ALLIANCE CONSULTING ENGINEERS, INC
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SUBDIVSION ANNEXATION REQUEST FEASIBILITY REPORT

14 FEBRUARY 2018

PARCELS: 02-004-0001, 02-004-0002, 02-004-0003
500 NORTH AND 300 EAST IN PROVIDENCE, UTAH

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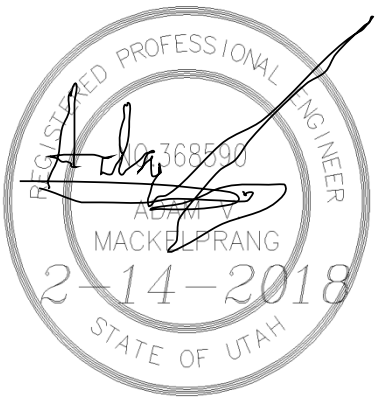
SUBDIVISION FEASIBILITY SUMMARY

At the request of Ridgeview Park, LLC a feasibility study has been prepared for parcels 02-004-0001, 02-004-0002 and 02-004-0003.

The previously mentioned parcels are located in the County between River Heights City (1000 East, 600 South) and Providence City (300 East, 500 North).

These parcels have recently been purchased by Ridgeview Park, LLC and are in the process of being developed into residential lots and housing to be known as Ridgeway Park. In order to proceed with development the above mentioned parcels need to be annexed into an adjacent city. With parcel 02-004-0003 already on the Providence City annexation masterplan it made sense to the developer to look at annexing the additional two parcels into Providence City as well.

Based on the details contained in this report, parcels 02-004-0001 and 02-004-0002 should be added to the Providence City Annexation masterplan.



NOTE: This feasibility study is based on utility research, on site topography and sampling, meetings with the city and other online resources.

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LIST OF ATTACHMENTS

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1.0 Introduction

The purpose of this report is to determine the feasibility of annexing parcels 02-004-0001, 02-004-0002 and 02-004-0003 into Providence City.

The parcels are located in the County between River Heights City (1000 East, 600 South) and Providence City (300 East, 500 North) and have the option of annexing into either city. This being said, the developer knows that a successful development is often based on the ability of a City to provide the necessary services. This report has been compiled to analyze the ability of Providence City to provide said services.

2.0 Current Annexation

The current annexation/masterplan of Providence City is included in Figure 1. As Ridgeview Park, LLC has completed the purchase of Parcels 02-004-0001, 02-004-0002 and 02-004-0003, they desire that they all be developed within the same City. Per the Providence City annexation masterplan parcel 02-004-0003 is already part of the annexation masterplan of Providence City.

3.0 Site- Layout and density

A potential layout of the site has been included in Figure 2. This shows how the project would beautifully fit into the surrounding area. The conceptual project will contain a neighborhood that will cater to individuals in all stages of life with approximately (43) active adult lots, (47) single family lots and (29) 4-plex townhomes in 38.35 acres for an over density of 5.37. These numbers are subject to change slightly as the design process is completed.

The project is bordered on the north by 600 South (River Heights), on the south by Spring Creek Parkway (500 North in Providence) and on the east by 300 East (Providence). Each of these roads have a 66 foot right of way and sufficient capacity for the proposed development.

4.0 Culinary Water

Per a meeting with Providence City, the City has adequate pressure and water capacity in the area. The development will be serviced by existing waterlines in Spring Creek Parkway to the west and 300 East to the east. As part of the development the waterline in Spring Creek will be extended to 300 East providing additional looping for the develpments to the east (ie. Providence Hollow). A map of the area is provided in Figure 3.

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5.0 Sewer Disposal

Per a meeting with Providence City, the City has sufficient sewer capacity in the area. An existing sewer line runs down the entire length of Spring Creek (500 North). In order to ensure that the sewer is deep enough to service the entire project, a field topo was performed. An analysis of maximum sewer depths based on an assumed layout was then performed. The sewer depths along with the existing contours are shown on Figure 3. As shown on the map the sewer is adequately deep for any needs by the developer.

6.0 Storm Water

The project is fortunate enough to be located adjacent to Spring Creek and will use it as an outlet for storm water. The project has designated several areas sufficient in size for the detention requirements throughout. As such the project will have zero impact on the city's facilities. A map showing the project masterplan is shown in Figure 2.

7.0 Geological/Geotechnical

Prior to the actual purchase of the property, the developer contracted with ACacheCorp. to perform a full Geotechnical investigation. The study found no red flags in regards to ground water, liquefaction, fault lines or collapsible soils.

The report has been included for review by the City in Appendix A.

8.0 Flood Water/Wetlands

Per the current FEMA flood map, "Cache County, Utah Map no. 49005C0379C Effective May 24, 2011 the previously discussed parcels contain a small amount of area with flood potential. The area is located along Spring Creek at the southwest corner of the project and will not impact any future building lots. In a recent meeting with the City, we were informed that the area is currently under review by FEMA and may be amended within a year. Based on the actual location of Spring Creek, the natural rising slope of the land to the northeast and the distance of the future lots from Spring Creek, the revised map will have a minimal impact on the development.

Per the Fish and Wildlife Wetlands Mapper, a small amount of Fresh Water Emergent Wetlands exists along Spring Creek in the same area. These wetlands will interfere with the extension of Spring Creek Parkway and will need to be mitigated. However, given the small amount of wetlands, the road extension will be able to be constructed using Section 404 of the Clean Water Act.

The location of both the flood water and wetlands is shown in Figure 4.

9.0 Conclusion/ Recommendation

Per the below summary the Parcels 02-004-0001, 02-004-0002 and 02-004-0003 are perfectly suited to be annexed into Providence City.

1-All necessary utilities (gas, phone, cable, power, sewer and water) are readily available.
2-The City has sufficient sewer capacity and the sewer is deep enough to service the entire project.
3-The City has sufficient water pressure and flow and with the construction of this project the dead end waterline in Spring Creek Parkway will be continued to 300 East allowing for looping of the City water system.
4-Storm water will be detained on site and will be released at the historical pre development rate into Spring Creek. There will be zero impact on City storm facilities.
5-Access is plentiful with three adjacent 66' wide rights-of-ways.
6-The site is located over 3000' from the nearest fault line and has a low potential for liquefaction.
7-While there has been high ground water recorded in the area, at the time of the soil study the ground water was found to be at 11 feet. The study does clarify that the season ground water is estimated to much higher and recommends that no basements be allowed in the area without efforts to mitigate the potential high level, ie field drains.
8-There is limited potential impact from wetlands or flooding. The wetlands and floodplain only impacts the extension of the SpringCreek Parkway and not any future lots.

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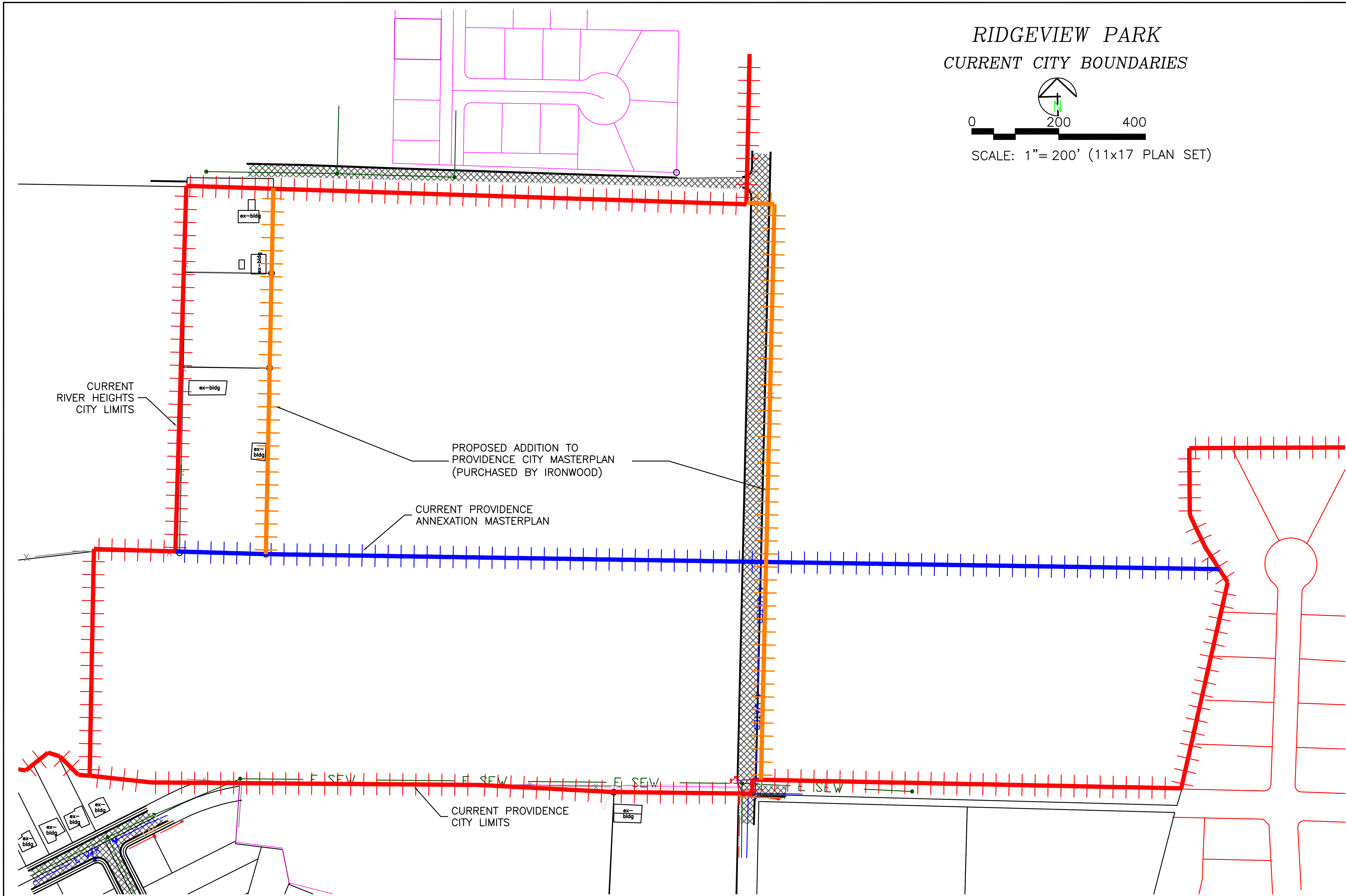
Figure 1. Current Annexation Map



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No.	REVISIONS/ SUBMISSIONS	DATE

REVIEWED :
DRAWN :
CAD FILE :
PROJECT NO. :

PROJECT TITLE
RIDGEVIEW PARK

DRAWING TITLE
CURRENT CITY BOUNDARIES

DATE : FEB,2018
DRAWING No.

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Figure 2. Conceptual Site Map

RIDGEVIEW PARK
CONCEPTUAL SITE MAP

0 160 320

SCALE: 1"= 160' (11x17 PLAN SET)

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No.	REVISIONS / SUBMISSIONS	DATE

REVIEWED :
DRAWN :
CAD FILE :
PROJECT NO. :

PROJECT TITLE: RIDGEVIEW PARK

DRAWING TITLE: CONCEPTUAL SITE MAP

DATE : OCT,2017

DRAWING No.

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Figure 3. Utility Service Map

RIDGEVIEW PARK

UTILITY SERVICE MAP

0 160 320

SCALE: 1"= 160' (11x17 PLAN SET)

600 SOUTH

E SEW

ex-bldg

IE: 4138.69

IE: 4139.30

8 PVC SEWER

IE: 4136.65

IE: 4134.36

IE: 4135.08

IE: 4132.69

4138 4140 4142 4144 4146 4148 4150 4152 4154 4156 4158 4160

300 EAST STREET

WATER

500 NORTH

IE: 4131.96

SEWER CONNECTION WITH FLOW ELEVATION

EXISTING TRANSFORMER / COMMUNICATION BOX

EXISTING WATER

EXISTING GAS

SPRINGCREEK PARKWAY

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REVIEWED :
CAD FILE :
DRAWN :
PROJECT NO. :

PROJECT TITLE: RIDGEVIEW PARK

DRAWING TITLE: UTILITY SERVICE MAP

DATE : FEB.2018

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Figure 4. Flood Water/ Wetland Map

RIDGEVIEW PARK

FLOOD WATER/ WETLAND MAP

0 100 200

SCALE: 1"= 100' (24x36 PLAN SET)
SCALE: 1"= 200' (11x17 PLAN SET)

EXISTING BOUNDARY
EXISTING CREEK
EXISTING WETLANDS
EXISTING FLOOD BOUNDARY
EXISTING 2' CONTOUR
EXISTING 10' CONTOUR

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No.	REVISIONS/ SUBMISSIONS	DATE

DRAWN :
PROJECT NO. :
REVIEWED :
CAD FILE :

PROJECT TITLE: RIDGEVIEW PARK

DRAWING TITLE: FLOOD WATER/ WETLAND MAP

DATE : OCT,2017

DRAWING No.

ALLIANCE CONSULTING ENGINEERS, INC
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Appendix A. Geotechnical Investigation

ACache Corp.

Engineering a Firm Foundation

Geotechnical Investigation
for the proposed
ELEGANT ACRES SUBDIVISION
PHASE 1
800 South 1000 East
River Heights, Utah

PREPARED FOR:
IRONWOOD DEVELOPMENT
Care of:
Randy Eck
925 W. 200 N. Ste. A5
Logan, Utah 84321

PREPARED BY:
ACache Corp.
PROJECT NO. 1170013

July 12, 2017

July 12, 2017

Attn. Randy Eck
Ironwood Development
925 W. 200 N. Ste. A5
Logan, Utah 84321

Subject: **Geotechnical Investigation for the proposed ELEGANT ACRES SUBDIVISION PHASE 1 800 South 1000 East, River Heights, Utah**

ACache Corp. Project No. 1170013

Mr. Eck

It is with great pleasure that ACache Corp. presents this report of our findings for the subject site. It contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics.

Soil samples were obtained during our investigation. Please note that we will store these samples for 30 days after the signed date on this report, at which time they will be discarded unless you request otherwise.

We appreciate the opportunity of working with you on this project and look forward to future projects with you. If you have questions regarding this project, or any other, please do not hesitate to contact us at **(435)-760-3103**.

Sincerely,

ACache Corp.

Jay E. Apedaile, P.E. M.S.
President

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1.0 GENERAL PROJECT INFORMATION

1.1 Project Authorization

ACache Corp. (ACC) was retained by Randy Eck of Ironwood Development to conduct a Geotechnical Subsurface Investigation for the proposed Elegant Acres Subdivision Phase 1 located on the north west corner of 800 South 1000 East in River Heights, Utah (see **Figures 1 and 2** in the Appendix).

1.2 Project Purpose and Description

The purpose of this study was to obtain design level soil information to be used in the design of the proposed structures. Based on the information provided by Randy Eck, the proposed construction will consist of the development of approximately 5.38 acres for high density housing with accompanied roadways. The planned structures would consist of single and double story structures. Structural loads are anticipated to consist of column loads ranging from 2 to 20 kips, and wall loads ranging from 2.0 to 5.0 kips per linear foot, for dead plus live loads.

This report and the recommendations here in are based on the available project information. If this information is incorrect, then ACC shall be informed, preferably in writing, so ACC can evaluate the validity of this report.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 Site Investigation

The site is located on the north east corner of 800 South 1000 East in River Heights, Utah (see **Figures 1 and 2** in the Appendix).

The general subsurface conditions at the site were investigated by drilling 3 boreholes ranging in depth from 17-feet to 36.5 -feet below the current site grade. The approximate location of each explored location is shown on **Figure 2** in the Appendix. Soil samples were obtained at significant change of strata and in general accordance with ASTM D-420 and ASTM 2488. The subsurface conditions observed in the field investigation are discussed in Section 3.4 and in the Boring Logs.

Logs of the boreholes including a description of all soil strata encountered are presented in the Appendix as **Figures 4-6**. Sampling information and other pertinent data and observations are also included in the logs. A legend of the symbols used in the boring logs is presented in the Appendix as **Figure 3**.

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2.2 Laboratory Investigation

Samples obtained during the field investigation were returned to the laboratory and inspected and classified in accordance with the Unified Soil Classification System (ASTM 2487). Selected laboratory tests were performed on representative soil samples to determine their classification and characteristics with respect to engineering design. The following list indicates typical laboratory tests which may have been conducted on some of the samples retrieved from the site.

Test	Standard	To Determine
Moisture Content	ASTM D 2216	% moisture representative of field conditions
Atterberg Limits	ASTM D 4318	Plasticity and workability
% Pass #200 Sieve	ASTM D 1140	% fines in sample
Dry Density	ASTM D 2937	Dry unit weight representative of field conditions.
Consolidation	ASTM D 2435	Maximum past pressure, collapse, swell and consolidation Potential,

The testing results and the soil classifications are illustrated in in the Boring logs and on the Test Data Summary Sheets contained in the Appendix (**Figure 7**).

3.0 FINDINGS

3.1 Site Conditions

At the time of this investigation the site was a hay field. The ground was firm and dry. The open field being cut for the first harvest as we did the drilling and sampling.

3.2 Surface Drainage

Currently, most of the surface runoff drains toward the southwest in the direction of the spring creek. The soil conditions appear to be adequate in keeping the surface soils from eroding.

3.3 Geology

The site is mapped by James McCalpin (1989) as lps (Lacustrine silt and sand related to Provo and younger shoreline). The soils at the site appeared to be lacustrine clayey silt with minor fine sand.

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3.4 Soil Profile

The soil profile at the site appeared to be somewhat consistent across the site with some variations. A typical cross-section would consist of 8 to 12 inches of topsoil at surface followed by a brown clay silt with cemented pinholes down to 12 to 13 feet below grade followed by a brown sily clay, trace mottling's and trace sand in lenses down to34 feet. Below that a brown fine silty sand was observed to the full depth explored (36.5').

For detailed observations of the sub-soils, the location they were observed, the characteristic observed, and any other pertinent information observed in the field or in the laboratory, see the Boring Logs in the Appendix.

A Consolidation test was conducted on a samples of the tan silt with cemented pinholes and it was found that they have a very small potential of collapse but are susceptible to consolidation over time.

3.5 Fault and Seismicity

The site is located in a seismically active region. It is within 1.0 mile west of an mapped location of the Utah East Cache Fault, as depicted on the Surficial Geologic Map of the East Cache Fault Zone (James McCalpin, 1989). During the life of the project seismic activity caused by active faults in the area, have the potential of causing moderate to strong shaking. According to the findings of our subsurface investigation and given the proposed structure we recommend using a Site Class **D** (ASCE 7, Section 20) of the International Building Code (IBC, 2015).

3.6 Liquefaction Evaluation

A site specific liquefaction assessment was conducted by obtaining SPT-N values and samples for laboratory analysis of the sub-soils to a depth of 36.5-feet below the current site grade. Liquefaction potential analysis was conducted following the procedures by Seed and Idriss (1982), Seed, et. Al, (1983; 1985), and Youd and Idriss (1997), using Standard Penetration Test (SPT), and laboratory results. **According to the analysis, the site soils have a very low susceptibility to liquefaction during a large seismic event**. This is primarily due to the dry conditions observed in the upper soils.

3.7 Ground Water

Ground water was observed in each of the borings. B-1 and B-2 at 8' and B-3 at 11 feet below the current grade. It is likely that the groundwater fluctuates some during the year according to rainfall and other climatic and manmade (irrigation) influences. A detailed evaluation of the groundwater is beyond the scope of this investigation. **We would not recommend basement be placed in this phase of the subdivision.**

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3.8 Site Subsurface Variations

It is our experience that variations in continuity and nature of subsurface conditions should be anticipated. Due to the nature and depositional characteristics of soils encountered at the site, care should be taken in interpolating or extrapolating subsurface conditions beyond the exploratory borings. Seasonal fluctuations in ground water conditions are likely to occur.

4.0 RECOMMENDATIONS

Recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions observed in the field and laboratory, as well as common engineering practice. Prudence and common engineering practices should be followed in conjunction to the recommendations of this report.

4.1 Site Preparation and Grading

All topsoil, vegetation, unsuitable soils, fill, and any other deleterious materials, should be removed from areas of new construction. This material shall not be used as structural fill. Soils that pump, rut, or tend to deflect excessively, should be removed and replaced with properly compacted structural fill. **For best results this should take place during a period of dry weather, as *the observed silts and clays will likely be susceptible to pumping if the moisture content is increased.***

4.2 Foundation Recommendations for Buildings

Conventional spot and continuous wall foundations may be used for the support of the proposed structure at the subject site. Based on field and laboratory data an **allowable bearing capacity of 1000 psf.** may be used for strip and spot foundations as provided the following recommendations are observed:

- Foundations shall be placed on native undisturbed or compacted soils or compacted structural fill (conforming to Sections 5.2 and 5.3).
- Onsite soils shall be examined by a qualified geotechnical engineer from this office, to verify that all topsoil, construction debris, soft spots, and any other deleterious materials have been removed prior to the placement of footings or structural fill.
- Structural fill shall be a well-graded granular soil, free of organics, debris, or other deleterious materials as outlined in Section 5.3.

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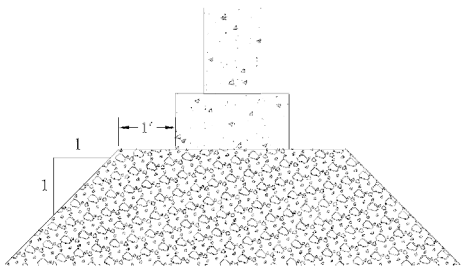

- Structural fill shall be compacted as outlined in Section 5.3.
- Structural fill shall extend as a minimum 1-foot past the edge of the footing, and then for every 1-foot of fill (vertically) placed below the footing, it shall extend a minimum of 1-foot horizontally.
- Continuous footing width shall be maintained at a minimum of 1.5 feet and a maximum of 5.0 feet.
- Spot footings shall be a minimum of 1.5 feet in width and a maximum of 5 feet.
- Exterior footings shall be placed a minimum of 30 inches below final grade, and interior footing shall be placed a minimum of 16 inches below grade for frost protection.

Allowable bearing pressure may be increased by 1/3 for temporary loads such as wind or seismic forces. Foundations designed and constructed in accordance with our recommendations could experience some settlement. If the recommendations provided herein are observed, we estimate settlement should not exceed one inch, with differential settlements on the order of one-half inch. We anticipate approximately 75 percent of initial settlement to take place during construction.

Larger footing sizes will cause more settlement to occur and should be evaluated.

4.3 Lateral Soil Pressures

Lateral soil pressures are dependent on the type of soil present. For the native silty clays the following lateral soil pressures shall be used for design:

1. An equivalent fluid pressure of 56 pounds per cubic foot (pcf) for the active case. That is when the structure is allowed to yield, that is to say the structure is allowed to move away from the soil. This requires a minimum movement or rotation at the top of the wall of 0.001H, where "H" is the height of the wall (bottom of footing to top of wall).
2. 75 pcf for the at-rest case. That is when the wall is not allowed to yield.
3. 235 pcf for the passive case. That is when the wall exerts pressure on the soil.
4. A coefficient of friction of 0.24 shall be used for the interface between the native silty clay and the cast-in-place concrete.

4.4 Drainage

For constructability, adequate surface drainage should be provided at the site to minimize any increase in moisture content of the foundation supporting soils during and after construction. Foundation soils shall be protected from any increase in moisture.

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For final grade we recommend all areas around the structures be generously sloped to provide drainage away from these areas. We recommend a minimum slope of 6 inches in the first 10 feet away from the structure.

4.5 Floor Slabs

All topsoil and deleterious materials shall be removed. We recommend a minimum of 6 inches of free draining structural fill, free from organic material and debris, be used just below floor slabs as a vapor barrier. If grade is required to be re-established or raised above current grade a structural fill shall be used and placed in accordance with Sections 5.2 and 5.3.

4.6 Pavements

All topsoil and deleterious materials shall be removed prior to placement of any pavement section. We expect site traffic to consist primarily of lightweight vehicle and pedestrian traffic with some heavy semi-trucks with trailers. Table 1 below contains the minimum recommended pavement sections based on an estimated CBR of 0.6%. The observed soils are typically very susceptible to frost heave.

TABLE 1 : PAVEMENT DESIGN

	Pavement Section Thickness (in)		
Material	**Pedestrian Traffic**	**Light Traffic**	**Truck Lanes**
Asphalt Pavement	**-**	**3**	**5**
Concrete Pavement	**4**	**-**	**-**
Road-Base Material	**-**	**4**	**4**
Sub base	**12**	**12**	**18**
Total Thickness	**16**	**19**	**27**

It is recommended that the topsoil be removed prior to the placing of any; geo-grid, base material, and structural fill. If any areas appear soft, the soft soils should be removed and replaced with structural fill. A geogrid of geofabric may be required in soft areas if compaction cannot be accomplished or is difficult. This office may be contacted for recommendations of a type of fabric or grid to be used. **All structural fill materials overlying native soil should be compacted in accordance with section 5.2 of this report. The asphalt pavement should be compacted to 96% of the maximum density for the asphalt material.**

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5.0 GENERAL CONSTRUCTION CONSIDERATIONS

The guidelines and recommendations outlined below address the geotechnically related construction considerations for this project.

5.1 Foundation Excavations

All areas that will support foundation loads should be inspected by the geotechnical engineer, or his approved representative, to insure that all loose, soft, or otherwise undesirable material is removed, and that the structure will bear on satisfactory material. This shall occur prior to the placement of any structural fill or concrete. (We recommend giving this office a few days notice for scheduling.) Any loose or deleterious material should be replaced with a free draining granular fill as outlined in **Sections 5.2 and 5.3**.

If unsatisfactory material pockets are encountered in the excavation, the undesirable material should be removed, and the elevation re-established by backfilling. This backfilling can be done with a lean concrete, or a well-compacted structural fill as define in **Section 5.3**.

All structural fill supporting footing loads should be compacted to at least 95 percent of the Modified Proctor Maximum Density (ASTM D 1557), provided the foundation is designed as outlined in **Section 4.2**. Compaction tests should be taken on each lift to insure the required compaction is being achieved.

Foundation excavations shall be protected against any harmful change in condition such as disturbance, rain, and freezing. Surface runoff should be directed away from the excavation and not allowed to pond. Ideally all footing concrete should be poured the same day as the excavation is made. If this is not practical, the foundation excavation should be adequately protected, and foundation placement should take place as soon as possible. For best construction results we recommend that earth work be conducted during the dry months of the year, typically June through October.

Excavation slopes shall maintain a maximum slope of 1.5 horizontal to 1 vertical. It may be possible to have steeper slopes for temporary excavations. This will depend on the conditions location and precautions taken. Contact our office for further consultation. Otherwise if it is required that slopes are steeper, it is necessary that excavation shoring/bracing be used.

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5.2 Fill Compaction

All fill material should be compacted in accordance to the following criteria based on the Modified Proctor Maximum Laboratory Density (ASTM D 1557):

1. Structural fill, supporting foundations.	95%
2. Structural fill, below floor stabs	94%
3. Backfill of trenches	
a. Below foundations	95%
b. Below floor stabs	94%
c. Below pavements	94%
d. Others	90%
4. Beneath Pavements	95%

Compaction should be accomplished by placing the fill in a maximum of 8-inch loose lifts, and mechanically compacting each lift to the specified minimum density. Field density tests should be performed on each lift as necessary to insure that compaction is being achieved. As a minimum 33% of all spot footings, and one test for every 50 lineal feet of continuous wall footings shall be tested for each lift.

5.3 Types of Fill

5.3.1 Structural Fill: Sub-base (pit-run)

Well-graded granular soils free of organics, debris, or other deleterious materials are recommended for use as structural fill at this site. We recommend a well-graded sandy gravel material with no less than 5%, and no more than 10% passing the #200 sieve, and no particles greater than 4 inches in maximum dimension. Structural fill shall be compacted at a moisture content ranging from -2 to +6 percentage point of optimum in accordance to the Modified Proctor Maximum Laboratory Density (ASTM D 1557).

5.3.2 Structural Fill: Roadbase

Granular soils free of organics or other deleterious materials and debris. We recommend a sand and fractured gravel material with between 5 and 12 percent passing the #200 sieve, and no particles greater than approximately 1 inch in maximum dimension.

5.3.3 Non-Structural Fill

On-site soils appear to be suitable for non-structural site grading and landscaping fill. All fill material shall be approved by the engineer prior to placement.

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5.4 Quality Control

Our recommendations are based on the assumption that adequate quality control testing and observations will be conducted during construction to verify compliance. This may include but is not necessarily limited to the following:

5.4.1 Field observations

Observations during all phases of construction should occur. Observations such as site preparation, foundation excavation, structural fill placement, and concrete placement.

5.4.2 Fill Compaction

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

5.4.3 Concrete Quality

We recommend that freshly mixed concrete be tested in accordance with ASTM designations as follows:

- Slump, Temperature, Unit Weight, and Yield testing should be conducted on every delivery truck (ASTM C 138 and C 143).

- Entrained Air testing should also be conducted on every delivery truck for exposed concrete or concrete placed above the frost line (ASTM C 231).

- Test cylinders should be taken a minimum of every 50 cubic yards. Cylinder compressive strength tests should be conducted at 7 and 28 days from the placement date (ASTM C 31).

6.0 LIMITATIONS

The recommendations submitted in this report were based on evaluating the information obtained from the borings and site investigation, and the design details furnished by Ironwood Development for the proposed project. The borehole data reflects the subsurface condition only at the specific location at the particular time designated on the borehole logs. Soil and ground water conditions may differ from conditions encountered at the actual borehole location. The nature and extent of any variation in the borehole may not become evident until construction begins. If variations do appear, it may become necessary to re-evaluate the recommendations of this report after we have

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observed the variation. If ACache Corp. is not notified of changes to the project or variations of the soils, ACache Corp. will not be responsible for the impact of those changes on the project.

The Geotechnical Engineer warrants that the findings, recommendations, specification, or professional advice contained herein, have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

Once the plans and specifications are more complete, the Geotechnical Engineer may be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At this time, it may be necessary to submit supplementary recommendations. If ACache Corp. is not retained to perform these functions, ACache Corp. will not be responsible for the impact of those conditions on the project. This report has been prepared for the exclusive use of Ironwood Development for the specific use on the proposed Elegant Acres Subdivision Phase 1 in River Heights, Utah.

7.0 REFERENCES

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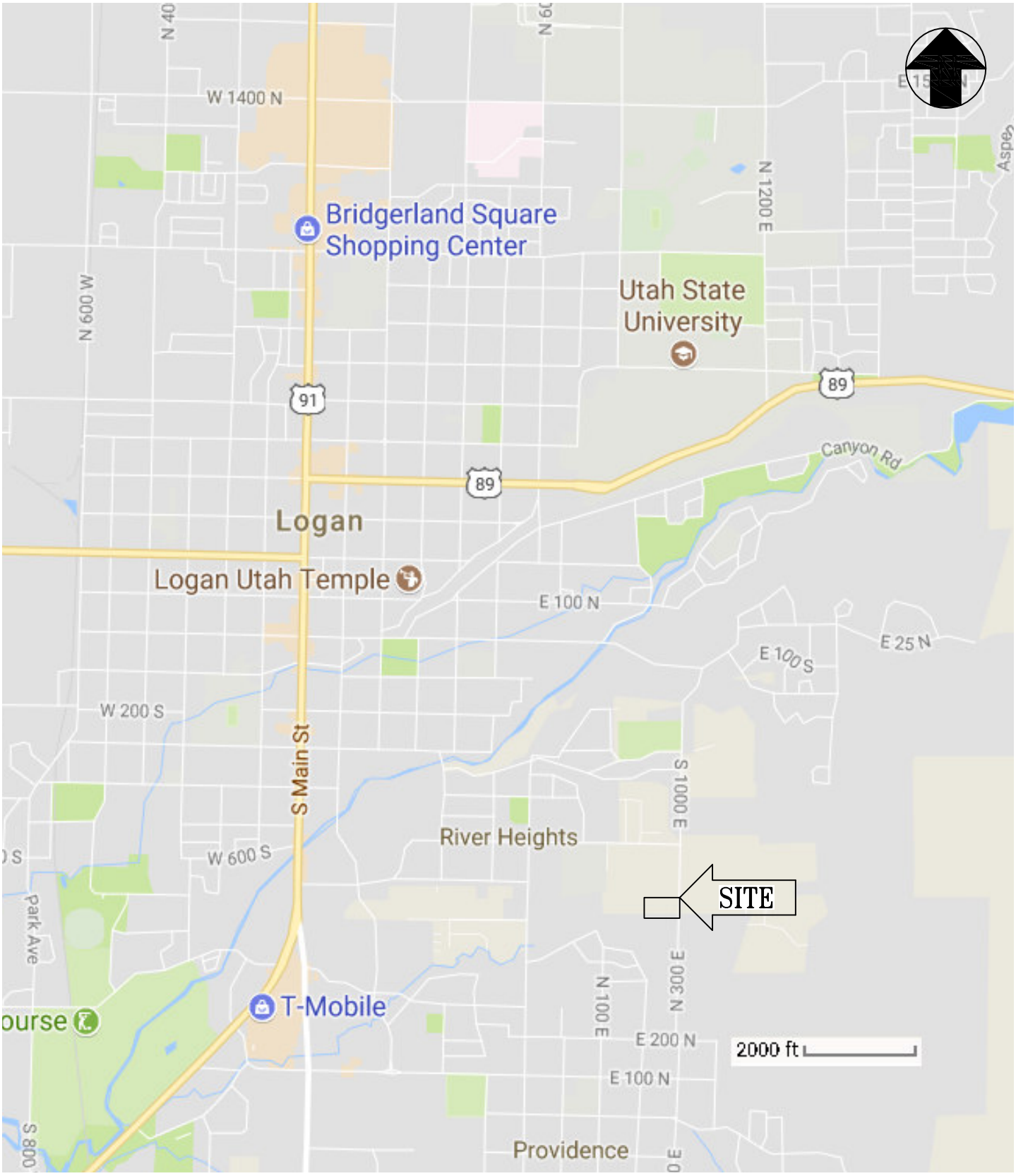
APPENDIX



UTAH

Google 2017

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Elegant Acres Subdivision Phase 1

800 S. 1000 E. River Heights, UT

TITLE:	Vicinity Map
SCALE:	No Scale
DATE:	6/5/2017
DRAWING NO.	1170013 Figures.dwg

ENGINEER:	DRAWN BY:
J. Apedaile	JA

FIGURE 1

UTAH

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Elegant Acres Subdivision Phase 1

800 S. 1000 E. River Heights, UT

TITLE:	Site Map
SCALE:	No Scale
DATE:	6/5/2017
DRAWING NO.	1170013 Figures.dwg

ENGINEER:	DRAWN BY:
J. Apedaile	JA

FIGURE 2

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES				GRAPH SYMBOL	LETTER SYMBOL [1]	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size. [2] (The No. 200 sieve size is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.		SW	Well graded sands, gravelly sands, little or no fines.
			Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	Poorly graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	Non-plastic fines (for identification procedures see ML below).		SM	Silty sands, poorly graded sand-silt mixtures.
			Plastic fines (for identification procedures see CL below).		SC	Clayey sands, poorly graded sand-clay mixtures.
	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE					
		DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)		
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	SILTS AND CLAYS Liquid limit less than 50	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity.
		Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity.
	SILTS AND CLAYS Liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays.
		Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS		Readily identified by color, odor, spongy feel and frequently by fibrous texture.			Pt	Peat and other highly organic soils.

[1] Boundary classifications: –Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW–GC, well graded gravel–sand mixture with clay binder.
[2] All sieve sizes on this chart are U.S. standard.

GENERAL NOTES

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

LOG KEY SYMBOLS

- Bulk / Bag Sample
- 2.0"Ø O.D. Penetration Split Spoon Sampler
- 2.5"Ø O.D.Penetration Split Spoon Sampler
- 3.0"Ø O.D. Penetration Split Spoon Sampler
- Shelby Tube
- Rock Core
- No Recovory
- Water Level (level after completion)
- Water Level (level where first encountered)

FINE - GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE UNDRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by Thumb. Squeezes through fingers.
Soft	2 - 4	0.125 - 0.25	0.25 - 0.5	Easily penetrated 1 " by Thumb . Molded by light finger pressure.
Medium Stiff	4 - 8	0.25 - 0.5	0.5 - 1.0	Penetrated over 1/2 " by Thumb with moerate effort. Molded by strong finger pressure.
Stiff	8 - 15	0.5 - 1.0	1.0 - 2.0	Indented about 1/2 " 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

COARSE -GRAINDE SOIL

APPERENT DENSITY	SPT (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	<4	0 - 15	Easily penetrated with 1/2 " reinforcing rod pushed by hand
Loose	4 - 10	15 - 35	Difficult to penetrated with 1/2 " reinforcing rod pushed by hand
Medium Dense	10 - 30	35 - 65	Easily penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Dense	30 - 50	65 - 85	Difficult to penetrated a foot with 1/2 " reinforcing rod driven with 5-lb hammer
Very Dense	>50	85 - 100	Penetrated only a few inches with 1/2 " reinforcing rod driven with 5-lb hammer

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2 "
LAYER	1/2 - 12 "

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness
Frequent	More than on per foot of thichness

CEMENTATION

DESCRIPTION	DESCRIPTION
Weakely	Crumbles or breaks with handling of slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumbles or breaks with finger pressure

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 water, usually soil below Water Table

FIGURE 3

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BORING LOG

Elegant Acres Subdivision Phase 1

BORING No. : B–1	JOB No. : 1170013	DATE : 6/5/2017	SHEET 1 OF 3
PROJECT : Elegant Acres Subdivision Phase 1 800 S. 1000 E. River Heights, UT	SURF. EL. :	BORE DIA. : 8"	DEPTH : 36.5'
	WATER EL. :	COORDINATES: (approximate)	
BORING TYPE : Hollow Stem Auger	CAD FILE : 1170013 Figures.dwg		

DEPTH, Ft.	GRAPHIC LOG	SAMPLE	SOIL DESCRIPTION B–1	% FINER No. 200 SIEVE	BLOWS/Ft.	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH, TSF (● MINIATURE VANE; ⊖ RESIDUAL MINIATURE VANE; ⊗ POCKET PENETROMETER; ◒ UNCONFINED COMPRESSION(UU); ⊕ TORVANE; (OPEN SYMBOLS REPRESENT REMOLDED TESTS.) 1.0 2.0)	WET/DRY UNIT WT.,lb/cu.ft.
			8" Dark brown topsoil.		7			14.9		
			8"~12' Brown sandy SILT (ML); Iron mottlings, week to moderatly cemented, moist to wet. medium stiff to very soft.		7			19.1		
5				85	4			22		
			▼	88.7	0			28.9		
10					3	36	25	29.5		
			12'~34' Brown Clay (CL); with trace sands, trace mottling, medium stiff.							
			dense fine sand layer at 15'–16.5'		15			23.2		
20				93	5	30	20	28		
25				87.8	5	3	3	24.2		
30					9			27.5		
			34'~36.5' Brown silty fine SAND (SM); dense, wet.							
35				15.2	33			24.6		

REMARKS : End @ 36.5'

REMARKS : Blows/Ft. obtained using a stamdard sampler driven with an automatic hammer

WTR DEPTH @ COMPL. :8'

FIELD ENG.: Jay Apedaile

COMPLETION DATE : 6/5/2017

FIGURE 4

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BORING LOG

Elegant Acres Subdivision Phase 1

BORING No. : B–2	JOB No. : 1170013	DATE : 6/5/2017	SHEET 1 OF 1
PROJECT : Elegant Acres Subdivision Phase 1 800 S. 1000 E. River Heights, UT	SURF. EL. :	BORE DIA. : 8"	DEPTH : 17'
	WATER EL. :	COORDINATES: (approximate)	
BORING TYPE : Hollow Stem Auger	CAD FILE : 1170013 Figures.dwg		

SHEAR STRENGTH, TSF
● MINIATURE VANE
⊖ RESIDUAL MINIATURE VANE
⊗ POCKET PENETROMETER
◒ UNCONFINED COMPRESSION(UU)
⊕ TORVANE
(OPEN SYMBOLS REPRESENT REMOLDED TESTS.)
1.0 2.0

DEPTH, Ft.	GRAPHIC LOG	SAMPLE	SOIL DESCRIPTION B–2	% FINER No. 200 SIEVE	BLOWS/Ft.	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	WET/DRY UNIT WT.,lb/cu.ft.
			10" Dark topsoil.		6			16	
			10"~13.5' Brown fine sandy SILT (ML); medium stiff to soft, iron mottlings, week to modrate cementation, moist to wet.	85	12			18.1	
5					3			19.9	
			Trace pinholes. ▼		3			28.6	
10				97	5			27.7	
15			13.5'~17' Brown CLAY (CL); mottlings, medium stiff to stiff, wet.		14			22.5	
			End @ 17'						
20									
25									
30									
35									

REMARKS :

REMARKS : Blows/Ft. obtained using a California sampler driven with an automatic hammer

WTR DEPTH @ COMPL. : 8'

FIELD ENG.: Jay Apedaile

COMPLETION DATE : 6/5/2017

FIGURE 5

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BORING LOG

Elegant Acres Subdivision Phase 1

BORING No. : B-3	JOB No. : 1170013	DATE : 6/5/2017	SHEET 1 OF 1
PROJECT : Elegant Acres Subdivision Phase 1 800 S. 1000 E. River Heights, UT	SURF. EL. :	BORE DIA. : 8"	DEPTH : 17'
	WATER EL. :	COORDINATES: (approximate)	
BORING TYPE : Hollow Stem Auger	CAD FILE : 1170013 Figures.dwg		

DEPTH, Ft.	GRAPHIC LOG	SAMPLE	SOIL DESCRIPTION B-3	% FINER No. 200 SIEVE	BLOWS/Ft.	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH, TSF ● MINIATURE VANE ⊖ RESIDUAL MINIATURE VANE ⊗ POCKET PENETROMETER ◒ UNCONFINED COMPRESSION(UU) ⊕ TORVANE (OPEN SYMBOLS REPRESENT REMOLDED TESTS.) 1.0 2.0	WET/DRY UNIT WT.,lb/cu.ft.
			10" Dark brown topsoil.	88	7			14.5		
			10"~12' Brown fine sandy SILT (ML); medium stiff to soft, iron mottlings, weak to moderate cementation, moist to wet.		6			16.2		
5			Trace pinholes.		shelby	27	18	16.5		
				79	2			16.4		
10			▼		5			19.8		
			12'~17' Brown CLAY (CL), soft to medium stiff, trace sands, wet.							
15					4	32	19	27.2		
			End @ 17'							
20										
25										
30										
35										

REMARKS :

REMARKS : Blows/Ft. obtained using a California sampler driven with an automatic hammer

WTR DEPTH @ COMPL. : 11'

FIELD ENG.: Jay Apedaile

COMPLETION DATE : 6/5/2017

FIGURE 6

Test Data Summary

HOLE NO./ SAMPLE NO.	DEPTH (ft) BELOW GROUND SURFACE	STANDARD PENETRATION BLOWS PER FOOT	IN-PLACE DENSITY UNIT WEIGHT Dry (estimated) LB./FT.^{3}	MOISTURE PERCENT	GRADATION % SAND	GRADATION % GRAVEL	% PASSING NO. 200 SIEVE	TORVANE SHEAR TONS/FT.^{2}	ATTERBERG LIMITS L.L.	ATTERBERG LIMITS P.L.	ATTERBERG LIMITS P.I.	SOIL CLASSIFICATION UNIFIED SYSTEM
1/1	0.0	7		14.9								ML
1/2	2.5	7		19.1								ML
1/3	5.0	4		22.0	15.0		85.0					ML
1/4	6.5			27.4								ML
1/5	7.5	0		28.9	11.0		89.0					ML
1/6	10.0	3		29.5					36	25	11	ML
1/7	15.0	15		23.2								CL
1/8	20.0	5		28.0	7.0		93.0		30	20	10	CL
1/9	25.0	5		24.2	12.0		88.0		31	21	10	CL
1/10	30.0	9		27.5								CL
1/11	35.0	33		24.6	85.0		15.0					SC
2/12	0.0	6		16.0								ML
2/13	2.5	12		18.1	15.0		85.0					ML
2/14	5.0	3		19.9								ML
2/15	7.5	3		28.6								ML
2/16	10.0	5		27.7	3.0		97.0					CL
2/17	15.0	14		22.5								CL
3/18	0.0	7		14.5	12.0		88.0					ML
3/19	2.5	6		16.2								ML
3/20	5-7'	shelby		16.5					27	18	9	ML-CL
3/21	7.5	2		16.4	21.0		79.0					CL
3/22	10.0	5		19.8								CL
3/23	15.0	4		27.2					32	19	13	CL

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Elegant Acres Phase 1

FIGURE 7