The existing slopes on the property should not be over-steepened by cutting or filling. We recommend that all non-retained cut and fill slopes be graded no steeper than a 3 to 1 (horizontal to vertical) grade. If steeper grades are required, additional slope stability assessments may be required.

5.3 FOUNDATIONS

Due to the presence of swelling soils, the foundations for the planned structures may consist of conventional continuous and/or spread footings established either entirely on undisturbed native gravel soil or entirely on sandstone or conglomerate bedrock. Where clay or silt soils are exposed or where claystone or siltstone bedrock are exposed, the soil or bedrock should be over-excavated to allow for the placement of at least 3 feet of structural fill below the footings. The footings for the proposed structures should be a minimum of 20 inches and 30 inches wide for continuous and spot footings, respectively. The exterior footings should be established at a minimum of 30 inches below the lowest adjacent grade to provide frost protection and confinement. Interior footings that are not subject to frost should be embedded a minimum of 18 inches for confinement.

Continuous and spread footings that are established on undisturbed native gravel soils, sandstone bedrock, conglomerate bedrock or structural fill may be proportioned for a maximum net allowable bearing capacity of 2,000 psf. A one-third increase may be used for transient wind or seismic loads. All footing excavations should be observed by the geotechnical engineer prior to the construction of footings.

5.4 ESTIMATED SETTLEMENT

If the foundations are designed and constructed in accordance with the recommendations presented in this report, there is a low risk that total settlement will exceed 1 inch and a low risk that differential settlement will exceed ½ inch for a 30-foot span.

5.5 LATERAL EARTH PRESSURES

Buried structures, such as basement walls, should be designed to resist the lateral loads imposed by the soils retained. The lateral earth pressures on the below-grade walls and the distribution of those pressures will depend upon the type of structure, hydrostatic pressures, in-situ soils, backfill,

and tolerable movements. Basement and retaining walls are usually designed with triangular stress distributions, which are based on an equivalent fluid pressure and calculated from lateral earth pressure coefficients. If soils similar to the native soils are used to backfill the basement walls, then the walls may be designed using the following ultimate values:

Table No. 3: Lateral Earth Pressures

Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)
Active Static	0.32	37
Active Seismic	0.17	19
At-Rest	0.53	61
Passive Static	5.15	593
Passive Seismic	-0.91	-105

We recommend that walls which are allowed little or no wall movement be designed using "at rest" conditions. Walls that are allowed to rotate at least 0.4 percent of the wall height may be designed with "active" pressures. The coefficients and densities that are presented above assume a level backfill with no buildup of hydrostatic pressures. If anticipated, hydrostatic pressures and any surcharge loads should be added to the presented values. If sloping backfill is present, we recommend that the geotechnical engineer be consulted to provide more appropriate lateral pressure parameters once the design geometry is established.

The seismic active and passive earth pressure coefficients provided in the table above are based on the Mononobe-Okabe method and only account for the dynamic horizontal force produced by a seismic event. The resulting dynamic pressure should therefore be added to the static pressure to determine the total pressure on the wall. The dynamic pressure distribution can be represented as an inverted triangle, with stress decreasing with depth, and the resultant force acting approximately 0.6 times the height of the retaining wall, measured upward from the bottom of the wall.

Lateral building loads will be resisted by frictional resistance between the footings and the foundation soils and by passive pressure developed by backfill against the wall. For footings on native soils, we recommend that an ultimate coefficient of friction of 0.35 be used. If passive resistance is used in conjunction with frictional resistance, the passive resistance should be reduced by ½. The passive earth pressure from soils subject to frost or heave should usually be neglected in design.

The coefficients and equivalent fluid densities presented above are ultimate values and should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used.

5.6 CONCRETE SLAB-ON-GRADE CONSTRUCTION

The laboratory testing that was completed for this investigation indicates that the native clay soils, silt soils, claystone bedrock, and siltstone bedrock at the site have a high swell potential with changes in moisture. Concrete slabs, including basement floor slabs and exterior flatwork, have a high risk of movement when placed on these soils due to their light loading. To reduce the risk of expansion and slab movement, we recommend placing at least 3 feet of imported structural fill below any concrete slabs where clay, silt, claystone, or siltstone are encountered. Where clay soils, silt soils, claystone bedrock are not present, we recommend that concrete slabs-on-grade be constructed over at least 4 inches of compacted gravel to help distribute floor loads, break the rise of capillary water, and to aid in the curing process. The gravel should consist of free-draining gravel compacted to a firm, unyielding condition. To help control normal shrinkage and stress cracking, the floor slab should have adequate reinforcement for the anticipated floor loads with the reinforcement continuous through the interior joints. In addition, we recommend adequate crack control joints to control crack propagation. Prior to the construction of slabs-on-grade, the site grading recommendations presented in Section 5.2.1 should be followed.

5.7 MOISTURE PROTECTION AND SURFACE DRAINAGE

Any wetting of the foundation soils will likely cause some degree of volume change within the soil and should be prevented both during and after construction. We recommend that the following precautions be taken at this site:

1. The ground surface should be graded to drain away from the structures in all directions, with a minimum fall of 8 inches in the first 10 feet.
2. Roof runoff should be collected in rain gutters with downspouts that are designed to discharge well outside of the backfill limits.
3. Sprinkler heads should be aimed away from and placed at least 12 inches from foundation walls.
4. There should be adequate compaction of backfill around foundation walls, to a minimum of 90% density (ASTM D 1557). Water consolidation methods should not be used.

5.8 SUBSURFACE DRAINAGE

Due to the relatively high elevation of the subject site, we recommend that all basement walls incorporate a foundation drain. The foundation drain should consist of a 4-inch-diameter slotted pipe placed at or below the bottom of footings and encased in at least 12 inches of free-draining gravel. The gravel should extend up the foundation wall to within 2 feet of the final ground surface, and a filter fabric, such as Mirafi 140N, should separate the gravel from the native soils. The pipe should be graded to drain to the land drains, a storm drain or to another free-gravity outfall unless provisions for pumped sumps are made. The gravel which extends up the wall may be replaced by a fabricated drain panel such as Mirafi G200N or equivalent.

5.9 SLOPE STABILITY

As recommended in the Geologic Hazards Evaluation by Western Geologic, a slope stability assessment was performed using the Slide computer program and the modified Bishop's method of slices. Two profiles were used to assess the slopes at the property. The locations of the profiles are shown on Plate 2 and are based on the cross sections presented in the Western Geologic report. The strength of the bedrock used in our analyses was based on a direct shear test which indicated a strength consisting of an angle of internal friction of 33 degrees and a cohesion of 105 psf. The alluvial fan deposits were assumed to have a strength consisting of an angle of internal friction of 26 degrees and a cohesion of 100 psf. The landslide deposits were assumed to have a strength consisting of an angle of internal friction of 26 degrees and a cohesion of 100 psf.

The profiles were assessed under static and pseudo static conditions. The pseudo static condition is used to assess the slope during a seismic event. As indicated in Section 4.1, the peak ground acceleration at this site is estimated to be 0.488g. As is common practice, half of this value was used in our pseudo static assessments. Minimum factors of safety of 1.5 and 1.0 for static and seismic conditions, respectively, were considered acceptable. Our analyses indicate that the profiles have safety factors greater than 1.5 and 1.0 for the static and pseudo static conditions and are therefore considered suitable for residential construction.

The slope stability analysis presented above is based on the assumption that no significant cuts or fills will occur during the development of the site. Significant changes to the site grade, such as the steepening of slopes with cuts or fills, may adversely affect the stability of the slopes and increase the risk of slope failures. If cuts or fills over 15 feet are planned, additional slope stability assessments may be necessary and Christensen Geotechnical should be contacted to provide the

additional assessments. The results of our slope stability assessments may be found on Plates 54 through 57.

5.10 PAVEMENT DESIGN

Pavement sections for roadways within the proposed development were assessed using the PAS computer program (prepared by the American Concrete Pavement Association) and an assumed CBR value of 3 percent. No traffic information was available at the time this report was prepared; Christensen Geotechnical has therefore assumed a traffic load for the roadways based on our experience with similar projects. We have assumed that traffic will consist of 300 passenger cars per day, 4 medium trucks per day and 4 heavy trucks per day. We have further assumed no increase in traffic over the life of the pavement. Based on this information, we recommend a pavement section consisting of 3 inches of asphalt over 14 inches of untreated base. As an alternative, a pavement section of 3 inches of asphalt, 6 inches of untreated base, and 9 inches of granular borrow may be used. The asphalt should consist of a high-stability plant mix and should be compacted to at least 96 percent of the Marshall maximum density. The untreated base should meet the material requirements for Weber County or UDOT. The granular borrow should meet the recommendations for imported structural fill as presented in Section 5.2.4 of this report. The untreated base and granular borrow should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D 1557.

6.0 LIMITATIONS

The recommendations contained in this report are based on limited field exploration, laboratory testing, and our understanding of the proposed construction. The subsurface data used in this report was obtained from the explorations that were made specifically for this investigation. It is possible that variations in the soil and groundwater conditions could exist between and beyond the points explored. The nature and extent of variations may not be evident until construction occurs. If any conditions are encountered at this site that are different from those described in this report, Christensen Geotechnical should be immediately notified so that we may make any necessary revisions to the recommendations contained in this report. In addition, if the scope of the proposed construction changes from that described in this report, Christensen Geotechnical should be notified.

This report was prepared in accordance with the generally accepted standard of practice at the time the report was written. No other warranty, expressed or implied, is made.

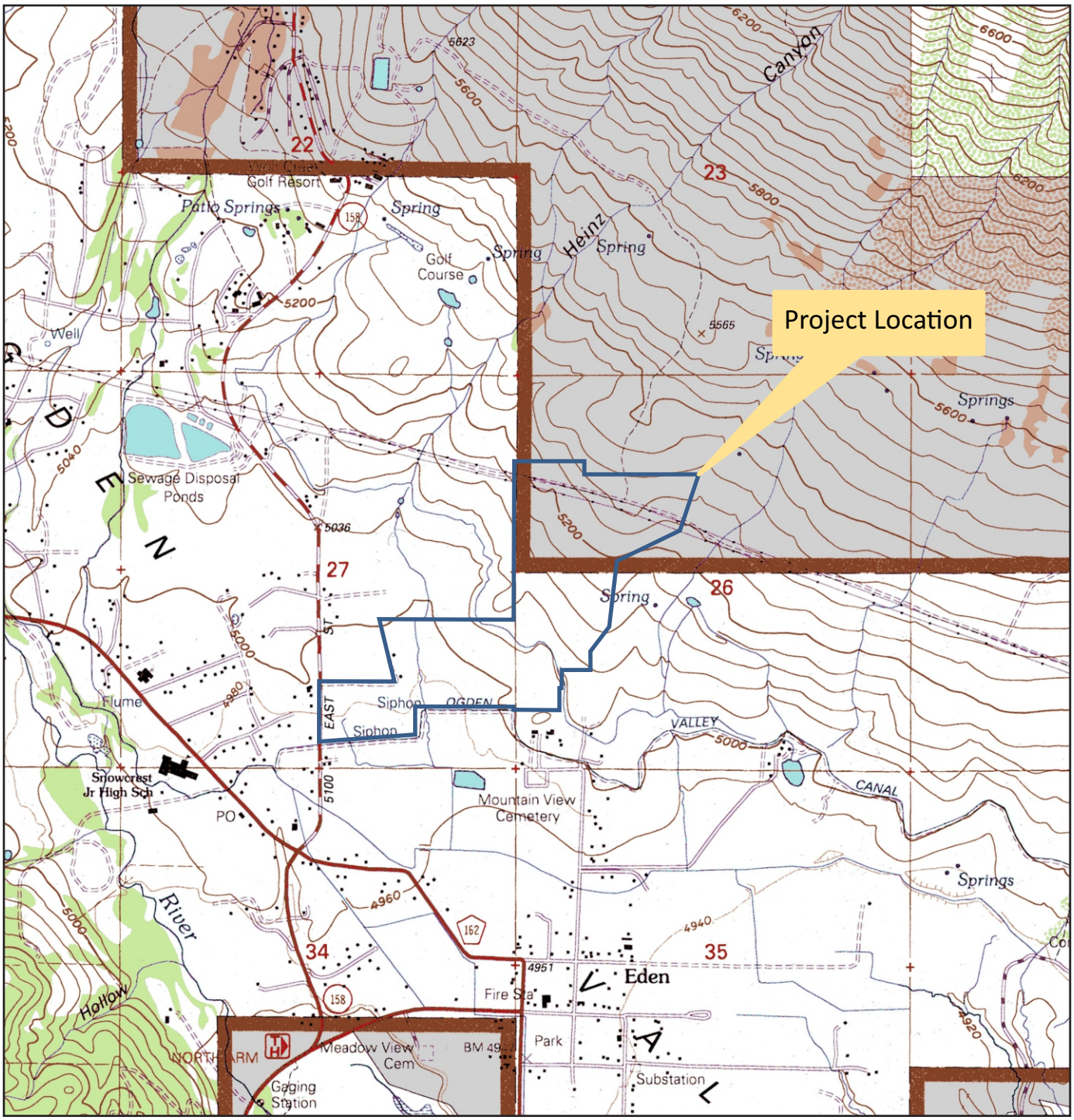
It is the client's responsibility to see that all parties to the project, including the designer, contractor, subcontractors, etc., are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

The recommendations presented within this report are based on the assumption that an adequate program of tests and observations will be followed during construction to verify compliance with our recommendations. We also assume that we will review the project plans and specifications to verify that our conclusions and recommendations are incorporated and remain appropriate (based on the actual design).

7.0 REFERENCES

Black, Bill, February 28, 2022, "Geologic Hazards Evaluation, Proposed Cobabe Ranch Development, About 2720 North 5100 East, Eden, Weber County, Utah," Western Geologic, consultant's unpublished report.

Christenson, Gary E. and Shaw, Lucas M., 2008, "Liquefaction Special Study Areas, Wasatch Front and Nearby Areas, Utah," Utah Geological Survey, Supplement Map to Utah Circular 106.



Base: U.S. Geological Survey topographic map, Huntsville quadrangle

N

0 1000 2000

Scale 1 inch equals 2,000 feet (1:24,000)

Approximate Project Boundary

Christensen Geotechnical	Lewis Homes Cobabe Ranch Development Eden, Weber County, Utah, Project No. 133-015 **Vicinity Map**	Plate 1

Project Location

Base: Utah Geographic Resource Center, 2012 high resolution orthophoto, 12.5 cm resolution. Site plan modified from Gardner Engineering preliminary plan sheet SP1 dated 06-15-2021.

N

0 200 400

Scale 1:2,400 (1 inch equals 200 feet)

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Weber County, Utah,
Project No. 133-015

Exploration Locations

Plate 2

Date		TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started: 12/8/2021			Equipment: Trackhoe	TP-1
Completed: 12/8/2021			Location: See Plate 2	Sheet 1 of 1
Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
5				CL	Lean CLAY - stiff, moist, brown					
10				GC	Clayey GRAVEL with sand - medium dense, moist, brown		6.7	16.3		
15					Bottom of test pit at 11 feet					

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
Project No.: 133-015

Plate
3

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started: 12/8/2021			Equipment: Trackhoe	TP-2
	Completed: 12/8/2021			Location: See Plate 2	Sheet 1 of 1
	Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				CL	Lean CLAY with sand - stiff, moist, brown		19.8	84.0	44	25
5										
				GC	Clayey GRAVEL with sand - medium dense, moist, brown					
10										
					Bottom of test pit at 11 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
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Plate
4

Date		TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started: 12/8/2021			Equipment: Trackhoe	TP-3
Completed: 12/8/2021			Location: See Plate 2	Sheet 1 of 1
Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				ML	Sandy SILT - stiff, slightly moist, light brown		18.8	69.2	44	12
5				CL	Lean CLAY with sand - stiff, moist, brown					
10				GC	Clayey GRAVEL with sand - med dense, moist, brown					
					Bottom of test pit at 12½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
Project No.: 133-015

Plate
5

Date	Started: 12/8/2021	TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Completed: 12/8/2021		Equipment: Trackhoe	TP-4
	Backfilled:		Location: See Plate 2	Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				CH	Fat CLAY with sand - stiff, moist, brown		15.5	91.3	54	32
5										
				ML	Sandy SILT (Bedrock?) - stiff, moist, light brown					
10										
					Bottom of test pit at 11½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample

▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
6

Date	Started: 12/8/2021	TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Completed: 12/8/2021		Equipment: Trackhoe	TP-5
	Backfilled:		Location: See Plate 2	Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				CL	Sandy Lean CLAY - stiff, moist, brown		13.0	54.5	43	24
5				ML	Sandy SILT (Bedrock?) - stiff, moist, light gray-brown					
10					Bottom of test pit at 10 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
7

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started: 12/8/2021			Equipment: Trackhoe	TP-6
	Completed: 12/8/2021			Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				CL	Lean CLAY - stiff, moist, brown					
5				SM	Silty SAND - medium dense, moist, brown		11.1	20.3		
10					Bottom of test pit at 10½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
8

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started: 12/8/2021			Equipment: Trackhoe	TP-7
	Completed: 12/8/2021			Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				GC	Clayey GRAVEL with sand - medium dense, moist, brown					
				CL	Lean CLAY - stiff, moist, brown					
5					Sandstone to Claystone Bedrock - weak to moderately strong, completely weathered to weathered, light brown					
							21.1	49.0		
10										
					Bottom of test pit at 13 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
9

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started: 12/8/2021			Equipment: Trackhoe	TP-8
	Completed: 12/8/2021			Location: See Plate 2	Sheet 1 of 1
	Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
	☒			GC	Clayey GRAVEL with sand - medium dense, moist, brown		15.0	47.5		
5					Claystone Bedrock - weak, completely weathered, light red-brown					
10	▥									
					Bottom of test pit at 14 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
10

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/13/2021		Equipment: Trackhoe	TP-9
	Completed:	12/13/2021		Location: See Plate 2	Sheet 1 of 1
	Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
	☒			GC	Clayey GRAVEL with sand - medium dense, moist, brown		8.0	39.6		
5					Claystone Bedrock - weak, completely weathered, gray-green					
					Sandstone Bedrock - weak, completely weathered, brown					
10	▥									
					Bottom of test pit at 11½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
11

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started: 12/13/2021			Equipment: Trackhoe	TP-10
	Completed: 12/13/2021			Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
	☒			GC	Clayey GRAVEL with sand - medium dense, moist, brown					
5					Siltstone to Sandstone Bedrock - weak,completely weathered, gray-green to brown					
10	▥					74.3	42.8	94.4	80	34
					Bottom of test pit at 12 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
12

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/13/2021		Equipment: Trackhoe	TP-11
	Completed:	12/13/2021		Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
				GC	Clayey GRAVEL with sand - medium dense, moist, brown					
5				CL	Lean CLAY with sand and gravel (Bedrock?) - stiff, moist, dark gray-brown		16.5	65.2		
10				CL	Lean CLAY - very stiff, moist, brown					
15					Bottom of test pit at 13 feet					

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Plate
13

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started: 12/10/2021			Equipment: Trackhoe	TP-12
	Completed: 12/10/2021			Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
5	☒			GC	Clayey GRAVEL with sand (Bedrock?) - medium dense, moist, brown					
10	☒						3.3	12.0		
					Bottom of test pit at 10 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
14

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started:	12/13/2021			Equipment: Trackhoe	TP-13
Completed:	12/13/2021			Location: See Plate 2	Sheet 1 of 1
Backfilled:					

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				CH	Fat CLAY with sand - very stiff, slightly moist, brown		17.7	82.6	53	31
5					Siltstone to Sandstone Bedrock - weak, completely weathered, light brown					
10					- moderately strong and weathered below 8 feet					
					Bottom of test pit at 11½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
15

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started:	12/13/2021			Equipment: Trackhoe	TP-14
Completed:	12/13/2021			Location: See Plate 2	Sheet 1 of 1
Backfilled:					

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
				CH	Fat CLAY with sand - very stiff, slightly moist, gray-brown					
5					Siltstone to Sandstone Bedrock - weak, completely weathered, gray-green					
					- moderately strong and weathered below 8 feet		63.1	49.2		
10					Bottom of test pit at 10½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
16

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/13/2021		Equipment: Trackhoe	TP-15
	Completed:	12/13/2021		Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
	☒			GC	Clayey GRAVEL with sand - medium dense, slightly moist, brown					
5					Conglomerate Bedrock - moderately strong, weathered, light brown					
	☒						4.6	10.1		
10					Bottom of test pit at 10 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
17

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/10/2021		Equipment: Trackhoe	TP-16
	Completed:	12/10/2021		Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
	☒			GC	Clayey GRAVEL with sand - medium dense, slightly moist, brown		9.4	20.7		
5					Claystone to Siltstone Bedrock - weak, completely weathered, light gray-green to light red-brown					
	▥									
10					Bottom of test pit at 10 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
18

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/10/2021		Equipment: Trackhoe	TP-17
	Completed:	12/10/2021		Location: See Plate 2	Sheet 1 of 1
	Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
				GC	Clayey GRAVEL with sand - medium dense, slightly moist, brown					
5				SC	Clayey SAND - medium dense, moist, light gray-green to light red-brown		22.0	46.4	44	21
					Claystone Bedrock - weak, completely weathered, light gray-green to red-brown					
10										
					Bottom of test pit at 11½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
19

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started: 12/10/2021			Equipment: Trackhoe	TP-18
	Completed: 12/10/2021			Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY with sand - moist, dark brown					
					Clayey GRAVEL with sand - medium dense, moist brown					
5	☒			GC						
	☒						12.5	34.6		
10					Bottom of test pit at 10 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
20

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/11/2021		Equipment: Trackhoe	TP-19
	Completed:	12/11/2021		Location: See Plate 2	Sheet 1 of 1
	Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY with sand and gravel- moist, dark brown					
				GC	Clayey GRAVEL with sand - medium dense, moist brown					
					Elastic SILT - stiff, moist, light gray-green to red-brown		46.6	84.1	73	27
5				MH						
10					Bottom of test pit at 10½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
21

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started:	12/10/2021			Equipment: Trackhoe	TP-20
Completed:	12/10/2021			Location: See Plate 2	Sheet 1 of 1
Backfilled:					

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY with sand and gravel- moist, dark brown					
				CL	Lean CLAY with sand and gravel - stiff, moist, brown brown					
				MH	Elastic SILT - stiff, moist, light gray-green to brown					
5										
10							41.4	92.4	65	22
					Bottom of test pit at 11½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
22

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/10/2021		Equipment: Trackhoe	TP-21
	Completed:	12/10/2021		Location: See Plate 2	Sheet 1 of 1
	Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
				GC	Clayey GRAVEL with sand - medium dense, moist, brown			17.1		
5										
					Claystone Bedrock - weak, completely weathered, gray-green					
10					Bottom of test pit at 10 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
23

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/10/2021		Equipment: Trackhoe	TP-22
	Completed:	12/10/2021		Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
	☒			CH	Fat CLAY with sand and gravel - stiff, moist, brown		29.5	71.6	65	38
5	☒			GC	Clayey GRAVEL with sand - medium dense, moist, brown					
10					Bottom of test pit at 10 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
24

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started:	12/10/2021			Equipment: Trackhoe	TP-23
Completed:	12/10/2021			Location: See Plate 2	Sheet 1 of 1
Backfilled:					

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY with sand and gravel - moist, dark brown					
				CH	Fat CLAY with sand and gravel - stiff, moist, brown					
5				MH	Elastic SILT - stiff, moist, light gray-green to light red-brown					
10						68.4	51.7	99.4	80	40
					Bottom of test pit at 10½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample

▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
25

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started:	12/9/2021			Equipment: Trackhoe	TP-24
Completed:	12/9/2021			Location: See Plate 2	
Backfilled:					Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				CH	Fat CLAY with sand and gravel - stiff, moist, brown					
					Elastic SILT - stiff, moist, light gray-green to light red-brown					
5							42.1	95.4	55	23
				MH						
10										
					Bottom of test pit at 12½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
26

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/10/2021		Equipment: Trackhoe	TP-25
	Completed:	12/10/2021		Location: See Plate 2	Sheet 1 of 1
	Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY with sand and gravel - moist, dark brown					
				CH	Fat CLAY with sand and gravel - stiff, moist, brown	90.7	26.8	83.5	74	48
5				MH	Elastic SILT - stiff, moist, light gray-green to light red-brown					
10					Bottom of test pit at 10 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
27

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started: 12/13/2021			Equipment: Trackhoe	TP-26
	Completed: 12/13/2021			Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
	☒			GC	Clayey GRAVEL with sand - medium dense, moist, brown					
5					- very dense and light brown below 4 feet					
10	☒						11.4	35.7		
					Bottom of test pit at 11 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
28

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/8/2021		Equipment: Trackhoe	TP-27
	Completed:	12/8/2021		Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
				GC	Clayey GRAVEL with sand - medium dense, moist, brown					
5				MH	Elastic SILT - stiff, moist, light gray-green					
10							47.8	85.5	63	25
					Bottom of test pit at 13 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
29

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/8/2021		Equipment: Trackhoe	TP-28
	Completed:	12/8/2021		Location: See Plate 2	Sheet 1 of 1
	Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
	☒			GC	Clayey GRAVEL with sand - medium dense, moist, brown					
5										
	▥				Siltstone to Claystone Bedrock - weak, completely weathered, light brown to brown		42.8	87.1	69	21
10										
					Bottom of test pit at 13 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Project No.: 133-015

Plate
30

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/13/2021		Equipment: Trackhoe	TP-29
	Completed:	12/13/2021		Location: See Plate 2	Sheet 1 of 1
	Backfilled:				

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Clayey GRAVEL with sand - moist, dark brown					
				CH	Fat CLAY with sand and gravel - very stiff, moist, brown	90.6	27.0	83.2	70	45
5					Siltstone to Claystone Bedrock - weak, completely weathered, gray-green to brown					
10										
					Bottom of test pit at 11 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Eden, Utah
Project No.: 133-015

Plate
31

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started:	12/8/2021		Equipment: Trackhoe	TP-30
	Completed:	12/8/2021		Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				CH	Fat CLAY with sand and gravel - very stiff, moist, brown		32.9	77.6	80	53
5					Claystone to Siltstone Bedrock - weak, completely weathered, gray-green to brown					
10										
					Bottom of test pit at 13 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
Project No.: 133-015

Plate
32

Date	Started: 12/8/2021	TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Completed: 12/8/2021		Equipment: Trackhoe	TP-31
	Backfilled:		Location: See Plate 2	Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Fill; Lean CLAY - moist, brown					
				CL	Sandy Lean CLAY - stiff, moist, light gray-green					
5										
					Siltstone to Claystone Bedrock - weak to strong, weathered to slightly weathered, light gray-green					
10					Bottom of test pit at 10 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
Project No.: 133-015

Plate
33

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started:	12/8/2021			Equipment: Trackhoe	TP-32
Completed:	12/8/2021			Location: See Plate 2	Sheet 1 of 1
Backfilled:					

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
				MH	Elastic SILT - stiff, moist, brown	84.2	44.6	99.2	76	39
5				SM	Silty SAND - medium dense, moist, brown					
					Siltstone to Claystone Bedrock - moderately strong, weathered, light gray-green					
10										
					Bottom of test pit at 12 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

Christensen Geotechnical

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Cobabe Ranch Development
Eden, Utah
Project No.: 133-015

Plate
34

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
	Started: 12/13/2021			Equipment: Trackhoe	TP-33
	Completed: 12/13/2021			Location: See Plate 2	
	Backfilled:				Sheet 1 of 1

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
					Fat CLAY - stiff, moist, brown					
							18.4	92.0	52	32
5				CH						
					- gray-green below 8 feet					
10										
					Bottom of test pit at 12 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
Project No.: 133-015

Plate
35

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started:	12/13/2021			Equipment: Trackhoe	TP-34
Completed:	12/13/2021			Location: See Plate 2	Sheet 1 of 1
Backfilled:					

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
5				CL	Lean CLAY - stiff, moist, brown to gray-brown					
		▽			- wet below 8 feet					
10							29.3	91.4	42	24
					Bottom of test pit at 12 feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
Project No.: 133-015

Plate
36

Date			TEST PIT LOG	Logged By: M Christensen	Test Pit No.
Started:	12/13/2021			Equipment: Trackhoe	TP-35
Completed:	12/13/2021			Location: See Plate 2	Sheet 1 of 1
Backfilled:					

Depth (feet)	Sample Type	Groundwater	Graphic Log	Group Symbol	Material Description	Dry Density (pcf)	Moisture Content (%)	Minus #200 (%)	Liquid Limit	Plasticity Index
					Topsoil; Lean CLAY - moist, dark brown					
					Lean CLAY - stiff, moist, brown to gray-brown					
						105.9	19.4	94.1	49	27
5				CL						
		▽			- wet below 8 feet					
10										
					Bottom of test pit at 10½ feet					
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample
▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
Project No.: 133-015

Plate
37

RELATIVE DENSITY – COURSE GRAINED SOILS

Relative Density	SPT (blows/ft.)	3 In OD California Sampler (blows/ft.)	Relative Density (%)	Field Test
Very Loose	<4	<5	0 – 15	Easily penetrated with a ½ inch steel rod pushed by hand
Loose	4 – 10	5 – 15	15 – 35	Difficult to penetrate with a ½ inch steel rod pushed by hand
Medium Dense	10 – 30	15 – 40	35 – 65	Easily penetrated 1-foot with a steel rod driven by a 5 pound hammer
Dense	30 – 50	40 – 70	65 – 85	Difficult to penetrate 1-foot with a steel rod driven by a 5 pound hammer
Very Dese	>50	>70	85 - 100	Penetrate only a few inches with a steel rod driven by a 5 pound hammer

CONSISTENCY – FINE GRAINED SOILS

Consistency	SPT (blows/ft)	Torvane Undrained Shear Strength (tsf)	Pocket Penetrometer Undrained Shear Strength (tsf)	Field Test
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches with thumb
Soft	2 – 14	0.125 – 0.25	0.25 – 0.5	Easily penetrated one inch with thumb
Medium Stiff	4 – 8	0.25 – 0.5	0.5 – 1.0	Penetrated over ½ inch by thumb with moderate effort. Molded by strong finger pressure
Stiff	8 – 15	0.5 – 1.0	1.0 – 2.0	Indented ½ inch by thumb with great effort
Very Stiff	15 – 30	1.0 – 2.0	2.0 – 4.0	Readily indented with thumbnail
Hard	>30	>2.0	>4.0	Indented with difficulty with thumbnail

CEMENTATION

Weakly	Crumbles or breaks with handling or little finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumble or break with finger pressure

MOISTURE

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually below water table

GRAIN SIZE

Description		Sieve Size	Grain Size (in)	Approximate Size
Boulders		>12”	>12”	Larger than basketball
Cobbles		3” – 12”	3” – 12”	Fist to basketball
Gravel	Coarse	3/4” - 3”	3/4” - 3”	Thumb to fist
	Fine	#4 – 3”	0.19 – 0.75	Pea to thumb
Sand	Coarse	#10 - #4	0.079 – 0.19	Rock salt to pea
	Medium	#40 - #10	0.017 – 0.079	Sugar to rock salt
	Fine	#200 - #40	0.0029 – 0.017	Flour to sugar
Silt/Clay		<#200	<0.0029	Flour sized or smaller

STRATAFICATION

Occasional	One or less per foot of thickness
Frequent	More than one per foot of thickness

MODIFIERS

Trace	<5%
Some	5-12%
With	>12%

STRATIFICATION

Seam	1/16 to 1/2 inch
Layer	1/2 to 12 inch

NOTES

1. The logs are subject to the limitations and conclusions presented in the report.
2. Lines separating strata represent approximate boundaries only. Actual transitions may be gradual.
3. Logs represent the soil conditions at the points explored at the time of our investigation.
4. Soils classifications shown on logs are based on visual methods . Actual designations (based on laboratory testing)may vary.

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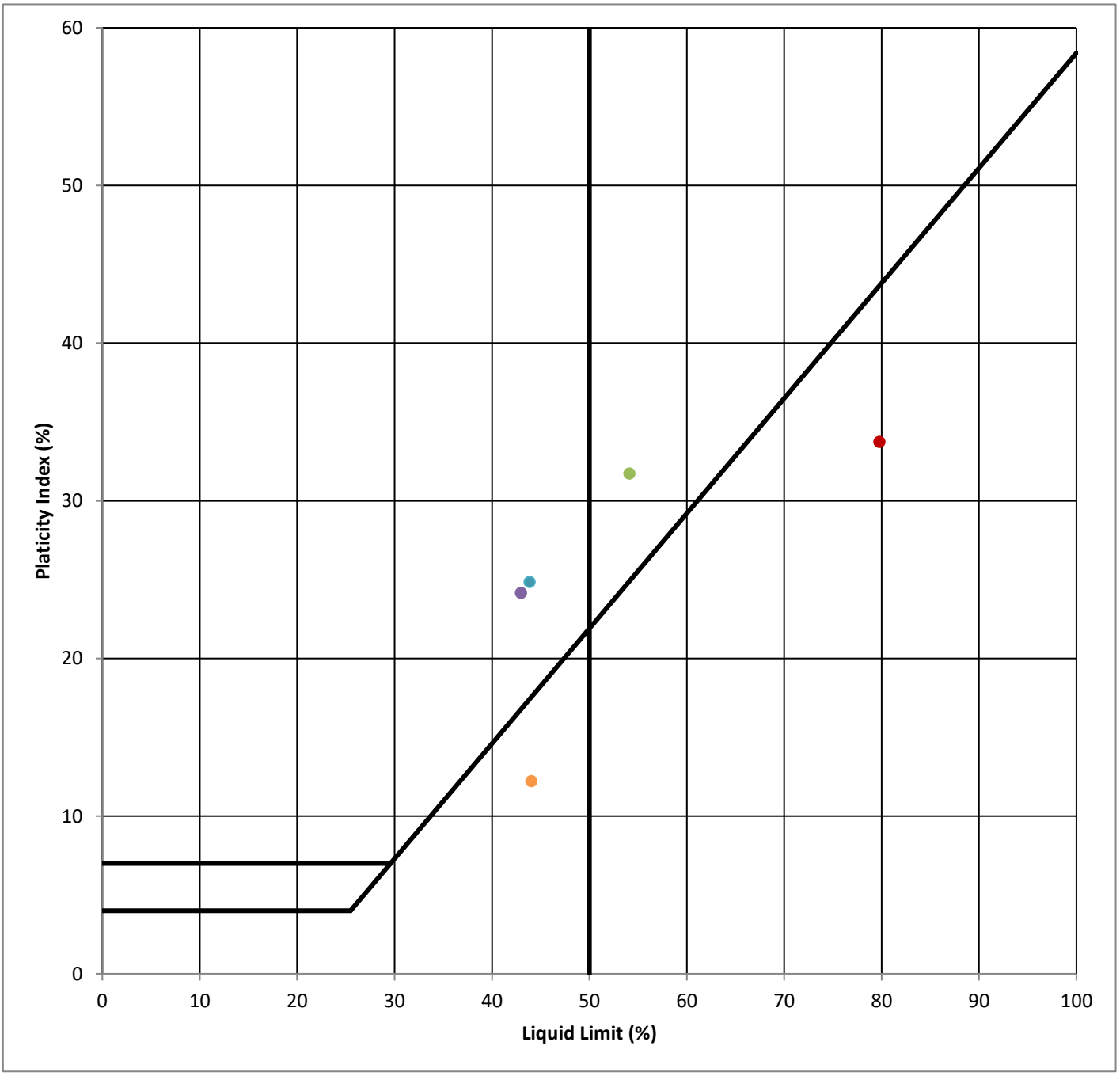
Soil Terms Key

Plate 38

Atterberg Limits



Location	Depth (ft)		Classification	Liquid Limit	PI
TP-2	3	●	Lean CLAY with sand	44	25
TP-3	4	●	Sandy SILT	44	12
TP-4	3	●	Fat CLAY	54	32
TP-5	3	●	Sandy Lean CLAY	43	24
TP-10	10	●	Elastic SILT (Bedrock)	80	34

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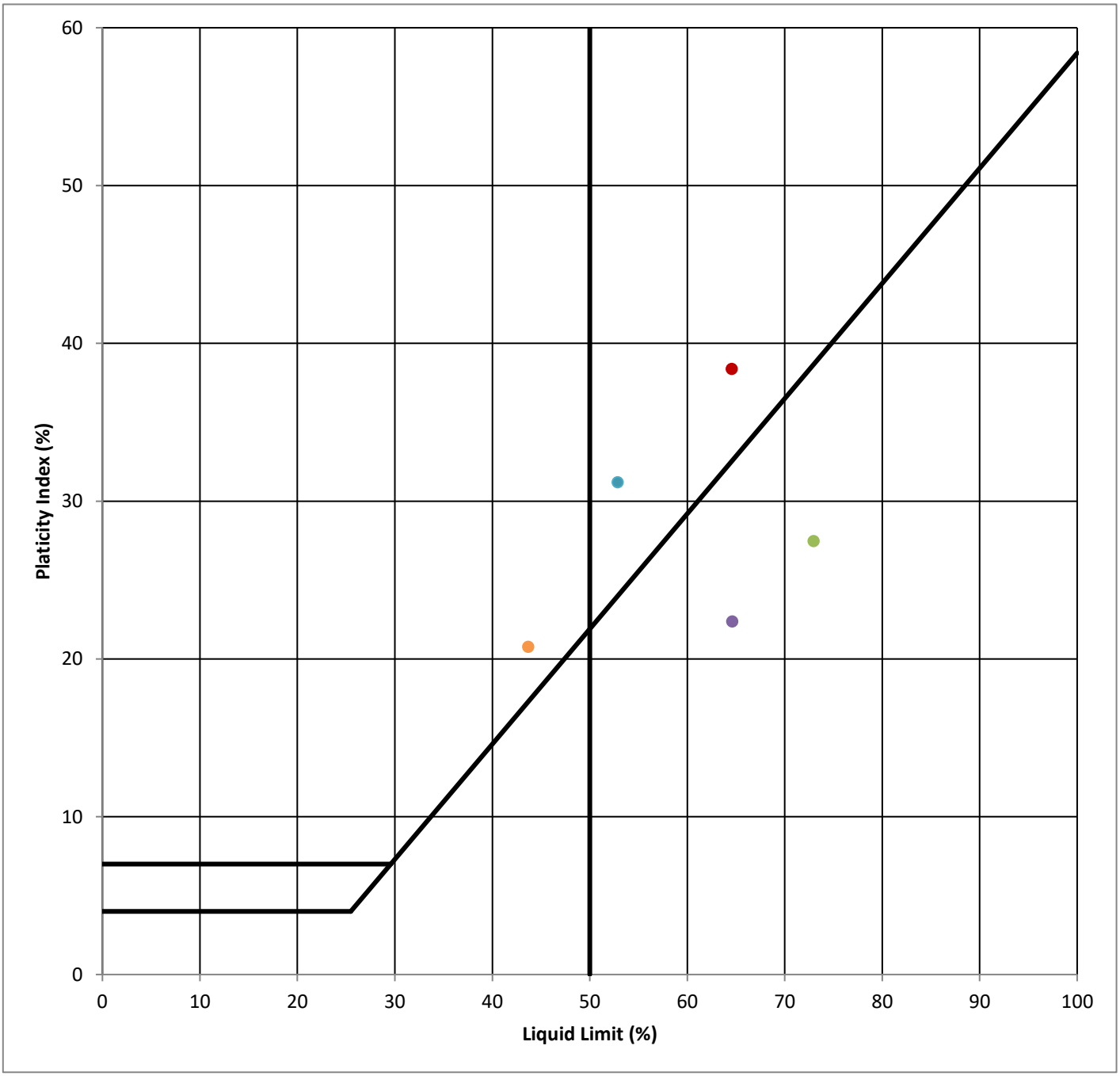
Atterberg Limits



Location	Depth (ft)		Classification	Liquid Limit	PI
TP-13	3	●	Fat CLAY with sand	53	31
TP-17	5	●	Clayey SAND	44	21
TP-19	4	●	Elasit SILT with sand	73	27
TP-20	10	●	Elasit SILT	65	22
TP-22	2	●	Fat CLAY with sand and gravel	65	38

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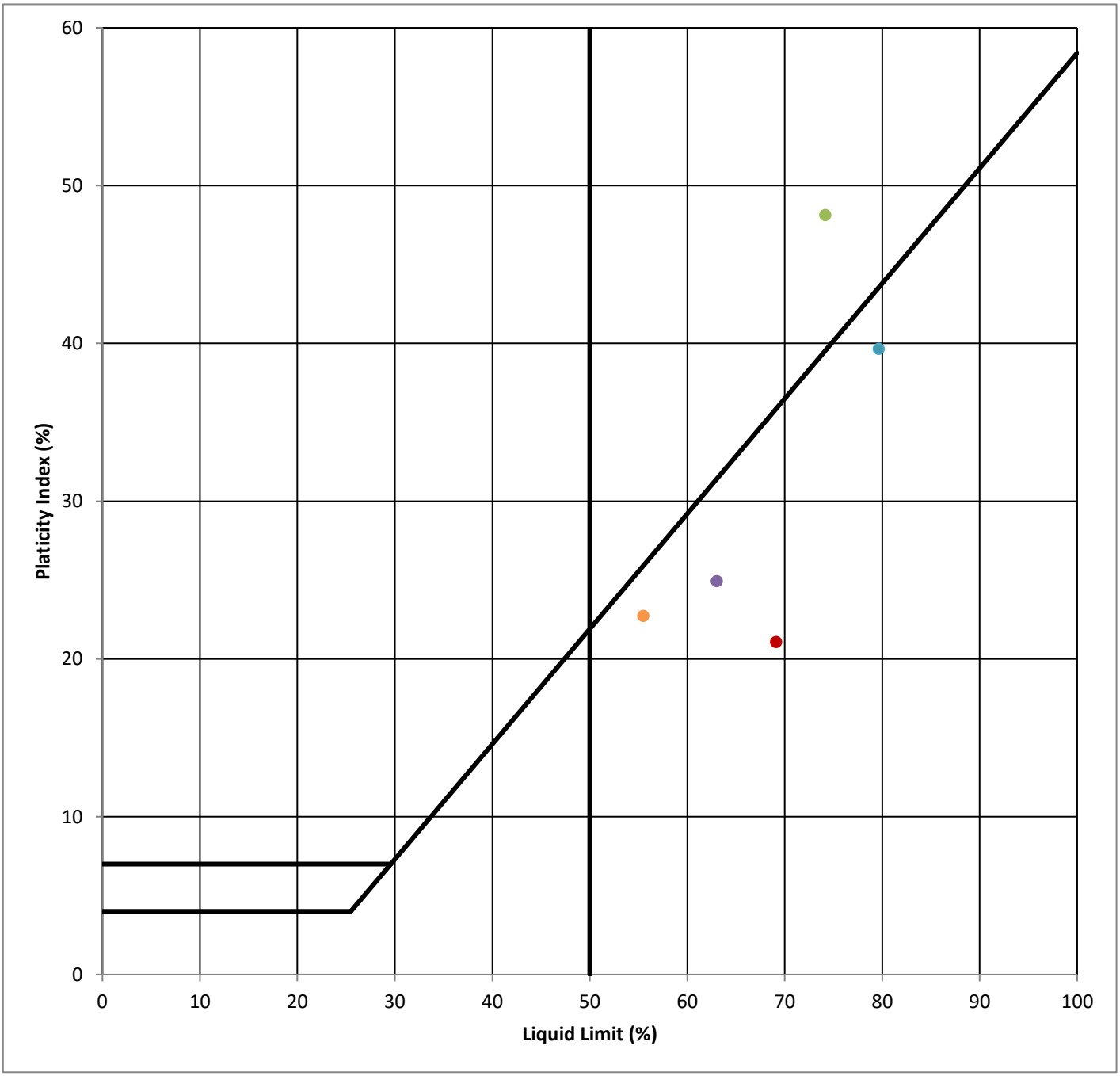
Atterberg Limits



Location	Depth (ft)		Classification	Liquid Limit	PI
TP-23	9	●	Elastic SILT	80	40
TP-24	6	●	Elastic SILT	55	23
TP-25	3	●	Fat CLAY with sand and gravel	74	48
TP-27	12	●	Elastic SILT	63	25
TP-28	7	●	Elastic SILT (Bedrock)	69	21

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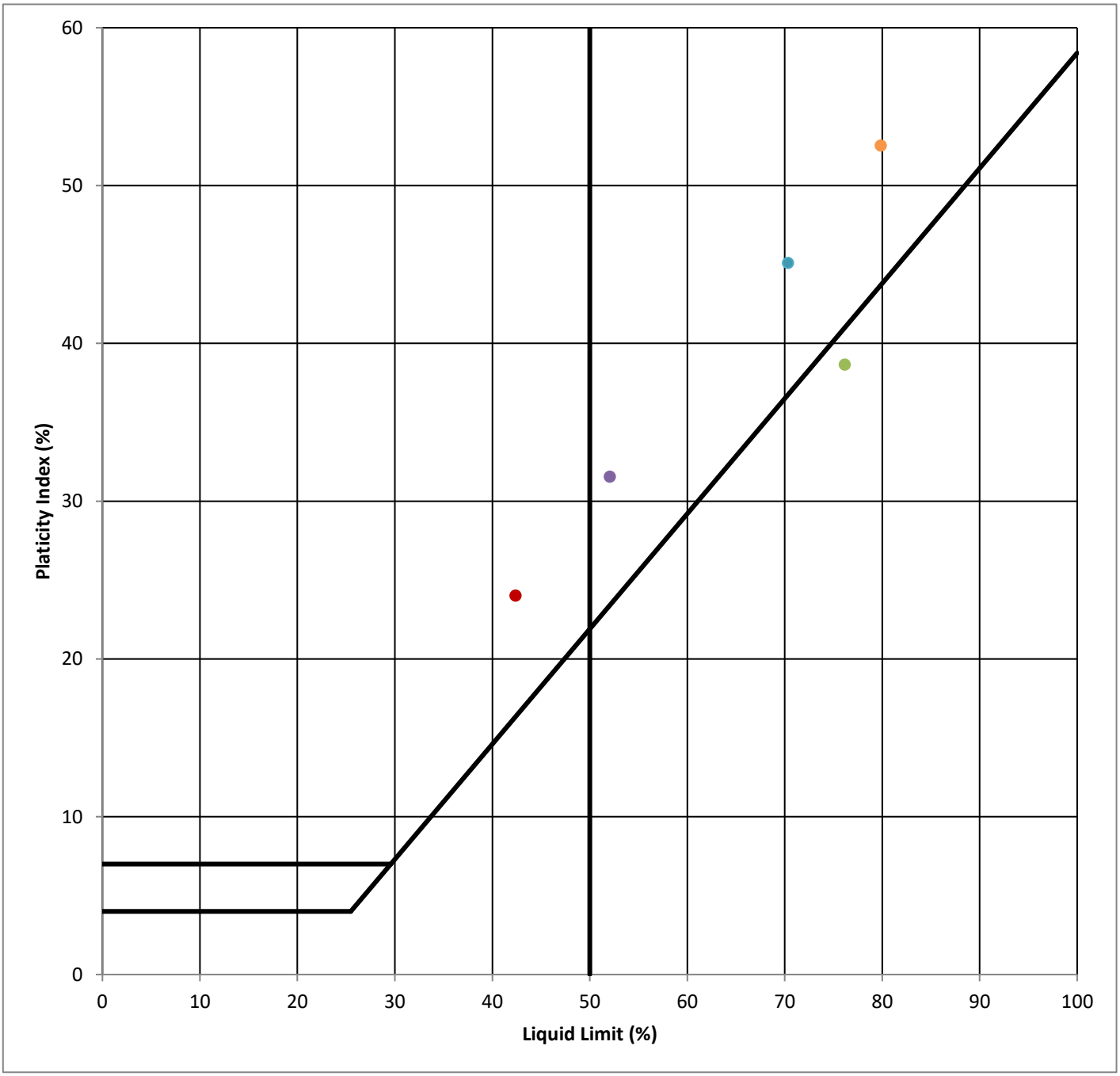
Atterberg Limits



Location	Depth (ft)		Classification	Liquid Limit	PI
TP-29	3	●	Fat CLAY with sand & gravel	70	45
TP-30	4	●	Fat CLAY with sand & gravel	80	53
TP-32	4	●	Elastic SILT	76	39
TP-33	3	●	Fat CLAY	52	32
TP-34	10	●	Lean CLAY	42	24

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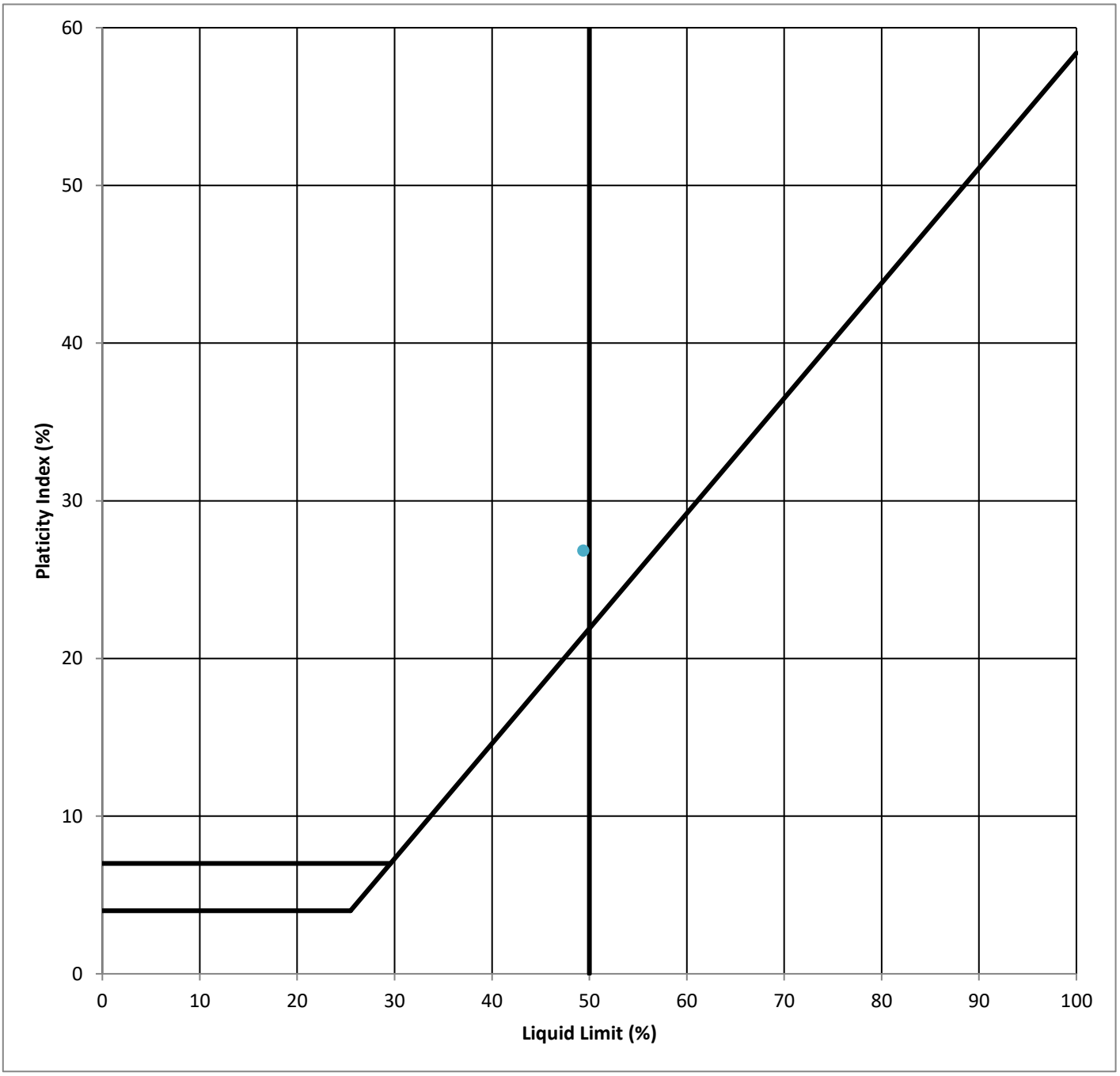
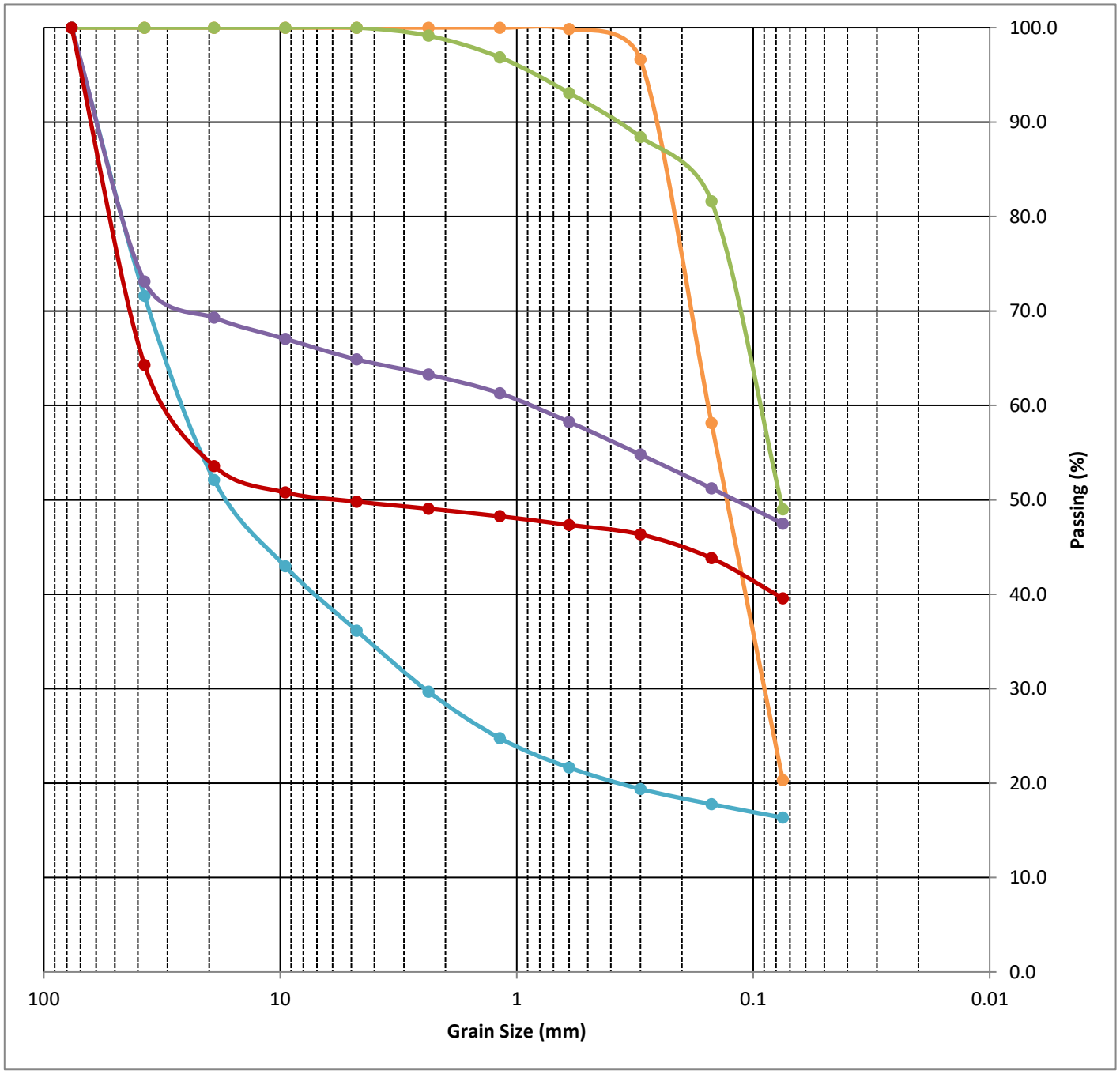
Atterberg Limits



Location	Depth (ft)		Classification	Liquid Limit	PI
TP-35	4	●	Lean CLAY	49	27

Christensen Geotechnical	Lewis Homes Cobabe Ranch Development Eden, Utah Project No.: 133-015	Plate 43

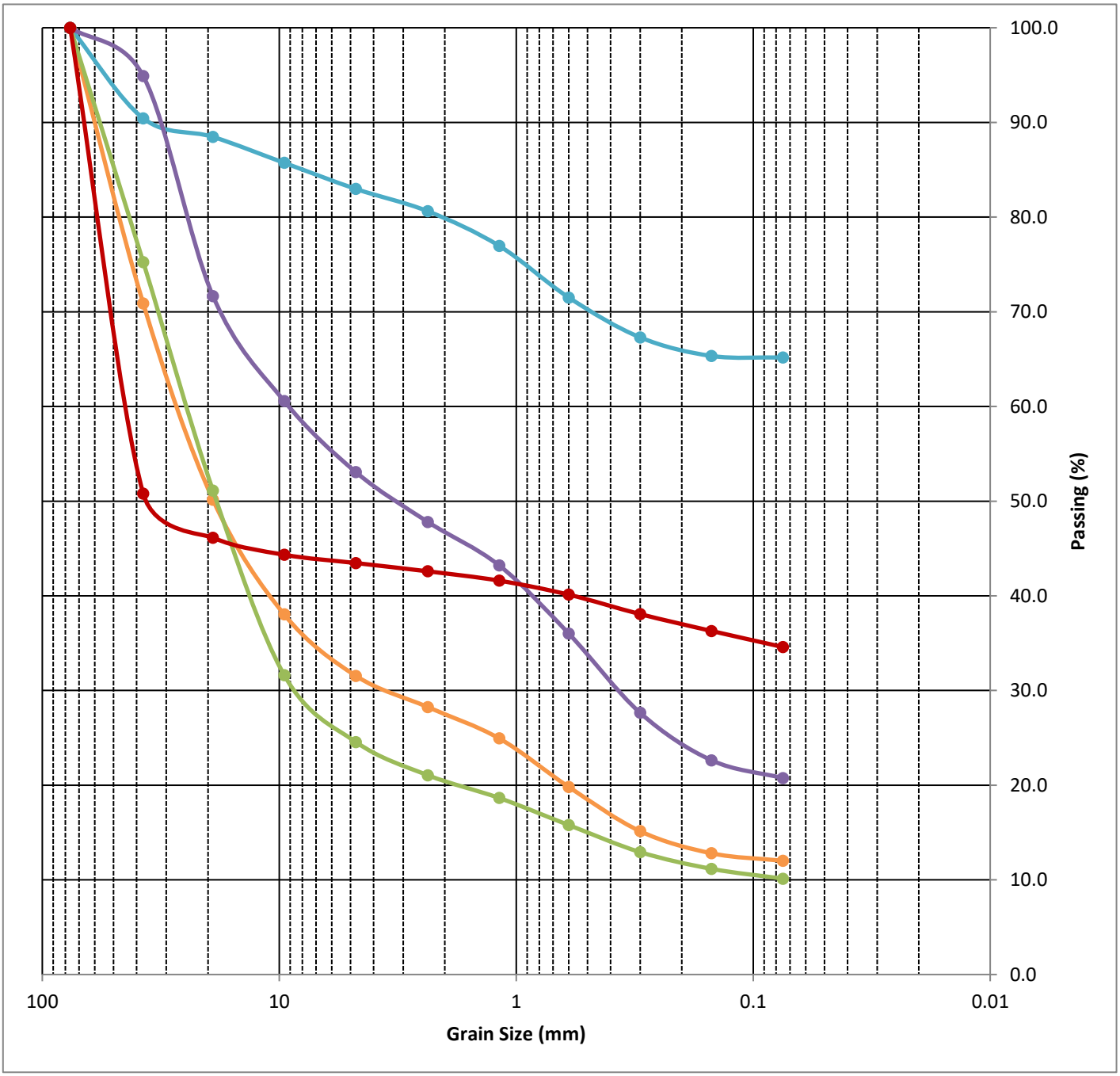
Grain Size Distribution



Location	Depth		Classification	% Gravel	% Sand	% Silt and Clay
TP-1	10	●	Clayey GRAVEL with sand	63.8	19.8	16.3
TP-6	8	●	Silty SAND	0.0	79.7	20.3
TP-7	11	●	Silty SAND (Bedrock)	0.0	51.0	49.0
TP-8	4	●	Clayey GRAVEL with sand	35.1	17.4	47.5
TP-9	3	●	Clayey GRAVEL with sand	50.2	10.2	39.6

Christensen Geotechnical	**Lewis Homes** **Cobabe Ranch Development** **Eden, Utah** **Project No.: 133-015**	**Plate** **44**

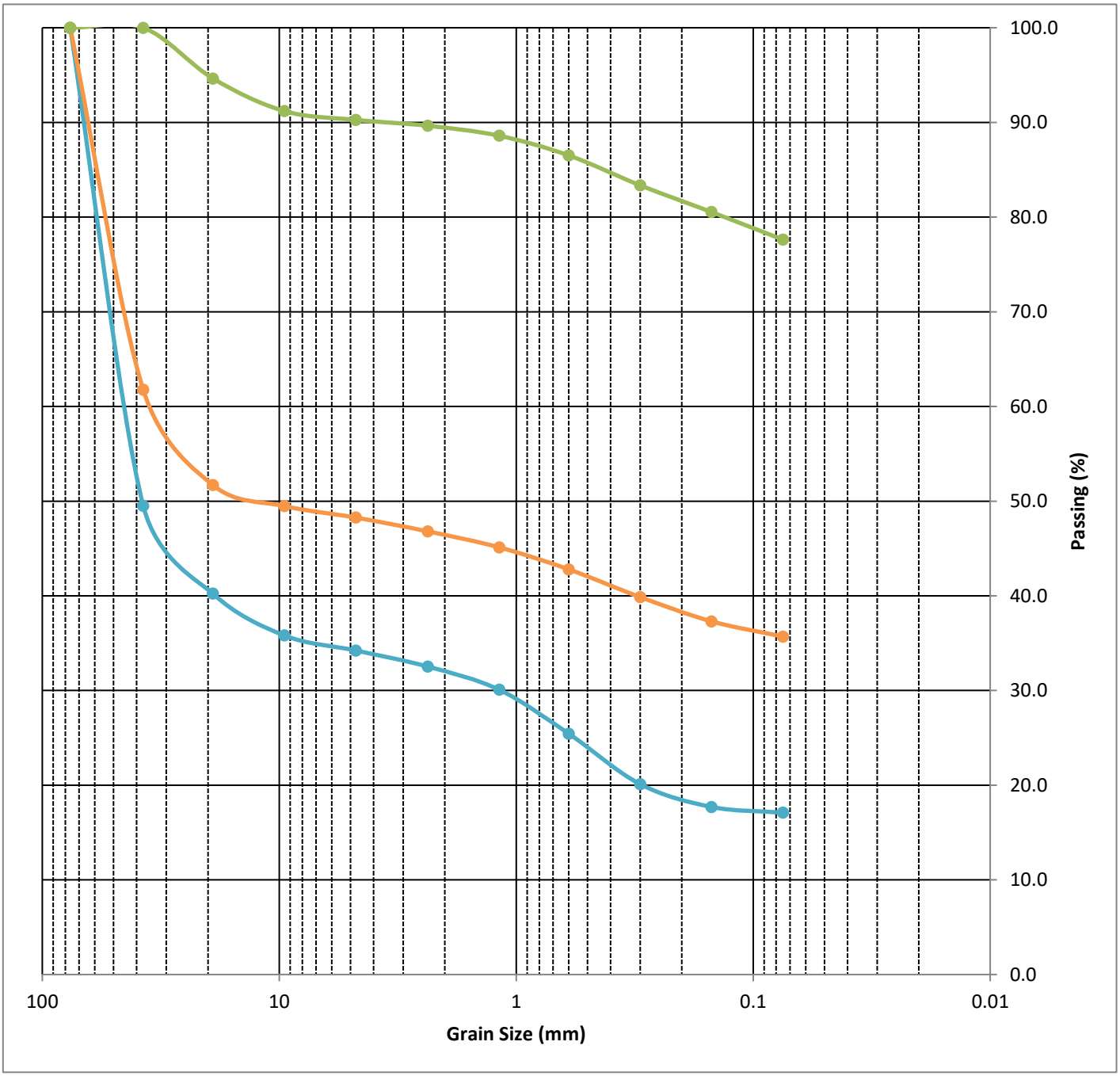
Grain Size Distribution



Location	Depth		Classification	% Gravel	% Sand	% Silt and Clay
TP-11	5	●	Lean CLAY with sand & Gravel	17.0	17.8	65.2
TP-12	9	●	Clayey GRAVEL with sand	68.5	19.5	12.0
TP-15	8	●	Poorly Graded GRAVEL w/ silt & sand (Bedrock)	75.4	14.4	10.1
TP-16	2	●	Clayey GRAVEL with sand	46.9	32.3	20.7
TP-18	8	●	Clayey GRAVEL with sand	56.5	8.9	34.6

Christensen Geotechnical	**Lewis Homes** **Cobabe Ranch Development** **Eden, Utah** **Project No.: 133-015**	**Plate** **45**

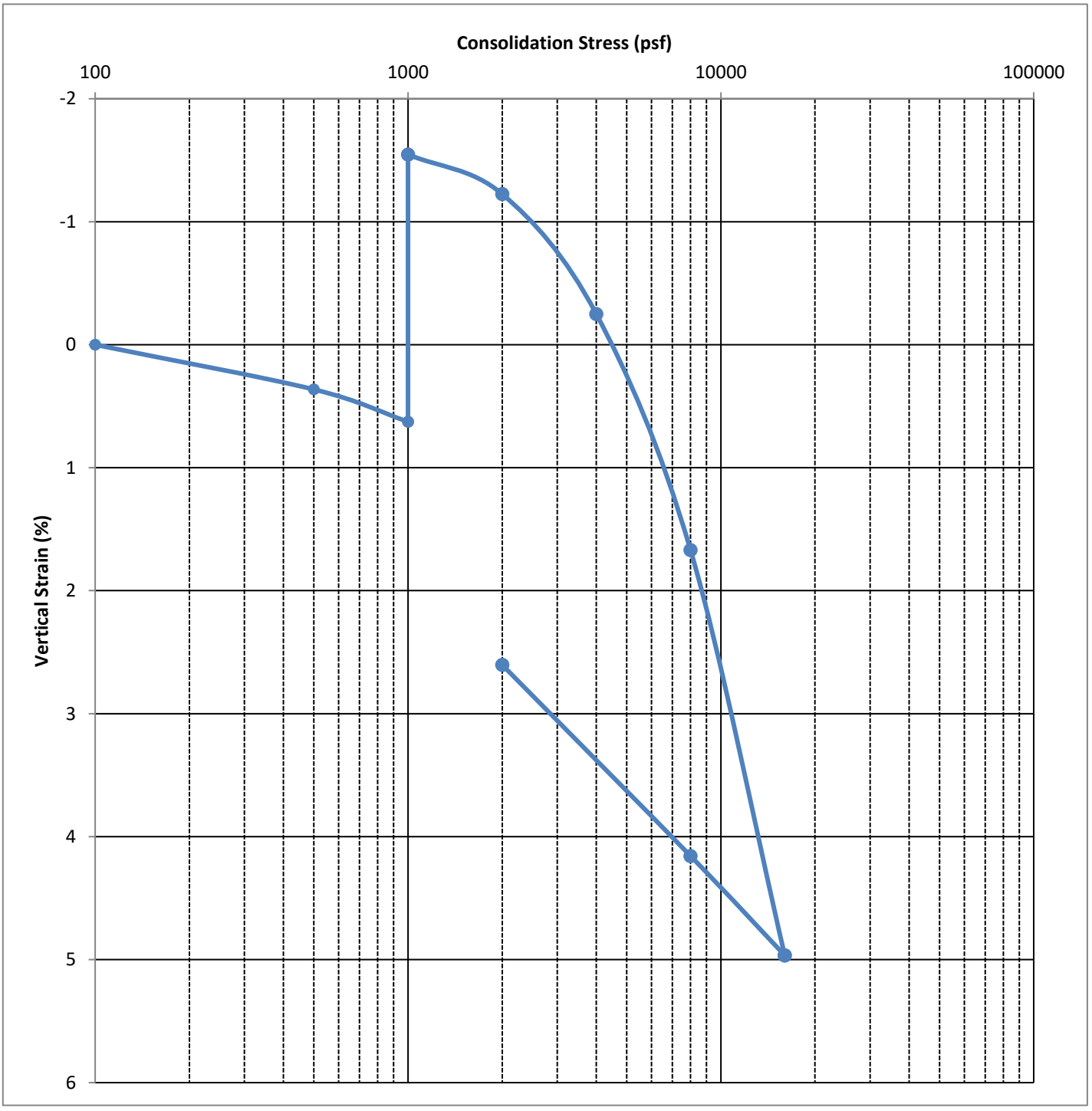
Grain Size Distribution



Location	Depth		Classification	% Gravel	% Sand	% Silt and Clay
TP-21	4	●	Clayey GRAVEL with sand	65.8	17.1	17.1
TP-26	10	●	Clayey GRAVEL with sand	51.7	12.6	35.7
TP-30	4	●	Fat CLAY with sand & Gravel	9.7	12.6	77.6

Christensen Geotechnical	Lewis Homes Cobabe Ranch Development Eden, Utah Project No.: 133-015	Plate 46

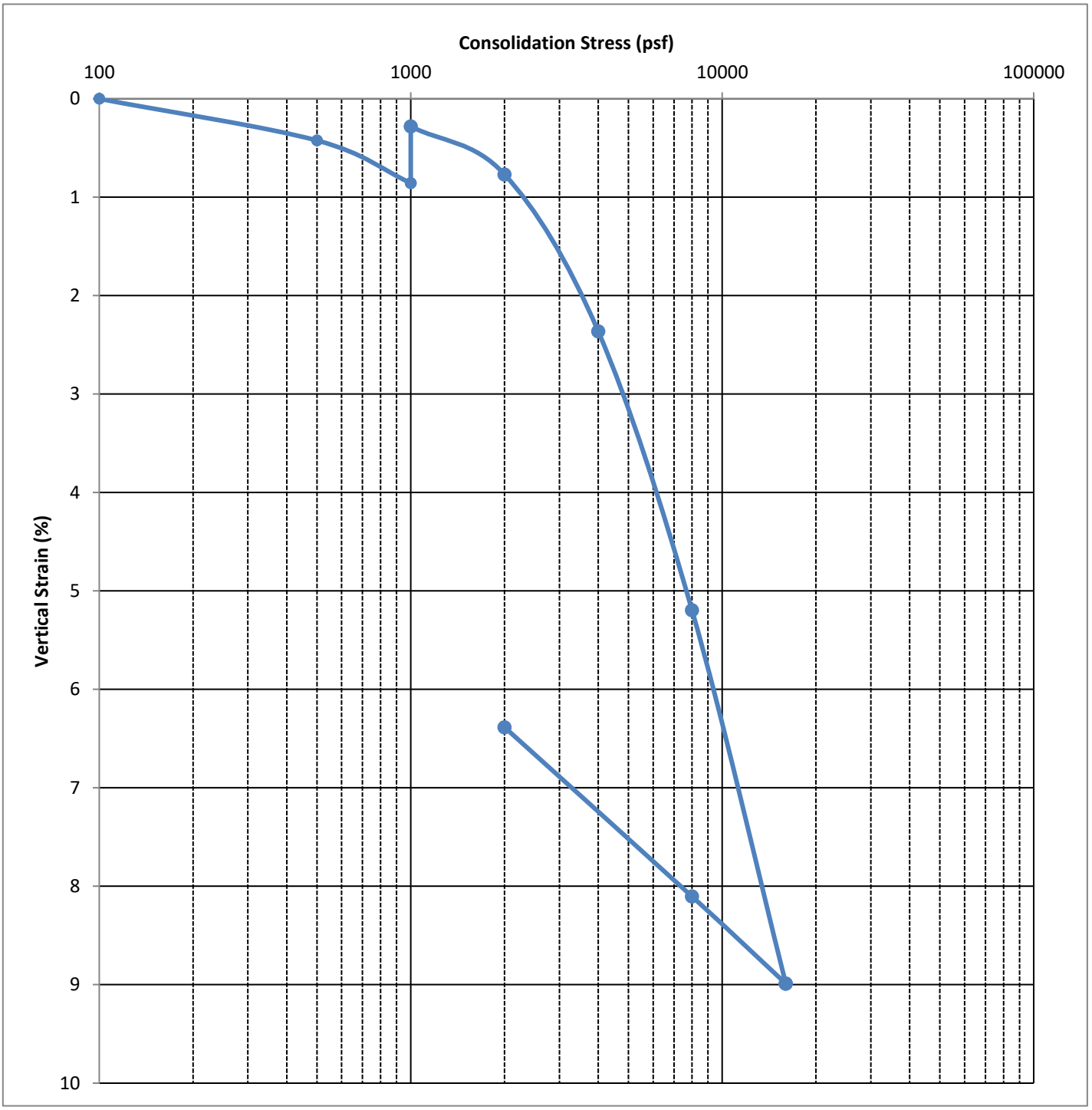
1-D Consolidation



Location	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	σ_o (psf)	σ_p (psf)	C_c	C_r	OCR
TP-10	10	74.3	42.8	1,100	4,500	0.087	0.026	4.1

Christensen Geotechnical	Lewis Homes Cobabe Ranch Development Eden, Utah Project No.: 133-015	Plate 47

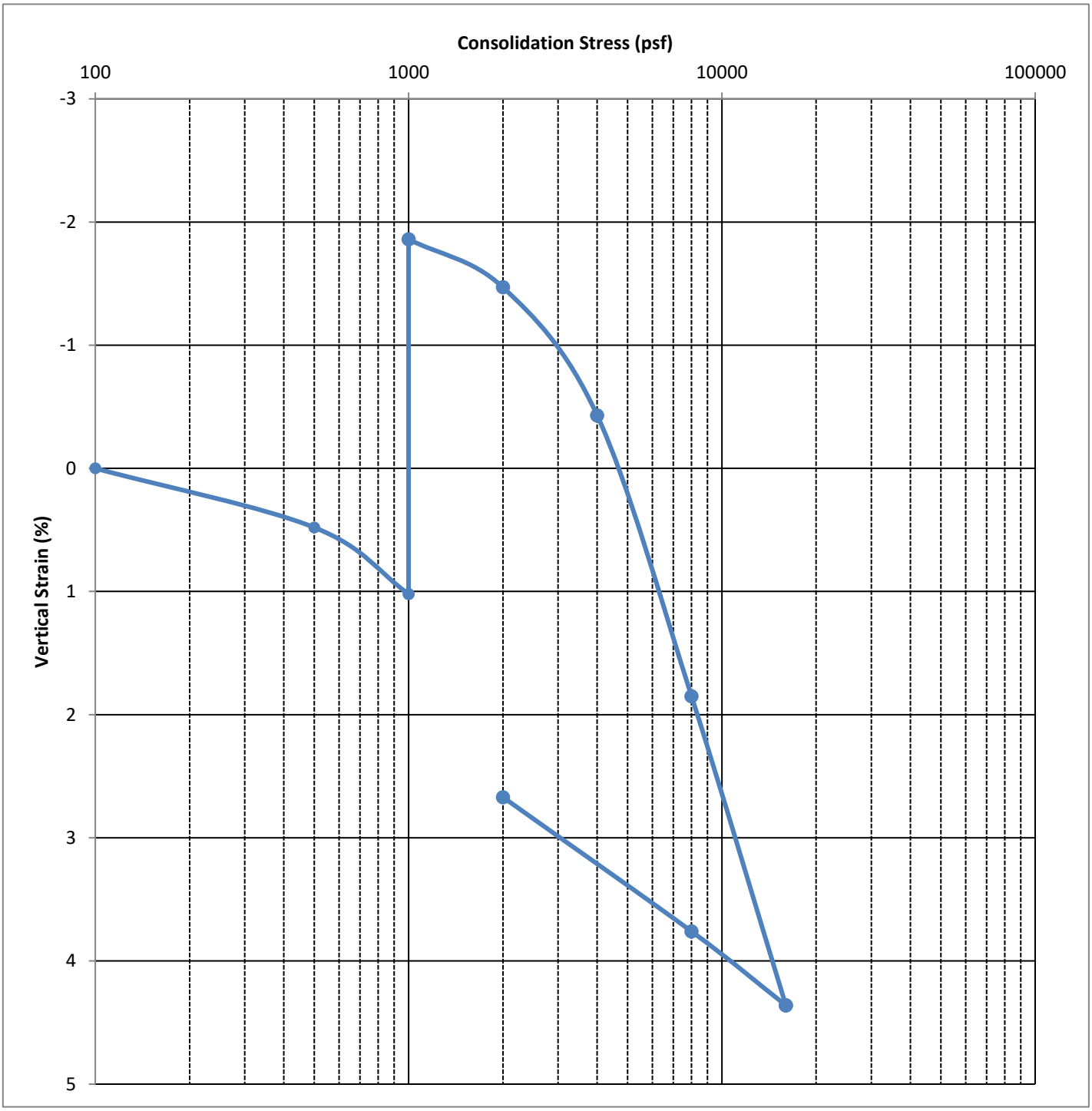
1-D Consolidation



Location	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	σ_o (psf)	σ_p (psf)	C_c	C_r	OCR
TP-23	9	68.4	51.7	900	3,700	0.110	0.029	4.1

Christensen Geotechnical	Lewis Homes Cobabe Ranch Development Eden, Utah Project No.: 133-015	Plate **48**

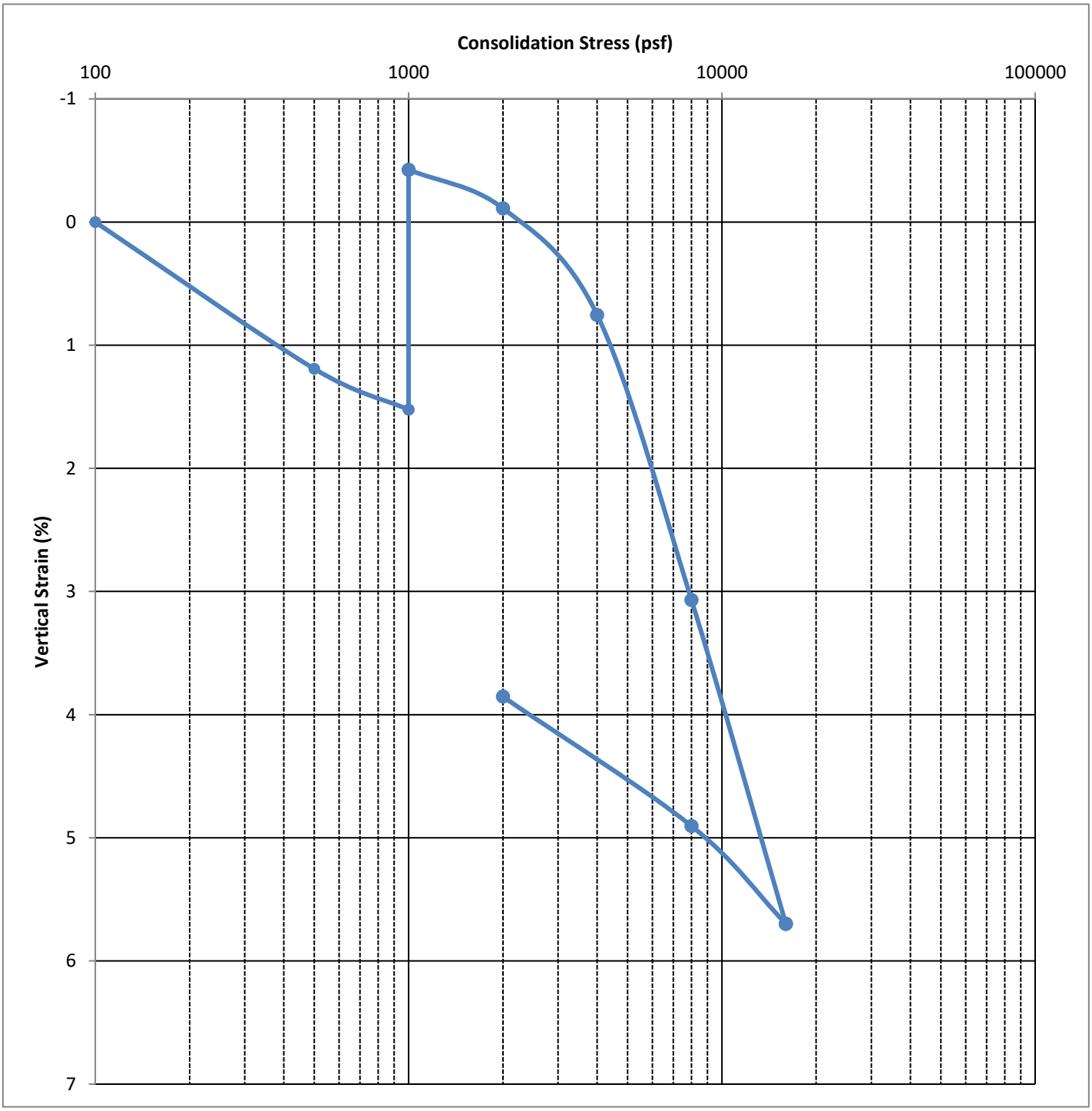
1-D Consolidation



Location	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	σ_o (psf)	σ_p (psf)	C_c	C_r	OCR
TP-25	3	90.7	26.8	300	3,000	0.080	0.019	10.0

Christensen Geotechnical	Lewis Homes Cobabe Ranch Development Eden, Utah Project No.: 133-015	Plate 49

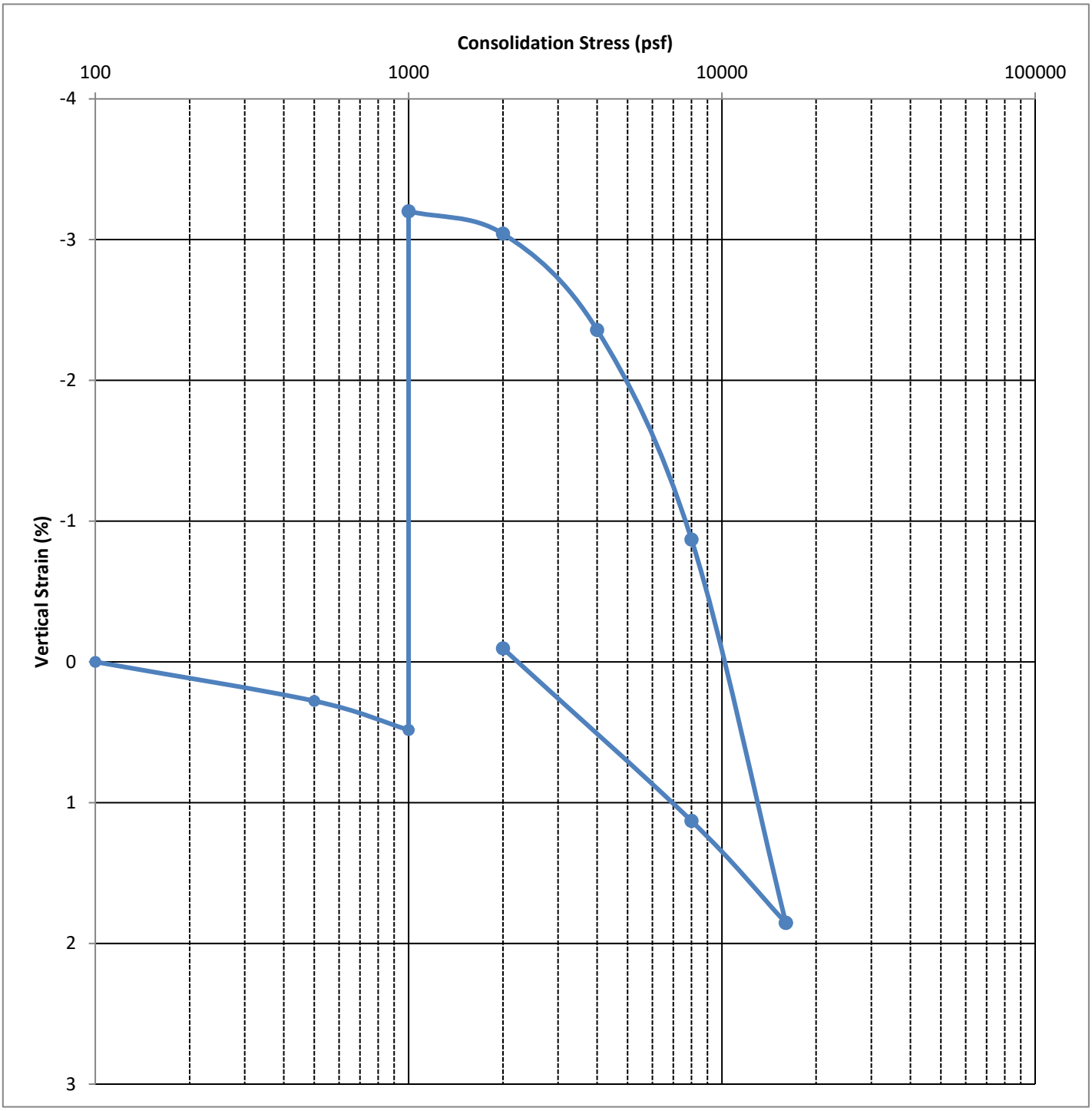
1-D Consolidation



Location	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	σ_o (psf)	σ_p (psf)	C_c	C_r	OCR
TP-29	3	90.6	27.0	300	3,800	0.082	0.020	12.7

Christensen Geotechnical	Lewis Homes Cobabe Ranch Development Eden, Utah Project No.: 133-015	Plate **50**

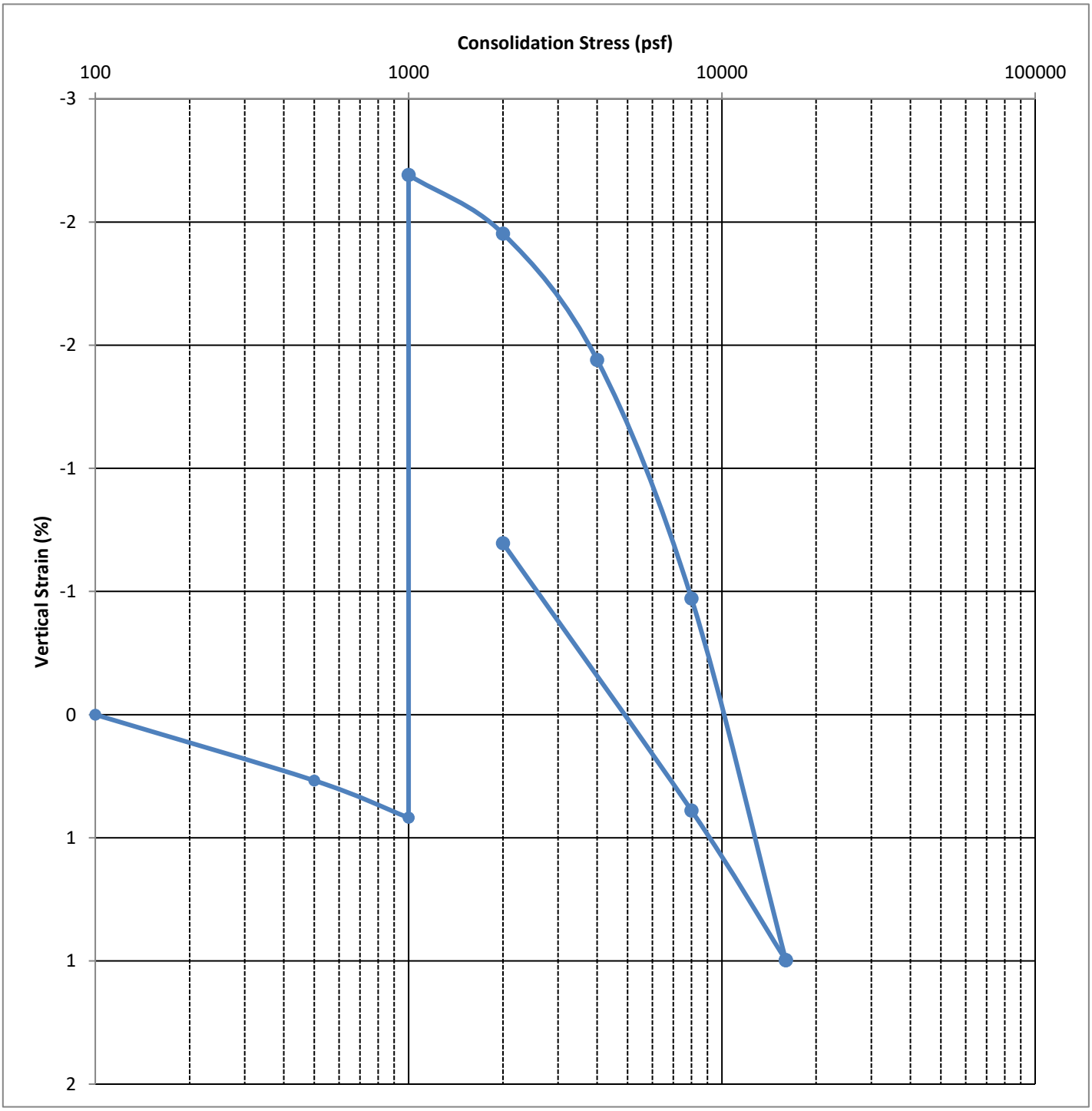
1-D Consolidation



Location	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	σ_o (psf)	σ_p (psf)	C_c	C_r	OCR
TP-32	4	84.2	44.6	500	4,800	0.070	0.022	9.6

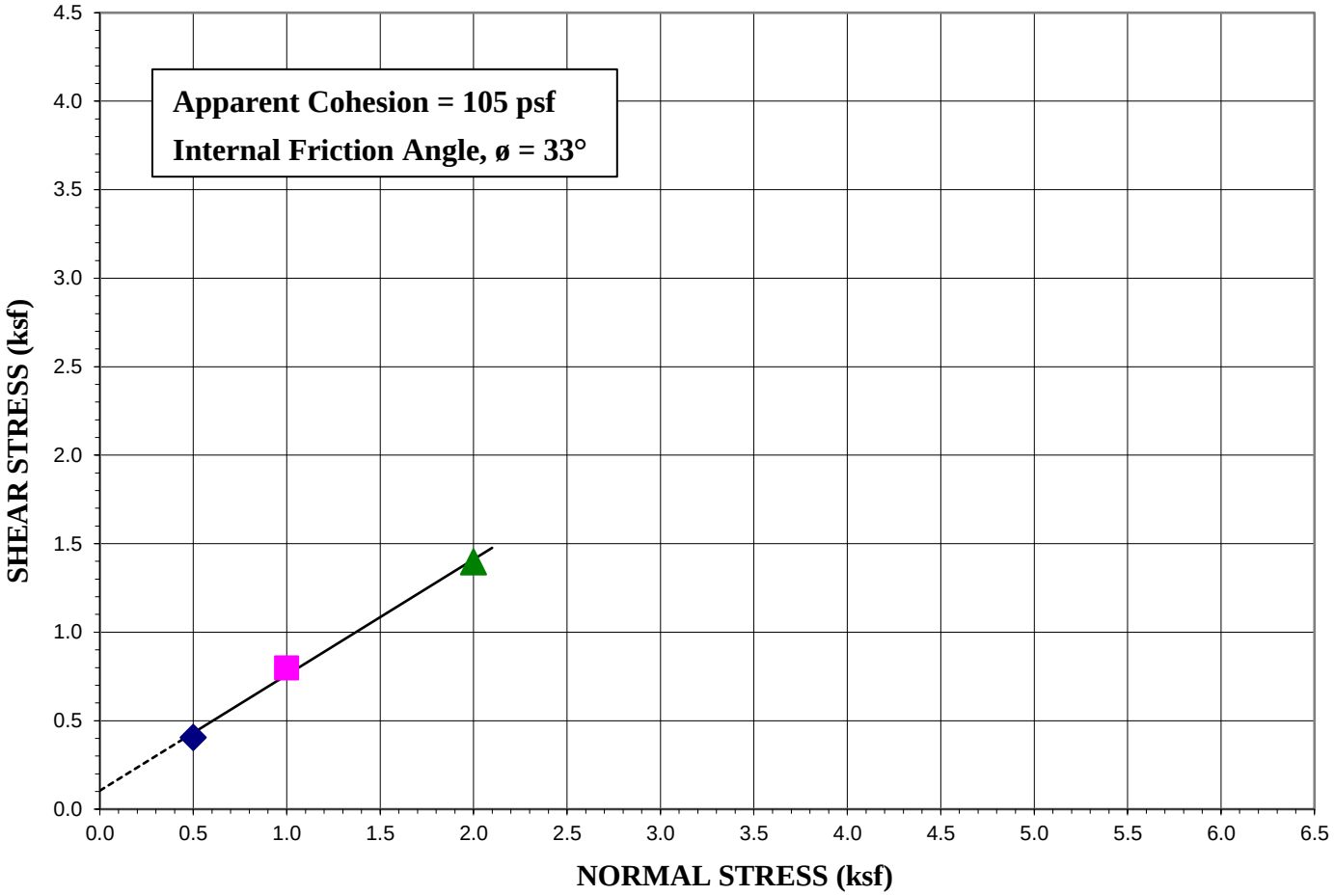
Christensen Geotechnical	Lewis Homes Cobabe Ranch Development Eden, Utah Project No.: 133-015	Plate 51

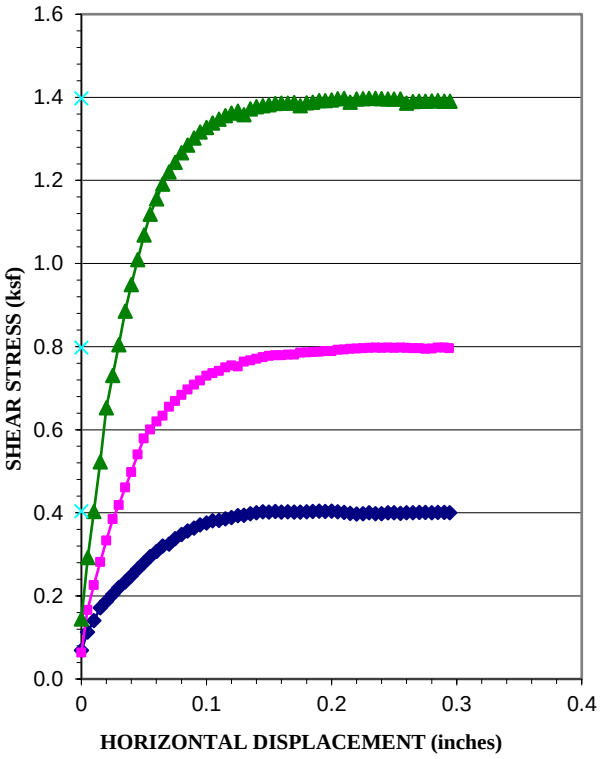
1-D Consolidation



Location	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	σ_o (psf)	σ_p (psf)	C_c	C_r	OCR
TP-35	4	105.9	19.4	500	4,000	0.040	0.019	8.0

Christensen Geotechnical	Lewis Homes Cobabe Ranch Development Eden, Utah Project No.: 133-015	Plate 52





Location: TP-20	Depth: 10.0 ft		
Type of Test:	Consolidated Drained/Saturated		
Test No. (Symbol)	1 (◆)	2 (■)	3 (▲)
Sample Type:	Fully Softened		
Initial Height, in.	1	1	1
Diameter, in.	2.4	2.4	2.4
Dry Density Before, pcf	64.7	64.6	64.6
Moisture % Before	59.1	59.1	59.1
Normal Load, ksf	0.5	1.0	2.0
Shear Stress, ksf	0.40	0.80	1.40
Strain Rate	0.001 in/min		

Sample Properties	
Cohesion, psf	105
Friction Angle, ϕ	33
Liquid Limit, %	65
Plasticity Index, %	22
Percent Gravel	---
Percent Sand	---
Percent Passing No. 200 sieve	92.4
Classification	Elastic SILT

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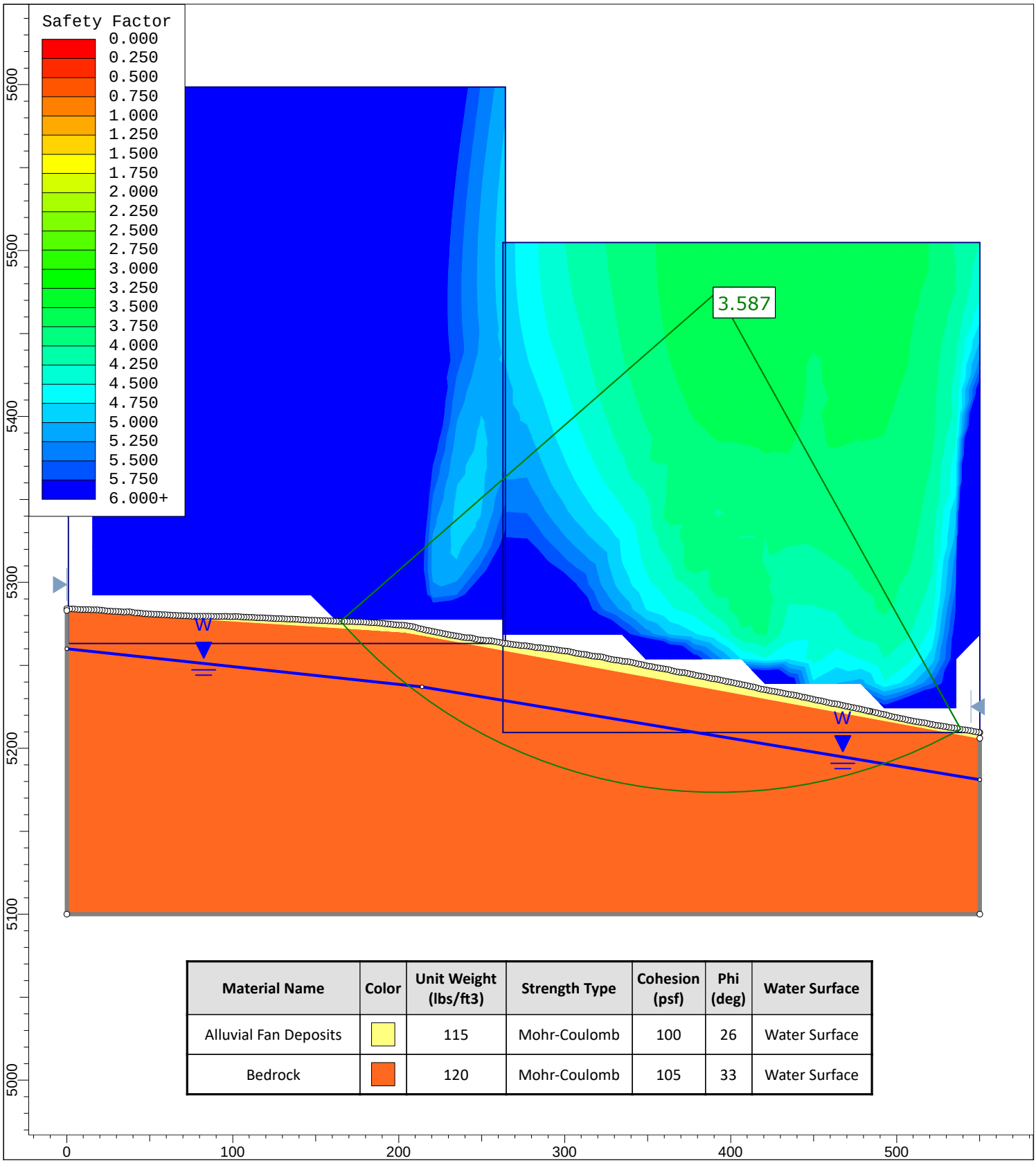
Lewis Homes
Cobabe Ranch Development
Eden, Utah
Project No.: 133-015

Plate
53



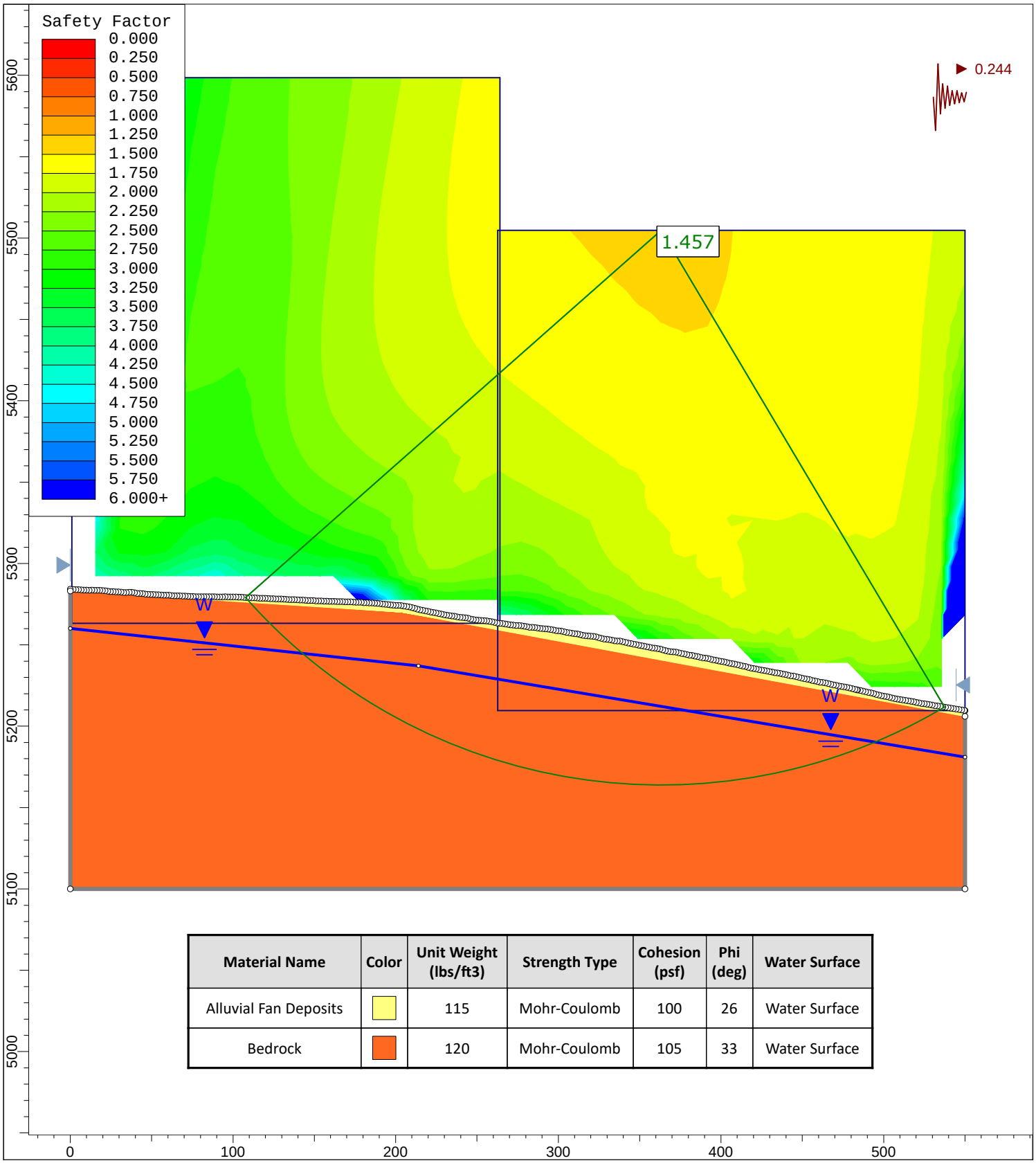
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Alluvial Fan Deposits		115	Mohr-Coulomb	100	26	Water Surface
Bedrock		120	Mohr-Coulomb	105	33	Water Surface

Profile A - Static

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
133-015

Plate
54



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Alluvial Fan Deposits		115	Mohr-Coulomb	100	26	Water Surface
Bedrock		120	Mohr-Coulomb	105	33	Water Surface

Profile A - Pseudo Static

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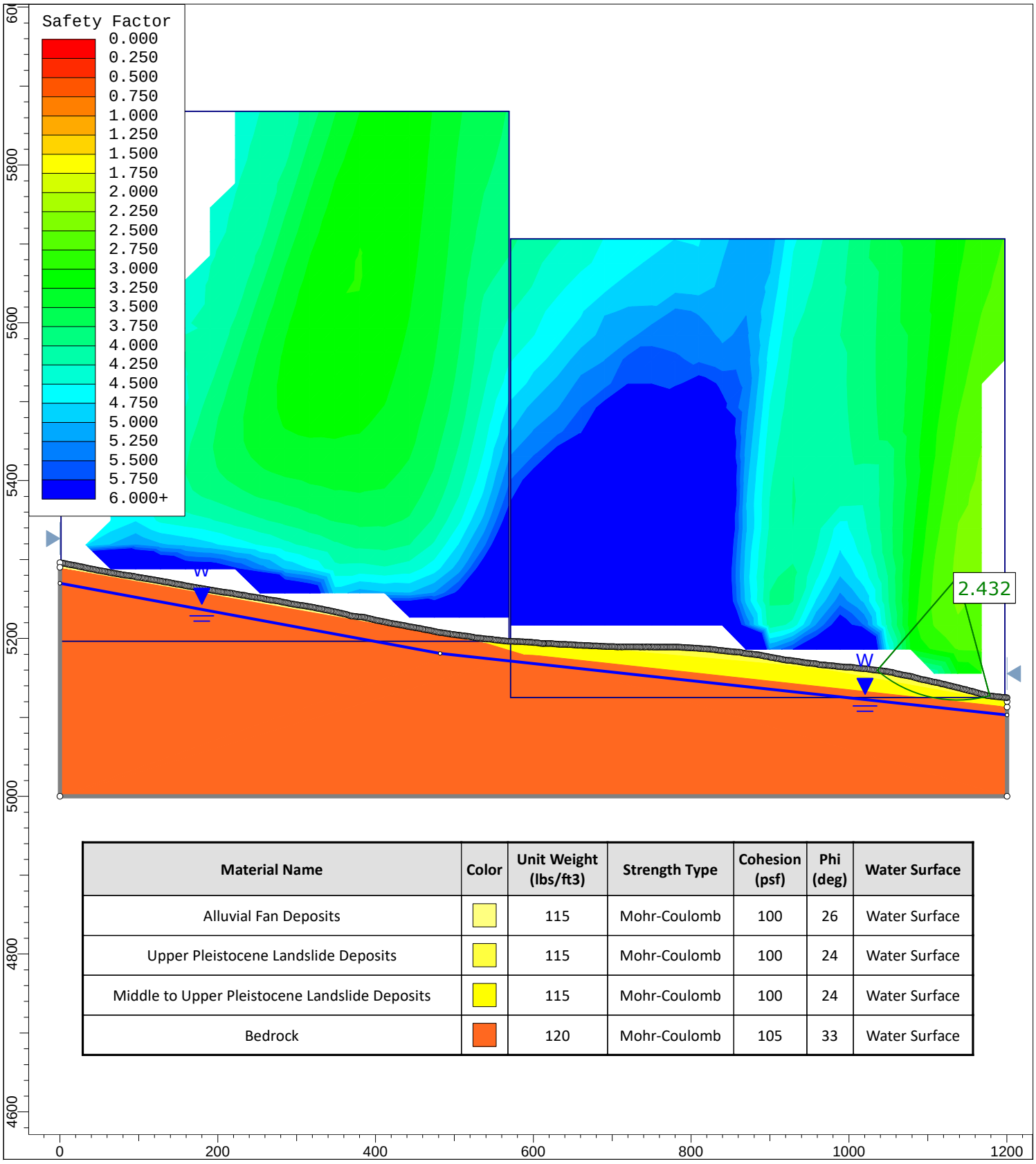
Lewis Homes
Cobabe Ranch Development
Eden, Utah
133-015

Plate
55



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Alluvial Fan Deposits		115	Mohr-Coulomb	100	26	Water Surface
Upper Pleistocene Landslide Deposits		115	Mohr-Coulomb	100	24	Water Surface
Middle to Upper Pleistocene Landslide Deposits		115	Mohr-Coulomb	100	24	Water Surface
Bedrock		120	Mohr-Coulomb	105	33	Water Surface

Profile B - Static

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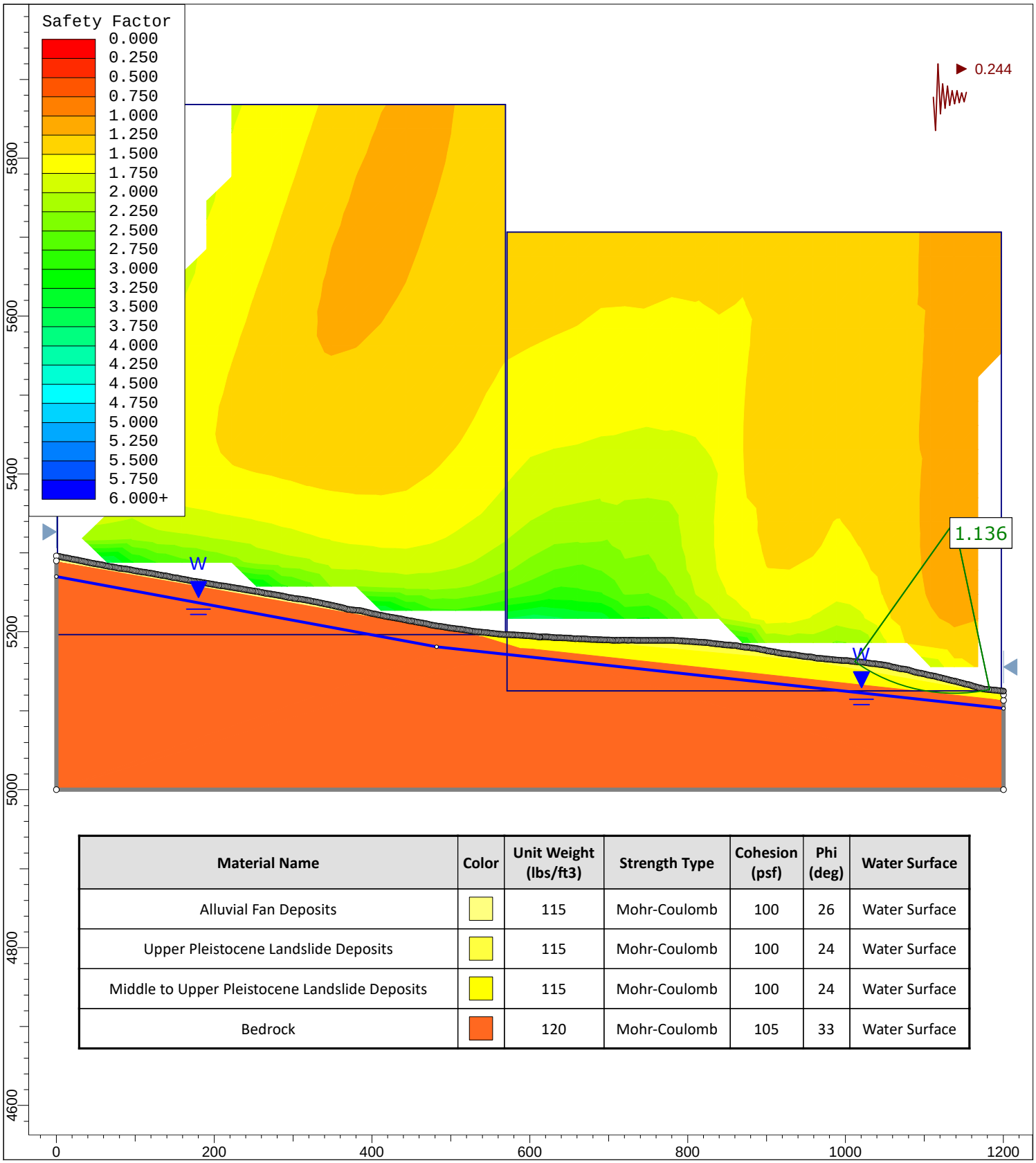
Lewis Homes
Cobabe Ranch Development
Eden, Utah
133-015

Plate
56



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface
Alluvial Fan Deposits		115	Mohr-Coulomb	100	26	Water Surface
Upper Pleistocene Landslide Deposits		115	Mohr-Coulomb	100	24	Water Surface
Middle to Upper Pleistocene Landslide Deposits		115	Mohr-Coulomb	100	24	Water Surface
Bedrock		120	Mohr-Coulomb	105	33	Water Surface

Profile B - Pseudo Static

Christensen Geotechnical

Lewis Homes
Cobabe Ranch Development
Eden, Utah
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Plate
57