

**NOTICE OF MEETING
HILLSIDE REVIEW BOARD
CITY OF ST. GEORGE
WASHINGTON COUNTY, UTAH**

Public Notice

Notice is hereby given that the Hillside Review Board of the City of St. George, Washington County, Utah, will hold meetings at the 2 reference sites listed below on **Wednesday, August 26, 2026**, commencing at site #1 at 8:30 am.

The agenda for the meeting is as follows:

Call to Order

Call for disclosure of conflicts of interest

1. IHC St George Regional Hospital Parking Lot Expansion

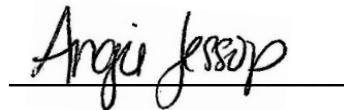
A request to obtain a Hillside Development Permit to allow disturbance of areas in the 20-30%, 30-40% and 40% and above slope areas for a parking lot expansion to add 137 additional parking spaces to the off-site parking lot. **Meeting time is approximately 8:30 am at the Southeast parking lot on Medical Center Dr. (See map #1 below)**

2. Desert Haven

A request to obtain a Hillside Development Permit to allow disturbance of areas in the 20-30%, 30-40%, and 40% and above slope areas, to develop single-family homes. **Meeting time is approximately 9:30 am at the Southeast end of Joey Way in Desert Canyons. (See map #2 below)**

3. Minutes

Consider a request to approve the meeting minutes from the July 22, 2026 meeting.

A handwritten signature in black ink, reading "Angie Jessop", is written over a horizontal line.

Angie Jessop – Development Services

REASONABLE ACCOMMODATION: The City of St. George will make efforts to provide reasonable accommodations to disabled members of the public in accessing City programs. Please contact the City Human Resources Office at (435) 627-4674 at least 24 hours in advance if you have special needs.

Meeting #1 Location



Meeting #2 Location



HILLSIDE REVIEW BOARD AGENDA REPORT:

08/26/2026

Intermountain Health St George Regional Hospital Parking Expansion Hillside Development Permit (Case No. 2025-HS-002)		
Request:	A Hillside Development Permit to allow disturbance of areas in the 20-30%, 30-40% and 40% and above-slope areas for a parking lot expansion to add 137 additional parking spaces to the off-site parking lot.	
Applicant:	Great Basin Engineering	
Representative:	Heather Avner	
Location:	Near the intersection of Foremaster Drive and Medical Center Drive	
General Plan:	COM (Commercial) and OS (Open Space)	
Existing Zoning:	PD-C (Planned Development Commercial)	
Surrounding Zoning:	North	PD-C (Planned Development Commercial)
	South	PD-C (Planned Development Commercial)
	East	PD-C (Planned Development Commercial)
	West	PD-C (Planned Development Commercial)
Land Area:	1.61 Acres	



BACKGROUND

The first phase of the parking lot received Planned Development Commercial zoning as well as a Hillside Development Permit in 2016. This application proposes an expansion of the original parking lot, adding 137 additional parking spaces. This parking lot is part of a large parcel shown on the map below.

**APPLICABLE ORDINANCE(S) (Selected portions)****10-13A-1: Density and Disturbance Standards**

- A. The hillside development overlay zone (HDOZ) limits development densities and provides specific development incentives to transfer underlying zone densities from hillsides (sending areas) to less steep slopes or more safe development areas (receiving areas), within a development.
- B. For those portions of a proposed development with natural slopes 20% or less, development density follows the density and development standards in the underlying zone.
- C. For those portions of a proposed development with natural slopes from 21% to 30%, development activity shall not disturb more than 30% of the parcel within this slope category.

D. For those portions of a proposed development with natural slopes from 31% to 40%, development activity shall not disturb more than 5% of the area within this slope category.

E. A proposed development may not disturb slopes in excess of 40%.

10-13A-2: Slope and Slope Areas Determined

A. Slope shall be determined for each significant portion of development parcel.

B. *Procedure:* The applicant shall map the location of the natural slope by using the following procedure:

1. *Preparation of Contour Maps:* The applicant shall submit an accurate, current contour map, prepared and certified by a licensed professional engineer or surveyor, which shows all land contours at intervals no greater than five feet (5'), drawn at a one inch equals one hundred feet (1" = 100') scale maximum.

2. *Verification through Field Surveys:* The city engineer, or designee may require the applicant to submit a field survey to verify the accuracy of the contour map.

C. *Determination of Slope Areas:* Using the contour map, natural slopes shall be calculated using points identified as natural slopes of 20%, 30%, and 40%, and shall be located on the contour map and connected by a continuous line. That area bounded by said lines and intersecting property lines shall be used for determining project density. Small washes or outcrops, which have slopes distinctly different from surrounding property, and are not part of the contiguous topography, may be excluded from the slope determination.

EXHIBITS PROVIDED

1. Exhibit A – Narrative
2. Exhibit B – Construction Drawings
3. Exhibit C – Landscape Plan
4. Exhibit D – Slope Analysis Parking Lot Expansion
5. Exhibit E – Slope Analysis Entire Parcel
6. Exhibit F – 2016 Geotechnical Engineering Report
7. Exhibit G – 2016 Geotechnical Engineering Report Addendum

RECOMMENDATION

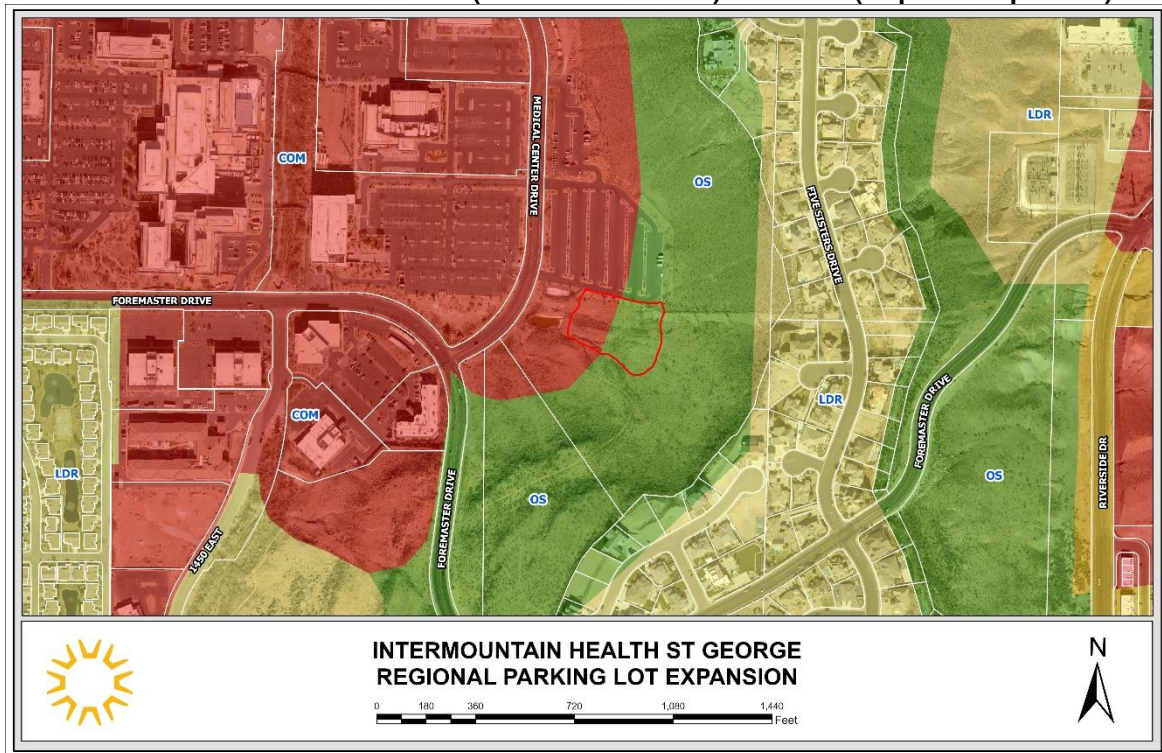
Section 10-13A-8(B)(1) of the “Hillside Review Board Powers and Duties” states that the Hillside Board can make recommendations to “adopt, modify or reject a proposal” to the Planning Co

FINDINGS

1. The proposed development generally aligns with the intent of the Hillside Development Overlay Zone in that it concentrates density in more buildable areas while limiting disturbance on steeper slopes.

Based on the materials provided, including the slope analysis and grading plans, the project appears to stay within the allowable disturbance thresholds for slope between 20% and 40%, and avoids disturbance in areas exceeding 40% slope, consistent with City ordinance requirements.

General Plan – COM (Commercial) & OS (Open Space)



Zoning – PD-C (Planned Development Commercial)

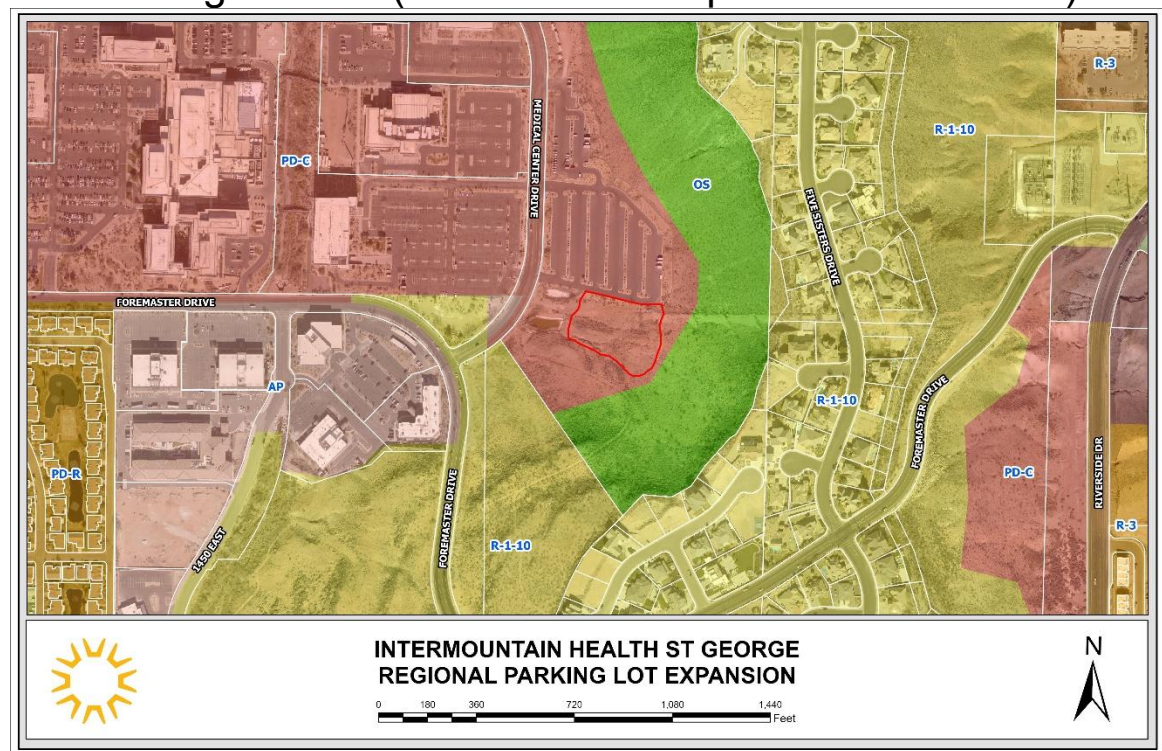


EXHIBIT A

Narrative

August 17, 2026

St. George City
175 East 200 North
St. George, Utah 84770

**RE: Intermountain Health St. George Regional Hospital Parking Lot Expansion Project
Hillside Review Narratvie**

To Whom it May Concern,

The parking lot expansion project at the Saint George Regional Hospital is located near the corner of Foremaster Drive and Medical Center Drive (refer to figure 1.) The project is an addition to the existing parking lot north of the project area. The project includes drive aisles and parking bays to match the existing parking. It does not include any street design within the city ROW. The project will add 137 standard parking spaces to the campus that is in need of additional parking.

The existing property lines will not be adjusted or altered. The legal description on the Washington County website has been attached to this narrative. Surveyed data has been included in ther drawing file.

Please let me know if you need any thing else from us.

Thank you,



Heather Avner, P.E.
Great Basin Engineering

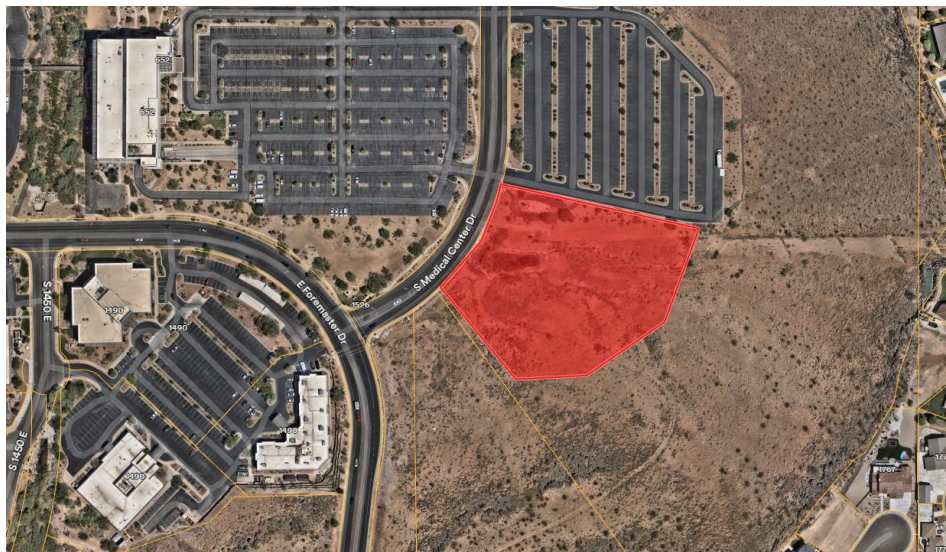


Figure 1: Project Area Map

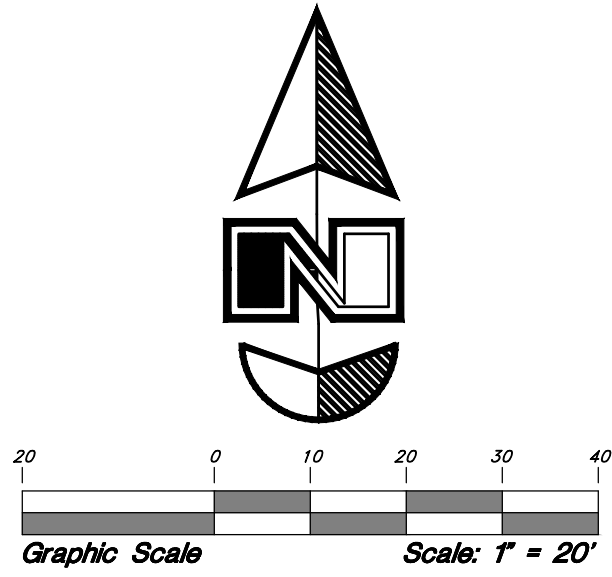
EXHIBIT B

Construction Drawings

SHEET NO.

C000

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PRINT DATE: 07/17/2026 3:29 PM (DATE: 07/17/2026 3:29 PM) (DATE: 07/17/2026 3:29 PM) (DATE: 07/17/2026 3:29 PM)
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Legend	
(Note: All items may not appear on drawing)	
San. Sewer Manhole	Fire Department Connection
Water Manhole	Finish Contour
Storm Drain Manhole	Exist. Contour
Cleanout	Finish Grade
Electrical Manhole	Exist. Grade
Catch Basins	Ridge Line
Catch Fire Hydrant	Direction of Flow
Fire Hydrant	Sanitary Sewer Exist.
Fire Department Connection	Culinary Water Exist.
Post Indicator Valve	Gas Line Exist.
Water Valve	Irrigation Line Exist.
Sanitary Sewer	Storm Drain Exist.
Culinary Water	Telephone Line Exist.
Gas Line	Power Line Exist.
Storm Drain	Fire Line Exist.
Telephone Line	Light Pole
Secondary Waterline	New Asphalt
Fire Line	Heavy Duty Asphalt
Land Drain	Existing Concrete
Power pole w/guy	New Concrete
Light Pole	Heavy Duty Concrete
Flowline of ditch	Demo'd Road Base
Overhead Power Line	Spill Curb & Gutter
Corrugated Metal Pipe	Tree To Remain in Place
Concrete Pipe	Building Grid Lines
Reinforced Concrete Pipe	Property Line
Ductile Iron	Construction Limits
Polyvinyl Chloride	Match Existing
Top of Asphalt	
Edge of Asphalt	
Centerline	
Flowline	
Finish Floor	
Top of Curb	
Top of Wall	
Top of Concrete	
Natural Ground	
Finish Grade	
Match Existing	

- GENERAL DEMOLITION NOTES:**
- Demolition and site clearing for this contract are to include all areas shown within demolition limits or by note.
 - Refer to site improvement plans for more details on limits of removal.
 - Demolish existing buildings and clear from site. (Including removal of all footings and foundations.)
 - All curbs, gutters, walks, slabs, walls, fences, flatwork, asphalt, waterlines and meters, gas lines, sewer lines, light poles, buried cables, storm drain piping and structures to be cleared from site unless otherwise shown.
 - All utilities, sewer, water, gas, telephone and electrical services to be disconnected and capped according to city, county and utility company requirements, unless otherwise shown.
 - Basements and other excavated areas to be backfilled with clean granular material compacted to 95% of maximum lab density as determined by ASTM D 1557-76. (Test results to be given to owner)
 - Clear and grub trees, shrubs, and vegetation within construction limits, disposal to be off-site except where noted otherwise.
 - DO NOT interrupt any services or disrupt the operation of any businesses shown outside the demolition limits.
 - If ASBESTOS is found in existing structures, the Asbestos must be removed in a legal manner by a contractor licensed to handle asbestos materials. (Not a part of contract)
 - The location and/or elevation of existing utilities as shown on these plans is based on records of the various utility companies and, where possible, measurements taken in the field. The information is not to be relied upon as being exact or complete. Contractor shall contact authorities having jurisdiction for field locations. Contractor shall be responsible for protection of in place and relocated utilities during construction.
 - Stockpiles shall be graded to maintain slopes not greater than 3 horizontal to 1 vertical. Provide erosion control as needed to prevent sediment transport to adjacent drainage ways.
 - Contractor shall be responsible for disposal of all waste material. Disposal shall be at an approved site for such material. Burning onsite is not permitted.
 - Contractor shall verify with city any street removal, curb cuts, and any restoration required for utility line removal.
 - Install traffic warning devices as needed in accordance with local standards.
 - Contractor shall obtain all permits necessary for demolition from City, County, State or Federal Agencies as required.

CAUTION NOTICE TO CONTRACTOR

The contractor is specifically cautioned that the location and/or elevation of existing utilities as shown on these plans are based on records of the various utility companies and, where possible, measurements taken in the field. The information is not to be relied on as being exact or complete. The contractor must call the appropriate utility company at least 48 hours before any excavation to request exact field location of utilities. It shall be the responsibility of the contractor to relocate all existing utilities which conflict with the proposed improvements shown on the plans.

PRIVATE ENGINEER'S NOTICE TO CONTRACTORS

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the contractor shall defend, indemnify, and hold the owner and the engineer harmless from any and all liability, real or alleged, in connection with the performance of work on this project, excepting for liability arising from the sole negligence of the owner or the engineer.

ALL CONSTRUCTION TO CONFORM TO CITY STANDARDS AND SPECIFICATIONS IN RIGHT OF WAY

HKS

ARCHITECT
HKS, INC.
DENVER PLACE
999 18TH STREET, SUITE 225N
DENVER, CO 80202

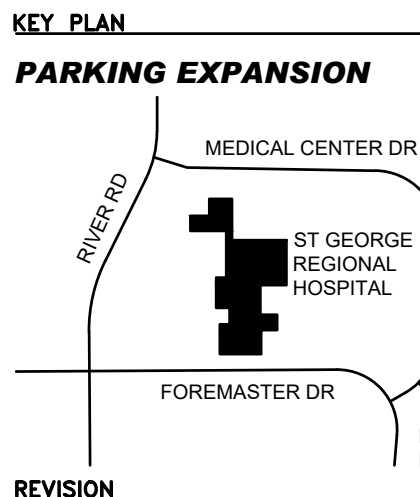
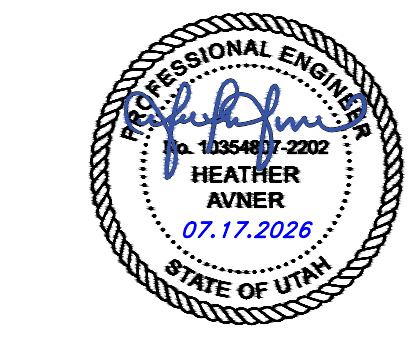
CIVIL / LANDSCAPE
GREAT BASIN ENGINEERING, INC.
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ELECTRICAL
LYNK ENGINEERS
324 STATE ST SUITE 400
SALT LAKE CITY, UT 84111

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SALT LAKE CITY, UT 84110
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Intermountain Health

**INTERMOUNTAIN HEALTH
ST. GEORGE
REGIONAL HOSPITAL
PARKING EXPANSION**

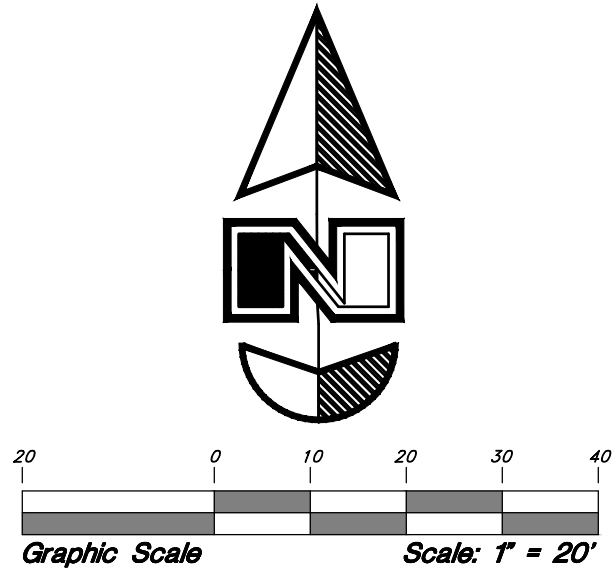


REVISION

HKS PROJECT NUMBER
26120
DATE
07/02/26
ISSUE
PR-014

SHEET TITLE
DEMOLITION
PLAN

SHEET NO.
C001

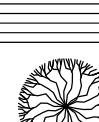


	Square Footage	Acreage	Percent of Total Area
Construction Limits	70,115	1.6096	100%
Total Hardscape Area	46,405	1.0653	66%
Total Landscaped Area	23,710	0.5443	34%

<u>PARKING DATA TABLE</u>	
Overall Parking: 137 Stalls	
<u>Site Keynotes</u>	
1	Const. 24" Concrete Curb & Gutter per Detail 2/C501
2	Const. Asphalt Paving per Detail 1/C501
3	Const. 4" White Striping per Detail 3/C501
4	Const. 3.0' wide Waterway per Detail 4/C501
5	Light Pole, see Electrical plans

Legend

(Note: All items may not appear on drawing)

San. Sewer Manhole	①	Fire Department Connection	RFC
Water Manhole	②	Finish Contour	—
Storm Drain Manhole	③	Exist. Contour	—
Cleanout	④	Exist. Grade	65.35714
	⑤	Ridge Line	95.3714
Electrical Manhole	⑥	Direction of Flow	→
Catch Basins	⑦	Sanitary Sewer Exist.	—
Fire Hydrant	⑧	Culinary Water Exist.	—
Fire Hydrant	⑨	Gas Line Exist.	—
Proposed Connection	⑩	Telephone Line Exist.	—
Post Indicator Valve	⑪	Storm Drain Exist.	—
Water Valve	⑫	Water Valve Exist.	—
Water Valve	⑬	Power Line Exist.	—
Culinary Water	⑭	Fire Line Exist.	—
Sanitary Sewer	⑮	Existing Asphalt	—
Irrigation Line	⑯		
Storm Drain	⑰	New Asphalt	—
Telephone Line	⑱		
Secondary Waterline	⑲	Heavy Duty Asphalt	—
Power Line	⑳		
Fire Line	㉑	Existing Concrete	—
Land Drain	㉒		
Power Pole	㉓	New Concrete	—
Power pole w/guy	㉔		
Light Pole	㉕		
Fence	㉖		
Flowline of ditch	—	Heavy Duty Concrete	—
Overhead Power Line	QHP		
Corrugated Metal Pipe	CMP		
Concrete Pipe	CP		
Reinforced Concrete Pipe	RCP	Demo'd Road Base	—
Quotient line	Q		
Polystyrene Chloride	PCV	Spill Curb & Gutter	—
Top of asphalt	PA		
Edge of asphalt	EA		
Flowline	FL		
Finish Floor	FF		
Top of curb	TC	Tree to Remain in Place	
Edge of Wall	TW		
Top of Walk	TW	Building Grid Lines	—
Top of Concrete	TC	Property Line	—
Natural Ground	NG	Construction Limits	—
Finish Grade	FG		
Midline	ML		

GENERAL SITE NOTES:

1. Stalls designated as accessible will require a painted accessible symbol and sign. (See Details)
2. Fire lane markings and signs to be installed as directed by the Fire Marshall.
3. Aisle markings, directional arrows and stop bars will be painted at each driveway as shown on the plans.
4. Building sidewalks, ramps, and bollards are building contractor responsible items. See architectural plans.
5. All dimensions are to back of curb unless otherwise noted.

PRIVATE ENGINEER'S NOTICE TO CONTRACTORS

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ALL CONSTRUCTION TO CONFORM TO CITY STANDARDS AND SPECIFICATIONS IN RIGHT OF WA

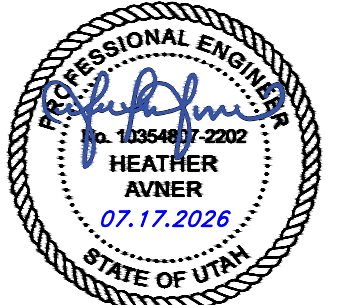
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DENVER, CO 80202

CIVIL / LANDSCAPE
GREAT BASIN ENGINEERING, INC
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SOUTH OGDEN, UT 84403

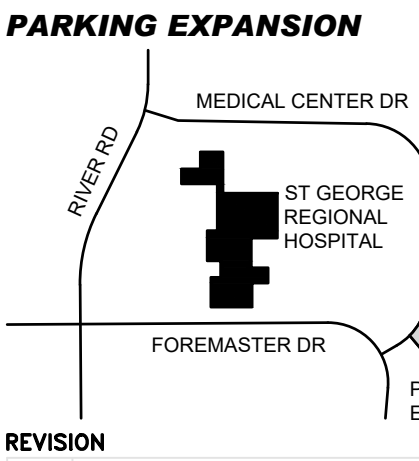
ELECTRICAL
LYNK ENGINEERS
324 STATE ST SUITE 400
SALT LAKE CITY, UT 84111



**INTERMOUNTAIN HEALTH
ST. GEORGE
REGIONAL HOSPITAL**



KEY PLAN



HKS PROJECT NUMBER
26120

DATE
07/02/26

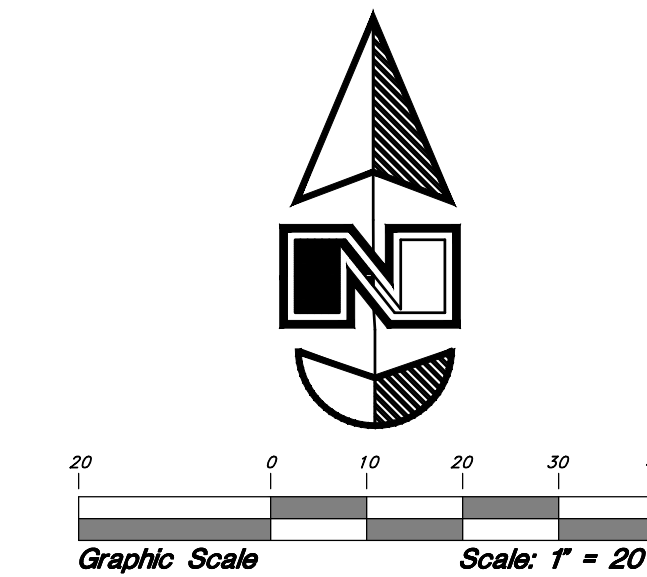
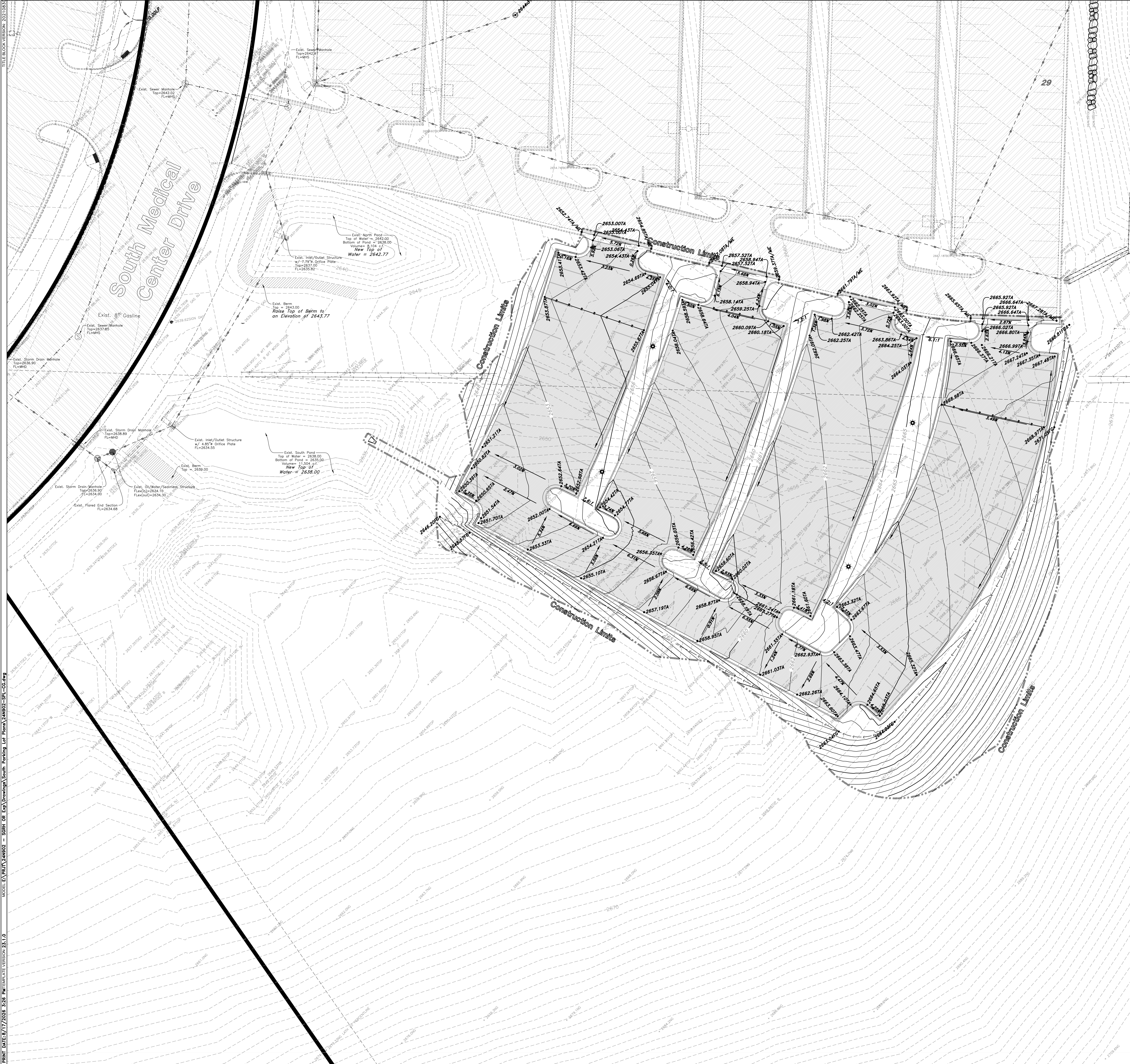
ISSUE
PR-014

SHEET TITLE
SITE PLAN

SHEET NO.

C101

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PRELIMINARY EARTHWORK
Cut 2,076 cy
Fill 3,840 cy
Imported Fill (required cut) 1,340 cy
Net 433 cy (Fill)

Legend
(Note: All items may not appear on drawing)

San. Sewer Manhole	Fire Department Connection
Water Manhole	Finish Contour
Storm Drain Manhole	Exist. Contour
Cleanout	Finish Grade
Electrical Manhole	Exist. Gravel
Catch Basin	Ridge Line
Exist. Fire Hydrant	Direction of Flow
Fire Department Connection	Sanitary Sewer Exist.
Pass Indicator Valve	Culinary Water Exist.
Exist. Water Valve	Gas Line Exist.
Sanitary Sewer	Irrigation Line Exist.
Culinary Water	Storm Drain Exist.
Gas Line	Power Line Exist.
Irrigation Line	Fire Line Exist.
Storm Drain	Existing Asphalt
Telephone Line	New Asphalt
Power Line	Heavy Duty Asphalt
Land Drain	Existing Concrete
Power pole w/guy	New Concrete
Light pole	Heavy Duty Concrete
Fence	Demo'd Road Base
Flowline of ditch	Spill Curb & Gutter
Overhead Power Line	
Corrugated Metal Pipe	
Concrete Pipe	
Reinforced Concrete Pipe	
Ductile Iron	
Polyvinyl Chloride	
Top of Asphalt	
Edge of Asphalt	
Flowline	
Finish Floor	
Top of Curb	
Top of Walk	
Top of Concrete	
Natural Ground	
Finish Grade	
Match Existing	

GENERAL GRADING NOTES:
1. All work shall be in accordance with the City Public Works Standard.
2. Cut slopes shall be no steeper than 2 horizontal to 1 vertical.
3. Fill slopes shall be no steeper than 2 horizontal to 1 vertical.
4. Fills shall be compacted per the recommendations of the geotechnical report prepared for the project and shall be certified by the geotechnical engineer.
5. Areas to receive fill shall be properly prepared and approved by the City inspector and geotechnical Engineer prior to placing fill.
6. Fills shall be benched into competent material as per specifications and geotechnical report.
7. All trench backfill shall be tested and certified by the site geotechnical engineer per the grading code.
8. A geotechnical engineer shall perform periodic inspections and submit a complete report and may upon completion of the rough grading.
9. The final compaction report and certification from the geotechnical engineer shall contain the type of field testing performed. Each test shall be identified with the method of obtaining the in-place density, whether sand cone or drive ring and shall be so noted for each test. Sufficient maximum density determinations shall be performed to verify the accuracy of the maximum density curves used by the field technician.
10. Dust shall be controlled by watering.
11. The location and protection of all utilities is the responsibility of the permittee.
12. Approved protective measures and temporary drainage provisions must be used to protect adjoining properties during the grading project.
13. All public roadways must be cleared daily of all dirt, mud and debris deposited on them as a result of the grading operation. Cleaning is to be done to the satisfaction of the city engineer.
14. The site shall be cleared and grubbed of all vegetation and deleterious matter prior to grading.
15. The contractor shall provide shoring in accordance with OSHA requirements for trench walls.
16. Aggregate base shall be compacted per the geotechnical report prepared for the project.
17. Elevations shown on this plan are finish grades. Rough grades are the subgrades of the improvements shown hereon.
18. The recommendations in the following Geotechnical Engineering Report by xxxx are included in the requirements of grading and site preparation.
The report is titled "GEOTECHNICAL INVESTIGATION"
Job No.: _____ Address: _____
Dated: _____
19. As part of the construction documents, owner has provided contractor with a topographic survey performed by manual or aerial means. Such survey was prepared for project design purposes and is provided to the contractor as a courtesy. It is expressly understood that such survey may not accurately reflect existing topographic conditions.
20. Erosion Control: Protect all inlet boxes, catch basins, etc. with straw bales or other approved method to strain the storm water during construction. Protect surrounding properties and streets from site runoff with sandbags and earth berms.

CURB AND GUTTER CONSTRUCTION NOTES:
1. Open face gutter shall be constructed where drainage is directed away from curb.
2. Open face gutter locations are indicated by shading and notes on site and grading plan.
3. It is the responsibility of the surveyor to adjust top of curb grades at the time construction staking.
4. Refer to the typical details for a standard and open face curb and gutter for dimensions.
5. Transitions between open face and standard curb and gutter are to be smooth. Hand form these areas if necessary.

ADA NOTES:
Contractor must maintain a running slope on Accessible routes no steeper than 5.0% (1:20). The cross slope for Accessible routes must be no steeper than 2.0% (1:50). All Accessible routes must have a minimum clear width of 36". If grades on plans do not meet this requirement notify Consultants immediately.
The Client, Contractor, and Subcontractor should immediately notify the Consultant of any conditions of the project that they believe do not comply with the current state of the ADA and/or FHAA.

PRIVATE ENGINEER'S NOTICE TO CONTRACTORS
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ALL CONSTRUCTION TO CONFORM TO CITY STANDARDS AND SPECIFICATIONS IN RIGHT OF WAY

HKS

ARCHITECT
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TEL: 435.375.1521 FAX: 435.375.1522
WWW.GREATBASINENGINEERING.COM

Intermountain Health

INTERMOUNTAIN HEALTH
ST. GEORGE
REGIONAL HOSPITAL
PARKING EXPANSION

KEY PLAN
PARKING EXPANSION

REVISION

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HKS PROJECT NUMBER
26120

DATE
07/02/26

ISSUE
PR-014

SHEET TITLE
GRADING PLAN

SHEET NO.
C201

TITLE BLOCK VERSION: 203.00334
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PRINT DATE: 6/17/2026 3:29 PM (DATE: 6/17/2026 3:29 PM) (DATE: 6/17/2026 3:29 PM)



Legend
(Note: All items may not appear on drawing)

San. Sewer Manhole	Fire Department Connection	FDC
Water Manhole	Exist. Contour	95.571A
Storm Drain Manhole	Exist. Contour	95.721A
Cleanout	Exist. Grade	R
Electrical Manhole	Ridge Line	
Catch Basins	Direction of Flow	
Exist. Fire Hydrant	Sanitary Sewer Exist.	---
Fire Hydrant	Culinary Water Exist.	---
Fire Department Connection	Gas Line Exist.	---
Post Indicator Valve	Irrigation Line Exist.	---
Exist. Water Valve	Storm Drain Exist.	---
Culinary Water	Telephone Line Exist.	---
Sanitary Sewer	Power Line Exist.	---
Gas Line	Fire Line Exist.	---
Irrigation Line	Water	---
Telephone Line	Storm Drain	---
Secondary Waterline	Power pole w/guy	---
Fire Line	Light Pole	---
Land Drain	Fence	---
Power pole	Overhead Power line	---
Light Pole	Corrugated Metal Pipe	---
Fence	Concrete Pipe	---
Overhead Power line	Reinforced Concrete Pipe	---
Corrugated Metal Pipe	Ductile Iron	---
Concrete Pipe	Polyvinyl Chloride	---
Reinforced Concrete Pipe	Top of Asphalt	---
Ductile Iron	Edge of Asphalt	---
Polyvinyl Chloride	Centerline	---
Top of Asphalt	Finish Floor	---
Edge of Asphalt	Top of Curb	---
Centerline	Top of Wall	---
Finish Floor	Top of Walk	---
Top of Curb	Top of Concrete	---
Top of Wall	Natural Ground	---
Top of Walk	Finish Grade	---
Top of Concrete	Match Existing	---
Natural Ground		
Finish Grade		
Match Existing		

GENERAL UTILITY NOTES:

- Coordinate all utility connections to building with plumbing plans and building contractor.
- Verify depth and location of all existing utilities prior to constructing any new utility lines. Notify Civil Engineer of any discrepancies or conflicts prior to any connections being made.
- All catch basin and inlet box grates are to be bicycle proof.
- All inlet boxes located in curb and gutter are to be placed parallel to the curb and gutter and set under the frame and grate. Improperly placed boxes will be removed and replaced at no additional cost to the owner. Precast or cast in place boxes are acceptable.
- Refer to the site electrical plan for details and locations of electrical lines, transformers and light poles.
- Gas lines, telephone lines, and cable TV lines are not a part of these plans unless otherwise noted.
- Water meters are to be installed per city standards and specifications. It will be the contractor's responsibility to install all items required.
- Water lines, valves, fire hydrants, fittings, etc. are to be constructed as shown. Contractor is responsible to construct any vertical adjustments necessary to clear sewer, storm drain or other utilities as necessary including valve boxes and hydrant apools to proper grade.
- Field verify all existing and/or proposed Roof Drain/Roof Drain down spout connections to Storm Water System with Civil, Plumbing & Architectural plans. Notify Engineer of any discrepancies.
- All gravity flow utility lines shall be installed prior to any pressurized utilities unless written permission is obtained from the engineer of record before construction begins.

UTILITY PIPING MATERIALS:

All piping to be installed per manufacturers recommendations. Refer to project specifications for more detailed information regarding materials, installation, etc.

CULINARY SERVICE LATERALS

- 3/4" to 2" diameter pipe — copper tube ASTM B, Type K, Soft Temper
- Over 2" diameter pipe — AWWA C-900 Class 150 pipe

WATER MAIN LINES AND FIRE LINES

- Pipe material as shown on utility plan view or to meet city standards.

SANITARY SEWER LINES

- All sewer piping to be Polyvinyl Chloride (PVC) sewer pipe, ASTM D 3034, Type PSM, SDR 35

STORM DRAIN LINES

- 12" pipes or smaller — Polyvinyl Chloride (PVC) sewer pipe, ASTM D3034, Type PSM, SDR 35
- 12" or larger — Reinforced Concrete Pipe, ASTM C76, Class III up to 13' of cover, Class IV for 13' to 21' of cover, Class V for 21' to 32' of cover, and Special Design for cover greater than 32 feet

NATURAL GAS SERVICE LATERALS (QUESTAR)

- PLASTIC PIPING MATERIAL: Plastic polyethylene pipe materials and compression couplings must be approved for natural gas applications and must be installed underground. All plastic pipe and fittings must conform to ASTM D2513 (60 psi and above high density pipe approved 3408).
- Plastic pipe must be joined by individuals qualified in the heat fusion method of connecting pipe and fittings or approved mechanical fittings. A minimum number 18 insulated yellow copper tracer wire shall be installed with underground nonmetallic gas piping and shall terminate above grade at each end. Tracer wire shall not come in contact with plastic piping.
- Risers and prefabricated risers inserted with plastic pipe shall conform to ASTM D2513, shall be metallic, have a space of 10 inches from the bottom of the service valve and grade, and shall be wrapped or coated to a point at least 6 inches above grade or protected in an approved manner. When a riser connects underground to plastic pipe, the underground horizontal metallic portion of the riser shall extend at least 12 inches before connecting to the plastic pipe by means of an approved transition fitting, adapter or heat fusion.
- Plastic pipe used underground for customer fuel lines must be approved polyethylene material and be buried a minimum of 12 inches. It shall not be used inside buildings or above ground. PVC (Polyvinyl Chloride) is not approved for piping systems in Questar Gas's service area. Individual gas lines (metallic or plastic) to single outside appliance (outside lights, grilles, etc.) shall be installed a minimum of 8 inches below grade, provided such installation is approved and installed in locations not susceptible to physical damage.

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PRIVATE ENGINEER'S NOTICE TO CONTRACTORS

The Contractor agrees that he shall assume sole and complete responsibility for job site conditions during the course of construction of this project, including safety of all persons and property; that this requirement shall apply continuously and not be limited to normal working hours; and that the contractor shall defend, indemnify, and hold the owner and the engineer harmless from any and all liability, real or alleged, in connection with the performance of work on this project, excepting for liability arising from the sole negligence of the owner or the engineer.

ALL CONSTRUCTION TO CONFORM TO CITY STANDARDS AND SPECIFICATIONS IN RIGHT OF WAY

HKS

ARCHITECT
HKS, INC.
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DENVER, CO 80202

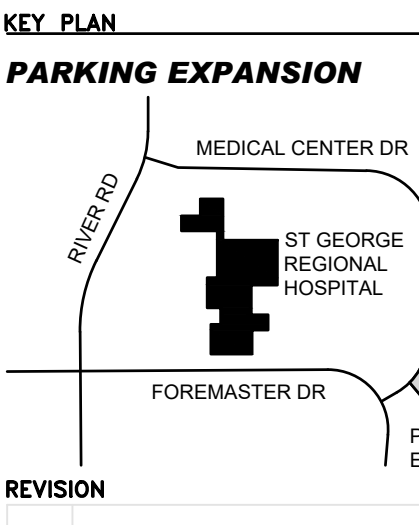
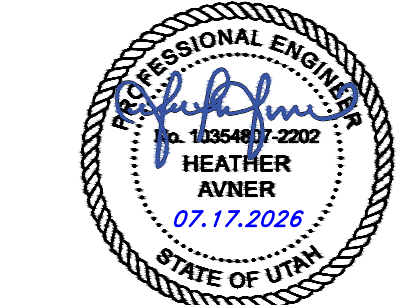
CIVIL / LANDSCAPE
GREAT BASIN ENGINEERING, INC.
5746 S 1475 E
SOUTH OGDEN, UT 84403

ELECTRICAL
LYNK ENGINEERS
324 STATE ST SUITE 400
SALT LAKE CITY, UT 84111

GREAT BASIN ENGINEERING, INC.
5746 S. 1475 E. SUITE 200
OGDEN, UT 84403
PHONE (801) 392-7544
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Intermountain Health

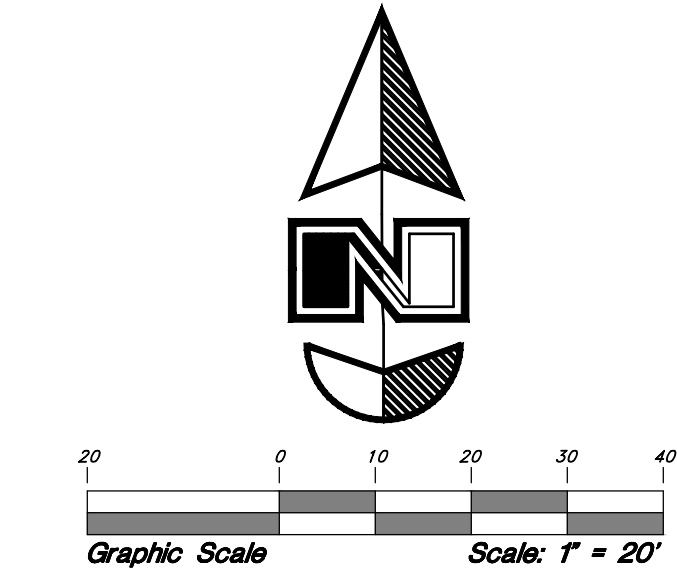
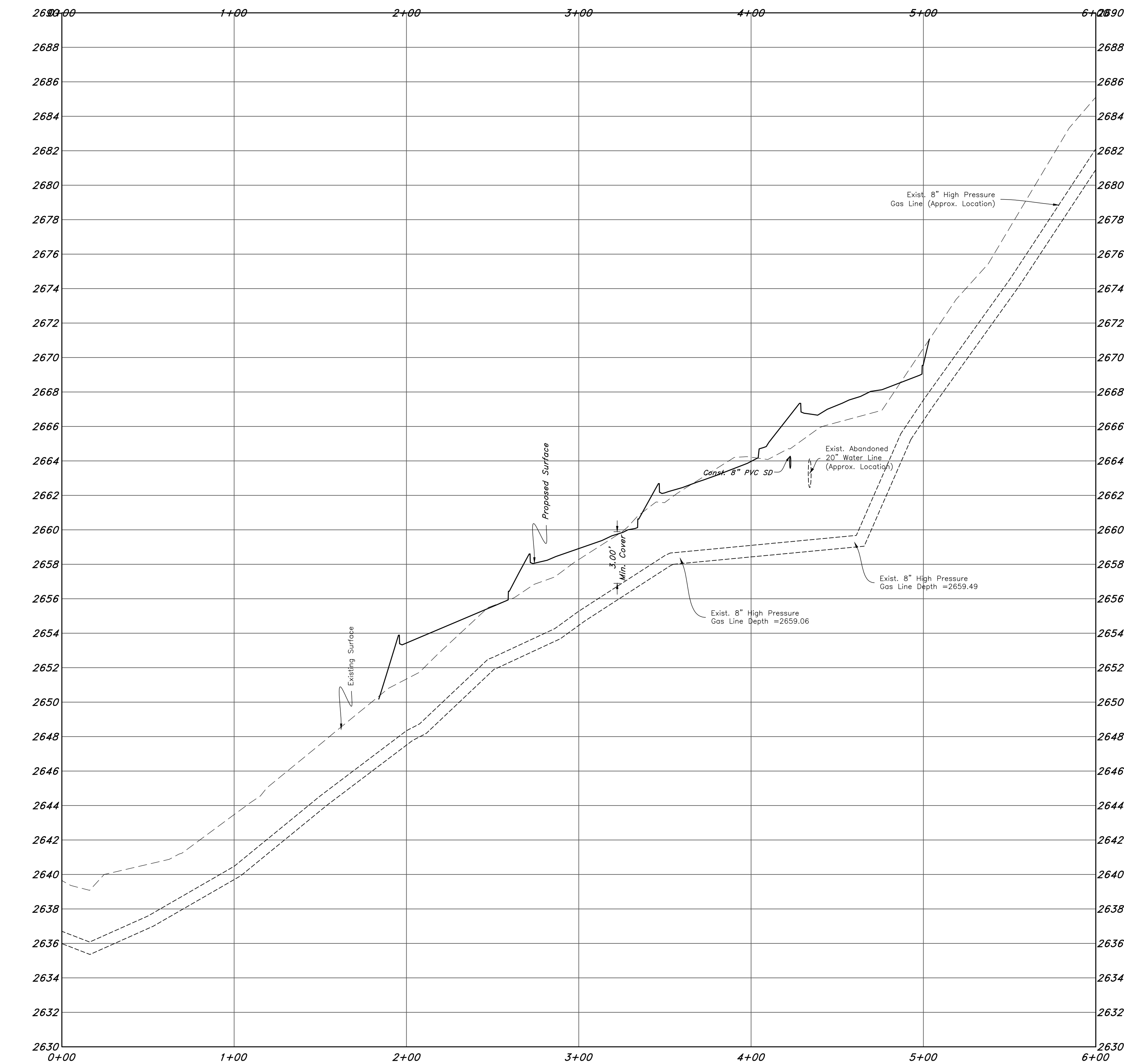
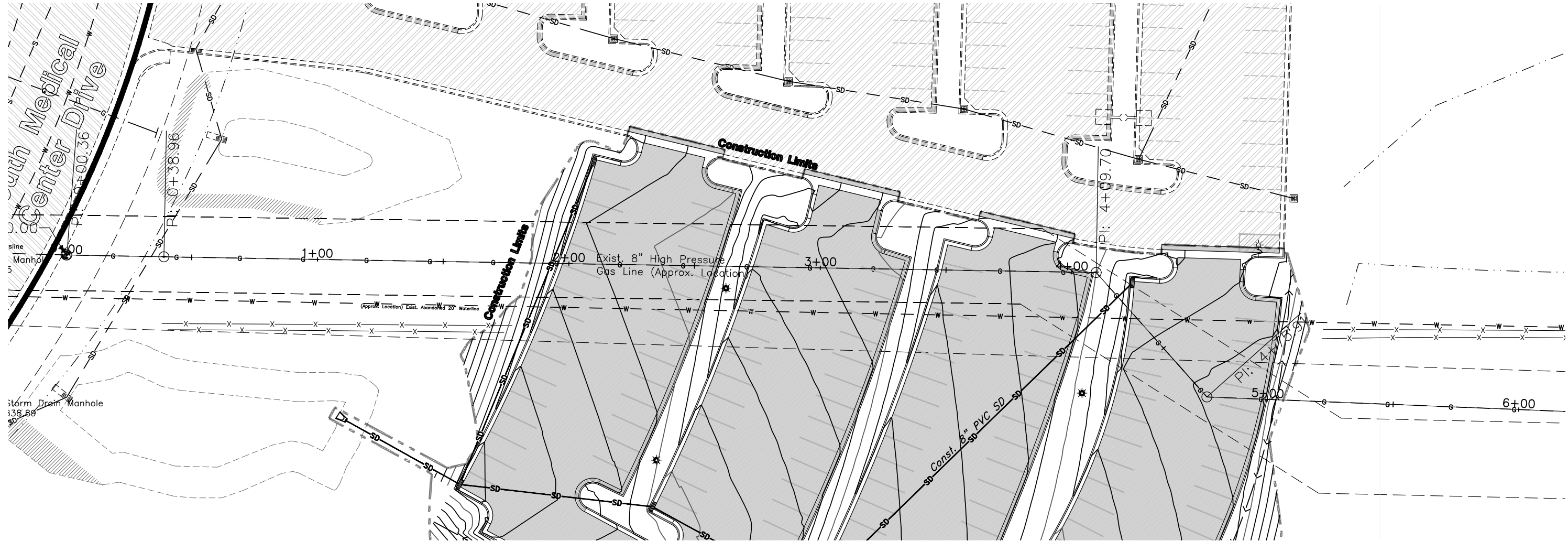
INTERMOUNTAIN HEALTH
ST. GEORGE
REGIONAL HOSPITAL
PARKING EXPANSION



HKS PROJECT NUMBER
26120
DATE
07/02/26
ISSUE
PR-014

SHEET TITLE
UTILITY PLAN

SHEET NO.
C301



Legend

(Note: All items may not appear on drawing.)

San. Sewer Manhole	⊙	Fire Department Connection	FDC
Water Manhole	⊙	Finish Contour	---
Storm Drain Manhole	⊙	Exist. Contour	---
Cleanout	⊙	Finish Grade	---
Electrical Manhole	⊙	Exist. Grade	---
Catch Basins	⊙	Ridge Line	---
Exist. Fire Hydrant	⊙	Direction of Flow	---
Fire Department Connection	⊙	Sanitary Sewer Exist.	---
Post Indicator Valve	⊙	Culinary Water Exist.	---
Exist. Water Valve	⊙	Gas Line Exist.	---
Water Valve	⊙	Irrigation Line Exist.	---
Sanitary Sewer	---	Storm Drain Exist.	---
Culinary Water	---	Telephone Line Exist.	---
Gas Line	---	Power Line Exist.	---
Irrigation Line	---	Fire Line Exist.	---
Storm Drain	---	Existing Asphalt	---
Telephone Line	---	New Asphalt	---
Secondary Waterline	---	Heavy Duty Asphalt	---
Power Line	---	Existing Concrete	---
Fire Line	---	New Concrete	---
Land Drain	---	Heavy Duty Concrete	---
Power pole	---	Demo'd Road Base	---
Power pole w/guy	---	Spill Curb & Gutter	---
Light Pole	---	Tree To Remain in Place	---
Fence	---	Building Grid Lines	---
Flowline of ditch	---	Construction Limits	---
Overhead Power line	---		
Corrugated Metal Pipe	---		
Concrete Pipe	---		
Reinforced Concrete Pipe	---		
Ductile Iron	---		
Polyvinyl Chloride	---		
Top of Asphalt	---		
Edge of Asphalt	---		
Centerline	---		
Finish Floor	---		
Top of Curb	---		
Top of Wall	---		
Top of Walk	---		
Top of Concrete	---		
Natural Ground	---		
Finish Grade	---		
Match Existing	---		

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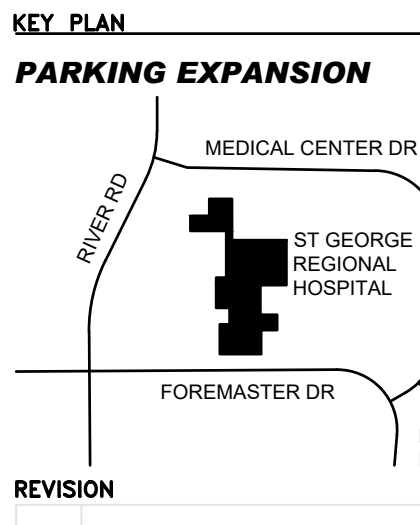
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**INTERMOUNTAIN HEALTH
ST. GEORGE
REGIONAL HOSPITAL
PARKING EXPANSION**



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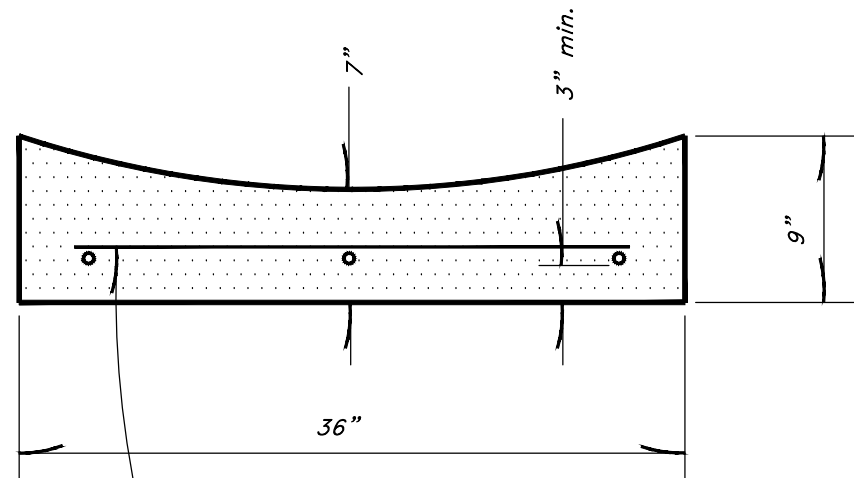
SHEET TITLE
PLAN & PROFILE

SHEET NO.
C401

4

Typical Waterway

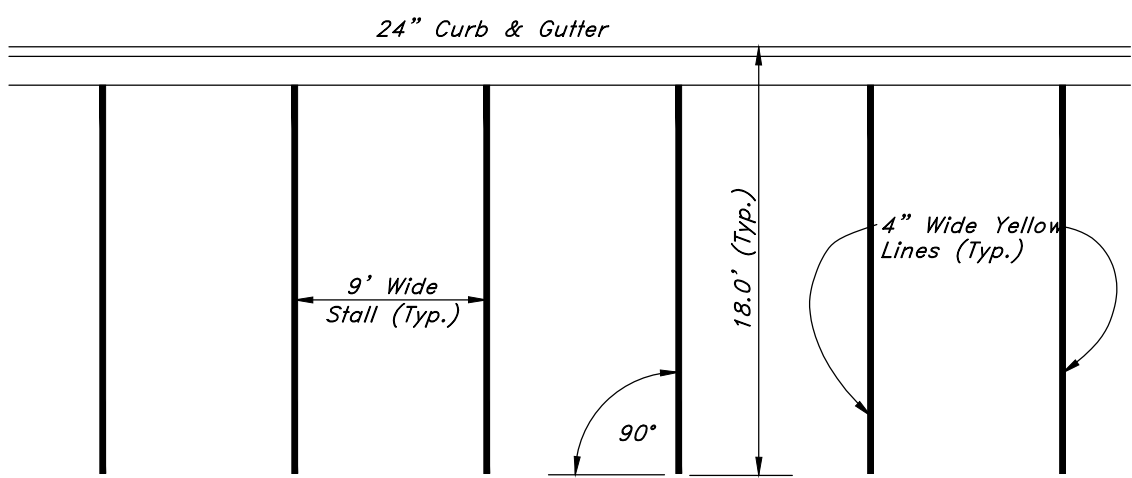
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DETAIL NO

Typical Parking Lot Striping Plan

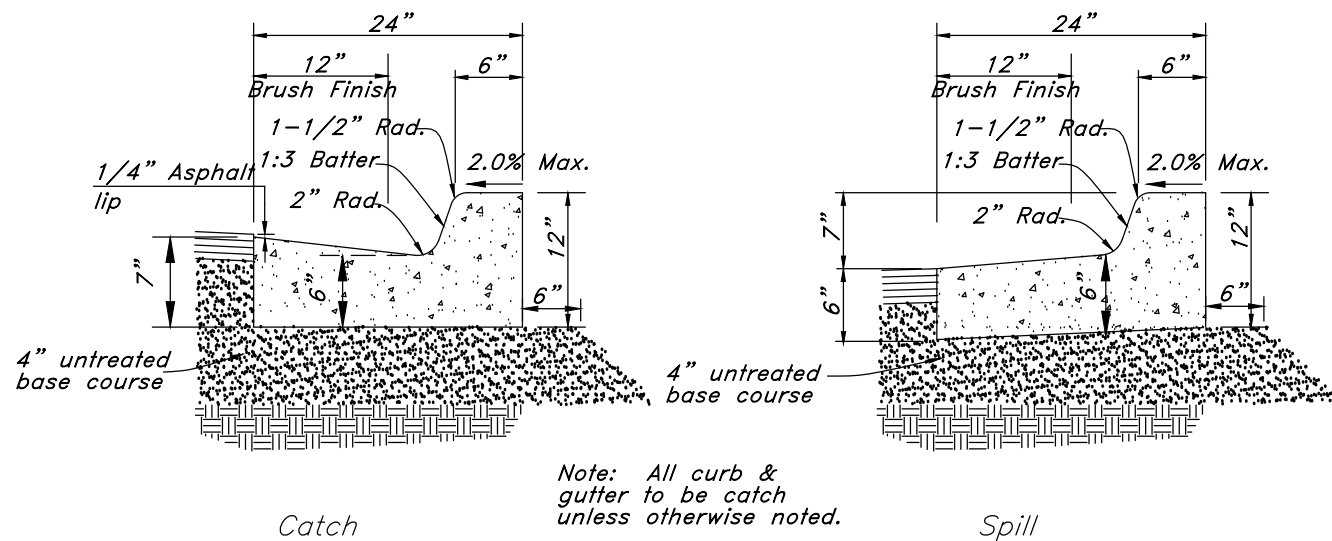
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2

Typical Section - 24" Curb & Gutter

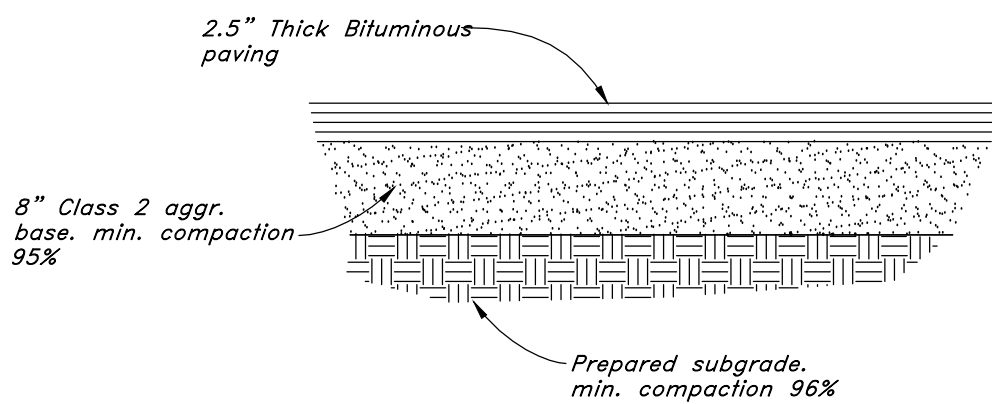
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1

Typical Bituminous Pavement Section

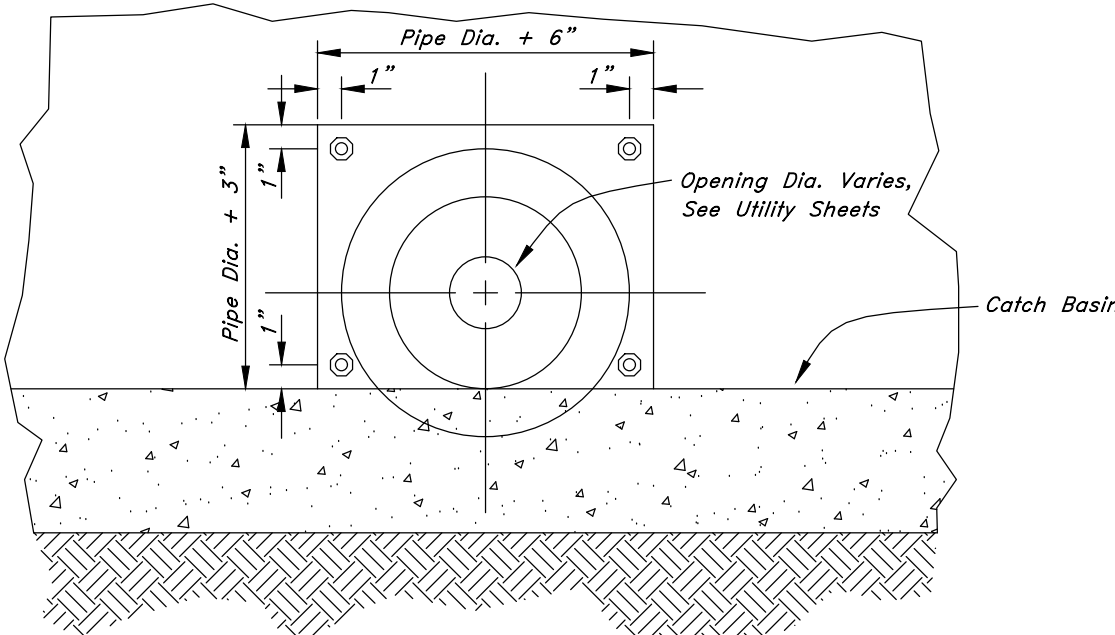
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6

Typical Orifice Plate Detail

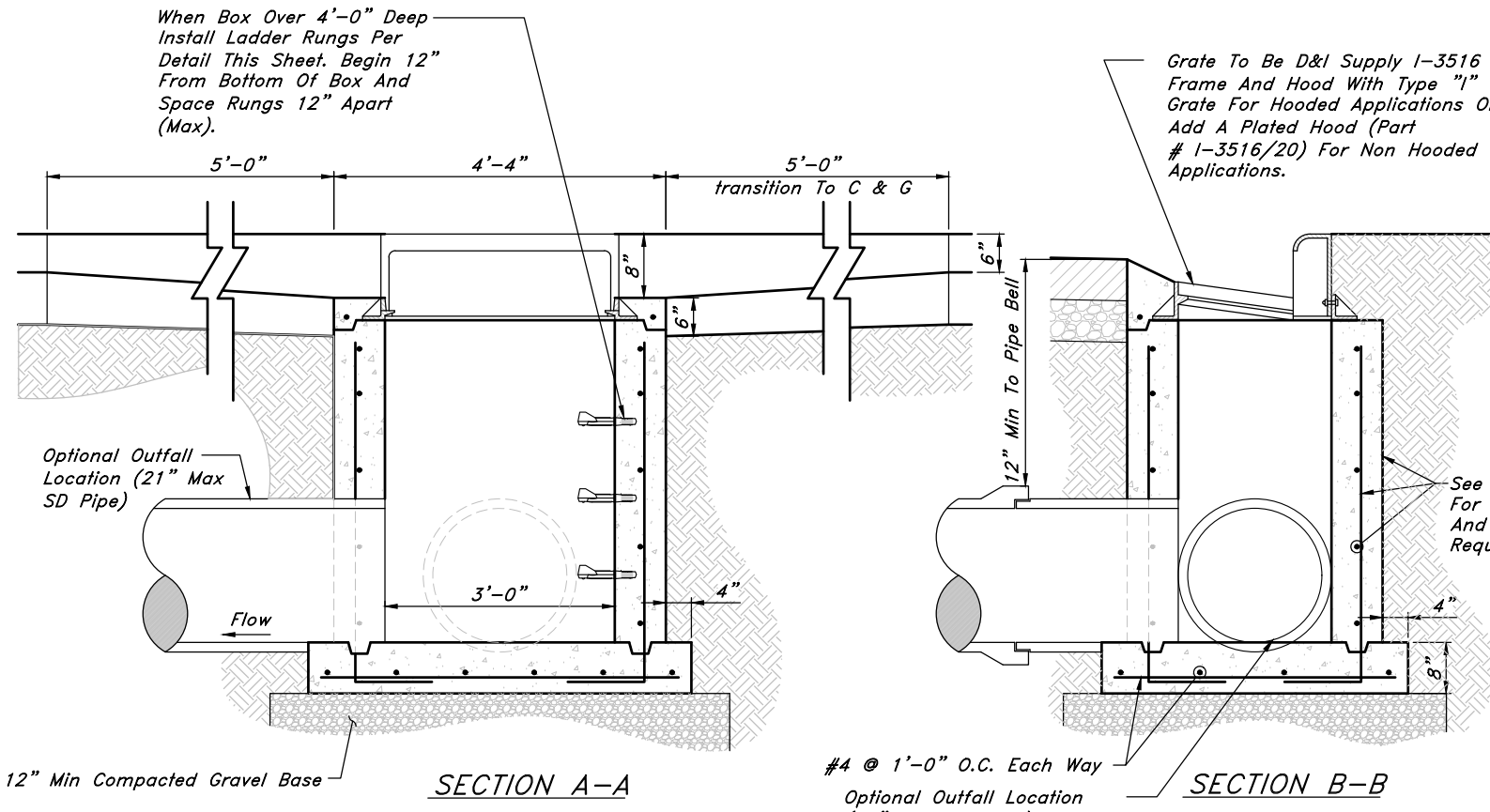
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5

Typical Inlet Box

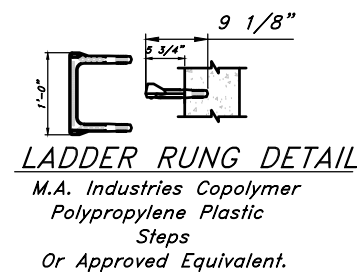
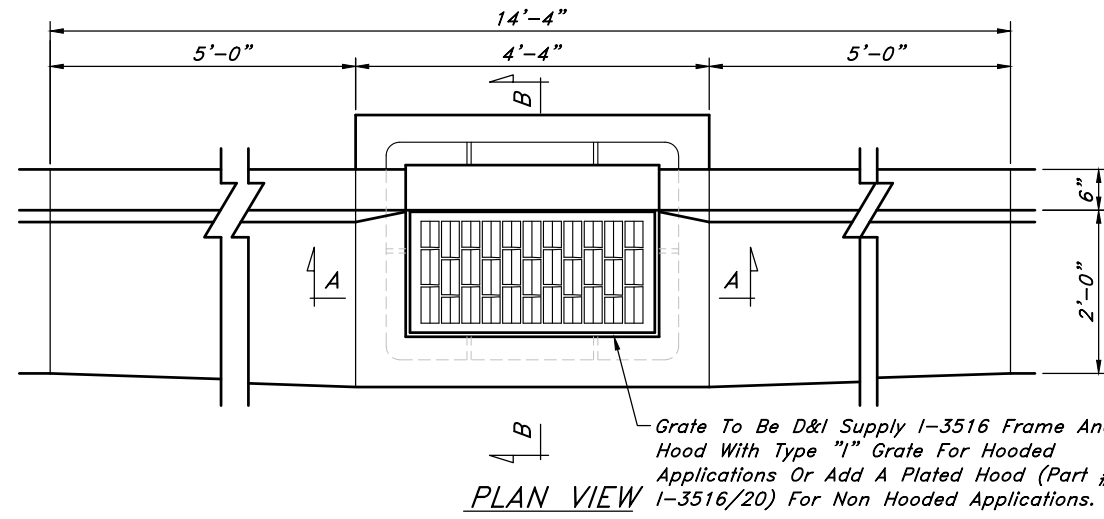
In Curb & Gutter
Not to Scale



- Notes:
1. All Boxes Must Be Formed Inside And Out. The City Inspector Must Observe Prior To Placing Concrete.
 2. All Reinforcing Steel Shall Be Intermediate Grade 40, And Shall Have A Minimum Of Two Inches Cover Or Clearance From All Surfaces And Openings, Unless Otherwise Specified.
 3. All Concrete Shall Be Class AA(A), Unless Otherwise Specified.
 4. Hawking Elevations, Pipe Sizes, And Locations Shall Be Shown On Other Drawings.
 5. Rebar Splice Shall Not Be Less Than 18 Inches.
 6. 2x4 Shear Keys Are Required As Shown.
 7. Compact Base Material To 96% Of Maximum Dry Density Per ASTM D-1557.
 8. Precast Storm Drain Box May Be Used In Lieu Of Cast-In-place. Must Provide Submittals To The Design Engineer For Approval Prior To Use.

STEEL SCHEDULE				WALL THICKNESS
HEIGHT	VERT. STL.	HORIZ. STL.		
5'-4"	#3 @ 12" O.C.	#3 @ 12" O.C.		6" WALL
4'-6"	#3 @ 12" O.C.	#4 @ 12" O.C.		6" WALL
6'-8"	#3 @ 12" O.C.	#4 @ 12" O.C.		6" WALL
8'-10"	#3 @ 12" O.C.	#4 @ 12" O.C.		6" WALL
10'-12"	#3 @ 12" O.C.	#4 @ 12" O.C.		6" WALL

NOTE:
1) INSIDE FACE BAR TO BE SET AS SHOWN IN OUTSIDE FACE BAR.
2) USE DOUBLE CURTAIN REBAR FOR INLET BOXES 6' - 8' OR MORE DEEP.

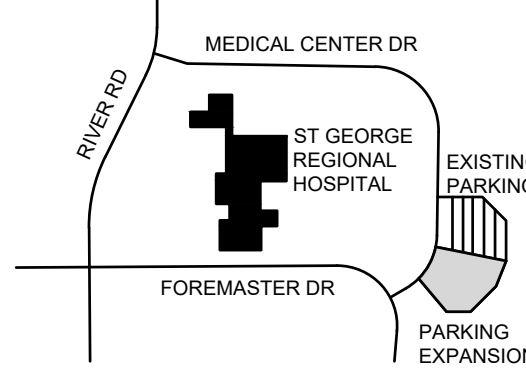


INTERMOUNTAIN HEALTH
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PARKING EXPANSION



KEY PLAN

PARKING EXPANSION



REVISION

HKS PROJECT NUMBER

26120

DATE

07/02/26

ISSUE

PR-014

SHEET TITLE

DETAILS

SHEET NO.

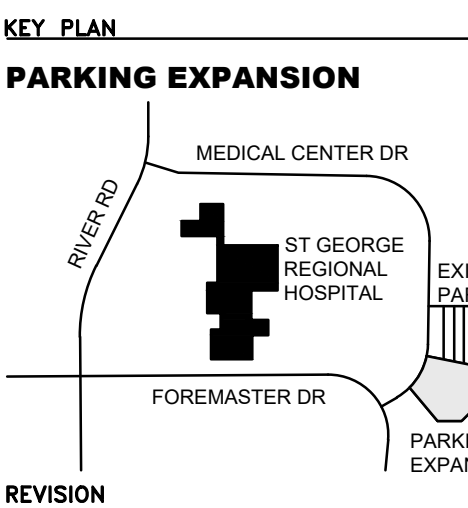
C501

EXHIBIT C

Landscape Plans



**INTERMOUNTAIN HEALTH
ST. GEORGE
REGIONAL HOSPITAL**



HKS PROJECT NUMBER
26120

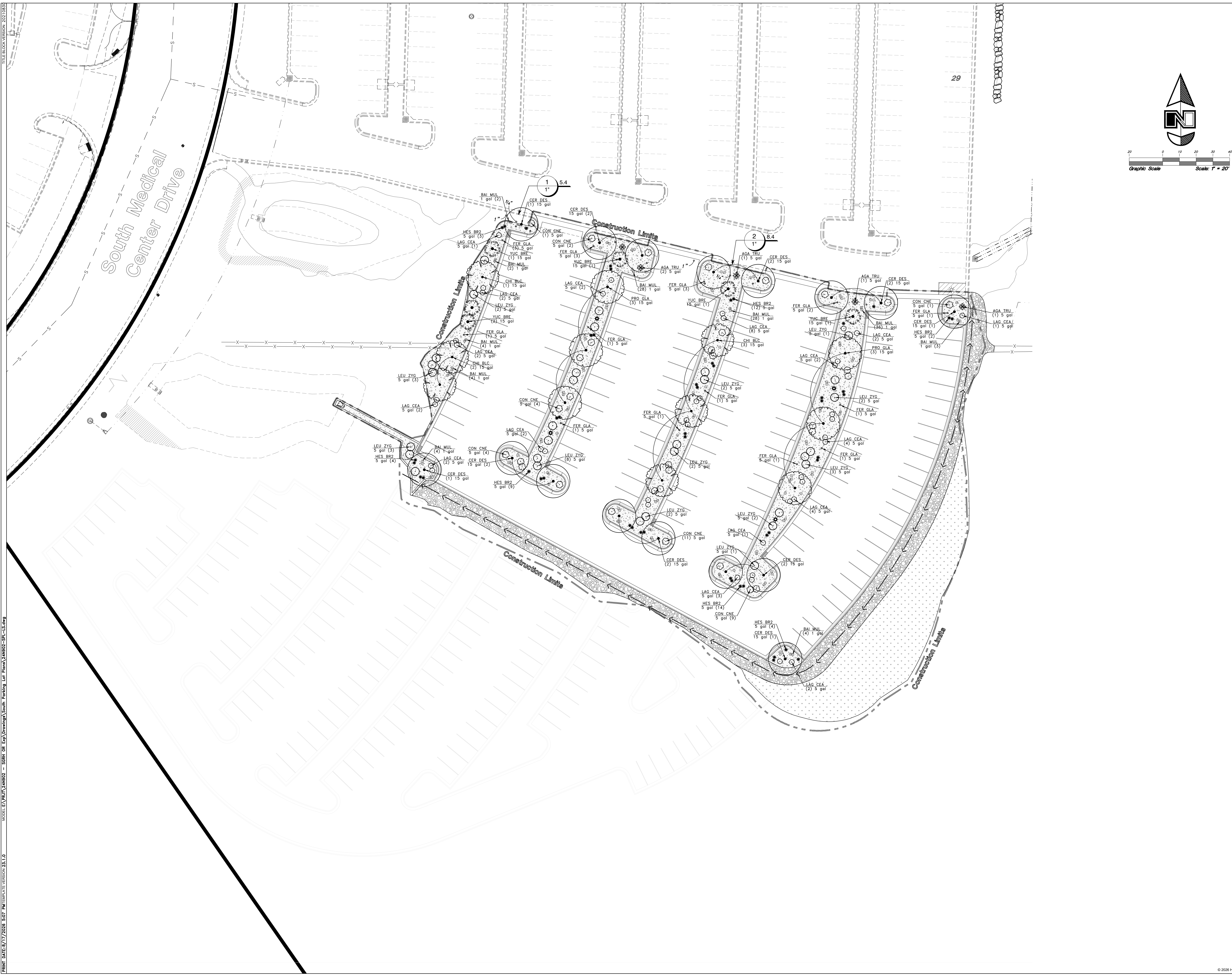
DATE
08/17/26

ISSUE
PR-014

SHEET TITLE
**LANDSCAPE
PLAN**

SHEET NO.

LP101



PLANTING NOTES

1. EXAMINE THE SITE CONDITIONS, THE SUBGRADE AND VERIFY THE DEPTHS OF TOPSOIL AND MULCH. NOTIFY THE ARCHITECT IN WRITING OF ANY UNSATISFACTORY CONDITIONS. DO NOT BEGIN LANDSCAPE WORK UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN RESOLVED.
2. ALL PLANTS SHOWN GRAPHICALLY ARE REQUIRED. ANY PLANT QUANTITIES ARE FOR CONVENIENCE ONLY. CONTRACTOR TO VERIFY PLANT QUANTITIES PRIOR TO BIDDING.
3. SPACING BETWEEN PLANTS AND BETWEEN PLANTS AND PAVING ARE BASED ON THE MATURE SPREAD OF THE PLANTS. PRIOR TO PLANTING, VERIFY ROOM TO ACCOMMODATE MATURE PLANT WITHOUT OVERCROWDING AND ENCRoACHING ON PAVING.
4. VERIFY LOCATIONS OF ALL UTILITIES PRIOR TO ANY DIGGING. ANY DAMAGE TO EXISTING UTILITIES CAUSED BY THIS CONTRACTOR SHALL BE REPAIRED AT NO ADDITIONAL EXPENSE TO THE OWNER.
5. TOPSOIL IS TO BE IMPORTED (HARVESTED AND STOCKPILED ON SITE) TO THE SITE. SUBMIT TOPSOIL TEST, SCREEN AND AMEND TO MEET THE FOLLOWING STANDARDS:

5.1. ORGANIC MATTER: GREATER THAN 1.0%

5.2. SOLUBLE SALTS: LESS THAN 4 dS/m

5.3. PH: BETWEEN 5.0 AND 8.2

5.4. TEXTURE: SAND: 15-60%, SILT: 10-60% CLAY: 5-30%

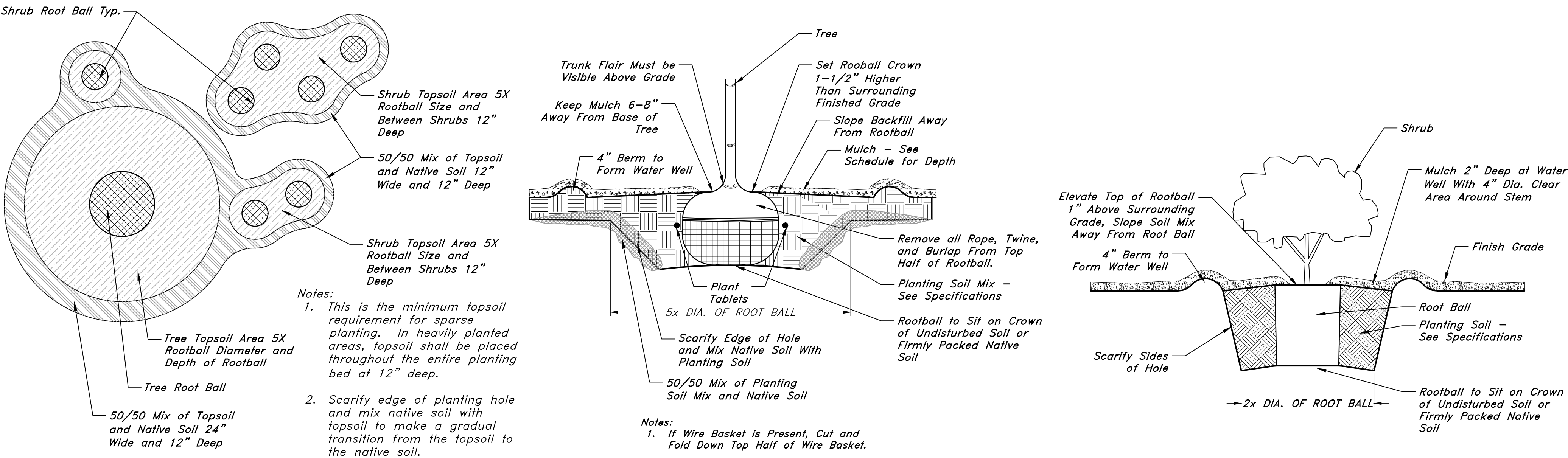
5.5. SODIUM ADSORPTION RATIO (SAR): BELOW 10 FOR SANDY CLAY LOAM, SANDY LOAM AND LOAM, BELOW 7 FOR SILT LOAM, SILTY CLAY LOAM, AND CLAY LOAM.

5.6. COARSE FRAGMENTS 2mm AND SMALLER: LESS THAN 5%.

5.7. NO ROCKS OVER 1.5"
6. CONTRACTOR IS RESPONSIBLE FOR PROVIDING 6" OF TOPSOIL FOR TURF AND 12" OF TOPSOIL FOR SHRUBS AND TREES.
7. THE LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR FINISH GRADE ELEVATIONS. ALLOW FOR SPECIFIED TOPSOIL AND MULCH LAYER THICKNESS. COORDINATE ROUGH GRADING WITH THE GENERAL CONTRACTOR.
8. ALL PLANT MATERIAL MUST MEET THE SIZES AS INDICATED ON THE PLANT SCHEDULE. PLANT MATERIAL THAT DOES NOT MEET THE QUALITY STANDARDS OF THE PROJECT WILL BE REFUSED BY THE LANDSCAPE ARCHITECT.
9. TURFGRASS SOD SHALL BE CERTIFIED NUMBER 1 QUALITY/PREMIUM SOD - SEE SPECIFICATIONS.

PLANT SCHEDULE

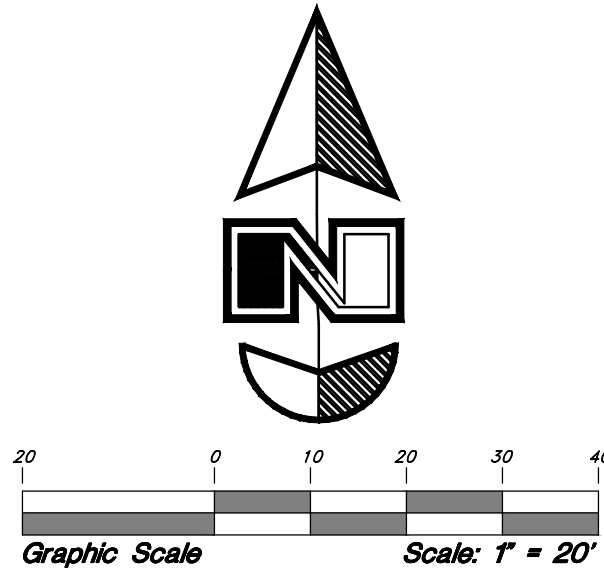
CODE	QTY	BOTANICAL / COMMON NAME	CONT	CAL
TREES				
CER DES	16	Cercidium x 'Desert Museum' / Desert Museum Palo Verde	15 gal	
CHI BLC	6	Chilopsis linearis 'Burgundy Lace' / Burgundy Lace Desert Willow	15 gal	
PRO GLA	6	Prosopis glandulosa / Honey Mesquite	15 gal	
YUC BRE	6	Yucca brevifolia / Joshua Tree	15 gal	
SHRUBS				
AGA TRU	5	Agave parryi truncata / Artichoke Parry's Agave	5 gal	
CON CNE	32	Convolvulus cneorum / Bush Morning Glory	5 gal	
FER GLA	20	Ferocactus glaucescens / Blue Barrel Cactus	5 gal	
HES BR2	48	Hesperaloe parviflora 'Perpa' / Brakelights® Red Yucca	5 gal	
LAG CEA	40	Lagerstroemia indica 'HOCH226' / Summerlasting Strawberry Crape Myrtle	5 gal	
LEU ZYG	31	Leucophyllum zygomphyllum 'Cimarron' / Cimarron Texas Sage	5 gal	
PERENNIALS				
BAI MUL	115	Baileya multiradiata / Desert Marigold	1 gal	
GROUND COVERS				
SYMBOL QTY BOTANICAL / COMMON NAME CONT TYPE SPACING				
1. DECOMPOSED GRANITE MULCH				
3/8" Minus Decomposed Granite, Pink to match Existing. Place 4" deep min. over 12" Deep Imported Topsoil and Dewitt Pro-5 weed barrier fabric. Raked Finish - Do not compact.				
2. COBBLE MULCH				
4-6" Angular Cobble, Dark Gray to match Existing. Place 6" deep min. over Dewitt Pro-5 weed barrier fabric.				
7. NATIVE SEED MIX				
Hydroseed Over Existing Topsoil- See Native Seed Mix Schedule				



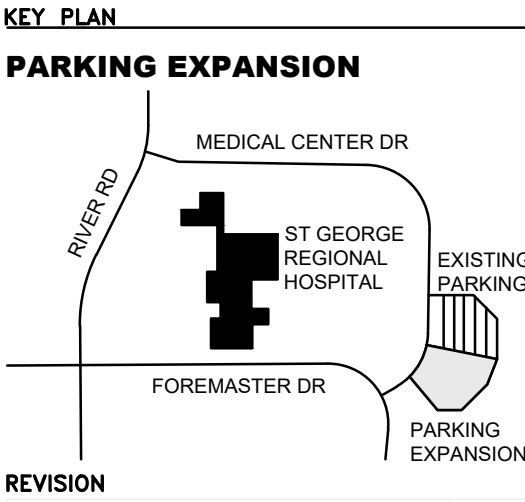
TOPSOIL PLACEMENT AT SHRUBS AND TREES

TREE PLANTING

SHRUB PLANTING



INTERMOUNTAIN HEALTH
ST. GEORGE
REGIONAL HOSPITAL
PARKING EXPANSION



HKS PROJECT NUMBER
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PR-014

SHEET TITLE
**LANDSCAPE
DETAILS**

SHEET NO.

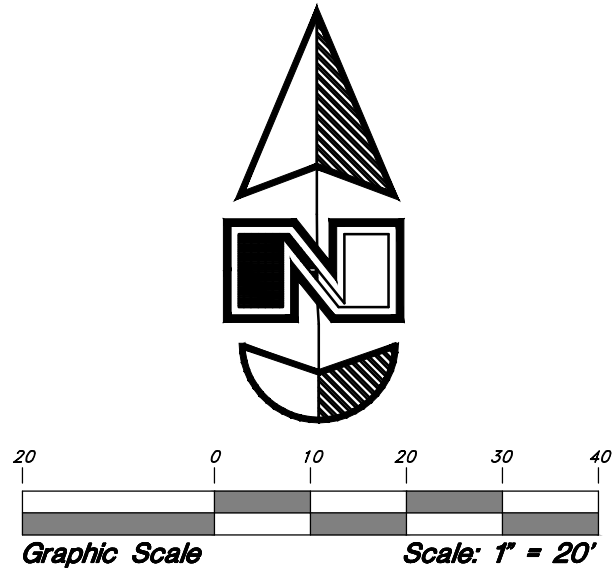
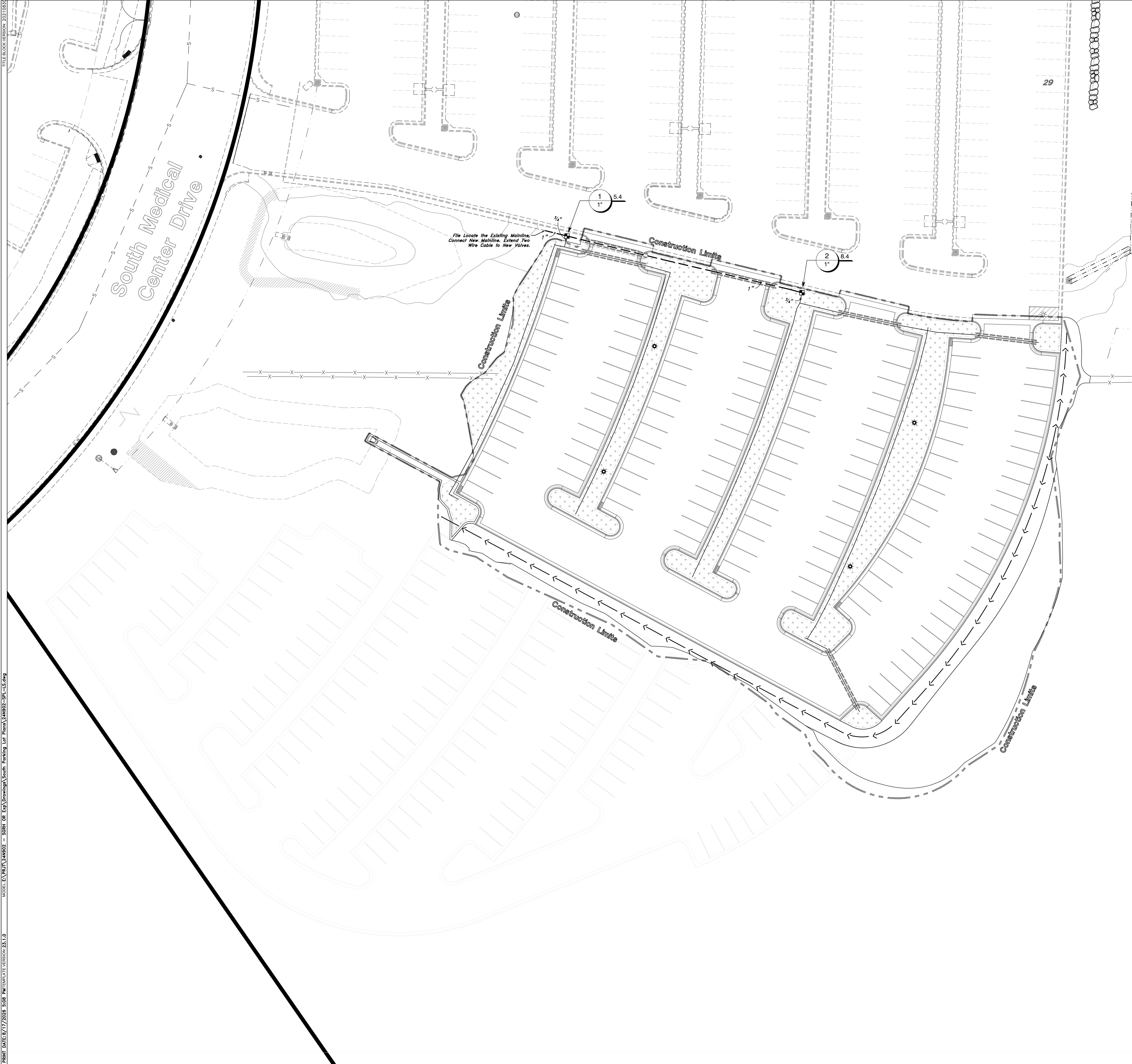
LP501

ARCHITECT
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OGDEN, UT 84403 MAIN (801) 234-4315
P.O. BOX 1521 OGDEN, UT 84403
WWW.GREATBASINENGINEERING.COM

Intermountain Health

PRINT DATE: 6/17/2026 5:08 PM TEMPLATE VERSION: 23.1.0
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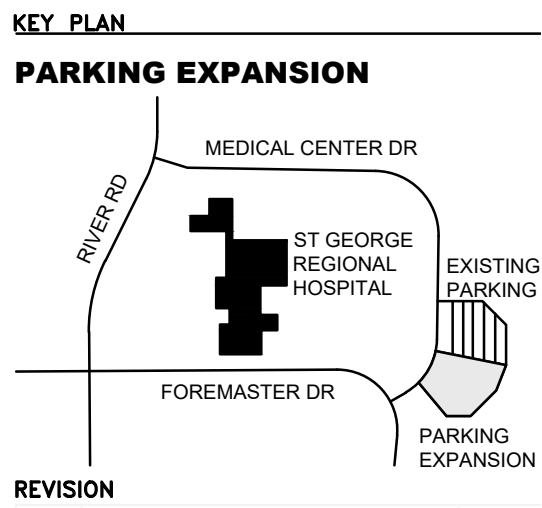
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SHEET TITLE
**IRRIGATION
PLAN**

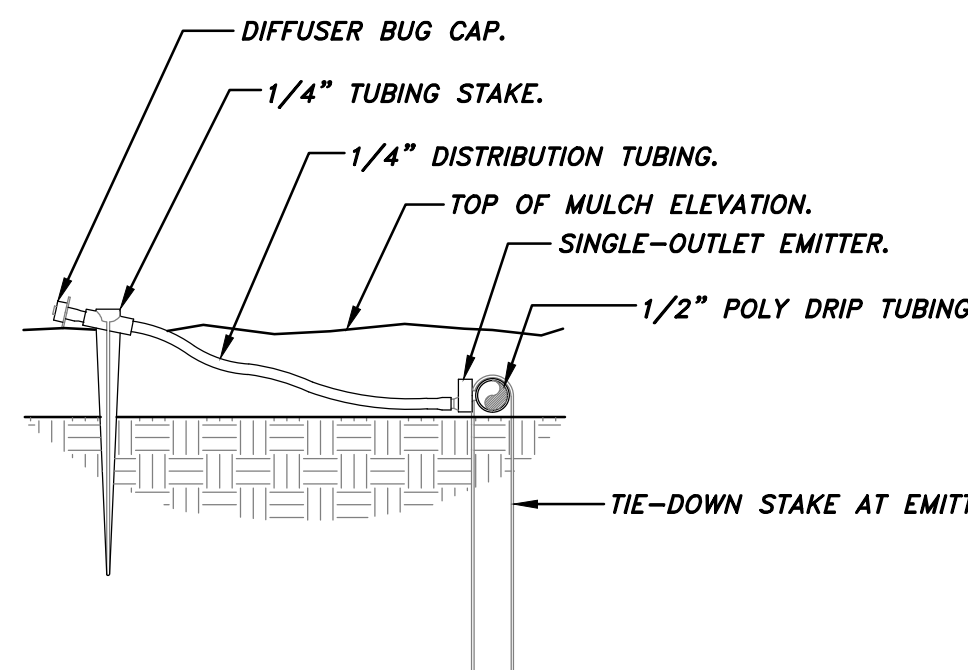
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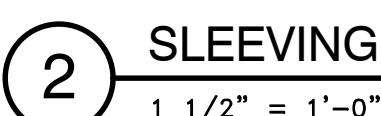
1. THIS PROJECT REQUIRES THE REMOVAL OF AN EXISTING IRRIGATION SYSTEM AND THE PROTECTION AND MAINTENANCE OF THE EXISTING SYSTEM TO REMAIN.
2. COORDINATE WITH OWNER FOR ANY DISRUPTIONS OF SERVICE. CONTRACTOR IS RESPONSIBLE FOR HANDLING ANY VEGETATION DAMAGE TO THE EXISTING SYSTEM. IN THE EVENT OF A DISRUPTION OF SERVICE, ANY PLANTS LOST DUE TO LACK OF WATER DUE TO CONTRACTOR NEGLIGENCE WILL BE REPLACED AT NOT COST TO THE OWNER.
3. FIELD VERIFY THE LOCATIONS AND SIZES OF THE EXPECTED TIE-INS FOR MAIN LINES AND LATERAL LINES.
4. MAINTAIN AND PROTECT THE EXISTING CONTROLLER AND EXISTING CONTROL WIRES THAT ARE TO REMAIN. CONTRACTOR TO SUPPLY EQUIPMENT AND WIRING NECESSARY TO MAKE NEW EQUIPMENT WORK WITH EXISTING EQUIPMENT.

1. INSTALL IRRIGATION WIRE UNDER PAVED AREAS IN SEPARATE PVC SLEEVE, SIZE FOR NUMBER OF WIRES.
2. EXAMINE THE SITE CONDITIONS, THE SUBGRADE AND VERIFY ELEVATIONS, NOTIFY THE ARCHITECT IN WRITING OF ANY UNSATISFACTORY CONDITIONS. DO NOT BEGIN LANDSCAPE WORK UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN RESOLVED.
3. BEFORE ANY TRENCHING, EXCAVATION, OR DIGGING, THE CONTRACTOR SHALL HAVE THE AREA "BLUE STAKED" AND CONTACT THE APPROPRIATE UTILITY COMPANIES. CONTRACTOR SHALL PROTECT ALL UTILITIES FROM DAMAGE
4. VERIFY LOCATIONS OF ALL UTILITIES AND SITE FEATURES PRIOR TO ANY DIGGING. ANY DAMAGE TO EXISTING UTILITIES AND SITE FEATURES CAUSED BY THIS CONTRACTOR SHALL BE REPAIRED AT NO ADDITIONAL EXPENSE TO THE OWNER.
5. ALL LINES SHALL SLOPE TO DRAIN, ADD MANUAL DRAINS AT ALL MAINLINE LOW POINTS AS NECESSARY FOR COMPLETE DRAINAGE OF THE ENTIRE SYSTEM. INDICATE ALL DRAIN LOCATIONS ON RECORD DRAWINGS.
6. THIS DRAWING IS DIAGRAMMATIC AND IS INTENDED TO CONVEY THE GENERAL LAYOUT OF IRRIGATION SYSTEM COMPONENTS. FIELD ADJUSTMENTS MAY BE NECESSARY TO MAINTAIN FULL COVERAGE IN ACTUAL SITE CONDITIONS. CONTACT THE LANDSCAPE ARCHITECT IF ANY CORRECTION OR CHANGES ARE NECESSARY. THE CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR REVISIONS TO THE IRRIGATION SYSTEM IF THE IRRIGATION SYSTEM IS INSTALLED WHEN SITE CONDITIONS DIFFER FROM PLAN LAYOUT AND THE LANDSCAPE ARCHITECT WAS NOT INFORMED.
7. LATERAL AND MAIN LINES SHALL BE LAID IN COMMON TRENCHES IN LANDSCAPE AREAS WHEREVER POSSIBLE.
8. ALL PIPING AND WIRING UNDER PAVEMENT SHALL BE RUN THROUGH SEPARATE SLEEVES. CONTROL WIRES NOT LAID IN A COMMON TRENCH WITH A MAIN LINE SHALL BE INSTALLED IN A CONDUIT OF SUFFICIENT SIZE.
9. ALL IRRIGATION EQUIPMENT NOT DETAILED SHALL BE INSTALLED AS PER MANUFACTURER RECOMMENDATIONS, SPECIFICATIONS, AND DETAILS.
10. THIS SYSTEM IS DESIGNED TO OPERATE AT 40 PSI FOR ALL DRIP EMITTERS.
11. THE IRRIGATION WATER SOURCE IS THE EXISTING IRRIGATION MAINLINE. PRESSURE AT THE POINT OF CONNECTION IS EXPECTED TO BE AT LEAST 60 PSI. IF ACTUAL PRESSURE VARIES FROM THE EXPECTED, CONTACT LANDSCAPE ARCHITECT.
12. SUPPLY PRODUCTS AS SPECIFIED. NO SUBSTITUTIONS WILL BE ALLOWED UNLESS PRE-APPROVED IN WRITING BY THE OWNER OR LANDSCAPE ARCHITECT.
13. CONTRACTOR TO SUPPLY ALL KEYS AND ATTIC STOP PER THE SPECIFICATIONS.
14. CONTRACTOR TO SHUT DOWN AND WINTERIZE THE IRRIGATION SYSTEM AT THE END OF THE FIRST SEASON AND TURN ON THE SYSTEM AT THE BEGINNING OF THE FOLLOWING SEASON. THIS WORK IS TO BE DONE IN THE PRESENCE OF THE OWNERS' MAINTENANCE PERSONNEL.

<u>SYMBOL</u>	<u>MANUFACTURER/MODEL/DESCRIPTION</u>
	Rain Bird XCZ-100-LC Wide Flow Drop Control Kit, for Light Commercial Uses, 1in. PEB Valve, with 1in. Pressure Regulating 40psi Basket Filter. 0.3-20 GPM.
	Area to Receive Drop Emitters Rain Bird XBCV-PC Single Outlet, Pressure Compensating Drop Emitters. Flow rates of 0.5PC 0.5 GPH=blue, 1.0PC 1.0 GPH=black, and 2.0PC 2.0 GPH=red. Comes with a self-placing barb inlet x barb outlet. With check valve.
<u>SYMBOL</u>	<u>MANUFACTURER/MODEL/DESCRIPTION</u>
	Irrigation Lateral Line: PVC Schedule 40
	Irrigation Mainline: PVC Schedule 40
	Pipe Sleeve: PVC Class 200 SDR 21 Sleeves to be Same the Size of Through Pipes. At Mainlines, Run Separate Sleeve for Control Wires.
	Valve Coultout - Valve Number - Valve Flow - Valve Size
	Existing 1-1/2" Mainline (Field Verify Location)
	1" PVC Sch 40 Control Wire Conduit

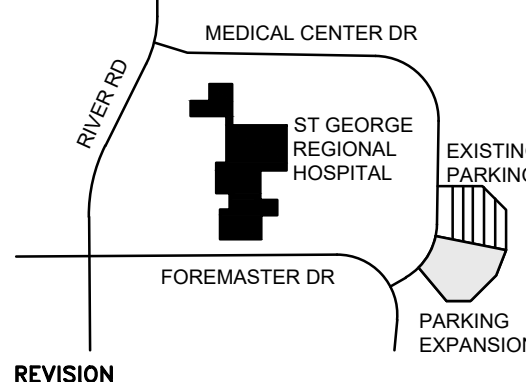


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**INTERMOUNTAIN HEALTH
ST. GEORGE
REGIONAL HOSPITAL
PARKING EXPANSION**

PARKING EXPANSION



SHEET TITLE
**IRRIGATION
DETAILS**

SHEET NO.

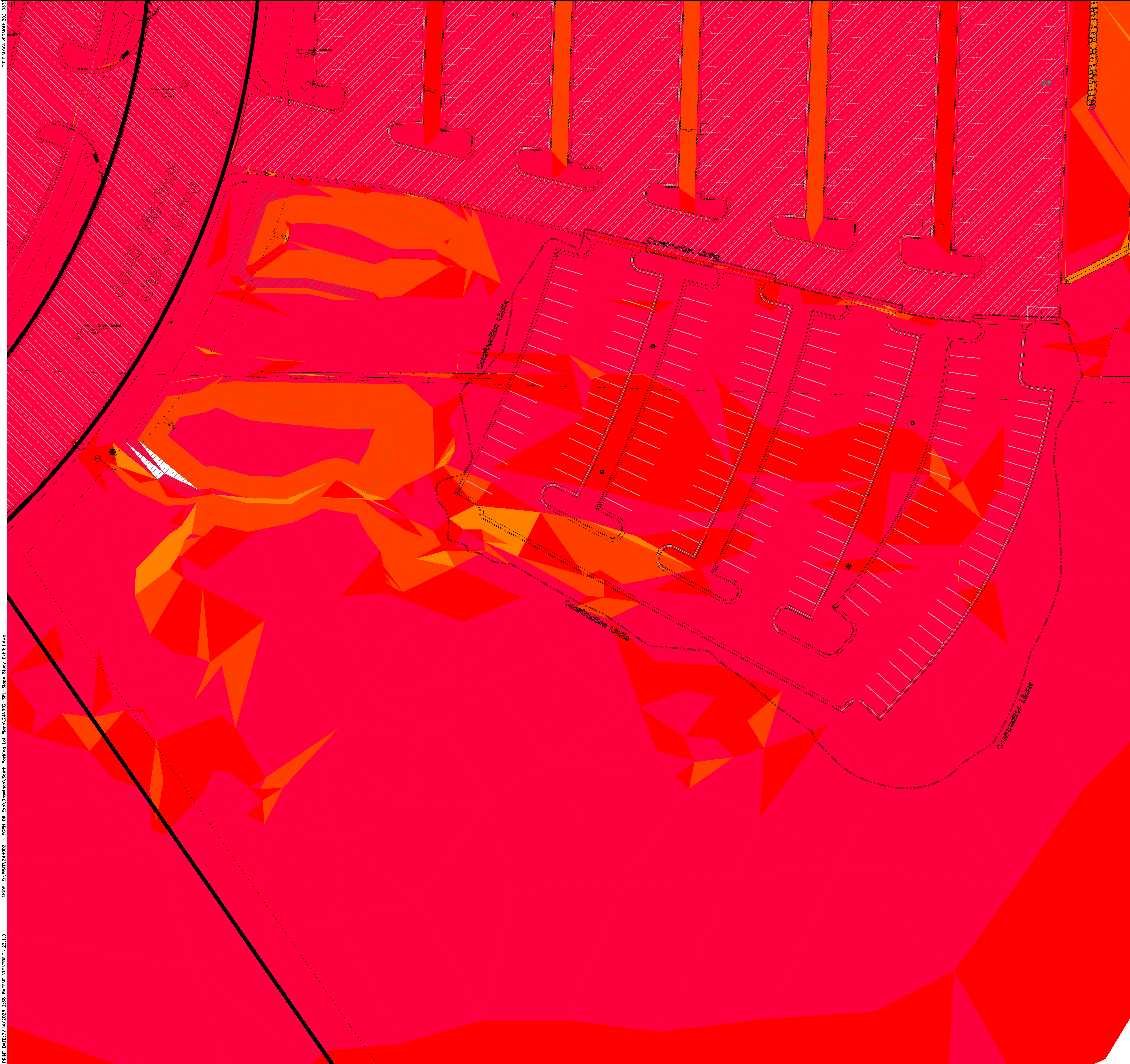
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EXHIBIT D

Slope Analysis Parking Lot Expansion

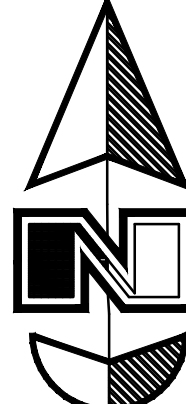
<i>SURFACE SLOPE DATA</i>			
<i>NUMBER</i>	<i>MINIMUM SLOPE</i>	<i>MAXIMUM SLOPE</i>	<i>COLOR</i>
<i>1</i>	<i>0.000%</i>	<i>20.000%</i>	
<i>2</i>	<i>20.000%</i>	<i>30.000%</i>	
<i>3</i>	<i>30.000%</i>	<i>40.000%</i>	
<i>4</i>	<i>40.000%</i>	<i>99999900.000%</i>	

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GREAT BASIN ENGINEERING
5746 SOUTH 1475 EAST SUITE 200
OGDEN, UTAH 84403 MAIN (801) 394-4515
S.L.C. (801) 521-0222 FAX (801) 392-7544
WWW.GREATBASINENGINEERING.COM



Graphic Scale
Scale: 1" = 20'

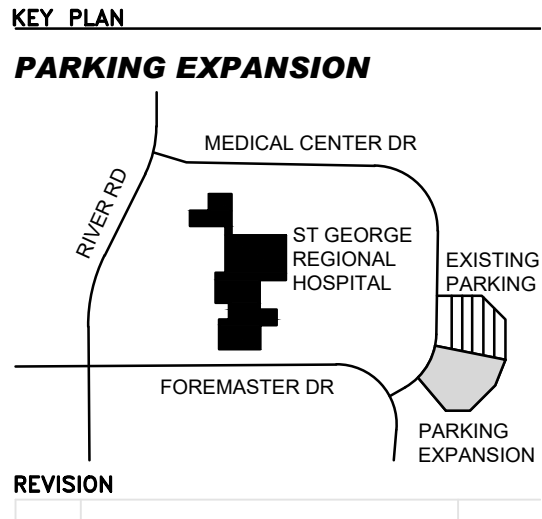
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NUMBER	MINIMUM SLOPE	MAXIMUM SLOPE	COLOR
1	0.000%	20.000%	
2	20.000%	30.000%	
3	30.000%	40.000%	
4	40.000%	99999900.000%	

HKS

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**INTERMOUNTAIN HEALTH
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Slope Analysis Exhibit

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EX-1

EXHIBIT E

Slope Analysis Entire Parcel

<i>SURFACE SLOPE DATA</i>					
<i>NUMBER</i>	<i>MINIMUM SLOPE</i>	<i>MAXIMUM SLOPE</i>	<i>COLOR</i>	<i>TOTAL AREA (ACRES)</i>	<i>DISTURBED AREA (ACRES)</i>
<i>1</i>	<i>0%</i>	<i>20%</i>		<i>11.26</i>	<i>1.17 (10.39%)</i>
<i>2</i>	<i>20%</i>	<i>30%</i>		<i>5.23</i>	<i>0.39 (7.46%)</i>
<i>3</i>	<i>30%</i>	<i>40%</i>		<i>1.46</i>	<i>0.06 (4.11%)</i>
<i>4</i>	<i>40%</i>	<i>99999900%</i>		<i>0.51</i>	<i>0.02 (3.92%)</i>

TOTAL STUDY AREA = 18.46 Ac

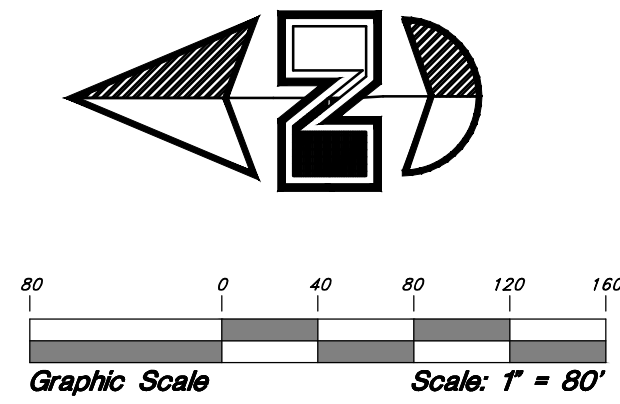
TOTAL DISTURBED AREA = 1.64 Ac (8.88%)

<i>DISTURBED AREA SLOPE DATA</i>					
<i>NUMBER</i>	<i>MINIMUM SLOPE</i>	<i>MAXIMUM SLOPE</i>	<i>COLOR</i>	<i>TOTAL AREA (ACRES)</i>	<i>DISTURBED AREA (%)</i>
<i>1</i>	<i>0%</i>	<i>20%</i>		<i>1.17</i>	<i>71.34%</i>
<i>2</i>	<i>20%</i>	<i>30%</i>		<i>0.39</i>	<i>23.78%</i>
<i>3</i>	<i>30%</i>	<i>40%</i>		<i>0.06</i>	<i>3.66%</i>
<i>4</i>	<i>40%</i>	<i>99999900%</i>		<i>0.02</i>	<i>1.22%</i>

TOTAL STUDY AREA = 1.64 Ac

100%

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SURFACE SLOPE DATA					
NUMBER	MINIMUM SLOPE	MAXIMUM SLOPE	COLOR	TOTAL AREA (ACRES)	DISTURBED AREA (ACRES)
1	0%	20%	Red	11.26	1.17 (10.39%)
2	20%	30%	Green	5.23	0.39 (7.46%)
3	30%	40%	Blue	1.46	0.06 (4.11%)
4	40%	99999900%	Orange	0.51	0.02 (3.92%)
				TOTAL STUDY AREA = 18.46 Ac	
				TOTAL DISTURBED AREA = 1.64 Ac (8.88%)	

DISTURBED AREA SLOPE DATA					
NUMBER	MINIMUM SLOPE	MAXIMUM SLOPE	COLOR	TOTAL AREA (ACRES)	DISTURBED AREA (%)
1	0%	20%	Red	1.17	71.34%
2	20%	30%	Green	0.39	23.78%
3	30%	40%	Blue	0.06	3.66%
4	40%	99999900%	Orange	0.02	1.22%
				TOTAL STUDY AREA = 1.64 Ac	
				100%	

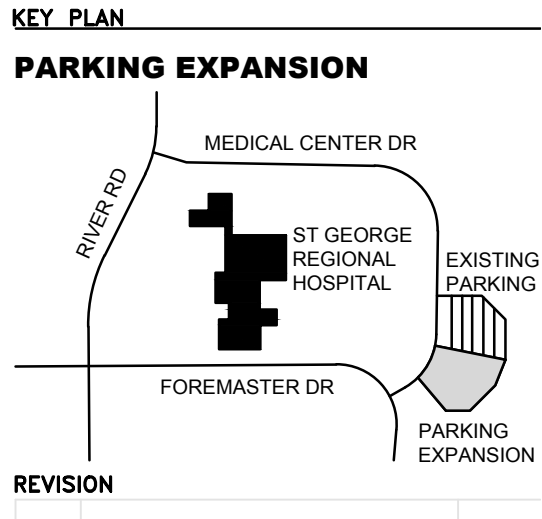
HKS

ARCHITECT
HKS, INC.
DENVER PLACE
999 18TH STREET, SUITE 225N
DENVER, CO 80202
CIVIL / LANDSCAPE
GREAT BASIN ENGINEERING, INC.
5746 S 1475 E
850TH OGDEN, UT 84403
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Intermountain Health

INTERMOUNTAIN HEALTH
ST. GEORGE
REGIONAL HOSPITAL
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26120
DATE
08/17/26
ISSUE
PR-014
SHEET TITLE
Slope Analysis Exhibit

SHEET NO.
EX-1

EXHIBIT F

2016 Geotechnical Engineering Report



January 8, 2016
Kleinfelder Project No: 20162945.001A

Intermountain Healthcare
36 South State Street, 23rd Floor
Salt Lake City, UT 84111-1486

ATTENTION: Mr. Steve Kelly
Facility Planning and Development

SUBJECT: GEOTECHNICAL ENGINEERING REPORT
DIXIE REGIONAL MEDICAL CENTER (DRMC) CONSOLIDATION PROJECT
1380 EAST MEDICAL CENTER DRIVE
ST. GEORGE, UTAH

Dear Mr. Kelly:

We are pleased to submit our geotechnical engineering report for the proposed Dixie Regional Medical Center (DRMC) located at 1380 East Medical Center Drive in St. George, Utah. This investigation was performed in accordance with our proposal to you dated September 30, 2015.

Based on our geotechnical investigation, we have provided geotechnical recommendations for the proposed development. Our report includes recommendations for earthwork, foundations, concrete-slabs-on-grade, drainage, and pavement.

We appreciate the opportunity to provide geotechnical services to you on this project. Please contact Mr. Trent Parkhill at 801.261.3336, if you have any questions regarding this report or if we can provide assistance with other aspects of the project.

Sincerely,

KLEINFELDER

Matthew Moriarty, EIT
Staff Geotechnical Engineer

Trent Parkhill, PE
Sr. Principal Geotechnical Engineer



**GEOTECHNICAL ENGINEERING REPORT
DIXIE REGIONAL MEDICAL CENTER
CONSOLIDATION PROJECT
1380 EAST MEDICAL CENTER DRIVE
ST. GEORGE, UTAH
KLEINFELDER PROJECT NO. 20162945.001A**

JANUARY 8, 2016

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ONLY THE CLIENT OR ITS DESIGNATED REPRESENTATIVES MAY USE THIS DOCUMENT AND ONLY FOR THE SPECIFIC PROJECT FOR WHICH THIS REPORT WAS PREPARED.

A Report prepared for:

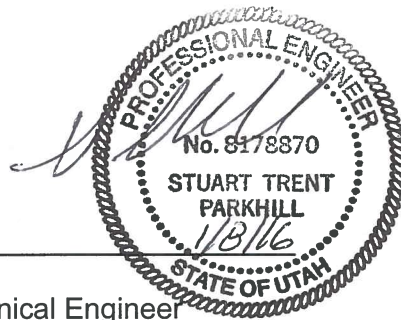
Intermountain Healthcare
36 South State Street, 23rd Floor
Salt Lake City, UT 84111-1486

**GEOTECHNICAL ENGINEERING REPORT
DIXIE REGIONAL MEDICAL CENTER CONSOLIDATION REPORT
1380 EAST MEDICAL CENTER DRIVE
ST. GEORGE, UTAH**

Prepared by:



Matthew Moriarty, EIT
Staff Geotechnical Engineer



Trent Parkhill, PE
Sr. Principal Geotechnical Engineer

KLEINFELDER
849 W. Levoy Drive, Suite 200
Salt Lake City, Utah 84123
Phone: 801.261.3336
Fax: 801.261.3306

January 8, 2016
Kleinfelder Project No. 20162945.001A

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- C Laboratory Test Results
- D Important Information about your Geotechnical Engineering Report

**GEOTECHNICAL ENGINEERING REPORT
DIXIE REGIONAL MEDICAL CENTER CONSOLIDATION PROJECT
1380 EAST MEDICAL CENTER DRIVE
ST. GEORGE, UTAH**

1 INTRODUCTION

1.1 GENERAL

This report presents the results of Kleinfelder's geotechnical investigation for the design and construction of Intermountain Health Care's proposed Dixie Regional Medical Center (DRMC) Consolidation Project located at 1380 East Medical Center Drive in St. George, Utah. The location of the project site is shown on the Site Vicinity Map (Figure A-1) in Appendix A. Our services for this study were performed in accordance with the scope of work outlined in our September 30, 2015 proposal. In addition to this geotechnical engineering report, a Phase 1 Environmental Site Assessment (ESA) is being prepared concurrently. The findings of the Phase 1 ESA will be presented in a separate report.

This report includes our recommendations relating to the geotechnical aspects of project design and construction. The conclusions and recommendations stated in this report are based on the subsurface conditions encountered in our exploratory borings at the time they were performed. They also are subject to the limitations and provisions stated in Section 6 of this report.

1.2 PROJECT DESCRIPTION

We understand that the project will include the construction of a 150,000 square foot (SF) 5-story hospital patient tower (Southeast Tower), a 160,000 SF 5-story hospital patient tower (North Tower), and a 65,000 SF D&T expansion. We understand that the new facilities are planned to achieve LEED Silver certification. We anticipate that the additions will be constructed at the following elevations:

- Southeast Tower – El 2638,
- North Tower – El 2654, except for the southeast corner and southern corridor, which are at El 2638,
- D&T expansion – Generally at El 2638

A final grading plan was not provided at the time of this investigation; however, we understand that general site grading will require retaining walls in some localized areas of the site. Also, at the time of this report no structural loads were provided. Kleinfelder should review the final grading plan and loading conditions once finalized to ensure that recommendations provided herein remain valid.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of our investigation was to explore and evaluate subsurface conditions at the proposed project site and develop geotechnical recommendations based on the conditions encountered at the site. The conclusions and recommendations presented in this report are based on our analyses of the data from our field exploration and laboratory testing programs.

Kleinfelder's scope of services included:

- Review selected published geologic maps and geotechnical data pertinent to the project site. Including previous geotechnical reports and explorations performed for previous site improvements.
- Advance 31 exploratory borings. Conduct 15 borings for proposed structures to a maximum depth of approximately 40.5 feet below ground surface (bgs). Conduct 5 borings for future structures to a maximum depth of approximately 45 feet bgs. Conduct 9 borings in the proposed parking areas to a maximum depth of approximately 14 feet bgs. Conduct 3 borings along the proposed retaining wall alignment to a maximum depth of approximately 14.5 feet bgs. Boring B-9 was eliminated from the original scope of work because it was located on a steep slope and if moved would rest very close to other proposed borings.

- Perform a percolation test
- Test selected samples obtained during the field exploration to evaluate relevant engineering properties of the soil.
- Preparation of this report, which includes a description of the proposed project and a description of the surface and subsurface site conditions found during our investigation, and summarizes our conclusions and recommendations for foundation design and related geotechnical issues.

2 FIELD EXPLORATION AND LABORATORY TESTING

2.1 FIELD EXPLORATION

Kleinfelder drilled 31 exploratory borings at the site between November 6 and 17, 2015. The exploratory borings were advanced using a truck-mounted and ATV-mounted drill rigs equipped with 9-inch outside diameter (O.D.) hollow-stem augers and air coring capabilities. Subsurface soil samples were obtained during exploration using a standard split-spoon sampler (2-inch O.D.) or a modified California sampler (2.5-inch O.D.) driven into the soil with blows from a 140-pound automatic hammer falling through a 30-inch drop. The raw blows required to drive the samplers into the soil are recorded on each of the boring logs. These blow counts are an indication of the relative density or consistency of the on-site soils. Subsurface rock samples were obtained during exploration by air coring.

Samples obtained during the field exploration were transported to our laboratory for further examination and testing. Samples will be retained for a period of 90 days from the date of this geotechnical report after which time samples will be discarded unless otherwise requested by the Intermountain Health Care.

Approximate boring locations are shown on the Exploration Location Map (Figure A-2). Appendix B includes graphical logs of the exploration borings and Appendix C includes laboratory test results. A key to the logs and a summary of the USCS (Unified Soil Classification System) soil descriptions are also contained in Appendix B. The lines defining boundaries between soil types on the logs are based upon Kleinfelder's field observations and are therefore approximate. Transition between soil types may be abrupt or may be gradual.

2.1.1 Percolation Test

At the time of the exploration program we had not received a location for any planned infiltration features. A percolation test was performed on site in accordance to Section 5 of the On-site Wastewater Systems Rule R317-4 at Boring P-3 as shown on Figure A-2. The final stabilized percolation rate of 2.5 minutes per inch was measured during this percolation test. Note that this

rate is for the surface soils at the location of the test. As the site contains soils and shallow rock that would be expected to have highly variable infiltration rates, if an infiltration feature is planned, the actual ability of the soil and rock to take on water should be confirmed for the planned site and conditions. Given the expansive nature of site soils, should the decision be made to infiltrate water on the site, this should be done as far as possible from structures and pavement.

2.2 LABORATORY TESTING

2.2.1 Geotechnical Laboratory Testing

Geotechnical laboratory tests were performed on selected soil and rock samples to estimate their relative engineering properties. Testing for the following properties was performed in general accordance with recognized standards:

- Moisture Content (20 tests);
- Minus 200 Wash (20 tests);
- Atterberg Limits (17 tests);
- Swell/Collapse Test (15 test);
- Unconfined Compression Test (4 tests);
- Standard Proctor (1 test); and
- California Bearing Ratio (1 test).

Results of the geotechnical laboratory tests are included in Appendix C of this report. Selected geotechnical test results are also shown on the boring logs contained in Appendix B. The Standard Proctor test performed on near surface silty sand soils resulted in a maximum dry density of 122.0 pcf with an optimum moisture content of 11.5%. The result of the California Bearing Ratio (CBR) test performed on the near surface soils at the site was a CBR of 8%; however previous studies (AGEC, 2001) indicate a CBR of as low as 6%.

2.2.2 Analytical Laboratory Testing

Analytical laboratory testing was not within the scope of work for this phase of the site development. However; testing performed by AGEC (April 2009) indicates that on-site soils contain water soluble sulfate concentrations ranging from 445 to 9,225 ppm.

3 SITE CONDITIONS

3.1 SURFACE

The project site is located in St. George, Utah at 1380 East Medical Center Drive. The site is bounded on the north and east by Medical Center Drive and on the south by 700 South. It is bounded on the west by River Road. At the time of our investigation, the site consisted of existing structures and parking areas associated with the DRMC.

3.2 GEOLOGIC SETTING

The site is located in the eastern portion of St. George, Utah. St. George is located in the southwestern part of the Colorado Plateau in the St. George Basin physiographic area. The St. George basin acts as a transition zone between the Colorado Plateau and the Basin and Range province located to the north and west. The near surface sediments are mapped in the USGS Washington County 7.5' Quadrangle map (Hayden and Willis, 2011). The majority of the site is mapped as mixed alluvial and eolian deposits (Qaeo) and mixed alluvial and colluvial deposits (Qac). The mixed alluvial and eolian deposits consist of clay to sand sized sediment with extensive eolian sands and the mixed alluvial and colluvial deposits consist of clay to boulder sized sediments. Areas of near surface rock are mapped near the existing wash that runs south across the site. These areas are mapped as the Moenave Formation, Whitmore Point Member, and Petrified Forest Member. These units primarily consist of interbedded shale, mudstone, claystone, and siltstone with thin bedded sandstone, siltstone and limestone. The Petrified Forest Member is known to be expansive and cause problems for roadways and foundations. Near surface sediments encountered in our explorations were generally consistent with the mapped geologic units.

3.3 GEOLOGIC HAZARDS

3.3.1 Seismicity and Faulting

The proposed project site is located within the Intermountain Seismic Belt, a seismically active region that extends from Arizona to Montana (Smith and Arabasz, 1991). Hayden and Willis (2011) have mapped the St. George Fault as running through proposed parking areas in the southwest corner of the site. Active faults in the region are potential sources for seismic loading hazards at the site. A fault is considered to be active if displacement has occurred within the past 10,000 years.

A Probabilistic Seismic Hazard Analysis (PSHA) has been performed for the site. The findings of the PSHA will be issued in a separate report. The seismic design parameters presented here should be used as reference only and will be superseded by the results of the PSHA. Based on our soils investigation and subsequent analysis, the subsurface soils at the site correspond with a Site Class C. The design spectral response acceleration parameters, assuming a Site Class C, are $S_{DS} = 0.407g$ and $S_{D1} = 0.171g$ for short period and 1-second period, respectively. The intermediate values from IBC used to obtain the design parameters are contained below in Tables 1 and 2:

TABLE 1
DESIGN ACCELERATION FOR SHORT PERIODS

S_S	S_{MS}	S_{DS}
0.510	0.610	0.407

S_S = The mapped spectral accelerations for short periods (U.S. Geological Survey Seismic Design Maps, 2008)

S_{MS} = The maximum considered earthquake spectral response accelerations for short periods

S_{DS} = 5 percent damped design spectral response acceleration at short periods

TABLE 2
DESIGN ACCELERATION FOR 1-SEC PERIOD

S_1	S_{M1}	S_{D1}
0.156	0.257	0.171

S_1 = The mapped spectral accelerations for 1-second period (U.S. Geological Survey Seismic Design Maps, 2008)

S_{M1} = The maximum considered earthquake spectral response accelerations for 1 second period

S_{D1} = 5 percent damped design spectral response acceleration at 1 second period

3.3.2 Liquefaction and Lateral Spreading

Liquefaction is a phenomenon whereby loose, saturated, 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. Horizontally continuous liquefied layers may also have a potential to spread laterally where sufficient slope or free-face conditions exist. 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 information gathered during our subsurface investigation and subsequent analysis along with liquefaction hazard mapping for the St. George area (Lund et al., 2008a) the liquefaction hazard at the site is considered to be low.

3.3.3 Swell and Collapse

On-site soils and rock are mapped as having a moderate to high potential for swell (Lund et al., 2008b). On-site soils are also mapped as having a moderate potential for wetting induced collapse (Lund et al., 2008c). The mapped hazards for swell and collapse are consistent with laboratory testing performed during this and previous site investigations (AGEC, 2001 and AGEC, 2009) which found that the swell potential of the on-site rock and soil varies from 0 to 4 percent and the potential for collapse of the on-site soils varies from 0 to 1.6 percent. Testing performed for this study found swell up to 1.2% and collapse of 0.2 to 1.6%. Swell or collapse of

foundation materials can be harmful to structure performance and should be mitigated prior to construction. Recommendations for preventing damage to the proposed structures due to swell or collapse of foundation materials are given in Section 4.

3.4 GROUNDWATER

Groundwater was observed in borings B-7, B-14, B-15, and F-2 at depths ranging from 20 to 36 feet bgs during drilling. Previous investigations have encountered groundwater as shallow as 13 feet bgs (AGEC, 2001). In both instances, groundwater was encountered in the on-site rock in isolated areas of the site. Groundwater levels are generally dependent on seasonal precipitation, irrigation practices, and land use and runoff conditions. As such, it is possible that the observed water level may fluctuate during dryer and wetter seasons of the year. A detailed study of site hydrogeologic conditions was beyond the scope of work of this investigation; as a result, we are unable to characterize potential groundwater fluctuations at the site.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 GENERAL CONCLUSIONS

Based on the results of our field and laboratory investigations, it is our opinion that the site is suitable for the construction of the proposed structures and parking areas provided that the recommendations contained in this report are followed with particular attention given to the expansive soil and rock issues. These opinions, conclusions, and recommendations are based on our field exploration, engineering analysis, the properties of the materials encountered in our borings, the results of the laboratory testing program, and our understanding of the proposed development of the site.

4.2 EARTHWORK

4.2.1 General Site Preparation and Grading

Prior to commencing site-grading operations, the planned building and pavement areas, including driveways and sidewalk areas, should be stripped of all pavement, vegetation, topsoil, undocumented fill, and debris. The required stripping depth will vary across the site depending on the amount of vegetation, topsoil, and debris present.

A final grading plan was not provided at the time of this investigation; however, we understand that general site grading will require retaining walls in some localized areas of the site. Kleinfelder should review the final grading plan upon completion to ensure that recommendations provided herein remain valid.

In much of the site, silty soils with low to moderate plasticity were encountered at the ground surface or below the pavement section during our investigation. These soils are susceptible to softening when exposed to water, and are expected to be difficult to work with during the wetter times of the year, and when exposed to construction traffic. These soils would likely become very unstable when encountered near the groundwater table. Given the depth of groundwater

encountered, it is likely that unstable soils would only be encountered in excavations in soil greater than 15 feet below the existing ground surface.

4.2.2 Wet Weather Construction

If exposed to excess moisture and repeated construction traffic, areas where native silty soils still exist at the surface will likely become unstable, especially during wetter weather. Unstable, disturbed soils must be overexcavated to a stable depth and replaced with structural fill. The use of track-mounted equipment with low ground pressure tracks and/or the use of dump and spread techniques to place material should be considered during wet weather. If stable construction conditions cannot be accomplished using these techniques, construction of granular construction access roads in these areas should be considered to allow for equipment mobility during construction.

4.2.3 Temporary Excavation Stability

Stability of construction excavations is the contractor's responsibility. If stability of an excavation becomes questionable, the excavation should be evaluated promptly by Kleinfelder. The soils classification and strength properties presented in this report may be used for the planning of excavations and trench slopes in accordance with OSHA requirements or for the design of excavation slopes, shoring and/or the use of trench boxes. Construction personnel should be aware that soil conditions may change rapidly if soil moisture conditions change or if soils that have been disturbed by previous excavations are encountered. Measures should be taken to protect construction personnel from raveling of trench sidewalls. If sloughing or free water is encountered, it may be necessary to reduce trench slopes beyond OSHA requirements or provide shoring. If groundwater is encountered in excavations precautions should be taken to mitigate buoyancy of tanks or utilities placed in the excavations. All excavations should comply with current OSHA safety requirements. Backfill of excavations should be structural fill in compliance with section 4.2.5. If conditions other than those encountered in the geotechnical explorations are encountered, excavation slopes should immediately be re-evaluated.

Where utility trenches and other excavations that extend beneath the water table the water may disturb the excavation bottom. The bottom of these excavations may be protected by dewatering the excavation, overexcavating the bottom of the trench a minimum of 10 inches and

then lining the bottom of the trench with a Mirafi 500X woven geosynthetic filter fabric or equivalent. A minimum of 10 inches of 6 inch minus crushed rock should then be placed on the fabric in the trench bottom and then wrapped on top with the excess fabric. Pipe bedding material may then be placed on top of the geosynthetic wrapped crushed rock.

4.2.4 Excavatability

We anticipate that excavation of the native on-site soil and weathered rock can be performed using conventional earth-moving equipment; however, it is anticipated that excavations will extend into slightly weathered to competent rock where excavation will likely become more difficult. Excavation in slightly weathered to competent bedrock will likely require the use of heavy duty excavation equipment capable of ripping and hydraulic breaking. The contractor should satisfy himself as to the difficulty involved and the type of equipment needed.

4.2.5 Structural Fill and Compaction

Structural fill placed within the proposed construction should be comprised of imported material that meets the specifications outlined in Table 3, untreated base course (UTBC) meeting the requirements outlined in Table 4, or native soil meeting the requirements in Table 5.

TABLE 3
CRITERIA FOR IMPORTED STRUCTURAL FILL

Gradation Requirements	
Standard Sieve Size	Percent Passing
4 inch	100
¾ inch	100-70
No. 40	10-60
No. 200	0-15
Plasticity Requirements of Fines (Atterberg Limits)	
Plasticity Index	6 or less

*Fill with more than 15 percent fines may be acceptable as approved by Kleinfelder

TABLE 4
CRITERIA FOR UNTREATED BASE COURSE

Gradation Requirements	
Standard Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90-100
¾ inch	70-85
½ inch	65-80
3/8 inch	55-75
No. 4	40-65
No. 16	25-40
No. 200	7-11
Plasticity Requirements of Fines (Atterberg Limits)	
Plasticity Index	6 or less

TABLE 5
CRITERIA ON-SITE STRUCTURAL FILL

Gradation Requirements	
Standard Sieve Size	Percent Passing
No. 200	0-75
Plasticity Requirements of Fines (Atterberg Limits)	
Liquid Limit	20 or less

As an alternate, UTBC meeting the UDOT specification is acceptable if the earthwork contractor provides a job mix target gradation for the imported UTBC. The job mix gradation may deviate from the job mix target gradation as allowed by the UDOT specification. The job mix gradation may not exceed the minimum percent passing outlined in the Job Mix Gradation Target Band outlined in the UDOT specification. Untreated base course material should be comprised of Untreated Base Course Aggregate Class "C" per Section 02721 of the Utah Department of Transportation Standard Specifications for Untreated Base Course.

Imported fill materials should be approved by the testing agency prior to importing. Also, prior to placing structural fill, the excavation should be observed by the testing agency to note that unsuitable material has been removed and the exposed soil is in a firm and unyielding condition.

Structural fill should be placed in maximum 8-inch-thick loose lifts and compacted to at least 95 percent of the maximum dry density as determined by ASTM-D1557 (Modified Proctor). Imported structural fill should moisture condition the soils to be within 2 percent of the optimum water content at the time of compaction. Native soils being used as structural fill should be moisture conditioned to 1 to 3 percent wet of optimum at the time of compaction. All utility trenches should be backfilled with structural fill.

Note that if the on-site fine-grained soils are used for structural fill, achieving acceptable compaction will be significantly more difficult than for the soils described in Table 3 and 4.

4.3 FOUNDATIONS

To mitigate the adverse effects of swelling and collapsible material found on-site, we recommend that the proposed structures be supported on drilled shafts founded in the rock. Basement slabs should be structural slabs supported entirely by the drilled shafts leaving a minimum gap of 1 foot between the bottom of the slab and the soil. We understand that the current plan is to provide large crawl spaces, on the order of seven feet, below structural slabs.

Subject to the conditions listed below, drilled shafts should be designed to achieve capacity through skin friction and end bearing resistance in the rock layers. We recommend a unit skin friction of 3 ksf for portions of the drilled shafts founded in the rock. We recommend that an end bearing capacity of 60 ksf for drilled shafts bearing at least 15 feet into rock. Skin friction should also be neglected within one shaft diameter of the bottom shaft, or bottom 5 feet whichever is greater. The upper 15 feet of soil should also be neglected in determining skin friction capacity. An appropriate factor of safety or resistance factor should be applied to the calculated ultimate drilled shaft capacities.

Lateral design parameters for use in lateral load analysis of drilled pier foundations using LPILE software (by Ensoft, Inc., Version 2012) are provided in Table 6 based on the conditions encountered on the site. Lateral resistance should be ignored in the upper 5 feet.

Table 6
LPILE Geotechnical Parameters

Depth (feet)	Soil Type	Unit Weight γ' (pcf)	Undrained Cohesion c (psf)	Uniaxial Compressive Strength (psi)	RQD	Soil Modulus Parameter ϵ_{50}	Initial Modulus (psi)	Strain Factor K_{RM}
Varies by Location	Stiff Clay w/o Free Water (Reese)*	115	1800	-	-	0.007	-	-
Varies by Location	Weak Rock (Reese)	150	-	2000	50	-	100,000	0.0005

* While there are also silt to sandy silt soils in the upper portions of some areas, this material model is considered appropriate for modeling their reactions.

Additional considerations for drilled pier foundations include:

- Skin friction should be ignored in soils in the upper 15 feet of drilled pier length.
- Skin friction should also be neglected within one shaft diameter of the bottom, or the bottom 5 feet whichever is greater.
- Lateral resistance should be ignored in the upper 5 feet of drilled pier length.
- Drilled shafts should be designed by a qualified structural engineer.
- Drilled shafts should be embedded a minimum of 15 feet into the on-site rock and should support a minimum pressure of 10 ksf to mitigate potential for swelling rock.
- No reduction of axial capacity need be considered for group effects provided that drilled piers are a minimum of 3 diameters apart.

- Shallow sand is present in some areas of the site, which will likely result in caving conditions in drilled pier excavations. Temporary casing and/or drilling with a water head or drilling fluids should be anticipated for all pier holes.
- We recommend concrete pier holes be designed and placed at a slump between 5 and 7 inches.
- Concrete placement should occur immediately after pier hole drilling, cleaning, installation of reinforcement, and observation. Tremie placement of concrete to displace water and any drilling fluids would be required in any excavations below the water table or where drilling fluids are used. Concrete should be placed in one continuous placement without any cold joints. Sufficient concrete head must be maintained to prevent groundwater or soil intrusion into the pier.
- A minimum pier diameter of 24 inches is recommended to allow for pier cleaning, dewatering, and observation.
- The installation of the drilled piers should be observed by a Kleinfelder representative to observe the construction techniques and confirm the subsurface conditions are as anticipated from our exploratory borings.

For foundations constructed in accordance to the recommendations presented herein, total foundation settlement should be less than 1 inch.

4.4 RETAINING WALLS

It is our understanding that retaining walls with varying heights are planned as part of the site development. Retaining walls should be designed and constructed using the following recommendations:

- Soil behind the walls should be replaced with imported structural fill or on-site soils (only when they meet the requirements specified in Section 4.2, and Table 3) to a distance equal to the height of the walls.
- A minimum of 1 foot of free-draining material should be placed immediately behind the wall along its entire height and length.

- Soil below the walls should be over-excavated to a depth of 3 feet below the bottom of the wall, moisture conditioned to 1 to 3 percent wet of the optimum water content, replaced in maximum 8-inch thick loose lifts, and recompact to a minimum of 95 percent of the maximum dry density as determined by the Modified Proctor. For walls shorter than 4 feet an over-excavation depth of 2 feet may be considered provided the Owner understands that these walls may experience additional movement and may require additional maintenance.
- Sufficient drainage features and sloping should be provided to prevent soils from re-wetting after each rain (e.g. the ground surface at toe of the wall should slope away from the wall.)
- We assume that carefully monitored drip irrigation systems may be installed near the walls. Irrigation for landscaping near the walls should be limited, and any leaks should be quickly repaired.
- The wall toes should be backfilled with min. 2 ft. of on-site, low permeability soils, moisture conditioned to 1 to 3 percent wet of the optimum water content and compacted to 95 percent of the maximum dry density as determined by the modified proctor.
- All wall manufacture's recommendations should be followed.
- These walls assume level backfill and no hydrostatic pressures.

It is our understanding that the wall Cast in Place (CIP) walls are planned for the site; however, wall types may change at some point in the future. Although the recommendations given above are intended to mitigate the effects of swelling soils, some differential movement may still occur. Rigid walls such as CIP walls are typically more prone to noticeable damage such as tilting and cracking under these types of conditions. Movement of flexible walls, such as Mechanically Stabilized Earth (MSE) walls, is generally exhibited in a more subtle manner. If CIP walls are to be used, we recommend that joints be placed at regular intervals to reduce the potential for cracking.

The lateral soil loads acting on the wall varies by wall and soil type. Lateral loads are provided as equivalent fluid weights in Table 7 for the combination of walls and soils that may be used during site development. Care should be taken not to over-compact the backfill since this could

cause excessive lateral pressure on the walls and subsequent cracking especially if future wetting adds soil expansion loads to these higher lateral pressures.

Table 7
LPILE Geotechnical Parameters

Wall Type	Retained Soil	Static Lateral Load (pcf)	Increase in Lateral Load Due to Seismic Loading (pcf)
Rigid (CIP)	Imported Structural Fill	52	10
	On-Site Structural Fill	55	10
Flexible (MSE)	Imported Structural Fill	33	10
	On-Site Structural Fill	35	10

An ultimate lateral passive earth pressure may be computed using an equivalent fluid weight of 400 pcf. To obtain the recommended earth pressures, it is important that any backfill placed around the walls and footings is placed and compacted properly. Therefore, we recommend that the geotechnical engineer or his representative be present during any footing or wall backfill placement. An appropriate factor of safety should be applied to the earth pressure values given above.

It should be noted that the above lateral earth pressures assume drained conditions behind the walls and a horizontal backfill surface. If actual retaining wall design deviates from these assumptions or the recommendations given above, we should be contacted to provide revised earth pressure design values based upon the design retaining wall configurations and backfill conditions.

The footings for the proposed retaining walls may be proportioned using a bearing capacity of 2,250 psf.

4.5 CONCRETE SLABS

Direct support for the concrete floor slabs associated with the proposed structures should be provided by the drilled shaft foundations. A minimum void of 1 foot should exist between the bottom of the structural slab and the soil. Care should be taken to ensure that concrete is not

allowed to fill the void forms or boxes if used, making sure that there is no contact between the soil and structural slab.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking, or curling in the slabs. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute Manual (ACI, 2011).

4.6 PAVEMENT DESIGN AND CONSTRUCTION

We assume that the site parking and drive areas may be comprised of both AC pavement and PCC pavement. No traffic estimates were provided for this phase of site improvements; however, we understand that previous pavement design used 1,000 passenger cars, 10 panel trucks, 10 buses, and 10 ambulances per day for light duty areas and 10 panel trucks, 10 3-axle semis and 10 5-axle semis per day for heavy duty areas (AGEC, 2001). Recommendations for pavement sections are based on these previously used traffic data.

4.6.1 AC Pavement Design

The following pavement design information is based on existing pavement sections and information obtained during our field investigation. Kleinfelder's design was performed in accordance with the Asphalt Institute (Manual Series No. 1) and was based on a laboratory CBR value, the design traffic number, and a design life of 20 years. Table 8 presents existing pavement thickness and Kleinfelder's recommend AC pavement structural section. Existing pavement sections appear to have performed adequately; however, we have proposed an alternative for the light duty pavement section which may decrease project cost.

TABLE 8
EXISTING AND RECOMMENDED AC PAVEMENT SECTIONS

Material	Heavy Duty Pavement		Light Duty Pavement	
	Existing Pavement Thickness (in)*	Recommended Pavement Thickness (in)	Existing Pavement Thickness (in)	Recommended Pavement Thickness (in)
Asphalt	3	3	2.5	3
Untreated Base Course	NA	8	NA	6

NA = Not available.

* Existing pavement thicknesses were observed at the test borings.

AC pavement materials quality and construction requirements should conform to the Utah Department of Transportation Specifications for Hot Mix Asphalt, Section 02741.

4.6.2 PCC Pavement Design

Using the same methodology to design the AC pavement and based on the same traffic loads, we recommend that PCC pavement should be a minimum of 5 inches thick. PCC pavement in heavy duty areas should be underlain by at least 4 inches of untreated base course. PCC pavement materials quality and construction requirements should conform to the Utah Department of Transportation Specifications for Portland Cement Concrete Pavement.

4.6.3 Paving Courses

Asphaltic concrete paving course or overlay must be at a minimum 1.5 inches in depth. Prime coats are not desired and tack coats are to be called out for vertical surfaces or when base and top coats are not installed consecutively.

4.6.4 CBR values

Based on laboratory CBR tests on the soil for native subgrade, a CBR value of 6% was used for design assuming a properly prepared subgrade (see Section 4.2.1).

4.6.5 Pavement Subgrade Preparation

It is our understanding that the original pavements sections were placed directly on the native soils. Based on observations made during our field investigations it appears that the pavement sections have performed relatively well in this condition. However, pavement sections placed directly on the native soils pose an increased risk of pavement damage due to differential movement of swelling soils which may lead to a decreased pavement life.

GBE is showing 12" of structural fill

The potential for differential movement may be further reduced by over excavating soils supporting paved areas to a depth of 3 feet, moisture conditioning the excavated material to 1 to 3 percent wet of optimum moisture content, and replacing the soil in 8-inch thick loose lifts compacted to a minimum of 95% of the maximum dry density as determined by the Modified Proctor.

If the owner can verify that the original pavement was placed directly on native soils, feels that the paved sections have performed adequately and accepts the increase risk of differential movement and decreased pavement life, new pavement sections (AC and PCC) may be placed on native material. Prior to placing pavement sections, exposed soils should be either proofrolled with a fully loaded tandem-axle dump truck, or fully loaded water truck, and observed by the testing agency, or hand probed at regular, frequent intervals by the testing agency to identify soft or unstable areas. Soft soils encountered during proofrolling or probing should be overexcavated and replaced. Overexcavation depth should extend to competent soil as assessed by the testing agencies on-site representative and should extend beyond the footing a distance equal to the depth of the excavation below planned subgrade elevation. Overexcavated areas should be backfilled with structural fill in accordance with Section 4.2.5. If stable construction conditions cannot be accomplished using these techniques, construction of granular construction access roads should be considered to allow for equipment mobility during construction. The final pavement subgrade should be graded to provide positive drainage and prevent ponding and/or moisture infiltration.

Once the subgrade has been proofrolled and approved, untreated base course may be placed. The untreated base course should be compacted to a minimum of 95 percent of the maximum dry density as determined in accordance with the Modified Proctor. Moisture content at the time of compaction should be within 2 percent of the optimum moisture content.

4.7 MOISTURE PROTECTION AND SURFACE DRAINAGE

Precautions should be taken during and after construction to eliminate, or at least reduce the potential for saturation of soils beneath foundations and pavements during and after construction. Over-wetting of the native soils prior to or during construction may result in softening and pumping, causing equipment mobility problems and difficulty in achieving compaction. Increased water content after construction may lead to retaining wall and pavement damage from differential movement in swelling soils. Positive drainage should be established away from the structure and pavements. Landscape watering adjacent to structures should be significantly reduced and preferably avoided. All utility trenches leading into the structure should be backfilled with compacted structural fill. Special care should be taken during installation of sub-floor sewer and water lines to reduce the possibility of future subsurface saturation.

Prior to placing pavements, slabs on grade and footings, the water content of the supporting soils should be measured. If the soils have dried below the placement moisture content requirements (1 to 3 % wet of optimum), the soils should be scarified, moisture conditioned and recompacted, such that the moisture content of the soils is within this range during pavement or foundation placement.

4.8 SOIL CORROSION AND REACTIVITY

No additional laboratory testing was completed during this phase of the investigation to provide data regarding corrosivity of onsite soils. Our scope of services does not include corrosion engineering and, therefore, a detailed analysis of the corrosion test results is not included in this report. A qualified corrosion engineer should be retained to review the test results and design protective systems that may be required. Kleinfelder may be able to provide those services.

Ferrous metal and concrete elements in contact with soil, whether part of a foundation or part of the supported structure, are subject to degradation due to corrosion or chemical attack. Therefore, buried ferrous metal and concrete elements should be designed to resist corrosion and degradation based on accepted practices.

The degradation of concrete or cement grout can be caused by chemical agents in the soil or groundwater that react with concrete to either dissolve the cement paste or precipitate larger compounds within the concrete, causing cracking and flaking. The concentration of water-soluble sulfates in the soils is a good indicator of the potential for chemical attack of concrete or cement grout. The American Concrete Institute (ACI) in their publication *Guide to Durable Concrete* (ACI 201.2R-08) provides guidelines for this assessment.

While laboratory testing for corrosion or reactivity was not part of the scope of this project, testing performed by AGECEC (April 2009) indicates that on-site soils contain water soluble sulfate concentrations ranging from 445 to 9,225 ppm. The results of sulfate test indicate that the potential for deterioration of concrete is moderate and that a Type II cement should be used.

5 LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than three years from the date of the report.

The work performed was based on project information provided by Client. Any changes in the project information listed herein that will have an impact on recommendations in this report must be approved by Kleinfelder's engineer.

The scope of services was limited at each site. It should be recognized that definition and evaluation of subsurface conditions are difficult. Judgments leading to conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. The client and key members of the design team should discuss the issues covered in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk and expectations for future performance and maintenance.

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. If soil, rock or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that Kleinfelder is notified immediately so that we may reevaluate the recommendations of this report. If the scope of the proposed construction, including the estimated building loads, and the design depths or locations of the foundations, changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions of this report are modified or approved in writing, by Kleinfelder.

As the geotechnical engineering firm that performed the geotechnical evaluation for this project, we recommend that Kleinfelder be retained to verify the design assumptions and confirm the recommendations of this report are properly incorporated in the design of this project, and properly implemented during construction. This may avoid misinterpretation of the information by other parties and will allow us to review and modify our recommendations if variations in subsurface conditions are encountered. It is our recommendation Kleinfelder be retained to provide the following continuing services for the project:

- Review the project plans and specifications, including any revisions or modifications;
- Observe and evaluate the site earthwork operations to confirm subgrade soils are suitable for construction of foundations, slabs-on-grade, pavements and placement of engineered fill;
- Confirm engineered fill for the structure and other improvements is placed and compacted per the project specifications; and
- Observe foundation bearing soils to confirm conditions are as anticipated.

If a third party is retained to provide the above activities, they are responsible to notify Kleinfelder of any changed site conditions that affect the recommendations presented herein. Kleinfelder must also be retained to perform a supplemental evaluation and to issue a revision to our original report. If notification is not provided, the testing company will assume responsibility associated with the changed site conditions.

Kleinfelder cannot be responsible for interpretation by others of this report or the conditions encountered in the field.

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's geotechnical engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during earthwork and foundation construction. Furthermore, the contractor should be prepared to handle contamination conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers.

This service includes providing information obtained through laboratory testing regarding corrosivity of on-site soils. Kleinfelder does not practice corrosion engineering and, therefore, detailed analysis of corrosion test results is not included. We recommend a qualified corrosion engineer be retained to review the test results and design protective systems that may be required.

This service includes information obtained through laboratory testing regarding nutrients of onsite soils. Kleinfelder does not practice landscape architecture and, therefore, detailed analysis of soil nutrient test results is not included in this report. We recommend a qualified landscape architect be retained to review the test results.

6 REFERENCES

American Concrete Institute (ACI), ACI Manual of Concrete Practice, 2011.

Applied Geotechnical Engineering Consultants (2001). Geotechnical Investigation Proposed Intermountain Health Care Regional Hospital

Applied Geotechnical Engineering Consultants (2009). Hillside Review Geologic Hazard Assessment and Preliminary Geotechnical Investigation

Asphalt Institute, Asphalt Pavements for Highways & Streets, Manual Series No. 1 (MS-1), Lexington, Kentucky, 2008.

Hayden, J.M. and Willis, G.C. (2011). Geologic Map the St. George 7.5' Quadrangle, Washington County, Utah

Hunt, C.B. (1967). Physiography of the United States: San Francisco, W.H. Freeman, 480 p.

Hinckley, D.W. (2010). Liquefaction-Induced Ground Displacement Mapping for the Salt Lake Valley.

International Code Council, International Building Code (IBC), 2012.

Lund, W.R., Knudsen, T.R., Vice, G.S., and Shaw, L.M. (2008a). Liquefaction-Hazard Map for the St. George-Hurricane Metropolitan Area

Lund, W.R., Knudsen, T.R., Vice, G.S., and Shaw, L.M. (2008b). Expansive-Soil-and Rock-Susceptibility Map for the St. George-Hurricane Metropolitan Area

Lund, W.R., Knudsen, T.R., Vice, G.S., and Shaw, L.M. (2008c). Collapsible-Soil-Susceptibility Map for the St. George-Hurricane Metropolitan Area

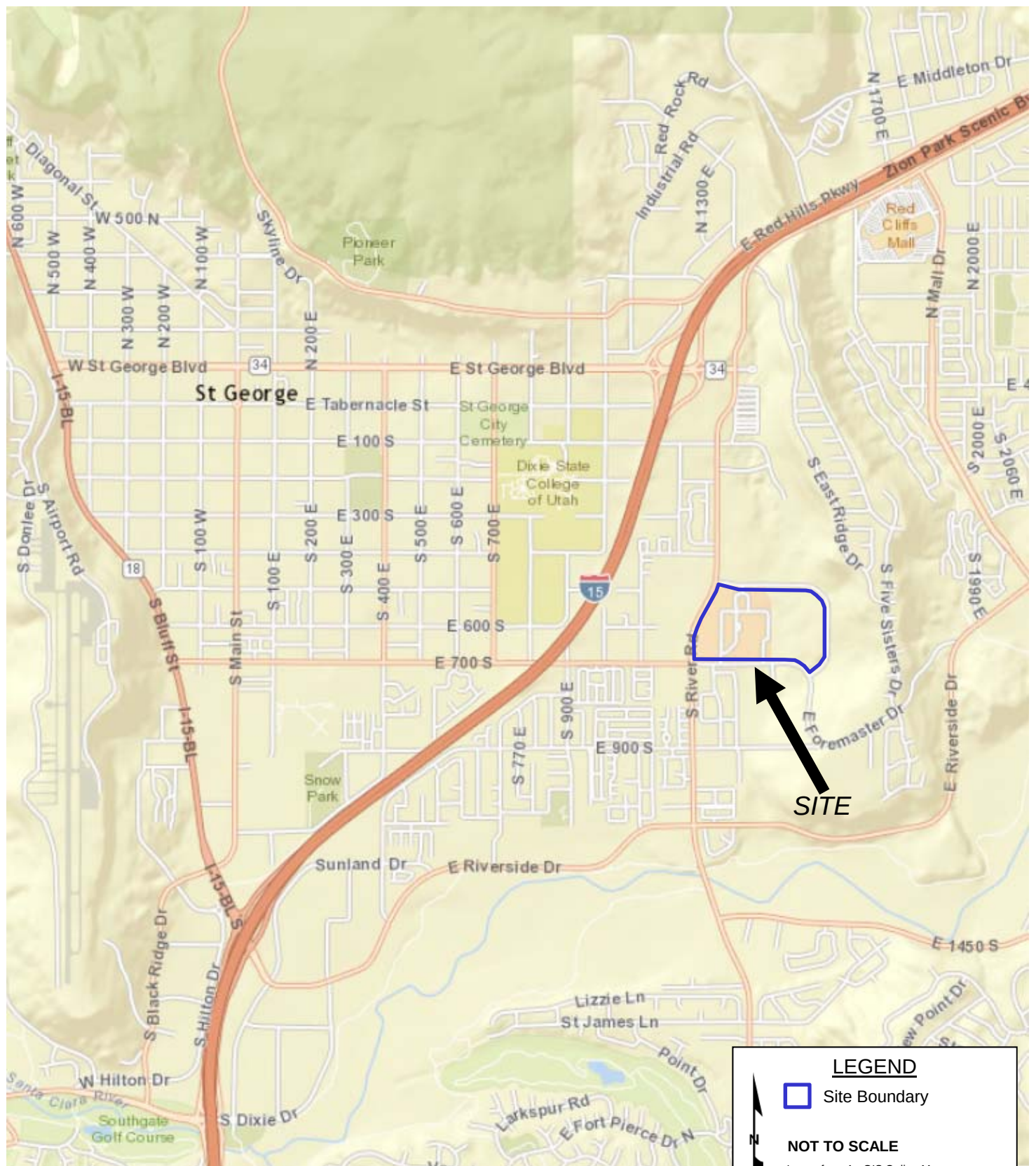
Petersen, M.D., A.D. Frankel, S.C. Harmsen, C.S. Mueller, K.M. Haller, R.L. Wheeler, R.L. Wesson, Y. Zeng, O.S. Boyd, D.M. Perkins, N. Luco, E.H. Field, C.J. Wills, & K.S. Rukstales (2008), "Documentation for the 2008 Update of the United States National Seismic Hazard Maps," U.S. Geological Survey Open-File Report 2008-1128, 61 p.

Smith, R. B., and Arabasz, W. J. (1991). Seismicity of the Intermountain Seismic Belt, in Slemmons, D. B., Engdahl, E. R., Zoback, M. D., and Blackwell, D. D., editors, Neotectonics of North America, Geological Society of America, Decade Map Volume 1, p. 185-228.

Utah Department of Transportation (UDOT), (2010). Geotechnical Manual of Instruction.

APPENDIX A

Figures



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LEGEND

 Site Boundary

NOT TO SCALE

Image from ArcGIS Online Maps

Locations are Approximate



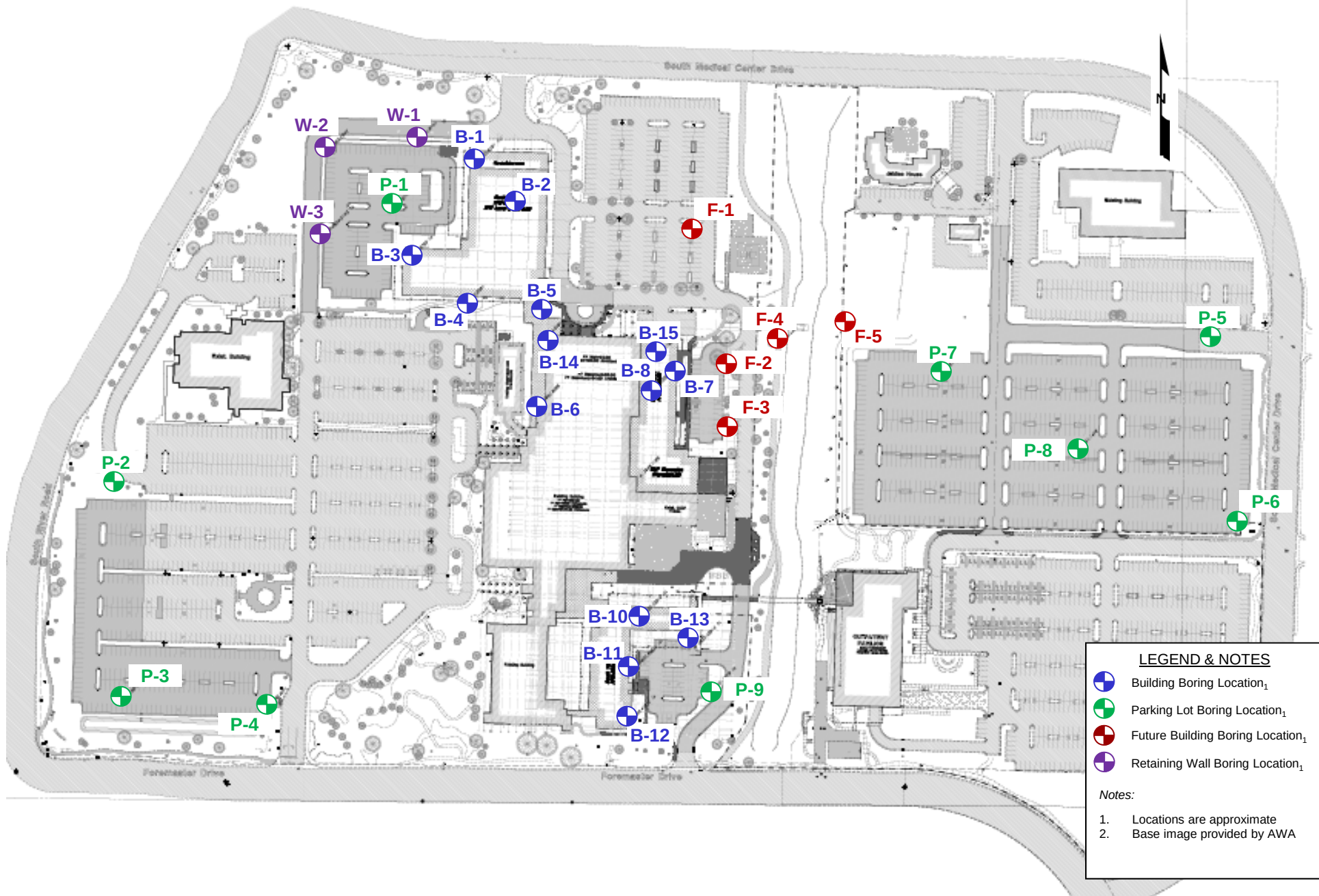
PROJECT NO.	20162945
DRAWN	12/23/2015
DRAWN BY:	M. Moriarty
CHECKED BY:	T. Parkhill
FILE:	

SITE VICINITY MAP

Dixie Regional Medical Center
Consolidation Project
1380 East Medical Center Drive
St. George, UT

FIGURE

A-1



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PROJECT NO.	20162945
DRAWN	12/28/2015
DRAWN BY:	M. Moriarty
CHECKED BY:	T. Parkhill
FILE:	

EXPLORATION LOCATION MAP
Dixie Regional Medical Center 1380 East Medical Center Drive St. George, UT

FIGURE
A-2

APPENDIX B

Logs of Exploratory Borings

SAMPLE/SAMPLER TYPE GRAPHICS

	BULK SAMPLE
	CORE SAMPLER
	MODIFIED CALIFORNIA SAMPLER (2 or 2-1/2 in. (50.8 or 63.5 mm.) outer diameter)
	STANDARD PENETRATION SPLIT SPOON SAMPLER (2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)

ROCK LITHOLOGY GRAPHICS

	CLAYSTONE
	INTERBEDDED SHALE-CLAYSTONE
	INTERBEDDED SILTSTONE-CLAYSTONE
	INTERBEDDED SILTSTONE-SANDSTONE
	NO RECOVERY
	SANDSTONE
	SILTSTONE

GROUND WATER GRAPHICS

	WATER LEVEL (level where first observed)
	WATER LEVEL (level after exploration completion)
	WATER LEVEL (additional levels after exploration)
	OBSERVED SEEPAGE

NOTES

- The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.
- No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.
- Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.
- Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, ie., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.
- If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

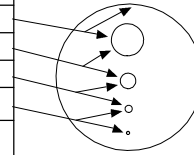
UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

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 GRAVEL WITH <5% FINES	Cu ≥4 and 1≤ Cc≤3		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			Cu <4 and/ or 1>Cc>3		GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH 5% TO 12% FINES	Cu ≥4 and 1≤ Cc≤3		GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
			Cu <4 and/ or 1>Cc>3		GP-GM	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
					GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		GRAVELS WITH > 12% FINES		GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES	
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES	
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤ Cc≤3		SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			Cu <6 and/ or 1>Cc>3		SP	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤ Cc≤3		SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
					SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
			Cu <6 and/ or 1>Cc>3		SP-SM	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
				SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES	
SANDS WITH > 12% FINES			SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES		
			SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES		
			SC-SM	CLAYEY SANDS, SAND-SILT-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 AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY	
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
				CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
		SILTS AND CLAYS (Liquid Limit greater than 50)		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY	
				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		

 KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20162945	GRAPHICS KEY Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	APPENDIX
	DRAWN BY: MAP CHECKED BY: MDM DATE: 1/6/2016 REVISED: -		B-1

GRAIN SIZE

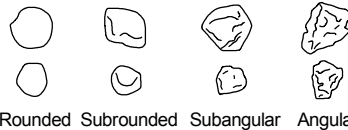
DESCRIPTION	SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders	>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles	3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse 3/4 - 3 in. (19 - 76.2 mm.)	3/4 - 3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine #4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse #10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium #40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine #200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines	Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller

**Munsell Color**

NAME	ABBR
Red	R
Yellow Red	YR
Yellow	Y
Green Yellow	GY
Green	G
Blue Green	BG
Blue	B
Purple Blue	PB
Purple	P
Red Purple	RP
Black	N

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

**Particles Present**

Amount	Percentage
trace	<5
few	5-10
little	15-25
some	30-45
and	50
mostly	50-100

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

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 is below water table

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N ₆₀ (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (q _u)(psf)	CRITERIA
Very Soft	< 1000	Thumb will penetrate soil more than 1 in. (25 mm.)
Soft	1000 - 2000	Thumb will penetrate soil about 1 in. (25 mm.)
Firm	2000 - 4000	Thumb will indent soil about 1/4-in. (6 mm.)
Hard	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail
Very Hard	> 8000	Thumbnail will not indent soil

NOTE: AFTER TERZAGHI AND PECK, 1948

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	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

	PROJECT NO.: 20162945	SOIL DESCRIPTION KEY	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-2
	DATE: 1/6/2016		
	REVISED: -		

INFILLING TYPE

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Iron Oxide	Fe	Talc	Ta
Manganese	Mn	Unknown	Uk

DENSITY/SPACING OF DISCONTINUITIES

DESCRIPTION	SPACING CRITERIA
Unfractured	> 6 ft. (> 1.83 meters)
Slightly Fractured	2 - 6 ft. (.061 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm.)
Highly Fractured	2 - 8 in. (50.80 - 203.30 mm.)
Intensely Fractured	< 2 in. (< 50.80 mm.)

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification

DEGREES OF WEATHERING

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical/mechanical alternation; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relict rock texture/structure; Generally molded and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS

GRADE		UCS (MPa)	FIELD TEST
R0	Extremely Weak	0.25 - 1.0	Indented by thumbnail
R1	Very Weak	1.0 - 5.0	Crumbles under firm blows of geological hammer, can be peeled by a pocket knife
R2	Weak	5.0 - 25	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer
R3	Medium Strong	25 - 50	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single firm blow of a geological hammer
R4	Strong	50 - 100	Specimen requires more than one blow of geological hammer to fracture it
R5	Very Strong	100 - 250	Specimen requires many blows of geological hammer to fracture it
R6	Extremely Strong	> 250	Specimen can only be chipped with a geological hammer

BEDDING CHARACTERISTICS

TERM	Thickness (in.)	Thickness (mm.)
Very Thick Bedded	> 36	> 915
Thick Bedded	12 - 36	305 - 915
Moderately Bedded	4 - 12	102 - 305
Thin Bedded	1 - 4	25 - 102
Very Thin Bedded	0.4 - 1	10 - 25
Laminated	0.1 - 0.4	2.5 - 10
Thinly Laminated	< 0.1	< 2.5

Bedding Planes Planes dividing the individual layers, beds, or stratigraphy of rocks.

Joint Fracture in rock, generally more or less vertical or traverse to bedding.

Seam Applies to bedding plane with unspecified degree of weather.

APERTURE

DESCRIPTION	CRITERIA [in.(mm.)]
Tight	< 0.04 (< 1)
Open	0.04 - 0.20 (1 - 5)
Wide	> 0.20 (> 5)

DISCONTINUITY TYPE

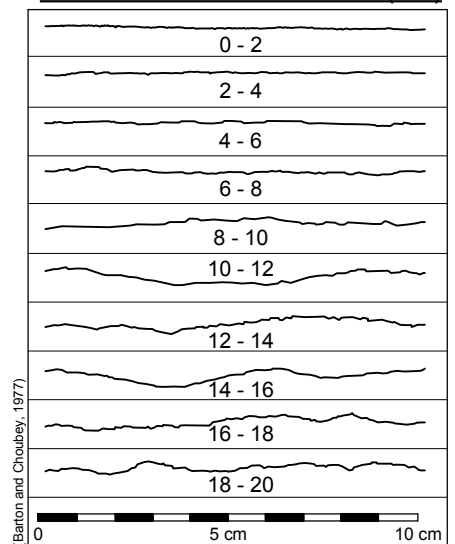
DESCRIPTION
Fault
Joint
Shear
Foliation
Vein
Bedding

INFILLING AMOUNT

DESCRIPTION
Surface Stain
Spotty
Partially Filled
Filled
None

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

JOINT ROUGHNESS COEFFICIENT (JRC)

RQD Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm. or more.



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

ROCK DESCRIPTION KEY

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX**B-3**

PLOTTED: 01/06/2016 09:53 AM BY: MMoriarty

Date Begin - End: 11/09/2015	Drilling Company: AGECE	BORING LOG B-1
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Coring	
Weather: Clear, 50° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS								
			Approximate Ground Surface Elevation (ft.): 2,662.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks		
															Lithologic Description	
			ASPHALT: 2"-3" thick													
2660			Sandy SILT (ML): red to reddish brown, moist, stiff to very stiff													
	5				BC=6 10 9 PP=3.0	18"										
2655																
	10		Lean CLAY with Sand (CL): medium plasticity, reddish brown, slightly moist to moist, very stiff to hard		BC=39 50/4" PP=4.5+ RQD=28	12"										
2650			CLAYSTONE/SHALE: reddish brown, slightly weathered, some gypsum and manganese oxide along fractures, some seams of SILTSTONE, moist, R2			40%		6.0	137.0			29	12	Swell = 0.43%		
	15				PP=4.5+ RQD=28	100%										
2645																
	20		CLAYEY SILTSTONE: reddish brown, slightly weathered, some gypsum along fractures, breaks along bedding, otherwise slightly fractured, becoming slightly coarser, R2 - friable from 20 to 23 feet		PP=4.5+ RQD=28	100%										
2640																
	25		CLAYSTONE/SHALE: reddish brown, slightly weathered, massive, slightly fractured, moist, harder - fractures along bedding below 25 feet, R3		PP=4.5+ RQD=20	80%										
2635																
	30				RQD=25	%										
2630			SILTY/SANDY CLAYSTONE/SHALE: reddish brown, slightly weathered, slightly fractured, R2-R3													

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 20162945	BORING LOG B-1	APPENDIX B-4
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	
	DATE: 1/6/2016		
	REVISED: -		
PAGE: 1 of 2			

GINT FILE: PROJECTWISE: 20162945, dixie Regional Medical Center.gpj
 GINT TEMPLATE: PROJECTWISE: KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 11/09/2015	Drilling Company: AGECE	BORING LOG B-1
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Coring	
Weather: Clear, 50° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,662.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
2625		The boring was terminated at approximately 35 ft. below ground surface. The boring was backfilled with auger cuttings on November 09, 2015. Rock was encountered at a depth of 10 ft. during this exploration. Coring started at a depth of 10 ft. GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.													
	40														
2620															
	45														
2615															
	50														
2610															
	55														
2605															
	60														
2600															
	65														
2595															

	PROJECT NO.: 20162945	BORING LOG B-1	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-5
	DATE: 1/6/2016		
	REVISED: -		PAGE: 2 of 2

PLOTTED: 01/06/2016 09:53 AM BY: MMoriarty

Date Begin - End: 11/09/2015	Drilling Company: AGECE	BORING LOG B-2
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Coring	
Weather: Clear, 55-60° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								Additional Tests/Remarks
			Approximate Ground Surface Elevation (ft.): 2,658.00 Surface Condition: Asphalt	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	
				ASPHALT: 3" thick											
				Silty SAND (SM): red, moist, medium dense											
				SILT with Sand (ML): red to reddish brown, moist, very stiff											
2655	5				BC=19 50/5"	11"									
					PP=4.5+										
2650															
	10			CLAY (CL): medium plasticity, red to pale greenish gray, moist, very stiff to hard, moderately variegated	BC=13 19 27	18"		CL	16.0	102.0		91	40	15	Collapse = 0.15%
					PP=4.5+										
2645															
	15			CLAY (CL) /CLAYSTONE/SHALE: reddish brown, moist, hard, fissile, very thinly bedded	BC=21 50/4"	10"									
				CLAYSTONE/SHALE: reddish brown, slightly weathered, highly fractured, slightly moist, locally friable, R2-R3	PP=4.5+	50%									
					RQD=10										
2640															
	20			SANDSTONE: very fine-grained, slightly fractured, R4											
				CLAYSTONE/SHALE: red to reddish brown, locally highly fractured with clay infilling, moist, R2-R3	PP=4.5+	100%									
					RQD=33										
2635															
	25			SANDSTONE: slightly fractured, R4											
				CLAYSTONE/SHALE: red to reddish brown, slightly fractured, moist, R2-R3	PP=4.5+	66%									
					RQD=55										
2630															
	30			Bluish gray (Gley 2-6/5B) below 29 feet											
The boring was terminated at approximately 30 ft. below ground surface. The boring was backfilled with auger cuttings on November 09, 2015. Rock was encountered at a depth of 15 ft. during this exploration. Coring started at a depth of 15 ft. <u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.															

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 20162945	BORING LOG B-2	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM		
	DATE: 1/6/2016	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-6
	REVISED: -		PAGE: 1 of 1

GINT FILE: PROJECTWISE: 20162945.dixie Regional Medical Center.gpj
 GINT TEMPLATE: PROJECTWISE: KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 11/09/2015 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Air Coring
Weather: Clear **Exploration Diameter:** 9 in. O.D.

BORING LOG B-3

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,654.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
			Sandy SILT (ML): reddish brown to red (2.5YR 4/6), moist, stiff												
	2650		Sandy SILT (ML) to Silty SAND (SM): very fine-grained sand, reddish brown, moist, very stiff		BC=8 17 34	18"					53				
	5														
			No recovery		BC=50/5.5"	NR									
	2645														
	10		SILTSTONE or Silty Sandstone: red to reddish brown, very fine-grained sandstone, unweathered to slightly weathered, moderately fractured, minor sericite, R3		RQD=7	100%									
	2640														
	15		- slightly weathered, locally minor gypsum along fractures below 15 feet		PP=4.5+ RQD=0	100%									
	2635														
	20		- moderately to highly fractured, minor gypsum below 20 feet, R2		PP=4.5+ RQD=8	100%									
	2630														
	25		The boring was terminated at approximately 25 ft. below ground surface. The boring was backfilled with auger cuttings on November 09, 2015. Rock was encountered at a depth of 10 ft. during this exploration. Coring started at a depth of 10 ft.												
	2625		GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.												
	30														
	2620														



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG B-3

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

B-7

PAGE: 1 of 1

Date Begin - End: 11/16/2015 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Coring
Weather: Cloudy, Light Rain **Exploration Diameter:** 9 in. O.D.

BORING LOG B-4

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								Additional Tests/Remarks
			Approximate Ground Surface Elevation (ft.): 2,654.00 Surface Condition: Asphalt	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	
				ASPHALT: 3" asphalt											
				SILT (ML): red, slightly moist, very stiff to hard, fissile											
2650	5					BC=13 27 40	18"								
2645	10			Sandy SILT (ML): red to reddish brown, moist, hard, some gypsum noted, minor caliche		BC=50/5.5"	6"								
2640	15			SANDSTONE: light gray SANDY CLAYSTONE: reddish brown to dark reddish brown, moderately weathered, locally highly fractured, especially in top 2 feet of run, R2		PP=4.5+ RQD=13	60%								
2635	20			CLAYSTONE: brown, reddish brown, bluish gray, moderately weathered, locally highly fractured, some gypsum and chlorite along fractures, moist, variegated, R2		PP=4.5+ RQD=40	83%								
2630	25			CLAYSTONE/SHALE: slightly weathered, slightly fractured, variegated, R3		PP=4.5+ RQD=95	100%								
2625	30			SANDY CLAYSTONE or Siltstone: becoming coarse-grained, slightly weathered to unweathered, thickly bedded, R3		PP=4.5+ RQD=85	100%								
2620						RQD=100	100%			2.0	139.0		NP	NP	Swell = 0.25%



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG B-4

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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PAGE: 1 of 2

KLEINFELDER - 849 West Levoy Drive, Suite 200 | Taylorsville, UT 84123 | PH: 801.261.3336 | FAX: 801.261.3306 | www.kleinfelder.com

Date Begin - End: 11/16/2015	Drilling Company: AGECE	BORING LOG B-5
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Coring	
Weather: Cloudy, 45° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS									
			Approximate Ground Surface Elevation (ft.): 2,654.00 Surface Condition: Asphalt	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks		
			ASPHALT: 2"-3" thick														
			Sandy SILTSTONE or SANDSTONE with Silt: very fine-grained sandstone, pale red to reddish brown, slightly moist, dense, laminated														
2650	5				BC=31 22 18 PP=4.5	18"											
			Weathered CLAYSTONE: reddish brown, bluish gray, light maroon, moist, hard, variegated, moderately weathered														
2645	10				BC=10 12 50/3" PP=4.5+	12"											
																Auger refusal at 12 to 13 feet	
2640	15			CLAYEY SILTSTONE: gray to reddish brown to reddish gray, slightly to moderately weathered, moderately fractured, vertical fractures with gypsum infilling noted, slightly moist, R2-R3		PP=4.5+ RQD=55	90%										
			- becoming Sandy SILTSTONE at approximately 17 feet														
2635	20			SANDY SILTSTONE or Silty Sandstone: reddish brown, very fine-grained sandstone, slightly fractured, slightly moist, R3		PP=4.5+ RQD=75	100%										
2630	25			- slightly weathered, slightly fractured to unfractured, slightly variegated below 23 feet		PP=4.5+ RQD=68	100%		4.0	145.0			NP	NP	Swell = 1.17%		
2625	30					PP=4.5+ RQD=70	93%										
2620				- slightly fractured below 34 feet		RQD=80	100%										



PROJECT NO.: 20162945
DRAWN BY: MAP
CHECKED BY: MDM
DATE: 1/6/2016
REVISED: -

BORING LOG B-5

Dixie Regional Medical Center
1380 East Medical Center Drive
St. George, Utah

APPENDIX

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PAGE: 1 of 2

KLEINFELDER - 849 West Levoe Drive, Suite 200 | Taylorsville, UT 84123 | PH: 801.261.3336 | FAX: 801.261.3306 | www.kleinfelder.com

Date Begin - End: 11/16/2015		Drilling Company: AGECE		BORING LOG B-6	
Logged By: D. Krupicka		Drill Crew: Ben L., Hugo			
Hor.-Vert. Datum: Not Available		Drilling Equipment: CME-55		Hammer Type - Drop: 140 lb. Auto - 30 in.	
Plunge: -90 degrees		Drilling Method: Hollow Stem Auger/ Air Coring			
Weather: P. Cloudy, 50° F		Exploration Diameter: 9 in. O.D.			

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								
			Approximate Ground Surface Elevation (ft.): 2,652.00 Surface Condition: Landscaped	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
2650	5		Sandy SILT (ML): brown to reddish brown, moist, medium stiff, mottled, friable	BC=7 8 11 PP=4.5+	18"										
2645	10		Lean CLAY (CL): medium plasticity, brown to reddish brown, moist, stiff, moderately weathered	BC=4 6 10 PP=4.5+	18"										
2640	15		medium plasticity, very stiff to hard, fissile	BC=23 28 50/3" PP=4.5+	13"	CL	8.0	135.0		94	30	9			
2635	20		Silty SAND (SM) /SANDSTONE: red to reddish brown, slightly moist, very dense to hard	BC=50/5"	5"										
2630	25		SANDY SILTSTONE: red, slightly weathered, slightly fractured with manganese oxide infilling, breaks along bedding, slightly moist to moist, R3	PP=4.5+ RQD=42	60%										
2625	30			PP=4.5+ RQD=55	100%										
2620			R3-R4	PP=4.5+ RQD=83	100%										



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PROJECT NO.: 20162945

DRAWN BY: MAP

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DATE: 1/6/2016

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BORING LOG B-6

Dixie Regional Medical Center
1380 East Medical Center Drive
St. George, Utah

APPENDIX

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PAGE: 1 of 2

KLEINFELDER - 849 West Levoe Drive, Suite 200 | Taylorsville, UT 84123 | PH: 801.261.3336 | FAX: 801.261.3306 | www.kleinfelder.com

Date Begin - End: 11/11/2015 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Coring
Weather: Clear, Cool **Exploration Diameter:** 9 in. O.D.

BORING LOG B-7

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								
			Approximate Ground Surface Elevation (ft.): 2,649.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
		ASPHALT: 2"-3" thick SILT (ML): reddish brown, moist, stiff, some variegation noted (pale olive)													
2645	5			BC=4 4 6 PP=1.5	18"										
2640	10			BC=50/5"	4"										
2635	15			BC=50/5" PP=4.5+	5"										
				RQD=10	60%										
2630	20			RQD=60	100%										
2625	25			RQD=44	100%										
2620	30			RQD=87	100%										
2615															

Unc. Comp. Str.=
qu: 2770 psi



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG B-7

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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PAGE: 1 of 2

Date Begin - End: 11/11/2015	Drilling Company: AGECE	BORING LOG B-7
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Coring	
Weather: Clear, Cool	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS						
			Approximate Ground Surface Elevation (ft.): 2,649.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
2610	40	The boring was terminated at approximately 35 ft. below ground surface. The boring was backfilled with auger cuttings on November 11, 2015. Rock was encountered at a depth of 12 ft. during this exploration. Coring started at a depth of 15 ft. <u>GROUNDWATER LEVEL INFORMATION:</u> ☒ Groundwater was observed at approximately 25 ft. below ground surface during drilling. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.												
2605	45													
2600	50													
2595	55													
2590	60													
2585	65													
2580														

	PROJECT NO.: 20162945	BORING LOG B-7	APPENDIX
	DRAWN BY: MAP	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-15
	CHECKED BY: MDM		
	DATE: 1/6/2016		
	REVISED: -		PAGE: 2 of 2

Date Begin - End: 11/10/2015 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Coring
Weather: Cloudy, Cool 50° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-8

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,652.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
			ASPHALT: 2"-3" thick												
2650			Sandy Lean CLAY (CL): medium plasticity, reddish brown to red, moist, very stiff, very minor gypsum												
	5				BC=8 11 10 PP=4.5	18"									
2645															
	10		- very stiff to hard below 9 feet		BC=33 50/3" PP=4.5+	9"									
2640															
	15				BC=50/5" PP=4.5+	5"									
			CLAYSTONE: reddish brown, slightly to moderately weathered, locally variegated, R0-R1		RQD=20	60%		13.0	105.0		73	NP	NP	Swell = 0.0%	
2635															
	20		Red to reddish brown, slightly weathered, wet, some 1"-3" sandstone seams below 20 feet, R1-R2		PP=3.0 RQD=55	100%									
2630			R3-R4												
	25		SANDY CLAYSTONE or Siltstone: R2-R3		PP=4.0	100%									
2625			No core recovery from 27 to 30 feet												
	30		Unable to establish circulation, drill ahead to 35 feet												
2620															



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG B-8

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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PAGE: 1 of 2

Date Begin - End: 11/10/2015 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Coring
Weather: Cloudy, Cool 50° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-8

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								Additional Tests/Remarks
			Approximate Ground Surface Elevation (ft.): 2,652.00 Surface Condition: Asphalt	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1st ROD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	
2615	40			SILTSTONE or Sandy Claystone/shale: dark reddish brown, moist	BC=80/6"	6"									
2610				SANDY CLAYSTONE/SHALE: dark reddish brown, moist	BC=80/6"	6"									
The boring was terminated at approximately 40.5 ft. below ground surface. The boring was backfilled with auger cuttings on November 10, 2015. Rock was encountered at a depth of 15 ft. during this exploration. Coring started at a depth of 15 ft.															
GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.															



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG B-8

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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PAGE: 2 of 2

Date Begin - End: 11/13/2015 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Air Coring
Weather: Clear, 45° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-10

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,634.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
			Sandy SILT (ML): red, moist, very stiff												
			Lean CLAY with Sand (CL): red, moist, hard, friable												
2630	5			BC=12 50/2" PP=3.0	7"	CL	13.0	112.0		75	29	14	Swell = 1.06%		
2625	10		No recovery	BC=50/5.5"	NR										
			SILT/SILTSTONE: reddish brown, slightly weathered, moderately fractured along bedding, also vertical fracture ~12° with gypsum infilling, moist, R2	PP=4.5+ RQD=13	50%										
2620	15		- red to reddish brown, breaks easily along bedding with some gypsum or sericite infilling below 15 feet	PP=4.5+ RQD=66	100%										
2615	20														
			The boring was terminated at approximately 20 ft. below ground surface. The boring was backfilled with auger cuttings on November 13, 2015. Rock was encountered at a depth of 10 ft. during this exploration. Coring started at a depth of 10 ft.												
2610	25														
2605	30														
2600															

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.

GENERAL NOTES:
The exploration location and elevation are approximate and were estimated by Kleinfelder.

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 20162945	BORING LOG B-10	APPENDIX B-18
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	
	DATE: 1/6/2016		
	REVISED: -		PAGE: 1 of 1

PLOTTED: 01/06/2016 09:53 AM BY: MMoriarty

Date Begin - End: 11/13/2015	Drilling Company: AGECE	BORING LOG B-11
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Coring	
Weather: Clear, 50° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,633.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description

 KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20162945	BORING LOG B-11	APPENDIX
	DRAWN BY: MAP CHECKED BY: MDM DATE: 1/6/2016 REVISED: -	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-19
			PAGE: 1 of 1

GINT FILE: PROJECTWISE: 20162945_dixie Regional Medical Center.gpi
 GINT TEMPLATE: PROJECTWISE: KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 11/13/2015	Drilling Company: AGECE	BORING LOG B-12
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Coring	
Weather: Clear, 60° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,633.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
		<													

	PROJECT NO.: 20162945	BORING LOG B-12	APPENDIX
DRAWN BY: MAP			
CHECKED BY: MDM		Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-20
DATE: 1/6/2016			
REVISED: -			PAGE: 1 of 1

PLOTTED: 01/06/2016 09:53 AM BY: MMoriarty

Date Begin - End: 11/13/2015	Drilling Company: AGECE	BORING LOG B-13
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Coring	
Weather: Not Available	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,633.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
2630	5		Sandy Lean CLAY (CL): brown to reddish brown, moist, stiff, variegated		BC=6 8 PP=3.0	18"	CL	13.0	111.0		68	23	8	Collapse = 0.34%	
2625	10		SILT (ML) or SILTSTONE with Sand: dark reddish brown, slightly moist, hard		BC=50/3"	3"									
2620	15		SANDY SILTSTONE or Sandstone: red to reddish brown, very fine-grained sandstone, thinly bedded, slightly fractured, breaks along bedding, some variegation noted, slightly moist, R3		PP=4.5+ RQD=56	60%									
2615	20		- moist below 15 feet, R3-R4		PP=4.5+ RQD=97	100%									
2610	25		The boring was terminated at approximately 20 ft. below ground surface. The boring was backfilled with auger cuttings on November 13, 2015. Rock was encountered at a depth of 10 ft. during this exploration. Coring started at a depth of 10 ft.												
2605	30		<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.												
2600															

	PROJECT NO.: 20162945	BORING LOG B-13	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-21
	DATE: 1/6/2016		
	REVISED: -		
		PAGE: 1 of 1	

GINT FILE: PROJECTWISE: 20162945_dixie Regional Medical Center.gpi
 GINT TEMPLATE: PROJECTWISE: KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 11/06/2015	Drilling Company: AGECE	BORING LOG B-14
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Coring	
Weather: Clear, 60° F	Exploration Diameter: 9 in. O.D.	
		Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS									
			Approximate Ground Surface Elevation (ft.): 2,653.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks			
															Lithologic Description		
			ASPHALT: 2"-3" thick														
			Clayey SAND (SC): red, moist, medium dense														
			- becomes pale gray to olive below 4 feet		BC=3 7 6	18"											
	5		CLAY (CL): medium plasticity, pale gray, yellow, reddish brown, mottled, moist, very stiff, variegated														
					BC=14 50/4" PP=4.0	12"											
	10																
			- with sand, red to reddish brown, fissile below 15 feet		BC=26 50/5"												
	15		CLAYSTONE/SHALE: red to reddish brown, unweathered to slightly weathered, highly fractured, moist, R2		PP=4.5+ RQD=0	50%											
			- becomes reddish brown, slightly weathered, with chlorite or epidote along fractures below 20 feet, R2-R3		PP=4.5+ RQD=20	100%		1.0	165.0			NP	NP		Collapse = 0.15% Unc. Comp. Str.= qu: 3378 psi		
	20																
			RQD increases in lower 12" of run														
			SANDY CLAYSTONE/SHALE locally Siltstone: reddish brown, slightly weathered, highly fractured, R3-R4		PP=4.5+ RQD=40	100%											
	25																
			CLAYSTONE/SHALE: reddish brown		PP=4.5+ RQD=8	100%											
			SILTSTONE or Silty Sandstone: highly fractured, some iron oxide and manganese oxide along fractures, R2-R3														
	30																
				</													

	PROJECT NO.: 20162945	BORING LOG B-14	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-22
DATE: 1/6/2016			
REVISED: -			PAGE: 1 of 2

Date Begin - End: 11/06/2015	Drilling Company: AGECE	BORING LOG B-14
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Coring	
Weather: Clear, 60° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,653.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr: Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
	2615		SANDY SHALE to Sandstone: reddish brown, very fine-grained sandstone, slightly weathered, highly fractured, moist to wet, R2-R3		PP=4.5+ RQD=40	100%									
	40		The boring was terminated at approximately 40 ft. below ground surface. The boring was backfilled with auger cuttings on November 06, 2015. Rock was encountered at a depth of 16 ft. during this exploration. Coring started at a depth of 16 ft. <u>GROUNDWATER LEVEL INFORMATION:</u>  Groundwater was observed at approximately 36 ft. below ground surface during drilling. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.												
	2610														
	45														
	2605														
	50														
	2600														
	55														
	2595														
	60														
	2590														
	65														
	2585														



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG B-14

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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PAGE: 2 of 2

Date Begin - End: 11/10/2015 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Coring
Weather: Cloudy, Cool **Exploration Diameter:** 9 in. O.D.

BORING LOG B-15

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								Additional Tests/Remarks
			Approximate Ground Surface Elevation (ft.): 2,653.00 Surface Condition: Asphalt	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	
				ASPHALT: 2"-3" thick											
				Sandy SILT (ML): red, moist, medium stiff											
2650	5			- very stiff, friable, fissile below 4 feet		BC=6 12 20 PP=3.0	18"								
2645	10			Lean CLAY with Sand (CL): red, moist, very stiff to hard, friable		BC=15 42 50/2" PP=4.5+	18"								
2640	15			CLAYEY SILTSTONE or Sandstone: red to reddish brown, very fine-grained sandstone, moderately weathered, highly fractured with gypsum infilling, R2-R3		RQD=0 BC=50/4"	66%								
2635	20			- with prominent vertical fracture with gypsum filling below 20 feet		RQD=68	100%								
2630	25			CLAYSTONE/SHALE: red, slightly fractured, R2-R3		RQD=76	100%								
2625	30			SILTSTONE or Sandstone: very fine-grained sandstone, R2-R3											
2620				CLAYSTONE: red to reddish brown, highly fractured, wet, R1-R2		RQD=25									



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG B-15

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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PAGE: 1 of 2

Date Begin - End: 11/10/2015	Drilling Company: AGECE	BORING LOG B-15
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Coring	
Weather: Cloudy, Cool	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,653.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr: Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
2615			CLAYSTONE: red to reddish brown, highly fractured, wet, R1-R2 - contains 1/2"-3" siltstone/sandstone seams below 35 feet, R-1		RQD=NA										
40			The boring was terminated at approximately 40 ft. below ground surface. The boring was backfilled with auger cuttings on November 10, 2015. Rock was encountered at a depth of 15 ft. during this exploration. Coring started at a depth of 15 ft.												
2610			GROUNDWATER LEVEL INFORMATION: Groundwater was observed at approximately 25 ft. below ground surface during drilling. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.												
45															
2605															
50															
2600															
55															
2595															
60															
2590															
65															
2585															



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG B-15

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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PAGE: 2 of 2

PLOTTED: 01/06/2016 09:54 AM BY: MMoriarty

Date Begin - End: 11/17/2015	Drilling Company: AGECE	BORING LOG F-1
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Coring	
Weather: Clear, 35° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS									
			Approximate Ground Surface Elevation (ft.): 2,655.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks		
															Lithologic Description	
			Silty SAND (SM) or Sandy SILT (ML): very fine-grained, reddish yellow to yellow, moist, medium dense													
2650	5															
			CLAY (CL): medium plasticity, light brownish gray to pale olive, moist, stiff to very stiff		BC=6 9 15 PP=4.5+	18"										
2645	10															
			SANDY SILTY CLAYSTONE: variegated reddish brown to bluish gray, moderately weathered, moderately fractured, especially in upper 2 feet of core run, clay infilling, moist, R2		PP=4.5+ RQD=52	100%										
2640	15															
			- becoming coarse, possibly Clayey SILTSTONE, slightly weathered, slightly fractured below 18 feet R2-R3		PP=4.5+ RQD=75	100%										
2635	20															
			SILTSTONE: reddish brown to bluish gray, slightly fractured to unfractured, less variegated, R3		PP=4.5+ RQD=95	100%										
2630	25															
			- some clay seams below 28 feet		PP=4.5+ RQD=75	100%										
2625	30															

 KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20162945	BORING LOG F-1	APPENDIX
	DRAWN BY: MAP CHECKED BY: MDM DATE: 1/6/2016 REVISED: -	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-26
			PAGE: 1 of 2

GINT FILE: PROJECTWISE: 20162945_dixie Regional Medical Center.gpi
 GINT TEMPLATE: PROJECTWISE: KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

KLEINFELDER - 849 West Levoe Drive, Suite 200 | Taylorsville, UT 84123 | PH: 801.261.3336 | FAX: 801.261.3306 | www.kleinfelder.com

Date Begin - End: 11/11/2015 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Air Core
Weather: Clear, 55° F **Exploration Diameter:** 9 in. O.D.

BORING LOG F-2

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS									
			Approximate Ground Surface Elevation (ft.): 2,647.00 Surface Condition: Asphalt		Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks		
			Lithologic Description														
			ASPHALT: 2"-3" thick													Possible fill material to 16 feet	
			Sandy SILT (ML): red, slightly moist, medium dense/stiff														
2645																	
	5		- minor gypsum below 4 feet			BC=9 8 8 PP=3.0	18"										
2640																	
	10		- moist, very stiff below 9 feet			BC=8 10 13 PP=4.5+	18"										
2635																	
	15		- soft to medium stiff below 13 feet			BC=3 3 2	18"										
2630			SILTY SANDSTONE: red to reddish brown, very fine-grained, slightly moist													Hard at 16 feet	
						BC=50/3"	3"										
	20																
2625			Slightly weathered, thickly bedded, slightly fractured to unfractured, wet below 20 feet, R3-R4			PP=4.5+ RQD=60	58%										
	25																
2620						PP=4.5+ RQD=95	100%										
	30																
2615						PP=4.5+ RQD=95	100%										



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG F-2

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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Date Begin - End: 11/11/2015	Drilling Company: AGECE	BORING LOG F-2
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Core	
Weather: Clear, 55° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,647.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1st RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
2610		The boring was terminated at approximately 35 ft. below ground surface. The boring was backfilled with auger cuttings on November 11, 2015. Rock was encountered at a depth of 16 ft. during this exploration. Air Core started at a depth of 20 ft. GROUNDWATER LEVEL INFORMATION: ☒ Groundwater was observed at approximately 20 ft. below ground surface during drilling. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.													
40															
2605															
45															
2600															
50															
2595															
55															
2590															
60															
2585															
65															
2580															

	PROJECT NO.: 20162945	BORING LOG F-2		APPENDIX
	DRAWN BY: MAP	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah		B-29
	CHECKED BY: MDM			
	DATE: 1/6/2016			
	REVISED: -			PAGE: 2 of 2

Date Begin - End: 11/11/2015 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Air Core
Weather: Clear, 55° F **Exploration Diameter:** 9 in. O.D.

BORING LOG F-3

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								Additional Tests/Remarks
			Approximate Ground Surface Elevation (ft.): 2,649.00 Surface Condition: Asphalt	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	
				ASPHALT: 2"-3" thick											Possible fill material to 16 feet
				SILT (ML): red, slightly moist, stiff to very stiff, fissile											
2645	5					BC=6 11 13 PP=3.0	18"								
2640	10			- loose to medium stiff, minor gypsum, friable below 9 feet		BC=3 2 4 PP=1.0	18"								
2635	15			- increasing sand content, becoming very stiff to hard below 13 feet		BC=5 19 43 PP=4.0	18"	ML				92	NP	NP	
2630	20					BC=50/3" PP=4.5	3"								Hard at 16 feet
2625	25			SANDSTONE or Siltstone: red, very fine-grained, unweathered to slightly weathered, thickly bedded, slightly fractured, minor gypsum infilling along bedding, moist, R3-R4		PP=4.5+ RQD=50	66%								
2620	30					PP=4.5+ RQD=68	100%								
2615				R4		PP=4.5+ RQD=68	100%								



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG F-3

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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PLOTTED: 01/06/2016 09:54 AM BY: MMoriarty

Date Begin - End:	11/11/2015	Drilling Company:	AGEC	BORING LOG F-3
Logged By:	D. Krupicka	Drill Crew:	Ben L., Hugo	
Hor.-Vert. Datum:	Not Available	Drilling Equipment:	CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge:	-90 degrees	Drilling Method:	Hollow Stem Auger/ Air Core	
Weather:	Clear, 55° F	Exploration Diameter:	9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS						
			Approximate Ground Surface Elevation (ft.): 2,649.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf ROD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks

2610 40	The boring was terminated at approximately 35 ft. below ground surface. The boring was backfilled with auger cuttings on November 11, 2015. Rock was encountered at a depth of 20 ft. during this exploration. Air Core started at a depth of 20 ft. GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.													
2605 45														
2600 50														
2595 55														
2590 60														
2585 65														
2580														

	PROJECT NO.: 20162945	BORING LOG F-3	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-31
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gINT FILE: PROJECTWISE: 20162945_dixie Regional Medical Center.gpi
 gINT TEMPLATE: PROJECTWISE: KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 11/12/2015	Drilling Company: AGECE	BORING LOG F-4
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Core	
Weather: Clear, 60° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,637.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
			ASPHALT: 1"-2" thick												
			SILT (ML): red, moist												
2635															
	5		SILT with Sand (ML): reddish brown, slightly moist, stiff		BC=6 9 50/3" PP=1.5	14"	ML	12.0	104.0		80	NP	NP	Collapse = 0.0%	
			- hard below 5 feet												
2630															
			SILTY SANDSTONE or Siltstone: reddish brown, fine to very fine-grained		BC=50/4"	4"									
	10														
			- dark red to reddish brown, very fine-grained, slightly weathered, breaks along bedding, slightly fractured, moist, R3		PP=4.5+ RQD=42	76%									
2625															
	15				PP=4.5+ RQD=75	100%									
2620															
	20		R3-R4		RQD=95	100%									
2615															
	25														
2610			The boring was terminated at approximately 25 ft. below ground surface. The boring was backfilled with auger cuttings on November 12, 2015. Rock was encountered at a depth of 7 ft. during this exploration. Air Core started at a depth of 10 ft.					GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.							
	30														
2605															

	PROJECT NO.: 20162945	BORING LOG F-4 Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	APPENDIX B-32
	DRAWN BY: MAP CHECKED BY: MDM DATE: 1/6/2016 REVISED: -		
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Date Begin - End: 11/12/2015	Drilling Company: AGECE	BORING LOG F-5
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger/ Air Core	
Weather: Clear, Cool	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,641.00 Surface Condition: Bare Earth	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Lithologic Description											
-2640			Lean CLAY with Sand (CL): medium plasticity, dark red, moist, stiff		BC=5 5 5 PP=4.5	18"								
	5		- stiff to very stiff below 4 feet		BC=6 20 20 PP=4.5+	18"	CL	10.0	115.0			25	9	Collapse = 0.95%
-2635														
	10		SILT (ML)/SILTSTONE: red to reddish brown, fissile		BC=50/4"	6"								
-2630			SILTSTONE or Silty Sandstone: dark red to reddish brown, fine-grained sandstone, slightly weathered, fractured along bedding planes, minor gypsum, moist, R3		PP=4.5+ RQD=9	50%								
	15				PP=4.5+ RQD=57	100%								
-2625														
	20		- prominent vertical fracture with gypsum infilling from 20 to 21 feet		PP=4.5+ RQD=100	100%								
-2620														
	25				RQD=95									
-2615														
	30													
-2610			The boring was terminated at approximately 30 ft. below ground surface. The boring was backfilled with auger cuttings on November 12, 2015. Rock was encountered at a depth of 8 ft. during this exploration. Air Core started at a depth of 10 ft. GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.											

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 20162945	BORING LOG F-5	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-33
	DATE: 1/6/2016		
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gINT FILE: PROJECTWISE: 20162945.dixie Regional Medical Center.gpi
gINT TEMPLATE: PROJECTWISE: KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

Date Begin - End: 11/06/2015 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben L.
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger/ Coring
Weather: Clear, 50° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-1

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,657.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
			ASPHALT: 2" thick												
			Sandy SILT (SM): very fine-grained, yellowish brown to yellow, tan, moist, very stiff												
2655															
	5														
2650															
			- light brownish gray (2.5Y 6/2), hard to very hard												
	10														
2645															
								</							

The boring was terminated at approximately 14 ft. below ground surface. The boring was backfilled with auger cuttings on November 06, 2015.

GROUNDWATER LEVEL INFORMATION:

Groundwater was not encountered during drilling or after completion.

GENERAL NOTES:

The exploration location and elevation are approximate and were estimated by Kleinfelder.



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
 REVISED: -

BORING LOG P-1

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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PLOTTED: 01/06/2016 09:54 AM BY: MMoriarty

Date Begin - End: 11/12/2015	Drilling Company: AGECE	BORING LOG P-2
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Not Available	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,646.00 Surface Condition: Bare Earth	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
2645			Sandy SILT (ML) to Silty SAND (SM): up to 30% fine gravel, red to reddish brown, slightly moist, very stiff, gypsum	BC=3 15 17										Possible fill material
5														
2640			SILT with Sand (ML): reddish brown, moist, very stiff, moderate gypsum	BC=6 18 14										
				BC=8 18 50/4"										
10			The boring was terminated at approximately 8.5 ft. below ground surface. The boring was backfilled with auger cuttings on November 12, 2015.				<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.							
2635														
15														
2630														
20														
2625														
25														
2620														
30														
2615														

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 20162945	BORING LOG P-2	APPENDIX B-35
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	PAGE: 1 of 1
DATE: 1/6/2016			
REVISED: -			

Date Begin - End: 11/12/2015	Drilling Company: AGECE	BORING LOG P-3
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear, 60° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS						
			Approximate Ground Surface Elevation (ft.): 2,638.00 Surface Condition: Bare Earth	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Sandy SILT (ML): reddish brown, dry, soft to medium stiff	BC=6 4 4	18"	ML	4.0	95.0		58	NP	NP		
2635														
	5		Clayey SILT (ML): reddish brown, moist, medium stiff	BC=2 3 7 PP=2.5	18"									
2630			Sandy SILT (ML): moist, hard, with variegations and gypsum veining	BC=6 16 24										
	10		The boring was terminated at approximately 8.5 ft. below ground surface. The boring was backfilled with auger cuttings on November 12, 2015.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.						
2625														
	15													
2620														
	20													
2615														
	25													
2610														
	30													
2605														

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 20162945	BORING LOG P-3	APPENDIX B-36
	DRAWN BY: MAP CHECKED BY: MDM DATE: 1/6/2016 REVISED: -		
PAGE: 1 of 1			

Date Begin - End: 11/12/2015 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben L., Hugo
Hor.-Vert. Datum: Not Available **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Not Available **Exploration Diameter:** 9 in. O.D.

BORING LOG P-4

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,638.00 Surface Condition: Bare Earth	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf ROD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
			SILT (ML): low plasticity, red, moist, stiff - some variegation and minor gypsum below 4 feet - some moist clay interbedded below 7 feet		BC=4 8 7 PP=4.0	18"									
2635															
	5					BC=4 6 8 PP=2.0	18"								
2630					BC=9 11 42 PP=4.0	18"									
	10	The boring was terminated at approximately 8.5 ft. below ground surface. The boring was backfilled with auger cuttings on November 12, 2015.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.								
2625															
	15														
2620															
	20														
2615															
	25														
2610															
	30														
2605															



PROJECT NO.: 20162945
 DRAWN BY: MAP
 CHECKED BY: MDM
 DATE: 1/6/2016
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BORING LOG P-4

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

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Date Begin - End: 11/12/2015	Drilling Company: AGECE	BORING LOG P-5
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear, 55° F	Exploration Diameter: 9 in. O.D.	Hammer Type - Drop: 140 lb. Auto - 30 in.

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,672.00 Surface Condition: Asphalt	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
2670			Silty SAND (SM) to Sandy SILT (ML): red to reddish brown, dry, medium dense, gypsum, friable		BC=12 8 8	18"									Possible fill material
	5				BC=4 9 9										
2665															
	10				BC=19 35 50/2"										Hard at 9.5 feet, possible sandstone
2660		The boring was terminated at approximately 10 ft. below ground surface. The boring was backfilled with auger cuttings on November 12, 2015.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.								
	15														
2655															
	20														
2650															
	25														
2645															
	30														
2640															

	PROJECT NO.: 20162945	BORING LOG P-5	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-38
	DATE: 1/6/2016		
	REVISED: -		PAGE: 1 of 1

Date Begin - End: 11/12/2015	Drilling Company: AGECE	BORING LOG P-6
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear, 57° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Approximate Ground Surface Elevation (ft.): 2,667.00 Surface Condition: Bare Earth	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf ROD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
															Lithologic Description
2665			SILT with Sand (ML): reddish brown, dry, medium stiff, some gypsum, rootlets	BC=3 3 6 PP=1.5	18"	ML	3.0	92.0		80				Collapse = 1.60% Possible fill material	
	No recovery		BC=20 50/3"												
2660			Lean CLAY (CL) and SILT (ML): reddish brown, dry, very stiff	BC=15 50/5.5"	12"										
	10	The boring was terminated at approximately 8 ft. below ground surface. The boring was backfilled with auger cuttings on November 12, 2015.													
		<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.													
2655															
	15														
2650															
	20														
2645															
	25														
2640															
	30														
2635															

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 20162945	BORING LOG P-6	APPENDIX
	DRAWN BY: MAP CHECKED BY: MDM DATE: 1/6/2016 REVISED: -	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-39
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Date Begin - End: 11/12/2015	Drilling Company: AGECE	BORING LOG P-7
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Not Available	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								
			Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
			Silty SAND (SM): slightly moist to dry, loose		BC=2 4 4	16"									
-2650															
	5		- dense to very dense, some gypsum below 4 feet		BC=17 28 34 PP=4.5+	18"									
-2645															
	10		No recovery at 9 feet		BC=33 50/1"	NR									
-2640			The boring was terminated at approximately 9.5 ft. below ground surface. The boring was backfilled with auger cuttings on November 12, 2015.												
			GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.												
	15														
-2635															
	20														
-2630															
	25														
-2625															
	30														
-2620															

 KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20162945	BORING LOG P-7 Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	APPENDIX B-40
	DRAWN BY: MAP CHECKED BY: MDM DATE: 1/6/2016 REVISED: -		
			PAGE: 1 of 1

GINT FILE: PROJECTWISE: 20162945_dixie Regional Medical Center.gpi
 GINT TEMPLATE: PROJECTWISE: KLF_STANDARD_GINT_LIBRARY_2016.GLB [KLF_BORING/TEST PIT SOIL LOG]

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Date Begin - End: 11/13/2015	Drilling Company: AGECE	BORING LOG P-9
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear, 60° F	Exploration Diameter: 9 in. O.D.	

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								Additional Tests/Remarks
			Approximate Ground Surface Elevation (ft.): 2,631.00 Surface Condition: Asphalt	Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf ROD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	
				ASPHALT: 3" thick		BC=13 18 17 PP=4.5+	18"								
				Clayey SAND (SC): medium plasticity, reddish brown, moist, dense											
				SILT with Sand (ML): low plasticity, red, moist, hard to very hard											
	5					BC=10 15 19		ML	14.0	110.0		81	NP	NP	Collapse = 0.87%
				Silty Clayey SAND (SM) or SILT (ML): low plasticity, brown to reddish brown, moist, medium dense		BC=6 10 12									
	10			The boring was terminated at approximately 8.5 ft. below ground surface. The boring was backfilled with auger cuttings on November 13, 2015.											
				<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.											
	15														
	20														
	25														
	30														



PROJECT NO.: 20162945
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BORING LOG P-9

Dixie Regional Medical Center
1380 East Medical Center Drive
St. George, Utah

APPENDIX

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Date Begin - End: 11/06/2015		Drilling Company: AGECE		BORING LOG W-1	
Logged By: D. Krupicka		Drill Crew: Ben L., Hugo			
Hor.-Vert. Datum: Not Available		Drilling Equipment: CME-55		Hammer Type - Drop: 140 lb. Auto - 30 in.	
Plunge: -90 degrees		Drilling Method: Hollow Stem Auger			
Weather: Sunny, 60° F		Exploration Diameter: 9 in. O.D.			

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS						
			Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
			Approximate Ground Surface Elevation (ft.): 2,658.00 Surface Condition: Bare Earth											
			Poorly graded SAND with Silt (SP-SM): fine-grained sand, red to reddish yellow, moist, medium dense	BC=4 6 9 PP=4.0	18"									
2655	5			BC=3 4 9	18"									
2650	10		Lean CLAY (CL): medium plasticity, brown to reddish brown, slightly moist, very stiff	BC=8 14 17 PP=4.5+	18"									
2645	15		- very hard at 14 feet	BC=50/2"	NR									
			The boring was terminated at approximately 14.5 ft. below ground surface. The boring was backfilled with auger cuttings on November 06, 2015.					GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.						
2640	20													
2635	25													
2630	30													
2625														



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PROJECT NO.: 20162945

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DATE: 1/6/2016

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BORING LOG W-1

Dixie Regional Medical Center
1380 East Medical Center Drive
St. George, Utah

APPENDIX

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PAGE: 1 of 1

Date Begin - End: 11/06/2015	Drilling Company: AGECE	BORING LOG W-2
Logged By: D. Krupicka	Drill Crew: Ben L., Hugo	
Hor.-Vert. Datum: Not Available	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear, 55° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS								
			Approximate Ground Surface Elevation (ft.): 2,659.00 Surface Condition: Bare Earth	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf ROD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks		
															Lithologic Description	
			Sandy SILT (ML): pale red to reddish brown, slightly moist, stiff	BC=7 10 10	18"	CL	10.0	109.0	86	25	8	Collapse = 0.29%				
2655	5		Lean CLAY (CL): medium plasticity, light reddish brown, moist, very stiff	BC=11 14 25 PP=3.5												
2650	10		- red (2.5YR 4/6), slightly moist, hard, fissile, moderate amount of gypsum below 9 feet	BC=20 34 44 PP=4.0	18"											
2645	15		- decreased sand below 14 feet	BC=50/4"	4"											
The boring was terminated at approximately 14.5 ft. below ground surface. The boring was backfilled with auger cuttings on November 06, 2015.															<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion. <u>GENERAL NOTES:</u> The exploration location and elevation are approximate and were estimated by Kleinfelder.	
2640	20															
2635	25															
2630	30															
2625																

	PROJECT NO.: 20162945	BORING LOG W-2	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-44
	DATE: 1/6/2016		
	REVISED: -		
			PAGE: 1 of 1

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Date Begin - End:	11/06/2015	Drilling Company:	AGEC	BORING LOG W-3	
Logged By:	D. Krupicka	Drill Crew:	Ben L., Hugo		
Hor.-Vert. Datum:	Not Available	Drilling Equipment:	CME-55		
Plunge:	-90 degrees	Drilling Method:	Hollow Stem Auger		
Weather:	Clear, 55° F	Exploration Diameter:	9 in. O.D.	Hammer Type - Drop:	140 lb. Auto - 30 in.

Approximate Elevation (feet)	Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
			Lithologic Description	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
			Approximate Ground Surface Elevation (ft.): 2,654.00 Surface Condition: Asphalt												
			Lithologic Description												
			ASPHALT: 2" thick												
			Silty SAND (SM): light reddish brown to pink, moist, very dense												
2650	5			BC=20 30 53 PP=4.5+	18"						29				
2645	10		transitions to rock	BC=50/4" PP=4.5+	2"										
The boring was terminated at approximately 9.5 ft. below ground surface. The boring was backfilled with auger cuttings on November 06, 2015.															
GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion. GENERAL NOTES: The exploration location and elevation are approximate and were estimated by Kleinfelder.															
2640	15														
2635	20														
2630	25														
2625	30														
2620															

	PROJECT NO.: 20162945	BORING LOG W-3	APPENDIX
	DRAWN BY: MAP		
	CHECKED BY: MDM	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	B-45
	DATE: 1/6/2016		
	REVISED: -		PAGE: 1 of 1

APPENDIX C

Laboratory Test Results

Exploration ID	Depth (ft.)	Sample Description	Water Content (%)	Dry Unit Wt. (pcf)	Sieve Analysis (%)			Atterberg Limits			Additional Tests
					Passing 3/4"	Passing #4	Passing #200	Liquid Limit	Plastic Limit	Plasticity Index	
B-1	10.0	LEAN CLAY (CL)	6.0	137.0				29	17	12	Swell = 0.43%
B-2	9.0		16.0	102.0			91	40	25	15	Collapse = 0.15%
B-3	3.0						53				
B-4	25.0		2.0	139.0				NP	NP	NP	Swell = 0.25%
B-5	22.0		4.0	145.0				NP	NP	NP	Swell = 1.17%
B-5	27.0										Unconfined Compressive Strength=
											q _u : 3448 psi
B-6	14.0		8.0	135.0			94	30	21	9	Unconfined Compressive Strength=
B-7	25.0										q _u : 2770 psi
B-8	15.0	SILT WITH SAND (ML)	13.0	105.0			73	NP	NP	NP	Swell = 0.0%
B-10	4.0	LEAN CLAY WITH SAND (CL)	13.0	112.0			75	29	15	14	Swell = 1.06%
B-11	5.0		1.0	133.0				NP	NP	NP	Swell = 0.30%
B-11	11.0			153.0							Unconfined Compressive Strength=
											q _u : 39 psi
B-13	4.0	SANDY LEAN CLAY (CL)	13.0	111.0			68	23	15	8	Collapse = 0.34%
B-14	20.0		1.0	165.0				NP	NP	NP	Collapse = 0.15%
											Unconfined Compressive Strength=
											q _u : 3378 psi
F-1	27.0		2.0	127.0				NP	NP	NP	Swell = 0.46%
F-3	13.0	SILT (ML)					92	NP	NP	NP	
F-4	3.5	SILT WITH SAND (ML)	12.0	104.0			80	NP	NP	NP	Collapse = 0.0%
F-5	4.0	LEAN CLAY WITH SAND (CL)	10.0	115.0				25	16	9	Collapse = 0.95%
P-1	8.0	SANDY SILT (ML)	5.0	115.0			65				
P-3	0.0	SANDY SILT (ML)	4.0	95.0			58	NP	NP	NP	
P-6	0.0	SILT WITH SAND (ML)	3.0	92.0			80				Collapse = 1.60%
P-8	0.0	SILTY SAND (SM)	4.0	113.0							
P-9	4.0	SILT WITH SAND (ML)	14.0	110.0			81	NP	NP	NP	Collapse = 0.87%

Refer to the Geotechnical Evaluation Report or the supplemental plates for the method used for the testing performed above.
NP = NonPlastic



PROJECT NO.: 20162945

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DATE:

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LABORATORY TEST RESULT SUMMARY

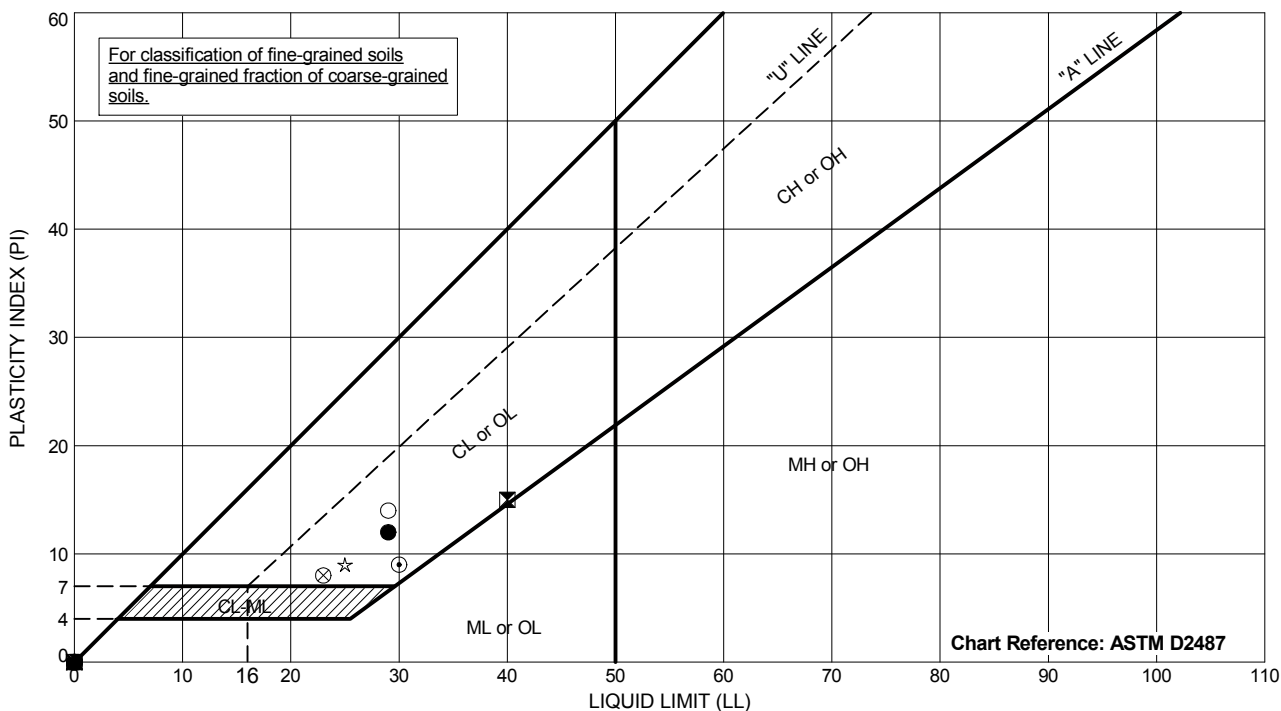
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1380 East Medical Center Drive
St. George, Utah

APPENDIX

C-1



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Exploration ID	Depth (ft.)	Sample Description	Passing #200	LL	PL	PI
● B-1	10		NM	29	17	12
⊠ B-2	9	LEAN CLAY (CL)	91	40	25	15
▲ B-4	25		NM	NP	NP	NP
⊗ B-5	22		NM	NP	NP	NP
⊙ B-6	14	LEAN CLAY (CL)	94	30	21	9
⊕ B-8	15	SILT with SAND (ML)	73	NP	NP	NP
○ B-10	4	LEAN CLAY with SAND (CL)	75	29	15	14
△ B-11	5		NM	NP	NP	NP
⊗ B-13	4	SANDY LEAN CLAY (CL)	68	23	15	8
⊕ B-14	20		NM	NP	NP	NP
□ F-1	27		NM	NP	NP	NP
⊕ F-3	13	SILT (ML)	92	NP	NP	NP
⊕ F-4	3.5	SILT with SAND (ML)	80	NP	NP	NP
☆ F-5	4	LEAN CLAY WITH SAND (CL)	NM	25	16	9
⊗ P-3	0	SANDY SILT (ML)	58	NP	NP	NP

Testing performed in general accordance with ASTM D4318.
 NP = Nonplastic
 NM = Not Measured



PROJECT NO.: 20162945

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DATE:

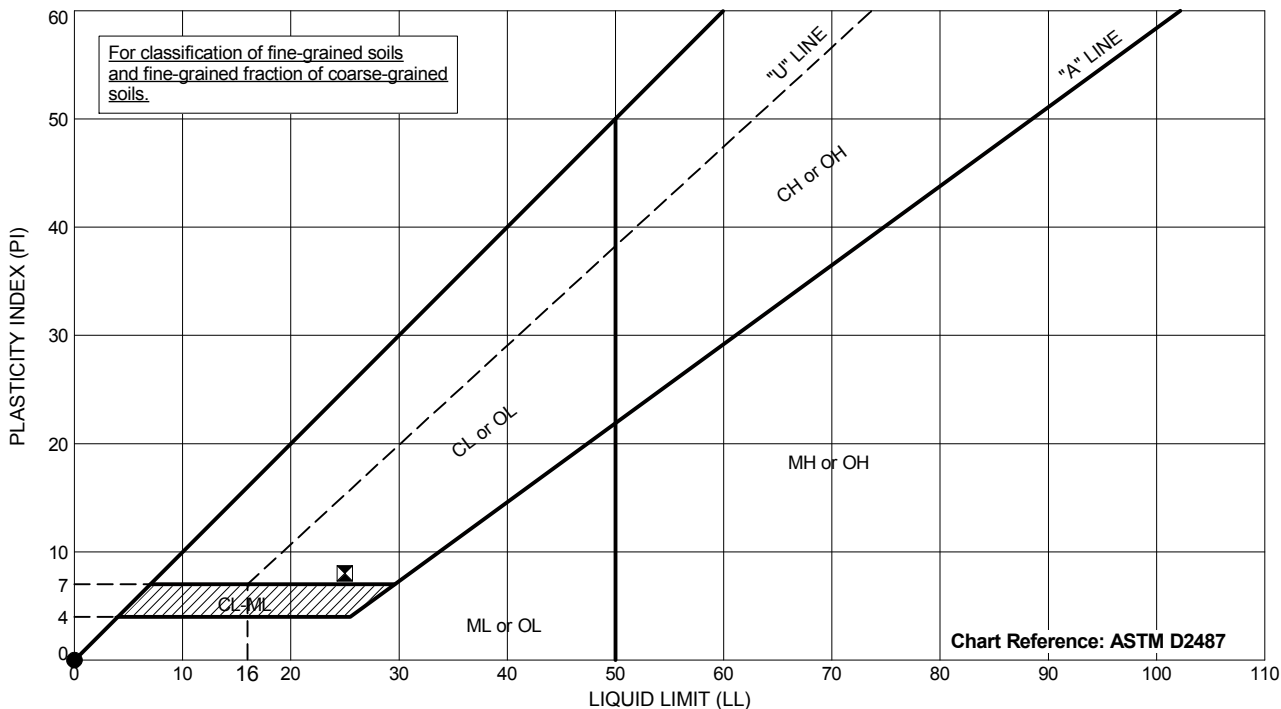
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ATTERBERG LIMITS

Dixie Regional Medical Center
 1380 East Medical Center Drive
 St. George, Utah

APPENDIX

C-2

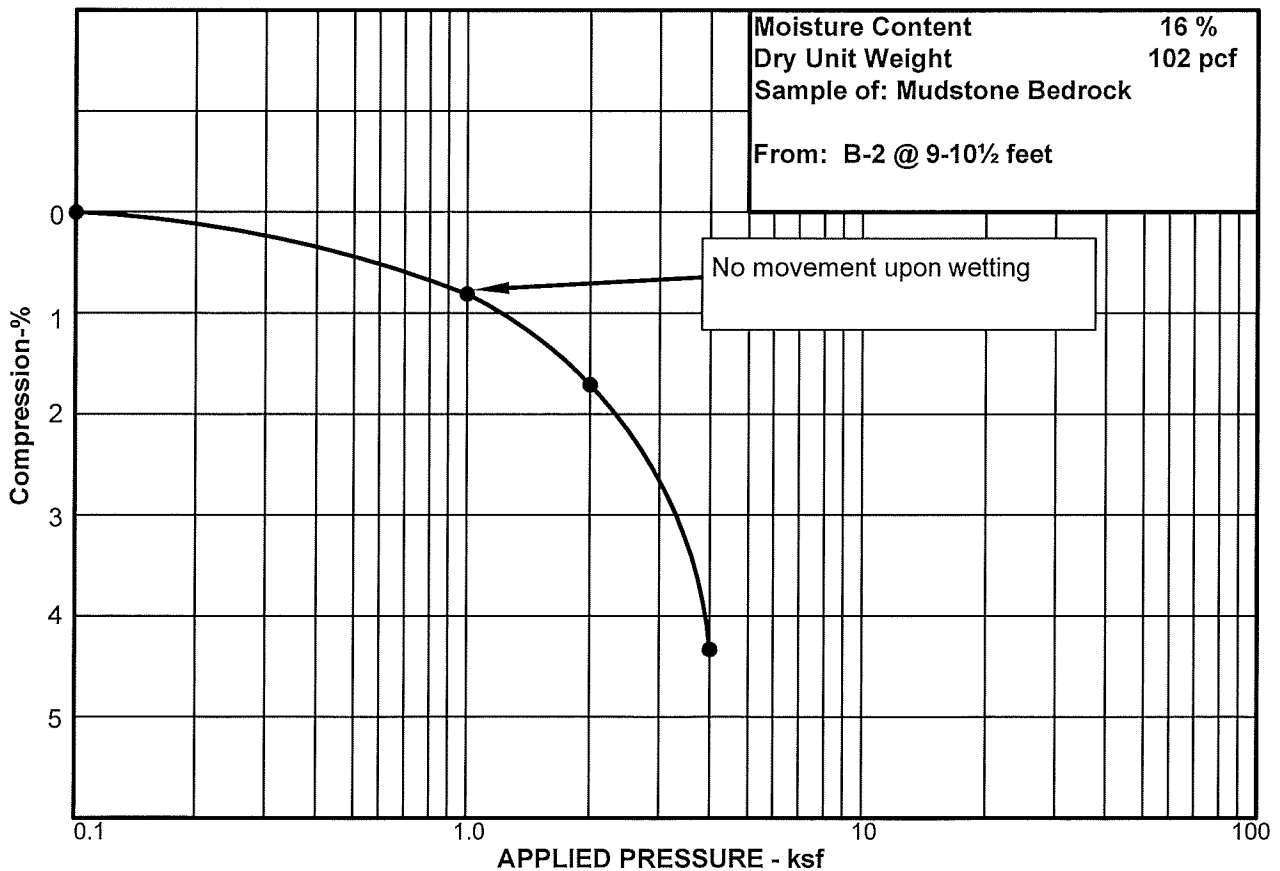
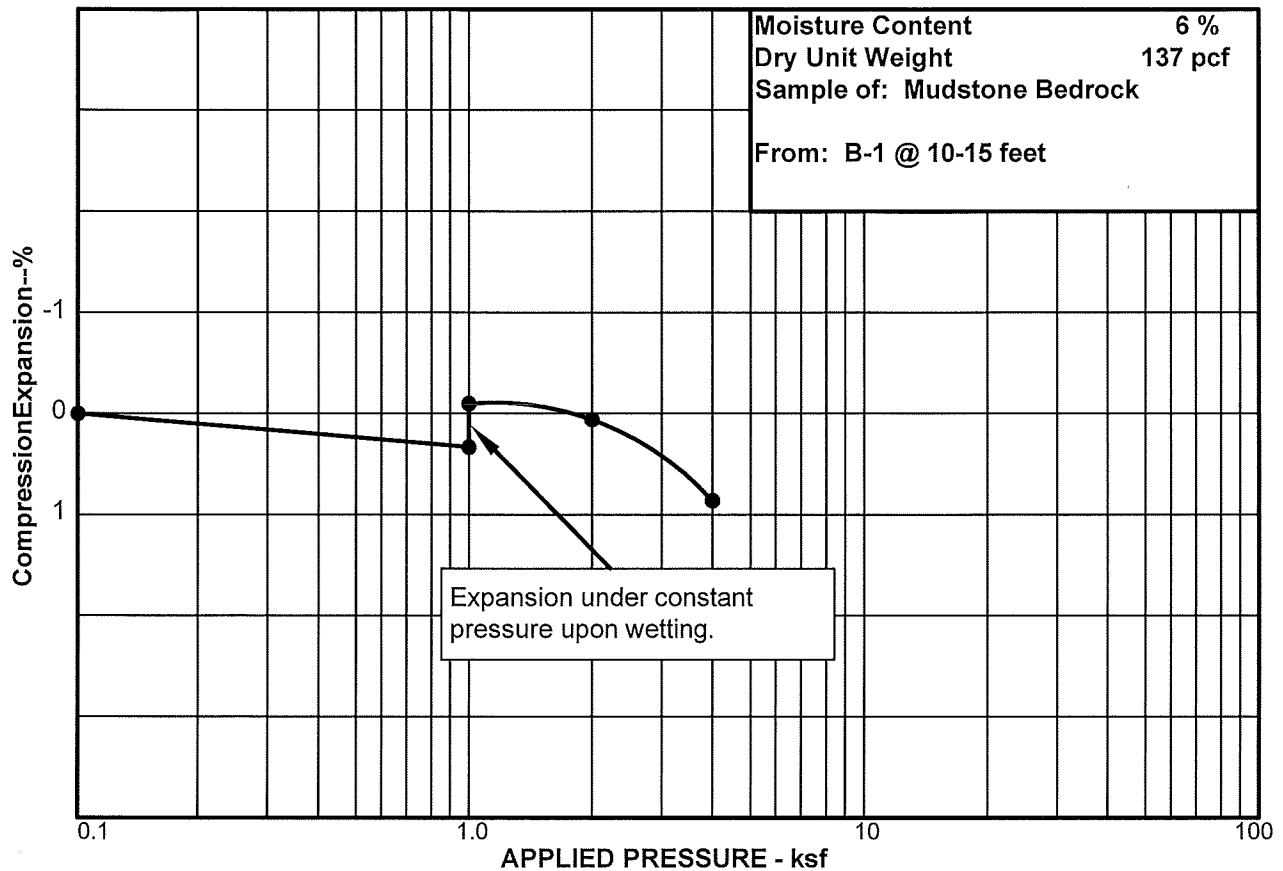


Exploration ID	Depth (ft.)	Sample Description	Passing #200	LL	PL	PI
● P-9	4	SILT with SAND (ML)	81	NP	NP	NP
⊠ W-2	4.5	LEAN CLAY (CL)	86	25	17	8

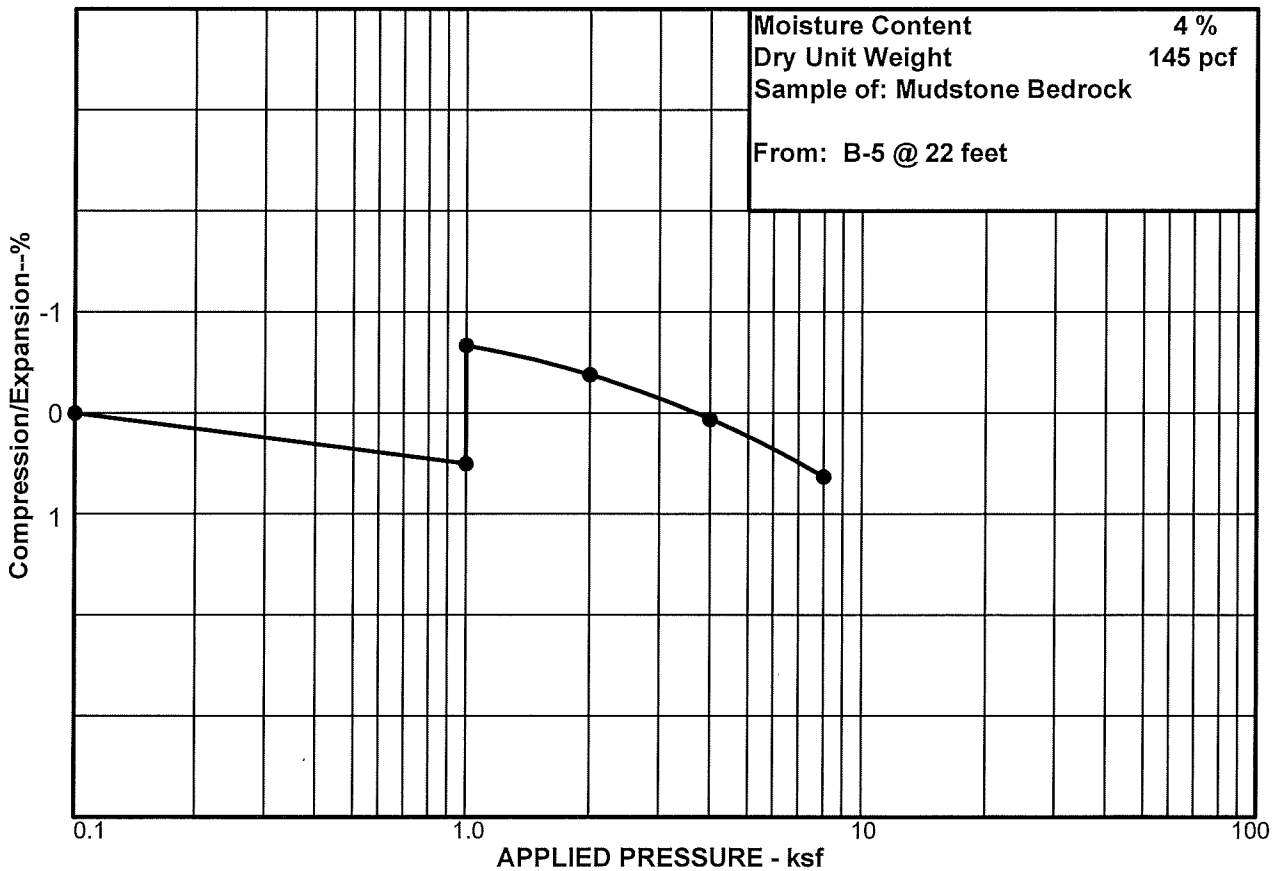
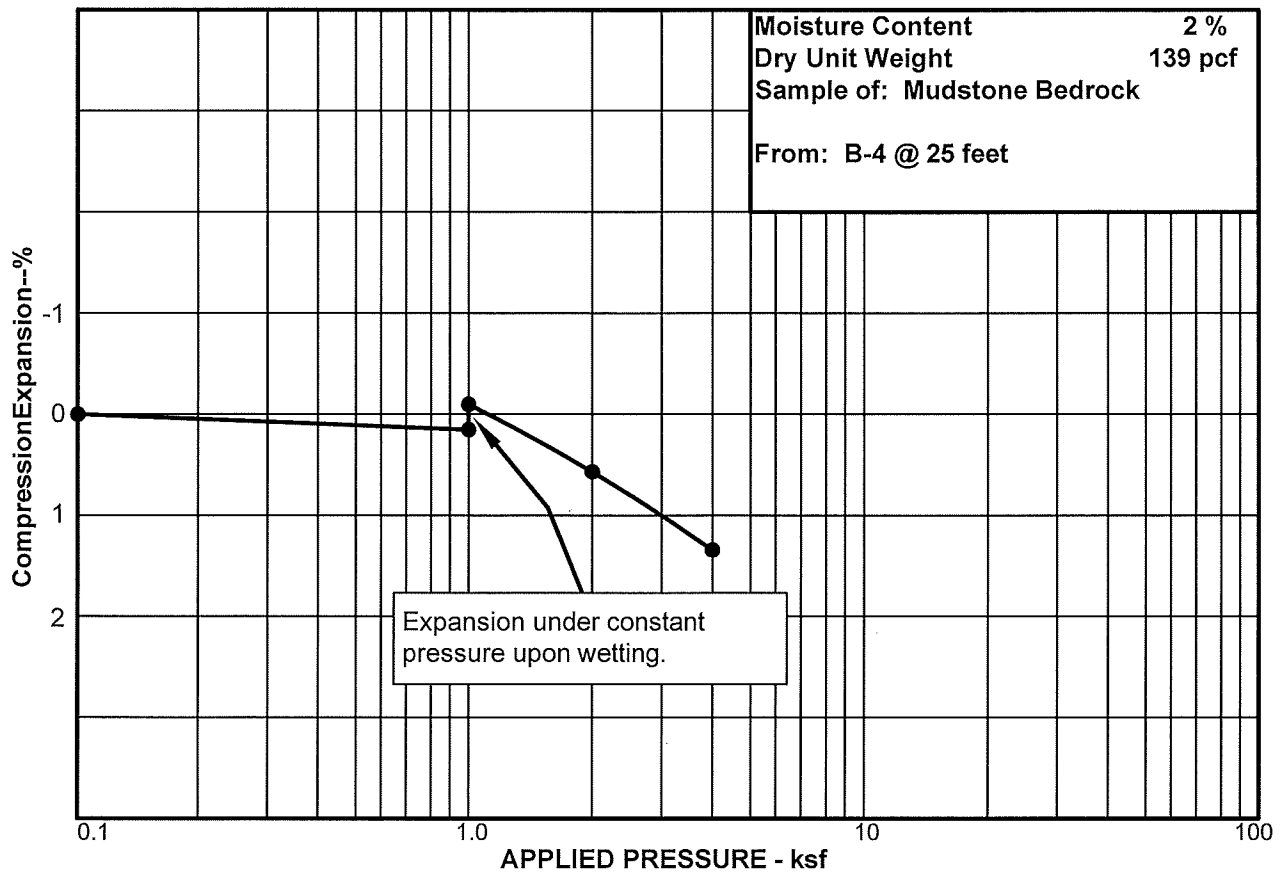
Testing performed in general accordance with ASTM D4318.
 NP = Nonplastic
 NM = Not Measured

	PROJECT NO.: 20162945 DRAWN BY: MAP CHECKED BY: DATE: REVISED: -	ATTERBERG LIMITS Dixie Regional Medical Center 1380 East Medical Center Drive St. George, Utah	APPENDIX C-3

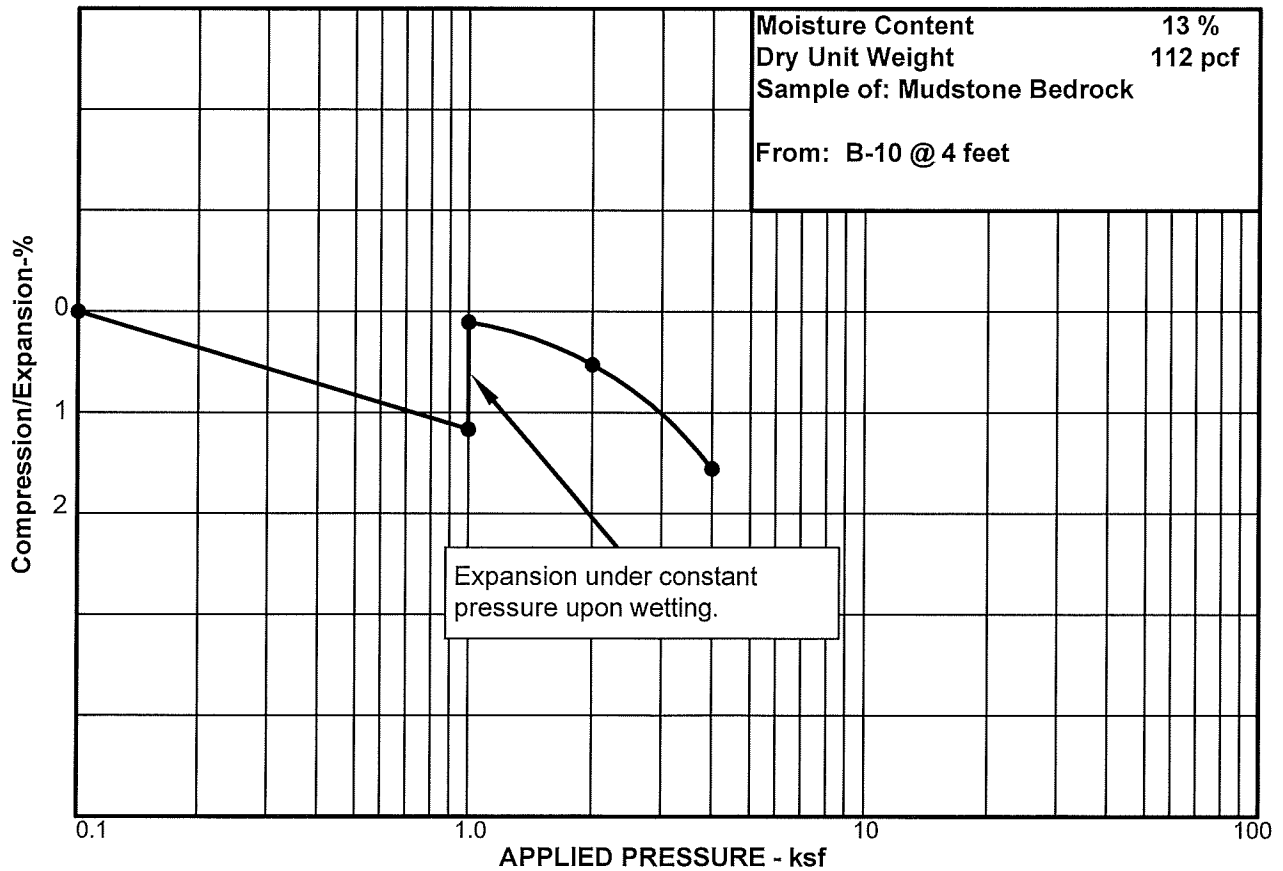
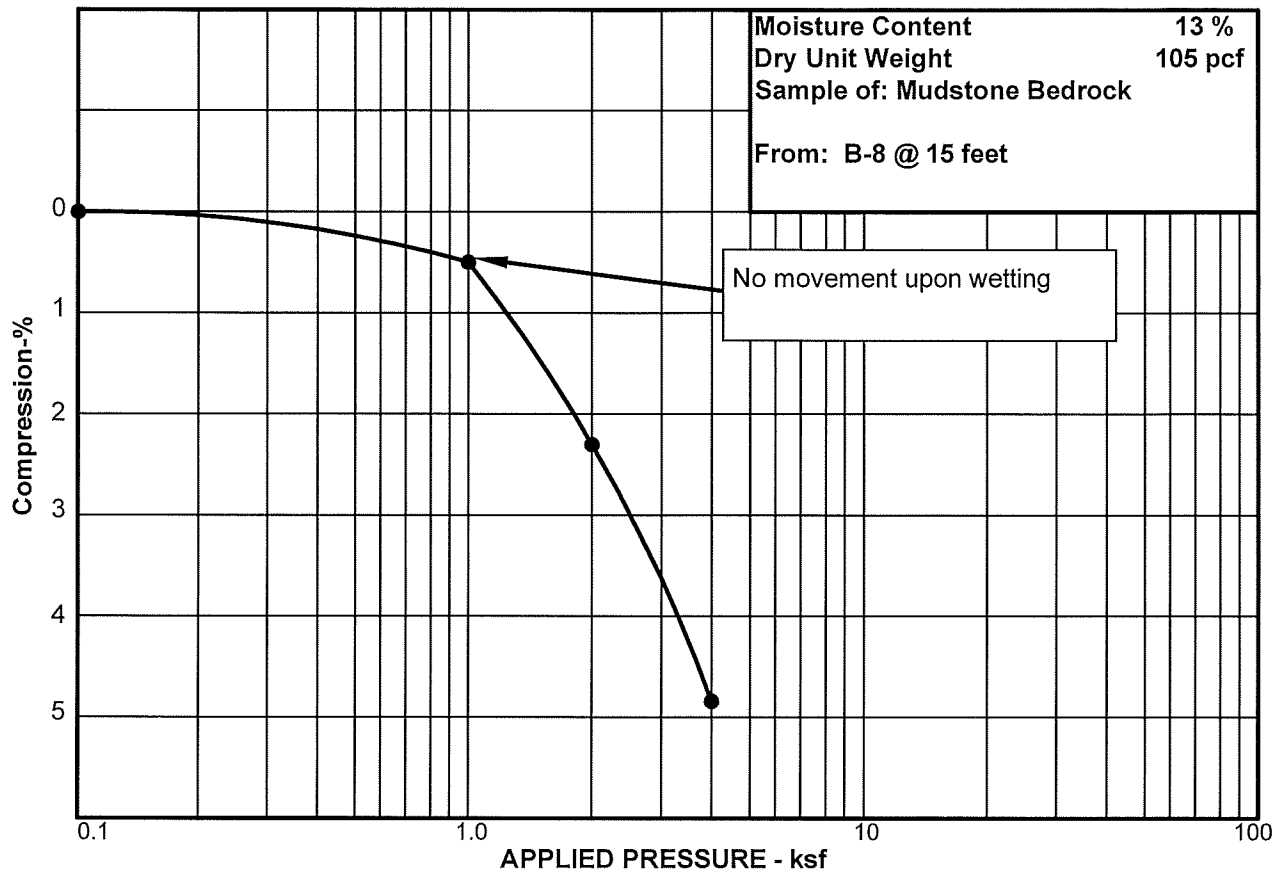
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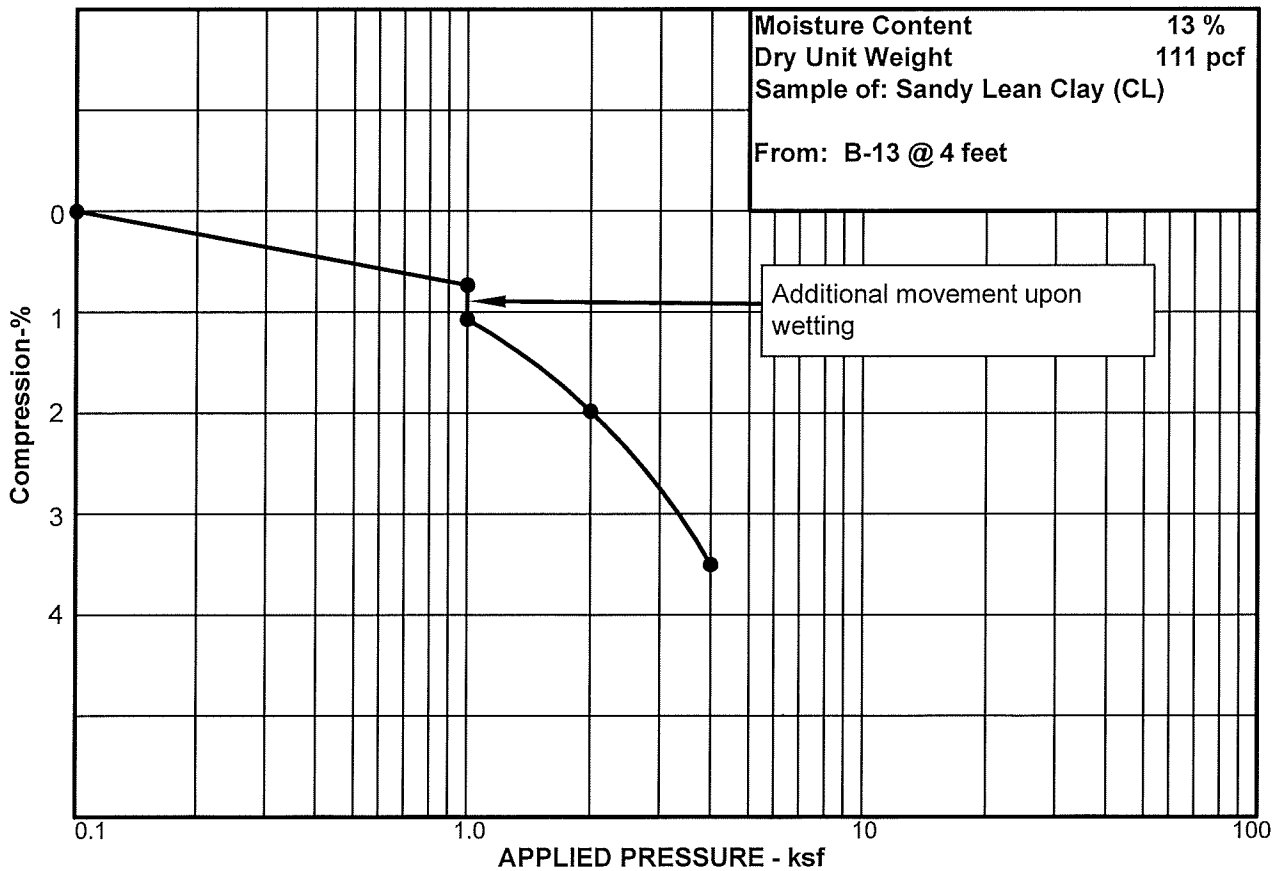
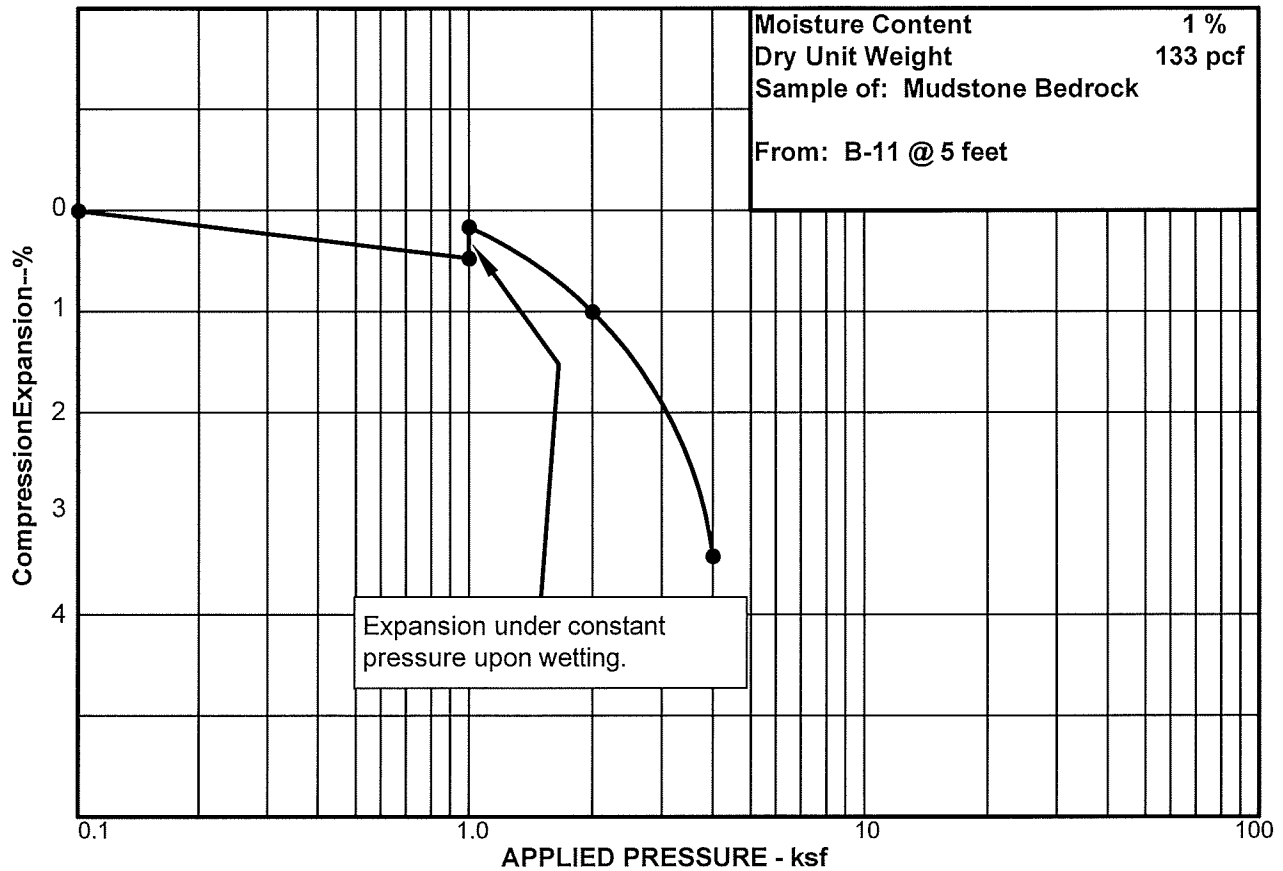
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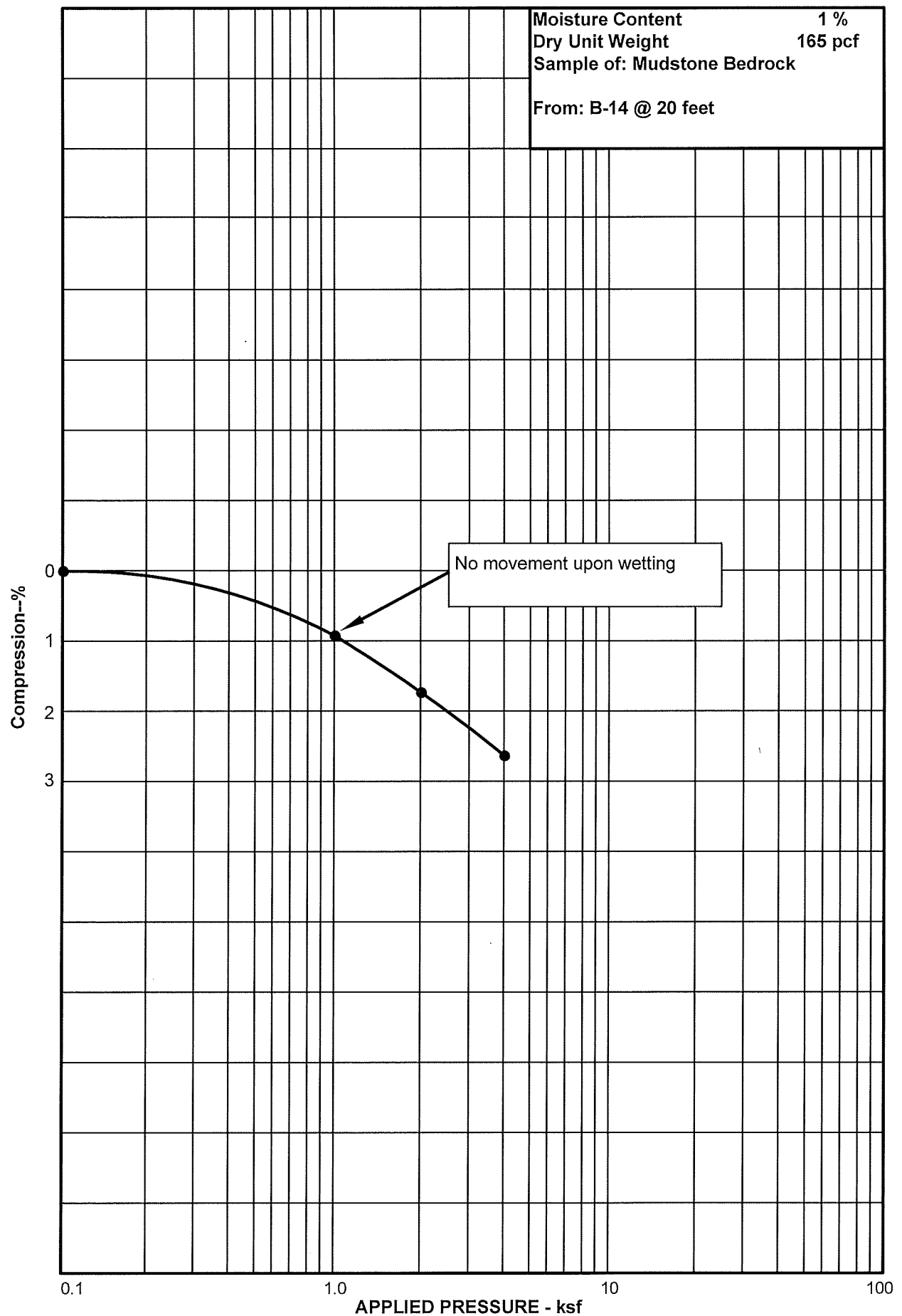
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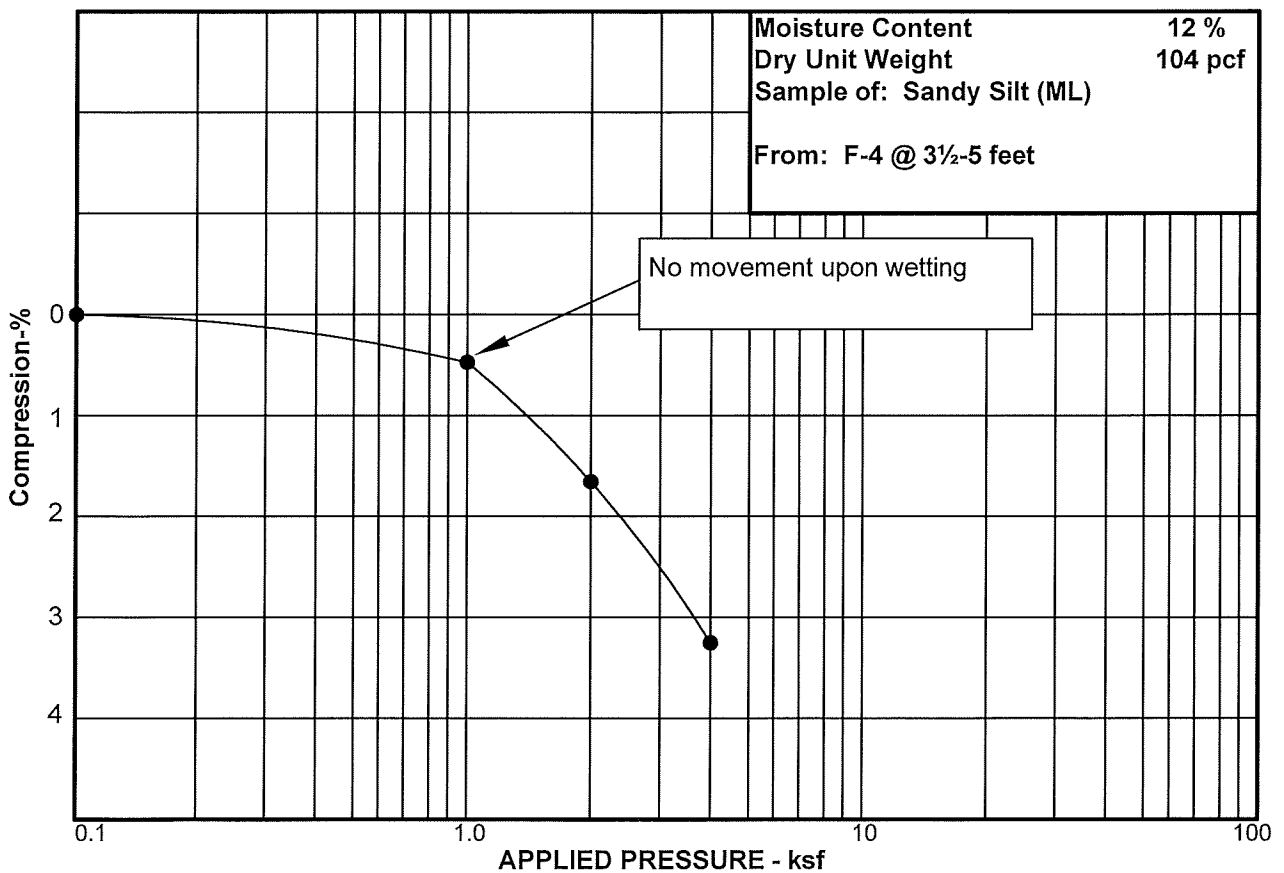
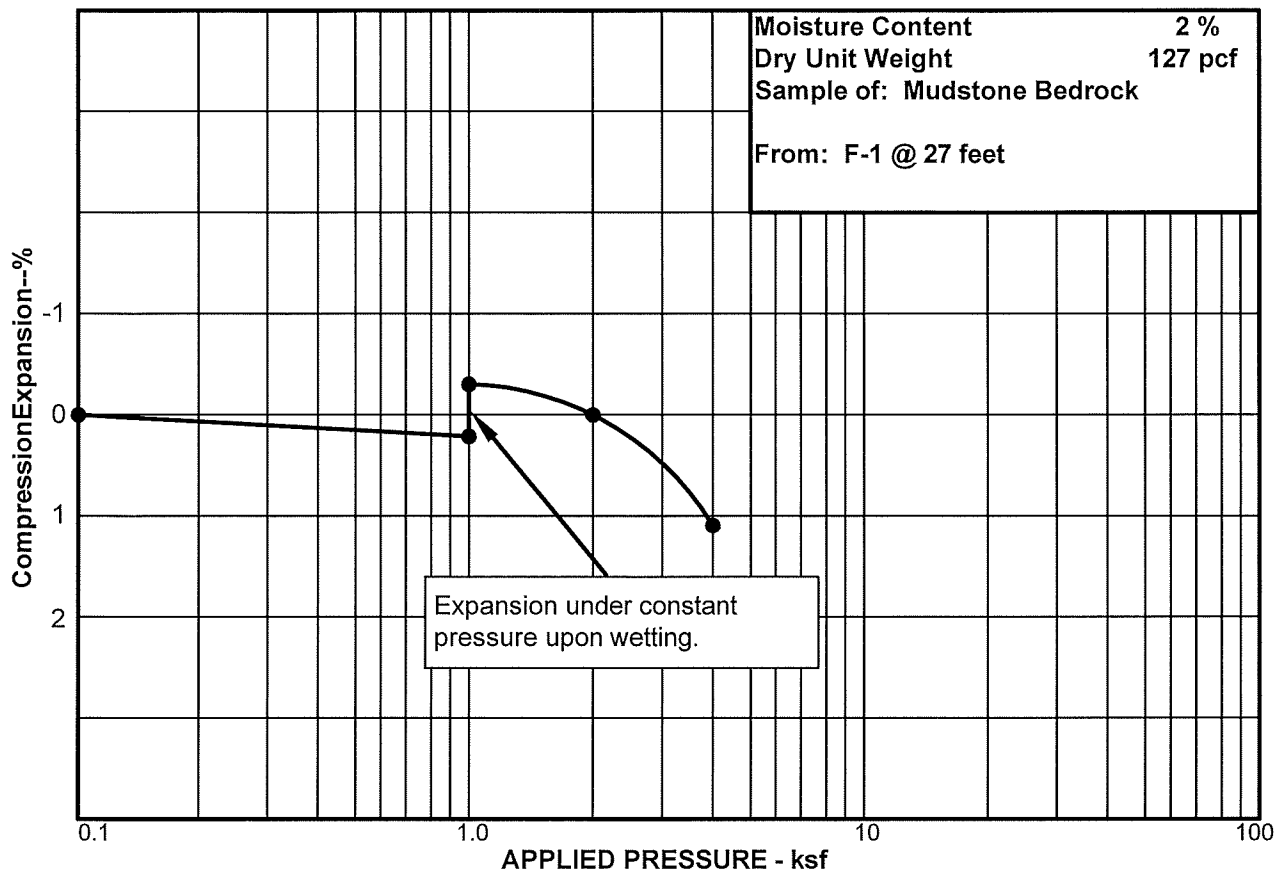
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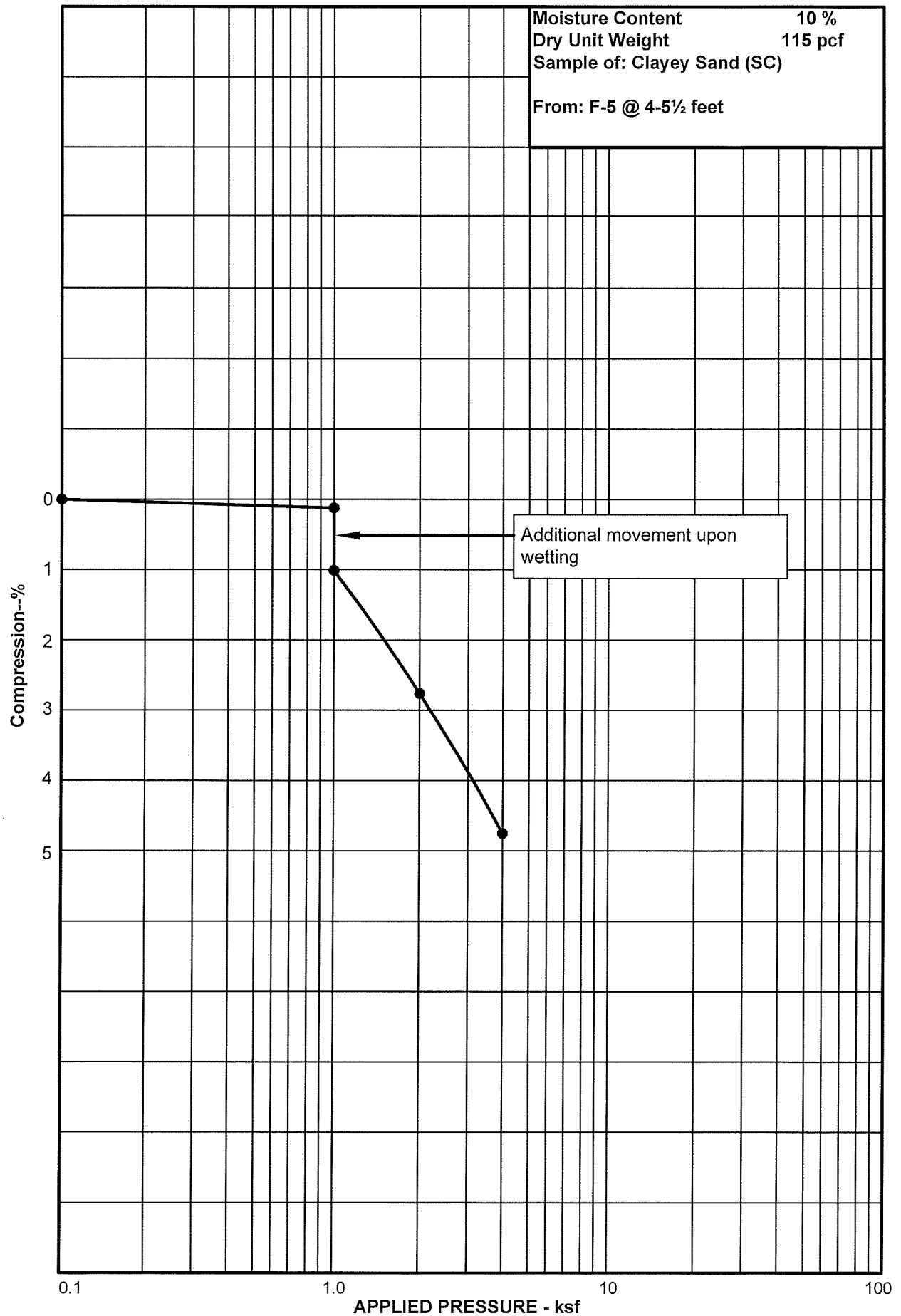
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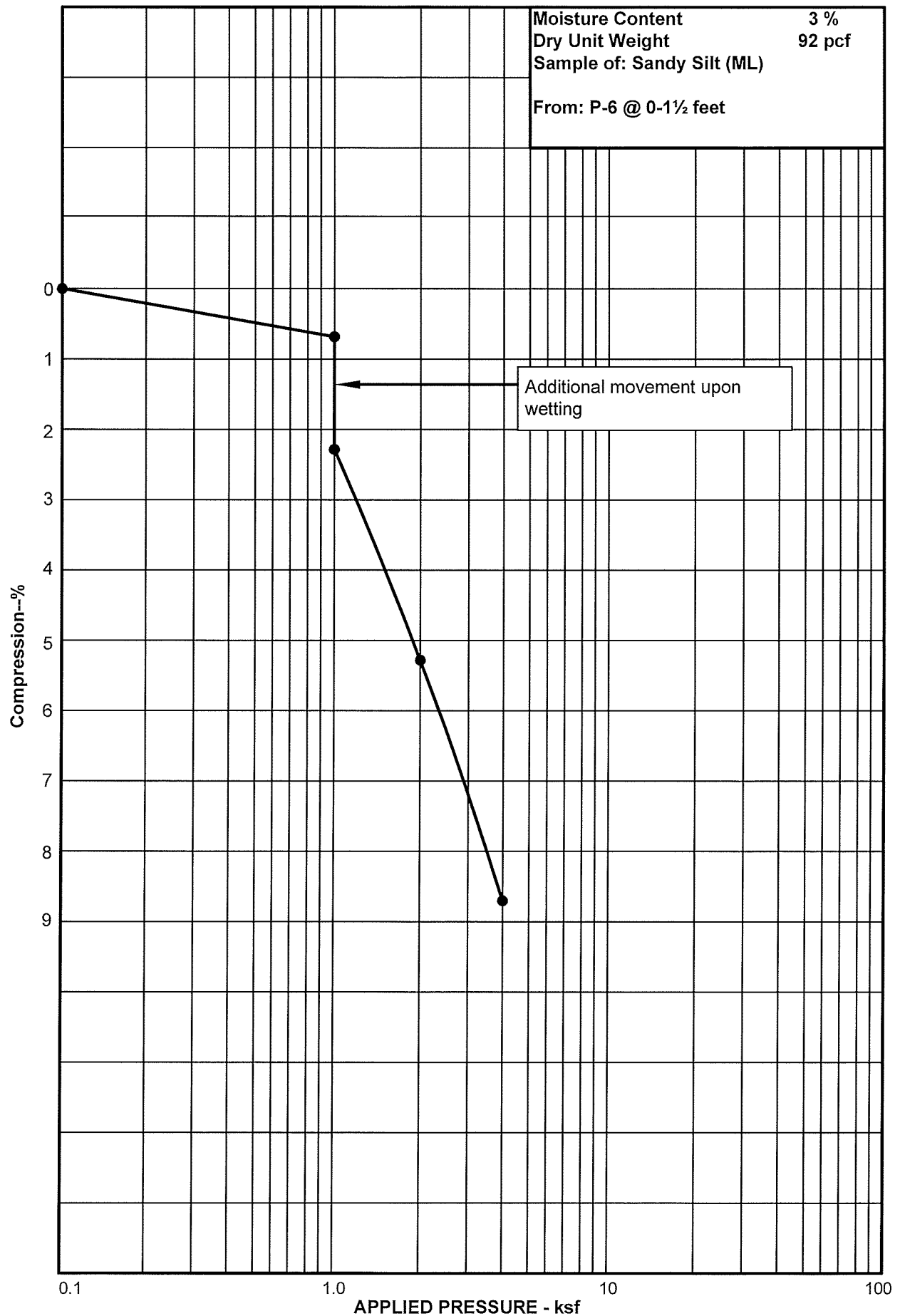
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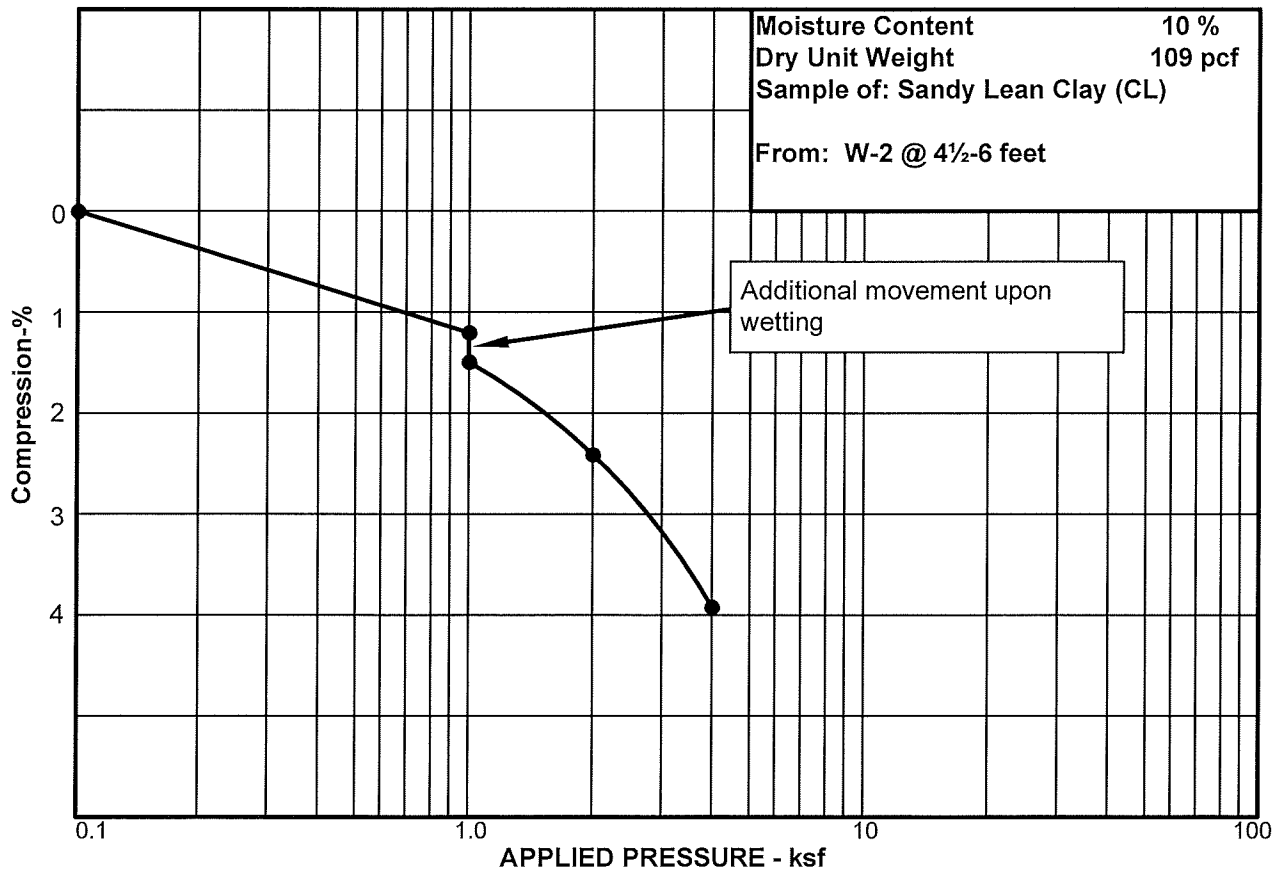
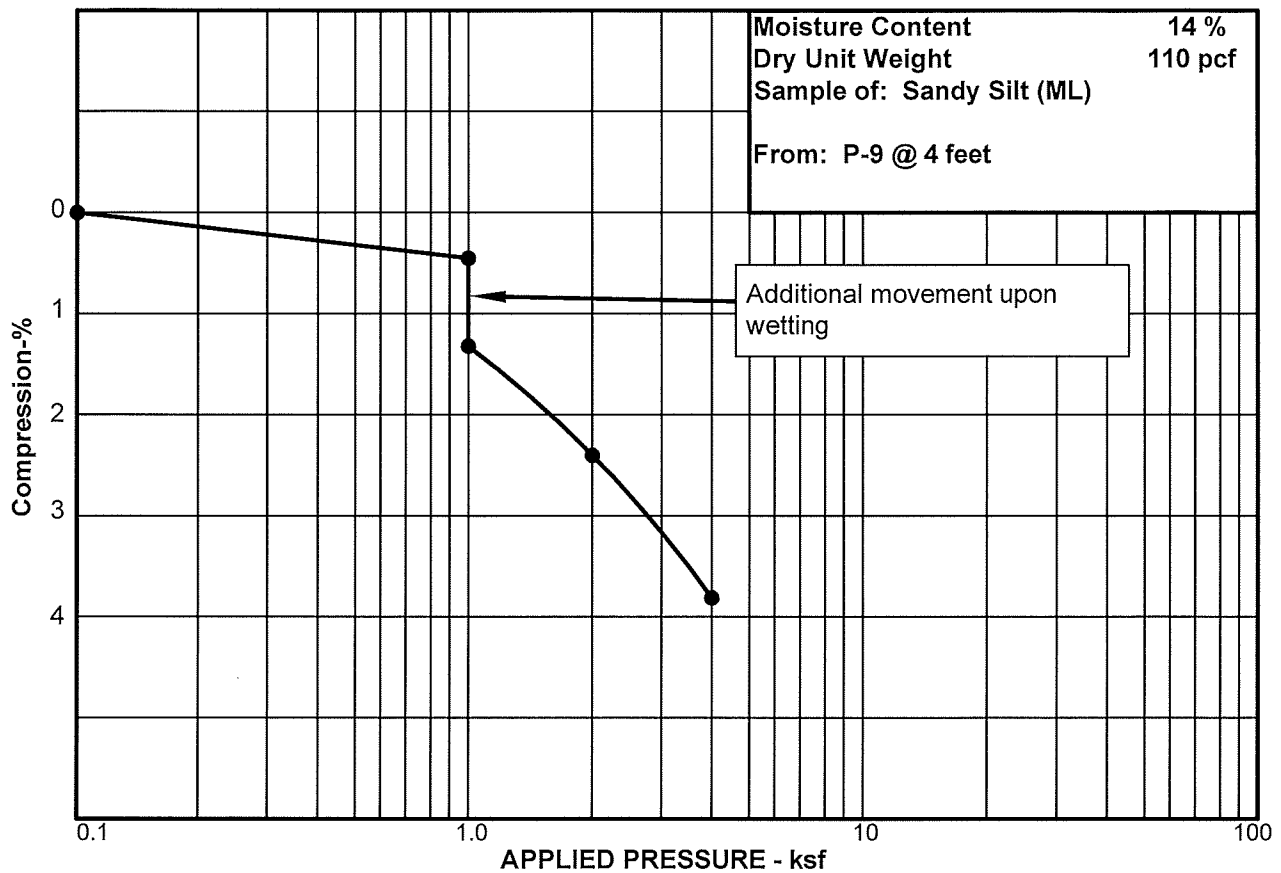
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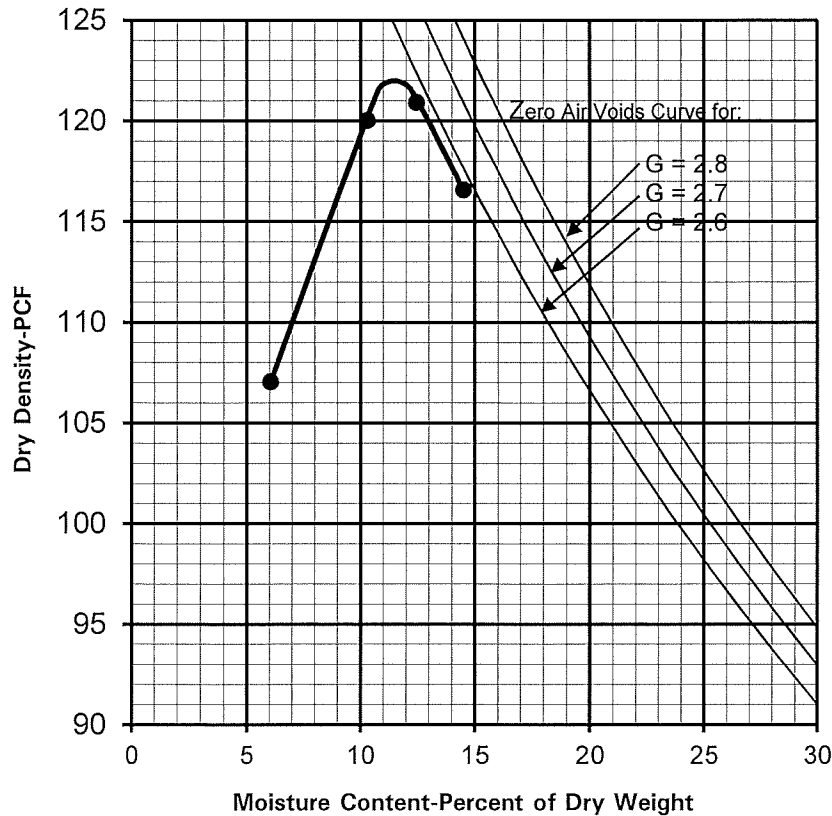
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Applied GeoTech

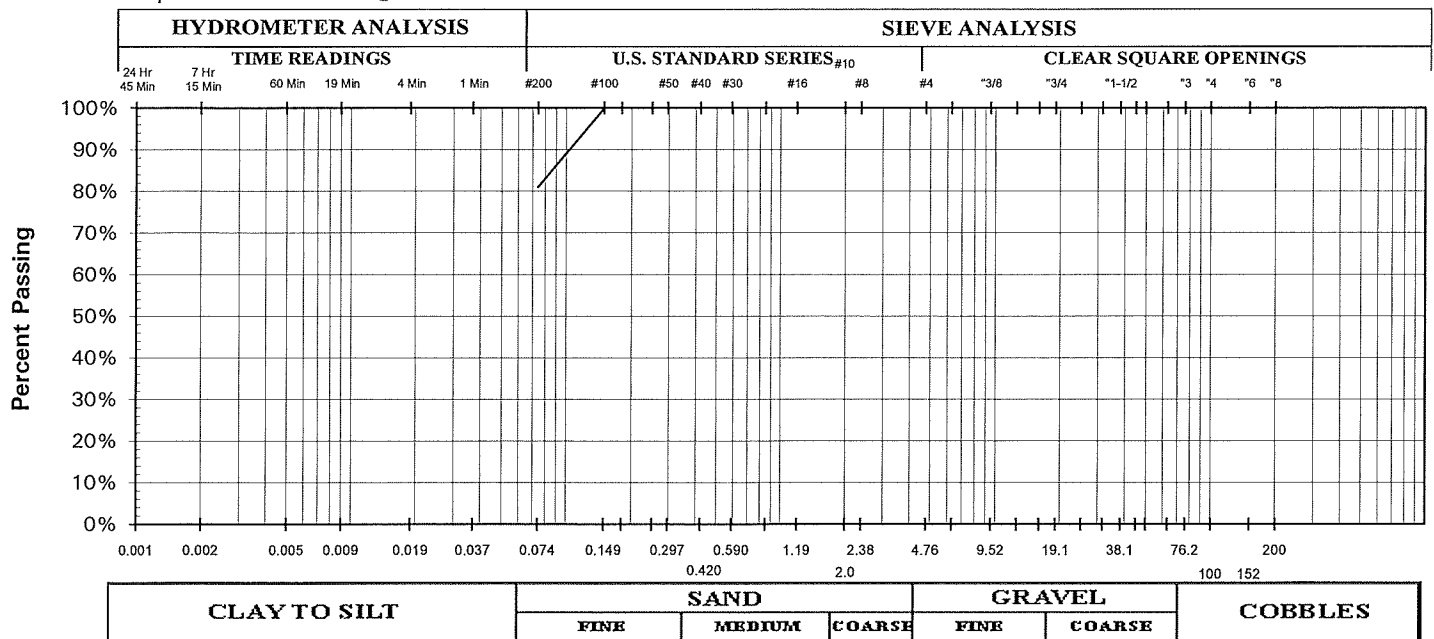
Project: IHC Expansion (Drilling and Lab)



Sample Date: 12/4/15
Sample No. 151208A
Maximum Dry Density: 122.0
Optimum Moisture: 11.5
Atterberg Limits
Liquid Limit:
Plasticity Index: Non-Plastic
Gradation
Gravel: 0%
Sand: 19%
Silt & Clay: 81%

Moisture - Density Relationship Test Procedure: ASTM D-698 B
Sample Description: silt with sand (ML)
AASHTO Classification: A-4
Sample Location: P-9 @ 2-4'

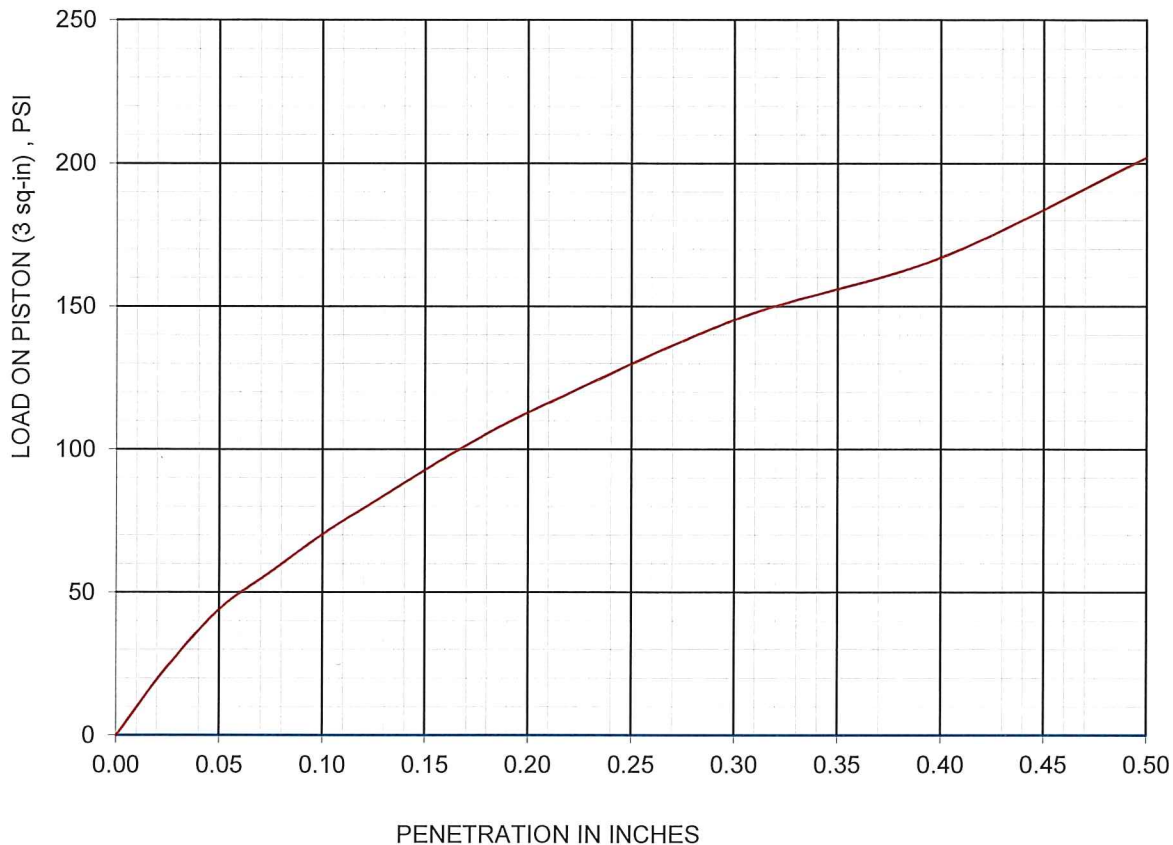
Reviewed By: TT



GRADATION AND MOISTURE-DENSITY RELATIONSHIP RESULTS

Project No.: 2151384

Figure:



Project	IHC Expansion (Drilling and Lab)			Sample Location	P-9 @ 2-4'		
Sample Classification	sandy Clay CL			AGEC Sample ID No.	A-120815		
Method of sample preparation: Remolded to approximately 95% of the maximum dry density at the optimum moisture content as per ASTM D 1557							
Sample penetration after soaking for				96	hours		
Dry Density:	as molded	120.5	pcf	Moisture Content:	as molded	11.1 percent	
	after soaking	119.8	pcf		top 1-inch after soaking	13.5 percent	
Swell:	after soaking	0.1	percent		average after soaking	13.1 percent	
	Comment CBR value taken at 0.2 inch penetration						
Bearing Ratio of Sample,		CBR =	8	percent	Surcharge	30 lb	



UTAH DEPARTMENT OF HEALTH
PERCOLATION TEST CERTIFICATE AND SOIL EXPLORATION RESULTS
(Information required for Determining Soil Suitability for Individual Wastewater Disposal Systems)

Project/Property Location: **IHC Expansion
St. George, Utah
Project No. 2151384**

Prepared for: **Kleinfelder, Inc.
Attn: Trent Parkhill
849 West Levoy Drive, Suite 200
Taylorsville, Utah 84123**

I certify that percolation tests have been conducted on the above property, in accordance with requirements specified in Section 5 of the **On-site Wastewater Systems Rule R317-4**, adopted by the Utah Department of Health, and that percolation rate, calculated as specified by said regulations, is as follows (use reverse side or additional sheets if necessary):

TEST HOLE NO.	TEST HOLE DEPTH (FEET)	SATURATION PERIOD (HOURS)	SWELLING PERIOD (HOURS)	FINAL WATER LEVEL DROP 10 MIN. PERIOD* (INCHES)	FINAL STABILIZED PERCOLATION RATE ** (MINUTES PER INCH)
P3	1	1/2	NA	4	2.5

Date percolation test conducted: **December 10, 2015**

Statement of present and maximum anticipated groundwater table throughout the property and area of the proposed soil absorption: **Groundwater was not encountered to a depth of 0 feet.**

I hereby certify that, to the best of my knowledge, the foregoing information is correct.

Date **December 14, 2015**

Signed by:

APPENDIX D

Important Information about your Geotechnical Engineering Report

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply this report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time to perform additional study.* Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold-prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical-engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.



8811 Colesville Road/Suite G106, Silver Spring, MD 20910

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e-mail: info@geoprofessional.org www.geoprofessional.org

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June 16, 2016
Kleinfelder Project No: 20162945.001A

Intermountain Healthcare
36 South State Street, 23rd Floor
Salt Lake City, UT 84111-1486

ATTENTION: Mr. Steve Kelly
Facility Planning and Development

SUBJECT: ADDENDUM NO. 1 - GEOTECHNICAL ENGINEERING REPORT
DIXIE REGIONAL MEDICAL CENTER (DRMC) CONSOLIDATION PROJECT
1380 EAST MEDICAL CENTER DRIVE
ST. GEORGE, UTAH

Dear Mr. Kelly:

Kleinfelder Inc. was retained by Intermountain Healthcare (IHC) to perform additional geotechnical services for the Precision Medicine Building associated with the Dixie Regional Medical Center (DRCM) Consolidation Project. We understand that the project will include the construction of the 117,000 square foot, 1 to 2 story, Precision Medicine Building and two associated parking areas as shown in Figures A-1 and A-2 in Appendix A.

This addendum letter summarizes the results of our field and laboratory testing and provides recommendations relating to the geotechnical aspects of project design and construction specific to the Precision Medicine Building and associated parking areas only. The conclusions and recommendations given in this addendum should not be used for other structures associated with the DRMC Consolidation Project. Unless otherwise stated in this letter, all recommendations given in the referenced geotechnical report are valid for the Precision Medicine Building.

SCOPE OF SERVICES

As authorized by IHC, per our proposal dated May 5, 2016, our scope of services for additional exploration and evaluation included the following items:

Kleinfelder's scope of services included:

- Review existing site conditions and the proposed grading and structure design, and evaluate an "excavate and replace" design alternative for the building foundation support.
- Field exploration including the drilling of 13 borings to depths ranging from 5½ to 35 feet below the ground surface at the approximate locations shown on Figure A-2.
- Laboratory testing of select soil samples recovered from the borings to evaluate pertinent soil and rock properties.
- Attachments including logs of borings and laboratory test results.
- Provide a brief letter report that will include boring logs, laboratory testing, and any required updates to the foundation recommendations in our existing geotechnical report (Kleinfelder 2016).

FIELD EXPLORATION AND LABORATORY TESTING

Field Investigation

Kleinfelder drilled 13 exploratory borings at the site between May 25 and 26, 2016. The exploratory borings were advanced using a CME-55 truck-mounted drill rig equipped with 9-inch outside diameter (O.D.) hollow-stem augers and air coring capabilities. Three of the proposed borings were not completed due to site access difficulties. Subsurface soil samples were obtained during exploration using a standard split-spoon sampler (2-inch O.D.) or a modified California sampler (2.5-inch O.D.) driven into the soil with blows from a 140-pound automatic hammer falling through a 30-inch drop. The raw blows required to drive the samplers into the soil are recorded on each of the boring logs. These blow counts are an indication of the relative density or consistency of the on-site soils. Subsurface rock samples were obtained during exploration by air coring.

Samples obtained during the field exploration were transported to a laboratory for further examination and testing. Samples will be retained for a period of 90 days from the date of this addendum letter after which time samples will be discarded unless otherwise requested by the Intermountain Health Care.

Approximate boring locations are shown on the Exploration Location Map (Figure A-2). Appendix B includes graphical logs of the exploration borings and Appendix C includes laboratory test results. A key to the logs and a summary of the USCS (Unified Soil Classification System) soil descriptions are also contained in Appendix B. The lines defining boundaries between soil types on the logs are based upon Kleinfelder's field observations and are therefore approximate. Transition between soil types may be abrupt or may be gradual.

Laboratory Testing

Geotechnical laboratory tests were performed on selected soil and rock samples to estimate their relative engineering properties. Testing for the following properties was performed in general accordance with recognized standards:

- Moisture Content (7 tests);
- Dry Density (6 tests)
- Minus 200 Wash (4 tests);
- Gradation (2 tests)
- Atterberg Limits (6 tests);
- Swell/Collapse Test (5 test);

Results of the geotechnical laboratory tests are included in Appendix C of this report. Selected geotechnical test results are also shown on the boring logs contained in Appendix B.

Analytical Laboratory Testing

Analytical laboratory testing was not within the scope of work for this phase of the site development. However; testing performed by AGECE (April 2009) indicates that on-site soils contain water soluble sulfate concentrations ranging from 445 to 9,225 ppm.

SURFACE AND SUBSURFACE CONDITIONS

Near surface sediments encountered in our explorations generally consisted of 4 to 15 feet of soil overlying bedrock. The soils encountered during our investigation generally consisted of sand, silt and clay mixtures. The underlying rock was composed of claystone, siltstone, and sandstone with various degrees of weathering and strength.

Groundwater

Groundwater was not observed in the boring performed for this part of the DRMC Consolidation Project. However, groundwater was encountered in previous investigations as discussed in the referenced geotechnical reports. Groundwater levels are generally dependent on seasonal precipitation, irrigation practices, and land use and runoff conditions. As such, it is possible that the observed water level may fluctuate during dryer and wetter seasons of the year. A detailed study of site hydrogeologic conditions was beyond the scope of work of this investigation; as a result, we are unable to characterize potential groundwater fluctuations at the site.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our field and laboratory investigations, it is our opinion that the site is suitable for the construction of the proposed structure and associated parking areas provided that the recommendations contained in this report and the referenced geotechnical report (Kleinfelder 2016) are followed, with particular attention given to the expansive soil and rock issues. These opinions, conclusions, and recommendations are based on our field exploration, engineering analysis, the properties of the materials encountered in our borings, the results of the laboratory testing program, and our understanding of the proposed development of the site.

It is our understanding that given the amount of fill that needs to be placed, that rather than constructing the Precision Medicine building with drilled shafts and a structural slab, IHC has decided to build the proposed structure with footings and a slab-on-grade supported on non-expansive structural fill. In order to mitigate the adverse effects of swelling and collapsible material found on-site, we recommend that the structure slab be supported by a minimum of 15 feet of non-expansive structural fill. This fill should be placed on compacted as described in the structural fill section below.

STRUCTURAL FILL AND COMPACTION

Structural fill placed within the proposed construction may be comprised of native soils that are classified as silt, sand, gravel, or any mixture of these soil types. Structural fill may also be comprised of reworked rock that classifies as siltstone or sandstone or any combinations of these rock types. Any native soil classified as lean clay or fat clay and any native rock classified as claystone, silty claystone, mudstone, or shale **should not** be reworked and used as structural fill. These soil and rock types have been shown to be very expansive when reworked and, if used as fill, could create an environment where very high differential movement in the structure could occur. **If native soils are used as structural fill, very careful, experienced, and continuous monitoring must be in effect to ensure that the correct soil types are used. Failure to carefully monitor the soil and rock types used for fill and/or mistakes in judgement regarding the classification of backfill materials would be expected to cause distress in the structure, should water get into the subgrade at some point in the future.**

Imported structural fill should be comprised of imported material that meets the specifications outlined in Table 1 or untreated base course (UTBC) meeting the requirements outlined in Table 2. As an alternate, UTBC meeting the UDOT specification is acceptable if the earthwork contractor provides a job mix target gradation for the imported UTBC. The job mix gradation may deviate from the job mix target gradation as allowed by the UDOT specification. The job mix gradation may not exceed the minimum percent passing outlined in the Job Mix Gradation Target Band outlined in the UDOT specification.

TABLE 1
CRITERIA FOR USE OF STRUCTURAL FILL

Gradation Requirements	
Standard Sieve Size	Percent Passing
4 inch	100
¾ inch	100-70
No. 40	10-60
No. 200	0-15
Plasticity Requirements of Fines (Atterberg Limits)	
Plasticity Index	6 or less

*Fill with more than 15 percent fines may be acceptable as approved by Kleinfelder

TABLE 2
CRITERIA FOR UNTREATED BASE COURSE

Gradation Requirements	
Standard Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90-100
3/4 inch	70-85
1/2 inch	65-80
3/8 inch	55-75
No. 4	40-65
No. 16	25-40
No. 200	7-11
Plasticity Requirements of Fines (Atterberg Limits)	
Plasticity Index	6 or less

Untreated base course material should be comprised of Untreated Base Course Aggregate Class “C” per Section 02721 of the Utah Department of Transportation Standard Specifications for Untreated Base Course.

Imported fill materials should be approved by the testing agency prior to importing. Also, prior to placing structural fill, the excavation should be observed by the testing agency to note that unsuitable material has been removed, that the excavation has reached the required 15 ft. below slab, and that the exposed soil is in a firm and unyielding condition.

Structural fill should be placed in maximum 8-inch-thick loose lifts and compacted to at least 95 percent of the maximum dry density as determined by ASTM-D1557 (Modified Proctor). The contractor should moisture condition the soils to within the $\pm 2\%$ of the optimum water content as determined using the Modified Proctor. The native soils are expected to be moisture sensitive and may pose a challenge in meeting the recommended compaction. All utility trenches should be backfilled with imported structural fill.

FOUNDATIONS

All foundation parameters are dependent on the material used for structural fill on the site. Foundation parameters are presented in Table 1 for native and imported structural fill placed and compacted as described in the previous section. Conventional continuous and spread footings established on structural fill as described above, may be proportioned using a maximum net allowable soil bearing capacity shown in Table 3. All footings should be founded a minimum of 18 inches below the final grade. A one third increase in allowable bearing capacity may be applied for transient wind or seismic loads. It is estimated that total, static, post-construction settlement of the fill and footings should be on the order of 1 inch or less with maximum differential settlements of ½ inch or less.

TABLE 3
FOUNDATION PARAMETERS

Parameter	Native Soils as Structural Fill	Imported Structural Fill
Bearing Capacity	3,500 psf – Spot footings 5 feet x 5 feet or larger, strip footings larger than 3 feet.	5,000 psf
	3,000 psf - Spot footings smaller than 5 feet x 5 feet and strip footings smaller than 3 feet wide.	
At Rest Equivalent Lateral Fluid Weight	61 pcf	52 pcf
Active Equivalent Lateral Fluid Weight	42 pcf	33 pcf
Passive Equivalent Lateral Fluid Weight	318 pcf	442 pcf
Increase in Equivalent Lateral Fluid Weight Due to Seismic Loading	10 pcf	10 pcf
Coefficient of Friction	0.35	0.46
Modulus of Subgrade Reaction, k_1 (pci)	90 pci	200 pci

Bearing surfaces for foundations should not be left exposed during inclement weather. Saturation of the on-site soils can cause instability of foundation excavations. If inclement weather is expected during footing excavations, or if the footings will be exposed for an extended period of time, the contractor should consider taking measures to convey storm water away from work areas.

Excavations for footings should either be recompact, completed with a smooth bucket backhoe, or be trimmed by hand following excavation to minimize disturbance of the compacted structural fill soils. Upon their exposure, all bearing grades should have excess and loosened material removed. The final grades should be firm and stable, and free of any loose soil, rock, mud, water or frost. Also, concrete should not be placed on frozen subgrades.

Foundation bearing surfaces should be observed by a geotechnical engineer prior to concrete placement to confirm that suitable soils are present at the bearing elevation. Soft or unsuitable areas observed at the bearing elevation should be overexcavated to firm material at the direction of a geotechnical engineer. Any bearing grades which are identified as exhibiting insufficient shear strength should be overexcavated as directed by the geotechnical engineer. The width of the base of the overexcavation should be at least as wide as the footing plus the depth of the overexcavation. This will facilitate proper distribution of the applied foundation pressures within the structural fill.

Horizontal loads acting on foundations formed in open excavations will be resisted by friction acting at the base of foundations and by passive earth pressures. If design makes use of passive earth pressures, it is important that any backfill below or around footings is placed and compacted properly. Therefore, we recommend that the inspectors monitoring the earthwork be present during any footing backfill placement.

The friction acting along the base of footings founded on native soils may be computed by using the coefficient of friction presented in Table 3 with the normal dead load. An ultimate lateral passive earth pressure may be computed using the passive equivalent lateral fluid weight presented in Table 3 for the side of footings placed against properly placed and compacted structural fill. An appropriate factor of safety should be applied to the passive earth pressure value listed above. The values given above may be increased by one-third for transient wind or seismic loads.

An at rest earth pressure may be computed by using the at rest equivalent lateral fluid weight shown in Table 3 for the side of foundation walls backfilled with properly placed and compacted structural fill.

CONCRETE SLABS

Direct support for the concrete floor slabs may be provided by a minimum 6-inch blanket of untreated base course (UTBC) material. Prior to placement of the base course material, a minimum of 15 feet of non-expansive structural fill should be placed as described above. As a basis for designing concrete slab thickness, soils prepared and compacted according to the specifications of this report may be considered to possess the subgrade modulus (k_1) given in Table 3. It is prudent to prevent compacted subgrades from drying out prior to placement of UTBC to prevent long-term moisture susceptibility to the subgrade beneath slabs. It is likewise prudent to prevent moisture buildup beneath concrete slabs on grade. The water content of the structural fill beneath the slab should be checked prior to placement of the UTBC. If, just prior to placement of the UTBC, the soils are found to have dried below the optimum water content of these soils, the surficial soil should be moisture conditioned and recompacted.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking, or curling in the slabs. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute Manual (ACI, 2011).

Soil Corrosion and Reactivity

No additional laboratory testing was completed during this phase of the investigation to provide data regarding corrosivity of onsite soils. Our scope of services does not include corrosion engineering and, therefore, a detailed analysis of the corrosion test results is not included in this report. A qualified corrosion engineer should be retained to review the test results and design protective systems that may be required. Kleinfelder may be able to provide those services.

Ferrous metal and concrete elements in contact with soil, whether part of a foundation or part of the supported structure, are subject to degradation due to corrosion or chemical attack. Therefore, buried ferrous metal and concrete elements should be designed to resist corrosion and degradation based on accepted practices.

The degradation of concrete or cement grout can be caused by chemical agents in the soil or groundwater that react with concrete to either dissolve the cement paste or precipitate larger compounds within the concrete, causing cracking and flaking. The concentration of water-soluble sulfates in the soils is a good indicator of the potential for chemical attack of concrete or cement grout. The American Concrete Institute (ACI) in their publication *Guide to Durable Concrete* (ACI 201.2R-08) provides guidelines for this assessment.

While laboratory testing for corrosion or reactivity was not part of the scope of this project, testing performed by AGECEC (April 2009) indicates that on-site soils contain water soluble sulfate concentrations ranging from 445 to 9,225 ppm. The results of sulfate test indicate that the potential for deterioration of concrete is moderate and that a Type II cement should be used.

LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than three years from the date of the report.

The work performed was based on project information provided by Client. Any changes in the project information listed herein that will have an impact on recommendations in this report must be approved by Kleinfelder's engineer.

The scope of services was limited at each site. It should be recognized that definition and evaluation of subsurface conditions are difficult. Judgments leading to conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. The client and key members of the design team should discuss the issues covered in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk and expectations for future performance and maintenance.

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. If soil, rock or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that Kleinfelder is notified immediately so that we may reevaluate the recommendations of this report. If the scope of the proposed construction, including the estimated building loads, and the design depths or locations of the foundations, changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions of this report are modified or approved in writing, by Kleinfelder.

As the geotechnical engineering firm that performed the geotechnical evaluation for this project, we recommend that Kleinfelder be retained to verify the design assumptions and confirm the recommendations of this report are properly incorporated in the design of this project, and properly implemented during construction. This may avoid misinterpretation of the information by other parties and will allow us to review and modify our recommendations if variations in subsurface conditions are encountered. It is our recommendation Kleinfelder be retained to provide the following continuing services for the project:

- Review the project plans and specifications, including any revisions or modifications;
- Observe and evaluate the site earthwork operations to confirm subgrade soils are suitable for construction of foundations, slabs-on-grade, pavements and placement of engineered fill;

- Confirm engineered fill for the structure and other improvements is placed and compacted per the project specifications; and
- Observe foundation bearing soils to confirm conditions are as anticipated.

If a third party is retained to provide the above activities, they are responsible to notify Kleinfelder of any changed site conditions that affect the recommendations presented herein. Kleinfelder must also be retained to perform a supplemental evaluation and to issue a revision to our original report. If notification is not provided, the testing company will assume responsibility associated with the changed site conditions.

Kleinfelder cannot be responsible for interpretation by others of this report or the conditions encountered in the field.

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's geotechnical engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during earthwork and foundation construction. Furthermore, the contractor should be prepared to handle contamination conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers.

This service includes providing information obtained through laboratory testing regarding corrosivity of on-site soils. Kleinfelder does not practice corrosion engineering and, therefore, detailed analysis of corrosion test results is not included. We recommend a qualified corrosion

engineer be retained to review the test results and design protective systems that may be required.

This service includes information obtained through laboratory testing regarding nutrients of onsite soils. Kleinfelder does not practice landscape architecture and, therefore, detailed analysis of soil nutrient test results is not included in this report. We recommend a qualified landscape architect be retained to review the test results.

Sincerely,

KLEINFELDER, INC



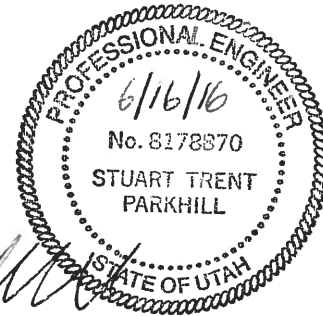
Matthew Moriarty, EIT

Staff Geotechnical Engineer



Trent Parkhill, PE

Sr. Principal Geotechnical Engineer



REFERENCES

Kleinfelder, Geotechnical Engineering Report, Dixie Regional Medical Center (DRMC) Consolidation Project, 1380 East Medical Center Drive, St. George, Utah, Project No. 20162945, dated January 8, 2016.



KLEINFELDER

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APPENDIX A

Figures



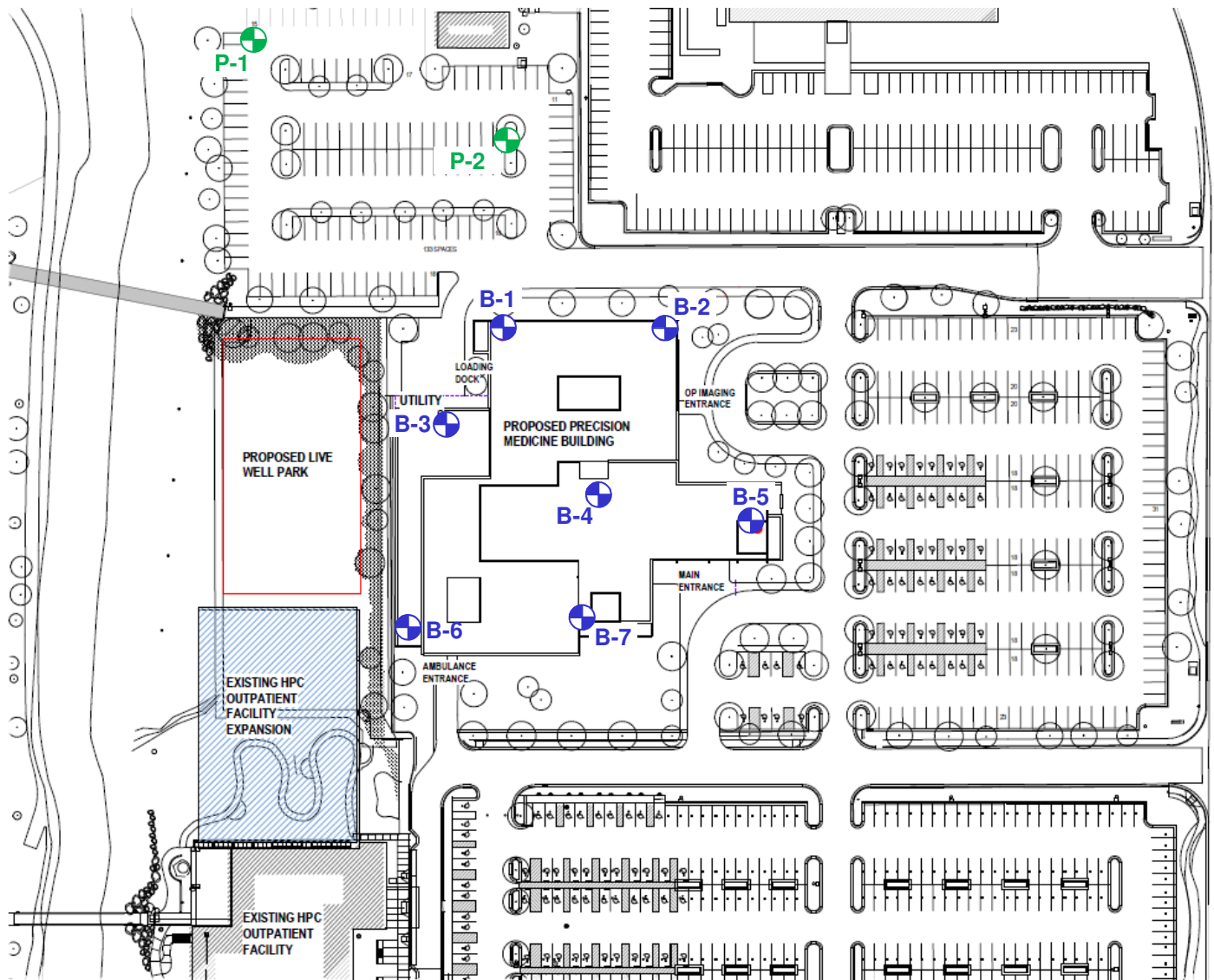
PROJECT NO.	20162945
DRAWN	6/13/2016
DRAWN BY:	M. Moriarty
CHECKED BY:	T. Parkhill
FILE:	

SITE VICINITY MAP

Addendum No. 1 Dixie Regional Medical Center Consolidation Project
1380 East Medical Center Drive
St. George, UT

FIGURE

A-1



LEGEND & NOTES

 Building Boring Location,
 Parking Lot Boring Location,

Notes:

- Locations are approximate
- Base image provided by HDR

The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO. 20162945	EXPLORATION LOCATION MAP	FIGURE A-2
	DRAWN 6/13/2016		
	DRAWN BY: M. Moriarty	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, UT	
	CHECKED BY: T. Parkhill		
	FILE:		



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APPENDIX B

Logs of Exploratory Borings

SAMPLE/SAMPLER TYPE GRAPHICS

CORE SAMPLER

MODIFIED CALIFORNIA SAMPLER
(2 or 2-1/2 in. (50.8 or 63.5 mm.) outer diameter)STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)**GROUND WATER GRAPHICS**

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

• The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.

• Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.

• No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.

• Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.

• In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.

• Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, i.e., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.

• If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

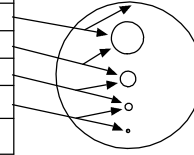
UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

GRAVELS (More than half of coarse fraction is larger than the #200 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu ≥ 4 and 1 ≤ Cc ≤ 3		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		Cu < 4 and/or 1 > Cc > 3		GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
	GRAVELS WITH 5% TO 12% FINES	Cu ≥ 4 and 1 ≤ Cc ≤ 3		GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
		Cu ≥ 4 and 1 ≤ Cc ≤ 3		GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
		Cu < 4 and/or 1 > Cc > 3		GP-GM	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES
		Cu < 4 and/or 1 > Cc > 3		GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES
	GRAVELS WITH > 12% FINES			GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES
SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH <5% FINES	Cu ≥ 6 and 1 ≤ Cc ≤ 3		SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		Cu < 6 and/or 1 > Cc > 3		SP	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
	SANDS WITH 5% TO 12% FINES	Cu ≥ 6 and 1 ≤ Cc ≤ 3		SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
		Cu ≥ 6 and 1 ≤ Cc ≤ 3		SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
		Cu < 6 and/or 1 > Cc > 3		SP-SM	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES
		Cu < 6 and/or 1 > Cc > 3		SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES
	SANDS WITH > 12% FINES			SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES
				SC-SM	CLAYEY SANDS, SAND-SILT-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 AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	SILTS AND CLAYS (Liquid Limit greater than 50)			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
				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

	PROJECT NO.: 20162945	GRAPHICS KEY Precision Medicine 1380 East Medical Center Drive St. George, UT	APPENDIX B-1
	DRAWN BY: MDM CHECKED BY: STP DATE: 6/9/2016 REVISED: -		

GRAIN SIZE

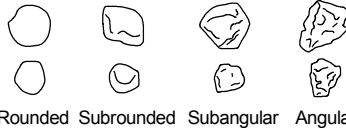
DESCRIPTION	SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders	>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles	3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse 3/4 - 3 in. (19 - 76.2 mm.)	3/4 - 3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine #4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse #10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium #40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine #200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines	Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller

**MUNSELL COLOR**

NAME	ABBR
Red	R
Yellow Red	YR
Yellow	Y
Green Yellow	GY
Green	G
Blue Green	BG
Blue	B
Purple Blue	PB
Purple	P
Red Purple	RP
Black	N

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

**PARTICLES PRESENT**

Amount	Percentage
trace	<5
few	5-10
little	15-25
some	30-45
and	50
mostly	50-100

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

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 is below water table

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N ₆₀ (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (q _u)(psf)	CRITERIA
Very Soft	< 1000	Thumb will penetrate soil more than 1 in. (25 mm.)
Soft	1000 - 2000	Thumb will penetrate soil about 1 in. (25 mm.)
Firm	2000 - 4000	Thumb will indent soil about 1/4-in. (6 mm.)
Hard	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail
Very Hard	> 8000	Thumbnail will not indent soil

NOTE: AFTER TERZAGHI AND PECK, 1948

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	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

	PROJECT NO.: 20162945	SOIL DESCRIPTION KEY Precision Medicine 1380 East Medical Center Drive St. George, UT	APPENDIX B-2
	DRAWN BY: MDM CHECKED BY: STP DATE: 6/9/2016 REVISED: -		

INFILLING TYPE

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Iron Oxide	Fe	Talc	Ta
Manganese	Mn	Unknown	Uk

DENSITY/SPACING OF DISCONTINUITIES

DESCRIPTION	SPACING CRITERIA
Unfractured	> 6 ft. (> 1.83 meters)
Slightly Fractured	2 - 6 ft. (.061 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm.)
Highly Fractured	2 - 8 in. (50.80 - 203.30 mm.)
Intensely Fractured	< 2 in. (< 50.80 mm.)

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification

DEGREES OF WEATHERING

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical/mechanical alternation; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relic rock texture/structure; Generally molded and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS

GRADE		UCS (MPa)	FIELD TEST
R0	Extremely Weak	0.25 - 1.0	Indented by thumbnail
R1	Very Weak	1.0 - 5.0	Crumbles under firm blows of geological hammer, can be peeled by a pocket knife
R2	Weak	5.0 - 25	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer
R3	Medium Strong	25 - 50	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single firm blow of a geological hammer
R4	Strong	50 - 100	Specimen requires more than one blow of geological hammer to fracture it
R5	Very Strong	100 - 250	Specimen requires many blows of geological hammer to fracture it
R6	Extremely Strong	> 250	Specimen can only be chipped with a geological hammer

BEDDING CHARACTERISTICS

TERM	Thickness (in.)	Thickness (mm.)
Very Thick Bedded	> 36	> 915
Thick Bedded	12 - 36	305 - 915
Moderately Bedded	4 - 12	102 - 305
Thin Bedded	1 - 4	25 - 102
Very Thin Bedded	0.4 - 1	10 - 25
Laminated	0.1 - 0.4	2.5 - 10
Thinly Laminated	< 0.1	< 2.5

Bedding Planes Planes dividing the individual layers, beds, or stratigraphy of rocks.

Joint Fracture in rock, generally more or less vertical or traverse to bedding.

Seam Applies to bedding plane with unspecified degree of weather.

APERTURE

DESCRIPTION	CRITERIA [in.(mm.)]
Tight	< 0.04 (< 1)
Open	0.04 - 0.20 (1 - 5)
Wide	> 0.20 (> 5)

DISCONTINUITY TYPE

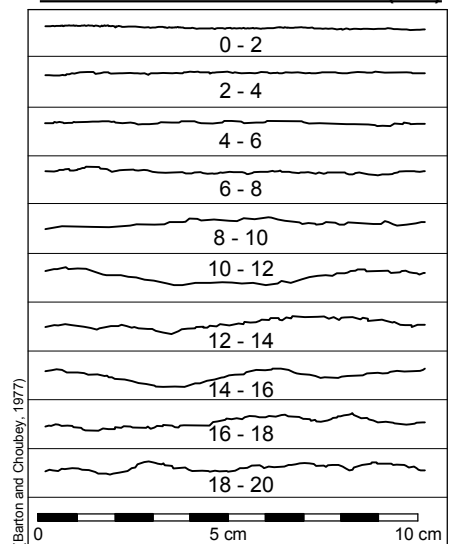
DESCRIPTION
Fault
Joint
Shear
Foliation
Vein
Bedding

INFILLING AMOUNT

DESCRIPTION
Surface Stain
Spotty
Partially Filled
Filled
None

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

JOINT ROUGHNESS COEFFICIENT (JRC)

RQD Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm. or more.



PROJECT NO.: 20162945
DRAWN BY: MDM
CHECKED BY: STP
DATE: 6/9/2016
REVISED: -

ROCK DESCRIPTION KEY

Precision Medicine
1380 East Medical Center Drive
St. George, UT

APPENDIX**B-3**

Date Begin - End: 5/25/2016	Drilling Company: AGECE	BORING LOG B-1
Logged By: D. Krupicka	Drill Crew: Ben and Hugo	
Hor.-Vert. Datum: WGS84	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear / 80° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55126° N Longitude: 37.09841° W Surface Condition: Roadbase	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Possible Fill : SILT with Sand (ML) : red to reddish brown, dry to slightly moist												
5		SILT with Sand (ML) : red to reddish brown, dry to slightly moist, very stiff	BC=13 32 50/3" PP=<1	14"										
10		Sandy SILT (ML) : red, slightly moist, very stiff	BC=35 50/3"	9"										
15	x 													

	PROJECT NO.: 20162945	BORING LOG B-1	APPENDIX
	DRAWN BY: MDM CHECKED BY: STP DATE: 6/9/2016 REVISED: -		
	Precision Medicine 1380 East Medical Center Drive St. George, UT		B-4
			PAGE: 1 of 1

Date Begin - End: 5/25/2016	Drilling Company: AGECE	BORING LOG B-2
Logged By: D. Krupicka	Drill Crew: Ben and Hugo	
Hor.-Vert. Datum: WGS84	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear / 80° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55084° N Longitude: 37.09841° W Surface Condition: Roadbase	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Possible Fill : Sandy SILT (ML) : red, slightly moist												
5		Silty SAND (SM) : red, slightly moist, very dense, trace gravel	BC=10 22 50/5" PP=3	16"	SM					16	NP	NP		
10			BC=15 23 40 PP=1	14"										
15		Sandy SILTSTONE : reddish brown, slightly moist	BC=50/4"	NR										
20			BC=50/3"	2"										
		Sandy Silty CLAYSTONE : reddish brown, slightly moist, Strength: R1 - R2, JRC: 6 - 8	RQD=15	32"										
25		Clayey SILTSTONE : red to reddish brown, moist, laminated, unweathered, Strength: R2 - R3, JRC: 6 - 8	RQD=86	58"		3.0	133.0							
30		Sandy SILTSTONE : red to reddish brown, moist, Strength: R3, JRC: 4 - 6	RQD=90	60"										
35		The boring was terminated at approximately 35 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.					GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.							

	PROJECT NO.: 20162945	BORING LOG B-2	APPENDIX
	DRAWN BY: MDM		
	CHECKED BY: STP	Precision Medicine 1380 East Medical Center Drive St. George, UT	B-5
	DATE: 6/9/2016		
	REVISED: -		
PAGE: 1 of 1			

Date Begin - End: 5/26/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Partly Cloudy 80° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-3

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55150° N Longitude: 37.09822° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
														Lithologic Description
5		Fill : Silty SAND (SM) : red and tan, slightly moist, dense to very dense		BC=9 13 17 PP=0.5	18"	SM	5.0	114.0	36	NP	NP			
10		BC=6 18 50	14"											
15		BC=50/5" RQD=34	5" 41"											
20		JRC : 10-12, Strength : R3		RQD=75	64"									
25														
30		The boring was terminated at approximately 25 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.					GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.							

The boring was terminated at approximately 25 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.



PROJECT NO.: 20162945
 DRAWN BY: MDM
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BORING LOG B-3

Precision Medicine
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 St. George, UT

APPENDIX

B-6

PAGE: 1 of 1

Date Begin - End: 5/26/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 75° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-4

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS						
		Latitude: -113.55100° N Longitude: 37.09807° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Lithologic Description											
5		SILT with Sand (ML): reddish brown, moist, hard		BC=10 50	12"	ML	5.0			83	NP	NP	
10		Sandy SILT (ML): red, slightly moist to moist, hard, becoming laminated siltstone		BC=50/4"	4"								
15		Silty SANDSTONE: reddish brown, slightly moist, laminated, JRC: 10 - 12, Strength: R2		BC=50/4" RQD=18	4" 48"								
20				RQD=85	60"								
25				RQD=36	50"								
		SILTSTONE: red to reddish brown, slightly moist, slightly weathered, some calcite infilling along fractures, JRC: 2 - 4, Strength: R2 - R3											
		CLAYSTONE: reddish brown, moist, Strength: R1 - R2											
		SILTSTONE: reddish brown, moist, Strength: R2 - R3											
30		The boring was terminated at approximately 29.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.						



PROJECT NO.: 20162945
 DRAWN BY: MDM
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BORING LOG B-4

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 St. George, UT

APPENDIX

B-7

PAGE: 1 of 1

Date Begin - End: 5/26/2016 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Partly Cloudy 80° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-5

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55059° N Longitude: 37.09800° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Fill : SILT with Sand (ML) : red to tan to olive gray, slightly moist, very stiff to hard		BC=10 12 12 PP=4	18"	ML								
5														
		SILT (ML) : red to tan to olive gray, slightly moist, very stiff to hard, occasional sandstone cobble		BC=25 28 50 PP=0.5	14"					90	NP	NP		
10														
		SILTSTONE : reddish brown, slightly moist, laminar, unweathered, Strength: R2		BC=50/5" RQD=48	4" 22"									
15	x 													



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
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BORING LOG B-5

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APPENDIX

B-8

PAGE: 1 of 1

Date Begin - End: 5/26/2016	Drilling Company: AGECE	BORING LOG B-6
Logged By: D. Krupicka	Drill Crew: Ben and Hugo	
Hor.-Vert. Datum: WGS84	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear / 70° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55150° N Longitude: 37.09778° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Sandy SILT (ML): red to dark red, moist, hard												
5			BC=17 50 PP=1.5	15"										
10			BC=50/5.5"	5"										
15		SILTSTONE: reddish brown to brown, slightly moist, possibly very fine grained sandstone, Strength: R2 - R3	BC=50/5.5" RQD=35	5" 12"										
		Strength: R2		29"										
20		CLAYSTONE: reddish brown, moist, slightly weathered, JRC: 8 - 10, Strength: R2	RQD=40	60"										
25		The boring was terminated at approximately 24.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.							
30														

	PROJECT NO.: 20162945	BORING LOG B-6	APPENDIX
	DRAWN BY: MDM		
	CHECKED BY: STP	Precision Medicine 1380 East Medical Center Drive St. George, UT	B-9
	DATE: 6/9/2016		
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Date Begin - End: 5/26/2016	Drilling Company: AGECE	BORING LOG B-7
Logged By: D. Krupicka	Drill Crew: Ben and Hugo	
Hor.-Vert. Datum: WGS84	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear / 65° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55104° N Longitude: 37.09781° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf ROD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Possible Fill : Silty SAND with Sand (SM) : red, slightly moist to moist, dense, trace fine gravel				SM	5.0	111.0	81	26	NP	NP		
5			BC=8 17 20 PP=4	18"										
10		Lean CLAY with Sand (CL) : reddish brown, moist	BC=9 38 46 PP=4.5	16"										
15		CLAYSTONE : dark red, moist, laminated	BC=11 22 50/2"" PP=4.5+	15"										
20		Sandy SILTSTONE : dark red, moist	BC=42 50/1""	9"										
25		Sandy Silty CLAYSTONE : dark red, laminated	BC=50/5.5"" PP=4.5+											
The boring was terminated at approximately 25.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.														
GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.														
30														



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DRAWN BY: MDM
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BORING LOG B-7

Precision Medicine
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St. George, UT

APPENDIX

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Date Begin - End: 5/25/2016 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 75° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-1

Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS									
		Latitude: -113.55189° N Longitude: 37.09904° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks		
		Lithologic Description													
5															



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BORING LOG P-1

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APPENDIX

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Date Begin - End: 5/25/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 75° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-2

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55122° N Longitude: 37.09881° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
5		Fill :Road Base: hard, compacted												
		SILT with Sand (ML): red, dry, very stiff, some gypsum												
			BC=6 9 10											
	The boring was terminated at approximately 6 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.													
	GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.													



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 CHECKED BY: STP
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BORING LOG P-2

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Date Begin - End: 5/25/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 65° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-3

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.54893° N Longitude: 37.09855° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		SILT with Sand (ML): red to reddish brown, slightly moist, very stiff		BC=8 10 18	11"									
5		Sandy SILT (ML): red, slightly moist, becoming coarser-grained		BC=32 50/4"	9"									
10		SANDSTONE: reddish brown, very fine-grained		BC=50/5.5"										
				BC=50/1"										
15		The boring was terminated at approximately 12 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.							
20														
25														
30														



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BORING LOG P-3

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Date Begin - End: 5/25/2016 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 70° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-4

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS						
		Latitude: -113.54878° N Longitude: 37.09804° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Lithologic Description											
		SILT (ML): red to reddish brown, slightly moist, stiff		BC=5 8 10 PP=0.5	14"	ML	3.0	110.0		58	NP	NP	
5		Sandy SILTSTONE: red to reddish brown, slightly moist, hard, abundant gypsum		BC=20 47 50/5.5" PP=4	18"								
10		SANDSTONE: very fine-grained, olive to olive gray, slightly moist, hard		BC=50/4" RQD=7	48"								
		Sandy CLAYSTONE: reddish brown, slightly moist, highly fractured, JRC: 10 - 12, Strength: R1											
15		SILTSTONE: moderate gypsum infilling along fractures, Strength: R2											
The boring was terminated at approximately 15 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.													
<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.													
20													
25													
30													



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BORING LOG P-4

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Date Begin - End: 5/25/2016 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear **Exploration Diameter:** 9 in. O.D.

BORING LOG P-5

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.54892° N Longitude: 37.09749° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		SILT with Gravel (ML): rounded to sub-rounded, gravel composed of basalt, some boulder sized material												
		Sandy SILT (ML): red to reddish brown, dry, hard												
5				BC=10 19 25 PP=3	16"									
10		CLAYSTONE: reddish brown, slightly moist, hard, with gypsum		BC=43 50/2"" PP=4.5+	10"									
				BC=20 37 50/5.5""	18"									
15		The boring was terminated at approximately 13.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.							
20														
25														
30														



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BORING LOG P-5

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Date Begin - End: 5/25/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 75° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-6

Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								
		Latitude: -113.54906° N Longitude: 37.09699° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		SILT (ML): non-plastic, red to reddish brown, dry, stiff		BC=10 6 7 PP=3	18"									
5		CLAYSTONE: red to reddish brown, slightly moist, hard, moderate to abundant gypsum		BC=37 50/2"										
The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.														<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.
10														
15														
20														
25														
30														

	PROJECT NO.: 20162945	BORING LOG P-6	APPENDIX
	DRAWN BY: MDM		
	CHECKED BY: STP	Precision Medicine 1380 East Medical Center Drive St. George, UT	B-16
	DATE: 6/9/2016		
	REVISED: -		PAGE: 1 of 1



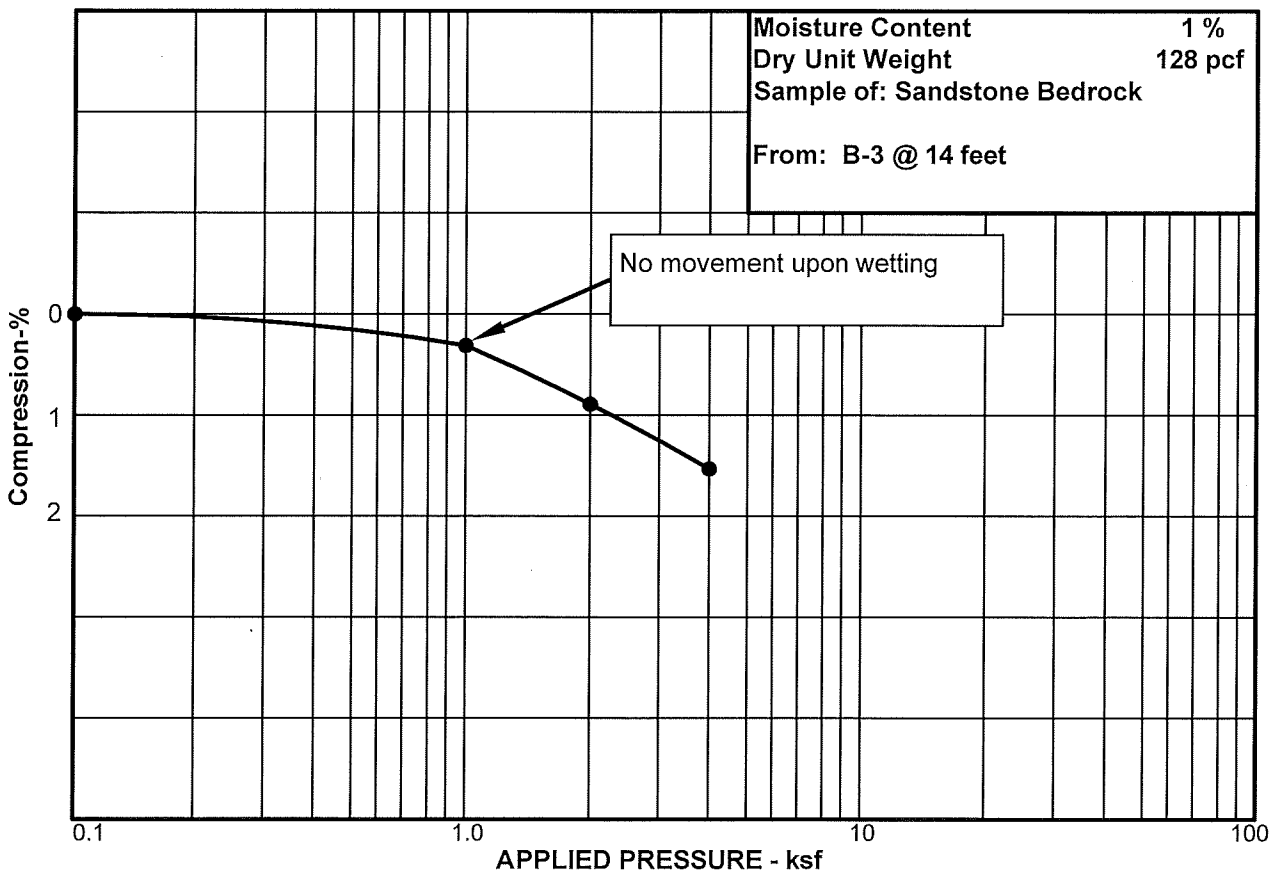
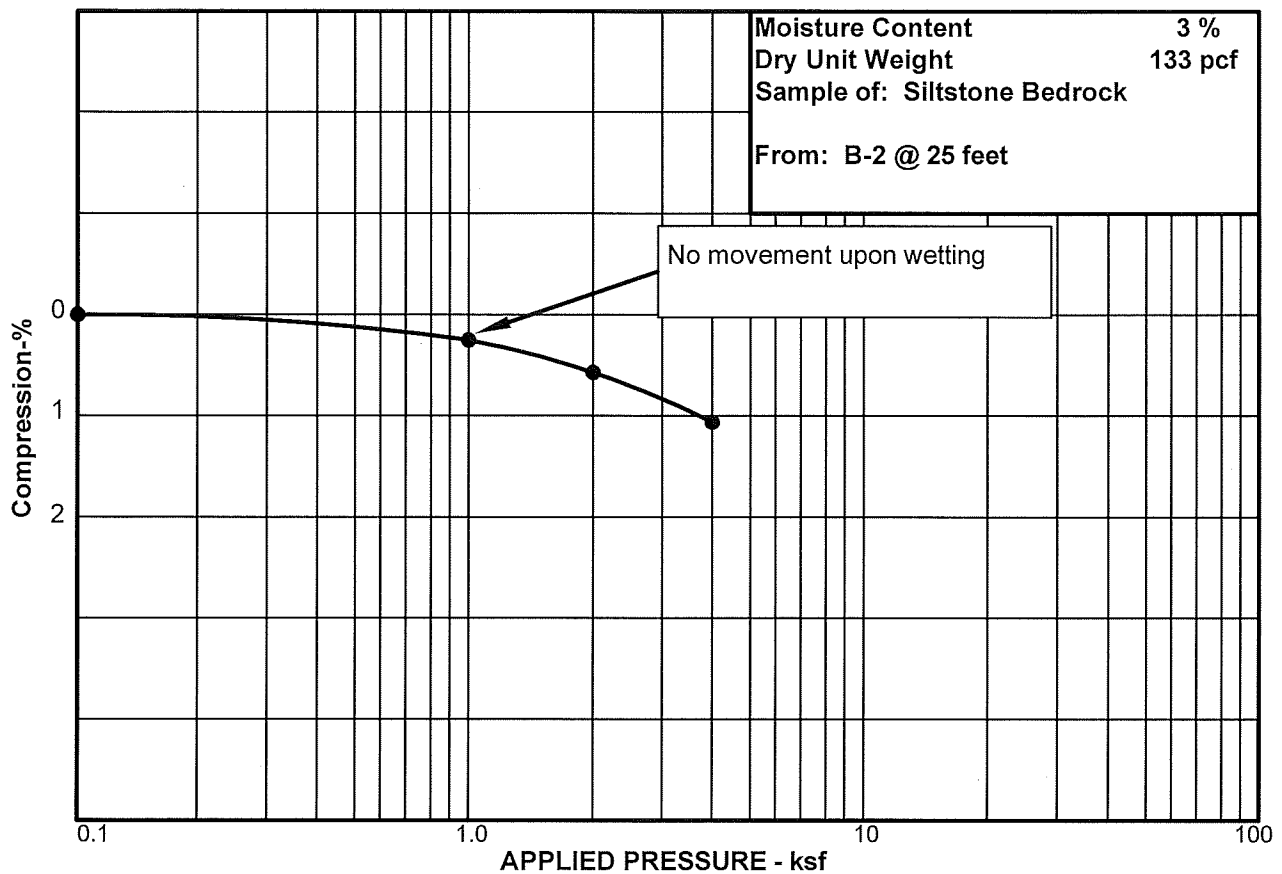
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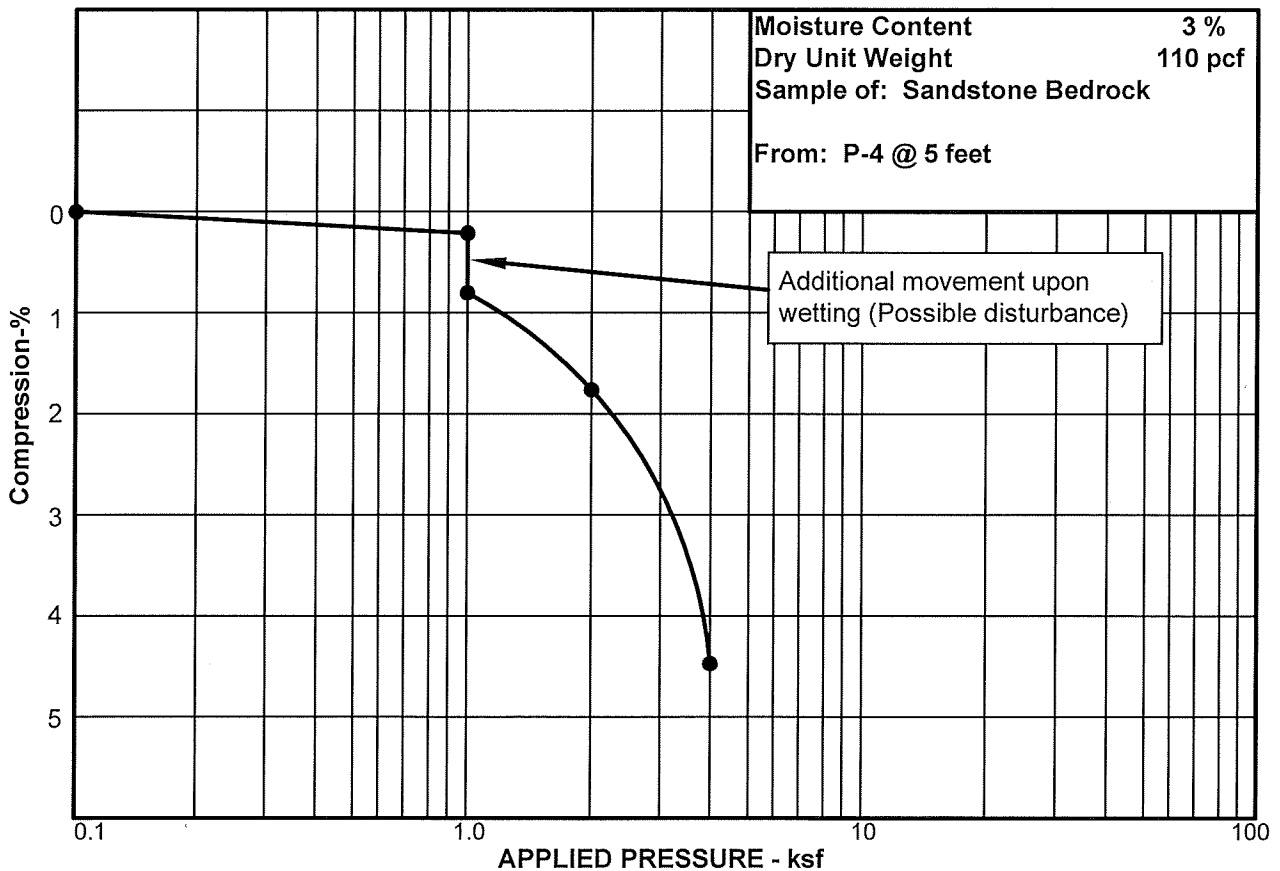
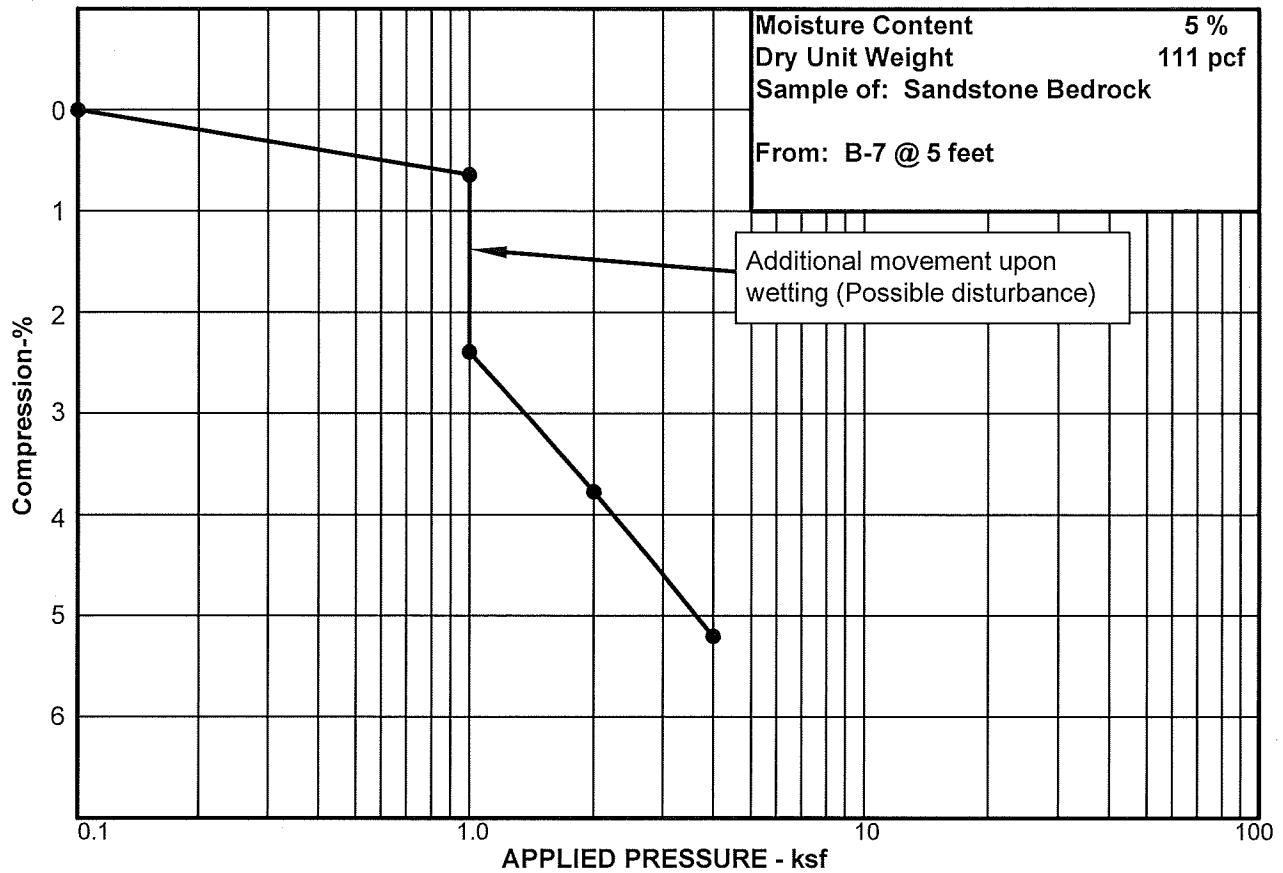
APPENDIX C

Laboratory Test Results

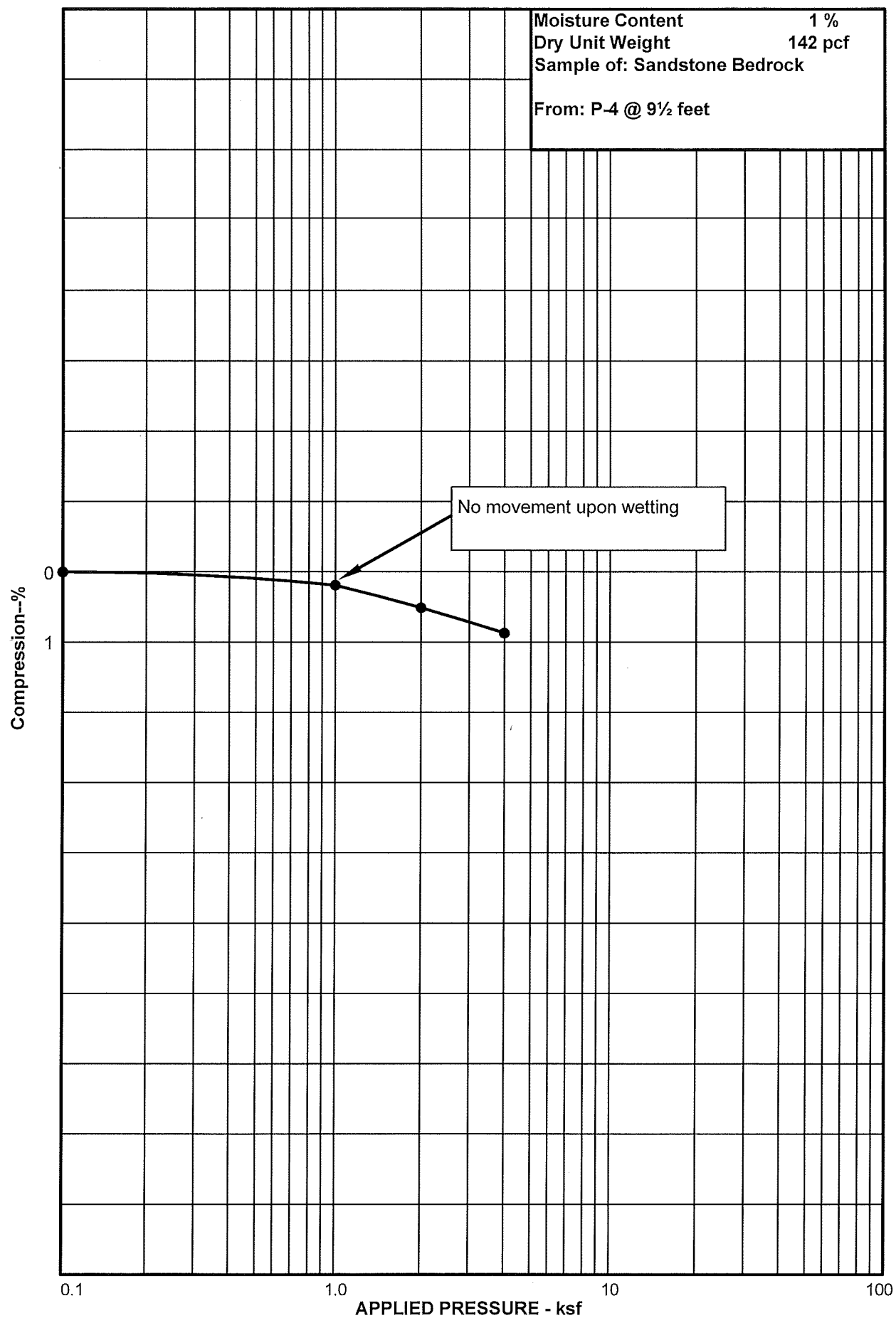
Applied Geotechnical Engineering Consultants, Inc.



Applied Geotechnical Engineering Consultants, Inc.



Applied Geotechnical Engineering Consultants, Inc.



APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I
SUMMARY OF LABORATORY TEST RESULTS

IHC Expansion

Project Number 2151384

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg Limits		Sample Classification
Boring No.	Depth (feet)			Gravel (%)	Sand (%)	Silt/ clay (%)	Liquid Limit (%)	Plasticity Index (%)	
B-2	5			17	67	16		NP	Sandstone Bedrock
B-2	25	3	133						Siltstone Bedrock
B-3	7½	5	114			36		NP	Sandstone Bedrock
B-3	14	1	128						Sandstone Bedrock
B-4	5	5				83		NP	Siltstone Bedrock
B-5	10					90		NP	Siltstone Bedrock
B-7	5	5	111	19	55	26		NP	Sandstone Bedrock
P-4	5	3	110			58		NP	Sandstone Bedrock
P-4	9½	1	142						Sandstone Bedrock



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APPENDIX D

Important Information about your Geotechnical Engineering Report

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply this report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold-prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical-engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.



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EXHIBIT G

2016 Geotechnical Engineering Report Addendum



June 16, 2016
Kleinfelder Project No: 20162945.001A

Intermountain Healthcare
36 South State Street, 23rd Floor
Salt Lake City, UT 84111-1486

ATTENTION: Mr. Steve Kelly
Facility Planning and Development

SUBJECT: ADDENDUM NO. 1 - GEOTECHNICAL ENGINEERING REPORT
DIXIE REGIONAL MEDICAL CENTER (DRMC) CONSOLIDATION PROJECT
1380 EAST MEDICAL CENTER DRIVE
ST. GEORGE, UTAH

Dear Mr. Kelly:

Kleinfelder Inc. was retained by Intermountain Healthcare (IHC) to perform additional geotechnical services for the Precision Medicine Building associated with the Dixie Regional Medical Center (DRCM) Consolidation Project. We understand that the project will include the construction of the 117,000 square foot, 1 to 2 story, Precision Medicine Building and two associated parking areas as shown in Figures A-1 and A-2 in Appendix A.

This addendum letter summarizes the results of our field and laboratory testing and provides recommendations relating to the geotechnical aspects of project design and construction specific to the Precision Medicine Building and associated parking areas only. The conclusions and recommendations given in this addendum should not be used for other structures associated with the DRMC Consolidation Project. Unless otherwise stated in this letter, all recommendations given in the referenced geotechnical report are valid for the Precision Medicine Building.

SCOPE OF SERVICES

As authorized by IHC, per our proposal dated May 5, 2016, our scope of services for additional exploration and evaluation included the following items:

Kleinfelder's scope of services included:

- Review existing site conditions and the proposed grading and structure design, and evaluate an "excavate and replace" design alternative for the building foundation support.
- Field exploration including the drilling of 13 borings to depths ranging from 5½ to 35 feet below the ground surface at the approximate locations shown on Figure A-2.
- Laboratory testing of select soil samples recovered from the borings to evaluate pertinent soil and rock properties.
- Attachments including logs of borings and laboratory test results.
- Provide a brief letter report that will include boring logs, laboratory testing, and any required updates to the foundation recommendations in our existing geotechnical report (Kleinfelder 2016).

FIELD EXPLORATION AND LABORATORY TESTING

Field Investigation

Kleinfelder drilled 13 exploratory borings at the site between May 25 and 26, 2016. The exploratory borings were advanced using a CME-55 truck-mounted drill rig equipped with 9-inch outside diameter (O.D.) hollow-stem augers and air coring capabilities. Three of the proposed borings were not completed due to site access difficulties. Subsurface soil samples were obtained during exploration using a standard split-spoon sampler (2-inch O.D.) or a modified California sampler (2.5-inch O.D.) driven into the soil with blows from a 140-pound automatic hammer falling through a 30-inch drop. The raw blows required to drive the samplers into the soil are recorded on each of the boring logs. These blow counts are an indication of the relative density or consistency of the on-site soils. Subsurface rock samples were obtained during exploration by air coring.

Samples obtained during the field exploration were transported to a laboratory for further examination and testing. Samples will be retained for a period of 90 days from the date of this addendum letter after which time samples will be discarded unless otherwise requested by the Intermountain Health Care.

Approximate boring locations are shown on the Exploration Location Map (Figure A-2). Appendix B includes graphical logs of the exploration borings and Appendix C includes laboratory test results. A key to the logs and a summary of the USCS (Unified Soil Classification System) soil descriptions are also contained in Appendix B. The lines defining boundaries between soil types on the logs are based upon Kleinfelder's field observations and are therefore approximate. Transition between soil types may be abrupt or may be gradual.

Laboratory Testing

Geotechnical laboratory tests were performed on selected soil and rock samples to estimate their relative engineering properties. Testing for the following properties was performed in general accordance with recognized standards:

- Moisture Content (7 tests);
- Dry Density (6 tests)
- Minus 200 Wash (4 tests);
- Gradation (2 tests)
- Atterberg Limits (6 tests);
- Swell/Collapse Test (5 test);

Results of the geotechnical laboratory tests are included in Appendix C of this report. Selected geotechnical test results are also shown on the boring logs contained in Appendix B.

Analytical Laboratory Testing

Analytical laboratory testing was not within the scope of work for this phase of the site development. However; testing performed by AGECE (April 2009) indicates that on-site soils contain water soluble sulfate concentrations ranging from 445 to 9,225 ppm.

SURFACE AND SUBSURFACE CONDITIONS

Near surface sediments encountered in our explorations generally consisted of 4 to 15 feet of soil overlying bedrock. The soils encountered during our investigation generally consisted of sand, silt and clay mixtures. The underlying rock was composed of claystone, siltstone, and sandstone with various degrees of weathering and strength.

Groundwater

Groundwater was not observed in the boring performed for this part of the DRMC Consolidation Project. However, groundwater was encountered in previous investigations as discussed in the referenced geotechnical reports. Groundwater levels are generally dependent on seasonal precipitation, irrigation practices, and land use and runoff conditions. As such, it is possible that the observed water level may fluctuate during dryer and wetter seasons of the year. A detailed study of site hydrogeologic conditions was beyond the scope of work of this investigation; as a result, we are unable to characterize potential groundwater fluctuations at the site.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our field and laboratory investigations, it is our opinion that the site is suitable for the construction of the proposed structure and associated parking areas provided that the recommendations contained in this report and the referenced geotechnical report (Kleinfelder 2016) are followed, with particular attention given to the expansive soil and rock issues. These opinions, conclusions, and recommendations are based on our field exploration, engineering analysis, the properties of the materials encountered in our borings, the results of the laboratory testing program, and our understanding of the proposed development of the site.

It is our understanding that given the amount of fill that needs to be placed, that rather than constructing the Precision Medicine building with drilled shafts and a structural slab, IHC has decided to build the proposed structure with footings and a slab-on-grade supported on non-expansive structural fill. In order to mitigate the adverse effects of swelling and collapsible material found on-site, we recommend that the structure slab be supported by a minimum of 15 feet of non-expansive structural fill. This fill should be placed on compacted as described in the structural fill section below.

STRUCTURAL FILL AND COMPACTION

Structural fill placed within the proposed construction may be comprised of native soils that are classified as silt, sand, gravel, or any mixture of these soil types. Structural fill may also be comprised of reworked rock that classifies as siltstone or sandstone or any combinations of these rock types. Any native soil classified as lean clay or fat clay and any native rock classified as claystone, silty claystone, mudstone, or shale **should not** be reworked and used as structural fill. These soil and rock types have been shown to be very expansive when reworked and, if used as fill, could create an environment where very high differential movement in the structure could occur. **If native soils are used as structural fill, very careful, experienced, and continuous monitoring must be in effect to ensure that the correct soil types are used. Failure to carefully monitor the soil and rock types used for fill and/or mistakes in judgement regarding the classification of backfill materials would be expected to cause distress in the structure, should water get into the subgrade at some point in the future.**

Imported structural fill should be comprised of imported material that meets the specifications outlined in Table 1 or untreated base course (UTBC) meeting the requirements outlined in Table 2. As an alternate, UTBC meeting the UDOT specification is acceptable if the earthwork contractor provides a job mix target gradation for the imported UTBC. The job mix gradation may deviate from the job mix target gradation as allowed by the UDOT specification. The job mix gradation may not exceed the minimum percent passing outlined in the Job Mix Gradation Target Band outlined in the UDOT specification.

TABLE 1
CRITERIA FOR USE OF STRUCTURAL FILL

Gradation Requirements	
Standard Sieve Size	Percent Passing
4 inch	100
¾ inch	100-70
No. 40	10-60
No. 200	0-15
Plasticity Requirements of Fines (Atterberg Limits)	
Plasticity Index	6 or less

*Fill with more than 15 percent fines may be acceptable as approved by Kleinfelder

TABLE 2
CRITERIA FOR UNTREATED BASE COURSE

Gradation Requirements	
Standard Sieve Size	Percent Passing
1-1/2 inch	100
1 inch	90-100
¾ inch	70-85
½ inch	65-80
3/8 inch	55-75
No. 4	40-65
No. 16	25-40
No. 200	7-11
Plasticity Requirements of Fines (Atterberg Limits)	
Plasticity Index	6 or less

Untreated base course material should be comprised of Untreated Base Course Aggregate Class “C” per Section 02721 of the Utah Department of Transportation Standard Specifications for Untreated Base Course.

Imported fill materials should be approved by the testing agency prior to importing. Also, prior to placing structural fill, the excavation should be observed by the testing agency to note that unsuitable material has been removed, that the excavation has reached the required 15 ft. below slab, and that the exposed soil is in a firm and unyielding condition.

Structural fill should be placed in maximum 8-inch-thick loose lifts and compacted to at least 95 percent of the maximum dry density as determined by ASTM-D1557 (Modified Proctor). The contractor should moisture condition the soils to within the $\pm 2\%$ of the optimum water content as determined using the Modified Proctor. The native soils are expected to be moisture sensitive and may pose a challenge in meeting the recommended compaction. All utility trenches should be backfilled with imported structural fill.

FOUNDATIONS

All foundation parameters are dependent on the material used for structural fill on the site. Foundation parameters are presented in Table 1 for native and imported structural fill placed and compacted as described in the previous section. Conventional continuous and spread footings established on structural fill as described above, may be proportioned using a maximum net allowable soil bearing capacity shown in Table 3. All footings should be founded a minimum of 18 inches below the final grade. A one third increase in allowable bearing capacity may be applied for transient wind or seismic loads. It is estimated that total, static, post-construction settlement of the fill and footings should be on the order of 1 inch or less with maximum differential settlements of ½ inch or less.

TABLE 3
FOUNDATION PARAMETERS

Parameter	Native Soils as Structural Fill	Imported Structural Fill
Bearing Capacity	3,500 psf – Spot footings 5 feet x 5 feet or larger, strip footings larger than 3 feet.	5,000 psf
	3,000 psf - Spot footings smaller than 5 feet x 5 feet and strip footings smaller than 3 feet wide.	
At Rest Equivalent Lateral Fluid Weight	61 pcf	52 pcf
Active Equivalent Lateral Fluid Weight	42 pcf	33 pcf
Passive Equivalent Lateral Fluid Weight	318 pcf	442 pcf
Increase in Equivalent Lateral Fluid Weight Due to Seismic Loading	10 pcf	10 pcf
Coefficient of Friction	0.35	0.46
Modulus of Subgrade Reaction, k_1 (pci)	90 pci	200 pci

Bearing surfaces for foundations should not be left exposed during inclement weather. Saturation of the on-site soils can cause instability of foundation excavations. If inclement weather is expected during footing excavations, or if the footings will be exposed for an extended period of time, the contractor should consider taking measures to convey storm water away from work areas.

Excavations for footings should either be recompact, completed with a smooth bucket backhoe, or be trimmed by hand following excavation to minimize disturbance of the compacted structural fill soils. Upon their exposure, all bearing grades should have excess and loosened material removed. The final grades should be firm and stable, and free of any loose soil, rock, mud, water or frost. Also, concrete should not be placed on frozen subgrades.

Foundation bearing surfaces should be observed by a geotechnical engineer prior to concrete placement to confirm that suitable soils are present at the bearing elevation. Soft or unsuitable areas observed at the bearing elevation should be overexcavated to firm material at the direction of a geotechnical engineer. Any bearing grades which are identified as exhibiting insufficient shear strength should be overexcavated as directed by the geotechnical engineer. The width of the base of the overexcavation should be at least as wide as the footing plus the depth of the overexcavation. This will facilitate proper distribution of the applied foundation pressures within the structural fill.

Horizontal loads acting on foundations formed in open excavations will be resisted by friction acting at the base of foundations and by passive earth pressures. If design makes use of passive earth pressures, it is important that any backfill below or around footings is placed and compacted properly. Therefore, we recommend that the inspectors monitoring the earthwork be present during any footing backfill placement.

The friction acting along the base of footings founded on native soils may be computed by using the coefficient of friction presented in Table 3 with the normal dead load. An ultimate lateral passive earth pressure may be computed using the passive equivalent lateral fluid weight presented in Table 3 for the side of footings placed against properly placed and compacted structural fill. An appropriate factor of safety should be applied to the passive earth pressure value listed above. The values given above may be increased by one-third for transient wind or seismic loads.

An at rest earth pressure may be computed by using the at rest equivalent lateral fluid weight shown in Table 3 for the side of foundation walls backfilled with properly placed and compacted structural fill.

CONCRETE SLABS

Direct support for the concrete floor slabs may be provided by a minimum 6-inch blanket of untreated base course (UTBC) material. Prior to placement of the base course material, a minimum of 15 feet of non-expansive structural fill should be placed as described above. As a basis for designing concrete slab thickness, soils prepared and compacted according to the specifications of this report may be considered to possess the subgrade modulus (k_1) given in Table 3. It is prudent to prevent compacted subgrades from drying out prior to placement of UTBC to prevent long-term moisture susceptibility to the subgrade beneath slabs. It is likewise prudent to prevent moisture buildup beneath concrete slabs on grade. The water content of the structural fill beneath the slab should be checked prior to placement of the UTBC. If, just prior to placement of the UTBC, the soils are found to have dried below the optimum water content of these soils, the surficial soil should be moisture conditioned and recompacted.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Special precautions must be taken during the placement and curing of all concrete slabs. Excessive slump (high water-cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could lead to excessive shrinkage, cracking, or curling in the slabs. We recommend that all concrete placement and curing operations be performed in accordance with the American Concrete Institute Manual (ACI, 2011).

Soil Corrosion and Reactivity

No additional laboratory testing was completed during this phase of the investigation to provide data regarding corrosivity of onsite soils. Our scope of services does not include corrosion engineering and, therefore, a detailed analysis of the corrosion test results is not included in this report. A qualified corrosion engineer should be retained to review the test results and design protective systems that may be required. Kleinfelder may be able to provide those services.

Ferrous metal and concrete elements in contact with soil, whether part of a foundation or part of the supported structure, are subject to degradation due to corrosion or chemical attack. Therefore, buried ferrous metal and concrete elements should be designed to resist corrosion and degradation based on accepted practices.

The degradation of concrete or cement grout can be caused by chemical agents in the soil or groundwater that react with concrete to either dissolve the cement paste or precipitate larger compounds within the concrete, causing cracking and flaking. The concentration of water-soluble sulfates in the soils is a good indicator of the potential for chemical attack of concrete or cement grout. The American Concrete Institute (ACI) in their publication *Guide to Durable Concrete* (ACI 201.2R-08) provides guidelines for this assessment.

While laboratory testing for corrosion or reactivity was not part of the scope of this project, testing performed by AGECEC (April 2009) indicates that on-site soils contain water soluble sulfate concentrations ranging from 445 to 9,225 ppm. The results of sulfate test indicate that the potential for deterioration of concrete is moderate and that a Type II cement should be used.

LIMITATIONS

This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

This report may be used only by the Client and the registered design professional in responsible charge and only for the purposes stated for this specific engagement within a reasonable time from its issuance, but in no event later than three years from the date of the report.

The work performed was based on project information provided by Client. Any changes in the project information listed herein that will have an impact on recommendations in this report must be approved by Kleinfelder's engineer.

The scope of services was limited at each site. It should be recognized that definition and evaluation of subsurface conditions are difficult. Judgments leading to conclusions and recommendations are generally made with incomplete knowledge of the subsurface conditions present due to the limitations of data from field studies.

Kleinfelder offers various levels of investigative and engineering services to suit the varying needs of different clients. Although risk can never be eliminated, more detailed and extensive studies yield more information, which may help understand and manage the level of risk. Since detailed study and analysis involves greater expense, our clients participate in determining levels of service, which provide information for their purposes at acceptable levels of risk. The client and key members of the design team should discuss the issues covered in this report with Kleinfelder, so that the issues are understood and applied in a manner consistent with the owner's budget, tolerance of risk and expectations for future performance and maintenance.

Recommendations contained in this report are based on our field observations and subsurface explorations, limited laboratory tests, and our present knowledge of the proposed construction. If soil, rock or groundwater conditions are encountered during construction that differ from those described herein, the client is responsible for ensuring that Kleinfelder is notified immediately so that we may reevaluate the recommendations of this report. If the scope of the proposed construction, including the estimated building loads, and the design depths or locations of the foundations, changes from that described in this report, the conclusions and recommendations contained in this report are not considered valid unless the changes are reviewed, and the conclusions of this report are modified or approved in writing, by Kleinfelder.

As the geotechnical engineering firm that performed the geotechnical evaluation for this project, we recommend that Kleinfelder be retained to verify the design assumptions and confirm the recommendations of this report are properly incorporated in the design of this project, and properly implemented during construction. This may avoid misinterpretation of the information by other parties and will allow us to review and modify our recommendations if variations in subsurface conditions are encountered. It is our recommendation Kleinfelder be retained to provide the following continuing services for the project:

- Review the project plans and specifications, including any revisions or modifications;
- Observe and evaluate the site earthwork operations to confirm subgrade soils are suitable for construction of foundations, slabs-on-grade, pavements and placement of engineered fill;

- Confirm engineered fill for the structure and other improvements is placed and compacted per the project specifications; and
- Observe foundation bearing soils to confirm conditions are as anticipated.

If a third party is retained to provide the above activities, they are responsible to notify Kleinfelder of any changed site conditions that affect the recommendations presented herein. Kleinfelder must also be retained to perform a supplemental evaluation and to issue a revision to our original report. If notification is not provided, the testing company will assume responsibility associated with the changed site conditions.

Kleinfelder cannot be responsible for interpretation by others of this report or the conditions encountered in the field.

The scope of services for this subsurface exploration and geotechnical report did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous substances in the soil, surface water, or groundwater at this site.

This report, and any future addenda or reports regarding this site, may be made available to bidders to supply them with only the data contained in the report regarding subsurface conditions and laboratory test results at the point and time noted. Because of the limited nature of any subsurface study, the contractor may encounter conditions during construction which differ from those presented in this report. In such event, the contractor should promptly notify the owner so that Kleinfelder's geotechnical engineer can be contacted to confirm those conditions. We recommend the contractor describe the nature and extent of the differing conditions in writing and that the construction contract include provisions for dealing with differing conditions. Contingency funds should be reserved for potential problems during earthwork and foundation construction. Furthermore, the contractor should be prepared to handle contamination conditions encountered at this site, which may affect the excavation, removal, or disposal of soil; dewatering of excavations; and health and safety of workers.

This service includes providing information obtained through laboratory testing regarding corrosivity of on-site soils. Kleinfelder does not practice corrosion engineering and, therefore, detailed analysis of corrosion test results is not included. We recommend a qualified corrosion

engineer be retained to review the test results and design protective systems that may be required.

This service includes information obtained through laboratory testing regarding nutrients of onsite soils. Kleinfelder does not practice landscape architecture and, therefore, detailed analysis of soil nutrient test results is not included in this report. We recommend a qualified landscape architect be retained to review the test results.

Sincerely,

KLEINFELDER, INC



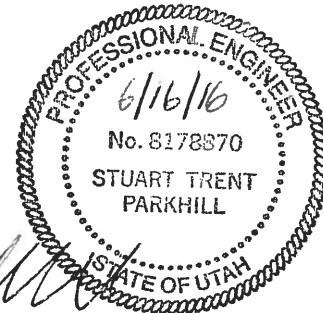
Matthew Moriarty, EIT

Staff Geotechnical Engineer



Trent Parkhill, PE

Sr. Principal Geotechnical Engineer



REFERENCES

Kleinfelder, Geotechnical Engineering Report, Dixie Regional Medical Center (DRMC) Consolidation Project, 1380 East Medical Center Drive, St. George, Utah, Project No. 20162945, dated January 8, 2016.

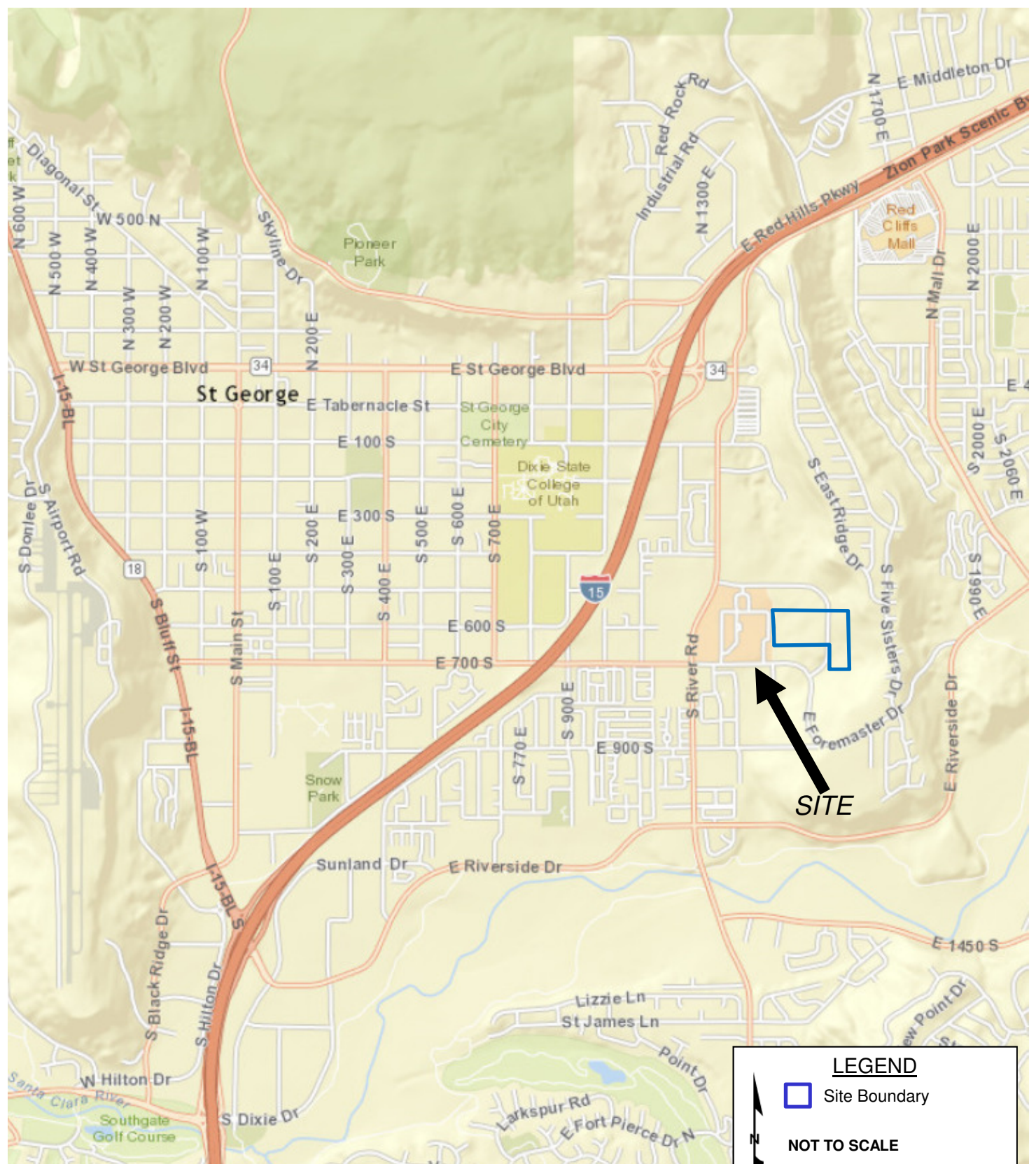


KLEINFELDER

Bright People. Right Solutions.

APPENDIX A

Figures



LEGEND



NOT TO SCALE

Image from ArcGIS Online Maps

Locations are Approximate



PROJECT NO. 20162945

DRAWN 6/13/2016

DRAWN BY: M. Moriarty

CHECKED BY: T. Parkhill

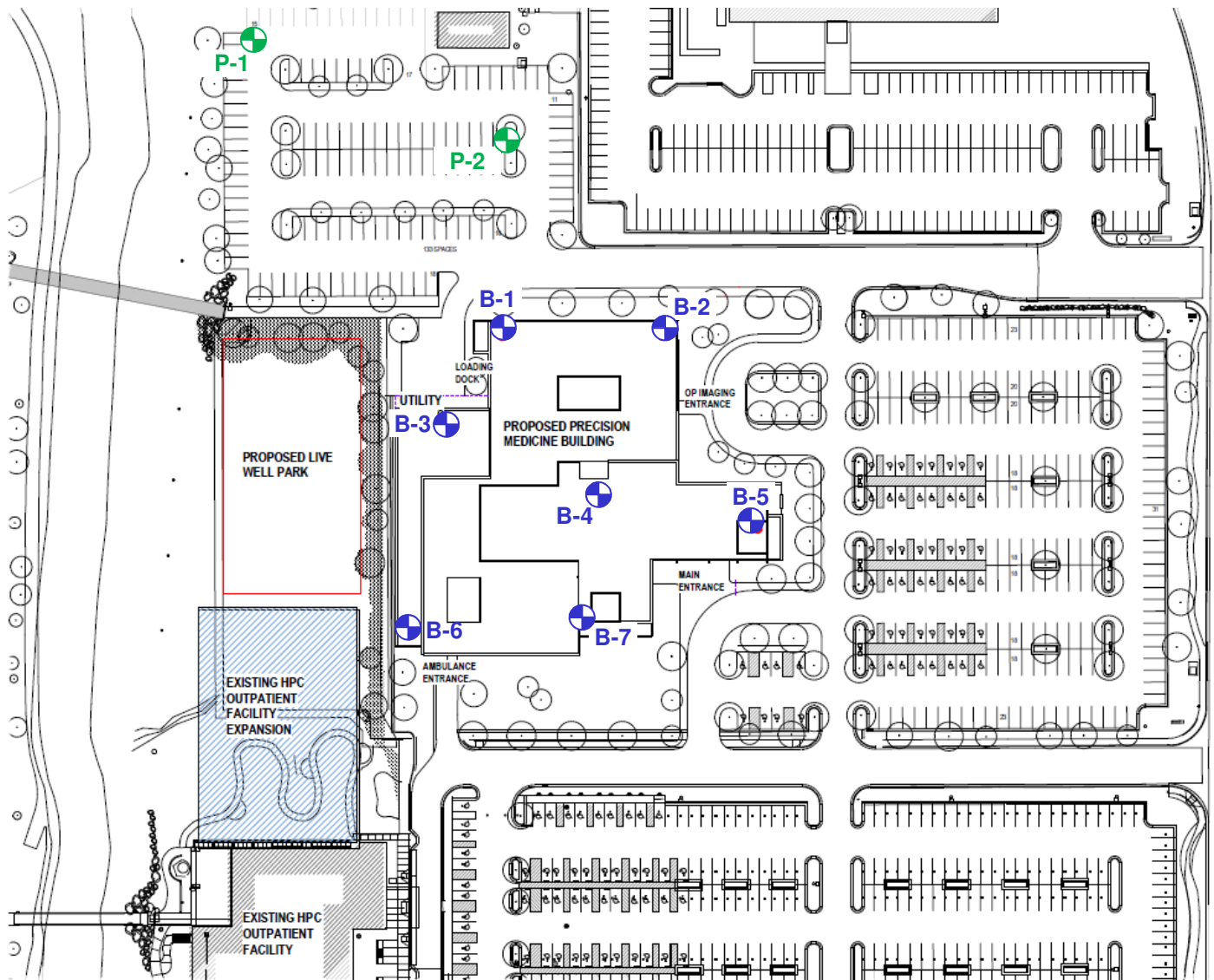
FILE:

SITE VICINITY MAP

Addendum No. 1 Dixie Regional
Medical Center Consolidation Project
1380 East Medical Center Drive
St. George, UT

FIGURE

A-1



LEGEND & NOTES

Building Boring Location,
 Parking Lot Boring Location,

Notes:

- Locations are approximate
- Base image provided by HDR

The information included on this graphic representation has been compiled from a variety of sources and is subject to change without notice. Kleinfelder makes no representations or warranties, express or implied, as to accuracy, completeness, timeliness, or rights to the use of such information. This document is not intended for use as a land survey product nor is it designed or intended as a construction design document. The use or misuse of the information contained on this graphic representation is at the sole risk of the party using or misusing the information.

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO. 20162945	EXPLORATION LOCATION MAP	FIGURE A-2
	DRAWN 6/13/2016		
	DRAWN BY: M. Moriarty	Dixie Regional Medical Center 1380 East Medical Center Drive St. George, UT	
	CHECKED BY: T. Parkhill		
	FILE:		



APPENDIX B

Logs of Exploratory Borings

SAMPLE/SAMPLER TYPE GRAPHICS

CORE SAMPLER

MODIFIED CALIFORNIA SAMPLER
(2 or 2-1/2 in. (50.8 or 63.5 mm.) outer diameter)STANDARD PENETRATION SPLIT SPOON SAMPLER
(2 in. (50.8 mm.) outer diameter and 1-3/8 in. (34.9 mm.) inner diameter)**GROUND WATER GRAPHICS**

- WATER LEVEL (level where first observed)
- WATER LEVEL (level after exploration completion)
- WATER LEVEL (additional levels after exploration)
- OBSERVED SEEPAGE

NOTES

• The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.

• Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown.

• No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.

• Logs represent general soil or rock conditions observed at the point of exploration on the date indicated.

• In general, Unified Soil Classification System designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.

• Fine grained soils that plot within the hatched area on the Plasticity Chart, and coarse grained soils with between 5% and 12% passing the No. 200 sieve require dual USCS symbols, i.e., GW-GM, GP-GM, GW-GC, GP-GC, GC-GM, SW-SM, SP-SM, SW-SC, SP-SC, SC-SM.

• If sampler is not able to be driven at least 6 inches then 50/X indicates number of blows required to drive the identified sampler X inches with a 140 pound hammer falling 30 inches.

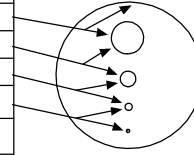
UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

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 GRAVEL WITH <5% FINES	Cu ≥4 and 1≤ Cc≤3		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 5% TO 12% FINES	Cu ≥4 and 1≤ Cc≤3		GW-GM	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES	
				GW-GC	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES	
		Cu <4 and/or 1>Cc>3		GP-GM	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE FINES	
				GP-GC	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE CLAY FINES	
	GRAVELS WITH > 12% FINES			GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES	
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
				GC-GM	CLAYEY GRAVELS, GRAVEL-SAND-CLAY-SILT MIXTURES	
SANDS (More than half of coarse fraction is smaller than the #4 sieve)						
CLEAN SANDS WITH <5% FINES	Cu ≥6 and 1≤ Cc≤3		SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES		
	Cu <6 and/or 1>Cc>3		SP	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES		
SANDS WITH 5% TO 12% FINES	Cu ≥6 and 1≤ Cc≤3		SW-SM	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES		
			SW-SC	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES		
	Cu <6 and/or 1>Cc>3		SP-SM	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE FINES		
			SP-SC	POORLY GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE CLAY FINES		
SANDS WITH > 12% FINES			SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES		
			SC	CLAYEY SANDS, SAND-GRAVEL-CLAY MIXTURES		
			SC-SM	CLAYEY SANDS, SAND-SILT-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 AND VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, SILTS WITH SLIGHT PLASTICITY			
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS			
		CL-ML	INORGANIC CLAYS-SILTS OF LOW PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS			
SILTS AND CLAYS (Liquid Limit greater than 50)		OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY			
		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			

 KLEINFELDER Bright People. Right Solutions.	PROJECT NO.: 20162945	GRAPHICS KEY Precision Medicine 1380 East Medical Center Drive St. George, UT	APPENDIX
	DRAWN BY: MDM CHECKED BY: STP DATE: 6/9/2016 REVISED: -		B-1

GRAIN SIZE

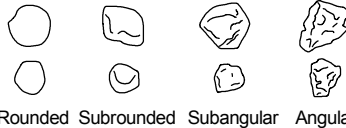
DESCRIPTION	SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders	>12 in. (304.8 mm.)	>12 in. (304.8 mm.)	Larger than basketball-sized
Cobbles	3 - 12 in. (76.2 - 304.8 mm.)	3 - 12 in. (76.2 - 304.8 mm.)	Fist-sized to basketball-sized
Gravel	coarse 3/4 - 3 in. (19 - 76.2 mm.)	3/4 - 3 in. (19 - 76.2 mm.)	Thumb-sized to fist-sized
	fine #4 - 3/4 in. (#4 - 19 mm.)	0.19 - 0.75 in. (4.8 - 19 mm.)	Pea-sized to thumb-sized
Sand	coarse #10 - #4	0.079 - 0.19 in. (2 - 4.9 mm.)	Rock salt-sized to pea-sized
	medium #40 - #10	0.017 - 0.079 in. (0.43 - 2 mm.)	Sugar-sized to rock salt-sized
	fine #200 - #40	0.0029 - 0.017 in. (0.07 - 0.43 mm.)	Flour-sized to sugar-sized
Fines	Passing #200	<0.0029 in. (<0.07 mm.)	Flour-sized and smaller

**MUNSELL COLOR**

NAME	ABBR
Red	R
Yellow Red	YR
Yellow	Y
Green Yellow	GY
Green	G
Blue Green	BG
Blue	B
Purple Blue	PB
Purple	P
Red Purple	RP
Black	N

ANGULARITY

DESCRIPTION	CRITERIA
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved sides and no edges

**PARTICLES PRESENT**

Amount	Percentage
trace	<5
few	5-10
little	15-25
some	30-45
and	50
mostly	50-100

PLASTICITY

DESCRIPTION	LL	FIELD TEST
Non-plastic	NP	A 1/8-in. (3 mm.) thread cannot be rolled at any water content.
Low (L)	< 30	The thread can barely be rolled and the lump or thread cannot be formed when drier than the plastic limit.
Medium (M)	30 - 50	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump or thread crumbles when drier than the plastic limit.
High (H)	> 50	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump or thread can be formed without crumbling when drier than the plastic limit.

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 is below water table

REACTION WITH HYDROCHLORIC ACID

DESCRIPTION	FIELD TEST
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT-N ₆₀ (# blows/ft)	MODIFIED CA SAMPLER (# blows/ft)	CALIFORNIA SAMPLER (# blows/ft)	RELATIVE DENSITY (%)
Very Loose	<4	<4	<5	0 - 15
Loose	4 - 10	5 - 12	5 - 15	15 - 35
Medium Dense	10 - 30	12 - 35	15 - 40	35 - 65
Dense	30 - 50	35 - 60	40 - 70	65 - 85
Very Dense	>50	>60	>70	85 - 100

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH (q _u)(psf)	CRITERIA
Very Soft	< 1000	Thumb will penetrate soil more than 1 in. (25 mm.)
Soft	1000 - 2000	Thumb will penetrate soil about 1 in. (25 mm.)
Firm	2000 - 4000	Thumb will indent soil about 1/4-in. (6 mm.)
Hard	4000 - 8000	Thumb will not indent soil but readily indented with thumbnail
Very Hard	> 8000	Thumbnail will not indent soil

NOTE: AFTER TERZAGHI AND PECK, 1948

STRUCTURE

DESCRIPTION	CRITERIA
Stratified	Alternating layers of varying material or color with layers at least 1/4-in. thick, note thickness
Laminated	Alternating layers of varying material or color with the layer less than 1/4-in. thick, note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

CEMENTATION

DESCRIPTION	FIELD TEST
Weakly	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

	PROJECT NO.: 20162945	SOIL DESCRIPTION KEY	APPENDIX
	DRAWN BY: MDM		
	CHECKED BY: STP	Precision Medicine 1380 East Medical Center Drive St. George, UT	B-2
	DATE: 6/9/2016		
	REVISED: -		

INFILLING TYPE

NAME	ABBR	NAME	ABBR
Albite	Al	Muscovite	Mus
Apatite	Ap	None	No
Biotite	Bi	Pyrite	Py
Clay	Cl	Quartz	Qz
Calcite	Ca	Sand	Sd
Chlorite	Ch	Sericite	Ser
Epidote	Ep	Silt	Si
Iron Oxide	Fe	Talc	Ta
Manganese	Mn	Unknown	Uk

DENSITY/SPACING OF DISCONTINUITIES

DESCRIPTION	SPACING CRITERIA
Unfractured	> 6 ft. (> 1.83 meters)
Slightly Fractured	2 - 6 ft. (.061 - 1.83 meters)
Moderately Fractured	8 in - 2 ft. (203.20 - 609.60 mm.)
Highly Fractured	2 - 8 in. (50.80 - 203.30 mm.)
Intensely Fractured	< 2 in. (< 50.80 mm.)

ADDITIONAL TEXTURAL ADJECTIVES

DESCRIPTION	RECOGNITION
Pit (Pitted)	Pinhole to 0.03 ft. (3/8 in.) (>1 to 10 mm.) openings
Vug (Vuggy)	Small openings (usually lined with crystals) ranging in diameter from 0.03 ft. (3/8 in.) to 0.33 ft. (4 in.) (10 to 100 mm.)
Cavity	An opening larger than 0.33 ft. (4 in.) (100 mm.), size descriptions are required, and adjectives such as small, large, etc., may be used
Honeycombed	If numerous enough that only thin walls separate individual pits or vugs, this term further describes the preceding nomenclature to indicate cell-like form
Vesicle (Vesicular)	Small openings in volcanic rocks of variable shape and size formed by entrapped gas bubbles during solidification

DEGREES OF WEATHERING

DESCRIPTION	CRITERIA
Unweathered	No evidence of chemical/mechanical alternation; rings with hammer blow.
Slightly Weathered	Slight discoloration on surface; slight alteration along discontinuities; <10% rock volume altered.
Moderately Weathered	Discoloring evident; surface pitted and alteration penetration well below surface; Weathering "halos" evident; 10-50% rock altered.
Highly Weathered	Entire mass discolored; Alteration pervading most rock, some slight weathering pockets; some minerals may be leached out.
Decomposed	Rock reduced to soil with relic rock texture/structure; Generally molded and crumbled by hand.

RELATIVE HARDNESS / STRENGTH DESCRIPTIONS

GRADE		UCS (MPa)	FIELD TEST
R0	Extremely Weak	0.25 - 1.0	Indented by thumbnail
R1	Very Weak	1.0 - 5.0	Crumbles under firm blows of geological hammer, can be peeled by a pocket knife
R2	Weak	5.0 - 25	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer
R3	Medium Strong	25 - 50	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with a single firm blow of a geological hammer
R4	Strong	50 - 100	Specimen requires more than one blow of geological hammer to fracture it
R5	Very Strong	100 - 250	Specimen requires many blows of geological hammer to fracture it
R6	Extremely Strong	> 250	Specimen can only be chipped with a geological hammer

BEDDING CHARACTERISTICS

TERM	Thickness (in.)	Thickness (mm.)
Very Thick Bedded	> 36	> 915
Thick Bedded	12 - 36	305 - 915
Moderately Bedded	4 - 12	102 - 305
Thin Bedded	1 - 4	25 - 102
Very Thin Bedded	0.4 - 1	10 - 25
Laminated	0.1 - 0.4	2.5 - 10
Thinly Laminated	< 0.1	< 2.5

Bedding Planes Planes dividing the individual layers, beds, or stratigraphy of rocks.

Joint Fracture in rock, generally more or less vertical or traverse to bedding.

Seam Applies to bedding plane with unspecified degree of weather.

APERTURE

DESCRIPTION	CRITERIA [in.(mm.)]
Tight	< 0.04 (< 1)
Open	0.04 - 0.20 (1 - 5)
Wide	> 0.20 (> 5)

DISCONTINUITY TYPE

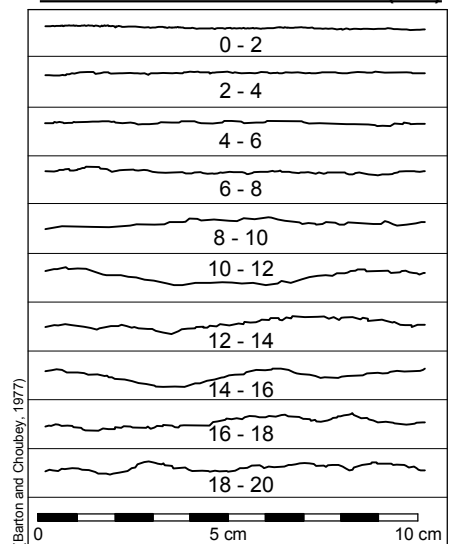
DESCRIPTION
Fault
Joint
Shear
Foliation
Vein
Bedding

INFILLING AMOUNT

DESCRIPTION
Surface Stain
Spotty
Partially Filled
Filled
None

ROCK QUALITY DESIGNATION (RQD)

DESCRIPTION	RQD (%)
Very Poor	0 - 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90
Excellent	90 - 100

JOINT ROUGHNESS COEFFICIENT (JRC)

RQD Rock-quality designation (RQD) Rough measure of the degree of jointing or fracture in a rock mass, measured as a percentage of the drill core in lengths of 10 cm. or more.



PROJECT NO.: 20162945
DRAWN BY: MDM
CHECKED BY: STP
DATE: 6/9/2016
REVISED: -

ROCK DESCRIPTION KEY

Precision Medicine
1380 East Medical Center Drive
St. George, UT

APPENDIX**B-3**

Date Begin - End: 5/25/2016	Drilling Company: AGECE	BORING LOG B-1
Logged By: D. Krupicka	Drill Crew: Ben and Hugo	
Hor.-Vert. Datum: WGS84	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear / 80° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55126° N Longitude: 37.09841° W Surface Condition: Roadbase	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Possible Fill : SILT with Sand (ML) : red to reddish brown, dry to slightly moist												
5		SILT with Sand (ML) : red to reddish brown, dry to slightly moist, very stiff	BC=13 32 50/3" PP=<1	14"										
10		Sandy SILT (ML) : red, slightly moist, very stiff	BC=35 50/3"	9"										
15	x x													

	PROJECT NO.: 20162945	BORING LOG B-1	APPENDIX
	DRAWN BY: MDM CHECKED BY: STP DATE: 6/9/2016 REVISED: -		
	Precision Medicine 1380 East Medical Center Drive St. George, UT		B-4 PAGE: 1 of 1

Date Begin - End: 5/25/2016	Drilling Company: AGECE	BORING LOG B-2
Logged By: D. Krupicka	Drill Crew: Ben and Hugo	
Hor.-Vert. Datum: WGS84	Drilling Equipment: CME-55	
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear / 80° F	Exploration Diameter: 9 in. O.D.	
Hammer Type - Drop: 140 lb. Auto - 30 in.		

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55084° N Longitude: 37.09841° W Surface Condition: Roadbase	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Possible Fill : Sandy SILT (ML) : red, slightly moist												
5		Silty SAND (SM) : red, slightly moist, very dense, trace gravel	BC=10 22 50/5" PP=3	16"	SM					16	NP	NP		
10			BC=15 23 40 PP=1	14"										
15		Sandy SILTSTONE : reddish brown, slightly moist	BC=50/4"	NR										
20			BC=50/3"	2"										
		Sandy Silty CLAYSTONE : reddish brown, slightly moist, Strength: R1 - R2, JRC: 6 - 8	RQD=15	32"										
25		Clayey SILTSTONE : red to reddish brown, moist, laminated, unweathered, Strength: R2 - R3, JRC: 6 - 8	RQD=86	58"		3.0	133.0							
30		Sandy SILTSTONE : red to reddish brown, moist, Strength: R3, JRC: 4 - 6	RQD=90	60"										
35		The boring was terminated at approximately 35 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.					GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.							

	PROJECT NO.: 20162945	BORING LOG B-2	APPENDIX
	DRAWN BY: MDM		
	CHECKED BY: STP	Precision Medicine 1380 East Medical Center Drive St. George, UT	B-5
	DATE: 6/9/2016		
	REVISED: -		
PAGE: 1 of 1			

Date Begin - End: 5/26/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Partly Cloudy 80° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-3

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55150° N Longitude: 37.09822° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Fill : Silty SAND (SM) : red and tan, slightly moist, dense to very dense												
5				BC=9 13 17 PP=0.5	18"									
10				BC=6 18 50	14"	SM	5.0	114.0		36	NP	NP		
15		SILTSTONE : reddish brown, moist, laminated, unweathered, Strength: R2		BC=50/5" RQD=34	5" 41"									
20		JRC : 10-12, Strength : R3		RQD=75	64"									
25														
30		The boring was terminated at approximately 25 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.					GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.							

The boring was terminated at approximately 25 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.

GROUNDWATER LEVEL INFORMATION:
Groundwater was not encountered during drilling or after completion.



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
 DATE: 6/9/2016
 REVISED: -

BORING LOG B-3

Precision Medicine
 1380 East Medical Center Drive
 St. George, UT

APPENDIX

B-6

PAGE: 1 of 1

Date Begin - End: 5/26/2016 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 75° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-4

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS						
		Latitude: -113.55100° N Longitude: 37.09807° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Lithologic Description											
5		SILT with Sand (ML): reddish brown, moist, hard		BC=10 50	12"	ML	5.0			83	NP	NP	
10		Sandy SILT (ML): red, slightly moist to moist, hard, becoming laminated siltstone		BC=50/4"	4"								
15		Silty SANDSTONE: reddish brown, slightly moist, laminated, JRC: 10 - 12, Strength: R2		BC=50/4" RQD=18	4" 48"								
20				RQD=85	60"								
25				RQD=36	50"								
		SILTSTONE: red to reddish brown, slightly moist, slightly weathered, some calcite infilling along fractures, JRC: 2 - 4, Strength: R2 - R3											
		CLAYSTONE: reddish brown, moist, Strength: R1 - R2											
		SILTSTONE: reddish brown, moist, Strength: R2 - R3											
30		The boring was terminated at approximately 29.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.						



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
 DATE: 6/9/2016
 REVISED: -

BORING LOG B-4

Precision Medicine
 1380 East Medical Center Drive
 St. George, UT

APPENDIX

B-7

PAGE: 1 of 1

Date Begin - End: 5/26/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Partly Cloudy 80° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-5

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55059° N Longitude: 37.09800° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Fill : SILT with Sand (ML) : red to tan to olive gray, slightly moist, very stiff to hard		BC=10 12 12 PP=4	18"	ML								
5														
10		SILT (ML) : red to tan to olive gray, slightly moist, very stiff to hard, occasional sandstone cobble		BC=25 28 50 PP=0.5	14"					90	NP	NP		
15		SILTSTONE : reddish brown, slightly moist, laminar, unweathered, Strength: R2		BC=50/5" RQD=48	4" 22"									
20		moist, slightly weathered, Strength: R2		RQD=48	60"									
25		calciate infilling between 23 and 24 feet, Stregth: R3		RQD=25	56"									
30		moist to wet, Strength: R2 - R3												
The boring was terminated at approximately 30 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.														
GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.														



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
 DATE: 6/9/2016
 REVISED: -

BORING LOG B-5

Precision Medicine
 1380 East Medical Center Drive
 St. George, UT

APPENDIX

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Date Begin - End: 5/26/2016	Drilling Company: AGECE	BORING LOG B-6
Logged By: D. Krupicka	Drill Crew: Ben and Hugo	
Hor.-Vert. Datum: WGS84	Drilling Equipment: CME-55	Hammer Type - Drop: 140 lb. Auto - 30 in.
Plunge: -90 degrees	Drilling Method: Hollow Stem Auger	
Weather: Clear / 70° F	Exploration Diameter: 9 in. O.D.	

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55150° N Longitude: 37.09778° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Sandy SILT (ML): red to dark red, moist, hard												
5				BC=17 50 PP=1.5	15"									
10				BC=50/5.5"	5"									
15		SILTSTONE: reddish brown to brown, slightly moist, possibly very fine grained sandstone, Strength: R2 - R3		BC=50/5.5" RQD=35	5" 12"									
20		Strength: R2			29"									
		CLAYSTONE: reddish brown, moist, slightly weathered, JRC: 8 - 10, Strength: R2		RQD=40	60"									
25		The boring was terminated at approximately 24.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.							
30														

 KLEINFELDER <i>Bright People. Right Solutions.</i>	PROJECT NO.: 20162945	BORING LOG B-6	APPENDIX
	DRAWN BY: MDM CHECKED BY: STP DATE: 6/9/2016 REVISED: -	Precision Medicine 1380 East Medical Center Drive St. George, UT	B-9
			PAGE: 1 of 1

Date Begin - End: 5/26/2016 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 65° F **Exploration Diameter:** 9 in. O.D.

BORING LOG B-7

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55104° N Longitude: 37.09781° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		Possible Fill : Silty SAND with Sand (SM) : red, slightly moist to moist, dense, trace fine gravel				SM	5.0	111.0	81	26	NP	NP		
5			BC=8 17 20 PP=4	18"										
10		Lean CLAY with Sand (CL) : reddish brown, moist		BC=9 38 46 PP=4.5	16"									
15		CLAYSTONE : dark red, moist, laminated		BC=11 22 50/2"" PP=4.5+	15"									
20		Sandy SILTSTONE : dark red, moist		BC=42 50/1""	9"									
25		Sandy Silty CLAYSTONE : dark red, laminated		BC=50/5.5"" PP=4.5+										
		The boring was terminated at approximately 25.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 26, 2016.												
		GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.												
30														



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
 DATE: 6/9/2016
 REVISED: -

BORING LOG B-7

Precision Medicine
 1380 East Medical Center Drive
 St. George, UT

APPENDIX

B-10

PAGE: 1 of 1

Date Begin - End: 5/25/2016 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 75° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-1

Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS							
		Latitude: -113.55189° N Longitude: 37.09904° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Lithologic Description											
5	</												



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
 DATE: 6/9/2016
 REVISED: -

BORING LOG P-1

Precision Medicine
 1380 East Medical Center Drive
 St. George, UT

APPENDIX

B-11

PAGE: 1 of 1

Date Begin - End: 5/25/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 75° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-2

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.55122° N Longitude: 37.09881° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
5		Fill :Road Base: hard, compacted												
		SILT with Sand (ML): red, dry, very stiff, some gypsum												
			BC=6 9 10											
	The boring was terminated at approximately 6 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.													
	GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.													

	PROJECT NO.: 20162945	BORING LOG P-2	APPENDIX
	DRAWN BY: MDM		
	CHECKED BY: STP	Precision Medicine 1380 East Medical Center Drive St. George, UT	B-12
	DATE: 6/9/2016		
	REVISED: -		PAGE: 1 of 1

Date Begin - End: 5/25/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 65° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-3

Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS							
		Latitude: -113.54893° N Longitude: 37.09855° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		SILT with Sand (ML): red to reddish brown, slightly moist, very stiff		BC=8 10 18	11"								
5		Sandy SILT (ML): red, slightly moist, becoming coarser-grained		BC=32 50/4"	9"								
10		SANDSTONE: reddish brown, very fine-grained		BC=50/5.5"									
				BC=50/1"									
15		The boring was terminated at approximately 12 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016. <u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.											
20													
25													
30													



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
 DATE: 6/9/2016
 REVISED: -

BORING LOG P-3

Precision Medicine
 1380 East Medical Center Drive
 St. George, UT

APPENDIX

B-13

PAGE: 1 of 1

Date Begin - End: 5/25/2016 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 70° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-4

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS						
		Latitude: -113.54878° N Longitude: 37.09804° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= 1sf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks
		Lithologic Description											
		SILT (ML): red to reddish brown, slightly moist, stiff		BC=5 8 10 PP=0.5	14"	ML	3.0	110.0	58	NP	NP		
5		Sandy SILTSTONE: red to reddish brown, slightly moist, hard, abundant gypsum	BC=20 47 50/5.5" PP=4	18"									
10		SANDSTONE: very fine-grained, olive to olive gray, slightly moist, hard	BC=50/4" RQD=7	48"									
		Sandy CLAYSTONE: reddish brown, slightly moist, highly fractured, JRC: 10 - 12, Strength: R1											
15		SILTSTONE: moderate gypsum infilling along fractures, Strength: R2											
The boring was terminated at approximately 15 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.													<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.
20													
25													
30													



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
 DATE: 6/9/2016
 REVISED: -

BORING LOG P-4

Precision Medicine
 1380 East Medical Center Drive
 St. George, UT

APPENDIX

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PAGE: 1 of 1

Date Begin - End: 5/25/2016 **Drilling Company:** AGECEC
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear **Exploration Diameter:** 9 in. O.D.

BORING LOG P-5

Depth (feet)	Graphical Log	FIELD EXPLORATION					LABORATORY RESULTS							
		Latitude: -113.54892° N Longitude: 37.09749° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		SILT with Gravel (ML): rounded to sub-rounded, gravel composed of basalt, some boulder sized material												
		Sandy SILT (ML): red to reddish brown, dry, hard												
5				BC=10 19 25 PP=3	16"									
10		CLAYSTONE: reddish brown, slightly moist, hard, with gypsum		BC=43 50/2"" PP=4.5+	10"									
				BC=20 37 50/5.5""	18"									
15		The boring was terminated at approximately 13.5 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.					<u>GROUNDWATER LEVEL INFORMATION:</u> Groundwater was not encountered during drilling or after completion.							
20														
25														
30														



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
 DATE: 6/9/2016
 REVISED: -

BORING LOG P-5

Precision Medicine
 1380 East Medical Center Drive
 St. George, UT

APPENDIX

B-15

PAGE: 1 of 1

Date Begin - End: 5/25/2016 **Drilling Company:** AGECE
Logged By: D. Krupicka **Drill Crew:** Ben and Hugo
Hor.-Vert. Datum: WGS84 **Drilling Equipment:** CME-55 **Hammer Type - Drop:** 140 lb. Auto - 30 in.
Plunge: -90 degrees **Drilling Method:** Hollow Stem Auger
Weather: Clear / 75° F **Exploration Diameter:** 9 in. O.D.

BORING LOG P-6

Depth (feet)	Graphical Log	FIELD EXPLORATION				LABORATORY RESULTS								
		Latitude: -113.54906° N Longitude: 37.09699° W Surface Condition: Soil	Sample Type	Blow Counts(BC)= Uncorr. Blows/6 in. Pocket Pen(PP)= tsf RQD=%	Recovery (NR=No Recovery)	USCS Symbol	Water Content (%)	Dry Unit Wt. (pcf)	Passing #4 (%)	Passing #200 (%)	Liquid Limit	Plasticity Index (NP=NonPlastic)	Additional Tests/ Remarks	
		Lithologic Description												
		SILT (ML): non-plastic, red to reddish brown, dry, stiff		BC=10 6 7 PP=3	18"									
5		CLAYSTONE: red to reddish brown, slightly moist, hard, moderate to abundant gypsum		BC=37 50/2"										
The boring was terminated at approximately 5 ft. below ground surface. The boring was backfilled with auger cuttings on May 25, 2016.														
GROUNDWATER LEVEL INFORMATION: Groundwater was not encountered during drilling or after completion.														
10														
15														
20														
25														
30														



PROJECT NO.: 20162945
 DRAWN BY: MDM
 CHECKED BY: STP
 DATE: 6/9/2016
 REVISED: -

BORING LOG P-6

Precision Medicine
 1380 East Medical Center Drive
 St. George, UT

APPENDIX

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PAGE: 1 of 1



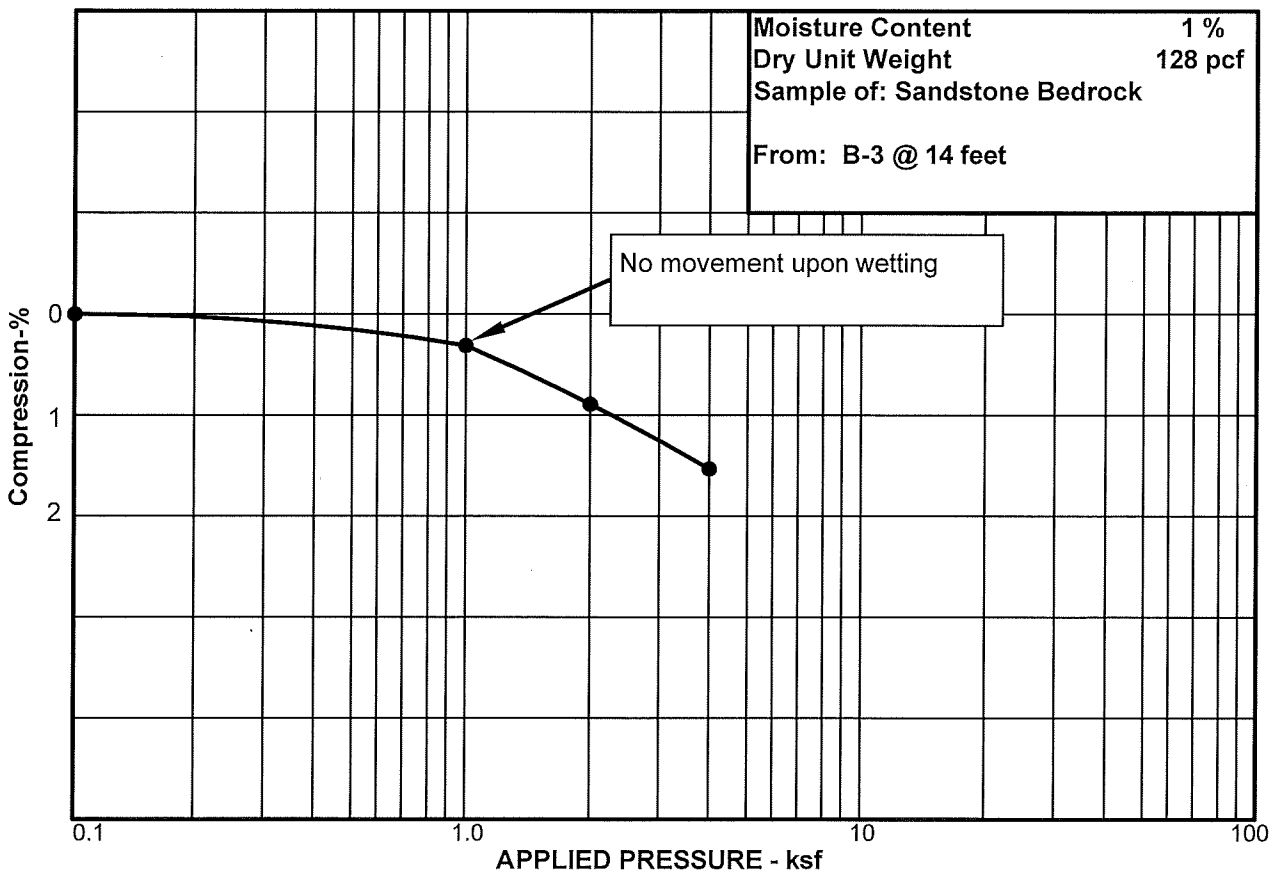
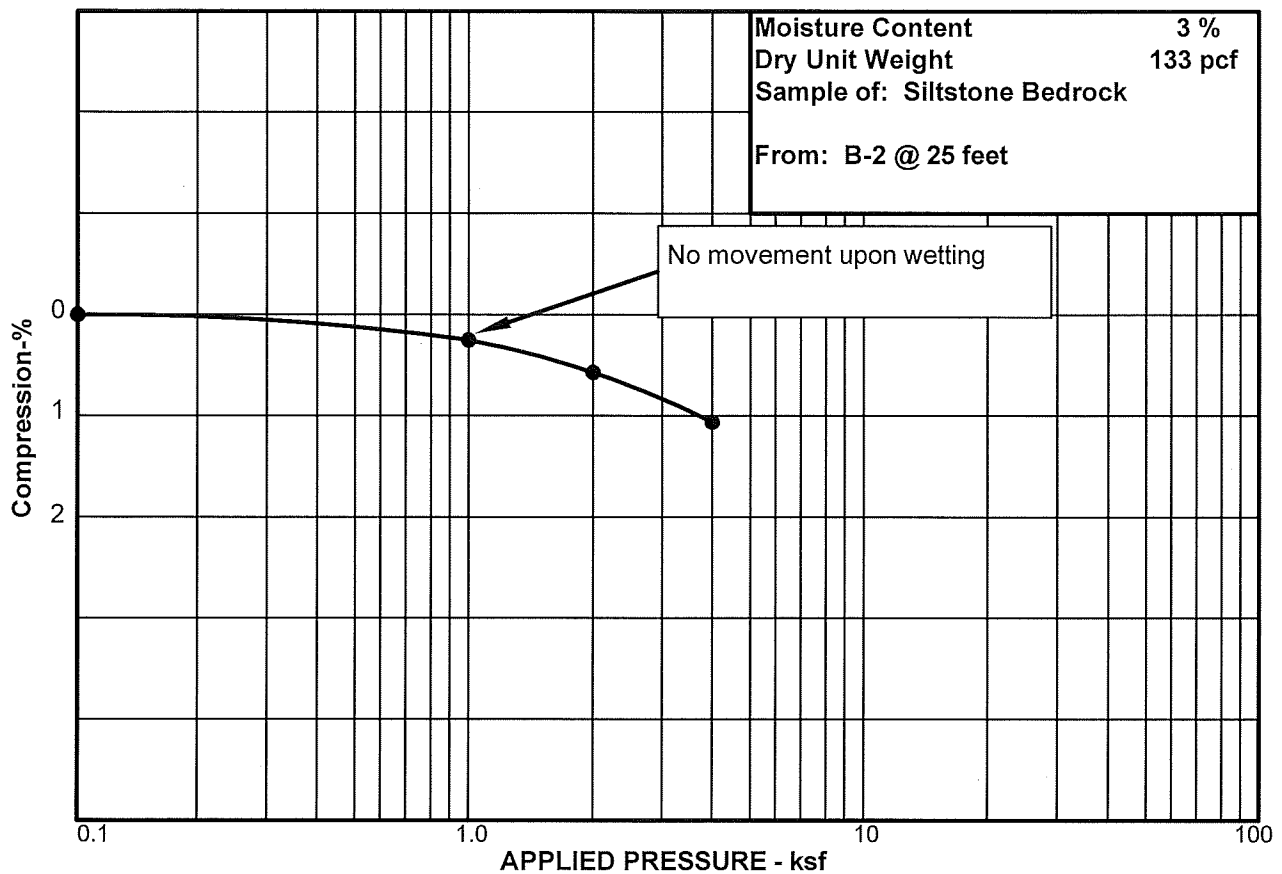
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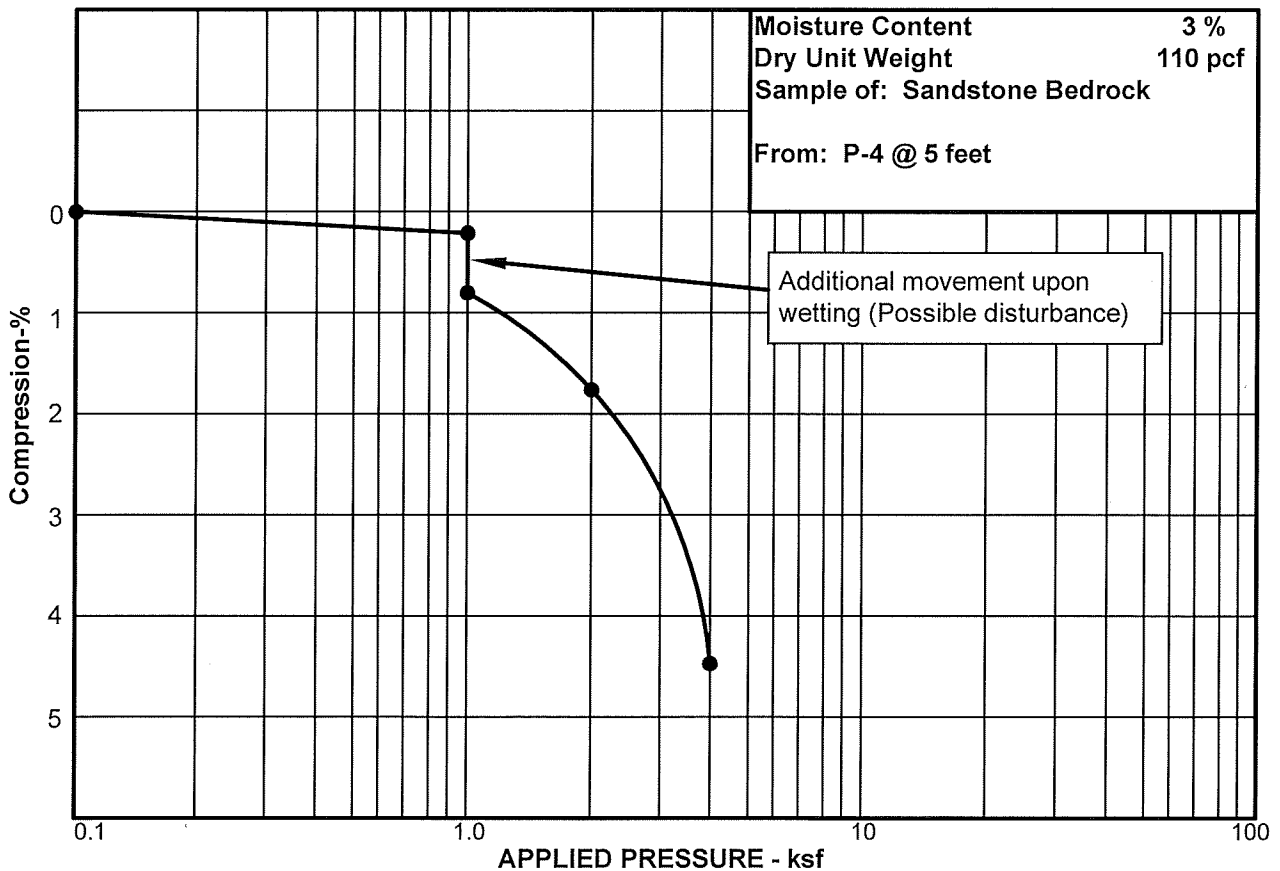
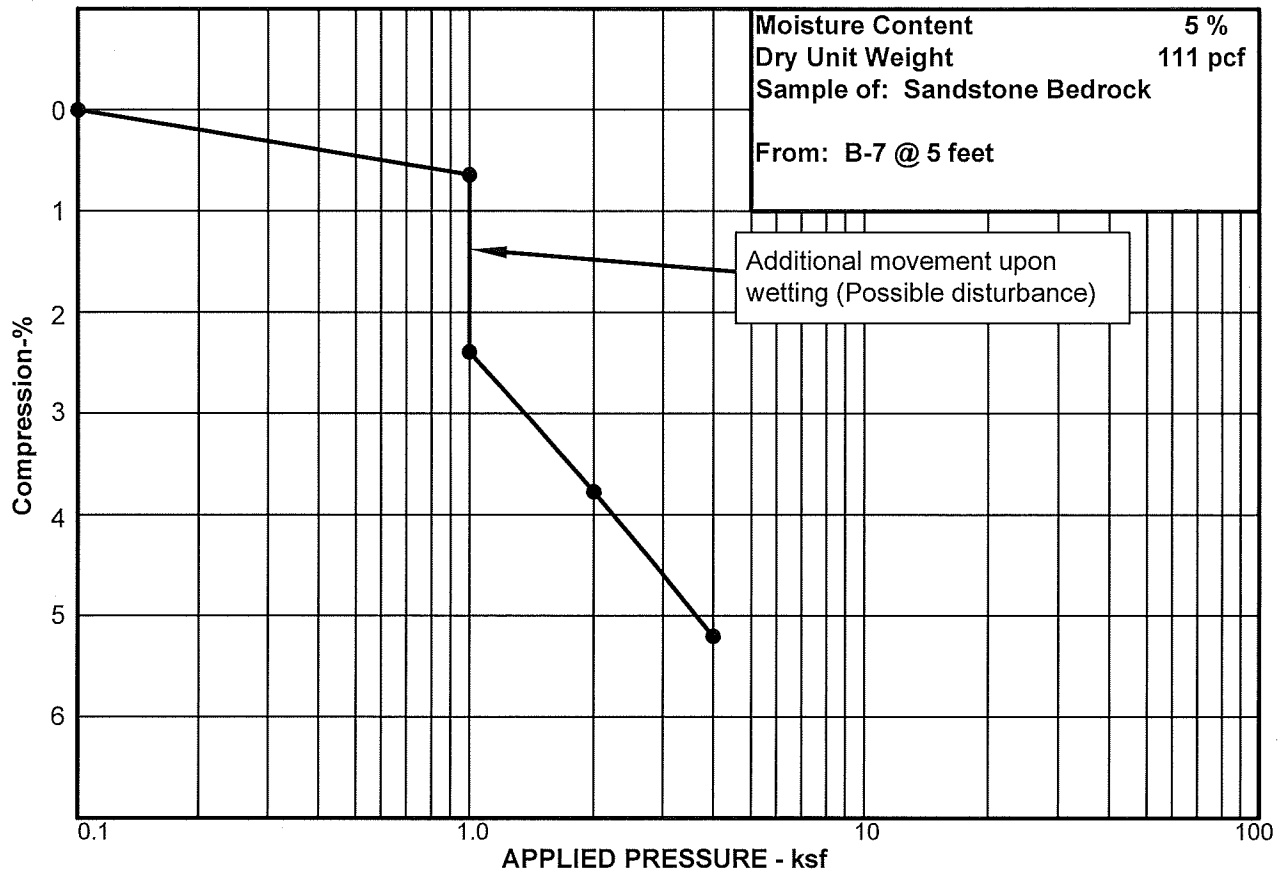
APPENDIX C

Laboratory Test Results

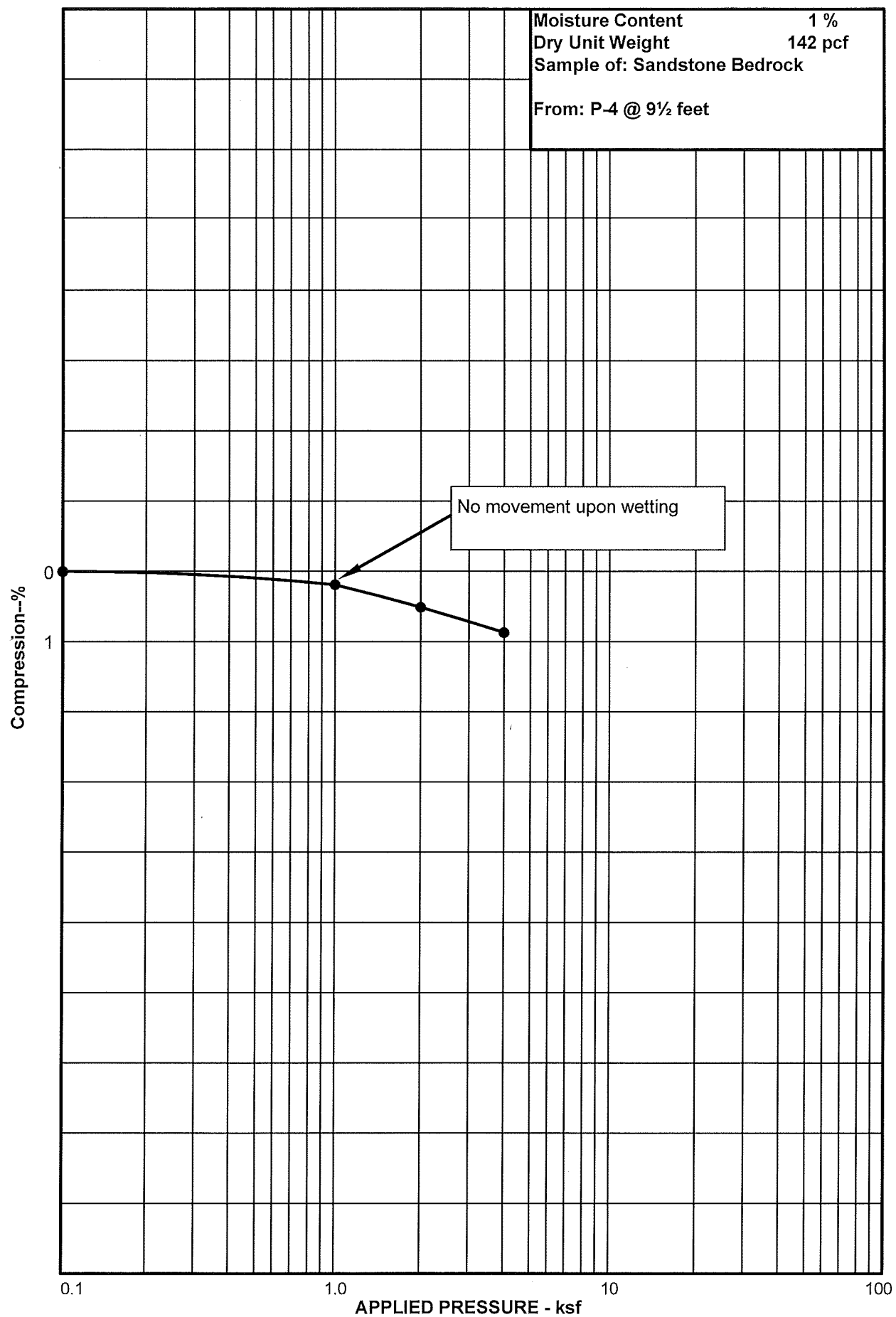
Applied Geotechnical Engineering Consultants, Inc.



Applied Geotechnical Engineering Consultants, Inc.



Applied Geotechnical Engineering Consultants, Inc.



APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I
SUMMARY OF LABORATORY TEST RESULTS

IHC Expansion

Project Number 2151384

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg Limits		Sample Classification
Boring No.	Depth (feet)			Gravel (%)	Sand (%)	Silt/ clay (%)	Liquid Limit (%)	Plasticity Index (%)	
B-2	5			17	67	16		NP	Sandstone Bedrock
B-2	25	3	133						Siltstone Bedrock
B-3	7½	5	114			36		NP	Sandstone Bedrock
B-3	14	1	128						Sandstone Bedrock
B-4	5	5				83		NP	Siltstone Bedrock
B-5	10					90		NP	Siltstone Bedrock
B-7	5	5	111	19	55	26		NP	Sandstone Bedrock
P-4	5	3	110			58		NP	Sandstone Bedrock
P-4	9½	1	142						Sandstone Bedrock



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APPENDIX D

Important Information about your Geotechnical Engineering Report

Important Information about This Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply this report for any purpose or project except the one originally contemplated.*

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an

assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by:* the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time to perform additional study.* Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help

others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold-prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical-engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.



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e-mail: info@geoprofessional.org www.geoprofessional.org

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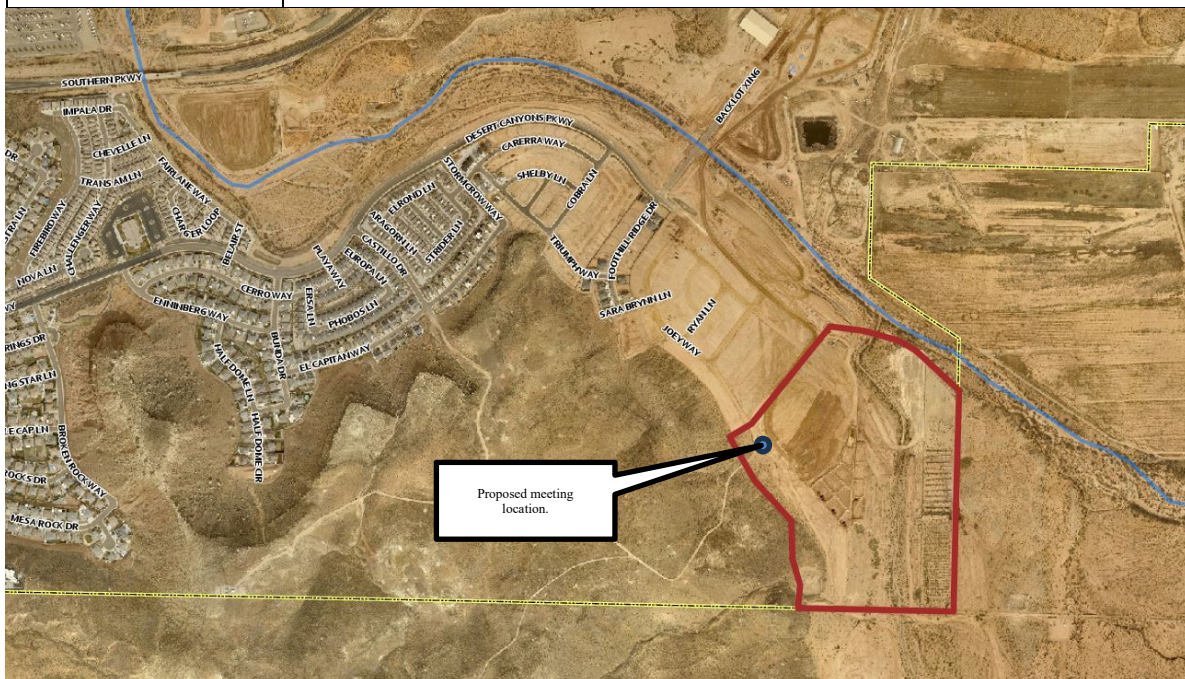
Item 2

Hillside Permit

Item 2

Hillside Permit

Desert Haven Hillside Development Permit (Case No. 2026-HS-003)		
Request:	A Hillside Development Permit to allow disturbance of areas in the 20-30%, 30-40%, and 40% and above slope areas. This application is required in order to develop single-family homes.	
Applicant:	DSG Engineering, Inc, Ken Miller	
Location:	Generally located south of the Fort Pierce Wash, along the Utah-Arizona border.	
General Plan:	Medium Density Residential (MDR)	
Existing Zoning:	R-1 ()	
Surrounding Zoning:	North	A-20 (Agriculture 20-acre minimum lot size)
	South	Arizona
	East	Washington County
	West	PD-R (Planned Development Residential) and A-20 (Agriculture 20-acre minimum lot size)
Land Area:	Approximately 55 acres	



BACKGROUND

This is a request to obtain a hillside permit for the property generally located south of the Fort Pierce Wash, along the Utah-Arizona border. (See Exhibit A, Vicinity Map). This property was included in a 212.679-acre annexation approved by the City on November 7, 2019. On May 7, 2020, the property received an MDR (Medium Density Residential) General Plan land use designation. The City Council recently approved a zone change to an R-1 (Single-Family Residential with no minimum lot size requirement and 10-foot minimum lot width/frontage) zoning district on July 2, 2026. The R-1 zoning district is a recently adopted residential zone that was approved by the City Council on March 25, 2026. The R-1 zone provides flexibility in lot sizes by eliminating lot area requirements. However, the density must still meet the General Plan designation of MDR (Medium Density Residential) and no more than 9 units per acre.

According to the applicant and documents provided, the Desert Haven Subdivision is relatively flat. A small portion of the west side of the project is proposed at the toe of the existing hillside. The applicant is proposing grading that includes cutting into portions of the hillside with existing slopes in the 20% to 30% range. The applicant has provided grading and drainage plans which detail the cut slopes. Located outside of the proposed lot boundaries, cut slopes will include a drainage collection and conveyance swale at the toe of the slope. These drainage swales and cut slopes will be owned and maintained by the HOA.

The applicant has provided a Slope Summary showing the approximate proposed disturbed area for your analysis. This summary shows the following buildable areas:

DESERT HAVEN SLOPE ANALYSIS
Proposed Disturbed Area Only

NUMBER	MINIMUM SLOPE, %	MAXIMUM SLOPE, %	DISTURBED AREA, SF	DISTURBED AREA, AC	PERCENT OF OVERALL HILLSIDE AREA, %	MAXIMUM ALLOWABLE SLOPE DISTURBANCE, %	REMAINING MAXIMUM ALLOWABLE SLOPE DISTURBANCE, AC
1	0	20	69257	1.59	15.09%	NA	NA
2	20	30	38499	0.88	2.08%	30.00%	11.88
3	30	40	407	0.01	0.06%	5.00%	0.83
4	40	100+	0	0.00	0.00%	0.00%	0.00
			108163	2.48	2.32%		

The Hillside Review Board will visit the site to determine what conditions exist on the ground and if there are any unique features that should be protected. They will look at the proposed concept plans, grading plans, geotechnical reports, slope maps and make a recommendation to the Planning Commission who will in turn make a recommendation to the City Council.

APPLICABLE ORDINANCE(S) (Selected portions)

10-13A-1: Density and Disturbance Standards

- A. The hillside development overlay zone (HDOZ) limits development densities and provides specific development incentives to transfer underlying zone densities from hillsides (sending areas) to less steep slopes or more safe development areas (receiving areas), within a development.
- B. For those portions of a proposed development with natural slopes twenty percent (20%) or less, development density follows the density and development standards in the underlying zone.
- C. For those portions of a proposed development with natural slopes from twenty-one percent (21%) to thirty percent (30%), development activity shall not disturb more than thirty percent (30%) of the parcel within this slope category.
- D. For those portions of a proposed development with natural slopes from thirty-one percent (31%) to forty percent (40%), development activity shall not disturb more than five percent (5%) of the area within this slope category.
- E. A proposed development may not disturb slopes in excess of forty percent (40%).

10-13A-2: Slope and Slope Areas Determined

- A. Slope shall be determined for each significant portion of development parcel.
- B. *Procedure:* The applicant shall map the location of the natural slope by using the following procedure:
 - 1. *Preparation of Contour Maps:* The applicant shall submit an accurate, current contour map, prepared and certified by a licensed professional engineer or surveyor, which shows all land contours at intervals no greater than five feet (5'), drawn at a one inch equals one hundred feet (1" = 100') scale maximum.
 - 2. *Verification through Field Surveys:* The city engineer or designee may require the applicant to submit a field survey to verify the accuracy of the contour map.
- C. *Determination of Slope Areas:* Using the contour map, natural slopes shall be calculated using points identified as natural slopes of twenty

percent (20%), thirty percent (30%), and forty percent (40%), and shall be located on the contour map and connected by a continuous line. That area bounded by said lines and intersecting property lines shall be used for determining project density. Small washes or outcrops, which have slopes distinctly different from surrounding property, and are not part of the contiguous topography, may be excluded from the slope determination.

EXHIBITS PROVIDED

1. Exhibit A – General Plan Maps
“Exhibit A” in the packet are the maps the applicant supplied showing the existing and proposed General Plan maps. The proposed map will be revised based on HSRB discussion.
2. Exhibit B – Grading and Drainage Plan
“Exhibit B” in the packet is a Grading and Drainage plan.
3. Exhibit C – Slope Summary
“Exhibit C” in the packet is a slope summary.
4. Exhibit D – Desert Canyons Geotechnical Study
“Exhibit D” in the packet is the Desert Canyons Geotechnical report by AGECE.
5. Exhibit E – Desert Haven Drainage Study
“Exhibit E” in the packet is the Desert Haven Drainage Study.

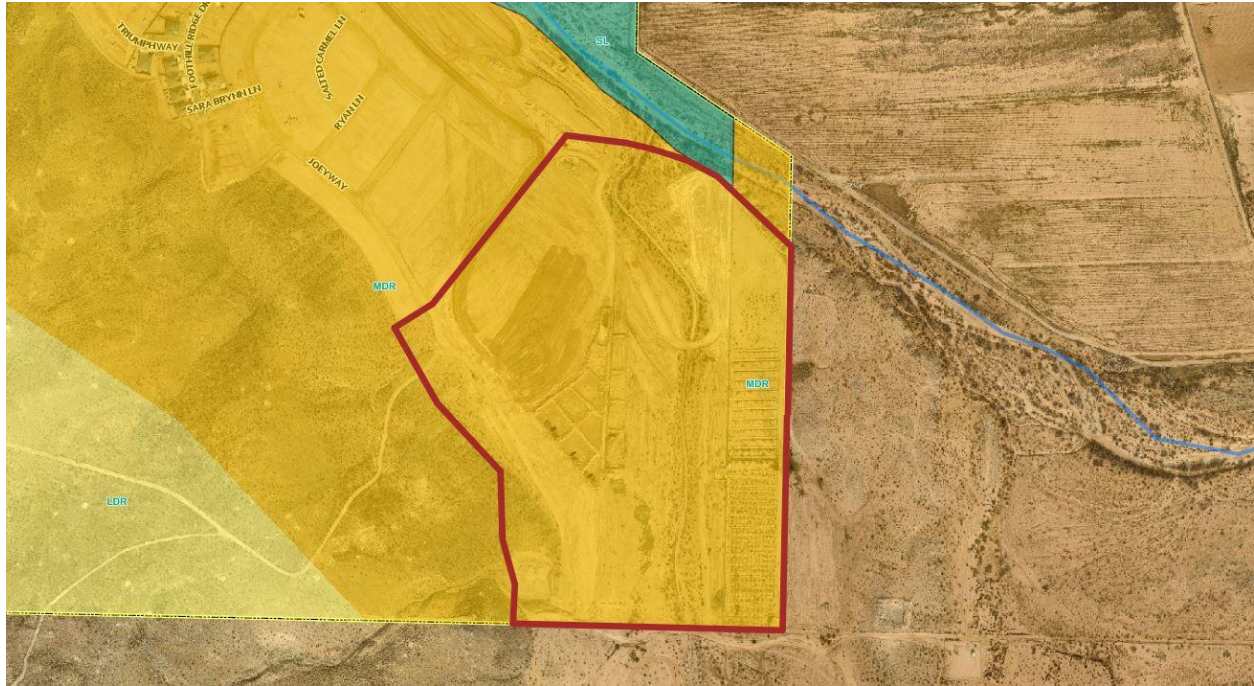
RECOMMENDATION

Section 10-13A-8(B)(1) of the “Hillside Review Board Powers and Duties” states that the hillside board can make recommendations to “adopt, modify or reject a proposal” to the Planning Commission (PC).

FINDINGS

1. The proposed development generally aligns with the intent of the Hillside Development Overlay Zone in that it concentrates density in more buildable areas while limiting disturbance on steeper slopes.
2. Based on the materials provided, including the slope analysis and grading plans, the project appears to stay within the allowable disturbance thresholds for slope between 20% and 40%, and avoids disturbance in areas exceeding 40% slope, consistent with City ordinance requirements.

EXHIBIT A
DESERT HAVEN
General Plan – MDR (Medium Density Residential)



Zoning - R-1

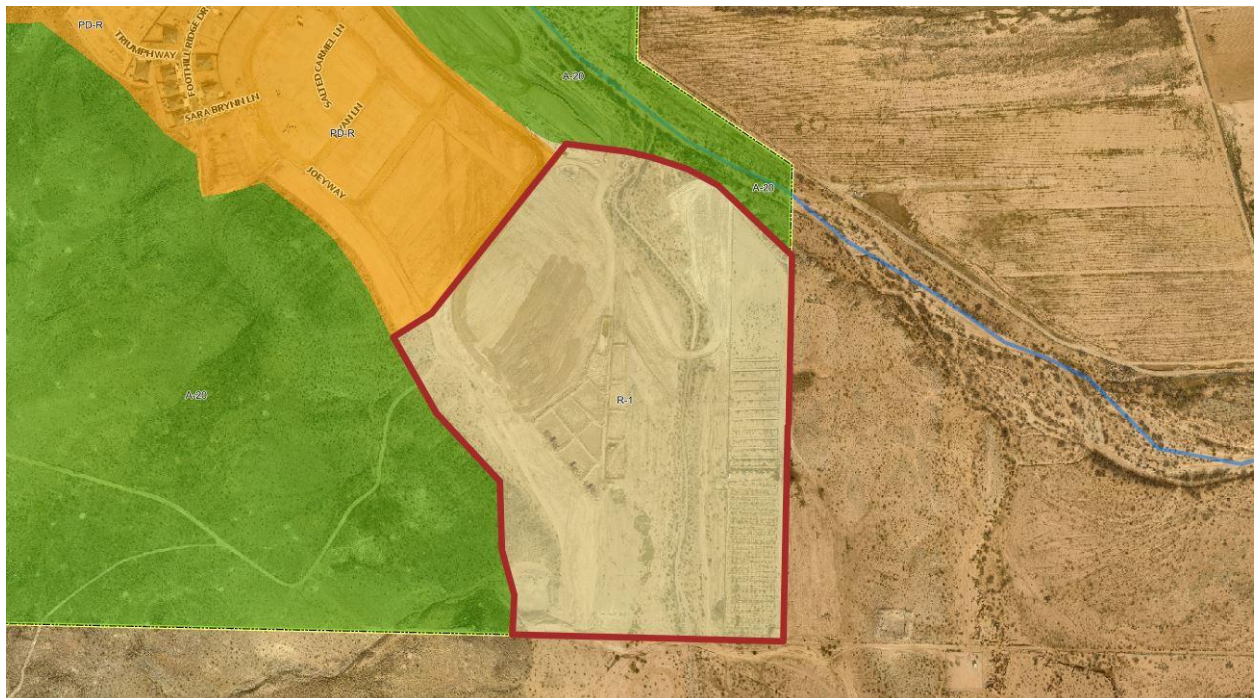
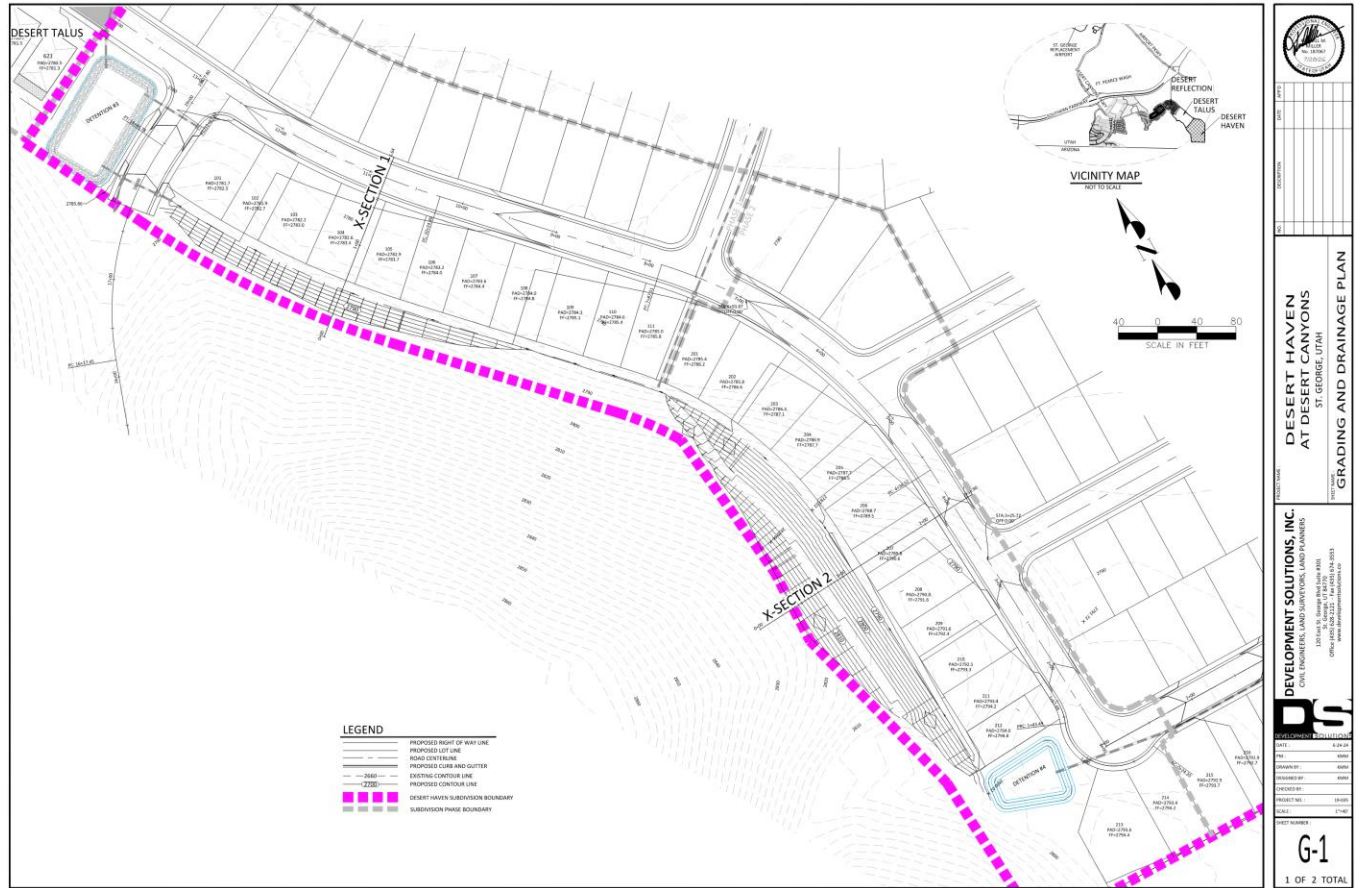
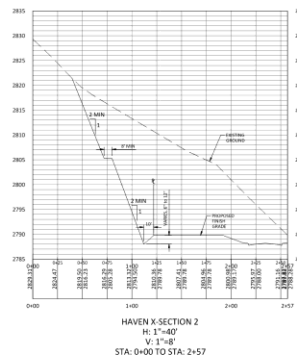
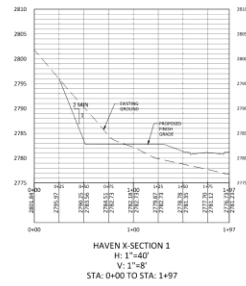


EXHIBIT B

DESERT HAVEN GRADING AND DRAINAGE PLAN AND CROSS SECTIONS



DESERT TALUS



PROJECT NAME:		DATE:		SHEET:	
DESIGNER:		DRAWN BY:		CHECKED BY:	
PROJECT NO.:		SHEET NO.:		SHEET TOTAL:	
DESIGN SOLUTIONS, INC. 10100 N. 10th Avenue, Suite 100 Phoenix, AZ 85021 Phone: (602) 998-1234 Fax: (602) 998-1235 www.designsolutionsllc.com					
DESERT HAVEN AT DESERT CANYONS 517 GEORGE, UTAH					
CROSS SECTIONS					

EXHIBIT C

DESERT HAVEN SLOPE SUMMARY

DESERT CANYONS SLOPE SUMMARY
CONTIGUOUS HILLSIDE AREA OUTSIDE OF EXISTING AND PROPOSED DEVELOPMENT

NUMBER	MINIMUM SLOPE, %	MAXIMUM SLOPE, %	AREA, SF	AREA, AC	PERCENT OF TOTAL AREA, %
1	0	20	459019	10.54	9.82%
2	20	30	1853289	42.55	39.67%
3	30	40	732458	16.81	15.68%
4	40	100+	1627237	37.36	34.83%
			4672003	107.25	100.00%

DESERT HAVEN SLOPE ANALYSIS
Proposed Disturbed Area Only

NUMBER	MINIMUM SLOPE, %	MAXIMUM SLOPE, %	DISTURBED AREA, SF	DISTURBED AREA, AC	PERCENT OF OVERALL HILLSIDE AREA, %	MAXIMUM ALLOWABLE SLOPE DISTURBANCE, %	REMAINING MAXIMUM ALLOWABLE SLOPE DISTURBANCE, AC
1	0	20	69257	1.59	15.09%	NA	NA
2	20	30	38499	0.88	2.08%	30.00%	11.88
3	30	40	407	0.01	0.06%	5.00%	0.83
4	40	100+	0	0.00	0.00%	0.00%	0.00
			108163	2.48	2.32%		

EXHIBIT D
DESERT CANYONS GEOTECHNICAL REPORT BY AGE



GEOTECHNICAL INVESTIGATION
DESERT CLIFFS AREA 165 ACRES AT DESERT CANYONS
ST. GEORGE, UTAH

PREPARED FOR:



1472 EAST 3950 SOUTH
ST. GEORGE, UTAH 84790

ATTENTION: CURT GORDON

PROJECT NO. 2200519

MAY 16, 2022

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SUMMARY

1. AGEC conducted a Geotechnical Investigation to define subsurface conditions and to provide geotechnical recommendations for the proposed residential development.
2. The subsurface profile observed within the test pits generally consists of silty sand to sandy silt overlying silty gravel with sand underlain by siltstone, mudstone, and sandstone bedrock. A layer of sandy lean clay was encountered at approximately 12 feet below grade in TP-20. Practical excavator refusal was encountered on sandstone bedrock and dense gravels in test pits TP-2, TP-7, TP-10, TP-11, TP-12, TP-13, TP-14, TP-15, TP-17, TP-18, and TP-20 at depths ranging from approximately 7 to 20 feet below the existing grade.
3. Subsurface water was not encountered within the test pits to the maximum depth investigated, approximately 20 feet. Fluctuations in the groundwater level may occur over time. An evaluation of such fluctuations is beyond the scope of this report.
4. The on-site soils and bedrock in their existing condition are not suitable to support the proposed construction. The site is suitable for the proposed slab-on-grade residences provided recommendations within this report are followed. If basements or pools are proposed, additional subsurface investigation and grading recommendations are required.
5. The upper approximately 0 to 18½ feet of the near surface overburden soil (varies across the site) is loose, dry and potentially collapsible when wetted. Prior to placing fill or concrete, we recommend that the full depth of potentially collapsible soil be removed. The approximate depth of removal is shown on the site plan and test pit logs (Figures 2 and 3).

Alternatively, a soil treatment process known as pre-wetting may be implemented to treat the collapsible soils by adding moisture to the "under-saturated" soils. The building pads may be graded into a series of terraced ponds. The ponds may then be filled with appropriate volume of water to pre-wet the underlying "under-saturated" soils to essentially densify the soils subsequently reducing the collapse potential prior to construction. This process is currently being implemented in the St. George area to treat collapsible soils.

6. The proposed residences may be supported on conventional spread footings bearing on properly compacted structural fill underlain by a properly prepared subgrade. Specifically, the subgrade should be prepared during site grading by overexcavating the building pads to remove unsuitable soils as recommended in the Subgrade Preparation section of this report.

7. The on-site soils, and properly processed siltstone and sandstone bedrock, free of organics and debris are suitable for use as structural fill, site grading fill, wall backfill and utility trench backfill. The bedrock should be processed such that the maximum particle size is 4 inches and at least 50 percent of the material passes the No. 4 sieve. The mudstone bedrock is not suitable for use and should be disposed of off site.
8. Site drainage recommendations should be implemented as recommended in the Site Drainage section of this report.
9. Detailed recommendations for subgrade preparation, materials, foundations, drainage and pavement are included in the report.
10. The information provided in this summary should not be used independent of that provided within the body of this report.

SCOPE

This report presents the results of a geotechnical investigation for the proposed Desert Cliffs Area (165 Acres) at Desert Canyons planned residential area to be located in St. George, Utah, as shown in Figure 1. This report presents the subsurface conditions encountered, laboratory test results, and recommendations for the project. This report was prepared in general accordance with the Geotechnical Engineering Services Agreement dated March 17, 2020 under Project No. 2200519.

Field exploration was conducted to obtain information on the subsurface conditions and to obtain samples. Information obtained from the field was used to define conditions at the site and to develop recommendations for the proposed development.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction are included in the report.

SITE CONDITIONS

The site is located east and southeast of the planned Desert Reflection subdivision. The area to the north, east and south is undeveloped. The project site generally slopes down from the west to the east with a few small washes that traverse the area in a northwest to southeast direction. Vegetation at the site consists generally of desert grass and sage brush.

Grubbing of a portion of the site has been performed. Test pit locations and elevations reflect the pre-grubbed elevations.

FIELD STUDY

On June 23, 24, and 25, 2020 an engineer from AGECEC visited the site and observed the excavation of 20 test pits (planned TP-5 was inaccessible) at the approximate locations shown on the Site Plan, Figure 2. The test pits were excavated with a trackhoe excavator. The subsurface soil profile was logged and soil samples were obtained.

SUBSURFACE SOIL CONDITIONS

The subsurface profile observed within the test pits generally consists of silty sand to sandy silt overlying silty gravel with sand underlain by siltstone, mudstone, and sandstone bedrock. A layer of sandy lean clay was encountered at approximately 12 feet below grade in TP-20. Practical excavator refusal was encountered on sandstone bedrock and dense gravels in test pits TP-2, TP-7, TP-10, TP-11, TP-12, TP-13, TP-14, TP-15, TP-17, TP-18, and TP-20 at depths ranging from approximately 7 to 20 feet below the existing grade.

Laboratory testing and observations of the subsurface soil during our investigation indicate the upper approximately 0 to 18½ feet of the near surface sandy to silty soil is loose, dry and potentially collapsible when wetted.

Detailed descriptions of the soil and bedrock types encountered follow.

Sandy Silt - The sandy silt is medium dense, dry, porous in upper layers, contains roots near the surface, various amounts of sand, and is light brown in color.

Laboratory tests conducted on samples of the sandy silt indicate in-place moisture contents ranging from less than 1 to 7 percent, in-place dry densities ranging from 82 to 95 pounds per cubic foot (pcf) and fines contents (percent passing the No. 200 sieve) ranging from 59 to 96 percent. One dimensional consolidation/collapse tests conducted on samples of the sandy silt material indicate that the material is

moderately moisture sensitive (collapsible) when wetted under a constant pressure of 1,000 pounds per square foot (psf) and slightly compressible under additional loading. Less than 1 percent and 2½ percent collapse potentials were measured during the consolidation/collapse tests.

Sandy Lean Clay - The sandy lean clay is medium dense to dense, dry, low plastic, and is light brown in color.

Laboratory tests conducted on samples of the sandy lean clay indicate an in-place moisture content of 4 percent, an in-place dry density of 101 pcf and a fines content of 76 percent. A one dimensional consolidation/swell test conducted on a sample of the sandy lean clay material indicates that the material is not moisture sensitive (expansive) when wetted under a constant pressure of 1,000 pounds per square foot (psf) and slightly compressible under additional loading.

Silty Sand - The silty sand is loose to dense, dry to moist, contains various amounts of gravel, and is light brown to red in color.

Laboratory tests conducted on samples of the silty sand indicate an in-place moisture content of 2 percent, an in-place dry density of 82 pcf and a fines content of 41 percent.

Silty Gravel with Sand - The silty gravel with sand is medium dense to very dense, dry, contains some cobbles to boulders, and is light grey to light brown in color.

Laboratory tests conducted on samples of the silty gravel with sand indicate an in-place moisture content of 2 percent, a gravel content (percent retained on the No. 4 sieve) of 30 percent and a fines content of 37 percent.

Sandstone Bedrock - The sandstone bedrock is hard, dry, contains some conglomerate layers throughout, and is yellow to green to grey in color.

Mudstone Bedrock - The mudstone bedrock is soft, moist, low to medium plastic, and is green in color.

Laboratory tests conducted on samples of the mudstone bedrock indicate an in-place moisture content of 2 percent, in-place dry densities of 115 and 141 pcf and fines contents of 75 and 98 percent. Atterberg Limits tests indicate liquid limits of 25 and 39 percent and plasticity indexes of 15 and 17 percent. One dimensional consolidation/swell tests conducted on samples of the mudstone bedrock indicate that the material is moderately moisture sensitive (expansive) when wetted under a constant pressure of 1,000 pounds per square foot (psf) and highly compressible under additional loading. Approximately ½ and 3 percent swell potentials were measured during the consolidation/swell tests.

The Logs, Legend and Notes of Test Pits are shown on Figures 3-7. Laboratory test results are also shown on Figures 3-6 and are summarized in the Summary of Laboratory Test Results, Table 1. The One-dimensional Consolidation/Collapse/Swell Test Results are shown graphically on Figures 8-11.

SUBSURFACE WATER

Subsurface water was not encountered within the test pits to the maximum depth investigated, approximately 20 feet. Fluctuations in the groundwater level may occur over time. An evaluation of such fluctuations is beyond the scope of this report.

PROPOSED CONSTRUCTION

The property is proposed to be developed into a residential subdivision. The subdivision will include roadways, site improvements and underground utilities. Additionally, we anticipate building pads will be constructed to support single family, slab-on-grade residences.

Single-family, slab-on-grade residences are proposed for construction and will consist of single and multi-story construction. The residences will be constructed using conventional spread footings with slab-on-grade floors. The residences will likely be constructed with wood framing, stucco or rock veneer, and tile roofs. We do not anticipate the use of basements. If basements or pools are desired, AGECE should evaluate them on an individual case.

For design purposes, we have assumed wall loads of up to 3 kips per linear foot and column loads of up to 25 kips. As part of the development, we understand that roadways, utilities and city improvements will also be included. The roadways will likely include 45 and 50-foot right-of-ways (ROW). For design purposes, we have utilized a Traffic Index (TI) of 5 for 45 and 50-foot ROWs in accordance with the City of St. George standards. When a grading plan is completed it should be shared with AGECE to update the recommendations within this report if needed.

If the proposed construction, building loads or pavement requirements are significantly different from those listed, we should be notified so that we can reevaluate our recommendations.

RECOMMENDATIONS

Based on our experience in the area, the subsurface conditions encountered, laboratory test results, and the proposed construction, the following recommendations are given:

A. Site Grading

1. Subgrade Preparation

General - Prior to placing fill or concrete beneath building areas, pavement/flatwork or site improvements, the site should be grubbed to remove the existing vegetation and soil containing significant roots and organics. Organics and vegetation should be disposed of off-site.

The grubbed soil may be stockpiled for use in landscaped areas. If this soil is placed in landscaped areas, CMU fence footings or other structures/improvements which may be supported in these areas (above the grubbed soil) should be overexcavated to allow for the placement of properly compacted structural fill which extends to the appropriate depth as stated below.

Loose, Dry Collapsible Soil (buildings and structures) - Laboratory testing and observations of the subsurface soil during our investigation indicate the upper approximately 0 to 18 ½ feet of the near surface overburden soil (varies across the site) is loose, dry and potentially collapsible when wetted. Prior to placing fill or concrete, we recommend that the full depth of potentially collapsible soil be removed. The approximate depth of removal is shown on the site plan and test pit logs (Figures 2 and 3). This soil is unsuitable in its existing condition to support the proposed construction.

The limits of overexcavation should extend at least 5 feet beyond the perimeter of the proposed building pads, including patios, porches and porch columns. The lateral extent of the overexcavation should be determined by survey and is the responsibility of the owner/contractor.

Consideration should also be given to extending the overexcavation to include areas which will support flatwork and other improvements such as masonry fences.

Alternative Collapsible Soil (buildings and structures) - As an alternative to removing the full depth of the collapsible soil, a process known as “pre-wetting” may be used to add moisture to the under-saturated soils. This process is intended to improve the support condition of the underlying soils by adding moisture and subsequently reducing the collapse potential prior to construction.

Our experience has shown that when the dry density exceeds on the order of 105 pcf or the fines content (percent silt and clay) is less than on the order of 15 percent, the underlying soils are typically less moisture sensitive regardless of the moisture condition. Laboratory testing performed for this project indicate that the upper sandy silt to silty sand have a density generally less than 105 pcf and fines content greater than 15 percent and therefore are considered to have collapse potential.

The prewetting process can typically be achieved by constructing a series of ponds over the area to be treated. Typically, the pre-wetting ponds should be no larger than 20,000 to 25,000 square feet to ensure a relatively even distribution of water treatment. Based upon previous pre-wetting studies, we estimate a 1 foot high column of water will be necessary to treat every 2 to 3 feet of the underlying potentially collapsible soil and result in an increased saturation (of the soils) which exceeds approximately 50 percent. Pre-wetting near existing homes or site improvements is not recommended and could result in settlement and subsequent distress.

Upon completion of the pre-wetting program, we recommend conducting subsurface investigation to evaluate and verify the pre-wetting process was effective.

Subsequent to pre-wetting and prior refilling ponds or building pads, the bottom of the pre-wetting ponds should be overexcavated to remove loose, soft soils. The overexcavation should extend at least 3 feet below the existing grade or 3 feet below the bottom of footings, whichever is greater. An alternative to overexcavation of the wet soils would be to let the soils dry out prior to mass grading (AGEC should be consulted prior to grading, if this alternative is selected).

The limits of treatment should extend at least 5 feet beyond the perimeter of the proposed building pads, including patios, porches and porch columns. The lateral extent of the overexcavation should be determined by survey and is the responsibility of the owner/contractor.

Potentially Expansive Bedrock - Potentially expansive mudstone bedrock was encountered in test pits TP-4 and TP-12. Based on AGECE's experience in the area, a recommended separation of at least 5 feet above the potentially expansive mudstone should be maintained. Based on the observed depths of the mudstone AGECE does not anticipate the need for overexcavation of mudstone bedrock, however AGECE recommends that additional recommendations be provided once a final grading plan has been provided.

Pavement, Flatwork and Improvements - The pre-wetting method discussed above would be appropriate for these areas. If pre-wetting is not utilized, we recommend at a minimum that the upper 12 inches be scarified, moisture-conditioned, and compacted in areas which will support hard surfaces.

The overexcavation and compaction process is intended to reduce the potential for collapse and also to provide a less permeable, compacted zone of soil beneath the improvements supported above. However, potentially collapsible soils will still remain beneath the overexcavated zone. Settlement could still occur if the remaining collapsible soils are wetted.

The estimated settlement resulting from wetting of the potentially collapsible soils is provided in the following table. If the potential settlement is not acceptable, additional overexcavation or full depth treatment should be conducted. As a minimum, we recommend the exposed subgrade beneath roads and rigid improvements extend at least 5 feet below the existing grade to removed and recompact a portion of the underlying potentially collapsible soils.

Thickness of remaining potential collapsible soil (feet)	Estimated Additional Potential Future Surface Settlement (inches)
10	3 to 3 ½
8	2 to 2 ½
6	1 ½ to 2
4	¾ to 1 ½
2	½ to ¾
0	< ½

2. Excavation

We anticipate that excavation of the overburden soils and soft bedrock at the site can be accomplished with typical excavation equipment. Portions of deeper bedrock may require the use of heavy duty excavation equipment.

3. Grading Slopes and Trenches

The following table provides the maximum recommended slope steepness for a given slope condition. Slopes should include benches in accordance with the 2018 IBC.

Slope Condition	Maximum Slope (Horizontal:Vertical)
Permanent Cut Slopes in Overburden Soils	2:1
Unretained, Properly Compacted Fill	2 ½:1
Permanent Cut Slopes in Moderately Hard Bedrock	½:1
Utility Trenches in On-site Soils and Soft Bedrock (OSHA Soil Class C)	1 ½:1

Fill slopes should be graded by overbuilding and then cutting them back to the desired grade to provide a compacted slope face. Fill placed on existing slopes steeper than 3:1 should be placed using a benching procedure to key the fill into the existing slope. Benches should be of sufficient width to allow adequate area for the compaction equipment.

Steeper trenches may require the use of shoring or a trench box to provide a safe work environment. Safe trench excavation is the responsibility of the contractor.

4. Materials

A. Import Materials:

Import materials should be non-expansive, non-gypsiferous, granular soil. Listed below are the materials recommended for imported fill.

Area	Fill Type	Recommendations
Foundations/slabs	Site grading/ structural fill	-200 < 35%, LL < 30% Maximum size: 4 inches Solubility < 1%
Underslab (upper 4 inches)	Base course	-200 < 12% Maximum size: 1 inch Solubility < 1%

-200 = Percent Passing the No. 200 Sieve

LL = Liquid Limit

B. On-site Materials:

The on-site soils, and properly processed siltstone and sandstone bedrock, free of organics and debris are suitable for use as structural fill, site grading fill, wall backfill and utility trench backfill. The bedrock should be processed such that the maximum particle size is 4 inches and at least 50 percent of the material passes the No. 4 sieve. The mudstone bedrock is not suitable for use and should be disposed of off site.

The potential impact of the collapsible characteristics of the underlying natural silt and sand can be reduced by protecting the collapsible soil from becoming wet. Placement of relatively low permeable fill above the natural soil can help reduce the possibility of water coming in contact with the underlying collapsible soil. The low permeable fill supporting these areas is intended to provide a low permeable zone to reduce the potential for water to infiltrate and wet the underlying subgrade.

Low permeable fill used should meet one of the following set of criteria.

Liquid Limit (%)	Percent Passing the No. 200 Sieve
45 +	15-20
30-45	20-40
0-30	30-100

Laboratory testing indicates the onsite soils would be suitable for use as low permeable fill.

5. Compaction

Compaction of materials placed at the site should equal or exceed the following minimum densities when compared to the maximum dry density as determined by ASTM D-1557:

Area	Percent Compaction
Subgrade	90
Footings/building pad	95
Site grading	95
Utility trenches	95
Wall backfill (as needed)	95

To facilitate the compaction process, the overburden soil and processed, non-expansive bedrock should be moisture conditioned to within 2 percentage points of the optimum moisture content as determined by ASTM D-1557 prior to placement.

Fill should be placed in loose lift thicknesses which do not exceed the capacity of the equipment being utilized. Generally, 6 to 8-inch loose lifts are adequate. Lift thicknesses should be reduced to 4-inches for hand compaction equipment.

6. Shrinkage

We anticipate a significant volume loss of material during the compaction process. Based on our experience, we anticipate on the order of 25 percent loss of the material in the compacted zone. We also anticipate a loss of 2 to 4 inches of surface elevation during the pre-wetting and replacement (loading) and compaction of the materials and the exposed subgrade. These volume losses should be taken into account for material quantity estimates.

7. Surface Drainage

Positive site drainage should be maintained during the course of construction. After construction has been completed, positive drainage of the surface water away from the buildings in each direction must be maintained. To reduce infiltration adjacent to foundations we recommend the following:

- a. A minimum slope of 6 inches in the first 10 feet from the perimeters of the structures should be provided.
- b. Roof gutter systems should be installed around the perimeters of the structures. Roof downspouts should discharge away from the buildings so as to prevent ponding adjacent to foundations. We recommend piping roof gutter downspouts off site directly into the adjacent curb and gutter.
- c. Placement of 3 to 4 foot wide concrete aprons around the perimeters of the structures.
- d. Landscaping requiring water should not be placed adjacent to foundations or within 10 feet of foundations.

- e. Below grade portions of walls/fences which are backfilled with soil should be protected with an impermeable membrane and a subsurface drain on the backfilled side. A gravel covered, perforated PVC pipe should also be placed at the base of the wall to carry water to a discharge point. This is intended to reduce the potential for salt weathering and sulfate attack on concrete/masonry.

B. Foundations

This report does not address support of swimming pools or basements. Support of pools and basements should be addressed with a lot specific subsurface investigation to provide additional support and grading recommendations. Recommendations for design of conventional spread and spot footings are provided below.

1. Bearing Material

The proposed residences may be supported on conventional spread footings bearing on a minimum of 1 foot of properly compacted structural fill underlain by a properly prepared subgrade. Specifically, the subgrade should be prepared during site grading by overexcavating the building pads to remove unsuitable soils as recommended in the Subgrade Preparation section of this report.

2. Bearing Pressures

Footings bearing on properly compacted structural fill may be designed for the following net allowable bearing pressures.

Load Condition	Net Allowable Bearing Pressure (psf)
Walls	2,000
Spots/Columns	2,500

3. Footing Width and Embedment

Footings should have a minimum width of 18 inches and should be embedded at least 12 inches below the lowest adjacent grade.

4. Temporary Loading Conditions

The allowable bearing pressures may be increased by one-half for temporary loading conditions such as wind or seismic loads.

5. Settlement

We estimate that settlement will be approximately 1 inch for footings designed as indicated above due to the load of the structure. Differential settlement is estimated to be approximately $\frac{1}{2}$ inch.

6. Foundation Base

The base of excavations should be cleared of loose or deleterious material prior to placement of fill or concrete.

7. Foundation Setback

Foundations should be set back from the top crest of slopes a horizontal distance equal to or greater than $\frac{1}{3}$ the total slope height.

C. **Concrete Slab-on-Grade**

1. Slab Support

Concrete slabs may be supported on a zone of properly prepared (overexcavated) and compacted fill as stated in the Subgrade Preparation and Materials sections of this report with a minimum thickness of at least 12 inches.

2. Underslab Base Course

A 4-inch layer of properly compacted base course should be placed below slabs to provide a firm and consistent subgrade and promote even curing of the concrete.

3. Vapor Barrier

A vapor barrier should be placed below slabs in areas which will receive sensitive floor coverings or coverings which are impermeable. Vapor barriers also provide protection from salt and sulfate attack.

D. Lateral Earth Pressures

1. Lateral Resistance for Footings

Lateral resistance for spread footings is controlled by sliding resistance developed between the footing and the subgrade soil. An ultimate friction value of 0.40 may be used in design for ultimate lateral resistance of footings bearing on properly compacted on-site soils. The friction value may be increased to 0.45 if the foundations bear on imported, granular structural fill or gravel soils.

2. Retaining Structures

The following equivalent fluid weights are given for design of subgrade walls and retaining structures. The active condition is where the wall moves away from the soil. The passive condition is where the wall moves into the soil and the at-rest condition is where the wall does not move. We recommend the basement walls be designed in an at-rest condition.

The values listed below assume a horizontal surface adjacent the top and bottom of the wall.

Description	Active	At-Rest	Passive
Fine/Granular-Grained Backfill - Equivalent Fluid Weight	38 pcf	58 pcf	260 pcf
Fine/Granular-Grained Backfill - Earth Pressure Coefficient	0.33	0.50	-

Care should be taken to prevent percolation of surface water into the backfill material adjacent to the retaining walls. The risk of hydrostatic buildup can be reduced by placing a subdrain behind the walls consisting of free-draining gravel wrapped in a filter fabric.

3. Seismic Conditions

Under seismic conditions, the equivalent fluid weight should be modified as follows according to the Mononobe-Okabe method assuming a level backfill condition:

Lateral Earth Pressure Condition	Seismic Modification (2% PE in 50 yrs)
	Fine/Granular Backfill
Active	9 pcf increase
At-rest	no increase
Passive	22 pcf decrease

The resultant of the seismic increase should be placed up 60 percent of the height of the wall.

4. Safety Factors

The values recommended assume mobilization of the soil to achieve the assumed soil strength. Conventional safety factors used for structural analysis for such items as overturning and sliding resistance should be used in design.

E. Seismicity, Liquefaction and Faulting

1. Listed below is a summary of the site parameters as required by the 2018 International Building Code and ASCE 7-16:

Description	Seismic Parameter
	2,500 yr event ($\approx 2\%$ PE in 50 yrs)
2018 IBC	C
PGA	0.26g
S_s (0.2 second period)	0.59g
S_1 (1 second period)	0.19g
F_a	1.26
F_v	1.50
F_{PGA}	1.20

The values provided above were generated using the ASCE 7-16 Seismic Hazard Tool. Based on the observed subsurface conditions, a ground motion hazard analysis (GMHA) as per ASCE 7-16 is not required by the 2018 International Building Code.

2. Liquefaction

Based on subsurface conditions encountered in the test pits, the subsurface soils observed are non-liquefiable to the depths investigated during a seismic event. Liquefiable soils at greater depths are not likely due to the relatively shallow bedrock.

3. Faulting

Based on a review of available geologic literature, there are no mapped faults extending near or through the site.

F. Soil Corrosion

Based on our experience in the area, the on-site soils, bedrock, and many imported sources may contain sulfates in sufficient concentration to be corrosive to concrete. Therefore, we recommend concrete elements that will be exposed to the on-site soils be designed in accordance with provisions provided in the American Concrete Institute Manual of Concrete Practice (ACI) 318-14. Tables 19.3.1.1 and 19.3.2.1 of ACI 318-14 should be referenced for design of concrete elements utilizing a Sulfate Exposure Class of S2.

Consideration should also be given to cathodic protection of buried metal pipes. We recommend utilizing PVC pipes where local building codes allow.

G. Pavement

1. Subgrade Support

We anticipate that the subgrade materials beneath the pavement areas will consist of sandy silt to silty sand. Prior to placement of road base, the subgrade should be prepared as recommended in the subgrade preparation section of this report. A California Bearing Ratio (CBR) of 7 percent was assumed for a properly compacted subgrade for purposes of design.

2. Pavement Thickness

Based on the assumed traffic loadings and St. George City traffic indexes, a 20-year design life, and AASHTO design methods, the following pavement sections are recommended.

Roadway	TI	Asphalt (in.)	Base Course (in.)
45-Foot ROW	5	2½	6
50-Foot ROW	5	2½	6

3. Pavement Materials

The pavement materials should meet City of St. George specifications for gradation and quality. The pavement thicknesses indicated above assume that the base course is a high quality material with a CBR of at least 50 percent and the asphaltic concrete has a minimum Marshall stability of 1,800 pounds. Other materials may be considered for use in the pavement section. The use of other materials may result in other pavement material thicknesses.

4. Drainage

The collection and diversion of drainage away from the pavement surface is extremely important to the satisfactory performance of the pavement section. Proper drainage should be provided.

H. Construction Testing and Observations

We recommend the following testing and observations be done as a minimum as required by the City of St. George.

1. Observe grubbing and verify removal of soil containing roots and organics.
2. Verify that recommended overexcavation depths or subgrade treatment is achieved to appropriate depth in the building pad areas and beneath roadways.
3. Verify that potentially collapsible soils have been overexcavated or prewetted in the outlined area (shown on Figure 2).
4. After mass grading is complete, additional exploration may be necessary in "cut" areas to verify subsurface conditions and the depth to underlying potentially expansive layers of bedrock.

5. Verify that recommended structural fill depths are provided below foundations and slabs.
6. Conduct compaction testing on fill placed below foundations and in building pads. We recommend testing each foot of fill placed.
7. Conduct construction materials testing on city improvements at a frequency which meets or exceeds St. George City requirements.

I. Geotechnical Recommendation Review

The client should familiarize themselves with the information contained in this report. If specific questions arise or if the client does not fully understand the conclusions/recommendations provided, AGECH should be contacted to provide clarification.

LIMITATIONS

This report has been prepared in accordance with generally accepted soil and foundation engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the report are based on the information obtained from the excavated test pits, the data obtained from laboratory testing and our experience in the area. Variations in the subsurface conditions may not become evident until excavation is conducted. If the subsurface conditions or groundwater level are found to be significantly different from those described above, we should be notified to reevaluate our recommendations.

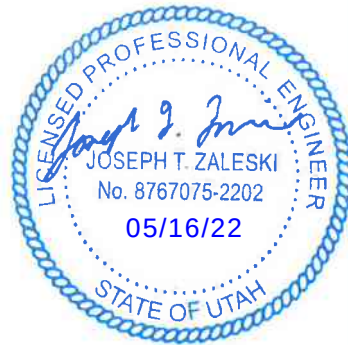
If you have any questions or if we can be of further service please call.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

Joseph T. Zaleski, P.E.

Reviewed by: Jake Erickson, P.E.

P:\2020 Project Files\2200500\2200519 - Desert Cliffs Area 165 Acres\desert cliffs area 11



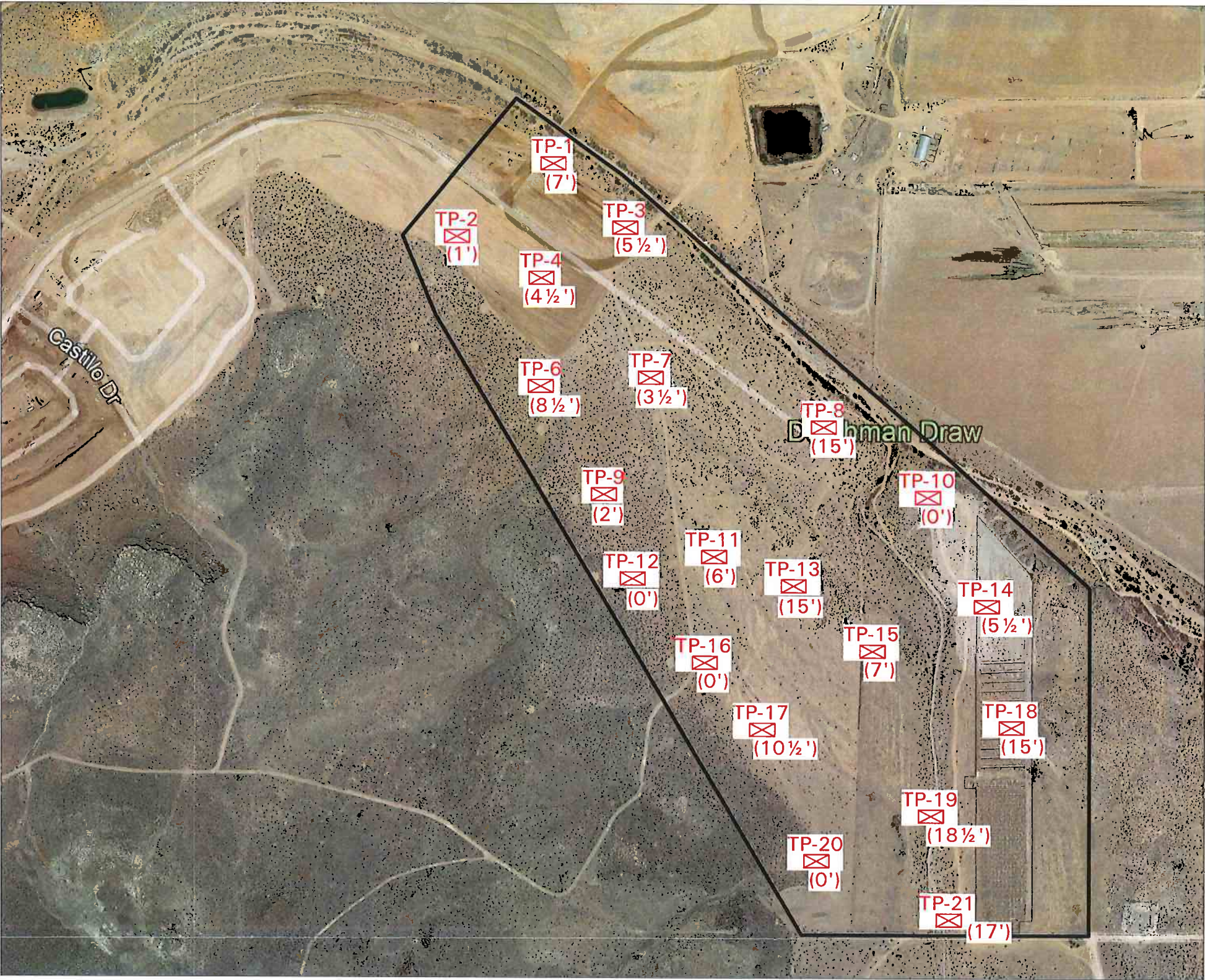
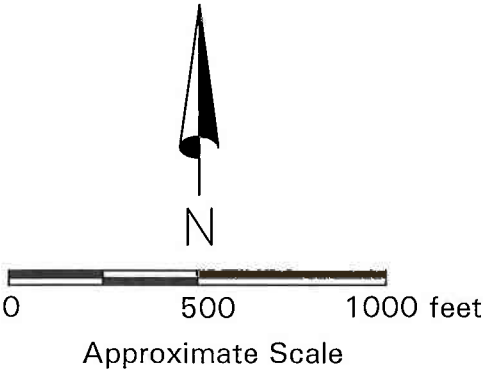


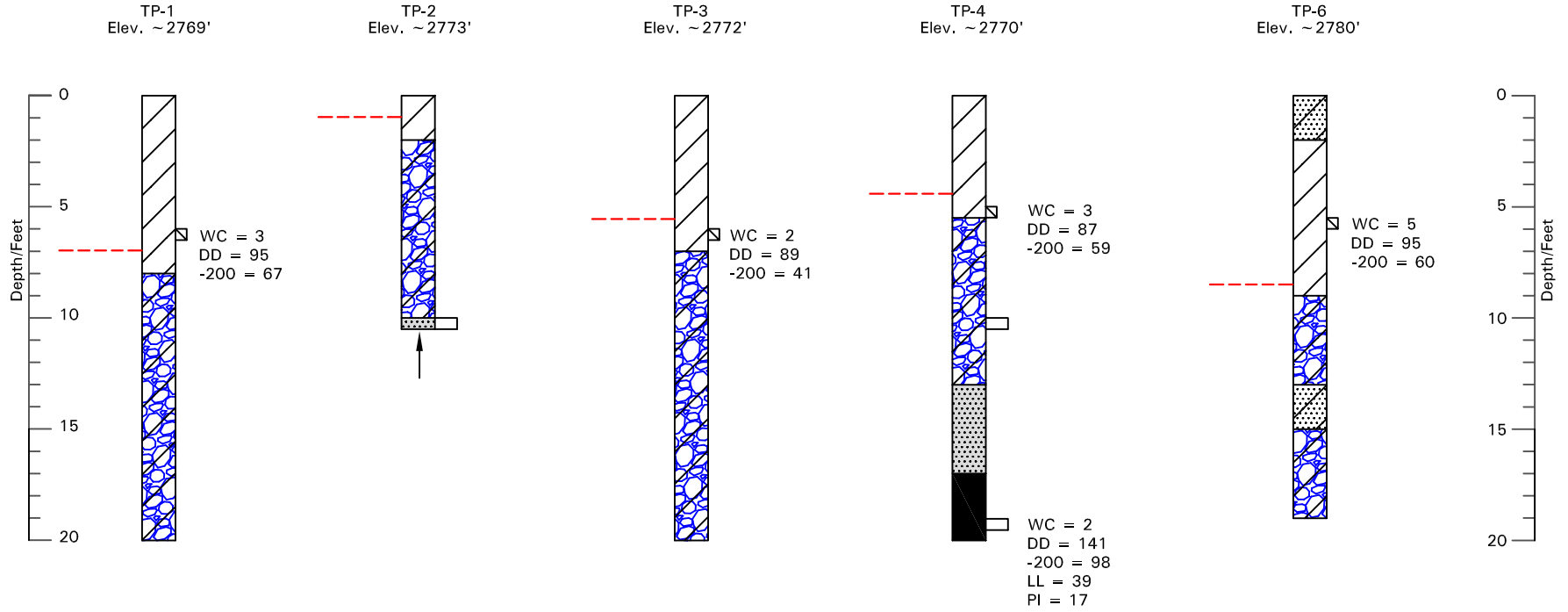
Not to Scale

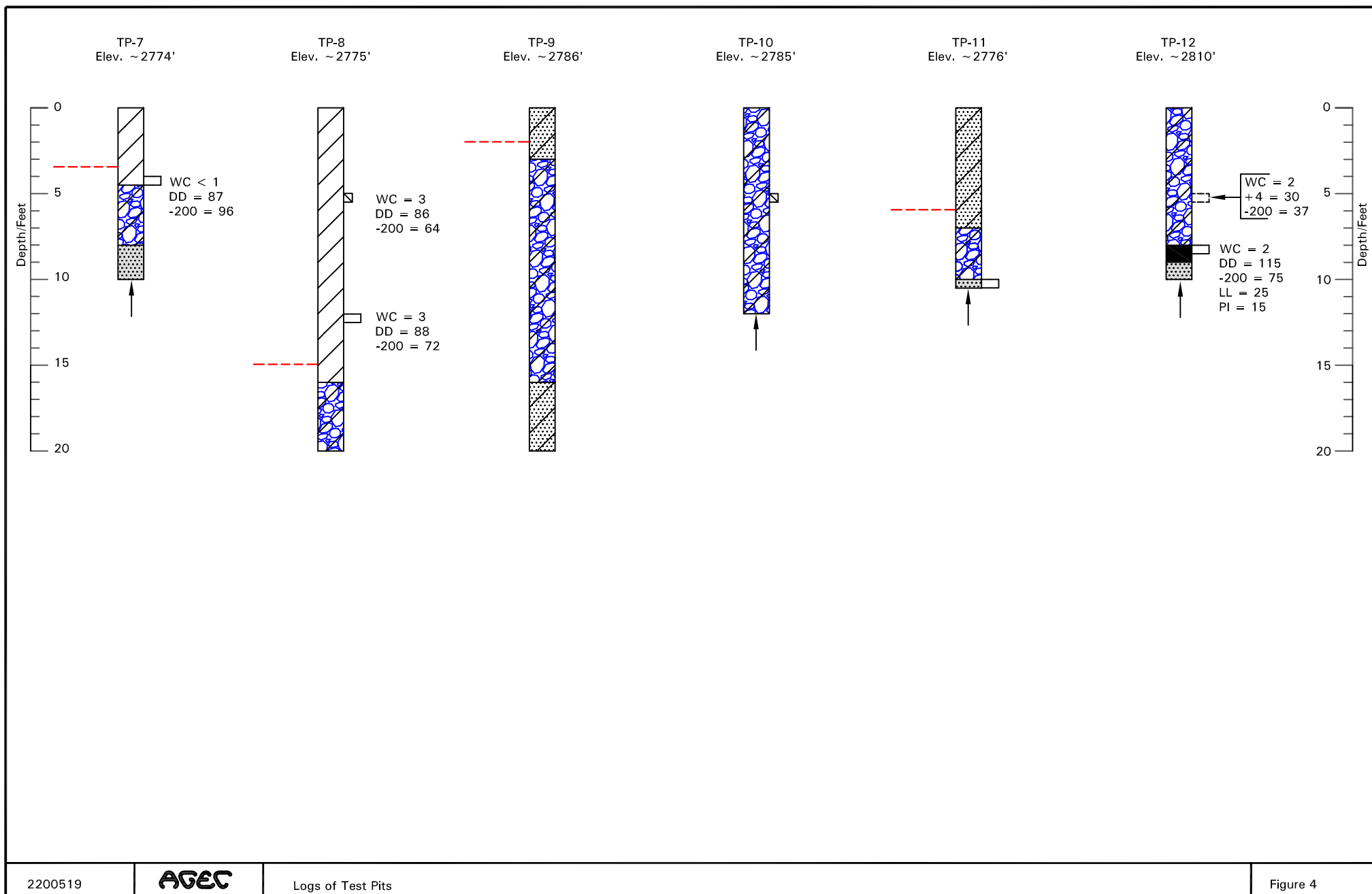
DESERT CLIFFS AREA
165 ACRES AT DESERT CANYONS
ST. GEORGE, UTAH

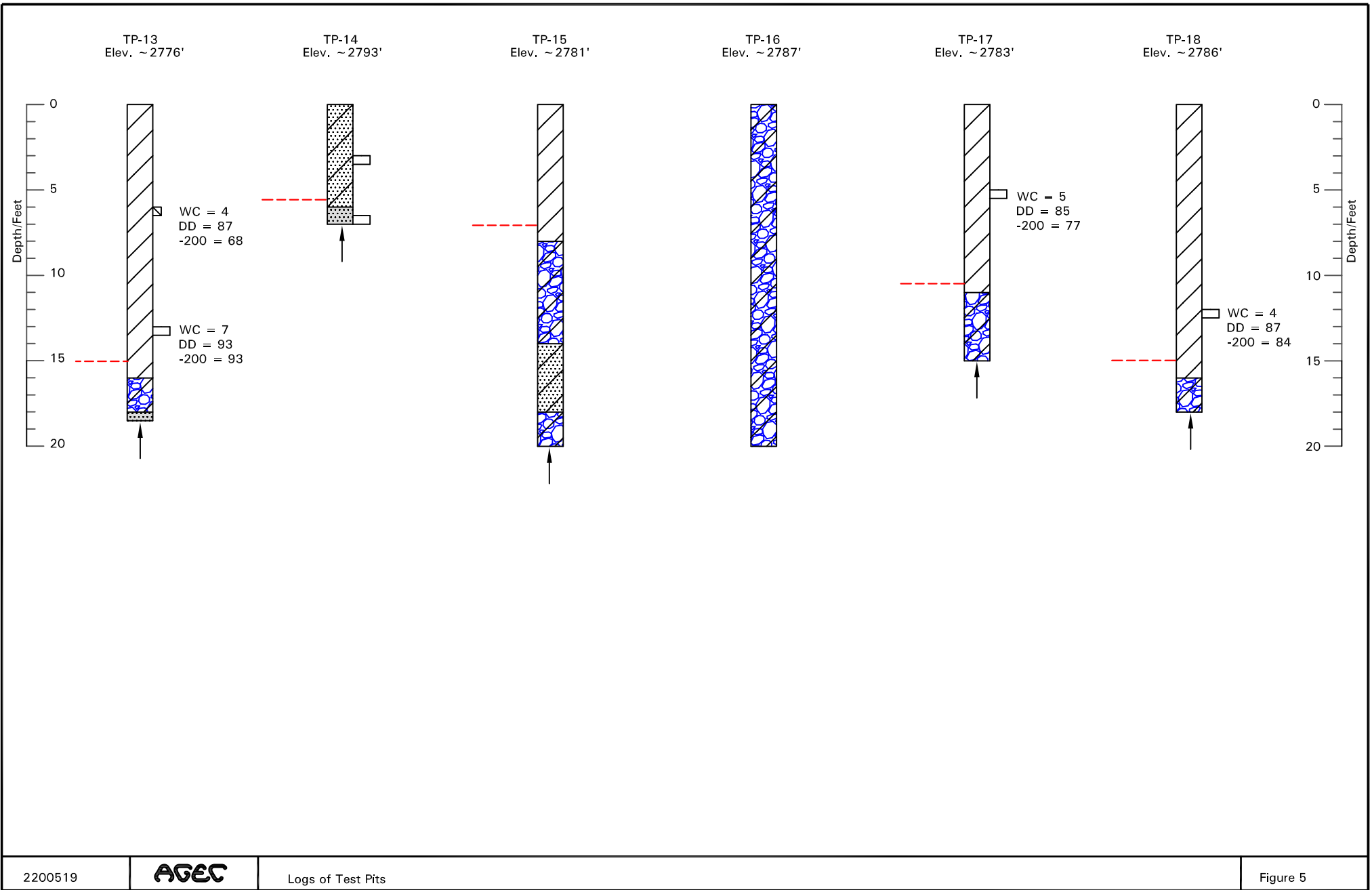
DESERT CLIFFS AREA
165 ACRES AT DESERT CANYONS
ST. GEORGE, UTAH

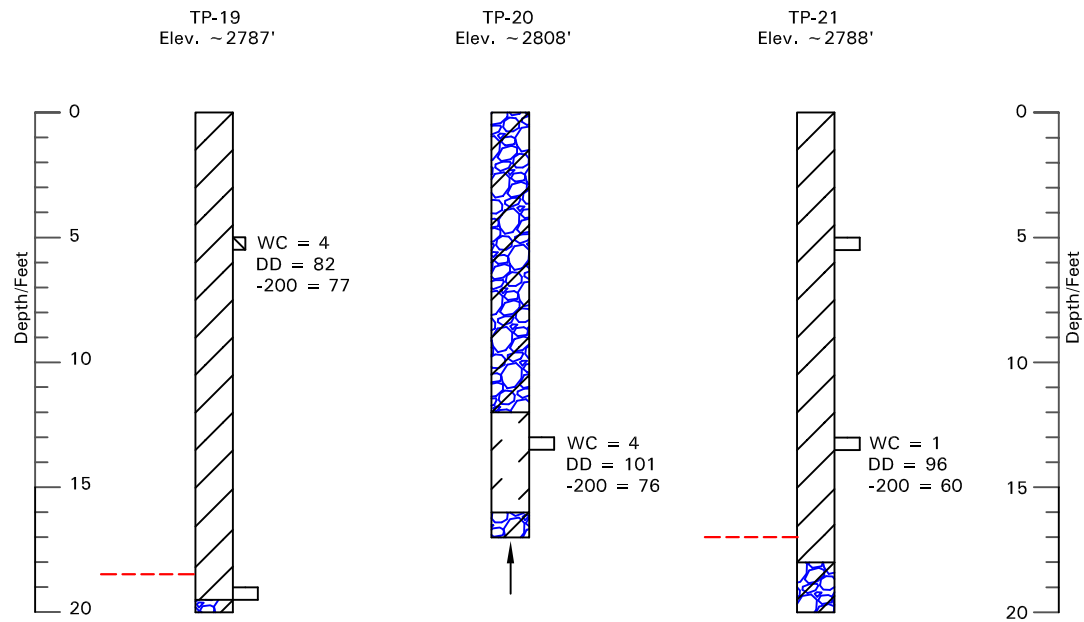
- ⊠ Approximate test pit location
- (#') Approximate depth of overexcavation











LEGEND:



Sandy Silt (ML); medium dense, dry, porous, roots near surface, various amounts of sand, and is light brown in color.



Sandy Lean Clay (CL); medium dense to dense, dry, low plastic, and is light brown in color.



Silty Sand (SM); loose to dense, dry to moist, various amounts of gravel, and is light brown to red in color.



Silty Gravel with Sand (GM); medium dense to very dense, dry, some cobbles to boulders, and is light grey to light brown in color.



Sandstone Bedrock; hard, dry, some conglomerate layers, and is yellow/green/grey in color.



Mudstone Bedrock; soft, moist, low to medium plastic, and is green in color.



Indicates relatively undisturbed hand drive sample taken.



Indicates relatively undisturbed block sample taken.



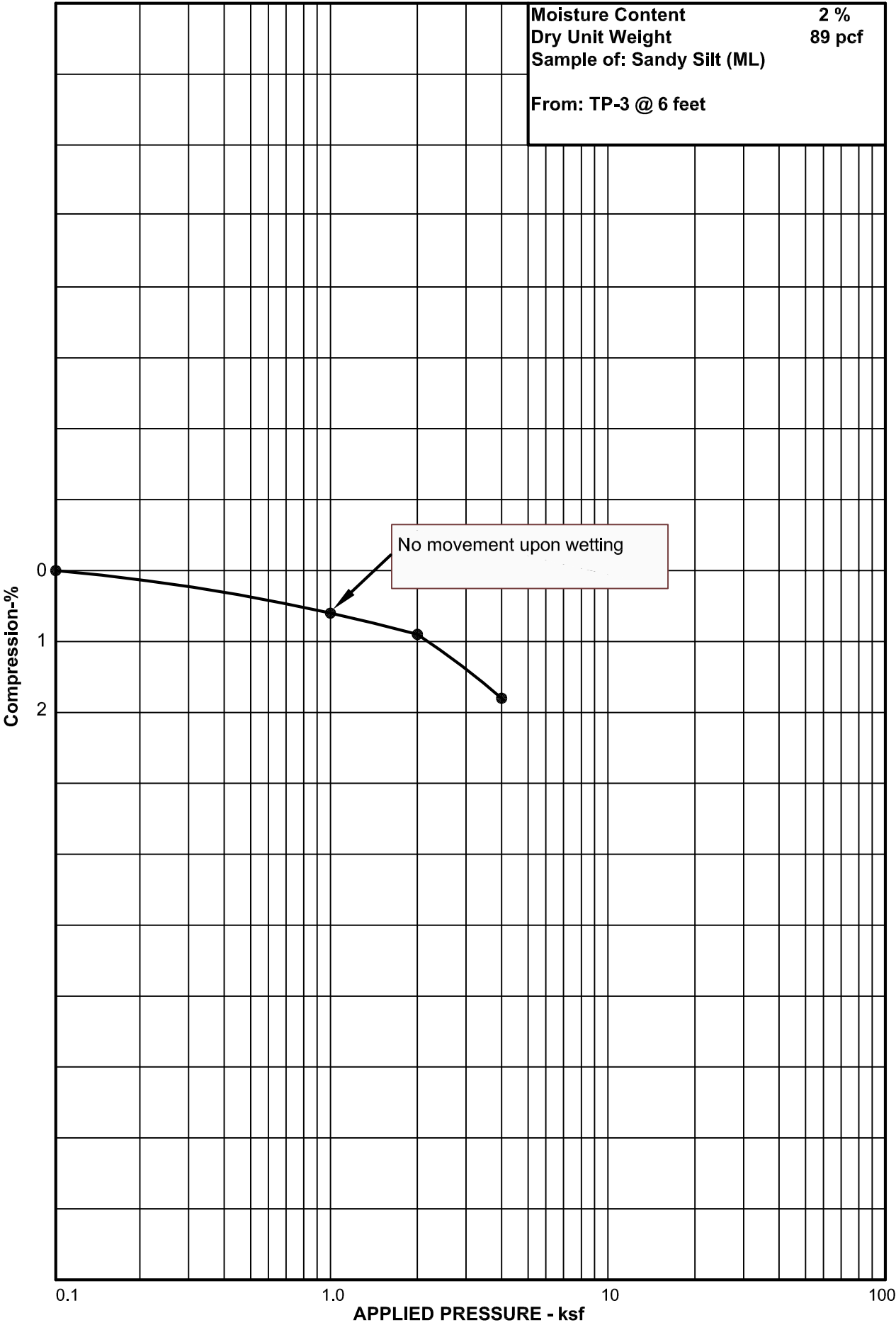
Indicates disturbed sample taken.

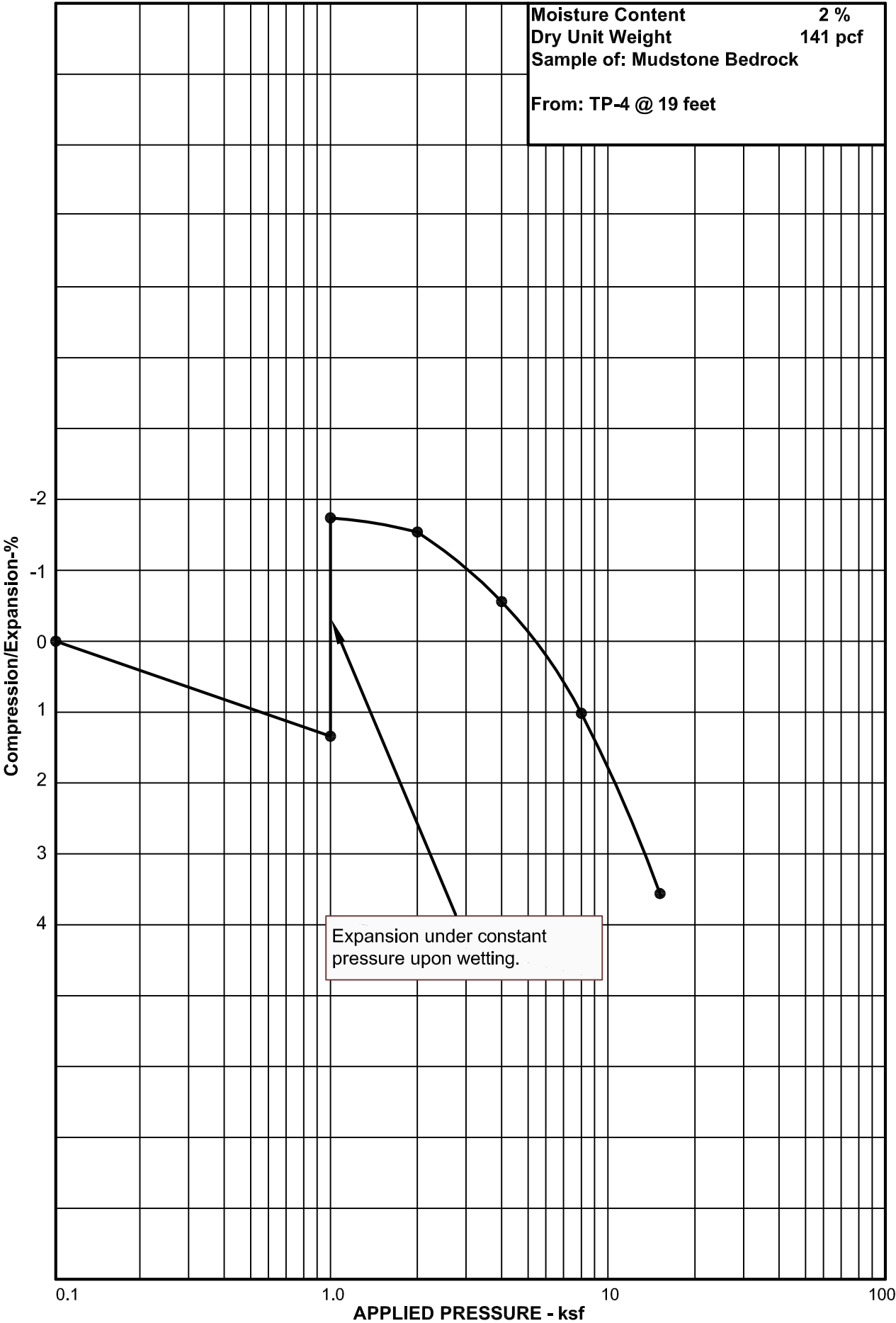


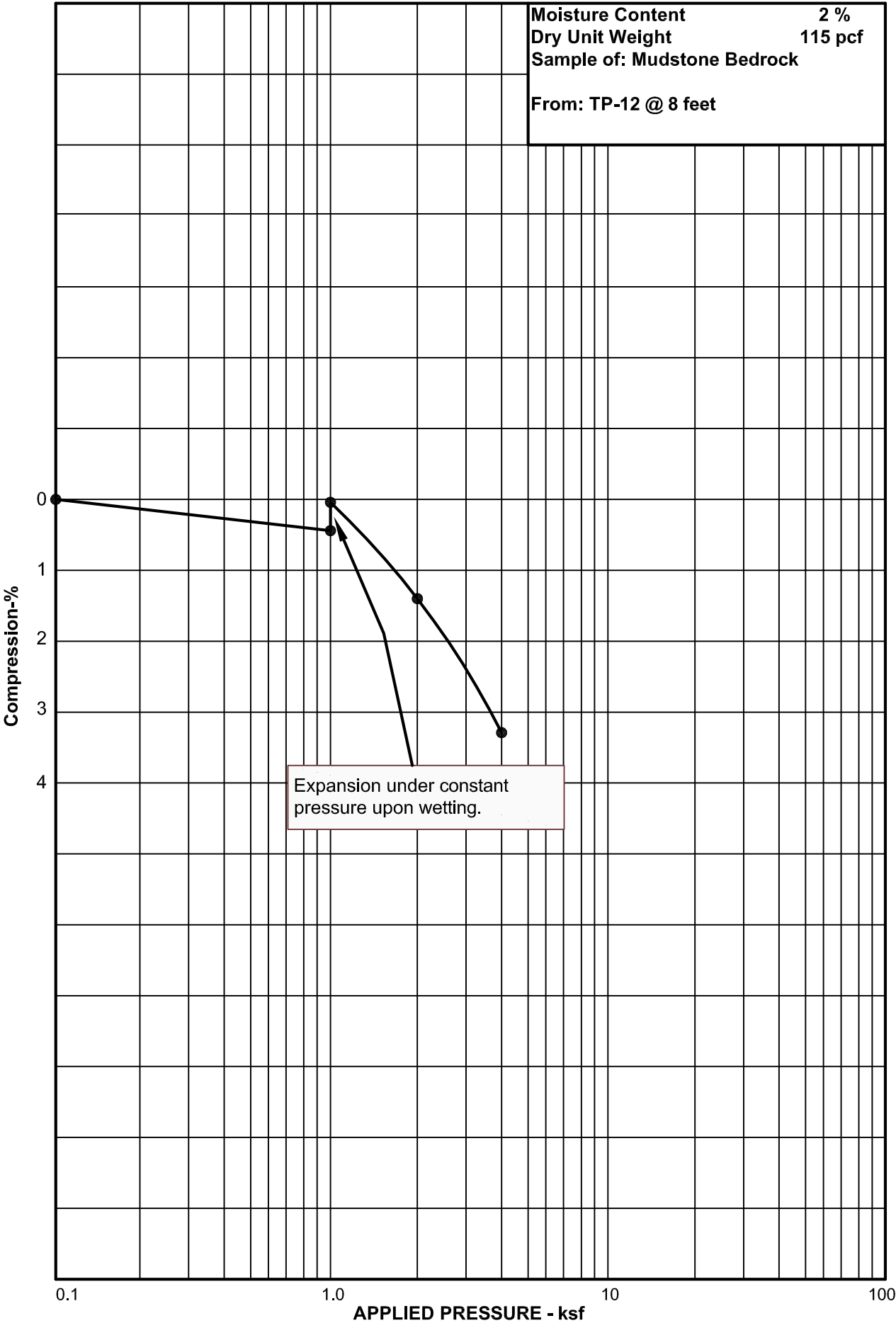
Indicates practical backhoe refusal on boulders, sandstone bedrock, or limestone bedrock.

NOTES:

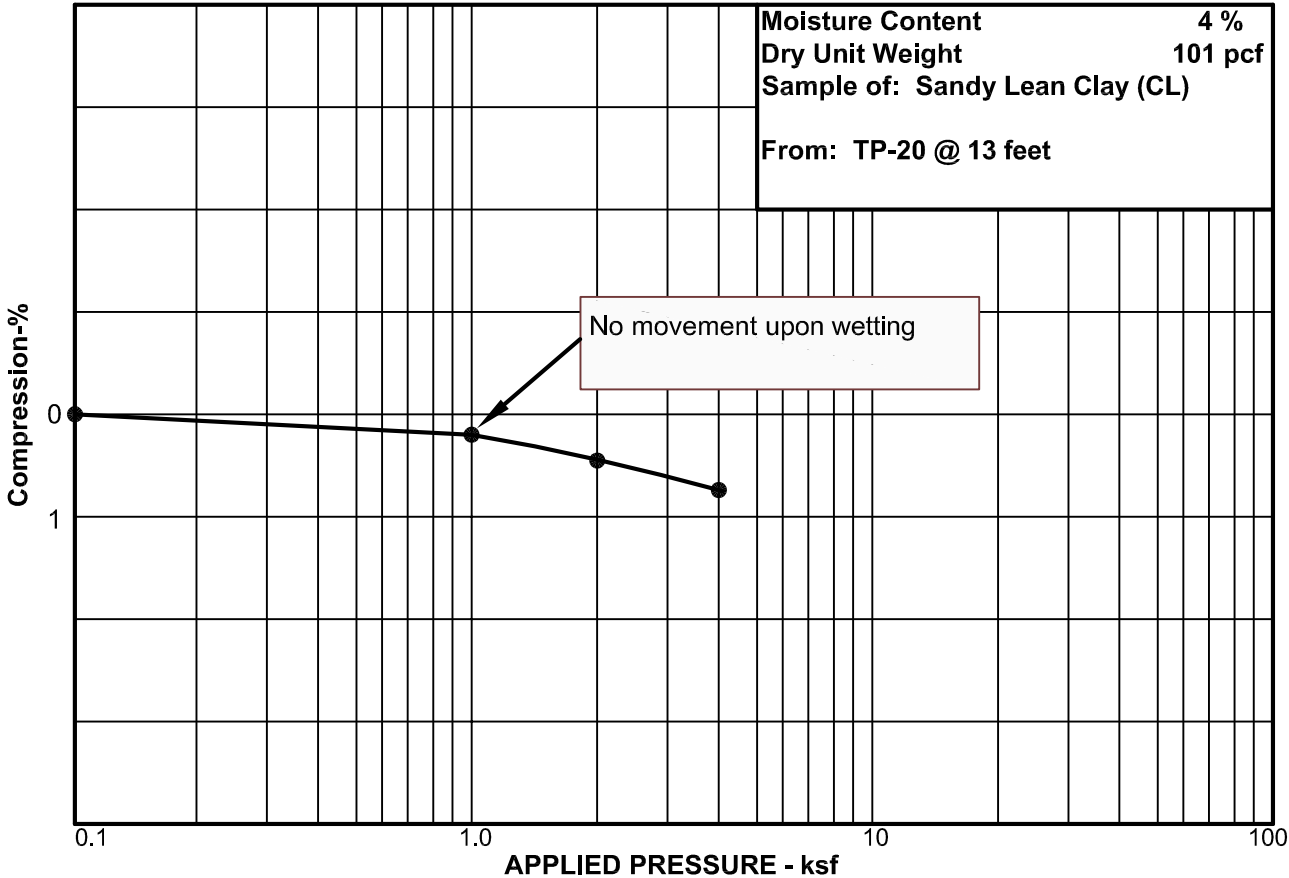
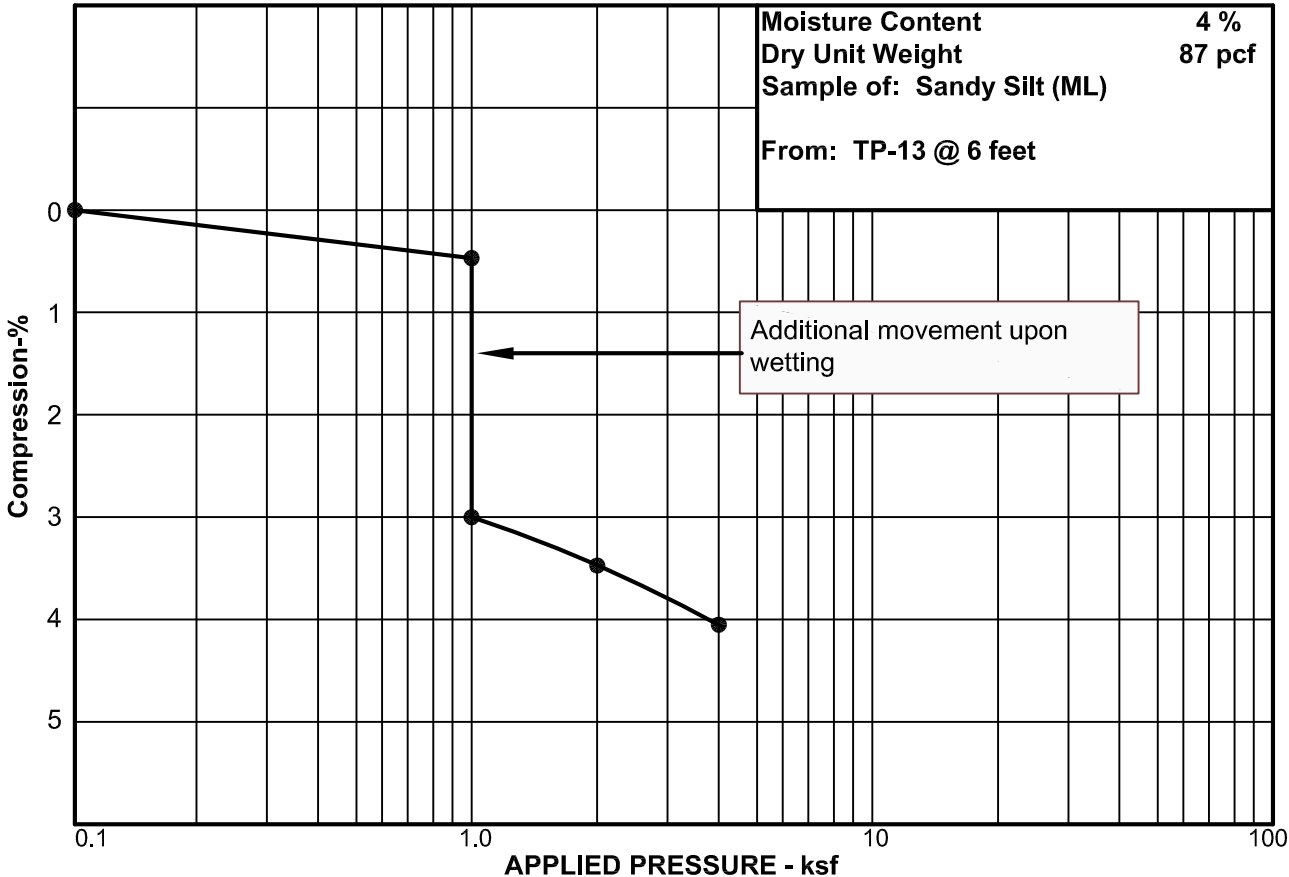
1. The test pits were excavated on June 23, 24, and 25, 2020 with a trackhoe.
2. The locations of the test pits were measured by pacing from property corners.
3. The elevations of the test pits were estimated from the Google Earth elevations.
4. The test pit locations and elevations should be considered accurate only to the degree implied by the method used.
5. The lines between the materials shown on the test pit logs represent the approximate boundaries between material types and the transitions may be gradual.
6. Free water was not encountered in the borings at the time of drilling.
7. WC = water content (%);
DD = dry density (pcf);
+ 4 = percent retained on the No. 4 sieve;
-200 = percent passing No. 200 sieve;
PI = plasticity index (%);
NP = non-plastic;







Applied Geotechnical Engineering Consultants, Inc.



APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I SUMMARY OF LABORATORY TEST RESULTS

Desert Cliff Area

Project Number 2200519

Sample Location		Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg Limits		Sample Classification
Test Pit No.	Depth (feet)			Gravel (%)	Sand (%)	Silt/ clay (%)	Liquid Limit (%)	Plasticity Index (%)	
TP-1	6	3	95			67			Sandy Silt (ML)
TP-3	6	2	89			41			Silty Sand (SM)
TP-4	5	3	87			59			Sandy Silt (ML)
TP-4	19	2	141			98	39	17	Mudstone Bedrock
TP-6	5½	5	95			60			Sandy Silt (ML)
TP-7	4	< 1	87			96			Silt (ML)
TP-8	5	3	86			64			Sandy Silt (ML)
TP-8	12	3	88			72			Silt with Sand (ML)
TP-12	5	2		30	33	37			Silty Gravel with Sand (GM)
TP-12	8	2	115			75	25	15	Mudstone Bedrock
TP-13	6	4	87			68			Sandy Silt (ML)
TP-13	13	7	93			93			Silt (ML)
TP-17	5	5	85			77			Silt with Sand (ML)
TP-18	12	4	87			84			Silt with Sand (ML)
TP-19	5	4	82			77			Silt with Sand (ML)
TP-20	13	4	101			76			Sandy Lean Clay (CL)
TP-21	13	1	96			60			Sandy Silt (ML)

EXHIBIT E
DESERT HAVEN DRAINAGE STUDY

DESERT HAVEN SUBDIVISION, OFFSITE ONLY

Preliminary Drainage Study



Prepared By:



113 East 200 North Suite #2
St. George, Utah 84770
(435) 628-2121

July, 2026

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APPENDIX

1.0 INTRODUCTION

This Drainage Study addresses the hydrologic impacts of offsite runoff on the proposed Desert Haven subdivision, located in the Desert Canyons Master Planned Development in St. George, Utah. The objective of this study is to analyze the off-site hydrology under current conditions, and to analyze the impact of runoff on the proposed development located within the Hillside Overlay Zone. Flow patterns, points of discharge, and peak runoff are evaluated and compared to determine compliance with City of St. George drainage requirements. A plan was developed for the conveyance of storm flows through and around the site, establishment of flow rates for use as the basis of design for permanent and temporary flood protection facilities, and for the determination of potential impacts to adjacent properties and facilities.

2.0 PROJECT DESCRIPTION

2.1 Location

The project site is in the southern portion of St. George City, within portions of Sections 35, and 36, Township 43 South, Range 15 West, Salt Lake Base and Meridian. The proposed Desert Haven development is located immediately south of the Desert Talus residential subdivision. Desert abuts the Utah/Arizona state line on the south. A map illustrating the location of the project in relation to St. George and the surrounding area is presented in Figure 1 of the Appendix.

2.2 Project Description

The proposed Desert Haven residential subdivision project consists of R-1 zoned, single-family detached units to be constructed on approximately 55 acres. The undeveloped project site is in an upland terrace area. Properties surrounding the project site are undeveloped and consist primarily of sparsely vegetated desert habitat. The project site is bounded on the northeast by the Ft. Pearce Wash floodplain. A portion of the site is encroached by the current floodplain.

2.3 Soils

Soils information was referenced from the USDA Web Soil Survey. A copy of the soil map is included in the Appendix. Soils found within onsite sub-basins consist primarily of the Junction fine sandy loam (hydrologic group "A"), and Hobcan fine sandy loam (hydrologic group "B"), respectively. Soils found within offsite sub-basins consist primarily of the Hobcan fine sandy loam (hydrologic group "B"), and minor outcropping of Stony colluvial land are found in the offsite steep hillside area (estimated hydrologic group "D"), and Junction fine sandy loam (hydrologic group "A"). Composite SCS Curve number calculations based upon soil types and land uses are included in the Appendix.

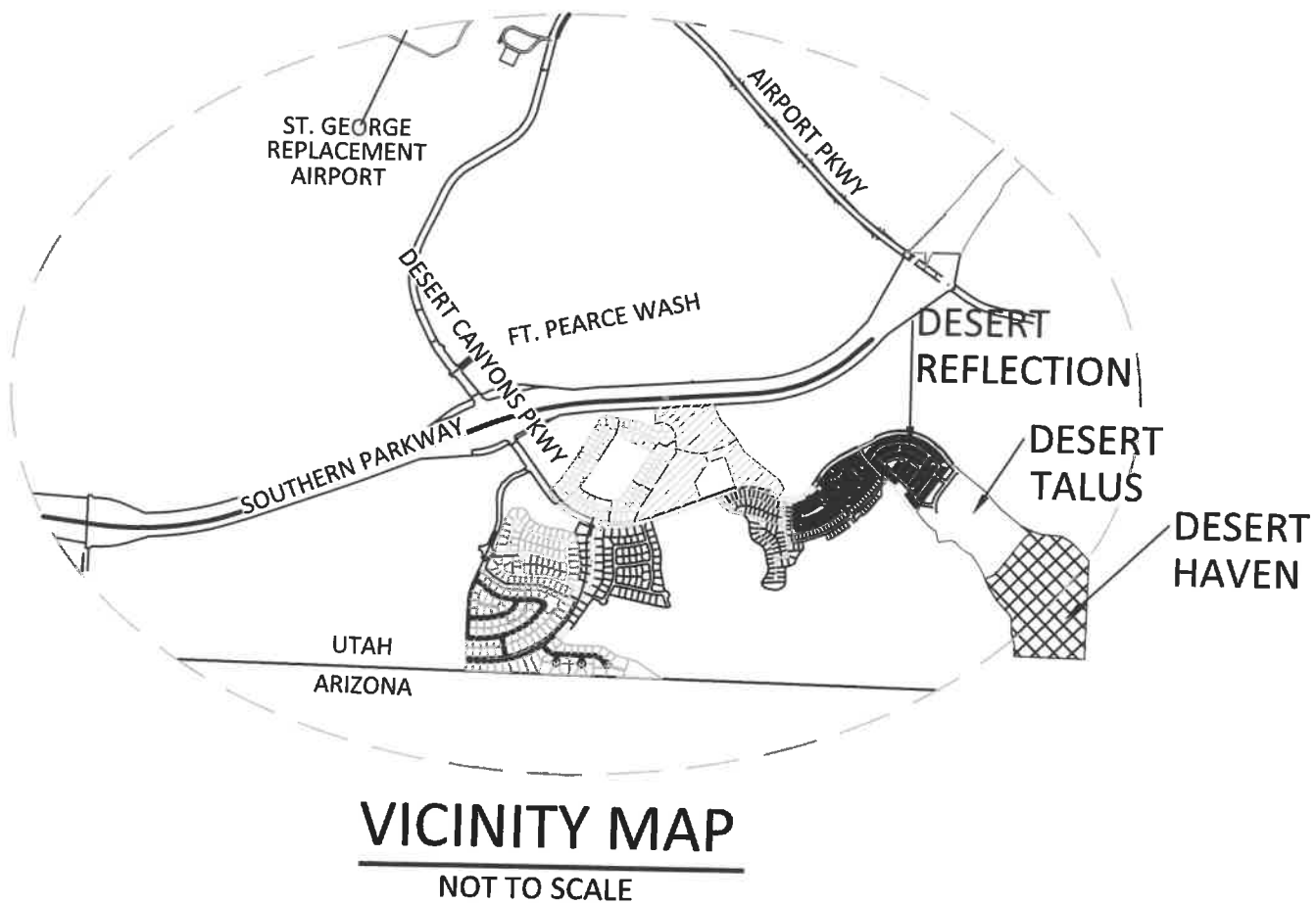


FIGURE 1

3.0 DRAINAGE BASINS

3.1 FEMA Floodplain

Based upon the current Flood Insurance Rate Map (FIRM), a portion of the site (Phases 1-2) lie entirely within an area designated as Zone "X", defined by FEMA as an area outside the 100-year floodplain. Other proposed phases lie within area designated as zone AE, as shown on FEMA map ID 49053C1063G, effective 4/2/2009, and LOMR 22-08-0356P, effective 5/2/2023.

3.2 Master Plan Drainage Facilities

No master planned drainage facilities are addressed in the St. George City Master Drainage Study within the project boundaries.

3.3 Existing Drainage Conditions

The existing hydrologic conditions consist of flat to moderately steep upland areas. The site is rough graded and drains to the northeast to the Ft Pearce wash. Offsite drainage consists of runoff from undeveloped subbasins located west of the project site which drain to the westerly project boundary (Subbasins OFF8, OFF9, and OFF10). Existing offsite hydrologic conditions are illustrated on Figure 2.

3.4 Developed Drainage Conditions

The proposed Desert Haven development will consist of R-1 zoned single-family detached units with appurtenant improved public streets, detention/retention facilities, and storm drain facilities. Runoff generated offsite will be conveyed within natural and graded swale to the proposed onsite detention basin facilities. Additional storage and orifice-controlled outlet structures provide additional detention volume, thus reducing the overall peak runoff rates to a pre-development condition, or less.

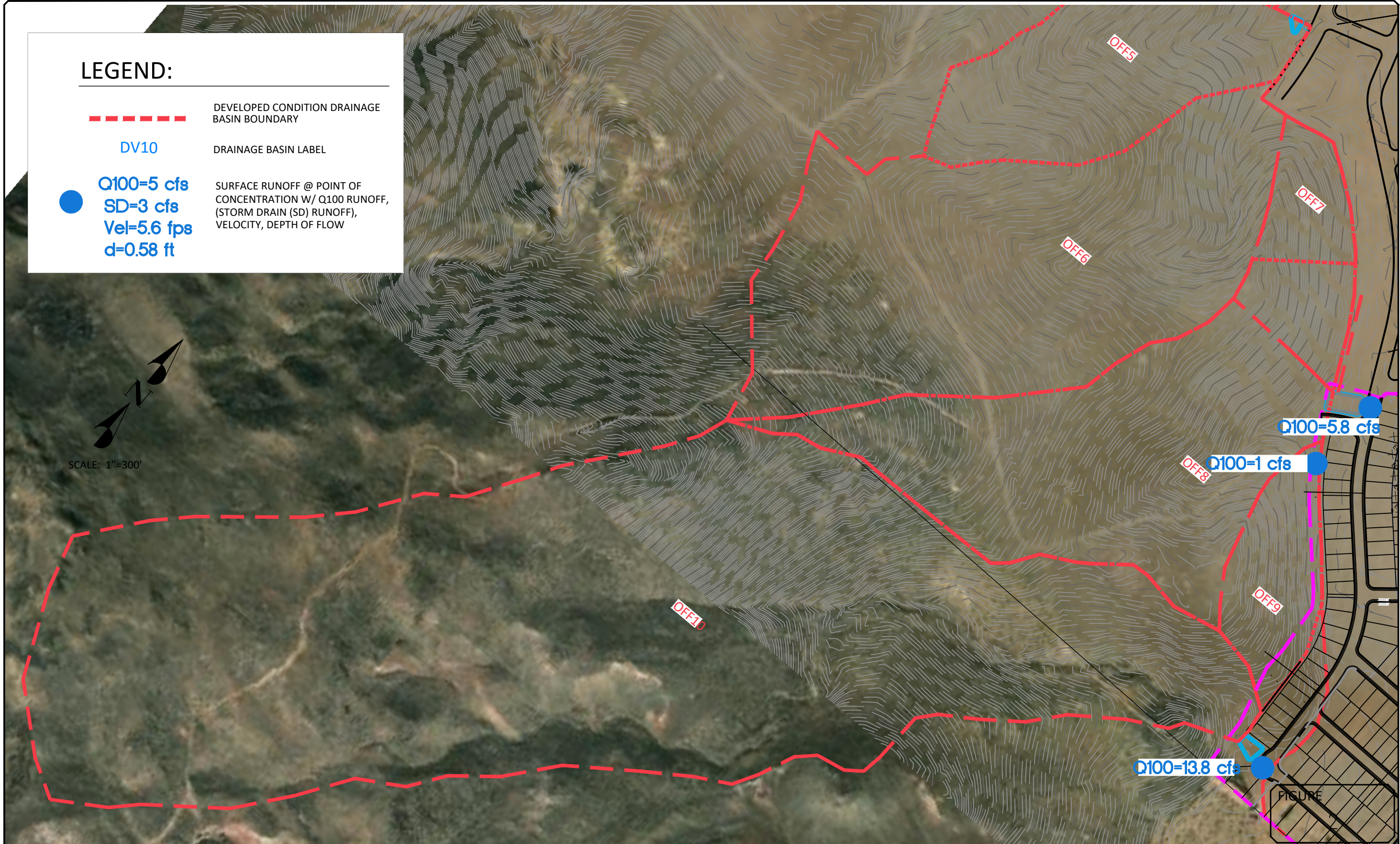
LEGEND:

- DV10

Q100=5 cfs
SD=3 cfs
Vel=5.6 fps
d=0.58 ft
- DEVELOPED CONDITION DRAINAGE
BASIN BOUNDARY

DRAINAGE BASIN LABEL

SURFACE RUNOFF @ POINT OF
CONCENTRATION W/ Q100 RUNOFF,
(STORM DRAIN (SD) RUNOFF),
VELOCITY, DEPTH OF FLOW



EXISTING OFFSITE CONDITIONS
DESERT HAVEN
@ DESERT CANYONS



4.0 HYDROLOGICAL DESIGN METHODS

4.1 Rainfall Methodology

The rainfall and runoff data developed for this hydrologic analysis was prepared for use with the Army Corp of Engineering's program HEC-HMS in accordance with the City of St. George Drainage Design Manual. HEC-HMS input data was generated using the St. George Drainage Manual. Runoff modeling was performed for the 10-year and 100-year storm frequencies.

A 100-year, 3-hour point rainfall depth of 1.64 inches was utilized in the HEC-HMS portion of this hydrology analysis to size the detention basin and calculate street flows. A 10-year, 3-hour point rainfall depth of 1.00 inch was utilized to size the storm drain system. Point rainfall depths for the 24-hour storm of 1.68 inches and 2.51 inches were assumed for the 10-year and 100-year rainfall events, respectively. No area reduction was utilized in the point rainfall determinations.

4.2 Runoff Methodology

The SCS Curve number method was used for the loss calculations in all scenarios. The curve numbers for the water sheds were determined using a weighted average based on soil type, vegetation and land use. The lag time for each basin was calculated using both the travel time component method and the SCS empirical method. The shortest lag time was then used in the transform analysis. The time of concentration was calculated as follows:

$$T_c = T_i + T_t$$

where:

T_c = Time of concentration

T_i = Initial, inlet or sheet flow travel time

T_t = Travel time for shallow concentrated flow

Initial flow time was calculated as follows:

$$T_i = 0.007(nL)^{0.8}/(P_2)^{0.5}s^{0.4}$$

where:

T_i = Initial overland travel time (minutes)

n = manning's number

L = sheet flow length (typically less than 300 feet)

P_2 = 2-yr 24-hr precipitation (inches)

s = slope (ft/ft)

Shallow concentrated flow travel time was calculated as follows:

$$T_t = L/3600V$$

Where:

T_t = travel time for shallow concentrated flow

L = flow length (feet)

V = average velocity (ft/s)

The lag time was calculated as follows: $T_{lag} = 0.6T_c$ (hours)

5.0 RESULTS OF ANALYSIS

5.1 Peak Runoff

Historical, existing on-site, and developed on-site calculated peak runoff at critical points of discharge for the site are indicated on Figure 3, and in Table 1 below.

Table 1.
Calculated Runoff

Hydrologic Condition/Basin	3-hr FF		24-hour
	Q10 (cfs)	Q100 (cfs)	Q10 (cfs)
Existing Conditions			
OFF8	1	10	2.9
OFF9	<1	2.1	<1
OFF10	3.3	29.7	10.9
Reservoir 3 discharge	<1	5.8	2.4
Reservoir 4 discharge	1.6	13.8	6.7

*Includes onsite routing and detention.

5.2 Stormwater Runoff Detention

Sufficient stormwater detention is proposed to mitigate excess developed condition runoff. The two on-site detention basins include at least 6" of sediment capture, as well as detention of the offsite runoff prior to discharge to the proposed onsite storm drain system. Maximum pool detention volumes of 0.75 and 1.2 acre feet for detention basins 3 and 4, respectively, are sufficient to reduce peak offsite flow rates to levels sufficient for future downstream conveyance capacities.

6.0 CONCLUSIONS

Street and storm drain improvements are designed to convey the calculated 100-yr and 10-yr storm event runoff within the limits established by the City of St. George. Existing condition peak stormwater runoff rates will not be exceeded after the proposed project is constructed.

APPENDIX

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

PROJECT: DESERT HAVEN

FILE : SF4

Run: Final

CALCULATED BY: kmm

DATE : 7/28/2026

Sub-Basin Data

DESIG				CN	K	AREA (acres)	AREA (mi²)	Initial/Overland Time (Ti)			Travel Time (Tt)				Tc	Tc Check (Urbanized Basins)	Final Tc	Tlag	Remarks
(1)					(2)	(3)		LENGTH (ft) (4)	SLOPE (%) (5)	Ti (min) (6)	LENGTH (ft) (7)	SLOPE (%) (8)	VELOCITY (fps) (9)	Tt (min) (10)	Tc=Ti+Tt (min) (11)	TOTAL (ft) (12)	Tc (min) (13)	(min) (14)	
OFFSITE BASINS - EXISTING CONDITIONS																			
OFF8				78	0.640	20.20	0.0316	300	24.00	5.0	832	10.00	4.1	3.4	8.4	1132.0	NA	8.4	5
OFF9				78	0.640	4.30	0.0067	280	25.00	4.7	325	1.00	2.5	2.2	6.9	605.0	NA	6.9	4
OFF10				78	0.640	75.00	0.1172	300	25.00	4.9	3500	6.00	3.8	15.4	20.3	3800.0	NA	20.3	12
Tt= $\frac{1.48(1.49K)^{1/2}L^{1/2}}{(S^{1/3})}$																			
Tc= Ti+Tt																			
K=0.0132/CN ^{1.39}																			
															use 5 min				

$$T_i = (1.48(1.1 - K)L^{0.55}) / (S^{0.33})$$

$$T_c = T_i + T_t$$

$$K = 0.0132(CN)^{-0.39}$$

* Soil is Type 'C'.

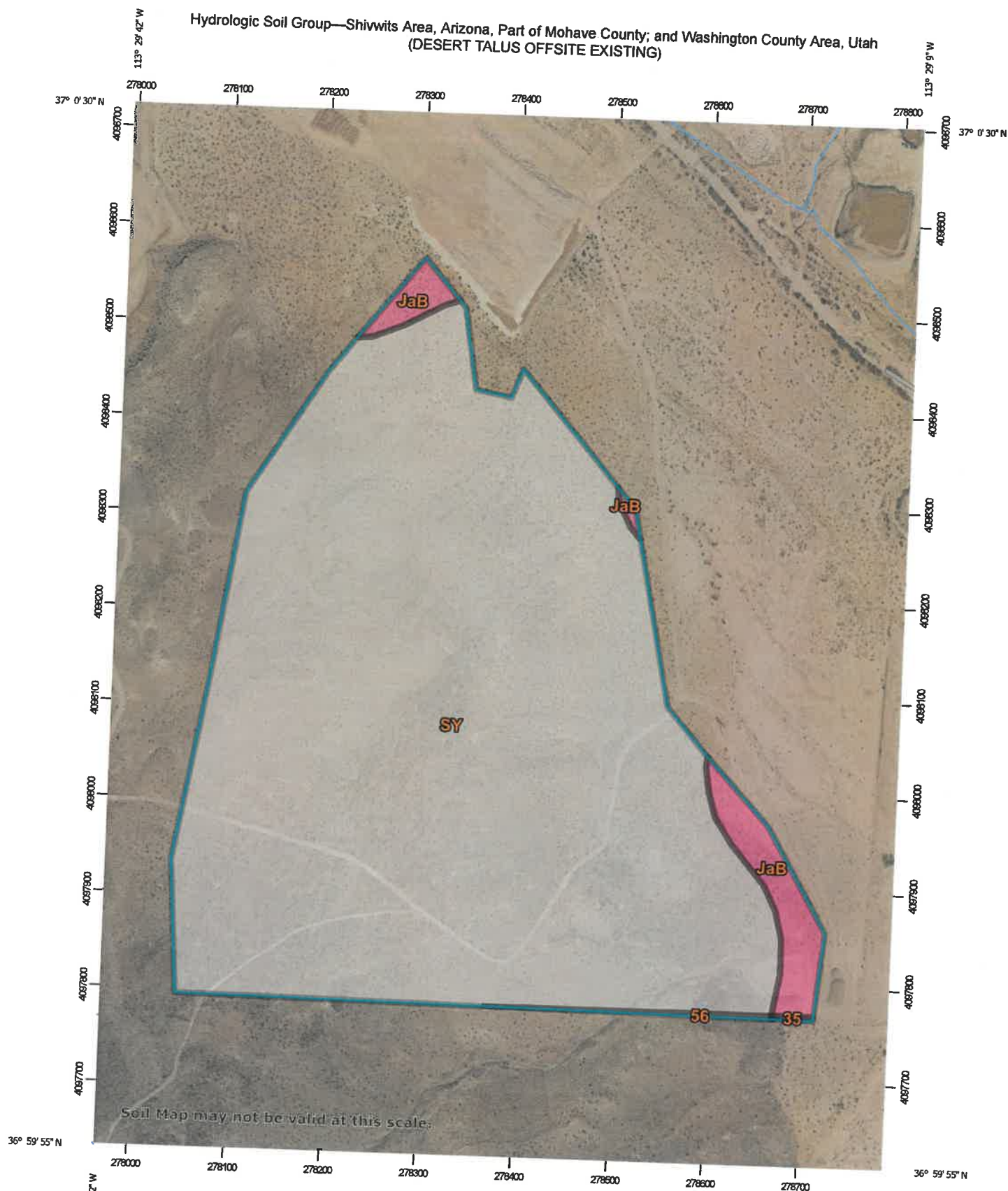
$$T_{lag} = 6T_c$$

REFERENCE:

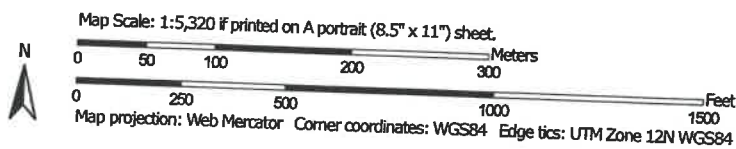
STANDARD FORM 4

Hydrologic Criteria

Hydrologic Soil Group—Shivwits Area, Arizona, Part of Mohave County; and Washington County Area, Utah (DESERT TALUS OFFSITE EXISTING)



Soil Map may not be valid at this scale.



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

12/3/2024
Page 1 of 5

Hydrologic Soil Group—Shivwits Area, Arizona, Part of Mohave County; and Washington County Area, Utah
(DESERT TALUS OFFSITE EXISTING)

MAP LEGEND

Area of Interest (AOI)			C
	Area of Interest (AOI)		C/D
Soils			D
Soil Rating Polygons			Not rated or not available
	A	Water Features	
	A/D		Streams and Canals
	B	Transportation	
	B/D		Rails
	C		Interstate Highways
	C/D		US Routes
	D		Major Roads
	Not rated or not available		Local Roads
Soil Rating Lines		Background	
	A		Aerial Photography
	A/D		
	B		
	B/D		
	C		
	C/D		
	D		
	Not rated or not available		
Soil Rating Points			
	A		
	A/D		
	B		
	B/D		

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Shivwits Area, Arizona, Part of Mohave County

Survey Area Data: Version 21, Aug 29, 2024

Soil Survey Area: Washington County Area, Utah

Survey Area Data: Version 18, Aug 28, 2024

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 8, 2022—Sep 29, 2022

Hydrologic Soil Group—Shivwits Area, Arizona, Part of Mohave County; and Washington County Area, Utah
(DESERT TALUS OFFSITE EXISTING)

MAP LEGEND

MAP INFORMATION

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

12/3/2024
Page 3 of 5

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
35	Hobcan fine sandy loam, 1 to 5 percent slopes	B	0.0	0.1%
56	Nikey family-Ruesh family-Rock outcrop complex, 10 to 40 percent slopes		0.1	0.2%
Subtotals for Soil Survey Area			0.2	0.2%
Totals for Area of Interest			84.4	100.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
JaB	Junction fine sandy loam, 1 to 2 percent slopes	A	3.6	4.3%
SY	Stony colluvial land		80.6	95.5%
Subtotals for Soil Survey Area			84.2	99.8%
Totals for Area of Interest			84.4	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

**HEC-RAS Output Summaries
Desert Haven Subdivision
Offsite Runoff
Existing and Developed Conditions
100-Yr., 10-Yr. Storm Events**

Simulation End: 1 January 2024, 24:00

Executed: 29 July 2026, 18:37

Downstream	
Element Name	Downstream
Reach - 2	Junction - 2
Reach - 1	Reservoir - 3
Reach - 3	Junction - 3

Route: Muskingum Cunge												
Element Name	Method	Channel	Length (FT)	Energy Slope (FT/FT)	Mannings n	Diameter	Initial Variable	Space - Time Method	Index Parameter Type	Index Flow	Maximum Depth Iterations	Maximum Route Step Iterations
Reach - 2	Muskingum Cunge	Circular	300	0.01	0.01	2	Combined Inflow	Automatic DX and DT	Index Flow	2	20	30
Reach - 1	Muskingum Cunge	Circular	100	0.01	0.01	1.5	Combined Inflow	Automatic DX and DT	Index Flow	2	20	30
Reach - 3	Muskingum Cunge	Circular	300	0.01	0.01	1.5	Combined Inflow	Automatic DX and DT	Index Flow	2	20	30

Global Results Summary

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off10	0.12	10.88	01Jan2024, 12:30	0.31
Reservoir - 4	0.12	6.76	01Jan2024, 13:00	0.31
Reach - 2	0.12	6.72	01Jan2024, 13:00	0.31
Junction - 2	0.12	6.72	01Jan2024, 13:00	0.31
Off8	0.03	2.93	01Jan2024, 12:30	0.31
Off9	0.01	0.62	01Jan2024, 12:30	0.31
Junction - 1	0.01	0.62	01Jan2024, 12:30	0.31
Reach - 1	0.01	0.62	01Jan2024, 12:30	0.31
Reservoir - 3	0.04	2.42	01Jan2024, 13:00	0.31
Reach - 3	0.04	2.4	01Jan2024, 13:00	0.31
Junction - 3	0.04	2.4	01Jan2024, 13:00	0.31

Subbasin: OFF10

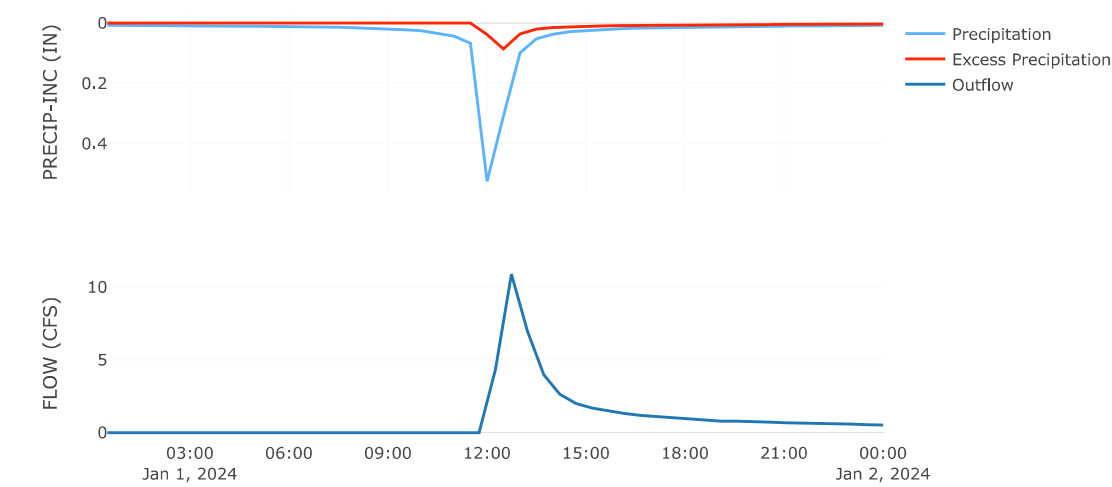
Area (MI²): 0.12
Downstream : Reservoir - 4

Loss Rate: SCS	
Percent Impervious Area	0
Curve Number	78

Transform: SCS	
Lag	12
Unitgraph Type	Standard

Results: OFF10	
Peak Discharge (CFS)	10.88
Time of Peak Discharge	01Jan2024, 12:30
Volume (IN)	0.31
Precipitation Volume (AC - FT)	10.48
Loss Volume (AC - FT)	8.51
Excess Volume (AC - FT)	1.97
Direct Runoff Volume (AC - FT)	1.95
Baseflow Volume (AC - FT)	0

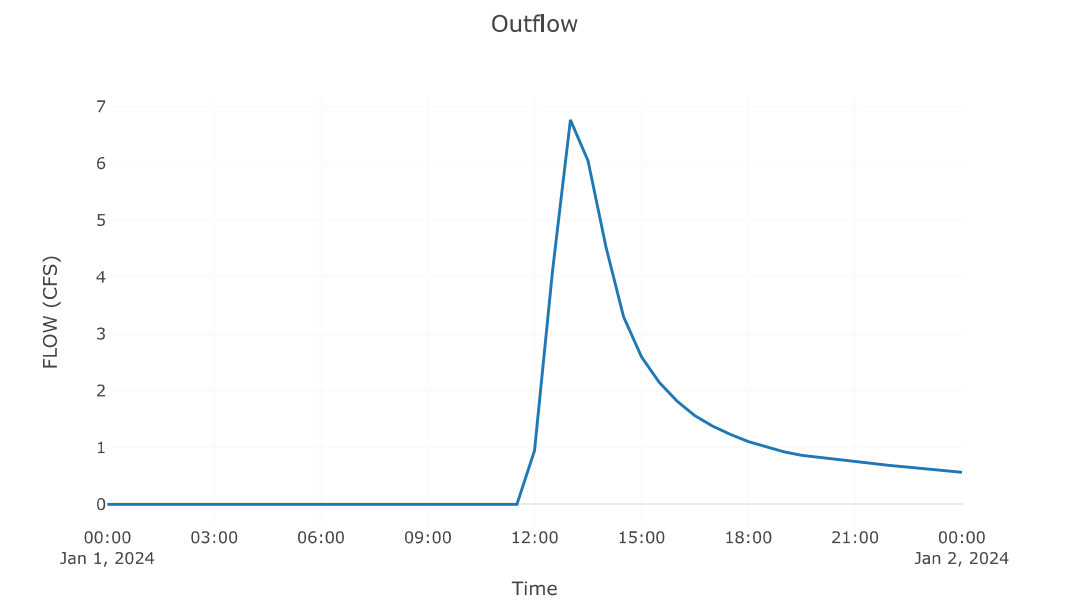
Precipitation and Outflow



Reservoir: Reservoir-4

Downstream : Reach - 2

Results: Reservoir-4	
Peak Discharge (CFS)	6.76
Time of Peak Discharge	01Jan2024, 13:00
Volume (IN)	0.31
Peak Inflow (CFS)	10.88
Time of Peak Inflow	01Jan2024, 12:30
Inflow Volume (AC - FT)	1.95
Maximum Storage (AC - FT)	0.62
Peak Elevation (FT)	2792.75
Discharge Volume (AC - FT)	1.91

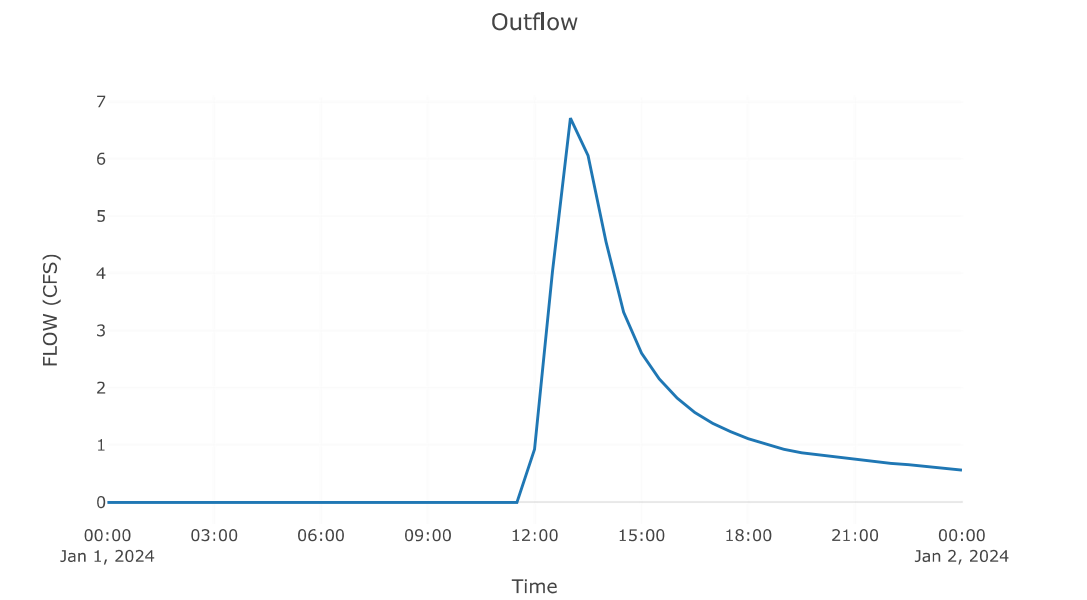


Reach: Reach-2

Downstream : Junction - 2

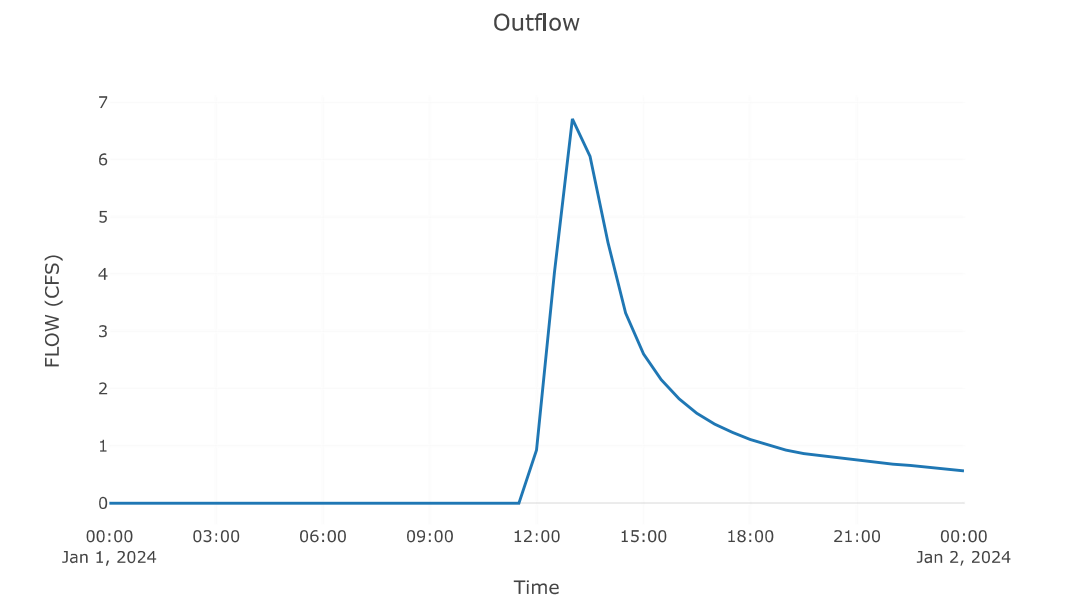
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Circular
Length (FT)	300
Energy Slope (FT/FT)	0.01
Mannings n	0.01
Diameter	2
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Flow
Index Flow	2
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-2	
Peak Discharge (CFS)	6.72
Time of Peak Discharge	01Jan2024, 13:00
Volume (IN)	0.31
Peak Inflow (CFS)	6.76
Inflow Volume (AC - FT)	1.91



Junction: Junction-2

Results: Junction-2	
Peak Discharge (CFS)	6.72
Time of Peak Discharge	01Jan2024, 13:00
Volume (IN)	0.31



Subbasin: OFF8

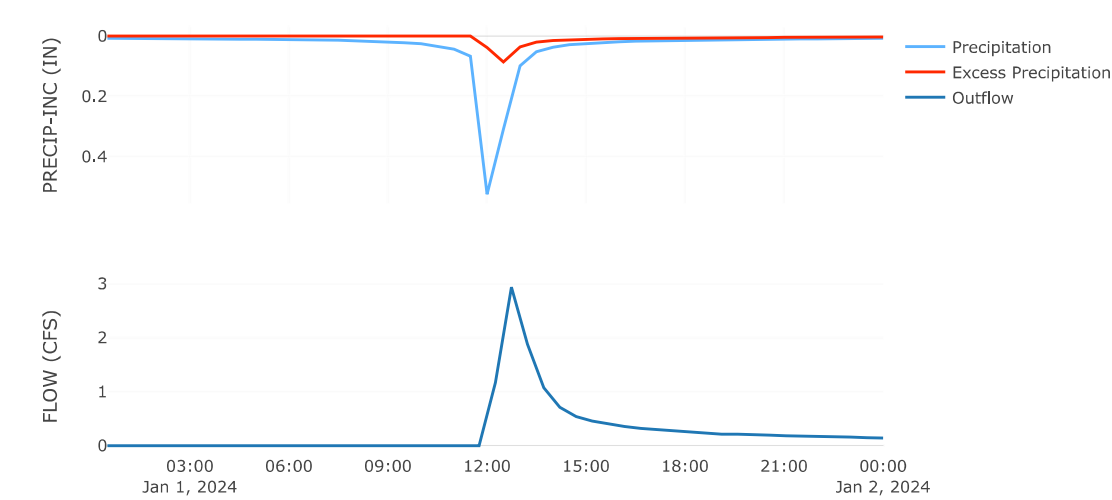
Area (MI²): 0.03
Downstream : Reservoir - 3

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	78

Transform: Scs	
Lag	5
Unitgraph Type	Standard

Results: OFF8	
Peak Discharge (CFS)	2.93
Time of Peak Discharge	01Jan2024, 12:30
Volume (IN)	0.31
Precipitation Volume (AC - FT)	2.83
Loss Volume (AC - FT)	2.3
Excess Volume (AC - FT)	0.53
Direct Runoff Volume (AC - FT)	0.53
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



Subbasin: OFF9

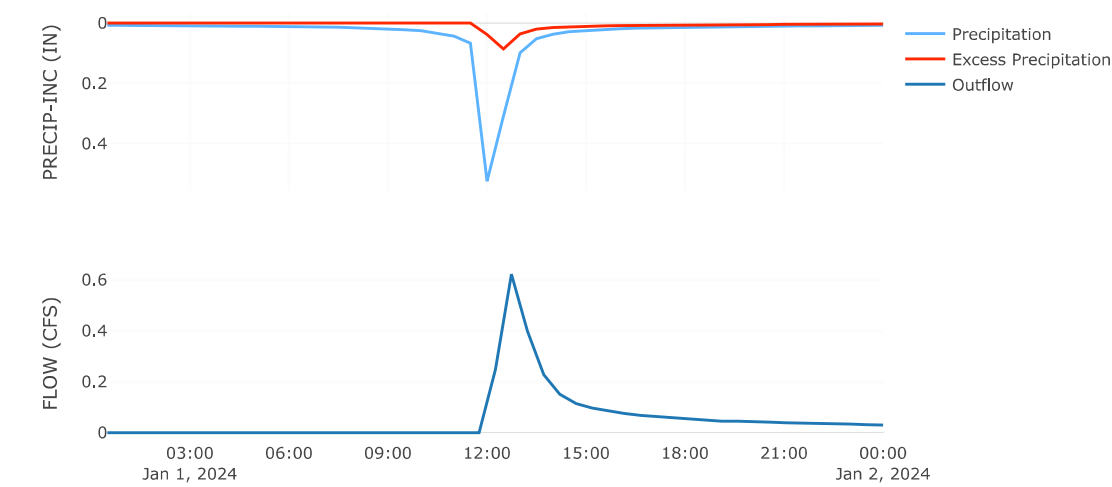
Area (MI2) : 0.01
Downstream : Junction - 1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	78

Transform: Scs	
Lag	5
Unitgraph Type	Standard

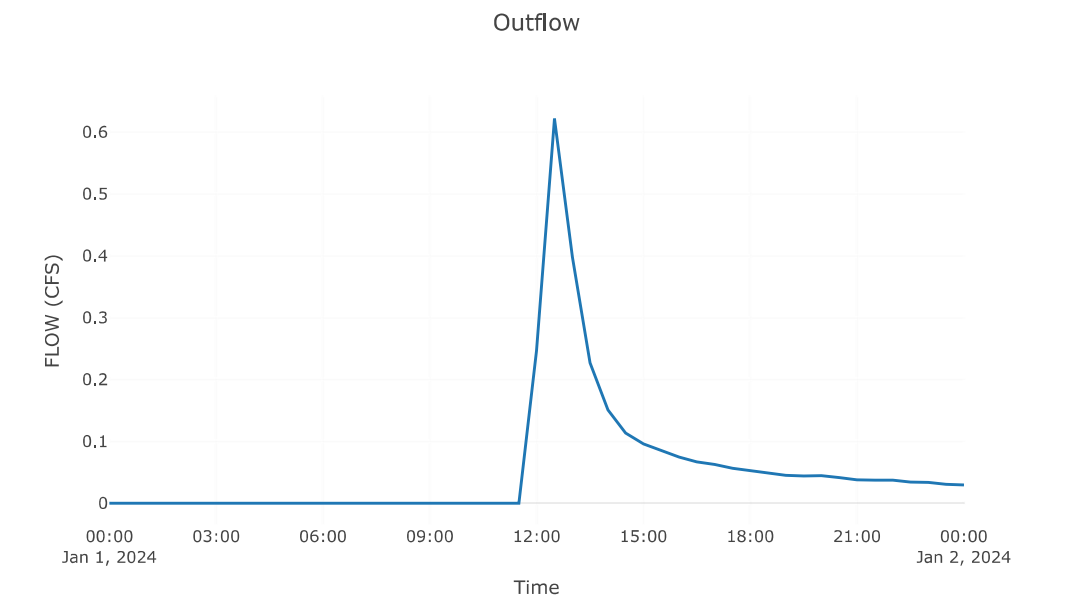
Results: OFF9	
Peak Discharge (CFS)	0.62
Time of Peak Discharge	01Jan2024, 12:30
Volume (IN)	0.31
Precipitation Volume (AC - FT)	0.6
Loss Volume (AC - FT)	0.49
Excess Volume (AC - FT)	0.11
Direct Runoff Volume (AC - FT)	0.11
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



Junction: Junction-1

Results: Junction-1	
Peak Discharge (CFS)	0.62
Time of Peak Discharge	01-Jan-2024, 12:30
Volume (IN)	0.31

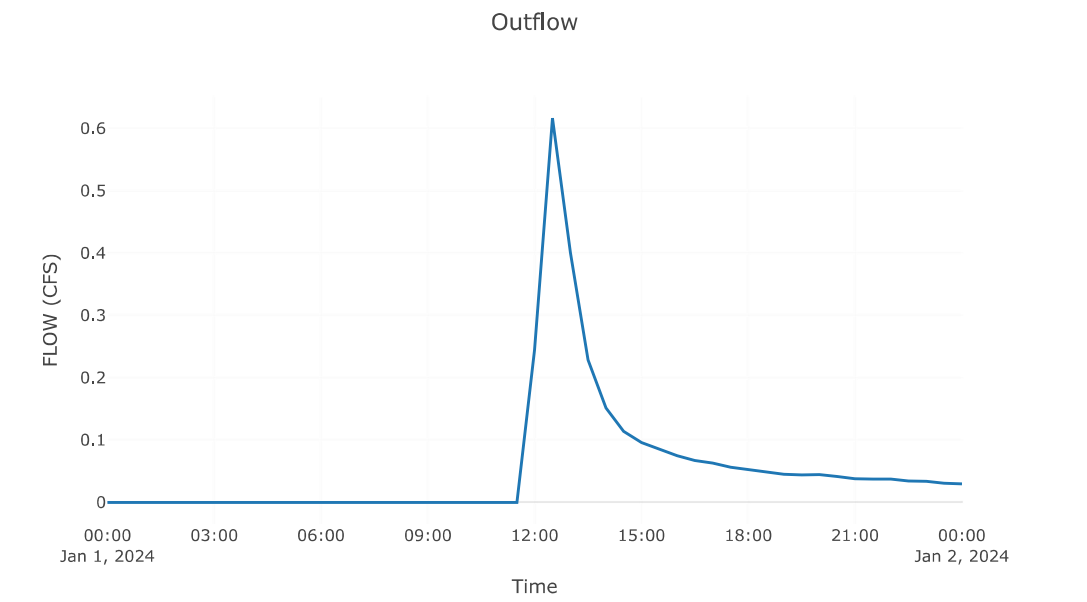


Reach: Reach-1

Downstream : Reservoir - 3

Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Circular
Length (FT)	100
Energy Slope (FT/FT)	0.01
Mannings n	0.01
Diameter	1.5
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Flow
Index Flow	2
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

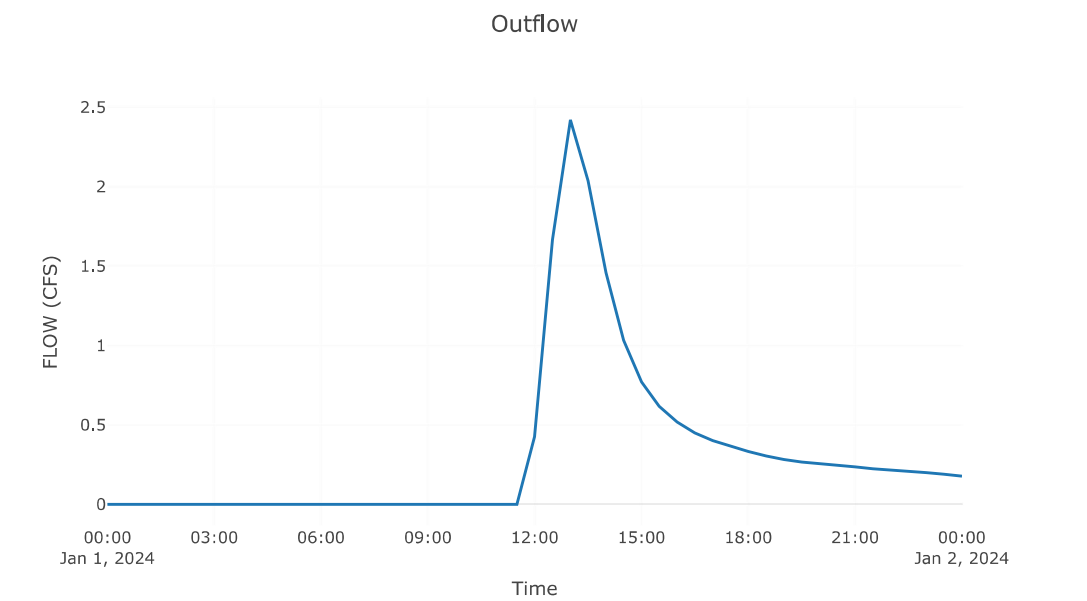
Results: Reach-1	
Peak Discharge (CFS)	0.62
Time of Peak Discharge	01Jan2024, 12:30
Volume (IN)	0.31
Peak Inflow (CFS)	0.62
Inflow Volume (AC - FT)	0.11



Reservoir: Reservoir-3

Downstream : Reach - 3

Results: Reservoir-3	
Peak Discharge (CFS)	2.42
Time of Peak Discharge	01Jan2024, 13:00
Volume (IN)	0.31
Peak Inflow (CFS)	3.55
Time of Peak Inflow	01Jan2024, 12:30
Inflow Volume (AC - FT)	0.64
Maximum Storage (AC - FT)	0.24
Peak Elevation (FT)	2776.81
Discharge Volume (AC - FT)	0.63

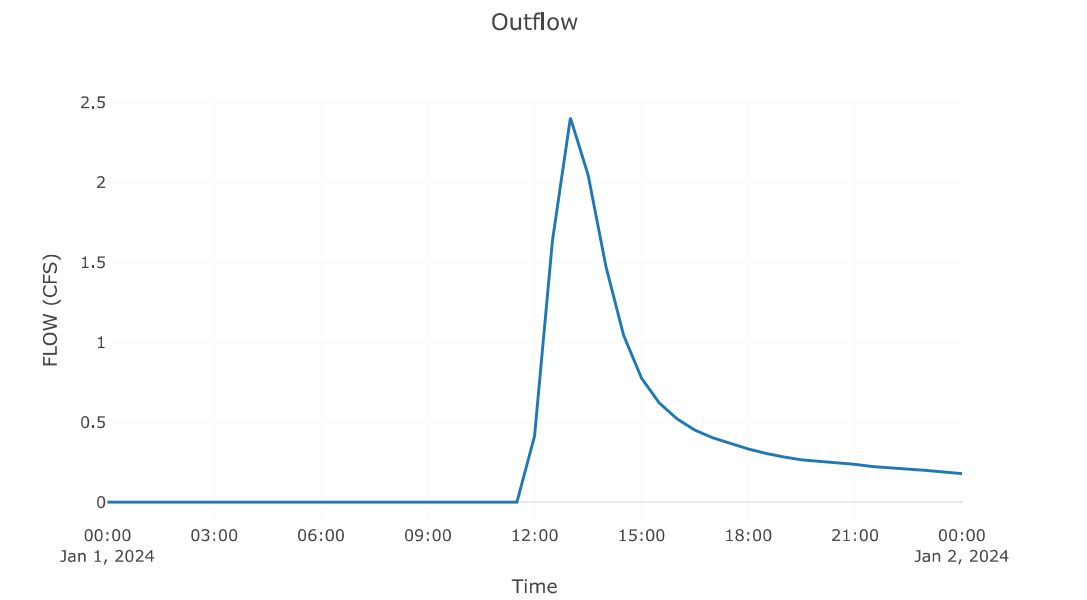


Reach: Reach-3

Downstream : Junction - 3

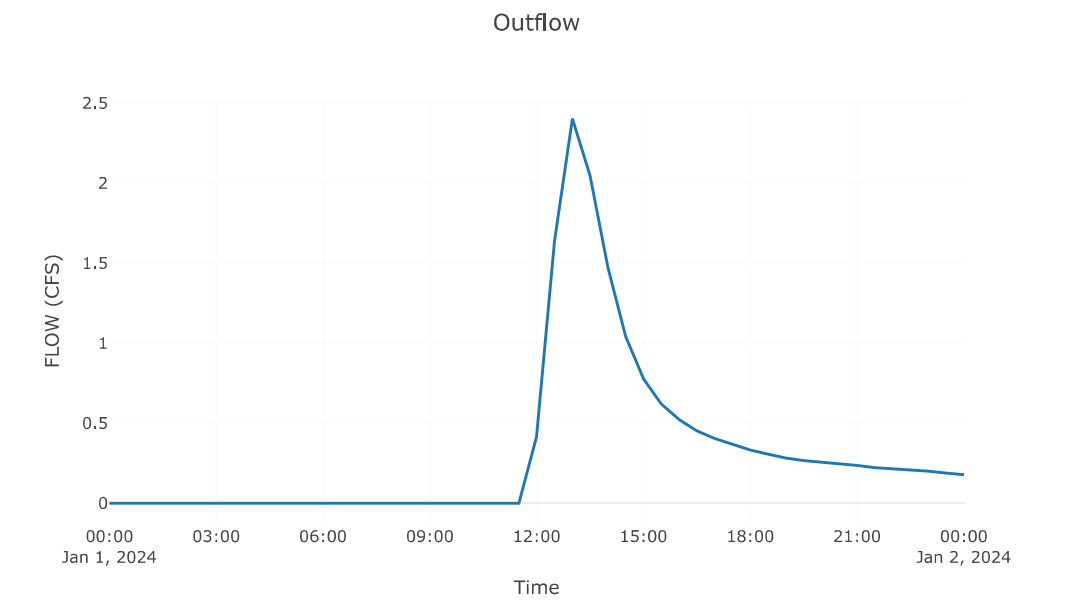
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Circular
Length (FT)	300
Energy Slope (FT/FT)	0.01
Mannings n	0.01
Diameter	1.5
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Flow
Index Flow	2
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-3	
Peak Discharge (CFS)	2.4
Time of Peak Discharge	01Jan2024, 13:00
Volume (IN)	0.31
Peak Inflow (CFS)	2.42
Inflow Volume (AC - FT)	0.63



Junction: Junction-3

Results: Junction-3	
Peak Discharge (CFS)	2.4
Time of Peak Discharge	01Jan2024, 13:00
Volume (IN)	0.31



Simulation End: 1 January 2023, 03:00

Executed: 29 July 2026, 18:36

Downstream	
Element Name	Downstream
Reach - 2	Junction - 2
Reach - 1	Reservoir - 3
Reach - 3	Junction - 3

Route: Muskingum Cunge												
Element Name	Method	Channel	Length (FT)	Energy Slope (FT/FT)	Mannings n	Diameter	Initial Variable	Space - Time Method	Index Parameter Type	Index Flow	Maximum Depth Iterations	Maximum Route Step Iterations
Reach - 2	Muskingum Cunge	Circular	300	0.01	0.01	2	Combined Inflow	Automatic DX and DT	Index Flow	2	20	30
Reach - 1	Muskingum Cunge	Circular	100	0.01	0.01	1.5	Combined Inflow	Automatic DX and DT	Index Flow	2	20	30
Reach - 3	Muskingum Cunge	Circular	300	0.01	0.01	1.5	Combined Inflow	Automatic DX and DT	Index Flow	2	20	30

Global Results Summary

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off10	0.12	3.3	01Jan2023, 01:10	0.05
Reservoir - 4	0.12	1.56	01Jan2023, 01:50	0.04
Reach - 2	0.12	1.56	01Jan2023, 01:50	0.04
Junction - 2	0.12	1.56	01Jan2023, 01:50	0.04
Off8	0.03	1.03	01Jan2023, 01:00	0.06
Off9	0.01	0.22	01Jan2023, 01:00	0.06
Junction - 1	0.01	0.22	01Jan2023, 01:00	0.06
Reach - 1	0.01	0.22	01Jan2023, 01:05	0.06
Reservoir - 3	0.04	0.66	01Jan2023, 01:30	0.04
Reach - 3	0.04	0.65	01Jan2023, 01:30	0.04
Junction - 3	0.04	0.65	01Jan2023, 01:30	0.04

Subbasin: OFF10

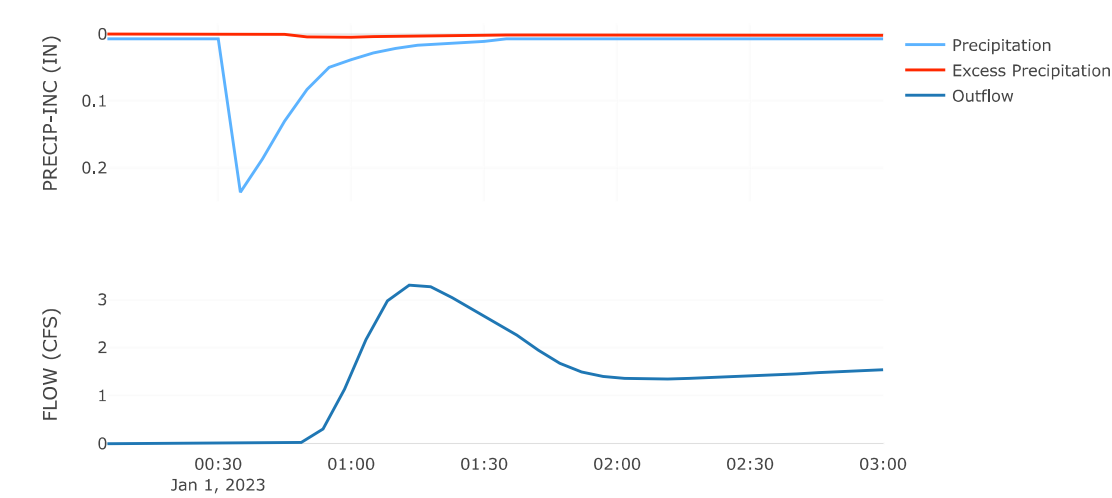
Area (MI²): 0.12
Downstream : Reservoir - 4

Loss Rate: SCS	
Percent Impervious Area	0
Curve Number	78

Transform: SCS	
Lag	12
Unitgraph Type	Standard

Results: OFF10	
Peak Discharge (CFS)	3.3
Time of Peak Discharge	01Jan2023, 01:10
Volume (IN)	0.05
Precipitation Volume (AC - FT)	6.25
Loss Volume (AC - FT)	5.89
Excess Volume (AC - FT)	0.37
Direct Runoff Volume (AC - FT)	0.33
Baseflow Volume (AC - FT)	0

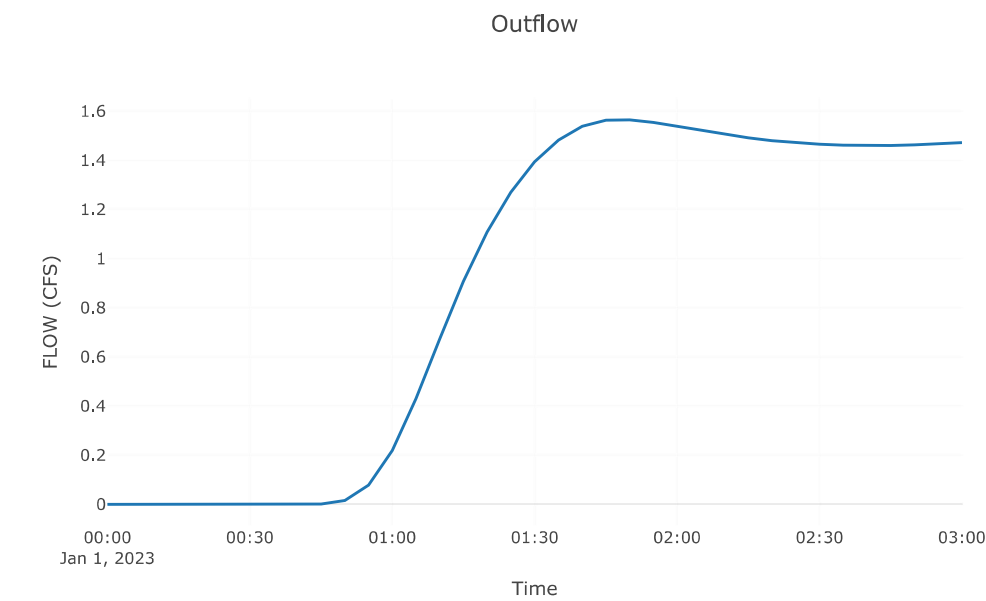
Precipitation and Outflow



Reservoir: Reservoir-4

Downstream : Reach - 2

Results: Reservoir-4	
Peak Discharge (CFS)	1.56
Time of Peak Discharge	01Jan2023, 01:50
Volume (IN)	0.04
Peak Inflow (CFS)	3.3
Time of Peak Inflow	01Jan2023, 01:10
Inflow Volume (AC - FT)	0.33
Maximum Storage (AC - FT)	0.31
Peak Elevation (FT)	2791.52
Discharge Volume (AC - FT)	0.22

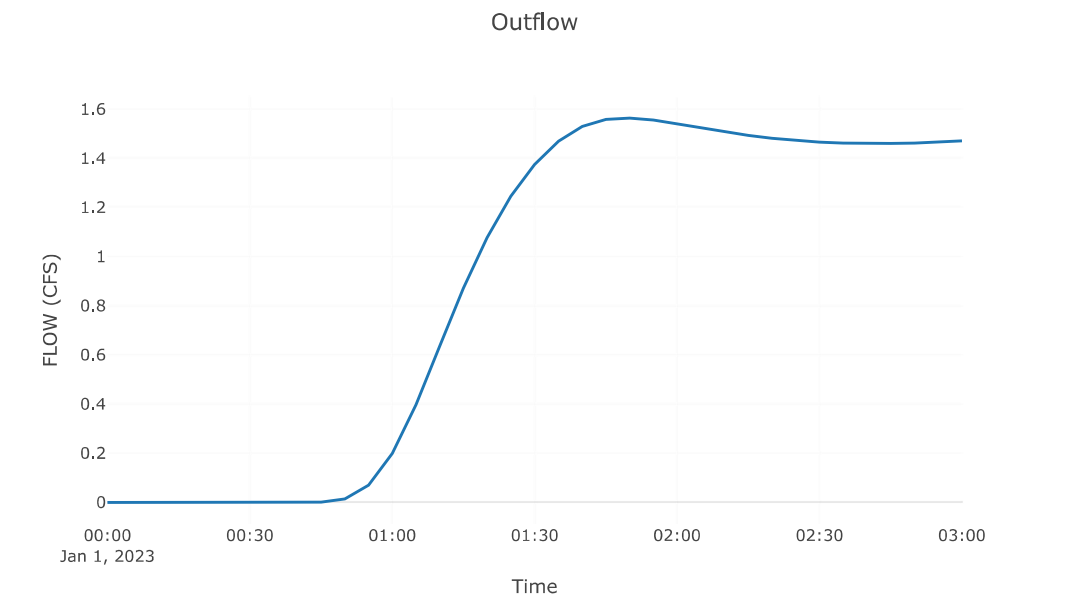


Reach: Reach-2

Downstream : Junction - 2

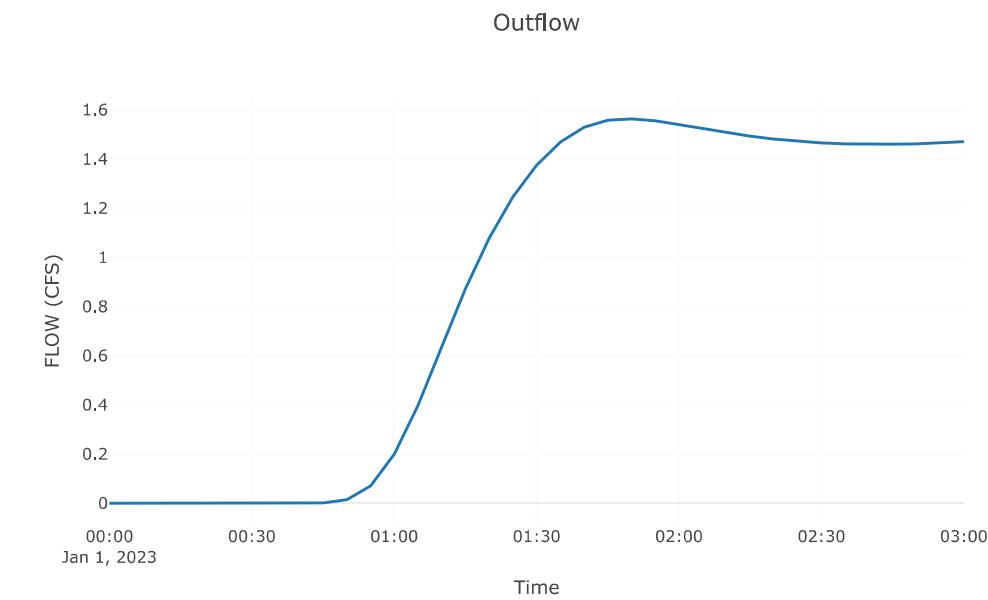
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Circular
Length (FT)	300
Energy Slope (FT/FT)	0.01
Mannings n	0.01
Diameter	2
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Flow
Index Flow	2
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-2	
Peak Discharge (CFS)	1.56
Time of Peak Discharge	01Jan2023, 01:50
Volume (IN)	0.04
Peak Inflow (CFS)	1.56
Inflow Volume (AC - FT)	0.22



Junction: Junction-2

Results: Junction-2	
Peak Discharge (CFS)	1.56
Time of Peak Discharge	01Jan2023, 01:50
Volume (IN)	0.04



Subbasin: OFF8

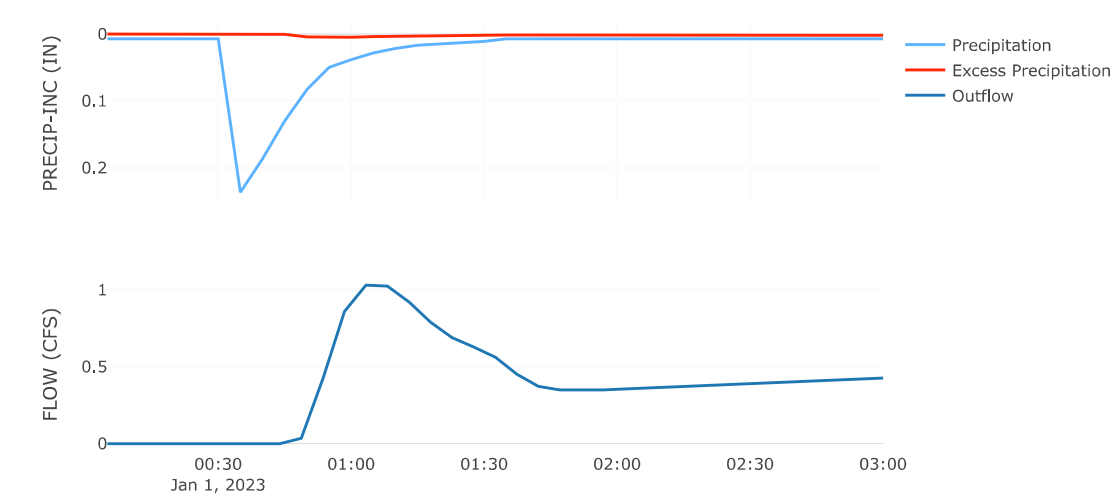
Area (MI²): 0.03
Downstream : Reservoir - 3

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	78

Transform: Scs	
Lag	5
Unitgraph Type	Standard

Results: OFF8	
Peak Discharge (CFS)	1.03
Time of Peak Discharge	01Jan2023, 01:00
Volume (IN)	0.06
Precipitation Volume (AC - FT)	1.69
Loss Volume (AC - FT)	1.59
Excess Volume (AC - FT)	0.1
Direct Runoff Volume (AC - FT)	0.09
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



Subbasin: OFF9

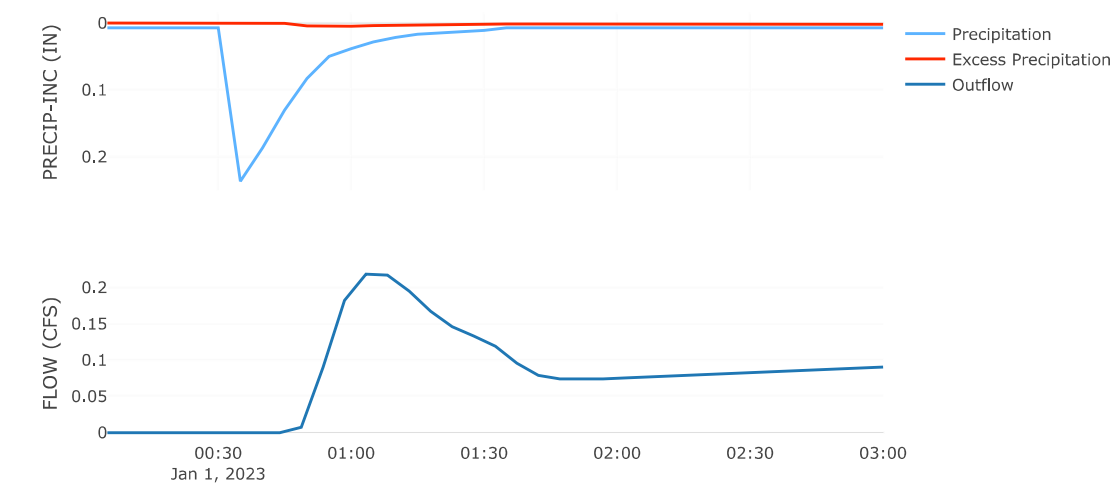
Area (MI²): 0.01
Downstream : Junction - 1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	78

Transform: Scs	
Lag	5
Unitgraph Type	Standard

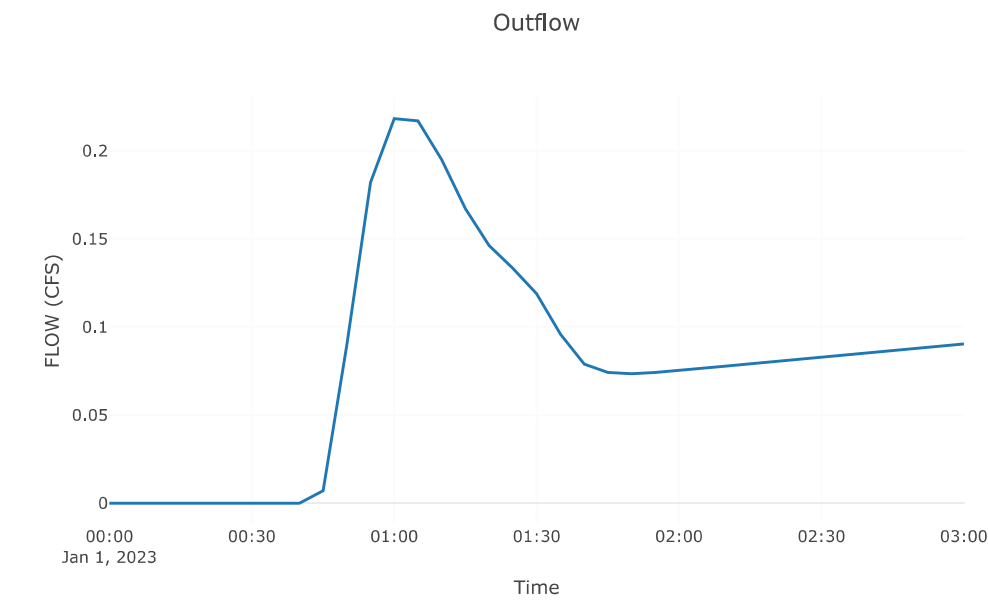
Results: OFF9	
Peak Discharge (CFS)	0.22
Time of Peak Discharge	01Jan2023, 01:00
Volume (IN)	0.06
Precipitation Volume (AC - FT)	0.36
Loss Volume (AC - FT)	0.34
Excess Volume (AC - FT)	0.02
Direct Runoff Volume (AC - FT)	0.02
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



Junction: Junction-1

Results: Junction-1	
Peak Discharge (CFS)	0.22
Time of Peak Discharge	01Jan2023, 01:00
Volume (IN)	0.06

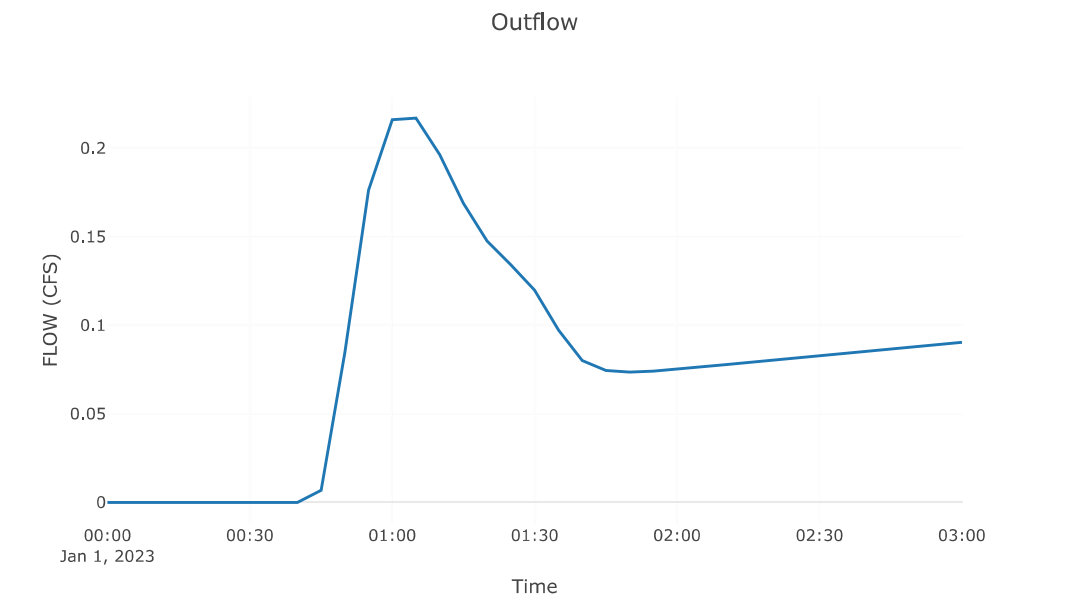


Reach: Reach-1

Downstream : Reservoir - 3

Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Circular
Length (FT)	100
Energy Slope (FT/FT)	0.01
Mannings n	0.01
Diameter	1.5
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Flow
Index Flow	2
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

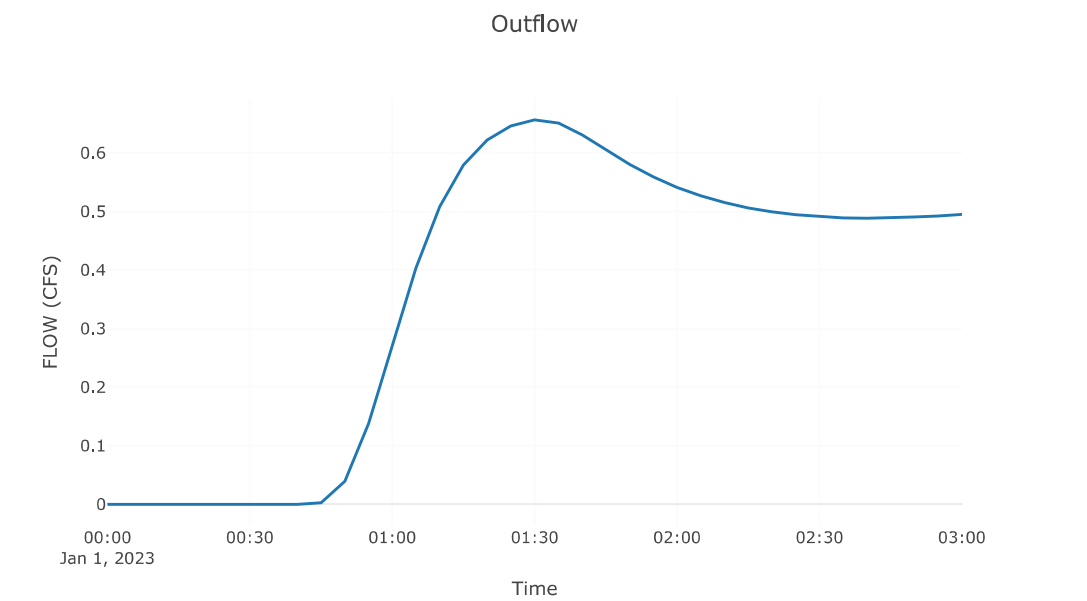
Results: Reach-1	
Peak Discharge (CFS)	0.22
Time of Peak Discharge	01Jan2023, 01:05
Volume (IN)	0.06
Peak Inflow (CFS)	0.22
Inflow Volume (AC - FT)	0.02



Reservoir: Reservoir-3

Downstream : Reach - 3

Results: Reservoir-3	
Peak Discharge (CFS)	0.66
Time of Peak Discharge	01Jan2023, 01:30
Volume (IN)	0.04
Peak Inflow (CFS)	1.25
Time of Peak Inflow	01Jan2023, 01:00
Inflow Volume (AC - FT)	0.11
Maximum Storage (AC - FT)	0.15
Peak Elevation (FT)	2776.22
Discharge Volume (AC - FT)	0.09

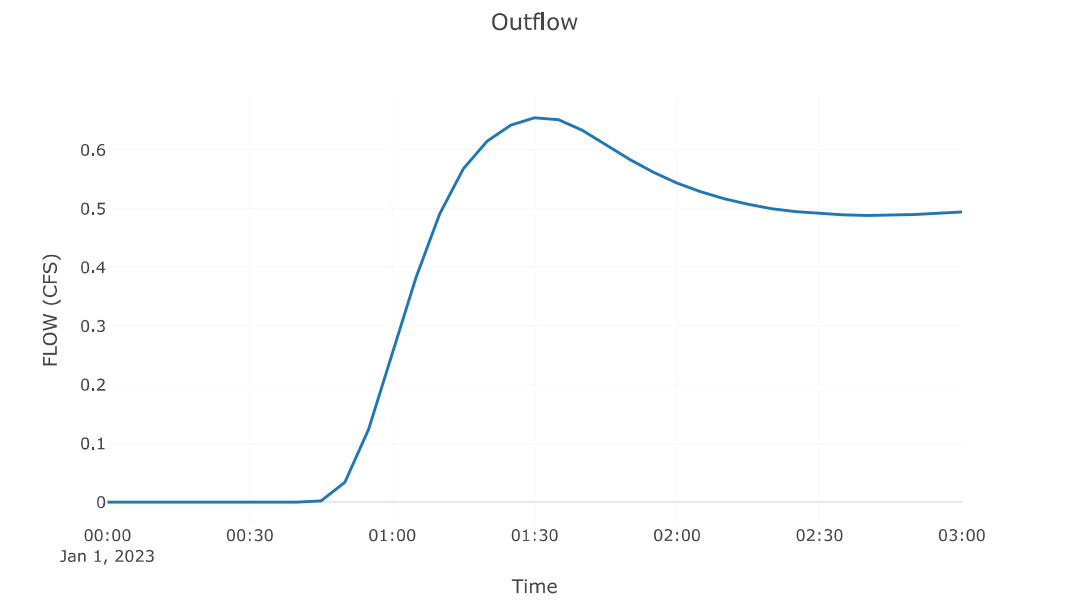


Reach: Reach-3

Downstream : Junction - 3

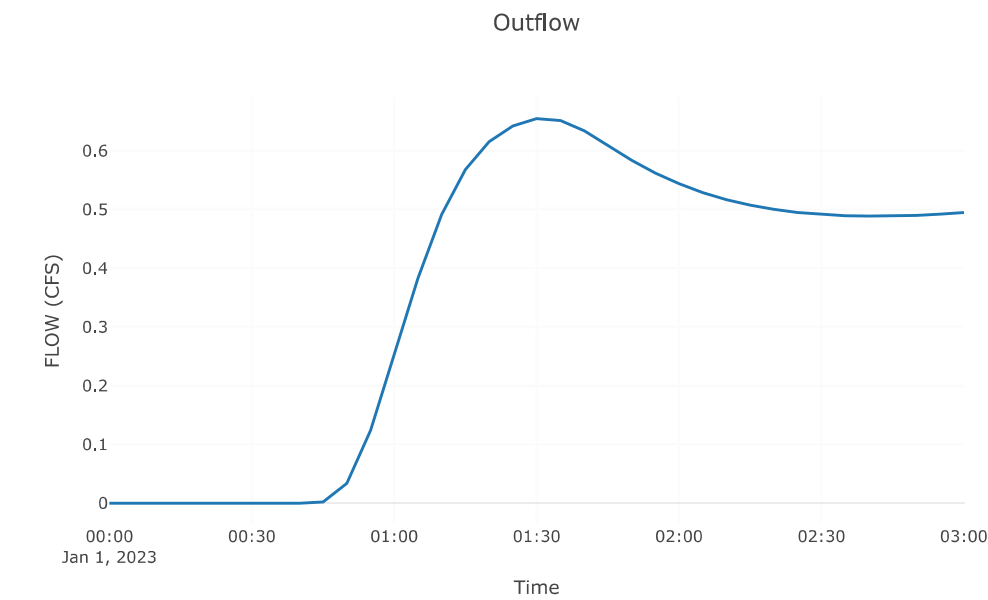
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Circular
Length (FT)	300
Energy Slope (FT/FT)	0.01
Mannings n	0.01
Diameter	1.5
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Flow
Index Flow	2
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-3	
Peak Discharge (CFS)	0.65
Time of Peak Discharge	01Jan2023, 01:30
Volume (IN)	0.04
Peak Inflow (CFS)	0.66
Inflow Volume (AC - FT)	0.09



Junction: Junction-3

Results: Junction-3	
Peak Discharge (CFS)	0.65
Time of Peak Discharge	01Jan2023, 01:30
Volume (IN)	0.04



Simulation End: 1 January 2023, 03:00

Executed: 29 July 2026, 18:32

Downstream	
Element Name	Downstream
Reach - 2	Junction - 2
Reach - 1	Reservoir - 3
Reach - 3	Junction - 3

Route: Muskingum Cunge												
Element Name	Method	Channel	Length (FT)	Energy Slope (FT/FT)	Mannings n	Diameter	Initial Variable	Space - Time Method	Index Parameter Type	Index Flow	Maximum Depth Iterations	Maximum Route Step Iterations
Reach - 2	Muskingum Cunge	Circular	300	0.01	0.01	2	Combined Inflow	Automatic DX and DT	Index Flow	2	20	30
Reach - 1	Muskingum Cunge	Circular	100	0.01	0.01	1.5	Combined Inflow	Automatic DX and DT	Index Flow	2	20	30
Reach - 3	Muskingum Cunge	Circular	300	0.01	0.01	1.5	Combined Inflow	Automatic DX and DT	Index Flow	2	20	30

Global Results Summary

Hydrologic Element	Drainage Area (MI ²)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off10	0.12	29.68	01Jan2023, 01:05	0.29
Reservoir - 4	0.12	13.78	01Jan2023, 01:35	0.24
Reach - 2	0.12	13.77	01Jan2023, 01:35	0.24
Junction - 2	0.12	13.77	01Jan2023, 01:35	0.24
Off8	0.03	10	01Jan2023, 00:55	0.29
Off9	0.01	2.12	01Jan2023, 00:55	0.29
Junction - 1	0.01	2.12	01Jan2023, 00:55	0.29
Reach - 1	0.01	2.08	01Jan2023, 00:55	0.29
Reservoir - 3	0.04	5.81	01Jan2023, 01:15	0.27
Reach - 3	0.04	5.78	01Jan2023, 01:15	0.27
Junction - 3	0.04	5.78	01Jan2023, 01:15	0.27

Subbasin: OFF10

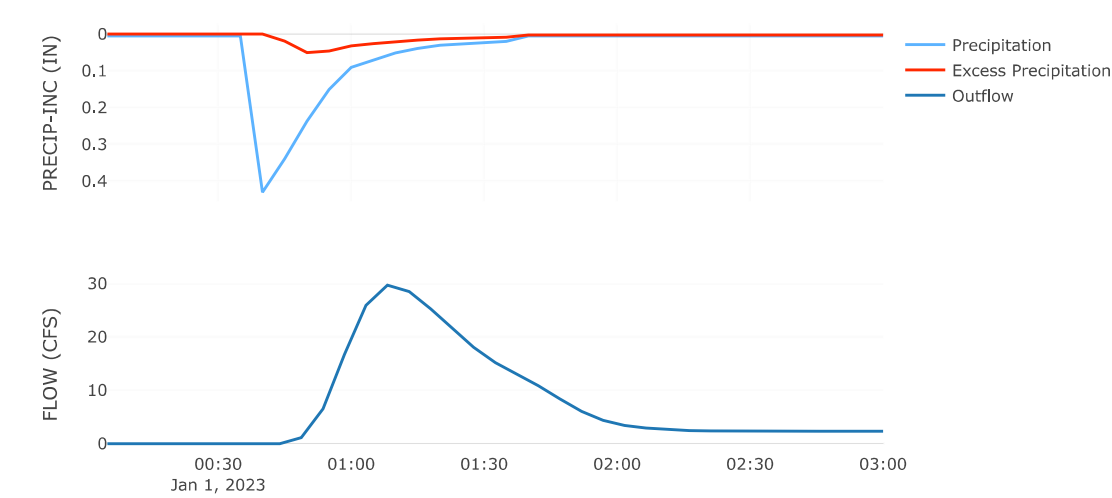
Area (MI2) : 0.12
Downstream : Reservoir - 4

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	78

Transform: Scs	
Lag	12
Unitgraph Type	Standard

Results: OFF10	
Peak Discharge (CFS)	29.68
Time of Peak Discharge	01Jan2023, 01:05
Volume (IN)	0.29
Precipitation Volume (AC - FT)	10.25
Loss Volume (AC - FT)	8.39
Excess Volume (AC - FT)	1.86
Direct Runoff Volume (AC - FT)	1.8
Baseflow Volume (AC - FT)	0

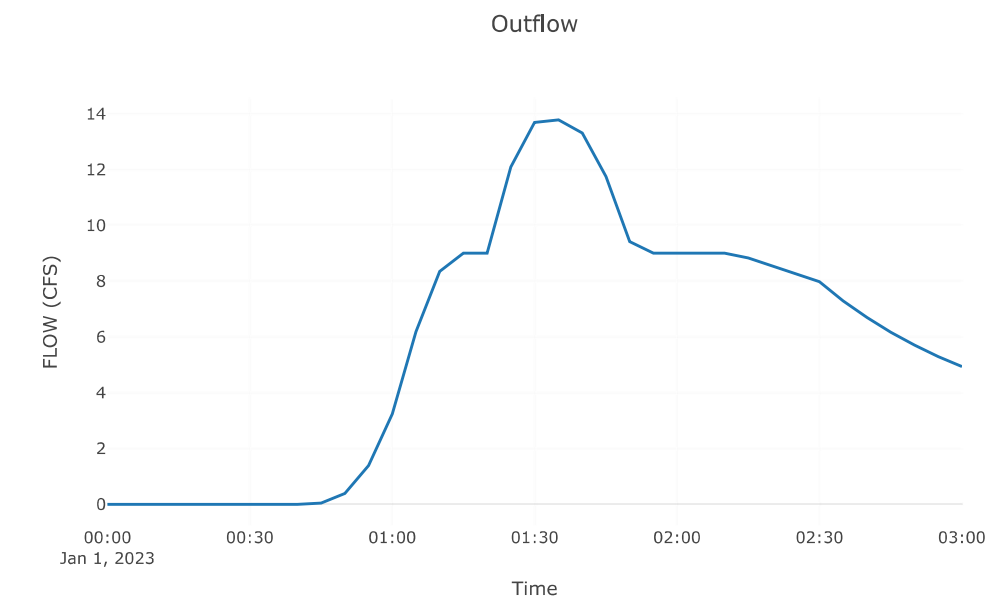
Precipitation and Outflow



Reservoir: Reservoir-4

Downstream : Reach - 2

Results: Reservoir-4	
Peak Discharge (CFS)	13.78
Time of Peak Discharge	01Jan2023, 01:35
Volume (IN)	0.24
Peak Inflow (CFS)	29.68
Time of Peak Inflow	01Jan2023, 01:05
Inflow Volume (AC - FT)	1.8
Maximum Storage (AC - FT)	1.06
Peak Elevation (FT)	2794.12
Discharge Volume (AC - FT)	1.48

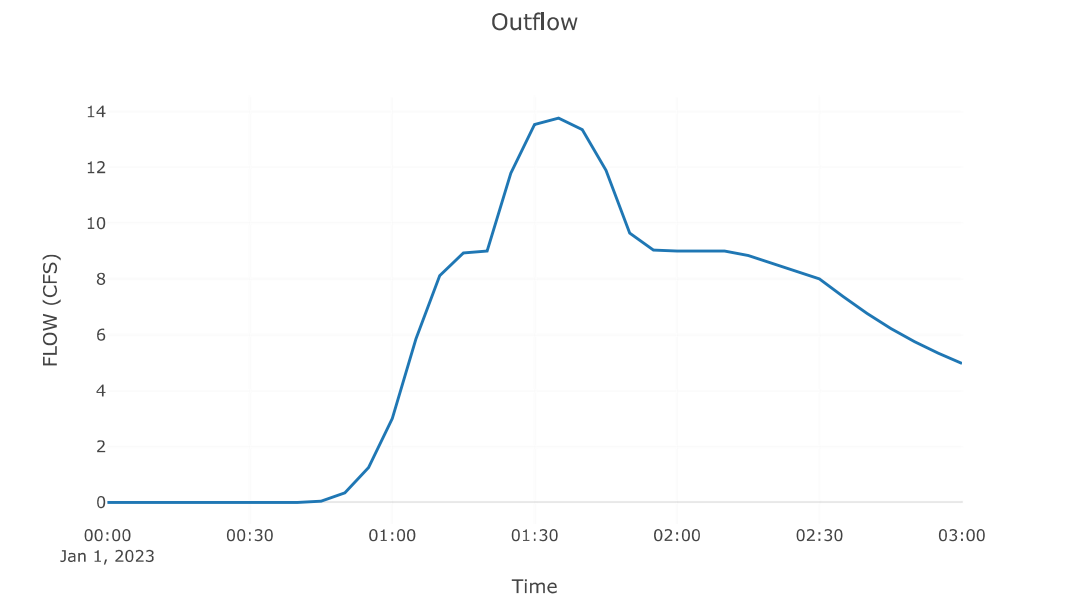


Reach: Reach-2

Downstream : Junction - 2

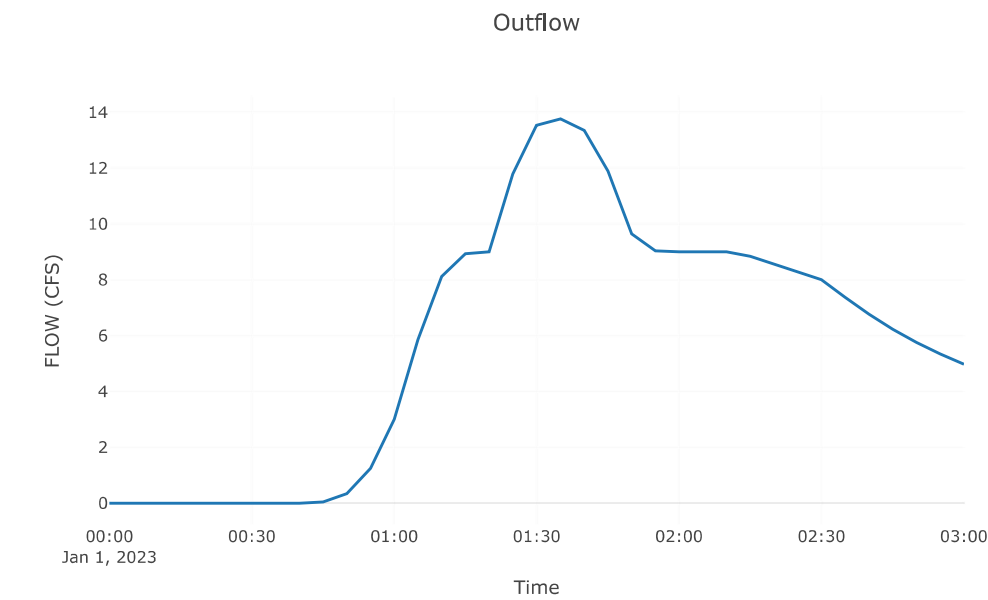
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Circular
Length (FT)	300
Energy Slope (FT/FT)	0.01
Mannings n	0.01
Diameter	2
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Flow
Index Flow	2
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-2	
Peak Discharge (CFS)	13.77
Time of Peak Discharge	01Jan2023, 01:35
Volume (IN)	0.24
Peak Inflow (CFS)	13.78
Inflow Volume (AC - FT)	1.48



Junction: Junction-2

Results: Junction-2	
Peak Discharge (CFS)	13.77
Time of Peak Discharge	01Jan2023, 01:35
Volume (IN)	0.24



Subbasin: OFF8

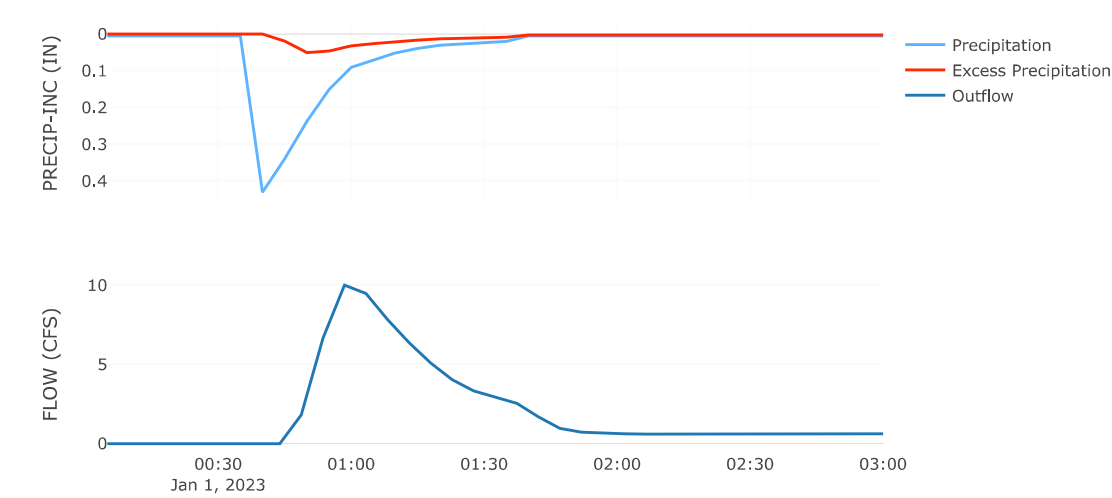
Area (MI²): 0.03
Downstream : Reservoir - 3

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	78

Transform: Scs	
Lag	5
Unitgraph Type	Standard

Results: OFF8	
Peak Discharge (CFS)	10
Time of Peak Discharge	01Jan2023, 00:55
Volume (IN)	0.29
Precipitation Volume (AC - FT)	2.76
Loss Volume (AC - FT)	2.26
Excess Volume (AC - FT)	0.5
Direct Runoff Volume (AC - FT)	0.49
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



Subbasin: OFF9

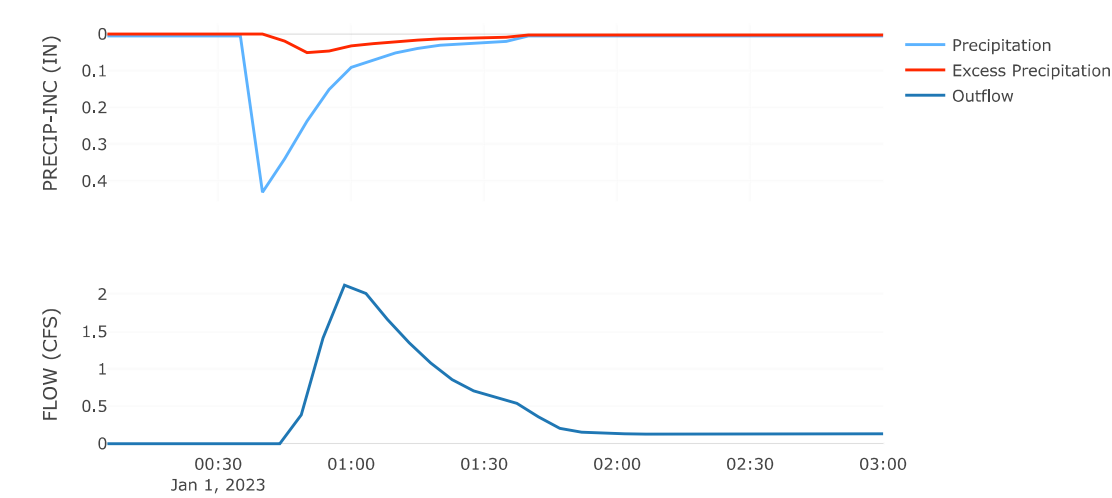
Area (MI2) : 0.01
Downstream : Junction - 1

Loss Rate: Scs	
Percent Impervious Area	0
Curve Number	78

Transform: Scs	
Lag	5
Unitgraph Type	Standard

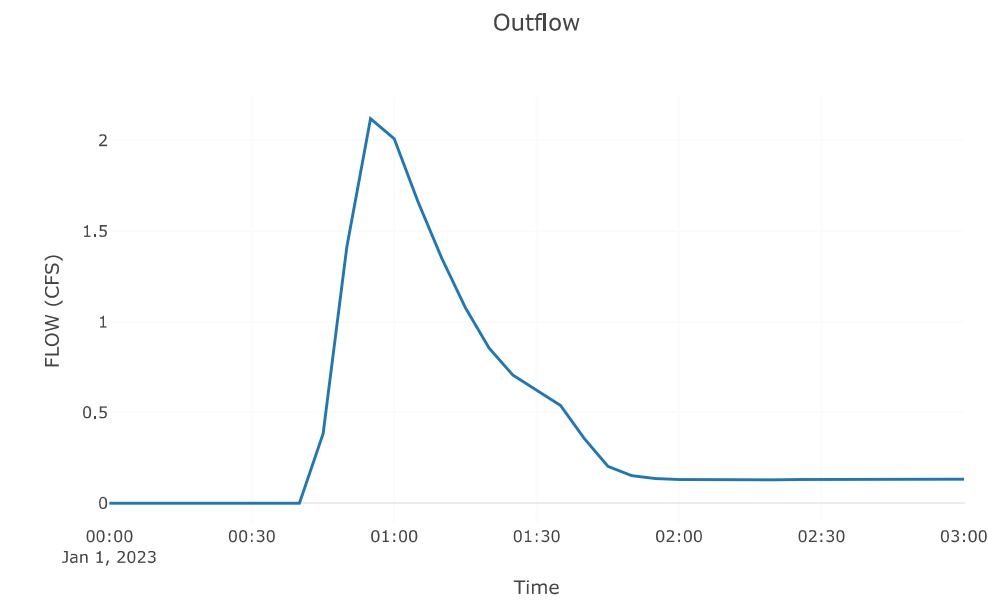
Results: OFF9	
Peak Discharge (CFS)	2.12
Time of Peak Discharge	01Jan2023, 00:55
Volume (IN)	0.29
Precipitation Volume (AC - FT)	0.59
Loss Volume (AC - FT)	0.48
Excess Volume (AC - FT)	0.11
Direct Runoff Volume (AC - FT)	0.1
Baseflow Volume (AC - FT)	0

Precipitation and Outflow



Junction: Junction-1

Results: Junction-1	
Peak Discharge (CFS)	2.12
Time of Peak Discharge	01Jan2023, 00:55
Volume (IN)	0.29

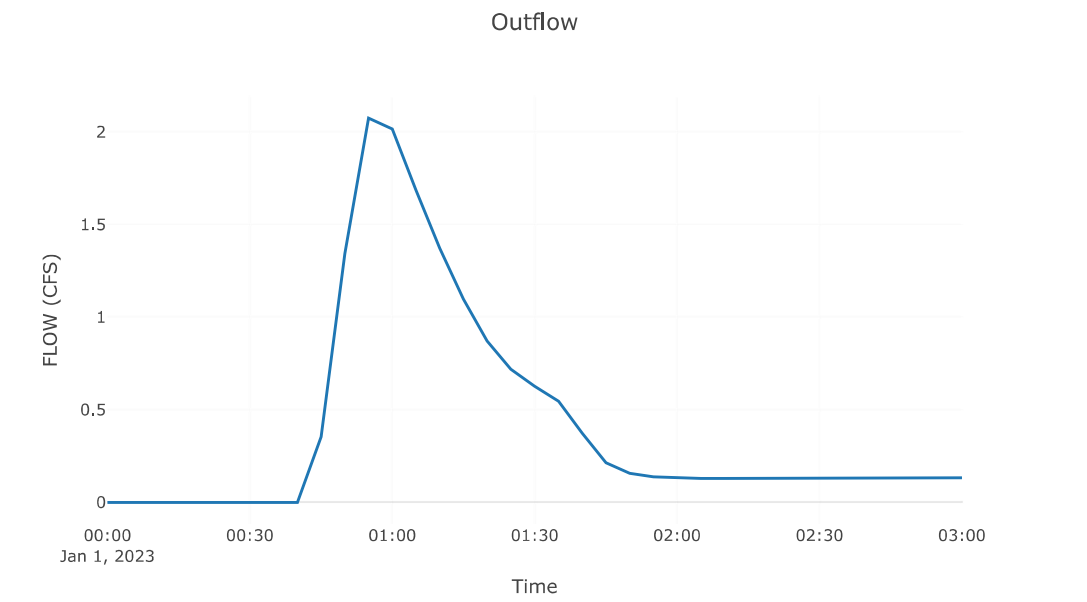


Reach: Reach-1

Downstream : Reservoir - 3

Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Circular
Length (FT)	100
Energy Slope (FT/FT)	0.01
Mannings n	0.01
Diameter	1.5
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Flow
Index Flow	2
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

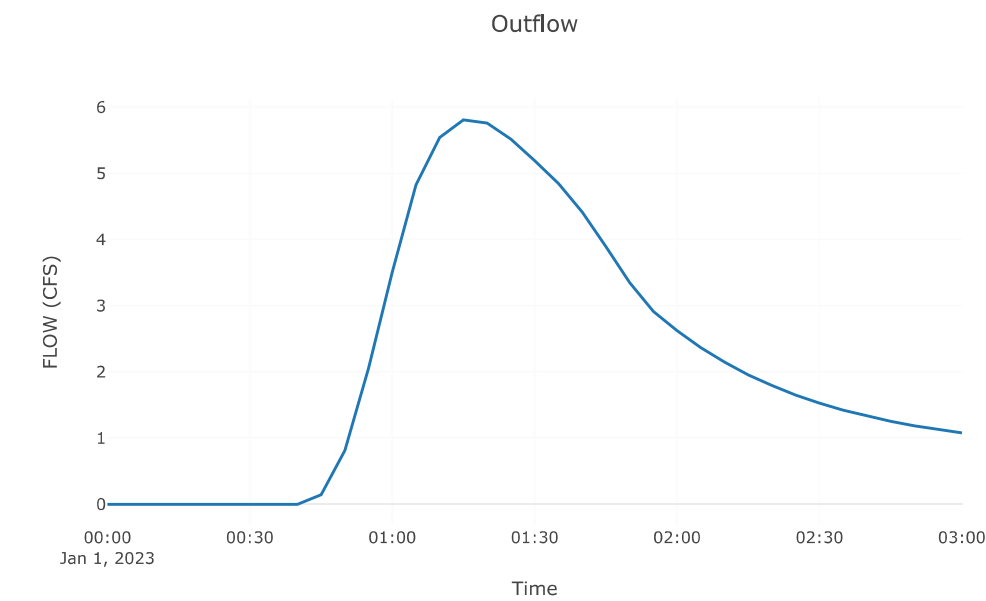
Results: Reach-1	
Peak Discharge (CFS)	2.08
Time of Peak Discharge	01Jan2023, 00:55
Volume (IN)	0.29
Peak Inflow (CFS)	2.12
Inflow Volume (AC - FT)	0.1



Reservoir: Reservoir-3

Downstream : Reach - 3

Results: Reservoir-3	
Peak Discharge (CFS)	5.81
Time of Peak Discharge	01Jan2023, 01:15
Volume (IN)	0.27
Peak Inflow (CFS)	12.08
Time of Peak Inflow	01Jan2023, 00:55
Inflow Volume (AC - FT)	0.6
Maximum Storage (AC - FT)	0.36
Peak Elevation (FT)	2777.56
Discharge Volume (AC - FT)	0.55

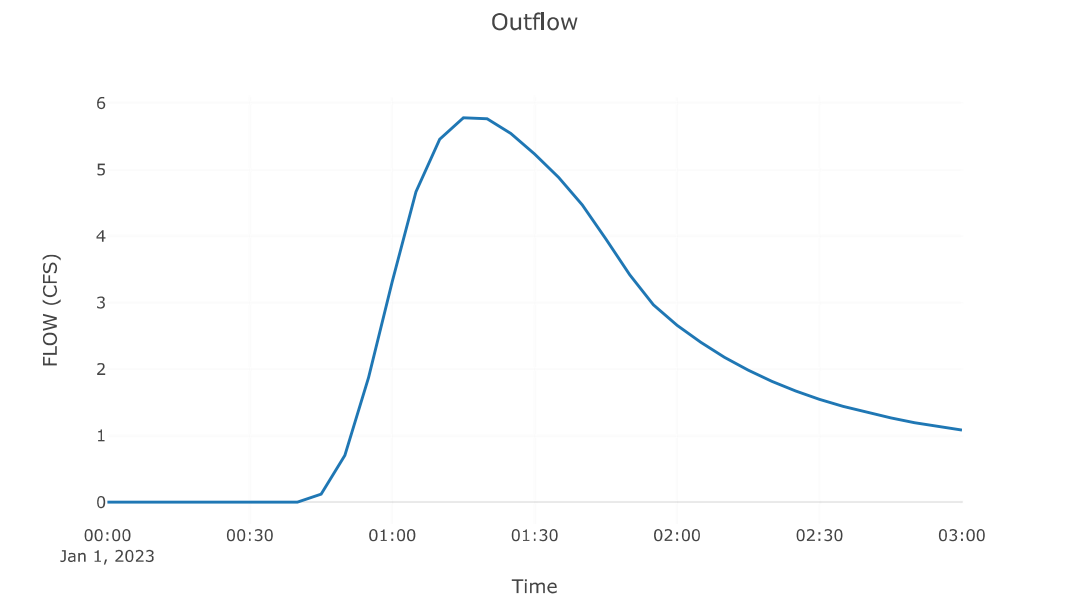


Reach: Reach-3

Downstream : Junction - 3

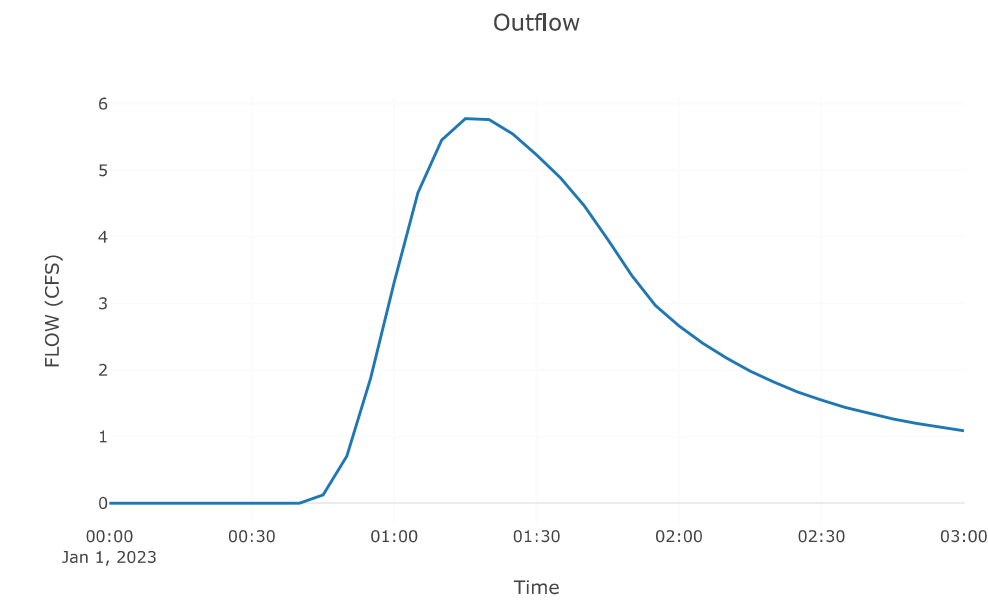
Route: Muskingum Cunge	
Method	Muskingum Cunge
Channel	Circular
Length (FT)	300
Energy Slope (FT/FT)	0.01
Mannings n	0.01
Diameter	1.5
Initial Variable	Combined Inflow
Space - Time Method	Automatic DX and DT
Index Parameter Type	Index Flow
Index Flow	2
Maximum Depth Iterations	20
Maximum Route Step Iterations	30

Results: Reach-3	
Peak Discharge (CFS)	5.78
Time of Peak Discharge	01Jan2023, 01:15
Volume (IN)	0.27
Peak Inflow (CFS)	5.81
Inflow Volume (AC - FT)	0.55



Junction: Junction-3

Results: Junction-3	
Peak Discharge (CFS)	5.78
Time of Peak Discharge	01Jan2023, 01:15
Volume (IN)	0.27



ST. GEORGE HILLSIDE REVIEW BOARD MINUTES
July 22, 2026, 8:30 A.M.
ON SITE, 2 locations

PRESENT:

Hillside Review Board Chair James Sullivan
Hillside Review Board Member, Dave Black (absent Item 1, present Item 2)
Hillside Review Board Member, Hugo Angeles
Hillside Review Board Member, Jeff Mathis

EXCUSED:

Hillside Review Board Member, Kevin Holyoak

STAFF MEMBERS PRESENT:

Assistant Public Works Director, Wes Jenkins
Community Development Director, Carol Winner
Engineering Manager, Carolyn Prickett
City Landscape Architect, Paul Stead
Planner, Brenda Hatch
Assistant City Attorney, Kristopher Pearson
Development Office Supervisor, Angie Jessop

OTHERS IN ATTENDANCE:

Location #1

Applicant Jared Bates
Owner/Developer Sam Flemataakis
Arnold De Castro

Location #2

Corey Edwards
Nate Ormand

SITE #1, approximately 280 S Luce Del Sol Dr.

Link to Call to Order by Board Chair Sullivan [00:00:00](#)

Link to Roll Call [00:00:18](#)

ITEM 1

Mirabella at Sunbrook - This is a request to obtain a hillside permit for the property generally located south of Sunbrook Dr and east of Luce Del Sol Dr in anticipation of construction of seven (7) three story condominium buildings, a private street and amenity areas. This property is in the hillside overlay. The applicant is Rosenberg Associates, represented by Jared Bates. Case No. 2026-HS-004

Agenda Packet [\[page 3\]](#)

Link to presentation by Jared Bates [00:01:05](#)

Discussion with Hillside Review Board members, staff members and applicants
[00:02:00](#)

Link to motion [00:38:41](#)

MOTION:

A motion was made by Board Member Angeles to recommend approval of the project with the recommendation that all the man-made materials are okay to be removed and no natural materials need to be touched. And regarding the areas with building E, we recommend to do slope stability analysis on the hill on the side and we recommend to come back here to review those studies.

SECOND:

The motion was seconded by Board Member Mathis.

VOTE:

Board Chair Sullivan called for a vote, as follows:

Chair Sullivan – aye
Board Member Mathis – aye
Board Member Angeles –aye
Board Member Black –absent
Board Member Holyoak – absent

The vote is unanimous. Motion carries.

Adjourn from this location to Site #2 location [00:39:53](#)

SITE #2, approximately 584 S Dixie Drive in the Northeast Cul de sac.

Link to Call to Order by Board Chair Sullivan [00:00:00](#)

Link to Roll Call [00:00:30](#)

ITEM 2

Crown Point Lots 18, 19, 20 Hillside Disturbance Mitigation – This is a request to consider a Hillside Development Permit to remove excess material from hillside placed during over excavation of 3 residential lots. The applicant is Jace Jackson. Case No. 2026-HS-005

Agenda Packet [\[page 161\]](#)

Link to presentation by Corey Edwards [00:00:57](#)

Discussion with Hillside Review Board members, staff, and applicants [00:03:35](#)

Link to motion [00:34:58](#)

MOTION:

A motion was made by Board Member Mathis to do a continuance on this property for item 2 on the agenda. We are looking for a comparison between historical contours, new contours, what's been filled; we need information on where the utilities are on the site relative to the property lines. The south corner is more concerning than the north side, but we will address that once this gets

continued. We would also like to make sure that they have engineered drawings and stability analysis on the slopes, possible retaining wall locations, what the final grades would be, and that type of engineering information.

SECOND:

The motion was seconded by Board Member Black.

VOTE:

Board Chair Sullivan called for a vote, as follows:

Chair Sullivan – aye
Board Member Mathis – aye
Board Member Angeles –aye
Board Member Black –aye
Board Member Holyoak – absent

The vote is unanimous. Motion carries.

Link to question of clarification by applicant and discussion with Board Members [00:36:35](#)

APPROVAL OF MINUTES:

Consider a request to approve the minutes from the May 27, 2026 meeting

Agenda Packet [\[page 178\]](#)

Link to motion [00:38:50](#)

MOTION:

A motion was made by Board Member Black to approve the minutes from the May 27, 2026 meeting.

SECOND:

The motion was seconded by Board Member Mathis.

VOTE:

Board Chair Sullivan called for a vote, as follows:

Chair Sullivan – aye
Board Member Mathis – aye
Board Member Angeles –aye
Board Member Black – aye
Board Member Holyoak – absent

The vote is unanimous and the motion carries

MOTION:

A motion was made by Board Member Mathis to adjourn.

156 /s/

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158 Angie Jessop, Development Office Supervisor

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DRAFT