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 referenced sites on **Wednesday, August 18, 2021,** commencing on-site at approximately 8:30 a.m.

The estimated site time is in bold.
The agenda for the meeting is as follows:

1. Consider a request for a Hillside Development Permit on Soleil Ridge. The property is generally located west of Bluff Street at approximately 300 West and 900 South. The property is currently zoned C-2 (Commercial) and OS (Open Space). The owner is Soleil Ridge Partners, LLC. Case No. 2021-HS-007. (*See 'Meeting Place' exhibit below*). **Meeting time approx. 8:30 am**
2. Consider approval of the meeting minutes from June 23, 2021 and July 21, 2021.

Dan Boles, GISP
Senior Planner
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 Place
300 West and 900 South



St.George
Community Development

Item 1
Hillside Permit

HILLSIDE REVIEW BOARD AGENDA REPORT: **08/18/2021**

HILLSIDE DEVELOPMENT PERMIT
Soleil Ridge
Case No. 2021-HS-007

Request: This is a request for a Hillside Development Permit for "Soleil Ridge"

Location: The property is generally located west of Bluff Street at approximately 300 West and 900 South.

Proposed: The property is proposed to be developed into a multi-family residential project.

Background: The City Council has approved a number of amendments to change a portion of OS (Open Space) and COM (Commercial) land use designations to HDR (High Density Residential) and areas of OS (Open Space) to COM (Commercial). The applicant intends to submit a zone change application after the hillside permit process. The applicant will need to submit all requirements for the zone change prior to being put on an agenda.

Owner: Soleil Ridge Partners, LLC

Applicant: Wasatch Commercial Builders

Geological Hazards: AGEC has provided a letter dated January 6, 2020 titled "Geological Hazard Assessment" and it was submitted with the hillside application. The hazards discussed in the letter include: 1) Rockfall Evaluation, 2) Landslide Evaluation, 3) Debris Flow, and 4) Fault Rupture

Geotech: Produced by AGEC, July 1, 2020 is attached to this report.

Drainage: A preliminary drainage study prepared by Rosenberg Associates and dated July 27, 2021 Job # 191258 was submitted with the hillside application.

Current Zoning: The current zoning on the property is primarily C-2. There is a small sliver of OS (Open Space) designated at the top of the bluff as well. Now that the General Plan amendment was approved by council, zoning will have to be changed in the future to conform to how the applicant would like to develop the property.

General Plan: The General Plan Land Use Map is HDR and Open Space.

Area: The area is just approximately 16 acres.

Surrounding: The surrounding properties to the south and east are commercial businesses. Properties to the north and west are currently undeveloped hillside.

Powers & Duties: 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).

Permit required: Section 10-13A-7 requires that all major development (i.e., cut greater than 4', etc.) on slopes above 20% requires a 'hillside development permit' granted by the City Council upon recommendation from the Hillside Review Board and the Planning Commission.

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.

Percent Natural Slope	Dwelling Units (DU) / Acre
0-19	See underlying zone
20-29	2 DU/acre, provided the units are clustered on 30 percent (30%) or less of the land area within this slope category. 70 percent of this slope category shall remain undisturbed. The 70 percent area is based upon the overall area/development rather than per lot. Also see subsections A1, A2, and A3 of this section.
30-39	1 DU/10 acres, provided no more than 5 percent (5%) of the site is disturbed, and 95 percent of the site remains undisturbed. If the cumulative area is at least 1 acre but less than 10 acres, the cumulative area shall be allowed 1 DU.
40	Development is not permitted (0%), **except** as provided for in subsection A2 of this section.

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

A. Slope shall be determined for each significant portion of a 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.

Staff Comments: If the HSRB recommends approval of the hillside permit, then the permit request advances forward to the Planning Commission (PC) for review and recommendation and then on to the City Council (CC) for approval or denial.

1. Hillside Permit - A hillside permit is required per ordinance and the HSRB will make recommendations to the PC & CC.
2. Zoning – Currently the zoning is C-2 and OS, but the applicant will have to approach the city council with a zone change request in order to proceed with the development.
3. Development – It's proposed to grade the area as presented.
4. Geotechnical Investigation – All earthworks shall comply with the recommendations and mitigations presented in Geotech Report.
5. Drainage – Drainage shall comply with the Drainage Study by Rosenberg Associates dated July 27, 2021.
6. Grading Permit - If approved, the applicant will work with staff for submittal of a Grading Permit with the required accompanying civil engineering plan set (for plan review).

Example Motion: The Hillside Review Board recommends _____ of the request for a Hillside Development Permit to allow development of Soleil Ridge as requested and outlined the staff report and has the following comments:

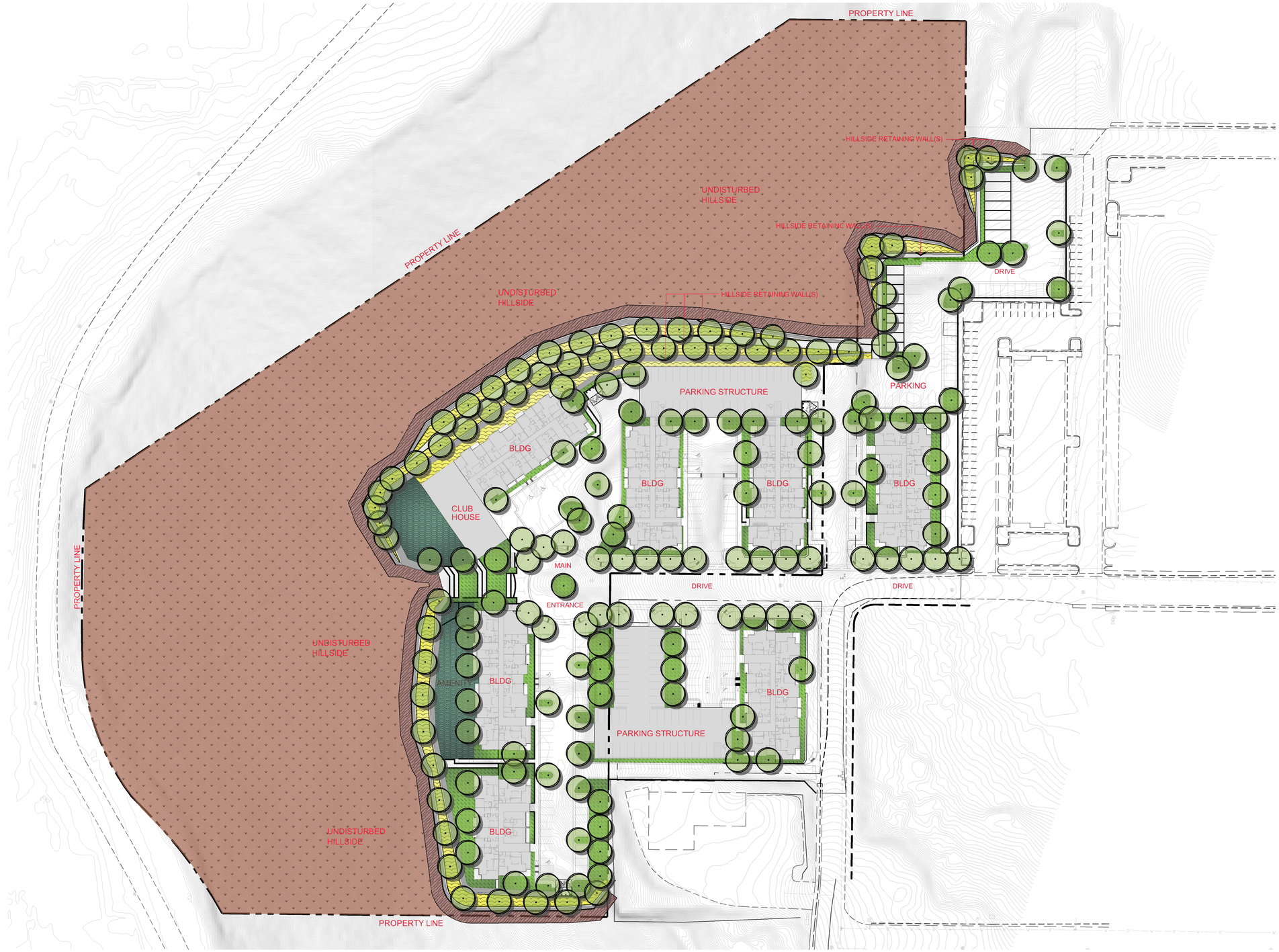
1. _____

2. _____

3. _____

HSRB 2021-HS-007
Soleil Ridge

Proposed Site Plan



CONCEPT PLANTING SCHEDULE

PROPOSED TREE
WATERWISE AND DROUGHT TOLERANT DECIDUOUS AND EVERGREEN TREES
-

EXISTING HILLSIDE ZONE
PROTECT IN PLACE - NO IRRIGATION REQUIRED
-

RESTORE HILLSIDE PLANTING ZONE
15' WIDE TRANSITION ZONE FROM PRESERVED EXISTING HILLSIDE TO PROPOSED PLANTING AREAS - IRRIGATION SYSTEM TO BE TEMPORARY UNTIL NATIVE PLANTINGS ARE RESTORED TO PRISTINE EXISTING CONDITION
-

LANDSCAPE AREAS
LANDSCAPE AREAS SHALL COMPLY WITH LOCAL CITY STANDARDS AND SHALL BE A COMBINATION OF LOW WATER TREES AND PLANTINGS WITH DRIP IRRIGATION
-

HILLSIDE RETAINING WALL LANDSCAPE ZONE
LANDSCAPE AREA ON DISTURBED HILLSIDE WHALL BE WATER-WISE AND DRIP IRRIGATED SUCH AS NOT TO COMPROMISE THE EXISTING HILLSIDE AND RETAINING WALLS
-

PROJECT AMENITIES
EXTERIOR AMENITIES FOR RESIDENTS
-

NOT FOR CONSTRUCTION

6/4
LOFTSIXFOUR

DESIGNING OUTDOOR LIVING EXPERIENCES

A: 9500 S 500 W STE 215
SANDY UT 84070

P: 801 878 4717

W: LOFTSIXFOUR.COM

THE DESIGNS SHOWN AND DESCRIBED HEREIN, INCLUDING ALL TECHNICAL DRAWINGS, GRAPHIC REPRESENTATION AND MODELS THEREOF, ARE PROPRIETARY AND CAN NOT BE COPIED, DUPLICATED, OR COMMERCIALLY EXPLOITED IN WHOLE OR IN PART WITHOUT THE SOLE AND EXPRESS WRITTEN PERMISSION FROM LOFT SIX FOUR. THESE DRAWINGS ARE AVAILABLE FOR LIMITED REVIEW AND EVALUATION BY CLIENTS, CONSULTANTS, CONTRACTORS,GOVERNMENT AGENCIES, VENDORS, AND OFFICE PERSONNEL ONLY IN ACCORDANCE WITH THIS NOTICE.

SOLEIL RIDGE HILLSIDE

250 W 900 S /
ST GEORGE / UTAH

DATE //	2021-07-28
PROJECT NO. //	2112
DRAWN BY //	NKJ
CHECKED BY //	BAR

REVISIONS //

TITLE //

HILLSIDE REVIEW PLAN

SHEET //

LH101

HSRB 2021-HS-007
Soleil Ridge

Slope Map

PREVIOUSLY ESTABLISHED DISTURBANCE LINE

PREVIOUSLY ESTABLISHED DISTURBANCE LINE

PREVIOUSLY ESTABLISHED DISTURBANCE LINE

PREVIOUSLY ESTABLISHED DISTURBANCE LINE

COLOR	PERCENT NATURAL SLOPE	TOTAL ACREAGE	ALLOWED DISTURBANCE AREA/PERCENTAGE	PROPOSED DISTURBANCE ACREAGE	PROPOSED DISTURBANCE PERCENTAGE	ALLOWED DU/AC	CALCULATION (ALLOWED UNITS PER ACRE)
	0% - 20%	5.65	100% (5.65 AC.)	5.65	100%	22	5.65 x 22= 124
	20.01% - 30%	0.22	30% (0.06 AC.)	0.09	40.1%	2	0.09 x 2= 0
	30.01% - 40%	0.77	5% (0.04 AC.)	0.04	5%	1 PER 10	.4 AC < 10 AC= 1
	40.01% & GREATER	6.58	0%	0.02	3%	0	6.58 x 0= 0
	PREVIOUSLY DISTRUBED AREA	5.79	100% (5.79 AC.)	5.79	100%	22	5.79 x 22= 127
TOTALS		18.99	11.54	11.54			252 TOTAL UNITS

N

0 60' 120'

SCALE: 1"=60'

DATE: 06/23/2021
JOB NO.: 12560-21
DESIGNED BY: FMD
CHECKED BY: RAR
DWG: SLOPE MAP

REVISIONS
DATE:

ROSENBERG ASSOCIATES
CIVIL ENGINEERS • LAND SURVEYORS

352 East Riverside Drive, Suite A-2
St. George, Utah 84790
Ph (435) 673-8586 Fx (435) 673-8397
www.racivil.com

EXISTING GROUND SLOPE MAP
FOR
SOLEIL RIDGE APARTMENTS
ST. GEORGE, UTAH

STATE OF UTAH
No. 189106
ROBERT A. REID
LICENSED PROFESSIONAL ENGINEER

SHEET
1
1 OF 1 SHEETS

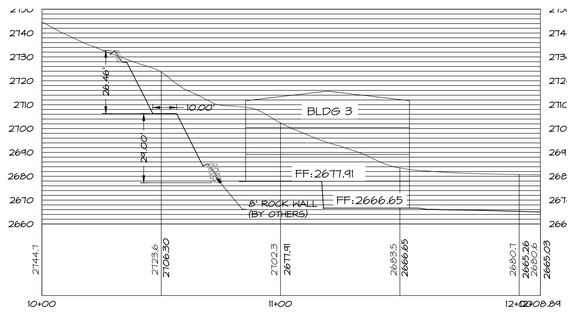
HSRB 2021-HS-007
Soleil Ridge

Hillside Submittal Plans



SECTION 3 - PLAN VIEW

SCALE: 1" = 30'



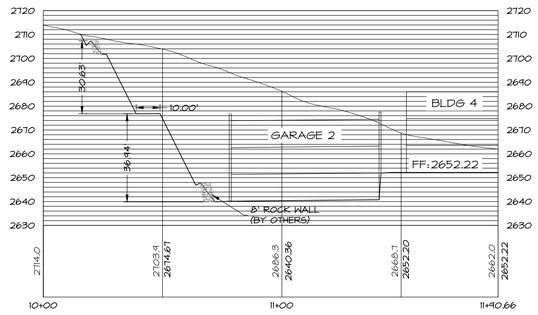
SECTION 3 - PROFILE

SCALE: 1" = 30'



SECTION 4 - PLAN VIEW

SCALE: 1" = 30'



SECTION 4 - PROFILE

SCALE: 1" = 30'

0 30' 60'

SCALE: 1"=30'

DATE: 01/21/2021
JOB NO.: 12560-21
DESIGNED BY: FMD
CHECKED BY: RAR
DWG: HILLSIDE

REVISIONS
DATE:

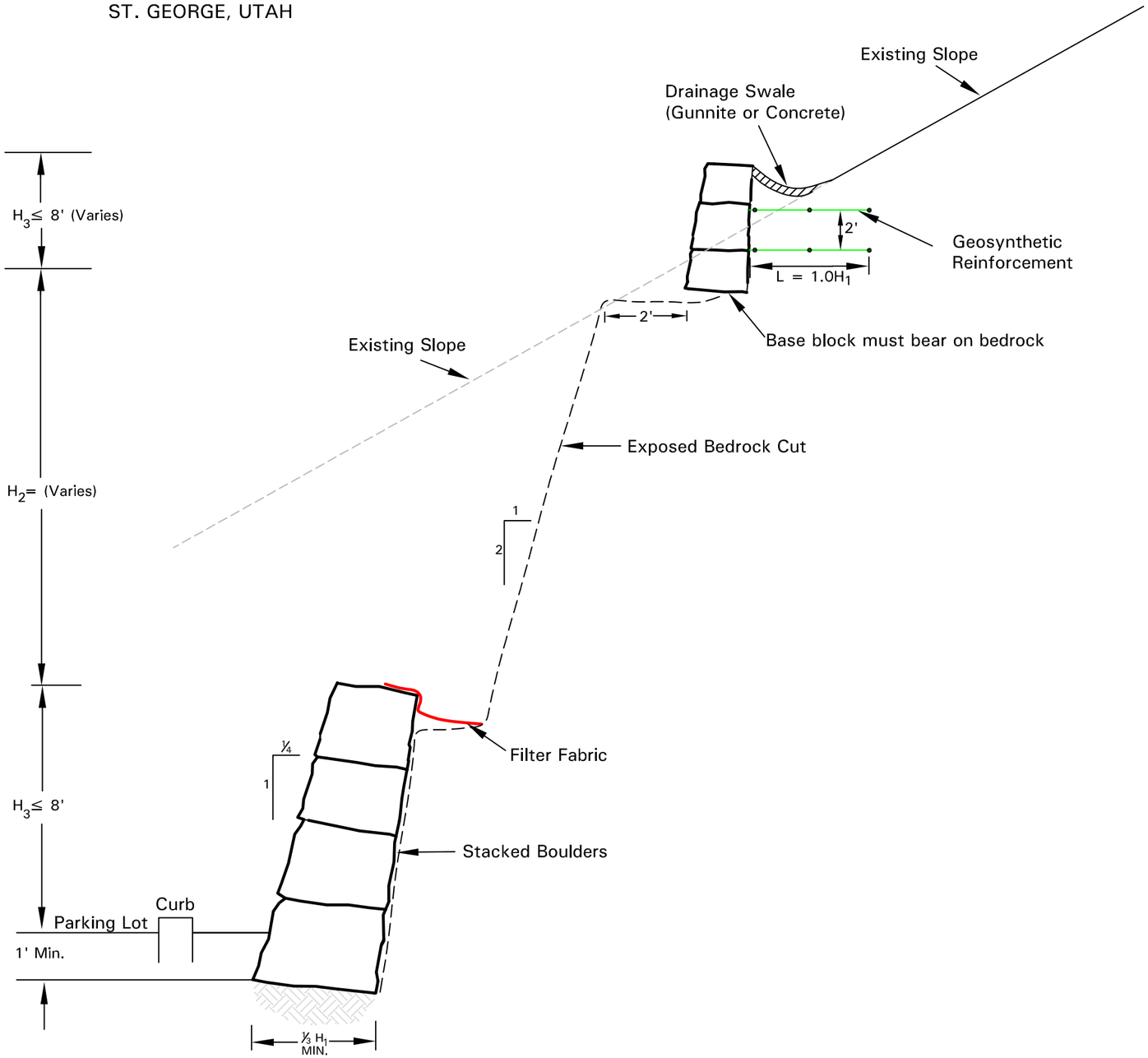
ROSENBERG ASSOCIATES
CIVIL ENGINEERS • LAND SURVEYORS

352 East Riverside Drive, Suite A-2
St. George, Utah 84790
Ph (435) 673-8586 Fx (435) 673-8397
www.racivil.com

SITE CROSS SECTIONS - 2
FOR
SOLEIL RIDGE
ST. GEORGE, UT

SHEET
2
2 OF 2 SHEETS

THE COVE
ST. GEORGE, UTAH



LICENSED PROFESSIONAL ENGINEER
07/31/20
No. 177876
G. WAYNE
ROGERS
STATE OF UTAH

By: G. Wayne Rogers, P.E.

2192092	AGEC	ROCKERY FACED SLOPE DESIGN	Figure 1

THE COVE
ST. GEORGE, UTAH

Geosynthetic Reinforcement Schedule ¼:1 (H:V) Slope

Top Tier Boulder Faced Fill Slope Height (ft)	Geosynthetic Reinforcement Required	* Geogrid	Geosynthetic Vertical Spacing (ft)	Grid Lengths (L)
			S_1	L_1
$H_T \leq 8$	Yes	Mirafi 5XT	1	$1.0H_T$

* Approved Equivalents - Tensar UX1500HS = Miragrid 5XT = Fortrac 80/30-20 = Macaafari WG5

Boulder Slope Construction Notes:

1. Stacked boulders should consist of durable material resistant to weathering and approved by AGEC. Boulders should typically range from 2 to 4 feet in size with boulder sizes decreasing as they are stacked. Typical materials suitable for this application include basalt, limestone and some sandstones. The on-site sandstone should be suitable.
2. The slope/boulder foundation subgrade should be cleared of vegetation, rock or other obstacles and the surface level and smooth such that depressions and humps do not exceed 6 inches.
3. The boulders placed at the base of each tier should be embedded at least 1 foot below the lowest adjacent grade.
4. The subgrade should be properly prepared by compacting to at least 95% of ASTM D-1557.
5. The boulders should be stacked no steeper than ¼:1 (H:V). Less steep slopes may be required at the engineers discretion.

Geosythetic Notes:

1. Geosynthetic reinforcement should be placed continuously in the primary strength direction. It may not be spliced in the primary strength direction.
2. The placement of the geosynthetic reinforcement should be observed by a representative of AGEC to verify the specified geosynthetic is being used and properly placed. It should be stretched by hand until taut and free of wrinkles. Individual lengths of the geosynthetic reinforcement should be overlapped at least 1 foot.
3. The filter fabric should consist of Mirafi 140N non-woven filter fabric or equivalent.

Grading Notes:

1. The onsite sand may be used as backfill.
2. Backfill placed behind boulders and in reinforced areas should be tested frequently to verify compaction is at least 95% of the maximum dry density as determined by ASTM D-1557. We recommend a testing frequency of each lift of fill placed staggered approximately every 50 lineal feet. If the fill is not properly compacted, the stability of the slope will be reduced.
3. Backfill should be placed/spread over layers of specified geosynthetic in such a way which minimizes wrinkles and/or movement of the geosynthetic. Backfill within 3 feet of the boulders should be compacted with hand compaction equipment. Rubber-tired equipment may be utilized to compact the fill without causing damage to the geosynthetic. Track-mounted equipment should not be operated directly on the geosynthetic. At least 12 inches of fill should be placed above the geosynthetic prior to operating track-mounted equipment.

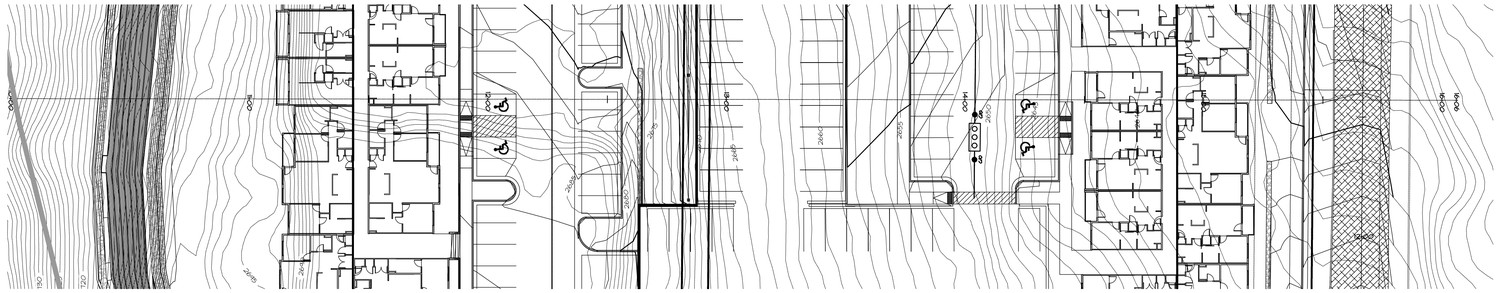


By: G. Wayne Rogers P.E.



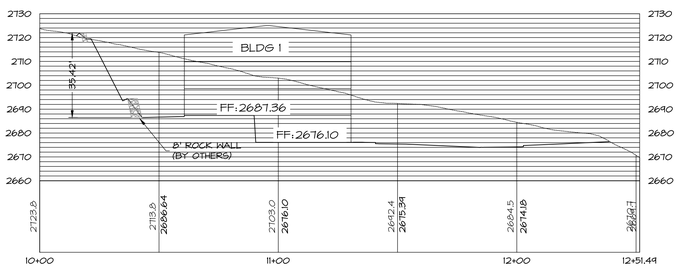
SECTION 1 - PLAN VIEW

SCALE: 1" = 30'



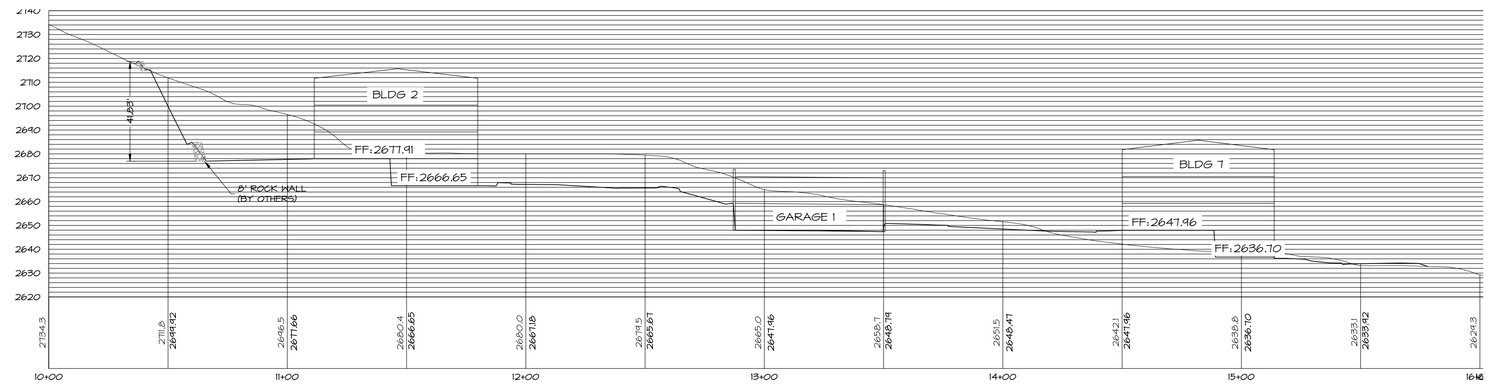
SECTION 2 - PLAN VIEW

SCALE: 1" = 30'



SECTION 1 - PROFILE

SCALE: 1" = 30'



SECTION 2 - PROFILE

SCALE: 1" = 30'

N

0 30' 60'

SCALE: 1"=30'

DATE: 01/21/2021
JOB NO.: 12560-21
DESIGNED BY: FMD
CHECKED BY: RAR
DWG: HILLSIDE

REVISIONS DATE:

ROSENBERG ASSOCIATES
CIVIL ENGINEERS • LAND SURVEYORS

352 East Riverside Drive, Suite A-2
St. George, Utah 84790
Ph (435) 673-8586 Fx (435) 673-8397
www.racivil.com

SITE CROSS SECTIONS - 1
FOR
SOLEIL RIDGE
ST. GEORGE, UT

SHEET
1
1 OF 2 SHEETS

HSRB 2021-HS-007
Soleil Ridge

Drainage Report

PLIMINARY DRAINAGE CONTROL REPORT

FOR HILSIDE REVEW
SOLEIL RIDGE APARTMENTS
St. George, Utah

Prepared For:

Wasatch Commercial Builders
1820 W Printers Row
West Valley City, Utah 84119



ROSENBERG ASSOCIATES
Project No: 12560-21

July 27, 2021

This report for the drainage design of the Soleil Ridge Apartments on 900 South Bluff Street was prepared by me (or under my direct supervision) in accordance with the provisions of the City of St. George Drainage Manual and was designed to comply with the provisions thereof. It is understood that the City of St. George does not assume liability for drainage facilities design.

Copyright 2021 Rosenberg Associates
All Rights Reserved

ROSENBERG ASSOCIATES
CIVIL ENGINEERS LAND SURVEYORS

TABLE OF CONTENTS

1.0 PROJECT LOCATION 1

2.0 EXISTING DRAINAGE CONDITIONS 1

2.1 Existing On-Site Drainage 1
2.2 Existing Off-Site Drainage 1
2.3 Previous Drainage Studies/Related Drainage Studies 1

3.0 DEVELOPED DRAINAGE CONDITIONS 2

3.1 Developed On-Site Drainage 2
3.2 Developed Off-Site Drainage 2

4.0 HYDROLOGIC ANALYSIS 3

4.1 Hydrologic Calculations 3
4.2 Comparison of Peak Flow Values 3

5.0 PROPOSED DRAINAGE IMPROVEMENTS 4

5.1 Detention and Retention Requirements 4

6.0 CONCLUSIONS 4

FIGURES AND TABLES

Table 1 – Hydraulic Model Input 3
Table 2 – Hydraulic Model Output 3

APPENDIX

Figure 1 – *Vicinity Map*
Figure 2 – *Existing Drainage Conditions*
Figure 3 – *Proposed Developed Drainage Conditions*
Figure 4 – *Excerpt from FEMA Flood Insurance Rate Map*

HEC-HMS Modeling Input Information

HEC-HMS Modeling Output Information

NRCS Soil Report

1.0 PROJECT LOCATION

The proposed study area is located near 250 West and 900 South in St. George, Utah. The site encompasses parcels SG-6-2-36-110, SG-VW-50-A-1, and SG-VW-5-6-A.

See Figure 1 – *Vicinity Map*

2.0 EXISTING DRAINAGE CONDITIONS

2.1 EXISTING ON-SITE DRAINAGE

The combined area of the properties is 19.12 total acres, of which it is anticipated that 9.29 acres will be developed with this project. The site is bound on the west side by Airport Road, to the east by 250 West St. and Red Lion Hotel (Parcel SG-VW-2-5-A), To the north by Parcels SG-6-2-36-14011 and SG-6-2-36-13312, and to the south by Parcel SG-VW-50-B and Auto Value Parts Store (Parcel SG-VW-49-C).

The site is currently undeveloped, the west portion of the site is not developable due to slopes exceeding 40%. There is evidence of previous rough grading and disturbance on the lower/east portions of the site. Current vegetation consists of grasses and small weeds and native sagebrush.

2.2 EXISTING OFF-SITE DRAINAGE

A 3-D surface was obtained of the site and immediate surrounding area for determining existing tributary drainage of the site. It has been determined that a portion of the upper mesa drains off the hill from east to west and continues onto the subject site. The site is generally sloped from west to east with existing storm water draining mostly as sheet flow accumulating and draining mainly onto 900 S St.

See Preexisting Exabit EX-1

2.3 PREVIOUS DRAINAGE STUDIES/RELATED DRAINAGE STUDIES

A preliminary drainage study was performed for *The Cove* by Bush and Gudgell Engineering dated 4/29/2020 for portions of this site.

2.4 FLOODPLAIN INFORMATION

According to the FEMA National Flood Hazard Layer FIRMette map the subject area is in an Area of Minimal Flood Hazard numbered 49053C1029G, dated April 2, 2009, the site is located Zone X. The project area is located outside the Erosion Hazard Zone.

2.5 REQUIRED PERMITS/PLANS

Proposed earthwork will require a grading permit and the proposed Storm Water Pollution Prevention Plan (SWPPP) should comply with the City of St. George's established best management practices. The grading plan, geotechnical report, and SWPPP (including NOI and NOT) will be submitted independent of this study prior to construction.

A completed Long-Term Storm Water Maintenance Plan will be submitted with the project construction plans accompanied by the Long-Term Storm Water Maintenance Agreement, signed by the property owner.

2.6 HILLSIDE CONCERNS

Hillside areas on the west portion of the property contribute drainage to the site. Grading and drainage plans will need special considerations to accommodate hillside drainage and control discharge velocities.

3.0 DEVELOPED DRAINAGE CONDITIONS

3.1 DEVELOPED ON-SITE DRAINAGE

The proposed development of the site will convey offsite runoff from the steep hillsides in drainage channels behind proposed retaining walls and then conveyed through the site with drain pipes. This offsite drainage is ultimately conveyed to Bluff Street. On-site drainage will be captured and directed to proposed underground detention basins located in the parking areas. Detained storm water will be released to 900 South Street and then to Bluff Street. The detention/retention areas will be sized for a 100-year 3-hour design storm event.

See Figure 3 – *Post Drainage Exhibit EX-2*

3.2 DEVELOPED OFF-SITE DRAINAGE

Offsite improvements are not proposed at this time with this development.

4.0 HYDROLOGIC ANALYSIS

4.1 HYDROLOGIC CALCULATIONS

HEC-HMS[1] Version 4.8 was used to perform the hydrologic analysis for this study. Curve numbers for existing and developed conditions were calculated using a custom Natural Resources Conservation Service (NRCS). The Farmer-Fletcher distribution is used for the 3-hour storm events and the SCS Type II distribution is used for the 24-hour storm events. Simulated precipitation values were determined using the Point Precipitation Frequency Estimates (St. George Gauge Station) from the NOAA Atlas 14[2]. Utilizing the model input values listed in Table 1, the HEC-HMS model yielded the design storm peak flow values summarized in Table 2.

TABLE 1 – HYDRAULIC MODEL INPUT

Hydraulic Element		Hydraulic Properties		Area		
		Lo (ft)	*S (%)*	*(sq ft)*	*(acre)*	*(sq mi)*
Pre SA-1	Pre-Developed Site	1,465	20.1	1,515,825	34.80	0.05437
Post Off	Offsite Only	847	23.8	1,111,297	25.51	0.03986
Post Site	Developed Site Area Only	758	14.0	404,528	9.29	0.01451

TABLE 2 – HYDRAULIC MODEL OUTPUT

Hydrologic Element	10-Year 3-Hour	100-Year 3-Hour
	(cfs)	(cfs)
Pre SA-1	9.00	9.50
Post Off	7.20	27.50
Post Site	12.40	43.20
Increase	3.40	33.70

4.2 Comparison of Peak Flow Values

Based on information shown in Table 2, the proposed project increases runoff within the site by 3.4 cfs during the 100-year 3-hour design storm event.

[1] U.S. Army Corps of Engineers, Hydraulic Engineering Circular Hydrologic Modeling System (HEC-HMS) software, Version 4.6.1.

[2] NOAA's National Weather Service. Precipitation Frequency Data Server. Retrieved February 24, 2017

5.0 PROPOSED DRAINAGE IMPROVEMENTS

5.1 DETENTION AND RETENTION REQUIREMENTS

The City of St. George Drainage Manual[3] requires the peak storm runoff exiting a site not be increased by new development and be limited to 0.20 cfs/acre. A detention volume of 56,340 cubic-feet has been estimated to limit the peak storm water runoff to 0.20 cfs/acre of 1.86 cfs. It is anticipated that detention will be provided with some surface detention basins along with underground detention networks to provide the required detention volume.

6.0 CONCLUSIONS

It is the opinion of Rosenberg Associates the proposed recommendations and drainage improvements included in this study and shown in the improvement plans will effectively convey storm water through the site. A final drainage control report should be prepared in conjunction with the grading and drainage improvement plans. Drainage improvement designs are intended to be compliant with the City of St. George drainage requirements and computations/methods used to create designs were completed using the current standard of care.

[3] City of St. George Drainage Manual, Bowen Collins and Associates, John Humphrey, May 2009.

APPENDIX

Figure 1 – *Vicinity Map*

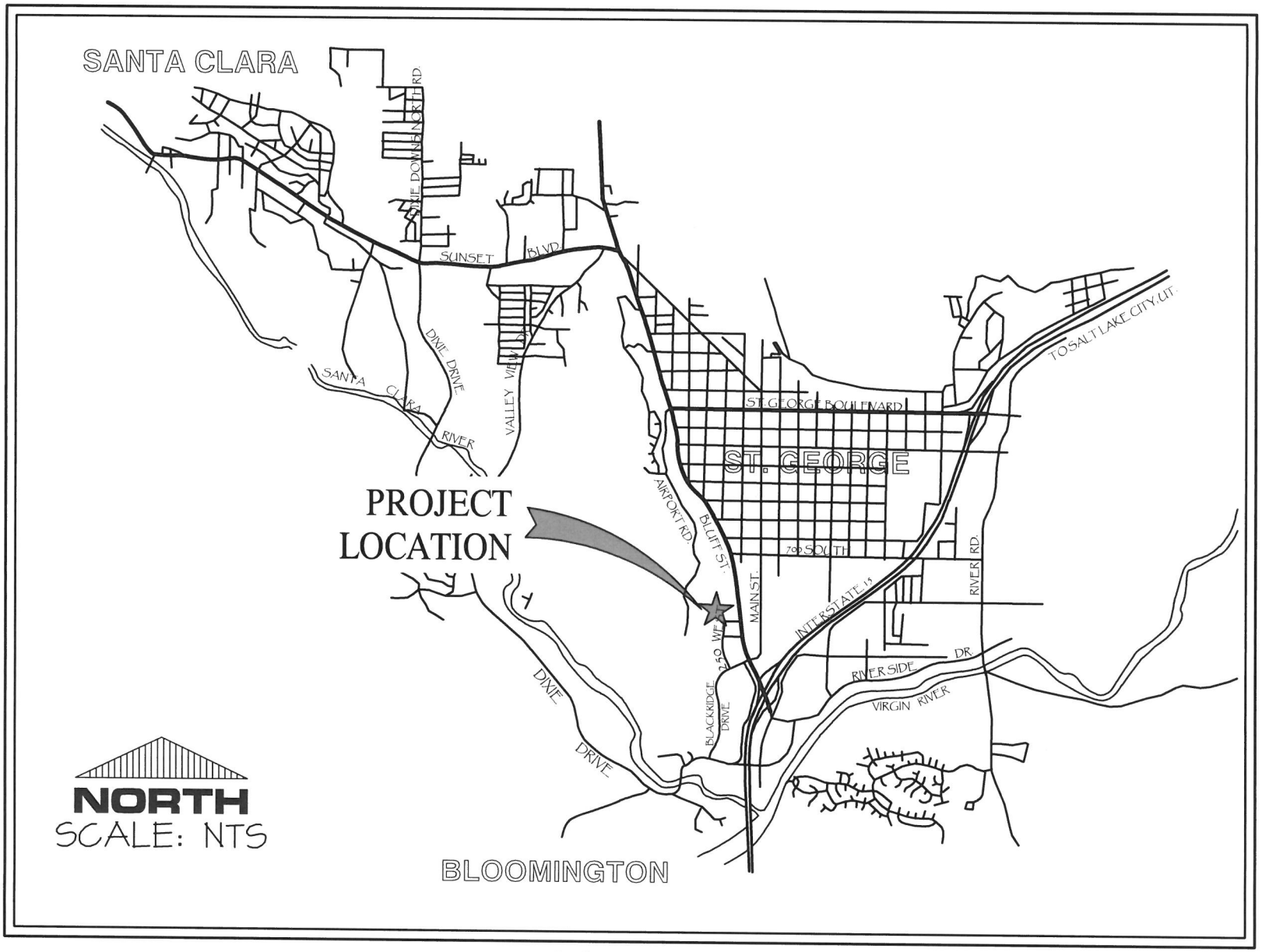
Figure 2 – *Existing Drainage Conditions*

Figure 3 – *Developed Drainage Conditions*

HEC-HMS Modeling Input Information

HEC-HMS Modeling Output Information

NRCS Soil Report



VICINITY MAP

FOR

WASATCH COMMERCIAL BUILDERS

1820 WEST PRINTERS ROW

WEST VALLEY CITY, UT 84116

PREEXISTING DRAINAGE EXHIBIT

FOR

SOLEIL RIDGE APARTMENTS

ST. GEORGE UT

SHEET EX-1

ROSENBERG ASSOCIATES
CIVIL ENGINEERS • LAND SURVEYORS
352 East Riverside Drive, Suite A-2
St. George, Utah 84790
Ph (435) 673-8586 Fx (435) 673-8897
www.rasmt.com

DATE:	08/24/22
JOB NO:	12660-3
DESIGNED BY:	DSH
CHECKED BY:	RAR
DWG:	TOPO/DRAIN BASIN

POST DRAINAGE EXHIBIT

FOR

SOLEIL RIDGE APARTMENTS

ST. GEORGE UT

SHEET

EX-2

ROSENBERG ASSOCIATES
CIVIL ENGINEERS • LAND SURVEYORS

352 East Riverside Drive, Suite A-2
St. George, Utah 84790
Ph (435) 673-8586 Fx (435) 673-8997
www.rasmt.com

DATE:	08/24/23
JOB NO:	12600-3
DESIGNED BY:	DSH
CHECKED BY:	RAR
DWG:	TOPO/DRAIN BASIN

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainag areas of less than one square mile *Zone*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represe an authoritative property location.

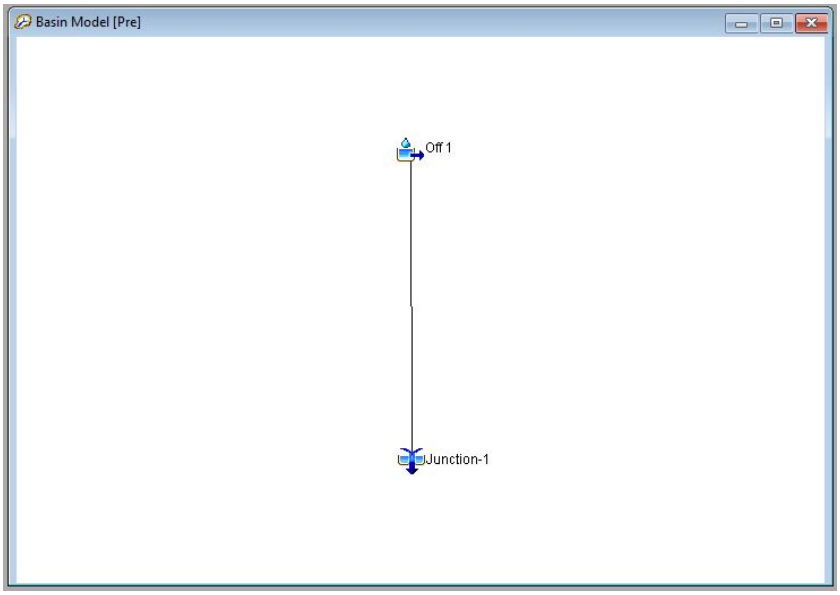
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/28/2021 at 1:37 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

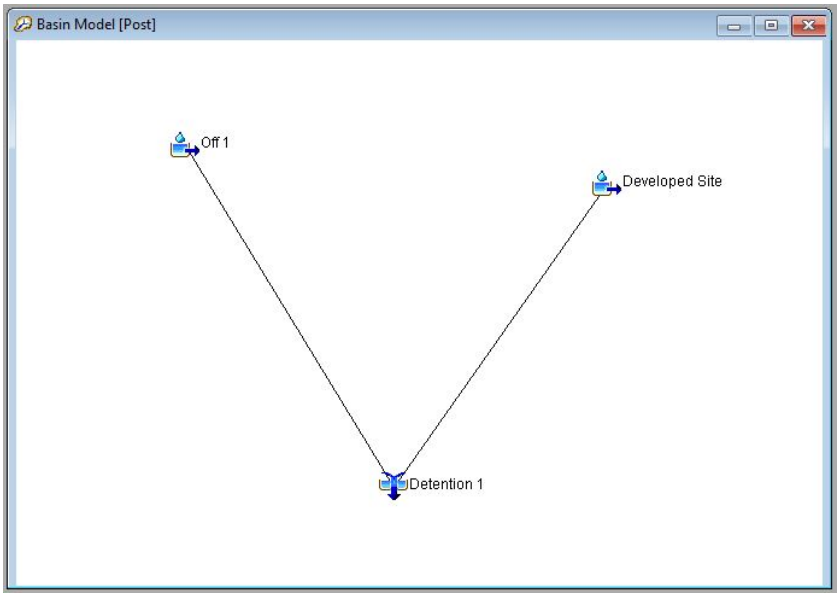
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

HEC-HMS MODELING INPUT INFORMATION

PRE-DEVELOPED BASIN MODEL

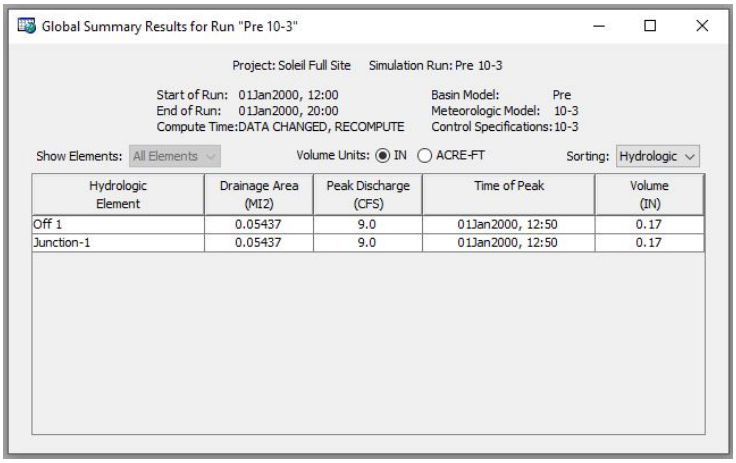


POST-DEVELOPED BASIN MODEL



HEC-HMS MODELING OUTPUT INFORMATION

PRE-DEVELOPED 10-YEAR 3-HOUR DESIGN STORM MODEL RESULTS



Global Summary Results for Run "Pre 10-3"

Project: Soleil Full Site Simulation Run: Pre 10-3

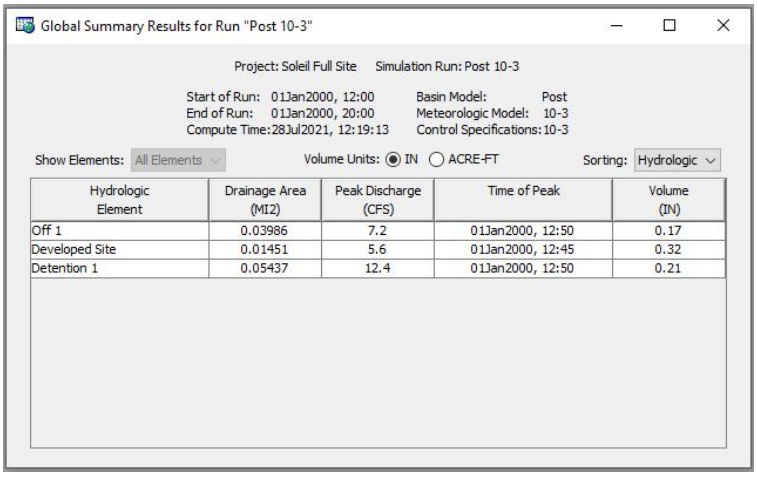
Start of Run: 01Jan2000, 12:00
End of Run: 01Jan2000, 20:00
Compute Time: DATA CHANGED, RECOMPUTE

Basin Model: Pre
Meteorologic Model: 10-3
Control Specifications: 10-3

Show Elements: All Elements Volume Units: (•) IN ( ) ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off 1	0.05437	9.0	01Jan2000, 12:50	0.17
Junction-1	0.05437	9.0	01Jan2000, 12:50	0.17

POST-DEVELOPED 10-YEAR 3-HOUR DESIGN STORM MODEL RESULTS



Global Summary Results for Run "Post 10-3"

Project: Soleil Full Site Simulation Run: Post 10-3

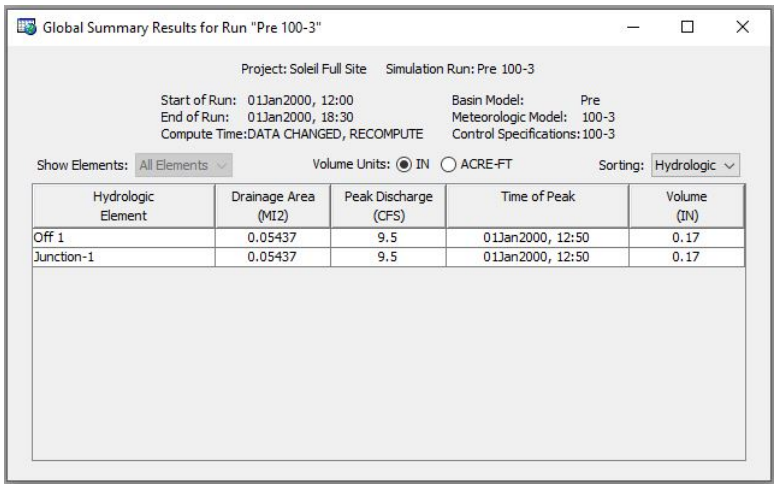
Start of Run: 01Jan2000, 12:00
End of Run: 01Jan2000, 20:00
Compute Time: 28Jul2021, 12:19:13

Basin Model: Post
Meteorologic Model: 10-3
Control Specifications: 10-3

Show Elements: All Elements Volume Units: (•) IN ( ) ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off 1	0.03986	7.2	01Jan2000, 12:50	0.17
Developed Site	0.01451	5.6	01Jan2000, 12:45	0.32
Detention 1	0.05437	12.4	01Jan2000, 12:50	0.21

PRE-DEVELOPED 100-YEAR 3-HOUR DESIGN STORM MODEL RESULTS



Global Summary Results for Run "Pre 100-3"

Project: Soleil Full Site Simulation Run: Pre 100-3

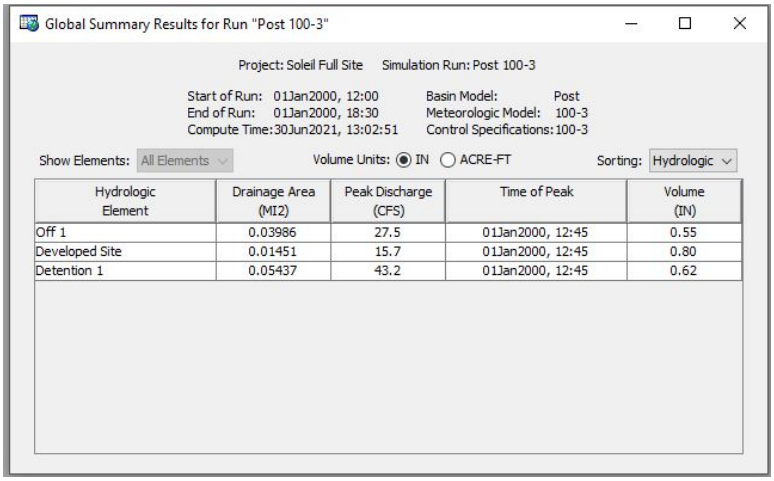
Start of Run: 01Jan2000, 12:00
End of Run: 01Jan2000, 18:30
Compute Time: DATA CHANGED, RECOMPUTE

Basin Model: Pre
Meteorologic Model: 100-3
Control Specifications: 100-3

Show Elements: All Elements Volume Units: (•) IN ( ) ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off 1	0.05437	9.5	01Jan2000, 12:50	0.17
Junction-1	0.05437	9.5	01Jan2000, 12:50	0.17

POST-DEVELOPED 100-YEAR 3-HOUR DESIGN STORM MODEL RESULTS



Global Summary Results for Run "Post 100-3"

Project: Soleil Full Site Simulation Run: Post 100-3

Start of Run: 01Jan2000, 12:00
End of Run: 01Jan2000, 18:30
Compute Time: 30Jun2021, 13:02:51

Basin Model: Post
Meteorologic Model: 100-3
Control Specifications: 100-3

Show Elements: All Elements Volume Units: (•) IN ( ) ACRE-FT Sorting: Hydrologic

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
Off 1	0.03986	27.5	01Jan2000, 12:45	0.55
Developed Site	0.01451	15.7	01Jan2000, 12:45	0.80
Detention 1	0.05437	43.2	01Jan2000, 12:45	0.62

ROSENBERG ASSOCIATES
CIVIL ENGINEERS • LAND SURVEYORS

PROJECT NO. 12560-21

PROJECT: Soleil Ridge 900 South Bluff Civil BY: DSH DATE: 28-Jul-21

SUBJECT: Drainage Study Hydrology Information CHKD: RAR DATE: 28-Jul-21

EXISTING PRE-DEVELOPMENT CONDITION WATERSHED

Hydraulic Element		Hydraulic Properties		Area		
		Lo (ft)	*S (%)*	*(sq ft)*	*(acre)*	*(sq mi)*
Pre SA-1	Pre-Developed Site	1,465	20.1	1,515,825	34.80	0.05437
Post Off	Offsite Only	847	23.8	1,111,297	25.51	0.03986
Post Site	Developed Site Area Only	758	14.0	404,528	9.29	0.01451

ROSENBERG ASSOCIATES
CIVIL ENGINEERS • LAND SURVEYORS

PROJECT NO. 12560-21

PROJECT: Soleil Ridge 900 South Bluff Civil BY: DSH DATE: 28-Jul-21

SUBJECT: Hydraulic Routing CHKD: RAR DATE: 28-Jul-21

Hydraulic Element		Routed Length (ft)	Average Slope (%)	Manning's Roughness (n)	Culvert Diameter (in)	Bottom Width (ft)	Side Slopes (H:1V)
C1	Routing 2580 to SA1	644	1.70	0.016	-	2.0	2.50
C2	Routing 2580 to SA1	894	0.50	0.010	24	N/A	N/A
C3	Routing 2580 to SA2	894	0.50	0.010	24	N/A	N/A

TYPICAL MANNING'S n VALUES

0.013 - Poly Pipe	0.023 - Dirt
0.017 - CM Pipe	0.026 - Grass
0.015 - Concrete	0.035 - Gravel
0.016 - Asphalt	0.040 - Riprap

PROJECT NO. 12560-21

PROJECT: Soleil Ridge 900 South Bluff Civil BY: DSH DATE: 28-Jul-21

SUBJECT: NRCS Curve Number CHKD: RAR DATE: 28-Jul-21

NRCS CURVE NUMBER (CN) CHART

Land Use Description	SCS Curve Number (CN) Values									
	Group A		Group B		Group C		Group D		Totals	
	CN	%	CN	%	CN	%	CN	%	CN	%
Cultivated Land										
Cultivated Land; Without Conservation Treatment	72		81		88		91			
Cultivated Land; With Conservation Treatment	62		71		78		81			
Pasture or Range Land										
Pasture or Range Land; Poor Condition	68		79		86		89			
Pasture or Range Land; Good Condition	39		61		74		80			
Open Spaces (Lawns, Parks, etc.)										
Open Space; Poor Condition; Grass Cover < 50%	68		79		86		89			
Open Space; Fair Condition; Grass Cover 50% to 75%	49		69		79		84			
Open Space; Good Condition; Grass Cover > 75%	39		61		74		80			
Impervious Areas										
Impervious Areas; Paved Parking Lots, Roofs, Driveways	98		98		98		98			
Impervious Areas; Streets and Roads; Paved; Curbs and Storm Sewers	98		98		98		98			
Impervious Areas; Streets and Roads; Paved; Open Ditches (w/ Right-of-Way)	83		89		92		93			
Impervious Areas; Streets and Roads; Gravel (w/ Right-of-Way)	76		85		89		91			
Impervious Areas; Streets and Roads; Dirt (w/ Right-of-Way)	72		82		87		89			
Urban Commercial and Industrial Districts										
Urban Districts; Commercial and Business; Average 85% Impervious	89		92		94		95			
Urban Districts; Industrial; Average 72% Impervious	81		88		91		93			
Residential Districts										
Residential Districts; 1/8 Acre (Town Houses); Average 65% Impervious	77		85		90		92			
Residential Districts; 1/4 Acre; Average 38% Impervious	61		75		83		87			
Residential Districts; 1/3 Acre; Average 30% Impervious	57		72		81		86			
Residential Districts; 1/2 Acre; Average 25% Impervious	54		70		80		85			
Residential Districts; 1 Acre; Average 20% Impervious	51		68		79		84			
Residential Districts; 2 Acre; Average 12% Impervious	46		65		77		82			
Western Desert Urban Areas										
Natural Desert Vegetation (Pervious Areas Only)	63		77		85		88			
Artificial Desert Landscaping	96		96		96		96			
Developing Urban Area (No Vegetation)										
Newly Graded Area (Pervious Only)	77		86		91		94			

ROSENBERG ASSOCIATES
CIVIL ENGINEERS • LAND SURVEYORS

PROJECT NO. 12560-21

PROJECT: Soleil Ridge 900 South Bluff Civil BY: DSH DATE: 28-Jul-21

SUBJECT: NRCS Curve Number CHKD: RAR DATE: 28-Jul-21

NRCS WEIGHTED AVERAGE CN VALUES

Land Use Description	SCS Curve Number (CN) Values									
	Group A		Group B		Group C		Group D		Totals	
	CN	%	CN	%	CN	%	CN	%	CN	%
Pre SA-1									85	100
Natural Desert Vegetation (Pervious Areas Only)	63		77		85	100	88		85	100
Post Off									85	100
Natural Desert Vegetation (Pervious Areas Only)	63		77		85	100	88		85	100
##									90	100
Residential Districts; 1/8 Acre (Town Houses); Average 65% Impervious	77		85		90	100	92		90	100

PROJECT NO. 12560-21

PROJECT: Soleil Ridge 900 South Bluff Civil BY: DSH DATE: 28-Jul-21

SUBJECT: SCS Lag Time CHKD: RAR DATE: 28-Jul-21

EXISTING PRE-DEVELOPMENT CONDITION

Hydrologic Element	SCS CN	Longest Length Lo (ft)	Average Slope S (%)	t_c (hr)	Lag Time (hr)	Lag Time (min)
Pre SA-1	85.0	1,465	20.10	0.136	0.082	4.90
Post Off	85.0	847	23.80	0.081	0.048	2.91
Post Site	90.0	758	14.00	0.080	0.048	2.87

TIME OF CONCENTRATION

$$t_c = \frac{1.67\, L_O^{\,0.8} \left(\frac{1000}{CN} - 9 \right)^{0.7}}{1900 \sqrt{S_{percent}}}$$

Where: CN = SCS runoff curve number
S = Average slope in percent
Lo = Length in ft

SCS LAG TIME

13.46 SCS Lag = 0.6*t_c

PROJECT NO. 12560-21

PROJECT: Soleil Ridge 900 South Bluff Civil BY: DSH DATE: 28-Jul-21

SUBJECT: SCS TR-55 Tc and Lag CHKD: DATE:

SCS TR-55 LAG TIME

SUBAREA GRE-B130

GRE-B130 SHEET FLOW TRAVEL TIME

Manning roughness, n	0.011		Smooth surfaces (concrete/asphalt/gravel/bare soil)
Flow length, L (300 ft max)	100	ft	
2-year 24-hour rainfall, P_2	1.160	in	
Average Slope, S	6.67	%	
Travel Time, T_t	0.0207	hr	$T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5} S^{0.4}}$
	1.24	min	

GRE-B130 SHALLOW CONCENTRATED FLOW TRAVEL TIME

Paved surface? (Y/N)	Y		
Flow length, L	760	ft	
Average Slope, S	12.30	%	
			$V = 16.1345\,(s)^{1/2}$ unpaved
Average velocity, V	7.13	ft/sec	$V = 20.3282\,(s)^{1/2}$ paved
Travel Time, T_t	0.0296	hr	$T_t = \frac{L}{3600V}$
	1.78	min	

GRE-B130 OPEN CHANNEL FLOW TRAVEL TIME 1

Estimated average channel geometry:

Bottom width	10	ft	
Side slopes	5.0	H:1V	
Flow depth	1.0	ft	
Manning roughness, n	0.032		sand/earth bottom w/ soil-cement sides
Flow length, L	3,229	ft	
Average Slope, S	6.90	%	
Hydraulic radius, r	0.743		r = area/wetted perimeter
Average velocity, V	10.0	ft/sec	$V = \frac{1.49\, r^{2/3} s^{1/2}}{n}$
Travel Time, T_t	0.0894	hr	$T_t = \frac{L}{3600V}$
	5.37	min	

GRE-B130TIME OF CONCENTRATION, Tc **0.1398 hr** T_c = sum all travel times T_t

PROJECT: Soleil Ridge 900 South Bluff Civil BY: DSH DATE: 28-Jul-21

SUBJECT: SCS TR-55 Tc and Lag CHKD: DATE:

8.39 min

GRE-B130 LAG TIME, L **0.0839 hr** **L = 0.6 T_c**

5.03 min

MANNING ROUGHNESS VALUE FOR SHEET FLOW		USE
Smooth surfaces (concrete/asphalt/gravel/bare soil)		0.011
Fallow (no residue)		0.050
Cultivated soils:	Residue cover ≤20%	0.060
	Residue cover >20%	0.170
Grass:	Short grass prairie	0.150
	Dense grasses	0.240
	Bermuda grass	0.410
	Range (natural)	0.130
Woods:	Light underbrush	0.400
	Dense underbrush	0.800

MANNING ROUGHNESS VALUE FOR OPEN CHANNEL FLOW		USE
Asphalt surfaces:	Unobstructed	0.016
	Cars present	0.020
Pipeline:	Corrugated metal	0.025
	Plastic or HDPE smoothwall	0.010
Concrete surfaces:	Trowel finish	0.013
	Float or light broom finish	0.015
	Heavy broom finish	0.016
	Unfinished	0.017
Channels:	sand/earth bottom w/ bare earth sides	0.022
	sand/earth bottom w/earth/grass/weeds sides	0.025
	sand/earth bottom w/earth/trees/shrubs sides	0.032
	sand/earth bottom w/shotcrete sides	0.022
	sand/earth bottom w/ soil-cement sides	0.025
	sand/earth bottom w/ concrete sides	0.020
	sand/earth bottom w/ dry rubble or riprap sides	0.033
Natural channels:	sand bottom w/ tree/shrub sides	0.035
	sand bottom w/ rock sides	0.032
	rock bottom w/ rock sides	0.060
Overbank floodplain:	desert brush, normal density	0.060

PROJECT: Soleil Ridge 900 South Bluff Civil BY: DSH DATE: 28-Jul-21

SUBJECT: Model Results CHKD: RAR DATE: 28-Jul-21

EXISTING PRE-DEVELOPMENT CONDITION

Hydrologic Element	10-Year 3-Hour (cfs)	100-Year 3-Hour (cfs)
Pre SA-1	9.00	9.50
Post Off	7.20	27.50
Post Site	12.40	43.20
Increase	3.40	33.70

ROSENBERG ASSOCIATES
CIVIL ENGINEERS • LAND SURVEYORS

PROJECT NO. 12560-21

PROJECT: Soleil Ridge 900 South Bluff Civil BY: DSH DATE: 28-Jul-21

SUBJECT: Detention Calculations CHKD: RAR DATE: 28-Jul-21

Total Developed Area ***9.29 acres***

MaximumRelease Allowed From Developed Area ***1.86 cfs*** *(0.2 cfs per acre)*

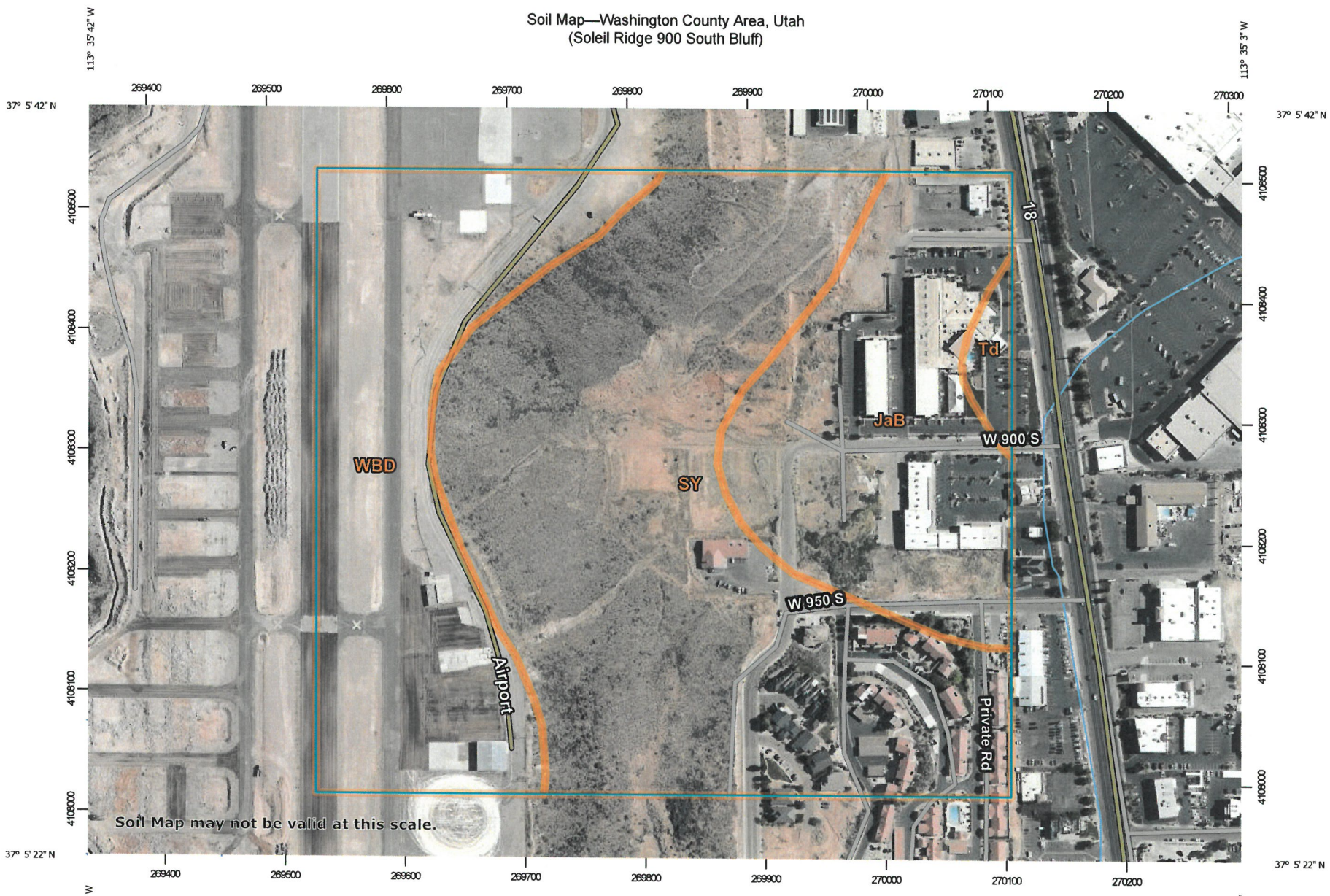
Max release allowed with offsite flows passing through:

100-year 3-hour storm = 1.86 cfs + 9.5 cfs OFF-1 **11.36 cfs**

100-YEAR 3-HOUR STORM HYDROGRAPHS

Time	Hydrographs			
	Post	Allowed	Detainied	Volume
(hour)	(cfs)	(cfs)	(cfs)	(cf)
12:25	0	11.36	0.0	0.00
12:30	0	11.36	0.0	0.00
12:35	4.8	11.36	0.0	0.00
12:40	31.3	11.36	31.3	9,390.00
12:45	43.2	11.36	43.2	12,960.00
12:50	38	11.36	38.0	11,400.00
12:55	27.2	11.36	27.2	8,160.00
13:00	20.5	11.36	20.5	6,150.00
13:05	15.6	11.36	15.6	4,680.00
13:10	12	11.36	12.0	3,600.00
13:15	9.3	11.36	0.0	0.00
13:20	8	11.36	0.0	0.00
13:25	7.1	11.36	0.0	0.00
13:30	6	11.36	0.0	0.00
13:35	3.1	11.36	0.0	0.00
13:40	2.2	11.36	0.0	0.00
13:45	2	11.36	0.0	0.00
13:50	1.9	11.36	0.0	0.00
13:55	1.9	11.36	0.0	0.00
14:00	1.9	11.36	0.0	0.00
14:05	1.9	11.36	0.0	0.00
14:10	1.9	11.36	0.0	0.00
14:15	1.9	11.36	0.0	0.00
14:20	1.9	11.36	0.0	0.00
14:25	1.9	11.36	0.0	0.00
14:30	1.9	11.36	0.0	0.00
14:35	1.9	11.36	0.0	0.00
14:40	1.9	11.36	0.0	0.00
14:45	1.9	11.36	0.0	0.00
14:50	1.9	11.36	0.0	0.00
14:55	1.9	11.36	0.0	0.00
15:00	2	11.36	0.0	0.00
15:05	0.6	11.36	0.0	0.00
15:10	0.1	11.36	0.0	0.00
15:15	0	11.36	0.0	0.00
15:20	0	11.36	0.0	0.00
15:25	0	11.36	0.0	0.00
15:30	0	11.36	0.0	0.00
Total				**56,340**

Soil Map—Washington County Area, Utah
(Soleil Ridge 900 South Bluff)



Map Scale: 1:4,390 if printed on A landscape (11" x 8.5") sheet.

N

0 50 100 200 300 Meters

0 200 400 800 1200 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

USDA **Natural Resources Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

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: Washington County Area, Utah
Survey Area Data: Version 14, Jun 8, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 1, 2018—Aug 1, 2018

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
JaB	Junction fine sandy loam, 1 to 2 percent slopes	16.2	21.8%
SY	Stony colluvial land	37.0	49.8%
Td	Tobler silty clay loam	1.1	1.4%
WBD	Winkel gravelly fine sandy loam, 1 to 8 percent slopes	20.0	27.0%
Totals for Area of Interest		**74.3**	**100.0%**

HSRB 2021-HS-007
Soleil Ridge

Geotechnical Report

AGEC
Applied GeoTech

GEOTECHNICAL INVESTIGATION
& HILLSIDE EVALUATION

THE COVE

ST. GEORGE, UTAH

PREPARED FOR:

HOLDAWAY CONSTRUCTION
38 E. 590 N.
HURRICANE, UTAH 84737

ATTN:

BRENT HOLDAWAY

PROJECT NO. 2192092 **JULY 1, 2020**

1420 South 270 East • St. George, Utah 84790 • (435) 673-6850 • FAX (435) 673-1044

TABLE OF CONTENTS

SUMMARY. . . . . Page 1

SCOPE. . . . . Page 3

SITE CONDITIONS. . . . . Page 3

FIELD STUDY. . . . . Page 4

SUBSURFACE SOIL CONDITIONS. . . . . Page 4

GEOLOGY. . . . . Page 4
- A. Geomorphology of the Area. . . . . Page 5
- B. Stratigraphy of the Area. . . . . Page 5

GEOLOGIC HAZARDS. . . . . Page 6
- A. Liquefaction. . . . . Page 6
- B. Flooding. . . . . Page 6
- C. Expansive Soil/Bedrock. . . . . Page 6
- D. Landslides. . . . . Page 6
- E. Rock Fall. . . . . Page 6
- F. Faults. . . . . Page 6

PROPOSED CONSTRUCTION. . . . . Page 7

RECOMMENDATIONS. . . . . Page 7
- A. Site Grading. . . . . Page 8
- B. Foundation Recommendations. . . . . Page 12
- C. Concrete Slab-on-Grade. . . . . Page 13
- D. Lateral Earth Pressures. . . . . Page 14
- E. Seismicity. . . . . Page 15
- F. Soil Corrosion. . . . . Page 16
- G. Pavement. . . . . Page 17
- H. Construction Testing and Observations. . . . . Page 18
- I. Geotechnical Recommendations Review. . . . . Page 19

LIMITATIONS. . . . . Page 19

REFERENCES. . . . . Page 20

Vicinity Map — Figure 1
Site Plan — Figure 2 and 2a
Logs, Legend and Notes of Exploratory Borings and Test Pits — Figures 3-6

SUMMARY

1. This report is a preliminary geotechnical study and also a part of the hillside submittal for St. George City Hillside Ordinance. A final report with details for design and construction will be provided up completion of the laboratory testing and evaluation of the proposed construction.

2. The site was evaluated by drilling 8 borings and observing the excavation of 4 test pits at the approximate locations shown on Figure 2 and 2a. The subsurface profile observed within the borings and test pits consisted of varied thicknesses of sand and gravel and clay overlying various types of bedrock. The bedrock varies from siltstone to shale to claystone.

   The bedrock is mapped as Dinosaur Canyon member of the Moenave Formation. Portions of the bedrock appear to be expansive. Laboratory testing is currently in progress to identify the layers and magnitude of the expansive characteristics.

3. Groundwater was encountered at various depths from 14 to 50 feet below the surface. Fluctuations in groundwater may occur over time. An evaluation of such fluctuations was beyond the scope of this report. Springs or seepages were not observed on the site. The affect of the groundwater will be evaluated and recommendations provided in the final report.

4. The topography of the site consists of a moderately steep to more gentle hillside sloping down to the east and south. The site is a cove or bowl type shape. The site is proposed to be graded by small cuts on the west and north and filling to the east and south. There will be significant cuts for the lower parking levels and building levels.

5. Based on the proposed grading, we anticipate that the majority of the cuts will be in the sands and gravels and will expose the various bedrock layers. We anticipate that the cuts for buildings will be shored temporarily and retained permanently. The upper cut on the parking area will be retained using stacked rock slopes.

6. AGEC has previously provided a Geologic hazard Assessment dated January 6, 2020. This report is attached. The geologic hazard of potentially expansive bedrock layers has not been addressed in the previous report. This hazard is discussed in this report.

7. The proposed structures may be supported on conventional spread footings bearing on a properly prepared subgrade. As an alternative, micropiles or deep foundations may be utilized. Following completion of the laboratory testing and final details of construction, detailed foundation recommendations will be provided.

8. The on-site sand and gravel soils, free of organics and debris, are suitable for use as structural fill, site grading fill, and utility trench backfill. There are occasional surface cobbles and boulders along with limited subsurface materials that are oversized for use as fill materials. The oversized material will require processing to remove the larger particles such that the maximum particle size is 6 inches and at least 50 percent of the material

passes the No. 4 sieve. Larger materials may be used on slopes for erosion protection or placed in deeper fills, provided they are properly nested. The on-site claystone bedrock is not suitable for use as structural fill, but may be used as fill in non-structural areas or as trench backfill, wall backfill, or at least 4 feet below pavement areas.

9. Positive drainage of the surface soils within the development is critical and should be maintained throughout the development. We recommend the piping of surface drainage and in no case should be ponding of water be allowed adjacent to or up-gradient of structures.

SCOPE

This report presents the results of a preliminary geotechnical investigation and hillside evaluation for the proposed Cove Development 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. AGEC has previously completed a Geologic-hazard Assessment for the project dated January 6, 2020.

A field exploration of 8 borings and 4 test pits were conducted to obtain information on the subsurface conditions and to obtain samples for laboratory testing. Information obtained from the field and laboratory was used to define conditions at the site and to develop recommendations for the proposed development. AGEC has also utilized the proposed grading plans and conceptual plans to develop our recommendations. Additional details will be provided in a final report following completion of the laboratory testing.

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. The report is intended to meet the requirements for evaluation for St. George City Hillside developments. The findings, conclusions and recommendations for design and construction are included in this report.

SITE CONDITIONS

The subject site consists of the parcel shown on Figure 1. The property is located west of the proposed 250 West at approximately 900 South and encompasses the hillside area or “bowl” type area as shown on the attached Figures 1, 2 and 2a. The property is moderately steep with a flatter area at the base of the hillside. Portions of the property have been previously graded with pad areas along the north and western portions of the planned construction area. The property is sparsely covered with vegetation consisting of small brush and grasses.

FIELD STUDY

On June 4-10, 2020, an engineer from AGEC visited the site for a subsurface investigation. Eight borings were drilled using a truck mounted rig using hollow stem augers. Portions of the bedrock were cored using mud rotary or air to removed cuttings from a 2.5 inch HQ core barrel for continuous sampling. The 4 test pits were excavated with a track excavator. The locations are shown on Figure 2 and 2a.

SUBSURFACE SOIL CONDITIONS

The subsurface profile observed within the borings and test pits consisted of varied thicknesses of sand and gravel and clay overlying various types of bedrock. The bedrock varies from siltstone to shale to claystone.

The bedrock is mapped as Dinosaur Canyon member of the Moenave Formation. Portions of the bedrock appear to be expansive. Laboratory testing is currently in progress to identify the layers and magnitude of the expansive characteristics.

The preliminary boring and test pit logs are shown on Figures 3 to 6 with the legend and notes on Figure 7. These logs will be updated following the classification data provided from laboratory testing in a final report.

GEOLOGY

The geologic conditions at the site were evaluated based on a review of geologic literature, and a site geologic reconnaissance.

A. **Geomorphology of the Area**

The site is located along the east slope of the West Black Ridge or edar Bench Lava Flow in St. George, Utah as shown on Figure 1. The site is also located on the north side of the Virgin River Anticline. This area is part of the St. George Basin which is bound on the north by the Pine Valley Mountains, on the east by the Hurricane Cliffs, on the west by the Beaver Dam Mountains, and on the south by the Mount Trumball area.

Bedrock in the St. George basin mainly consists of Upper Permian and Lower Jurassic sandstone, shale, siltstone, limestone, gypsum, and conglomerate. These beds are folded to the southeast into the northeast trending Virgin anticline. Several north-trending faults are present within the St. George Basin, the most prominent of which is the Washington Fault (Christensen and Deen, 1983).

The St. George Basin is characterized by basalt capped buttes and cuestas that were once stream channels along which lava flowed. Erosion of the surrounding softer sedimentary rocks over time has resulted in an inverted topography of old stream channel becoming resistant basalt ridges such as the Middleton Black Ridge and the West Black Ridge (Christenson and Deen, 1983).

The geologic structure within the basin is dominated by the Virgin anticline which trends northwest to southeast and is located south of the site. The Virgin anticline is a broad, generally symmetrical fold with maximum flank dips of 25 to 30 degrees to the northwest and southeast (Christenson and Deen, 1983).

The geologic conditions at the site were evaluated based on a review of geologic literature, boring and test pit exploration and a reconnaissance of the site.

B. Stratigraphy of the Area

The stratigraphy of the area consists of Upper Triassic to Lower Jurassic- aged bedrock of the Moenave Formation. There is alluvium (Holocene to lower Pleistocene aged) deposits over the Chinle that cover the majority of the site. The top of the ridge is capped by the Lava Ridge lava flow, which consists of Basalt of the lower Pleistocene aged deposit.

GEOLOGIC HAZARDS

Based on review of geologic literature and site reconnaissance, the following information is provided concerning geologic hazards.

A. Liquefaction

Relatively shallow bedrock was encountered across the site. Thus, based upon subsurface conditions encountered our experience in the area, the subsurface soils below the developed areas are considered to be a non-liquefiable during a severe seismic event to the depths investigated.

B. Expansive Soil/Bedrock

The presence of potentially expansive layers of bedrock is identified by the geologic mapping hazard by Lund and others, 2008. The expansive bedrock is mapped as the Dinosaur Canyon member of the Moenave Formation. Our laboratory testing is currently in progress. Our experience in the area also indicate that claystone bedrock on the project site is moderately expansive.

An evaluation and analysis along with detailed recommendations to address this concern for expansive layers will be provided in a final report.

D. Landslides

See attached document.

E. Rock Fall

See attached document.

F. Faults

Based on previous work by Christenson and Deen (1983), Willis and Higgins (1995) Lund and others (2008), the inferred location of the St. George Fault is located further east near River Road.

PROPOSED CONSTRUCTION

The Cove Development will consist of developing the property with two 2 apartment/townhome type buildings. The buildings will be multiple levels with underground parking. The buildings are to be constructed with reinforced concrete on the garage level and wood framing on the above grade levels. We anticipate wall loads on the order of 8 to 10 kips per lineal foot and column loads up to 300 kips.

There will be access to the site from 900 South and 250 West which will be further improved as a part of the site development. There is an existing sewer up the 900 South roadway alignment. The anticipated traffic for the different areas consists of a Traffic Index of 7 for the Public Roads and a 5 for the parking and access areas.

The proposed grading consists of significant temporary cuts for construction. The cuts will be retained or shored during construction. The hill side cuts above the parking area are proposed to be retained by rockery faced slopes. The fills will be located in walkout areas and in the lower area on the west side of the project.

The proposed construction, or building loads are estimated and should be verified to refine our recommendations in the final report.

RECOMMENDATIONS

Based on our experience in the area, the subsurface conditions encountered, our engineering analysis, and the proposed construction, the following recommendations are provided. A final report will be provided that defines the expansive bedrock characteristics following completion of the lab testing. The final report will include overexcavation depths for buildings, foundation alternatives such as micropiles and shoring recommendations.

A. Site Grading

Based on the subsurface conditions and proposed grading provided by Bush & Gudgell Engineering, the following is provided:

1. Subgrade Preparation

General: Prior to placing structural fill, site grading fill or concrete, the site should be grubbed to remove vegetation and soil containing roots and organics.

Expansive Bedrock Removal - Buildings and Structures: We recommend that a separation be provided between the expansive claystone and the building pad grades. The thickness of removal will be defined and provided in a final report as the laboratory testing is completed. The claystone should be removed below structures, entry areas and canopies, extending at least 5 feet beyond the perimeter of the structure. The limits of removal should be determined by survey and documented following removal.

Expansive Bedrock Removal - Roadways and Flatwork*:* We recommend providing at least a separation of 4 feet below the proposed subgrade elevation and the surface of the expansive mudstone. The material should be removed a distance of at least 2 feet beyond the edge of roadway/flatwork improvements .

2. Excavation/Slopes

Based on the proposed grading, we anticipate that the majority of the cuts will be in bedrock. The cuts are significant and will require shoring or permanent retaining. Details will be provided in a final report.

The upper cuts will be in the sands and gravels with portions of the parking cuts extending into the bedrock. In order to maintain stable slopes, they should be retained or slopes should be graded no steeper than 2:1 Horizontal to Vertical (H:V). Fill slopes should be graded no steeper than 2:1 (H:V).

To control erosion and weathering, the bedrock cut slopes should be protected by erosion protection. This would be particularly critical where softer bedrock is exposed. Benches may also be cut into the slopes to assist in controlling drainage and erosion. Benches should be at least 5 feet in width and should be constructed at intervals in accordance with the 2018 IBC. In lieu of facing bedrock cuts, they could be flattened to a 3:1 (H:V) slope.

Fill slopes should be constructed by overbuilding the slope and then cutting back the slope face to the desired grade to provide a properly compacted slope face. Fill placed on existing slopes steeper than 3:1 (H:V) should be keyed into the existing slope using a benching procedure. Benches should be of sufficient width to allow for operation of compaction equipment.

Utility trenches excavated in the on-site soils should be excavated in accordance with OSHA requirements using a OSHA Soil Class C (1½:1 H:V) for overburden soils and Soil Class A (½:1 H:V) for trenches excavated into the bedrock. Steeper trenches may require the use of shoring or a trench box to provide as safe work environment. Safe trench excavation is the responsibility of the contractor.

3. 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%
Roadways	Base course	CBR>50%, **200** <12% Maximum size: ¾ inch
Underslab	Base course	**-200** <12% Maximum size: 1 inch

-200 = Percent Passing the No. 200 Sieve
LL = Liquid Limit

The on-site silt, sand and gravel soils and fill soils, free of organics and debris, are suitable for use as structural fill, site grading fill, and utility trench backfill. The on-site claystone is not suitable for use as structural fill or site grading fill, but may be used as fill in non structural areas, trench backfill, wall backfill, or at least 4 feet below pavement areas. An AGEC engineer should observed the bedrock removal to determine suitability for its intended use.

4. Compaction

Compaction of fill materials placed at the site should equal or exceed the following percentages when compared to the maximum dry density as determined by ASTM D-698 or ASTM D-1557:

Area	Percent Compaction ASTM D-698*	Percent Compaction ASTM D-1557**
Subgrade	90	90
Footings/foundations	NA	95
Slabs/Pad Fill (over excavation)	100	95
Utility trench backfill (Structural Areas)	100	95
Wall Backfill (Structural Areas)	100	95

* Fine-grained or processed mudstone/clay.

** Granular site grading/structural fill

Fill should be placed in lifts which do not exceed the capability of the equipment used. Generally 6 to 8 inch lifts are adequate for heavy rubber tire equipment. Lift thicknesses should be reduced to 4 inches for hand compaction equipment. Fill placed at the site should be properly moisture conditioned prior to placement and should be tested to verify proper compaction.

Fill materials should be properly moisture conditioned prior to placement. Fine-grained should be moisture conditioned to 0 to 4 percentage points over the optimum moisture content as determined by ASTM D-698. Granular soil should be

moisture conditioned to within 2 percentage points of the optimum moisture content as determined by ASTM D-1557.

5. Drainage

The following drainage recommendations should be implemented:

- Positive site drainage should be maintained during the course of construction. In no case should water be allowed to pond adjacent to buildings/foundations.

- After construction has been completed, positive drainage of surface water away from the structures should be maintained throughout the life of the structures. We recommend a minimum slope of 6 inches in the first 10 feet from the perimeter of the structures. Hard or impermeable surfaces may be used to direct water away from buildings.

- Roof gutters should also be utilized with downspouts which extend out away and down slope from buildings. Preferably, downspouts should discharge off-site.

- Landscaping that requires water (grass) should be limited to reduce the potential for wetting of foundation support soils and to reduce the potential future accumulation of perched water on top of the bedrock.
- We also recommend that desert landscaping, which requires little to no water, be used adjacent to concrete or masonry walls which will be backfilled to reduce salt migration of soluble salts and the subsequent salt weathering on cement containing elements. The below grade portions of walls/fences which are backfilled with soil should be protected with an impermeable membrane and a subsurface drain. 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.

6. Subsurface Drainage Protection

A perimeter subsurface drain should be provided around the basement of each structure.

The drain system should consist of 1 foot of gravel adjacent the perimeter foundation supporting the building. A 4 inch perforated PVC pipe should be placed in the bottom of the gravel zone sloped at a 1% grade (minimum) to drain by gravity. Prior to backfilling, Mirafi 140N filter fabric should be placed over the gravel.

B. Foundation Recommendations

Based on the subsurface conditions, the proposed grading provided by Bush & Gudgell Engineering and that the proper separation from expansive soils has been provided, the following foundation recommendations are provided for support of slab on grade foundations. If the expansive soils are not removed to provide the proper separation, the use of micropiles or a deep foundation system should be used. Recommendations for deep foundation systems are not included in this report. If requested, those recommendations can be provided.

1. Foundations

   The proposed structures may be supported on conventional spread footings with slab-on-grade floors supported on a properly prepared subgrade as indicated in the Subgrade Preparation section of this report.

2. Bearing Material

   Footings should bear on properly compacted structural fill underlain by a properly prepared subgrade as recommended in the Subgrade Preparation section of this report.

3. Bearing Pressure

   Spread footings bearing on properly compacted structural fill may be designed for a net allowable bearing pressure of 2,500 pounds per square foot (psf). Spot footings supporting columns or footings with a width of greater than 3 feet may be

designed for a net allowable bearing pressure of 3,000 psf. If larger footings are anticipated, the bearing pressures may be increased with further evaluation.

4. Temporary Loading Conditions

The bearing pressure indicated above may be increased by one-half for temporary wind and seismic loads.

5. Footing Width and Embedment

Spread footings should have a minimum width of 18 inches and exterior or unheated footings should be embedded at least 12 inches below the lowest adjacent grade.

6. Settlement/Heave

Based on the subsoil conditions encountered and the anticipated building loads, we estimate a total settlement/heave for the foundation designed as indicated above to be up to approximately 1 inch. Differential settlement is estimated to be approximately ½ inch.

C. Concrete Slab-on-Grade

1. Slab Support

Concrete slabs may be supported on a properly compacted subgrade as recommended in the Subgrade Preparation section of this report. Fill placed in slab areas should be tested to verify compaction meets the recommendations provided within this report.

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.

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 0.45 may be used in design for ultimate lateral resistance of footings bearing on properly compacted structural fill.

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
Granular Backfill (Sand or Gravel)	35 pcf	55 pcf	350 pcf
Granular Backfill - Earth Pressure Coefficient	0.28	0.44	-
On-site Clay Soil/Processed claystone	50 pcf	65pcf	190 pcf
On-site Clay Soil/Processed claystone - Earth Pressure Coefficient	0.45	0.59	-

The above values account for the lateral earth pressures due to the soil and level backfill conditions and do not account for hydrostatic pressures or surcharge loads.

Lateral loading should be increased to account for surcharge loading using the appropriate earth pressure coefficient and a rectangular distribution if structures are placed above the wall and are within a horizontal distance equal to the height of the

wall. If the ground surface slopes up away from the wall, the equivalent fluid weights should also be increased.

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 weights 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)
	Granular Backfill
Active	7 pcf increase
At-rest	no increase
Passive	18 pcf decrease

The resultant of the seismic increase should be placed up ⅓ from the base of the wall.

4. Safety Factors

The given values 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

Listed below is a summary of the site parameters as required by the 2018 International Building Code and ASCE 7, Chapter 20:

Description	Seismic Event - 2% PE in 50 Yrs
	Value
2018 IBC Site Class	C
PGA	0.22g
S_s (0.2 second period)	0.505g
S_1 (1 second period)	0.164g
F_{PGA}	1.2
F_a	1.298
F_v	1.5

The values provided above were generated using the ASCE 7-16 Siesmic 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. A 10-percent decrease in design seismic load might be achieved if shear wave velocities are measured on site. If this is requested, we propose to perform a Refraction Microtremor (ReMi) survey to measure subsurface shear wave velocity.

F. Soil Corrosion

Our experience has shown that portions of the on-site soil/bedrock and many imported soils 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

Based on the subsoil conditions encountered and the laboratory test results, the following recommendations are given:

1. Analysis

   Asphaltic Concrete: The flexible pavement analysis is based on UDOT and AASHTO design methods and a 20 year design life. The following parameters were considered for our analysis:

   - Base course that meets specifications which would correspond to a Structural Coefficient (a_2) of at least 0.12. Asphalt that provides a Structural Coefficient (a_1) of at least 0.40.

   - Drainage Coefficient = 1.0.
   - The subgrade support soils consists generally of silty sand to gravel. Based on the on-site soils, a M_R value of 15,000 psi was used for the subgrade based upon an estimated California Bearing Ratio (CBR) value of 10 percent and the relationship between CBR and Resilient Modulus (M_R).
   - Serviceability Index: P_o=4.2, P_t=2.5.
   - Reliability of 90 percent.
   - Standard Deviation (S_o) = 0.45.

2. Subgrade Support

   We anticipate the subgrade materials will consist of compacted on-site silty sand to gravel. Our design assumes a properly compacted subgrade. Prior to placing base course or pavement area grading fill, the subgrade should be prepared as recommended in the Subgrade Preparation section of this report.

3. Pavement Thickness

Based on the anticipated traffic, a 20 year design life, PCC and AASHTO design methods, the following pavement sections are recommended.

	Flexible Pavement	
Area	Asphaltic concrete (inches)	Base Course (inches)
300 West, 900 South	3	8
Acces/Entrance Road	2.5	8
Parking areas	2.5	6

4. Pavement Materials

The pavement materials should meet AASHTO and City of St. George Specifications for gradation and quality. The pavement thicknesses indicated above assume that the base course is high quality material with a CBR of at least 60 percent. Asphalt material should have a Marshall stability of at least 1,800 pounds.

5. 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. We further recommend a yearly maintenance program including crack sealing and a surface treatment such as a “slurry seal” to extend the pavement life and reduce water infiltration into the subsurface soils.

H. Construction Testing and Observations

We recommend testing fill, concrete, and asphalt materials at a frequency which meets or exceeds St. George City minimum testing frequency requirements for city improvements.

We also recommend the following:

1. Verify the subgrade is properly prepared/compacted in accordance with the recommendations provided in the Subgrade Preparation section of this report.

2. Verify that foundation subgrade is properly compacted prior to placement of concrete.

3. Conduct compaction testing on fill placed below foundations, in building pads, and paved areas. We recommend testing each foot of fill placed.

4. Conduct construction materials testing of soils, concrete and asphalt materials and special inspections as required for the proposed construction by St. George City and the structural engineer.

5. Conduct special inspections on the proposed building as required by the 2018 International Building Code and the structural engineer.

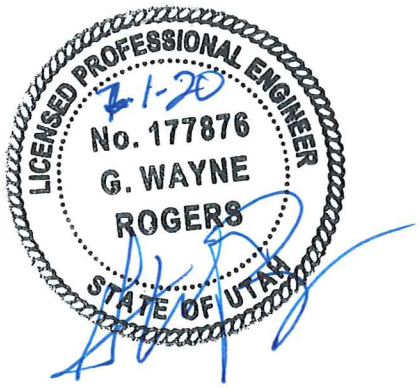
I. Geotechnical Recommendation Review

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, AGEC 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 subsurface investigation, laboratory test results 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.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



G. Wayne Rogers, P.E.

P:\2019 Project Files\2192000\2192092 - GT The Cove\Report.wpd

REFERENCES:

Christenson, G.E. and Deen, R.D., 1983, Engineering Geology of the St. George area Washington County, Utah: Utah Geological and Mineral Survey Special Studies 58, 32 p., scale 1:24,000.

Lund, W.R., Knudsen, T.R., Vice, G.S., and Shaw, L.M., 2008, Geologic hazards and adverse construction conditions, St. George-Hurricane Metropolitan Area, Washington County, Utah, Utah Geological Survey Special Study 127, 14 plates, scale 1:24,000.

Hayden, Janice, M and Willis, Grant C. UGS Map 251DM. 2011, Geologic Map of the St. George Quadrangle, Washington County, Utah, Utah Geological Survey.



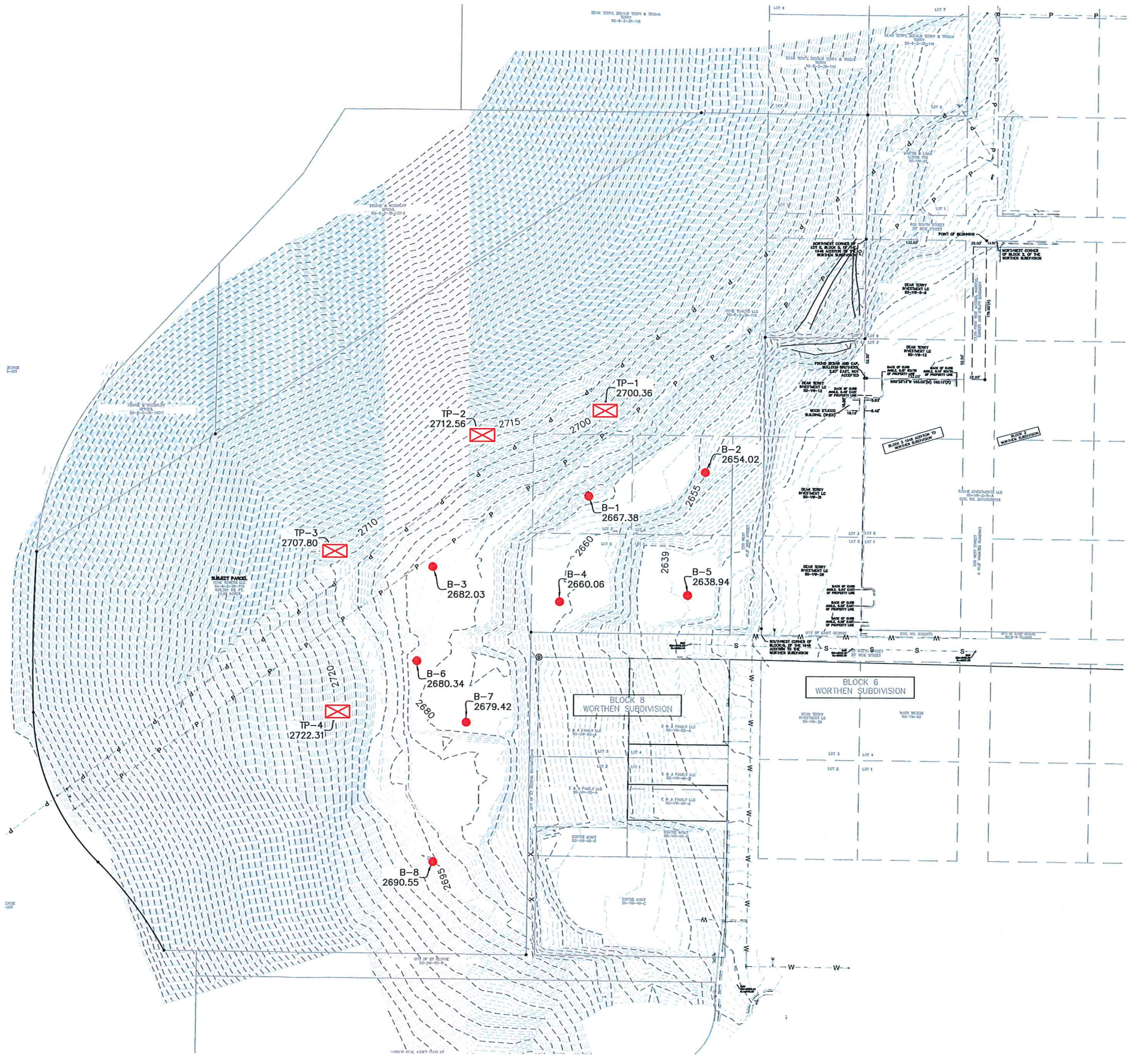
N

Not to Scale

THE COVE
ST. GEORGE, UTAH

2192092	AGEC	Vicinity Map	Figure 1

THE COVE
ST. GEORGE, UTAH



- Approximate boring location
- Approximate test pit location

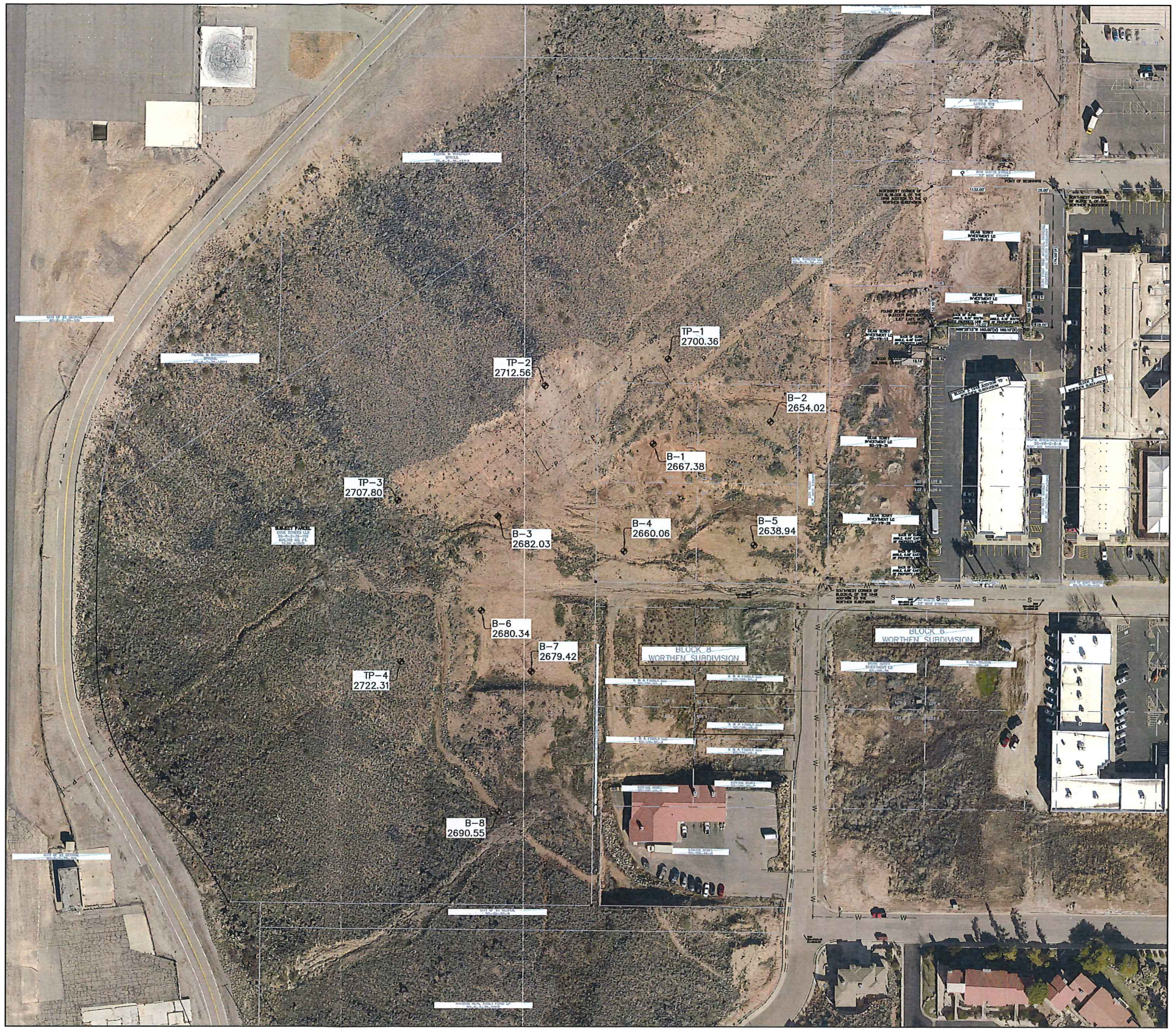
N

0 150 300 feet

Approximate Scale

2192092	AGEC	Site Plan	Figure 2

THE COVE
ST. GEORGE, UTAH

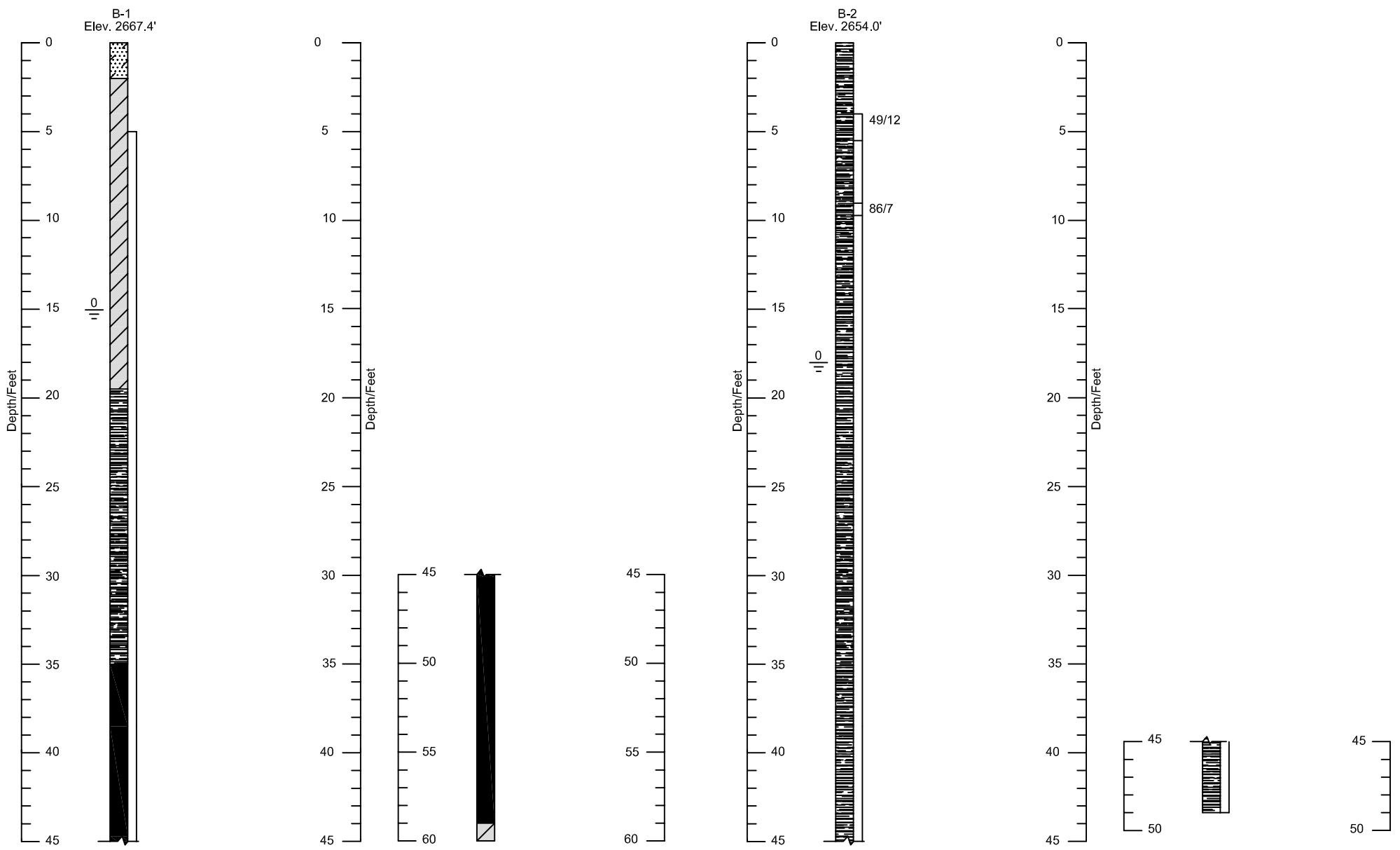


N

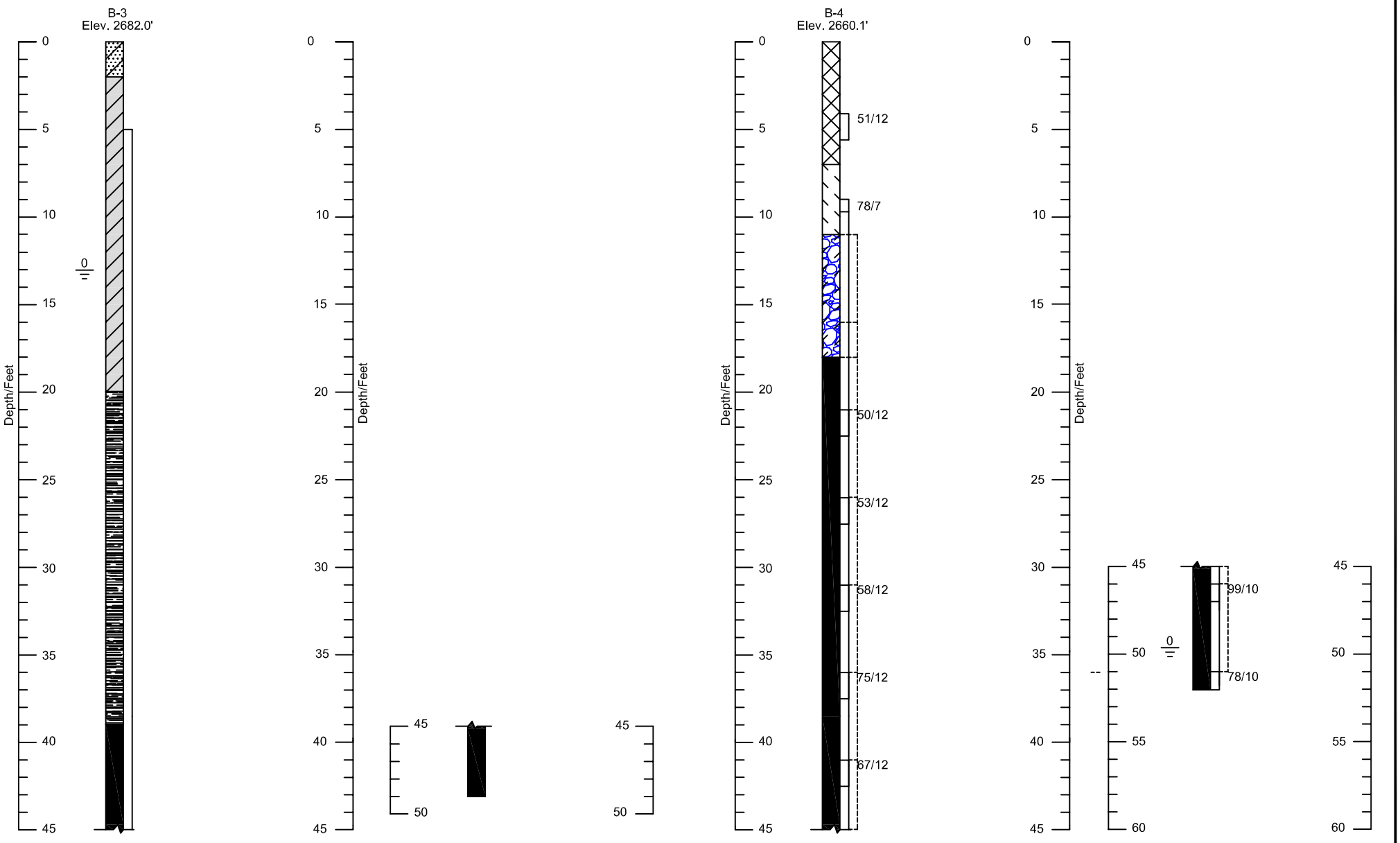
0 200 400 feet

Approximate Scale

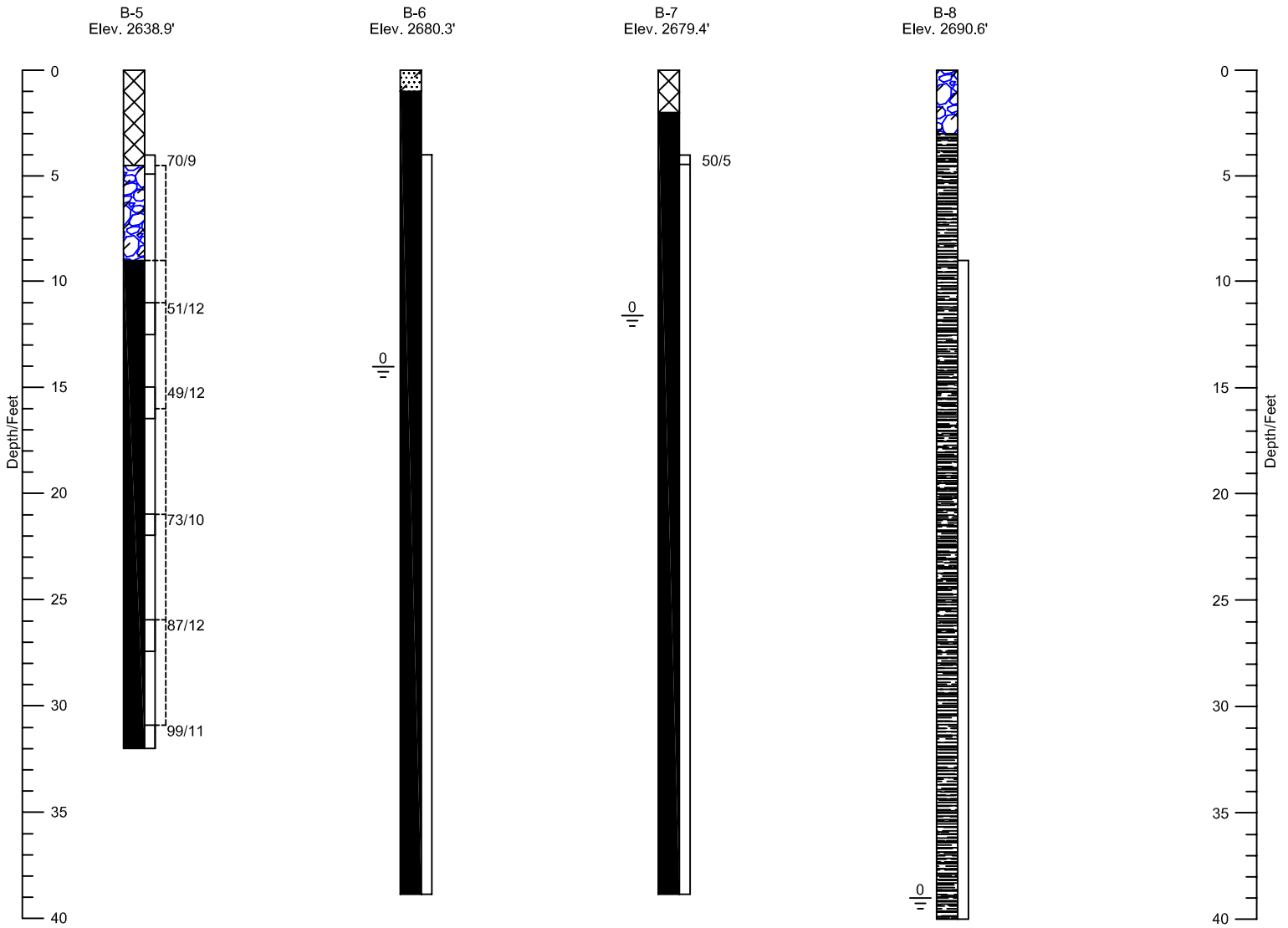
2192092	AGEC	Site Plan	Figure 2a



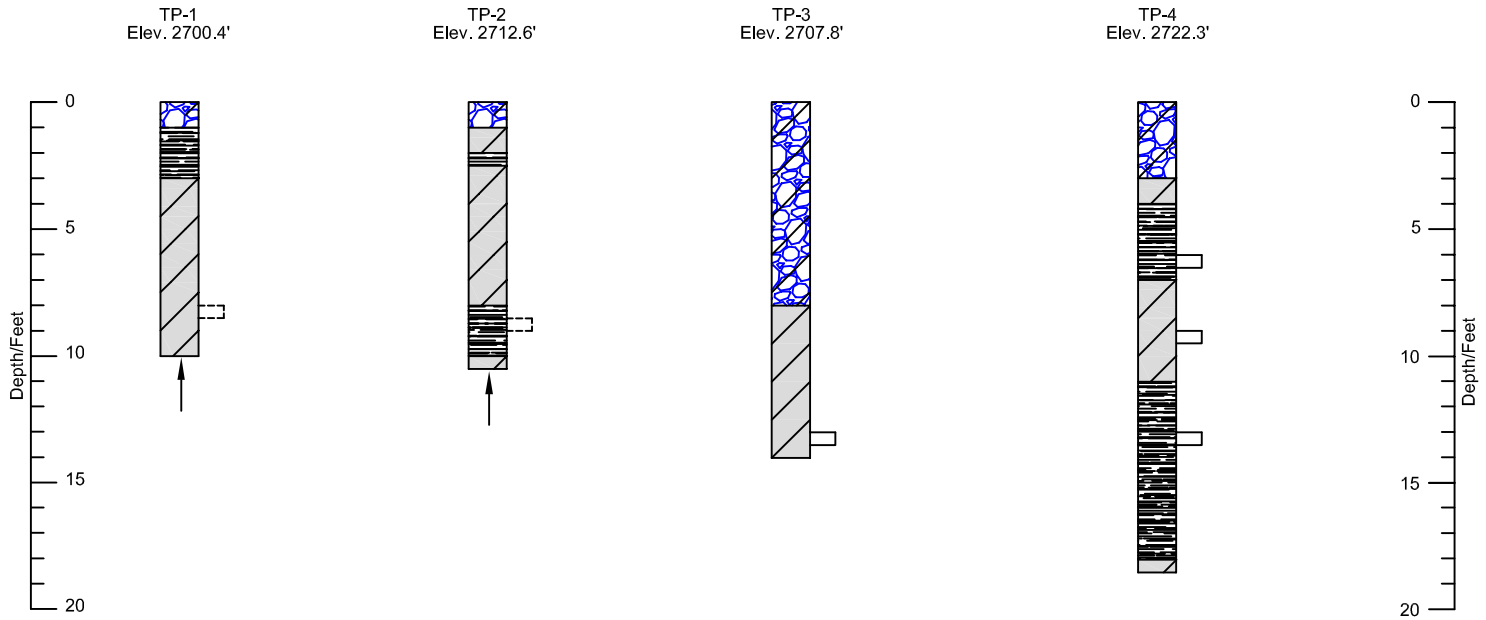
2192092 | AGEC | Logs of Exploratory Borings | Figure 3



2192092 | AGEC | Logs of Exploratory Borings | Figure 4



2192092	AGEC	Logs of Exploratory Borings	Figure 5



2192092	AGEC	Logs of Exploratory Borings	Figure 6

LEGEND:



Fill; Silty to Clayey Sand with Gravel, poorly compacted, slightly moist, and reddish brown in color.



Fat Clay (CH); medium stiff, moist, and reddish brown in color.



Clayey Sand (SC); medium dense, slightly moist, and reddish brown in color.



Silty Sand (SM); medium dense, moist, and reddish brown in color.



Clayey Gravel (GC); dense, moist, basalt cobbles and boulders, and black to red in color.



Silty Gravel with Sand (GM); dense, moist, basalt cobbles and boulders, and black to red in color.



Shale Bedrock; moderately hard, slightly moist, low to medium plastic, layered, gypsum, and red in color.



Claystone Bedrock; soft to moderately hard, moist, medium to high plastic, gypsum streaks, and red with white in color.



Siltstone Bedrock; moderately hard, slightly moist, non to low plastic, sandstone lenses/layers, and red-brown in color.



California drive sample taken. The symbol 10/12 indicates that 10 blows from a 140 pound hammer falling 30 inches were required to drive the sampler 12 inches.



Indicates core sample taken.



Indicates relatively undisturbed block sample taken.



Indicates disturbed sample taken.



Indicates the depth to free water and the number days after excavation the measurement was taken.

Indicates practical trackhoe refusal on boulders, sandstone bedrock, or limestone bedrock.

NOTES:

1. The borings were drilled on June 4, 5, 8, 9, and 10 with a truck mounted drill rig equipped with 8-inch hollow-stem augers. The test pits were excavated on June 9 and 10, 2020 with a trackhoe. Portions of the bedrock were cored using a 2½ inch diameter HQ bit using either air or mud rotary.
2. The locations and elevations of the borings and test pits were measured by survey by Bush and Gudgell, Inc.
3. The boring and test pit locations and elevations should be considered accurate only to the degree implied by the method used.
4. The lines between the materials shown on the logs represent the approximate boundaries between material types and the transitions may be gradual.
5. Water level readings shown on the logs were made at the time and under the conditions indicated. Fluctuations in the water level may occur with time.



B-1 @ 5-15 ft.



B-1 @ 15-24 ft



B-1 @ 24-32 ft.



B-1 @ 32-41 ft.



B-1 @ 41-50 ft.



B-1 @ 50-58 ft.



B-1 @ 58-60 ft.



B-2 @ 9-23 ft.



B-2 @ 23-32 ft.



B-2 @ 32-42 ft.



B-2 @ 42-44 ft.



B-3 @ 4-19 ft.



B-3 @ 19-29 ft.



B-3 @ 29-39 ft.



B-3 @ 39-49 ft.



B-6 @ 4-14 ft.



B-6 @ 14–26 ft.



B-6 @ 26-34 ft.



B-6 @ 34-39 ft.



B-7 @ 4-17 ft.



B-7 @ 17-26 ft.



B-7 @ 26-36 ft.



B-7 @ 36-39 ft.



B-8 @ 9-22 ft.



B-8 @ 22-29 ft.



B-8 @ 29-34 ft.



B-8 @ 34-39 ft.

AGEC
Applied GeoTech

January 6, 2020

Holdaway Construction
38 East 590 North
Hurricane, Utah 84737

Attention: Brent Holdaway
EMAIL: bholdaway@live.com

Subject: Geologic-hazard Assessment
Proposed Cove Development
300 West 900 South
St George, Utah
Project No. 2192092

Gentlemen:

Applied Geotechnical Engineering Consultants, Inc. (AGEC) was requested to evaluate geologic hazards for the proposed Cove development to be constructed at approximately 300 West 900 South in St George, Utah.

PROPOSED CONSTRUCTION

We understand a mixed-use development consisting of retail, restaurant and residential facilities is planned for the east portion of the property. The west side of the developed area will be cut into the slope of the hillside.

GEOLOGY

The geology of the site is mapped by Hayden and Willis (2011) to consist of talus and landslide deposits on the hillside and bedrock near the base of the slope. The relatively flat east side of the property is mapped as mixed eolian and alluvial deposits. The bedrock is the Springdale Sandstone Member of the Kayenta Formation overlying the Whitmore Point Member of the Moenave Formation overlying the Dinosaur Canyon Member of the Moenave Formation. The bedrock dips gently down in a north/east direction.

Low-sun-angle aerial photographs from 1981, color aerial photographs from 2000, black and white aerial photographs from 1960 and lidar data from 2017 were reviewed to evaluate geologic hazards in the area. The resolution of the photographs along is not sufficient to allow evaluation of rockfall. In addition, the area planned for development had been disturbed

by the time of the photographs. Landslide deposits can be identified on the aerial photographs south of the site. The landslide mapped on the northwest slope above the proposed development area is not apparent from the aerial photographs or lidar. The area mapped as landslide is terraced suggesting there may be creep or shallow-depth movement of the ground in this area. The affected soil does not appear to extend more than about 2 or 3 feet deep.

ROCKFALL EVALUATION

There are outcrops of basalt above the property with some areas of rock that could potentially become dislodged, particularly during a major earthquake, and result in rockfall hazard for the proposed development. The rocks are generally less than 5 feet in size. The approximate extent of the rockfall hazard is presented on Figure 2. This is based on field observation and experience with similar sites in the area. The extent of the potential rockfall hazard cannot be well defined due to land disturbance and likely removal of rocks in the runout zone.

The area planned for buildings could be protected from rockfall hazards by constructing a barrier along the uphill side of the development or removal of the source rocks.

The rockfall-protection berm, assumed to be constructed just up slope of the west and northwest cut slopes for the development, should have a height of at least 8 feet, a top width of at least 6 feet and an upslope face of ½ horizontal to 1 vertical or steeper. It is important to have a steep upslope face for the berm so rocks are not directed over the berm. The berm should be reinforced using geogrid to maintain a steep upslope face. The reinforcement spacing and slope construction will depend on the type of fill used and reinforcement selected. Internal design of the berm reinforcement could be provided upon request.

LANDSLIDE EVALUATION

The landslide on the northwest side of the property appears to be less than 2 or 3 feet deep and is not expected to be a hazard for the proposed development if slopes are adequately reinforced. This should be evaluated in the geotechnical study for the site.

OTHER GEOLOGIC HAZARDS

Other geologic hazards considered for this study are debris flow and fault rupture. Based on geologic mapping for the area, our site reconnaissance, and review of aerial photographs and lidar data, these are not considered hazards at the site.

LIMITATIONS

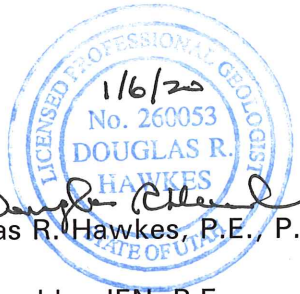
This letter has been prepared in accordance with generally geologic engineering practices in the area for the use of the client. The conclusions and recommendations included in the letter are based on conditions observed during our field study, topographic information provided and

our experience with similar type projects. If conditions are significantly different from those described in this letter, we should be notified to reevaluate the recommendations given.

If you have questions or if we can be of further service, please call.

Sincerely,

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

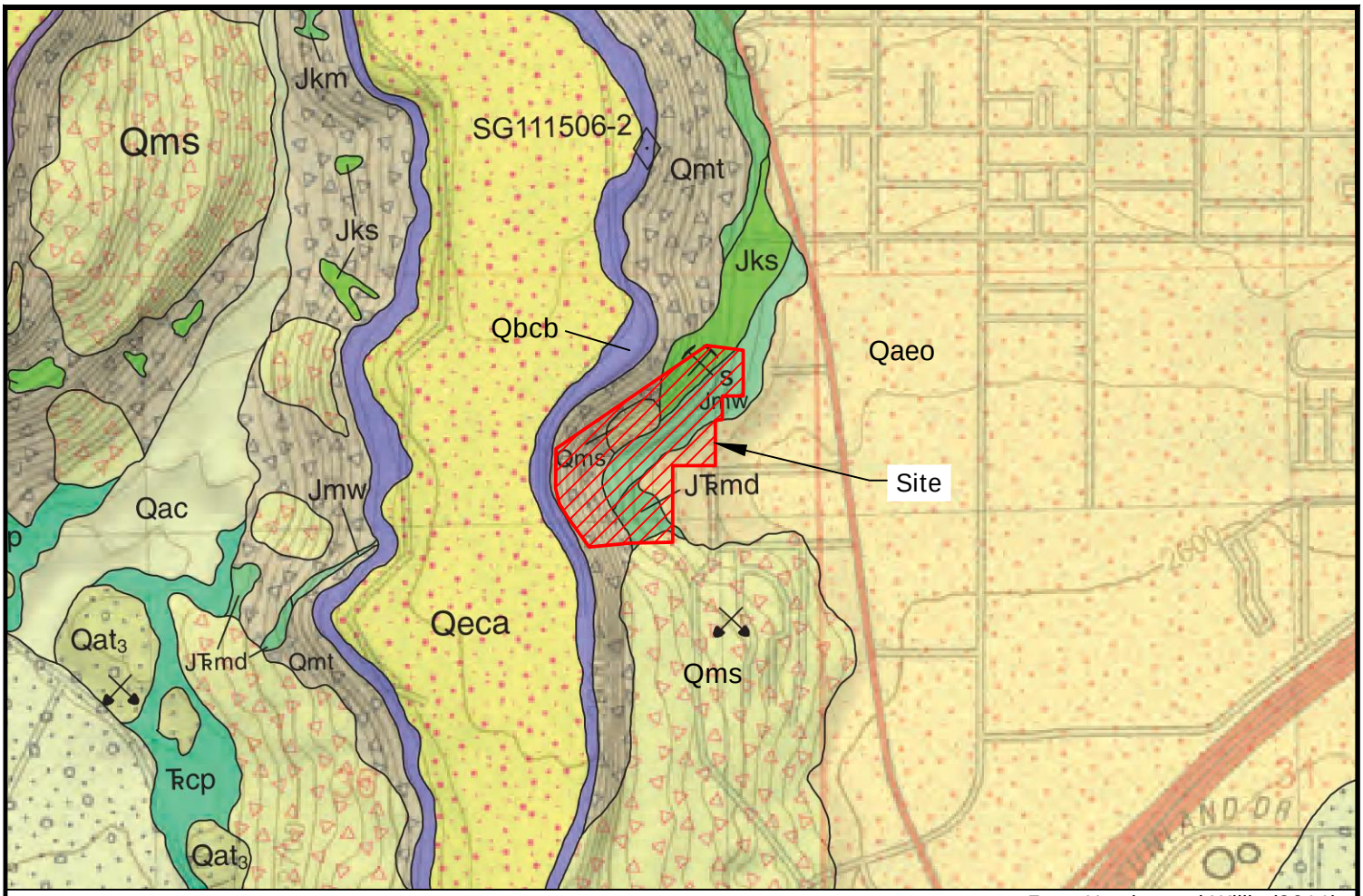


Douglas R. Hawkes, P.E., P.G.

Reviewed by JEN, P.E.
DRH/rs
Enclosures

Reference:

Hayden, J.M. and Willis, G.C., 2011; Geologic map of the St George 7.5' quadrangle, Washington County, Utah, Utah Geological Survey Map 251DM.



From Hayden and Willis (2011)

EXPLANATION OF SYMBOLS AND GEOLOGIC UNITS IN AREA OF PROPOSED DEVELOPMENT

Qmt - Talus deposits (Holocene to upper Pleistocene)

Qms - Landslide deposits (Holocene to middle Pleistocene).

Qeca - Eolian and alluvial deposits with thick calcic soil on lava flows (Holocene to lower Pleistocene).

Qaeo - Mixed alluvial and eolian deposits (Holocene to middle Pleistocene).

Qbcb - Cedar Bench lava flow (lower Pleistocene)

Jks - Springdale Sandstone Member of the Kayenta Formation (Lower Jurasic)

Jmw - Whitmore Point Member of the Moenave Formation (Lower Jurassic)

JTrmd - Dinosaur Canyon Member of the Moenave Formation (Lower Jurassic to Upper Triassic).

——— — — Geologic contact between units, dashed where approximate.

Normal fault, bar and ball on down thrown side, dashed where approximate, dotted where concealed.

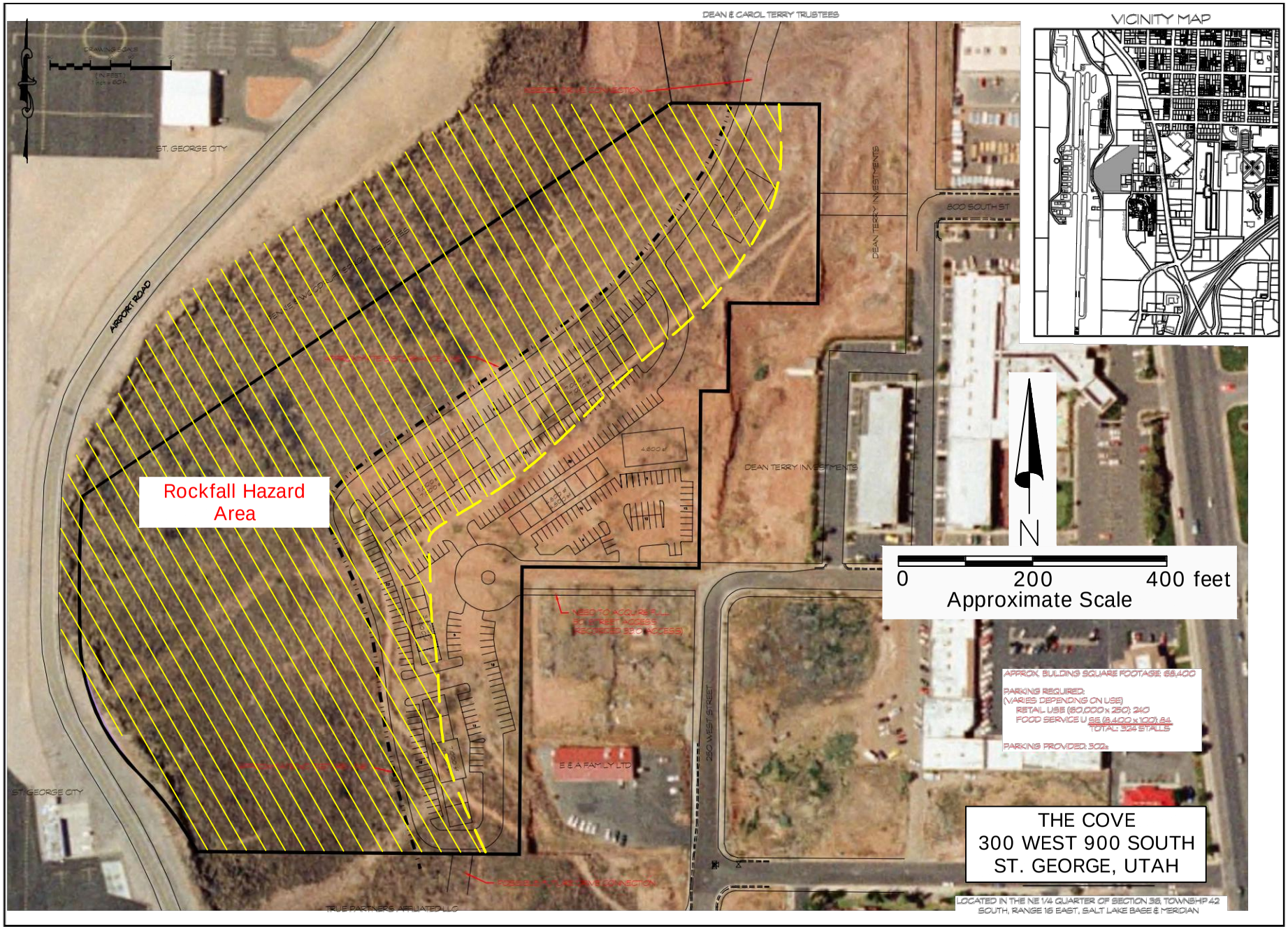
N

0 1000 2000 feet

Approximate Scale

THE COVE
300 WEST 900 SOUTH
ST. GEORGE, UTAH

2192092	AGEC	Geologic Map	Figure 1



2192092	AGEC	Rockfall Hazard Area	Figure 2

HSRB 2021-HS-007
Soleil Ridge

Hazards Report

AGEC
Applied GeoTech

January 6, 2020

Holdaway Construction
38 East 590 North
Hurricane, Utah 84737

Attention: Brent Holdaway
EMAIL: bholdaway@live.com

Subject: Geologic-hazard Assessment
Proposed Cove Development
300 West 900 South
St George, Utah
Project No. 2192092

Gentlemen:

Applied Geotechnical Engineering Consultants, Inc. (AGEC) was requested to evaluate geologic hazards for the proposed Cove development to be constructed at approximately 300 West 900 South in St George, Utah.

PROPOSED CONSTRUCTION

We understand a mixed-use development consisting of retail, restaurant and residential facilities is planned for the east portion of the property. The west side of the developed area will be cut into the slope of the hillside.

GEOLOGY

The geology of the site is mapped by Hayden and Willis (2011) to consist of talus and landslide deposits on the hillside and bedrock near the base of the slope. The relatively flat east side of the property is mapped as mixed eolian and alluvial deposits. The bedrock is the Springdale Sandstone Member of the Kayenta Formation overlying the Whitmore Point Member of the Moenave Formation overlying the Dinosaur Canyon Member of the Moenave Formation. The bedrock dips gently down in a north/east direction.

Low-sun-angle aerial photographs from 1981, color aerial photographs from 2000, black and white aerial photographs from 1960 and lidar data from 2017 were reviewed to evaluate geologic hazards in the area. The resolution of the photographs along is not sufficient to allow evaluation of rockfall. In addition, the area planned for development had been disturbed

by the time of the photographs. Landslide deposits can be identified on the aerial photographs south of the site. The landslide mapped on the northwest slope above the proposed development area is not apparent from the aerial photographs or lidar. The area mapped as landslide is terraced suggesting there may be creep or shallow-depth movement of the ground in this area. The affected soil does not appear to extend more than about 2 or 3 feet deep.

ROCKFALL EVALUATION

There are outcrops of basalt above the property with some areas of rock that could potentially become dislodged, particularly during a major earthquake, and result in rockfall hazard for the proposed development. The rocks are generally less than 5 feet in size. The approximate extent of the rockfall hazard is presented on Figure 2. This is based on field observation and experience with similar sites in the area. The extent of the potential rockfall hazard cannot be well defined due to land disturbance and likely removal of rocks in the runout zone.

The area planned for buildings could be protected from rockfall hazards by constructing a barrier along the uphill side of the development or removal of the source rocks.

The rockfall-protection berm, assumed to be constructed just up slope of the west and northwest cut slopes for the development, should have a height of at least 8 feet, a top width of at least 6 feet and an upslope face of ½ horizontal to 1 vertical or steeper. It is important to have a steep upslope face for the berm so rocks are not directed over the berm. The berm should be reinforced using geogrid to maintain a steep upslope face. The reinforcement spacing and slope construction will depend on the type of fill used and reinforcement selected. Internal design of the berm reinforcement could be provided upon request.

LANDSLIDE EVALUATION

The landslide on the northwest side of the property appears to be less than 2 or 3 feet deep and is not expected to be a hazard for the proposed development if slopes are adequately reinforced. This should be evaluated in the geotechnical study for the site.

OTHER GEOLOGIC HAZARDS

Other geologic hazards considered for this study are debris flow and fault rupture. Based on geologic mapping for the area, our site reconnaissance, and review of aerial photographs and lidar data, these are not considered hazards at the site.

LIMITATIONS

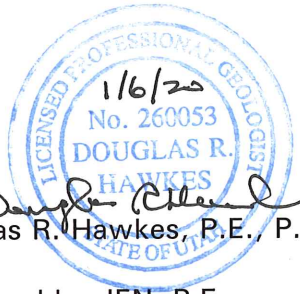
This letter has been prepared in accordance with generally geologic engineering practices in the area for the use of the client. The conclusions and recommendations included in the letter are based on conditions observed during our field study, topographic information provided and

our experience with similar type projects. If conditions are significantly different from those described in this letter, we should be notified to reevaluate the recommendations given.

If you have questions or if we can be of further service, please call.

Sincerely,

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

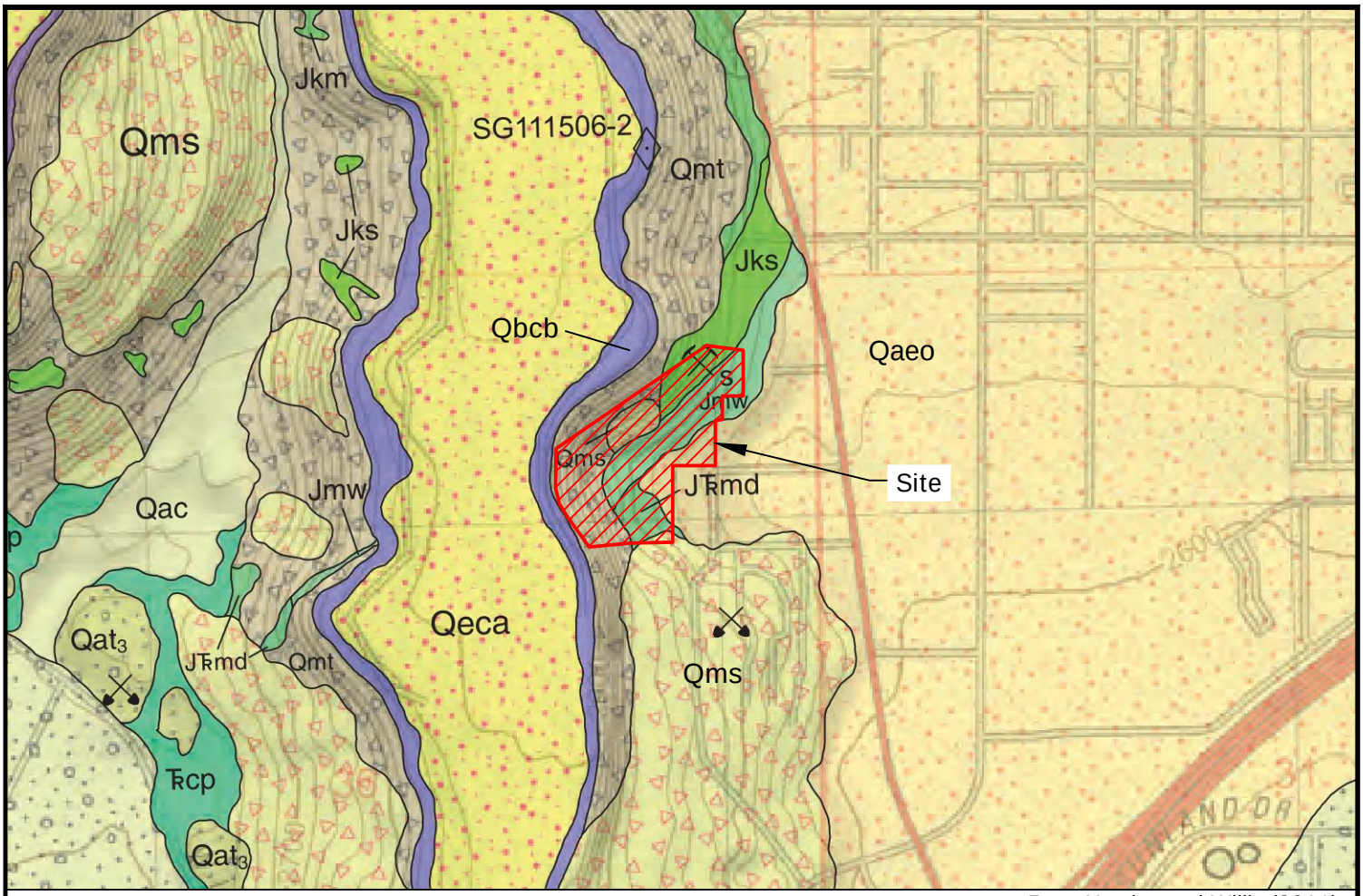


Douglas R. Hawkes, P.E., P.G.

Reviewed by JEN, P.E.
DRH/rs
Enclosures

Reference:

Hayden, J.M. and Willis, G.C., 2011; Geologic map of the St George 7.5' quadrangle, Washington County, Utah, Utah Geological Survey Map 251DM.



From Hayden and Willis (2011)

EXPLANATION OF SYMBOLS AND GEOLOGIC UNITS IN AREA OF PROPOSED DEVELOPMENT

Qmt - Talus deposits (Holocene to upper Pleistocene)

Qms - Landslide deposits (Holocene to middle Pleistocene).

Qeca - Eolian and alluvial deposits with thick calcic soil on lava flows (Holocene to lower Pleistocene).

Qaeo - Mixed alluvial and eolian deposits (Holocene to middle Pleistocene).

Qbcb - Cedar Bench lava flow (lower Pleistocene)

Jks - Springdale Sandstone Member of the Kayenta Formation (Lower Jurasic)

Jmw - Whitmore Point Member of the Moenave Formation (Lower Jurassic)

JTrmd - Dinosaur Canyon Member of the Moenave Formation (Lower Jurassic to Upper Triassic).

——— — — Geologic contact between units, dashed where approximate.

Normal fault, bar and ball on down thrown side, dashed where approximate, dotted where concealed.

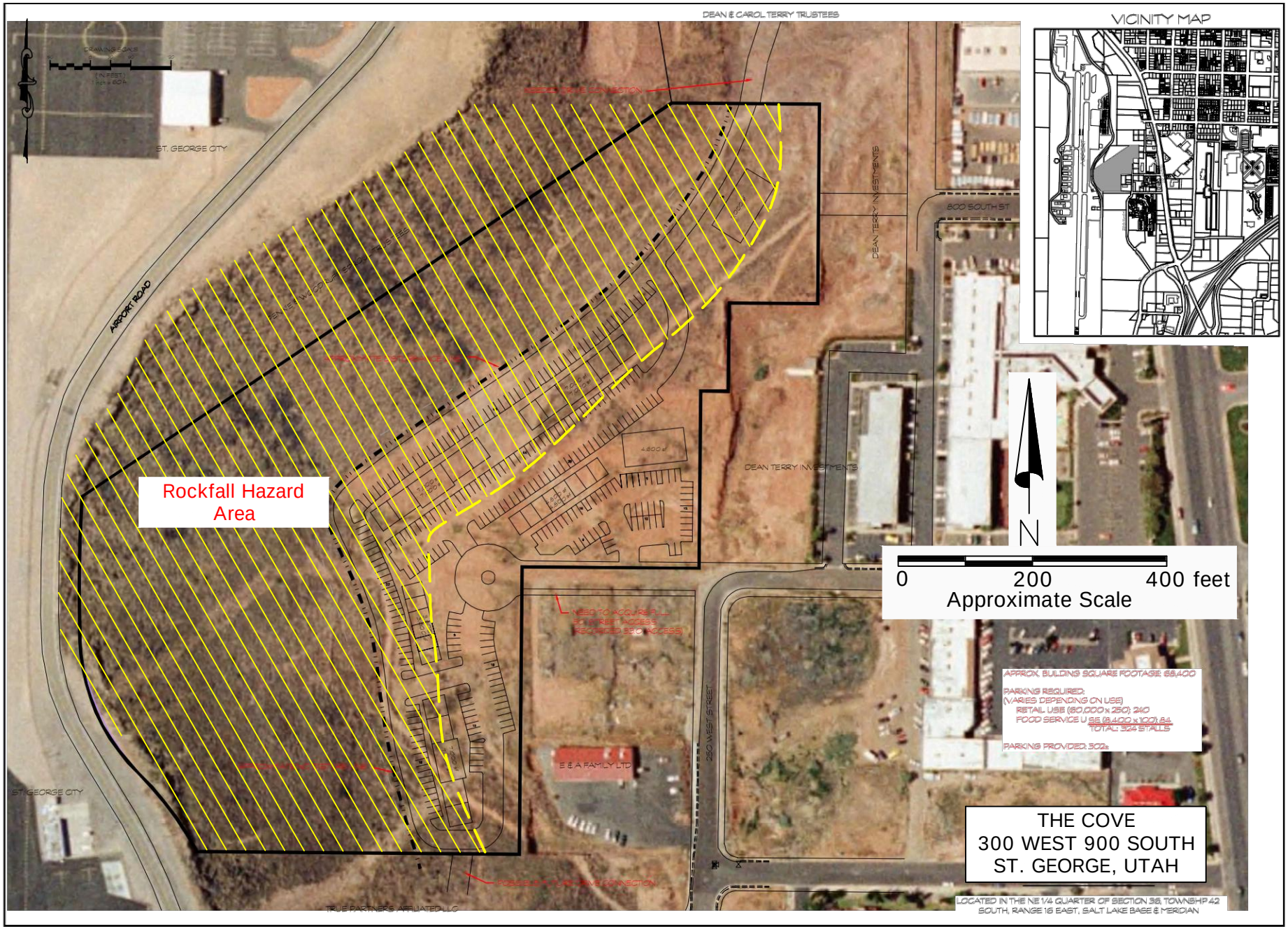
N

0 1000 2000 feet

Approximate Scale

THE COVE
300 WEST 900 SOUTH
ST. GEORGE, UTAH

2192092	AGEC	Geologic Map	Figure 1



2192092	AGEC	Rockfall Hazard Area	Figure 2

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

PRESENT:
James Dotson
Dave Black
Jeff Mathis

EXCUSED:
James Sullivan
Russ Owens

CITY STAFF:
Assistant Public Works Director Wes Jenkins
Planner III Dan Boles

APPLICANT:
Adam Allen
Wayne Rogers
Nathan Peterson
Todd Smith

The agenda for the meeting is as follows:

1. Consider a request for a Hillside Development Permit on Netta's Knoll. The property was originally considered for hillside approval in 2005 and again in 2018 but to this point has not been developed. The property is generally located on the south-east intersection of Riverside Drive and Foremaster Drive. The property is currently zoned R-2 (Residential multi-family). The owner is Sierra Health Services. Case No. 2021-HS-004.

   Adam Allen – We are looking at it a bit differently than the previous people, it's currently zoned R-2, others were trying to put a denser development in there. We are trying to keep the amount of stuff up there to a minimum. We will be disturbing as much or more than before. I want to talk about the most dramatic stuff we're doing on the bottom end. We want to cut the top off and use that dirt to fill down here, to try and make it step up the hill. It will look a lot like Stone Cliff at this angle, so it isn't creating a lot of extra ridgeline. Along the top we went as high as we could go, making sure we could maintain this intersection and then come around and tie this back in.

   Jeff Mathis – That was one of the questions I had, can you get your site distance on those?

   Adam Allen – I'd have to look at the site distance coming up the hill, but from the intersection going in and out you'll have your site distance. There will be some restrictions on how much landscaping they will be able to have down there.

Jeff Mathis – Site distance intersection with retaining walls and slopes is 260 feet, that's what the hillside ordinance says.

Adam Allen – Yes, we might have to cut that slope back and change it into some retaining so that we can see in there. So, we will raise this up almost 8 to 10 feet. As of right now, we are trying to maintain the look of the ridgeline, my thoughts were, that if that top is gone it's not going to really change the look of it. And that's why it will be built up there to kind of try to maintain a continuous ridgeline.

Wayne Rogers – So it is just easier for us to knock it out, but we're trying to maintain some of the hillside look and so forth at this point.

Jeff Mathis – So is that why you've gone over the 40% in all these areas? Because of what you just said?

Adam Allen – I am going through a specific elevation of 30, there is a little bit of that where it's a little steeper and you touch those rocks. Coming down farther it's cutting down so much that there is 20-foot steps and that's why I didn't come right here and cut an extra 20 feet off of this portion right there.

Dave Black – I think from a Hillside Committee standpoint, that would be hard to say no to because it kind of buffers it. If it is going to be there on the plans then we would agree to it, I just want to make sure it happens because it looks a little problematic. It's going to be fairly expensive to put those walls from the back and can you in reality put the walls with stacking block without some other things behind it. So, you probably need to look at it and see if it's feasible to construct it. How could we say no from a Hillside but if we say yes then we have to be there for the construction. It would be easier just to pull it off.

Wayne Rogers – How would you feel about that? Would that be an issue?

Discussion on what is agreed to and that it will follow through with construction.

Dave Black – When you are cutting and getting close to these slopes, the tendency is for the guy on the dozer or whatever is to go over the top and we get, so all that stuff has to be pulled back, because all that stuff needs to be prevented from going over. Because as soon as it goes over how do you address it?

Todd Smith – We could probably put a silt fence at the no disturb line that absolutely cannot be touched, or we will fine the contractor.

Dave Black – Is there a mitigation or something, if oops this happened?

Wayne Rogers – There is a bonding thing or whatever it is that goes with the hillside ordinance, and that's part of the restoration. I guess you could tie that to it. Whatever that bond is.

Discussion continued on working on the edges and keeping the ridgeline aesthetic on the other side.

Dave Black – I don't think 18 feet is feasible.

Wes Jenkins – What is the concern?

Wayne Rogers – Right now these are being cut back into the edge of this hill, so instead of chopping that off flat, we have left a ridge up and over right there.

Jeff Mathis – What is our guiding principle as the Hillside Board? Do we try to maintain a ridgeline, or do we not care?

Wes Jenkins – Whatever the ridgeline is, it's established. The City years ago established a ridgeline map. On the map that was approved by City Council they did certain areas where the ridgeline has a 50-foot setback.

Jeff Mathis – Oh, ok, so the rule doesn't apply to this because this is a plateau of 30 feet.

Wes Jenkins – What happened is, if it doesn't show up on that map, which this isn't then it goes to the 30 feet.

Wayne Rogers – I think if we leave the conglomerate ridgeline alone, then you'll see a housetop but not the whole back yard.

James Dotson – So what are we talking about, as far as the pad versus what that ridge is going to be left at?

Adam Allen – These top two lots I'm cutting the ridge at the pad, because it's pretty much just a little bit above the top of that conglomerate. You can tell right here that I can't go up any higher. And then here at this pad it is about 18 feet lower than that top ridge, at what I've currently got designed and that's what we're talking about maybe doing a little different. From a visual standpoint this ridgeline will look like it's continuing on down.

Discussion on where there really isn't a ridgeline.

Wayne Rogers – When we ran the stability analysis we were below the 1.5 if we just do nothing to the ground and fill on top of it. We will have to go in and over ex down to the clay and put a reinforce zone through there to make that stability get up to the stable point.

Discussion on material to use to reinforce the walls.

Wes Jenkins – Let me give you a little feedback, we took the one we just did off of Sunset to Council and it was tabled, they were concerned about that slope. It was all about aesthetics, they want to know what it is going to look like. It will be a very visual thing here; the Council is probably going to want to see what this looks like.

Jeff Mathis – I think Dave is right on the money, you don't make it straight, you don't make it flat, you undulate it and make sure it blends in.

Dave Black – And you can do that with concrete or natural, but you have got to pick the right stuff and the right colors. I think you are going to need a few color illustrations.

Todd Smith – That's no problem, we can do that. We can build a 3-D model so they can look at it.

Discussion of how to show what they will do with the walls.

Wayne Rogers – These are walk outs on this side, there has been a real tendency for some people to say I just want a slab on grade and not build a walk out. That has to mandatory, unless we change how we prep the lot and the stability of it. That much more fill weight on top of the edge right there is a whole different design for how we do it. If they do come back and want a slab on grade, that has to be reevaluated or you just draw the line.

Todd Smith – I think that is much simpler than reevaluated, it's just sorry if this doesn't work for you we understand, there are tons of other places you can buy ½ acre lots and build.

Dave Black – We will have to have the contingency in a motion that they must be able to meet the 1.5 factor of safety. It's a stability issue with the walk out basements, plus it makes the wall higher.

Wayne Rogers – I have reviewed and went over them all, we can do a sub grade treatment and make the less than 1.5 to come up and if we get that to a higher strength it will easily come into the 1.5. We just didn't show it because at that point we know we can make it work, we just didn't know how we wanted to do it.

Dave Black – So is the City comfortable with that?

Wes Jenkins – So does a walk out option then get you to a 1.5 easier than a slab on grade?

Wayne Rogers – Yes.

Wes Jenkins = So then I think we just hold to that.

Todd Smith – We will make a note on the plat. It is the agent making the right representation to the buyer, you absolutely cannot change this, I don't care if you're building in 2 years or 5 or 12. It's never going to get approved.

Dave Black – Whatever we do on the other side will need to be reflected by the agent.

Wayne Rogers – And that can be notes on the plat that Adam puts on there. That can guarantee.

Todd Smith – And so at the end of the day, we will have covenants and so we will make it a function of the covenants as well. If the architectural committee doesn't sign off on the plans then they don't get a building permit so we can make sure those stay intact.

Wayne Rogers – Great, those are good mechanisms.

Dave Black – What do you think the City Council is going to want to see concerning the hill striations? Are they going to just want this view? Are they going to want a view that is coming off Foremaster? Are they going to want a view on the other side of Riverside Dr?

Todd Smith – I think we will do several.

Dave Black – On some of the lots on the side lots, there is quite a bit of elevation change, and I think on some of those walls, probably any wall that is 4 feet or greater, should be built with the development.

Todd Smith – We are building all the walls, every single wall that's on here. And that will be another thing, whatever we decide on material whatever we decide we are ok with, all of them will be that.

Wayne Roger – The other thing to is that these lots are big enough that if there is a subgrade treatment that needs to happen from a Geotech standpoint, we are not going to do it upfront until we know where the house goes. Like an over ex or piers, whatever.

Wes Jenkins – So you are going to mass grade this to the elevations right?

Wayne Rogers – There may be some areas that aren't quite perfectly level. We will get the walls built and then get it up to grade, and then when they do their house…

Discussion continued on grading.

The Hillside Review Board and Dan Boles took a truck to look at the lay of the site, the conversation in the truck was not pertinent to this item.

Dave Black – We could recommend for approval, recommend denying or recommend approval with conditions.

Discussion surrounding walls.

MOTION: Dave Black made a motion to recommend approval of the Knetta's Knoll project as presented with the following conditions: 1. That they demonstrate that they can obtain a safety factor of at least 1.5 on the east side of the development with the tall retaining walls. 2. Where they show walk out basements, that needs to be a mandatory walk out basement, needs to be on the plat identified, otherwise it affects the stability of those lots, so they need to stay as designed. 3. The contiguous 40% slope areas need to be avoided, mainly on the south side and south-west side on lot 10 and 11. 4. That they will build interior side walls at the time of construction. 5. The retaining walls on the east side of the project should have renderings to look at aesthetics. That is a key issue and concern for the Hillside. They should do what they can to break up long continuous walls, that they match color and they come up with an aesthetically pleasing material that is approved by the Council. 6. On the interior of the project there are some isolated areas of 20%, 30% and 40% slopes. They are in the opinion of the Hillside Review Board not contiguous and may be disturbed as part of the development.
SECOND: James Dotson
AYES (3)
James Dotson
David Black
Jeff Mathis
NAYS (0)
Motion carries.

2. Consider approval of the meeting minutes from April 21, 2021.

MOTION: Dave Black made a motion to accept the minutes.
SECOND: Jeff Mathis
AYES (3)
James Dotson
David Black
Jeff Mathis
NAYS (0)
Motion carries.

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

PRESENT:
James Sullivan
Russ Owens
Dave Black
Jeff Mathis

EXCUSED:
James Dotson

CITY STAFF:
Assistant Public Works Director, Wes Jenkins
Planner III, Mike Hadley
Development Office Supervisor, Brenda Hatch

APPLICANT:
Bob Hermandson
Wayne Rogers

The agenda for the meeting is as follows:

Chair James Sullivan called the meeting to order at 8:34 am.

Consider a request for a Hillside Development Permit on Twin Lakes. The property is located east of Twin Lakes Dr approximately between 700 N and 800 N. The property is currently zoned Open Space & R-3 (Residential multi-family). The owner is Twin Lakes Rhino LLC. Case No. 2021-HS-006

Jeff Mathis – Just so you guys know I'm working on the project with Bob and his group as well doing the preliminary architecture design. I don't know if that is a problem for anybody, but if you want me to step back, in my mind I can be pretty objective. Any thoughts on that?

Dave Black – I think it's appropriate that you have at least bring it up in front.

James Sullivan – Yeah, I appreciate that.

Wayne Rogers – I would say it would be a conflict if the design of the buildings affected the hillside, but other than that, no.

Dave Black – Yes, James has had some conflicts like that where he's been the landscape architect. I think it's appropriate to declare it.

Jeff Mathis – There would be a quorum without me, so if you want me to step back, then I will.

James Sullivan – I think we're good with it.

Bob Hermandson – So obviously this is the old Twin Lakes golf course. This is what is left of the old golf course. They had three holes right here. This has just been sitting forever. My office did all the work from the beginning, so we have been involved for a long time. Now it is just a remnant parcel that we are trying to clean up. The proposal is to, we looked at several different options, none of them felt great. I feel like in the end this is the right option. The reason that I parked right here is because you can see it really well and this is also the entrance to the road that goes onto these and ties into that intersection. The configuration didn't work to leave it low, so we are just going to fill this whole thing up so that the road is literally draining straight through to here, you can see it's slightly higher than here, about 7 feet higher. You have two constants that are existing here, the upper cut, the old Middleton Drive. If you walk up there, there is existing asphalt still. It's part of the City's master plan for a trail that will be built in the future at some point. Right now, it is just the old asphalt road. The lower cut that is right here, that is just one step down, that is the old highway that goes through the tunnel. The asphalt is still there, it's in much rougher shape, it's much older, but it's still there. Below this is all of the remanent of the golf course. The thought is the existing second cut, the old highway that goes through the tunnel, we would make about a 10-foot bench on the existing road that is there, and then come down at roughly 1.5 to 1 based on Wayne's recommendation. The rest of the site will get infilled to build this whole thing up. There is a ton of fill for a little tiny project. In the end of the day, we end up with a public street here and a public street there. We won't be tucking any of these buildings up against any hillsides, we're not doing that there is plenty of gap, plenty of space. We are basically splitting the difference by bringing this up and bringing that down to make that match this fill. (Bob described where the units will sit and where the roads will be.) The rest of that is all the rocks that are in here, the intent is to use them as retaining walls as we work our way through there. As far as the rock fall goes, I'm happy to provide a bench along there, there is plenty of room. In addition to that the thought was that if there is any rocks that Wayne felt like they might be of risk, we are happy to pick them off one by one, do whatever manually. The intent of this group is to keep this as rentals for eternity, so we want no risk. We want to lower it down as much as possible, even if it's above the exposure limits of what Wayne is recommending. We just want to make it as best we can.

Russ Owens – So on the scaling of the rocks, do you have any authority to do that up above your property?

Bob Hermandson – We do the project above as well, so whatever needs to happen, I have met with them, and they are happy to work with us. However, because of that study, and that these benches exist, it's pure coincidence, right? The two old roads across this hillside are just an anomaly, and Wayne can go deeper into that. The rockfall

never gets down here. If we need to provide an extra 10 feet on the highway, no problem, we're happy to do that too.

Wayne Rogers - Dave and I just discussed it this morning actually, where the second bench came in, we will look at that a little closer, we will do whatever it takes to make that second bench work. The problem with picking rocks is where do you start and stop. If you pick one out then it affects the one above it.

Dave Black – From a hillside aspect too, you might get into the you might get into disturbance, and we like it undisturbed. Ideally if you can come up with an alternative option then it may be the better option.

Wayne Rogers – The other thing too is that the rock fall doesn't encroach into the units until it gets right around this bend over here, and it's actually a splatter over there so we have a lot more options, we can stack a bunch of rock in that or something just as an extra berm. We will make sure that, really it's the two units there and then the three units here, but with the bench it should help tremendously on that side.

Jeff Mathis – It looks like the old highway has already caught a couple of rocks.

Wayne Rogers – Yeah, it has.

Dave Black – The report that was submitted, is a preliminary so I would thing that as a part of our motion we will need to have the final report that specifically address the mitigation plan. That way you have identified the concern, and then give a specific mitigation for that concern.

Wayne Rogers – Ok.

Dave Black – And then the final Geotech report, that you also address that you will sustain the cut slopes and stuff like that.

Wayne Rogers – Right, the way we're filling this up, these slopes pretty much go away.

James Sullivan – So you won't be touching the existing dirt cut that is above the highway up there?

Bob Hermandson – Correct. We don't want to go there, it just doesn't, it just never ends, right? The further up it just continues to get worse and so you don't gain anything.

Dave Black – They will be using the old highway as a bench, so they won't be disturbing above that.

Bob Hermandson – That's exactly what we want, that's where our slope catches anyway, we will just leave it that bench and then if we need an extra 10 feet so be it.

Wayne Rogers – We really don't want to do Jersey barriers, like they did over there, it doesn't look as good. We will just leave the bench instead.

Dave Black – That lower bench has some rocks on it, so I think is shows the test factor for rocks to come down. Also, that bench seems to be performing well. Sometimes you look at these and say those rocks have been there forever, they won't come down, but they do. After heavy rains and stuff like that.

Russ Owens – So drainage you will have an upper swale that goes at the top of the project and then the roadway will come through?

Bob Hermandson – We will now, because all along this new toe, right, to catch the hillside runoff. Which is another reason why the units on that layout aren't backing up against that hillside. We pulled them off so you can have full access to maintain it. We will have to maintain it forever as well. All of that drainage gets into these roads and then goes down into the system. If we are going to put a bench up there then we could also put one in the corner. The reason that exists is because of the road, the curve ending up there. That's the only reason that depression zone exists, otherwise we would have pushed units up in there. There is a little swale right there that catches it. To make sure it stays there and goes right into the system. Then the overland comes through there then to detention and then straight into the road then into the system, get underground and get out of here. That's the thought to mitigate it.

Discussion on drainage and how it will be mitigated continued.

Jeff Mathis – Aren't you going to have to improve that side of the road?

Bob Hermandson – It will be eventually, but it will not be a part of this project. We worked that out with the City through a whole bunch of discussions over the last year of the improvements of this. As far as that goes. We were designing this entire road, we are doing the fill for the road, we are doing the retaining wall for the road, but then the actual finish improvements will be part of a much larger project which will fix all of this and eventually get to the north corridor. We are doing a portion of it, yes, the grading and the little bit of retaining that will be right here.

Jeff Mathis – You're going to put in this section of sidewalk?

Bob Hermandson – I think we will have to do this section, but not this section.

Discussion continued regarding roads.

James Sullivan – So water was found in the test pit, are you not concerned about that?

Dave Black – How much fill do you put in that area?

Bob Hermandson – If I remember right it's about 10 feet in the hole, where the tree is there.

Wayne Rogers – There is a little down deeper, we are never going to get to it, so I don't worry about it.

Bob Hermandson – I don't have a building or structure on it intentionally, that's where the drainage is going.

Wayne Rogers – There is a reason that tree is there, I most of it is probably trapped water, just run off going down and it's just sitting in there. I don't think there are any springs right through this property.

Bob Hermandson – There is nowhere for any of it to get out of this little basin.

James Sullivan – Does anyone have any other questions, or can we entertain a motion?

MOTION: Dave Black mad a motion to recommend for approval the Twin Lakes Townhomes project as presented to us with the following conditions: 1. The final Geotechnical investigation reports specifically address the rock fall mitigation plan and any stable cut slopes 2. Any retaining walls should be as such to match the esthetics of the basalt boulders will be acceptable, ideal as much as possible 3. In our opinion the proposed grading plan cuts into 40% slopes that are not contiguous and/or were manmade from previous disturbance and we have no concerns with the grading plan.
SECOND: Russ Owens
AYES (4)
James Sullivan
Russ Owens
Dave Black
Jeff Mathis
NAYS (0)
Motion carries.

ADJOURN

MOTION: James Sullivan made a motion to adjourn at 8:57 am
SECOND: Jeff Mathis
AYES (4)
James Sullivan
Russ Owens
Dave Black
Jeff Mathis
NAYS (0)
Motion carries