Geotechnical Investigation
Smart Fields Property
Ogden, Utah

September 27, 2021

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Geotechnical Investigation
Smart Fields Property
Approximately 1700 South 4300 West
Ogden, Utah
CG Project No.: 145-013

Prepared by:

9/27/21
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September 27, 2021

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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation that was performed for the Smart Fields property which is located at Approximately 1700 South 4300 West in Ogden, 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.

The work performed for this report was authorized by Mr. Pat Burns and was conducted in accordance with the Christensen Geotechnical proposal dated August 25, 2021.

1.2 PROJECT DESCRIPTION

Based on a site plan by Great Basin Engineering and conversations with our client, we understand that the proposed development at the site is to consist of a 29-lot residential subdivision approximately 28 acres in size. The proposed structures within the development are to consist of single-family residences that are one to two stories in height with slab-on-grade floors at or near existing grades. The development will also include associated roadways, utilities, and landscaping. The structural loads for the proposed residences are anticipated to be on the order of 3 to 4 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

2.1.1 Test Pits

The subsurface conditions at the site were explored by excavating seven test pits to depths of approximately 8 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 9. A key to the symbols and terms used on the Test Pit Logs may be found on Plate 10.

The test pit excavations were accomplished with a mini 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.

2.1.2 Percolation Test

As part of our field investigation, two percolation tests were performed at a depth of 1 foot at the locations identified as P-1 and P-1 on Plate 2. The percolation tests were performed in a 4-inch diameter hole which was hand-augered to a depth of 24 inches. The results of the percolation tests indicate that the subsurface soils at the site have an infiltration rates of 11 minutes per inch at P-1 and 16 minutes per inch at P-2.

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 determinations, Atterberg limits evaluations, and gradation analyses. A summary of our laboratory testing is presented in the table below:

Table No. 1: Laboratory Test Results

TEST HOLE NO.	DEPTH (ft.)	NATURAL DRY DENSITY (pcf)	NATURAL MOISTURE (%)	ATTERBERG LIMITS		GRAIN SIZE DISTRIBUTION (%)			SOIL TYPE
				LIQUID LIMIT	PLASTICITY INDEX	GRAVEL (+ #4)	SAND	SILT/ CLAY (-#200)	
TP-1	2		22.5	29	6			80.3	ML
TP-2	3		14.6	NP	NP	0.0	75.4	22.6	SM
TP-3	2		13.3	NP	NP	0.0	54.6	45.4	SM
TP-4	3		20.4	NP	NP			72.0	ML
TP-5	4		28.7	31	9			69.3	CL
TP-6	6		21.3	NP	NP	0.0	87.9	12.1	SM
TP-7	6		30.4	NP	NP	0.0	94.8	5.2	SP-SM

The results of our laboratory tests are also presented on the Test Pit Logs, Plates 3 through 9, and more detailed laboratory results are presented on the laboratory testing plates, Plates 11 and 12.

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 agricultural land. The property was nearly level and was broken into three fields. One of the fields was located east of 4300 West Street, which is to be the location of Phase 1 of the proposed development. This field was cultivated with alfalfa. The other two fields were located West of 4300 West Street, which is to be the location of Phase 2. These fields had been plowed and appeared to have been used to raise onions and corn. The site was bordered by agricultural land with a few houses to the south.

3.2 SUBSURFACE CONDITIONS

3.2.1 Soils

Based on the seven test pits that were completed for this investigation, soils at the site generally consist of ½ to 1½ feet of topsoil overlying zones of Silty SAND (SM) and SILT with sand (ML) with occasional layers of Lean CLAY (CL) and Lean CLAY with sand (CL).

3.2.2 Groundwater

Groundwater was encountered within each of our test pits at depths of 4 to 5 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. Due to the relatively high groundwater at the site, we recommend that all basements and subgrade walls incorporate a foundation drain.

4.0 GEOLOGIC CONDITIONS

4.1 SURFACE GEOLOGY

The subject site is located within a large valley basin in Ogden, Utah. Geologic mapping of this area indicates that the near-surface geology of the subject site consists of early Holocene-aged deltaic deposits. These deposits generally consist of muddy to sandy fines which are thought to be less than 10 feet thick (Sack, 2005).

4.2 FAULTING

Based upon published data, no active faults are known to traverse the site. The nearest known active fault is the Weber Segment of the Wasatch Fault, which lies approximately 7.2 miles east of the subject property (UGS).

4.3 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: 41.23735^{o} N -112.08351^{o} W	
Name	**Response Spectral Value**
S_S	**1.15**
S_1	**0.41**
S_{MS}	**1.38**
S_{M1}	**See ASCE Section 11.4.8**
S_{DS}	**0.92**
S_{D1}	**See ASCE Section 11.4.8**
PGA	**0.506**
PGA_M	**0.607**

4.4 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.

A review of the “Liquefaction-Potential Map for a Part of Weber County, Utah” (Anderson, 1994), indicates that the subject site is located in an area designated as having a high potential for liquefaction. A high potential for liquefaction indicates that there is a 50 percent probability of liquefaction at this site within a 100-year period. 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 and flatwork concrete 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 ½ to 1 ½ 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 high groundwater 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 structural fill may consist of the native clay, silt, and sand soils; however, it should be understood that the clay and silt soils 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.

5.3 FOUNDATIONS

The foundations for the planned structures may consist of conventional continuous and/or spread footings established either on undisturbed native soil or on properly placed and compacted structural fill which extends down to undisturbed native soil. The footings for the proposed structure 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 soils or on structural fill may be proportioned for a maximum net allowable bearing capacity of 1,500 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	Case	Lateral Pressure Coefficient	Equivalent Fluid Pressure (pcf)
Active	Static	0.33	38
	Seismic	1.00	115
At-Rest (Rankine)	Static	0.50	58
	Seismic	1.09	126
Passive (Rankine)	Static	3.00	345
	Seismic	2.51	288

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 0.38 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

Concrete slabs-on-grade should 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.

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 high groundwater at 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 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 5 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 500 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 10 inches of untreated base. As an alternative, a pavement section of 3 inches of asphalt, 6 inches of untreated base, and 6 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 Ogden City 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

Anderson, L.R., Keaton, J.R. and Bay, J.R., 1994, "Liquefaction-Potential Map for a Part of Weber County Utah," Utah Geological Survey, Public Information Series 27.

Sack, Dorothy, 2005, "Geologic Map of the Roy 7.5' Quadrangle, Weber and Davis Counties, Utah," Utah Geological Survey, Miscellaneous Publication MP-05-03.

UGS, Utah Quaternary Fault and Fold Database, interactive web-based map.

Base Photo: Utah AGRC

Drawing Not to Scale

☐ **Approximate Project Boundary**

N

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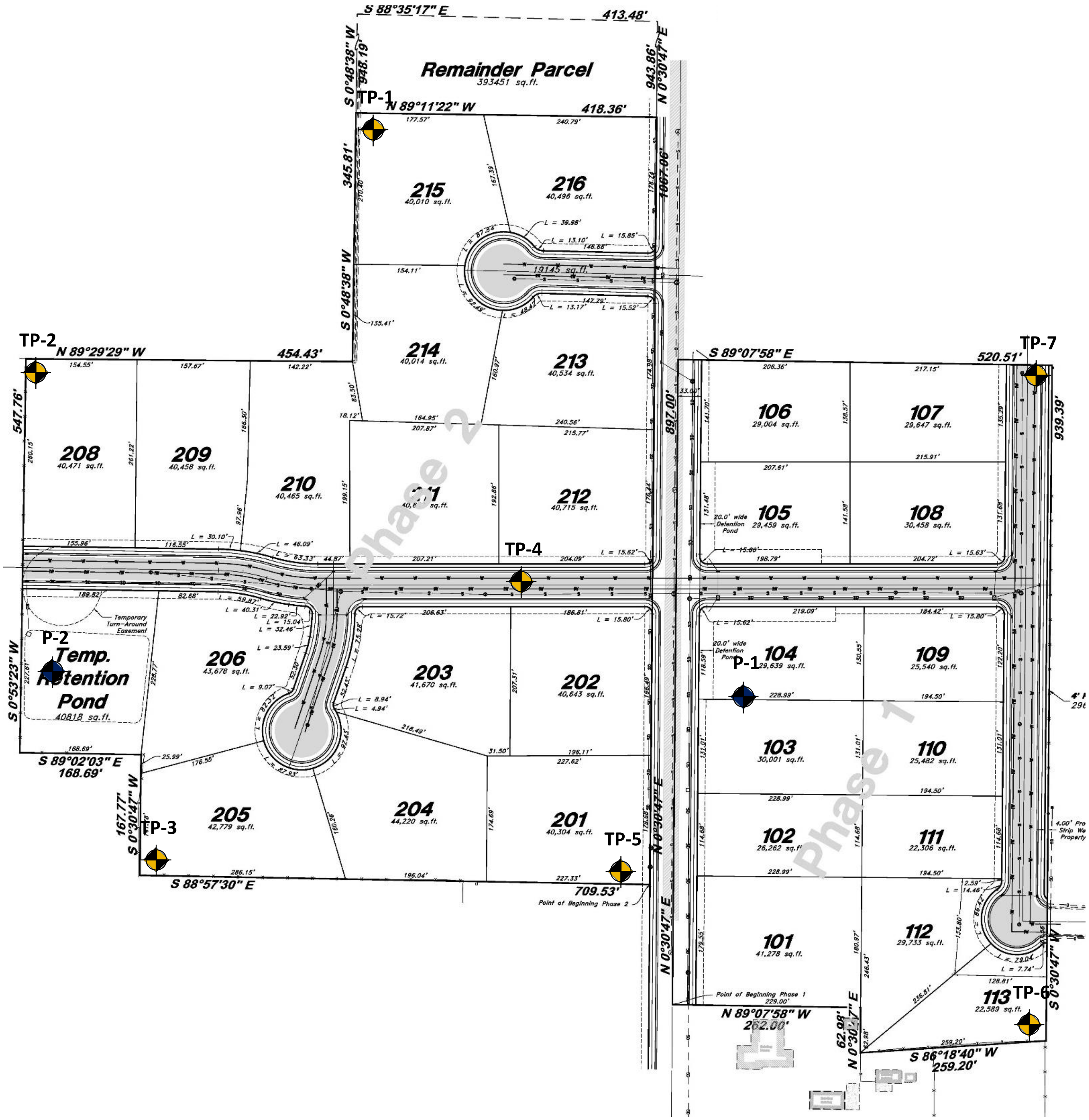
Ogden, Utah
Project No. 145-013

Vicinity Map

Plate
1



Base Map: Great Basin Engineering

Drawing Not to Scale

- **Approximate Test Pit Location**
- **Approximate Percolation Test Location**

N

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Exploration Location Map

Plate
2

Date		
	Started:	9/8/2021
	Completed:	9/8/2021
	Backfilled:	9/8/2021

TEST PIT LOG

Logged By: M Christensen
Equipment: Mini Trackhoe
Location: See Plate 2

Test Pit No.

TP-1

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; Silty SAND - moist, dark brown					
	▥	▼	▥	ML	SILT with sand - stiff, moist, brown		22.5	80.3	29	6
5	☒		░	SM	Silty SAND - medium dense, wet, brown					
10 15					Bottom of test pit at 8 feet					

☒ Bulk/Bag Sample
▥ Undisturbed Sample

▼ StabIlized Groundwater
▽ Groundwater At Time of Excavation

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Plate

3

Date		
Started:	9/8/2021	
Completed:	9/8/2021	
Backfilled:	9/8/2021	

TEST PIT LOG

Logged By: M Christensen
Equipment: Mini Trackhoe
Location: See Plate 2

Test Pit No.

TP-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; Silty SAND - moist, dark brown					
	☒			SM	Silty SAND - medium dense, moist, brown		14.6	22.6	NP	NP
5	▥	▽		ML	SILT with sand - stiff, wet, brown					
				SM	Silty SAND - medium dense, wet, brown					
					Bottom of test pit at 8 feet					
10										
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample

▼ StabIlized Groundwater
▽ Groundwater At Time of Excavation

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Plate

4

Date		
Started:	9/8/2021	
Completed:	9/8/2021	
Backfilled:	9/8/2021	

TEST PIT LOG

Logged By: M Christensen
Equipment: Mini Trackhoe
Location: See Plate 2

Test Pit No.

TP-3

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; Silty SAND - moist, dark brown - moist below 1 foot					
	☒	▼	░	SM	Silty SAND - medium dense, moist, brown - wet and light brown below 4 feet					
5	▥		▨	CL	Sandy Lean CLAY - stiff, wet, light brown					
			░	SM	Silty SAND - medium dense, wet, brown					
					Bottom of test pit at 8 feet					
10										
15										

☒ Bulk/Bag Sample
▥ Undisturbed Sample

▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Plate

5

Date		
Started:	9/8/2021	
Completed:	9/8/2021	
Backfilled:	9/8/2021	

TEST PIT LOG

Logged By: M Christensen
Equipment: Mini Trackhoe
Location: See Plate 2

Test Pit No.

TP-4

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; Silty SAND - moist, dark brown - moist below 1 foot					
5	▥	⩡	▥		SILT with sand - stiff, moist, light brown - wet below 5 feet		20.4	72.0	NP	NP
	☒		░		Silty SAND - medium dense, wet, brown					
10 15					Bottom of test pit at 8 feet					

☒ Bulk/Bag Sample
▥ Undisturbed Sample

⯆ StabIlized Groundwater
⩡ Groundwater At Time of Excavation

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Plate

6

Date		
	Started:	9/8/2021
	Completed:	9/8/2021
	Backfilled:	9/8/2021

TEST PIT LOG

Logged By: M Christensen
Equipment: Mini Trackhoe
Location: See Plate 2

Test Pit No.

TP-5

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; Silty SAND - moist, dark brown					
	☒		░	SM	Silty SAND - medium dense, moist, brown					
5	▥	▽	▨	CL	Sandy Lean CLAY - stiff, moist, brown		28.7	69.3	31	9
			░	SM	Silty SAND - medium dense, wet, brown, with clay seams					
10 15					Bottom of test pit at 8 feet					

☒ Bulk/Bag Sample
▥ Undisturbed Sample

▼ Stabllized Groundwater
▽ Groundwater At Time of Excavation

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Plate

7

Date		
Started:	9/8/2021	
Completed:	9/8/2021	
Backfilled:	9/8/2021	

TEST PIT LOG

Logged By: M Christensen
Equipment: Mini Trackhoe
Location: See Plate 2

Test Pit No.

TP-6

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; Silty SAND - moist, dark brown					
	☒		░	SM	Silty SAND - medium dense, moist, brown					
5	▥	▽	▥	ML	SILT with sand - stiff, moist, brown - wet below 5 feet					
	☒		░	SM	Silty SAND - medium dense, wet, brown		23.1	12.1	NP	NP
10 15					Bottom of test pit at 8 feet					

☒ Bulk/Bag Sample
▥ Undisturbed Sample

▼ StabIlized Groundwater
▽ Groundwater At Time of Excavation

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Lync Construction
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Date		
Started:	9/8/2021	
Completed:	9/8/2021	
Backfilled:	9/8/2021	

TEST PIT LOG

Logged By: M Christensen
Equipment: Mini Trackhoe
Location: See Plate 2

Test Pit No.

TP-7

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; Silty SAND - moist, dark brown					
	☒		▨	CL	Lean CLAY - stiff, moist, light brown					
5	▥	▼	▨	CL	Sandy Lean CLAY - stoff, moist, brown - wet below 5 feet					
	☒		░	SP-SM	Poorly Graded SAND with silt - medium dense, wet, brown		30.4	5.2	NP	NP
10 15					Bottom of test pit at 8 feet					

☒ Bulk/Bag Sample
▥ Undisturbed Sample

▼ StabIlized Groundwater
▽ Groundwater At Time of Excavation

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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
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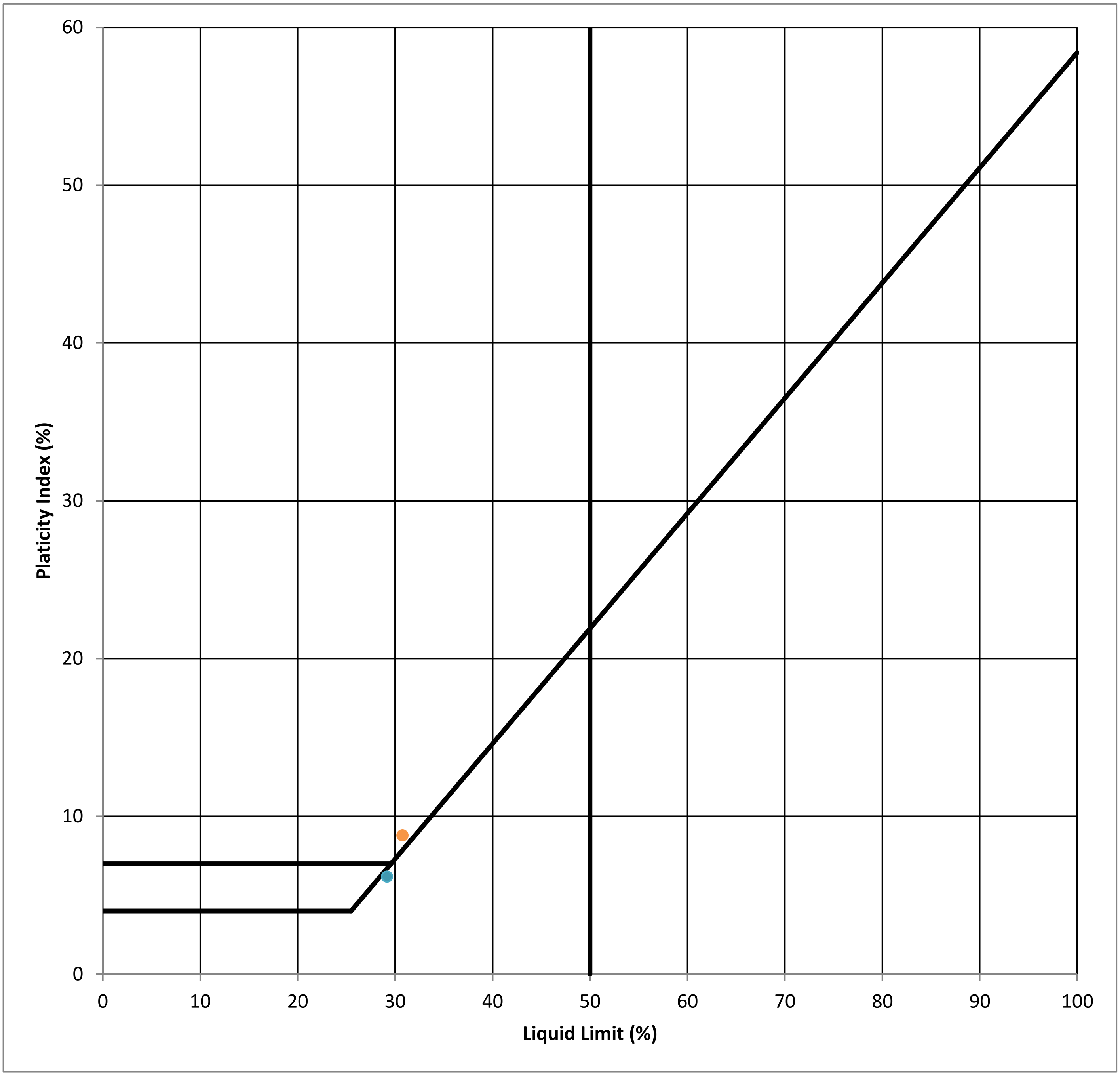
Atterberg Limits



Location	Depth (ft)		Classification	Liquid Limit	PI
TP-1	2	●	SILT with sand	29	6
TP-5	4	●	Sandy Lean CLAY	31	9

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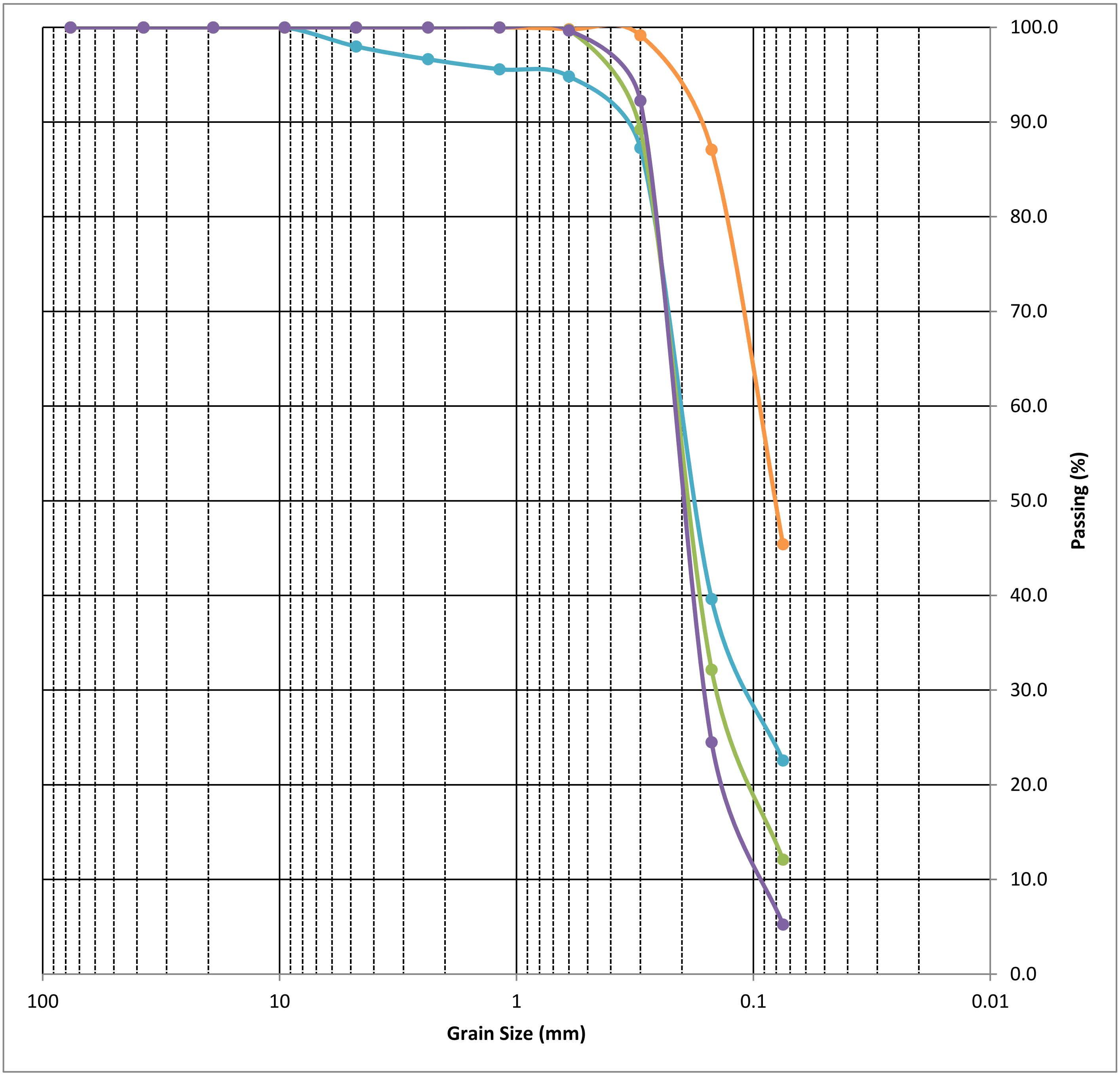
Grain Size Distribution



Location	Depth		Classification	% Gravel	% Sand	% Silt and Clay
TP-2	3	●	Silty SAND	2.0	75.4	22.6
TP-3	2	●	Silty SAND	0.0	54.6	45.4
TP-6	6	●	Silty SAND	0.0	87.9	12.1
TP-7	6	●	Poorly Graded SAND with silt	0.0	94.8	5.2

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