Western Technologies Inc.

GEOTECHNICAL EVALUATION REPORT

MOUNTAIN VIEW STATION SUBDIVISION
Approximately 4131 West 12600 South
Riverton, Utah
WT Reference No. 6126JT220

Parkside

PREPARED FOR:
Riverton Ranch LLC
6150 South Redwood Road, Suite 150
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Attn: Mr. Ryan Button

February 16, 2017

LICENSED PROFESSIONAL ENGINEER
2/16/17
No. 180305-2202
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TABLE OF CONTENTS

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MOUNTAIN VIEW STATION SUBDIVISION
APPROXIMATELY 4131 WEST 12600 SOUTH
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1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the proposed Mountain View Station Subdivision, and was performed in general accordance with our contract. The purpose of our services is to provide information and recommendations regarding:

- Foundation design parameters, including footing types, depths, allowable bearing capacities, and estimated settlements
- Earthwork, including site preparation, fill placement, and suitability of existing soils for fill materials, and compaction
- Drainage
- Pavements
- Seismic considerations
- Corrosivity to concrete
- Excavation conditions
- Slabs-on-grade
- Groundwater
- Geologic hazards

Results of the field exploration, field and laboratory tests are presented in the Appendices.

2.0 PROJECT DESCRIPTION

Project information supplied by Mr. Ryan Button on December 7, 2016 indicates that the proposed 23-acre subdivision will consist of one- to two-story single family houses with basements using wood frame construction. The maximum wall and column loads are assumed to be three to five kips per linear foot and 75 to 100 kips, respectively. We anticipate that the main floor level will be at or slightly above existing site grade and that no extraordinary slab criteria are required. On-site asphalt paved areas for local roads and rigid pavements for driveways, curbs and sidewalks will be constructed. Final site grading plans were not available at the time of this report. Should our assumptions not be correct, we should be notified immediately.

3.0 SCOPE OF SERVICES

3.1 Field Exploration

Eleven borings were drilled to depths of 15 to 16.5 feet below existing grade in the proposed building areas. The borings were at the approximate locations shown on the attached Boring Location Diagram. A field log was prepared for each boring. These logs contain visual classifications of the materials encountered during drilling as well as interpolation of the subsurface conditions between samples. Final logs, included in Appendix A, represent our interpretation of the field logs and may include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thicknesses, and the locations where samples were obtained.

The Unified Soil Classification System was used to classify soils. The soil classification symbols appear on the boring logs and are briefly described in Appendix A. Local and regional geologic characteristics were used to estimate the seismic design criteria and liquefaction potential.

3.2 Laboratory Analyses

Laboratory analyses were performed on representative soil samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils for preparation of this report. The following tests were performed in general accordance with applicable procedures, and the results are presented in Appendix B.

- Field moisture content
- In-situ soil density
- Consolidation/collapse
- #4 and #200 Sieve
- Liquid limit and plasticity index
- Water soluble sulfate content

3.3 Analyses and Report

Analyses were performed and this report was prepared for the exclusive purpose of providing geotechnical engineering and/or testing information and recommendations. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken. We are available to discuss the scope of such studies with you.

This geotechnical engineering report includes a description of the project, a discussion of the field and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as required to satisfy the purpose previously described.

4.0 SITE CONDITIONS

4.1 Surface

At the time of our exploration, the Site was agricultural ground with a house and outbuildings. The ground surface was relatively flat sloping gently to the east. Site drainage trended to the east as sheet surface flow. Other site features include a large irrigation canal running along the west side of the Site. Vegetation consisted of a moderate growth of grass and weeds with small trees and shrubs along the fence lines and ditch. Fill and debris piles were noted in the southwest corner of the site along with two junk cars. Power, gas and fiber optic lines run across the southwest corner of the Site.

4.2 Subsurface

As presented on the boring logs, with the exception of Borings B-2 and B-7, surface soils consist of a foot of sandy clay topsoil underlain by very stiff to hard clay and sandy clay to a depths of 4 to 7.5 feet. The materials underlying the surface soils and extending to the full depth of exploration consisted of interbedded medium dense to very dense silty sand, gravelly sand sandy gravel and stiff clay. Boring B-2 has very dense to medium dense gravelly sand below the topsoil to a depth of 13 feet with very dense sandy gravel to the total depth explored; and Boring B-7 has medium dense gravelly sand to a depth of four feet below the topsoil over gravelly sandy clay to the total depth explored.

4.3 Groundwater

Groundwater was not encountered at the time of exploration. These observations represent the groundwater conditions at the time of measurements and may not be indicative of other times. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions, groundwater withdrawal and recharge, local irrigation practices, and future development.

4.4 Geology

The Site is located in the Jordan Valley west of the western slope of the Central Wasatch Range section of the Middle Rocky Mountains Province. The Wasatch Range trends north-south and includes broad alluvial valley bottoms and low hills in the north and rugged mountains cut by deep valleys in the south. The Site is in an area bounded by the Great Salt Lake to the north, the Oquirrh Mountains to the west, the Traverse Mountains to the south, and the Wasatch Mountains to the east. Most of the area is sloping gently down to the east. The Site is located on the fine-grained lacustrine deposits including brown, dark brown, grayish-brown and gray calcareous, laminated silt, and sandy silt (*Geologic Map of the Midvale Quadrangle, Salt Lake County, Utah*, Utah Geological Survey, 2000).

4.5 Geologic Hazards

The nearest mapped fault is approximately eight miles to the east. According to the Salt Lake County *Surface Fault Rupture Liquefaction Potential Special Study Areas Map,* the Site is located in a "very low" liquefaction potential area and surface fault rupture is not expected.

5.0 GEOTECHNICAL PROPERTIES & ANALYSIS

5.1 Laboratory Tests

Laboratory test results (see Appendix B) indicate that native subsoils near shallow foundation level exhibit low compressibility at existing water contents. Low additional compression or collapse occurs when the water content is increased.

Near-surface soils are of medium plasticity. Slabs-on-grade supported on re-compacted native clayey soils have a low potential for heaving if the water content of the soil

increases. Densification of the soil by the passage of construction equipment may increase the expansion potential of the native clayey soil.

Chemical tests were performed on a representative sample to determine the sulfate exposure for concrete due to sulfates in the on-site soils. The sulfate content test was performed by American West Analytical Laboratories and the results are presented in **Appendix B.**

5.2 Field Tests

Native subsoils near shallow and basement foundation level exhibited moderate to high resistance to penetration using the standard penetration test method (ASTM D1586) or Ring-lined barrel sampling (ASTM D3550). These soils correlate to having moderate bearing capacity in their present condition.

The boring logs included in this report are indicators of subsurface conditions only at the specific location and date noted. Variations from the field conditions represented by the borings may become evident during construction. If variations appear, we should be contacted to re-evaluate our recommendations.

6.0 RECOMMENDATIONS

6.1 General

Recommendations contained in this report are based on our understanding of the project criteria described in **Section 2.0**, and the assumption that the soil and subsurface conditions are those disclosed by the borings. Others may change the plans, final elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing.

6.2 Design Considerations

The borings indicate the presence of moderately collapsible clay soils to a depth of 6 to 7 feet below the existing ground surface elevations. Collapsible soils compress when the moisture content increases under foundation loads. Structures and related improvements situated on collapsible clay soils could be subject to movements if the

foundation soils experience an increase in moisture content. The depth of the collapsible soils varies from boring to boring.

6.3 Foundations

Conventional spread and continuous wall footings may be used to support houses with basements. Footings may be founded at shallow depths, 12 to 18 inches, below the finished basement floor elevations using an allowable bearing pressure of up to 2000 psf. Since the upper clay soils at the Site are moderately collapsible, foundations should bear on non-collapsible native soils or upon engineered fills extending to non-collapsible soils. Basement excavations which extend a minimum of six feet below the existing ground surface will most likely be below the collapsible soils. Garage footings as shallower depths will require over-excavation to the basement footing depth.

Any existing fill on the Site should not be used for support of foundations without removal and re-compaction or replacement.

Allowable bearing capacities assume fulfillment of **EARTHWORK** recommendations. Minimum depth for frost protection for exterior footings or footings in unheated spaces is 2.5 feet.

The allowable bearing capacities apply to dead loads plus design live load conditions. Recommended minimum widths of column and wall footings are 24 inches and 16 inches, respectively.

We anticipate that total and differential movement of the proposed structures, supported as recommended, should be less than 1 inch and ¾ inch, respectively. Additional foundation movements could occur if water from any source infiltrates the foundation soils. Therefore, proper drainage should be provided in the final design and during construction.

All footings, stem walls, and masonry walls should be reinforced to reduce the potential for distress caused by differential foundation movements. The use of joints at openings or other discontinuities in masonry walls is recommended.

We recommend that the geotechnical engineer or his representative observe the footing excavations before reinforcing steel and concrete are placed. This observation is to assess whether the soils exposed are similar to those anticipated for support of the footings. Any

soft, loose or unacceptable soils should be undercut to suitable materials and backfilled with approved fill materials. Soil backfill should be properly compacted.

6.4 Lateral Design Criteria

Lateral loads may be resisted by concrete interface friction and by passive resistance. For shallow foundations bearing on properly compacted fill at this site, we recommend the following lateral resistance criteria:

- Coefficient of Friction 0.25
- Passive Pressure.....300 psf/ft

The frictional resistance and the passive pressure may be combined without reduction in determining the total lateral resistance.

6.5 Earth Retaining Structures

a. Unrestrained Structures

Earth retaining structures less than 8 feet in height, above any free water surface, with level backfill and no surcharge loads may be designed using the equivalent fluid pressure method. Recommended equivalent fluid pressures and coefficients of base friction are:

- Active:
  Undisturbed subsoil .....35 psf/ft
  Compacted imported backfill .....30 psf/ft
  Clay site soils ..... not recommended for use

- Passive:
  Shallow wall footings .....250 psf/ft
  Shallow column footings.....375 psf/ft

- Coefficient of base friction..... 0.35*

*The coefficient of base friction should be reduced to 0.25 when used in conjunction with passive pressure.

b. Restrained Structures

Where the design includes restrained elements less than eight feet in height, the following equivalent fluid pressures are recommended:

- At-rest:
  Undisturbed subsoil .....55 psf/ft
  Compacted granular backfill .....60 psf/ft

The lateral earth pressures presented herein do not include the lateral pressures arising from the presence of:

- Hydrostatic conditions, submergence or partial submergence
- Sloping backfill, positively or negatively
- Surcharge loading, permanent or temporary
- Seismic or dynamic conditions

We recommend a free-draining soil layer or manufactured geosynthetic material, be constructed adjacent to the back of the wall. A filter may be required between the soil backfill and drainage layer. This drainage zone should help prevent development of hydrostatic pressure on the wall. This vertical drainage zone should be tied into a gravity drainage system at the base of the wall.

It is important that all backfill be properly placed and compacted. Backfill should be mechanically compacted in layers. Flooding or jetting should not be permitted. Care should be taken not to damage the walls when placing the backfill. Backfills should be observed and tested during placement.

Fill against footings, stem walls, basement walls, and retaining walls should be compacted to densities specified in **EARTHWORK**. Medium to high plasticity clay soils should not be used as backfill against retaining walls. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Over-compaction may cause excessive lateral earth pressures that could result in wall movements.

6.6 Seismic Considerations

For structural designs based upon the International Building Code 2012, the following criteria will apply:

- The seismic site class for the on-site soils is D.
- S_s, the mapped spectral acceleration for short periods, is 1.147 g.
- S_1, the mapped spectral acceleration for one second periods, is 0.381 g.
- The design spectral response acceleration parameter for short period S_{DS} is 0.796 g.
- The design spectral response acceleration parameter for 1-second period S_{D1} is 0.416 g.
- Maximum considered earthquake spectral response for short period is S_{MS} is 1.195 g
- Maximum considered earthquake spectral response for 1-second period is S_{M1} is 0.624 g

Due to the fine grained soils, dense granular soils, and lack of groundwater, the potential settlement and lateral spread due to liquefaction is low and not a significant concern at this Site.

6.5 Conventional Slab-on-Grade Support

Floor slabs can be supported on properly placed and compacted fill or approved natural soils. The slab subgrade should be prepared by the procedures outlined in this report. A minimum 4-inch layer of base course should be provided beneath all slabs to help prevent capillary rise and a damp slab.

For design of interior slabs-on-grade, we recommend using a modulus of subgrade reaction (k) of 150 pounds per cubic inch (pci) for the on-site clays and a value of 250 pci for the on-site sand, gravel or imported fill material.

The use of vapor retarders is desirable for any slab-on-grade where the floor will be covered by products using water based adhesives, wood, vinyl backed carpet, impermeable floor coatings (urethane, epoxy, acrylic terrazzo, etc.) or where the floor will be in contact with moisture sensitive equipment or product. The design and installation should be in accordance with the recommendation given in ACI 302.1R-15 and 302.2R-15.

If moisture sensitive equipment, product, floor coverings, or impermeable floor coverings are to be placed on interior slabs-on-grade, consideration should be given to the use of a

vapor retarder. Final determination on the use of a vapor retarder should be left to the slab designer.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (high water-cement ratio) could cause excessive shrinkage, cracking or curling. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

6.6 Drainage

The major cause of soil problems in this vicinity is moisture increase in soils below structures. Therefore, it is extremely important that positive drainage be provided during construction and maintained throughout the life of the proposed structures. Infiltration of water into utility or foundation excavations must be prevented during construction.

In areas where sidewalks or paving do not immediately adjoin the structure, protective slopes should be provided with an outfall of about five percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to minimize the possibility of moisture infiltration.

If planters and/or landscaping are adjacent to or near the structure, we recommend the following:

- Grades should slope away from the structures.
- Only shallow rooted landscaping should be used.
- Watering should be kept to a minimum.

In areas where sand and gravel soils are present at footing elevation, no perimeter drain is required According to Table R405.1 of the International Residential Code. However areas with clayey soil are classified as Group II soils and a perimeter drain at the bottom of footing level is required. This drain should consist of a perforated four inch diameter pipe, wrapped in a filter fabric sleeve, and placed in a clean gravel layer a minimum of 12 inches thick, extending a minimum of 6 inches above the top of the footing. The gravel layer should be covered with a filter fabric. Filter fabric should be Mirafi 140n or equivalent. The pipe should flow by gravity to a sump which extends a minimum of 24 inches below the basement finish floor elevation.

6.7 Corrosivity to Concrete

For determining the exposure categories and classes for concrete in accordance with **Section 1904 Durability Requirements** for concrete of the *2012 International Building Code,* sulfate exposure from the soils at the site classify as "not applicable" (Class S0) according to Table 4.2.1 of ACI 318-08, Building Code Requirements for Structural Concrete

6.8 Pavements

The on-site soils are considered as poor quality materials for support of pavements. The types of traffic anticipated to use the local roadways include passenger vehicles and small to large size trucks. On this basis, a daily traffic value of 14 Equivalent 18-kip Single Axle Loads (ESAL) was estimated for the local roadways. A resilient modulus (M_r) of 4500 pounds per square inch was assigned to the on-site soil corresponding to a CBR value of 3. A reliability value of 85 percent was assigned to the facility that corresponds to occasional interruption of traffic for pavement repairs. Based upon these parameters, the resulting pavement sections according to the AASHTO procedure for a 20-year design life are:

Traffic Area	Asphaltic Concrete (in.)	Base Course (inches)
Standard Residential Roads	3	10

The "design life" of a pavement is defined as the expected life at the end of which reconstruction of the pavement will need to occur. Normal maintenance, including crack sealing, slurry sealing, and/or chip sealing, should be performed during the life of the pavement.

Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course material should conform with specification requirements for Untreated Base of the City of Riverton specifications.

Material and compaction requirements should conform to recommendations presented under **Earthwork**. The gradient of paved surfaces should ensure positive drainage. Water should not pond in areas directly adjoining paved sections.

7.0 EARTHWORK

7.1 General

The conclusions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted and tested in accordance with the recommendations contained herein. It is not reasonable to rely upon our conclusions and recommendations if any future unobserved and untested trenching, earthwork activities or backfilling occurs.

Although underground facilities such as septic tanks, cesspools, basements, and dry wells were not observed, such features might be encountered during construction. These features should be demolished in accordance with the recommendations of the geotechnical engineer. Any loose or disturbed soils resulting from demolition should be removed or recompacted as engineered fill and any excavations should be backfilled in accordance with recommendations presented herein.

7.2 Site Clearing

Strip and remove any existing vegetation, organic topsoil, debris, fill and any other deleterious materials from the building and pavement areas. The building area is defined as that area within the building footprint plus five feet beyond the perimeter of the footprint. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

7.3 Excavation

We anticipate that excavations for shallow foundations and utility trenches for the proposed construction can be accomplished with conventional equipment.

On-site clayey soils will pump or become unworkable at high water contents. Workability may be improved by scarifying and drying. Over-excavation of wet zones and replacement with granular materials may be necessary. The use of lightweight excavation and compaction equipment may be required to minimize subgrade pumping.

7.4 Temporary Excavations and Slopes

Temporary, un-surcharged construction excavations should be sloped or shored. Slopes should not be steeper than 1 to 1 (Horizontal to Vertical) in sands and gravels and 0.5H to 1V in fine-grained soils. Slopes may need to be flattened depending on conditions exposed during construction. If there is not enough space for sloped excavations, shoring should be used. Exposed slopes should be kept moist (not saturated) during construction. Underpinning may be required to protect adjacent structures, if excavations are deeper than existing foundations.

If any excavation, including a utility trench, is extended to a depth of more than 20 feet, it will be necessary to have the side slopes designed by a professional engineer.

As a safety measure, it is recommended that all vehicles and soil piles be kept a minimum lateral distance back from the crest of the slope at least equal to the slope height. The exposed slope face should be protected against the elements.

We recommend that the contractor retain a geotechnical engineer to observe the soils exposed in all excavations and provide engineering design for the slopes. This will provide an opportunity to classify the soil types encountered, and to modify the excavation slopes as necessary. This also allows the opportunity to analyze the stability of the excavation slopes during construction.

7.5 Foundation Preparation

In footing areas, remove all collapsible soils below footings for both the basement and garage areas. Footings should bear upon undisturbed native soils or engineered fill. If over-excavation is required to remove the collapsible soils, the excavation should extend a beyond the footing edges for the same distance as the depth below the footings. Replace with engineered fill material.

7.6 Conventional Interior Slab Preparation

Scarify, moisten or dry as required, and compact all subgrade soils to a minimum depth of 8 inches. The subgrade preparation is to be accomplished in a manner that will result in uniform water contents and densities after compaction.

7.7 Exterior Slab Preparation

Compacted subgrade soils expand due to frost. Therefore, exterior concrete grade slabs may heave, resulting in cracking or vertical offsets. This potential would be greatest where slabs overlie compacted clayey subgrade soils or in areas where the passage of construction equipment has inadvertently densified subsoils. To reduce the potential for damage, we recommend:

- Use of fill with low expansion potential
- Use of fill with low to negligible frost susceptibility
- Placement of effective control joints on relatively close centers
- Moisture-density control during placement of subgrade fills
- Provision for adequate drainage in areas adjoining the slabs
- Use of designs which allow vertical movement between the exterior slabs and adjoining structural elements

7.8 Pavement Preparation

The subgrade should be scarified, moistened as required, and recompacted for a minimum depth of 10 inches prior to placement of fill and pavement materials. All utility trenches should be compacted to the requirements for engineered fill prior to placement of paving materials

7.9 Materials

Imported materials and granular native soils may be used as fill material for the following:

- foundation areas
- interior slab areas
- pavement areas
- backfill

On-site clay soils may be used as fill material below the pavement section, in landscape areas and as non-structural backfill.

Imported soils should conform to the following:

- Gradation (ASTM C136):

	percent finer by weight
6"	100
4"	85-100
¾"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	25 (max)

Frozen soils should not be used as fill or backfill.

The materials used in the engineered fill below footings and slab should be reasonable free of rocks or lumps having a particle diameter greater than 6 inches. Acceptance of the quantity of oversize material shall be at the discretion of the geotechnical engineer.

7.10 Placement and Compaction

a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.
b. Uncompacted fill lifts should not exceed 10 inches.
c. No fill should be placed over frozen ground.
d. Materials should be compacted to the following:

Material Compaction (ASTM D1557)	Minimum Percent
• On-site soil, reworked and fill:	
Below footings	95
Below slabs-on-grade	95
Below pavement	95
• Imported soil:	
Below footings	95
Below slabs-on-grade	95
Below pavement	95
• Untreated base	95
• Nonstructural backfill	90

Imported and on-site soils should be compacted within a water content range of two percent below to three percent above optimum.

7.11 Compliance

Recommendations for slabs-on-grades, foundations, and pavement elements supported on compacted fills or prepared subgrade depend upon compliance with **Earthwork** recommendations. To assess compliance, observation and testing should be performed under the direction of a geotechnical engineer.

8.0 LIMITATIONS

This report has been prepared assuming the project criteria described in **Section 2.0**. If changes in the project criteria occur, or if different subsurface conditions are encountered or become known, the conclusions and recommendations presented herein shall become invalid. In any such event, WT should be contacted in order to assess the effect that such variations may have on our conclusions and recommendations.

The recommendations presented are based entirely upon data derived from a limited number of samples obtained from widely spaced borings. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. This report assumes the uniformity of the geology and soil structure between borings, however variations can and often do exist. Whenever any deviation, difference or change is encountered or becomes known, WT should be contacted.

This report is for the exclusive benefit of our client alone. There are no intended third-party beneficiaries of our contract with the client or this report., and nothing contained in the contract or this report shall create any express or implied contractual or any other relationship with, or claim or cause of action for, any third party against WT.

This report is valid for the earlier of one year from the date of issuance, a change in circumstances, or discovered variations. After expiration, no person or entity shall rely on this report without the express written authorization of WT.

9.0 CLOSURE

We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon data obtained at the location of the borings, and from laboratory tests. Work on your project was performed in accordance with generally accepted standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.

NORTH

NOT TO SCALE

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
The Quality People
Since 1955

PLATE 1. SITE VICINITY MAP
Mountain View Station Subdivision
Reverton, Utah

WT Job No. 6126JT220

LEGEND

Approximate Boring Location

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PLATE 2. **BORING LOCATION DIAGRAM**
Mountain View Station Subdivision
Reverton, Utah

WT Job No. 6126JT220

APPENDIX A

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Backfill	A specified material placed and compacted in a confined area.
Base Course	A layer of specified aggregate material placed on a subgrade or subbase.
Base Course Grade	Top of base course.
Bench	A horizontal surface in a sloped deposit.
Caisson/Drilled Shaft	A concrete foundation element cast in a circular excavation which may have an enlarged base (or belled caisson).
Concrete Slabs-On-Grade	A concrete surface layer cast directly upon base course, subbase or subgrade.
Crushed Rock Base Course	A base course composed of crushed rock of a specified gradation.
Differential Settlement	Unequal settlement between or within foundation elements of a structure.
Engineered Fill	Specified soil or aggregate material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.
Existing Fill	Materials deposited through the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.
Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Fill	Materials deposited by the actions of man.
Finished Grade	The final grade created as a part of the project.
Gravel Base Course	A base course composed of naturally occurring gravel with a specified gradation.
Heave	Upward movement.
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil.
Rock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Sand and Gravel Base Course	A base course of sand and gravel of a specified gradation.
Sand Base Course	A base course composed primarily of sand of a specified gradation.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Soil	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
Strip	To remove from present location.
Subbase	A layer of specified material placed to form a layer between the subgrade and base course.
Subbase Grade	Top of subbase.
Subgrade	Prepared native soil surface.

COARSE-GRAINED SOILS

LESS THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVEL OR WELL-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVEL OR POORLY-GRADED GRAVEL WITH SAND, LESS THAN 5% FINES	
GM	SILTY GRAVEL OR SILTY GRAVEL WITH SAND, MORE THAN 12% FINES	
GC	CLAYEY GRAVEL OR CLAYEY GRAVEL WITH SAND, MORE THAN 12% FINES	
SW	WELL-GRADED SAND OR WELL-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SAND OR POORLY-GRADED SAND WITH GRAVEL, LESS THAN 5% FINES	
SM	SILTY SAND OR SILTY SAND WITH GRAVEL, MORE THAN 12% FINES	
SC	CLAYEY SAND OR CLAYEY SAND WITH GRAVEL, MORE THAN 12% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

FINE-GRAINED SOILS

MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	SILT, SILT WITH SAND OR GRAVEL, SANDY SILT, OR GRAVELLY SILT	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	LEAN CLAY OF LOW TO MEDIUM PLASTICITY, SANDY CLAY, OR GRAVELLY CLAY	
OL	ORGANIC SILT OR ORGANIC CLAY OF LOW TO MEDIUM PLASTICITY	
MH	ELASTIC SILT, SANDY ELASTIC SILT, OR GRAVELLY ELASTIC SILT	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	FAT CLAY OF HIGH PLASTICITY, SANDY FAT CLAY, OR GRAVELLY FAT CLAY	
OH	ORGANIC SILT OR ORGANIC CLAY OF HIGH PLASTICITY	
PT	PEAT AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics (e.g. CL-ML).

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL	No. 4 – 3 in.
Coarse	¾ in. – 3 in.
Fine	No. 4 – ¾ in.
SAND	No. 200 – No. 4
Coarse	No. 10 – No. 4
Medium	No. 40 – No. 10
Fine	No. 200 – No. 40
Fines (Silt or Clay)	Below No. 200

NOTE: Only sizes smaller than three inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS PER FOOT
VERY SOFT	0 – 2
SOFT	3 – 4
FIRM	5 – 8
STIFF	9 – 15
VERY STIFF	16 – 30
HARD	OVER 30

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS PER FOOT
VERY LOOSE	0 – 4
LOOSE	5 – 10
MEDIUM DENSE	11 – 30
DENSE	31 – 50
VERY DENSE	OVER 50

NOTE: Number of blows using 140-pound hammer falling 30 inches to drive a 2-inch-OD (1⅜-inch ID) split-barrel sampler (ASTM D1586).

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 20	MEDIUM
Over 20	HIGH

DEFINITION OF WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

The number shown in **"BORING NO."** refers to the approximate location of the same number indicated on the "Boring Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features, or through the use of Global Positioning System (GPS) devices. The accuracy of GPS devices is somewhat variable.

"DRILLING TYPE" refers to the exploratory equipment used in the boring wherein **HSA = hollow stem auger**, and the dimension presented is the outside diameter of the HSA used.

"N" in "BLOW COUNTS" refers to a 2-inch outside diameter split-barrel sampler driven into the ground with a 140 pound drop-hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows, or "blow count", of the hammer is recorded for each of three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2nd and 3rd increments) is defined as the Standard Penetration Test (SPT) "**N**"-Value. Refusal to penetration is considered more than 50 blows per 6 inches. (Ref. ASTM D1586).

"R" in "BLOW COUNTS" refers to a 3-inch outside diameter ring-lined split barrel sampler driven into the ground with a 140 pound drop-hammer dropped 30 inches repeatedly until a penetration of 12 inch is achieved or until refusal. The number of blows required to advance the sampler 12 inches is defined as the "**R**" blow count. The "**R**" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows per foot. (Ref. ASTM D3550).

"CS" in "BLOWS/FT." refers to a 2½-in. outside diameter California style split-barrel sampler, lined with brass sleeves, driven into the ground with a 140-pound hammer dropped 30 inches repeatedly until a penetration of 18 inches is achieved or until refusal. The number of blows of the hammer is recorded for each of the three 6-inch increments totaling 18 inches. The number of blows required for advancing the sampler for the last 12 inches (2nd and 3rd increments) is defined as the "CS" blow count. The "CS" blow count requires an engineered conversion to an equivalent SPT N-Value. Refusal to penetration is considered more than 50 blows for a 6-inch increment. (Ref. ASTM D 3550)

"SAMPLE TYPE" refers to the form of sample recovery, in which **N** = Split-barrel sample, **R** = Ring-lined sample, **"CS"** = California style split-barrel sample, **G** = Grab sample, **B** = Bucket sample, **C** = Core sample (ex. diamond bit rock coring).

"DRY DENSITY (LBS/CU FT)" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol **"NR"** indicates that no sample was recovered.

"WATER (MOISTURE) CONTENT" (% of Dry Wt.) refers to the laboratory-determined water content in percent using the standard test method ASTM D2216.

"USCS" refers to the "Unified Soil Classification System" Group Symbol for the soil type as defined by ASTM D2487 and D2488. The soils were classified visually in the field, and where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the boring logs represent our interpretation of the approximate boundary between soil or rock types based upon visual field classification at the boring location. The transition between materials is approximate and may be more or less gradual than indicated.

DATE DRILLED: **1-17-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-1

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
		N		11				TOPSOIL; sandy clay, dark brown, organics, moist
						CL		CLAY; some sand, light brown, hard, dry
13.3		CS		40				
						GP-GM		SANDY GRAVEL; with silt, light brown, very dense, dry
2.9		N		72	5			
						SM		GRAVELLY, SILTY SAND; light brown, dense, dry
3.8		N		40				
						CL		CLAY; some sand, light brown, hard, dry
11.0		CS		50-5.5"	10			
						GM		SANDY, SILTY GRAVEL; light brown, very dense, dry
4.8		N		50-5"	15			
								BORING TERMINATED AT 15.92 FEET

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

Geotechnical Environmental Inspections Materials

Western Technologies Inc.
The Quality People
Since 1955

PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

PLATE **A-4**

BORING LOG

DATE DRILLED: **1-18-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-10

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
					0			TOPSOIL; sandy clay, dark brown, organics, moist
						CL		CLAY; some sand, trace gravel, brown, very stiff, dry
15.5		N		23				
								... light brown, hard
14.8	97	CS		58	5			
						GM		SILTY GRAVEL; with sand, light brown, very dense, dry
		N		82-11"				
5.6		N		65	10			
								... slightly damp
		N		50-5"	15			
								BORING TERMINATED AT 15.42 FEET

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

Geotechnical Environmental Inspections Materials

Western Technologies Inc.
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PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

PLATE
A-13

BORING LOG

DATE DRILLED: **1-18-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-11

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
								TOPSOIL; sandy clay, dark brown, organics, moist
						CL		SANDY CLAY; brown, stiff, damp
		CS		14				
		N		38	5	SP-SM		GRAVELLY SAND; with silt, light brown, dense, slightly damp
		N		77				... very dense, dry
		N		47	10			... dense
		N		50-5"	15			... very dense
								BORING TERMINATED AT 15.92 FEET

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

Geotechnical Environmental Inspections Materials

Western Technologies Inc.
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PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

PLATE **A-14**

BORING LOG

DATE DRILLED: **1-17-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-2

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
								TOPSOIL; sandy clay, dark brown, organics, moist
						SP-SM		GRAVELLY SAND; with silt, light brown, very dense, dry
		N		83				
		N		55	5			
								... medium dense
		N		19				
		N		62	10			... very dense
						GP-GM		SANDY GRAVEL; with silt, light brown, very dense, dry
		N		50-5"	15			
								BORING TERMINATED AT 15.92 FEET

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

Geotechnical Environmental Inspections Materials

Western Technologies Inc.
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PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

PLATE **A-5**

BORING LOG

DATE DRILLED: **1-17-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-3

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
								TOPSOIL; sandy clay, dark brown, organics, moist
						CL		SANDY CLAY; light brown, stiff, dry
		N		14				
						SP-SM		GRAVELLY SAND; with silt, light brown, very dense, dry
		N		64	5			
								... brown, slightly damp
		N		79				
								... light brown, dry
		N		50-5"	10			
		N		31	15			
						CL		SANDY CLAY; light brown, hard, slightly damp
								BORING TERMINATED AT 16.5 FEET

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

Geotechnical Environmental Inspections Materials

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Since 1955

PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

PLATE **A-6**

BORING LOG

DATE DRILLED: **1-17-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-4

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
								TOPSOIL; sandy clay, dark brown, organics, moist
						CH		FAT CLAY; some sand, trace gravel, brown, stiff, damp
		N		11				
					5	SM		GRAVELLY, SILTY SAND; rusty brown, medium dense, dry
		CS		21				
						CL		SANDY CLAY; with gravel, brown, very stiff, slightly damp
		N		16				
					10			
		CS		59		SM		GRAVELLY, SILTY SAND; light brown, very dense, slightly damp
		N		50-5"	15			
								BORING TERMINATED AT 15.92 FEET

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

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PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

PLATE **A-7**

BORING LOG

DATE DRILLED: **1-17-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-5

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
								TOPSOIL; sandy clay, dark brown, organics, moist
						CH		FAT CLAY; some sand, trace gravel, light brown-gray, stiff, damp
30.4	72	CS		19				
						SM		SILTY SAND; brown, medium dense, slightly damp
7.1	87	CS		24	5			
						GP-GM		SANDY GRAVEL; with silt, light brown, very dense, dry
4.5		N		50-5"				
		N		50-5"	10			
								... dense, slightly damp
5.5		N		37	15			
								BORING TERMINATED AT 16.5 FEET

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

PLATE **A-8**

BORING LOG

DATE DRILLED: **1-18-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-6

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
								TOPSOIL; sandy clay, dark brown, organics, moist
						CL		SANDY CLAY; light brown, very stiff, slightly damp
		CS		26				
					5	SM		SILTY SAND; light brown, medium dense, dry
		CS		35				
						SP-SM		GRAVELLY SAND; with silt, light brown, dense, dry
		N		49				
						GP-GM		SANDY GRAVEL; with silt, light brown, very dense, dry
		N		50-1"	10			
						SP-SM		GRAVELLY SAND; with silt, light brown, very dense, dry
		N		50-5"	15			
								BORING TERMINATED AT 15.42 FEET

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

PLATE **A-9**

BORING LOG

DATE DRILLED: **1-18-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-7

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
					0			TOPSOIL; sandy clay, dark brown, organics, moist
						SP-SM		GRAVELLY SAND; with silt, light brown, medium dense, dry
		N		24				
						CL		GRAVELLY, SANDY CLAY; light brown, iron oxide stains, very stiff, slightly damp
		CS		24	5			
		N		27				
								... brown, damp
		N		17	10			
		CS		32	15			
								BORING TERMINATED AT 16.5 FEET

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

Geotechnical Environmental Inspections Materials

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PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

BORING LOG

PLATE
A-10

DATE DRILLED: **1-18-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-8

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
								TOPSOIL; sandy clay, dark brown, organics, moist
						CL		CLAY; some gravel and sand, light brown, very stiff, dry
19.1		CS		25				
					5			... brown, hard, slightly damp
22.8	93	CS		56				
								... with sand and gravel, very stiff
15.6		CS		28				
		N		62	10	SP-SM		GRAVELLY SAND; with silt, light brown, very dense, dry
						CL		CLAY; with gravel and sand, brown, very stiff, damp
		N		19	15			
								BORING TERMINATED AT 16.5 FEET

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

PLATE **A-11**

BORING LOG

DATE DRILLED: **1-18-17**
LOCATION: **See Location Diagram**
ELEVATION: **Not Determined**

BORING NO. B-9

EQUIPMENT TYPE: **Mobile B80**
DRILLING TYPE: **7" H.S.A**
FIELD ENGINEER: **M. Schedel**

MOISTURE CONTENT (% OF DRY WT.)	DRY DENSITY (LBS/CU FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT.	DEPTH (FEET)	USCS	GRAPHIC	SOIL DESCRIPTION
								TOPSOIL; sandy clay, dark brown, organics, moist
						CL		CLAY; some sand, trace gravel, light brown, very stiff, dry
18.8		CS		34				
					5			... brown, hard, slightly damp
		CS		41				
		CS		51				
		N		80	10	SP-SM		GRAVELLY SAND; with silt, light brown, very dense, slightly damp
		N		39	15			
						CL		CLAY; some sand, light brown, hard, slightly damp
								BORING TERMINATED AT 16.5 FEET

N- STANDARD SAMPLER
R- RING SAMPLER
CS- CALIFORNIA STYLE SAMPLER
G- GRAB SAMPLE
B- BUCKET SAMPLE

NOTES: **Groundwater Not Encountered**

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

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PROJECT: **MOUNTAIN VIEW STATION SUBDIVISION**
LOCATION: **RIVERTON, UTAH**
PROJECT NO.: **6126JT220**

BORING LOG

PLATE
A-12

APPENDIX B

Boring No.	Sample Depth (ft)	USCS Class.	Initial Dry Density (pcf)	Initial Water Content (%)	Percent Passing		Atterberg Limits		Collapse/Compression Properties			Remarks
					#4	#200	LL	PI	Surcharge (ksf)	Total Compression (%)		
										In-Situ	After Saturation	
B-1	2.5	CL	--	13.3	100	94	42	20				
B-1	5	GP-GM	--	2.9	40	9	--	NP				
B-1	7.5	SM	--	3.8	67	22	--	NP				
B-1	10	CL	--	11.0	100	86	30	11				
B-1	15	GM	--	4.8	51	14	--	NP				
B-5	2.5	CH	71.5	30.4	99	91	50	25	0.4	-0.92		
									0.8	-1.79		
									1.6	-2.94	-4.79	1, 2, 4
									3.2		-7.28	
									6.4		-11.22	
									12.8		-15.01	
B-5	5	SM	86.9	7.1	100	23	--	NP	0.42	-0.34		
									0.84	-0.70		
									1.67	-1.04	-3.32	1, 4
									3.34		-3.51	
									6.67		-6.18	
									13.29		-8.10	
									6.67		-7.91	
									3.34		-7.68	
B-5	7.5	GP-GM	--	4.5	46	10	--	NP				
B-5	15	GP-GM	--	5.5	53	12	--	NP				
B-8	2.5	CL	--	19.1	93	86	47	24				
B-8	5	CL	93.2	22.8	92	79	35	17	1.68	-1.39	-0.72	1, 2, 3
B-8	7.5	CL	--	15.6	80	57	36	18				
B-9	2.5	CL	--	18.8	96	87	43	22				

NOTES: Initial Dry Density and initial Water Content are in-situ values unless otherwise noted.
NP = Non-plastic

REMARKS – Collapse / Compression

1. Submerged to approximate saturation.
2. Sample disturbance observed.
3. Slight rebound after saturation.
4. Additional compression after saturation.

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PROJECT: MOUNTAIN VIEW STATION SUBDIVISION

JOB NO.: 6126JT220

PLATE **B-1**

SOIL PROPERTIES

Boring No.	Sample Depth (ft)	USCS Class.	Initial Dry Density (pcf)	Initial Water Content (%)	Percent Passing		Atterberg Limits		Collapse/Compression Properties			Remarks
					#4	#200	LL	PI	Surcharge (ksf)	Total Compression (%)		
										In-Situ	After Saturation	
B-10	2.5	CL	--	15.5	99	89	33	13				
B-10	5	CL	97.1	14.8	99	85	30	11	1.7	-1.25	-3.29	1, 2, 4
B-10	10	GM	--	5.6	40	14	--	NP				

NOTES: Initial Dry Density and initial Water Content are in-situ values unless otherwise noted.
NP = Non-plastic

REMARKS – Collapse / Compression

1. Submerged to approximate saturation.
2. Sample disturbance observed.
3. Slight rebound after saturation.
4. Additional compression after saturation.

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PROJECT: MOUNTAIN VIEW STATION SUBDIVISION
JOB NO.: 6126JT220

PLATE
B-2

SOIL PROPERTIES

INORGANIC ANALYTICAL REPORT

Client: Western Technologies, Inc. **Contact:** Warren Clyde
Project: Mountain View Station Subd. / 6147PO033
Lab Sample ID: 1701363-001
Client Sample ID: 6126JT220 B-1 @ 0'
Collection Date: 1/18/2017
Received Date: 1/24/2017 1405h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Sulfate	mg/kg-dry		1/25/2017 632h	SM4500-SO4-E	6.11	**21.2**	&

& - Analysis is performed on a 1:1 DI water extract for soils.

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Kyle F. Gross
Laboratory Director

Jose Rocha
QA Officer

INORGANIC ANALYTICAL REPORT

Client: Western Technologies, Inc. **Contact:** Warren Clyde
Project: Mountain View Station Subd. / 6147PO033
Lab Sample ID: 1701363-002
Client Sample ID: 6126JT220 B-8 @ 2.5'
Collection Date: 1/19/2017
Received Date: 1/24/2017 1405h

Analytical Results

Compound	Units	Date Prepared	Date Analyzed	Method Used	Reporting Limit	Analytical Result	Qual
Sulfate	mg/kg-dry		1/25/2017 632h	SM4500-SO4-E	29.2	**186**	&

& - Analysis is performed on a 1:1 DI water extract for soils.

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USGS Design Maps Summary Report

User–Specified Input

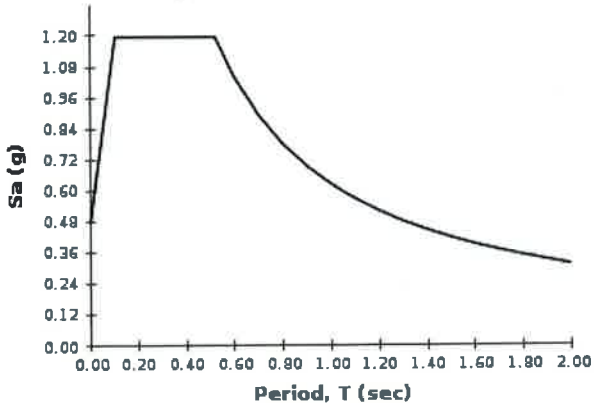
Report Title	Mountain View Station Subdivision Tue February 14, 2017 20:03:23 UTC
Building Code Reference Document	2012/2015 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	40.51854°N, 111.99193°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

USGS–Provided Output

S_S =	1.147 g	S_{MS} =	1.195 g	S_{DS} =	0.796 g
S_1 =	0.381 g	S_{M1} =	0.624 g	S_{D1} =	0.416 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum



Design Response Spectrum