GeoStrata
14425 South Center Point Way Bluffdale, Utah 84065
Phone (801) 501-0583 | Fax (801) 501-0584

Geotechnical Investigation
McPolin Barn
Park City, Utah

GeoStrata Job No. 125-014

October 21, 2015

Prepared for:

Park City
1200 Little Kate Road
Park City, Utah 84060

Attn: Mr. Ken Fischer

Learn More

GeoStrata 14425 South Center Point Way Bluffdale, Utah 84065
T: (801) 501-0583 ~ F: (801) 501-0584

Prepared for:

Park City
Attn: Ken Fisher
1200 Little Kate Road
Park City, Utah 84060

Geotechnical Investigation
McPolin Barn
Park City, Utah

GeoStrata Job No. 125-014

10/21/15

No. 188039
LICENSED
STATE OF UTAH

J. Scott Seal, P.E.
Staff Engineer

Mark Christensen P.E
Senior Engineer

GeoStrata
14425 South Center Point Way
Bluffdale, UT 84065
(801) 501-0583

October 21, 2015

TABLE OF CONTENTS

APPENDICES

1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for proposed structural upgrades to the existing McPolin Barn located at 3000 highway 224 in Park City, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the proposed site and to provide geotechnical design recommendations for the upgrade.

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed upgrade provided that the recommendations contained in this report are complied with.

Subsurface conditions were investigated through the advancement of three exploratory boreholes ranging in depth from 34½ to 51½ feet below the site grade as it existed at the time of our investigation. Based on our observations, the subject property is underlain by 1½ feet of silty topsoil overlaying Pleistocene sand and gravel deposits associated with glacial outwash processes. Groundwater was encountered in each of the boreholes at depths ranging from 26 to 27½ feet below the existing site grade, and is not anticipated to impact the proposed development.

The foundation for the proposed structural upgrade may consist of strip and/or spread footings founded on undisturbed native gravel soils. Conventional strip and spread footings founded on undisturbed native sand and gravel soils may be proportioned for a maximum net allowable bearing capacity of **3,600 psf**. Recommendations for general site grading, design of foundations, slabs-on-grade, moisture protection as well as other aspects of construction are included in this report.

NOTE: This executive summary is not intended to replace the report of which it is part and should not be used separately from the report. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report

Copyright © 2015 GeoStrata

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation conducted for proposed structural upgrades to the existing McPolin Barn located at 3000 highway 224 in Park City, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the proposed site and to provide geotechnical design recommendations for the upgrade.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses, and preparation of this report. Our services were performed in accordance with our proposal and signed authorization, dated August 4, 2015. The recommendations contained in this report are subject to the limitations presented in the "Limitations" section of this report.

2.2 PROJECT DESCRIPTION

The existing McPolin Barn is located at 3000 highway 224 in Park City, Utah (see Plate A-1, *Site Vicinity Map*). It is our understanding that it is planned to provide structural upgrades to the barn requiring geotechnical design parameters. The barn is constructed of wood with high walls. Structural loads were not provided, however we estimate that the structure will have footing loads on the order of 3 to 5 klf and up to 80 kips for columns.

3.0 METHOD OF STUDY

3.1 SUBSURFACE INVESTIGATION

As part of this investigation, subsurface soil conditions were explored by advancing three boreholes to depths ranging from 34½ to 51½ feet below the site grade as it existed at the time of our investigation. The approximate locations of the explorations are shown on the *Exploration Location Map*, Plate A-2 in Appendix A. Exploration points were selected to provide a representative cross section of the subsurface soil conditions in the vicinity of the barn. Subsurface soil conditions as encountered in the explorations were logged at the time of our investigation by qualified personnel and are presented on the enclosed Borehole Logs, Plates B-1 to B-6 in Appendix B. A *Key to USCS Soil Symbols and Terminology* is presented on Plate B-7.

The boreholes were advanced using a Mobile B-80 truck mounted drill rig. Due to the gravel and cobbles encountered, only disturbed soil samples were obtained from the subject site. Bulk samples were collected through the use of a standard split spoon sampler, and placed in bags and buckets. All samples were transported to our laboratory for testing to evaluate engineering properties of the various earth materials observed. The soils were classified according to the *Unified Soil Classification System* (USCS) by the Geotechnical Engineer. Classifications for the individual soil units are shown on the attached Borehole Logs.

3.2 LABORATORY TESTING

Geotechnical laboratory tests were conducted on samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. Laboratory tests conducted during this investigation include:

- Grain Size Distribution Analysis (ASTM D422)
- -#200 Grain-Size Soils Wash (ASTM D1140)
- Atterberg Limits (ASTM D4318)

The results of laboratory tests are presented on the Borehole Logs in Appendix B (Plates B-1 to B-6), the Laboratory Summary Table and the test result plates presented in Appendix C (Plates C-1 and C-3).

3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using soil data obtained from the laboratory test results and empirical correlations from material density, depositional characteristics and classification. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care.

4.0 GENERALIZED SITE CONDITIONS

4.1 SURFACE CONDITIONS

At the time of our subsurface investigation, a home, a relatively large barn/shed, and two concrete grain silos were located near the front (south side) of the property. Concrete and asphalt pavement were located around these existing facilities. The northern portion of the property existed in a relatively natural state, and contains a creek oriented in a northwest-southeast direction. Vegetation at the site consisted of native grasses and weeds with a few small trees.

4.2 SUBSURFACE CONDITIONS

As mentioned previously, the subsurface soil conditions were explored at the subject property by advancing six boreholes to depths ranging from 34½ to 51½ feet below the existing site grade. Subsurface soil conditions were logged during our field investigation and are included on the borehole logs in Appendix B (Plates B-1 to B-6). The soil and moisture conditions encountered during our investigation are discussed below.

4.2.1 Soils

Based on our observations and geologic literature review, the subject property is mantled with approximately 1½ feet of silty topsoil. Underlying the topsoil, we encountered a layer of Pleistocene-aged sand and gravel associated with glacial deposits of Pinedale age. Descriptions of the soil units encountered are described below:

<u>Topsoil:</u> Where observed, generally consists of brown to dark brown Sandy SILT (ML) with gravel. Typically displays trace 'pinhole' structure. This unit also has an organic appearance and texture, with roots throughout. This unit was observed in each of the boreholes advanced as part of this study and is anticipated to overlay the majority of the site.

<u>Pleistocene-Aged Glacial Outwash Gravel and Sand Deposits:</u> Where observed, generally consists of alternating layers of dense to very dense, moist to wet, brown, Poorly Graded GRAVEL (GP-GM) with silt and sand, Silty GRAVEL (GM) with sand, Poorly Graded SAND (SP) with gravel, and Silty SAND (SM) with gravel. Interbedded seams of fine-grained soils including hard, moist to wet, dark brown Sandy Lean CLAY (CL), Lean CLAY (CL) with sand, and Silty CLAY (CL-ML), were also observed within the boreholes. These soils were deposited

Copyright © 2015 GeoStrata

by meltwater at the toe of glaciers, and persisted to the full depth of our investigation. It should be noted that auger refusal on oversized material was encountered in boreholes B-2 and B-3 at a depth of 34½ feet.

The stratification lines shown on the enclosed Borehole Logs represent the approximate boundary between soil types. The actual in-situ transition may be gradual. Due to the nature and depositional characteristics of the native soils, care should be taken in interpolating subsurface conditions between and beyond the exploration locations.

4.2.2 Groundwater Conditions

Groundwater was encountered in the boreholes at depths of 26 to 27½ feet below existing site grade. Seasonal fluctuations in precipitation, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions; groundwater conditions can be expected to rise several feet seasonally depending on the time of year; however, it is not anticipated that groundwater will impact the proposed upgrade.

5.0 GEOLOGIC CONDITIONS

5.1 GEOLOGIC SETTING

The site is located at an elevation of approximately 6,680 feet above mean sea level, within an area described by Stokes (1986) as the Hinterlands portion of the Rocky Mountain physiographic province situated in the West Hills between the Wasatch Mountains to the west and the Kamas Valley to the east. The Park City region lies on the north side of a broad east-west trending uplift, generally considered to be the westward extension of the Uinta arch, and beds dip gently to the north-northwest. The anticline and associated folding are thought to be of Tertiary age and may be associated with the intrusion of porphyries in late Eocene or Oligocene time (Gill and others, 1984). The subject property is mapped as being underlain by Pleistocene-aged glacial outwash deposits (Bromfield and others, 1971). Bedrock underlying the surficial deposits is mapped as consisting of Triassic-aged Thaynes Limestone, a light grey, thin- to thick- bedded limestone with occasional beds of light-gray sandstone, siltstone, and shale (Bryant, 1990).

5.2 SEISMICITY AND FAULTING

The site lies within the north-south trending belt of seismicity known as the Intermountain Seismic Belt (ISB) (Hecker, 1993). The ISB extends from northwestern Montana through southwestern Utah. An active fault is defined as a fault that has had activity within the Holocene (<11ka). No active faults are mapped through or immediately adjacent to the site (Black et. al, 2003, Hecker, 1993). The site is located approximately 3¼ miles northwest of the Frog Valley fault. The Frog Valley fault is a northwest trending normal fault mapped along the eastern boundary of Deer Valley. This fault was reportedly last active during the early to middle Quaternary (>1.6 Ma.), although the dynamics associated with its movements are poorly understood. Holocene-aged activity has not been documented on the Frog Valley fault; thus, this fault is considered inactive.

The site is also located approximately 6¾ miles northwest of the Bald Mountain fault. The Bald Mountain fault is a northwest trending normal fault mapped along the east flank of Bald Mountain (Black et al., 2004). This fault was reportedly last active during the early to middle Quaternary (>125 k.a.), although the dynamics associated with its movement are poorly understood. Holocene-age activity has not been documented on the Bald Mountain fault; thus, this fault is considered inactive.

Finally, the site is also located approximately 14 miles east of the Salt Lake City segment of the Wasatch fault zone. The Salt Lake City segment is reported to be active and thought to generate earthquakes of approximate magnitude 7.0 to 7.5 every 1350 ± 200 years (Black et al., 2004). Analyses of ground shaking hazard along the Wasatch Front suggests that the Wasatch fault zone is the single greatest contributor to the seismic hazard in the Salt Lake City region.

Seismic hazard maps depicting probabilistic ground motions and spectral response have been developed for the United States by the U.S. Geological Survey as part of NEHRP/NSHMP (Frankel et al, 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2012). Spectral responses for the Maximum Considered Earthquake (MCE) are shown in the table below. These values generally correspond to a two percent probability of exceedance in 50 years (2PE50) for a "firm rock" site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on our field exploration, it is our opinion that this location is best described as a Site Class D. The spectral accelerations are shown in the table below. The spectral accelerations are calculated based on the site's approximate latitude and longitude of 40.6773 and -111.5271° respectively and the United States Geological Survey U.S Design Maps Tool. Based on the IBC, the site coefficients are F_a=1.28 and F_v= 1.97. From this procedure the peak ground acceleration (PGA) is estimated to be 0.33g.

MCE Seismic Response Spectrum Spectral Acceleration Values for IBC Site Class D[a]

Site Location: **Latitude = 40.6773 N** **Longitude = -111.5271 W**	**Site Class D Site Coefficients:** **Fa = 1.28** **Fv = 1.97**
Spectral Period (sec)	**Response Spectrum Spectral Acceleration (g)**
0.2	S_{MS}=(F_a*S_s=1.28*0.65) = 0.84
1.0	S_{M1}=(F_v*S_1=1.97*0.22) = 0.43
[a] IBC 1615.1.3 recommends scaling the MCE values by 2/3 to obtain the design spectral response acceleration values; values reported in the table above have not been reduced.	

5.3 LIQUEFACTION

Certain areas within the intermountain region possess a potential for liquefaction during seismic events. Liquefaction is a phenomenon whereby loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup resulting from dynamic loading, such as that caused by an earthquake. Among other effects, liquefaction can result in densification of such deposits causing settlements of overlying layers after an earthquake as excess pore water pressures are dissipated. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions; (2) soil type and consistency; and (3) depth to groundwater.

Based on the soil types, blow counts, and depth to groundwater we evaluate the liquefaction potential at this site to be low.

6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

Supporting data upon which the following recommendations are based have been presented in the previous sections of this report. The recommendations presented herein are governed by the physical properties of the earth materials encountered and tested as part of our subsurface exploration and the anticipated design data discussed in the **PROJECT DESCRIPTION** section. If subsurface conditions other than those described herein are encountered in conjunction with construction, and/or if design and layout changes are initiated, GeoStrata must be informed so that our recommendations can be reviewed and revised as changes or conditions may require.

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for the proposed upgrade provided that the recommendations contained in this report are incorporated into the design and construction of the project.

6.2 EARTHWORK

If the project requires addition footings or concrete flatwork as part of the structural upgrade proper site grading is recommended below these additions is recommended to provide proper support. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential settlement of foundations as a result of variations in subgrade moisture conditions.

6.2.1 General Site Preparation and Grading

Prior to placing structural fill, footings or concrete flatwork, any existing vegetation, topsoil, undocumented fill, debris, or otherwise unsuitable soils should be removed. Any soft, loose, or disturbed soils should also be removed. If over-excavation is required, the excavation should extend a minimum of one foot laterally for every foot of depth of over-excavation. Excavations should extend laterally at least two feet beyond flatwork, pavements, and slabs-on-grade. Following the removal of vegetation, topsoil, undocumented fill, unsuitable soils, and loose or disturbed soils, as described above, site grading may be conducted to bring the site to design elevations.

A GeoStrata representative should observe the site preparation and grading operations to assess that the recommendations presented in this report are complied with.

6.2.2 Soft Soil Stabilization

Although unlikely, soft or pumping soils may be exposed in excavations at the site. Once exposed, all subgrade surfaces beneath areas of footings and flat work concrete added as part of the structural upgrade should be proof rolled with a piece of heavy wheeled-construction equipment. If soft or pumping soils are encountered, these soils should be stabilized prior to construction of footings. Stabilization of the subgrade soils can be accomplished using a clean, coarse angular material worked into the soft subgrade. We recommend the material be greater than 2 inch diameter, but less than 6 inches. A locally available pit-run gravel may be suitable but should contain a high percentage of particles larger than 2 inches and have less than 7 percent fines (material passing the No. 200 sieve). A pit-run gravel may not be as effective as a coarse, angular material in stabilizing the soft soils and may require more material and greater effort. The stabilization material should be worked (pushed) into the soft subgrade soils until a firm relatively unyielding surface is established. Once a firm, relatively unyielding surface is achieved, the area may be brought to final design grade using structural fill.

In large areas of soft subgrade soils, stabilization of the subgrade may not be practical using the method outlined above. In these areas it may be more economical to place a woven geotextile fabric against the soft soils covered by 18 inches of coarse, sub-rounded to rounded material over the woven geotextile. An inexpensive non-woven geotextile “filter” fabric should also be placed over the top of the coarse, sub-rounded to rounded fill prior to placing structural fill or pavement section soils to reduce infiltration of fines from above. The woven geotextile should be Amoco 2004 or prior approved equivalent. The filter fabric should consist of an Amoco 4506, Amoco 4508, or equivalent as approved by the Geotechnical Engineer.

6.2.3 Excavation Stability

Based on Occupational Safety and Health Administration (OSHA) guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied, however, the presence of fill soils, loose soils, or wet soils may require that the walls be flattened to maintain safe working conditions. When the trench is deeper than 5 feet, we recommend a trench-shield or shoring be used as a protective system to workers in the trench. Based on our soil observations, laboratory testing, and OSHA guidelines, native soils at the site classify as Type C soils. Deeper excavations, if required, should be constructed with side slopes no steeper than one and one-half horizontal to one vertical (1.5H:1V). If wet conditions are encountered, side slopes should be further flattened to maintain slope stability. Alternatively shoring or trench boxes may be used to improve safe work conditions in trenches. The contractor is ultimately responsible for trench and site safety. Pertinent OSHA requirements should be met to provide a safe work environment. If site specific conditions arise that require engineering analysis in accordance with OSHA regulations, GeoStrata can respond and provide recommendations as needed.

We recommend that a GeoStrata representative be on-site during all excavations to assess the exposed foundation soils. We also recommend that the Geotechnical Engineer be allowed to review the grading plans when they are prepared in order to evaluate their compatibility with these recommendations.

6.2.4 Structural Fill and Compaction

All fill placed for the support of structures, concrete flatwork or pavements should consist of structural fill. Structural fill may consist of onsite sand and gravel soils with particles larger than 4inches removed. The native clay soils should not be used. Alternatively, structural fill may consist of an imported material. We recommend that imported structural fill consist of a relatively well graded granular soil with a maximum of 50 percent passing the No. 4 mesh sieve and a maximum fines fines content (minus No.200 mesh sieve) of 25 percent. Clay and silt particles in imported structural fill should have a liquid limit less than 35 and a plasticity index less than 15 based on the Atterberg Limit's test (ASTM D-4318). All structural fill should be free of vegetation, debris, or frozen material, and should contain no inert materials larger than 4 inches nominal size. Soils not meeting the aforementioned criteria may be suitable for use as structural fill. These soils should be evaluated on a case-by-case basis and should be approved by the Geotechnical Engineer prior to use.

All structural fill should be placed in maximum 6-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 8-inch loose lifts if compacted by light-duty rollers, and maximum 10-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by the geotechnical engineer. Structural fill should be compacted to at least 95% of the MDD, as determined by ASTM D-1557. The moisture content should be at or slightly above the OMC at the time of placement and compaction. Also, prior to placing any fill, the excavations should be observed by the geotechnical engineer to observe that any unsuitable materials or loose soils have been removed. In addition, proper grading should precede placement of fill, as described in the **General Site Preparation and Grading** subsection of this report (Section 6.2.1).

Fill soils placed for subgrade below exterior flat work and pavements, should be within 3% of the OMC when placed and compacted to at least 95% of the MDD as determined by ASTM D-1557. All utility trenches backfilled below the proposed structure, pavements, and flatwork concrete, should be backfilled with structural fill that is within 3% of the OMC when placed and compacted to at least 95% of the MDD as determined by ASTM D-1557. All other trenches, in landscape areas, should be backfilled and compacted to at least 90% of the MDD (ASTM D-1557).

The gradation, placement, moisture, and compaction recommendations contained in this section meet our minimum requirements, but may not meet the requirements of other governing agencies such as city, county, or state entities. If their requirements exceed our recommendations, their specifications should override those presented in this report.

6.3 FOUNDATIONS

The foundation for the proposed structural upgrade may consist of strip and/or spread footings founded on undisturbed native gravel soils. Strip and spread footings should be a minimum of 20 and 36 inches wide, respectively, and exterior shallow footings should be embedded at least 30-inches below final grade for frost protection and confinement.

Conventional strip and spread footings founded on undisturbed, native soils may be proportioned for a maximum net allowable bearing capacity of **3,600 psf**. The net allowable bearing capacity may be increased (typically by one-third) for temporary loading conditions such as transient wind and seismic loads. All footing excavations should be observed by the Geotechnical Engineer prior to footing placement.

6.4 SETTLEMENT

Settlements of properly designed and constructed conventional footings, founded as described above, are anticipated to be less than 1 inch. Differential settlements should be on the order of half the total settlement over 30 feet.

6.5 EARTH PRESSURES AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting subgrade. In determining the frictional resistance, a coefficient of friction of 0.43 should be used for native sand and gravel soils against concrete.

Ultimate lateral earth pressures from *granular* backfill acting against buried walls and structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in the following table:

Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pounds per cubic foot)
Active*	0.29	35
At-rest**	0.46	55
Passive*	3.39	407
Seismic Active***	0.25	30
Seismic Passive***	-0.53	-64

* Based on Coulomb's equation

** Based on Jaky

*** Based on Mononobe-Okabe Equation

These coefficients and densities assume level, granular backfill with no buildup of hydrostatic pressures. The force of the water should be added to the presented values if hydrostatic pressures are anticipated. If sloping backfill is present, we recommend the geotechnical engineer be consulted to provide more accurate lateral pressure parameters once the design geometry is established.

Walls and structures allowed to rotate slightly should use the active condition. If the element is constrained against rotation, the at-rest condition should be used. These values should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by ½.

For seismic analyses, the *active* and *passive* earth pressure coefficient provided in the table is based on the Mononobe-Okabe pseudo-static approach and only accounts for the dynamic horizontal thrust produced by ground motion. Hence, the resulting dynamic thrust pressure *should be added* to the static pressure to determine the total pressure on the wall. The pressure distribution of the dynamic horizontal thrust may be closely approximated as an inverted triangle with stress decreasing with depth and the resultant acting at a distance approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure.

The coefficients shown assume a vertical wall face. Hydrostatic and surcharge loadings, if any, should be added. Over-compaction behind walls should be avoided. Resisting passive earth pressure from soils subject to frost or heave, or otherwise above prescribed minimum depths of embedment, should usually be neglected in design.

6.6 CONCRETE SLAB-ON-GRADE CONSTRUCTION

Concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel overlying native soils or a zone of structural fill that is at least 12 inches thick. Disturbed native soils should be compacted to at least 95% of the MDD as determined by ASTM D-1557 (modified proctor) prior to placement of gravel. The gravel should consist of road base or clean drain rock with a ¾-inch maximum particle size and no more than 12 percent fines passing the No. 200 mesh sieve. The gravel layer should be compacted to at least 95 percent of the MDD of modified proctor or until tight and relatively unyielding if the material is non-proctorable. All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with welded wire, re-bar, or fiber mesh.

6.7 MOISTURE PROTECTION AND SURFACE DRAINAGE

Moisture should not be allowed to infiltrate the soils in the vicinity of the foundations. We recommend the following mitigation measures be implemented at the building location.

- The ground surface within 10 feet of the entire perimeter of the building should slope a minimum of five percent away from the structure. Alternatively, a slope of 5% is acceptable if the water is conveyed to a concrete ditch that will convey the water to a point of discharge that is at least 10 feet from the structures.
- Roof runoff devices (rain gutters) should be installed to direct all runoff a minimum of 10 feet away from the structure and preferably day-lighted to the curb where it can be transferred to the storm drain system. Rain gutters discharging roof runoff adjacent to or within the near vicinity of the structure may result in excessive differential settlement.

- We do not recommend storm drain collection sumps be used as part of this development. However, if necessary, sumps should not be located adjacent to foundations or within roadway pavements due to the presence of potentially collapsible soils.
- We recommend irrigation around foundations be minimized by selective landscaping and that irrigation valves be constructed at least 5 feet away from foundations.
- Jetting (injecting water beneath the surface) to compact backfill against foundation soils may result in excessive settlement beneath the building and is not allowed.
- Backfill against foundations walls should consist of on-site native fine-grained soils and should be placed in lifts and compacted to 90% modified proctor to create a moisture barrier.

Failure to comply with these recommendations could result in excessive total and differential settlements causing structural damage.

6.8 SOIL CORROSIVITIY

Based on our experience within the area of the project site as well as with similar soils, the near-surface soils are expected to exhibit a negligible potential for sulfate attack when in contact with concrete elements. We further anticipate that conventional Type I/II cement can be used for all concrete associated with the project.

The onsite soils are anticipated to be corrosive to ferrous metal. A qualified corrosion engineer should be consulted to provide an assessment of any metal that may be associated with construction of ancillary water lines and reinforcing steel, valves and similar improvements.

7.0 CLOSURE

7.1 LIMITATIONS

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

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

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

7.2 ADDITIONAL SERVICES

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during construction. GeoStrata staff should be on site to verify compliance with these recommendations. These tests and observations should include, but not necessarily be limited to, the following:

- Observations and testing during site preparation, earthwork and structural fill placement.
- Observation of foundation soils to assess their suitability for footing placement.
- Observation of soft/loose soils over-excavation.
- Observation of temporary excavations and shoring.
- Consultation as may be required during construction.
- Quality control and observation of concrete placement.

We also recommend that project plans and specifications be reviewed by GeoStrata to verify compatibility with our conclusions and recommendations. Additional information concerning the scope and cost of these services can be obtained from our office.

We appreciate the opportunity to be of service on this project. Should you have any questions regarding the report or wish to discuss additional services, please do not hesitate to contact us at your convenience at (801) 501-0583.

8.0 REFERENCES CITED

Black, B.D., Hecker, S., Hylland, M.D., Christenson, G.E., and McDonald G.N., 2003, Quaternary Fault and Fold Database and Map of Utah: Utah geological Survey Map 193DM.

Black, B.D., DuRoss, C.B., Hylland, M.D., McDonald, G.N., and Hecker, S., compilers, 2004, Fault number 2351f, Wasatch fault zone, Salt Lake City section, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults

Black, B.D., DuRoss, C.B., McDonald, G.N., and Hecker, S., compilers, 2004, Fault number 2390, Bald Mountain fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults

Black, B.D., and Hecker, S., compilers, 1999, Fault number 2389, Frog Valley fault, in Quaternary fault and fold database of the United States: U.S. Geological Survey website, http://earthquakes.usgs.gov/regional/qfaults

Bromfield, C.S., Crittenden, M.D., 1971 Geologic Map of the Park City East Quadrangle, Summit and Wasatch Counties, Utah. Utah Geological Survey Map CQ-852

Bryant, B., 1990, Geologic Map of the Salt Lake City 30' x 60' Quadrangle, North-Central Utah, and Uinta County, Wyoming: U.S. Geological Survey Map I-1944, Scale 1:100,000.

Federal Emergency Management Agency [FEMA], 1997, *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures,* FEMA 302, Washington, D.C.

Frankel, A., Mueller, C., Barnard, T., Perkins, D., Leyendecker, E.V., Dickman, N., Hanson, S., and Hopper, M., 1996, *National Seismic-hazard Maps: Documentation*, U.S. Geological Survey Open-File Report 96-532, June.

Gill, H.E., Lund, W.R., 1984, Engineering Geology of Park City, Summit County, Utah. Utah Geological and Mineral Survey, Special Studies 66

Harty, K.M., 1992, Landslide Map of the Salt Lake City 30' X 60' Quadrangle: Utah Geological Survey, Open File Report 236, Scale 1:100,000.

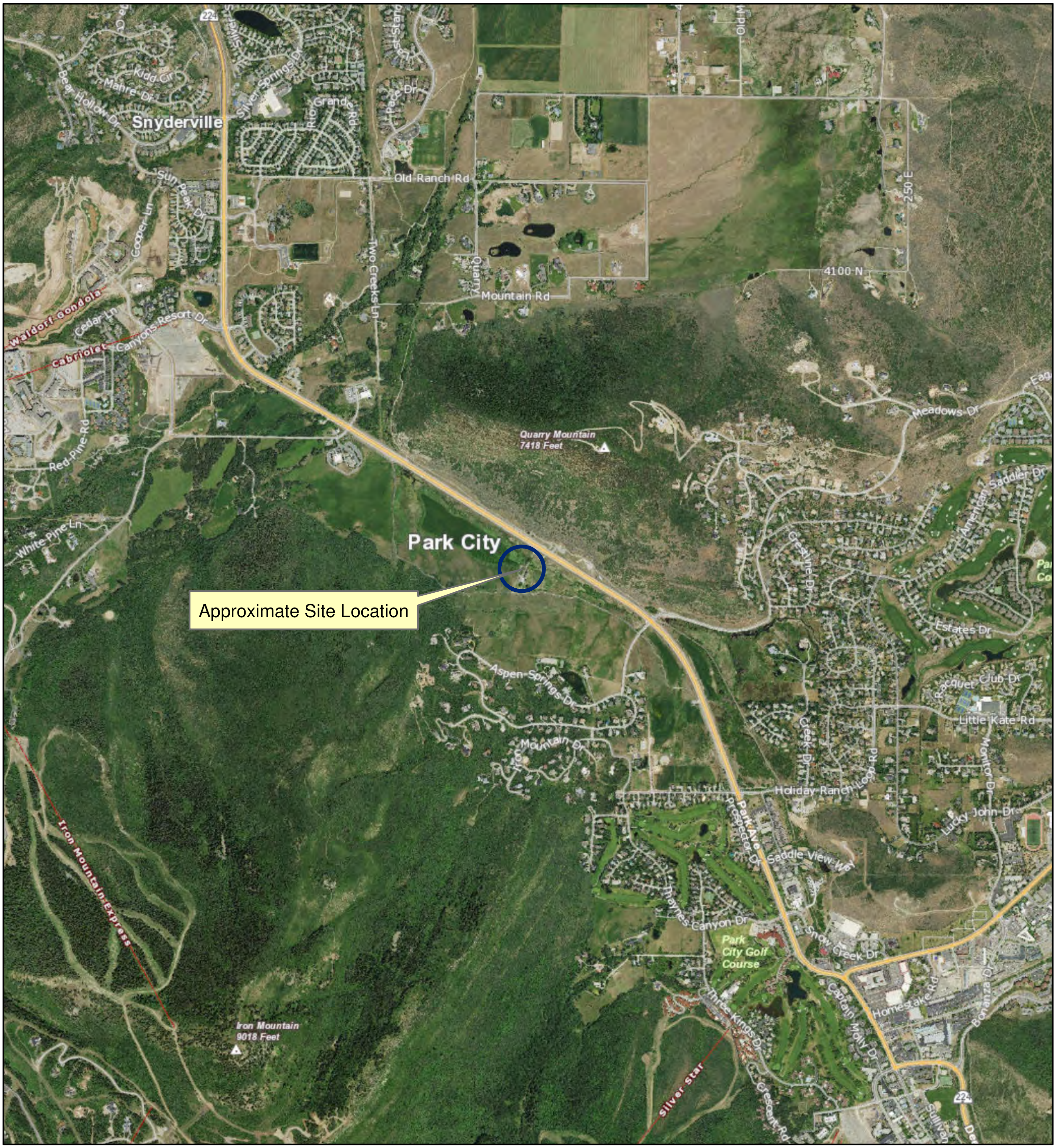
Hecker, S., 1993, Quaternary Tectonics of Utah with Emphasis on Earthquake-Hazard Characterization: Utah Geological Survey Bulletin 127.

Hintze, L. F., 1980, Geologic Map of Utah: Utah Geological and Mineral Survey Map-A-1, scale 1:500,000.

Hintze, L.F. 1993, Geologic History of Utah: Brigham Young University Studies, Special Publication 7, 202 p.

International Building Code [IBC], 2012, International Code Council, Inc.

Stokes, W.L., 1986, Geology of Utah: Utah Museum of Natural History and Utah Geological and Mineral Survey Occasional Paper Number 6, 280 p.



0 1,000 2,000 4,000 6,000 8,000 Feet

1:24,000

Base Map: Utah AGRC Hybrid Base Map

N

GeoStrata

Copyright GeoStrata, 2015

Park City
McPolin Barn
Park City, UT
Project Number: 125-014

Site Vicinity Map

Plate A-1

GeoStrata

Copyright GeoStrata, 2015

Park City
McPolin Barn
Park City, UT
Project Number: 125-014

Exploration Location Map

Plate A-2

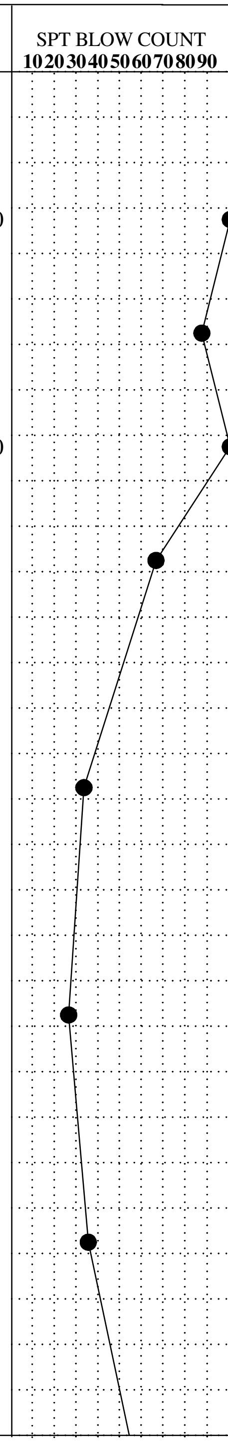
Legend

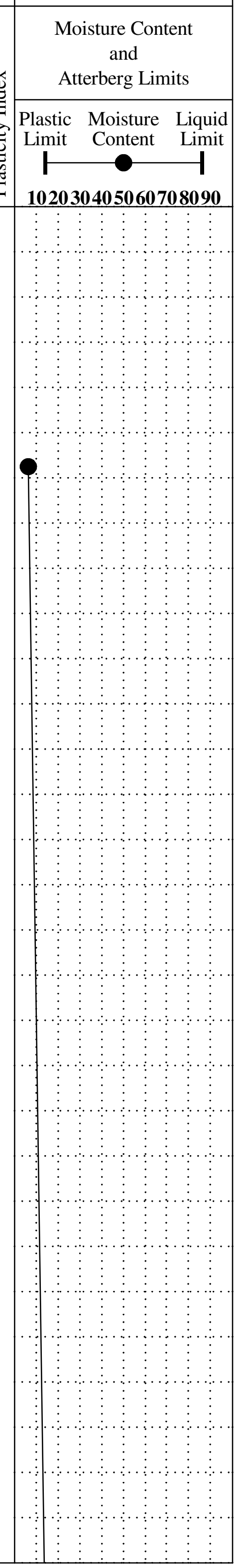
Approximate Boring Location

DATE		Project		BORING NO:
STARTED:	9/1/15	Park City McPolin Barn Park City, UT	GeoStrata Rep: C. Maughan	**B-1**
COMPLETED:	9/1/15		Rig Type: B-80	
BACKFILLED:	9/1/15	Project Number 125-014	Boring Type: Hollow Stem Auger	Sheet 1 of 2

LOCATION: STATION | OFFSET | ELEVATION

DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0				TOPSOIL; Sandy SILT with gravel, brown, moist							
				GP-GM	Poorly Graded GRAVEL with silt and sand - very dense, brown, moist							
1		X				50-4	100					
	5	X				49	87		6.3	7.2		
2												
		X		CL	Lean CLAY with gravel - hard, dark brown, moist	50-5	100					
3	10	X			- broken gravel/cobble in sample	41	66					
4												
	15	X			- very stiff, with red and grey	20	33					
5												
6	20	X		SM	Silty SAND with gravel - medium dense, grey-brown, moist	15	26					
7												
	25	X	▼		- medium dense, wet	22	35					
8												
9												





N - OBSERVED UNCORRECTED BLOW COUNT

N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

GeoStrata

Copyright (c) 2015, GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate

B - 1

DATE	
STARTED:	9/1/15
COMPLETED:	9/1/15
BACKFILLED:	9/1/15

Park City
McPolin Barn
Park City, UT

Project Number 125-014

GeoStrata Rep: C. Maughan
Rig Type: B-80
Boring Type: Hollow Stem Auger

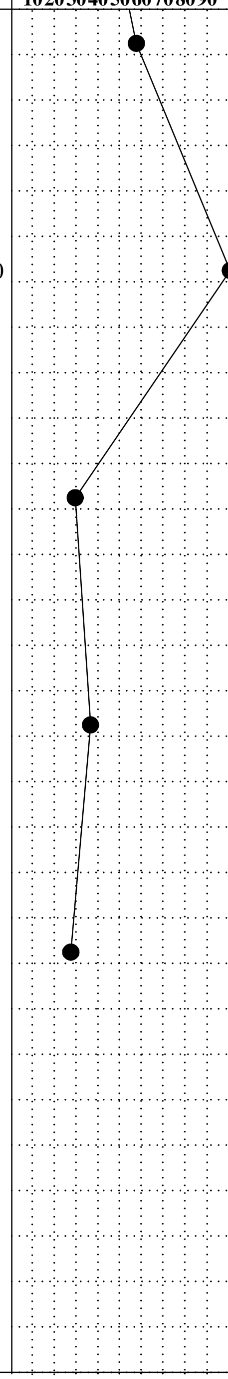
BORING NO: **B-1**

Sheet 2 of 2

LOCATION — STATION — OFFSET — ELEVATION

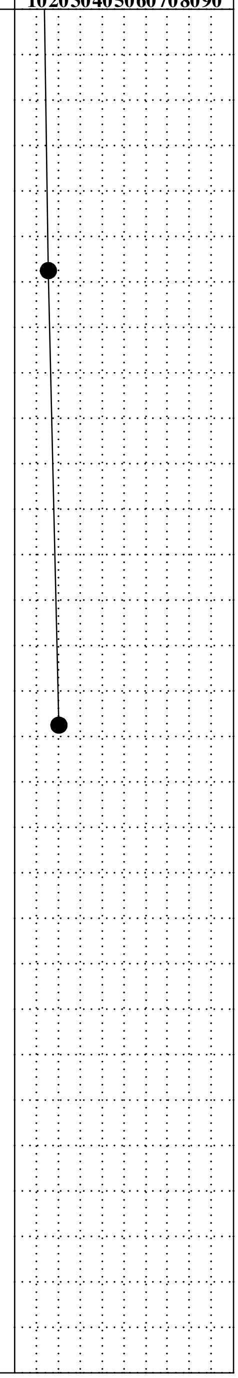
Depth (feet)	Samples	Water Level	Unified Soil Classification	MATERIAL DESCRIPTION	N	N*	Dry Density (pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
30	☒			- dense	38	57					
35	☒			- very dense	75	100		15.4	25.9		
40	☒		CL-ML	Silty CLAY - stiff, red-brown, very moist	21	29					
45	☒		SM	Silty SAND - medium dense, brown, wet	28	36		20.2	45.0		
50	☒				22	27					
51.5				Bottom of Boring @ 51.5 Feet							

SPT BLOW COUNT



Moisture Content and Atterberg Limits

Plastic Limit — Moisture Content — Liquid Limit



N - OBSERVED UNCORRECTED BLOW COUNT

N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

SAMPLE TYPE
- ☒ - 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

GeoStrata

Copyright (c) 2015, GeoStrata

Plate
B - 2

DATE	
STARTED:	9/1/15
COMPLETED:	9/1/15
BACKFILLED:	9/1/15

Park City
McPolin Barn
Park City, UT

Project Number 125-014

GeoStrata Rep: C. Maughan
Rig Type: B-80
Boring Type: Hollow Stem Auger

BORING NO:
B-2
Sheet 1 of 2

LOCATION

STATION | OFFSET | ELEVATION

N - OBSERVED UNCORRECTED BLOW COUNT; N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

DEPTH (FEET)	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0		TOPSOIL; Sandy SILT with gravel - brown, moist							
	GM	Silty GRAVEL with sand - very dense, brown, moist	45	84					
5			75	100		7.2	19.2	NP	NP
	CL	Lean CLAY - very stiff, brown, moist	29	49					
10		- with red and black mottling	23	37					
15	SM	Silty SAND with gravel - dense, brown with red, moist	35	58		13.5	45.0		
20			18	31					
25	CL-ML	Silty CLAY - stiff, dark brown and gray, moist	10	16					

SPT BLOW COUNT: 10 20 30 40 50 60 70 80 90

Moisture Content and Atterberg Limits: Plastic Limit, Moisture Content, Liquid Limit: 10 20 30 40 50 60 70 80 90

METERS: 0 1 2 3 4 5 6 7 8 9
FEET: 0 5 10 15 20 25

GeoStrata

Copyright (c) 2015, GeoStrata

SAMPLE TYPE
- ☒ - 2" O.D./1.38" I.D. Split Spoon Sampler
- ◪ - 2.5" O.D./2" I.D. California Split Spoon Sampler
- ▨ - 3" O.D. Thin-Walled Shelby Sampler
- ◫ - Grab Sample
- ▮ - 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
B - 3

DATE	
STARTED:	9/1/15
COMPLETED:	9/1/15
BACKFILLED:	9/1/15

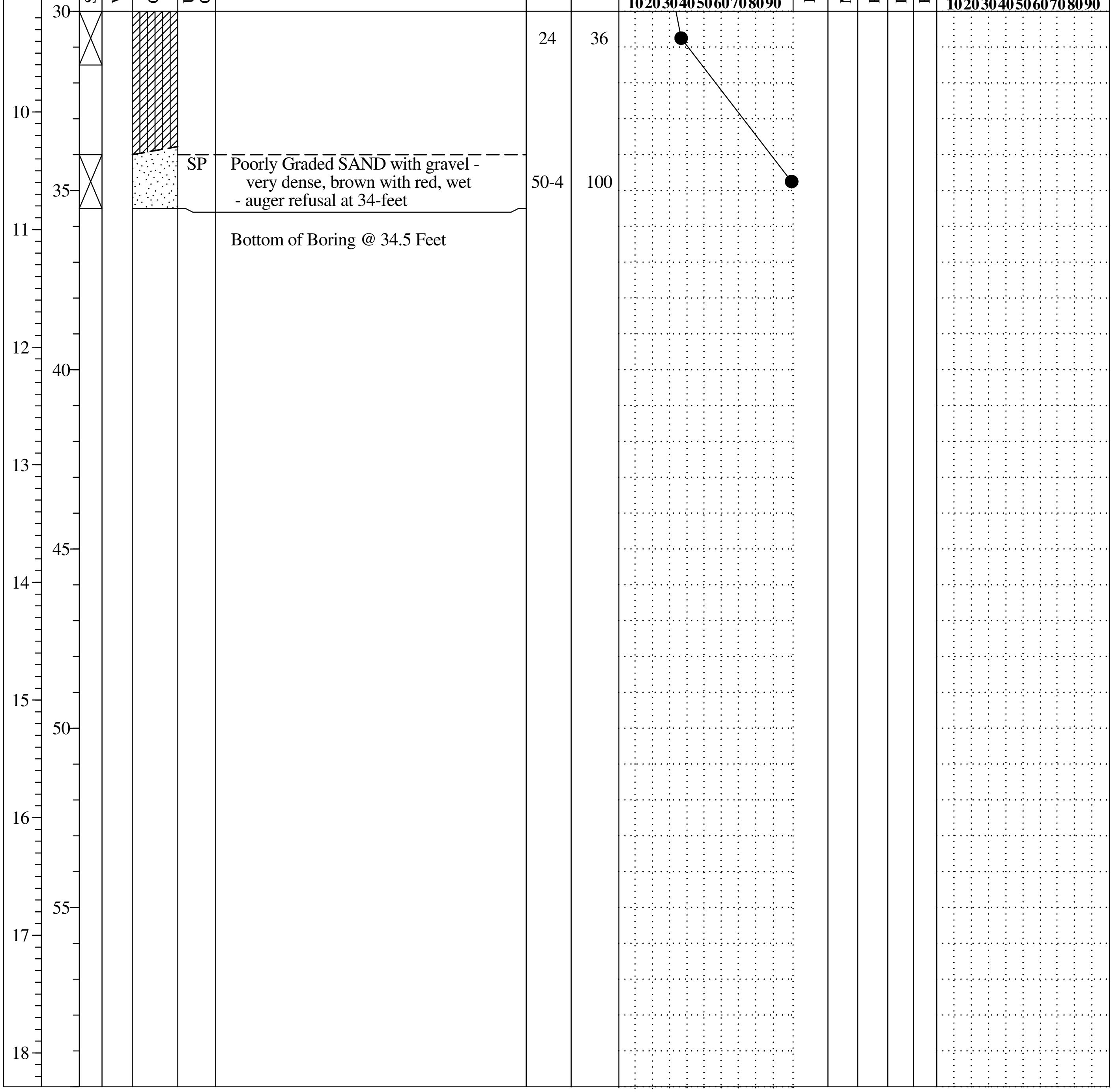
Park City
McPolin Barn
Park City, UT
Project Number 125-014

GeoStrata Rep: C. Maughan
Rig Type: B-80
Boring Type: Hollow Stem Auger

BORING NO:
B-2
Sheet 2 of 2

LOCATION: STATION / OFFSET / ELEVATION

DEPTH (FEET)	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
30	X					24	36					
35	X			SP	Poorly Graded SAND with gravel - very dense, brown with red, wet - auger refusal at 34-feet	50-4	100					
					Bottom of Boring @ 34.5 Feet							



N - OBSERVED UNCORRECTED BLOW COUNT
N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

GeoStrata

Copyright (c) 2015, GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
- MEASURED
- ESTIMATED

Plate
B - 4

DATE		
STARTED:	9/1/15	
COMPLETED:	9/1/15	
BACKFILLED:	9/1/15	

Park City
McPolin Barn
Park City, UT

Project Number 125-014

GeoStrata Rep: C. Maughan
Rig Type: B-80
Boring Type: Hollow Stem Auger

BORING NO:

B-3

Sheet 1 of 2

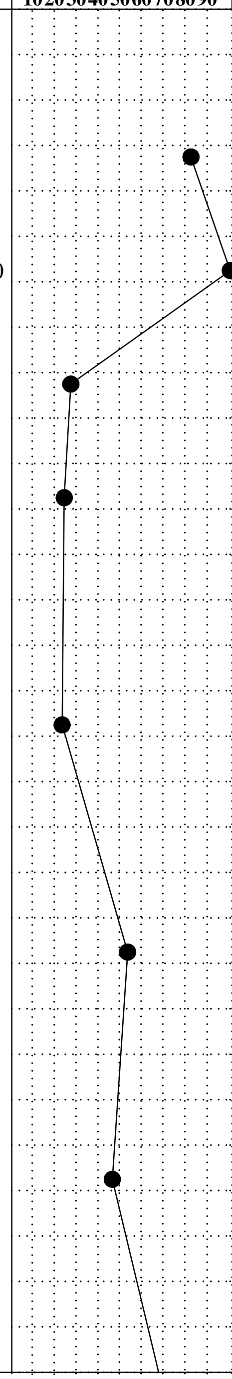
LOCATION

STATION OFFSET ELEVATION

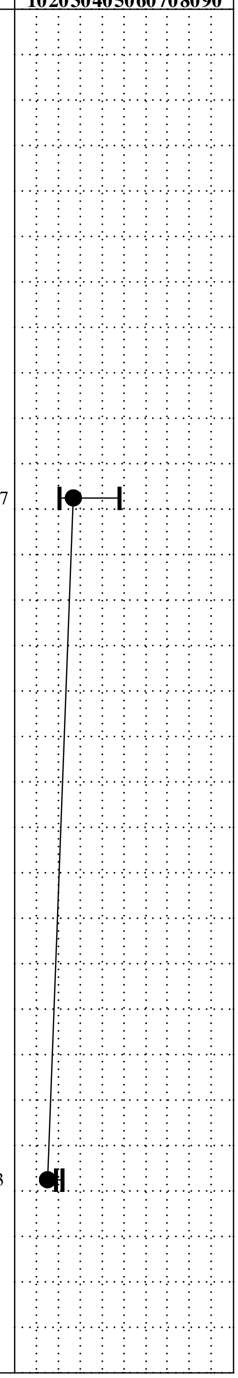
DEPTH (FEET)	USCS	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0		TOPSOIL; Sandy SILT with gravel <1", brown, moist							
	GM	Silty GRAVEL with sand - very dense, brown, moist - broken gravel/cobble at bottom of sample	44	82					
5			50-4	100					
	CL	Sandy Lean CLAY - very stiff, brown, moist	16	27					
10	CL	Lean CLAY with sand - stiff, brown with black mottling, moist	15	24		26.8	81.0	48	27
15		- very stiff	14	23					
20	SM	Silty SAND - dense, brown, moist	31	53					
25			29	46		15.0	49.7	22	3

METERS: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
FEET: 0, 5, 10, 15, 20, 25

SPT BLOW COUNT
10 20 30 40 50 60 70 80 90



Moisture Content and Atterberg Limits
Plastic Limit — Moisture Content — Liquid Limit
10 20 30 40 50 60 70 80 90



N - OBSERVED UNCORRECTED BLOW COUNT N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

GeoStrata

Copyright (c) 2015, GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate

B - 5

DATE		
STARTED:	9/1/15	
COMPLETED:	9/1/15	
BACKFILLED:	9/1/15	

Park City
McPolin Barn
Park City, UT
Project Number 125-014

GeoStrata Rep: C. Maughan
Rig Type: B-80
Boring Type: Hollow Stem Auger

BORING NO: **B-3**
Sheet 2 of 2

LOCATION: STATION | OFFSET | ELEVATION

DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT (10 20 30 40 50 60 70 80 90)	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit / Moisture Content / Liquid Limit; 10 20 30 40 50 60 70 80 90)
	30				SP	Poorly Graded SAND with gravel - dense, brown/black/white/green, wet	48	71							
10						- auger refusal at 33 feet	50-4	100							
	35					Bottom of Boring @ 34.5 Feet									
11															
12	40														
13															
14	45														
15	50														
16															
17	55														
18															

N - OBSERVED UNCORRECTED BLOW COUNT
N* - CORRECTED N1(60) EQUIVALENT SPT BLOW COUNT

GeoStrata

Copyright (c) 2015, GeoStrata

SAMPLE TYPE
- 2" O.D./1.38" I.D. Split Spoon Sampler
- 2.5" O.D./2" I.D. California Split Spoon Sampler
- 3" O.D. Thin-Walled Shelby Sampler
- Grab Sample
- 2" O.D./1.625" I.D. Liner Sampler

NOTES:

WATER LEVEL
▼ - MEASURED ▽ - ESTIMATED

Plate
B - 6

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

LOG KEY SYMBOLS

BORING SAMPLE LOCATION

TEST-PIT SAMPLE LOCATION

WATER LEVEL (level after completion)

WATER LEVEL (level where first encountered)

CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKELY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

STRATIFICATION

DESCRIPTION	THICKNESS	DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"	OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
LAYER	1/2 - 12"	FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil conditions between individual sample locations.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA. SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE UNTRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

GeoStrata

Copyright GeoStrata, 2015

Soil Symbols Description Key

Park City
McPolin Barn
Park City, UT
Project Number: 125-014

Plate B-7

Boring No.	Sample Depth (feet)	USCS Soil Classification	Natural Moisture Content (%)	Gradation			Atterberg	
				Gravel (%)	Sand (%)	Fines (%)	LL	PI
B-1	5	GP-GM	6.3	51.6	41.2	7.2		
B-1	35	SM	15.4	30.8	43.3	25.9		
B-1	45	SM	20.2	0.3	54.7	45.0		
B-2	5	GM	7.2	80.8		19.2	NP	NP
B-2	15	SM	13.5	26.8	28.2	45.0		
B-3	10	CL	26.8	19.0		81.0	48	28
B-3	25	SM	15	1.7	48.6	49.7	22	3

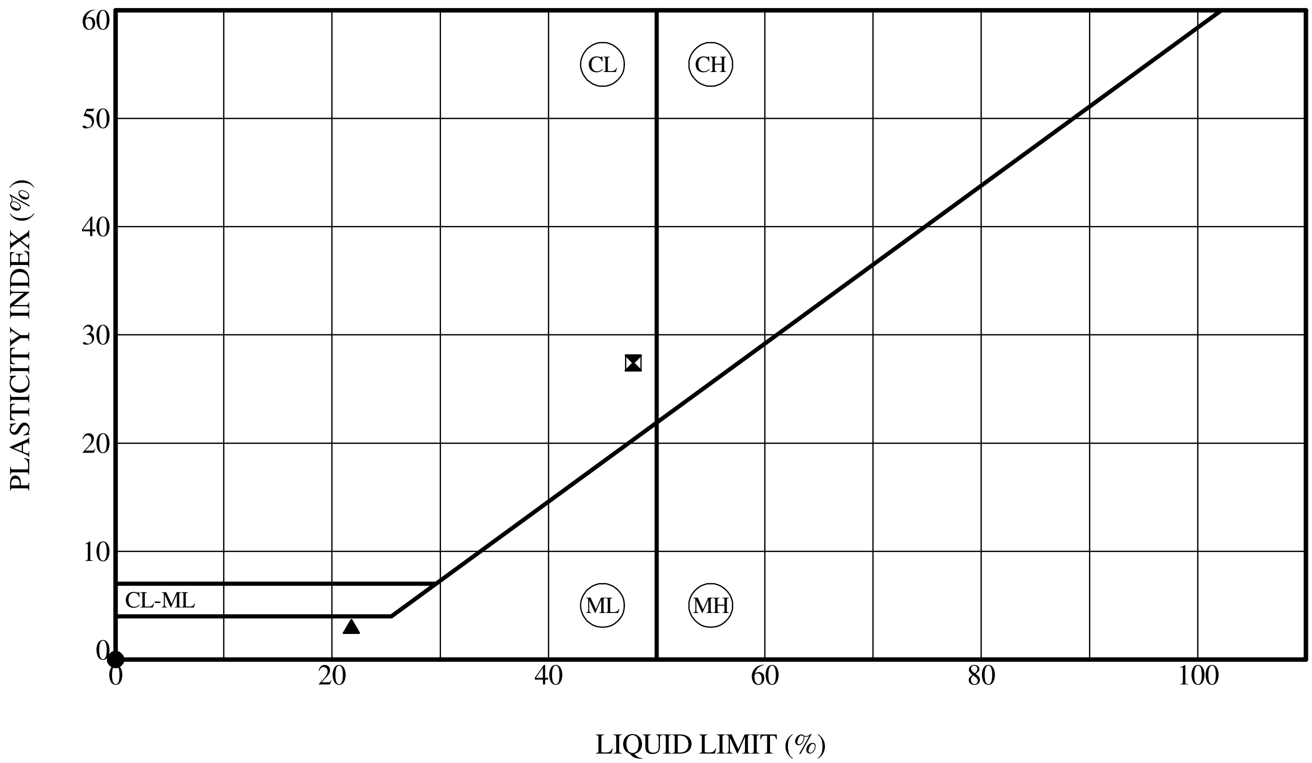
GeoStrata

Copyright GeoStrata, 2015

Lab Summary Report

Park City
McPolin Barn
Park City, UT
Project Number: 125-014

Plate C - 1



	Sample Location	Depth (ft)	LL (%)	PL (%)	PI (%)	Fines (%)	Classification
●	**B-2**	**5.0**	**NP**	**NP**	**NP**	**19.2**	**Silty GRAVEL with sand**
⊠	**B-3**	**10.0**	**48**	**20**	**28**	**81.0**	**Lean CLAY with sand**
▲	**B-3**	**25.0**	**22**	**19**	**3**	**49.7**	**Silty SAND**

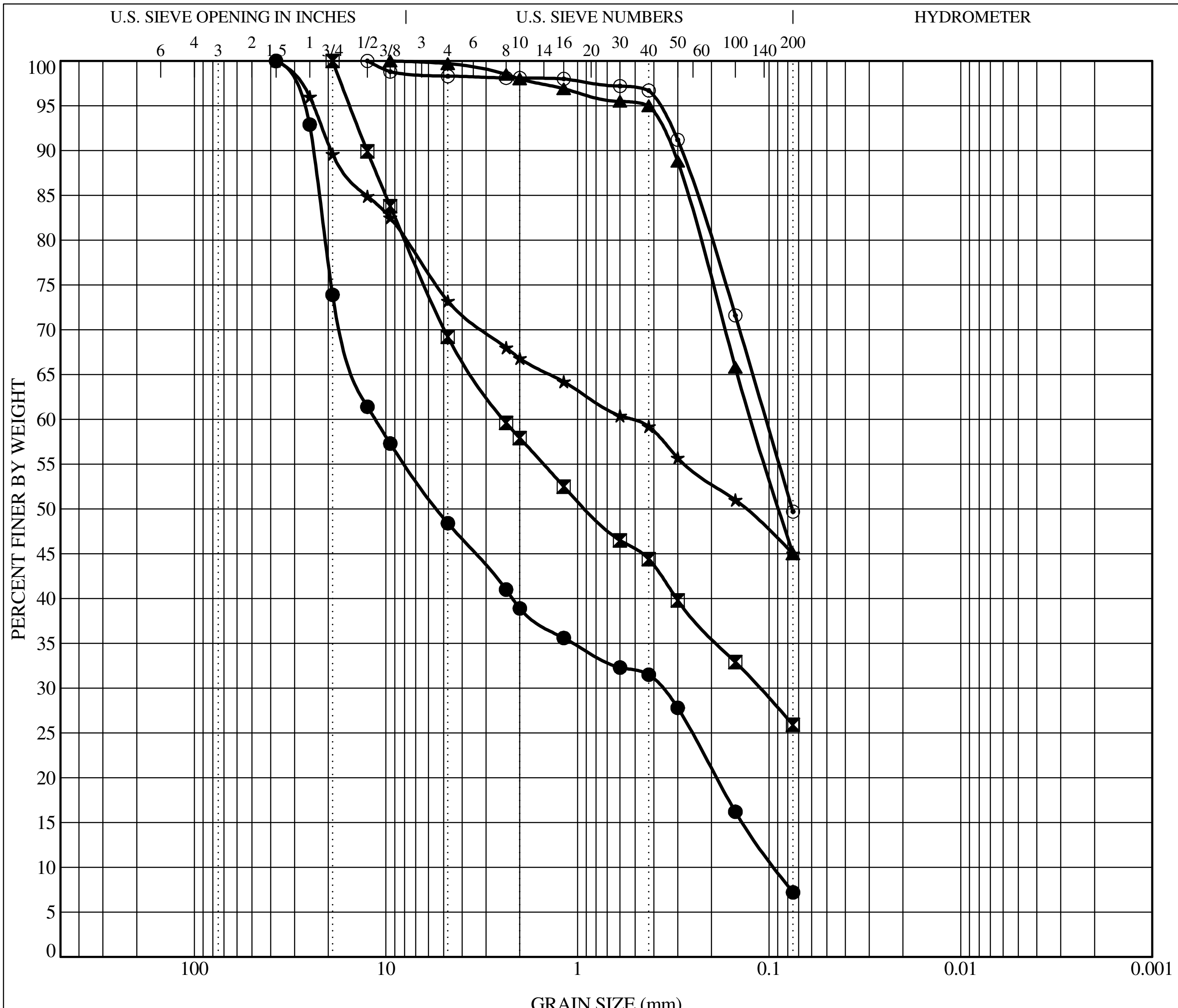
GeoStrata

ATTERBERG LIMITS' RESULTS - ASTM D 4318

Park City
McPolin Barn
Park City, UT
Project Number: 125-014

Plate

C - 2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample Location	Depth	Classification	LL	PL	PI	Cc	Cu
●	**B-1**	**5.0**	**Poorly Graded GRAVEL with silt and sand**				**0.13**	**122.32**
⊠	**B-1**	**35.0**	**Silty SAND with gravel**					
▲	**B-1**	**45.0**	**Silty SAND**					
★	**B-2**	**15.0**	**Silty SAND with gravel**					
⊙	**B-3**	**25.0**	**Silty SAND**	**22**	**19**	**3**		

	Sample Loctaion	Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-1**	**5.0**	**37.5**	**11.382**	**0.369**	**0.093**	**51.6**	**41.2**	**7.2**	
⊠	**B-1**	**35.0**	**19**	**2.43**	**0.113**		**30.8**	**43.3**	**25.9**	
▲	**B-1**	**45.0**	**9.5**	**0.124**			**0.3**	**54.7**	**45.0**	
★	**B-2**	**15.0**	**37.5**	**0.535**			**26.8**	**28.2**	**45.0**	
⊙	**B-3**	**25.0**	**12.5**	**0.104**			**1.7**	**48.6**	**49.7**	

GeoStrata

GRAIN SIZE DISTRIBUTION - ASTM D422

Park City
McPolin Barn
Park City, UT
Project Number: 125-014

Plate

C - 3

C_GSD BORING LOGS 825-014.GPJ GEOSTRATA.GDT 10/13/15