Geotechnical Engineering Study

Sunset Equestrian – Cluster Subdivision
About 4300 West 2200 South
Taylor, Weber County, Utah

PREPARED FOR:

Saddleback Development, LLC
1294 Santa Anita Drive
Kaysville, Utah 84037

PREPARED BY:

CMT Engineering Laboratories

CMT Project No. 10094

August 9, 2017

August 7, 2017

Mr. Chris Haertel
Saddleback Development, LLC
1294 Santa Anita Drive
Kaysville, Utah 84037

Subject: Geotechnical Engineering Study
Proposed Sunset Equestrian – Cluster Subdivision
About 4300 West 2200 South
Taylor, Weber County, Utah
CMT Project Number 10094

Mr. Haertel:

Submitted herewith is the report of our geotechnical engineering study for the subject site. This report contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics. It also contains recommendations to aid in the design and construction of the earth related phases of this project.

On July 19, 2017, a CMT Engineering Laboratories (CMT) engineer was on-site and supervised the excavation of 25 test pits extending to depths of approximately 10.5 to 13.0 feet below the existing ground surface. Soil samples were obtained during the field operations and subsequently transported to our laboratory for further testing. Static groundwater was measured 14 days following test pit excavation.

This report contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics. Based on the findings of the subsurface exploration, conventional spread and continuous footings may be utilized to support the proposed structures, provided the recommendations in this report are followed. A detailed discussion of our findings and earth related design and construction criteria is presented in this report.

We appreciate the opportunity to work with you on this project. CMT offers a full range of Geotechnical Engineering, Geological, Material Testing, Special Inspection services, and Phase I and II Environmental Site Assessments. With 4 offices throughout Northern Utah, and in Arizona, our staff is capable of efficiently serving your project needs. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 870-6730. To schedule materials testing please call (801) 908-5859.

Sincerely,
CMT Engineering Laboratories

Andrew M. Harris, P.E.
Senior Geotechnical Engineer

LICENSED PROFESSIONAL ENGINEER
ANDREW MICHAEL HARRIS
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CMT ENGINEERING LABORATORIES

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1.0 INTRODUCTION

1.1 General

CMT Engineering Laboratories (CMT) was retained by Saddleback Development, LLC to conduct a geotechnical study for the roughly 130.78-acre single-family residential development located at about 4300 West 2200 South in Taylor, Weber County, Utah. (See **Figures 1 and 2** in the Appendix).

1.2 Objectives and Scope

The objectives and scope of our study were planned in discussions among Mr. Chris Haertel with Saddleback Development, LLC, Mr. Chris Cave of Reeve and Associates, and Mr. Andrew Harris of CMT Engineering Laboratories (CMT).

In general, the objectives of this study were to:

1. Define and evaluate the subsurface soil and groundwater conditions across the site.

2. Provide appropriate foundation, earthwork, and pavement recommendations and geoseismic information to be utilized in the design and construction of the proposed development.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the excavating, logging, and sampling of 25 test pits.

2. A laboratory testing program.

3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 Authorization

Authorization was provided by returning a signed copy of our Proposal dated July 11, 2017.

2.0 EXECUTIVE SUMMARY

Our analysis indicates that the proposed structures may be supported upon conventional spread and continuous wall foundations established upon suitable natural soils and/or structural fill extending to suitable natural soils.

The most significant geotechnical aspects of the site are:

1 The relatively high groundwater levels;
2 Disturbed loose soil generally within the upper 6 to 12 inches and;
3 The existing structures to be removed.

Static groundwater was measured across the site between 3.6 to 7.6 feet below the existing ground surface. The shallow groundwater encountered at the site will affect the installation of utilities, foundations and any sublevel construction. It is recommended that the top of the lowest habitable slab be kept a minimum of 3.0 feet above the measured groundwater level. If a land drain is constructed within the development, the top of slabs within the lowest habitable level are recommended to be at least 1.5 feet above the level controlled by individual foundation subdrains tied into land drains within the development.

The upper 6 to 12 inches in general were loose/disturbed with the top 4 inches containing major roots/topsoil. CMT must verify that all topsoil, disturbed, or unsuitable soils have been removed and or properly prepared and that suitable soils have been encountered prior to placing site grading fills, footings, slabs, and pavements.

The on-site sand soils, may be re-utilized as structural site grading fills if they meet the requirements for such, and can be adequately re-compacted as stated herein. However, it must be noted that where the groundwater is shallow, the natural soils near or within the groundwater depths will be saturated and must be dried out to near optimum in order to adequately recompact. From a handling and compaction standpoint, drying and recompacting of these soils will be very difficult, if not impossible, during wet and cold periods of the year.

As part of the site preparations there are some existing out buildings at the northeast corner of the site that will likely be demolished and removed.

In the following sections, detailed discussions pertaining to site description and geoseismic setting, earthwork, foundations, lateral resistance, lateral pressure, floor slabs, and pavements are provided.

3.0 DESCRIPTION OF PROPOSED CONSTRUCTION

The project will consist of subdividing 130.78-acres to construct a 124-lot single-family residential subdivision with associated roadways and utilities to service the proposed residences. 59.84-acres of open space will also be encompassed within the development. Construction will likely consist of 1 to 2 wood-framed levels above grade founded on spread footings with slab on grade floors, suspended floors with crawlspaces, or full to partial depth concrete basements, as conditions permit. Projected maximum column and wall loads are on the order of 10 to 25 kips and 1 to 3 kips per lineal foot, respectively.

New residential roadways will be part of the development. It is anticipated that the residential streets will be constructed of asphalt pavement with relatively light projected traffic that includes primarily passenger vehicles, daily delivery trucks, and an occasional semi-tractor/trailer combination.

Site development will require a moderate amount of earthwork in the form of site grading. We recommend that site grading cuts be minimized to that required to remove vegetation, topsoil, disturbed soils and other unsuitable soils due to relatively shallow groundwater. Site grading fills to achieve design grades may be on the order of 2 to 3 feet. Larger cuts and fills may be required in isolated areas. Fills larger than about 6 feet must be identified and CMT informed to review settlements.

4.0 FIELD EXPLORATION AND SITE CONDITIONS

4.1 Field Exploration

The subsurface soil conditions were explored by excavating 25 test pits across the site at the approximate locations shown on **Figure 2** in the Appendix. The test pits extended to depths of approximately 10.5 to 13.0 feet below the existing ground surface. During the course of the excavating operations, a continuous log of the subsurface conditions encountered was

maintained. In addition, samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. Representative soil samples were placed in sealed plastic bags and containers prior to transport to the laboratory. A 2.42-inch inside diameter thin-wall drive sampler was also utilized in the subsurface sampling at the site. The soils were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on **Figures 3 through 27, Test Pit Log**. In addition, a Key to Symbols defining the terms and symbols used on the logs, is provided as **Figure 28** in the Appendix.

Following completion of the excavating and logging of each test pit, a slotted PVC pipe was installed for future static groundwater measurements and the test pits were subsequently backfilled. The backfill was not placed in uniform lifts and compacted to a specific density and therefore must be considered as non-engineered backfill. Settlement of the backfill with time is likely to occur.

4.2 General Geology

The subject site is located in the west-central portion of Weber County in north-central Utah. The site sits at an elevation of between approximately 4,230 and 4,250 feet above sea level. The site is located in a valley bound by the Wasatch Mountains on the east and Antelope Island (Great Salt Lake) and the Promontory Mountains to the west. The Valley is a deep, sediment-filled basin that is part of the Basin and Range Physiographic Province. The valley was formed by extensional tectonic processes during the Tertiary and Quaternary geologic time periods. The Valley is located within the Intermountain Seismic Belt, a zone of ongoing tectonism and seismic activity extending from southwestern Montana to southwestern Utah. The active (evidence of movement in the last 10,000 years) Wasatch Fault Zone is part of the Intermountain Seismic Belt and extends from southeastern Idaho to central Utah along the western base of the Wasatch Mountain Range.

Much of northwestern Utah, including the valley in which the subject site is located, was also previously covered by the Pleistocene age Lake Bonneville. The Great Salt Lake, located along the western margin of the valley and beyond, is a remnant of this ancient fresh water lake. Lake Bonneville reached a high-stand elevation of approximately 5,092 feet above sea level at between 18,500 and 17,400 years ago. Approximately 17,400 years ago, the lake breached its basin in southeastern Idaho and dropped relatively fast, by almost 300 feet, as water drained into the Snake River. Following this catastrophic release, the lake level continued to drop slowly over time, primarily driven by drier climatic conditions, until

reaching the current level of the Great Salt Lake. Shoreline terraces formed at the high-stand elevation of the lake and several subsequent lower lake levels are visible in places on the mountain slopes surrounding the valley. Much of the sediment within the Valley was deposited as lacustrine sediments during both the transgressive (rise) and regressive (fall) phases of Lake Bonneville.

The geology of the USGS Roy, Utah 7.5 Minute Quadrangle, that includes the location of the subject site, has been mapped by Sack[1]. The surficial geology over the majority of the subject site and adjacent properties is mapped as "Early Holocene fine-grained deltaic deposits" (Map Unit Qd_2) dated to be early Holocene. On the eastern and south-central portions of the site the surficial geology is mapped as "Marsh Deposits" (Map Unit Qsm) dated to be Holocene to uppermost Pleistocene. On the southeastern portion of the site the geology is mapped as "Alluvial-fan deposits" (Map Unit Qaf) dated to be Holocene to upper Pleistocene. No fill has been mapped at the location of the site on the geologic map, however, localized areas of fill or disturbed soil may be present.

The referenced geologic map describes Unit Qd_2 as "Muddy to sandy fines deposited between about 9.7 and 9.4 ka. Estimated thickness 10 to 20 feet (3-6 m)." Unit Qsm is described in the referenced mapping as "Wet, fine-grained, organic-rich sediments in association with springs, ponds, and seeps. Deposited from about 12.1 ka to present. Thickness probably less than 5 feet (1.5 m)." Unit Qaf is described as "Predominantly sandy fine-grained sediment deposited from about 13.2 ka to present. Thickness probably less than 10 feet (3 m)."

No active surface fault traces are shown on the referenced geologic map crossing or projecting toward the subject site. No landslide deposits or features, including lateral spread deposits, are mapped on or adjacent to the site. The site is not located within a known or mapped potential debris flow, stream flooding, or rock fall hazard area.

[1]Sack, D., 2005, Geologic Map of the Roy 7.5' Quadrangle, Weber and Davis Counties, Utah; Utah Geological Survey Miscellaneous Publication, Map MP-05-03, Scale 1:24,000.

4.3 Site Surface Conditions

The site is irregular in shape and consists primarily of agricultural land with associated out-buildings located at the northeast portion of the property. Surface vegetation consists of primarily grasses with some trees and brush. Based on readily available aerial photos on the internet extending back to 1997 the site has had very little change within that time period. Between 1997 and 2002, a single-family residential structure located along the western boundary of the site had been demolished. The site slopes gently to the southwest with a change in elevation of about 10 feet across the property. The subject property is bordered to the north by single-family residential structures and 1800 South Street, to the east by agricultural land, to the south by single-family residential structures and 2200 South Street, and to the west by single-family residential structures and 4300 West Street.

4.4 Subsurface Soil

The subsurface soil conditions encountered within the test pits completed across the site were relatively similar. At the majority of the test pits, disturbed soils about 6 to 12 inches thick were encountered at the surface with the upper 4 to 6 inches containing major roots/topsoil. At test pits TP-10 and TP-11, surficial non-engineered fill material consisting of silty sand was observed extending to about 1.5 to 4.0 feet below existing site grades. Below the topsoil/disturbed surface soil and non-engineered fills, natural soils encountered consisted primarily of fine sand with varying silt content, silty to sandy clay, and occasional mixtures of these soils. The sand soils were generally loose to medium dense, moist to saturated, and were brown to gray in color. The silty clay soils were generally medium stiff to very stiff, moist to saturated, and gray to brown in color.

For a more detailed description of the subsurface soil conditions, please refer to Figures 3 through 27, Test Pit Logs. The lines designating the interface between soil types on the test pit logs generally represent approximate boundaries. In-situ, the transition between soil types may be gradual.

4.5 Groundwater

At the time of the excavation and sampling operations, groundwater was encountered in the test pits at depths ranging between about 3.5 to 10.0 feet below the existing ground surface. Static groundwater was measured on Wednesday, August 2, 2017. The measured water levels are tabulated on the following page:

Test Pit No.	Groundwater Level Below Existing Grade (feet)* July 19, 2017*	Static Groundwater Level Below Existing Grade (feet) August 2, 2017
TP-1	4.0	4.4
TP-2	4.0	Pipe Damaged
TP-3	3.5	3.6
TP-4	5.0	6
TP-5	2.5	3.8
TP-6	4.5	3.9
TP-7	6.0	5.6
TP-8	9.5	6.5
TP-9	10.0	6.4
TP-10	8.0	6.6
TP-11	7.5	4.5
TP-12	4.5	5.3
TP-13	4.5	4.7
TP-14	7.0	5.7
TP-15	8.0	7.6
TP-16	5.5	6.4
TP-17	7.0	5.4
TP-18	4.5	6.1
TP-19	8.0	6.4
TP-20	7.0	7.5
TP-21	4.5	Pipe Damaged
TP-22	5.0	Pipe Damaged
TP-23	Not Encountered	Pipe Damaged
TP-24	6.0	Pipe Damaged
TP-25	3.0	Pipe Damaged

* During Test Pit Excavation-Not Stabilized

In general, seasonal and longer-term groundwater fluctuations of 1 to 2 feet should be anticipated with the exclusion of site irrigation. The highest seasonal levels will generally occur during the late spring and summer months. The contractor should must be prepared to dewater excavations as needed. Numerous other factors such as heavy precipitation, irrigation of this and neighboring land, and other unforeseen factors, may also influence ground water elevations at the site. The detailed evaluation of these and other factors, which may be responsible for ground water fluctuations, is beyond the scope of this study.

4.6 Site Subsurface Variations

Based on the results of the subsurface explorations and our experience, variations in the continuity and nature of subsurface conditions should be anticipated. Due to the heterogeneous characteristics of natural soils, care should be taken in interpolating or extrapolating subsurface conditions beyond the exploratory locations. Seasonal fluctuations in ground water conditions may also occur.

In addition, once the subsurface explorations were completed the test pits were backfilled with the excavated soils but little effort was made to compact these soils. Settlement of the backfill in the test pits over time should be anticipated and caution should be exercised when constructing over these locations.

4.7 Design Groundwater

Relatively shallow static groundwater was measured following excavations for this project. As a result, further measures may be required to control groundwater levels within the development if sublevels/basements are desired, such as the construction of a land drain system throughout the development. If a land drain is not constructed within the development, then habitable basement floor slab embedment should be kept a minimum of 3.0 feet above measured static groundwater levels indicated above in Section 4.5, Groundwater.

4.8 Seismic Setting

4.8.1 General

Utah municipalities have adopted the International Building Code (IBC) 2015. The IBC 2015 code determines the seismic hazard for a site based upon 2008 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

4.8.2 Faulting

Based upon our review of available literature, no active faults are known to pass through the site. The nearest mapped active fault is the Weber section of the Wasatch Fault located about 7.6 miles to the east.

4.8.3 Soil Class

For dynamic structural analysis, the Site Class D – Stiff Soil Profile as defined in Chapter 20 of ASCE 7 (per Section 1613.3.2, Site Class Definitions, of IBC 2015) can be utilized based on subsurface soil conditions encountered within the depths penetrated.

4.8.4 Ground Motions

The 2008 USGS mapping provides values of short and long period accelerations for the Site Class B boundary for the Maximum Considered Earthquake (MCE). This Site Class B boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for the MCE event and incorporates the appropriate soil amplification factor for a Site Class D soil profile. Based on the site latitude and longitude (41.231151 degrees north and 112.078093 degrees west, respectively), the values for this site are tabulated below.

Spectral Acceleration Value, T	Site Class B Boundary [mapped values] (% g)	Site Coefficient	Site Class D [adjusted for site class effects] (% g)	Design Values (% g)
Peak Ground Acceleration	49.0	F_a = 1.010	49.4	32.9
0.2 Seconds (Short Period Acceleration)	S_S = 122.4	F_a = 1.010	S_{MS} = 123.6	S_{DS} = 82.4
1.0 Second (Long Period Acceleration)	S_1 = 40.9	F_v = 1.591	S_{M1} = 65.1	S_{D1} = 43.4

4.8.5 Liquefaction

The site is located in an area that has been identified by the Utah Earthquake Preparedness Information Center Utah Division of Comprehensive Emergency Management for Weber County as having "high" liquefaction potential. Liquefaction is defined as the condition when saturated, loose, granular soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, generally will not liquefy during a major seismic event.

A liquefaction study was not completed as part of this study and would require drilling with Standard Penetration Test sampling (SPT) to a minimum depth of 30 feet below the ground surface and/or Cone Penetrometer Testing (CPT) in order to evaluate the saturated sand soils.

5.0 LABORATORY TESTING

5.1 Laboratory Examination

In order to provide data necessary for our engineering analyses, a laboratory testing program was completed. The program included; moisture, density, and partial gradation. The following paragraphs describe the tests and summarize the test data.

5.1.1 Moisture and Density Tests

To aid in classifying the soils and to help correlate other test data, moisture and density tests were performed on selected samples. The results of these tests are presented on the test pit logs, Figures 3 through 27.

5.1.2 Partial Gradation Tests

To aid in classifying the soils at the site, partial gradation tests were performed. Results of the tests are tabulated below:

Test Pit No.	Depth (feet)	% Moisture	Percent Passing No. 200 Sieve	Soil Classification
TP-1	2.5	19	10	SP-SM
TP-5	2.5	19	29	SM
TP-12	10	28	15	SM
TP-25	7	23	75	CL

5.1.3 Atterberg Limits Test

To aid in classifying the soils, Atterberg limit tests were performed on samples of the fine-grained soils. Results of the tests are tabulated below:

Test Pit No.	Depth (feet)	Liquid Limit (percent)	Plastic Limit (percent)	Plasticity Index (percent)	Soil Classification
TP-4	4.5	35	18	17	CL
TP-11	3.0	29	18	11	CL
TP-19	3.0	36	20	16	CL
TP-25	7.0	25	17	8	CL

5.1.4 One-Dimensional Consolidation Tests

To provide data necessary for our settlement analysis, 6 consolidation tests were performed on each of 6 representative samples of the fine grained natural silt/clay soils encountered. The results of the tests indicate that the samples tested were moderately over-consolidated and will exhibit moderate strength and compressibility characteristics under the anticipated loading range. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

6.0 SITE PREPARATION AND GRADING

6.1 Site Preparation

Initial site preparation will consist of the demolition and removal of existing structure(s), flatwork, and associated debris. Additional preparation will consist of the removal of surface vegetation, topsoil, any other deleterious materials, and loose/disturbed surface soils from beneath an area extending out at least 3 feet from the perimeter of the proposed home buildings and 2 feet beyond pavements and exterior flatwork areas.

Further, non-engineered fills and loose/disturbed surface soils must be completely removed below structures. Based on the test pits completed at the site, this may require the removal of up to 1.5 to 4.0 feet of existing fills. Variation in the depth and lateral extent of non-engineered fill material must be anticipated.

In-situ, non-engineered fills may remain below pavements if free of debris and deleterious materials, less than 3 feet in total thickness, no more than about 3 feet of subsequent overlying site grading is planned and if the in-situ fills are properly prepared. Proper preparation will consist of the scarification of the upper 12 inches below asphalt concrete (flexible pavement) The existing fill soils encountered consisted of fine-grained soils which are inherently difficult to adequately moisture prepare and re-compact. These fine-grained soils may become near impossible to re-compact during cold and wet periods of the year. As an alternative, the fills may be removed and replaced with imported granular structural fill over unfrozen, proof-rolled subgrade.

Subsequent to stripping and prior to the placement of structural site grading fill, pavements, floor slabs, or footings, the exposed subgrade shall be proofrolled by running moderate-weight rubber tire-mounted construction equipment uniformly over the surface at least

three times. An exception to this would be where the exposed subgrade is within 2 feet of groundwater. If excessively soft or otherwise unsuitable soils are encountered beneath footings, they must be totally removed and/or stabilized. If removal depth required is more than 2 feet or at groundwater level, CMT must be notified to provide additional recommendations. In pavement, floor slab, and outside flatwork areas, unsuitable natural soils shall be removed to a maximum depth of 2 feet and replaced with compacted granular structural fill.

Due to shallow groundwater conditions, we strongly recommend that land drains (if implemented) as well as major utilities be installed as far in advance as possible prior to roadway and residential construction. Further it is recommended that site grading cuts be kept to the minimum to remove vegetation, topsoil, disturbed soils and any other unsuitable soils. Ideally roadway structural sections would be designed at least two feet above the groundwater level to reduce potential subgrade stabilization needs. The earthwork contractor must be prepared to dewater and likely begin dewatering prior to major excavating.

Surface vegetation and other deleterious materials should generally be removed from the site. Topsoil, although unsuitable for utilization as structural fill, may be stockpiled for subsequent landscaping purposes.

A representative of CMT must verify that suitable natural soils and/or proper preparation of existing soils have been encountered/met prior to placing site grading fills, footings, slabs, and pavements.

6.2 Temporary Excavations

For granular (cohesionless) soils, construction excavations above the water table, not exceeding 4 feet, should be no steeper than one-half horizontal to one vertical (0.5H:1V). For excavations up to 8 feet, in granular soils and above the water table, the slopes should be no steeper than one horizontal to one vertical (1H:1V). Excavations deeper than about 8 feet are not anticipated at the site.

Excavations encountering saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing and dewatering as these soils will tend to flow into the excavation. Where excavations are known to extend below groundwater it is recommended that dewatering begin as far in advance and reasonably possible to help

facilitate the excavation process. Even with dewatering, adjacent saturated clean sand soils may flow into the excavation. Temporary shoring of excavations must be anticipated.

Temporary construction excavations in cohesive soil, not exceeding 4 feet in depth and above or below the groundwater table, may be constructed with near-vertical sideslopes. Temporary excavations up to 8 feet deep in fine-grained cohesive soils, above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical (0.5H:1V).

To reduce disturbance of the natural soils during excavation, it is recommended that smooth edge buckets/blades be utilized.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated. All excavations should be made following OSHA safety guidelines.

6.3 Structural Fill Material

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as imposed by footings, floor slabs, pavements, etc. Structural fill will be required as backfill over foundations and utilities, as site grading fill, and possibly as replacement fill below footings. All structural fill must be free of sod, rubbish, topsoil, frozen soil, and other deleterious materials.

Structural site grading fill is defined as structural fill placed over relatively large open areas to raise the overall grade. For structural site grading fill, the maximum particle size shall not exceed 4 inches; although, occasional larger particles, not exceeding 8 inches in diameter, may be incorporated if placed randomly in a manner such that “honeycombing” does not occur and the desired degree of compaction can be achieved. The maximum particle size within structural fill placed within confined areas shall be restricted to 2 inches.

On-site sand soils, may be re-utilized as structural site grading fill if they meet the requirements of such. However, again as stated previously, with the shallow depth to groundwater, the natural sand soils are likely above optimum moisture content and would therefore require drying prior to recompacting to bring the percent moisture down to near optimum. Further, this may be extremely difficult especially during periods of precipitation or during colder periods of the year.

We recommend imported granular structural fill consist of a fairly well graded mixture of sand and gravel with less than 30 percent fines (clays and silts) and no more than 30 percent retained on the 0.75-inch sieve.

To stabilize soft subgrade conditions (if encountered) or where structural fill is required to be placed closer than 1.0 foot above the water table at the time of construction, a mixture of coarse angular gravels and cobbles and/or 1.5- to 2.0-inch gravel (stabilizing fill) should be utilized. It may also help to utilize a stabilization fabric, such as Mirafi 600X or equivalent, placed on the native ground if 1.5- to 2.0-inch gravel is used as stabilizing fill.

Non-structural site grading fill is defined as all fill material not designated as structural fill and may consist of any cohesive or granular soils not containing excessive amounts of degradable material.

6.4 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, etc.) shall be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proofrolling shall be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proofrolling, they shall be removed to a maximum depth of 2 feet below design finish grade and replaced with structural fill.

Most utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – basically granular soils with limited fines) soils be used as backfill over utilities within public right away. These organizations are also requiring that in public roadways the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) method of compaction.

In private areas, natural soils may be re-utilized as trench backfill over the bedding layer provided that they are properly moisture prepared and compacted to the minimum requirements stated in section 6.5 Fill Placement and Compaction below.

Where the groundwater is shallow the utility installation contractor must be prepared to dewater and consider possible other measure to maintain the required excavation.

6.5 Fill Placement and Compaction

The various types of compaction equipment available have their limitations as to the maximum lift thickness that can be compacted. For example, hand operated equipment is limited to lifts of about 4 inches and most "trench compactors" have a maximum, consistent compaction depth of about 6 inches. Large rollers, depending on soil and moisture conditions can achieve compaction at 8 to 12 inches. The full thickness of each lift should be compacted to at least the following percentages of the maximum dry as determined by the ASTM[2] D-1557(AASHTO[3] T-180) compaction criteria in accordance with the table below:

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending at least 3 feet beyond the perimeter of the structure	0 to 5	95
Site grading fills outside area defined above	0 to 5	90
Site grading fills outside area defined above	5 to 8	95
Utility trenches within structural areas	--	96
Roadbase/Subbase	-	96

Structural fills greater than 8 feet thick are not anticipated at the site. We recommend for best compaction results that the moisture content for structural fill/backfill be within 2 percent of optimum.

Subsequent to stripping and prior to the placement of structural site grading fill, the subgrade shall be prepared as discussed in Section 6.1, Site Preparation, of this report. In confined areas, subgrade preparation should consist of the removal of all loose or disturbed soils.

2 American Society for Testing and Materials
3 American Association of State Highway and Transportation Officials

To stabilize soft soil conditions, coarse angular gravel and cobble mixtures (stabilizing fill) may be utilize and spread to a maximum loose lift thickness of 15 inches, and compacted by dropping a backhoe bucket onto the surface continuously at least twice. As an alternative, the stabilizing fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment at least twice. Subsequent fill material placed over the coarse gravels and cobbles shall be adequately compacted so that the "fines" are "worked into" the voids in the underlying coarser gravels and cobbles. Utilization of a filter fabric, such as Mirafi 600X or equivalent, over soft subgrade may also be advantageous.

Non-structural fill may be placed in lifts not exceeding 12 inches in loose thickness and compacted by passing construction, spreading, or hauling equipment over the surface at least twice.

Field density tests should be performed on each lift as necessary to verify that compaction is being achieved.

7.0 LATERAL EARTH PRESSURES

Buildings may or may not include full depth sublevels. For subgrade levels and retaining walls up to approximately 8 feet, the following discussion is provided. The lateral pressure parameters, as presented within this section, are for backfills which will consist of drained on-site sand soil, placed and compacted in accordance with the recommendations presented herein.

The lateral pressures imposed upon subgrade facilities will, therefore, be basically dependent upon the relative rigidity and movement of the backfilled structure. For active walls, such as retaining walls which can move outward (away from the backfill), backfill may be considered equivalent to a fluid with a density of 40 pounds per cubic foot in computing lateral pressures. For more rigid walls (moderately yielding), backfill may be considered equivalent to a fluid with a density of 50 pounds per cubic foot. For very rigid non-yielding walls, backfill should be considered equivalent to a fluid with a density of at least 60 pounds per cubic foot. The above values assume that the surface of the soils slope behind the wall is horizontal and that the fill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

For seismic loading of retaining/below-grade walls, the following uniform lateral pressures, in pounds per square foot (psf), should be added based on wall depth and wall case.

Uniform Lateral Pressures			
Wall Height (Feet)	**Active Pressure Case (psf)**	**Moderately Yielding Case (psf)**	**At Rest/Non-Yielding Case (psf)**
4	22	49	75
6	34	73	112
8	51	106	162

8.0 FOUNDATION RECOMMENDATIONS

The following recommendations have been developed on the basis of the previously described project characteristics, the subsurface conditions observed in the field, the laboratory test data, as well as common engineering practice.

8.1 Foundation Recommendations

The results of our analyses indicate that the proposed structures may be supported upon conventional spread and/or continuous wall foundations established upon suitable natural soils or granular structural fill extending to suitable natural soils. For design, with respect to the proposed construction and anticipated loading given in Section 3.0, Description of Proposed Construction, the following parameters are recommended:

Minimum Recommended Depth of Embedment for Frost Protection - 30 inches

Minimum Recommended Depth of Embedment for Non-frost Conditions - 15 inches

Recommended Minimum Width for Continuous Wall Footings - 18 inches

Minimum Recommended Width for Isolated Spread

Footings	- 24 inches
Recommended Net Bearing Pressure for Real Load Conditions on Suitable Natural Sand Soil	- 1,500 pounds per square foot
Bearing Pressure Increase for Seismic Loading	- 30 percent

The term "net bearing pressure" refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade. Therefore, the weight of the footing and backfill to lowest adjacent final grade need not be considered. Real loads are defined as the total of all dead plus frequently applied live loads. Total load includes all dead and live loads, including seismic and wind.

8.2 Installation

Under no circumstances shall the footings be established upon non-engineered fills, loose or disturbed soils, topsoil, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. If unsuitable soils are encountered, they must be completely removed and replaced with compacted structural fill.

The width of structural replacement fill below footings should be equal to the width of the footing plus one foot for each foot of fill thickness. For instance, if the footing width is 2 feet and the structural fill depth beneath the footing is 2 feet, the fill replacement width should be 4 feet, centered beneath the footing.

8.3 Estimated Settlement

Foundations designed and constructed in accordance with our recommendations could experience some settlement, but we anticipate that settlement of footings founded as recommended above will be 1 inch or less. We expect approximately 50 percent of initial settlement to take place during construction.

8.4 Lateral Resistance

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.30 should be utilized for natural soils and 0.40 for imported granular structural fills. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 250 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the friction component of the total is divided by 1.5.

9.0 FLOOR SLABS

Floor slabs may be established upon suitable natural soils and/or upon structural fill extending to suitable natural soils. Under no circumstances shall floor slabs be established directly over non-engineered fills, loose or disturbed soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

In order to facilitate curing of the concrete, it is recommended that floor slabs be directly underlain by at least 4 inches of “free-draining” fill, such as “pea” gravel or three-quarters to one-inch minus clean gap-graded gravel.

The tops of all floor slabs in habitable areas must be established at least 3 feet above the measured static water level or a minimum 18 inches above levels controlled by subdrains.

10.0 DRAINAGE RECOMMENDATIONS

10.1 General Drainage Recommendations

It is important to the long term performance of foundations and floor slabs that water not be allowed to collect near the foundation walls and infiltrate into the underlying soils. We recommend the following:

1. All areas around structures should be sloped to provide drainage away from the foundations. Where possible we recommend a minimum slope of 6 inches in the first 10 feet away from the structure.

2. All roof drainage should be collected in rain gutters with downspouts designed to discharge at least 10 feet from the foundation walls or well beyond the backfill limits, whichever is greater.

3. Adequate compaction of the foundation backfill should be provided. We suggest a minimum of 90% of the maximum laboratory density as determined by ASTM D-1557. Water consolidation methods should not be used under any circumstances.

4. Sprinklers should be aimed away and kept at least 4 feet from the foundation walls. The sprinkling systems should be designed with proper drainage and be well-maintained. Over watering should be avoided.

5. Other precautions may become evident during construction.

10.2 Subdrains

10.2.1 General

Groundwater at this site is shallow and variable across the site. If habitable floor slabs are to be placed less than 3.0 feet above measured groundwater then a foundation drain tied to a suitable down gradient land drain or another disposal system must be installed.

10.2.2 Foundation Subdrains

Foundation subdrains shall at a minimum consist of a 4-inch diameter perforated or slotted plastic or PVC pipe enclosed in clean gravel surrounding the home foundation. The invert of the subdrain should be at least 18 inches below the top of the lowest adjacent floor slab. The gravel portion of the drain should extend 2 inches laterally and below the perforated pipe and up to at least 1 foot above the top of the lowest adjacent floor slab. The gravel zone must be installed immediately adjacent to the perimeter footings and the foundation walls. To reduce the possibility of plugging, the gravel with drain pipe must be wrapped with a geotextile, such as Mirafi 140N or equivalent. Above the subdrain, a minimum 12-inch wide zone of “free-draining” sand/gravel should be placed adjacent to the foundation walls and

extend to within 2 feet of final grade and similarly separated from adjacent soils with a geotextile such as Mirafi 140N or equivalent. The upper 1 foot of soils should consist of a compacted low permeable soil where possible to reduce surface water infiltration into the drain. As an alternative to the zone of permeable sand/gravel, a prefabricated "drainage board," such as Miradrain or equivalent, may be placed adjacent to the exterior below-grade walls. Prior to the installation of the footing subdrain, the below-grade walls should be waterproofed. The slope of the subdrain should be at least 0.3 percent. The gravel placed around the drain pipe should be clean 0.75-inch to 1.0-inch minus gap-graded gravel and/or "pea" gravel. The foundation subdrains can be discharged into the area subdrains, storm drains, or other suitable down-gradient location. Further it is recommended that a minimum 8 inches of gravel be placed below the floor slab which is hydraulically tied to the perimeter foundation drain through either drain pipes or a minimum 4-inch gravel layer extending out and below the foundation and connecting to the perimeter drain.

Proper grading shall be completed around the home with a minimum 5 percent drop within the first 10 feet away from the home.

11.0 PAVEMENTS

The natural fine sand soils are anticipated to exhibit poor to fair pavement support when saturated. We anticipate relatively light traffic volumes and that vehicle types will be typical for residential construction, except during the build out phase when heavy trucks will be much more frequent. Our pavement design is based upon an estimated California Bearing Ratio (CBR) of 4 percent for the natural near surface soils and an average daily equivalent single axle load over a 20 year period (ESAL) of 7.0. The sections provided also assume that proper on-going maintenance be completed over the pavement lifetime.

Table 1: Pavement Design (New Residential Streets)

Material	Pavement Section Thickness (in)
Asphalt	**3**
Road-Base	**10**
Total Thickness	**13**
or	
Asphalt	**3**
Road-Base	**6**
Subbase	**8**
Total Thickness	**17**

*Subgrade should be proof-rolled

Prior to placing subbase, the subgrade must be properly prepared as outlined in Section 6.0 Site Preparation and Grading of this report. Subbase shall consist of a granular soil meeting a minimum CBR or 30 percent. Roadbase/Untreated base course (UTBC) should conform to city or 1"-minus UDOT specifications and have a CBR value greater than 70 percent. Asphalt should conform to the standard city or UDOT specification.

The asphalt pavement should be compacted to 96% of the maximum density for the asphalt material. Roadbase and subbase material shall be compacted as outlined in section 6.5 Fill Placement and Compaction of this report.

12.0 QUALITY CONTROL

Our recommendations in this report are based on the assumption that adequate quality control testing and observations will be conducted by CMT during construction to verify compliance. We recommend that CMT be retained as part of a comprehensive quality control testing and observation program to help facilitate implementation of our recommendations and to address any subsurface conditions encountered which vary from those described in this report, potentially saving you time and expense. Without such a program CMT cannot be responsible for application of our recommendations to subsurface conditions which may vary from those described herein. This program may include, but not necessarily be limited to, the following:

12.1 Field Observations

Observations should be completed during all phases of construction such as site preparation, individual home foundation excavations, structural fill placement and concrete placement. Additionally, if a land drain is not installed then static groundwater must be determined for each lot with a test pit prior to beginning foundation excavation.

12.2 Fill Compaction

Compaction testing by CMT is required for all structural supporting fill materials. Maximum Dry Density (Proctor-ASTM 1557) tests should be requested by the contractor immediately after delivery of any granular fill materials. The maximum density information should then be used for field density tests on each lift as necessary to ensure that the required compaction is being achieved.

12.3 Quality Control

All excavation procedures and processes should be observed by a geotechnical engineer from CMT. In addition, all backfill and structural fill placed in trenches and all pavements should be density tested by CMT.

13.0 LIMITATIONS

The recommendations provided herein were developed by evaluating the information obtained from the test pit and site exploration. The test pit data reflects the subsurface conditions only at the specific locations at the particular time designated on the test pit logs. Soil and ground water conditions may differ from conditions encountered at the actual exploration locations. The nature and extent of any variation in the explorations may not become evident until during the course of construction. If variations do appear, it may become necessary to re-evaluate the recommendations of this report after we have observed the variation.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

14.0 CLOSURE

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 870-6730. To schedule materials testing, please call (801) 381-5141.

Appendix

Sunset - Equestrian - Cluster Sub.

About 4300 W 2200 S, Taylor, UT

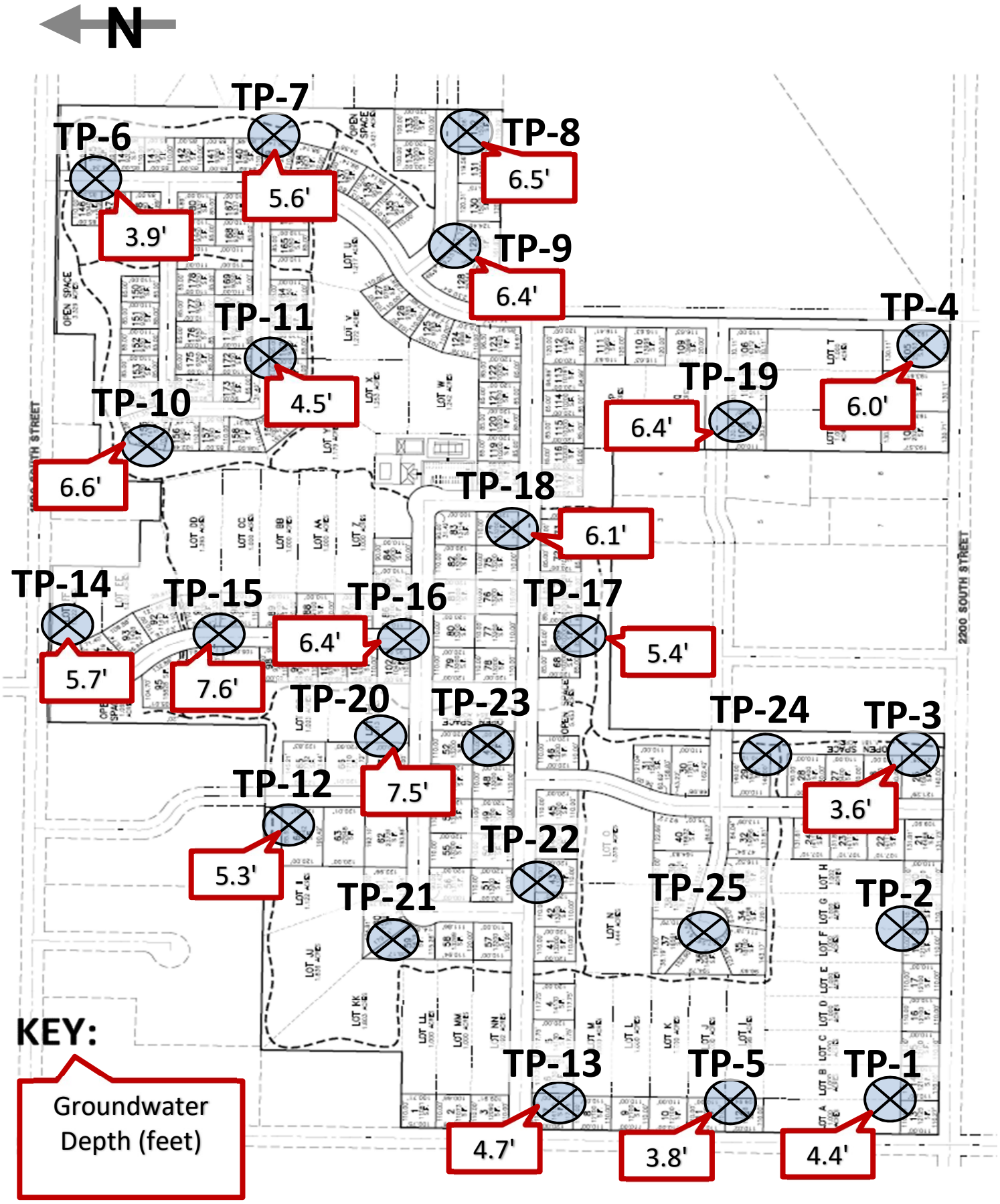
CMT ENGINEERING LABORATORIES

Vicinity Map

Date: 4-Aug-17

Job # 10094

Figure: 1



Sunset - Equestrian - Cluster Sub.

About 4300 W 2200 S, Taylor, UT

CMT ENGINEERING LABORATORIES

Site Map

Date: 4-Aug-17

Job # 10094

Figure: 2

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-1

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 4', 4.4'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		FINE SAND (SP-SM) with some silt; major roots (topsoil) to 4"; brown — loose to 8"										
2		moist, medium dense		1	21	98.1			10			
4		FINE SAND (SP) brown — saturated, medium dense										
5				2								
10		SILTY FINE SAND (SM) brown — saturated, medium dense; grades gray										
12				3								
		End at 12'										

Remarks: Groundwater encountered in test pit at depth of 4 feet and measured on 8/2/17 at depth of 4.4 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

Figure: 3

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-2

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe	Total Depth:	12'	Date: 7/19/17
Surface Elev. (approx):	Water Depth:	4'	Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY FINE SAND (SM) with major roots (topsoil) to 4"; brown — loose to 8"										
2		moist, medium dense		4								
4		FINE SAND (SP) brown — saturated, medium dense										
5				5								
7		SILTY CLAY (CL) with trace fine sand; dark gray / black — saturated, medium stiff										
11				6								
12		End at 12'										

Remarks: Groundwater encountered in test pit at depth of 4 feet.

Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating

Logged By: Hogan Wright

Page: 1 of 1

Figure: 4

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-3

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 3.5', 3.6'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY FINE SAND (SM) loose to 8"										
1		with major roots (topsoil) to 4"; brown										
2		SILTY CLAY (CL) moist										
3		with some fine sand; brown medium stiff		7								
4		saturated										
5												
6												
7				8								
8												
9												
10		grades gray / black										
11												
12		grades brown		9								
13		End at 12.5'										
14												

Remarks: Groundwater encountered in test pit at depth of 3.5 feet and measured on 8/2/17 at depth of 3.6 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
Page: 1 of 1

Figure: 5

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-4

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 5', 6'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY FINE SAND (SM) loose to 8" with major roots (topsoil) to 4"; brown										
1												
2		grades with moderate cementation										
3				10	25.1	99.4						
4		SILTY CLAY (CL) moist with some fine sand; brown medium stiff										
5		saturated										
6		SILTY FINE SAND (SM) saturated gray / brown medium dense		11								
7												
8		SILTY CLAY (CL) saturated with some fine sand; gray medium stiff										
9												
10												
11				12								
12		End at 12'										
13												
14												

Remarks: Groundwater encountered in test pit at depth of 5 feet and measured on 8/2/17 at depth of 6 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
Page: 1 of 1

Figure: 6

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-5

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 10.5'
Water Depth: 2.5', 3.8'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY FINE SAND (SM) with some clay; major roots (topsoil) to 4"; brown — loose to 8"										
1												
2												
3		saturated, medium dense		13	19.1				29			
4		SILTY CLAY (CL) with some fine sand; brown — saturated, medium stiff										
5				14								
6		SILTY FINE SAND (SM) brown — saturated, medium dense										
7												
8		FINE SAND (SP) brown — saturated, medium dense										
9												
10		grades gray		15								
11		End at 10.5'										
12												
13												
14												

Remarks: Groundwater encountered in test pit at depth of 2.5 feet and measured on 8/2/17 at depth of 3.8 feet.
Slotted PVC pipe installed to depth of 10' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
Page: 1 of 1

Figure: 7

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-6

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 4.5', 3.9'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose to 12"										
1												
2		very moist, medium stiff										
3				16								
4		SILTY FINE SAND (SM) brown — medium dense										
5		saturated		17								
6												
7		SILTY CLAY (CL) with some fine sand; brown — saturated, medium stiff										
8												
9												
10												
11				18								
12		End at 12'										
13												
14												

Remarks: Groundwater encountered in test pit at depth of 4.5 feet and measured on 8/2/17 at depth of 3.9 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
Page: 1 of 1

Figure: 8

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-7

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12.5'
Water Depth: 6', 5.6'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose to 12"										
1		moist, medium stiff										
2		SILTY FINE SAND (SM) brown — moist, medium dense										
3		SILTY CLAY (CL) with some fine sand; brown — moist, medium stiff										
4				19	26.9					35	18	17
5												
6		moist to saturated										
7				20								
8												
9												
10												
11												
12				21								
13		End at 12.5'										
14												

Remarks: Groundwater encountered in test pit at depth of 6 feet and measured on 8/2/17 at depth of 5.6 feet.

Slotted PVC pipe installed to depth of 12.5' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
Page: 1 of 1

Figure: 9

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-8

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 13'
Water Depth: 9.5', 6.5'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose to 8"										
1												
2												
3		moist, medium stiff		22	25.2	101						
4												
5												
6												
7												
8				23								
9												
10		saturated										
11												
12				24								
13		End at 13'										
14												

Remarks: Groundwater encountered in test pit at depth of 9.5 feet and measured on 8/2/17 at depth of 6.5 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

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Page: 1 of 1

Figure: 10

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-9

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 13'
Water Depth: 10', 6.4'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose										
1												
2												
3		moist, medium stiff										
4												
5				25								
6												
7												
8		very moist										
9				26								
10		saturated										
11												
12				27								
13		End at 13'										
14												

Remarks: Groundwater encountered in test pit at depth of 10 feet and measured on 8/2/17 at depth of 6.4 feet.
Slotted PVC pipe installed to depth of 13' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
Page: 1 of 1

Figure: 11

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-10

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 13'
Water Depth: 8', 6.6'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description		Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY FINE SAND (SM), FILL with trace medium to coarse sand; trace gravel; trace debris; brown	moist medium dense										
4		FINE SAND (SP) gray	moist medium dense										
6		SILTY CLAY (CL) brown	moist medium stiff		28								
8			saturated										
12					29								
13		End at 12.5'											
14													

Remarks: Groundwater encountered in test pit at depth of 8 feet and measured on 8/2/17 at depth of 6.6 feet.
Slotted PVC pipe installed to depth of 13 feet to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
Page: 1 of 1

Figure: 12

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-11

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 7.5', 4.5'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY FINE TO COARSE SAND (SM), FILL with some fine and coarse gravel; major roots (topsoil) to 4"; brown										
2		SILTY CLAY (CL) with some fine sand; brown										
3		very moist medium stiff		30	23.4	102				29	18	11
6				31								
7		saturated										
11				32								
12		End at 12'										

Remarks: Groundwater encountered in test pit at depth of 7.5 feet and measured on 8/2/17 at depth of 4.5 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
Page: 1 of 1

Figure: 13

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-12

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 11'
Water Depth: 4.5', 5.3'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY FINE SAND (SM) loose to 8" with major roots (topsoil) to 4"; brown										
3		very moist medium dense		33								
4												
5		FINE SAND (SP) saturated brown										
6				34								
10				35	28.1				15			
11		End at 11'										

Remarks: Groundwater encountered in test pit at depth of 4.5 feet and measured on 8/2/17 at depth of 5.3 feet.
Slotted PVC pipe installed to depth of 11' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
Page: 1 of 1

Figure: 14

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-13

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 11'
Water Depth: 4.5', 4.7'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) loose to 8" with some fine sand; major roots (topsoil) to 4"; brown										
1												
2		moist										
3		medium stiff		36								
4		FINE SAND (SP) medium dense brown										
5		saturated		37								
6												
7												
8												
9												
10				38								
11		End at 11'										
12												
13												
14												

Remarks: Groundwater encountered in test pit at depth of 4.5 feet and measured on 8/2/17 at depth of 4.7 feet.
Slotted PVC pipe installed to depth of 10' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

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Figure: 15

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-14

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 7', 5.7'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown										
2		moist very stiff		39								
3		SILTY FINE SAND (SM) brown										
4		moist medium dense										
5				40								
6												
7		very moist saturated										
8		SILTY CLAY (CL) with some fine sand; gray										
		saturated medium stiff		41								
9												
10												
11												
12		End at 12'										
13												
14												

Remarks: Groundwater encountered in test pit at depth of 7 feet and measured on 8/2/17 at depth of 5.7 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
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Figure: 16

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-15

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 13'
Water Depth: 8', 7.6'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — moist, medium stiff										
3				42								
4		SILTY FINE SAND (SM) brown — moist, medium dense										
5				43								
6												
7		very moist										
8		FINE SAND (SP) brown — saturated, medium dense										
9												
10												
11		grades gray										
12				44								
13		End at 13'										
14												

Remarks: Groundwater encountered in test pit at depth of 8 feet and measured on 8/2/17 at depth of 7.6 feet.
Slotted PVC pipe installed to depth of 13' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
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Figure: 17

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-16

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 5.5', 6.4'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		FINE SANDY CLAY (CL) with some silt; major roots (topsoil) 4"; brown — moist, medium stiff										
4				45								
5		SILTY FINE SAND (SM) brown — medium dense, saturated		46								
10		SILTY CLAY (CL) with some fine sand; brown — saturated, medium stiff		47								
12		End at 12'										

Remarks: Groundwater encountered in test pit at depth of 5.5 feet and measured on 8/2/17 at depth of 6.4 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

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Figure: 18

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-17

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 13'
Water Depth: 7', 5.4'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — moist, medium stiff										
1												
2		SILTY FINE SAND (SM) brown — moist, medium dense										
3				48								
4		SILTY CLAY (CL) with some fine sand; brown — very moist, medium stiff										
5												
6				49								
7		saturated, medium stiff										
8												
9												
10												
11												
12				50								
13		End at 13'										
14												

Remarks: Groundwater encountered in test pit at depth of 7 feet and measured on 8/2/17 at depth of 5.4 feet.
Slotted PVC pipe installed to depth of 13' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
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Figure: 19

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-18

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 4.5', 6.1'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose to 6"										
1		moist, medium stiff										
2		SILTY FINE SAND (SM) brown — moist, medium dense										
3				51								
4												
5		saturated										
6		SILTY CLAY (CL) with some fine sand; brown — saturated, medium stiff		52								
7												
8												
9												
10												
11				53								
12		End at 12'										
13												
14												

Remarks: Groundwater encountered in test pit at depth of 4.5 feet and measured on 8/2/17 at depth of 6.1 feet.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
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Figure: 20

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-19

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 13'
Water Depth: 8', 6.4'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose to 8"										
1												
2												
3		moist, medium stiff		54	18.1					36	20	16
4												
5												
6				55								
7		very moist										
8		saturated										
9		grades gray										
10												
11				56								
12		SILTY FINE SAND (SM) gray — saturated, medium dense										
13		End at 13'										
14												

Remarks: Groundwater encountered in test pit at depth of 8 feet and measured on 8/2/17 at depth of 6.4 feet.
Slotted PVC pipe installed to depth of 13' to facilitate water level measurements.

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Figure: 21

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-20

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 7', 7.5'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose to 8"										
1												
2												
3				57								
4		moist, medium stiff										
5		SILTY FINE SAND (SM) brown — moist, medium dense		58								
6												
7		saturated										
8												
9		FINE SAND (SP) gray — saturated, medium dense										
10												
11				59								
12		End at 12'										
13												
14												

Remarks: Groundwater encountered in test pit at depth of 7 feet and measured on 8/2/17 at depth of 7.5 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
Logged By: Hogan Wright
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Figure: 22

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-21

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe	Total Depth:	13'	Date: 7/19/17
Surface Elev. (approx):	Water Depth:	4.5'	Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose to 6"										
3		moist, stiff		60								
4		SILTY FINE SAND (SM) brown										
5		saturated, medium dense		61								
13		End at 13'		62								

Remarks: Groundwater encountered in test pit at depth of 4.5 feet.

Slotted PVC pipe installed to depth of 13' to facilitate water level measurements.

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Excavated By: Skyline Excavating

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Figure: 23

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-22

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 5'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose to 8"										
1		moist, medium stiff										
2		FINE SAND (SP) brown										
3				63								
4		moist, medium dense										
5 ▽		saturated										
6												
7				64								
8												
9												
10												
11				65								
12		End at 12'										
13												
14												

Remarks: Groundwater encountered in test pit at depth of 5 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

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Figure: 24

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-23

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 11'
Water Depth: (see Remarks)

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY CLAY (CL) loose to 8" with some fine sand; major roots (topsoil) to 4"; brown										
1		moist medium stiff										
2		SILTY FINE SAND (SM) brown										
3				66								
4		FINE SAND (SP) moist brown medium dense										
5												
6				67								
7												
8												
9												
10		grades gray		68								
11		End at 11'										
12												
13												
14												

Remarks: Groundwater not encountered during excavation.
Slotted PVC pipe installed to depth of 11' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

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Figure: 25

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-24

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 13'
Water Depth: 6'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation: Gravel %	Gradation: Sand %	Gradation: Fines %	Atterberg: LL	Atterberg: PL	Atterberg: PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — loose to 8"										
1												
2		FINE SAND (SP) brown										
3		moist, medium dense		69								
4												
5												
6 ▽		SILTY CLAY (CL) with some fine sand; brown — saturated, medium stiff		70								
7												
8												
9												
10												
11				71								
12												
13		End at 13'										
14												

Remarks: Groundwater encountered in test pit at depth of 6 feet.

Slotted PVC pipe installed to depth of 13' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

Excavated By: Skyline Excavating
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Figure: 26

Sunset - Equestrian - Cluster Subdivision

Test Pit Log

TP-25

About 4300 West 2200 South, Taylor, Weber County, Utah

Boring Type: Rubber Tire Backhoe
Surface Elev. (approx):

Total Depth: 12'
Water Depth: 3'

Date: 7/19/17
Job #: 10094

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation Gravel %	Gradation Sand %	Gradation Fines %	Atterberg LL	Atterberg PL	Atterberg PI
0		SILTY CLAY (CL) with some fine sand; major roots (topsoil) to 4"; brown — moist, medium stiff										
2		FINE SAND (SP) brown										
3		saturated		72								
5		CLAYEY SILT (CL-ML) with some fine sand; brown — saturated, medium stiff										
8				73	22.8				75	25	17	8
10		soft										
11				74								
12		End at 12'										

Remarks: Groundwater encountered in test pit at depth of 3 feet.
Slotted PVC pipe installed to depth of 12' to facilitate water level measurements.

CMT ENGINEERING LABORATORIES

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Figure: 27

Sunset - Equestrian - Cluster Subdivision

About 4300 West 2200 South, Taylor, Weber County, Utah

Key to Symbols

Date: 7/19/17
Job #: 10094

Depth (ft) ①	GRAPHIC LOG ②	Soil Description ③	Sample Type ④	Sample # ⑤	Moisture (%) ⑥	Dry Density(pcf) ⑦	Gradation ⑧ Gravel %	Sand %	Fines %	Atterberg ⑨ LL	PL	PI

COLUMN DESCRIPTIONS

① **Depth (ft.):** Depth (feet) below the ground surface (including groundwater depth - see water symbol below).

② **Graphic Log:** Graphic depicting type of soil encountered (see ② below).

③ **Soil Description:** Description of soils encountered, including Unified Soil Classification Symbol (see below).

④ **Sample Type:** Type of soil sample collected at depth interval shown; sampler symbols are explained below-right.

⑤ **Sample #:** Consecutive numbering of soil samples collected during field exploration.

⑥ **Moisture (%):** Water content of soil sample measured in laboratory (percentage of dry weight of sample).

⑦ **Dry Density (pcf):** The dry density of a soil measured in laboratory (pounds per cubic foot).

⑧ **Gradation:** Percentages of Gravel, Sand and Fines (Silt/Clay), obtained from lab test results of soil passing the No. 4 and No. 200 sieves.

⑨ **Atterberg:** Individual descriptions of Atterberg Tests are as follows:

LL = Liquid Limit (%): Water content at which a soil changes from plastic to liquid behavior.

PL = Plastic Limit (%): Water content at which a soil changes from liquid to plastic behavior.

PI = Plasticity Index (%): Range of water content at which a soil exhibits plastic properties (= Liquid Limit - Plastic Limit).

STRATIFICATION	
Description	**Thickness**
Seam	Up to ½ inch
Lense	Up to 12 inches
Layer	Greater than 12 in.
Occasional	1 or less per foot
Frequent	More than 1 per foot

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

MOISTURE CONTENT
Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp / moist to the touch, but no visible water.
Saturated: Visible water, usually soil below groundwater.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS	②	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 sieve size.	GRAVELS The coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS (< 5% fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		GRAVELS WITH FINES (≥ 12% fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS The coarse fraction passing through No. 4 sieve.	CLEAN SANDS (< 5% fines)	SW		Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP		Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (≥ 12% fines)	SM		Silty Sands, Sand-Silt Mixtures
			SC		Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS More than 50% of material is smaller than No. 200 sieve size.	SILTS AND CLAYS Liquid Limit less than 50%		ML		Inorganic Silts and Sandy Silts with No Plasticity or Clayey Silts with Slight Plasticity
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
			OL		Organic Silts and Organic Silty Clays of Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH		Inorganic Silts, Micacious or Diatomacious Fine Sand or Silty Soils
			CH		Inorganic Clays of High Plasticity, Fat Clays
			OH		Organic Silts and Organic Clays of Medium to High Plasticity
HIGHLY ORGANIC SOILS			PT		Peat, Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications (i.e. GP-GM, SC-SM, etc.).

SAMPLER SYMBOLS

- Block Sample
- Bulk/Bag Sample
- Modified California Sampler
- 3.5" OD, 2.42" ID D&M Sampler
- Rock Core
- Standard Penetration Split Spoon Sampler
- Thin Wall (Shelby Tube)

WATER SYMBOL

- Encountered Water Level
- Measured Water Level

(see Remarks on Logs)

1. The results of laboratory tests on the samples collected are shown on the logs at the respective sample depths.
2. The subsurface conditions represented on the logs are for the locations specified. Caution should be exercised if interpolating between or extrapolating beyond the exploration locations.
3. The information presented on each log is subject to the limitations, conclusions, and recommendations presented in this report.

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Figure: 28