ALPINE CITY PLANNING COMMISSION MEETING

NOTICE is hereby given that the **PLANNING COMMISSION** of Alpine City, Utah will hold an **Electronic Meeting** on **Tuesday, June 2, 2020 at 7:00 pm.** Meeting will be anchored from **Alpine City Hall,** 20 North Main, Alpine, Utah.

The public may view and participate in the meeting via the **Alpine City YouTube Channel**. A direct link to the channel can be found on the home page of the Alpine City website: **alpinecity.org**

Public Comments may be submitted to **admin@alpinecity.org** Comments for an item on the agenda may be submitted during the meeting and **comments for an item not on the agenda must be submitted by 5:00 pm the day of the meeting**.

I. GENERAL BUSINESS

A. Welcome and Roll Call:	Jane Griener
B. Prayer/Opening Comments:	Ethan Allen
C. Pledge of Allegiance:	John Mackay

II. PUBLIC COMMENT

Any person wishing to comment on any item not on the agenda may address the Planning Commission at this point by Submitting a public comment to admin@alpinecity.org and include his or her name and address for the record.

III. ACTION ITEMS

A. Public Hearing – Ordinance 2020-12: Trail Committee and Trail Ordinance
Proposed update to the ordinance to refer to the Trail Committee instead of the PRO Committee.

B. Public Hearing – Plat Amendment – Alpine View Estates Plat B
Proposed update to plat, adjusting the boundary between private property and public open space, to accommodate final trail alignment.

C. Public Hearing – Plat Amendment – Summit Pointe Amended Plat B
Proposal to create an 8-lot subdivision on the west end of Lakeview Drive.

D. Ordinance 2020-04: Business Commercial Setbacks
City Council has asked the Planning Commission to address setbacks for mixed use buildings.

E. Discussion – Bangerter & Burgess Properties
Planning Commission will discuss the future of the Bangerter and Burgess properties off Alpine Highway.

F. Discussion Cont. – Limitations on Size of Lots and Structures in the City
Planning Commission will continue discussion on size of homes, additions, accessory buildings, and lots.

IV. COMMUNICATIONS

V. APPROVAL OF PLANNING COMMISSION MINUTES: May 19, 2020

ADJOURN

Chair Jane Griener
June 2, 2020

THE PUBLIC IS INVITED TO ATTEND ALL PLANNING COMMISSION MEETINGS. If you need a special accommodation to participate in the meeting, please call the City Recorder's Office at 801-756-6347 ext. 5.

CERTIFICATION OF POSTING. The undersigned duly appointed recorder does hereby certify that the above agenda notice was posted at Alpine City Hall, 20 North Main, Alpine, UT. It was also sent by e-mail to The Daily Herald located in Provo, UT a local newspaper circulated in Alpine, UT. This agenda is also available on the City’s web site at www.alpinecity.org and on the Utah Public Meeting Notices website at www.utah.gov/pmn/index.html.

PUBLIC MEETING AND PUBLIC HEARING ETIQUETTE

Please remember all public meetings and public hearings are now recorded.

- All comments **must** be recognized by the Chairperson and addressed through the microphone.
- When speaking to the Planning Commission, please stand, speak slowly and clearly into the microphone, and state your name and address for the recorded record.
- Be respectful to others and refrain from disruptions during the meeting. Please refrain from conversation with others in the audience as the microphones are very sensitive and can pick up whispers in the back of the room.
- Keep comments constructive and not disruptive.
- Avoid verbal approval or dissatisfaction of the ongoing discussion (i.e., booing or applauding).
- Exhibits (photos, petitions, etc.) given to the City become the property of the City.
- Please silence all cellular phones, beepers, pagers or other noise making devices.
- Be considerate of others who wish to speak by limiting your comments to a reasonable length, and avoiding repetition of what has already been said. Individuals may be limited to two minutes and group representatives may be limited to five minutes.
- Refrain from congregating near the doors or in the lobby area outside the council room to talk as it can be very noisy and disruptive. If you must carry on conversation in this area, please be as quiet as possible. (The doors must remain open during a public meeting/hearing.)

Public Hearing vs. Public Meeting

If the meeting is a **public hearing**, the public may participate during that time and may present opinions and evidence for the issue for which the hearing is being held. In a public hearing there may be some restrictions on participation such as time limits.

Anyone can observe a **public meeting**, but there is no right to speak or be heard there - the public participates in presenting opinions and evidence at the pleasure of the body conducting the meeting.

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: **Public Hearing – Ordinance 2020-12: Trail Committee and Trail Ordinance**

FOR CONSIDERATION ON: **2 June 2020**

PETITIONER: **Staff**

ACTION REQUESTED BY PETITIONER: **Hold a public hearing, review the proposed ordinance and make a recommendation to City Council.**

BACKGROUND INFORMATION:

The Development Code needs to be updated. There are a few spots where the code still refers to the Parks, Recreation, and Open Space (PRO) Committee. This committee no longer exists, and responsibilities referred to in the code are now handled by the Trail Committee. Proposed update replaces all references to the PRO Committee with the Trail Committee.

STAFF RECOMMENDATION:
Hold a public hearing, review and discuss Ordinance 2020-12 and make a recommendation to City Council.

SAMPLE MOTION TO APPROVE:
I motion to recommend that Ordinance 2020-12 be approved as proposed.

SAMPLE MOTION TO APPROVE WITH CONDITIONS:
I motion to recommend that Ordinance 2020-12 be approved with the following conditions/changes:

- ***Insert Finding***

SAMPLE MOTION TO TABLE/DENY:
I motion to recommend that Ordinance 2020-12 be tabled/denied based on the following:

- ***Insert Finding***

ALPINE CITY
ORDINANCE 2020-12

AN ORDINANCE ADOPTING AMENDMENTS TO ARTICLES 3.17.070; 3.17.110; 3.17.130 OF THE ALPINE CITY DEVELOPMENT CODE PERTAINING TO THE TRAIL ORDINANCE AND TRAIL COMMITTEE.

WHEREAS, The Alpine City Council has deemed it in the best interest of Alpine City to update the trail ordinance; and

WHEREAS, the Alpine City Planning Commission has reviewed the proposed Amendments to the Development Code, held a public hearing, and has forwarded a recommendation to the City Council; and

WHEREAS, the Alpine City Council has reviewed the proposed Amendments to the Development Code:

NOW THEREFORE, be it ordained by the Council of Alpine City, in the State of Utah, as follows: The amendments to Articles 3.17.070; 3.17.110; and 3.17.130 will supersede Article 3.17.070; 3.17.110; and 3.17.130 as previously adopted. This ordinance shall take effect upon posting.

SECTION 1: **AMENDMENT** "3.17.110 Enforcement" of the Alpine City Development Code is hereby *amended* as follows:

AMENDMENT

3.17.110 Enforcement

1. **Subdivision Approval Stage**
    a. Trail designations and ownership shall be included on all plats and recorded on deeds.
    b. Trail signs shall be provided by the City. These signs shall indicate City-owned trails and penalties for misuse or damage.
    c. Developers are required to stake, clearly tape off and post signs marking all trail corridors prior to the start of construction. The site may be walked by City staff, ~~PRO~~ Trail Committee, Planning Commission, and City Council.
    d. A bond to be approved by the City Engineer shall be posted by the developer against damage to public trails during construction.
2. **Before Bond Release**
    a. Developers shall ensure that tapes and signs are in place continuously during construction. The tapes and signs shall remain in place until bonds are released. They shall be replaced if necessary if damaged or lost from other causes.
    b. Developers will be assessed a fine if damage is done to publicly owned areas by

their sub-contractors or their agents, and they will be required to restore the area(s) at their cost to the satisfaction of the City Engineer.

3. **Before Building Permit is Issued**
    a. Before building permits are issued, all potential homeowners with property adjacent to trails shall bond, (amount to be set by City Engineer) for any and all damage done to public property caused by the owner and/or his contractor or agents during home construction.
    b. Public trails must be staked, clearly taped and marked with signs so that all construction crews will be aware of these public lands.
    c. A copy of this ordinance shall be provided to the property owner when the building permit is issued.
4. **Before Occupancy Permits are Issued**
    a. All damage to public trails and/or improvements upon it caused by home construction must be repaired by the homeowner at his or her expense.
    b. If construction is completed during winter and weather prohibits replanting or other restoration, an additional bond may be posted to be held until repairs are approved by the City Administrator. The amount of bond is to be determined by the City Engineer.

(Ord. 99-08, 8-10-99; Amended by Ord. 2004-11, 7/13/04; Ord. 2008-05, 7/22/08; Ord. 2009-06, 4/28/09)

SECTION 2: **<u>AMENDMENT</u>** "3.17.130 Trail Safety And Etiquette" of the Alpine City Development Code is hereby *amended* as follows:

AMENDMENT

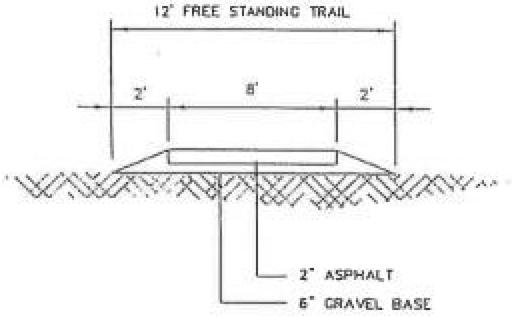
3.17.130 Trail Safety And Etiquette

1. **Purpose**. The purpose of this Ordinance is to secure the safe, quiet, orderly and suitable use and enjoyment by the public on Alpine City Trail, and to ensure the public's right quiet, lawful enjoyment, both users and homeowners.
2. **General Restrictions**
    a. Trails will be closed between dusk and dawn. This excludes the trails in all City parks and sidewalks designated as trails.
    b. Do not serve, possess, or consume any alcoholic beverages or illegal drugs within or upon the Trail Corridor.
    c. No discharge of any weapons.
    d. No Fires, Fireworks and Smoking along the trail corridor.
    e. No Dumping or any discharge of waste.
    f. Do not remove, alter, injure or destroy the natural resources in city open spaces and trail corridors (rocks, flowers, trees, etc.).
    g. No operation of motorized vehicles except in designated areas. Motorized

vehicle trails shall be closed from dusk to 7:00 am.

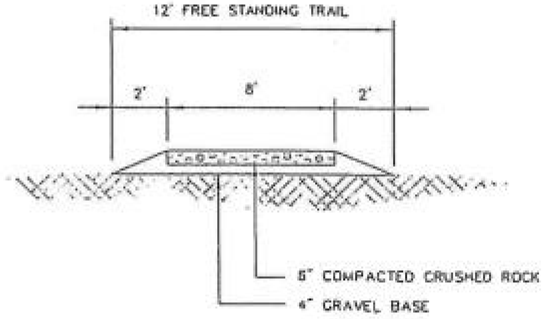
   h. All dogs must be leashed except within the boundaries of Lambert Park.
   i. Trail users shall not leave the trail corridor and enter on private property without permission of the landowner.
   j. New trails and trail realignments shall be approved by the City.
   k. Nothing will be constructed or placed to restrict the trail right of way.
   l. Any abuse of the above restrictions could result in closing the trail by the City.

3. **Trail Etiquette**
   a. Stay on established, marked trails.
   b. Do not cut cross country where there are not trails.
   c. Try to prevent widening of trails.
   d. Bikers yield to Hikers, both yield to horses. Motorized vehicles yield to all.
   e. Do not enter private property.
   f. Keep noise level appropriate.
   g. Keep speed under control.
4. **Trail Events**. Any organization wishing to use Alpine City trails must post a refundable deposit for events such as races, etc. to protect against the damage to public trails and clean-up costs. The refundable deposit shall be set by the Alpine City Council on the City Fee Schedule. Alpine City Council shall approve the trail/course to be used in the event. Alpine City shall not take responsibility for injury resulting from said activities.
5. **Trail Watch**. The Alpine City ~~PRO~~ Trail Committee is charged with the job of creating and overseeing the trail-watch program. The trail-watch program shall be created too provide a safe city trail system. The trail-watch program shall consist of the following four categories: 1) volunteer patrols, 2) trail maintenance reporting system, 3) better signage, and 4) training and notifying the public on various trail issues including what to do in an emergency or how to report on general trail problems.



CLASS B 8' ASPHALT TRAIL CROSS-SECTION

N.T.S.



CLASS C 8' CRUSHED ROCK TRAIL CROSS-SECTION

N.T.S.

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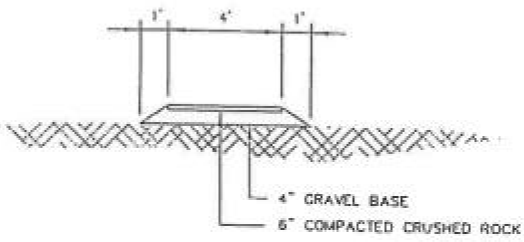
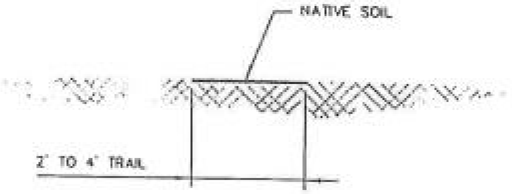
ALPINE CITY
STANDARD DRAWIN



CLASS D 4' CRUSHED ROCK TRAIL CROSS-SECTION

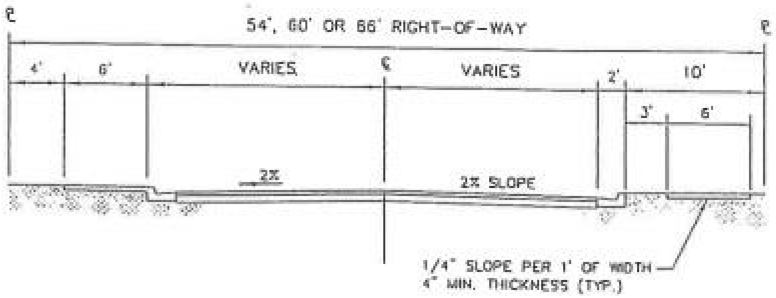
N.T.S.



CLASS E 2' DIRT TRAIL CROSS-SECTION

N.T.S.

ALPINE CITY
STANDARD DRAWING
FIGURE X-X



ALPINE CITY RESERVES THE RIGHT TO DETERMINE WHETHER THE COMBINATION OR PLANTER STRIP OPTION WILL BE CONSTRUCTED ON A CASE-BY-CASE BASIS.

CLASS A 6' SIDEWALK TRAIL CROSS-SECTION

N.T.S.

ALPINE CITY
STANDARD DRAWING
FIGURE X-X

S:\STANDARD\CITIES\ Trail_A.dwg 03/02/99 12:13 jmcrm

(Ord. 99-08, 8-10-99; Amended by Ord. 2004-11, 7/13/04; Ord. 2008-05, 7/22/08; Ord. 2009-06, 4/28/09)

SECTION 3: **AMENDMENT** "3.17.070 Trail Definitions And Designations" of the Alpine City Development Code is hereby *amended* as follows:

AMENDMENT

3.17.070 Trail Definitions And Designations

1. **Definition of Trail Types**. The following definitions include the types of trails allowed in the Ordinance. (See Appendix A for cross sections of the trail types.)
   a. Class A: Six (6) foot sidewalk.
   b. Class B: Eight (8) foot asphalt trail.
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   b. All trail corridors shall be a minimum of 20 feet in width and shall be on land deeded to Alpine City in fee simple or on trail easements obtained by the City.
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PASSED AND ADOPTED BY THE ALPINE CITY COUNCIL
________________________________.

	AYE	**NAY**	**ABSENT**	**ABSTAIN**
Lon Lott	_______	_______	_______	_______
Carla Merrill	_______	_______	_______	_______
Gregory Gordon	_______	_______	_______	_______
Jason Thelin	_______	_______	_______	_______
Jessica Smuin	_______	_______	_______	_______

Presiding Officer	Attest
________________________________	________________________________
Troy Stout, Mayor, Alpine City	Charmayne G. Warnock, City Recorder Alpine City

ALPINE CITY
ORDINANCE 2020-12

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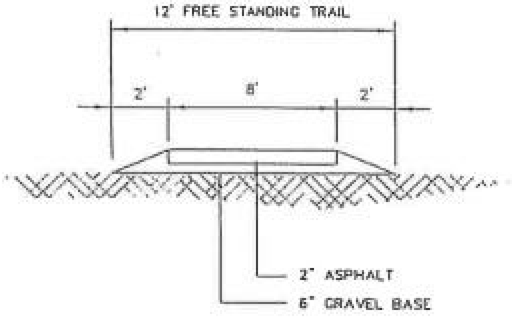
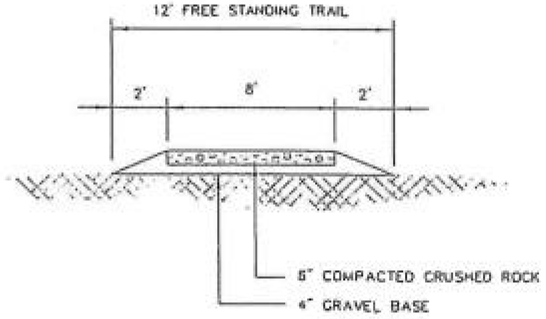


CLASS B 8' ASPHALT TRAIL CROSS-SECTION

N.T.S.



CLASS C 8' CRUSHED ROCK TRAIL CROSS-SECTION

N.T.S.

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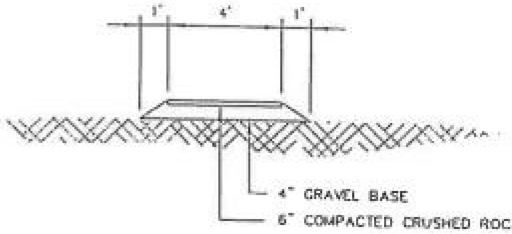
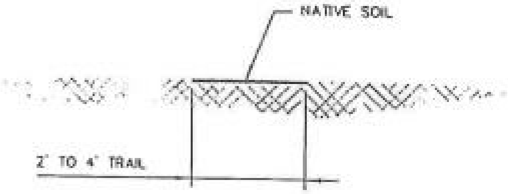
ALPINE CITY
STANDARD DRAWIN



CLASS D 4' CRUSHED ROCK TRAIL CROSS-SECTION

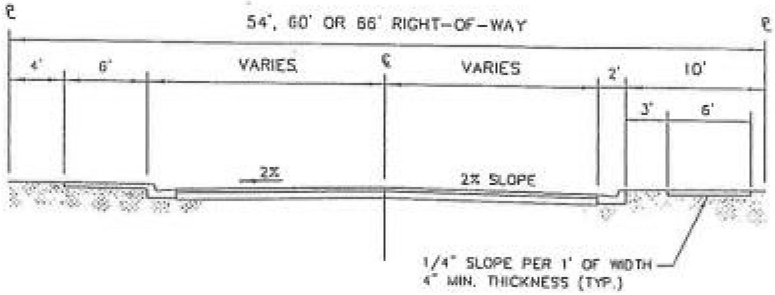
N.T.S.



CLASS E 2' DIRT TRAIL CROSS-SECTION

N.T.S.

ALPINE CITY
STANDARD DRAWING
FIGURE X-X



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CLASS A 6' SIDEWALK TRAIL CROSS-SECTION

N.T.S.

ALPINE CITY
STANDARD DRAWING
FIGURE X-X

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(Ord. 99-08, 8-10-99; Amended by Ord. 2004-11, 7/13/04; Ord. 2008-05, 7/22/08; Ord. 2009-06, 4/28/09)

SECTION 3: **AMENDMENT** "3.17.070 Trail Definitions And Designations" of the Alpine City Development Code is hereby *amended* as follows:

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(Ord. 99-08, 8-10-99; Amended by Ord. 2004-11, 7/13/04; Ord. 2008-05, 7/22/08; Ord. 2009-06, 4/28/09)

PASSED AND ADOPTED BY THE ALPINE CITY COUNCIL
_______________________________.

	AYE	**NAY**	**ABSENT**	**ABSTAIN**
Lon Lott	______	______	______	______
Carla Merrill	______	______	______	______
Gregory Gordon	______	______	______	______
Jason Thelin	______	______	______	______
Jessica Smuin	______	______	______	______

Presiding Officer

____
Troy Stout, Mayor, Alpine City

Attest

____
Charmayne G. Warnock, City
Recorder Alpine City

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: Public Hearing – Plat Amendment – Alpine View Estates Plat B

FOR CONSIDERATION ON: 2 June 2020

PETITIONER: Kyle Spencer of Northern Engineering, representing Griff Johnson

ACTION REQUESTED BY PETITIONER: Recommend and approve plat amendment

BACKGROUND INFORMATION:

Developer is seeking to adjust the boundary between Lot 11 of Alpine View Estates and public open space. Adjustment will allow for the trail alignment recommended by the Trail Committee through public open space. See staff report for full details.

STAFF RECOMMENDATION:
Hold a public hearing, review and discuss the proposed plat amendment and make a motion to approve or table the proposal.

SAMPLE MOTION TO APPROVE:
I motion to recommend that Alpine View Estates Plat B be approved as proposed.

SAMPLE MOTION TO APPROVE WITH CONDITIONS:
I motion to recommend that Alpine View Estates Plat B be approved with the following conditions/changes:

- ***Insert Finding***

SAMPLE MOTION TO TABLE/DENY:
I motion to recommend that Alpine View Estates Plat B be tabled/denied based on the following:

- ***Insert Finding***

ALPINE CITY
STAFF REPORT
May 26, 2020

To:	Alpine City Planning Commission & City Council
From:	Staff
Prepared By:	Austin Roy, City Planner Planning & Zoning Department Jed Muhlestein, City Engineer Engineering & Public Works Department

Re: **ALPINE VIEW ESTATES PLAT B – PLAT AMENDMENT**

Applicant:	Kyle Spencer of Northern Engineering, representing Griff Johnson
Project Location:	Approximately 400 North 400 West
Zoning:	CR-40,000 Zone
Acreage:	3.589 Acres
Lot Number & Size:	1 lot, 0.51 acres
Request:	Recommend and approve the plat amendment

SUMMARY & BACKGROUND

Alpine View Estates PRD Subdivision consists of 20 lots on 20.1 acres and is located off 400 West near 400 North. The development was required to install public trails. The developer has worked with the trail committee over the past few months to install these trails in the most practical locations possible. In doing so, one of the trails encroaches onto Lot 11. A lot line adjustment between Lot 11 and the Public Open Space is being proposed to remedy the situation. The Developer is seeking approval of the plat amendment to do so.

Development Code 3.16.040.2 states, "*Land included in these parks shall not be materially changed, improved, altered, disposed of in any manner or used for any other purpose except after a recommendation of the Planning Commission following a public hearing and by a super majority vote of the City Council (4 positive votes out of 5 City Council members are required). A material change shall include, but is not limited to, a change to the park's present and essential defining characteristics, creation of or improvement of roadways or parking lots within the park.*"

ANALYSIS

Lot Width and Area

As can be noted from the attached exhibit, the west and north property lines have been adjusted to accommodate the trail location. The boundary line adjustment results in a square foot per square foot exchange so the property and open space retain their original square footage. Frontage was checked on Lot 11, it still meets the appropriate frontage as measured at the setback.

Trails

The trail ordinance section of the development code (3.17) requires trails to be shown on recorded plats. Trails are shown on the proposed Plat B.

REVIEWS

PLANNING AND ZONING DEPARTMENT REVIEW

The analysis section in the body of this report serves as the Planning and Zoning Department review.

ENGINEERING AND PUBLIC WORKS DEPARTMENT REVIEW

The water policy has been met for this development and where no square footage difference is being proposed, no changes to the water policy are required.

NOTICING

Notice has been properly issued in the manner outlined in City and State Code

STAFF RECOMMENDATION

Review staff report and findings and make a motion to approve or table the proposed subdivision. Findings are outlined below.

Findings for a Positive Motion:

A. Lot 11 did not change in size and still meets all appropriate sections of ordinance;
B. Trails are shown on the proposed plat.

Findings for a Motion to Table:

A. None.

MODEL MOTIONS

SAMPLE MOTION TO APPROVE

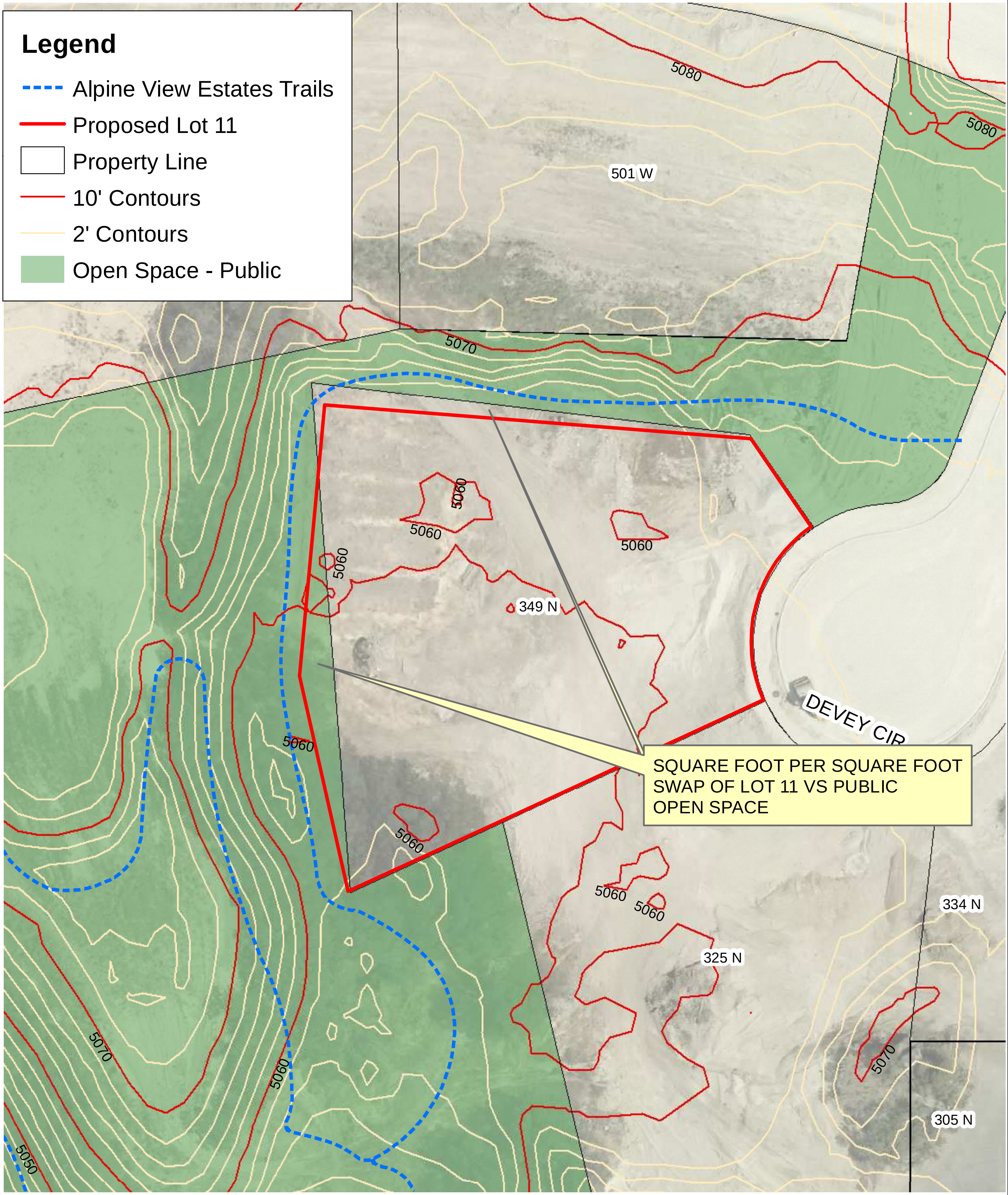
I motion to recommend approval of Alpine View Estates Plat B as proposed.

SAMPLE MOTION TO TABLE

I motion to table Alpine View Estates Plat B based on the following:

- **INSERT FINDING**

EXHIBIT A – LOT 11 BOUNDARY LINE ADJUSTMENT



SQUARE FOOT PER SQUARE FOOT SWAP OF LOT 11 VS PUBLIC OPEN SPACE

ALPINE VIEW ESTATES PLAT B (AMENDING PLAT A)

ALPINE CITY
ESTABLISHED 1850

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ALPINE PLANNING COMMISSION AGENDA

SUBJECT: Public Hearing – Plat Amendment – Summit Pointe Amended Plat B

FOR CONSIDERATION ON: 2 June 2020

PETITIONER: Jake Satterfield of Blue Bison LLC

ACTION REQUESTED BY PETITIONER: Recommend and approve plat amendment

BACKGROUND INFORMATION:

Developer is seeking to amend plat to allow for 8-lots on approximately 32.94 acres. Proposed plat amendment would dedicate approximately 3.69 acres to the City for storm water detention and debris field storage. See staff report for full details.

STAFF RECOMMENDATION:
Hold a public hearing, review, and discuss the proposed plat amendment, and make a motion to approve or table/deny the proposal.

SAMPLE MOTION TO APPROVE WITH CONDITIONS:
I motion to recommend that Summit Pointe Amended Plat B be approved with the following conditions/changes:

- An exception be granted for the excess grading beyond the 50-foot clear zone;
- The Developer work with the Fire Chief for approval on the gate design, secondary access road, and Lot 6 driveway/fire protection improvements;
- The Developer obtain a retaining wall permit prior to construction;
- The Developer place a note on the plat regarding the 1-acre irrigable area watering restriction and that only Xeriscape or drip irrigation be allowed above the 5350 elevation;
- The Developer provide a cost estimate and escrow funds for roadway preservation;
- The Developer address redlines on the plat and plans;
- The Developer meet the water policy.

SAMPLE MOTION TO TABLE/DENY:
I motion to recommend that Alpine View Estates Plat B be tabled/denied based on the following:

- ***Insert Finding***

ALPINE CITY
STAFF REPORT
May 29, 2020

To: Alpine City Council & Planning Commission

From: Staff

Prepared By: Austin Roy, City Planner
Planning & Zoning Department

Jed Muhlestein, City Engineer
Engineering & Public Works Department

Re: **Summit Pointe Amended Plat B**
Applicant: Jake Satterfield, representing Six Blue Bison, LLC
Project Location: West end of Lakeview Drive
Zoning: CR-40,000 Zone
Acreage: 8-Lots on Approximately 32.94 Acres
Lot Size: Lots range from 0.95 acres to 5.44 acres
Request: Recommend approval of the plat amendment

SUMMARY

Developer, Six Blue Bison LLC, is seeking to amend the recorded plat for the Summit Pointe Subdivision. The existing recorded plat is a 4-lot subdivision with lots ranging in size from 3.96 acres to 12.73 acres. The proposed plat amendment is for an 8-lot subdivision with lots ranging in size from 1.25 acres to 9.13 acres. Access to the existing lots on the recorded plat is through an approved private shared driveway. The plat amendment seeks to do away with the private shared driveway and proposes access to the 8-lots via public street through an extension of Lakeview Drive (west end of Lakeview Drive).

BACKGROUND

In late 2017 the Summit Pointe Subdivision changed ownership, with the developer, Six Blue Bison LLC acquiring the land. The land acquired included a recorded 4-lot subdivision with a shared private driveway, and frontage off Hog Hollow Road.

In February of 2018, the developer presented a proposed plat amendment for the Summit Pointe Subdivision which showed 15 lots and a road extending Lakeview Drive and stubbing into

Draper City. Some of the lots included in this plan were above the elevation of 5350, which could not be serviced by the City's water system. These plans were not approved.

In January 2019, the developer returned with a revised plat amendment but did not take plans to City Council for final approval. The developer has since reworked plans and is now returning with the latest draft of the plat amendment.

ANALYSIS

General Plan

Previous drafts of this plan showed a free-flowing access into Draper City. The plat amendment now proposes a cul-de-sac with a fire access connection, which meets the City's General Plan.

Location

Summit Pointe is located within the CR-40,000 zone. The Development Code requires all lots within this zone to be at least 40,000 sq. ft. in size. The smallest lot on the proposed plat amendment is 1.25 acres (54,498 sq. ft.), which meets the minimum requirement for the zone.

Frontage

Each lot meets the City's frontage requirements, plat does not show any lot with less than 110 feet of frontage on a public street.

Use

Single-unit detached dwellings, which is the proposed use for lots as shown on the plat amendment, are a permitted use in the zone. The developer has not proposed any other uses.

Sensitive Lands (Wildland Urban Interface)

The Summit Pointe Subdivision is located within the Wildland Urban Interface, which is part of the sensitive lands. Being located in the wildland interface, all lots in the proposed amendment would be required to meet the standards required by code, which includes: fire-sprinklers throughout the home for all homes, appropriate roof coverings, and minimum vegetative clearance around the homes.

All developments in the wildland interface require more than one point of access (point of ingress and egress) for emergencies. Both ends of the proposed road would need to be a working access to meet this requirement. See attached Memo from Lone Peak Fire Department for more details.

Parcel A

The developer is proposing to dedicate approximately 3.69 acres (Parcel A) to the City for storm water detention and debris field storage.

Trails

The trail master plan shows a trail running through the Summit Pointe property. The plat amendment has reserved a PUE in Parcel A for a potential trail easement that could be used to connect Alpine City open space.

REVIEWS

PLANNING AND ZONING DEPARTMENT REVIEW

The analysis section in the body of this report serves as the Planning and Zoning Department review.

ENGINEERING AND PUBLIC WORKS DEPARTMENT REVIEW

Streets

In terms of streets, Summit Pointe Amended proposes to extent Lakeview Drive and replace an approved (yet not existing) shared driveway system to four lots with a public right of way system that gives access to eight lots. Proposed at the end of Lakeview Drive is a gated secondary access which leads to a roadway system in Draper City. **The specific style, type, and operation of the gate, as well as the secondary access roadway design, must be reviewed and approved by the Fire Chief prior to installation.** At this time, to plans do not show what the secondary access roadway surface will be built from. The plat and plans show only a 26 feet wide easement for this access. Per City Standard details, this easement should be a minimum of 54 feet wide. This requirement is redlined on the plat and plans and included in the sample motion as being part of the redlines that need corrected.

In 2019 the applicant submitted a Traffic Impact Study (TIS) for an alternative version of this development with a more intensive traffic pattern scenario. At that time, the proposal was to have Lakeview Drive extend into Draper City and allow traffic to flow freely between the two cities. That proposal was not well received, and the plan has been updated with more of a "dead end" scenario where the secondary access is gated. No public access exits between the two cities (secondary access only). There is no need to update or submit a new TIS for four more lots above what is already approved. With the road open to both cities and free flowing (which this plan does NOT propose), the results showed traffic volumes on all studied Alpine City streets to be currently operating at a Level of Service A and would continue to operate at a Level of Service A in the future. The report can be provided if requested.

As with any development, frontage improvements are required. The property has frontage along 600 North that currently is not improved with sidewalk. The plans show completion of frontage improvements (a five-foot wide sidewalk) to be built at this location. The plans also show frontage improvements from where connection is shown on Lakeview Drive, to the development, and through the development.

In all but one location grading of roads appears to follow ordinance which limits grading to 50 feet from the right-of-way. The distance between the right-of-way and 50-foot grading limit is called the "50' CLEAR ZONE," as can be found in the cities adopted Construction Standard Specifications. The grading for the cul-de-sac is 63 feet beyond the right-of-way, which is 13 feet greater than that allowed by city specifications. The only option around this would be to add a retaining wall, which for 13 feet of extra grading, is not worth the future maintenance of a retaining wall which the City would inherit. **Staff would recommend an exception to the 50 Clear Zone rule in this instance**. Retaining walls are shown to help keep the other areas of roadway grading within the 50-Foot Clear Zone. All walls appear to meet ordinance which limits the exposed height of any single wall to 9 feet. **Redirock retaining walls are proposed and will require a separate building permit prior to construction.** Landscaping between tiers of walls would most likely be required on the downhill facing retaining walls, viewable from 600 North. This will be evaluated at the building permit level.

Road grades and curvature also appear to meet ordinance except in the cul-de-sac where the final running slope of the bubble is 1% greater than allowed. This has been redlined for the Developer to correct.

Alpine City specifications require escrow funds for a roadway preservation coat (See Alpine City Construction Standard Specifications 300.030 & 600.020). The amount for this requirement will be calculated based on current preservation coat costs at the time of recording. **The escrow funds for this roadway preservation coat will be required of the Developer prior to recording.**

Culinary and Pressurized Irrigation

Plans were provided for the new roadway and infrastructure which show new culinary and secondary water services to each new lot. The culinary system shows connection of a new 14" main to the existing 12" main in Lakeview Drive. A small portion of existing 8" main would need removed for this connection to take place. The buildable areas of each lot are below the 5350-foot elevation line (lot 8's is redlined on the plat for this), the elevation at which the current system can provide the minimum pressures and adequate fire flows. New culinary services are shown for each lot.

The currently recorded subdivision (Summit Pointe Plat A) has a 1-acre watering restriction for each lot. **Engineering recommends the same water restriction of 1-acre of irrigable area be included with this plat amendment. Engineering also recommends that only xeriscape or drip irrigation be allowed above the elevation of 5350** due to the water systems not being able to provide adequate pressure for any other type of outdoor water usage above that elevation. It needs to be clear that drip irrigation areas count as part of the irrigable area calculations. These items are redlined on the plans.

The pressurized irrigation system shows a new 6" main connecting to an existing 4" main in Lakeview Drive. We know from previous modeling for the property that these line sizes are adequate to provide the minimum pressures required by ordinance. Having said that, the pressurized irrigation lines would remain dry until offsite system improvements are made to the high zone to help with current pressure problems occurring in the high zone. New pressurized irrigation services are shown for each lot.

Sewer and Storm Drain

The sewer main is shown to connect to the existing system in 600 North/Hog Hollow providing gravity sewer flow to the development. New 4-inch sewer services are shown for each lot.

The storm drain system collects water near the east side of the development and will convey it to a detention pond on the south east side, near Hog Hollow. It will drain into the existing system on Hog Hollow where a connection to the existing system would be made.

Hazard Studies

The property is situated within the Wildland/Urban Interface and includes areas, classified by city hazard maps, to be evaluated for several things including rockfall, slide, and debris flow. A geotechnical report and hazards report have been turned in with the application. Worth mentioning is debris flows.

Debris flow events are common shortly after fires, as the City has experienced in the past. The report recommends that flows from such an event should be accounted for in the storm drain calculations for the proposed culvert that passes water under Lakeview Drive and the detention basin below. The Developer has chosen to use an area that was previously shown as a buildable lot for the location of the debris flow and storm drain basin. This lot was in the direct path of a potential debris flow event. Because of this, the plans show building a debris flow basin/storm drain basin at this location and dedicate the land to Alpine City.

Other

A bond would be required for the proposed infrastructure. **The developer needs to submit a cost estimate for the proposed public improvements** so one can be created.

The water policy would need to be met for the development. The water requirement can be either provided with Alpine Irrigation Co. shares, by purchasing water credits that people have with the City, or cash can be paid in lieu of water rights if City Council approval is obtained. The water policy was previously met for the Summit Pointe Plat A, there would be credit given for what was already turned in.

A Land Disturbance Permit would be required prior to construction which ensures a Storm Water Pollution Prevention Plan (SWPPP) is followed. All disturbed areas of the site are required to be revegetated after construction.

There are several redlines for both the plat and plans that would need corrected prior to construction and recordation of the plat.

The majority of the buildable area for Lot 6 resides over 200 feet uphill from the road. Similar to Lot 3, **Staff recommends the Developer provide a driveway design and a fire hydrant near the buildable area of Lot 6 that would meet fire code requirements.**

LONE PEAK FIRE DEPARTMENT REVIEW

See attached Lone Peak Fire Department Review of the proposed plat amendment.

NOTICING

Notice has been properly issued in the manner outlined in City and State Code

STAFF RECOMMENDATION

Review staff report and findings and make a recommendation to City Council to either approve or deny the proposed plat amendment. Findings are outlined below.

Findings for a Positive Motion:

A. With redlines corrected, the plans meet ordinance.
B. The Developer has provided a geotechnical report, geologic hazard report, debris flow analysis, and storm drain design report which show the area is safe to build on and that the design follows city standards.
C. The plan follows the City's General Plan by NOT showing a free-flowing access into Draper City.
D. Frontage improvements are shown throughout the development and beyond where it connects to Lakeview Drive.

Findings for Negative Motion:

A. The plan requires an exception to the 50-foot clear zone rule.
B. No details for the gate or secondary access road were provided.
C. Roadway grades do not follow ordinance in the cul-de-sac.
D. Plans do not show adequate easement area for the secondary access road.

MODEL MOTIONS

SAMPLE MOTION TO APPROVE

I motion to recommend approval of Summit Pointe Amended Plat "B" with the following conditions:

- **An exception be granted for the excess grading beyond the 50-foot clear zone;**
- **The Developer work with the Fire Chief for approval on the gate design, secondary access road, and Lot 6 driveway/fire protection improvements;**
- **The Developer obtain a retaining wall permit prior to construction;**
- **The Developer place a note on the plat regarding the 1-acre irrigable area watering restriction and that only Xeriscape or drip irrigation be allowed above the 5350 elevation;**
- **The Developer provide a cost estimate and escrow funds for roadway preservation;**
- **The Developer address redlines on the plat and plans;**
- **The Developer meet the water policy.**

SAMPLE MOTION TO DENY

I motion to recommend that the plat amendment Summit Pointe Amended Plat "B" be denied based on the following:

- ***Insert Findings***

LONE PEAK FIRE DISTRICT
5582 PARKWAY WEST DRIVE
HIGHLAND, UTAH 84003
(801) 763-5365
WWW.LONEPEAKFIRE.COM

REED M. THOMPSON, FIRE CHIEF

MEMORANDUM

DATE: 13 April 2020

TO: Jed Muhlestein, City Engineer, Alpine City
CC: Austin Roy, City Planner, Alpine City

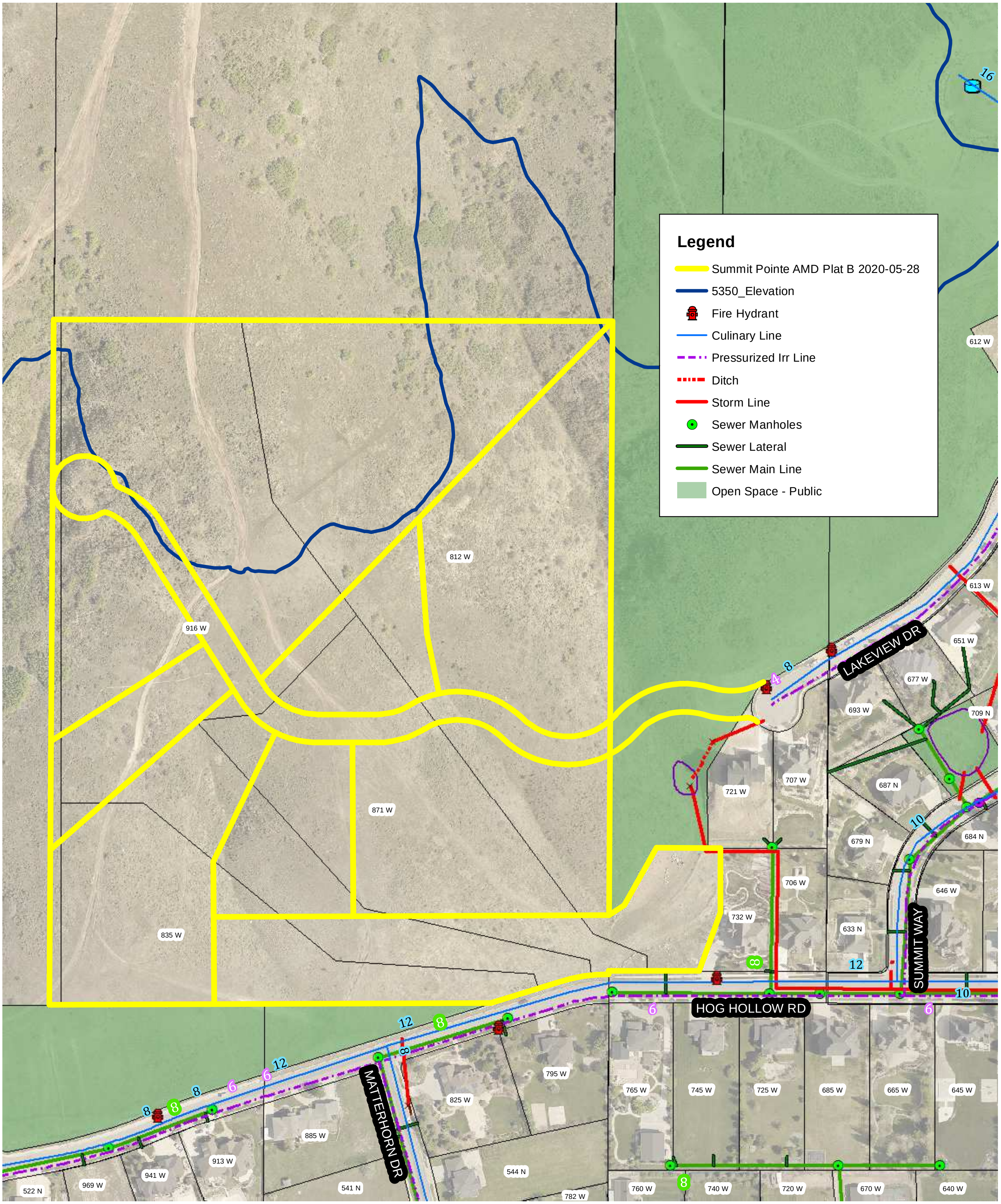
FROM: Reed M. Thompson, Fire Chief

SUBJECT: SUMMIT POINTE SUBDIVISION PLANS AND PLAT B SUMMIT POINTE AMENDED

In review of the proposed site development construction drawings for “Summit Pointe Amended Subdivision”, dated 27 March 2019, and “Plat B Summit Pointe Amended”, dated 27 March 2020, please note:

- The date listed on the plans references 2019, but is actually 2020.
- The proposed westerly cul-de-sac on the plans will make a fire access connection to a road in Draper City. In order to approve these lots, this connection is required due to the length of the road with relationship to the existing length of Lakeview Drive. Any gate and/or associated access road needs to meet structural standards established in the currently approved International Fire Code.
- In the cover page or construction notes on Sheet C000 language needs to identify that this project is within the Wildland Urban Interface Boundary and as such is subject to compliance with the Alpine City Sensitive Land Ordinance.

If you have further questions regarding this information, please contact me directly.



Property Boundaries and Utilities are shown for reference only. Though shown generally close, a survey and Blue Stake should be done to locate both accurately.

ALPINE CITY
ESTABLISHED 1850

SUMMIT POINT AMENDED PROPOSAL MAY 2020

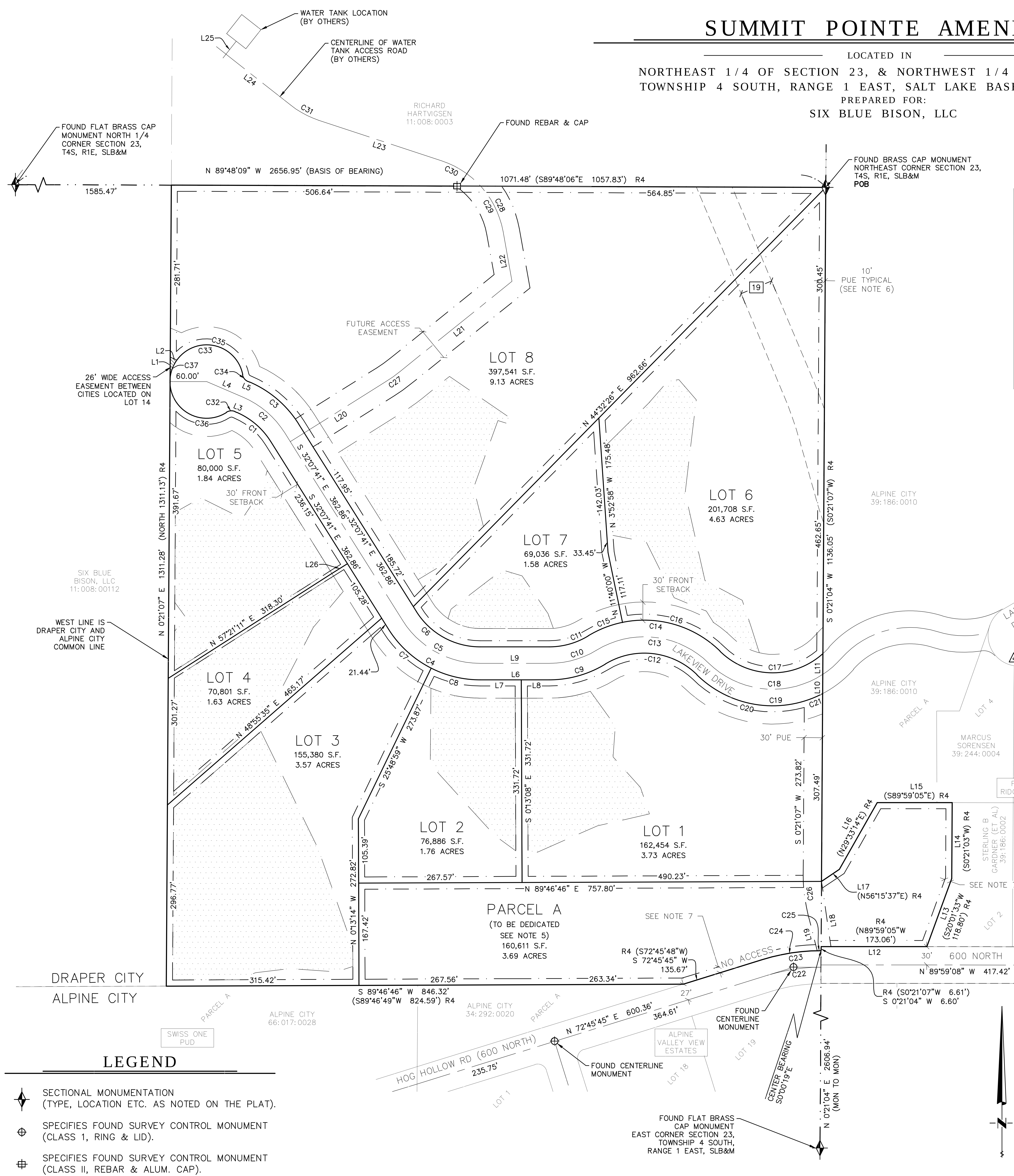
0 75 150 300 450 600
Feet

N

SUMMIT POINTE AMENDED

LOCATED IN

NORTHEAST 1/4 OF SECTION 23, & NORTHWEST 1/4 OF SECTION 24,
TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN
PREPARED FOR:
SIX BLUE BISON, LLC

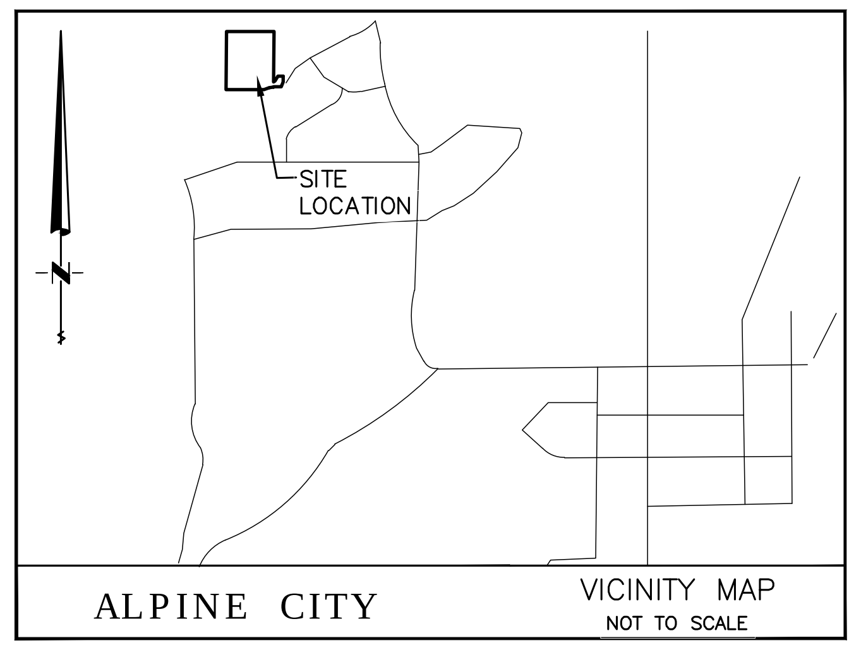


GRAPHIC SCALE

(IN FEET)
1 inch = 100 ft.

PARCEL LINE TABLE		
LINE #	DIRECTION	LENGTH
L1	N0° 21' 07"E	39.85
L2	N66° 43' 43"W	12.06
L3	S66° 43' 43"E	3.11
L4	S66° 43' 43"E	65.25
L5	S66° 43' 43"E	3.11
L6	N90° 00' 00"E	113.05
L7	N90° 00' 00"E	67.28
L8	N90° 00' 00"E	45.77
L9	N90° 00' 00"E	113.05
L10	N0° 25' 46"E	31.38
L11	N0° 16' 44"E	34.07
L12	N89° 58' 57"W	173.05
L13	S20° 01' 30"W	118.81
L14	S0° 21' 00"W	124.12
L15	S89° 59' 08"E	122.64
L16	N29° 33' 11"E	125.60
L17	N56° 15' 34"E	35.18
L18	S8° 10' 47"E	108.02
L19	N14° 13' 16"W	60.91
L20	N57° 52' 19"E	184.14
L21	S51° 08' 52"W	235.23
L22	N10° 13' 04"W	82.74
L23	N71° 44' 16"W	211.67
L24	N51° 46' 06"W	155.10
L25	N38° 13' 54"E	35.00
L26	S57° 52' 19"W	30.00

PARCEL CURVE DATA				
SEGMENT	LENGTH	RADIUS	DELTA	TANGENT
C1	74.28	123.00	34°36'02"	38.31
C2	90.58	150.00	34°36'02"	46.72
C3	106.89	177.00	34°36'04"	55.13
C4	178.78	177.00	57°52'19"	97.85
C5	151.51	150.00	57°52'19"	82.93
C6	124.24	123.00	57°52'19"	68.00
C7	95.59	177.00	30°56'39"	48.99
C8	83.19	177.00	26°55'40"	42.38
C9	96.58	177.00	31°15'44"	49.52
C10	81.84	150.00	31°15'44"	41.97
C11	67.11	123.00	31°15'44"	34.41
C12	162.58	123.00	75°44'00"	95.64
C13	198.27	150.00	75°44'00"	116.63
C14	233.96	177.00	75°44'00"	137.63
C15	60.54	177.00	19°35'44"	30.57
C16	173.42	177.00	56°08'16"	94.39
C17	185.44	123.00	86°22'47"	115.46
C18	203.12	150.00	77°35'10"	120.57
C19	222.36	177.00	71°58'51"	128.55
C20	189.83	177.00	61°26'56"	105.20
C21	32.54	177.00	10°31'55"	16.31
C22	89.16	297.00	17°11'59"	44.92
C23	97.45	324.00	17°13'56"	49.09
C24	91.13	324.00	16°06'57"	45.87
C25	6.31	324.00	1°06'58"	3.16
C26	66.13	260.00	14°34'23"	33.24
C27	29.34	250.00	6°43'27"	14.69
C28	161.06	150.00	61°31'12"	89.28
C29	83.84	150.00	32°01'22"	43.04
C30	77.22	150.00	29°29'49"	39.49
C31	52.28	150.00	19°58'10"	26.41
C32	14.65	15.00	55°56'39"	7.97
C33	305.66	60.00	291°53'18"	40.56
C34	14.65	15.00	55°56'39"	7.97
C35	139.73	60.00	133°25'51"	139.42
C36	128.83	60.00	123°01'29"	110.56
C37	37.11	60.00	35°25'58"	19.17



VICINITY MAP
NOT TO SCALE

LOT	BUILDABLE SF	AVG SLOPE	FRONTAGE @ 30' SETBACK
1	35,556	9%	526.02
2	26,024	12%	164.10
3	83,550	8%	129.10
4	37,033	8%	110.00
5	45,204	17%	397.18
6	41,340	13%	372.09
7	10,633	8%	293.26
8	49,182	5%	184.29

ADDRESS TABLE	
LOT	ADDRESS
1	823 W LAKEVIEW DR
2	891 W LAKEVIEW DR
3	915 W LAKEVIEW DR
4	931 W LAKEVIEW DR
5	957 W LAKEVIEW DR
6	812 W LAKEVIEW DR
7	872 W LAKEVIEW DR
8	929 W LAKEVIEW DR
PARCEL A	754 W 600 N

LEGEND

✦	SECTIONAL MONUMENTATION (TYPE, LOCATION ETC. AS NOTED ON THE PLAT).
⊕	SPECIFIES FOUND SURVEY CONTROL MONUMENT (CLASS 1, RING & LID).
⌗	SPECIFIES FOUND SURVEY CONTROL MONUMENT (CLASS II, REBAR & ALUM. CAP).
◉	SET 5/8" REBAR AND PLASTIC CAP (STAMPED CSI), UNLESS OTHERWISE NOTED ON THE PLAT.
△	SPECIFIES FOUND SURVEY CONTROL MONUMENT (RIVET).
▨	BUILDABLE AREA

CivilScience
Engineers | Surveyors | Solutions
3160 WEST CLUBHOUSE DRIVE
LEHI, UT 84043
801.768.7200

DATE: 5-21-2020
FILE: 19050.23
SHEET 1 OF 1

PLANNING COMMISSION APPROVAL

APPROVED THIS __________ DAY OF _____________, A.D. 20__, BY THE ALPINE CITY PLANNING COMMISSION.

DIRECTOR – SECRETARY

CHAIRMAN, PLANNING COMMISSION

APPROVAL AS TO FORM

APPROVED AS TO FORM THIS __________ DAY OF _____________, A.D. 20__,

CITY ATTORNEY

ACCEPTANCE BY LEGISLATIVE BODY

THE ___________ OF _________________, COUNTY OF UTAH, APPROVES THIS SUBDIVISION AND HEREBY ACCEPTS THE DEDICATION OF __________________ ALL STREETS, EASEMENTS, AND OTHER PARCELS OF LAND INTENDED FOR PUBLIC PURPOSES FOR THE PERPETUAL USE OF THE PUBLIC THIS __________ DAY _____________, A.D. 20__

APPROVED
ENGINEER (SEE SEAL BELOW)

ATTEST
CLERK – RECORDER (SEE SEAL BELOW)

OWNER'S DEDICATION

KNOW ALL MEN BY THESE PRESENTS THAT THE UNDERSIGNED OWNERS OF ALL OF THE ABOVE DESCRIBED TRACT OF LAND, HAVING CAUSED THE SAME TO BE SUBDIVIDED INTO FOURTEEN (14) LOTS, 3 PARCELS AND STREETS TO BE HEREAFTER KNOWN AS THE SUMMIT POINTE AMENDED PLAT "B", AND DO HEREBY DEDICATED FOR PERPETUAL USE ALL STREETS AND OTHER PUBLIC AREAS AS INDICATED HEREON AS INTENDED FOR PUBLIC USE

IN WITNESS WHEREOF _______ HAVE HEREUNTO SET _____________ THIS _______ DAY OF _________ A.D., 20___.

BY:
____

ACKNOWLEDGMENT

STATE OF _________________ }
COUNTY OF ________________ } S.S.

ON THE ___ DAY OF ___________________ 20__, PERSONALLY APPEARED BEFORE ME, THE UNDERSIGNED NOTARY PUBLIC IN AND FOR SAID STATE AND COUNTY, _____________ WHO BEING BY ME DULY SWORN, DID SAY THAT HE IS THE _____________ OF _________________, AND THAT HE EXECUTED THE FOREGOING OWNER'S DEDICATION IN BEHALF OF SAID _________________ BEING AUTHORIZED AND EMPOWERED TO DO SO BY THE OPERATING AGREEMENT OF SAID COMPANY, AND HE DID DULY ACKNOWLEDGE TO ME THAT SUCH COMPANY EXECUTED THE SAME FOR THE USES AND PURPOSES STATED THEREIN.

MY COMMISSION EXPIRES:

NOTARY PUBLIC
RESIDES IN:

SURVEYOR'S CERTIFICATE

I, DAVID T MORTENSEN, DO HEREBY CERTIFY THAT I AM A REGISTERED LAND SURVEYOR, AND THAT I HOLD LICENSE NO. 6436557 AS PRESCRIBED UNDER THE LAWS OF THE STATE OF UTAH. I FURTHER CERTIFY THAT BY AUTHORITY OF THE OWNER, I HAVE MADE A SURVEY OF THE TRACT OF LAND SHOWN ON THIS PLAT AND DESCRIBED BELOW, AND HAVE SUBDIVIDED SAID TRACT OF LAND INTO LOTS, HEREAFTER TO BE KNOWN AS THE SUMMIT POINTE AMENDED AND THAT THE SAME HAS BEEN CORRECTLY SURVEYED AND STAKED ON THE GROUND AS SHOWN ON THIS PLAT.

5-28-20
Expires 03-31-21

5-28-2020
DATE:
CIVIL SCIENCE, INC.

DAVID T MORTENSEN
REGISTERED LAND SURVEYOR
UTAH LICENSE NUMBER 6436557

BOUNDARY DESCRIPTION

LOTS 1, 2, 3 AND 4, PLAT "A" SUMMIT POINTE, INCLUDING A VACATION OF LOT 3 OF FALCON RIDGE SUBDIVISION PLAT "A", ACCORDING TO THE OFFICIAL PLAT THEREOF, AS RECORDED IN OFFICE OF THE COUNTY RECORDER, UTAH COUNTY, STATE OF UTAH; BEING A PART OF THE NORTHEAST 1/4 OF SECTION 23 AND THE NORTHWEST 1/4 OF SECTION 24, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN; MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEAST CORNER OF SAID SECTION 23, SAID POINT ALSO BEING THE NORTHEAST CORNER OF SAID PLAT "A" SUMMIT POINTE; THENCE S0°21'04"W ALONG THE EAST LINE OF SAID PLAT "A" SUMMIT POINT 1136.05 FEET TO THE NORTH LINE OF LOT 3 OF FALCON RIDGE SUBDIVISION PLAT "A"; THENCE ALONG THE BOUNDARY OF SAID LOT 3 THE FOLLOWING FIVE (5) COURSES: (1) N56°15'34"E 35.18 FEET, (2) N29°33'11"E 125.60 FEET, (3) S89°59'08"E 122.64 FEET, (4) S0°21'00"W 124.12 FEET, AND (5) S20°01'30"W 118.81 FEET, TO THE NORTH LINE OF 600 NORTH; THENCE ALONG SAID NORTH LINE THE FOLLOWING FOUR (4) COURSES: (1) N89°58'57"W 173.05 FEET, (2) S0°21'04"W 6.60 FEET, TO THE BEGINNING OF A NON-TANGENT CURVE, WITH A RADIUS OF 324.00 FEET AND A CENTER BEARING OF S0°00'19"E, (3) WESTERLY 97.45 FEET, THROUGH A CENTRAL ANGLE OF 17°13'56", AND (4) S72°45'45"W 135.67 FEET, TO THE NORTH LINE OF PARCEL A, ALPINE VALLEY VIEW ESTATES, OFFICIAL RECORDS; THENCE S89°46'46"W ALONG SAID LINE AND THE NORTH LINE OF PARCEL A, SWISS ONE PUD, OFFICIAL RECORDS 846.32 FEET, THE THE WEST LINE OF ALPINE CITY; THENCE N0°21'07"E ALONG SAID LINE 1311.28 FEET, TO THE NORTH LINE OF SAID NORTHEAST QUARTER OF SECTION 23; THENCE S89°48'09"E ALONG SECTION LINE 1071.48 FEET TO THE POINT OF BEGINNING.

CONTAINS 1,434,724 SQ FT OR 32.94 ACRES AND 8 LOTS

NOTES

1. NO ATTEMPT HAS BEEN MADE AS A PART OF THIS PRELIMINARY PLAT TO OBTAIN OR SHOW DATA CONCERNING EXISTENCE, SIZE, DEPTH, CONDITION, CAPACITY, OR LOCATION OF ANY UTILITY OR MUNICIPAL/PUBLIC SERVICE FACILITY. FOR INFORMATION REGARDING THESE UTILITIES OR FACILITIES, PLEASE CONTACT THE APPROPRIATE AGENCIES OR OTHER.

2. SURVEYOR HAS MADE NO INVESTIGATION OR INDEPENDENT SEARCH FOR EASEMENTS OF RECORD, ENCUMBRANCES, RESTRICTIVE COVENANTS, OWNERSHIP, TITLE EVIDENCE, OR ANY OTHER FACTS WHICH AN ACCURATE AND CURRENT TITLE SEARCH MAY DISCLOSE.

3. ALL COURSES SHOWN IN PARENTHESIS ARE RECORD INFORMATION TAKEN FROM DEED DESCRIPTION OR OFFICIAL MAPS OR PLATS OF RECORD. ALL OTHER COURSES ARE THE RESULT OF ACTUAL FIELD MEASUREMENTS.

4. ALL CURVES ARE TANGENT CURVES UNLESS OTHERWISE STATED. IF NEEDED A CENTER BEARING WILL BE SHOWN.

5. PARCEL A IS TO BE DEDICATED TO ALPINE CITY FOR STORM-WATER DETENTION AND DEBRIS FIELD STORAGE.

6. 10 FOOT PUE, FRONT, REAR, AND SIDE YARDS ON ALL LOTS.

7. PUE IN PARCEL A ALONG HOG HOLLOW ROAD, ALONG WITH EAST AND NORTH PUE IN PARCEL A ALSO BEING RESERVED FOR A POTENTIAL TRAIL EASEMENT PER ALPINE CITY MASTER PLAN.

NARRATIVE

THE PURPOSE OF THIS SURVEY IS TO COMBINE FOUR EXISTING PARCELS TO CREATE A 8 LOT AND A PARCEL "A" RESIDENTIAL DEVELOPMENT. THE SURVEY WAS PERFORMED AT THE REQUEST OF OUR CLIENT. THE BASIS OF BEARING FOR THIS SURVEY IS N 89°48'09" E ALONG THE NORTH LINE OF THE NORTHEAST QUARTER OF SECTION 23, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE & MERIDIAN; BETWEEN TWO SECTIONAL MONUMENTS, TYPE AND LOCATIONS OF WHICH ARE SHOWN ON THIS PLAT.

THE FOLLOWING DOCUMENTS OF RECORD WERE REVIEWED AND CONSIDERED AS A PART OF THIS SURVEY. THERE MAY BE OTHER DOCUMENTS EITHER PRIVATE OR OF RECORD THAT WOULD AFFECT THIS SURVEY. ANY NEW EVIDENCE CONTRADICTORY TO THIS SURVEY SHOULD BE PRESENTED TO CIVIL SCIENCE FOR REVIEW AND CONSIDERATION.

R1. ALPINE VALLEY VIEW ESTATES SUBDIVISION, MAP FILING # 8128, RECORDED JULY 01, 1999.

R2. FALCON RIDGE A PRD SUBDIVISIONS, MAP FILING # 10623, RECORDED AUGUST 10, 2004.

R3. LONE PEAK ESTATES, MAP FILING # 5609, RECORDED JULY 11, 1994.

R4. SUMMIT POINTE INCLUDING A VACATION OF LOT 3 OF FALCON RIDGE SUBDIVISION PLAT "A", MAP FILING # 15620, RECORDED JULY 13, 2017.

R5. SUNRISE POINT SUBDIVISION PHASE II, MAP FILING # 6580, RECORDED MAY 7, 1996.

R6. SWISS ONE PLANNED RESIDENTIAL DEVELOPMENT PHASE 3, MAP FILING # 10399, RECORDED MARCH 23, 2004.

EASEMENT NOTES

18. ANY AND ALL MATTERS DISCLOSED ON THE OFFICIAL RECORDED PLAT OF SAID SUBDIVISION, INCLUDING, BUT NOT LIMITED TO, PUBLIC UTILITIES AND DRAINAGE EASEMENTS, SEWER EASEMENTS, BUILDING SET-BACK LINES AND/OR BUILDABLE AREA LIMIT LINES, NOTES AND RECITALS, PRIVATE DRIVEWAY, CROSS ACCESS AND UTILITY EASEMENT, SEWER EASEMENT, AND THE TERMS AND CONDITIONS THEREOF, RECORDED: JULY 10, 2017, ENTRY NO.: 67625:2017. **(TO BE VACATED UPON RECORDATION OF THIS PLAT)**

19. EASEMENT, AND THE TERMS AND CONDITIONS GRANTEE: ALPINE CITY FOR THE PURPOSE OF A PERMANENT EASEMENT FOR THE LOCATION, CONSTRUCTION AND MAINTENANCE OF A PUBLIC ROAD RIGHT OF WAY AND RELATED FACILITIES RECORDED: JULY 10, 2017 ENTRY NO.: 66480:2017 **(AS SHOWN)**

20. EASEMENT, AND THE TERMS AND CONDITIONS THEREOF: GRANTEE: RICHARD HARTVIGSEN PURPOSE: ACCESS RECORDED: JULY 28, 2017, ENTRY NO.: 72701:2017 **(TO BE VACATED UPON RECORDATION OF THIS PLAT)**

PLAT VACATION NOTICE

THE CITY OF ALPINE IS SATISFIED THAT NEITHER THE PUBLIC NOR ANY PERSON WILL BE MATERIALLY INJURED BY THE VACATION OF SUMMIT POINTE, PLAT "A" AND THAT THERE IS GOOD CAUSE FOR THE VACATION. SUMMIT POINTE, PLAT "A" IS HEREBY VACATED.

PLAT "B"

SUMMIT POINTE AMENDED

INCLUDING A VACATION OF SUMMIT POINTE, PLAT "A"

LOCATED IN

NORTHEAST 1/4 OF SECTION 23,
NORTHWEST 1/4 OF SECTION 24,
TOWNSHIP 4 SOUTH, RANGE 1 EAST,
SALT LAKE BASE AND MERIDIAN
PREPARED FOR:
SIX BLUE BISON, LLC
SHEET 1 OF 1

SURVEYOR'S SEAL	NOTARY PUBLIC SEAL	CITY ENGINEERS SEAL	CLERK–RECORDER SEAL

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

Geotechnical Investigation
Summit Pointe Subdivision
Alpine, Utah

GeoStrata Job No. 1312-003

October 8, 2018

Prepared for:

Six Blue Bison, LLC
12543 Andreas Street
Riverton, UT

Attention: Mr. Jake Satterfield

Learn More

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

Prepared for:

Six Blue Bison, LLC
Attn: Jake Satterfield
12543 Andreas Street
Riverton, UT 84096

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10/08/18
No. 10186640
DANIEL J.
BROWN

Daniel Brown, P.E.
Senior Geotechnical Engineer

J. Scott Seal, P.E.
Associate Principal Engineer

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

October 8, 2018

TABLE OF CONTENTS

APPENDICES

1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for the proposed Summit Pointe Subdivision to be located at approximately 812 W Lakeview Drive in Alpine, Utah. A previous geotechnical investigation had been completed for the subject property by Earthtec Testing and Engineering in a report titled "Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah" and dated August 18, 2005 (Earthtec Job No. 051709). Based on information provided from the client as well as in the plans for the proposed development titled "Summit Pointe Amended Subdivision" prepared by S.E. Science, LLC and dated August 8, 2018. Due to modifications in the planned layout of the subdivision, and the fact that the locations of test pits and boreholes completed in the Earthtec geotechnical report do not provide full coverage of the site, an updated geotechnical investigation was performed for the proposed development. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the proposed site and to provide recommendations for general site grading and the design and construction of foundations and slabs-on-grade, and exterior concrete flatwork.

Based on the results of our analysis, it is our opinion that the site is suitable for the proposed development provided that the recommendations contained in this report are incorporated into the design and construction of the project.

Subsurface conditions were investigated through the excavation of 4 test pits to depths ranging from 10 to 11 feet below the existing site grade. Based on our observations and geologic literature review, the subject area is overlain by approximately 1 foot of topsoil comprised of silt, sand, clay and gravel. Underlying the topsoil, we encountered Tertiary-age Alluvial Fan Deposits and Pleistocene-aged Alluvial Fan Deposits. These deposits persisted to the full depth of our test pit excavations. Groundwater was not encountered at the site grade as it existed at the time of our investigation.

The foundations for the proposed structure may consist of conventional strip and/or spread footings founded on undisturbed native soil. Foundation elements founded in such a manner may be proportioned for a maximum net allowable bearing capacity of **1,500 psf**. We recommend that GeoStrata observe all foundation soils in footing excavations prior to placing reinforcing steel or concrete.

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

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a preliminary geotechnical investigation conducted for the proposed Summit Pointe Subdivision to be located at approximately 812 West Lakeview Drive in Alpine, Utah. The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the proposed site. A previous geotechnical investigation had been completed for the subject property by Earthtec Testing and Engineering in a report titled "Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah" and dated August 18, 2005 (Earthtec Job No. 051709). Pertinent information from that report has been incorporated into our investigation. Our understanding of the project is based on information provided by the client, as well as in the plans for the proposed development titled "Summit Pointe Amended Subdivision" prepared by S.E. Science, LLC and dated August 8, 2018. Due to modifications in the planned layout of the subdivision, and the fact that the locations of test pits and boreholes completed in the Earthtec geotechnical report do not provide full coverage of the site, an updated geotechnical investigation was performed for the proposed development. Structures are anticipated to consist of one- to two-story wood-framed structures with basements founded on conventional spread or strip footings. We anticipate footing loads on the order of 3 kips per lineal foot. Our investigation for the development will be used to provide geotechnical design parameters for construction of buildings, pavements, and associated infrastructure and to assess proposed cuts and fills for construction of the proposed roadway.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses, and preparation of this report. Our services were performed in accordance with our proposal and signed authorization, dated August 29, 2018. GeoStrata is concurrently completing a geologic hazards assessment for the subject lot, the results of which may be found in a separate report.

The recommendations contained in this report are subject to the limitations presented in the "Limitations" section of this report.

2.2 PROJECT DESCRIPTION

The Summit Pointe Subdivision is located in Alpine, Utah between Hog Hollow and Fort Canyon on the south flank of the Traverse Mountains in Alpine, Utah (see *Site Vicinity Map* Plate A-1). We understand that the proposed subdivision will consist of 8 residential lots with associated roadways and utilities located on approximately 30 acres.

3.0 METHOD OF STUDY

3.1 SUBSURFACE INVESTIGATION

As part of this investigation, subsurface soil conditions were explored by excavating 4 exploratory test pits to depths ranging from 10 to 11 feet below the site grade as it existed at the time of our investigation. The approximate locations of the explorations are shown on the Exploration Location Map, Plate A-2 in Appendix A. Exploration points were selected to provide a representative cross section of the subsurface soil conditions in the anticipated vicinity of the proposed structures. Subsurface soil conditions as encountered in the explorations were logged at the time of our investigation by a qualified field geologist and are presented on the enclosed Test Pit Logs, Plates B-1 through B-4 in Appendix B. A Key to USCS Soil Symbols and Terminology is presented on Plate B-5.

The test pits were advanced using a trackhoe. Both relatively undisturbed and bulk soil samples were obtained in each of the test pit explorations. Bulk soil samples were obtained in each of the explorations and placed in bags and buckets. Undisturbed soil samples were collected where feasible as block samples. All samples were transported to our laboratory for testing to evaluate engineering properties of the various earth materials observed. The soils were classified according to the *Unified Soil Classification System* (USCS) by the field personnel. Classifications for the individual soil units are shown on the attached Test Pit Logs.

3.2 LABORATORY INVESTIGATION

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

- Percent of Fines by Washing (ASTM D1140)
- Grain-Size Distribution Test (ASTM D6913)
- Atterberg Limits Test (ASTM D4318)
- Direct Shear Test (ASTM D3080)

The results of laboratory tests are presented on the Test Pit Logs in Appendix B (Plates B-1 to B-4), the Laboratory Summary Table and the test result plates presented in Appendix C (Plates C-1 to C-6).

3.3 ENGINEERING ANALYSIS

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

3.4 REVIEW OF PREVIOUS INVESTIGATION

As part of our study we completed a review of a previously completed geotechnical investigation performed for the subject property. The report was prepared by Earthtec Testing & Engineering, P.C. and is titled "Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah" dated August 18, 2005 (Earthtec Job No.: 051709).

4.0 GENERALIZED SITE CONDITIONS

4.1 SURFACE CONDITIONS

The Summit Pointe Subdivision is located in Alpine, Utah is located between Hog Hollow and Fort Canyon on the south flank of the Traverse Mountains in Alpine, Utah as shown on the Site Vicinity Map (Plate A-1). The study site is vegetated with scrub oak and sagebrush and is located at an elevation ranging from 5,380 to 5,200 feet above mean sea level (MSL). Hog Hollow and Fort Canyon are generally north-south trending canyons with small ephemeral streams at the base. The Hog Hollow fault trends along the bottom of Hog Hollow (Machette, 1992; Biek, 2005).

4.2 SUBSURFACE CONDITIONS

As mentioned previously, the subsurface soil conditions were explored at the site by excavating 4 test pits at the subject site to depths ranging from 10 to 11 feet below the existing grade. The soils encountered in the test pit explorations were visually classified and logged during our field investigation and are included on the Test Pit Logs in Appendix B (Plates B-1 to B-4). The subsurface conditions encountered during our investigation are discussed below.

4.2.1 Soils

Based on our observations and geologic literature review, the subject property is overlain by approximately 1 foot of topsoil comprised of silt, sand, clay and gravel. Underlying the topsoil, we encountered Tertiary-age Alluvial Fan Deposits and Pleistocene-aged Alluvial Fan Deposits.

<u>Topsoil:</u> Where observed these soils consisted of medium to dark brown, dense, moist Silty SAND (SM) with gravel. These soils contained an organic appearance. It is considered likely that topsoil will be encountered across the majority of the site.

<u>Tertiary-age Alluvial Fan Deposits (Taf)</u>: Where observed, these soils consisted of dense, tannish brown, moist, Silty GRAVEL (GM) with sand and cobbles, dense, red brown, moist Poorly Graded GRAVEL (GP) and Poorly Graded SAND (SP) with subrounded to subangular cobbles up to 6 inches in diameter and lastly, dense, whitish brown to reddish tan, moist Silty SAND (SM) with varying amounts of gravel and cobbles.

Pleistocene-age Alluvial and Alluvial Fan Deposits (Qafb, Qaly): Where observed, these soils consisted of stiff to hard, moist, dark red-brown Lean CLAY (CL) with varying amounts of sand.

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

4.2.2 Groundwater Conditions

Groundwater was not encountered in any of the explorations completed for this investigation and is not expected to impact the development. Due to the season of our investigation (late summer), we anticipate groundwater levels to be near their seasonal average. It is our experience that during snowmelt, runoff, irrigation on the property and surrounding properties, high precipitation events, and other activities, the groundwater level can rise several feet. Fluctuations in the groundwater level should be expected over time.

5.0 GEOLOGIC CONDITIONS

5.1 GEOLOGIC SETTING

As mentioned previously, GeoStrata is concurrently completing a geologic hazards potential assessment of the subject property. Information concerning the geologic nature of the subject property may be found in that report.

5.2 SEISMICITY AND FAULTING

The site lies within the north-south trending belt of seismicity known as the Intermountain Seismic Belt (ISB) (Hecker, 1993). The ISB extends from northwestern Montana through southwestern Utah. An active fault is defined as a fault that has had activity within the Holocene (<11ka). No active faults are mapped through or immediately adjacent to the site (Black et. al, 2003, Hecker, 1993). The site is located approximately 2 miles west of the nearest mapped section of the Provo segment of the Wasatch Fault Zone, which is mapped along the western flank of the Wasatch Mountains. The Provo segment is one of the longest sections of the Wasatch Fault Zone (Hecker, 1993) and is estimated to be approximately 43 miles long with a reported rupture length of 37 miles and a maximum potential to produce earthquakes up to magnitude (Ms) 7.5 to 7.7 (Black et al, 2003). The site is also located approximately 9 miles northeast of the nearest mapped portion of the Utah Lake Faults and Folds (ULFF). The ULFF consists of several northeast to northwest trending faults and folds located beneath Utah Lake and are reported to have been active in the past 15 ka (Black et al, 2003). However, since the ULFF is at the bottom of a large lake these faults are poorly understood – as such, the USGS does not include ULFF in their fault database for seismic hazard analysis. Finally, the site is located approximately 26 miles east of the nearest mapped segment of the Southern Oquirrh Mountains fault zone. The Oquirrh Fault Zone consists of a normal fault located along the western base of the Oquirrh Mountains in the eastern Tooele Valley. This fault was reportedly last active approximately 4,300 and 6,900 years ago and appears to be seismically independent of the Wasatch Fault Zone (Black and others, 2004). Analysis of the ground shaking hazard along the Wasatch Front suggests that the Wasatch Fault Zone is the single greatest contributor to the seismic hazard in the Utah Valley region. Each of the faults listed above show evidence of Holocene-aged movement and are therefore considered active.

Seismic hazard maps depicting probabilistic ground motions and spectral response have been developed for the United States by the U.S. Geological Survey as part of NEHRP/NSHMP (Frankel et al, 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2015). Spectral responses for the Maximum Considered Earthquake (MCE$_R$) are shown in the table below. These values generally correspond to a two percent probability of exceedance in 50 years (2PE50) for a “firm rock” site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on our field and office investigations, it is our opinion that this location is best described as a Site Class C for a “very dense soil and soft rock” site. The spectral accelerations are shown in the table below. The spectral accelerations are calculated based on the site’s approximate latitude and longitude of 40.4611° and -111.7931° respectively and the USGS U.S. Seismic Design Maps web-based tool. Based on the 2015 IBC, the site coefficients are F_a=1.00 and F_v=1.34. From this procedure the peak ground acceleration (PGA) is estimated to be 0.51g.

MCE$_R$ Seismic Response Spectrum Spectral Acceleration Values for IBC Site Class C[a]

Site Location: **Latitude = 40.4611 N** **Longitude = -111.7931 W**	**Site Class C Site Coefficients:** **Fa = 1.00** **Fv = 1.34**
Spectral Period (sec)	**Response Spectrum Spectral Acceleration (g)**
0.2	S_{MS}=(F_a*S_s=1.00*1.26) = 1.26
1.0	S_{M1}=(F_V*S_1=1.34*0.46) = 0.62

[a] IBC 1613.3.4 recommends scaling the MCE$_R$ values by 2/3 to obtain the design spectral response acceleration values; values reported in the table above have not been reduced.

6.0 CONCLUSIONS & RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

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

6.2 EARTHWORK

Prior to the placement of foundations, concrete flatwork, and pavements, general site grading is recommended to provide proper support for foundations, exterior concrete flatwork, concrete slabs-on-grade, and pavements. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential settlement of foundations as a result of variations in subgrade moisture conditions.

6.2.1 General Site Preparation and Grading

Within areas to be graded (below proposed structures, fill sections, concrete flatwork, or pavement sections), all vegetation, topsoil, potentially expansive soils, debris, and undocumented fill (if encountered) should be removed. Any existing utilities should be re-routed or protected in place. Tree roots are anticipated and should be grubbed-out and replaced with engineered fill. Any soft, loose, disturbed or undocumented fill soils should also be removed. Following the removal of vegetation, unsuitable soils, and loose or disturbed soils, as described above, site grading may be conducted to bring the site to design elevations.

6.2.2 Excavations

Unsuitable soils that include loose or expansive soils, undocumented fill or otherwise deleterious soils beneath foundations should be removed and replaced with structural fill. If over-excavation is required, the excavation should extend a minimum of one foot laterally for every foot of depth of over-excavation. Excavations should extend laterally at least two feet beyond flatwork, pavements, and slabs-on-grade. If materials are encountered that are not represented in the test pit logs or may present a concern, GeoStrata should be notified so observations and further recommendations as required can be made.

6.2.3 Excavation Stability

Based on Occupational Safety and Health Administration (OSHA) guidelines for excavation safety, trenches with vertical walls up to 4 feet in depth may be occupied, however, the presence of fill soils, loose soils, or wet soils may require that the walls be flattened to maintain safe working conditions. When the trench is deeper than 4 feet, we recommend a trench-shield or shoring be used as a protective system to workers in the trench. Based on our soil observations, laboratory testing, and OSHA guidelines, native soils at the site classify as Type C soils. Deeper excavations, if required, should be constructed with side slopes no steeper than one and one-half horizontal to one vertical (1.5H:1V). If wet conditions are encountered, side slopes should be further flattened to maintain slope stability. Alternatively shoring or trench boxes may be used to improve safe work conditions in trenches. The contractor is ultimately responsible for trench and site safety. Pertinent OSHA requirements should be met to provide a safe work environment. If site specific conditions arise that require engineering analysis in accordance with OSHA regulations, GeoStrata can respond and provide recommendations as needed.

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

6.2.4 Structural Fill and Compaction

All fill placed for the support of structures, concrete flatwork or pavements should consist of structural fill. Structural fill may consist of excavated onsite sandy or gravel soils, or an imported granular soil. Onsite clayey soils should not be used as structural fill due to concerns related to potential slope instability. Structural fill should be free of vegetation, debris, or frozen material. Alternatively, an imported fill structural fill meeting the specifications below may be used. If imported structural fill is needed, it should be a relatively well graded granular soil with a maximum of 50 percent passing the No. 4 mesh sieve and a maximum fines content (minus No.200 mesh sieve) of 25 percent. Soils not meeting the aforementioned criteria may be suitable for use as structural fill. These soils should be evaluated on a case-by-case basis and should be approved by the Geotechnical Engineer prior to use. The contractor should have confidence that the anticipated method of compaction will be suitable for the type of structural fill used, and should anticipate testing all soils used as structural fill frequently to assess the maximum dry density, fines content, and moisture content, etc.

All structural fill should be placed in maximum 6-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 8-inch loose lifts if compacted by light-duty rollers, and maximum 10-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by the geotechnical engineer. Structural fill should be compacted to at least 95% of the maximum dry density (MDD), as determined by ASTM D1557. The moisture content should be at or slightly above the optimum moisture content (OMC) at the time of placement and compaction. Also, prior to placing any fill, the excavations should be observed by the geotechnical engineer to observe that any unsuitable materials or loose soils have been removed. In addition, proper grading should precede placement of fill, as described in the **General Site Preparation and Grading** subsection of this report (Section 6.2.1).

For fill section with a total thickness of less than 5-feet, fill soils placed for subgrade below exterior flat work and pavements, should be within 3% of the OMC when placed and compacted to at least 95% of the MDD as determined by ASTM D1557. For structural fill sections with a total thickness of 5-feet or more, structural fill should be compacted to at least 98% of the MDD as determined by ASTM D1557. All utility trenches backfilled below the proposed structure, pavements, and flatwork concrete, should be backfilled with structural fill that is within 3% of the OMC when placed and compacted to at least 95% of the MDD as determined by ASTM D1557. All other trenches, in landscape areas, should be backfilled and compacted to at least 90% of the MDD (ASTM D1557).

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

6.3 FOUNDATIONS

The foundations for the proposed structures may consist of conventional strip and/or spread footings. Strip and spread footings should be a minimum of 20 and 36 inches wide, respectively, and exterior shallow footings should be embedded at least 36 inches below final grade for frost protection and confinement. Interior shallow footings not susceptible to frost conditions should be embedded at least 18 inches for confinement.

6.3.1 Installation and Bearing Material

Footings may be placed entirely on undisturbed, native, non-moisture sensitive soils or on structural fill which is bearing on undisturbed native soils. Foundation elements should not be founded on undocumented fill soils, and if these soils are encountered they should be over-excavated until suitable, native soils are exposed. The site may then be brought back up to design grade using properly placed and compacted structural fill. Structural fill should meet material recommendations and be placed and compacted as recommended in Section 6.2.4.

6.3.2 Bearing Pressure

Conventional strip and spread footings founded as described above may be proportioned for a maximum net allowable bearing capacity of **1,500 pounds per square foot (psf).** The recommended net allowable bearing pressure refers to the total dead load and can be increased by 1/3 to include the sum of all loads including wind and seismic.

6.3.3 Settlement

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

6.3.4 Frost Depth

All exterior footings are to be constructed at least 36 inches below the ground surface for frost protection and confinement. This includes walk-out areas and may require fill to be placed around buildings. Interior footings not susceptible to frost conditions should be embedded at least 18 inches for confinement. If foundations are constructed through the winter months, all soils on which footings will bear shall be protected from freezing.

6.3.5 *Construction Observation*

A geotechnical engineer shall periodically monitor excavations prior to installation of footings. Inspection of soil before placement of structural fill or concrete is required to detect any field conditions not encountered in the investigation which would alter the recommendations of this report. All structural fill material shall be tested under the direction of a geotechnical engineer for material and compaction requirements. Lot specific collapse testing should be completed at the time of the foundation excavation in order to observe whether collapsible soils underlie the proposed residences.

6.3.6 *Foundation Drainage*

Groundwater was not encountered in the test pits excavated for this investigation. Soils encountered in the subsurface explorations at elevations of proposed foundations consisted of silty gravel, silty sand, clayey gravel, and clay.

GeoStrata recommends footings and foundations be designed according to the International Residential Code (IRC 2015). Soils with medium to poor drainage characteristics require that a foundation drain be installed to allow water to drain away from the foundation and to reduce the risk of flooding of enclosed interior subgrade spaces. The clay and clayey gravel soils encountered in the test pits excavated for this investigation are considered to have poor drainage characteristics. The silty sand and silty gravel soils encountered in the test pits excavated for this investigation are considered to have medium to good drainage characteristics. If a basement is incorporated into the design of the proposed structures, a foundation drain is recommended in the clay and clayey gravel soil types based on the IRC. If basement foundations are founded on the silty sand and silty gravel soils, a foundation drain is not required according to the IRC. Each foundation excavation will need to be inspected on a lot by lot basis by the Geotechnical Engineer to assess if a foundation drain is warranted as a result of soil or moisture conditions.

6.4 EARTH PRESSURES AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting subgrade. In determining the frictional resistance, a coefficient of friction of 0.36 should be used for structural fill, drain gravel, or sandy native soils against concrete or 0.29 for native fine-grained soils.

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

Condition	**Lateral Pressure Coefficient**	**Equivalent Fluid Density (pounds per cubic foot)**
Active*	0.30	36
At-rest**	0.50	60
Passive*	6.11	733
Seismic Active***	0.22	26
Seismic Passive***	-1.31	-157

* Based on Coulomb's equation

** Based on Jaky

*** Based on Mononobe-Okabe Equation

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

Condition	**Lateral Pressure Coefficient**	**Equivalent Fluid Density (pounds per cubic foot)**
Active*	0.38	45
At-rest**	0.59	71
Passive*	3.79	455
Seismic Active***	0.26	31
Seismic Passive***	-0.92	-110

* Based on Coulomb's equation

** Based on Jaky

*** Based on Mononobe-Okabe Equation

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

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

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

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

6.5 CONCRETE SLAB-ON-GRADE CONSTRUCTION

As a minimum, concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel overlying native soils or a zone of structural fill that is at least 12 inches thick. Disturbed native soils should be compacted to at least 95% of the MDD as determined by ASTM D1557 (modified proctor) prior to placement of gravel. The gravel should consist of road base or clean drain rock with a ¾-inch maximum particle size and no more than 12 percent fines passing the No. 200 mesh sieve. The gravel layer should be compacted to at least 95 percent of the MDD of modified proctor or until tight and relatively unyielding if the material is non-proctorable. All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with welded wire, re-bar, or fiber mesh. Loading on any concrete slabs should not exceed 300 psf.

6.6 MOISTURE PROTECTION AND SURFACE DRAINAGE

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

- The ground surface within 10 feet of the entire perimeter of the building should slope a minimum of five percent away from the structure. Alternatively, a slope of 2% is acceptable if the water is conveyed to a concrete ditch that will convey the water to a point of discharge that is at least 10 feet from the structures.
- Roof runoff devices (rain gutters) should be installed to direct all runoff a minimum of 10 feet away from the structure and preferably day-lighted to the curb where it can be transferred to the storm drain system. Rain gutters discharging roof runoff adjacent to or within the near vicinity of the structure may result in excessive differential settlement.
- We do not recommend storm drain collection sumps be used as part of this development. However, if necessary, sumps should not be located adjacent to foundations or within roadway pavements due to the presence of potentially collapsible soils.
- We recommend irrigation around foundations be minimized by selective landscaping and that irrigation valves be constructed at least 5 feet away from foundations.
- Jetting (injecting water beneath the surface) to compact backfill against foundation soils may result in excessive settlement beneath the building and is not allowed.
- Backfill against foundations walls should consist of on-site native fine-grained soils and should be placed in lifts and compacted to 90% modified proctor to create a moisture barrier.

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

6.7 SLOPE STABILITY

Slope stability analysis was performed on three (3) slope profiles of the proposed construction. The analysis included both static and pseudo-static (seismic) analyses. The stability analyses were completed using the geometric conditions and soil strengths as described below and the subsurface conditions as observed in the test pits advanced for this investigation and the test pits and boreholes advanced for the 2005 Earthtec geotechnical investigation. The location of the profiles used in our stability analyses are shown on the attached Exploration Location Map (Plate A-2).

Stability of the slope was assessed using Slide, a computer program which incorporates, among others, the Bishop's Simplified Method of slices. Calculations for stability were developed by searching for the minimum factor of safety for a circular-type failure. Homogeneous earth materials were assumed.

Groundwater was not observed in our test pits or in the test pits and boreholes advanced for the 2005 Earthtec geotechnical investigation; therefore, groundwater was not incorporated in our slope stability analysis as it is not anticipated that groundwater will impact the proposed development.

Slope profiles of the existing slope were made using the existing topography for the site from the 2013-2014 0.5-meter Wasatch Front LiDAR data. Cross sections of the proposed cuts and fills from the August 8, 2018 S.E. Science, LLC construction drawings titled "Summit Pointe Amended Subdivision" were used to model the proposed final slope profiles. A cross-section of the subsurface soils was developed from review of available geologic maps, the results of our subsurface investigation, and review of the 2005 Earthtec geotechnical investigation.

Soil strength parameters used in our analysis were determined from laboratory testing on samples collected from the test pits excavated for this investigation. Two (2) direct shear tests were performed on samples of the sand and clay soils observed in the test pits.

Results of our slope stability analysis are presented in Appendix D and summarized in the table below. In general, the proposed modifications to the slope meet minimum acceptable factors of safety. Factors of safety of 1.5 and 1.0 were considered acceptable for static and pseudo static conditions, respectively.

Slope Profile	Static	Pseudo Static
Profile-A	1.894	1.130
Profile-B	1.583	1.019
Profile-C	1.687	1.011

Slope stability for individual lots was outside of the scope of this investigation. Once grading plans for individual lots are completed, including the size and location of proposed homes and any proposed cuts, fills, or retaining walls, lot specific slope stability analysis should be performed.

6.8 PAVEMENT SECTION

For pavement design, an assumed CBR value for the near surface subgrade soils of 4 was used in our analysis. No traffic information was available at the time this report was prepared; therefore, GeoStrata has assumed traffic counts for the roadway accounting for future development of the adjacent proposed 110-acre Sequoias development. We assumed that vehicle traffic along the roadway will consist of approximately 1,200 passenger car trips per day, 2 small trucks per day, and 2 large trucks per day with a 20-year design life. Based on these assumptions, our analysis uses 41,300 ESAL's for the traffic over the life of the pavement. Asphalt has been assumed to be a high stability plant mix and base course material (road base) composed of crushed stone with a minimum CBR of 70. We have further assumed that the traffic will be relatively consistent over the design life of the pavement sections. Therefore, no growth factor was applied in calculation of loading for each pavement sections' design life. The table below presents equivalent recommended pavement sections based on the above assumptions. Either pavement option may be selected based on economic considerations.

Flexible Pavement Section

Asphalt Concrete (in)	Untreated Base Course (in)	Granular Subbase (in)
3	12	---
3	6	8

If traffic conditions vary significantly from our stated assumptions, GeoStrata should be contacted so we can modify our pavement design parameters accordingly. Specifically, if the traffic counts are significantly higher or lower, we should be contacted to review the pavement sections as necessary. The pavement sections thicknesses above assumes that the majority of construction traffic including cement trucks, cranes, loaded haulers, etc. has ceased. If a significant volume of construction traffic occurs after the pavement section has been constructed, the owner should anticipate maintenance or a decrease in the design life of the pavement area.

7.0 CLOSURE

7.1 LIMITATIONS

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

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

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

7.2 ADDITIONAL SERVICES

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

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

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

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

8.0 REFERENCES CITED

Biek, R.F., 2005, Geologic Map of the Lehi Quadrangle Salt Lake and Utah Counties, Utah: Utah Geological Survey Map 210, scale 1:24,000.

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

Earthtec Testing and Engineeirng, P.C., 2005, Geotechnical Study Summit Hills Development & Lakeview Drive Extension, Alpine, Utah; Earthtec Job No. 051709, unpublished consultant's report.

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

International Building Code [IBC], 2015, International Code Council, Inc.

Machette, M.N., 1992, Surficial geologic map of Wasatch fault zone, eastern part of the Utah Valley, Utah County and parts of Salt Lake and Juab Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-2095, scale 1:50,000.

Appendix A

400 0 400 800 1200 1600 ft

1:10,000

GeoStrata

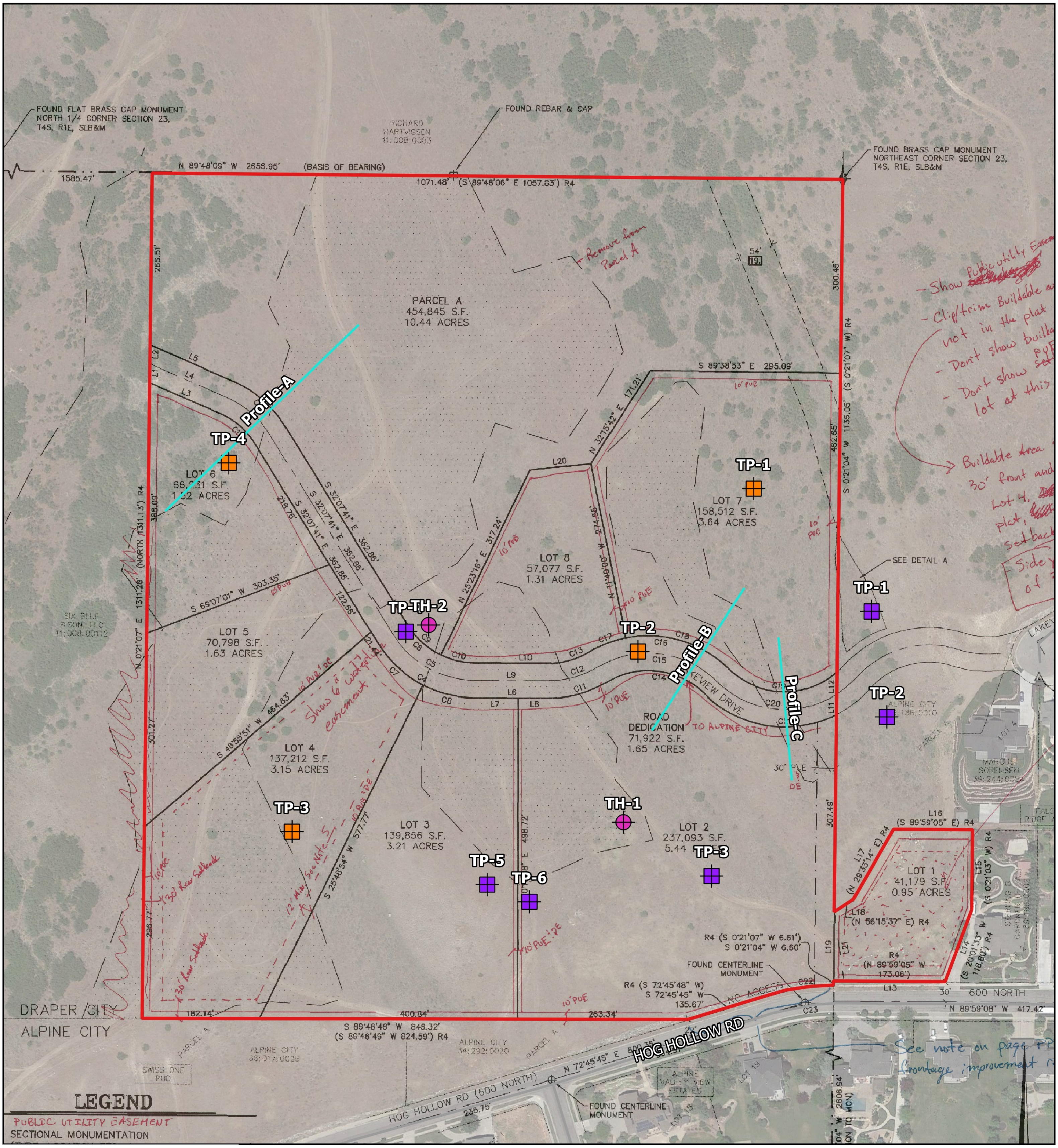
Legend

🟥 Approximate Site Boundary

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, UT
Project Number: 1312-003

Site Vicinity Map

Plate
A-1



Legend

- Slope Profile
- Approximate Site Boundary
- GeoStrata Test Pits
- Earthtec Borings
- Earthtec Test Pits

100 0 100 200 300 400 ft

1:2,400

GeoStrata

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, UT
Project Number: 1312-003

Exploration Location Map

Plate A-2

Appendix B

DATE	
STARTED:	9/13/18
COMPLETED:	9/13/18
BACKFILLED:	9/13/18

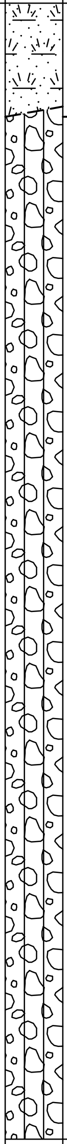
Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, Utah

Project Number 1312-003

GeoStrata Rep: A. Peay
Rig Type: PC 200 Trackhoe
Boring Type: Test Pit

BORING NO:
TP-1
Sheet 1 of 1

LOCATION
STATION
OFFSET
ELEVATION



DEPTH METERS	DEPTH FEET	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT 10 20 30 40 50 60 70 80 90	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits (Plastic Limit ├─●─┤ Moisture Content, Liquid Limit) 10 20 30 40 50 60 70 80 90
0	0				TOPSOIL; Silty SAND with gravel - dark brown, moist, organics throughout									
				GM	Silty GRAVEL with sand, cobbles and boulders - dense, tannish brown, moist, clasts are subrounded to subangular up to 1.5 feet in diameter									
1														
	5													
2														
		▯								5.4	18.3	NP	NP	●
3	10													
					Bottom of Boring @ 10 Feet									

N - OBSERVED UNCORRECTED BLOW COUNT

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

GeoStrata

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

NOTES:

WATER LEVEL
▼ - MEASURED ▽- ESTIMATED

Plate
B - 1

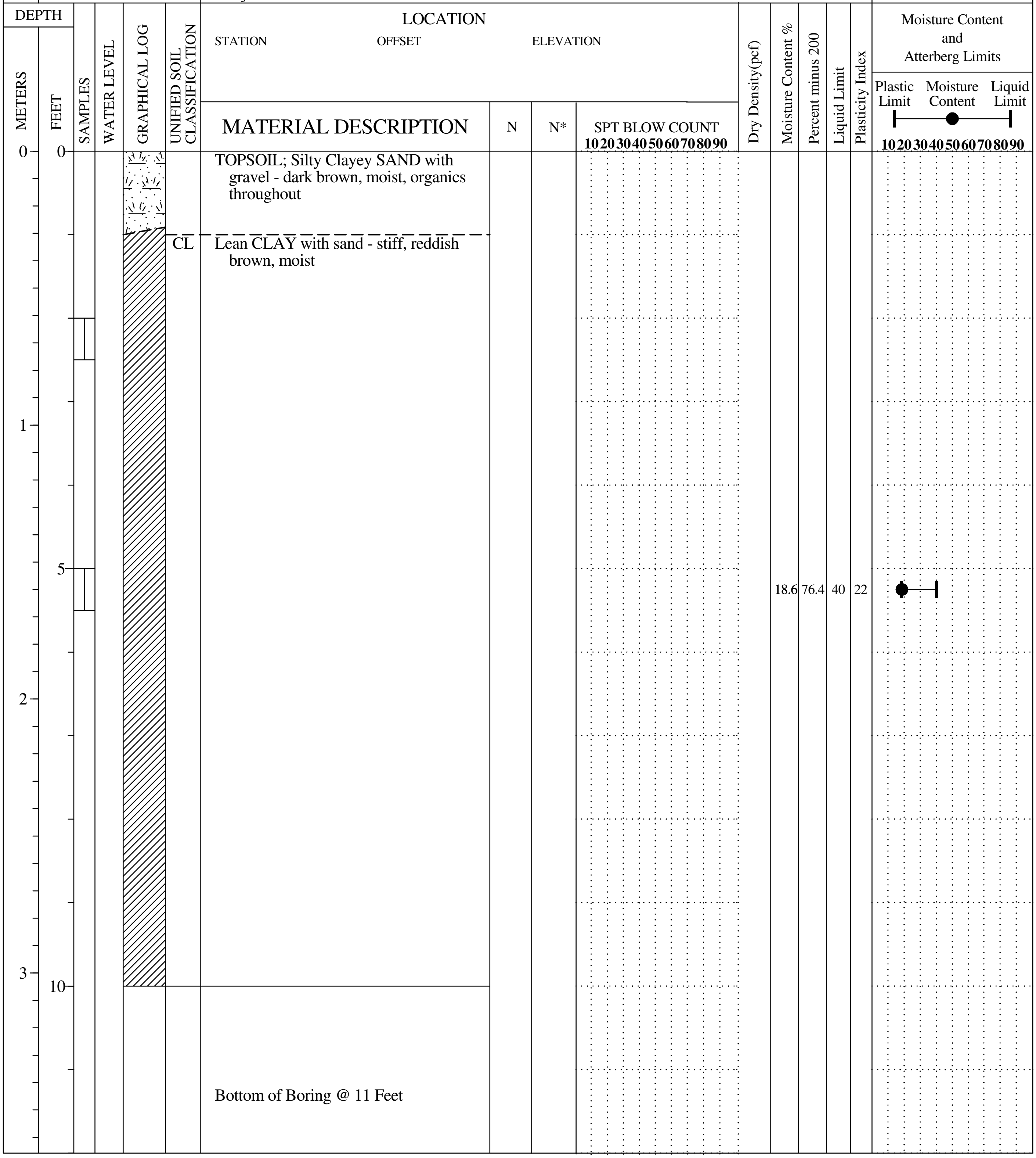
DATE		
STARTED:	9/13/18	
COMPLETED:	9/13/18	
BACKFILLED:	9/13/18	

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, Utah
Project Number 1312-003

GeoStrata Rep: A. Peay
Rig Type: PC 200 Trackhoe
Boring Type: Test Pit

BORING NO:
TP-2
Sheet 1 of 1

LOCATION
STATION OFFSET ELEVATION



Depth	USCS	MATERIAL DESCRIPTION	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0		TOPSOIL; Silty Clayey SAND with gravel - dark brown, moist, organics throughout				
	CL	Lean CLAY with sand - stiff, reddish brown, moist				
5			18.6	76.4	40	22
		Bottom of Boring @ 11 Feet				

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

GeoStrata

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

NOTES:

WATER LEVEL
▼- MEASURED ▽- ESTIMATED

Plate
B - 2

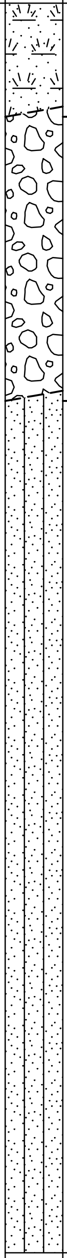
DATE	
STARTED:	9/13/18
COMPLETED:	9/13/18
BACKFILLED:	9/13/18

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, Utah
Project Number 1312-003

GeoStrata Rep: A. Peay
Rig Type: PC 200 Trackhoe
Boring Type: Test Pit

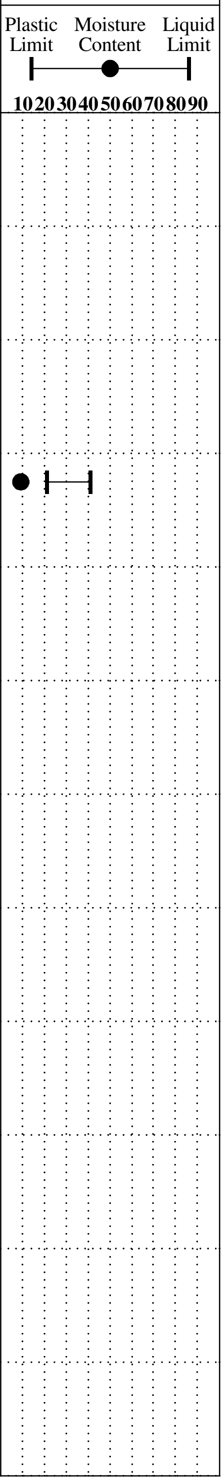
BORING NO:
TP-3
Sheet 1 of 1

LOCATION
STATION
OFFSET
ELEVATION



DEPTH (METERS)	DEPTH (FEET)	SAMPLES	WATER LEVEL	UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	SPT BLOW COUNT	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
0	0				TOPSOIL; Silty SAND with gravel - dark brown, moist, organics throughout								
				GP	Poorly Graded GRAVEL with cobbles - dense, red brown, moist, clasts are subrounded to subangular up to 6 inches in diameter								
1		▯							96.7	9.2	4.2	41	20
				SM	Silty SAND - dense, whitish brown, moist, clasts are subrounded to subangular up to 6 inches in diameter, average clast size between 3 and 4 inches								
	5	▯											
2													
3	10												
					Bottom of Boring @ 10 Feet								

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



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

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

NOTES:

WATER LEVEL
▼ - MEASURED ▽- ESTIMATED

Plate
B - 3

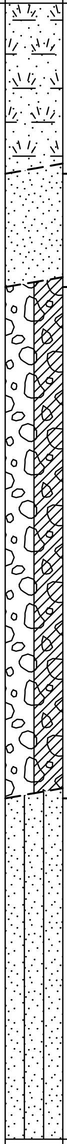
DATE	
STARTED:	9/13/18
COMPLETED:	9/13/18
BACKFILLED:	9/13/18

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, Utah
Project Number 1312-003

GeoStrata Rep: A. Peay
Rig Type: PC 200 Trackhoe
Boring Type: Test Pit

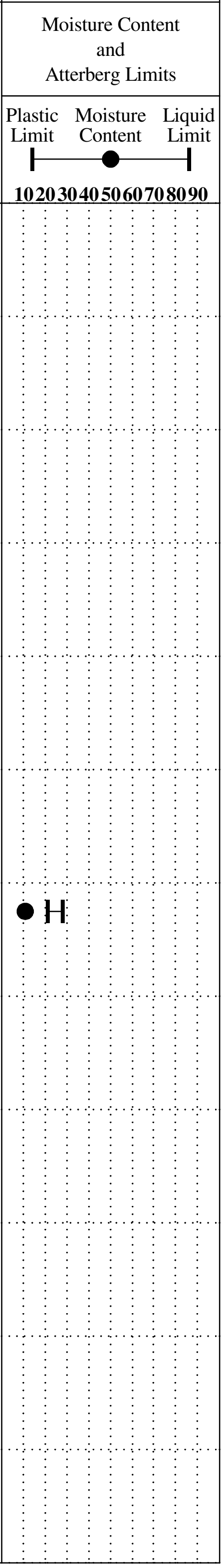
BORING NO:
TP-4
Sheet 1 of 1

LOCATION
STATION OFFSET ELEVATION



UNIFIED SOIL CLASSIFICATION	MATERIAL DESCRIPTION	N	N*	Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index
	TOPSOIL; Silty SAND with gravel - dark brown, moist, organics throughout							
SP	Poorly Graded SAND with silt, gravel and cobbles - dense, red brown, moist, clasts are subrounded to subangular up to 6 inches in diameter							
GP-GC	Poorly Graded GRAVEL with clay and sand - dense, whitish brown, moist, pinhole structures throughout			93.8	10.8	9.4	28	7
SM	Silty SAND with gravel - dense, reddish tan, moist, clasts are subrounded to subangular up to 6 inches in diameter, average clast size between 3 and 4 inches							
	Bottom of Boring @ 10 Feet							

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



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

GeoStrata

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

NOTES:

WATER LEVEL
▼ - MEASURED ▽- ESTIMATED

Plate
B - 4

UNIFIED SOIL CLASSIFICATION SYSTEM

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

LOG KEY SYMBOLS

BORING SAMPLE LOCATION

TEST-PIT SAMPLE LOCATION

WATER LEVEL (level after completion)

WATER LEVEL (level where first encountered)

CEMENTATION

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

OTHER TESTS KEY

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

MODIFIERS

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

MOISTURE CONTENT

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

STRATIFICATION

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

GENERAL NOTES

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

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

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

CONSISTENCY - FINE-GRAINED SOIL

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

GeoStrata

Soil Symbols Description Key

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, Utah
Project Number: 1312-003

**Plate
B-5**

Appendix C

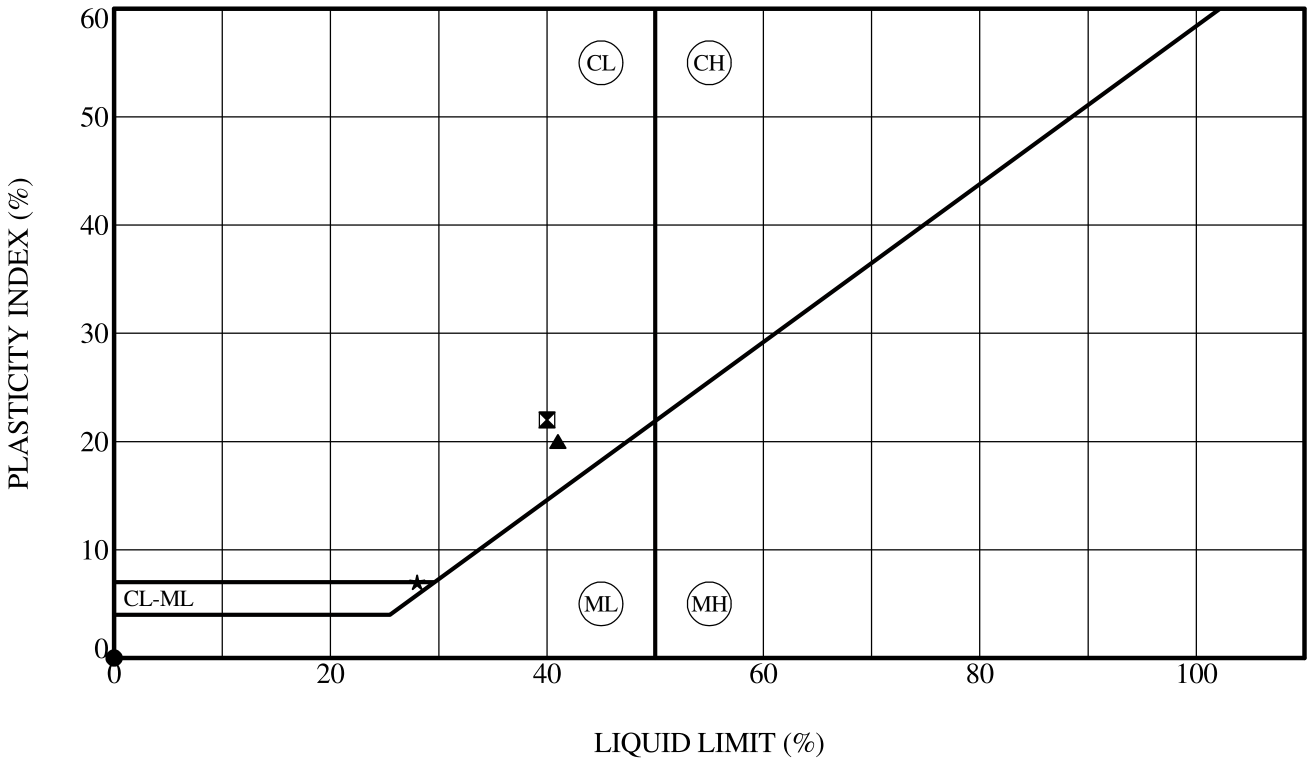
Test Pit No.	Sample Depth (feet)	USCS Soil Classification	Natural Moisture Content (%)	Natural Dry Density (pcf)	Gradation			Atterberg		Consolidation			Direct Shear	
					Gravel (%)	Sand (%)	Fines (%)	LL	PI	Cc	Cr	OCR	Internal Friction Angle (°)	Apparent Cohesion (psf)
TP-1	7	GM	5.4		57.4	24.3	18.3	NP	NP					
TP-2	5	CL	18.6	91.8	23.6		76.4	40	22	0.123	0.023	3	26	140
TP-3	3	GP	9.2	96.7	81.6	14.2	4.2	41	20					
TP-4	6	GP-GC	10.8	93.8	75.3	15.3	9.4	28	7				30	110

GeoStrata

Lab Summary Report

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, Utah
Project Number: 1312-003

Plate
C - 1



	Sample Location	Depth (ft)	LL (%)	PL (%)	PI (%)	Fines (%)	Classification
●	**TP-1**	**7.0**	**NP**	**NP**	**NP**	**18.3**	**Silty GRAVEL with sand**
☒	**TP-2**	**5.0**	**40**	**18**	**22**	**76.4**	**Lean CLAY with sand**
▲	**TP-3**	**3.0**	**41**	**21**	**20**	**4.2**	**Poorly Graded GRAVEL**
★	**TP-4**	**6.0**	**28**	**21**	**7**	**9.4**	**Poorly Graded GRAVEL with clay and sand**

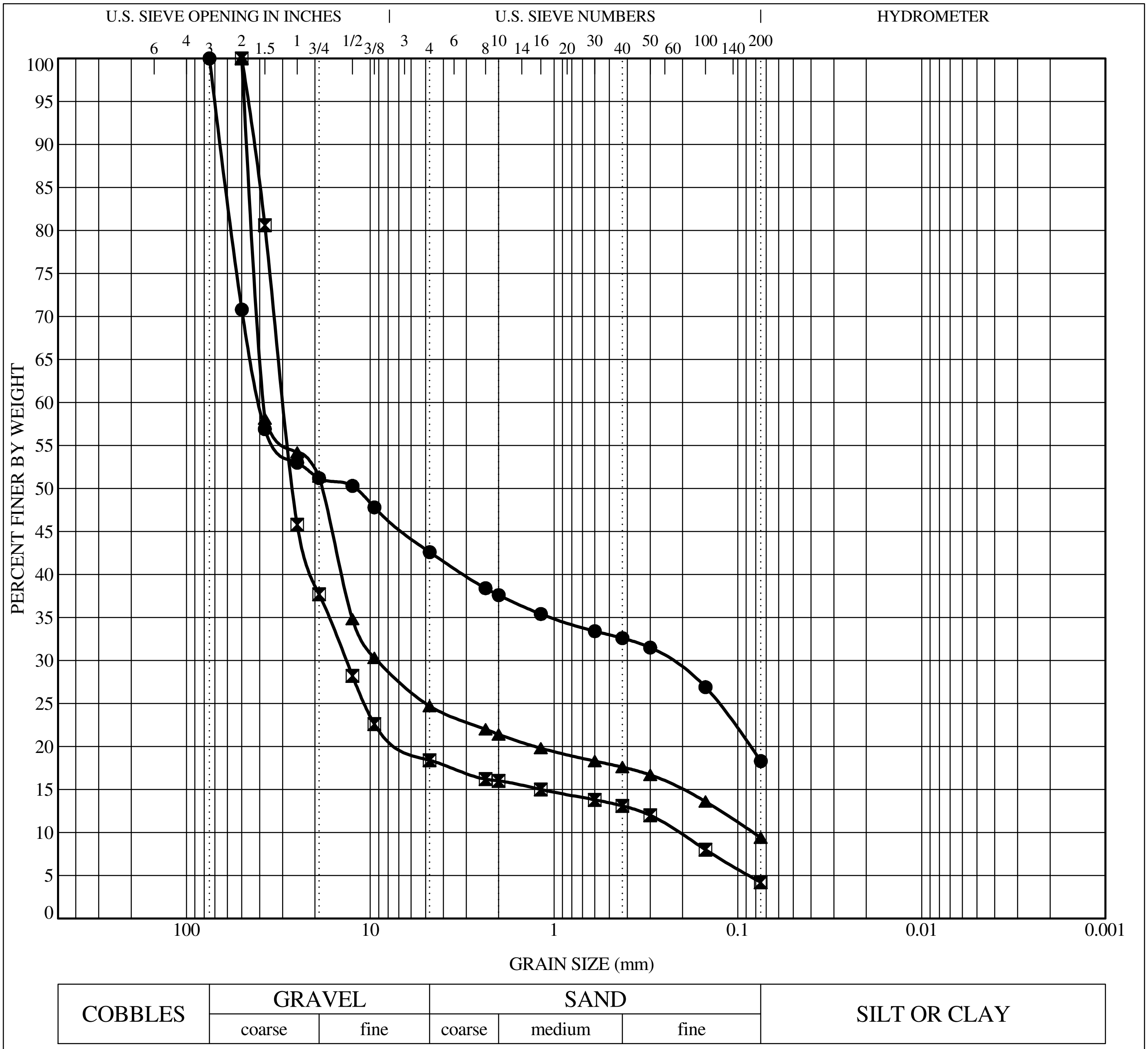
GeoStrata

ATTERBERG LIMITS' RESULTS - ASTM D 4318

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, Utah
Project Number: 1312-003

Plate

C - 2



Sample Location		Depth	Classification	LL	PL	PI	Cc	Cu
●	**TP-1**	**7.0**	**Silty GRAVEL with sand**	**NP**	**NP**	**NP**		
☒	**TP-3**	**3.0**	**Poorly Graded GRAVEL**	**41**	**21**	**20**	**29.26**	**139.06**
▲	**TP-4**	**6.0**	**Poorly Graded GRAVEL with clay and sand**	**28**	**21**	**7**	**26.63**	**458.81**

Sample Loctaion		Depth	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TP-1**	**7.0**	**75**	**39.985**	**0.239**		**57.4**	**24.3**	**18.3**	
☒	**TP-3**	**3.0**	**50**	**29.498**	**13.532**	**0.212**	**81.6**	**14.2**	**4.2**	
▲	**TP-4**	**6.0**	**50**	**37.992**	**9.154**	**0.083**	**75.3**	**15.3**	**9.4**	

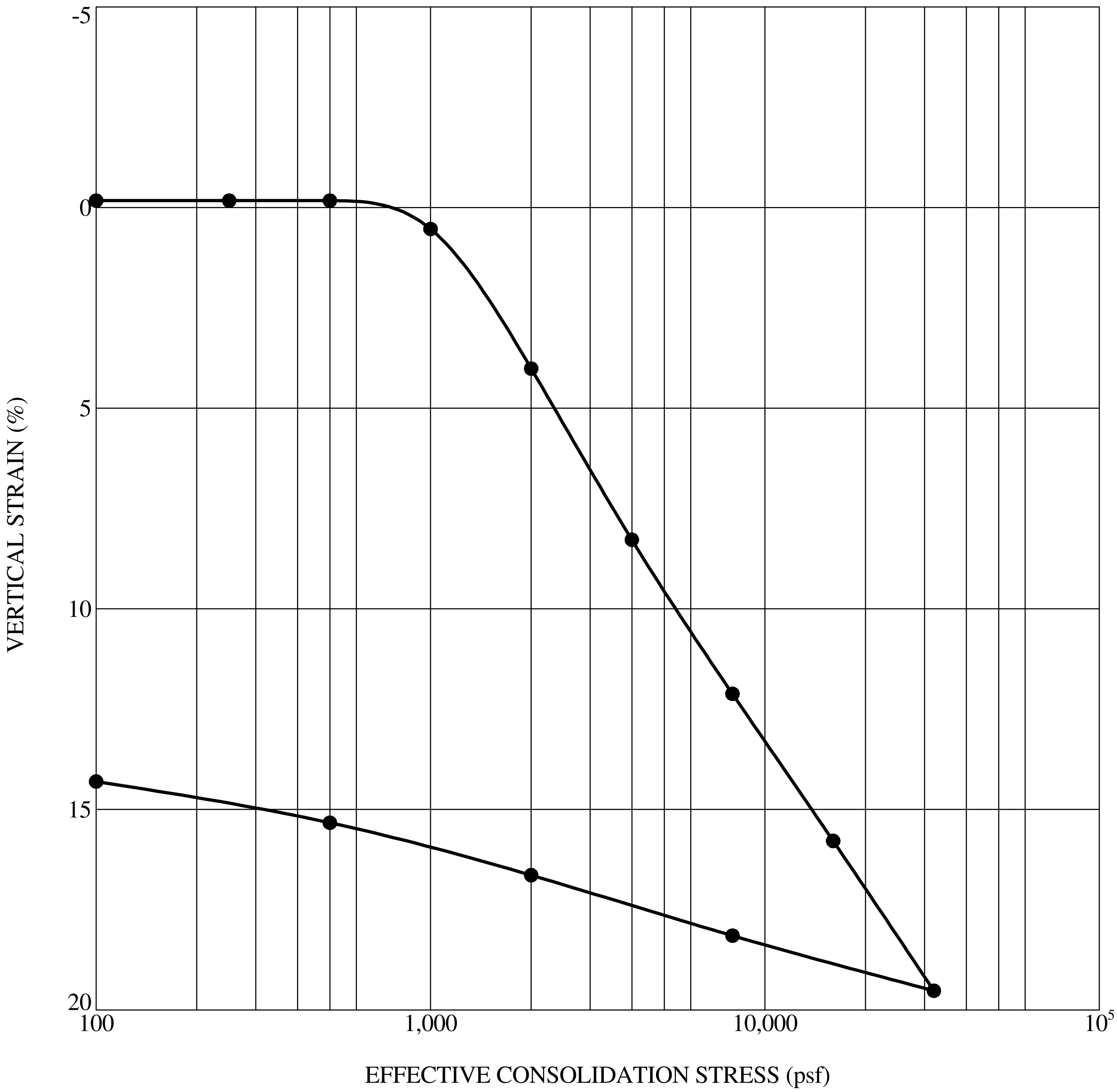
GeoStrata

GRAIN SIZE DISTRIBUTION - ASTM D422

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, Utah
Project Number: 1312-003

Plate

C - 3



	Sample Location	Depth (ft)	Classification	γ_d (pcf)	MC (%)	C'_c	C'_r	OCR
●	**TP-2**	**5.0**	**Lean CLAY with sand**	**91.8**	**20.0**	**0.123**	**0.023**	**3.0**

GeoStrata

1-D CONSOLIDATION TEST - ASTM D 2435

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, Utah
Project Number: 1312-003

Plate

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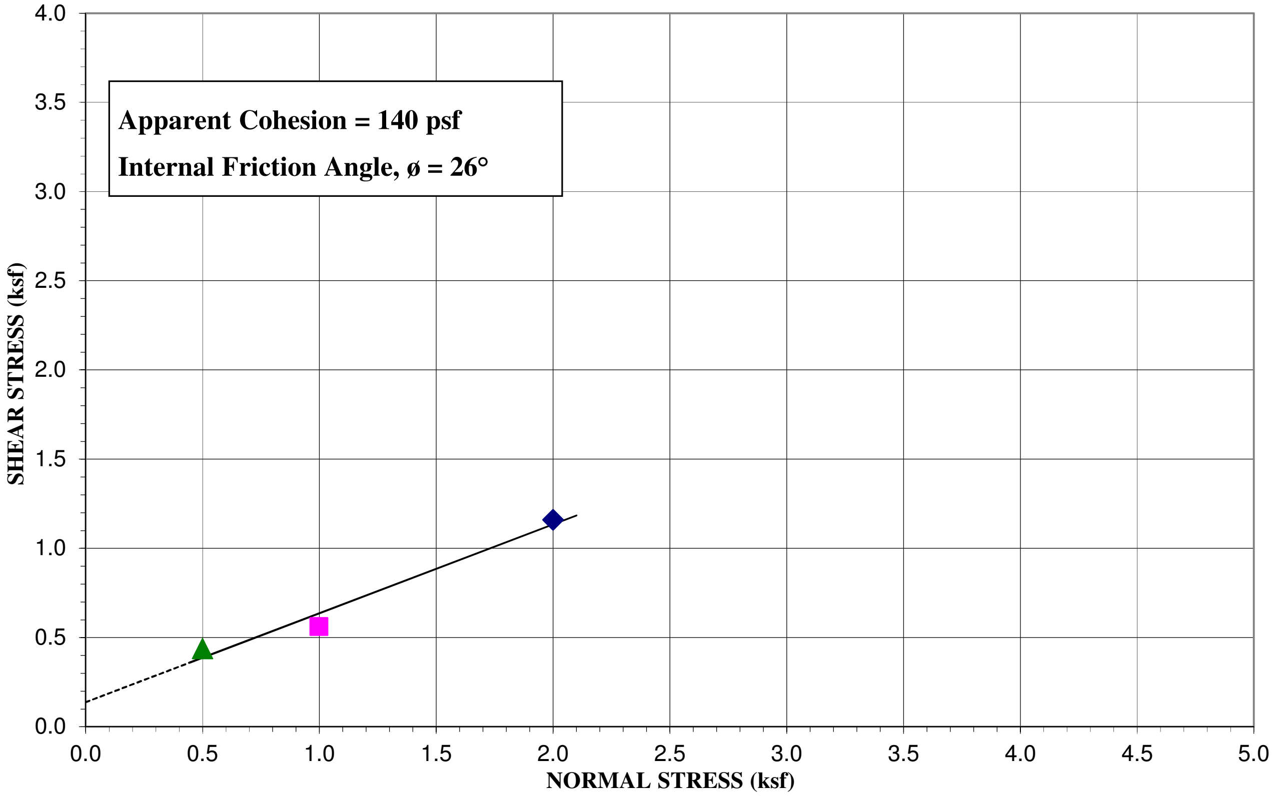
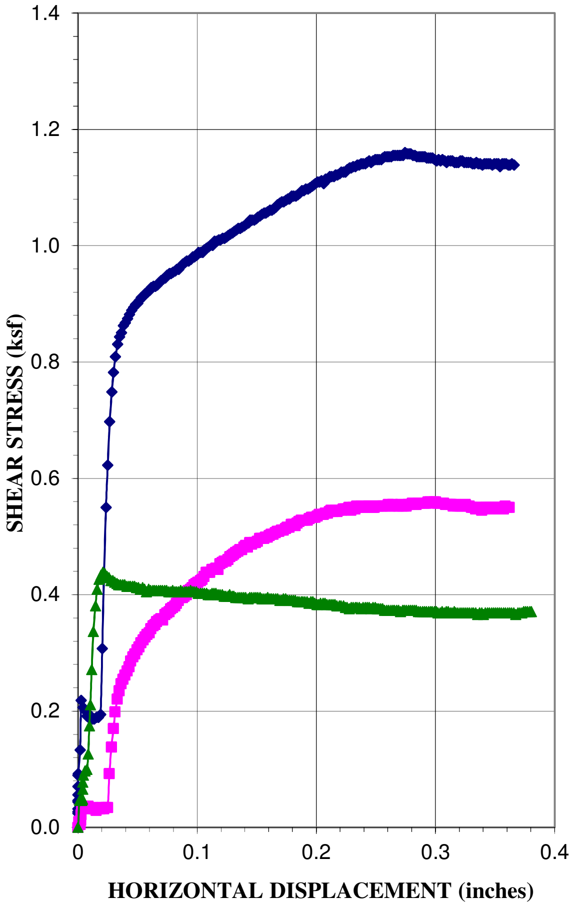
DIRECT SHEAR TEST





Sample Location:	TP-2 @ 5
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	1 (◆)	2 (■)	3 (▲)
Sample Type	Remolded		
Initial Height, in.	0.936	0.997	0.959
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	103.5	97.3	101.1
Dry Density After, pcf	105.3	99.0	102.8
Moisture % Before	14.0	15.2	14.6
Moisture % After	24.2	25.8	25.0
Saturation, % Before	61.8	57.7	60.8
Saturation, % After	112.3	101.8	109.2
Normal Load, ksf	2.0	1.0	0.5
Shear Stress, ksf	1.16	0.56	0.44
Strain Rate	0.003333 IN/MIN		

Sample Properties	
Cohesion, psf	140
Friction Angle, ϕ	26
Liquid Limit, %	40
Plasticity Index, %	22
Percent Gravel	23.6
Percent Sand	
Percent Passing No. 200 sieve	76.4
Classification	CL

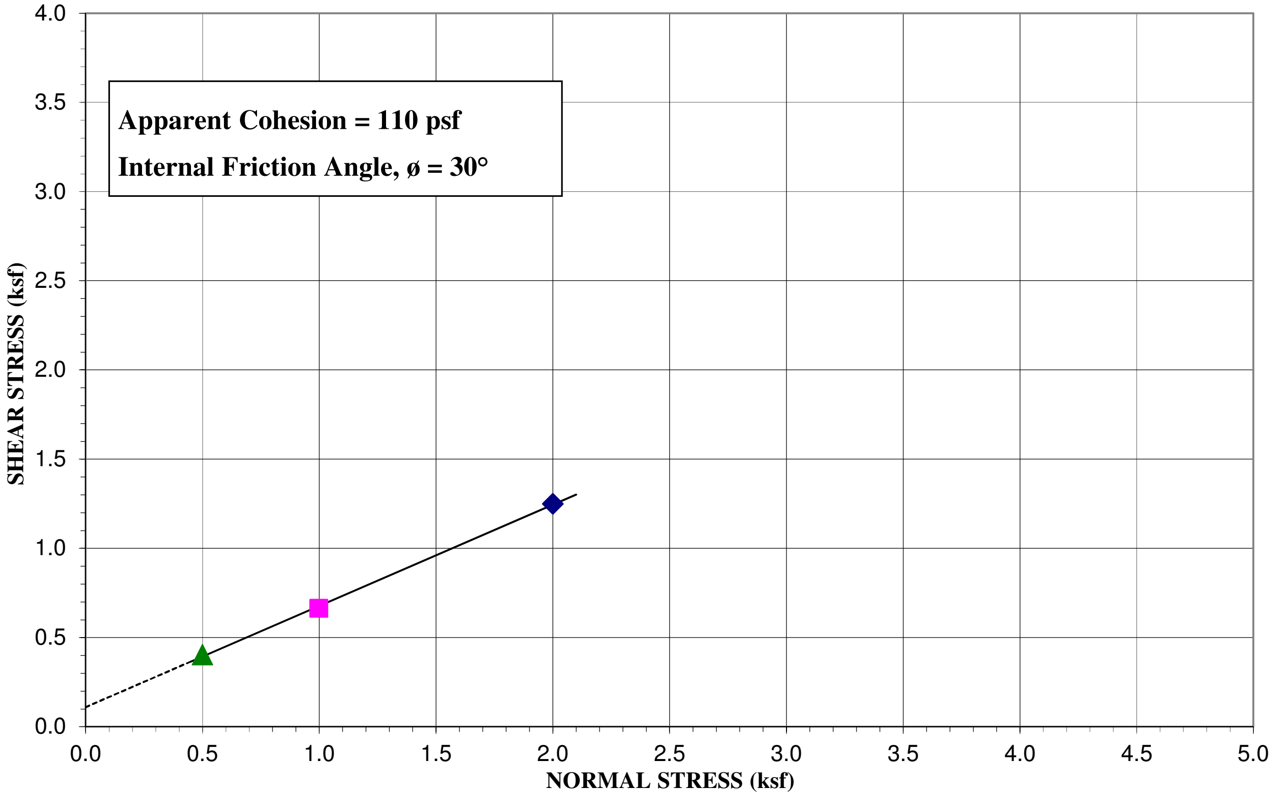
PROJECT: Summit Pointe

PROJECT NO.: **1312-003**

GeoStrata

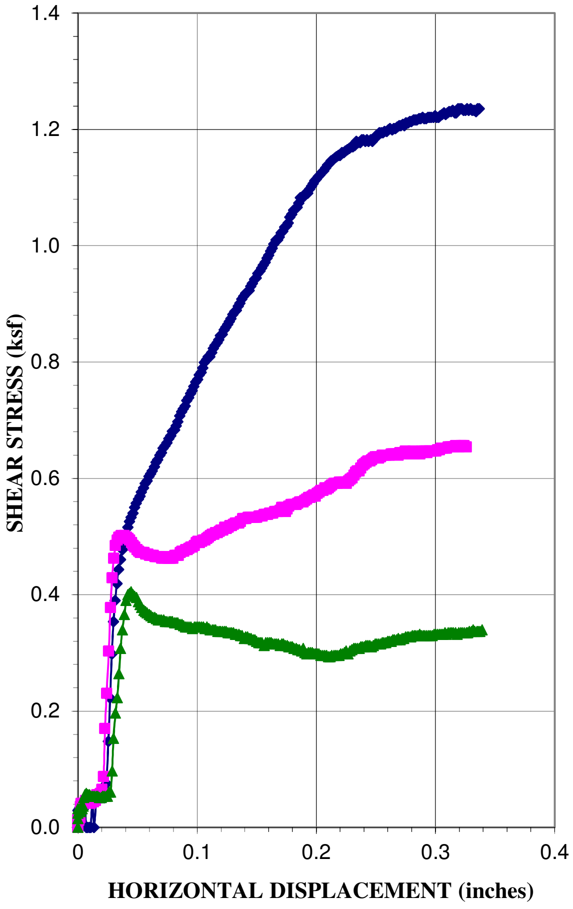
Plate
C-5

DIRECT SHEAR TEST



Apparent Cohesion = 110 psf

Internal Friction Angle, ø = 30°



Sample Location:	TP-4 @ 6
Type of Test:	Consolidated Drained/Saturated

Test No. (Symbol)	**1 (◆)**	**2 (■)**	**3 (▲)**
Sample Type	Remolded		
Initial Height, in.	0.947	0.937	0.945
Diameter, in.	2.5	2.5	2.5
Dry Density Before, pcf	98.9	99.4	98.8
Dry Density After, pcf	100.7	101.2	100.6
Moisture % Before	10.3	10.7	9.7
Moisture % After	25.0	25.8	26.8
Saturation, % Before	40.7	42.7	38.1
Saturation, % After	102.9	107.7	110.2
Normal Load, ksf	2.0	1.0	0.5
Shear Stress, ksf	1.25	0.66	0.40
Strain Rate	0.003008 IN/MIN		

Sample Properties	
Cohesion, psf	110
Friction Angle, ϕ	30
Liquid Limit, %	28
Plasticity Index, %	7
Percent Gravel	75.3
Percent Sand	15.3
Percent Passing No. 200 sieve	9.4
Classification	GP-GC

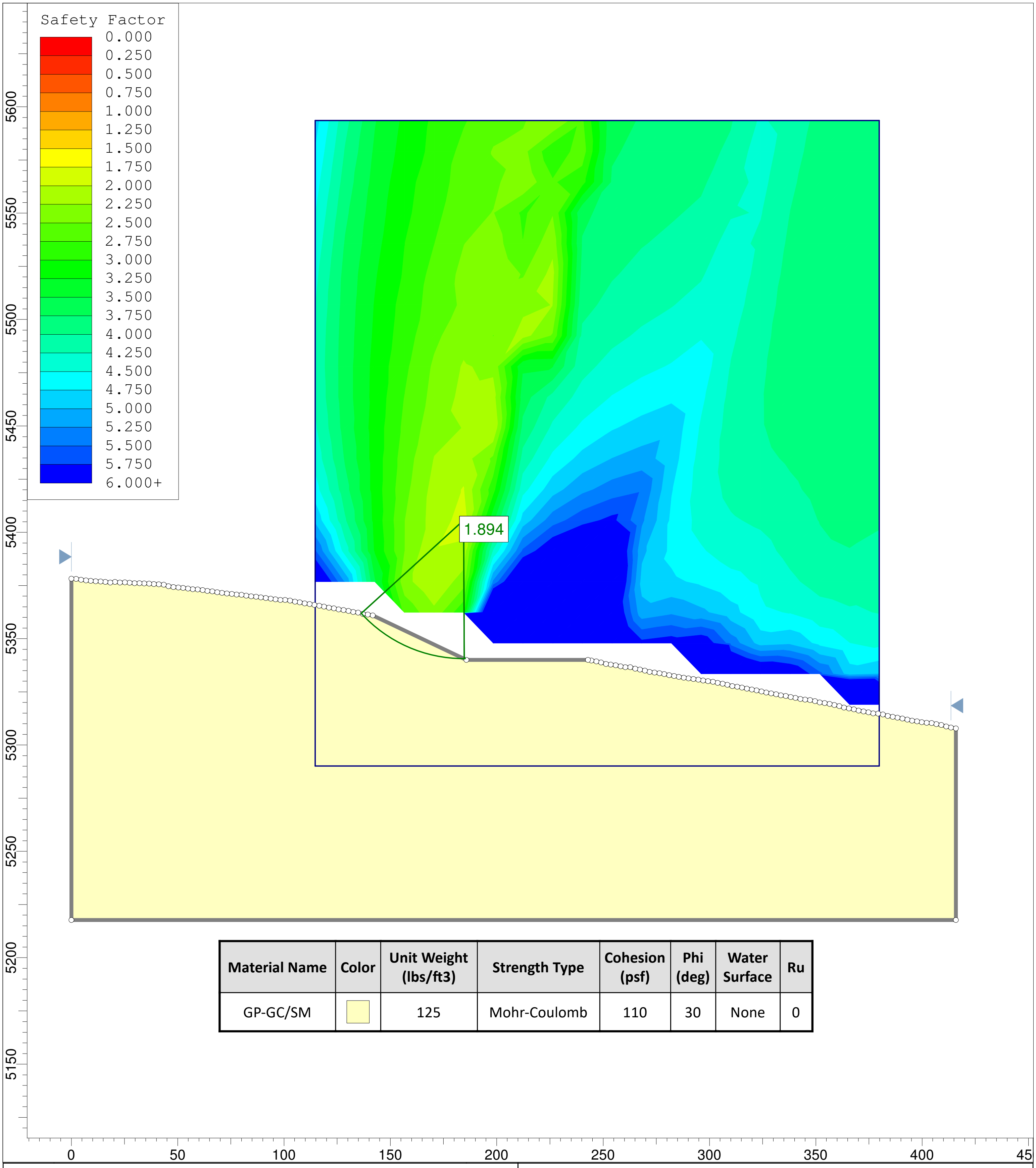
PROJECT: Summit Pointe

PROJECT NO.: **1312-003**

GeoStrata

Plate
C-6

Appendix D



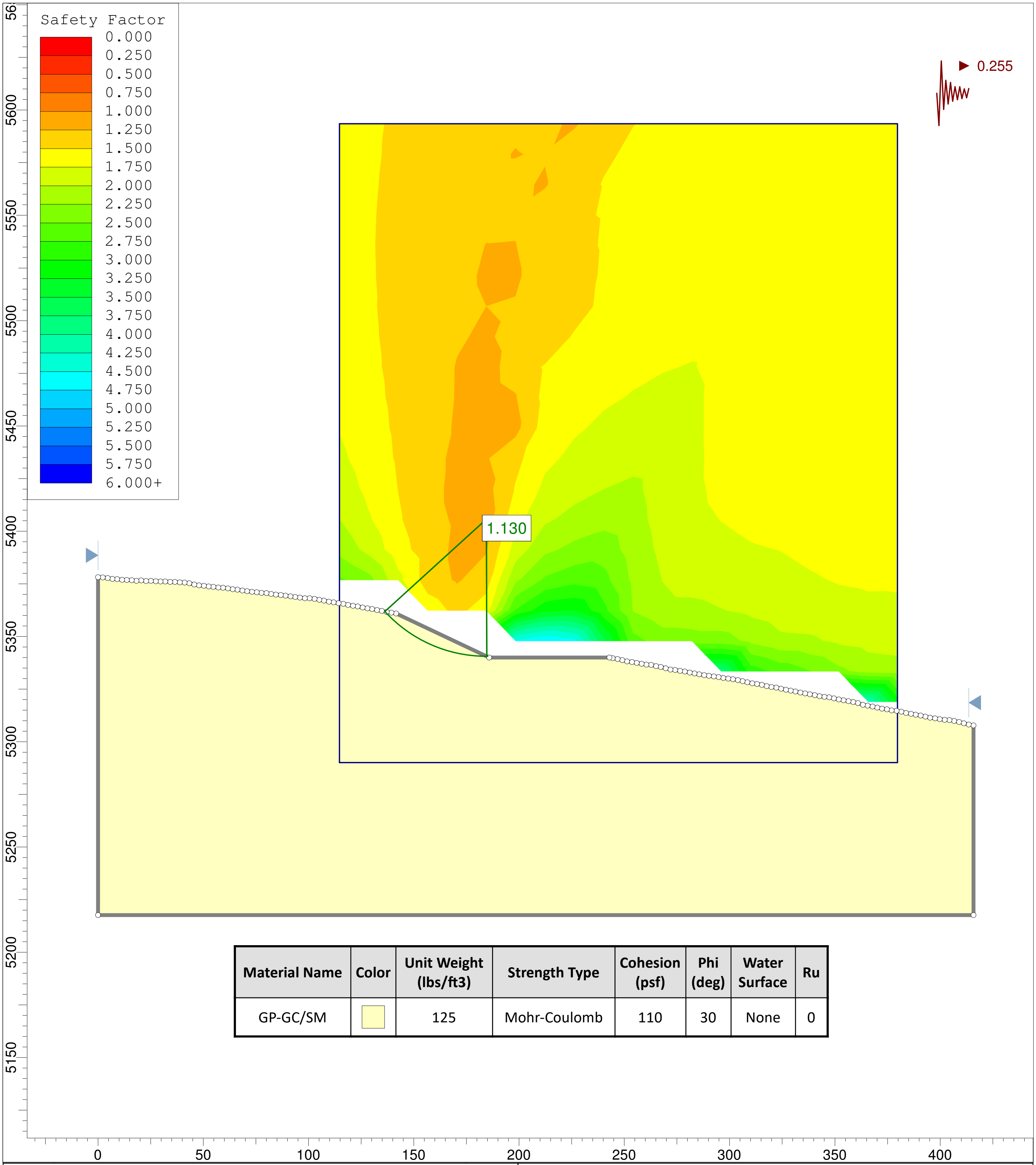
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
GP-GC/SM	🟨	125	Mohr-Coulomb	110	30	None	0

GeoStrata

Profile-A Static

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, UT
Project Number: 1312-003

Plate D-1



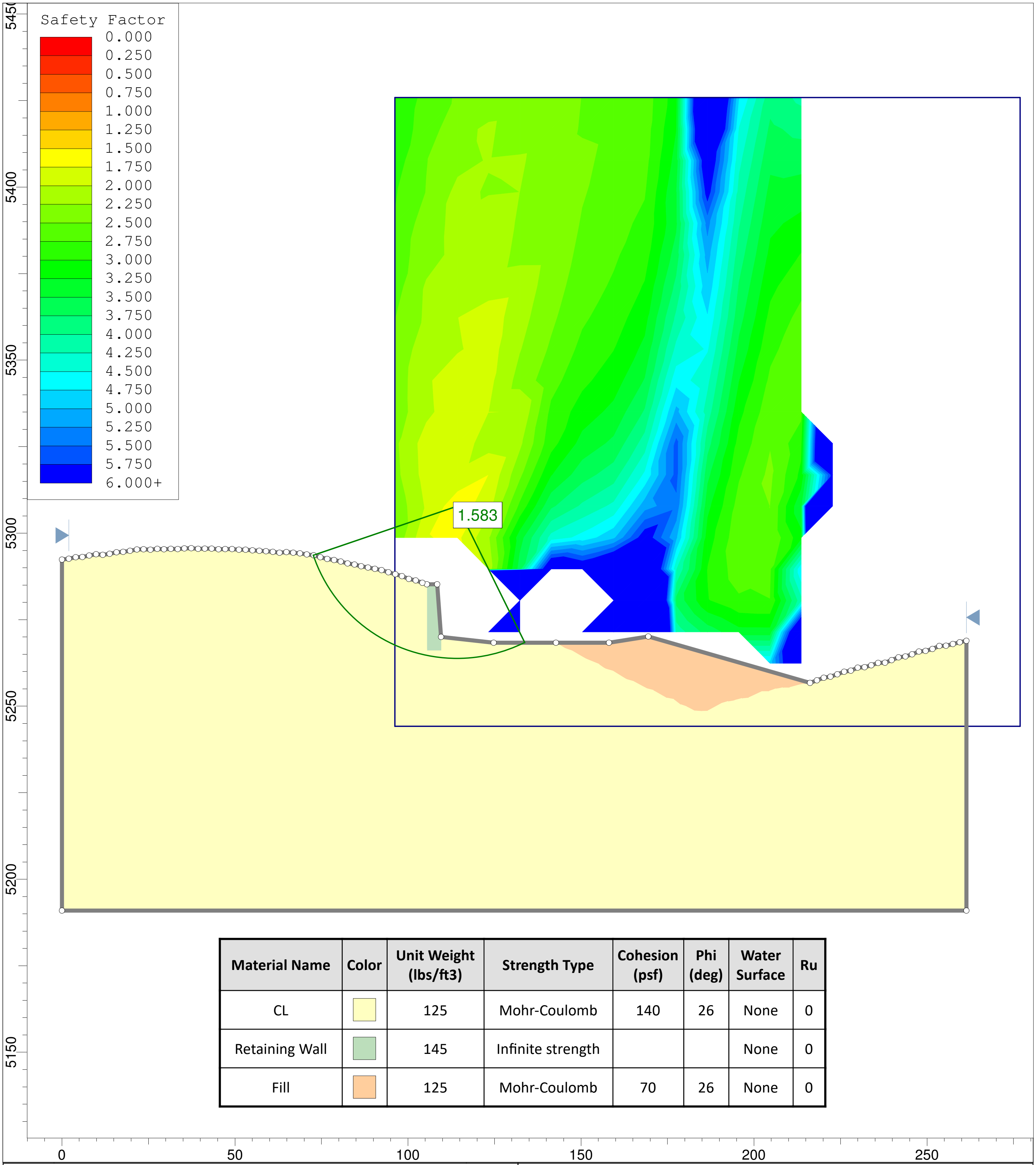
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
GP-GC/SM	🟨	125	Mohr-Coulomb	110	30	None	0

GeoStrata

Profile-A Pseudo Static

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, UT
Project Number: 1312-003

Plate D-2



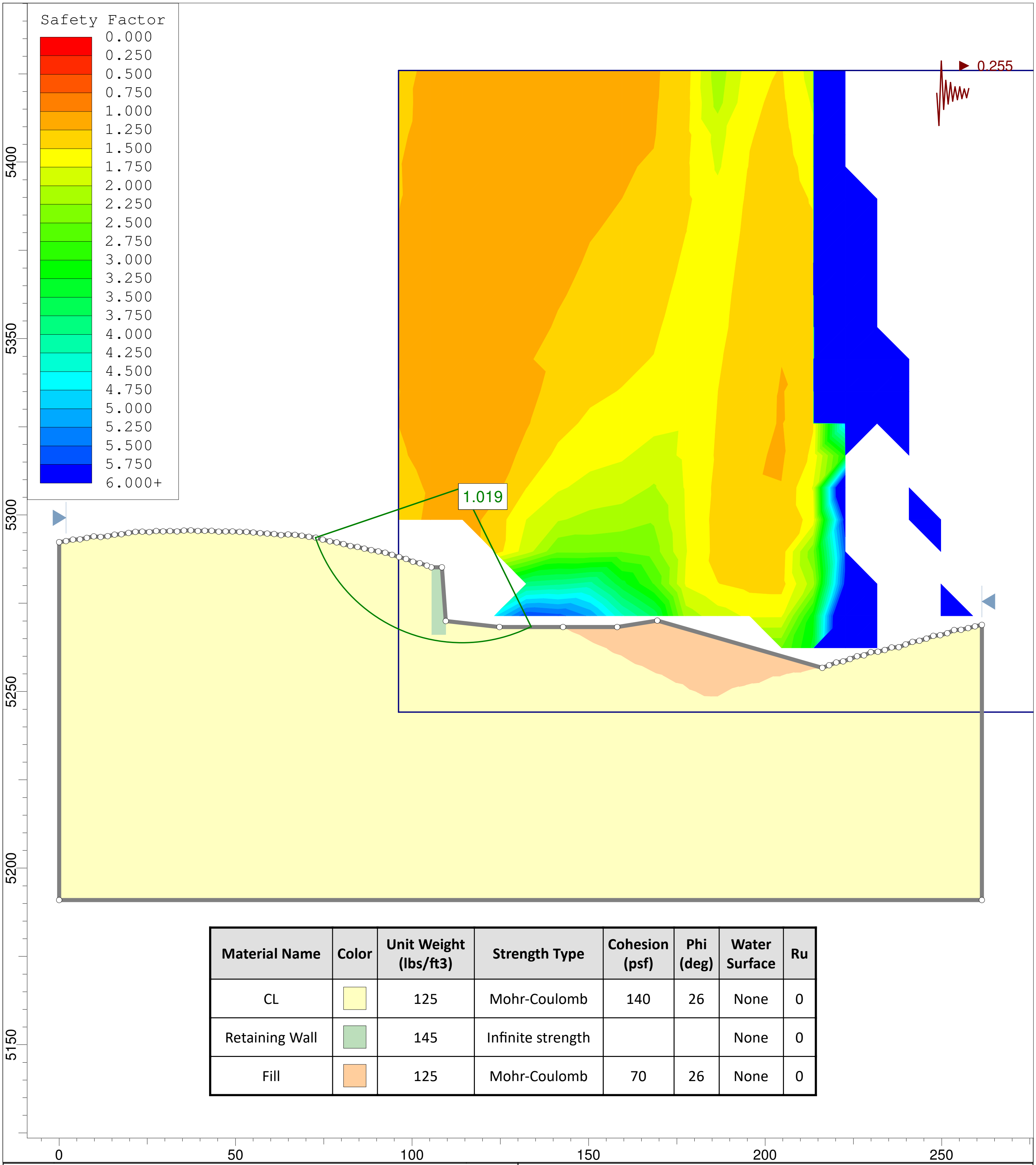
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
CL	🟨	125	Mohr-Coulomb	140	26	None	0
Retaining Wall	🟩	145	Infinite strength			None	0
Fill	🟧	125	Mohr-Coulomb	70	26	None	0

GeoStrata

Profile-B Static

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, UT
Project Number: 1312-003

Plate D-3



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
CL	🟨	125	Mohr-Coulomb	140	26	None	0
Retaining Wall	🟩	145	Infinite strength			None	0
Fill	🟧	125	Mohr-Coulomb	70	26	None	0

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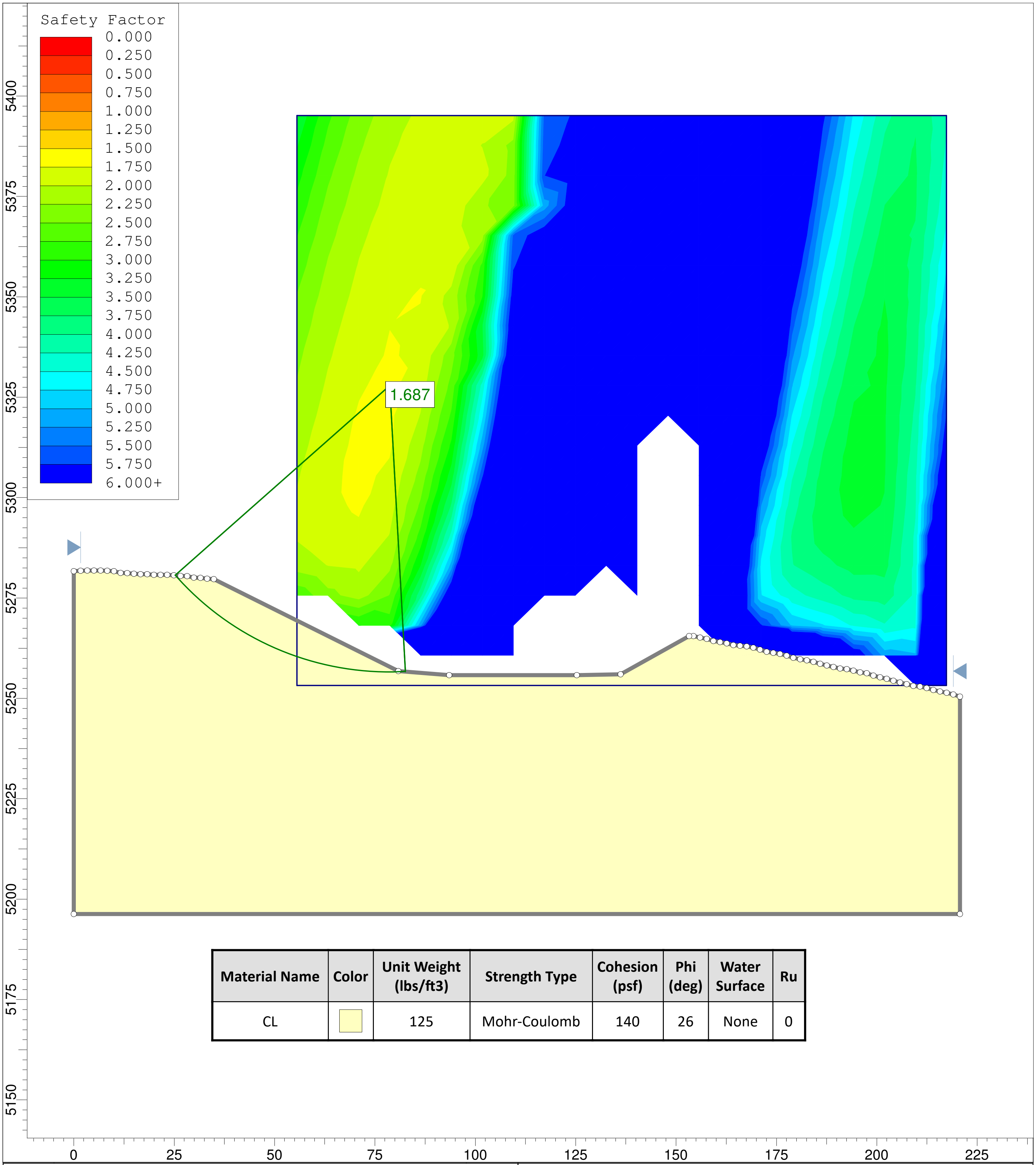
Profile-B Pseudo Static

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, UT
Project Number: 1312-003

Plate D-4



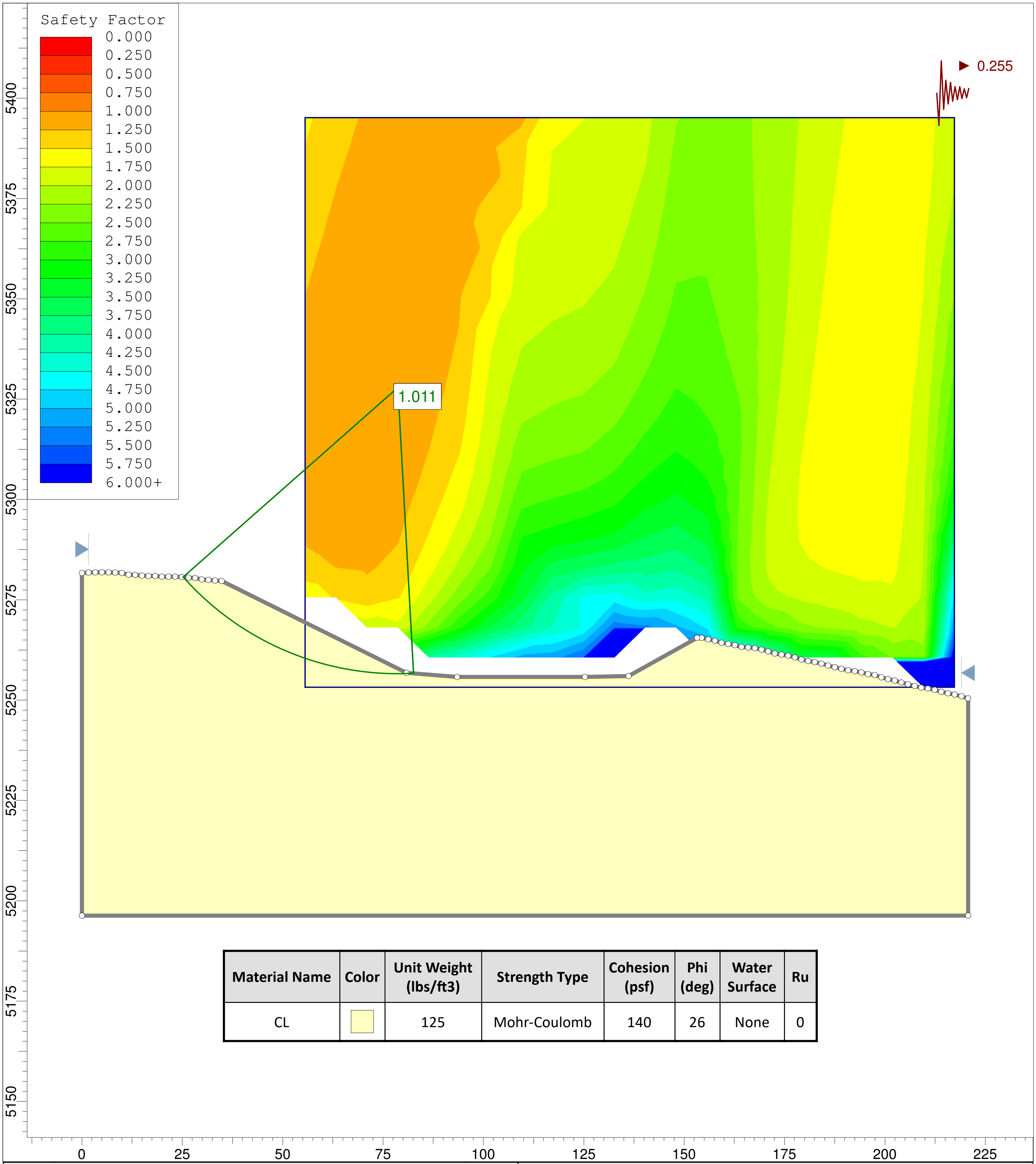
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
CL	🟨	125	Mohr-Coulomb	140	26	None	0

GeoStrata

Profile-C Static

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, UT
Project Number: 1312-003

Plate D-5



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
CL	🟨	125	Mohr-Coulomb	140	26	None	0

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Profile-C Pseudo Static

Six Blue Bison, LLC
Summit Pointe Subdivision
Alpine, UT
Project Number: 1312-003

Plate
D-6

GeoStrata

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Phone (801) 501-0583 | Fax (801) 501-0584

Debris Flow Hazard Assessment
Summit Pointe Development
Alpine, Utah

GeoStrata Job No. 1312-006

August 21, 2019

Prepared for:

Blue Bison Development
c/o Jake Satterfield
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Riverton, Utah 84096
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Debris Flow Hazard Assessment
Summit Pointe Development
Alpine, Utah

GeoStrata Job No. 1312-006

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August 21, 2019

TABLE OF CONTENTS

APPENDICES

1.0 EXECUTIVE SUMMARY

The purpose of this investigation and supplemental report is to investigate the alluvial fan flooding and debris flow hazard of an unnamed drainage that trends generally north-south in the eastern portion of the subject site and is crossed by a proposed roadway within the Summit Pointe development located in the foothills east of Lakeview Drive and North of Hog Hollow Road in Alpine, Utah.

The subject site is located north of Hog Hollow Road on a native hillside in Alpine, Utah at an elevation ranging from approximately 5,228 to 5,370 feet above sea level. We understand that the project site is an approximately 30.34 acres undeveloped parcel with hiking trails and unpaved access roads. It is our understanding that the proposed development, as currently planned, will consist of 8 single-family residential structures as well as associated driveways, utilities and landscape areas. The hillside in the area of the subject site is moderately to steeply sloping generally to the south. The subject site remains in a relatively native condition.

It is the opinion of GeoStrata that the alluvial fan flooding hazard is considered moderate and it is considered unlikely that alluvial fan flooding will impact the proposed development as long as a detention basin is designed by a professional engineer to handle the debris flow volumes as presented in Tables 2, 3, and 4 and all recommendations in this report are followed. The intent of this investigation was to provide recommendations and design parameters to store potential debris flow volumes sourced by the unnamed drainage and to reduce the impacts of the alluvial fan flooding hazard on established single family residences located south of the unnamed drainage.

NOTICE: The scope of services provided within this report are limited to the assessment of the subsurface conditions for the proposed development. This executive summary is not intended to replace the report of which it is part and should not be used separately from the report. The executive summary is provided solely for purposes of overview. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

The purpose of this investigation and supplemental report is to investigate the alluvial fan flooding and debris flow hazard of an unnamed drainage that trends generally north-south in the eastern portion of the subject site and is crossed by a proposed roadway within the Summit Pointe development located in the foothills east of Lakeview Drive and North of Hog Hollow Road in Alpine, Utah. The location of the site and the drainage that will be assessed in this report are shown on Plate A-1 Site Vicinity Map. The subject site will consist of multi-level single family residences. The work performed for this report was performed in accordance with our proposal, dated June 17, 2019. Our scope of services included the following:

- Review of available references and maps of the area.
- Stereographic aerial photograph interpretation of aerial photographs covering the site area.
- Review of the sub-meter Wasatch Front lidar elevation data (2013 to 2014) obtained from the State of Utah AGRC.
- Geologic reconnaissance of the site by an engineering geologist to observe and document pertinent surface features indicative of possible debris flow hazards and to collect cross-sections of drainage; and
- Evaluation of our observations combined with existing information to assess the potential debris flow hazard and prepare this written report with conclusions and recommendations for assessed debris flow volumes of the unnamed drainage.

The recommendations contained in this report are subject to the limitations presented in the Limitations section of this report.

2.2 PROJECT DESCRIPTION

The subject site is located north of Hog Hollow Road on a native hillside in Alpine, Utah at an elevation ranging from approximately 5,228 to 5,370 feet above sea level. We understand that the project site is an approximately 30.34 acres undeveloped parcel with hiking trails and unpaved access roads. It is our understanding that the proposed development, as currently planned, will consist of 8 single-family residential structures as well as associated driveways, utilities and landscape areas. The hillside in the area of the subject site is moderately to steeply sloping generally to the south. The subject site remains in a relatively native condition. The parcels to the east and south are established residential neighborhoods. The parcels to the west and north are undeveloped hillsides. The location and approximate boundaries of the subject site are shown on the Site Vicinity Map and the Topographic Map included in the Appendix of this report (Plate A-1; Plate A-2).

3.0 METHODS OF STUDY

3.1 OFFICE INVESTIGATION

To prepare for the investigation, GeoStrata reviewed pertinent literature and maps listed in the references section of this report, which provided background information on the local geologic history of the area and the locations of suspected or known geologic hazards (Elliot and Harty, 2010; Black and others, 2016; Biek, 2005; Constenius and others, 2011; Machette, 1992). A stereographic aerial photograph interpretation was performed for the subject site using two sets of stereo aerial photographs (Table 1) obtained from the Utah Geological Survey Aerial Imagery Collection database.

Source	Photo Number	Date	Scale
USBR	SLA_1-6_A	August 10, 1938	1:20,000
USBR	SLA_1-7_A	August 10, 1938	1:20,000

Table 1: Aerial Stereosets.

GeoStrata also conducted a review of hillshades derived from 2013-2014 0.5-meter lidar digital elevation data obtained from the State of Utah AGRC to assess the subject site for visible alluvial fan deposits and to observe general drainage characteristics (Plate A-3 Hillshade Map).

3.2 FIELD INVESTIGATION

An engineering geologist investigated the geologic conditions within the general site area. A field geologic reconnaissance was conducted to observe existing geologic conditions and to assess existing surficial evidence of alluvial fan flooding and debris flow. GeoStrata also collected cross sectional data of the unnamed drainage to further assess the alluvial fan flooding and debris flow hazard at the site.

4.0 GEOLOGIC CONDITIONS

4.1 GEOLOGIC SETTING

The site is located in Utah Valley on a south facing slope between Hog Hollow and Fort Canyon in Alpine, Utah. The subject site is located within the foothills of the Traverse Mountains, a structural salient denoting the boundary between Salt Lake Valley and Utah Valley and the southern terminus of the Salt Lake City Segment and the northern terminus of the Provo Segment of the Wasatch Fault Zone. Tertiary volcanic rocks and Tertiary alluvial fan deposits dominate the East Traverse Mountains and late Paleozoic shallow marine bedrock constitutes the west Traverse Mountains. The Utah Valley is a northwest trending deep, lacustrine sediment-filled structural basin of Cenozoic age bounded on the northeast and southwest by two normal faults that dip towards the center of the valley. Utah Valley is a fault graben flanked by two uplifted blocks, the Wasatch Range to the east and the Lake Mountains to the west. The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah (Stokes, 1986).

The near-surface geology of the Utah Valley is dominated by sediments, which were deposited within the last 30,000 years by Lake Bonneville (Scott and others, 1983; Hintze, 1993; Machette, 1992; Constenius and others, 2011). The lacustrine sediments near the mountain front consist mostly of gravel and sand. As the lake receded, streams began to incise large deltas formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt, and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover. Most surficial deposits along the Wasatch fault zone were deposited during the final cycle of the Bonneville Lake Cycle between approximately 32 to 10 ka (thousands of years ago) and in the Holocene (< 10 ka).

4.2 SITE GEOLOGY

The geology within the subject site and in the surrounding area is shown on Plate A-4a Site Vicinity Geologic Map and Plate A-5 Site Vicinity 30x60 Geologic Map. On Plate A-4a, the geology within the subject site is mapped as Tertiary alluvial fan (Taf) with Quaternary alluvial fan deposits (Qaf_1) mapped at the base of the slope and overlying Lake Bonneville lacustrine gravel and sand (Qlbg) along the southern property boundary of the site. The Tertiary alluvial fan deposits are described as unconsolidated pebble to boulder sized subangular to subrounded orthoquartzite and calcareous sandstone clasts with minor volcanic clasts. The Quaternary alluvial fan deposits are Holocene alluvial fans that are primarily debris flows that formed at the mouths of active drainages. Lastly, the lacustrine gravel and sand deposits are described as locally partially cemented, well-rounded, pebble to cobble gravel and pebbly sand that was deposited at and below the highest Bonneville shoreline, but above the Provo shoreline.

4.3 TECTONIC SETTING

The Fort Canyon fault is located approximately 1.5 miles northeast of the subject site. The Fort Canyon fault is 8 km long and connects the Salt Lake and Provo segments of the Wasatch fault zone (WFZ) (Biek, 2005; Machette, 1992; Hecker, 1993). Pleistocene glacial outwash is displaced by 3-6 m along the Fort Canyon fault near Dry Creek in Alpine, Utah (Machette, 1992). The Provo segment of the WFZ is located approximately 3 miles east of the subject site. The Provo segment is 70 km long and is one of the longest segments of the WFZ. Late Pleistocene scarp heights along the Provo segment are reported to be as much as 50 meters high. Surface offsets resulting from post-Bonneville faulting events are reported to have produced scarps up to 26 meters high along the Provo segment (Black and others, 2003, Machette, 1992). The Traverse Mountains mark the northern extent of the Provo segment and form a structural boundary between the Salt Lake City and Provo segments of the WFZ.

Analysis of the ground shaking hazard along the Wasatch Front suggests that the WFZ is the single greatest contributor to the seismic hazard in the Salt Lake City region. The Fort Canyon fault and Provo segment of the WFZ shows evidence of Holocene-aged movement and are therefore considered active.

5.0 GENERALIZED SITE CONDITIONS

5.1 SURFACE CONDITIONS

As stated previously, the project site is located along a south facing slope between Hog Hollow and Fort Canyon in Alpine, Utah (Plate A-2 Topographic Quadrangle). The subject site is located on a gently to moderately sloping native hillside vegetated with grasses, sagebrush and scrub oak mainly growing in the drainages. The hillside slopes between approximately 5 degrees to the south toward Alpine and locally 14 degrees along the drainages. At the time of our site visit, a roadcut for an unpaved road was graded from Lakeview Road west into the subject site. Exposure along the eastern portion of the roadcut consisted of a clast supported deposit containing poorly sorted well-rounded quartzite, sandstone and Alta Stock granodiorite gravel and cobbles. This exposure was observed to contain moderate bedding in places. Exposure along the western portion of the roadcut consisted of a red-brown matrix supported deposit containing subangular to rounded quartzite clasts. The site remains in a relatively natural state, apart from minor grading for access roads and hiking trails. The site is vegetated with grasses, weeds, sage brush throughout the site and scrub oak predominantly in the drainages. The parcels east and south of the subject site are established single-family residences. The parcels west and north of the subject site are undeveloped native hillsides.

6.0 METHOD OF STUDY

6.1 FIELD INVESTIGATION

Field investigations and observations used to assess the debris flow potential, probability and magnitude can be categorized into two areas of study (Giraud, 2005):

1. Channel Investigation – Studies of debris flows indicate that the majority of material/debris transported onto the alluvial fan comes from existing deposits within the defined drainage channel. The unit volume technique is commonly used to assign applicable debris yield rates (unit volume along distinct reaches of the channel) in order to approximate the potential debris volume.

2. Alluvial Fan Investigation – the thickness of debris deposits measured on the alluvial fan contribute to an understanding of past debris flow magnitude and potential run-out distance.

GeoStrata completed a site reconnaissance of the unnamed drainage on July 3, 2019. The site reconnaissance included observations of the surficial deposits in the drainage and collection of six cross-sections of the drainage. Along with GeoStrata's field observations, geologic mapping of the subject site (Plate A-4 Site Vicinity Geologic Map; Plate A-5 Site Vicinity 30'x60' Geologic Map) was reviewed by GeoStrata as part of this investigation. The drainage basins for the unnamed drainage and profile cross section locations are shown on Plate A-6 Cross-Section Location Map.

The cross-sectional geometry of the channels within the unnamed drainage is variable and ranged from a narrow channel bottom to a shallow and broad channel bottom. It was our objective to produce cross-sections that would be representative of the various geometries that exist in the main channel of the unnamed drainage. Evidence suggests that water is present during periods of high runoff, however, no water was observed in the drainage at the time of our site reconnaissance. Two minor tributary channels between approximately 200 to 300 feet in length and within the unnamed drainage were observed. Due to the relatively small size and poorly developed channel bottoms within these two minor tributaries, these two tributary channels and characteristics of these channels, it is the opinion of GeoStrata that the stored debris potential within these channels would be negligible and therefore they were not used to calculate debris flow volumes of the unnamed. The unnamed drainage is predominantly vegetated with grass and cluster of dense scrub oak. The following sections present results of our field investigations in the unnamed drainage basin.

6.2 UNNAMED DRAINAGE

The unnamed drainage basin is approximately 37 acres (0.15 square kilometers) in size with a total “defined” channel length of approximately 1,755 feet. The properties of the main drainage channel are variable with some areas containing low to moderate amounts of stored debris yield rates calculated to be between approximately 17 ft^3/ft to 5 ft^3/ft. In order to estimate potential debris discharge volumes from the unnamed drainage, GeoStrata produced cross-sections in 6 different locations within the drainage channel to more accurately estimate the amount of debris currently available for transport. The approximate locations of profile cross-sections are shown on the Cross-Section Location Map (Plate A-6).

The unnamed drainage contains a perennial channel incised into the southern flank of the Traverse Mountains. No subsurface investigation was performed in the unnamed drainage channel or on the associated alluvial fan and therefore the types of historical debris flows from the drainage could not be determined. Approximately 45 percent of the channel contains thick, healthy vegetation, predominantly scrub oaks, while approximately 55 percent of the channel is vegetated by grasses and brush. Six cross-sections along the length of the channel are shown on Plates B-1 to B-6.

7.0 GEOLOGIC HAZARDS

Geologic hazards can be defined as naturally occurring geologic conditions or processes that could present a danger to human life and property. These hazards must be considered before development of the site. There are several hazards that if present at the site should be considered in the design of habitable structures and other critical infrastructure. A report titled "*Geologic Hazards Screening Assessment Summit Pointe Subdivision"* and dated October 17, 2018 was compiled by GeoStrata for this development. As previously stated, this is a supplemental report that will assess the debris flow hazard of the unnamed drainage that is located trending generally north-south through the eastern portion of the site as shown on Plate A-1, Plate A-2, and Plate A-3.

7.1 ALLUVIAL FAN FLOODING

Alluvial fan flooding is a potential hazard that may exist in areas containing Holocene alluvial fan deposits. This type of flooding typically occurs as stream flows, hyperconcentrated flows or debris flows consisting of a mixture of water, soil, organic material, and rock debris with variations in sediment-water concentrations transported by fast-moving water flows. Stream flows contain approximately less than 20% sediment by volume and involve sediment transport by entrained and suspended sediment load (Bowman and Lund, 2016). Unconfined stream flows are referred to as sheetfloods which are spread over and occur in the distal areas of the alluvial fan or within unchanneled, broad, relatively flat-bottomed portions of drainages. Hyperconcentrated flows are alluvial fan flows with approximately between 20 to 60% sediment by volume whereas debris flows contain approximately 60% to 85% sediment by volume.

Alluvial fan flooding can be a hazard on or below alluvial fans or in stream channels above alluvial fans. Precipitation (rainfall and snowmelt) is generally viewed as an alluvial fan flood "trigger", but this represents only one of the many factors that contribute to alluvial fan flooding hazard. Vegetation, root depth, soil gradation, antecedent moisture conditions and long-term climatic cycles all contribute to the generation of debris and initiation of alluvial fan flooding. Events of relatively short duration, such as a fire, can significantly alter a basin's absorption of storm water and snowmelt runoff and natural resistance to sediment mobilization for an extended period of time. These factors are difficult to quantify or predict and vary not only between different watersheds, but also within each sub-area of a drainage basin. In general, there are two methods by which alluvial fan flooding can be mobilized: 1) when shallow landslides from channel side-slopes are conveyed in existing channels when mixed with water and 2) channel scour where debris is initially mobilized by moving water in a channel and then the mobilized debris continues to assemble and transport downstream sediments.

Based on review of published geologic maps, our stereographic aerial photograph interpretation, our review of the hillshades derived from the 0.5-meter lidar elevation data (2013-2014) and our field observations, a Holocene-aged alluvial fan deposit is mapped at the mouth of the unnamed drainage (Plate A-4 Site Vicinity Geologic Map; Plate A-5 Site Vicinity 30x60 Geologic Map). The geometry of the channel within the unnamed drainage was observed to vary. In some areas of the drainage the channel was observed to be at most approximately 1 foot wide and 1 foot deep while other areas did not have a defined channel. No water was observed to be flowing in the unnamed drainage at the time of our site visit in the beginning of July of 2019. No subsurface exploration to evaluate the types of debris flow deposits sourced by the unnamed drainage was conducted as part of this investigation. Based on our review of published geologic maps, our aerial photograph interpretation, our review of hillshades derived from 0.5-meter lidar and our field observations, the alluvial fan flooding hazard is considered moderate and our more in-depth assessment of this hazard is addressed in subsequent paragraphs.

7.1.1 Estimates of Debris Volume and Peak Flow

The prediction of total debris and peak debris-flow volumes is complex and dependent on several factors which include but are not limited to precipitation and vegetation as previously mentioned. While methods of initiation differ, our observations of the drainage basins and channels lead us to assume that under existing conditions the majority of debris currently available for transport in the unnamed drainage would be mobilized from existing deposits within their developed channels beds and likely only in a post fire condition.

Since GeoStrata did not conduct a subsurface investigation to classify the type of alluvial fan flooding (stream flow, hyperconcentrated flow and debris flow), it is the opinion of GeoStrata that the alluvial fan flooding hazard sourced by the unnamed drainage could potentially impact the area delineated as Qaf_1 on Plate A-7 Extent of Alluvial Fan.

There are several methods available for predicting peak discharge rates and total debris flow volumes associated with debris-flows. The methods used in our analysis for this investigation are discussed below. Results of each of the methods of analysis are presented below.

Debris Flow Bulking with Hydrology

Analysis of the hydrology of the unnamed drainage was performed by ESI Engineering to provide peak flow and total volume of rainfall runoff in order to calculate potential peak and total volume debris flow rates (Appendix C). Stream flow is considered to be a debris flow when the concentration by volume of sediment is greater than 60% (Bowman and Lund, 2016). In order to calculate debris flow volumes, we assumed a 50% bulking rate, meaning that of the total rainstorm runoff from a 100-year storm, a volume of sediment equal to the volume of water may be mobilized; therefore, the debris flow volume would equal to 2 times the volume of water. The table below presents stormwater and debris flow volumes and peak flow rates considering a 100-year storm with a duration of 24 hours.

Total Volume of Water from 100-year storm (ac-ft)	1.15
Total Volume of Water from 100-year storm with 6 cfs release rate (ac-ft)	0.29
Total Volume of Debris Flow from 100-year storm (ac-ft)*	2.30
Total Volume of Debris Flow from 100-year storm with 6 cfs release rate (ac-ft)*	1.44
Peak Flow Rate of Stormwater from 100-year storm (cfs)	17.7
Peak Flow Rate of Debris Flow from 100-year storm (cfs)	35.4

*debris flow volume equals volume of water and sediment combined

Table 2: Debris Flow Volumes from Bulking

The total volume of sediment calculated using this method far exceeds the estimated erodible sediment stored within the channel as calculated using the Unit Volume Analysis method as described below; therefore, it is our opinion that there is a low probability that volumes of debris flow as high as these will occur. However, from this we can conclude that most of the available erodible sediment stored in the channel may be mobilized in a 100-year rainstorm event.

Unit-Volume Analysis

The unit-volume analysis method involves measuring and estimating the stored erodible sediment in the channel. Cross-sections are taken at various points along a channel and the geometry of the channel is used to estimate the sediment stored in the bottom of the channel (Giraud, 2005). Estimating channel sediment volume available for bulking is critical because study of historical debris flows indicates that 80% to 90% of the debris flow volume comes from bulking of sediment from the bottom of the channel (Bowman and Lund, 2016).

All of the streambed cross sections used in our analysis were collected during our site reconnaissance. Available debris was estimated from field observations and the calculated height of the water in the channel during peak flow at each cross section during a 100-year storm event using the velocity of debris flow equation (Prochaska and others, 2008). Debris yield at these cross sections were calculated as volume per linear foot of channel and this yield was then extrapolated beyond the investigation locations along the length of the channel in order to approximate the potential total debris yield for the unnamed drainage as presented in Table 3 below. Utilizing this method, we estimate the volume of sediment stored in the channel that could be mobilized during an alluvial fan flooding event to be approximately one third the volume of sediment that we assessed using the debris flow bulking with hydrology method.

Erodible Sediment in Reach 1 (ac-ft)	0.11
Erodible Sediment in Reach 2 (ac-ft)	0.03
Erodible Sediment in Reach 3 (ac-ft)	0.03
Erodible Sediment in Reach 4 (ac-ft)	0.06
Erodible Sediment in Reach 5 (ac-ft)	0.06
Erodible Sediment in Reach 6 (ac-ft)	0.06
Total Erodible Sediment in Channel (ac-ft)	0.35
Total Debris Flow Volume (ac-ft)	0.70

Table 3: Volume of Sediment in Stream Channel

Post-fire Condition Assessment

The Western U.S. regression model was also used to estimate fire-related debris flow volumes (Gartner and others, 2008; Giraud and Castleton, 2009; Cannon and others 2010). The model estimates debris flow volumes as:

$$\ln V = 7.2 + 0.6(\ln A) + 0.7(B)^{1/2} + 0.2(T)^{1/2} + 0.3$$

where:

V = volume (cubic meters)
A = basin area with slopes greater than or equal to 30% (square kilometers)
B = basin area burned at moderate and high severity (square kilometers)
T = total storm rainfall (millimeters)

Based on the elevation data available, 97% of the total area of the unnamed drainage basin are slopes equal to or greater than 30%. We assumed that the entirety of the unnamed drainage basin was moderately to severely burned. Cannon and others (2010) recommend evaluation of debris flow events in response to low recurrence (<2-10 years), low-duration (<1 hr) rainstorms. Total storm rainfall was taken from the NOAA Atlas 14, Volume 1, Version 5 Point Precipitation Frequency Estimates for rainstorm events with 60-minute durations with a recurrence interval of 10 years.

Basin Area with Slopes Greater than 30% (sq-km)	0.146
Basin Area Burned at Moderate to High Severity (sq-km)	0.150
Total Storm Rainfall (mm)	23.2
Western U.S. Regression Model Debris Flow Volume (m^3)	1957.6
Western U.S. Regression Model Debris Flow Volume (ac-ft)	1.6

Table 4: Volume of Sediment in Stream Channel

Utilizing this method, we estimate the total volume of a potential post fire debris flow to be approximately two thirds the volume of total debris flow volume that we assessed using the debris flow bulking with hydrology method. The total debris flow volumes predicted using this method also assess the total debris flow volume for the unnamed drainage to be approximately two times the total debris flow volume when compared to the estimated erodible sediment within the channels utilizing the unit-volume analysis.

8.0 GEOLOGIC HAZARDS SUMMARY AND CONCLUSIONS

It is the opinion of GeoStrata that the geologic hazards that we assessed in this study that could impact the subject site include alluvial fan flooding. Below is a summary of the alluvial fan flooding hazard and GeoStrata's recommendation for mitigation:

- Based on our understanding of the project, debris flow hazard for the proposed development is likely only to impact Lot 1 as shown on the provided site plan. The debris flow hazard may be mitigated for Lot 1 by placing a detention basin on the uphill side of the proposed roadway where it crosses the drainage; however, Utah Dam Safety regulations may require a much more in-depth analysis of the proposed roadway embankment due to the potential classification of a high hazard dam. Alternatively, Lot 1 may be dedicated to the City as open space for construction of a debris basin and city park, and the density associated with Lot 1 may be moved to another portion of the development. The culvert to be constructed below the roadway embankment should be sized to allow the peak debris flow to pass through as assessed using the debris flow bulking with hydrology method (35.4 cfs). Consideration may then also be given to sizing a debris basin on Lot 1 to handle stormwater for the entire development as well as stormwater and debris flow volumes from the unnamed drainage of 1.44 ac-ft if a discharge rate of 6 cfs can be accommodated. The detention basin and all modifications to stream channels should be designed in consideration of flow velocities and superelevations as calculated using the methods and procedures outlined in Prochaska et. al, 2008.

A hazard rating of "Low" indicates that no evidence was found to indicate that the hazard is present and has a low probability of impacting the site, hazard not known or suspect to be present. A hazard rating of "Moderate" indicates that the hazard has a moderate probability of impacting the site, but the evidence is equivocal, based only on theoretical studies, or was not observed and further study is necessary as noted. A hazard rating of "High" indicates that that evidence is strong and suggests that there is a high probability of impacting the site and mitigation measures should be taken. It is the opinion of GeoStrata that the alluvial fan flooding hazard is considered moderate and it is considered unlikely that alluvial fan flooding will impact the proposed development with the exception of Lot 1. If it is desired that Lot 1 be used for placement of a residential structure then a detention basin will need to be designed by a professional engineer to handle the debris flow volumes as presented in Table 2 which in our opinion is the most conservative assessment method of potential alluvial fan flooding total volume for this site. All recommendations in this report should be followed. The intent of this investigation was to provide recommendations and design parameters to store potential debris flow volumes sourced by the unnamed drainage and to reduce the impacts of the alluvial fan flooding hazard on established single family residences located south of the unnamed drainage.

It is the opinion of GeoStrata that these hazards should not preclude the development of the subject site, assuming that these recommendations given above will be followed.

9.0 CLOSURE

9.1 LIMITATIONS

The conclusions and recommendations contained in this report, which include professional opinions and judgments, are based on the information available to us at the time of our evaluation, the results of our field observations and our understanding of the proposed site development. If any conditions are encountered at this site that are different from those described in this report, our firm should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed development changes from that described in this report, our firm should also be notified.

All services were completed in accordance with the current standard of care and generally accepted standard of practice at the time and in the place our services were completed. No other warranty, expressed or implied, is made. Development of property in the immediate vicinity of geologic hazards involves a certain level of inherent risk. It is impossible to predict where geologic hazards will occur. New geologic hazards may develop, and existing geologic hazards may expand beyond their current limits.

All services were performed for the exclusive use and benefit of the above addressee. No other person is entitled to rely on GeoStrata's services or use the information contained in this letter without the express written consent of GeoStrata. We are not responsible for the technical interpretations by others of the information described or documented in this report. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

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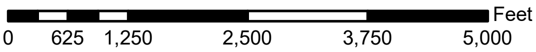
Appendix A

Legend

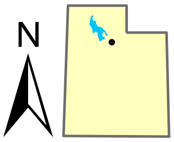
🟥 Approximate Site Boundary

🟦 Unnamed Drainage Basin



1 inch = 2,000 feet

Basemap:
2012 HRO 12.5cm aerial imagery and hillshades derived from
DEMs provided by the State of Utah AGRC.

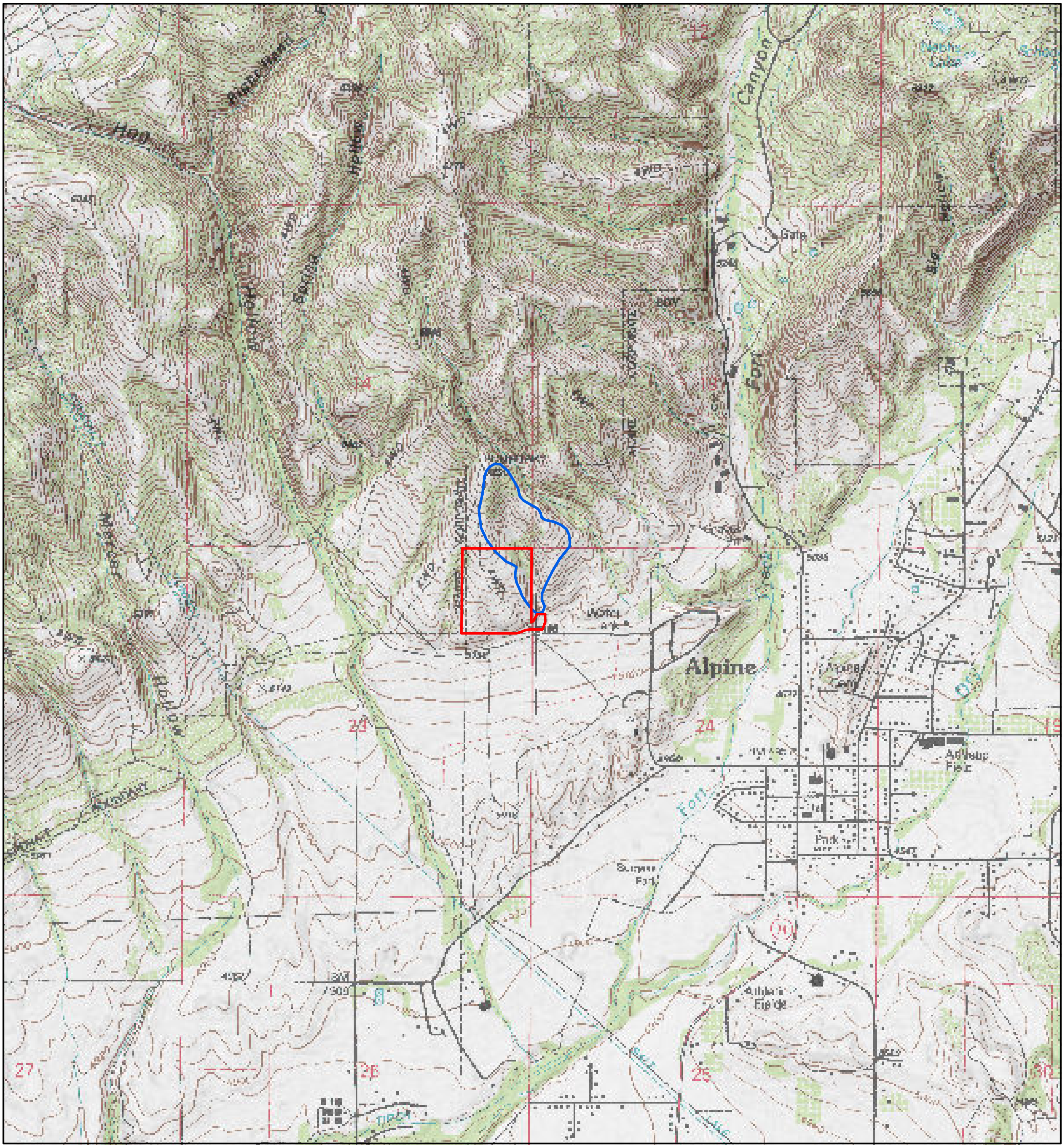


GeoStrata

Debris Flow Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-006

Site Vicinity Map

Plate A-1



Legend

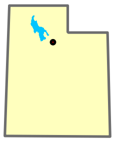
🟥 Approximate Site Boundary

0 625 1,250 2,500 3,750 5,000 Feet

1 inch = 2,000 feet

Basemap:
Lehi Quadrangle, Utah, 7.5-Minute Series (Topographic), USGS, 1998 and hillshades derived from DEMs provided by the State of Utah AGRC.

N



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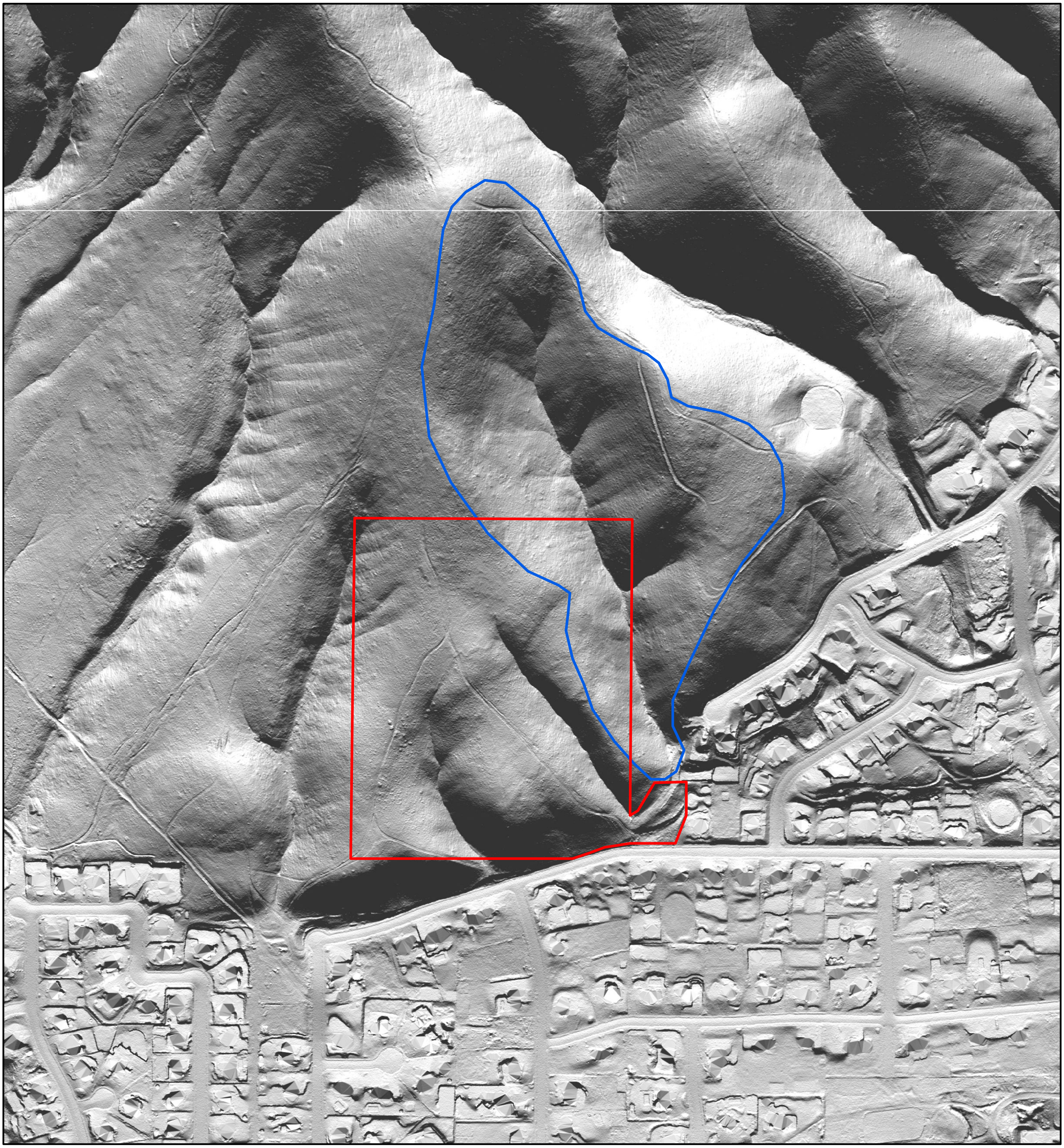
Alpine, Utah
Project Number: 1312-006

Topographic Quadrangle

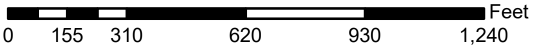
Plate A-2



Legend

🟥 Approximate Site Boundary

🟦 Unnamed Drainage Basin



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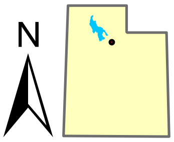
Basemap:
Hillshades derived from 2012-2013 0.5m lidar provided
by the State of Utah AGRC.



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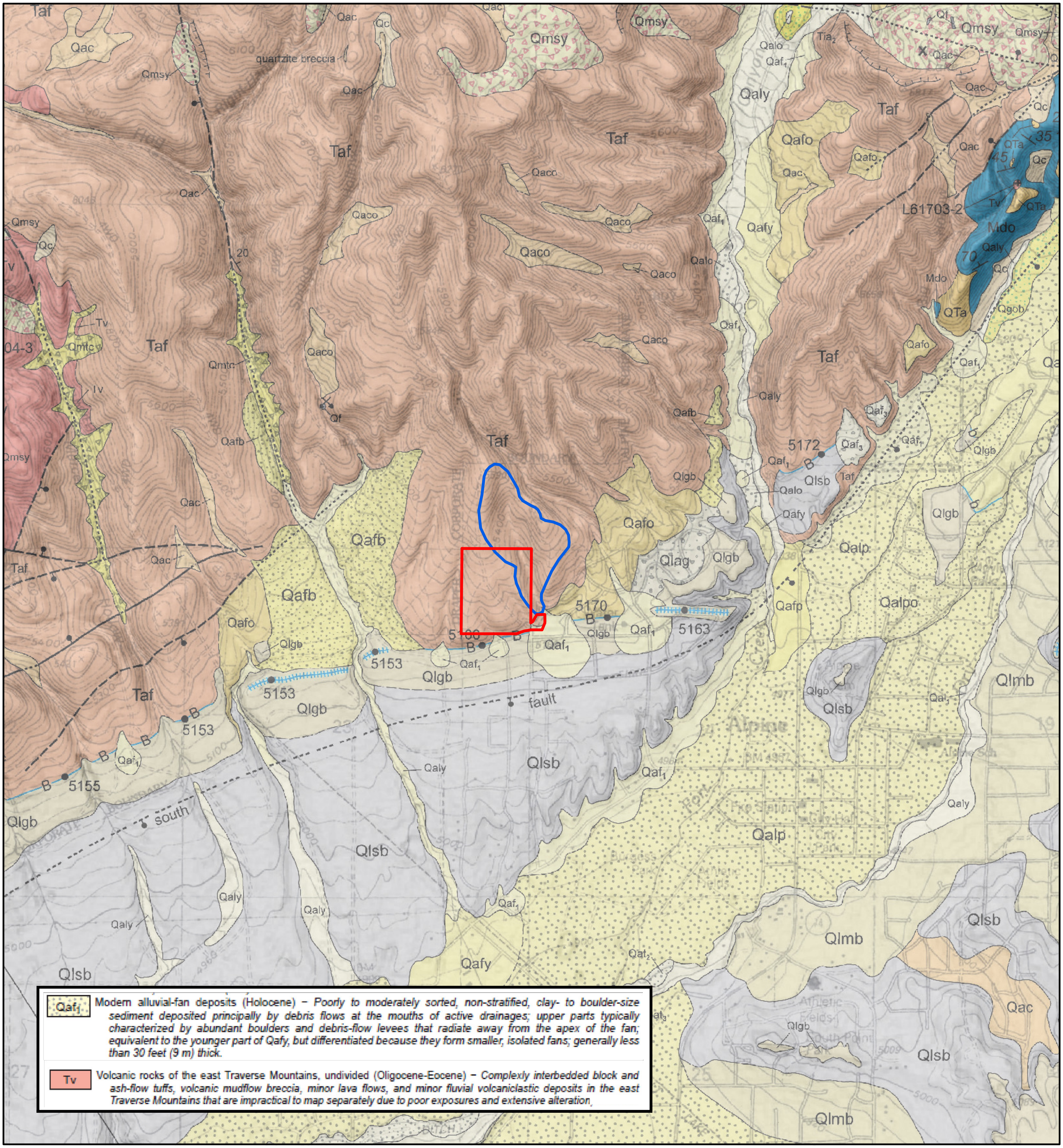
Alpine, Utah
Project Number: 1312-006

Hillshade

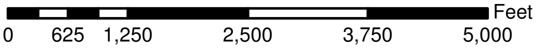
**Plate
A-3**



Qaf_1	Modern alluvial-fan deposits (Holocene) – *Poorly to moderately sorted, non-stratified, clay- to boulder-size sediment deposited principally by debris flows at the mouths of active drainages; upper parts typically characterized by abundant boulders and debris-flow levees that radiate away from the apex of the fan; equivalent to the younger part of Qafy, but differentiated because they form smaller, isolated fans; generally less than 30 feet (9 m) thick.*
Tv	Volcanic rocks of the east Traverse Mountains, undivided (Oligocene-Eocene) – *Complexly interbedded block and ash-flow tuffs, volcanic mudflow breccia, minor lava flows, and minor fluvial volcaniclastic deposits in the east Traverse Mountains that are impractical to map separately due to poor exposures and extensive alteration.*

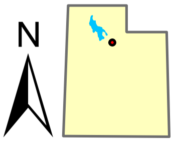
Legend

🟥 Approximate Site Boundary



1 inch = 2,000 feet

Basemap:
Geologic Map of the Lehi Quadrangle and Part of the Timpanogos Cave Quadrangle, Salt Lake and Utah Counties, Utah. Hillshades derived from DEMs provided by the State of Utah AGRC.

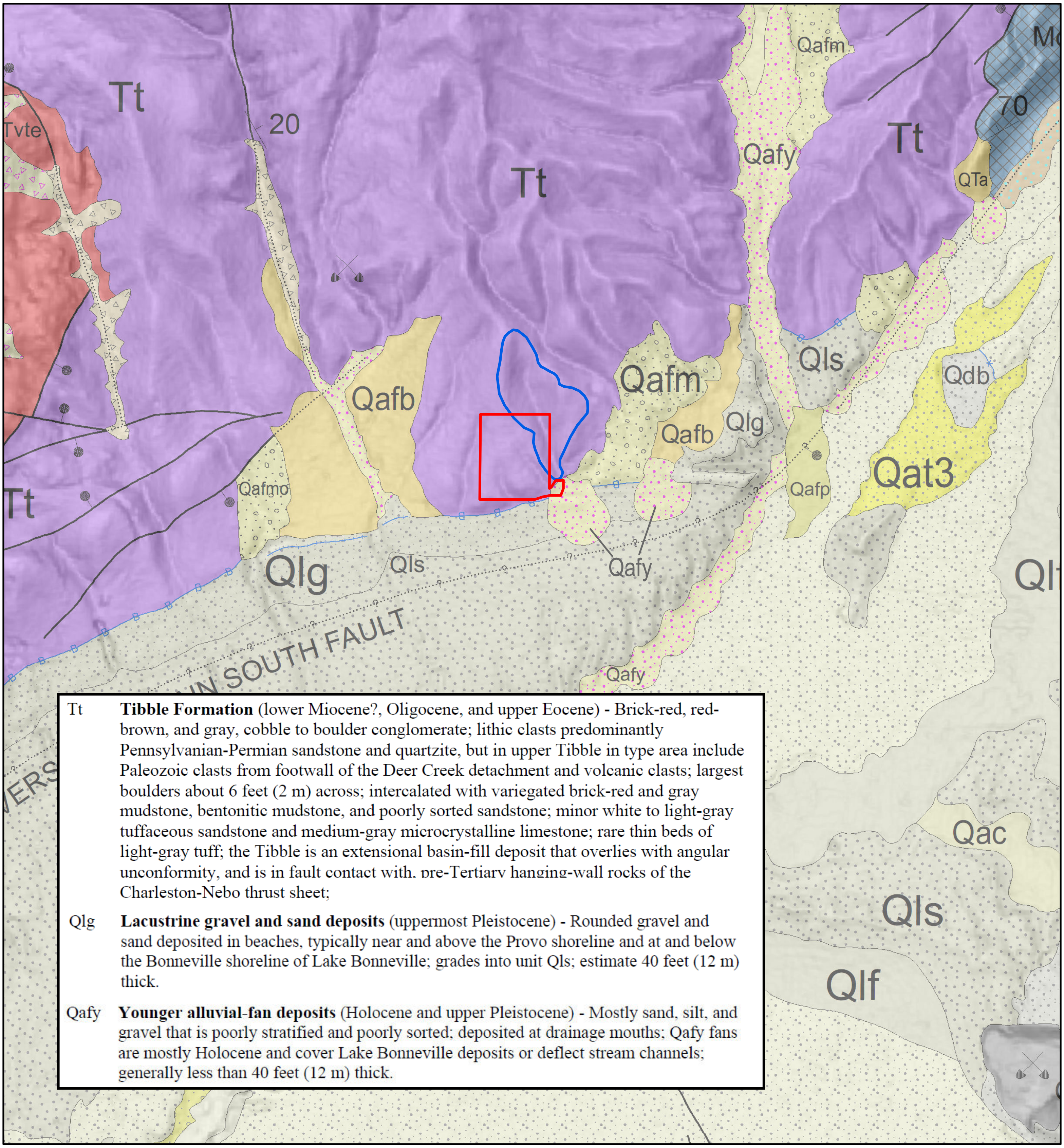


GeoStrata

Debris Flow Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-006

Site Vicinity Geologic Map

Plate
A-4



Tt	**Tibble Formation** (lower Miocene?, Oligocene, and upper Eocene) - Brick-red, red-brown, and gray, cobble to boulder conglomerate; lithic clasts predominantly Pennsylvanian-Permian sandstone and quartzite, but in upper Tibble in type area include Paleozoic clasts from footwall of the Deer Creek detachment and volcanic clasts; largest boulders about 6 feet (2 m) across; intercalated with variegated brick-red and gray mudstone, bentonitic mudstone, and poorly sorted sandstone; minor white to light-gray tuffaceous sandstone and medium-gray microcrystalline limestone; rare thin beds of light-gray tuff; the Tibble is an extensional basin-fill deposit that overlies with angular unconformity, and is in fault contact with, pre-Tertiary hanging-wall rocks of the Charleston-Nebo thrust sheet;
Qlg	**Lacustrine gravel and sand deposits** (uppermost Pleistocene) - Rounded gravel and sand deposited in beaches, typically near and above the Provo shoreline and at and below the Bonneville shoreline of Lake Bonneville; grades into unit Qls; estimate 40 feet (12 m) thick.
Qafy	**Younger alluvial-fan deposits** (Holocene and upper Pleistocene) - Mostly sand, silt, and gravel that is poorly stratified and poorly sorted; deposited at drainage mouths; Qafy fans are mostly Holocene and cover Lake Bonneville deposits or deflect stream channels; generally less than 40 feet (12 m) thick.

Legend

🟥 Approximate Site Boundary

🟦 Unnamed Drainage Basin

0 625 1,250 2,500 3,750 5,000 Feet

1 inch = 2,000 feet

Basemap:
Interim Geologic Map of the Provo 30' X 60' Quadrangle, Utah, Wasatch, and Salt Lake Counties, Utah. Hillshades derived from DEMs provided by the State of Utah AGRC.

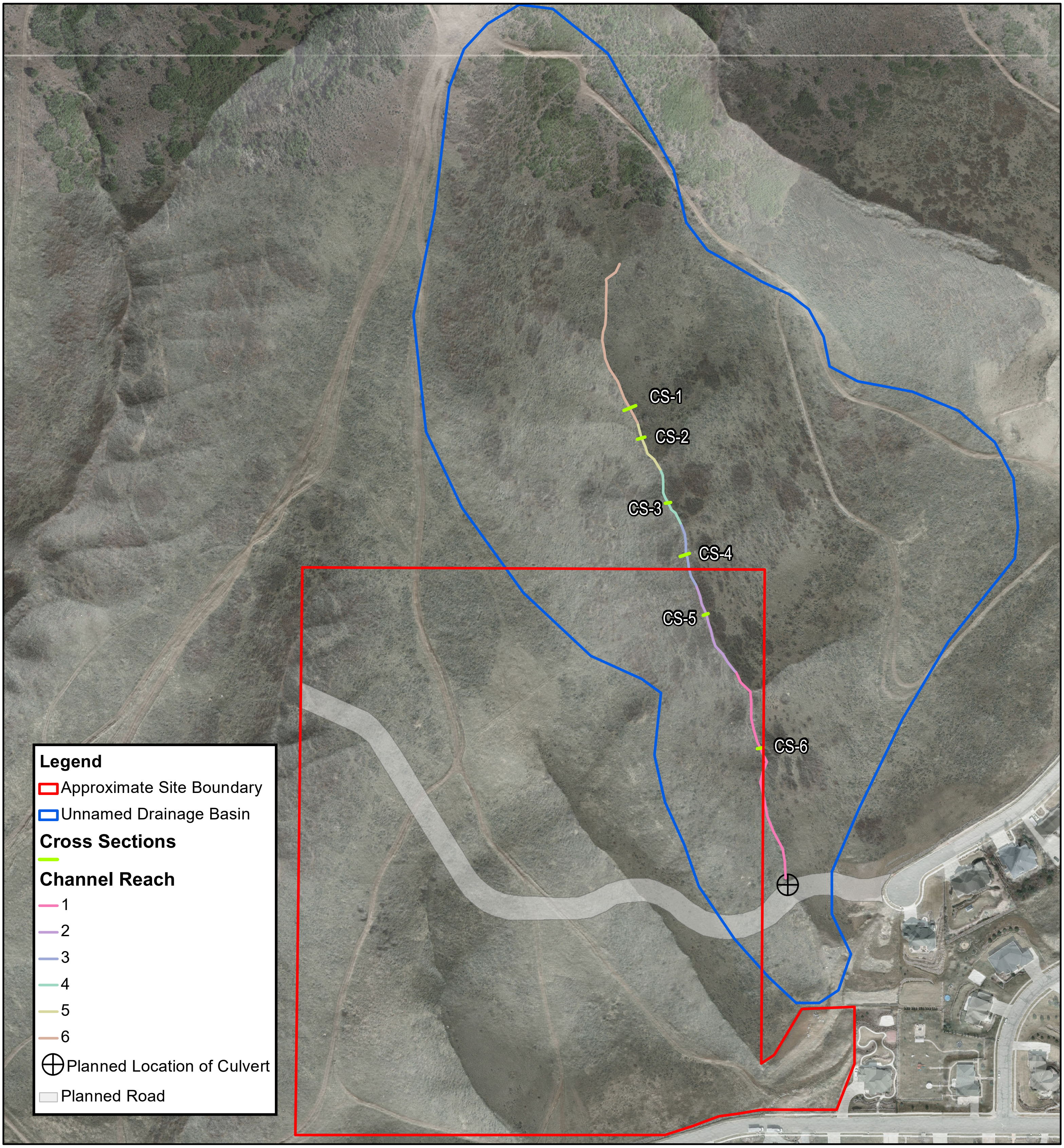
N

GeoStrata

Debris Flow Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-006

Site Vicinity 30x60 Geologic Map

Plate
A-5

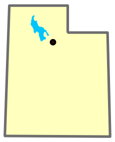


Feet
0 95 190 380 570 760

1 inch = 300 feet

Basemap:
2012 12.5cm aerial imagery and hillshades derived from 2012-2013
0.5m lidar provided by the State of Utah AGRC.

N



GeoStrata

Debris Flow Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-006

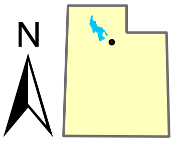
Cross Sections
& Channel Reaches

Plate
A-6

0 125 250 500 750 1,000 Feet

1 inch = 400 feet

Basemap:
2012 12.5cm aerial imagery and hillshades derived from 2012-2013
0.5m lidar provided by the State of Utah AGRC.

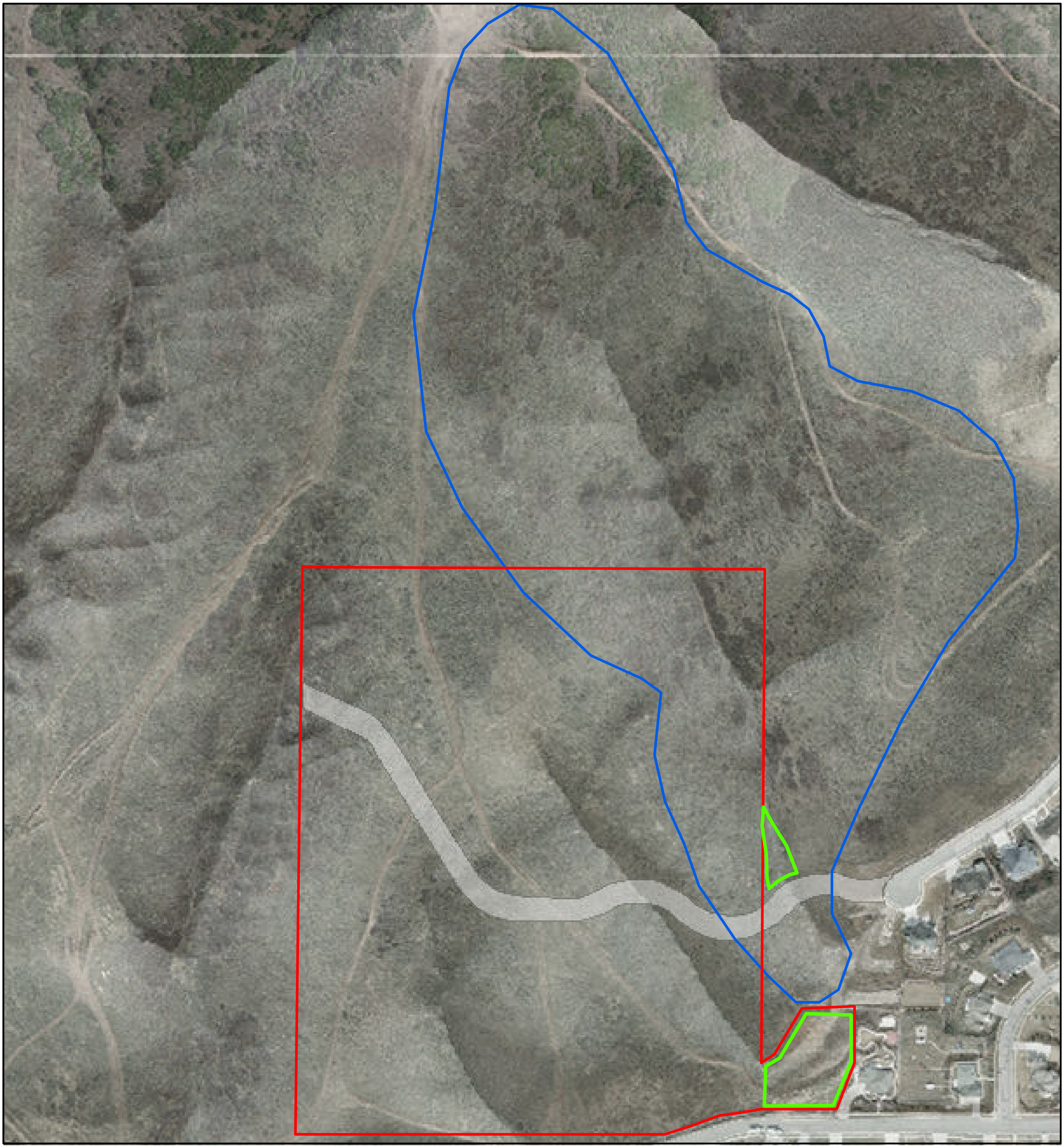


GeoStrata

Debris Flow Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-006

Extent of Alluvial Fan

Plate A-7



Legend

🟥 Approximate Site Boundary

🟦 Unnamed Drainage Basin

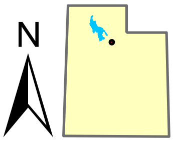
⬜ Planned Road

🟩 Potential Debris Basins

0 625 1,250 2,500 3,750 5,000 Feet

1 inch = 2,000 feet

Basemap:
2012 12.5cm aerial imagery and hillshades derived from 2012-2013
0.5m lidar provided by the State of Utah AGRC.



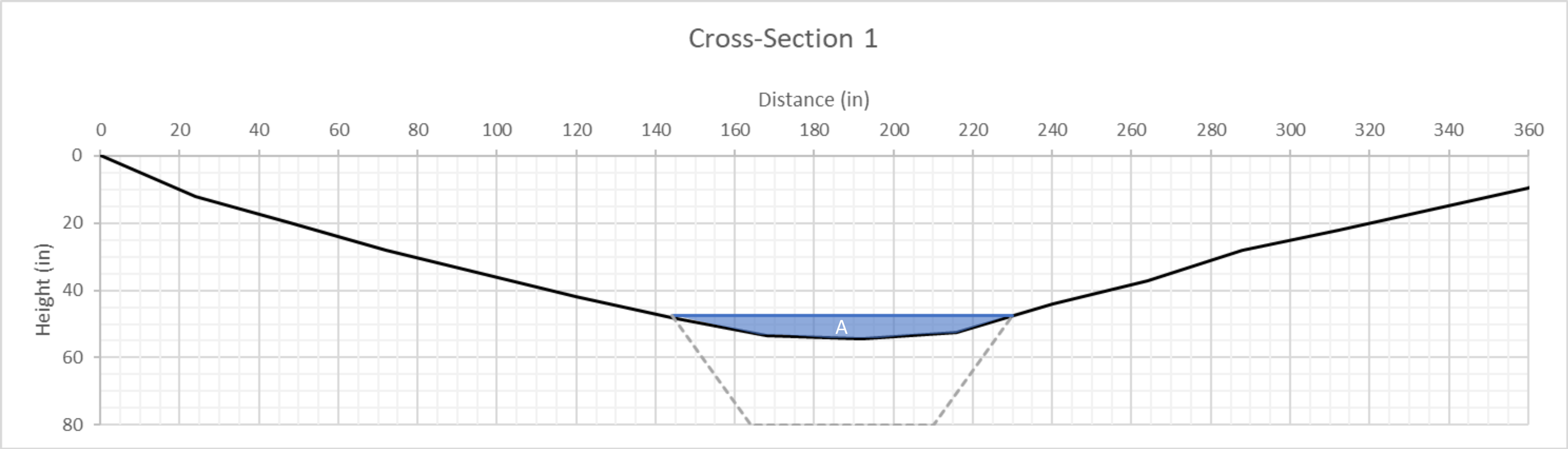
GeoStrata

Debris Flow Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-006

Potential Debris Basin Location Map

Plate A-8

Appendix B



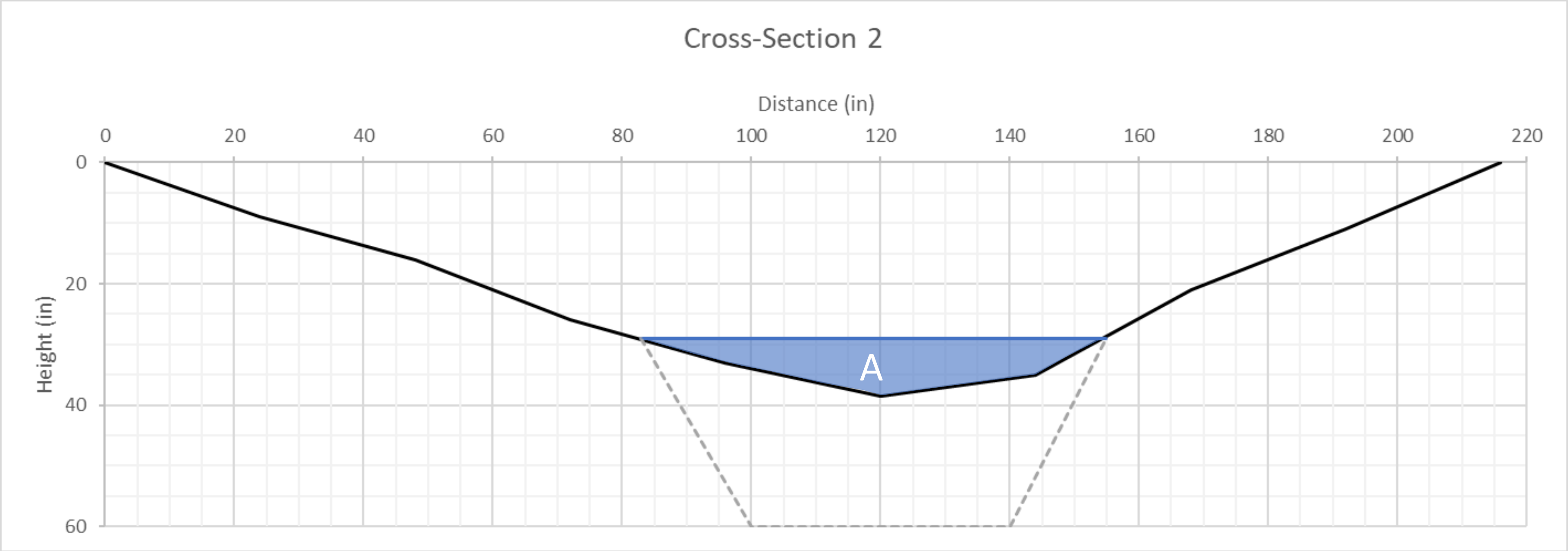
Area A (in²)	Area A (ft²)
432	3
Area of Trapazoid (in²)	**Area of Trapazoid (ft²)**
2194	15
Area of Erodible Sediment (in²)	**Area of Erodible Sediment (ft²)**
1762	12

Plate B-1

Debris Flow Assessment
Summit Pointe Subdivision
Alpine, Utah
Project Number –1312-006

Cross-Section 1

GeoStrata



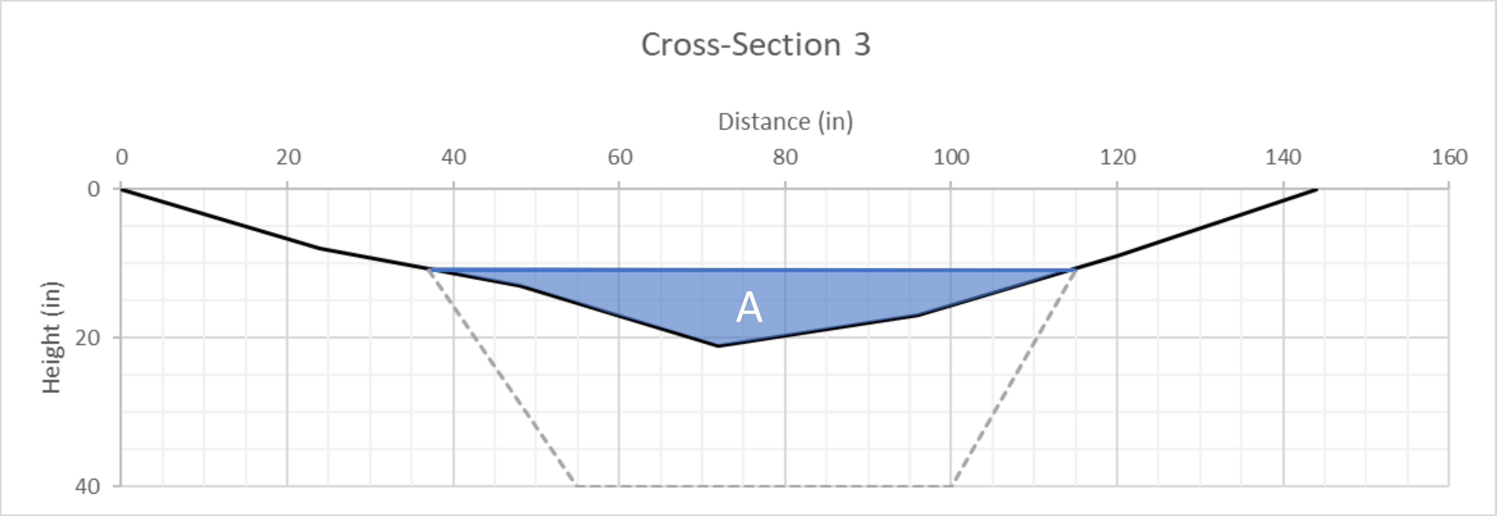
Area A (in^2)	Area A (ft^2)
432	3
Area of Trapazoid (in^2)	**Area of Trapazoid (ft^2)**
1763	12
Area of Erodible Sediment (in^2)	**Area of Erodible Sediment (ft^2)**
1331	9

Plate
B-2

Debris Flow Assessment
Summit Pointe Subdivision
Alpine, Utah
Project Number –1312-006

Cross-Section 2

GeoStrata



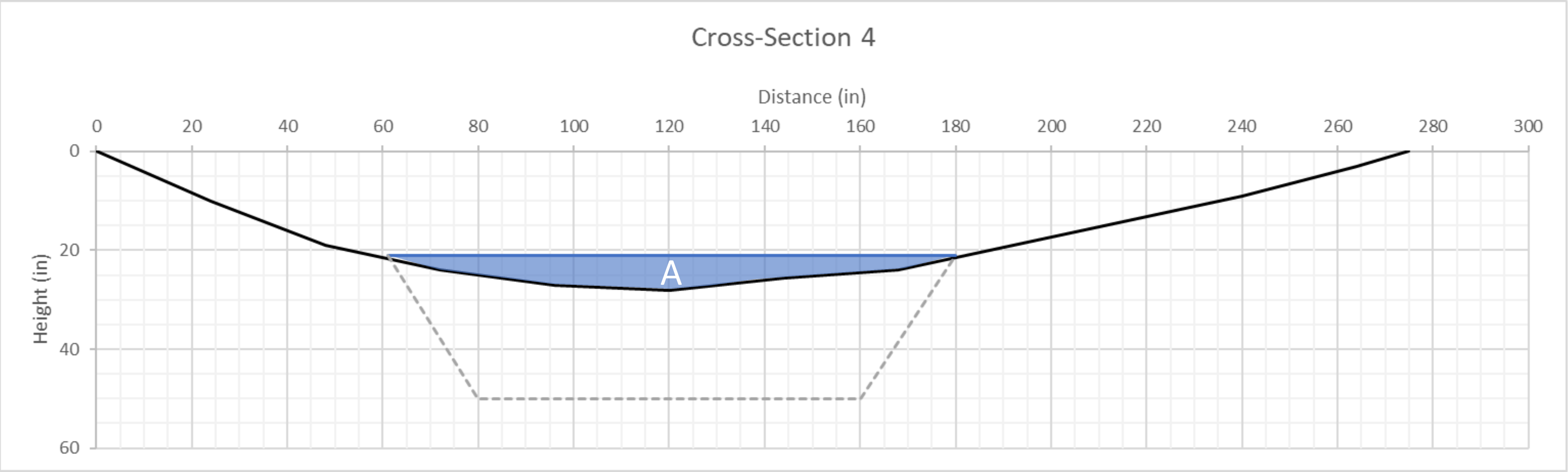
Area A (in^2)	Area A (ft^2)
432	3
Area of Trapazoid (in^2)	**Area of Trapazoid (ft^2)**
1838	13
Area of Erodible Sediment (in^2)	**Area of Erodible Sediment (ft^2)**
1406	10

Plate
B-3

Debris Flow Assessment
Summit Pointe Subdivision
Alpine, Utah
Project Number –1312-006

Cross-Section 3

GeoStrata



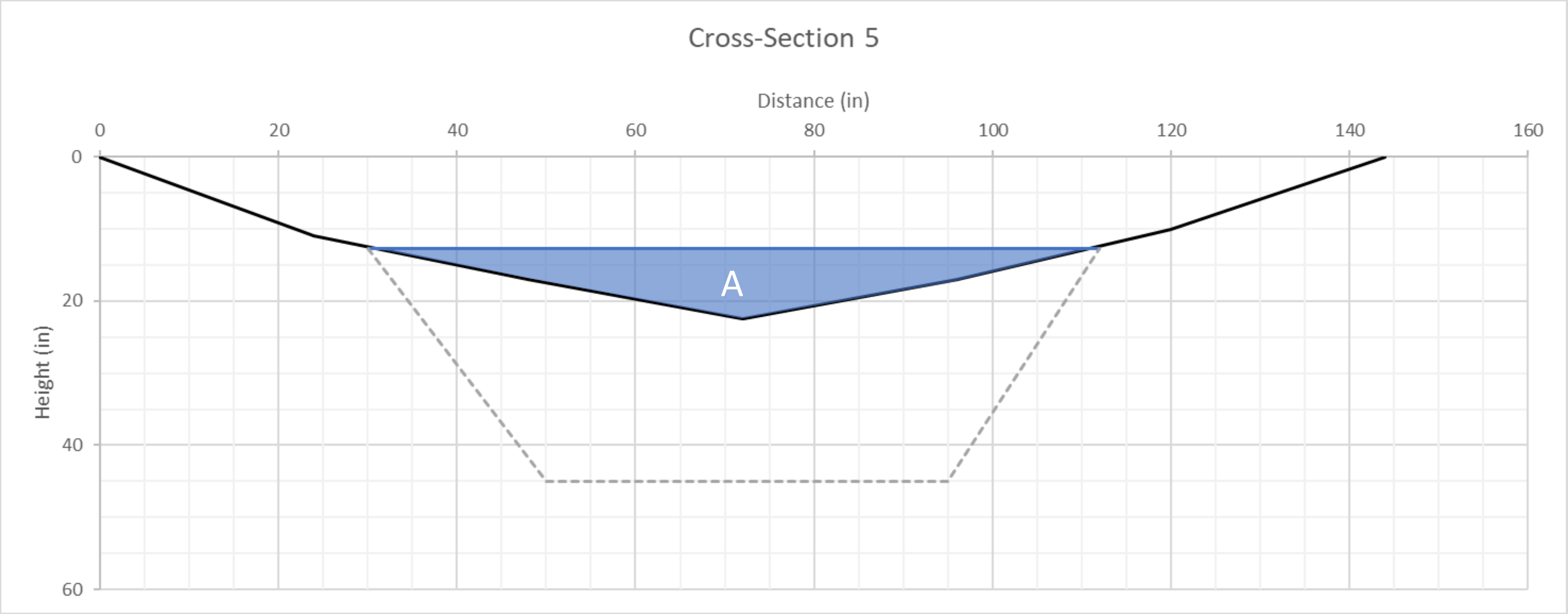
Area A (in^2)	Area A (ft^2)
432	3
Area of Trapazoid (in^2)	**Area of Trapazoid (ft^2)**
2925	20
Area of Erodible Sediment (in^2)	**Area of Erodible Sediment (ft^2)**
2493	17

Plate
B-4

Debris Flow Assessment
Summit Pointe Subdivision
Alpine, Utah
Project Number –1312-006

Cross-Section 4

GeoStrata



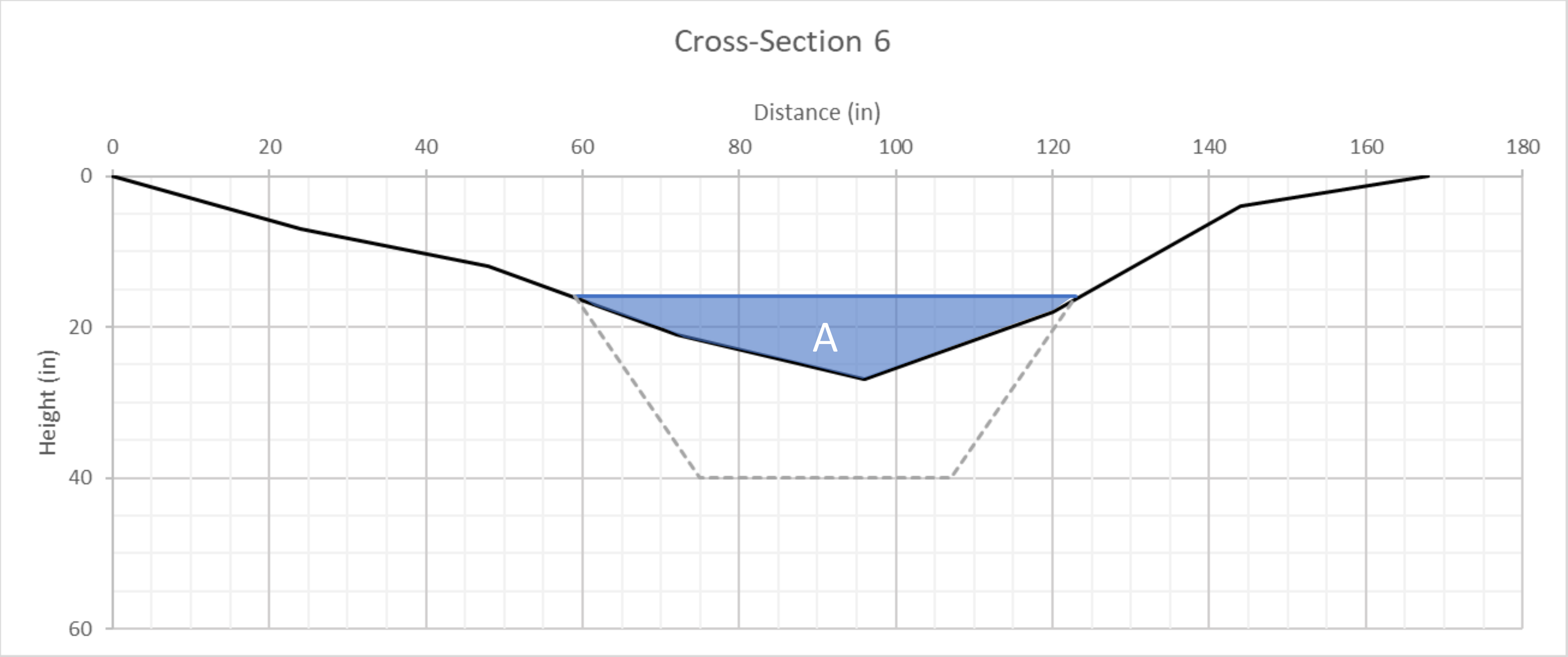
Area A (in²)	Area A (ft²)
432	3
Area of Trapazoid (in²)	**Area of Trapazoid (ft²)**
2031	14
Area of Erodible Sediment (in²)	**Area of Erodible Sediment (ft²)**
1599	11

Plate
B-5

Debris Flow Assessment
Summit Pointe Subdivision
Alpine, Utah
Project Number –1312-006

Cross-Section 5

GeoStrata



Area A (in²)	Area A (ft²)
432	3
Area of Trapazoid (in²)	**Area of Trapazoid (ft²)**
1188	8
Area of Erodible Sediment (in²)	**Area of Erodible Sediment (ft²)**
756	5

Plate
B-6

Debris Flow Assessment
Summit Pointe Subdivision
Alpine, Utah
Project Number –1312-006

Cross-Section 6

GeoStrata

Appendix C

Hydrology Study
Summit Pointe Subdivision
Alpine, UT
07/02/2019
Prepared by: Brian F. Campbell, P.E.

1. INTRODUCTION

Geostrata has asked ESI Engineering to analyze the hydrology for an area above the Summit Pointe subdivision. The study area is a small canyon where storm water collects and has potential for storm runoff. There is not a natural flowing stream with constant flow in the drainage area but there is evidence that storm water has collected and flowed through this area in past storm events. This study area is approximately 30 acres of typical soils, grasses and sagebrush commonly found in the foothills of the Wasatch Front. This study provides the Peak Flow and Peak Time as generated by WinTR-55 which is the information requested by Geostrata to perform their debris flow analysis.

WinTR-55 is a single event rainfall-runoff small watershed model. It was developed by the United States Department of Agriculture and the Natural Resources Conservation Service. The model applies to both urban and agricultural areas generating hydrographs from land areas and at selected points along the stream system. WinTR-55 was selected as the program to model this area because it is specifically used for small watershed modeling and is efficient in producing the requested information for this size of drainage area.

2. LAND USE DETAILS

2.1 Introduction

The WinTR-55 computer program uses the NRCS National Engineering Handbook Chapters 8 & 9 for ground cover descriptions and soil conditions based on the SCS definitions in the Land Use Summary Table. Land Use Categories are chosen. Hydrologic Soil Groups are chosen and acreage of each type of soil group is provided. The land use category chosen for this area was Urban. The cover description was chosen for arid and semiarid rangelands and classified as oak, aspen and grasses.

2.2 Initial Losses

Initial losses are highly dependent on soil condition. Initial losses are defined as the combination of interception, depression storage, and initial infiltration losses. Initial infiltration losses are losses resulting from infiltration rates in dry soils having greater values at the beginning of rainfall and eventually declining to saturated hydraulic conductivity values. Initial losses for pervious areas can be quite high under natural conditions when the soil is dry.

2.3 Soil Classifications

According to the SCS classification for soils this area was classified as a soil type B. Soil Group B is classified as moderately fine to moderately coarse texture soils with moderate infiltration rates.

2.4 Weighted Curve Number (CN)

Given the soils type, the acreage of each soil type, and the Land Use, a weighted curve number (CN) values is generated. The CN value for this area is 66.

3. TIME OF CONCENTRATION

3.1 Introduction

The Time of Concentration Details window is used to compute the Time of Concentration for the sub-areas within the watershed. Time of Concentration is the time it takes water to exit the watershed or drainage area.

Shallow concentrated flow travel time is determined using Manning's equation in a relationship where average velocity is a function of watercourse slope and estimated values for the type of channel, paved or unpaved.

This area was classified as Shallow Concentrated flow. Most of the flow from the drainage area is concentrated into a shallow channel located in the bottom of the draw. The slope of this channel is 12% unpaved surface. The length of the channel is 1530 linear feet. WinTR-55 calculated a time of concentration for this area of 0.076 hours. This number is too small and was replaced with a time of concentration of 0.1 hours for calculations. The velocity of this flow is 5.6 feet per second.

4. PRECIPITATION

4.1 Storm Characteristics

Utah County experiences flood-producing rainfall during the May through September cloudburst (severe thunderstorms) season. Most cloudbursts are produced by solar convective heating of moist air masses originating from the Gulf of Mexico. The largest cloudbursts are caused by the interaction of cold fronts approaching from the northwest and tropical moist air masses from the south. The duration of flood runoff producing high-intensity rain is typically 30 to 40 minutes, with total storm duration less than 3 hours. A very rare prolonged (up to 3 days), high-intensity, general rainstorm is caused by slow-moving tropical remnants of hurricanes from the Pacific interacting with approaching frontal systems or troughs. This longer storm provides design runoff volumes for durations greater than 3 hours.

The largest cloudbursts have historically occurred on the Lake Bonneville benches, between Interstate 15 and the 5,000-foot elevation contour to the east. This area of the largest cloudbursts appears to be caused by the orographic convergence of moist air masses, from the south, against the Wasatch foothills. Cloudbursts in the Wasatch foothills and mountains above 5,000 foot are more frequent, but less intense, than bench events, since there is less low-level moisture available for their growth.

4.2 Design Storms

Simulated precipitation is applied to a drainage area to obtain a design runoff hydrograph. The variability of precipitation depth and the temporal and areal distribution occurring in nature require that a statistical approach, a design storm, be used to represent this precipitation. Design storms are a distribution of rainfall depths or intensities over a time increment for a given storm duration and frequency. The following are elements of a design storm:

- Precipitation depth: the amount of precipitation occurring during a specified storm duration. The depths of rainfall are statistical depths obtained by studying historical precipitation data to find the depth for each duration for a particular frequency. Precipitation depth is usually expressed in inches.
- Duration: the specified length of storm time under study. Duration of a design storm event should be at least four times the response time of the basin. The response time is the time required for the flow peak to reach the point of interest, such as a structure, outlet or spillway. Duration may be expressed in any time unit such as minutes, hours, or days.
- Frequency: the frequency of occurrence of events with the specified precipitation depth and duration. This is expressed in terms of the return period. In order to provide a reasonable level of flood protection, the statistical concept of return period or recurrence interval is utilized to assist in assigning a probabilistic meaning to a precipitation event.

4.3 Depth-Duration-Frequency Analysis

Given a long history of maximum rainfall intensities for varying durations, a reasonable statistical interpretation can be made of the data to determine estimates of rainfall intensities or depths as a function of storm duration and of return frequency. Design storms for this report were based on Depth-Duration-Frequency (DDF) statistics from the NOAA Atlas 14 Volume 1 Version 5 at this specific location and the canyons elevation. See attached table.

4.4 Constructing a Design Storm

WinTR-55 can generate design storms for 1-, 2-, 5-, 10-, 25-, 50-, and 100-year recurrence intervals for durations of and hour storm once the storm information is input into the program. A 24 hour storm was selected for this model with the 100-year recurrence.

5 RESULTS AND FINDINGS

5.1 Unit Hydrograph

With the information noted above added to WinTR-55 the program is now able to compute the unit hydrograph. Below is the hydrograph for the Summit Pointe Area for the 100-yr Storm.

From the hydrograph we see that the peak flow is 17.71 cfs and occurs at hour 12.02 of the storm.

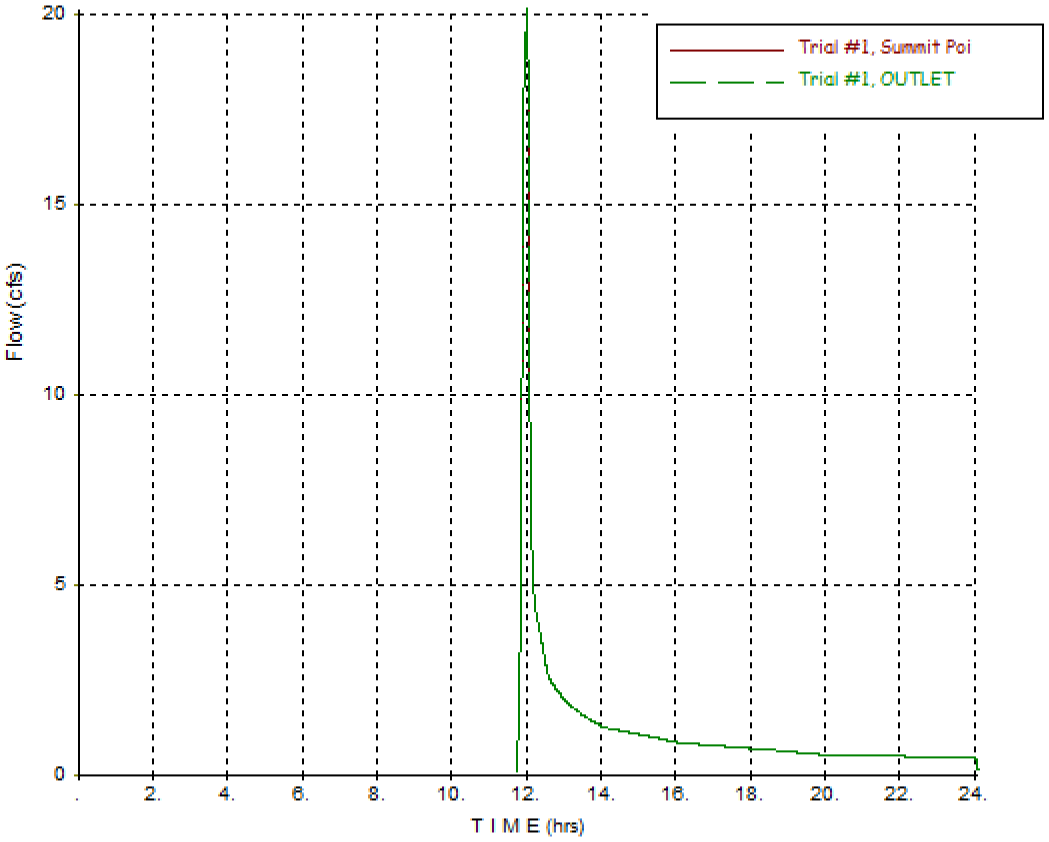
WinTR-55 Output Hydrograph

Project: Summit Pointe

7/15/2019

Subareas: (Summit Poi, Outlet) Storm: 100-Yr

J:\19-081\Documents\Summit Pointe - 2.w55



```
BFC                                 Summit Pointe

                                Salt Lake County, Utah

                           Hydrograph Peak/Peak Time Table

 Sub-Area       Peak Flow and Peak Time (hr) by Rainfall Return Period
 or Reach  ANALYSIS:
Identifier     (cfs)
            (hr)
----------------------------------------------------------------------------------
SUBAREAS
Summit Poi     17.71
           12.02


REACHES

OUTLET         17.71
```

Drainage Study
for the
Summit Pointe Subdivision
Alpine City, Utah

Prepared for:

Jacob Satterfield
Blue Bison Development

LICENSED PROFESSIONAL ENGINEER
NO. 4770481
PAUL S.
FESER
CIVIL
STATE OF UTAH

Prepared by:

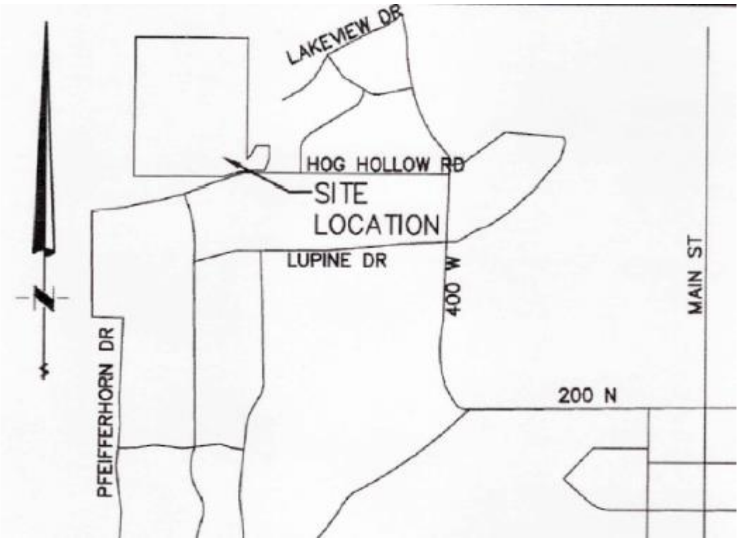
Paul Feser, P.E.
P.O. Box 2412
Salt Lake City, UT 84110
Ph: 801-433-2498

5/22/2020

I. GENERAL LOCATION AND DESCRIPTION

Location

The proposed project is a 33 acre project in Alpine City and on the corner of Draper and Highland. The site is bound by undeveloped property to the north and west and residential to the south and east.



Description of Property

The subject property presently consists of undeveloped ground. The existing topography generally slopes to the south and varies from 2-20% depending on the location.

Adjacent to the south east corner of subject property is a public roadway in which there is a storm drain outfall within roughly 200'. This particular storm drain in Hog Hollow Rd is the outfall for the steady release and the overflow for the detention pond.

The property is not located in a floodplain.

II. DRAINAGE BASINS AND SUB-BASINS

Site Conditions

The site is located in the Great Salt Lake Drainage Basin. The site affects approximately 7 acres.

Drainage

The drainage area for the basin consists of the roadway itself and then roughly 30' of area on the uphill side along the right of way. This resulted in roughly 2.3 acres incorporated into the basin. It is assumed that the residences in this area will retain their own runoff in a manner acceptable to the city standards.

The site is sized for a 100-year storm with a release rate of 0.07 cfs/acre. A weighted c value was calculated for the over developed property. The storm runoff surface drains into a surface detention basins. The following show the rational detention, orifice, and pipe flow calculations:

Rational Method of Storm Detention Calculation by Rainfall Precipitation

Project: Summit Pointe Subdivision
Date: 5/22/20
By: PSF

DRAINAGE AREA

Developed Conditions

	Area ft2	C	Land Use %	
Roadway	85,000	0.90	56.7%	
Lots	65,000	0.30	43.3%	(within 100' of right of way)
Total site	150,000			

Total (ac.):	3.44
C average:	0.64
Storm Data:	NOAA
Frequency:	100
City Rel. (cfs/acre)	0.07
Rel. Rate (cfs):	0.24

DETENTION CALCULATIONS

Time	Precipitation	Intensity	Acc.Vol	Rel.Vol.	Req. Stor.	Peak Flow
min	in	in/hr	ft3	ft3	ft3	cfs
5	0.58	6.96	4602	72	4529	15.3
10	0.88	5.28	6982	145	6837	11.6
15	1.09	4.36	8648	217	8431	9.6
30	1.47	2.94	11663	434	11229	6.5
60	1.82	1.82	14440	868	13572	4.0
120	2.05	1.03	16264	1736	14529	2.3
180	2.14	0.71	16979	2603	14375	1.6
360	2.44	0.41	19359	5207	14152	0.9
720	3.08	0.26	24436	10413	14023	0.6
1440	3.40	0.14	26975	20826	6149	0.3

Basin Size	
Max. Stor. Req. (cf):	14,529

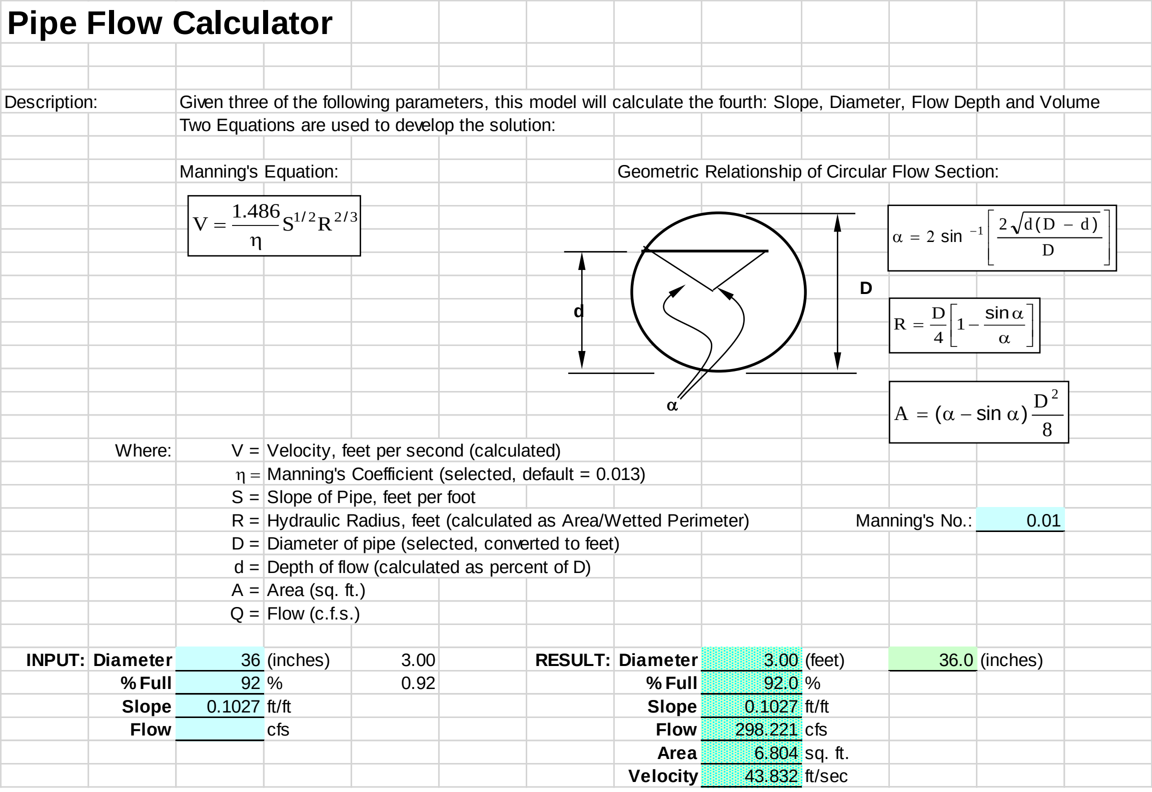
Peak Flow	
Flow (cfs):	0.24

Basin Size	
% of Total Site Area:	100.0%
Resulting Storage Req. (cf):	14,529
Surface Stor. Provided (cf):	100,000
Available Storage for Debris Flow / Runoff (cf):	85,471

Orifice Size	
% of Total Site Release	100.0%
Resulting Flow through orifice (cfs):	0.24
Head from middle of basin to middle of orifice (h):	1.5
Orifice Coefficient Cd (0.62 for square corners):	0.62
Calc. Area of Orifice (in^2):	5.7
Calc. Dia. Of orifice (in):	**2.7**

III. DEBRIS FLOW CONDUIT BYPASSING LAKEVIEW DR

The culvert under Lakeview Dr and in line with the debris flow was sized to accommodate a certain amount of flow determined by the geotechnical engineer. The capacity of the culvert is roughly 300 cfs.



Pipe Flow Calculator

Description: Given three of the following parameters, this model will calculate the fourth: Slope, Diameter, Flow Depth and Volume
Two Equations are used to develop the solution:

Manning's Equation:

$$V = \frac{1.486}{\eta} S^{1/2} R^{2/3}$$

Geometric Relationship of Circular Flow Section:

$$\alpha = 2 \sin^{-1}\left[\frac{2\sqrt{d(D-d)}}{D}\right]$$

$$R = \frac{D}{4}\left[1 - \frac{\sin\alpha}{\alpha}\right]$$

$$A = (\alpha - \sin\alpha)\frac{D^2}{8}$$

Where:
V = Velocity, feet per second (calculated)
η = Manning's Coefficient (selected, default = 0.013)
S = Slope of Pipe, feet per foot
R = Hydraulic Radius, feet (calculated as Area/Wetted Perimeter)
D = Diameter of pipe (selected, converted to feet)
d = Depth of flow (calculated as percent of D)
A = Area (sq. ft.)
Q = Flow (c.f.s.)

Manning's No.: 0.01

INPUT:	**Diameter**	36	(inches)	3.00	**RESULT:** **Diameter**	3.00	(feet)	36.0 (inches)
	% Full	92	%	0.92	**% Full**	92.0	%	
	Slope	0.1027	ft/ft		**Slope**	0.1027	ft/ft	
	Flow		cfs		**Flow**	298.221	cfs	
					Area	6.804	sq. ft.	
					Velocity	43.832	ft/sec	

IV. RIPRAP SIZING

The size if the riprap in the above debris flow was based on estimated runoff. In the technical memo dated August 13, 2018 it was determined that 15” riprap would be sufficient however in the plans we have specified 24” as a conservative measure. See the attached memo.

V. ENVIRONMENTAL PROTECTION CRITERIA

Construction Activities Storm Water Quality Control

Silt fences will be used along the edges of the site that abut adjacent property owners on the downhill side of the project. Inlet protection, consisting of gravel filters and straw bale barriers will be used for all inlets until disturbed areas are either paved or landscaping is established. The contractor is required to use vehicle-tracking control where vehicles enter and exit the site from public right-of-way. The detention facilities and outlet structures will serve as sediment basins during construction. Any disturbed areas left un-worked for more the 21 days must be seeded and mulched with 1 ton per acre of tacked hay within 14 days of last being worked.

During the construction process the above protection methods will be used to limit runoff sediment transport. Tacked hay mulch will control wind erosion over all exposed areas until permanent vegetation has been established. Surface roughening will be applied to side slopes greater than or equal to 3 horizontal to 1 vertical. This will aid in seedbed preparation and establishment of vegetation. It will also reduce runoff velocity, increase infiltration, reduce wind erosion and provide for sediment trapping. Maintenance of the on site controls will be the responsibility of the general contractor during construction operations and the developer and any subsequent tenants once build out has occurred.

Permanent Stabilization and Storm Water Quality Enhancement

Permanent measures used to achieve final stabilization and to control pollutants in storm water discharge after construction operations have been completed include site paving, landscaping, and full sedimentation-filtration systems within the on-site detention facility. The Urban Storm Drainage Criteria Manual was used to implement measures that provide water quality.

VI. CONCLUSIONS

In summary, the proposed commercial development is in conformance with city guidelines. 100-year runoff is captured and detained with release rates not exceeding city guidelines. The detention basin is sized to accommodate a 100-year storm. The emergency or excess of 100-year runoff is concentrated with predetermined flow paths and eventually flows to the east or north into the public right of way. No adverse impacts are anticipated to downstream properties due to the development of this property.

se science
Spinnaker Engineering Science, LLC

TECHNICAL MEMORANDUM

Date: August 13, 2018

To: Alpine City

CC: Project folder

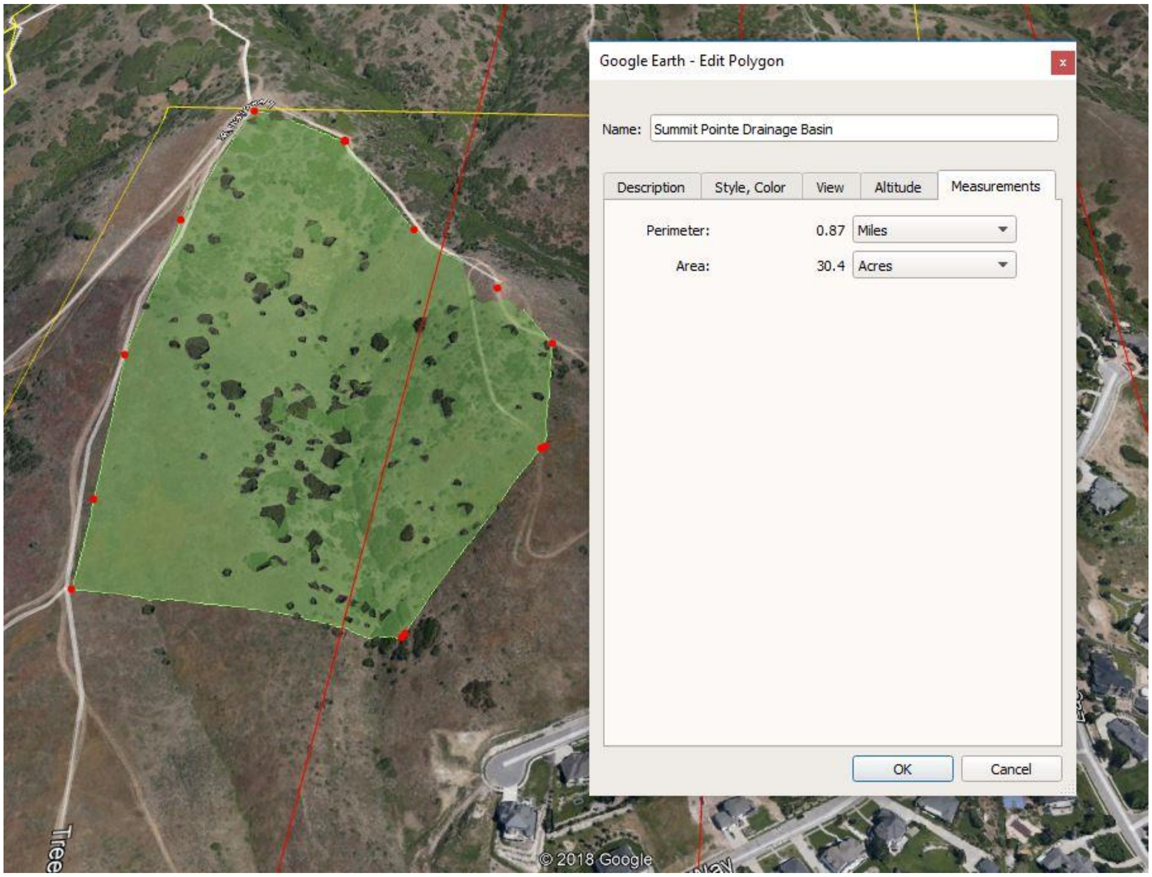
From: Paul Feser, P.E.

Subject: Summit Pointe Hillside Drainage Analysis / Riprap Sizing

S.E. Science was hired to analyze the drainage of the hillside adjacent to the Summit Pointe Subdivision in order to size riprap and a culvert under the proposed public roadway.

It was generally observed that the subject hillside does not act as a typical creek in the area where the Lakeview Drive will cross, as there is no flow except in theory in an extreme storm event. It is therefore assumed that the sizing of the culvert will not have a base flow.

The drainage area is generously approximated to be 30 acres. The length of the runoff is roughly 1800 l.f. at a slope of 10%.

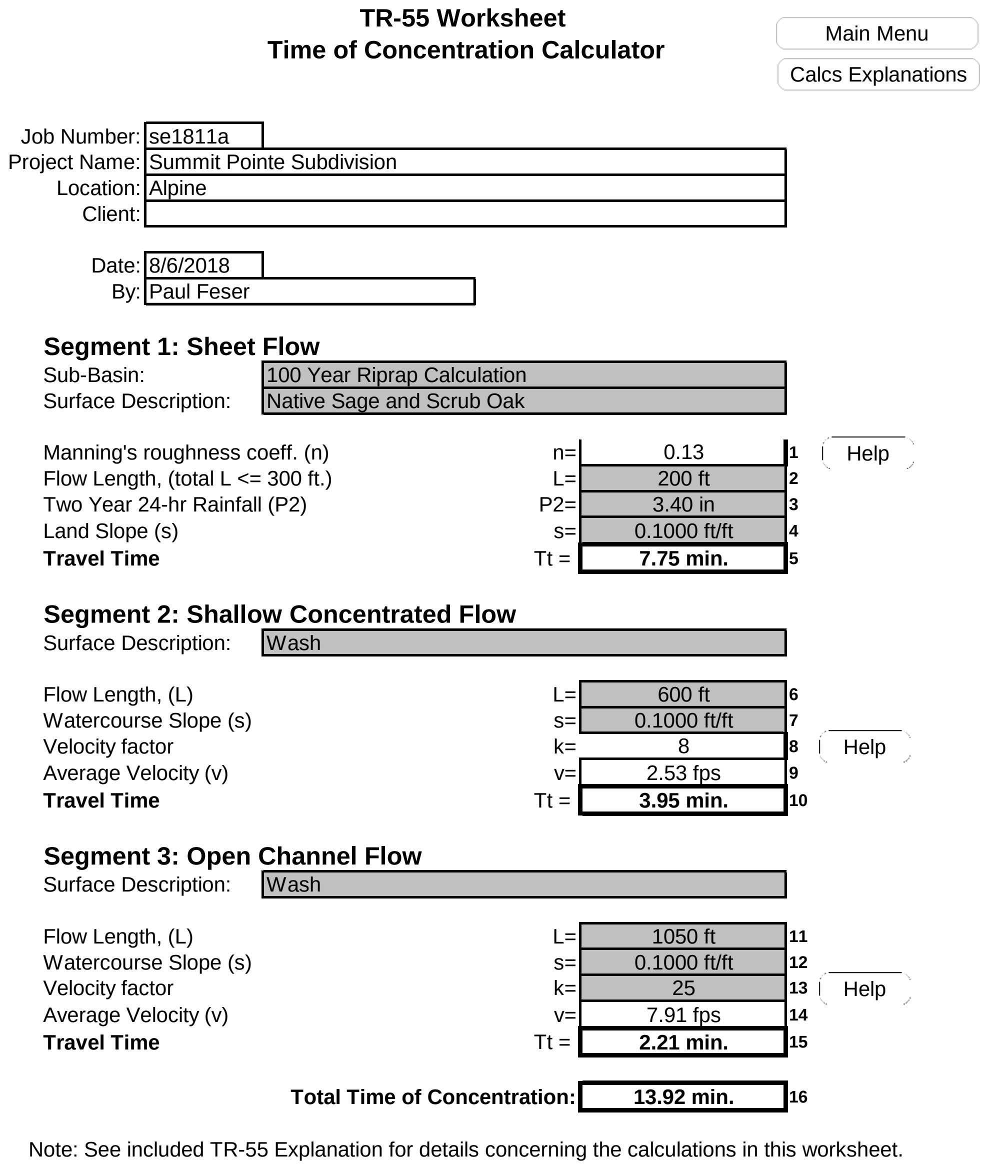


Name: Summit Pointe Drainage Basin

Perimeter: 0.87 Miles

Area: 30.4 Acres

Time of Concentration - The time of concentration is calculated to be 14 minutes and then rounded to be 15 minutes:



TR-55 Worksheet
Time of Concentration Calculator

Job Number: se1811a
Project Name: Summit Pointe Subdivision
Location: Alpine
Client:

Date: 8/6/2018
By: Paul Feser

Segment 1: Sheet Flow

Sub-Basin: 100 Year Riprap Calculation
Surface Description: Native Sage and Scrub Oak

Manning's roughness coeff. (n)	n=	0.13	1
Flow Length, (total L <= 300 ft.)	L=	200 ft	2
Two Year 24-hr Rainfall (P2)	P2=	3.40 in	3
Land Slope (s)	s=	0.1000 ft/ft	4
Travel Time	Tt =	**7.75 min.**	5

Segment 2: Shallow Concentrated Flow

Surface Description: Wash

Flow Length, (L)	L=	600 ft	6
Watercourse Slope (s)	s=	0.1000 ft/ft	7
Velocity factor	k=	8	8
Average Velocity (v)	v=	2.53 fps	9
Travel Time	Tt =	**3.95 min.**	10

Segment 3: Open Channel Flow

Surface Description: Wash

Flow Length, (L)	L=	1050 ft	11
Watercourse Slope (s)	s=	0.1000 ft/ft	12
Velocity factor	k=	25	13
Average Velocity (v)	v=	7.91 fps	14
Travel Time	Tt =	**2.21 min.**	15

Total Time of Concentration: **13.92 min.** 16

Note: See included TR-55 Explanation for details concerning the calculations in this worksheet.

Flow Rate - A rational approach was used to simplify the calculation which is a conservative approach as the rational method tends to overestimate in situations over 20 acres. The required runoff is roughly 20 cfs.

Rational Method of Storm Runoff Calculation by Rainfall Precipitation

Project: Summit Pointe Subdivision
Date: 8/8/18
By: PSF

DRAINAGE AREA			
	Developed Conditions		
	Area ft2	C	Land Use %
Hillside	1,324,224	0.15	100.0%
Total site	1,324,224		

Total (ac.):	30.40
C average:	0.15
Storm Data:	NOAA
Frequency:	100

RUNOFF CALCULATIONS			
Time	Precipitation	Intensity	Peak Flow
15	1.09	4.36	19.9

Culvert Sizing - An 18-inch pipe at 7.8% slope can pass roughly 40 cfs:

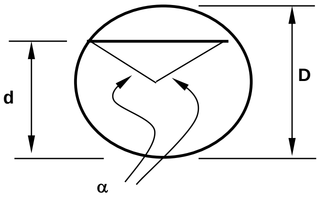
Pipe Flow Calculator

Description: Given three of the following parameters, this model will calculate the fourth: Slope, Diameter, Flow Depth and Volume
Two Equations are used to develop the solution:

Manning's Equation:

$$V = \frac{1.486}{\eta} S^{1/2} R^{2/3}$$

Geometric Relationship of Circular Flow Section:



$$\alpha = 2 \sin^{-1}\left[\frac{2\sqrt{d(D-d)}}{D}\right]$$

$$R = \frac{D}{4}\left[1 - \frac{\sin\alpha}{\alpha}\right]$$

$$A = (\alpha - \sin\alpha)\frac{D^2}{8}$$

Where:
V = Velocity, feet per second (calculated)
η = Manning's Coefficient (selected, default = 0.013)
S = Slope of Pipe, feet per foot
R = Hydraulic Radius, feet (calculated as Area/Wetted Perimeter)
D = Diameter of pipe (selected, converted to feet)
d = Depth of flow (calculated as percent of D)
A = Area (sq. ft.)
Q = Flow (c.f.s.)

Manning's No.: 0.01

INPUT:	**Diameter**	18	(inches)	1.50	**RESULT:**	**Diameter**	1.50	(feet)	18.0	(inches)
	% Full	90	%	0.9		**% Full**	90.0	%		
	Slope	0.078	ft/ft			**Slope**	0.0780	ft/ft		
	Flow		cfs			**Flow**	40.637	cfs		
						Area	1.675	sq. ft.		
						Velocity	24.258	ft/sec		

Riprap - The greatest outfall slope and greatest potential for erosion and failure is immediately adjacent to the inlet and outfall of the culvert. The required size of the riprap is estimated as follows.

Riprap Rock Sizing Calculator

Compute stable rock size. River channel erosion control, scour prevention. Isbash equation

Riprap is used for erosion control, to prevent scour, and to minimize sediment transport in rivers and streams. A stable riprap rock size is desired.

$$D = \frac{V^2}{2gC^2(s-1)}$$

		INPUT
Where:	Q max (cfs)	19.88
	Area of weir (s.f.)	2
	V = Water Velocity (ft/s)	9.94
	C = Isbash constant (0.86 typ.)	0.86
	C=0.86 for highly turbulent conditions or C=1.2 for low	
	S = Rock specific gravity	2.65
	2.56 to 2.92 depending on the rock	
	g = Acceleration due to gravity (32.2 ft/s)	
		RESULTS
	D = Rock Diameter (ft)	1.3
	D = Rock Diameter D50(in)	15.1

In conclusion the 24” riprap specified on the plans should be adequate for the project.

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Geologic Hazards Screening Assessment
Summit Pointe Subdivision
Alpine, Utah

GeoStrata Job No. 1312-005

October 17, 2018

Prepared for:

Six Blue Bison, LLC
c/o Jacob Satterfield
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Geologic Hazards Screening Assessment
Summit Pointe Subdivision
Alpine, Utah
Parcel # 23-029-0047

GeoStrata Job No. 1312-005

Prepared by:

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October 17, 2018

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APPENDICES

1.0 EXECUTIVE SUMMARY

The purpose of this investigation and report is to assess the approximately 30.34 acres parcel located on a native hillside north of Hog Hollow Road in Alpine, Utah for the presence of geologic hazards that may impact the planned development of the site. The geologic hazards considered for this site are presented in Table 2 of this report. The work performed for this report was performed in accordance with our proposal, dated August 29, 2018.

The subject site is located north of Hog Hollow Road on a native hillside in Alpine, Utah at an elevation ranging from approximately 5,228 to 5,370 feet above sea level. We understand that the project site is an approximately 30.34 acres undeveloped parcel with hiking trails and unpaved access roads. It is our understanding that the proposed development, as currently planned, will consist of 8 single-family residential structures as well as associated driveways, utilities and landscape areas.

The earthquake ground shaking hazard that would potentially impact the subject site was assessed as part of our study. Given our office investigations, it is the opinion of GeoStrata that the earthquake ground shaking hazard within the subject site should not preclude development at the subject site. The seismic data provide above should be used by the project geotechnical and structural engineers for proper site and structural design.

The surface fault rupture hazard that would potentially impact the subject site was assessed as part of our study. No active faults are located near the subject site. Given our field and office investigations, the surface fault rupture hazard within the subject site is considered low and it is considered unlikely that surface fault rupture will impact the proposed development. It is the opinion of GeoStrata that surface fault rupture hazard should not preclude development at the subject lot.

The tectonic deformation hazard that would potentially impact the site was assessed as part of our study. No active faults are reported or mapped within or adjacent to the subject site. It is the opinion of GeoStrata that the tectonic deformation hazard within the subject site is considered low and it is considered unlikely that tectonic deformation will impact the proposed development. It is the opinion of GeoStrata that the tectonic deformation hazard should not preclude development at the subject site.

The liquefaction hazard that would potentially impact the site was assessed as part of our study. The site is located in an area currently designated as having a “Very Low” liquefaction potential. The near-surface soils are not considered to be susceptible to liquefaction. It is the opinion of GeoStrata that liquefaction hazard should not preclude development at the subject site.

The rockfall hazards within the subject site were assessed as part of our study. No rockfall or talus deposits are located within or immediately adjacent to the subject lot. Our field investigation revealed no indications that the subject lot has been subjected to previous rockfall. Therefore, the rockfall hazard within the subject site is considered low and it is considered unlikely that rockfall will impact the proposed development. It is the opinion of GeoStrata that rockfall hazard should not preclude development at the subject site.

The landslide, slump and creep hazards that would potentially impact the site were assessed as part of this study. No landslide deposits are mapped within or adjacent to the subject site. During our field investigation, no landslide features such as hummocky topography, slumps or scarps were identified within or adjacent to the subject site. If planned mass grading for the development includes cut and fill sections of five feet or greater in height or if cut and fill slopes steeper than 3 horizontal: 1 vertical are planned as part of the development of the subject site, then we recommend that a site-specific slope stability assessment be conducted as part of a geotechnical investigation of the subject site to assess slope stability hazards within the site. GeoStrata is concurrently completing a geotechnical study for the proposed development which includes a site-specific slope stability assessment. It is the opinion of GeoStrata that the landslide, slump and creep hazard should not preclude development at the subject site as long as the recommendations stated above and presented in the geotechnical investigation being conducted for the site are followed.

Slope stability of the subject site was not assessed as part of this geological hazard assessment. The subject site was observed to be gently sloping to the south toward Alpine City and moderately sloping toward local drainages. The possibility that development of the site could negatively affect slope stability within the subject site is increased if development is planned for areas of the site with slopes steeper than approximately 3horizontal: 1 vertical. It should be noted that grading or development adjacent to the subject site could potentially impact the stability of the area within the subject site and assessment of that hazard is out of the scope of this assessment.

The snow avalanche hazard that would potentially impact the site was assessed as part of this study. No evidence of prior snow avalanche was observed within the subject site. It is the opinion of GeoStrata that the snow avalanche hazard within the subject site is considered low and it is considered unlikely that this hazard will impact the proposed development. It is the opinion of GeoStrata that snow avalanche hazard should not preclude development at the subject site.

The alluvial-fan flooding hazard that would potentially impact the site was assessed as part of this study. Holocene age alluvial fan deposits are mapped immediately south of the subject site. During our field investigation, we observed two minor drainages that trend through the central portion of the subject site. We observed these two drainages to be relatively small. It is our opinion that these two minor drainages have a low to moderate debris flow potential and the debris flow potential in these two minor drainages could be mitigated through proper site grading and drainage plans developed by a professional engineer as part of the development of the subject site.

As previously stated, a road cut was graded from Lakeview Drive west into the subject site and crosses the more developed drainage that trends north-south along the eastern property boundary. No culvert was observed beneath the fill where the road crosses the drainage. Based on our understanding of the project, a detention basin will be located within the upstream side of the roadway that will cross the eastern drainage and a culvert pipe will be installed beneath the roadway embankment fill to allow water drainage to be released downstream of the roadway. Given the size of the eastern drainage basin and the young alluvial fan deposit mapped at the base of this drainage, GeoStrata recommends that the potential debris flow volume associated with this drainage basin be evaluated and that the potential debris flow volume associated with this drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert.

It is the opinion of GeoStrata that the alluvial fan flooding hazard within subject site is considered low to moderate. It is considered unlikely that debris flows will impact the proposed development as long as potential stormwater flow volume of the two minor drainages within the subject site be included and mitigated in the grading and drainage plans engineered for the site by the project civil engineer and the potential debris flow volume associated with the larger eastern drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert. It is the opinion of GeoStrata that alluvial fan flooding hazard should not preclude development at the subject lot as long as the recommendations presented above are followed.

Shallow groundwater assessment is out of the scope of this study. Seasonal fluctuations in precipitation, rapid snowmelt, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions; groundwater conditions can be expected to rise several feet seasonally depending on the time of year. Shallow groundwater is to be addressed in the GeoStrata geotechnical investigation report for the subject site which is being completed concurrently with this report.

The stream flooding hazard that would potentially impact the site was assessed as part of this study. Pine Creek is located approximately 95 feet south of the subject site. Given our field and office investigations, the stream flooding hazard within the subject lot is considered low across most of the subject site, however stream flooding hazard within the three drainages observed in the central and eastern portions of the subject site and previously discussed in this report is considered moderate to high. Stream flooding could impact the proposed development within the three noted drainages. It is the opinion of GeoStrata that stream flooding hazard should not preclude development at the subject site as long as proper site grading, drainage, and erosion control plans are engineered and designed for the subject site as a part of the civil engineering design for the site to mitigate the potential for stream flooding to impact and damage planned structures or other planned associated infrastructure.

The canal flooding hazard that would potentially impact the site was assessed as part of this study. No canals were observed or are mapped within or adjacent to the subject site. Given our field and office investigations, the canal flooding hazard within the subject lot is considered low and it is considered unlikely that canal flooding will impact the proposed development. It is the opinion of GeoStrata that canal flooding hazard should not preclude development at the subject lot.

The dam failure hazard that would potentially impact the site was assessed as part of this study. No dams or reservoirs are located up-gradient of the subject site. Given our field and office investigations, the dam failure hazard within the subject lot is considered low and it is considered unlikely that dam failure will impact the proposed development. It is the opinion of GeoStrata that dam failure hazard should not preclude development at the subject lot.

The problem soils hazard is out of the scope of this study. Based on our review of published geologic maps and our field observations, the subject site is underlain by gravel and cobbles in a matrix of silt and sand. No laboratory testing was performed on these soils as part of this study and therefore this hazard was not assessed as part of this study. A geotechnical study is being completed by GeoStrata for the subject site concurrently with this report to assess soil properties for use in the design of footing, foundation elements and grading.

The radon gas hazard is out of the scope of this study. No published data that covers the area of the subject sites currently exists. Indoor testing following construction is recommended for determining radon gas levels and mitigation methods needed.

The karst and sink holes hazards is out of the scope of this study. The karst and sink holes hazards within the subject site are considered low and it is unlikely that karst and sink holes hazards will impact the proposed development.

NOTICE: The scope of services provided within this report are limited to the assessment of the subsurface conditions for the proposed development. This executive summary is not intended to replace the report of which it is part and should not be used separately from the report. The executive summary is provided solely for purposes of overview. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

The purpose of this investigation and report is to assess the approximately 30.34 acres parcel located on a native hillside north of Hog Hollow Road in Alpine, Utah for the presence of geologic hazards that may impact the planned development of the site. The geologic hazards considered for this site are presented in Table 2 of this report. The work performed for this report was performed in accordance with our proposal, dated August 29, 2018. Our scope of services included the following:

- Review of available references and maps of the area.
- Aerial photographs covering the site area.
- Review of 2013-2014 0.5-meter LiDAR
- Geologic reconnaissance and field mapping of the site by an engineering geologist to observe and document pertinent surface features indicative of geologic hazards.
- Evaluation of our observations combined with existing information and preparation of this written report with conclusions and recommendations regarding geologic hazards observed to affect the site.

The recommendations contained in this report are subject to the limitations presented in the Limitations section of this report.

2.2 PROJECT DESCRIPTION

The subject site is located north of Hog Hollow Road on a native hillside in Alpine, Utah at an elevation ranging from approximately 5,228 to 5,370 feet above sea level. We understand that the project site is an approximately 30.34 acres undeveloped parcel with hiking trails and unpaved access roads. It is our understanding that the proposed development, as currently planned, will consist of 8 single-family residential structures as well as associated driveways, utilities and landscape areas. The hillside in the area of the subject site is moderately to steeply sloping generally to the south. The subject site remains in a relatively native condition. The parcels to the east and south are established residential neighborhoods. The parcels to the west and north are undeveloped hillsides. The location and approximate boundaries of the subject site are shown on the Site Vicinity Map and the Topographic Map included in the Appendix of this report (Plate 1; Plate 2).

3.0 METHODS OF STUDY

3.1 OFFICE INVESTIGATION

To prepare for the investigation, GeoStrata reviewed pertinent literature and maps listed in the references section of this report, which provided background information on the local geologic history of the area and the locations of suspected or known geologic hazards (Elliot and Harty, 2010; Black and others, 2016; Biek, 2005; Constenius and others, 2011; Machette, 1992). A stereographic aerial photograph interpretation was performed for the subject site using two sets of stereo aerial photographs (Table 1) obtained from the Utah Geological Survey Aerial Imagery Collection database.

Source	Photo Number	Date	Scale
USBR	SLA_1-6_A	August 10, 1938	1:20,000
USBR	SLA_1-7_A	August 10, 1938	1:20,000

Table 1: Aerial Stereosets.

GeoStrata also conducted a review of hillshades derived from 2013-2014 0.5-meter LiDAR digital elevation data obtained from the State of Utah AGRC to assess the subject site for visible alluvial fan deposits, landslide geomorphology, lineations related to stream flooding hazards, surface fault rupture related geomorphology and all other geomorphology related to geologic hazards (Plate 3 Hillshade Map).

3.2 FIELD INVESTIGATION

An engineering geologist investigated the geologic conditions within the general site area. A field geologic reconnaissance was conducted to observe existing geologic conditions and to assess existing geomorphology for surficial evidence of geologic hazards. During our fieldwork we conducted site observations to assess geologic hazards that might impact the subject site. We used our field observations to confirm the observations made during our office research and to observe any evidence of geologic hazards that were not evident in our office research, but which could be observed in the field.

4.0 GEOLOGIC CONDITIONS

4.1 GEOLOGIC SETTING

The site is located in Utah Valley on a south facing slope between Hog Hollow and Fort Canyon in Alpine, Utah. The subject site is located within the foothills of the Traverse Mountains, a structural salient denoting the boundary between Salt Lake Valley and Utah Valley and the southern terminus of the Salt Lake City Segment and the northern terminus of the Provo Segment of the Wasatch Fault Zone. Tertiary volcanic rocks and Tertiary alluvial fan deposits dominate the East Traverse Mountains and late Paleozoic shallow marine bedrock constitute the west Traverse Mountains. The Utah Valley is a northwest trending deep, lacustrine sediment-filled structural basin of Cenozoic age bounded on the northeast and southwest by two normal faults that dip towards the center of the valley. Utah Valley is a fault graben flanked by two uplifted blocks, the Wasatch Range to the east and the Lake Mountains to the west. The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah (Stokes, 1986).

The near-surface geology of the Utah Valley is dominated by sediments, which were deposited within the last 30,000 years by Lake Bonneville (Scott and others, 1983; Hintze, 1993; Machette, 1992; Constenius and others, 2011). The lacustrine sediments near the mountain front consist mostly of gravel and sand. As the lake receded, streams began to incise large deltas formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt, and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover. Most surficial deposits along the Wasatch fault zone were deposited during the final cycle of the Bonneville Lake Cycle between approximately 32 to 10 ka (thousands of years ago) and in the Holocene (< 10 ka).

4.2 SITE GEOLOGY

The geology within the subject site and in the surrounding area is shown on Plate 4a Site Vicinity Geologic Map and Plate 5 Site Vicinity 30x60 Geologic Map. On Plate 4a, the geology within the subject site is mapped as Tertiary alluvial fan (Taf) with three Quaternary alluvial fan deposits (Qaf_1) mapped at the base of the slope and overlying Lake Bonneville lacustrine gravel and sand (Qlbg). The Tertiary alluvial fan deposits are described as unconsolidated pebble to boulder sized subangular to subrounded orthoquartzite and calcareous sandstone clasts with minor volcanic clasts. The Quaternary alluvial fan deposits are modern alluvial fans that are primarily debris flows that formed at the mouths of active drainages. Lastly, the lacustrine gravel and sand deposits are described as locally partially cemented, well-rounded, pebble to cobble gravel and pebbly sand that was deposited at and below the highest Bonneville shoreline, but above the Provo shoreline.

5.0 GENERALIZED SITE CONDITIONS

5.1 SURFACE CONDITIONS

As stated previously, the project site is located along a south facing slope between Hog Hollow and Fort Canyon in Alpine, Utah. The subject site is located on a gently to moderately sloping native hillside vegetated with grasses, sagebrush and scrub oak mainly growing in the drainages. The hillside slopes between approximately 5 degrees to the south toward Alpine and locally 14 degrees along the drainages. At the time of our site visit, a roadcut for an unpaved road was graded from Lakeview Road west into the subject site. Exposure along the eastern portion of the roadcut consisted of a clast supported deposit containing poorly sorted well-rounded quartzite, sandstone and Alta Stock granodiorite gravel and cobbles. This exposure was observed to contain moderate bedding in places. Exposure along the western portion of the roadcut consisted of a red-brown matrix supported deposit containing subangular to rounded quartzite clasts. The site remains in a relatively natural state, apart from minor grading for access roads and hiking trails. The site is vegetated with grasses, weeds, sage brush and scrub oak predominantly in the drainages. The parcels east and south of the subject site are established single-family residences. The parcels west and north of the subject site are undeveloped native hillsides.

6.0 GEOLOGIC HAZARDS

Geologic hazards can be defined as naturally occurring geologic conditions or processes that could present a danger to human life and property. These hazards must be considered before development of the site. There are several hazards that if present at the site should be considered in the design of habitable structures and other critical infrastructure. The hazards considered for this site are presented on Table 2 and discussed in the following sections of this report.

Hazard	**Hazard Rating***					**Further Study Recommended**
	Not Applicable	**Not Assessed**	**Low**	**Moderate**	**High**	
Ground Shaking			X			
Surface Fault Rupture			X			
Tectonic Deformation			X			
Liquefaction			X			
Rock Fall and Topple			X			
Landslide			X			
Slump			X			
Creep			X			
Avalanche			X			
Debris Flow			X	X		G
Hyperconcentrated Flow			X			
Stream Flow			X			
Shallow Groundwater		X				E
Stream Flooding			X			
Canal Flooding	X					
Dam Failure	X					
Problem Soils		X				E
Radon		X				
Karst and Sink Hole		X				

Table 2: Summary of Geologic Hazards.

Table 2 shows the summary of the geologic hazards assessed and not assessed at the study area. The hazard rating as shown on Table 2 is intended to assess the probability that the hazard could have an impact on the site and not the severity of the hazard. A hazard rating of "Not Assessed" are hazards this report does not consider and no inference is made as to the presence or absence of the hazard at the site. A hazard rating of "Low" indicates that no evidence was found to indicate that the hazard is present and has a low probability of impacting the site, hazard not known or suspect to be present. A hazard rating of "Moderate" indicates that the hazard has a moderate probability of impacting the site, but the evidence is equivocal, based only on theoretical studies, or was not observed and further study is necessary as noted. A hazard rating of "High" indicates that that evidence is strong and suggests that there is a high probability of impacting the site and mitigation measures should be taken. If a hazard is assessed to potentially impact the site then further studies may be recommended. The following are the recommended studies and the letter designation associated with those studies: "E" – geotechnical/engineering, "H" – hydrologic, "A" – avalanche, "G" – additional detailed geologic hazard study out of the scope of this study.

6.1 EARTHQUAKE GROUND SHAKING HAZARD

During the event of an earthquake, seismic waves radiate outward from the initial point of rupture and dissipate with distance. The ground shakes as the seismic waves displace the ground both vertically and horizontally. Ground shaking can cause significant damage to and potentially collapse structures and can also trigger landslides, avalanches and liquefaction. The type of soil a seismic wave travels through can amplify or dampen the effects of ground shaking.

Seismic hazard maps depicting probabilistic ground motions and spectral response have been developed for the United States by the U.S. Geological Survey as part of NEHRP/NSHMP (Frankel et al, 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2015). Spectral responses for the Maximum Considered Earthquake (MCE_R) are shown in the table below. These values generally correspond to a two percent probability of exceedance in 50 years (2PE50) for a "firm rock" site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on our field and office investigations, it is our opinion that this location is best described as a Site Class C which represents a "Very Dense Soil and Soft Rock" profile. The spectral accelerations are shown in the table below. The spectral accelerations are calculated based on the site's approximate latitude and longitude of 40.462294° and

-111.792817° respectively and the United States Geological Survey U.S. Seismic Design Maps web-based application. Based on the IBC, the site coefficients are F_a=1.00 and F_v= 1.34. From this procedure the peak ground acceleration (PGA) is estimated to be 0.50g.

Site Location: **Latitude = 40.462294 N** **Longitude = -111.792817 W**	**Site Class C Site Coefficients:** **F_a = 1.10** **F_v = 1.34**
Spectral Period (sec)	**Response Spectrum Spectral Acceleration (g)**
0.2	S_{MS}=(F_a*S_s=1.10*0.1.263) = 1.26
1.0	S_{M1}=(F_v*S_1=1.34*0.464) = 0.62

[a] IBC 1613.3.4 recommends scaling the MCE_R values by 2/3 to obtain the design spectral response acceleration values; values reported in the table above have not been reduced.

Table 3: MCE_R Seismic Response Spectrum Spectral Acceleration Values for IBC Site Class C[a].

Based on the above information, it is the opinion of GeoStrata that the earthquake ground shaking hazard within the subject site should not preclude development at the subject site. The seismic data provide above should be used by the project geotechnical and structural engineers for proper site and structural design.

6.2 SURFACE FAULT RUPTURE HAZARD

Movement along faults within the crustal rocks beneath the ground surface generates earthquakes. During large magnitude earthquakes (Richter magnitude 6.5 or greater) along the normal faults in the intermountain region, fault ruptures can propagate to the ground surface resulting in a surface fault rupture (Smith and Arabasz, 1991). The fault scarp formed during a surface fault rupture event along a normal fault is generally nearly vertical. A surface rupture fault may be comprised of a larger single surface rupture or several smaller surface ruptures across a fault zone. For all structures designed for human occupancy, a surface rupturing fault is considered active if it has experienced movement in approximately the past 10,000 years (Christenson and others, 2003).

Based on review of published geologic maps, our stereographic aerial photograph interpretation, our review of the hillshades derived from 2013-2014 0.5-meter LiDAR and our field observations, no active faults are located near the subject site (Plate 6 UGS Quaternary Fault

Map). The nearest fault is the Provo Section of the Wasatch Fault Zone which is less than 15,000 years old. The Provo section has a reported reoccurrence interval between 1,200 years (minimum) and 3,200 years (maximum) and a slip rate of 1.5 and 5.0 mm/yr (Black and others, 2003). This fault is located approximately 1.6 miles northeast of the subject site. Given our field and office investigations, the surface fault rupture hazard within the subject site is considered low and it is considered unlikely that surface fault rupture will impact the proposed development. It is the opinion of GeoStrata that surface fault rupture hazard should not preclude development at the subject lot.

6.3 TECTONIC DEFORMATION

Subsidence is a hazard associated with warping, lowering and tilting of a valley floor accompanying surface ruptures on normal faults (Robinson, 1993). Inundation along the shores of lakes and reservoirs and the rise of groundwater levels are the main hazards associated with subsidence. Structures that require gentle gradients or horizontal floors such as waste water treatment plants and sewer lines may be adversely affected by tectonic subsidence. Because subsidence may occur over very large areas, it is not generally practical to avoid the use of potentially affected land except in narrow areas of hazard due to lakeshore inundation (Keaton, 1987; Robison, 1993). According to Gary Christenson (UGS, personal communication 2001), tectonic subsidence is not typically assessed for subdivision development unless the development is located within an area of potential lake flooding.

Based on published geological maps, no active faults are reported or mapped within or adjacent to the subject site. It is the opinion of GeoStrata that the tectonic deformation hazard within the subject site is considered low and it is considered unlikely that tectonic deformation will impact the proposed development. It is the opinion of GeoStrata that the tectonic deformation hazard should not preclude development at the subject site.

6.4 LIQUEFACTION

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

Based on our review of the *Liquefaction Special Study Areas, Wasatch Front and Nearby Areas, Utah* compiled by Christenson and others, 2008, the site is located in an area currently designated as having a "Very Low" liquefaction potential. "Very Low" liquefaction potential indicates that there is less than a 5 percent probability of having an earthquake within a 100-year period that will be strong enough to cause liquefaction. The surface soils we observed during our field investigation are not considered to be susceptible to liquefaction. A liquefaction analysis was beyond the scope of this geologic hazards assessment; however, if the owner wishes to have greater understanding of the liquefaction potential of the soils at greater depths, a liquefaction analysis should be completed at the site. It is the opinion of GeoStrata that liquefaction hazard should not preclude development at the subject site.

6.5 ROCKFALL AND TOPPLE

Rockfalls are the fastest moving mass movement that predominantly occurs in mountains where a rock source exists along steep slopes and cliffs greater than 35 degrees. Rockfalls are a result of a loss of support from beneath the rock mass that can be caused by freeze/thaw action, rainfall, weathering and erosion, and/or strong ground shaking resulting from seismic activity. Rockfalls result in the collection of rock fall material, referred to as talus, at the base of the slope. The presence of talus indicates that a rockfall hazard has occurred and may still be present at the site.

Based on review of published geologic maps, our stereographic aerial photograph interpretation and our field observations, no rockfall or talus deposits are located within or immediately adjacent to the subject lot. Furthermore, no rockfall sources such as talus deposits or bedrock outcroppings were observed upslope from the subject site. Our field investigation revealed no indications that the subject lot has been subjected to previous rockfall. Therefore, the rockfall hazard within the subject site is considered low and it is considered unlikely that rockfall will impact the proposed development. It is the opinion of GeoStrata that rock fall hazard should not preclude development at the subject site.

6.6 LANDSLIDE, SLUMP, CREEP

There are several types of landslides that should be considered when evaluating geologic hazards at a site with moderately to steeply sloping terrain. These include shallow debris slides, deep-seated earth or rock slumps and earth flows. Landslides, slumps, creep and other mass movements can develop on moderate to steep slopes where the slope has been altered or disturbed. Movement can occur at the top of a slope that has been loaded by fill placement, at the base of a slope that has been undercut, or where local groundwater rises resulting in increased pore pressures within the slope. Slopes that exhibit prior failures and large landslide deposits are particularly susceptible to instability and reactivation.

Based on review of published geologic maps, our stereographic aerial photograph interpretation and hillshades derived from 2013-2014 0.5-meter LiDAR, no landslide deposits are mapped within or adjacent to the subject site (Plate 4a Site Vicinity Geologic Map; Plate 5 Site Vicinity 30x60 Geologic Map). During our field investigation, no landslide features such as hummocky topography, slumps or scarps were identified within or adjacent to the subject site. If planned mass grading for the development includes cut and fill sections of five feet or greater in height or if cut and fill slopes steeper than 3 horizontal: 1 vertical are planned as part of the development of the subject site, then we recommend that a site-specific slope stability assessment be conducted as part of a geotechnical investigation of the subject site to assess slope stability hazards within the site. GeoStrata is concurrently completing a geotechnical study for the proposed development which includes a site-specific slope stability assessment. It is the opinion of GeoStrata that the landslide, slump and creep hazard should not preclude development at the subject site as long as the recommendations stated above and presented in the geotechnical investigation being conducted for the site are followed.

Slope stability of the subject site was not assessed as part of this geological hazard assessment. The subject site was observed to be gently sloping to the south toward Alpine City and moderately sloping toward local drainages (Plate 2 Topographic Map). The possibility that development of the site could negatively affect slope stability within the subject site is increased if development is planned for areas of the site with slopes steeper than approximately 3horizontal: 1 vertical. It should be noted that grading or development adjacent to the subject site could potentially impact the stability of the area within the subject site and assessment of that hazard is out of the scope of this assessment.

6.7 AVALANCHE

An avalanche is a rapid flow of snow down a hill or mountainside. A snow avalanche can be a hazard in high alpine settings with slopes generally between 35 degrees and 45 degrees that accumulate appreciable amounts of snow. There are three types of avalanches: slough, dry slab and wet slab. Sloughs typically occur right after a heavy snowfall event. This type of slide occurs from a single point and accumulates snow as it moves downslope. Dry slabs are the most common type of avalanche and are the result of a fracture that occurs along a weak layer within the snowpack. Dry slabs can travel upwards of 80 mph removing trees and structures in its path. Wet slabs are triggered when percolating water dissolves bonds and decreases the strength of the weak snow layer. This type of slab can travel up to 20 mph. Several factors that influence a snow avalanche include weather, temperature, slope steepness, slope orientation, wind direction and wind loading, terrain, vegetation, and snowpack conditions. Snow avalanche hazard could affect access and snow removal on roads as well as the safety of habitable structures and critical facilities.

Based on review of our field observations, review of avalanche data and review of historical aerial imagery, no evidence of prior snow avalanche was observed within the subject site. It is the opinion of GeoStrata that the avalanche hazard within the subject site is low and it is considered unlikely that a snow avalanche will impact the proposed developed. It is the opinion of GeoStrata that snow avalanche hazards should not preclude development within the subject lot.

6.8 ALLUVIAL FAN FLOODING

Alluvial fan flooding is a potential hazard that may exist in areas containing Holocene alluvial fan deposits. This type of flooding typically occurs as a stream flows, hyperconcentrated flows and debris flows consisting of a mixture of water, soil, organic material, and rock debris with variations in sediment-water concentrations transported by fast-moving water flows. Stream flows contains approximately less than 20% sediment by volume and involves sediment transport by entrained and suspended sediment load (Bowman and Lund, 2016). Unconfined stream flows are referred to as sheetfloods which are spread over and occur in the distal areas of the alluvial fan. Hyperconcentrated flows are alluvial fan flows with 20 to 60% sediment by volume whereas debris flows contain greater than 60% sediment by volume.

Alluvial fan flooding can be a hazard on or below alluvial fans or in stream channels above alluvial fans. Precipitation (rainfall and snowmelt) is generally viewed as an alluvial fan flood "trigger", but this represents only one of the many factors that contribute to alluvial fan flooding hazard. Vegetation, root depth, soil gradation, antecedent moisture conditions and long-term climatic cycles all contribute to the generation of debris and initiation of alluvial fan flooding. Events of relatively short duration, such as a fire, can significantly alter a basin's absorption of storm water and snowmelt runoff and natural resistance to sediment mobilization for an extended period of time. These factors are difficult to quantify or predict and vary not only between different watersheds, but also within each sub-area of a drainage basin. In general, there are two methods by which alluvial fan flooding can be mobilized: 1) when shallow landslides from channel side-slopes are conveyed in existing channels when mixed with water and 2) channel scour where debris is initially mobilized by moving water in a channel and then the mobilized debris continues to assemble and transport downstream sediments.

Based on review of published geologic maps, Holocene age alluvial fan deposits are mapped immediately south of the subject site (Plate 4 Site Vicinity Geologic Map; Plate 5 Site Vicinity 30’ X 60’ Geologic Map). The alluvial fan deposits are characterized as debris flows located at the mouth of the drainages mapped trending north-south through the subject site (Plate 2 Topographic Map; Plate 8 Hydrology Map). During our field investigation, we observed two minor drainages that trend through the central portion of the subject site. We observed these two drainages to be relatively small. It is our opinion that these two minor drainages have a low to moderate debris flow potential and the debris flow potential in these two minor drainages could be mitigated through proper site grading and drainage plans developed by a professional engineer as part of the development of the subject site.

As previously stated, a road cut was graded from Lakeview Drive west into the subject site and crosses the more developed drainage that trends north-south along the eastern property boundary. No culvert was observed beneath the fill where the road crosses the drainage. Based on our understanding of the project, a detention basin will be located within the upstream side of the roadway that will cross the eastern drainage and a culvert pipe will be installed beneath the roadway embankment fill to allow water drainage to be released downstream of the roadway. Given the size of the eastern drainage basin and the young alluvial fan deposit mapped at the base of this drainage, GeoStrata recommends that the potential debris flow volume associated with this drainage basin be evaluated and that the potential debris flow volume associated with this drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert.

It is the opinion of GeoStrata that the alluvial fan flooding hazard within subject site is considered low to moderate. It is considered unlikely that debris flows will impact the proposed development as long as potential stormwater flow volume of the two minor drainages within the subject site be included and mitigated in the grading and drainage plans engineered for the site by the project civil engineer and the potential debris flow volume associated with the larger eastern drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert. It is the opinion of GeoStrata that alluvial fan flooding hazard should not preclude development at the subject lot as long as the recommendations presented above are followed.

6.9 SHALLOW GROUNDWATER

Shallow groundwater flooding is a hazard that can cause the flooding of excavated areas where the depth of excavation exceeds the depth of the local water table. Shallow groundwater flooding should be considered when designing habitable structures that require excavation that may exceed the depth to the shallow groundwater.

Shallow groundwater assessment is out of the scope of this study. Seasonal fluctuations in precipitation, rapid snowmelt, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions; groundwater conditions can be expected to rise several feet seasonally depending on the time of year. Shallow groundwater is to be addressed in the GeoStrata geotechnical investigation report for the subject site which is being completed concurrently with this report.

6.10 STREAM FLOODING

Stream flooding can be caused by precipitation, snowmelt or a combination of both. Throughout most of Utah floods are most common in spring during the snowmelt. High flows in drainages can last for a few hours to several weeks. Factors that affect the potential for flooding at a site include surface water drainage patterns and hydrology, site grading and drainage design, and seasonal runoff.

Based on review of our review of the hillshades derived from 2013-2014 0.5-meter LiDAR and our field observations, Pine Creek is located approximately 95 feet south of the subject site (Plate 8 Hydrology Map). Given our field and office investigations, the stream flooding hazard within the subject lot is considered low across most of the subject site, however stream flooding hazard within the three drainages observed in the central and eastern portions of the subject site and previously discussed in this report is considered moderate to high. Stream flooding could impact the proposed development within the three noted drainages. It is the opinion of GeoStrata that stream flooding hazard should not preclude development at the subject site as long as proper site grading, drainage, and erosion control plans are engineered and designed for the subject site as a part of the civil engineering design for the site to mitigate the potential for stream flooding to impact and damage planned structures or other planned associated infrastructure.

6.11 CANAL FLOODING

High runoff in a short period of time can lead to canal water breaching their banks and flooding the surrounding area. Failure of the canal embankments or a blockage in the canal could also lead to flooding surrounding the canal.

Based on review of published topographic maps, our review of the hillshades derived from 2013-2014 0.5-meter LiDAR and our field observations, no canals were observed or are mapped within or adjacent to the subject site. Given our field and office investigations, the canal flooding hazard within the subject lot is considered low and it is considered unlikely that canal flooding will impact the proposed development. It is the opinion of GeoStrata that canal flooding hazard should not preclude development at the subject lot.

6.12 DAM FAILURE

Dams are structures that store water and diverge and impound water upstream. Most dams have a spillway where water flow from the reservoir is controlled and hydroelectric power is produced. Failure in dams can occur from a collapse or a breach in the structure most commonly due to extended periods of high runoff.

Based on our review of the Lehi topographic quadrangle and our field investigation, no dams or reservoirs are located up-gradient of the subject site (Plate 1 Site Vicinity Map; Plate 2 Topographic Map). Given our field and office investigations, the dam failure hazard within the subject lot is considered low and it is considered unlikely that dam failure will impact the proposed development. It is the opinion of GeoStrata that dam failure hazard should not preclude development at the subject lot.

6.13 PROBLEM SOILS

Problem soils include collapsible soils and expansive soils. Collapsible soils are low density and typically dry soils that decrease in volume when exposed to water. This type of problem soil typically occurs in alluvial fan flooding deposits, dry loess or eolian deposits or unconsolidated colluvium deposits (Owens and Rollins, 1990). Expansive soils are soils that undergo an increase in volume upon wetting and typically include fine grained soils such as clay.

The problem soils hazard is out of the scope of this study. Based on our review of published geologic maps and our field observations, the subject site is underlain by gravel and cobbles in a matrix of silt and sand. No laboratory testing was performed on these soils as part of this study and therefore this hazard was not assessed as part of this study. A geotechnical study is being completed by GeoStrata for the subject site concurrently with this report to assess soil properties for use in the design of footing, foundation elements and grading.

6.14 RADON

Radon is a naturally occurring odorless, tasteless and colorless gas that is released during the breakdown of uranium in well drained permeable soils and uranium rich rocks which include granite, metamorphic rocks, black shales, and some volcanic rocks (Sprinkel and Solomon, 1990). Radon gas moves freely in the air and can also dissolve in water which can potentially migrate through cracks and open spaces in rock, soils, and foundations as well as utility pipes.

The radon gas hazard is out of the scope of this study. No published data that covers the area of the subject sites currently exists. Indoor testing following construction is recommended for determining radon gas levels and mitigation methods needed.

6.15 KARST AND SINK HOLES

A karst is a type of underground drainage terrain that is the result of dissolution of soluble bedrock such as limestone, carbonate rock, salt beds or other types of rocks that are easily dissolved by groundwater circulating through them. The most common type of hazard that forms within a karst terrain is subsidence or collapse of soils, these are referred to as sink holes. Sink holes can be a few feet to hundreds of acres wide and 1 to 100 feet deep and can form slowly or collapse suddenly.

Based on our review of published geologic maps, the karst and sink holes hazards within the subject sites are considered low and it is unlikely that karst and sink holes hazards will impact the proposed development. It is the opinion of GeoStrata that karst and sink hole hazards should not preclude development at the subject sites.

7.0 GEOLOGIC HAZARDS SUMMARY AND CONCLUSIONS

It is the opinion of GeoStrata that the geologic hazards that we assessed in this study that could impact the subject site or that have not been assessed as a part of this study, but which could impact the subject site include: alluvial fan flooding, shallow groundwater, problem soils and radon gas. Below is a summary of each geologic hazard and GeoStrata's recommendation for mitigation:

- Alluvial fan flooding hazard within the subject site was assessed as part of this study. It is the opinion of GeoStrata that the alluvial fan flooding hazard within subject site is considered low to moderate. It is considered unlikely that debris flows will impact the proposed development as long as potential stormwater flow volume of the two minor drainages within the subject site be included and mitigated in the grading and drainage plans engineered for the site by the project civil engineer and the potential debris flow volume associated with the larger eastern drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert.

- Shallow groundwater assessment is out of the scope of this study. Seasonal fluctuations in precipitation, rapid snowmelt, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions; groundwater conditions can be expected to rise several feet seasonally depending on the time of year. Shallow groundwater was not assessed as part of this study; however, a separate geotechnical study including subsurface exploration is being completed by GeoStrata concurrently with this report to assess this hazard.

- Stream flooding hazard within the subject site was assessed as part of this study. The stream flooding hazard within the subject lot is considered low across most of the subject site, however stream flooding hazard within the three drainages observed in the central and eastern portions of the subject site and previously discussed in this report is considered moderate to high. Stream flooding could impact the proposed development within the three noted drainages. It is the opinion of GeoStrata that stream flooding hazard should not preclude development at the subject site as long as proper site grading, drainage, and erosion control plans are engineered and designed for the subject site as a part of the civil engineering design for the site to mitigate the potential for stream flooding to impact and damage planned structures or other planned associated infrastructure.

- Problem soils hazard within the subject site was not assessed as part of this study. Based on our review of published geologic maps and our field observations, the subject site is underlain by gravel and cobbles in a matrix of silt and sand. No laboratory testing was performed on these soils as part of this study and therefore this hazard was not assessed as part of this study. A geotechnical study is being completed by GeoStrata for the subject site concurrently with this report in order to assess soil properties for use in the design of footing, foundation elements and grading.

- The radon gas hazard is out of the scope of this study. No published data that covers the area of the subject sites currently exists. Indoor testing following construction is recommended for determining radon gas levels and mitigation methods needed.

It is the opinion of GeoStrata that these hazards should not preclude the development of the subject site, assuming that these recommendations given above will be followed.

8.0 CLOSURE

8.1 LIMITATIONS

The conclusions and recommendations contained in this report, which include professional opinions and judgments, are based on the information available to us at the time of our evaluation, the results of our field observations and our understanding of the proposed site development. If any conditions are encountered at this site that are different from those described in this report, our firm should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed development changes from that described in this report, our firm should also be notified.

All services were completed in accordance with the current standard of care and generally accepted standard of practice at the time and in the place our services were completed. No other warranty, expressed or implied, is made. Development of property in the immediate vicinity of geologic hazards involves a certain level of inherent risk. It is impossible to predict where geologic hazards will occur. New geologic hazards may develop, and existing geologic hazards may expand beyond their current limits.

All services were performed for the exclusive use and benefit of the above addressee. No other person is entitled to rely on GeoStrata’s services or use the information contained in this letter without the express written consent of GeoStrata. We are not responsible for the technical interpretations by others of the information described or documented in this report. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

9.0 REFERENCES CITED

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Legend

🟥 Approximate Site Boundary

1 inch = 2,000 feet

Basemap:
2012 12.5 cm HRO aerial imagery provided by the State of Utah.
Hillshades derived from 5 Meter Auto-Correlated DEM from 1m GSD
Orthophotography (NAIP2006) provided by the
State of Utah AGRC.

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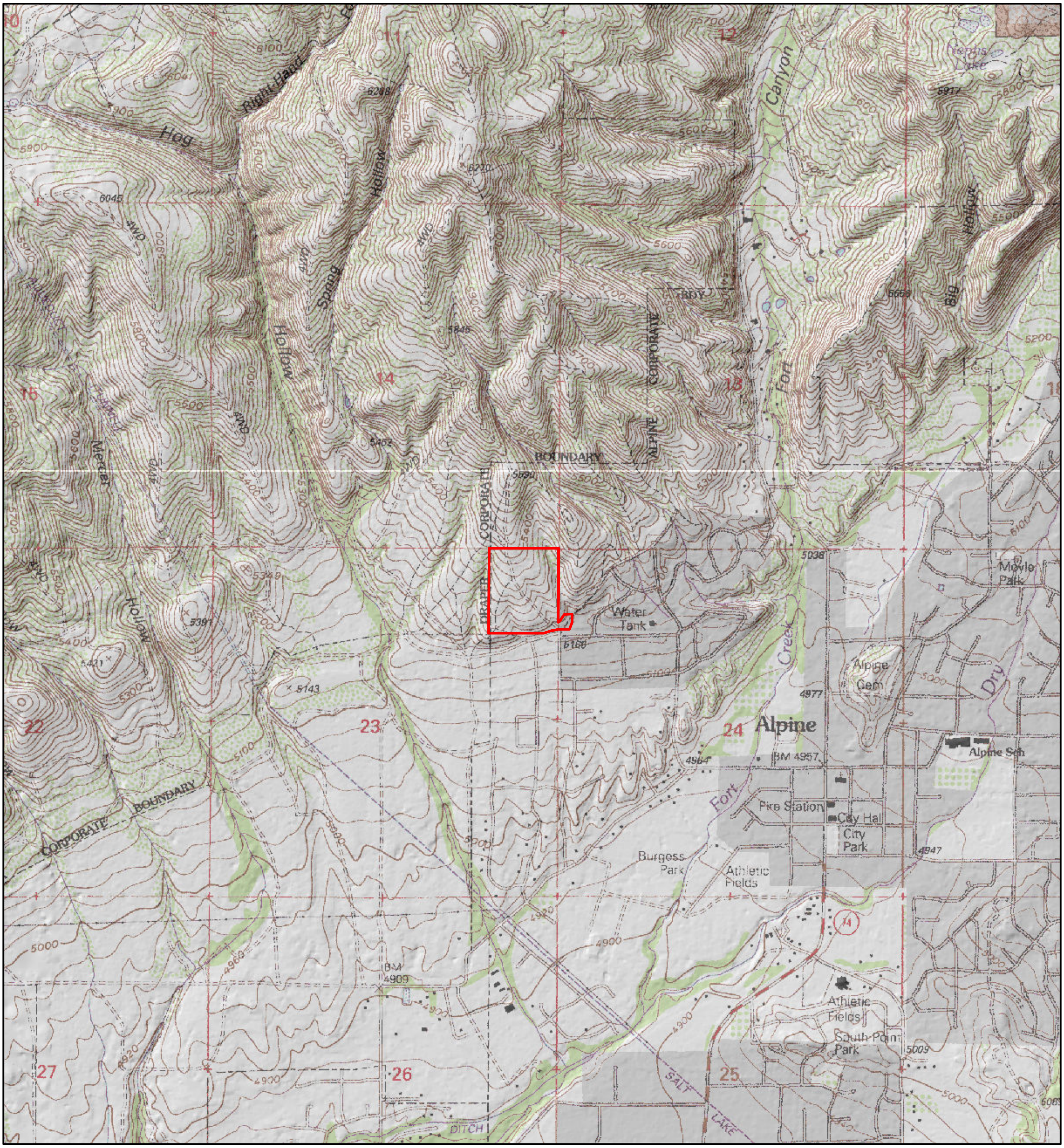
Geologic Hazards Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-005

Site Vicinity Map

Plate 1



Legend

🟥 Approximate Site Boundary

0 625 1,250 2,500 3,750 5,000 Feet

1 inch = 2,000 feet

Basemap:
Lehi Quadrangle, Utah, 7.5-Minute Series (Topographic), USGS 1998 and hillshades derived from 5 Meter Auto-Correlated DEM from 1m GSD Orthophotography (NAIP2006) provided by the State of Utah AGRC.

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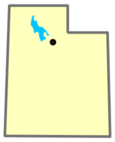

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Alpine, Utah
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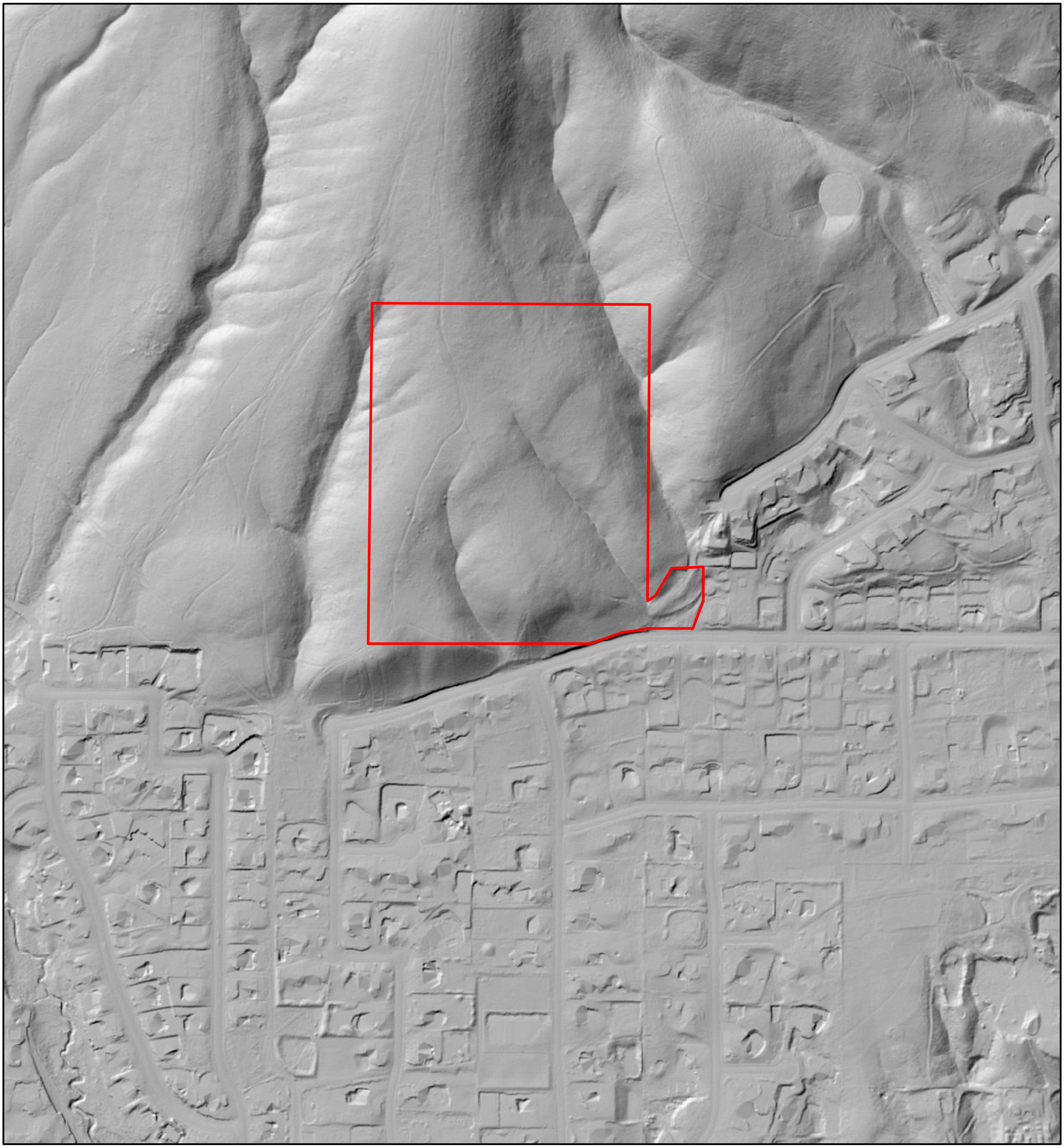
Site Topographic Map

Plate 2



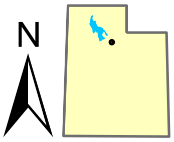
Legend

🟥 Approximate Site Boundary

0 155 310 620 930 1,240 Feet

1 inch = 500 feet

Basemap:
Hillshades derived from 2013-2014 0.5 meter LiDAR
provided by the State of Utah AGRC.



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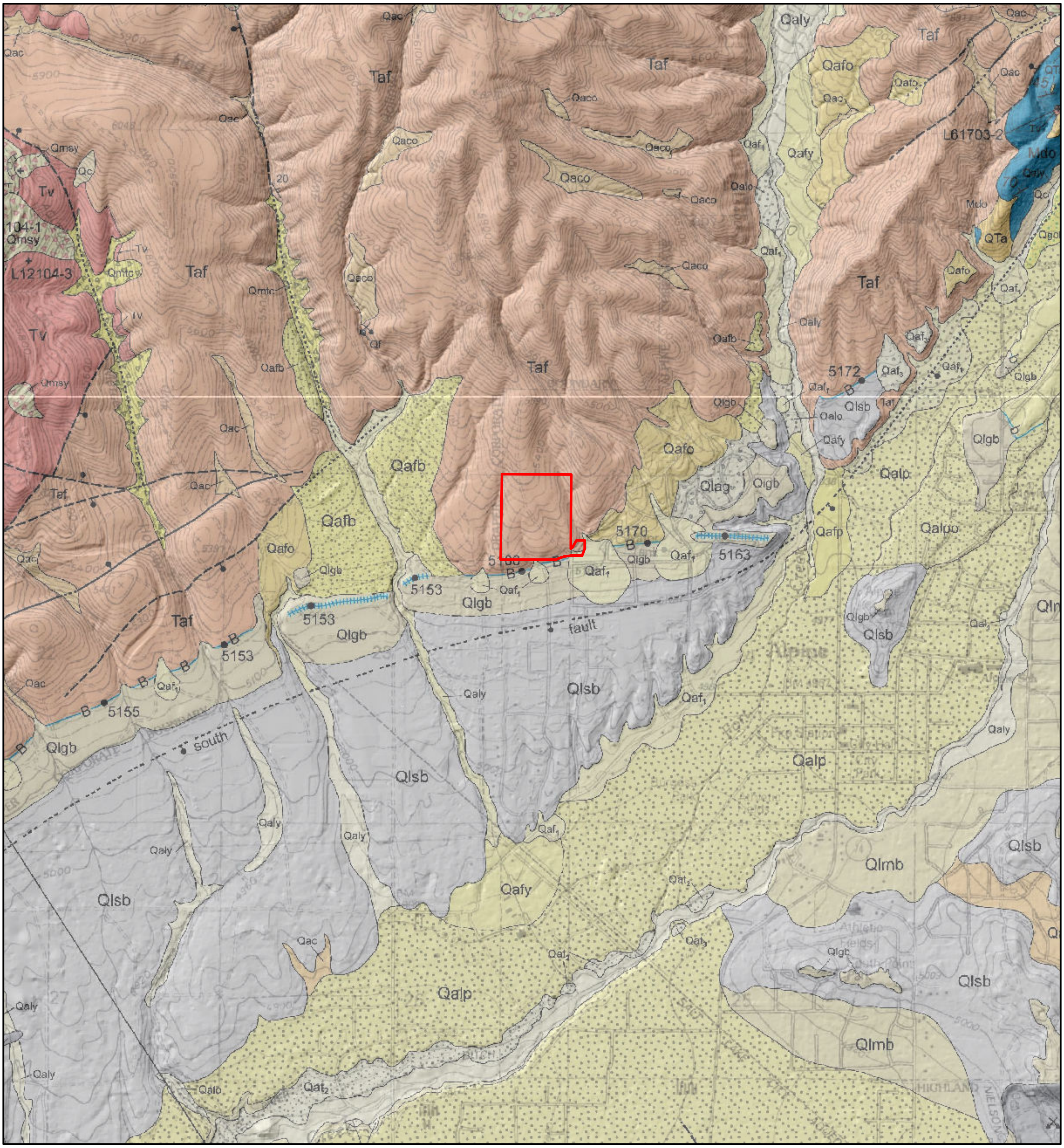
Hillshade Map

Plate 3



Legend

🟥 Approximate Site Boundary

0	625	1,250	2,500	3,750	5,000 Feet

1 inch = 2,000 feet

Basemap:
Geologic Map of the Lehi Quadrangle and Part of the Timpanogos Cave Quadrangle, Salt Lake and Utah Counties, Utah, Biek, 2005.
Hillshades derived from 2013-2014 0.5 meter LiDAR provided by the State of Utah AGRC.

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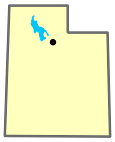

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Site Vicinity Geologic Map

Plate 4

Qaf$_1$ Modern alluvial-fan deposits (Holocene) – *Poorly to moderately sorted, non-stratified, clay- to boulder-size sediment deposited principally by debris flows at the mouths of active drainages; upper parts typically characterized by abundant boulders and debris-flow levees that radiate away from the apex of the fan; equivalent to the younger part of Qafy, but differentiated because they form smaller, isolated fans; generally less than 30 feet (9 m) thick.*

Qafo Older alluvial-fan deposits (Upper Pleistocene) – *Similar to younger undifferentiated alluvial-fan deposits (Qafy), but forms deeply dissected alluvial apron truncated by, and thus predating, the Bonneville shoreline; upper parts of fans locally receive sediment from minor washes; thickness unknown, but likely up to several tens of feet.*

Qafb Alluvial-fan deposits related to the Bonneville phase of the Bonneville lake cycle (Upper Pleistocene) – *Poorly to moderately sorted, clay- to cobble-size sediment deposited principally by debris flows; incised by younger alluvial and alluvial-fan deposits; deposited by streams associated with the Bonneville (transgressive) phase of Lake Bonneville; probably less than about 40 feet (12 m) thick.*

Qafo Older alluvial-fan deposits (Upper Pleistocene) – *Similar to younger undifferentiated alluvial-fan deposits (Qafy), but forms deeply dissected alluvial apron truncated by, and thus predating, the Bonneville shoreline; upper parts of fans locally receive sediment from minor washes; thickness unknown, but likely up to several tens of feet.*

Qlgp
Qlgb Lacustrine gravel and sand (Upper Pleistocene) – *Moderately to well-sorted, moderately to well-rounded, clast-supported, pebble to cobble gravel and pebbly sand; thin to thick bedded; typically interbedded with or laterally gradational to sand and silt facies; gastropods locally common in sandy lenses; locally partly cemented with calcium carbonate; typically forms well-developed wave-cut or wave-built benches, bars, and spits; intermediate shorelines are locally well developed on Provo-level deposits; Qlgb deposited at and below highest Bonneville shoreline but above the Provo shoreline, and Qlgp deposited at and below the Provo shoreline; exposed thickness from 0 to about 150 feet (0-45 m).*

Taf Alluvial-fan deposits (Miocene[?] to Oligocene[?]) – *Unconsolidated, pebble- to boulder-size, subangular to subrounded orthoquartzite and calcareous sandstone clasts and, especially near the base and top of the deposits, minor volcanic clasts; limestone clasts are rare and appear to be restricted to the upper part of the deposits; clasts of monzogranite or granodiorite of the Little Cottonwood stock are conspicuously absent, probably because the intrusion had not yet been unroofed when these sediments were being deposited; includes 300-foot-long (100 m) block of brecciated orthquartzite near the center of section 11, T. 4 S., R. 1 E. that I interpret to be a slide block derived from former nearby mountain front; a single good exposure of the lower part of the deposits in Hog Hollow that dips 20° east reveals subangular to subrounded, pebble- to cobble-size clasts with fewer boulders, medium to thick beds, and clasts that are about 60% sandstone and orthoquartzite and about 40% grussified volcanic clasts of the east Traverse Mountains; appears to lack tuffaceous sediments and so is likely older than the Salt Lake Formation; may correlate with the Tibble Formation (late Eocene to Oligocene), and if so the deposits in the east Traverse Mountains probably have undergone about 4 miles (7 km) of southwestward tectonic transport along the Deer Creek detachment fault (see Constenius and others, 2003), with orthoquartzite clasts derived principally from footwall exposures of the Weber Sandstone; first mapped as undifferentiated Oquirrh Group by Bullock (1958) and later reinterpreted as Neogene-age alluvial-fan deposits by Machette (1992); mapped south of the Fort Canyon fault at the east end of the Traverse Mountains where it unconformably overlies volcanic rocks of the east Traverse Mountains (Tv); age poorly constrained between middle Oligocene(?) and Miocene(?); lineaments visible on aerial photographs suggest that these deposits may be cut by additional, unmapped normal or oblique-slip faults that are difficult to identify due to poor exposures and lack of marker beds; similarly, aerial photo interpretation indicates that additional landslide deposits may be present on this unit, but subdued features and poor exposures make positive identification impossible without detailed geotechnical investigations; thickness uncertain but likely in excess of 1000 feet (330 m).*

Geologic Map of the Lehi Quadrangle and Part of the Timpanogos
Cave Quadrangle, Salt Lake and Utah Counties, Utah.

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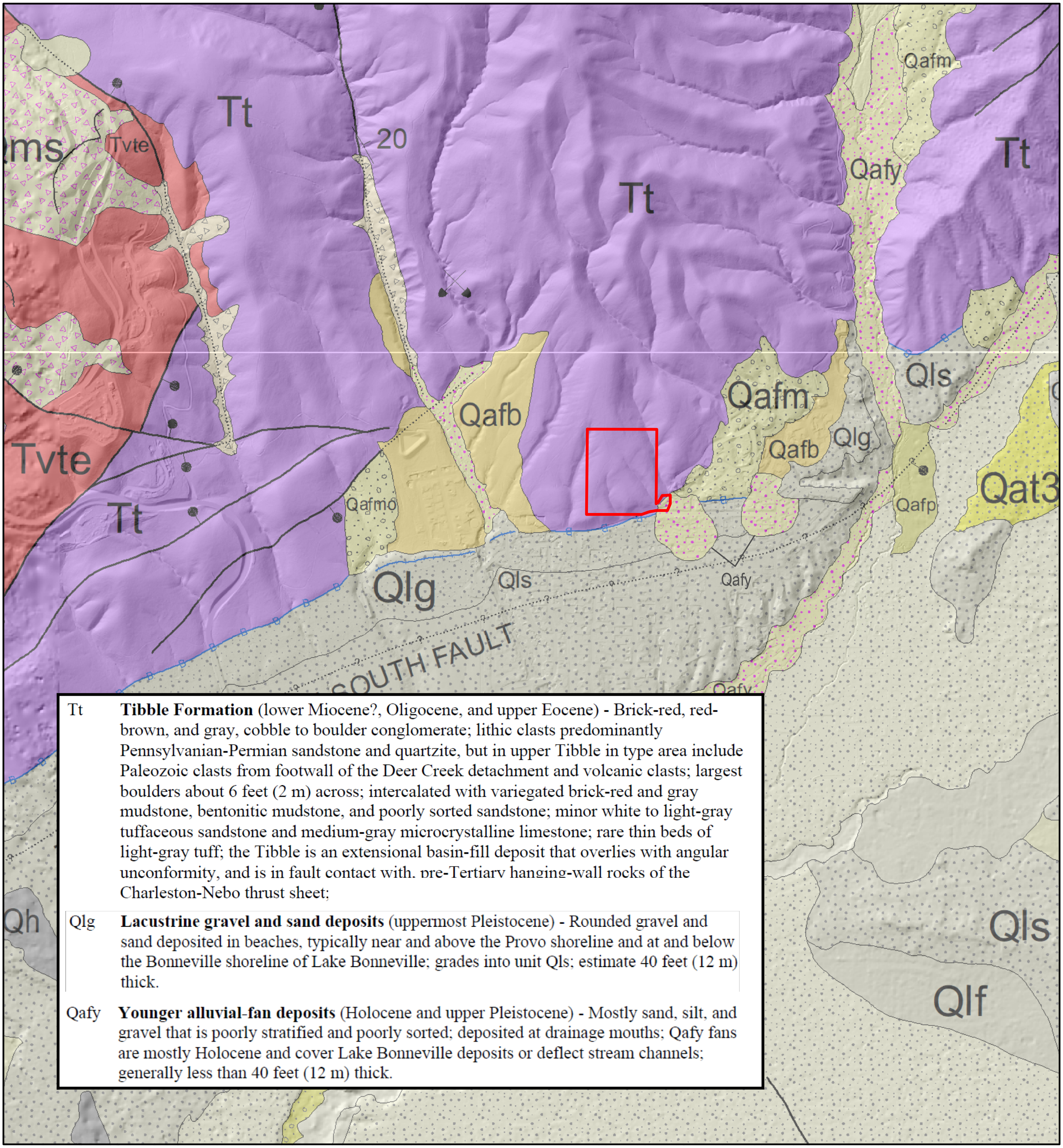
Geologic Map Descriptions

Plate 4b



Tt	**Tibble Formation** (lower Miocene?, Oligocene, and upper Eocene) - Brick-red, red-brown, and gray, cobble to boulder conglomerate; lithic clasts predominantly Pennsylvanian-Permian sandstone and quartzite, but in upper Tibble in type area include Paleozoic clasts from footwall of the Deer Creek detachment and volcanic clasts; largest boulders about 6 feet (2 m) across; intercalated with variegated brick-red and gray mudstone, bentonitic mudstone, and poorly sorted sandstone; minor white to light-gray tuffaceous sandstone and medium-gray microcrystalline limestone; rare thin beds of light-gray tuff; the Tibble is an extensional basin-fill deposit that overlies with angular unconformity, and is in fault contact with, pre-Tertiary hanging-wall rocks of the Charleston-Nebo thrust sheet;
Qlg	**Lacustrine gravel and sand deposits** (uppermost Pleistocene) - Rounded gravel and sand deposited in beaches, typically near and above the Provo shoreline and at and below the Bonneville shoreline of Lake Bonneville; grades into unit Qls; estimate 40 feet (12 m) thick.
Qafy	**Younger alluvial-fan deposits** (Holocene and upper Pleistocene) - Mostly sand, silt, and gravel that is poorly stratified and poorly sorted; deposited at drainage mouths; Qafy fans are mostly Holocene and cover Lake Bonneville deposits or deflect stream channels; generally less than 40 feet (12 m) thick.

Legend

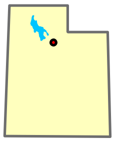
🟥 Approximate Site Boundary

0 625 1,250 2,500 3,750 5,000 Feet

1 inch = 2,000 feet

Basemap:
Interim Geologic Map of the Provo 30' X 60' Quadrangle, Utah, Wasatch, and Salt Lake Counties, Utah. Hillshades derived from 2013-2014 0.5 meter LiDAR provided by the State of Utah AGRC.

N

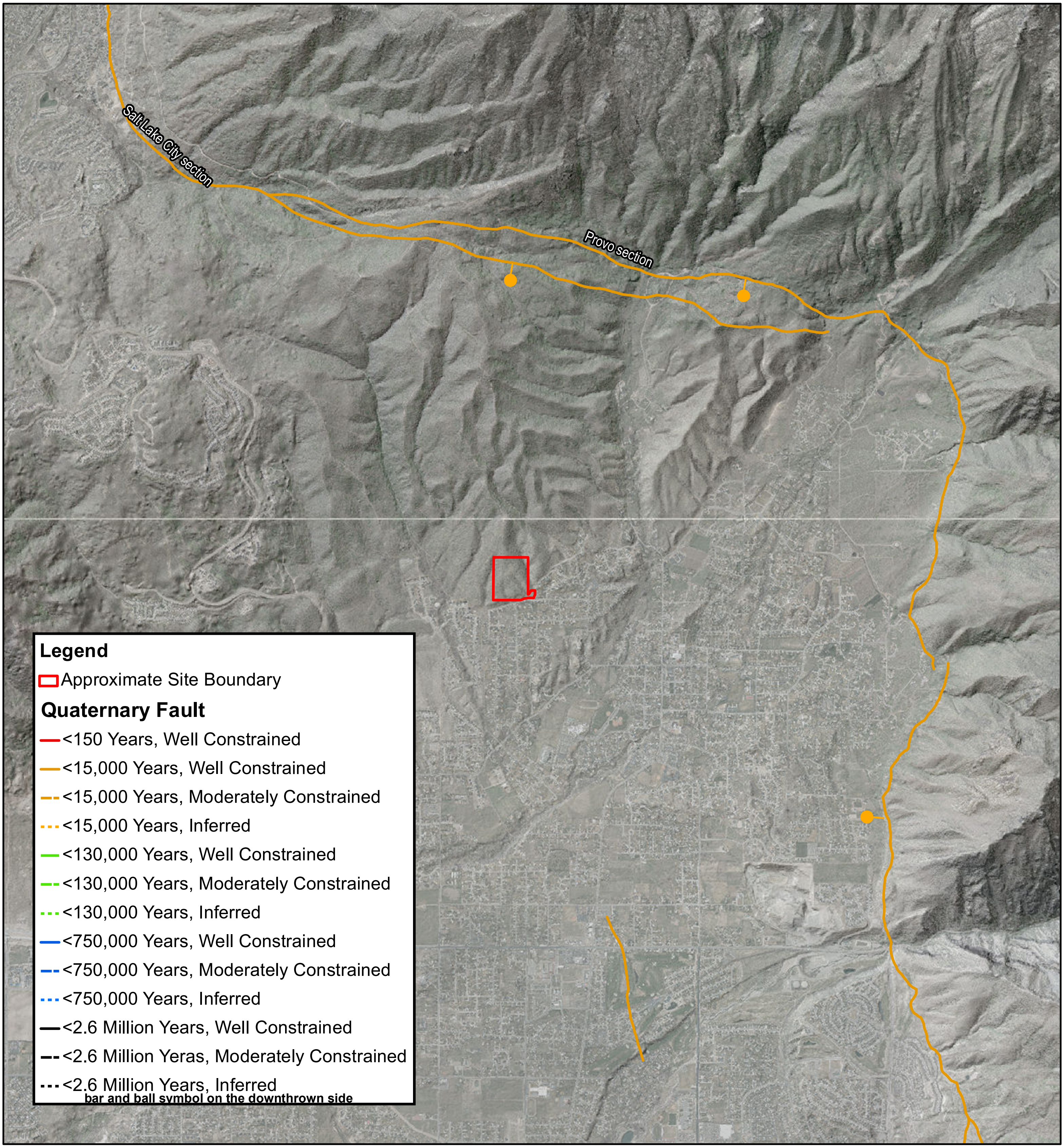


GeoStrata

Geologic Hazards Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-005

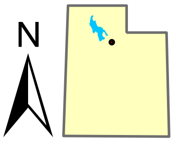
Site Vicinity 30x60 Geologic Map

Plate
5



1 inch = 4,000 feet

Basemap:
Utah Geological Survey Fold and Fault Database. 2012 12.5cm
HRO aerial imagery and hillshades derived from 2013-2014 0.5
meter LiDAR provided by the State of Utah AGRC.

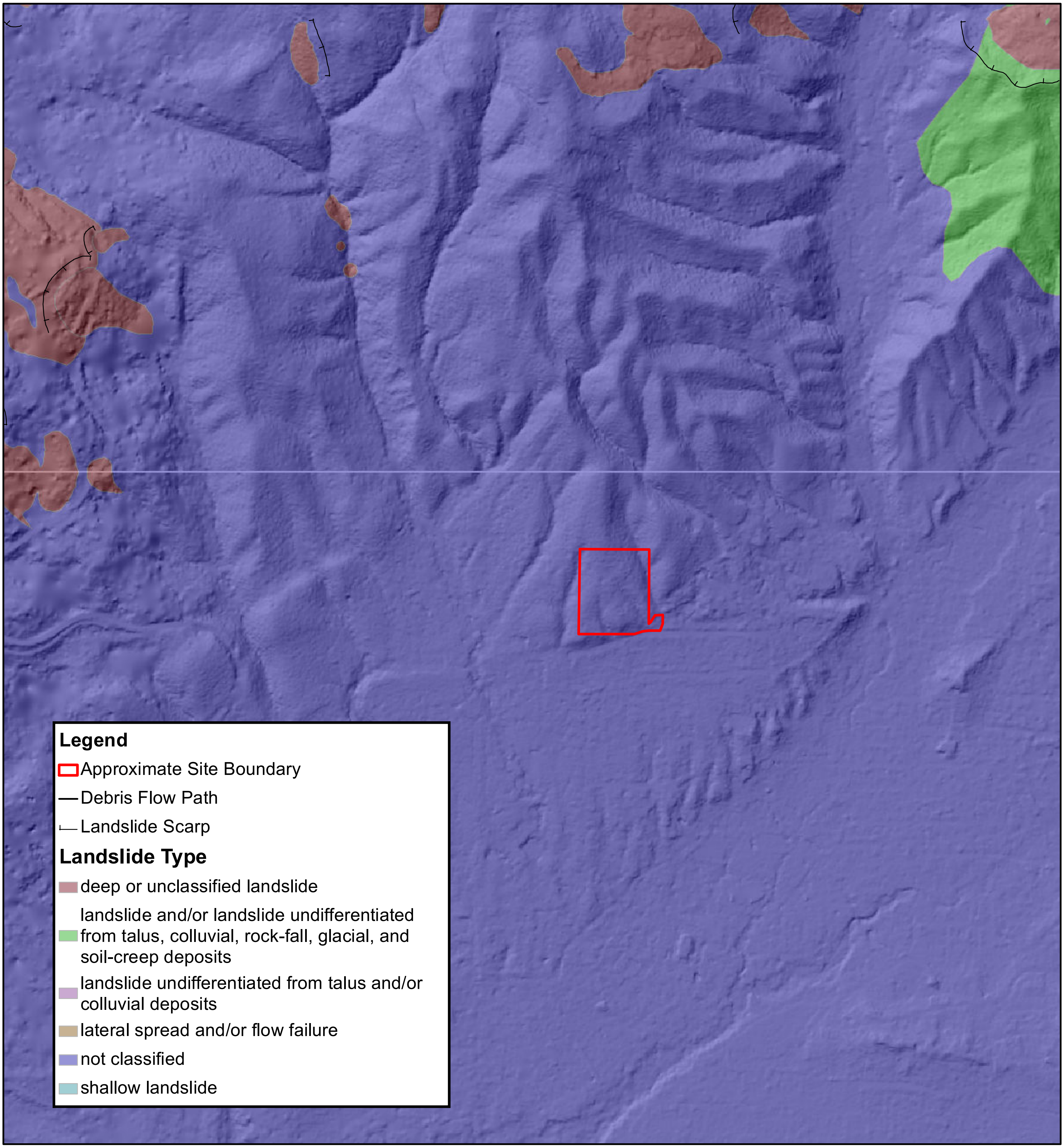


GeoStrata

Geologic Hazards Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-005

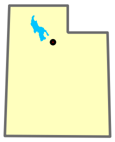
Quaternary Fault Map

Plate 6



1 inch = 2,000 feet

Basemap:
Landslide Maps of Utah, Elliot and Harty, 2010. Hillshades derived from 5 Meter Auto-Correlated DEM from 1m GSD Orthophotography (NAIP2006) provided by the State of Utah AGRC.



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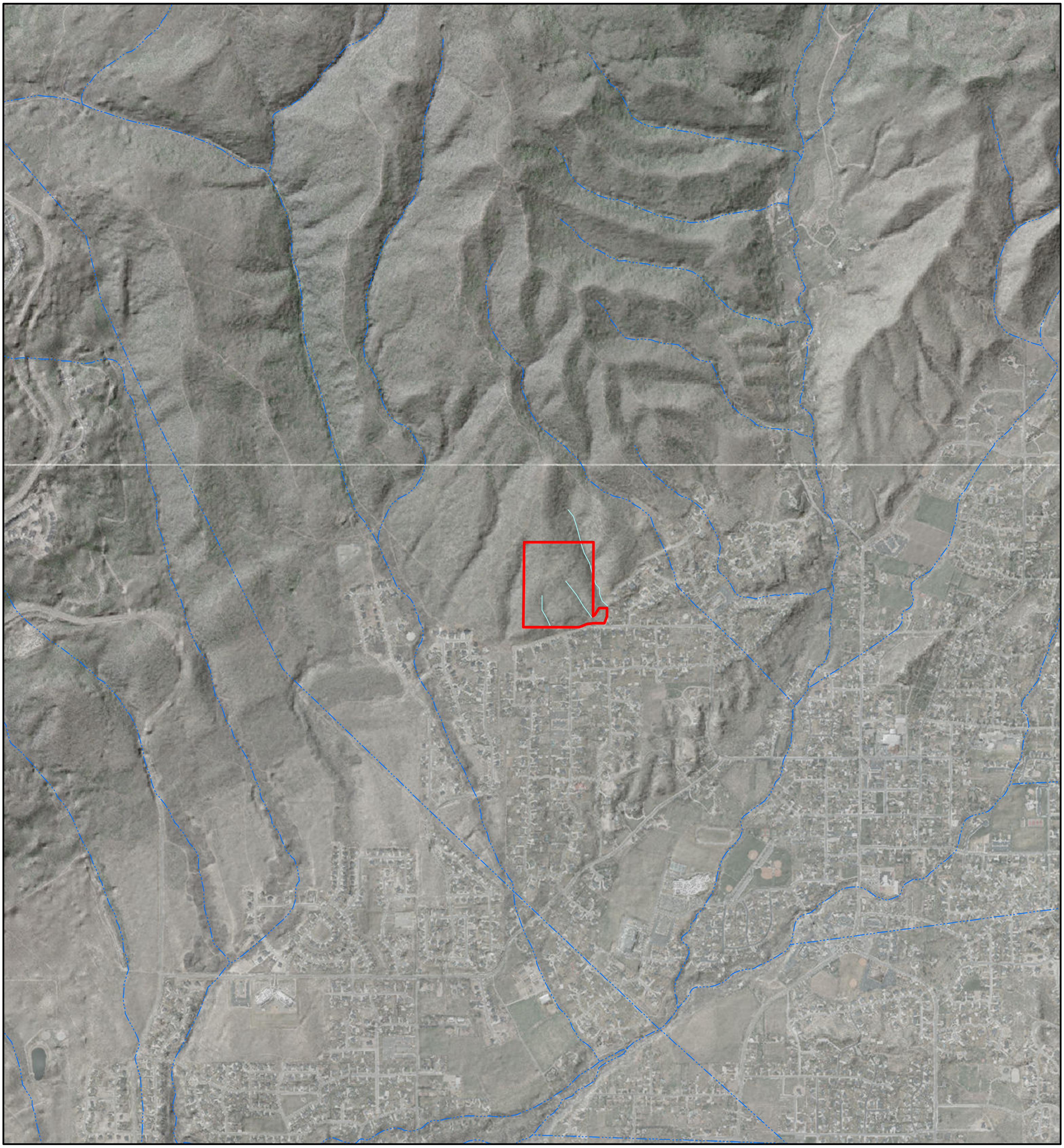
Alpine, Utah
Project Number: 1312-005

Landslide Hazard Map

Plate 7

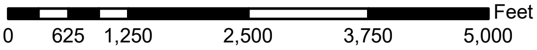


Legend

🟥 Approximate Site Boundary

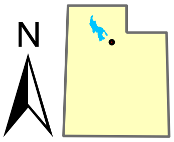
— Seasonal Drainages (GeoStrata)

-·- Streams (National Hydrology Dataset)



1 inch = 2,000 feet

Basemap:
Landslide Maps of Utah, Elliot and Harty, 2010.
Hillshades derived from 5 Meter Auto-Correlated
DEM from 1m GSD Orthophotography
(NAIP2006) provided by the
State of Utah AGRC.



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Geologic Hazards Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-005

Hydrology Map

Plate 8

GeoStrata
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Geologic Hazards Screening Assessment
Summit Pointe Subdivision
Alpine, Utah

GeoStrata Job No. 1312-005

October 17, 2018

Prepared for:

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Geologic Hazards Screening Assessment
Summit Pointe Subdivision
Alpine, Utah
Parcel # 23-029-0047

GeoStrata Job No. 1312-005

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October 17, 2018

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APPENDICES

1.0 EXECUTIVE SUMMARY

The purpose of this investigation and report is to assess the approximately 30.34 acres parcel located on a native hillside north of Hog Hollow Road in Alpine, Utah for the presence of geologic hazards that may impact the planned development of the site. The geologic hazards considered for this site are presented in Table 2 of this report. The work performed for this report was performed in accordance with our proposal, dated August 29, 2018.

The subject site is located north of Hog Hollow Road on a native hillside in Alpine, Utah at an elevation ranging from approximately 5,228 to 5,370 feet above sea level. We understand that the project site is an approximately 30.34 acres undeveloped parcel with hiking trails and unpaved access roads. It is our understanding that the proposed development, as currently planned, will consist of 8 single-family residential structures as well as associated driveways, utilities and landscape areas.

The earthquake ground shaking hazard that would potentially impact the subject site was assessed as part of our study. Given our office investigations, it is the opinion of GeoStrata that the earthquake ground shaking hazard within the subject site should not preclude development at the subject site. The seismic data provide above should be used by the project geotechnical and structural engineers for proper site and structural design.

The surface fault rupture hazard that would potentially impact the subject site was assessed as part of our study. No active faults are located near the subject site. Given our field and office investigations, the surface fault rupture hazard within the subject site is considered low and it is considered unlikely that surface fault rupture will impact the proposed development. It is the opinion of GeoStrata that surface fault rupture hazard should not preclude development at the subject lot.

The tectonic deformation hazard that would potentially impact the site was assessed as part of our study. No active faults are reported or mapped within or adjacent to the subject site. It is the opinion of GeoStrata that the tectonic deformation hazard within the subject site is considered low and it is considered unlikely that tectonic deformation will impact the proposed development. It is the opinion of GeoStrata that the tectonic deformation hazard should not preclude development at the subject site.

The liquefaction hazard that would potentially impact the site was assessed as part of our study. The site is located in an area currently designated as having a “Very Low” liquefaction potential. The near-surface soils are not considered to be susceptible to liquefaction. It is the opinion of GeoStrata that liquefaction hazard should not preclude development at the subject site.

The rockfall hazards within the subject site were assessed as part of our study. No rockfall or talus deposits are located within or immediately adjacent to the subject lot. Our field investigation revealed no indications that the subject lot has been subjected to previous rockfall. Therefore, the rockfall hazard within the subject site is considered low and it is considered unlikely that rockfall will impact the proposed development. It is the opinion of GeoStrata that rockfall hazard should not preclude development at the subject site.

The landslide, slump and creep hazards that would potentially impact the site were assessed as part of this study. No landslide deposits are mapped within or adjacent to the subject site. During our field investigation, no landslide features such as hummocky topography, slumps or scarps were identified within or adjacent to the subject site. If planned mass grading for the development includes cut and fill sections of five feet or greater in height or if cut and fill slopes steeper than 3 horizontal: 1 vertical are planned as part of the development of the subject site, then we recommend that a site-specific slope stability assessment be conducted as part of a geotechnical investigation of the subject site to assess slope stability hazards within the site. GeoStrata is concurrently completing a geotechnical study for the proposed development which includes a site-specific slope stability assessment. It is the opinion of GeoStrata that the landslide, slump and creep hazard should not preclude development at the subject site as long as the recommendations stated above and presented in the geotechnical investigation being conducted for the site are followed.

Slope stability of the subject site was not assessed as part of this geological hazard assessment. The subject site was observed to be gently sloping to the south toward Alpine City and moderately sloping toward local drainages. The possibility that development of the site could negatively affect slope stability within the subject site is increased if development is planned for areas of the site with slopes steeper than approximately 3horizontal: 1 vertical. It should be noted that grading or development adjacent to the subject site could potentially impact the stability of the area within the subject site and assessment of that hazard is out of the scope of this assessment.

The snow avalanche hazard that would potentially impact the site was assessed as part of this study. No evidence of prior snow avalanche was observed within the subject site. It is the opinion of GeoStrata that the snow avalanche hazard within the subject site is considered low and it is considered unlikely that this hazard will impact the proposed development. It is the opinion of GeoStrata that snow avalanche hazard should not preclude development at the subject site.

The alluvial-fan flooding hazard that would potentially impact the site was assessed as part of this study. Holocene age alluvial fan deposits are mapped immediately south of the subject site. During our field investigation, we observed two minor drainages that trend through the central portion of the subject site. We observed these two drainages to be relatively small. It is our opinion that these two minor drainages have a low to moderate debris flow potential and the debris flow potential in these two minor drainages could be mitigated through proper site grading and drainage plans developed by a professional engineer as part of the development of the subject site.

As previously stated, a road cut was graded from Lakeview Drive west into the subject site and crosses the more developed drainage that trends north-south along the eastern property boundary. No culvert was observed beneath the fill where the road crosses the drainage. Based on our understanding of the project, a detention basin will be located within the upstream side of the roadway that will cross the eastern drainage and a culvert pipe will be installed beneath the roadway embankment fill to allow water drainage to be released downstream of the roadway. Given the size of the eastern drainage basin and the young alluvial fan deposit mapped at the base of this drainage, GeoStrata recommends that the potential debris flow volume associated with this drainage basin be evaluated and that the potential debris flow volume associated with this drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert.

It is the opinion of GeoStrata that the alluvial fan flooding hazard within subject site is considered low to moderate. It is considered unlikely that debris flows will impact the proposed development as long as potential stormwater flow volume of the two minor drainages within the subject site be included and mitigated in the grading and drainage plans engineered for the site by the project civil engineer and the potential debris flow volume associated with the larger eastern drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert. It is the opinion of GeoStrata that alluvial fan flooding hazard should not preclude development at the subject lot as long as the recommendations presented above are followed.

Shallow groundwater assessment is out of the scope of this study. Seasonal fluctuations in precipitation, rapid snowmelt, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions; groundwater conditions can be expected to rise several feet seasonally depending on the time of year. Shallow groundwater is to be addressed in the GeoStrata geotechnical investigation report for the subject site which is being completed concurrently with this report.

The stream flooding hazard that would potentially impact the site was assessed as part of this study. Pine Creek is located approximately 95 feet south of the subject site. Given our field and office investigations, the stream flooding hazard within the subject lot is considered low across most of the subject site, however stream flooding hazard within the three drainages observed in the central and eastern portions of the subject site and previously discussed in this report is considered moderate to high. Stream flooding could impact the proposed development within the three noted drainages. It is the opinion of GeoStrata that stream flooding hazard should not preclude development at the subject site as long as proper site grading, drainage, and erosion control plans are engineered and designed for the subject site as a part of the civil engineering design for the site to mitigate the potential for stream flooding to impact and damage planned structures or other planned associated infrastructure.

The canal flooding hazard that would potentially impact the site was assessed as part of this study. No canals were observed or are mapped within or adjacent to the subject site. Given our field and office investigations, the canal flooding hazard within the subject lot is considered low and it is considered unlikely that canal flooding will impact the proposed development. It is the opinion of GeoStrata that canal flooding hazard should not preclude development at the subject lot.

The dam failure hazard that would potentially impact the site was assessed as part of this study. No dams or reservoirs are located up-gradient of the subject site. Given our field and office investigations, the dam failure hazard within the subject lot is considered low and it is considered unlikely that dam failure will impact the proposed development. It is the opinion of GeoStrata that dam failure hazard should not preclude development at the subject lot.

The problem soils hazard is out of the scope of this study. Based on our review of published geologic maps and our field observations, the subject site is underlain by gravel and cobbles in a matrix of silt and sand. No laboratory testing was performed on these soils as part of this study and therefore this hazard was not assessed as part of this study. A geotechnical study is being completed by GeoStrata for the subject site concurrently with this report to assess soil properties for use in the design of footing, foundation elements and grading.

The radon gas hazard is out of the scope of this study. No published data that covers the area of the subject sites currently exists. Indoor testing following construction is recommended for determining radon gas levels and mitigation methods needed.

The karst and sink holes hazards is out of the scope of this study. The karst and sink holes hazards within the subject site are considered low and it is unlikely that karst and sink holes hazards will impact the proposed development.

NOTICE: The scope of services provided within this report are limited to the assessment of the subsurface conditions for the proposed development. This executive summary is not intended to replace the report of which it is part and should not be used separately from the report. The executive summary is provided solely for purposes of overview. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

The purpose of this investigation and report is to assess the approximately 30.34 acres parcel located on a native hillside north of Hog Hollow Road in Alpine, Utah for the presence of geologic hazards that may impact the planned development of the site. The geologic hazards considered for this site are presented in Table 2 of this report. The work performed for this report was performed in accordance with our proposal, dated August 29, 2018. Our scope of services included the following:

- Review of available references and maps of the area.
- Aerial photographs covering the site area.
- Review of 2013-2014 0.5-meter LiDAR
- Geologic reconnaissance and field mapping of the site by an engineering geologist to observe and document pertinent surface features indicative of geologic hazards.
- Evaluation of our observations combined with existing information and preparation of this written report with conclusions and recommendations regarding geologic hazards observed to affect the site.

The recommendations contained in this report are subject to the limitations presented in the Limitations section of this report.

2.2 PROJECT DESCRIPTION

The subject site is located north of Hog Hollow Road on a native hillside in Alpine, Utah at an elevation ranging from approximately 5,228 to 5,370 feet above sea level. We understand that the project site is an approximately 30.34 acres undeveloped parcel with hiking trails and unpaved access roads. It is our understanding that the proposed development, as currently planned, will consist of 8 single-family residential structures as well as associated driveways, utilities and landscape areas. The hillside in the area of the subject site is moderately to steeply sloping generally to the south. The subject site remains in a relatively native condition. The parcels to the east and south are established residential neighborhoods. The parcels to the west and north are undeveloped hillsides. The location and approximate boundaries of the subject site are shown on the Site Vicinity Map and the Topographic Map included in the Appendix of this report (Plate 1; Plate 2).

3.0 METHODS OF STUDY

3.1 OFFICE INVESTIGATION

To prepare for the investigation, GeoStrata reviewed pertinent literature and maps listed in the references section of this report, which provided background information on the local geologic history of the area and the locations of suspected or known geologic hazards (Elliot and Harty, 2010; Black and others, 2016; Biek, 2005; Constenius and others, 2011; Machette, 1992). A stereographic aerial photograph interpretation was performed for the subject site using two sets of stereo aerial photographs (Table 1) obtained from the Utah Geological Survey Aerial Imagery Collection database.

Source	Photo Number	Date	Scale
USBR	SLA_1-6_A	August 10, 1938	1:20,000
USBR	SLA_1-7_A	August 10, 1938	1:20,000

Table 1: Aerial Stereosets.

GeoStrata also conducted a review of hillshades derived from 2013-2014 0.5-meter LiDAR digital elevation data obtained from the State of Utah AGRC to assess the subject site for visible alluvial fan deposits, landslide geomorphology, lineations related to stream flooding hazards, surface fault rupture related geomorphology and all other geomorphology related to geologic hazards (Plate 3 Hillshade Map).

3.2 FIELD INVESTIGATION

An engineering geologist investigated the geologic conditions within the general site area. A field geologic reconnaissance was conducted to observe existing geologic conditions and to assess existing geomorphology for surficial evidence of geologic hazards. During our fieldwork we conducted site observations to assess geologic hazards that might impact the subject site. We used our field observations to confirm the observations made during our office research and to observe any evidence of geologic hazards that were not evident in our office research, but which could be observed in the field.

4.0 GEOLOGIC CONDITIONS

4.1 GEOLOGIC SETTING

The site is located in Utah Valley on a south facing slope between Hog Hollow and Fort Canyon in Alpine, Utah. The subject site is located within the foothills of the Traverse Mountains, a structural salient denoting the boundary between Salt Lake Valley and Utah Valley and the southern terminus of the Salt Lake City Segment and the northern terminus of the Provo Segment of the Wasatch Fault Zone. Tertiary volcanic rocks and Tertiary alluvial fan deposits dominate the East Traverse Mountains and late Paleozoic shallow marine bedrock constitute the west Traverse Mountains. The Utah Valley is a northwest trending deep, lacustrine sediment-filled structural basin of Cenozoic age bounded on the northeast and southwest by two normal faults that dip towards the center of the valley. Utah Valley is a fault graben flanked by two uplifted blocks, the Wasatch Range to the east and the Lake Mountains to the west. The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah (Stokes, 1986).

The near-surface geology of the Utah Valley is dominated by sediments, which were deposited within the last 30,000 years by Lake Bonneville (Scott and others, 1983; Hintze, 1993; Machette, 1992; Constenius and others, 2011). The lacustrine sediments near the mountain front consist mostly of gravel and sand. As the lake receded, streams began to incise large deltas formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt, and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover. Most surficial deposits along the Wasatch fault zone were deposited during the final cycle of the Bonneville Lake Cycle between approximately 32 to 10 ka (thousands of years ago) and in the Holocene (< 10 ka).

4.2 SITE GEOLOGY

The geology within the subject site and in the surrounding area is shown on Plate 4a Site Vicinity Geologic Map and Plate 5 Site Vicinity 30x60 Geologic Map. On Plate 4a, the geology within the subject site is mapped as Tertiary alluvial fan (Taf) with three Quaternary alluvial fan deposits (Qaf_1) mapped at the base of the slope and overlying Lake Bonneville lacustrine gravel and sand (Qlbg). The Tertiary alluvial fan deposits are described as unconsolidated pebble to boulder sized subangular to subrounded orthoquartzite and calcareous sandstone clasts with minor volcanic clasts. The Quaternary alluvial fan deposits are modern alluvial fans that are primarily debris flows that formed at the mouths of active drainages. Lastly, the lacustrine gravel and sand deposits are described as locally partially cemented, well-rounded, pebble to cobble gravel and pebbly sand that was deposited at and below the highest Bonneville shoreline, but above the Provo shoreline.

5.0 GENERALIZED SITE CONDITIONS

5.1 SURFACE CONDITIONS

As stated previously, the project site is located along a south facing slope between Hog Hollow and Fort Canyon in Alpine, Utah. The subject site is located on a gently to moderately sloping native hillside vegetated with grasses, sagebrush and scrub oak mainly growing in the drainages. The hillside slopes between approximately 5 degrees to the south toward Alpine and locally 14 degrees along the drainages. At the time of our site visit, a roadcut for an unpaved road was graded from Lakeview Road west into the subject site. Exposure along the eastern portion of the roadcut consisted of a clast supported deposit containing poorly sorted well-rounded quartzite, sandstone and Alta Stock granodiorite gravel and cobbles. This exposure was observed to contain moderate bedding in places. Exposure along the western portion of the roadcut consisted of a red-brown matrix supported deposit containing subangular to rounded quartzite clasts. The site remains in a relatively natural state, apart from minor grading for access roads and hiking trails. The site is vegetated with grasses, weeds, sage brush and scrub oak predominantly in the drainages. The parcels east and south of the subject site are established single-family residences. The parcels west and north of the subject site are undeveloped native hillsides.

6.0 GEOLOGIC HAZARDS

Geologic hazards can be defined as naturally occurring geologic conditions or processes that could present a danger to human life and property. These hazards must be considered before development of the site. There are several hazards that if present at the site should be considered in the design of habitable structures and other critical infrastructure. The hazards considered for this site are presented on Table 2 and discussed in the following sections of this report.

Hazard	Hazard Rating*					Further Study Recommended
	Not Applicable	Not Assessed	Low	Moderate	High	
Ground Shaking			X			
Surface Fault Rupture			X			
Tectonic Deformation			X			
Liquefaction			X			
Rock Fall and Topple			X			
Landslide			X			
Slump			X			
Creep			X			
Avalanche			X			
Debris Flow			X	X		G
Hyperconcentrated Flow			X			
Stream Flow			X			
Shallow Groundwater		X				E
Stream Flooding			X			
Canal Flooding	X					
Dam Failure	X					
Problem Soils		X				E
Radon		X				
Karst and Sink Hole		X				

Table 2: Summary of Geologic Hazards.

Table 2 shows the summary of the geologic hazards assessed and not assessed at the study area. The hazard rating as shown on Table 2 is intended to assess the probability that the hazard could have an impact on the site and not the severity of the hazard. A hazard rating of “Not Assessed” are hazards this report does not consider and no inference is made as to the presence or absence of the hazard at the site. A hazard rating of “Low” indicates that no evidence was found to indicate that the hazard is present and has a low probability of impacting the site, hazard not known or suspect to be present. A hazard rating of “Moderate” indicates that the hazard has a moderate probability of impacting the site, but the evidence is equivocal, based only on theoretical studies, or was not observed and further study is necessary as noted. A hazard rating of “High” indicates that that evidence is strong and suggests that there is a high probability of impacting the site and mitigation measures should be taken. If a hazard is assessed to potentially impact the site then further studies may be recommended. The following are the recommended studies and the letter designation associated with those studies: “E” – geotechnical/engineering, “H” – hydrologic, “A” – avalanche, “G” – additional detailed geologic hazard study out of the scope of this study.

6.1 EARTHQUAKE GROUND SHAKING HAZARD

During the event of an earthquake, seismic waves radiate outward from the initial point of rupture and dissipate with distance. The ground shakes as the seismic waves displace the ground both vertically and horizontally. Ground shaking can cause significant damage to and potentially collapse structures and can also trigger landslides, avalanches and liquefaction. The type of soil a seismic wave travels through can amplify or dampen the effects of ground shaking.

Seismic hazard maps depicting probabilistic ground motions and spectral response have been developed for the United States by the U.S. Geological Survey as part of NEHRP/NSHMP (Frankel et al, 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and the *International Building Code* (IBC) (International Code Council, 2015). Spectral responses for the Maximum Considered Earthquake (MCE_R) are shown in the table below. These values generally correspond to a two percent probability of exceedance in 50 years (2PE50) for a “firm rock” site. To account for site effects, site coefficients which vary with the magnitude of spectral acceleration are used. Based on our field and office investigations, it is our opinion that this location is best described as a Site Class C which represents a “Very Dense Soil and Soft Rock” profile. The spectral accelerations are shown in the table below. The spectral accelerations are calculated based on the site’s approximate latitude and longitude of 40.462294° and

-111.792817° respectively and the United States Geological Survey U.S. Seismic Design Maps web-based application. Based on the IBC, the site coefficients are F_a=1.00 and F_v= 1.34. From this procedure the peak ground acceleration (PGA) is estimated to be 0.50g.

Site Location: **Latitude = 40.462294 N** **Longitude = -111.792817 W**	**Site Class C Site Coefficients:** **F_a = 1.10** **F_v = 1.34**
Spectral Period (sec)	**Response Spectrum Spectral Acceleration (g)**
0.2	S_{MS}=(F_a*S_s=1.10*0.1.263) = 1.26
1.0	S_{M1}=(F_v*S_1=1.34*0.464) = 0.62
[a] IBC 1613.3.4 recommends scaling the MCE_R values by 2/3 to obtain the design spectral response acceleration values; values reported in the table above have not been reduced.	

Table 3: MCE_R Seismic Response Spectrum Spectral Acceleration Values for IBC Site Class C[a].

Based on the above information, it is the opinion of GeoStrata that the earthquake ground shaking hazard within the subject site should not preclude development at the subject site. The seismic data provide above should be used by the project geotechnical and structural engineers for proper site and structural design.

6.2 SURFACE FAULT RUPTURE HAZARD

Movement along faults within the crustal rocks beneath the ground surface generates earthquakes. During large magnitude earthquakes (Richter magnitude 6.5 or greater) along the normal faults in the intermountain region, fault ruptures can propagate to the ground surface resulting in a surface fault rupture (Smith and Arabasz, 1991). The fault scarp formed during a surface fault rupture event along a normal fault is generally nearly vertical. A surface rupture fault may be comprised of a larger single surface rupture or several smaller surface ruptures across a fault zone. For all structures designed for human occupancy, a surface rupturing fault is considered active if it has experienced movement in approximately the past 10,000 years (Christenson and others, 2003).

Based on review of published geologic maps, our stereographic aerial photograph interpretation, our review of the hillshades derived from 2013-2014 0.5-meter LiDAR and our field observations, no active faults are located near the subject site (Plate 6 UGS Quaternary Fault

Map). The nearest fault is the Provo Section of the Wasatch Fault Zone which is less than 15,000 years old. The Provo section has a reported reoccurrence interval between 1,200 years (minimum) and 3,200 years (maximum) and a slip rate of 1.5 and 5.0 mm/yr (Black and others, 2003). This fault is located approximately 1.6 miles northeast of the subject site. Given our field and office investigations, the surface fault rupture hazard within the subject site is considered low and it is considered unlikely that surface fault rupture will impact the proposed development. It is the opinion of GeoStrata that surface fault rupture hazard should not preclude development at the subject lot.

6.3 TECTONIC DEFORMATION

Subsidence is a hazard associated with warping, lowering and tilting of a valley floor accompanying surface ruptures on normal faults (Robinson, 1993). Inundation along the shores of lakes and reservoirs and the rise of groundwater levels are the main hazards associated with subsidence. Structures that require gentle gradients or horizontal floors such as waste water treatment plants and sewer lines may be adversely affected by tectonic subsidence. Because subsidence may occur over very large areas, it is not generally practical to avoid the use of potentially affected land except in narrow areas of hazard due to lakeshore inundation (Keaton, 1987; Robison, 1993). According to Gary Christenson (UGS, personal communication 2001), tectonic subsidence is not typically assessed for subdivision development unless the development is located within an area of potential lake flooding.

Based on published geological maps, no active faults are reported or mapped within or adjacent to the subject site. It is the opinion of GeoStrata that the tectonic deformation hazard within the subject site is considered low and it is considered unlikely that tectonic deformation will impact the proposed development. It is the opinion of GeoStrata that the tectonic deformation hazard should not preclude development at the subject site.

6.4 LIQUEFACTION

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

Based on our review of the *Liquefaction Special Study Areas, Wasatch Front and Nearby Areas, Utah* compiled by Christenson and others, 2008, the site is located in an area currently designated as having a “Very Low” liquefaction potential. “Very Low” liquefaction potential indicates that there is less than a 5 percent probability of having an earthquake within a 100-year period that will be strong enough to cause liquefaction. The surface soils we observed during our field investigation are not considered to be susceptible to liquefaction. A liquefaction analysis was beyond the scope of this geologic hazards assessment; however, if the owner wishes to have greater understanding of the liquefaction potential of the soils at greater depths, a liquefaction analysis should be completed at the site. It is the opinion of GeoStrata that liquefaction hazard should not preclude development at the subject site.

6.5 ROCKFALL AND TOPPLE

Rockfalls are the fastest moving mass movement that predominantly occurs in mountains where a rock source exists along steep slopes and cliffs greater than 35 degrees. Rockfalls are a result of a loss of support from beneath the rock mass that can be caused by freeze/thaw action, rainfall, weathering and erosion, and/or strong ground shaking resulting from seismic activity. Rockfalls result in the collection of rock fall material, referred to as talus, at the base of the slope. The presence of talus indicates that a rockfall hazard has occurred and may still be present at the site.

Based on review of published geologic maps, our stereographic aerial photograph interpretation and our field observations, no rockfall or talus deposits are located within or immediately adjacent to the subject lot. Furthermore, no rockfall sources such as talus deposits or bedrock outcroppings were observed upslope from the subject site. Our field investigation revealed no indications that the subject lot has been subjected to previous rockfall. Therefore, the rockfall hazard within the subject site is considered low and it is considered unlikely that rockfall will impact the proposed development. It is the opinion of GeoStrata that rock fall hazard should not preclude development at the subject site.

6.6 LANDSLIDE, SLUMP, CREEP

There are several types of landslides that should be considered when evaluating geologic hazards at a site with moderately to steeply sloping terrain. These include shallow debris slides, deep-seated earth or rock slumps and earth flows. Landslides, slumps, creep and other mass movements can develop on moderate to steep slopes where the slope has been altered or disturbed. Movement can occur at the top of a slope that has been loaded by fill placement, at the base of a slope that has been undercut, or where local groundwater rises resulting in increased pore pressures within the slope. Slopes that exhibit prior failures and large landslide deposits are particularly susceptible to instability and reactivation.

Based on review of published geologic maps, our stereographic aerial photograph interpretation and hillshades derived from 2013-2014 0.5-meter LiDAR, no landslide deposits are mapped within or adjacent to the subject site (Plate 4a Site Vicinity Geologic Map; Plate 5 Site Vicinity 30x60 Geologic Map). During our field investigation, no landslide features such as hummocky topography, slumps or scarps were identified within or adjacent to the subject site. If planned mass grading for the development includes cut and fill sections of five feet or greater in height or if cut and fill slopes steeper than 3 horizontal: 1 vertical are planned as part of the development of the subject site, then we recommend that a site-specific slope stability assessment be conducted as part of a geotechnical investigation of the subject site to assess slope stability hazards within the site. GeoStrata is concurrently completing a geotechnical study for the proposed development which includes a site-specific slope stability assessment. It is the opinion of GeoStrata that the landslide, slump and creep hazard should not preclude development at the subject site as long as the recommendations stated above and presented in the geotechnical investigation being conducted for the site are followed.

Slope stability of the subject site was not assessed as part of this geological hazard assessment. The subject site was observed to be gently sloping to the south toward Alpine City and moderately sloping toward local drainages (Plate 2 Topographic Map). The possibility that development of the site could negatively affect slope stability within the subject site is increased if development is planned for areas of the site with slopes steeper than approximately 3horizontal: 1 vertical. It should be noted that grading or development adjacent to the subject site could potentially impact the stability of the area within the subject site and assessment of that hazard is out of the scope of this assessment.

6.7 AVALANCHE

An avalanche is a rapid flow of snow down a hill or mountainside. A snow avalanche can be a hazard in high alpine settings with slopes generally between 35 degrees and 45 degrees that accumulate appreciable amounts of snow. There are three types of avalanches: slough, dry slab and wet slab. Sloughs typically occur right after a heavy snowfall event. This type of slide occurs from a single point and accumulates snow as it moves downslope. Dry slabs are the most common type of avalanche and are the result of a fracture that occurs along a weak layer within the snowpack. Dry slabs can travel upwards of 80 mph removing trees and structures in its path. Wet slabs are triggered when percolating water dissolves bonds and decreases the strength of the weak snow layer. This type of slab can travel up to 20 mph. Several factors that influence a snow avalanche include weather, temperature, slope steepness, slope orientation, wind direction and wind loading, terrain, vegetation, and snowpack conditions. Snow avalanche hazard could affect access and snow removal on roads as well as the safety of habitable structures and critical facilities.

Based on review of our field observations, review of avalanche data and review of historical aerial imagery, no evidence of prior snow avalanche was observed within the subject site. It is the opinion of GeoStrata that the avalanche hazard within the subject site is low and it is considered unlikely that a snow avalanche will impact the proposed developed. It is the opinion of GeoStrata that snow avalanche hazards should not preclude development within the subject lot.

6.8 ALLUVIAL FAN FLOODING

Alluvial fan flooding is a potential hazard that may exist in areas containing Holocene alluvial fan deposits. This type of flooding typically occurs as a stream flows, hyperconcentrated flows and debris flows consisting of a mixture of water, soil, organic material, and rock debris with variations in sediment-water concentrations transported by fast-moving water flows. Stream flows contains approximately less than 20% sediment by volume and involves sediment transport by entrained and suspended sediment load (Bowman and Lund, 2016). Unconfined stream flows are referred to as sheetfloods which are spread over and occur in the distal areas of the alluvial fan. Hyperconcentrated flows are alluvial fan flows with 20 to 60% sediment by volume whereas debris flows contain greater than 60% sediment by volume.

Alluvial fan flooding can be a hazard on or below alluvial fans or in stream channels above alluvial fans. Precipitation (rainfall and snowmelt) is generally viewed as an alluvial fan flood “trigger”, but this represents only one of the many factors that contribute to alluvial fan flooding hazard. Vegetation, root depth, soil gradation, antecedent moisture conditions and long-term climatic cycles all contribute to the generation of debris and initiation of alluvial fan flooding. Events of relatively short duration, such as a fire, can significantly alter a basin’s absorption of storm water and snowmelt runoff and natural resistance to sediment mobilization for an extended period of time. These factors are difficult to quantify or predict and vary not only between different watersheds, but also within each sub-area of a drainage basin. In general, there are two methods by which alluvial fan flooding can be mobilized: 1) when shallow landslides from channel side-slopes are conveyed in existing channels when mixed with water and 2) channel scour where debris is initially mobilized by moving water in a channel and then the mobilized debris continues to assemble and transport downstream sediments.

Based on review of published geologic maps, Holocene age alluvial fan deposits are mapped immediately south of the subject site (Plate 4 Site Vicinity Geologic Map; Plate 5 Site Vicinity 30’ X 60’ Geologic Map). The alluvial fan deposits are characterized as debris flows located at the mouth of the drainages mapped trending north-south through the subject site (Plate 2 Topographic Map; Plate 8 Hydrology Map). During our field investigation, we observed two minor drainages that trend through the central portion of the subject site. We observed these two drainages to be relatively small. It is our opinion that these two minor drainages have a low to moderate debris flow potential and the debris flow potential in these two minor drainages could be mitigated through proper site grading and drainage plans developed by a professional engineer as part of the development of the subject site.

As previously stated, a road cut was graded from Lakeview Drive west into the subject site and crosses the more developed drainage that trends north-south along the eastern property boundary. No culvert was observed beneath the fill where the road crosses the drainage. Based on our understanding of the project, a detention basin will be located within the upstream side of the roadway that will cross the eastern drainage and a culvert pipe will be installed beneath the roadway embankment fill to allow water drainage to be released downstream of the roadway. Given the size of the eastern drainage basin and the young alluvial fan deposit mapped at the base of this drainage, GeoStrata recommends that the potential debris flow volume associated with this drainage basin be evaluated and that the potential debris flow volume associated with this drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert.

It is the opinion of GeoStrata that the alluvial fan flooding hazard within subject site is considered low to moderate. It is considered unlikely that debris flows will impact the proposed development as long as potential stormwater flow volume of the two minor drainages within the subject site be included and mitigated in the grading and drainage plans engineered for the site by the project civil engineer and the potential debris flow volume associated with the larger eastern drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert. It is the opinion of GeoStrata that alluvial fan flooding hazard should not preclude development at the subject lot as long as the recommendations presented above are followed.

6.9 SHALLOW GROUNDWATER

Shallow groundwater flooding is a hazard that can cause the flooding of excavated areas where the depth of excavation exceeds the depth of the local water table. Shallow groundwater flooding should be considered when designing habitable structures that require excavation that may exceed the depth to the shallow groundwater.

Shallow groundwater assessment is out of the scope of this study. Seasonal fluctuations in precipitation, rapid snowmelt, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions; groundwater conditions can be expected to rise several feet seasonally depending on the time of year. Shallow groundwater is to be addressed in the GeoStrata geotechnical investigation report for the subject site which is being completed concurrently with this report.

6.10 STREAM FLOODING

Stream flooding can be caused by precipitation, snowmelt or a combination of both. Throughout most of Utah floods are most common in spring during the snowmelt. High flows in drainages can last for a few hours to several weeks. Factors that affect the potential for flooding at a site include surface water drainage patterns and hydrology, site grading and drainage design, and seasonal runoff.

Based on review of our review of the hillshades derived from 2013-2014 0.5-meter LiDAR and our field observations, Pine Creek is located approximately 95 feet south of the subject site (Plate 8 Hydrology Map). Given our field and office investigations, the stream flooding hazard within the subject lot is considered low across most of the subject site, however stream flooding hazard within the three drainages observed in the central and eastern portions of the subject site and previously discussed in this report is considered moderate to high. Stream flooding could impact the proposed development within the three noted drainages. It is the opinion of GeoStrata that stream flooding hazard should not preclude development at the subject site as long as proper site grading, drainage, and erosion control plans are engineered and designed for the subject site as a part of the civil engineering design for the site to mitigate the potential for stream flooding to impact and damage planned structures or other planned associated infrastructure.

6.11 CANAL FLOODING

High runoff in a short period of time can lead to canal water breaching their banks and flooding the surrounding area. Failure of the canal embankments or a blockage in the canal could also lead to flooding surrounding the canal.

Based on review of published topographic maps, our review of the hillshades derived from 2013-2014 0.5-meter LiDAR and our field observations, no canals were observed or are mapped within or adjacent to the subject site. Given our field and office investigations, the canal flooding hazard within the subject lot is considered low and it is considered unlikely that canal flooding will impact the proposed development. It is the opinion of GeoStrata that canal flooding hazard should not preclude development at the subject lot.

6.12 DAM FAILURE

Dams are structures that store water and diverge and impound water upstream. Most dams have a spillway where water flow from the reservoir is controlled and hydroelectric power is produced. Failure in dams can occur from a collapse or a breach in the structure most commonly due to extended periods of high runoff.

Based on our review of the Lehi topographic quadrangle and our field investigation, no dams or reservoirs are located up-gradient of the subject site (Plate 1 Site Vicinity Map; Plate 2 Topographic Map). Given our field and office investigations, the dam failure hazard within the subject lot is considered low and it is considered unlikely that dam failure will impact the proposed development. It is the opinion of GeoStrata that dam failure hazard should not preclude development at the subject lot.

6.13 PROBLEM SOILS

Problem soils include collapsible soils and expansive soils. Collapsible soils are low density and typically dry soils that decrease in volume when exposed to water. This type of problem soil typically occurs in alluvial fan flooding deposits, dry loess or eolian deposits or unconsolidated colluvium deposits (Owens and Rollins, 1990). Expansive soils are soils that undergo an increase in volume upon wetting and typically include fine grained soils such as clay.

The problem soils hazard is out of the scope of this study. Based on our review of published geologic maps and our field observations, the subject site is underlain by gravel and cobbles in a matrix of silt and sand. No laboratory testing was performed on these soils as part of this study and therefore this hazard was not assessed as part of this study. A geotechnical study is being completed by GeoStrata for the subject site concurrently with this report to assess soil properties for use in the design of footing, foundation elements and grading.

6.14 RADON

Radon is a naturally occurring odorless, tasteless and colorless gas that is released during the breakdown of uranium in well drained permeable soils and uranium rich rocks which include granite, metamorphic rocks, black shales, and some volcanic rocks (Sprinkel and Solomon, 1990). Radon gas moves freely in the air and can also dissolve in water which can potentially migrate through cracks and open spaces in rock, soils, and foundations as well as utility pipes.

The radon gas hazard is out of the scope of this study. No published data that covers the area of the subject sites currently exists. Indoor testing following construction is recommended for determining radon gas levels and mitigation methods needed.

6.15 KARST AND SINK HOLES

A karst is a type of underground drainage terrain that is the result of dissolution of soluble bedrock such as limestone, carbonate rock, salt beds or other types of rocks that are easily dissolved by groundwater circulating through them. The most common type of hazard that forms within a karst terrain is subsidence or collapse of soils, these are referred to as sink holes. Sink holes can be a few feet to hundreds of acres wide and 1 to 100 feet deep and can form slowly or collapse suddenly.

Based on our review of published geologic maps, the karst and sink holes hazards within the subject sites are considered low and it is unlikely that karst and sink holes hazards will impact the proposed development. It is the opinion of GeoStrata that karst and sink hole hazards should not preclude development at the subject sites.

7.0 GEOLOGIC HAZARDS SUMMARY AND CONCLUSIONS

It is the opinion of GeoStrata that the geologic hazards that we assessed in this study that could impact the subject site or that have not been assessed as a part of this study, but which could impact the subject site include: alluvial fan flooding, shallow groundwater, problem soils and radon gas. Below is a summary of each geologic hazard and GeoStrata's recommendation for mitigation:

- Alluvial fan flooding hazard within the subject site was assessed as part of this study. It is the opinion of GeoStrata that the alluvial fan flooding hazard within subject site is considered low to moderate. It is considered unlikely that debris flows will impact the proposed development as long as potential stormwater flow volume of the two minor drainages within the subject site be included and mitigated in the grading and drainage plans engineered for the site by the project civil engineer and the potential debris flow volume associated with the larger eastern drainage be included in the design volume of the proposed detention basin and sizing and design of the proposed culvert.

- Shallow groundwater assessment is out of the scope of this study. Seasonal fluctuations in precipitation, rapid snowmelt, surface runoff from adjacent properties, or other on or offsite sources may increase moisture conditions; groundwater conditions can be expected to rise several feet seasonally depending on the time of year. Shallow groundwater was not assessed as part of this study; however, a separate geotechnical study including subsurface exploration is being completed by GeoStrata concurrently with this report to assess this hazard.

- Stream flooding hazard within the subject site was assessed as part of this study. The stream flooding hazard within the subject lot is considered low across most of the subject site, however stream flooding hazard within the three drainages observed in the central and eastern portions of the subject site and previously discussed in this report is considered moderate to high. Stream flooding could impact the proposed development within the three noted drainages. It is the opinion of GeoStrata that stream flooding hazard should not preclude development at the subject site as long as proper site grading, drainage, and erosion control plans are engineered and designed for the subject site as a part of the civil engineering design for the site to mitigate the potential for stream flooding to impact and damage planned structures or other planned associated infrastructure.

- Problem soils hazard within the subject site was not assessed as part of this study. Based on our review of published geologic maps and our field observations, the subject site is underlain by gravel and cobbles in a matrix of silt and sand. No laboratory testing was performed on these soils as part of this study and therefore this hazard was not assessed as part of this study. A geotechnical study is being completed by GeoStrata for the subject site concurrently with this report in order to assess soil properties for use in the design of footing, foundation elements and grading.

- The radon gas hazard is out of the scope of this study. No published data that covers the area of the subject sites currently exists. Indoor testing following construction is recommended for determining radon gas levels and mitigation methods needed.

It is the opinion of GeoStrata that these hazards should not preclude the development of the subject site, assuming that these recommendations given above will be followed.

8.0 CLOSURE

8.1 LIMITATIONS

The conclusions and recommendations contained in this report, which include professional opinions and judgments, are based on the information available to us at the time of our evaluation, the results of our field observations and our understanding of the proposed site development. If any conditions are encountered at this site that are different from those described in this report, our firm should be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed development changes from that described in this report, our firm should also be notified.

All services were completed in accordance with the current standard of care and generally accepted standard of practice at the time and in the place our services were completed. No other warranty, expressed or implied, is made. Development of property in the immediate vicinity of geologic hazards involves a certain level of inherent risk. It is impossible to predict where geologic hazards will occur. New geologic hazards may develop, and existing geologic hazards may expand beyond their current limits.

All services were performed for the exclusive use and benefit of the above addressee. No other person is entitled to rely on GeoStrata's services or use the information contained in this letter without the express written consent of GeoStrata. We are not responsible for the technical interpretations by others of the information described or documented in this report. The use of information contained in this report for bidding purposes should be done at the Contractor's option and risk.

9.0 REFERENCES CITED

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Legend

🟥 Approximate Site Boundary

1 inch = 2,000 feet

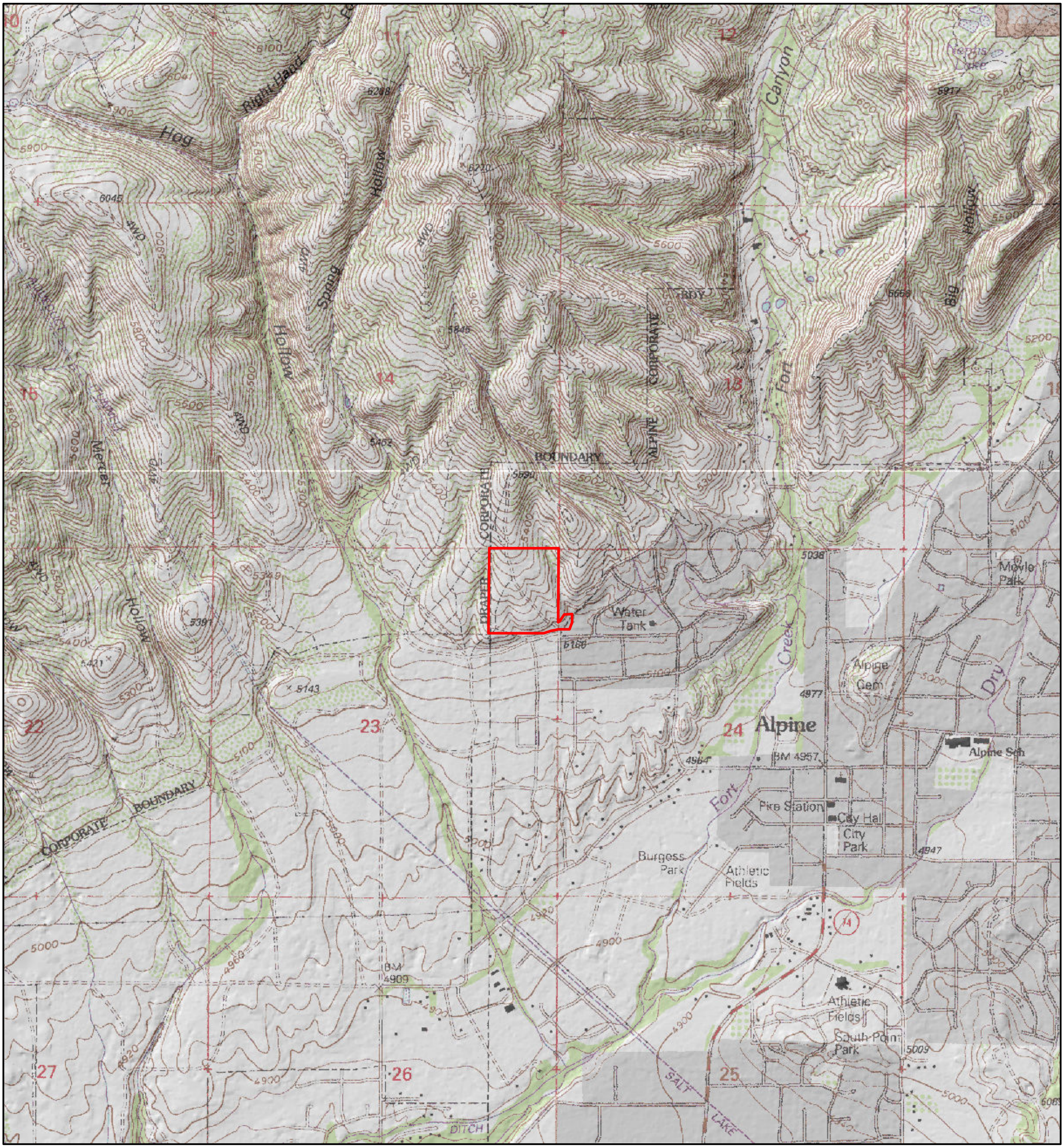
Basemap:
2012 12.5 cm HRO aerial imagery provided by the State of Utah.
Hillshades derived from 5 Meter Auto-Correlated DEM from 1m GSD
Orthophotography (NAIP2006) provided by the
State of Utah AGRC.

GeoStrata

Geologic Hazards Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-005

Site Vicinity Map

Plate
1



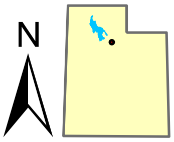
Legend

🟥 Approximate Site Boundary

0 625 1,250 2,500 3,750 5,000 Feet

1 inch = 2,000 feet

Basemap:
Lehi Quadrangle, Utah, 7.5-Minute Series (Topographic), USGS 1998 and hillshades derived from 5 Meter Auto-Correlated DEM from 1m GSD Orthophotography (NAIP2006) provided by the State of Utah AGRC.



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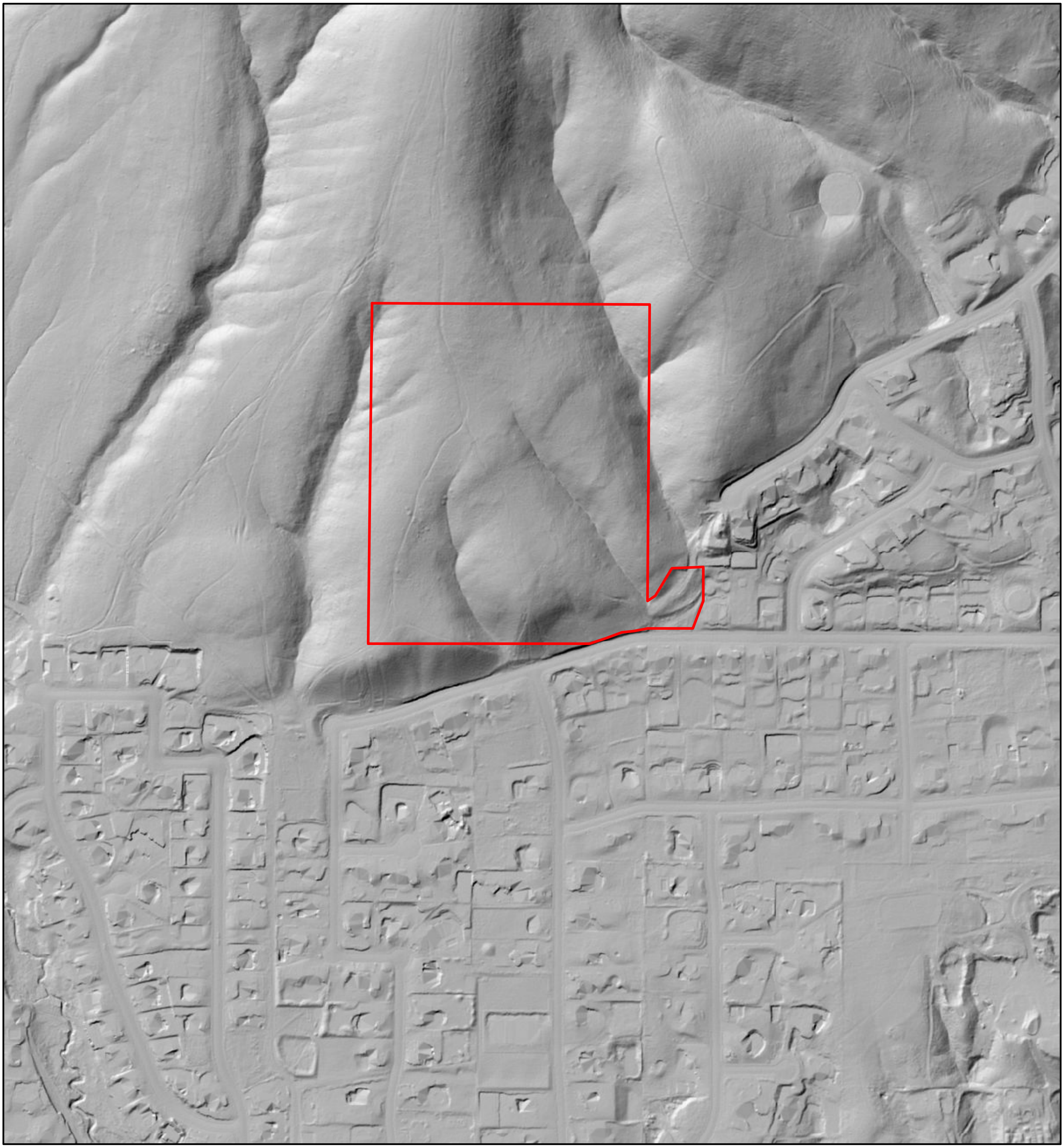
Site Topographic Map

Plate
2



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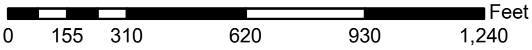
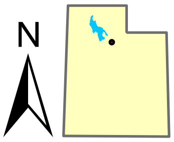
🟥 Approximate Site Boundary



1 inch = 500 feet

Basemap:
Hillshades derived from 2013-2014 0.5 meter LiDAR
provided by the State of Utah AGRC.



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Alpine, Utah
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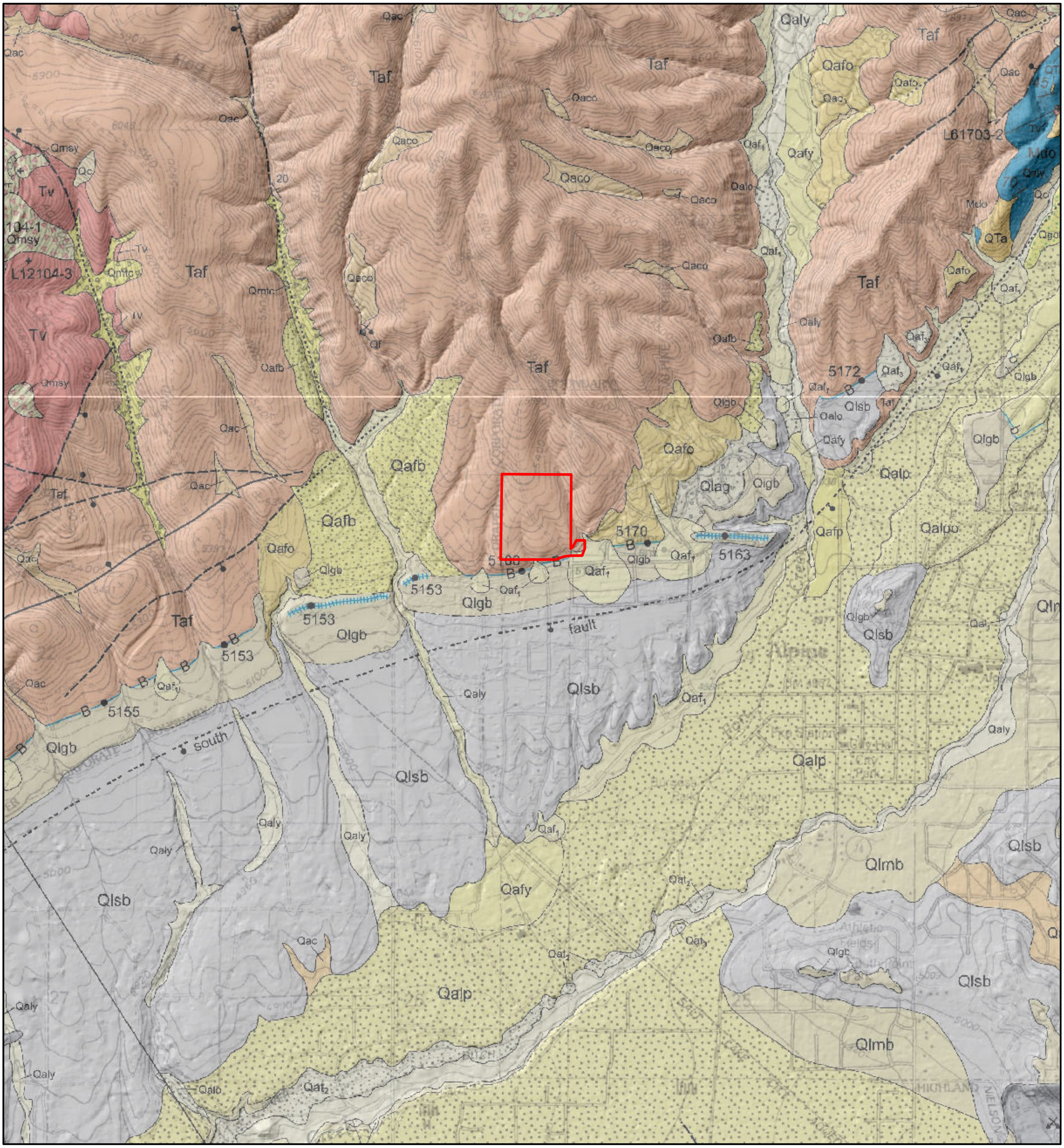
Hillshade Map

Plate 3

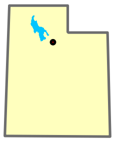


Legend

🟥 Approximate Site Boundary

1 inch = 2,000 feet

Basemap:
Geologic Map of the Lehi Quadrangle and Part of the Timpanogos Cave Quadrangle, Salt Lake and Utah Counties, Utah, Biek, 2005.
Hillshades derived from 2013-2014 0.5 meter LiDAR provided by the State of Utah AGRC.



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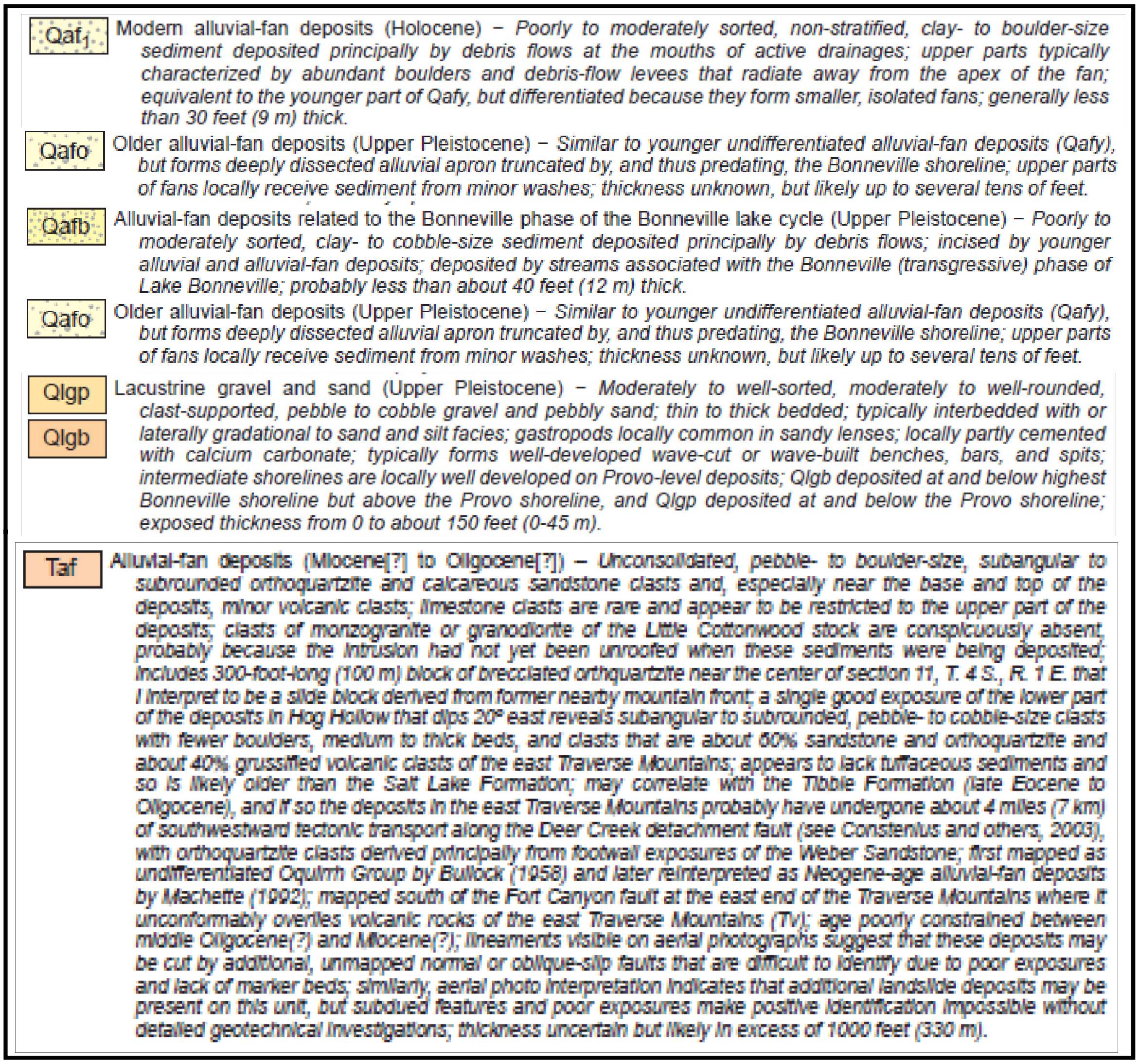
Site Vicinity Geologic Map

Plate 4



Qaf$_1$	Modern alluvial-fan deposits (Holocene) – *Poorly to moderately sorted, non-stratified, clay- to boulder-size sediment deposited principally by debris flows at the mouths of active drainages; upper parts typically characterized by abundant boulders and debris-flow levees that radiate away from the apex of the fan; equivalent to the younger part of Qafy, but differentiated because they form smaller, isolated fans; generally less than 30 feet (9 m) thick.*
Qafo	Older alluvial-fan deposits (Upper Pleistocene) – *Similar to younger undifferentiated alluvial-fan deposits (Qafy), but forms deeply dissected alluvial apron truncated by, and thus predating, the Bonneville shoreline; upper parts of fans locally receive sediment from minor washes; thickness unknown, but likely up to several tens of feet.*
Qafb	Alluvial-fan deposits related to the Bonneville phase of the Bonneville lake cycle (Upper Pleistocene) – *Poorly to moderately sorted, clay- to cobble-size sediment deposited principally by debris flows; incised by younger alluvial and alluvial-fan deposits; deposited by streams associated with the Bonneville (transgressive) phase of Lake Bonneville; probably less than about 40 feet (12 m) thick.*
Qafo	Older alluvial-fan deposits (Upper Pleistocene) – *Similar to younger undifferentiated alluvial-fan deposits (Qafy), but forms deeply dissected alluvial apron truncated by, and thus predating, the Bonneville shoreline; upper parts of fans locally receive sediment from minor washes; thickness unknown, but likely up to several tens of feet.*
Qlgp Qlgb	Lacustrine gravel and sand (Upper Pleistocene) – *Moderately to well-sorted, moderately to well-rounded, clast-supported, pebble to cobble gravel and pebbly sand; thin to thick bedded; typically interbedded with or laterally gradational to sand and silt facies; gastropods locally common in sandy lenses; locally partly cemented with calcium carbonate; typically forms well-developed wave-cut or wave-built benches, bars, and spits; intermediate shorelines are locally well developed on Provo-level deposits; Qlgb deposited at and below highest Bonneville shoreline but above the Provo shoreline, and Qlgp deposited at and below the Provo shoreline; exposed thickness from 0 to about 150 feet (0-45 m).*
Taf	Alluvial-fan deposits (Miocene[?] to Oligocene[?]) – *Unconsolidated, pebble- to boulder-size, subangular to subrounded orthoquartzite and calcareous sandstone clasts and, especially near the base and top of the deposits, minor volcanic clasts; limestone clasts are rare and appear to be restricted to the upper part of the deposits; clasts of monzogranite or granodiorite of the Little Cottonwood stock are conspicuously absent, probably because the intrusion had not yet been unroofed when these sediments were being deposited; includes 300-foot-long (100 m) block of brecciated orthquartzite near the center of section 11, T. 4 S., R. 1 E. that I interpret to be a slide block derived from former nearby mountain front; a single good exposure of the lower part of the deposits in Hog Hollow that dips 20° east reveals subangular to subrounded, pebble- to cobble-size clasts with fewer boulders, medium to thick beds, and clasts that are about 60% sandstone and orthoquartzite and about 40% grussified volcanic clasts of the east Traverse Mountains; appears to lack tuffaceous sediments and so is likely older than the Salt Lake Formation; may correlate with the Tibble Formation (late Eocene to Oligocene), and if so the deposits in the east Traverse Mountains probably have undergone about 4 miles (7 km) of southwestward tectonic transport along the Deer Creek detachment fault (see Constenius and others, 2003), with orthoquartzite clasts derived principally from footwall exposures of the Weber Sandstone; first mapped as undifferentiated Oquirrh Group by Bullock (1958) and later reinterpreted as Neogene-age alluvial-fan deposits by Machette (1992); mapped south of the Fort Canyon fault at the east end of the Traverse Mountains where it unconformably overlies volcanic rocks of the east Traverse Mountains (Tv); age poorly constrained between middle Oligocene(?) and Miocene(?); lineaments visible on aerial photographs suggest that these deposits may be cut by additional, unmapped normal or oblique-slip faults that are difficult to identify due to poor exposures and lack of marker beds; similarly, aerial photo interpretation indicates that additional landslide deposits may be present on this unit, but subdued features and poor exposures make positive identification impossible without detailed geotechnical investigations; thickness uncertain but likely in excess of 1000 feet (330 m).*

Geologic Map of the Lehi Quadrangle and Part of the Timpanogos
Cave Quadrangle, Salt Lake and Utah Counties, Utah.

GeoStrata

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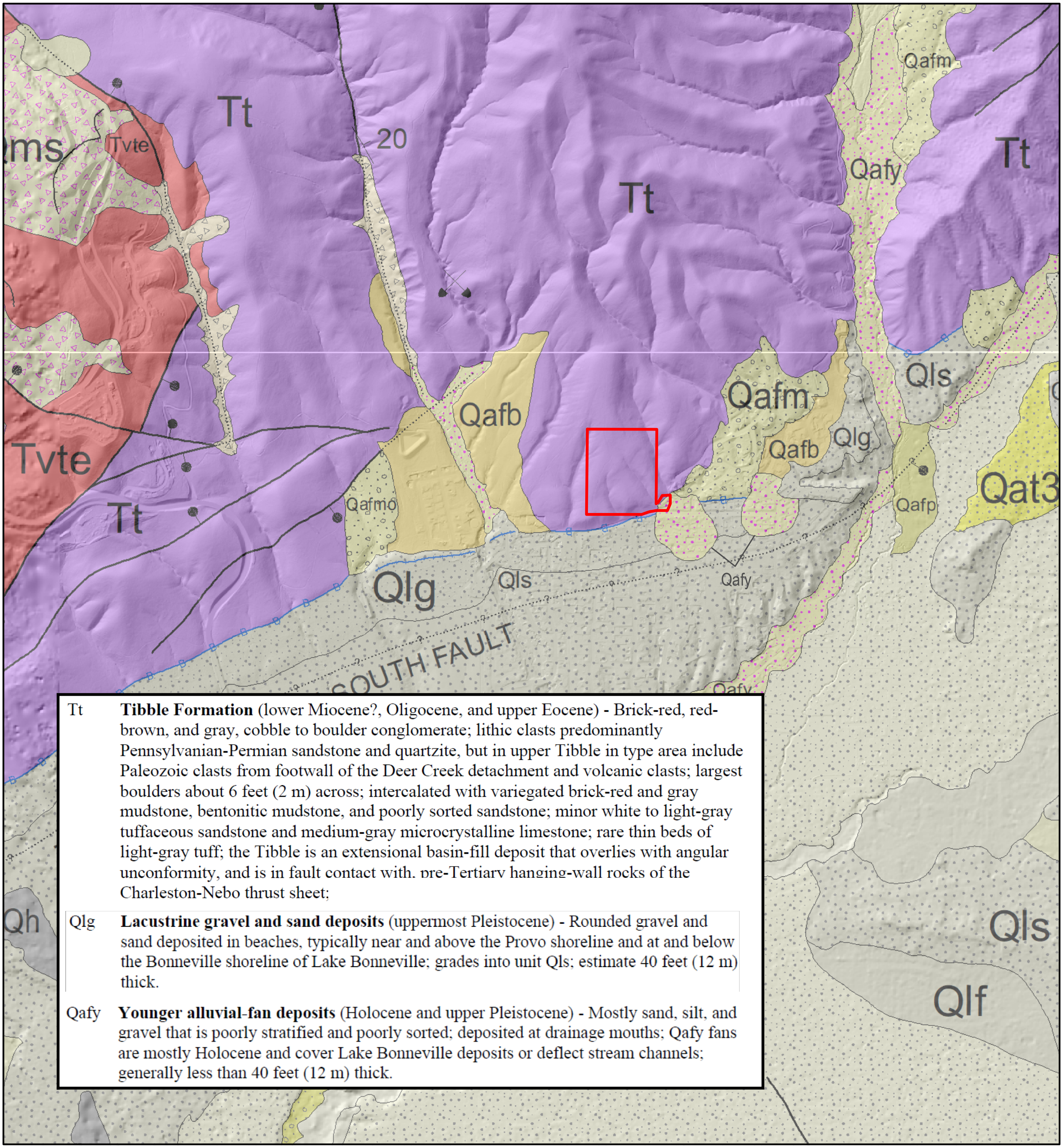
Geologic Map Descriptions

Plate
4b



Tt	**Tibble Formation** (lower Miocene?, Oligocene, and upper Eocene) - Brick-red, red-brown, and gray, cobble to boulder conglomerate; lithic clasts predominantly Pennsylvanian-Permian sandstone and quartzite, but in upper Tibble in type area include Paleozoic clasts from footwall of the Deer Creek detachment and volcanic clasts; largest boulders about 6 feet (2 m) across; intercalated with variegated brick-red and gray mudstone, bentonitic mudstone, and poorly sorted sandstone; minor white to light-gray tuffaceous sandstone and medium-gray microcrystalline limestone; rare thin beds of light-gray tuff; the Tibble is an extensional basin-fill deposit that overlies with angular unconformity, and is in fault contact with, pre-Tertiary hanging-wall rocks of the Charleston-Nebo thrust sheet;
Qlg	**Lacustrine gravel and sand deposits** (uppermost Pleistocene) - Rounded gravel and sand deposited in beaches, typically near and above the Provo shoreline and at and below the Bonneville shoreline of Lake Bonneville; grades into unit Qls; estimate 40 feet (12 m) thick.
Qafy	**Younger alluvial-fan deposits** (Holocene and upper Pleistocene) - Mostly sand, silt, and gravel that is poorly stratified and poorly sorted; deposited at drainage mouths; Qafy fans are mostly Holocene and cover Lake Bonneville deposits or deflect stream channels; generally less than 40 feet (12 m) thick.

Legend

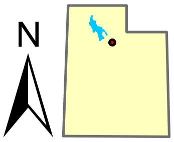
🟥 Approximate Site Boundary

Feet

0 625 1,250 2,500 3,750 5,000

1 inch = 2,000 feet

Basemap:
Interim Geologic Map of the Provo 30' X 60' Quadrangle, Utah, Wasatch, and Salt Lake Counties, Utah. Hillshades derived from 2013-2014 0.5 meter LiDAR provided by the State of Utah AGRC.

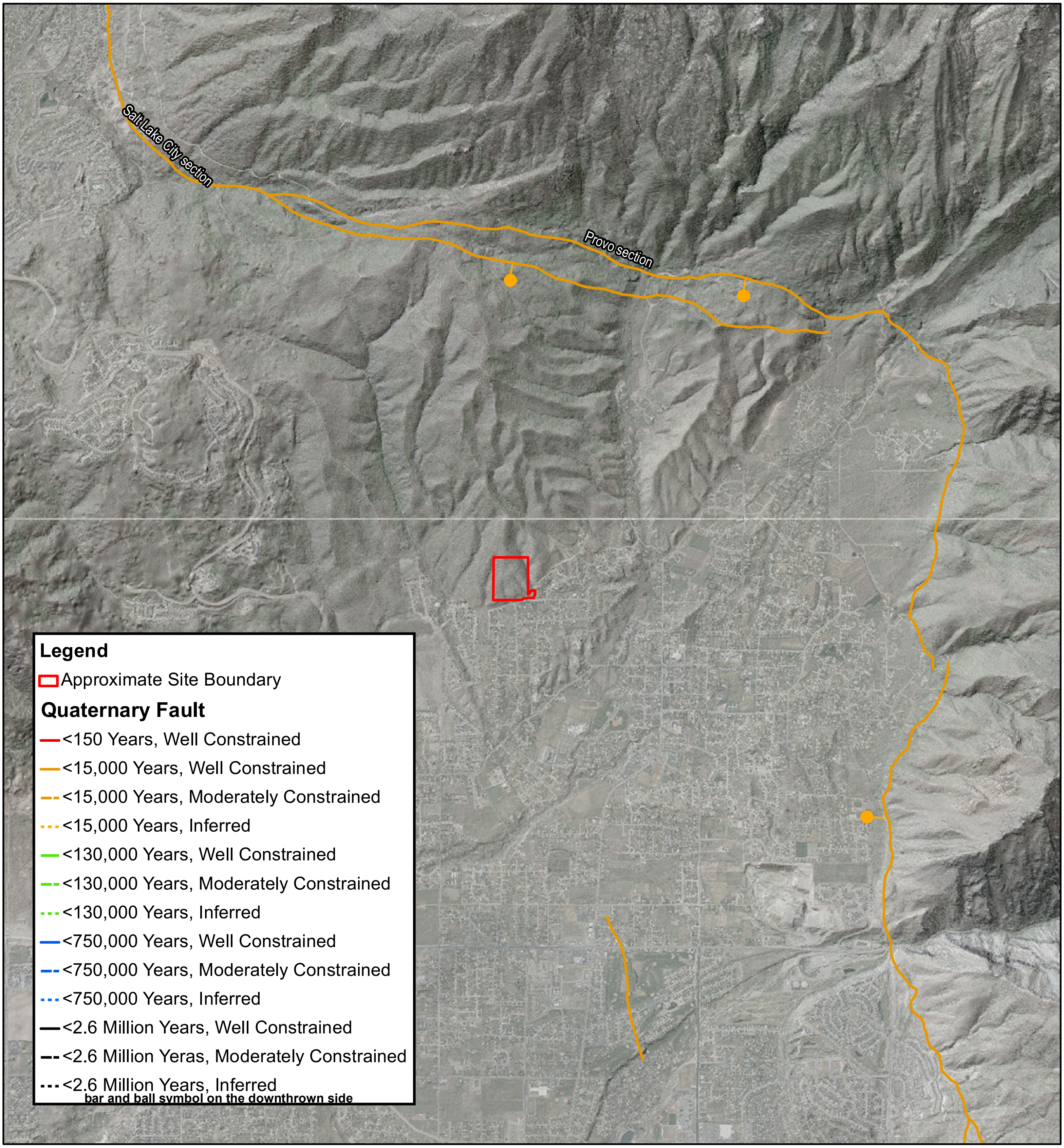


GeoStrata

Geologic Hazards Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-005

Site Vicinity 30x60 Geologic Map

Plate 5



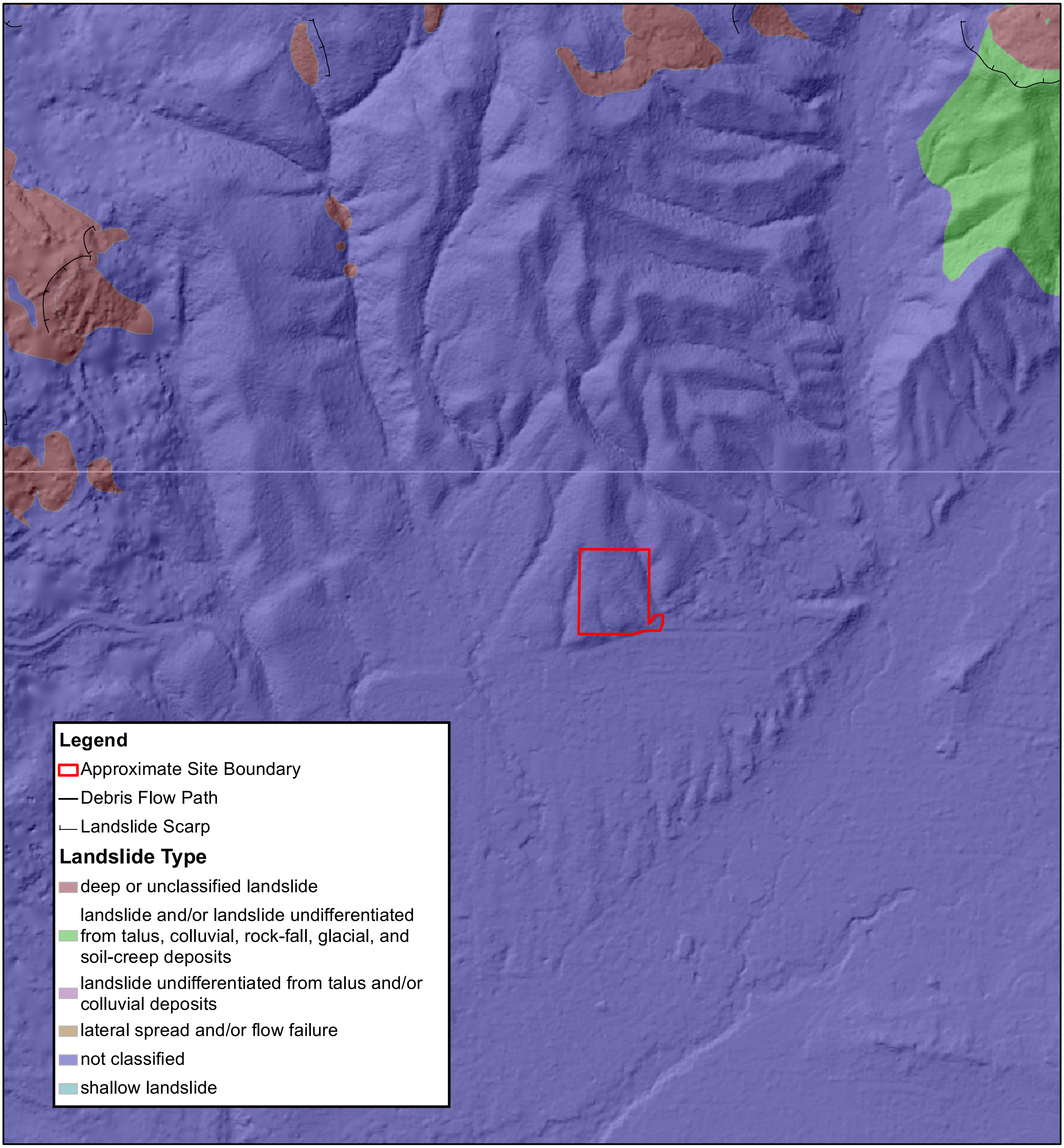
Basemap:
Utah Geological Survey Fold and Fault Database. 2012 12.5cm
HRO aerial imagery and hillshades derived from 2013-2014 0.5
meter LiDAR provided by the State of Utah AGRC.

GeoStrata

Geologic Hazards Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-005

Quaternary Fault Map

Plate
6



Feet
0 625 1,250 2,500 3,750 5,000

1 inch = 2,000 feet

Basemap:
Landslide Maps of Utah, Elliot and Harty, 2010. Hillshades derived from 5 Meter Auto-Correlated DEM from 1m GSD Orthophotography (NAIP2006) provided by the State of Utah AGRC.

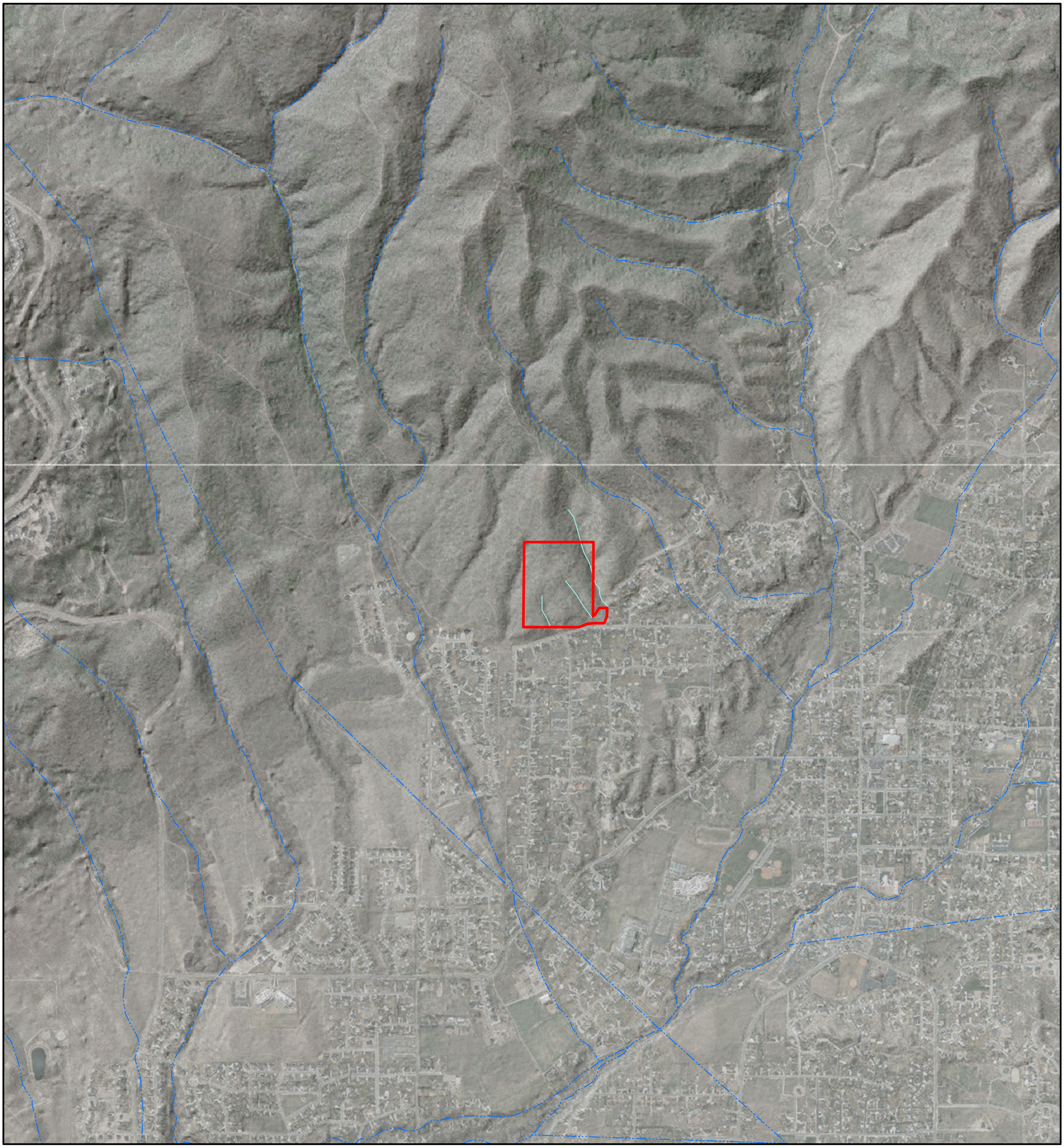
N

GeoStrata

Geologic Hazards Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-005

Landslide Hazard Map

Plate 7



Legend

🟥 Approximate Site Boundary

— Seasonal Drainages (GeoStrata)

-·- Streams (National Hydrology Dataset)

0 625 1,250 2,500 3,750 5,000 Feet

1 inch = 2,000 feet

Basemap:
Landslide Maps of Utah, Elliot and Harty, 2010.
Hillshades derived from 5 Meter Auto-Correlated
DEM from 1m GSD Orthophotography
(NAIP2006) provided by the
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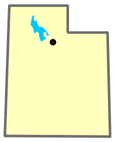

GeoStrata

Geologic Hazards Assessment
Summit Pointe Subdivsion
Alpine, Utah
Project Number: 1312-005

Hydrology Map

Plate 8

ALPINE CITY PLANNING COMMISSION AGENDA

SUBJECT: Business Commercial Setbacks – Ordinance 2020-04

FOR CONSIDERATION ON: 2 June 2020

PETITIONER: Staff

ACTION REQUESTED BY PETITIONER: Review and approve the proposed ordinance.

BACKGROUND INFORMATION:

On May 5, 2020, the Planning Commission recommended reduced setbacks in the Business/Commercial zone. The City Council subsequently reviewed the recommendation at the May 12, 2020 City Council meeting and asked that the item return to Planning Commission to address mixed use buildings and how setbacks should be applied.

Staff have prepared proposed language regarding mixed use buildings for the Planning Commission to discuss.

STAFF RECOMMENDATION:
Review and recommend approval of the ordinance as proposed.

SAMPLE MOTION TO APPROVE:
I motion to recommend that Ordinance 2020-04 be approved as proposed.

SAMPLE MOTION TO APPROVE WITH CONDITIONS:
I motion to recommend that Ordinance 2020-04 be approved with the following conditions/changes:

- ***Insert Finding***

SAMPLE MOTION TO TABLE/DENY:
I motion to recommend that Ordinance 2020-04 be tabled/denied based on the following:

- ***Insert Finding***

ALPINE CITY
ORDINANCE 2020-04

AN ORDINANCE ADOPTING AMENDMENTS TO ARTICLE 3.07.050 OF THE ALPINE CITY DEVELOPMENT CODE PERTAINING TO SETBACK REQUIREMENTS IN THE BUSINESS COMMERCIAL ZONE.

WHEREAS, The Alpine City Council has deemed it in the best interest of Alpine City to change the setback requirements in the Business Commercial Zone; and

WHEREAS, the Alpine City Planning Commission has reviewed the proposed Amendments to the Development Code, held a public hearing, and has forwarded a recommendation to the City Council; and

WHEREAS, the Alpine City Council has reviewed the proposed Amendments to the Development Code:

NOW THEREFORE, be it ordained by the Council of Alpine City, in the State of Utah, as follows: The amendments to Article 3.07.050 will supersede Article 3.07.050 as previously adopted. This ordinance shall take effect upon posting.

SECTION 1: **AMENDMENT** "3.07.050 Location Requirements" of the Alpine City Development Code is hereby *amended* as follows:

AMENDMENT

3.07.050 Location Requirements

All buildings shall comply with the following setbacks:

1. Front setback shall be not less than ~~thirty~~fifteen (~~30~~15) feet from the property line on all streets~~.~~; except corner lots, where setbacks shall not be less than eighteen (18) feet from the property line on all streets. No portion of the setback area adjacent to a street shall be used for off-street parking.
2. In commercial developments adjacent to other commercial areas, the side yard and rear yard setbacks will be not less than ten (10) ~~20~~ feet unless recommended by the Planning Commission and approved by the City Council where circumstances justify.
3. Where a commercial zone abuts a residential zone, the side yard and rear yard setbacks will be not less than twenty (20) feet unless recommended by the Planning Commission and approved by the City Council where circumstances justify.
4. A lot occupied by a dwelling structure shall comply with the setback requirements set forth in the TR-10,000 zone (DCA 3.02.050 Part 1) unless recommended by the Planning Commission and approved by the City Council where circumstances justify.
5. Where a commercial use and dwelling unit occupy the same building (mixed use), the

primary use shall determine the setback requirements. If the primary use is commercial, the building shall meet the setback requirements as outlined above. If the primary use is a dwelling, the building shall comply with the setback requirements set forth in the TR-10,000 zone (DCA 3.02.050 Part 1).

6. Accessory buildings shall be set back not less than five (5) feet from the main building.

(Ord. 95-22, 8/22/95 and Ord. 2002-13, Amended by Ord. 2011-09, 5/10/11; Ord. 2014-04, 3/25/14)
(Amended by Ord. 98-05, 3/10/98)

PASSED AND ADOPTED BY THE ALPINE CITY COUNCIL
________________________________.

	AYE	**NAY**	**ABSENT**	**ABSTAIN**
Lon Lott				
Carla Merrill				
Gregory Gordon				
Jason Thelin				
Jessica Smuin				

Presiding Officer

Troy Stout, Mayor, Alpine City

Attest

Charmayne G. Warnock, City Recorder Alpine City

ALPINE CITY
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PASSED AND ADOPTED BY THE ALPINE CITY COUNCIL
______________________________.

	AYE	**NAY**	**ABSENT**	**ABSTAIN**
Lon Lott	______	______	______	______
Carla Merrill	______	______	______	______
Gregory Gordon	______	______	______	______
Jason Thelin	______	______	______	______
Jessica Smuin	______	______	______	______

Presiding Officer

____
Troy Stout, Mayor, Alpine City

Attest

____
Charmayne G. Warnock, City
Recorder Alpine City

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: **Discussion – Bangerter & Burgess Properties**

FOR CONSIDERATION ON: **2 June 2020**

PETITIONER: **Paulo Bangerter and Clark Burgess**

ACTION REQUESTED BY PETITIONER: **Discuss the City's vision and plan for the Bangerter and Burgess properties.**

BACKGROUND INFORMATION:

The City has been approached by the Bangerter family and Clark Burgess regarding properties along the south end of Alpine Highway. Both parties are seeking to work with the City to best plan the future of these properties.

The Bangerter property consists of approximately 27 acres located at 542 South Alpine Highway and includes another approximately 2 acres of the Duffles property located along 800 South. The Bangerter's would like to work with the City on planning the best use of this property before they sale it. See attached letter from Paulo Bangerter for details of proposal.

The Burgess property consists of approximately 9.7 acres and is located due east of the Bangerter property at 642 South Alpine Highway. Clark Burgess is not looking to sale his property in the near future but would like to be included in the discussion for the future plan for the south end of Alpine City along the Alpine Highway. See attached letter from Clark Burgess for details of the proposal.

Both the Bangerter and Burgess properties are currently zoned CR-40,000 for large lot single family homes. If the City should consider another use for these properties updates to the General Plan and Zoning Map would be needed along with an eventual change of zone.

STAFF RECOMMENDATION:
Review the proposals received from the Bangerter and Burgess families and begin discussion on City plans for the future of the properties.

Austin Roy <aroy.alpinecity@gmail.com>

Re: Fw: Bangerter Property Discussion

Paulo Bangerter <paulo.bangerter@gmail.com> Wed, May 6, 2020 at 5:53 PM
To: Austin Roy <aroy@alpinecity.org>

Dear Austin -

Thanks to you and Shane Sorenson for taking time to meet with me and my brother Cory and sister Julie about our family farm on 542 South Alpine Highway - which included a brief discussion of the land owned by Sonia and Wilson Duffles that is located adjacent to the southwest corner of our land. Sonia and Wilson are close Bangerter family associates and they are presently willing to cooperate with any plans that we make with the City with respect to our farm property.

As we indicated in the meeting today, the Bangerter Family is preparing to sell the farm. We have been Alpine citizens since the early 1950's and our ancestors are buried in the Alpine Cemetary. I mention this just to express our love for Alpine and the heritage that it has given to us. Although we love the land and farm, we feel the time has come for us to arrange a final transfer / sale of the land to the next owner(s) while our mother, Geri Bangerter, is still living. As we indicated today, she recently turned 96 and we sense that time is limited for us to accomplish this.

Over the past decade our family has received offers to sell the property almost every month and we routinely reject them - but now we feel the need to move forward.

Our thoughts are these:

- The propety is currently zoned for 1 acre residential
- There is a SLC Metropolitain Water District and Utah Power easement that cuts across the south westportion of the property. Alpine City has inidicated to us several times in the past - that it envisions a road that would cross Dry Creek and connect to Westfield Road from Alpine Highway as well as other planning elements that could be along the line of the SLC / Utah Power easement.
- The City has also told us in the past that there are limited candidates for commercial or multi-use zone land left in Alpine that would be suitable to that purpose; and further, we have heard the City express that our property is one that would meet the needs of Alpine to have a multi-use zone along Alpine Highway in that area.
- Through the years Alpine City also has indicated to our family other possible interests/uses for the property which included ideas such as:
  - A park
  - A school site
  - Apartment housing
  - 1 acre housing; and
  - commercial zoning

Therefore, by means of this note and and our meeting with you and Shane - we want to let the City know our intentions and willingness to cooperate with the City on plans for the future use of our farm property - including zoning changes or requests. Shane indicated in the meeting that he had believed that the Bangerter family was opposed to any multi-use zoning on the property. We want to clarify that we are not and never have been opposed to a multi-use or commercial zoning. For financial reasons - we would prefer such multi-use zoning as it tends to increase the value of the land. We hope to be able to unite with the City to create a plan that would be mutually beneficial.

We were also pleased to hear from you today - that the City would prefer to have multi-use zoning for our farm property - and that it is probably not in the best interests of the City to have mere housing zoning. We support that position. We trust that the City would wisely design a plan that would be a benefit to all the community. Knowing the position of the City on this point enables us to position the land appropriately to the national buyers that we will be soliciting.

Thanks again for your time and kind consideration. We look forward to following up with you in the near future and hope that your needs and ours can match and that a good result for all can be achieved in a timely manner.

Yours Sincerely,

Paulo Bangerter
801-756-6465

Austin Roy <aroy.alpinecity@gmail.com>

Request to change the zoning on Burgess Orchard property

Clark Burgess <burgessorchards@gmail.com> Tue, May 19, 2020 at 9:01 PM
To: Austin Roy <aroy@alpinecity.org>, lonmoralpine@gmail.com

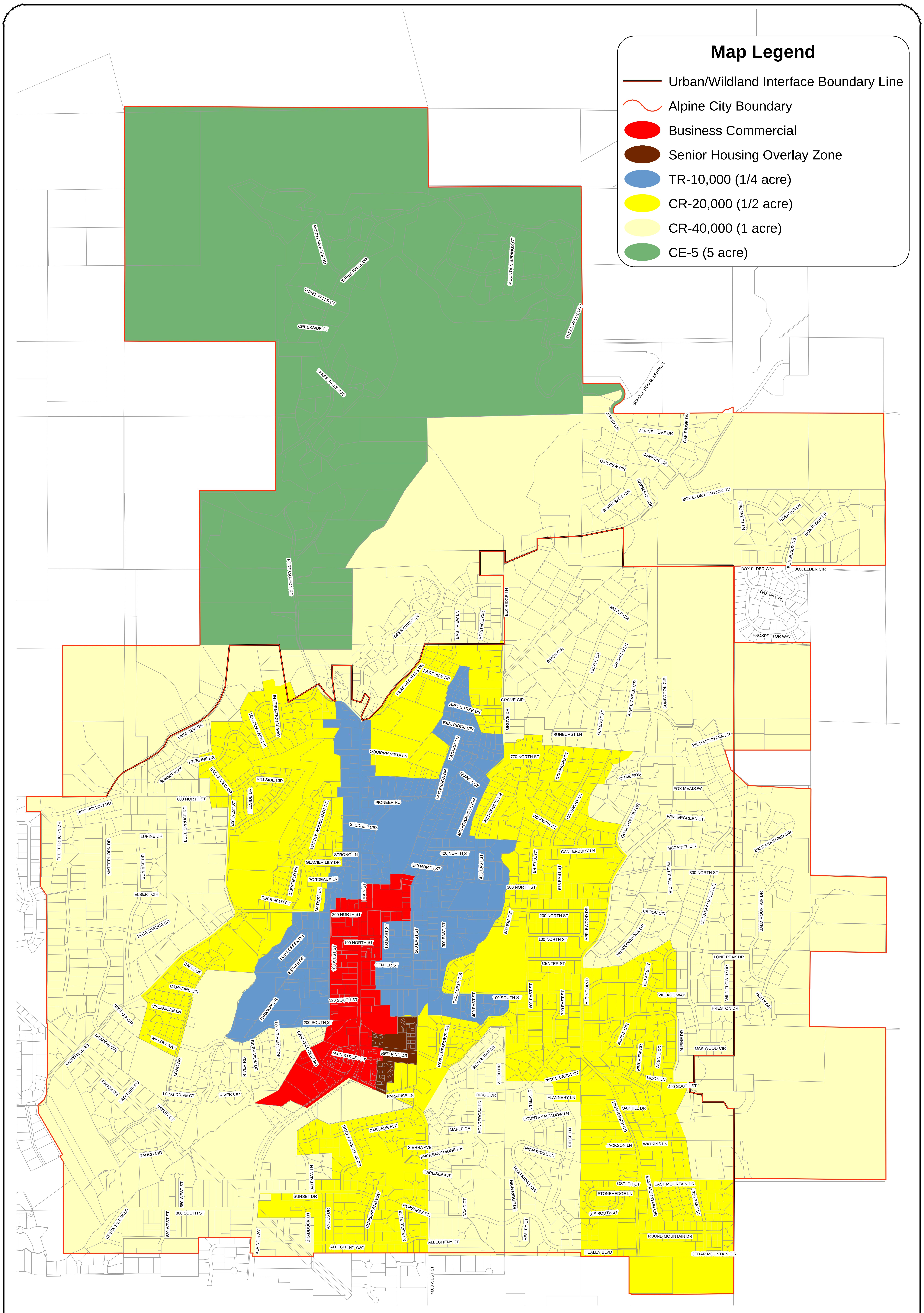
Austin,

We understand that the Bangerter family has recently approached Alpine City and indicated they are preparing to sell their farm.
We own 10 acres across the road from the Bangerter property that has been in the family for over 100 years.
We have also received many offers to sell our property but for now continue to enjoy the farming experience and feel that we are providing a valuable service and experience to the community and to those who come on our property and purchase at our fruit stand.
We do not currently have plans to sell the property but are very interested in joining the request of the Bangerter family in rezoning our property.

- The property is currently zoned for one (1) acre residential
- There are limited sites for commercial or multi-use zone land left in Alpine that would be suitable to that purpose; and further, we have heard the City express that our property is one that would meet the needs of Alpine to have a multi-use zone along Alpine Highway in that area.
- We want the City to know our intentions and willingness to cooperate on plans for the future use of our farm property - including zoning changes. For financial reasons - we would prefer such multi-use zoning as it tends to increase the value of the land.

We trust that the City will wisely design a plan that would be a benefit to all the community.

Clark Burgess



Alpine City Zoning Map

0 0.125 0.25 0.5 0.75 1 Miles

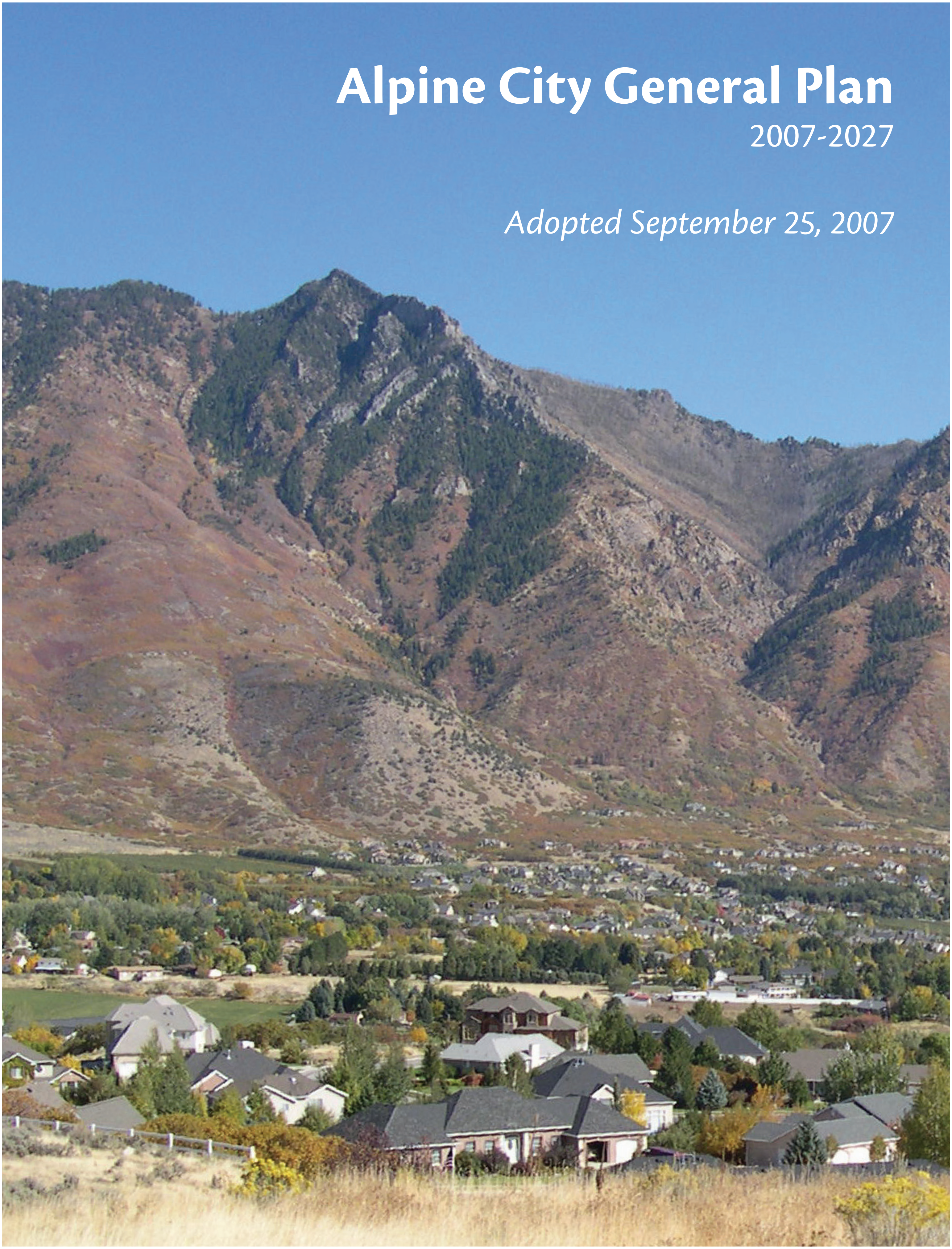
N
W E
S

Ordinance No. 2017-16
November 14, 2017

Alpine City General Plan

2007-2027

Adopted September 25, 2007



Acknowledgments

Mayor

Hunt Willoughby

City Council

Kimberly Bryant
Kent Hastings
Hata Puriri
Tracy Wallace
Thomas Whitchurch

Planning Commission

Jannicke Brewer
Steven Cosper
Steve McArthur
Jason Thelin
Jim Tracy
Lincoln Watkins

Others

Dale Porter, Former Planning Commission member
Kevin Cosper, Former Planning Commission member

City Staff

Ted Stillman, City Administrator
Shane Sorensen, City Engineer
Jay Healey, Public Works Director
April Riley, City Planner

Project Participants

Under the direction of Andrew Jackson, AICP

Robert Allen
Scott Ambrose
Aaron Baker
Jay Baughman
Michael Bennett
Reed Larsen
Ryan Loose
John Martineau
Matthew Michaelis
Marc Oliphant
April Riley
J. Scott Sellers

Special Dedication

Rachel McTeer, Former City Planner (4/23/2003 – 6/18/2005)
12/14/1975-6/18/2005

TABLE OF CONTENTS

Introduction

Experience has shown that many rewards come to communities that prepare and implement general plans, especially when several communities are adjacent to each other. Plans can be coordinated, more “mileage” can be obtained from tax dollars, and more efficient use of physical, financial, and human resources can be had. The preparation and implementation of a general plan can also serve as a prerequisite for outside aid for water supply and distribution works, sewage facilities and water treatment works, parks, libraries, streets, and urban conservation programs. The most important reward, however, is that a community becomes a healthier, safer, and more wholesome place in which to live and rear a family.

In accordance with Utah State Code, Alpine City has legally prepared and adopted the following General Plan in 2007. Although the information contained in this plan is general, it represents an important perspective that can help direct future planning decisions.

The mission of this General Plan is to provide a strong, positive civic image and quality of life in Alpine City by providing guidelines and standards that ensure the orderly and balanced distribution of growth; sound fiscal and economic investment; and preservation of the open and rural environment in a clean, attractive physical setting.

What is a General Plan?

A general plan, sometimes referred to as a comprehensive or master plan, expresses a shared vision for the growth and development of a city and sets forth the community’s development goals and objectives. Preparing a general plan provides an opportunity for a city to evaluate what it is today and what it wants to be in the future, what is working well and what needs to change. The general plan is not intended to be an idle document - it is to be used as a *guide* in the decision-making process and should remain flexible to allow for decisions to be made in the best interest of the city.

A general plan looks at least 20 years into the future, but usually has a life of about five years and will require updating or amending as a community changes. After a general plan is adopted, a city should develop, or may need to amend, zoning ordinances and other development guidelines to help implement the general plan.

Planning and Approval Process

The Alpine City General Plan is the result of a cooperative effort for Alpine’s future. Last updated in 1998, major efforts to revise the Plan began in 2005, including a community survey that asked numerous questions about various aspects of community development. A community visioning exercise was held with the Planning Commission and City Council. The combined results of the survey and visioning exercise were used to formulate the community vision and goals and objectives in this General Plan (see Appendix D for the General Plan Methodology).

The Planning Commission reviewed numerous drafts of the various elements in this General Plan and held a public hearing on February 20, 2007 to receive comment on the proposed General Plan. On August 21, 2007, the Planning Commission made a formal recommendation to the City Council. On September 25, 2007, the Alpine City Council formally adopted this General Plan by resolution.

Area History

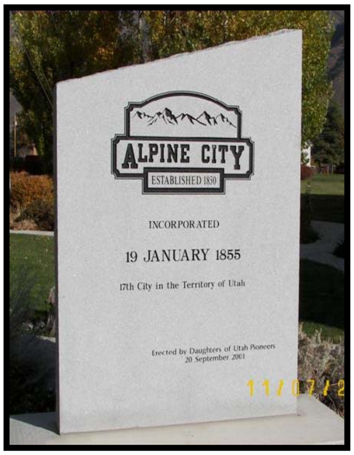
Alpine is located on State Highway 74 in the extreme northeast corner of Utah Valley, five miles north of American Fork near the mouth of American Fork Canyon. In 1849, a group of men was appointed by Brigham Young to travel to Utah Valley and determine its capabilities for a stock range. Tall bunch grass and meadow grass grew abundantly and cattle soon roamed the valley and low hills. In July 1850, another group headed to Utah Valley with the intention of locating there. This group ended up on lower Dry Creek (around Lehi City), but unhappy with the location because of insufficient water, their leader, William Wordsworth, returned to Salt Lake. In early September 1850, Wordsworth and his family and six others returned and settled in the area now known as Alpine (then known as Mountainville). Soon after the settlers arrived, the census taker came and his records showed a total of 29 persons lived in Alpine.

The grain planted in the fall of 1850 was a complete failure and in the spring of 1851, six of the families moved to other settlements. By the fall of 1851, however, the settlers had more or less caught up with their new environment and decided to become more of a community. Settlers were blessed with good crops for three years and life was beginning to look brighter until 1854 when an infestation of insects struck the crops. Over the next ten years, this plague of crickets and grasshoppers afflicted the crops. Settlers struggled to save enough of the crop for seed for the coming year and a meager existence for the families. Some nearly starved to death and many animals died.

In December 1851, the residents decided to build a meeting and school house which would serve for all public gatherings. Work commenced immediately and the building was completed January 1, 1852. It was a small log structure located north of the cemetery (Flag Hill). Although it was moved into Fort Wordsworth in 1854, this structure was later demolished.

Settlers also constructed two forts to defend their small town from Indian attacks and many chose to dwell within the walls of the forts for added safety. The first was occupied from 1853-1855. As the community grew, it became necessary to construct a larger fort, built around the first. Both forts shared the Old Fort Wall. The second fort remained in existence from the time of its construction in 1855 until 1868.

Of the first settlement, all were members of The Church of Jesus Christ of Latter-day Saints. The settlers held their church meetings at the home of their leader, William Wordsworth. Construction of a new meeting house for religious meetings and school classes began in 1857 within the Old Fort and was built of limestone and granite rocks hauled from the nearby mountains. A levy of twenty-one percent of all belongings was assessed on the people to be paid in labor to build this building. The building was dedicated in 1853 by Brigham Young and is located at 50 North Main – known today as the Relic Hall. This building served as the social and recreational center of the community until the erection of a new rock meetinghouse in 1878. It also served as the schoolhouse until 1899 when a two-story red brick schoolhouse was built. It was also used by Alpine City until 1936 when the present day City Hall was constructed.



On January 19, 1855, the Mountainville settlement was officially incorporated as the City of Alpine. By 1857, about 40 families called Alpine home. By 1860, the population of Alpine had increased to 135. By the turn of the century, the population reached 520. By 1962, there were 900 citizens in Alpine. The 1970's brought phenomenal growth and by 1980, the census count was 2,656. This growth has continued and in 1990, the population of Alpine was 3,492. The 2005 population is estimated to be 9,422 and is projected to increase by approximately 40% by 2030.

Community Vision Statement & Guiding Principles

Alpine City highly values its history and reputation as a great place to live and raise a family. Preserving the family oriented, small-town atmosphere is of utmost importance to the residents, business owners, and City officials of Alpine. Citizens have chosen to live in Alpine for a variety of reasons, with an overwhelming majority doing so because of the small-town, rural feel of the City and the stunning beauty of the surrounding mountains. The primary focus of Alpine City is to preserve and maintain these characteristics and its high quality of life.

Land Use

Land use decisions must be made on a case-by-case basis and these decisions must carefully consider how each use relates to the community's goals, objectives, and guidelines, as well as its overall impact on adjoining properties. Alpine City encourages development patterns which are compatible with adjacent land uses; attractive and efficient; and suitable for the terrain, vegetation, and wildlife.

Continued development is expected and the City plans to maintain its currently permitted densities and zoning patterns. Alpine City residents place a high value on their lower density neighborhoods. Future residential development must be carefully considered and designed to maintain the low-density feeling in the City. Residential development projects should focus on maintaining the traditional single-family residence as the primary housing style in Alpine City. In residential areas, the City also desires to provide increased access to parks and open space and will continue to work to provide these types of public facilities to current and future residents.

Future commercial development projects should be confined to the existing Business Commercial Zone. However, the possibility of expanding the Business Commercial Zone may be considered by the City if the City determines it is necessary or in the best interest of the City to do so. The most logical area for expansion would be to the south of the existing Business Commercial Zone (south of the roundabout). The City may also consider exploring the option of a new commercial zone that allows for underlying residential uses with larger lot requirements than the existing Business Commercial Zone permits.

All commercial development should be well-maintained with attractive streetscapes and landscaping, appropriate street lighting that complies with the City's overall street lighting plan, adequate off-street parking, and should conform to the Historic Architectural Guidelines. Any infill development, whether residential or commercial, should be consistent and compatible with surrounding development.

Alpine City also places a high value on its hillsides and open spaces, and is committed to preserving and protecting both, including the natural beauty of remaining viewsheds. The City will continue to work with private landowners, developers, and other interested parties to ensure that natural open spaces can be enjoyed by all citizens while respecting private property rights. The City should also consider annexing lands identified in its Annexation Policy Plan. Annexation of areas along the foothills can assist in preserving and protecting sensitive and critical lands, preserving the natural beauty of the foothills, and encouraging consistent development policy along the foothills.

Additionally, the City is interested in preserving and beautifying the three gateways into the City – Canyon Crest, Westfield Road, and Alpine Highway – as well as creating gateways that are unique so that travelers will know they have left the neighboring community and have entered Alpine City.

Transportation (Circulation)

Alpine City recognizes the importance of a safe and efficient transportation (circulation) system. The City desires to provide an appropriate level of service of City streets and to maintain the safety of streets for vehicular and pedestrian traffic. The City is also interested in maintaining a clean and attractive street system. The City understands that alternative methods of travel can increase accessibility to more people, and will encourage alternative methods of travel where feasible and compatible with the City's circulation system.

Historic Preservation

Alpine City recognizes the unique and valuable historical and cultural resources located within the community. Preserving, protecting, and restoring these resources can give the City a sense of how it gained its present form. The City is interested in preserving these resources where possible to enhance the quality of life in the City, to encourage an appreciation for the City's history and culture, and to maintain the character and identity of the community.

Public Facilities

Public facilities represent the public's investment in the development of the complex, urban infrastructure that is necessary to support the physical operation of the City. Alpine City understands that planning for future capital expenditures is key to the future of the community. The City desires to plan in advance for the construction of public facilities as a way to minimize their cost, optimize their usefulness, and maximize their public benefits and private sector support.

Moderate-Income Housing

Providing moderate-income housing will continue to be a challenge for Alpine City for various reasons. The price of land in Alpine is expensive in comparison to other cities. The City is not located near any colleges or universities, or large retail complexes that would create a demand for such housing, including high density multi-family dwellings. Additionally, there is not much opportunity for low or moderate-income employment within the City, and there is currently no access to public transportation for workers without vehicles to get to work in another community. The reality of the situation is that there is not a high demand for moderate-income housing in Alpine, and it is unlikely that there will be a high demand for such housing in the City.

The City, however, permits accessory apartments in residents' homes throughout the City and should continue to allow these apartments to assist the City in complying with Utah State moderate income housing requirements. The City should continue to ensure that each accessory apartment is legally registered with the City and conforms to applicable City ordinances and building codes.

Parks, Open Space, Trails & Recreation

Alpine provides a wide range of parks and recreation opportunities and values the contribution parks and recreation offer to the quality of life in the community. Existing park facilities include baseball, soccer and football fields; picnic and play areas. Other parks include open space and historic areas. The City desires to continue to provide these types of facilities and is interested in identifying future open space and recreational opportunities. Additionally, Alpine City desires to maintain and expand its network of trails to connect trails and open spaces throughout the City, and to provide a variety of trails for the various recreational interests of residents.

General Plan Goals

Each element in the General Plan begins with a vision statement for that element followed by a list of goals and objectives designed to help the City achieve the vision of the individual elements as well as the overall community vision statement and guiding principles. The goals are reprinted in this section for easier reference and to help outline a framework for the following elements.

Land Use

Goal 1 Preserve the quality of life and existing atmosphere of the City.
Goal 2 Maintain an attractive, centralized business district with low-impact type businesses.
Goal 3 Preserve and protect critical areas, including hillsides, viewsheds, and natural open spaces.

Transportation (Circulation)

Goal 1 Create and maintain a transportation system that is pedestrian friendly.
Goal 2 Develop and maintain a safe transportation system.
Goal 3 Develop and maintain an efficient transportation system.
Goal 4 Create and maintain an attractive streetscape along City streets.
Goal 5 Encourage a multi-modal approach to transportation issues.

Historic Preservation

Goal 1 Promote a greater sense of historic awareness.
Goal 2 Preserve the community identity, including the historic character of the downtown area.

Public Facilities

Goal 1 Consider the construction of new public facilities.
Goal 2 Continue to provide superb utility services.

Parks, Recreation, Trails & Open Space

Goal 1 Maintain the high quality and availability of parks and trails within the community.
Goal 2 Provide wholesome recreation that meets citizens’ needs.
Goal 3 Ensure an adequate amount of open space to preserve Alpine’s natural beauty.

Land Use Element

The Land Use Element is possibly the most important element of the General Plan and is designed to achieve the City's long-term vision by promoting sound land use decisions within the City's boundaries and in the annexation declaration areas. The identity of Alpine should be strengthened by land uses that contribute to the unique character of the community. When faced with decisions, City officials should refer to this element to help determine if the request before them is compatible with the community land use goals.

The Vision Statement for the Land Use Element is:

Alpine City desires to preserve and maintain the small-town, rural atmosphere of the community by maintaining lower density residential neighborhoods, limited and appropriate commercial growth, and preserving and protecting open space and hillsides.

The Goals of the Land Use Element are:

Goal 1 Preserve the quality of life and existing atmosphere of the City.

Objective: Maintain lower density residential neighborhoods with the traditional single-family residence as the principal housing style.

Objective: As infill development occurs, require an appropriate scale of houses.

Objective: Support residential development that maintains and protects natural resources and environmental features, including open space and open vistas.

Objective: Provide adequate screening or buffers when possible to minimize impacts on residential neighborhoods from commercial uses.

Objective: Encourage the construction of an adequate number of facilities and dwellings to accommodate senior citizens. Senior citizen facilities and dwellings should, whenever possible, be located in or near the town center.

Goal 2 Maintain an attractive, centralized business district with low-impact type businesses.

Objective: Create clear, concise guidelines as to the type and nature of encouraged and appropriate businesses.

Objective: National franchise projects are highly discouraged unless they design their buildings in a manner which promotes the ideals, heritage, and vision of the town center.

Objective: Discourage typical strip commercial development.

Objective: Commercial projects should be developed at an appropriate scale and density to be compatible with adjacent land uses.

Objective: Require adequate access, parking, traffic circulation, noise buffering, and other operational conditions within commercial areas; and encourage safe and convenient pedestrian access to commercial areas.

Objective: Maintain the image and appearance of the Business Commercial Zone by applying and enforcing the Gateway-Historic Design Guidelines.

Goal 3 Preserve and protect critical areas, including hillsides, viewsheds, and natural open spaces.

Objective: Define, review, prioritize, protect, and preserve environmentally and geologically sensitive lands.

Objective: The Sensitive Lands Overlay (SLO) should be kept current with the best and latest data.

Objective: Development should be minimized or prohibited on sensitive lands.

Objective: Viewsheds, including ridge lines, should be protected in a way that does not allow structures to protrude against the skyline as seen from any major roadway in the City classified as a collector or arterial. When developments are visible upon a hillside, measures should be taken to minimize the visual impact.

Hillsides in Alpine

Objective: Follow the Alpine City Annexation Policy Plan.

Objective: Restrict open space to specific uses when needed to protect the environment.

Objective: Work with landowners, developers, and other applicable agencies, such as the Forest Service or Utah County, to promote responsible development consistent with natural characteristics of the area; and to preserve and protect open space in the foothills.

LAND USE CATEGORIES

The Land Use Element should provide for a range and mix of land uses including residential, commercial, and special use areas, and should encourage the orderly and efficient distribution of all land uses in the City. The relationship of planned land uses should reflect consideration of existing development, environmental conditions, service and transportation needs, and fiscal impacts. Planned future land uses are indicated on the Land Use Map in Appendix E.

Residential Land Uses cover a range of classifications including very low, low, medium, and high density. In Alpine, density is expressed in lot sizes. Zoning regulations may allow a number of nonresidential uses, such as places of worship, museums, neighborhood parks, schools, home occupations, and governmental buildings (except correctional facilities) in residential areas either as permitted or conditional uses. (See Alpine City Zoning Ordinances for specific development standards.) The residential classifications for Alpine City are described as follows:

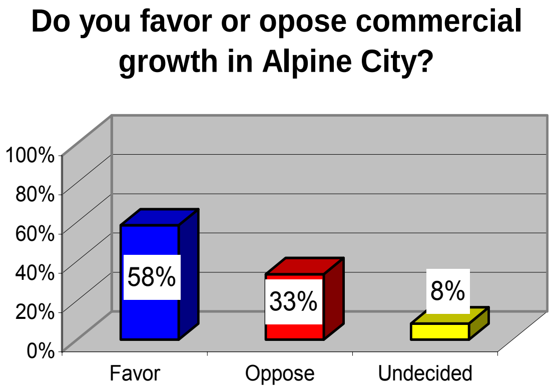
- Very Low: This category consists primarily of the more mountainous areas of the City which, because of the presence of steep slopes, unique soil characteristics, wildfire hazard or similar natural conditions are considered environmentally sensitive. This pattern is consistent with the CE-5 zone.

- Low: This category includes the territory generally located around the periphery of the City considered appropriate for low density residential development. Included in this zone are areas which as a result of the presence of steep slope, adverse soil characteristics, flood hazard, mudflow or earthquake potential, wildfire hazard or similar critical and sensitive natural conditions are considered environmentally fragile. This pattern is consistent with the CR-40,000 zone.

- Medium: This category is to provide a location within the City allowing residential development on the traditional agricultural lands and lower undeveloped areas within the City; and to provide for the perpetuation of the rural and open space image while reducing the impact of development on lands that are highly visible and susceptible to erosion. This pattern is consistent with the CR-20,000 zone.

- High: This category includes land generally located within the originally settled town center of Alpine, maintaining the village scale and character of the City. This pattern does not consider multi-family dwellings and is consistent with the TR-10,000 zone.

Commercial Land Uses should provide appropriate locations where a combination of business, retail, entertainment, and related activities may be established, maintained, and protected. Currently, the only commercial land use designation in Alpine is Business Commercial. The intent of this category is to provide an area in which the primary use of land is for retail and other commercial uses serving the immediate needs of residents, and is situated in an environment that is safe and aesthetically pleasing. Currently, commercial uses in Alpine provide a limited variety of goods and services to people who visit, live, and work in the community.



Do you favor or opose commercial growth in Alpine City?

In the 2005 community survey, 58% of respondents were in favor of commercial growth, and a majority of those who favored commercial development felt it should be located downtown and south of the roundabout. When asked about specific types of commercial growth, 58% want places where they can dine out, and 44% want a recreation center.

Other commercial uses desired include groceries, medical professionals, banking, boutiques, and entertainment. Alpine may be able to capture more consumer spending by analyzing which goods or services residents want, and which ones currently do not exist in the City. However, the City must also consider that nearby cities have larger commercial bases and many residents are willing to commute to these areas – this could have an affect on the feasibility of future commercial uses in Alpine.

As new commercial developments come in, the preservation of Alpine’s historic residential area and traditional town center should not be forgotten. Whenever commercial uses are adjacent to established or future residential areas, special care must be taken to ensure privacy and to protect personal property. Methods of protecting residential areas by providing transitions and buffers between residential and commercial areas include, but are not limited to: architectural guidelines, increased setbacks, landscaping, restricted land uses, diversion of traffic, controlled noise or light, height limitations, and transitional land uses such as minor offices or higher density residential uses.

Special Use areas include land use classifications that are distinct from residential and commercial land uses, including agricultural, public, and quasi-public uses. In some cases, the City does not control the location of special uses, such as schools or major transmission lines, and the state and federal governments can preempt local land use authority. However, the City can work with other jurisdictions and agencies on decisions regarding land use. Any negative impacts, including visual impacts, should be mitigated whenever possible. Some of the special uses within the City include the following:

- Public Facilities: This category indicates property in public ownership such as City buildings, schools, infrastructure facilities, the cemetery, and churches (quasi-public).

- Existing Parks and Trails: This category includes existing parks and trails.

- Proposed Parks and Trails: This category includes parks and trails proposed to be developed in the future in accordance with the Parks, Recreation, Open Space and Trails Element of the General Plan and the Alpine City Parks Master Plan.

- Open space: A natural riparian buffer should be maintained along indicated streams and creeks. This buffer may remain privately owned, but must be left in its natural state, with vegetation undisturbed. Dedication of these types of lands shall be made at the time of development; especially acquisition of rights-of-way along natural stream beds for trails.

- Sensitive Lands: This category protects and preserves environmentally sensitive lands. Sensitive lands can be considered to include lands with the potential for fire hazard, slope of the land, slope and soil stability, natural drainage ways, flood plains, wetlands, soil characteristics, potential landslide areas, seismic areas, and other such potential hazards. Development on these lands should be minimized or prohibited.

Overlay zones can be used to preserve and protect specific community characteristics, such as hillsides, scenic views, critical lands, historic districts, and senior housing. Overlay zones build on an underlying zoning by setting additional or stricter standards, and the standards of both zones apply. Alpine City has the following overlay zones:

- Gateway-Historic District: This overlay is intended to maintain a high character of community development by regulating the exterior architectural characteristics of structures and preservation and protection of buildings of architectural or historical significance. The overlay allows for both commercial and residential uses and follows the same boundary of the Business Commercial Zone.

- Sensitive Lands: This overlay is designed for sensitive and hazardous areas. The intent is to provide for safe, orderly, and beneficial development of areas characterized by diversity of sensitive and hazardous conditions as shown on the official Sensitive and Hazard Area Maps (floodplain, urban/wildlife, geologic hazards, hillside), to limit alteration to topography, and reduce encroachment upon, or alteration of, such areas.

- Urban/Wildland Interface: The intent of this overlay is to establish standards for development and fire prevention in areas bordering on wildlands.

- Flood Damage Prevention: This overlay is designed to minimize public and private losses due to flood conditions in specific areas.

- Hillside Protection: This overlay establishes standards for development of certain hillsides located in the City to minimize soil and slope instability, to minimize erosion, and to preserve the character of the hillsides.

- Senior Housing: This overlay provides for increased land use flexibility to assure that senior citizens can continue to contribute to the community without having heavy yard care maintenance and without ignoring legitimate concerns regarding impacts on surrounding residential areas. This overlay is contained within the Business Commercial Zone.

- Assisted Living and Nursing Care: This overlay provides for increased land use flexibility to assure that health and human services are appropriately located throughout the community and that neighborhood diversity is permitted without ignoring legitimate concerns regarding impacts on surrounding residential areas, and to further the objective of federal law by integrating health and human service facilities into normal surroundings. This overlay is contained within the Business Commercial Zone.

Annexation areas are specified in the Alpine City Annexation Policy Plan, which Alpine City has adopted as required under Utah State law. The Annexation Policy Plan, with accompanying map, represents the growth boundary which includes territories outside, but adjacent to, the community that may be annexed into the City in the future. These areas are indicated on the Annexation Map in Appendix E.

LAND USE GUIDELINES

1. Density increases should be considered only upon demonstration of adequate infrastructure, resource availability, amenities and benefit to the City and to the residents of the project.

2. Any changes to zoning ordinances or the zoning or land use maps should be preceded by amending the general plan when applicable.

3. The City will decide on what development pattern should be employed in a particular project.

4. The Land Use Element should be consulted before concept, preliminary, and final approval is given for any subdivision, annexation, commercial site, or any other land use issue addressed or implied in said element.

5. The Land Use Element should be reviewed and updated regularly to react to the needs of the City as it grows; and to verify that the Land Use Element, General Plan, land use ordinances, City standards, and any other planning documents are consistent within and between each other.

6. The Land Use Element should be consistent with all other laws, ordinances, and resolutions of Alpine City, the State of Utah, and the United States of America. If any section of this Land Use Element is found to be unlawful, the specific section may be severed or modified to comply with current law, with all other sections remaining valid. In all other cases of conflict, the strictest of two or more laws, ordinances, or resolutions shall apply.

Transportation (Circulation) Element

The Transportation, or Circulation, Element is designed to provide for the safe and efficient movement of people and goods in the City and does not necessarily indicate existing facilities. Movement in the City needs to be a workable balance between the movement of goods and people with automobiles, pedestrian facilities, bicycles and other non-motorized means while being sensitive to the built and natural environments. All future expansions should be planned and designed to be within the fiscal capacity of the City. These expansions should also maintain enough flexibility to evolve as needs and technology change. The location and design of any new facility should be integrated into the surrounding neighborhood and the community as a whole protecting the character of the City as changes occur. New transportation facilities should be designed to provide maximum durability and minimize maintenance costs.

The Vision Statement of the Circulation Element is:

Alpine City desires to create and maintain a transportation system that is pedestrian friendly, safe, efficient, and aesthetically pleasing while encouraging a multi-modal approach to transportation issues.

The Goals of the Circulation Element are:

Goal 1 Create and maintain a transportation system that is pedestrian friendly.

Objective: Identify and protect street crossings, particularly near schools and recreation areas.

Objective: Upgrade or install pedestrian safety features at intersections and crossing areas as needed, including ADA ramps.

Objective: Provide proper lighting at pedestrian facilities.

Objective: Provide adequate sidewalk facilities within the City.

Objective: Pedestrian pathways and sidewalks should provide connectivity between uses, such as neighborhoods, businesses, parks, trails, schools, and public facilities.

Goal 2 Develop and maintain a safe transportation system.

Objective: Follow applicable design and safety standards.

Objective: Review existing bridges regularly to determine if they meet safety standards, including seismic standards; and when feasible, widen, improve, or replace bridges that are obstacles to traffic flow and safety.

Objective: Regularly inventory street conditions and create a phased improvement program to address needed repairs and improvements.

Objective: Establish speed limits based on traffic engineering analysis, and enforce speed limits.

Objective: Implement traffic calming devices when appropriate.

Goal 3 Develop and maintain an efficient transportation system.

Objective: Develop a hierarchy of streets (arterial, collector, and local) and classify all new roads accordingly.

Objective: Provide a street system that operates at the highest level of service (LOS) possible for peak traffic volumes. Plan for alternative routes to satisfy LOS standards for the future.

Objective: Design an adequate street system in future growth areas and designate sufficient rights-of-way prior to land development or through the plan approval process.

Objective: Control access, intersection spacing, and parking on arterial streets to allow for traffic to flow.

Objective: Improve the guidance of traffic on streets when needed using appropriate traffic engineering solutions.

Objective: Encourage connections between neighborhoods.

Roundabout—Canyon Crest Road and Main Street/Alpine Hwy

Objective: Plan for two accesses to each part of town. Developments on residential streets over 450 feet long should be served by at least two accesses.

Objective: Work with adjacent communities and other agencies as appropriate to integrate with regional transportation and preserve future corridor locations.

Goal 4 Create and maintain an attractive streetscape along City streets.

Objective: Ensure the provision of adequate off-street parking facilities for all land uses.

Objective: Consider planting street and facility-friendly trees along arterial and collector streets.

Objective: Identify main streets where landscaping beautification may be beneficial, including gateways into the City.

Objective: Provide a list of approved trees that includes approved park strip trees to ensure tree roots do not create maintenance problems, that accommodates existing mature trees when possible, and allows native trees to provide a positive appearance.

Goal 5 Encourage a multi-modal approach to transportation issues.

Objective: Encourage UTA to provide bus service to and within Alpine.

Objective: Provide a balance between cyclist and pedestrian trails to satisfy transportation as well as recreational needs of City residents.

BACKGROUND

One of the most visible aspects of growth in smaller communities is the ability (or inability) to provide an adequate transportation infrastructure that efficiently keeps traffic circulating. Alpine City has experienced strong growth over the past fifteen years and the population is expected to increase by approximately 40% over the next 25 years. With this growth, the City will need to continue building and maintaining its streets to sustain a level of service that will facilitate efficient circulation and preserve a safe and small town atmosphere. The City should follow the short and long-term transportation projects as outlined in its Transportation Master Plan.

In the 2005 community survey, Alpine residents responded to numerous questions that will help guide future transportation planning. The survey showed that nearly 50% of respondents work in Salt Lake County or in the Provo/Orem area. That means that a substantial amount of Alpine residents commute to and from Alpine each day via main arterial roads. Additionally, respondents indicated that they do most of their shopping in Lehi and American Fork which results in additional trips on main arterial roads.

NEW TRANSPORTATION FACILITY REVIEW

Each roadway, street, and non-motorized transportation facility functions as a part of a larger network designed to create a logical and safe pattern for moving goods and people through the community. Each segment or facility in the network is highly dependent on many other segments. For this reason, it is important to review each development proposal and facility proposal from a larger point of view. As each new facility is planned or constructed, Alpine City should consider how the facility will affect the transportation and circulation system as a whole. If the proposed new facility will have a negative impact on the system as a whole, such as concentrating traffic on a few streets in residential areas, the applicant may be required to address the impact by upgrading existing facilities to meet new demands.

As new transportation facilities are planned or constructed within Alpine they should be reviewed for compatibility with the following key issues. In addition to addressing these issues, all new transportation facilities must satisfy requirements found in Alpine City subdivision and zoning ordinances, and all other relevant laws and standards of the City.

Compatibility with Built Form

A transportation system is affected by the existing land use, street pattern, and environment in which it occurs. Similarly, future development patterns are affected by the development of the transportation system. As transportation facility plans occur, efforts should be made to ensure that the facility and the desired future land use pattern are mutually supportive. The transportation facility should reflect the desired future development pattern in scale, function, and intensity, and should service development patterns.

Retail and commercial areas should be convenient for automobiles, bicycles, and pedestrians; and should include design for ample off-street parking and unloading zones. Residential areas should have facilities designed with safety as the key concern. Parks and other recreational areas should be well served by trails for use by non-motorized modes of transportation along with automobiles. In-fill development facilities should be constructed to provide an appropriate balance between existing transportation facilities and those planned for future use.

Integration Into Neighborhoods

New transportation facilities should be designed to improve the mobility and circulation within and between existing neighborhoods. Smooth transitions, functional intersections, and safety will be given special consideration. All facilities should be completed with future desired development patterns in mind so facilities will adequately handle the increased demand when additional developments are approved.

Protection of Natural Environment

While the construction of any transportation facility will inevitably affect the adjacent natural environment, Alpine City will work to minimize these impacts. Noise, air pollution, cuts and fills, and run off of oils and other pollutants are all concerns related to protecting the natural environment. Appropriate speed limits, noise barriers, vegetation and berms, enforcement of local, state, and federal vehicular noise reduction methods, and appropriate facilities in heavy traffic areas for large trucks can reduce noise impacts.

Enforcement of local, state, and federal air quality methods, including reducing vehicular trips and promoting non-motorized means of travel, will aid in reducing air pollution. Cuts and fills should be minimized to the extent possible without jeopardizing safety. All cuts and fills should be properly repaired and revegetated in accordance with City standards and ordinances. Drainage facilities, which filter out oils and other pollutants prior to their deposit into any watercourse, ditch or canal, should be designed on all new transportation facilities. Sumps, grease traps, and other means of cleaning run off pollutants should be included in all projects.

Safety

Transportation facilities should enhance safety in the community. Circulation, simplicity, and maintenance should be addressed with safety in mind. The system should provide each neighborhood with adequate access to police, fire, and medical services and for snow removal; and should be designed so that visitors and other users unfamiliar with the City can easily find their desired locations. All new and existing facilities should be properly maintained to minimize the possibility of accidents and injuries. Proper signage should be placed throughout the community to control traffic and guide users.

Planning and Priority of Facilities

All major construction and maintenance of transportation facilities should be included in the City’s Capital Facilities Program and planned to increase the effectiveness of each transportation dollar. This Element, including the accompanying Streets Map, should be regularly updated to reflect current development patterns, changes in transportation needs, and projected funding levels. If the City is required to prioritize transportation facility projects, the criteria should include, among other aspects, safety, number of citizens that will receive benefit, and linkages between facilities.

FACILITY CLASSIFICATIONS

Each road and street in the community is classified according to its intended use and capacity. Each of the following classifications represents a different type of roadway and a short description each.

- **Arterial:** A street which serves or is intended to serve as a major traffic way.
- **Collector:** A street of considerable continuity, which is the main means of access to arterial streets.
- **Local (minor):** A street which is supplementary to a collector street and of limited continuity, which serves or is intended to serve the local needs of a neighborhood and to give access to abutting properties.

The Transportation Master Plan Map in Appendix E shows the existing and anticipated new streets.

LEVEL OF SERVICE

To determine when a transportation facility has reached its intended capacity and should be expanded, or a new facility should be constructed, the City has adopted a level of service for the functional class of each facility. The following charts describe these levels of service.

Level of Service	Traffic Flow	Service Description
A	Free Flow	Posted speeds attainable with very little or no interference between vehicles.
B	Stable Flow	Posted speeds attainable with minor amounts of delay and interference. Smooth traffic flow.
C	Less Stable Flow	Posted speeds attainable with periods of delay during peak hours. Congested flow during peak periods of traffic.
D	Approaching Unstable Flow	Posted speeds not attainable during peak periods of traffic. Significant congestion during peak periods of traffic.
E	Unstable Flow	Posted speeds not attainable during peak periods of traffic. Intersection failure and heavy congestion in peak periods.
F	Forced Flow	Heavy congestion even during non-peak periods of traffic. Intersection failure most of the time.

NON-MOTORIZED TRANSPORTATION – SIDEWALKS, TRAILS, AND PATHS

Equally important to the facilities that move people and goods are the non-motorized transportation systems of the City. The non-motorized system should allow for access to all major commercial and recreational facilities in the City, but also provide links to regional and state non-motorized transportation systems.

Pedestrian Facilities

All new developments should address pedestrian needs. Pedestrian facilities in each development will be installed by the developer in a manner agreeable to the Planning Commission and City Council and compatible with the surrounding pedestrian system. Safety of pedestrians should always be the primary concern of the City in approving pedestrian facilities in new development.

Trails and Paths

A detailed description of the location and construction standards for non-motorized trail facilities in Alpine City will be found in the Parks and Trails Master Plan. Funding for the non-motorized trail system will be a combination of development exactions, impact fees, capital expenditures by the City, and any grants that the City may receive.

Historic Preservation Element

Alpine City recognizes the unique and valuable historical and cultural resources located within the community. Preserving, protecting, and restoring these resources can give the City a sense of how it gained its present form and a sense of place. Preservation of important historical and cultural resources enhances the quality of life in a city and of its built environment, encourages an appreciation for the city's history and culture, maintains the character and identity of the community, and in some instances can contribute to a city's economic vitality.

The Vision Statement for Alpine's Historic Preservation Element is:

Alpine City will continue to preserve its past to promote a greater sense of historic awareness and community identity, including the historic character of the downtown area.

The Goals of the Historic Preservation Element are:

Goal 1 Promote a greater sense of historic awareness.

Objective: Continue to compile photographs and artifacts about Alpine's history and support a historical display at Alpine Days.

Objective: Revive the Alpine Historical Society.

Objective: An inventory of historically and/or architecturally significant structures should be maintained and periodically updated, and consider placing commemorative plaques at designated historical landmark structures.

Objective: Prepare informational guides or walking tour guides for Alpine's most significant historical resources.

Objective: Continue to make available books about Alpine's history, such as *Alpine Yesterdays* by Jennie Adams Wild and *Lambert's* by Rulon McDaniel.

Objective: Explore sources of revenue for historic preservation.

Objective: Make available programs that promote Alpine's history, such as a shortened and simplified history for use in elementary schools.

Goal 2 Preserve the community identity, including the historic character of the downtown area.

Objective: Continue to enforce Gateway Historic District Design Guidelines for commercial structures in the downtown area.

Objective: Continue to maintain historic facilities, such as Moyle Park and Relic Hall; and maintain publicly owned property in the downtown area using Gateway Historic Design Guidelines.

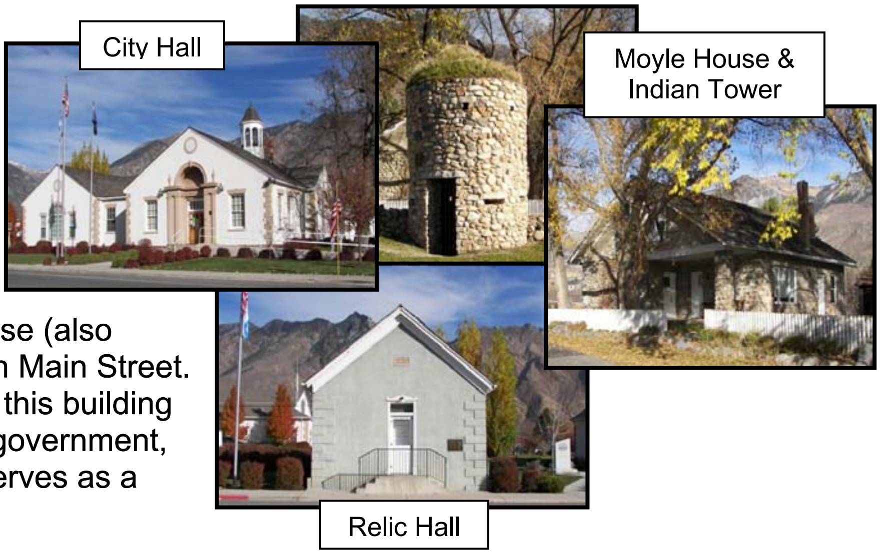
Objective: Consider establishing a Historic Preservation Ordinance to help identify historically significant structures or areas in the City, to protect historic homes in the downtown area from demolition, and outline infill guidelines to preserve the historic character of the downtown area.

BACKGROUND

Over the years, concerned citizens have been involved in Alpine's historic preservation. The establishment of the Alpine City Historical Register and the Gateway Historic District Overlay Zone has been an important step in the preservation of Alpine's past.

The 2005 community survey found that 88% of respondents felt that historic preservation was either very or somewhat important. Respondents also identified several sites of particular historic importance, including the Cemetery, City Hall, Pioneer Homes, Downtown, Relic Hall, and Lambert Homestead.

The following structures in Alpine are included on the National Register of Historic Places:



City Hall

Moyle House & Indian Tower

Relic Hall

- Alpine City Hall at 20 North Main Street. Built in the Colonial or Classical Revival style, City Hall was known for its architecture and the events held there.
- Alpine LDS Church Meetinghouse (also known as Relic Hall) at 50 North Main Street. Built in the Greek Revival style, this building has seen many uses including government, religious, and social. Today it serves as a museum.
- Moyle House and Indian Tower at 606 East 770 North. Built after the first settlers arrived, this was the family home of John Moyle, one of Alpine's first residents. Today, the home serves as a museum located in Moyle Park.

Public Facilities Element

Public facilities represent the public's investment in the development of the complex, urban infrastructure that is necessary to support the physical operation of the City. The Public Facilities Element is a plan for municipal utilities, public structures, properties, and measures required to meet the infrastructure needs of the community. The annual capital budget provides for financing the construction of immediate projects for the current fiscal year; the five-year Capital Improvements Plan (CIP) sets priorities for establishing and financing projects during the five (5) succeeding fiscal years; and the Public Facilities Element of the General Plan presents a longer term, more comprehensive view that addresses the existing infrastructure of the community and addresses projected needs over the next 30-50 years.

Planning for future capital expenditures is very important. It provides citizens, developers, and landowners with information about the timing and funding for infrastructure investments of the City. The location, size, timing, and financing of major streets, water, sewer, drainage systems, and parks and playgrounds must be planned in advance of their construction as a way to minimize their cost, optimize their usefulness, and maximize their public benefits and private sector support. This element is also necessary for the imposition and collection of impact fees used to provide the financing of infrastructure to new developments in the community.

The Vision Statement of the Public Facilities Element is:

Alpine City desires to continue to provide superb infrastructure and utility services; and will consider the construction of new public use facilities.

The Goals of the Public Facilities Element are:

Goal 1 Continue to provide superb infrastructure and utility services.

Objective: Continue to provide safe, efficient culinary water and sewer systems, making improvements as needed.

Objective: Increase the capacity of the pressurized irrigation system as the City grows.

Objective: Continue to provide adequate fire and police protection as Alpine's population grows.

Objective: Minimize potential future flood damage by maintaining and expanding the City's storm drain system and by minimizing/controlling development in flood zones.

Objective: Continue to provide recycling services to promote sustainability and reduce garbage disposal costs.

Goal 2 Consider the construction of new public use facilities.

Objective: Consider the construction of a City library.

Objective: Consider the construction of a swimming pool/recreation center within the City or within a larger recreational district.

Objective: Consider the construction of a City Parks Maintenance Facility.

Objective: Consider the construction of a senior center.

Objective: Consider areas surrounding the cemetery for expansion.

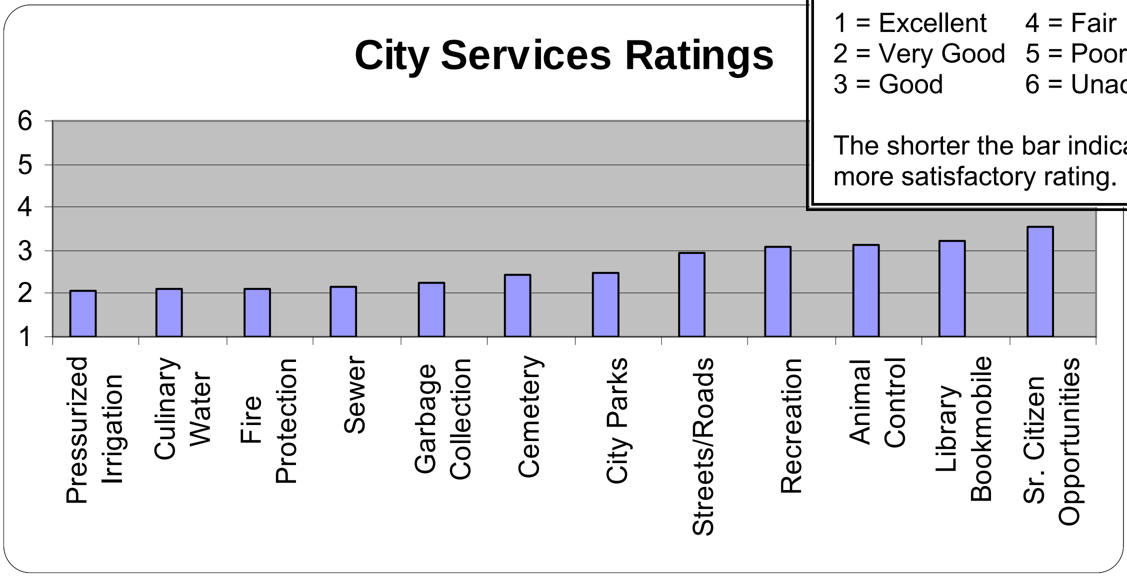
BACKGROUND

The 2005 community survey asked residents various questions regarding public facility issues. The following charts summarize some of the key findings of the survey in regards to public facilities. Respondents indicated their perception of the City's performance in a variety of areas. The following chart illustrates the mean responses for each service area.

Residents were asked to rate the services according to the following scale:

1 = Excellent	4 = Fair
2 = Very Good	5 = Poor
3 = Good	6 = Unacceptable

The shorter the bar indicates a more satisfactory rating.



CULINARY & PRESSURIZED IRRIGATION WATER SYSTEMS

The Alpine City Culinary Water System provides for the safe and efficient delivery of water to the community. The City provides for and controls the extraction, storage, and distribution facilities for its culinary water system. Alpine City has several sources of culinary water, including Grove Springs, 300 East Well, Busch Well, and Silverleaf Well; as well as six water storage tanks. The City also has sufficient water rights to drill additional wells if necessary.

Pressurized irrigation tank in Lambert Park

The Alpine City Pressurized Irrigation System provides for the efficient delivery of irrigation water to serve the outdoor water needs of residents. The City has entered into an agreement with the Alpine Irrigation Company to use and manage their water sources as part of the pressurized irrigation system. The City manages the various sources, storage facilities, and distribution system to provide irrigation irrigation water to its residents. Water from Dry Creek, Fort Creek, Box Elder Springs, and five wells provides water for the system. The surface water is used when available, with well water being pumped to supplement the system when surface water flows begin to diminish.

CULINARY & PRESSURIZED IRRIGATION WATER SYSTEM GUIDELINES

1. Private development should provide all internal distribution facilities and water shares necessary to serve their projects.

2. Development should be contingent upon available resources, infrastructure, and the transfer of water shares to the City based upon the development's annual water demand.

3. The locations and capacities of future reservoirs, water lines, and pumping stations should be guided by the City's Water Capital Facilities Plan, as well as other considerations, such as disruption to the natural environment.

SEWER SYSTEM

Alpine City's sewer system provides for the safe and efficient collection and conveyance of wastewater to the Timpanogos Special Service District, where it is treated. Alpine City's sewage lines were first constructed in 1978, and range in size from 8 to 18 inches and have an average flow of 122 million gallons. The City's sewage connects to an 18-inch outfall line at 800 South 750 West.

SEWER SYSTEM GUIDELINES

1. Private development will continue to participate in improvements to the municipal sewer system through sewer development impact fees, construction of selected facilities, and by providing additional resources.

2. Private development shall continue to provide all internal collection facilities necessary to serve individual projects.

3. Development projects within the City shall connect to the municipal sewer system.

4. Private sewer system improvements shall be constructed to all applicable City standards and specifications.

5. Existing septic systems on lots in newly annexed areas shall be required to connect to the City sewer system.

RECYCLING

Alpine City currently contracts with a disposal company to provide curbside recycling collection. The City funds the program and participation is voluntary.

RECYCLING GUIDELINES

1. City recycling services may be required in the future, so the City should plan to meet any future standards.

2. The City should continue to promote recycling and encourage its residents to participate.

STORM DRAINAGE/FLOOD CONTROL

Alpine City has 14.5 miles of storm water pipelines and 25 detention basins and relies upon ditches and canals for its storm drainage. The irrigation ditches are especially vital to the City in the event of a 25, 50, or 100-year flood. Some ditches are still used for irrigation and conveyance of storm water runoff. Most private ditches will eventually be filled in since a citywide pressurized irrigation system has been constructed.

There are two areas along the Fort Creek and Dry Creek located in the 100-year flood zone. The Clean Water Act (CWA) of 1987 requires municipalities to control storm runoff pollution. By updating the Storm Water Master Plan every five years, enforcing proper storm water activities, and participating in the Utah County Storm Water Coalition, Alpine City can meet the CWA requirements.

STORM DRAINAGE/FLOOD CONTROL GUIDELINES

1. The municipal storm drainage and flood control system should provide for the safe and efficient collection of storm water generated within the community.

2. New development projects should be designed to minimize potential damage from storm waters and flooding to the site and other properties.

3. Private development will participate in improvements to the major system through storm drainage and flood control development impact fees, construction of selected facilities, and by providing additional resources.

4. Remaining irrigation ditches should be regularly maintained and kept clear of debris.

5. Storm drain pollutants, such as salt and antifreeze, should be monitored. Best Management Practices should be developed and implemented in the storm drain system to help reduce pollution from storm drain runoff.

CITY BUILDINGS

The Alpine City Hall and Police Department are located at 20 N. Main Street. The Public Works facility is located on 200 North 180 East. The City cemetery is located at about 400 North Grove Drive. The Alpine Fire House is located at 50 E. 100 North.

CITY BUILDINGS GUIDELINES

1. City Hall should be the primary location for city administration.

2. City facilities should incorporate water and energy conservation measures and meet ADA accessibility requirements.

3. Alpine City shall develop and enforce reservation and use standards for the use of City Hall.

Parks, Recreation, Trails, & Open Space Element

The beauty of parks and open spaces in the community and the surrounding mountains are some of Alpine's greatest assets. These resources contribute greatly to the high quality of life that Alpine is known for. The Parks, Recreation, Trails and Open Space Element can help identify guidelines for preserving and improving existing parks, open space, and recreational activities for current and future generations.

The Vision Statement of the Parks, Recreation, and Open Space Element is:

Alpine City desires to maintain the quality and availability of parks and trails within the community; to provide wholesome and safe recreation that meets citizens' needs; and to ensure an adequate amount of open space to preserve Alpine's natural beauty.

The Goals of the Parks, Recreation, and Open Space Element are:

Goal 1 Maintain the high quality and availability of parks and trails within the community.

Healey Park

Objective: Maintain an appropriate level of service (LOS) as recommended in the Parks Master Plan and Capital Facilities Plan.

Objective: Maintain existing facilities, and upgrade deficient facilities to current industry standards, including ADA accessibility guidelines.

Objective: Perform periodic cleanup of trails on a staggered annual basis.

Objective: Encourage connection to regional trails; and work closely with neighboring municipalities and the appropriate entities to coordinate trails between cities and plan connections as appropriate.

Objective: Designate trails for specific uses where needed (i.e. equestrian, hiking, biking, OHV/ATV), including where motorized traffic is allowed.

Objective: Work with developers and/or establish alternate routes when proposed development encroaches on existing trails.

Objective: Continue to promote and implement the Bonneville Shoreline Trail.

Objective: Restore, or replace through acquisition, trails that have been threatened or eliminated by development.

Objective: Develop, follow, and update as needed, a master plan for the Rodeo Grounds.

Objective: Work to provide recreational opportunities in areas with minimal access to City parks and recreational facilities.

Goal 2 Provide wholesome recreation that meets citizens' needs.

Objective: Support recreation programming congruent with the core values of the community, including programming art and music activities in the park as appropriate.

Objective: Continue to support Alpine Days and other annual events that bring the community together.

Goal 3 Ensure an adequate amount of open space to preserve Alpine's natural beauty.

Objective: Require a certain amount of open space in Planned Residential Developments (PRD), and trails if appropriate.

Objective: Open space shall be designated as natural or conservation, semi-improved, developed, organized group recreation open space, or semi-improved recreation open space.

Objective: Privately owned open space may be part of the City's open space plan.

Objective: Publicly owned open space is retained for the use and benefit of the public. Improvement decisions are controlled by the City Council in compliance with the General Plan, open space designations, and City ordinances.

Lambert Park

Objective: Maintain Lambert Park as natural open space, with the exception of the Bowery and Rodeo Grounds, which shall be semi-improved recreational open space.

INTRODUCTION

Alpine offers a wide range of parks and recreation opportunities. Existing park facilities include baseball, soccer and football fields, and picnic areas and play areas. Other parks include open space and historic areas. The City places a high priority on its parks and open spaces and the value they bring to the community.

Legacy Park

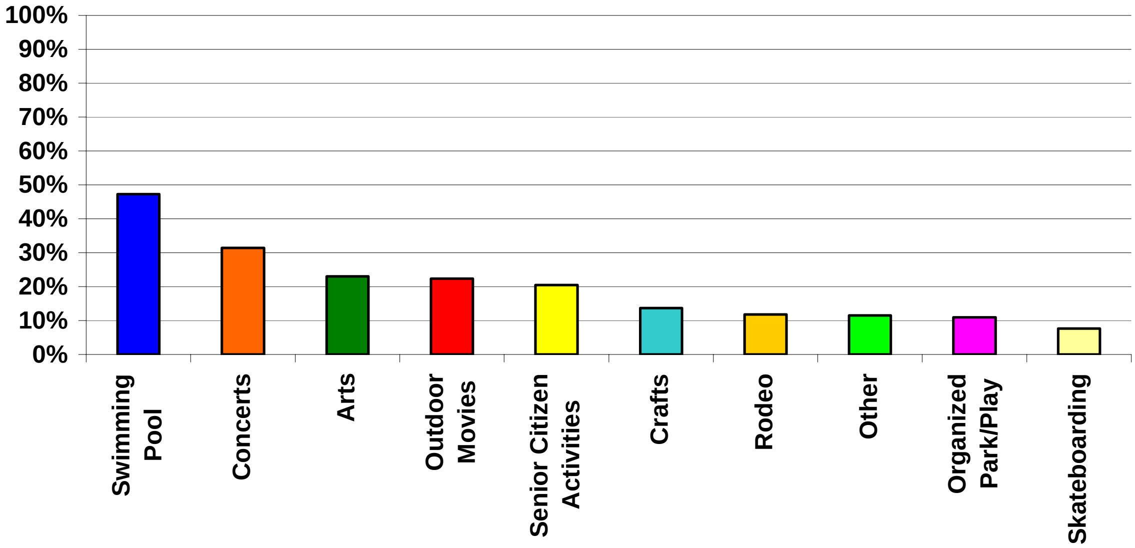
Smooth Canyon

Alpine City owns and maintains many parks including Burgess Park (10 acres), Healey Park (4.5 acres), Legacy Park (1 acre), Moyle Park (2 acres), Peterson/Silverleaf Park (10 acres), Rachel McTeer Park (2 acres), Smooth Canyon Park (6 acres), South Pointe Park (17.8 acres), and the unnamed park on 100 South (20 acres). Additionally, a 255-acre natural resource area known as Lambert Park preserves a considerable amount of open space in the City, and has an intricate network of biking and walking paths. The Parks, Recreation, and Open Space Map in Appendix E shows the existing and anticipated park and open space areas.

Some developments, such as the Stonehedge subdivision, in the City contain private open space owned by the homeowners' association (HOA) which serves the residents of those neighborhoods and contributes to the City's overall amount of open space. The City also has a variety of trails throughout the community as shown on the Trail Master Plan in Appendix E.

BACKGROUND

In the 2005 community survey, when asked to rank in order of importance a list of concerns the City should be sensitive to in planning future growth, the most important concern was "Hillside/Open Space Protection". Not far behind, as the third most important concern, was "Development of Parks and Recreation". In rating existing City services, 83% of respondents rated City parks as "good" to "excellent", while 60% rated recreation programs as "good" to "excellent". When asked what types of recreational opportunities citizens would like that are currently not provided, the following results were reported:



This same survey asked residents if they favor or oppose trails in residential areas, with 67% stating they are in favor. The survey also reported that almost half of respondents use City trails once a month or more often, including 27% reporting that they use trails once a week or more.

Also, the Alpine Trails Committee recently conducted its own survey on the City's trail system. The Committee found that 78% of residents in Alpine were in favor of helping with the trail system in such ways as maintenance, building, etiquette, and safety. The survey also revealed that 85% of Alpine citizens use the trails for biking, 70% for hiking, and 61% for walking. When asked what could be improved about the trails, the responses were maps, more trails, access and connections, maintenance, safety, and etiquette.

PARKS, RECRECATION, TRAILS & OPEN SPACE GUIDELINES

1. Alpine City should consider the General Plan survey results in planning for future City parks and recreation programs and should solicit citizen feedback about recreational needs and desires.

2. Using public land for parks, open space, and trails should take first priority over using private property.

3. Alpine City should consider working with neighboring cities for a combined recreation center.

4. The Alpine City Parks, Recreation and Open Space (PRO) Committee should act as an advisory board to the Planning Commission and the City Council in making decisions regarding parks, trails, recreational facilities and programs, and open space.

5. Alpine City should regularly update the Parks Master Plan and Capital Facilities Plan and include a priority list of park facility upgrades and new installations according to community needs.

6. Alpine City should follow the “Guiding Vision” for Trails (see Trails Use Map in Appendix E).

Moderate Income Housing Element

Utah State Code requires cities to adopt a plan for moderate income housing. A plan for moderate income housing is a written document that includes: (1) an estimate of the existing supply of moderate income housing, (2) an estimate of the need for moderate income housing for the next five years as revised biennially, (3) a survey of total residential land use, (4) an evaluation of how existing land uses and zones affect opportunities for moderate income housing, and (5) a description of the city's program to encourage an adequate supply of moderate income housing.

BACKGROUND

Moderate income housing means "housing occupied or reserved for occupancy by households with a gross household income equal to or less than 80% of the median gross income for households of the same size in the county in which the city is located" (Utah Code, Section 10-9a-103). In the following analysis, moderate income housing will be divided into three categories: 80%, 50%, and 30% of the median gross income.

According to the definition, the Utah County moderate income level is recommended to be used in assessing the affordability of housing in Alpine. The average household size for Utah County was 4.3 persons in 2000, rounding to 4.0 for statistical purposes. In 2000, the median gross income for a family of four in Utah County was $56,125. Therefore, an average household earning less than 80% ($44,900), 50% ($28,063), and 30% ($16,838) of the Utah County median income is considered to be the standard by which Alpine should assess the affordability of housing within the community.

However, the use of the Utah County median income level does not adequately reflect current income levels in Alpine. Therefore, various demographic data must be taken into consideration. Based on 2000 census data, Alpine's median household income level was about 50% higher than the Utah County level. The following table illustrates this disparity.

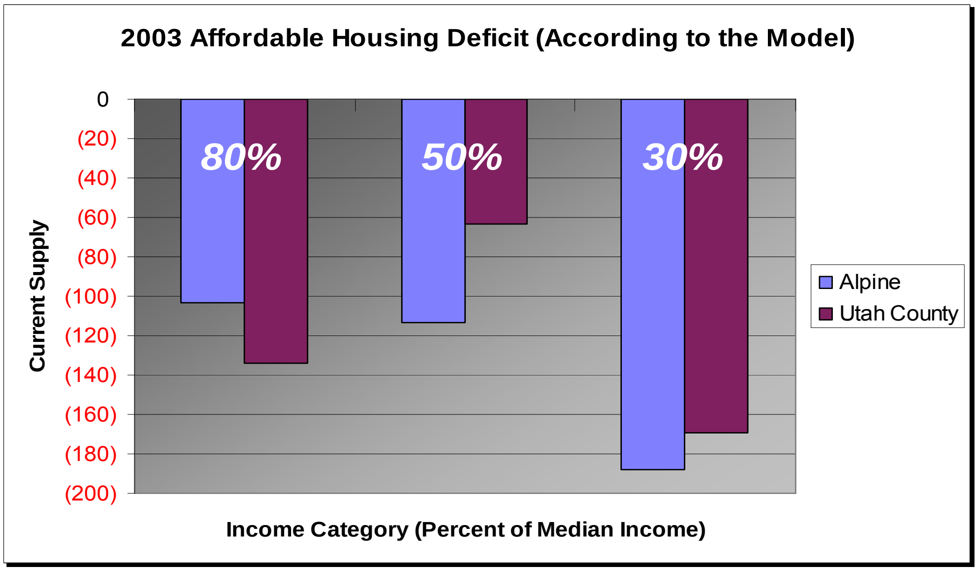
Income, Purchase Price, and Rent Comparisons

	Income Group	Utah Co.	Alpine	% Difference
Household Income	80%	$ 44,900	$ 70,256	56%
	50%	$ 28,063	$ 43,910	56%
	30%	$ 16,838	$ 26,346	56%
Maximum Purchase Price	80%	$ 174,600	$ 278,400	59%
	50%	$ 105,700	$ 170,600	61%
	30%	$ 59,700	$ 98,600	65%
Maximum Monthly Rent	80%	$ 945	$ 1,585	68%
	50%	$ 525	$ 925	76%
	30%	$ 245	$ 485	98%

They not only illustrate that Alpine residents typically have a higher income, but also that the housing market is substantially more expensive in Alpine. The outcomes determined by the spreadsheet model must be reviewed against Alpine's high income levels. As the State model may inadequately address the needs of the unique housing situation in Alpine, a more practical approach that caters to moderate income housing implementation for Alpine's specific housing needs must be considered.

ESTIMATE OF EXISTING SUPPLY

The chart below shows that in 2003, Alpine had a deficit of 104 units for households making 80% of the median annual income, a deficit of 113 units for those making 50% of the median income, and a deficit of 188 units for those making 30% of the median income. Utah County data also shows similar results: a deficit of 134 units for households making 80% of the median income, a deficit of 63 units available to those making 50% of the median income, and a deficit of 170 units for those making 30% of the median income.



ESTIMATE OF NEED (for the Next Five Years)

The majority of the need for moderate income housing in Alpine will be to serve the City's own growth. According to the moderate income housing model, population growth in Alpine has created a demand for the following units from 2004 to 2008:

Estimate of the Need for Moderate Income Housing

	Income Group	Utah County	Alpine
New Demand in Units (2004 to 2008)	80%	44	44
	50%	30	30
	30%	67	67
Net Need in Units (Current Supply Plus Future Demand)	80%	178	147
	50%	94	143
	30%	237	255
Units Needed Per Year to Comply with State Model	80%	36	29
	50%	19	29
	30%	47	51

The model projects a need for a total of 29-51 units in Alpine per year of affordable housing depending on income data used. From 2000-2002, 36 residential permits were issued and the median building permit valuation was $229,914, with a high of $693,713 and a low of $99,446 (not including lot prices). Using local income data, 113 permits, or about 48% of the total building permits, were in the affordable range for moderate income families. This is an average of 37 a year, which is slightly above the needed number of units projected by the model.

From 2003 to 2005, the City issued 255 residential building permits and the median building permit valuation was $251,000, with a high of $1,800,000 and a low of $135,000. About 42 permits, or 16% of the residential permits, were in the affordable range for moderate income families. This equates to an average of 14 a year, which is significantly below the needed number of units projected by the model. Thus, according to the model, Alpine had a sufficient supply of moderate income housing units from 2000-2002, but an insufficient supply of moderate income housing units from 2003-2005. This could be attributed, at least in part, to the rapid appreciation of land value in the area.

The median maximum purchase price of a home in Alpine is more than $100,000 higher than that of Utah County. The cost of housing includes mortgage or rent payments, utilities, interest, homeowners' insurance, mortgage insurance, property taxes, and other applicable fees. The entire sum of these costs should not exceed 30% of a household's gross income in order for the housing to be considered affordable.

Revisiting the demographic profile of the City deserves consideration at this point. Approximately 8% of the population is age 60 and older, retired, and on a fixed income. This may account for the slightly increasing percentage in the category for households making 30% of the median income. These people likely have their houses paid off even though the model predicts that their houses are not affordable to them, thus, potentially accounting for the higher deficit of housing affordable to those making 50% or less of the median income. Similarly, the model projects that the percentage of retired households classified as having low incomes will increase.

Also, in the 2005 community survey, 94% of respondents reported that they own their home. Of those who said they own the home they live in, 25% indicated that their home is paid off. In the same survey, residents were asked what percentage of their income is paid to housing costs. Almost 10% of respondents reported that they have no housing costs and 65% of respondents stated they pay 30% or less of their income towards housing costs. Thus, about three-quarters of residents live in affordable housing.

Additionally, Alpine allows for accessory apartments throughout the community. An accessory apartment is a subordinate, semi-independent living area created within a one-family home. In the 2005 community survey, about 10% of respondents indicated they have an accessory apartment, with only about half reporting that their accessory apartment is occupied. There are about 60 accessory apartments currently registered with the City, however, there is likely two or three times that many that are not registered. In the past, accessory apartments have enabled Alpine to meet the state moderate-income housing model and will continue to do so in the future.

SURVEY OF RESIDENTIAL ZONING

The City has four residential use zones, including:

- Town Residential District – T-R 10,000: allows for residential growth within the originally settled town center of Alpine; to maintain the village scale and character; to provide for appropriate community activities and civic buildings; and to allow a density of development that is compatible with the limitations of municipal resources.

- Country Residential - C-R 20,000: provides a location within the City allowing residential development on the traditional agricultural lands and lower undeveloped areas within the City; to provide for the perpetuation of the rural and open space image while reducing the impact of development on lands that are highly visible and susceptible to erosion; and to allow a density of development that is compatible with the limitations of municipal resources.

- Country Residential District - 1 Acre - C-R 40,000: includes the territory generally located around the periphery of the City considered appropriate for low-density residential development. Also included in the zone are areas, which because of the presence of steep slope, adverse soil characteristics, flood hazard, mud-flow or earthquake potential, wildfire hazard, or similar critical and sensitive natural conditions, are considered environmentally fragile.

- Critical Environment Zone District - CE-5: consists primarily of the more mountainous areas of the City, which, because of the presence of steep slopes, unique soil characteristics, wildfire hazard or similar natural conditions, are considered environmentally sensitive. It is anticipated that uses in this zone will be limited to one-family dwellings in naturalistic settings with associated personal uses and structures. Such uses will be permitted in those portions of the zone that are most suitable for development activity (development cluster areas) interspersed with large and undisturbed open space areas.

EVALUATION OF ZONING'S AFFECT ON HOUSING OPPORTUNITIES

For most cities, zoning and reducing impact fees for moderate income housing developments can be important keys for the Planning Commission and City Council to provide housing opportunities to persons of moderate income. In Alpine, however, these keys have very little impact. A combined reduction in impact fees and increased density will cause only a minor reduction in total housing costs. The total cost of new housing for the median priced home in Alpine would need to be reduced by about 60% to equal the housing costs targeted by the model. A 60% reduction of total housing cost is not feasible through zoning or an impact fee reduction.

Alpine is located in a very desirable housing market. Market demands for housing have driven up the cost of housing in the City. Adjustments in density that would be compatible with the City's infrastructure and topography would have a limited effect in reducing total cost of housing. The sale price of the lot does not necessarily decrease in direct proportion to a reduction in lot size.

ALPINE'S PROGRAM TO ENCOURAGE MODERATE INCOME HOUSING

This is the point in the analysis where the State model may be too broad to apply to the unique characteristics of Alpine. Impediments to moderate income housing in Alpine include a variety of factors. Alpine is a small bedroom community where residents highly value low-density residential housing. In the 2005 General Plan survey, over 90% of the respondents indicated that the minimum lot size should be 10,000 square feet or greater. In this same survey, a majority of respondents reported that they see no need for condominiums, twin homes, or apartments in the City. Higher density housing, including multi-family housing, would be very difficult to pursue in Alpine as there would be very little public support for such a project.

Additionally, there is a very limited amount of commercial business within the City. The majority of jobs that do exist in Alpine are either home occupations or could be categorized as small office business – such as mortgage companies, medical and dental offices, and realty. Essentially, if high-density moderate or low income housing is placed in Alpine, there would not be enough jobs to sustain it. Therefore, if Alpine did have moderate or low income housing, people would still have to commute to work in other cities. As Alpine does not currently receive public transportation services, other than paratransit services, any individual who did not have their own transportation would not have any public transportation options available in order to travel to and from their employment in other cities. Also, Alpine is not currently located near any large retail areas that would create a significant amount of moderate or low income jobs. Nor are there any colleges or universities nearby that would draw a population that would create a high demand for moderate or low income jobs and housing.

Other factors include market conditions, such as high land values. Higher land values enable developers to build higher density housing and charge a higher monthly rent or a higher sale price than they could in other cities, creating a substantial profit. Therefore, not only damaging the single-family residential identity of Alpine, but also the moderate or low income housing that may exist in the area is more expensive than it should be.

Nonetheless, to ensure that moderate income housing exists, Alpine should continue to allow accessory apartments. The City may consider an “amnesty” type of program to encourage more residents that have illegal accessory apartments in their homes to comply with current ordinances and register the apartment with the City. The City also has no minimum requirement on house size, which may provide another manner in which housing prices can be made more affordable. Landlords renting homes within the City also have the opportunity to work with the Utah County Housing Authority to provide housing more affordable to the moderate and/or low income population.

Implementation Element

The foregoing maps and explanatory matter constitute the General Plan for Alpine, but the plan is not self-executing. It is like a blueprint. It can only “sit on the shelf” until each public agency or person incorporates it into their individual programs.

After the General Plan has been adopted, the Planning Commission and City Council should no longer make decisions pertaining to matters relating to physical development without first referring to the General Plan. Not only will it be the responsibility of public officials to uphold the integrity of the General Plan, but it will also be necessary for them to adopt the policies and procedures of the plan and to support administrative officials in their duties as they carry out the plan.

PLANNING: A CONTINUING PROCESS

It should be recognized that a general plan is never finished in the sense that a plan of a building is finished. Rather, a general plan should become a repository for new and improved ideas that can be assimilated and made part of an on-going program. As better solutions to problems become known, or as changes and unforeseen conditions arise, corresponding changes should be made in the plans. On the other hand, it should also be recognized that to make one change in a general plan might require many other changes to be made. This occurs because of the interrelationships that are inherent in general plans. What may appear to be a better solution to one problem, in and of itself, may call for other changes to be made which, in total, become unacceptable. Therefore, changes should be made in the Plan only after the total effects have been taken into account.

IMPLEMENTATION MEASURES NEEDED

The following are measures that should be taken to implement the General Plan:

1. Preparation and adoption of revised zoning and subdivision ordinances designed to implement the Land Use, Transportation (Circulation), and Public Facilities Elements of the General Plan.

2. Preparation and adoption of policies covering extension to water and sewer lines and other public utilities as a means of encouraging development to take place in accordance with the Plan.

3. Preparation and adoption of a long-range Capital Improvement Program (CIP) showing public facilities listed according to priority of need and indicating the approximate amount and source of funds.

4. Adoption of impact fee ordinances to fund the improvements required by new development and growth.

Appendix A

Alpine City General Plan Survey 2005

This is an anonymous survey. You will not need to give your name, address or phone number.

As you may be aware the Alpine Planning Commission and City Council are working on an update of the General Plan for the City. The General Plan will be used to guide the City for the next 5 to 10 years. The General Plan and Zoning Ordinance will be used to regulate the development and use of land. Citizen input is essential for the new plan to meet the needs of the City. The Planning Commission has put this survey together to receive citizen input. Citizen input will also be received at public meetings, open houses and public hearings, before any decisions are made by the City Council. Please check the Newsline and City Website (www.alpinecity.org) for updates about the General Plan.

Please take a moment to make your opinions known to the Planning Commission and City Council by completing the following survey. Please fill in the bubble next to your answer.

1. What is the main reason you decided to live Alpine?

34%, 273	Small Town / Rural Atmosphere
28%, 227	Beauty / Mountains (and accessibility to them) / Nature
18%, 147	Secluded / Private / Quiet / Setting
16%, 125	Family-Centered community / Good neighborhood / Good quality of life / Educated Population
9%, 73	Location in relation to other cities (i.e. Provo, SLC)
9%, 69	Family / Friends live here
9%, 69	Born here / hometown / grew up here
7%, 57	Big Lot / House Value – Good quality
6%, 44	Good schools
5%, 40	Open space / Parks
4%, 29	Low congestion (traffic, people)
3%, 22	Safety
3%, 20	Good place to raise kids
1%, 7	Clean / Well-kept
1%, 4	No through traffic
1%, 4	Cost of living
1%, 4	Good rental conditions / prices
3%, 27	Other: (7) At the time, it was affordable – housing, cost of living, etc (5) Lack of businesses and industry (5) It felt right / We were inspired to live here (2) Lack of apartments and condos (2) Trails Property appreciation Escaping California Controlled growth We were married in Alpine I needed to follow my husband I loved it

2. How long have you lived in Alpine?

Under 1 year	**8%, 60**	16-20 years	**6%, 50**
1-5 years	**29%, 228**	21-25 years	**5%, 38**
6-10 years	**24%, 191**	26-30 years	**6%, 47**
11-15 years	**15%, 117**	Over 30 years	**12%, 93**

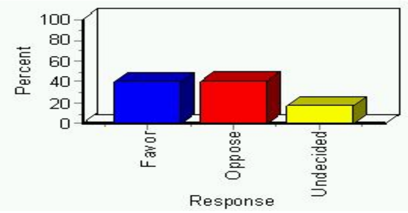
3. Which part of Alpine do you live in? (See map)

Northeast	**22%, 174**	Southeast	**30%, 241**
Northwest	**13%, 106**	Southwest	**15%, 123**
Downtown	**19%, 151**		

Recognize that while many of us like things to stay as they are, change will eventually come. People will sell land. Others will want to develop theirs. Our challenges as a City will be to guide change in such a way that the quality of life we all enjoy can be preserved. Therefore, think carefully as you answer these questions, your answers will have much to say about what our future will be like.

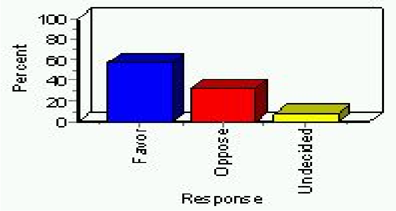
4. Our current ordinance allows for residential growth. How do you feel -- do you favor or oppose encouraging residential growth in the City?

Favor	**40%, 318**
Oppose	**42%, 334**
Undecided	**17%, 139**



5. Our current ordinance allows for limited downtown commercial growth. How do you feel -- do you favor or oppose encouraging commercial growth in the City?

Favor	**58%, 464**
Oppose	**33%, 266**
Undecided	**8%, 66**



6. If you favor commercial growth, where in the City would you like to see that growth occur and what types would you like to see? Choose as many as necessary.

Westfield Rd	**6%, 51**	Downtown Area	**49%, 394**
Canyon Crest	**8%, 61**	Healey Blvd	**3%, 24**
Alpine Hwy Area	**59%, 469**		

7. Types of Commercial--You may choose more than one.

58%, 467	Dining Out	**23%, 184**	Entertainment	**12%, 99**	Clothing
44%, 352	Rec. Center	**22%, 173**	Video Rentals	**8%, 66**	Auto Repairs
36%, 289	Groceries	**21%, 164**	Gasoline	**8%, 64**	Hospital
32%, 255	Doctors	**20%, 158**	Prescriptions	**7%, 55**	Furniture
26%, 204	Banking	**20%, 157**	Hardware	**2%, 15**	Automobiles/Appliances
25%, 201	Dental	**16%, 130**	Insurance	**8%, 65**	Other ______
24%, 191	Gifts	**14%, 108**	Guest Lodging		

- (16) Library
- (11) None
- (8) Post Office

- (3) Specialty stores
- (3) Bakery
- (3) Ice cream shop
- (3) Fast food
- (2) Bookstore (e.g. Barnes & Nobles, Borders)
- (2) Bed and breakfast
- Bagel shop
- Deli
- Dollar store
- Ice rink
- Target
- Professional attorney, designers, architects
- Skate park
- Golf course
- Pool
- Nursing home or Senior housing
- Arts and antiques
- Retail
- Art gallery other than the Arts Center

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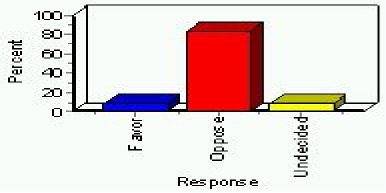
8. Currently, our ordinance does not allow industrial growth. How do you feel -- do you favor or oppose encouraging industrial growth in the City?



Favor	**8%, 61**
Oppose	**84%, 668**
Undecided	**8%, 60**

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9. If you favor industrial growth, where in the City would you like to see that growth occur and what types would you like to see? Choose as many as necessary.

Westfield Rd	**3%, 20**	Downtown Area	**5%, 40**	Canyon Crest	**2%, 16**
Healey Blvd	**1%, 10**	Alpine Hwy Area	**11%, 87**		

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10. Types of Industry--You may choose more than one.

None	**13%, 106**	Recycling	**5%, 36**
Hi-Tech	**13%, 103**	Auto Repair	**4%, 33**
Food	**11%, 84**	Manufacturing	**3%, 27**
Small/Light	**9%, 72**	Lumber	**2%, 19**
Tourism	**8%, 61**	Other	**1%, 6**
Clothing/Sewing	**5%, 43**		

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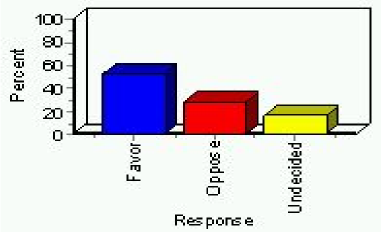
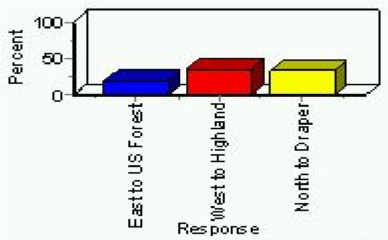
11. Some of the land surrounding Alpine is currently part of the unincorporated Utah County. It may be necessary to annex additional land into Alpine to accommodate future growth and to plan for future land uses. Do you favor or oppose future annexations of land into the City?



Favor	**53%, 422**
Oppose	**28%, 224**
Undecided	**17%, 133**

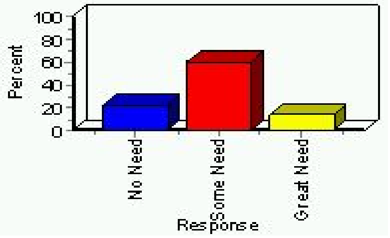
12. If you favor annexation, where should the City concentrate annexation efforts?

East to US Forest	**21%, 166**
North to Draper	**34%, 271**
West to Highland	**37%, 298**



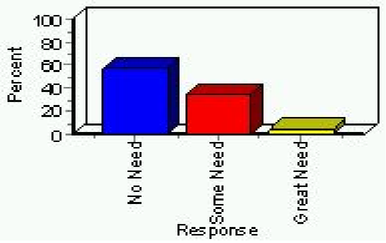
13. Do you feel there is a need in Alpine City for a retirement community?

No Need	**23%, 182**
Some Need	**60%, 483**
Great Need	**14%, 115**



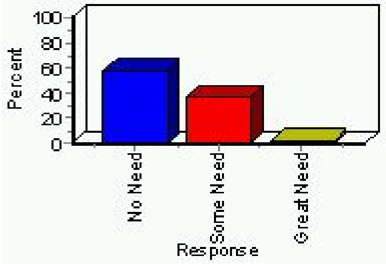
14. Do you feel there is a need in Alpine City for Condos?

No Need	**58%, 464**
Some Need	**35%, 283**
Great Need	**5%, 36**



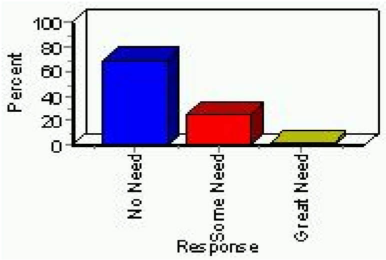
15. Do you feel there is a need in Alpine City for Twin homes?

No Need	**58%, 467**
Some Need	**37%, 295**
Great Need	**3%, 23**



16. Do you feel there is a need in Alpine City for Apartments?

No Need	**70%, 558**
Some Need	**25%, 199**
Great Need	**3%, 23**



17. Below are a list of concerns that the City should be sensitive to in planning future growth. Please rank them in order of importance to you, with 1 being most important and 9 being least important. Note: EACH NUMBER SHOULD ONLY BE USED ONCE FOR THIS QUESTION.

Hillside/Open Space Protection – Mean = 2.67

1	20%, 160	4	4%, 28	7	2%, 16
2	12%, 92	5	4%, 32	8	1%, 10
3	9%, 71	6	2%, 16	9	0%, 3

Loss of rural lifestyle – **Mean = 3.33**

1	14%, 111	4	6%, 48	7	2%, 19
2	11%, 91	5	5%, 36	8	3%, 21
3	7%, 58	6	5%, 37	9	1%, 7

Development of parks and recreation – **Mean = 3.78**

1	7%, 55	4	10%, 76	7	4%, 31
2	11%, 87	5	7%, 56	8	1%, 9
3	8%, 64	6	5%, 42	9	1%, 8

Traffic Management – **Mean = 4.55**

1	6%, 48	4	8%, 65	7	5%, 40
2	5%, 41	5	8%, 65	8	4%, 32
3	7%, 56	6	8%, 67	9	2%, 14

Preservation of Agriculture – **Mean = 5.17**

1	1%, 11	4	8%, 65	7	7%, 59
2	5%, 37	5	8%, 67	8	5%, 43
3	8%, 60	6	7%, 59	9	3%, 27

Noise Pollution – **Mean = 5.48**

1	1%, 10	4	8%, 61	7	8%, 63
2	3%, 26	5	9%, 68	8	5%, 36
3	6%, 47	6	9%, 74	9	5%, 43

Increase tax base for community projects – **Mean = 6.19**

1	2%, 15	4	4%, 31	7	9%, 68
2	3%, 27	5	7%, 52	8	12%, 96
3	3%, 26	6	6%, 47	9	8%, 66

Protect Animal Rights – **Mean = 6.86**

1	1%, 8	4	4%, 28	7	8%, 64
2	2%, 18	5	4%, 28	8	10%, 77
3	3%, 24	6	5%, 41	9	18%, 140

Affordable housing – **Mean = 6.94**

1	2%, 13	4	3%, 24	7	9%, 69
2	1%, 9	5	4%, 28	8	13%, 104
3	2%, 19	6	5%, 42	9	15%, 120

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18. Please rate, (1, 2, 3, 4, 5, 6, 7, 8 or 9) in order of importance, which type of infrastructure you feel would be most impacted by growth. The most impacted should be 1 and the least impacted should be 8. Note: EACH NUMBER SHOULD ONLY BE USED ONCE FOR THIS QUESTION.

Water – **Mean = 2.31**

1	30%, 241	4	5%, 39	7	1%, 9
2	10%, 82	5	3%, 20	8	1%, 7
3	6%, 49	6	2%, 19	9	1%, 5

Streets – **Mean = 3.22**

1	13%, 101	4	7%, 58	7	2%, 14
2	12%, 91	5	5%, 38	8	2%, 14
3	15%, 117	6	4%, 30	9	1%, 8

Sewer – **Mean = 4.26**

1	1%, 6	4	7%, 59	7	7%, 52
2	15%, 116	5	6%, 49	8	3%, 23
3	12%, 97	6	7%, 58	9	1%, 11

Parks and Recreation – **Mean = 4.75**

1	4%, 34	4	7%, 57	7	7%, 58
2	7%, 52	5	11%, 84	8	4%, 33
3	7%, 54	6	11%, 91	9	1%, 8

Pressurized Irrigation – **Mean = 5.07**

1	2%, 19	4	8%, 63	7	7%, 54
2	7%, 56	5	9%, 72	8	8%, 67
3	7%, 55	6	8%, 67	9	2%, 18

Need for Sidewalks – **Mean = 5.18**

1	2%, 18	4	11%, 88	7	8%, 65
2	4%, 32	5	10%, 79	8	6%, 46
3	6%, 48	6	9%. 71	9	3%, 24

Trails – **Mean = 5.35**

1	6%, 49	4	8%, 60	7	8%, 67
2	4%, 34	5	7%, 54	8	6%, 50
3	5%, 36	6	7%, 57	9	8%, 64

Garbage Collection – **Mean = 6.85**

1	0%, 2	4	5%, 36	7	13%, 106
2	1%, 4	5	7%, 59	8	17%, 138
3	1%, 9	6	6%, 50	9	8%, 67

Recycling – **Mean = 7.98**

1	1%, 4	4	1%, 10	7	6%, 44
2	1%, 4	5	2%, 16	8	12%, 92
3	1%, 7	6	4%, 28	9	33%, 266

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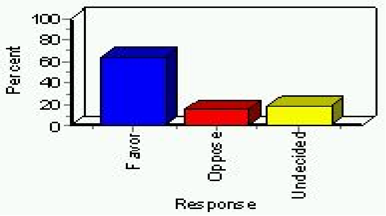
19. Are you in favor of curb, gutter and sidewalk in existing residential areas where there is currently no curb, gutter and sidewalk:

Favor	**65%, 516**
Oppose	**15%, 119**
Undecided	**19%, 150**



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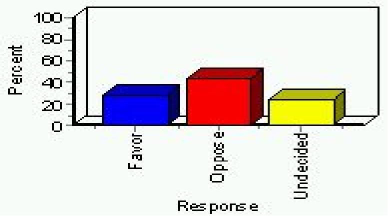
20. Do you favor or oppose a Special Improvement District (where individual property owners are responsible, not the City as a whole) to pay for the installation of curb, gutter and sidewalk?

Favor	**28%, 226**
Oppose	**44%, 352**
Undecided	**25%, 197**



21. Bonding is one way that cities and towns pay for major improvements. Bonding is when the City borrows money and promises to pay back the loan with future tax dollars or user fees. Bonding may or may not require tax increases. Do you feel the City should bond for:

The improvement of existing or future parks and recreation facilities						
Favor	**45%, 362**	Oppose	**35%, 276**	Undecided	**16%, 131**	
Road and Sidewalk Improvements						
Favor	**42%, 333**	Oppose	**36%, 289**	Undecided	**18%, 146**	
Protection of Open Space and Hillsides						
Favor	**56%, 446**	Oppose	**26%, 210**	Undecided	**14%, 115**	
Expansion of the Cemetery						
Favor	**35%, 282**	Oppose	**36%, 286**	Undecided	**26%, 206**	
Recreation Center/Swimming Pool						
Favor	**50%, 397**	Oppose	**36%, 285**	Undecided	**12%, 92**	
Skate Park						
Favor	**12%, 99**	Oppose	**72%, 578**	Undecided	**12%, 99**	
Creation of City Library						
Favor	**57%, 453**	Oppose	**31%, 244**	Undecided	**10%, 81**	

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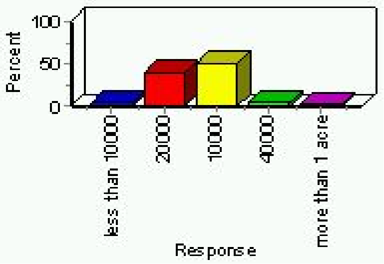
22. The current minimum residential lot size in Alpine is 10,000 square feet (approximately 1/4 acre). What minimum lot size do you suggest?

Less than 10,000 sqft	**3%, 25**	20,000 sqft (1/2 acre)	**40%, 319**
10,000 sqft (1/4 acre)	**50%, 399**	40,000 sqft (1 acre)	**3%, 26**
More than 1 acre	**1%, 11**		



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23. Animal rights, including large animals and household pets, are currently are permitted, with conditions, throughout Alpine. Are you happy with the current zoning for keeping animals?

Yes	**85%, 679**
No	**13%, 103**

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24. How do you feel about the current enforcement of leash laws?

Needs Better Enforcement	**45%, 360**
Current Enforcement is Adequate	**40%, 323**
Current Enforcement is too Harsh	**3%, 20**
No Comment	**10%, 82**

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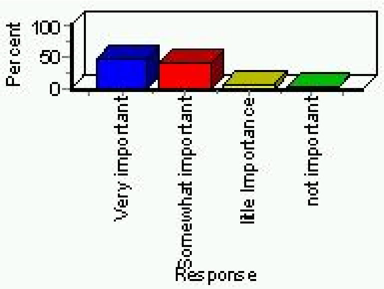
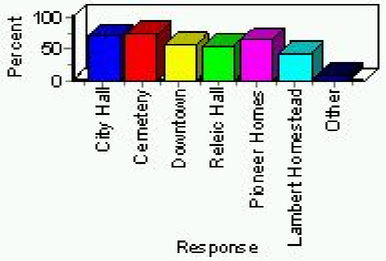
25. How important is historic preservation in Alpine to you?

Very Important	**47%, 376**	Somewhat Important	**41%, 328**
Little Importance	**8%, 67**	Not Important	**2%, 19**



26. Which historic sites are important? Check all that apply.

73%, 585	Cemetery	**56%, 450**	Downtown
69%, 550	City Hall	**56%, 447**	Relic Hall
64%, 516	Pioneer Homes	**42%, 334**	Lambert Homestead
6%, 45	Other_______		



- (35) Moyle Park
- (2) All
- Sliding Rock
- Gazebo
- Museum
- Power plant site, Early industry
- Fort Canyon
- Beck’s home by Bank of American Fork
- Red barn on Westfield Road
- Things of heritage significance

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27. Are you happy with the way public meetings are posted and advertised?

Yes	**76%, 610**
No	**19%, 152**

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28. Are you happy with the way City events (Memorial Day Services, Family First) are posted and advertised?

Yes	**90%, 716**
No	**7%, 56**

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29. The following is a list of city-wide activities or services. Please indicate the City's performance in the following areas:

Pressurized Irrigation – **Mean = 2.05**

Excellent	30%, 237	Fair	4%, 29
Very Good	37%, 298	Poor	2%, 13
Good	21%, 164	Unacceptable	1%, 4

Culinary Water – **Mean = 2.11**

Excellent	24%, 192	Fair	3%, 21
Very Good	41%, 324	Poor	1%, 8
Good	25%, 203	Unacceptable	0%, 2

Fire Protection – **Mean = 2.13**

Excellent	22%, 173	Fair	2%, 17
Very Good	38%, 307	Poor	0%, 1
Good	29%, 231	Unacceptable	0%, 0

Sewer – Mean - 2.18

Excellent	19%, 151	Fair	2%, 12
Very Good	41%, 329	Poor	1%, 4
Good	30%, 242	Unacceptable	0%, 2

Garbage Collection – **Mean = 2.24**

Excellent	16%, 130	Fair	2%, 17
Very Good	42%, 338	Poor	0%, 2
Good	33%, 260	Unacceptable	0%, 2

City Office Staff – **Mean = 2.32**

Excellent	17%, 137	Fair	6%, 44
Very Good	37%, 292	Poor	1%, 9
Good	31%, 244	Unacceptable	0%, 3

Cemetery – **Mean = 2.45**

Excellent	**11%, 91**	Fair	**5%, 42**
Very Good	**35%, 283**	Poor	**1%, 7**
Good	**37%, 295**	Unacceptable	**0%, 3**

Law Enforcement – **Mean = 2.46**

Excellent	16%, 125	Fair	9%, 73
Very Good	37%, 292	Poor	3%, 23
Good	28%, 223	Unacceptable	1%, 8

Utility Billing Options – **Mean = 2.47**

Excellent	14%, 112	Fair	7%, 53
Very Good	31%, 251	Poor	2%, 12
Good	37%, 292	Unacceptable	1%, 4

City Parks – **Mean = 2.50**

Excellent	12%, 98	Fair	7%, 57
Very Good	35%, 282	Poor	2%, 19
Good	36%, 285	Unacceptable	0%, 3

City Administration – **Mean = 2.51**

Excellent	11%, 89	Fair	7%, 58
Very Good	35%, 280	Poor	2%, 12
Good	35%, 277	Unacceptable	1%, 7

City Website – **Mean = 2.79**

Excellent	6%, 44	Fair	10%, 80
Very Good	23%, 181	Poor	3%, 20
Good	38%, 300	Unacceptable	1%, 5

Streets – **Mean = 2.94**

Excellent	7%, 54	Fair	15%, 119
Very Good	24%, 193	Poor	7%, 53
Good	39%, 314	Unacceptable	1%, 11

Code Enforcement – **Mean = 3.00**

Excellent	6%, 45	Fair	14%, 108
Very Good	21%, 169	Poor	8%, 60
Good	38%, 303	Unacceptable	1%, 10

Recreation Programs – **Mean = 3.10**

Excellent	5%, 43	Fair	17%, 138
Very Good	21%, 164	Poor	8%, 67
Good	34%, 274	Unacceptable	2%, 15

Building and Development Dept – **Mean = 3.11**

Excellent	3%, 25	Fair	17%, 135
Very Good	17%, 133	Poor	5%, 43
Good	42%, 335	Unacceptable	2%, 12

Animal Control – **Mean = 3.15**

Excellent	6%, 47	Fair	18%, 146
Very Good	23%, 183	Poor	11%, 87
Good	31%, 248	Unacceptable	3%, 23

Street Lights – **Mean = 3.20**

Excellent	6%, 46	Fair	19%, 148
Very Good	17%, 134	Poor	11%, 86
Good	37%, 296	Unacceptable	2%, 16

Library/Bookmobile – **Mean = 3.24**

Excellent	6%, 49	Fair	16%, 125
Very Good	20%, 157	Poor	9%, 69
Good	31%, 250	Unacceptable	7%, 54

Senior Citizen Opportunities – **Mean = 3.53**

Excellent	2%, 19	Fair	21%, 170
Very Good	9%, 75	Poor	13%, 102
Good	30%, 240	Unacceptable	3%, 24

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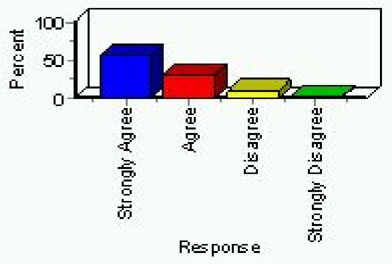
30. Should the City strongly enforce the laws against storing junk vehicles on private property?

Strongly Agree	**56%, 445**	Agree	**31%, 251**
Disagree	**9%, 70**	Strongly Disagree	**2%, 18**



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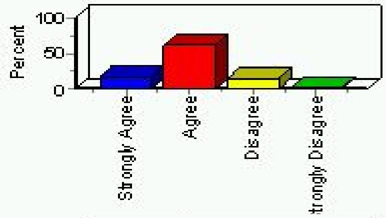
31. Should the City encourage more cultural events in the City?

Strongly Agree	**17%, 137**	Agree	**62%, 493**
Disagree	**16%, 129**	Strongly Disagree	**1%, 8**



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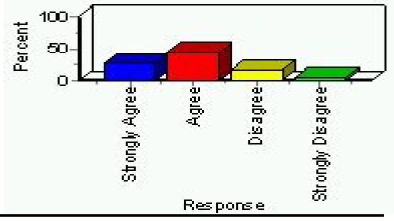
32. Should the City encourage curbside recycling?

Strongly Agree	**27%, 217**	Agree	**45%, 361**
Disagree	**18%, 143**	Strongly Disagree	**7%, 52**



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33. If your are in favor of recycling would you pay an additional fee for this service?

Yes	**41%, 324**
No	**52%, 413**

34. In which of the following locations do you purchase the majority of the following goods and services? Mark as many as apply.

a. Gasoline

Alpine	30%, 240	Lehi/AF	19%, 149	SL County	25%, 203
Highland	18%, 143	Other Utah Co	39%, 311	Internet	0%, 0

b. Groceries

Alpine	6%, 51	Lehi/AF	27%, 213	SL County	8%, 61
Highland	73%, 587	Other Utah Co	23%, 183	Internet	0%, 0

c. Hardware

Alpine	0%, 0	Lehi/AF	71%, 568	SL County	6%, 44
Highland	1%, 10	Other Utah Co	29%, 235	Internet	0%, 1

d. Dining out

Alpine	1%, 10	Lehi/AF	45%, 362	SL County	37%, 298
Highland	6%, 44	Other Utah Co	60%, 477	Internet	0%, 0

e. Prescriptions

Alpine	6%, 47	Lehi/AF	21%, 170	SL County	3%, 25
Highland	65%, 516	Other Utah Co	11%, 87	Internet	3%, 25

f. Doctors

Alpine	6%, 51	Lehi/AF	61%, 487	SL County	9%, 72
Highland	12%, 93	Other Utah Co	29%, 231	Internet	0%, 0

g. Hospital

Alpine	0%, 2	Lehi/AF	69%, 554	SL County	10%, 82
Highland	1%, 11	Other Utah Co	28%, 220	Internet	0%, 0

h. Dental

Alpine	27%, 215	Lehi/AF	34%, 268	SL County	9%, 73
Highland	9%, 68	Other Utah Co	26%, 207	Internet	0%, 0

i. Banking

Alpine	48%, 380	Lehi/AF	25%, 199	SL County	9%, 71
Highland	28%, 225	Other Utah Co	15%, 116	Internet	3%, 23

j. Auto repair

Alpine	4%, 28	Lehi/AF	47%, 374	SL County	13%, 102
Highland	12%, 95	Other Utah Co	37%, 294	Internet	0%, 0

k. Automobiles

Alpine	0%, 2	Lehi/AF	19%, 151	SL County	37%, 292
Highland	1%, 6	Other Utah Co	47%, 378	Internet	2%, 18

l. Appliances

Alpine	0%, 1	Lehi/AF	13%, 104	SL County	24%, 194
Highland	0%, 2	Other Utah Co	70%, 558	Internet	1%, 10

m. Clothing

Alpine	0%, 2	Lehi/AF	26%, 209	SL County	44%, 354
Highland	0%, 1	Other Utah Co	67%, 538	Internet	7%, 57

n. Insurance

Alpine	2%, 14	Lehi/AF	28%, 220	SL County	23%, 180
Highland	2%, 18	Other Utah Co	37%, 293	Internet	7%, 52

o. Furniture

Alpine	0%, 1	Lehi/AF	5%, 40	SL County	38%, 303
Highland	0%, 2	Other Utah Co	73%, 583	Internet	2%, 17

p. Entertainment

Alpine	5%, 36	Lehi/AF	50%, 399	SL County	44%, 349
Highland	3%, 23	Other Utah Co	55%, 442	Internet	1%, 10

q. Video Rental

Alpine	7%, 56	Lehi/AF	45%, 358	SL County	2%, 12
Highland	35%, 279	Other Utah Co	10%, 79	Internet	4%, 28

r. Gifts

Alpine	4%, 30	Lehi/AF	43%, 345	SL County	34%, 274
Highland	5%, 43	Other Utah Co	60%, 478	Internet	10%, 78

s. Guest Lodging

Alpine	2%, 15	Lehi/AF	16%, 125	SL County	30%, 237
Highland	1%, 4	Other Utah Co	33%, 263	Internet	7%, 54

t. Recreation Center

Alpine	0%, 3	Lehi/AF	63%, 505	SL County	5%, 38
Highland	2%, 12	Other Utah Co	17%, 137	Internet	0%, 3

u. Other

Alpine	2%, 13	Lehi/AF	8%, 61	SL County	9%, 73
Highland	2%, 16	Other Utah Co	14%, 115	Internet	6%, 44

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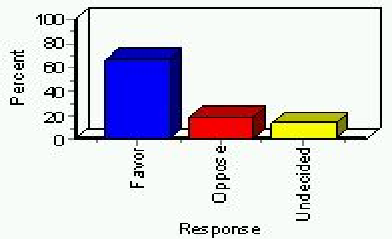
35. Do you favor or oppose trails in residential areas in Alpine City?

Favor	**67%, 532**
Oppose	**18%, 143**
Undecided	**13%, 106**



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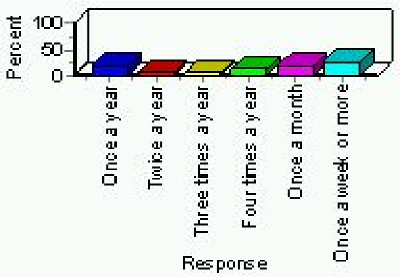
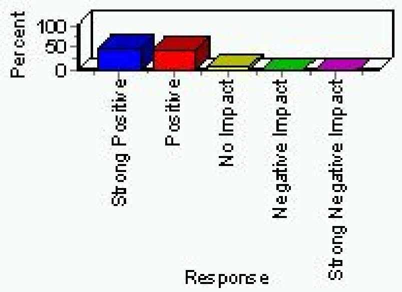
36. How often do you use the Alpine City Trails?

Once a year	**19%, 149**	Twice a year	**7%, 53**
Three times a year	**7%, 54**	Four times a year	**11%, 87**
Once a month	**19%, 155**	Once a week or more	**27%, 212**

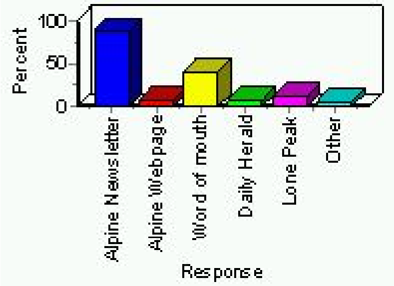


37. What impact do you feel the Alpine City Celebrations (Alpine Days, etc.) have on the community?



Strong Positive Impact	**48%, 385**	Positive Impact	**43%, 343**
No Impact	**6%, 49**	Negative Impact	**1%, 5**
Strong Negative Impact	**0%, 1**		

38. How do you hear about what is happening in Alpine?

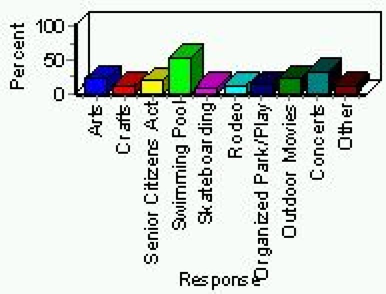


Alpine Newsletter	**88%, 704**
Alpine Website	**8%, 63**
Word of Mouth	**40%, 318**
Daily Herald	**8%, 66**
Lone Peak	**12%, 99**
Other	**6%, 51**

39. Should Alpine continue to publish a newsletter for its citizens?

Yes	**96%, 770**
No	**2%, 16**

40. What recreation opportunities would you like to see that are currently not provided?



Swimming Pool	**52%, 416**	Organized Park/Play	**14%, 111**
Concerts	**31%, 246**	Crafts	**13%, 104**
Outdoor Movies	**22%, 173**	Rodeo events	**12%, 92**
Arts	**21%, 168**	Skateboarding	**9%, 72**
Sr. Citizens Activities	**19%, 152**	Other_______	**10%, 81**

- (21) Library
- (18) Recreation/Fitness Center
- (18) None
- (5) More tennis courts (indoor/outdoor) and programs
- (3) More trails – for dirt bikes, hiking, and paved for bikes, etc
- (2) More plays / Bigger playhouse
- Preserve access to North and East mountains
- Summertime evening activities for families
- No opinion
- Gun range
- Golf tournament
- Skate Park
- Cheaper baseball and soccer programs
- Fitness classes
- Boutiques
- Movies
- Recreation classes for children
- More dedicated parks

Now just a few questions for statistical purposes.... We know these are personal questions, but they help us when the City is applying for grants or complying with state and federal laws. Thank you for your assistance.

41. Do you own or rent the home you live in?

Own	**94%, 750**
Rent	**5%, 39**

42. If you own your home is it paid off?

Yes	**25%, 197**
No	**69%, 549**

43. Do you have an accessory apartment?

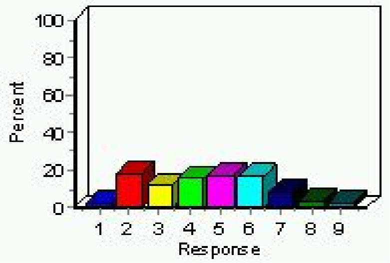
Yes	**10%, 82**
No	**86%, 686**

44. If yes, Is your accessory apartment currently occupied?

Yes	**5%, 36**
No	**21%, 168**

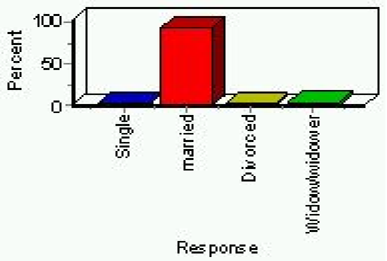
45. How many people live in your house?

1	**3%, 27**	4	**15%, 122**	7	**8%, 64**
2	**19%, 149**	5	**18%, 141**	8	**4%, 34**
3	**12%, 94**	6	**17%, 133**	9 or more	**3%, 24**



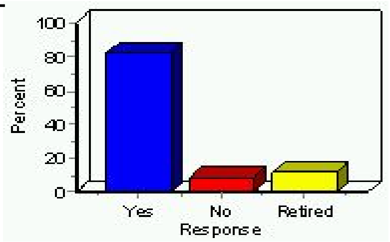
46. What is your current marital status?

Single	**2%, 15**	Married	**92%, 732**
Divorced	**2%, 17**	Widow(er)	**3%, 25**



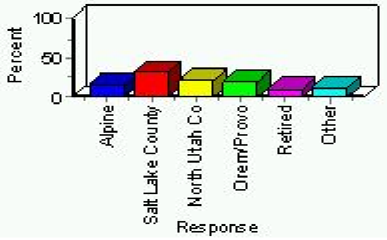
47. Are you currently employed?

Yes	**82%, 655**
No	**9%, 70**
Retired	**12%, 94**



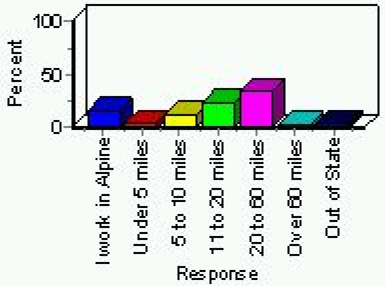
48. Where do you work?

Alpine City	**16%, 128**	Salt Lake Co.	**32%, 255**
North Utah Co.	**22%, 171**	Orem/Provo	**19%, 152**
Retired	**11%, 91**	Other	**13%, 105**



49. If not, how far do you commute to work one way? If more than one family member works mark all that apply.

I work in Alpine	**15%, 119**	20 to 60 miles	**35%, 277**
Under 5 miles	**4%, 32**	Over 60 miles	**3%, 25**
5 to 10 miles	**12%, 94**	Out of State	**5%, 43**
11 to 20 miles	**23%, 185**		



50. Which category best describes your age?

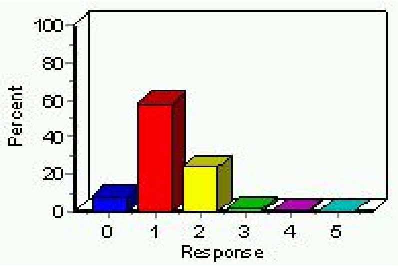
Under 20	**1%, 4**	35 to 39	**16%. 131**	55 to 59	**9%, 71**
20 to 24	**4%, 10**	40 to 44	**19%, 150**	60 to 64	**7%, 59**
25 to 29	**3%, 27**	45 to 49	**15%, 119**	65 and older	**4%, 111**
30 to 34	**7%, 58**	50 to 54	**14%, 108**		

51. Please indicate your household income level. This information is important when applying for certain types of grants and funding for the City.

Under $30,000	**5%, 39**	$120,001 -- $130,000	**4%, 34**
$30,001 -- $40,000	**4%, 33**	$130,001 -- $140,000	**2%, 14**
$40,001 -- $50,000	**7%, 57**	$140,001 -- $150,000	**2%, 17**
$50,001 -- $60,000	**6%, 51**	$150,001 -- $160,000	**3%, 26**
$60,001 -- $70,000	**6%, 45**	$160,001 -- $170,000	**1%, 9**
$70,001 -- $80,000	**7%, 57**	$170,001 -- $180,000	**1%, 7**
$80,001 -- $90,000	**8%, 63**	$180,001 -- $190,000	**1%, 8**
$90,001 -- $100,000	**9%, 70**	$190,001 -- $200,000	**2%, 15**
$100,001 -- $110,000	**6%, 50**	Over $200,001	**13%, 102**
$110,001 -- $120,000	**5%, 42**		

52. How many are working in your family to make the income listed above?

0	**8%, 65**	3	**1%, 11**
1	**58%, 466**	4	**1%, 8**
2	**24%, 195**	5+	**0%, 1**



53. Please figure the percent of your household income which goes towards housing costs. On the chart below, identify your yearly household income and the approximate amount you pay for housing (i.e. house payment or rent + utilities, taxes, etc.) per month. Please write the percentage category you fall into at the bottom. Example: If your yearly income is $55,000 and you pay $1,375 for housing --you are in the 30% category and you would fill in the 30% bubble. If you have no payment or rent, fill in the 0% bubble.

0%	**9%, 71**	15%	**7%, 56**	30%	**16%, 127**
5%	**3%, 22**	20%	**22%, 179**	35%	**4%, 33**
10%	**12%, 94**	25%	**5%, 36**	40% **+**	**7%, 54**

What do you like about Alpine?

42%, 337	Family-Centered community / Good neighborhood / Good quality of life / Educated Population
39%, 314	Beauty / Viewshed / Mountains (accessibility to them) / Nature
32%, 258	Small Town / Rural Atmosphere
24%, 193	Secluded/Private/Quiet/Setting
7%, 56	Open space/Parks
6%, 50	Safety
6%, 43	Good schools
3%, 27	Big Lot / House Value – Good quality
3%, 25	Low congestion (traffic, people)
3%, 25	Clean / Well-kept
2%, 18	Good place to raise kids
2%, 16	Location in relation to other cities (i.e. Provo, SLC)
8%, 60	Other_______

- (11) Lack of Commercialism and/or Industry
- (11) Everything
- (11) No Through Traffic
- (9) Hometown / Grew up here
- (3) Family and/or friends live here
- (2) Alpine concentrates on preservation rather than urban sprawl
- (2) Fabulous place
- Dark skies at night – can see the stars
- Great weather
- Few bugs
- Opportunities to voice opinions and get involved
- Nearby churches
- Animals kept under control
- Friendly police and city officials
- Mountain biking in Lambert Park
- Pressurized irrigation
- Support of events/arts/crafts
- Reasonable lot prices

What do you dislike?

23%, 186	Growth – losing small town feel / congestion / smaller lots / developer-controlled growth
11%, 83	Lack of services (e.g. library, swimming pool, rec center, post office)
9%, 68	Lack of commercial (stores, restaurant, etc)
8%, 60	Loss of open space / viewsheds / access
7%, 53	Elitism – poor attitudes re. class divisions

6%, 45	Traffic – congestion, speeders, parking
5%, 43	Poor animal control (leash law enforcement, barking)
5%, 36	High property / home costs – High taxes / cost of living
4%, 32	Poor government / city council decisions
4%, 30	Long commutes (to shop, eat, recreation, etc)
4%, 29	Poor service / maintenance (streets, cemetery, trails, etc)
3%, 19	Planning (poor zoning, urban sprawl planning, street size, sidewalks, etc)
2%, 17	Police (mean, too strict, poor enforcement, etc)
2%, 16	Lack of diversity (ethnic groups, socio-economic status, etc)
1%,11	Lighting for streets, trails, etc
1%,9	Too many deer
1%,9	Code enforcement
1%,5	City staff (unfriendly, unhelpful, etc)
1%,8	Overwhelming LDS culture/ultra-conservatism
8%,64	Other_______

- (10) Unkept yards / lots – junk, weeds, etc
- (7) Overcrowded schools
- (5) Ecessive noise due to construction, trucks, etc
- (3) Light pollution
- (2) Unfriendly people
- (2) Pressurized Irrigation – fee too high, poor service, etc
- Lehi and Draper closing in
- The wind
- Older broken down homes in old part of City
- Lack of community support for the arts
- Nothing
- Unenforcement of apartments and rental units
- Clay soil
- Alpine Days – decrease in quality
- Cougars in backyard
- Storm drainage
- People who fear new open space and trails will infringe on property rights
- Not much for teenagers to do
- Hard to find a half acre lot to build on
- Fast and reckless drivers
- ATVs and dirt bikes on public streets
- Politics in youth and high schools sports
- Joggers not wearing bright or reflective clothing
- Water billing – bill me for what I use, not what others use
- Lack of support for local businesses
- Allowing parking on streets
- Need more stop signs
- ATVs in mountains and trails
- Power outage
- Lack of parking at Healey Park and Smooth Canyon Park
- Bell at City Hall – early morning chimes
- Cemetery lot purchase limitations for long-time / senior residents

What would you like to see stay the same?

23%, 186	Small Town / Rural Atmosphere
15%, 118	Open space/parks/trails
10%, 82	Controlled Growth / low congestion (traffic, people)
8%, 66	Beauty / Viewshed / Mountains(and accessibility to them) / stop building on mountains
6%, 45	Family-Centered community / Good neighborhood / Good quality of life / Educated Population
5%, 38	Alpine Days
4%, 35	Low commercial / industry
4%, 35	Secluded / Private / Quiet / Setting
4%, 30	Big Lot / House Value/Quality – Avoid decreasing lot sizes
3%, 24	Downtown Preservation – historic/old homes and buildings
2%, 12	Safety
1%, 8	Good schools
1%, 8	Clean/Well-kept
1%, 8	Lack of Apartments / multi-family dwellings
1%, 6	Cost of living – no higher taxes
1%, 5	Street quality / sidewalks and gutters (install/don't install)
7%, 59	Other_______

- (22) Everything / About everything
- (3) Good place to raise kids
- (3) Water quality
- (2) City evernts/activities
- (2) Alpine traditions / appreciation for them
- (2) Lack of street lights
- (2) Roundabout and its landscaping
- Gazebo back up
- The two major creeks and their beds
- Many old-timers
- Holiday lights and festive atmosphere
- Welcoming new-comers
- Not so harsh animal control – keep as is
- The name
- Off-road vehicle access
- Lack of apartments
- Alpine newsletter
- Change is always good
- No more main roads
- Nothing, everything changes
- Bells at City Hall
- Well-kept yards
- New cemetery rules are a little severe
- Population
- Housing
- Change – consider all options, don't be persuaded by special interests
- The way it was 10, 20, 30 years ago
- Business closed on Sunday / No alcohol
- Family First
- No through traffic

If you could add one thing to the City, what would it be?

16%, 128	Library
16%, 127	Recreation Center
13%, 100	Swimming pool
7%, 54	More commercial / industry (bigger tax base)
6%, 45	Restaurant
5%, 43	Preserve open space / green space / parks (more of) / access to mountains / trails (paved for biking, jogging, etc)
2%, 16	Better controlled growth
2%, 12	City government – better decisions, planning, professionalism
1%, 11	Post Office
1%, 10	Skate Park
1%, 9	Movie theater / amphitheater / auditorium
1%, 7	Senior citizen center / activities / senior housing
1%, 6	More street lights
1%, 6	Sidewalks, gutters, improved streets
1%, 6	Ice cream parlor / bakery / small café
1%, 6	More diversity/acceptance – all-inclusive events
1%, 5	More city events / performing cultural arts
1%, 4	Traffic control / better speed enforcement
10%, 80	Other_______

- (5) Curbside recycling (free)
- (4) Put gazebo back up
- (3) Deer control / protection / Wildlife wintering area
- (3) A bar / Brew pub
- (3) More righteousness / integrity / humility among city officials and public
- (3) Beautify downtown – more attractive homes/buildings
- (3) Another main road – city entrance/exit
- (2) Golf course
- (2) Better enforcement of leash laws
- (2) Improve culinary and pressurized irrigation system and pay what is used
- (2) Consider less affluent – taxes are too high
- Create "old-town" with shops in old homes
- Updated Alpine sign
- Zions Bank
- Emergency preparation emphasis
- More beautiful and hallowed cemetery
- More trees
- Divide City into eight (8) sections – neighborhood representatives give input
- Remove ugly business buildings
- Continued weekend entertainment for locals
- Mayor and city council not led by developers
- Add recreation for girls (e.g. softball, volleyball)
- Better play structures for kids in City parks
- Fast food
- Better cell phone reception
- More participation in City politics, activities
- Able to decorate graves at cemetery
- Public mass transit connections
- Discoteque
- Indian casinos

- Annex all land around city
- Attractive homes/buildings on Main Street
- More recreation facilities for soccer, baseball, football
- A theme park
- A giant tower
- Development plan that gives City a uniqueness
- Bike paths/lanes on streets
- Monitor motor scooters before injuries/fatalities occur
- Better parking at rodeo grounds
- Remove commercial ads from Alpine Days
- Retirement centers
- Maintained restrooms at City parks
- Electronic announcement sign outside City Hall
- Alpine Pediatrics
- Better law enforcement
- Horse park
- Farmers’ market
- Nothing
- New Jr. High and Arts Center
- More roundabouts
- More tennis courts with lights
- Specialty foods
- Affordable housing
- Buy all empty land around cemetery for future need – e.g. Buckner property
- More recreation programs

Thank you for your time. Please list below any other information that you would like to city Council and Planning Commission to know when they are preparing the General Plan and Zoning Ordinance. We appreciate your input.

Comments:

6%, 51	Better development planning/control growth
4%, 33	Thank you for your service and taking input
1%, 10	Maintain quiet, small-town feel
1%, 9	Improve / maintain streets better – enlarge streets, another city entrance/exit
1%, 9	Preserve / add open space – more parks (clean, beautify parks)
1%, 9	More/better maintained trails
1%, 8	More commercial
1%, 7	Do not put a skate park here
1%, 7	Regulations / enforcement on lot maintenance/cleanliness
1%, 6	No new or higher taxes – property/home prices
1%, 6	Maintain / improve pressure, maintenance and/or cleanliness of culinary water & P.I.
1%, 5	Pool/Recreation Center – with activities for all ages
1%, 4	Animal control – leash law enforcement, code enforcement
8%, 63	Other_______

- (9) Alpine is great / Great people
- (3) Address overcrowded schools issue
- (2) Put gazebo back up
- (2) Preserve Alpine’s beauty / Family attractiveness
- SR 92 should be divided, restricted highway to allow access to I-15
- Police / Firefighters do a good job
- Silent majority should have more of a say than radical verbal minority

- There should be a mailing list for City meetings/minutes
- Don’t let Lehi/Draper/Highland dictate our environment, views, open space, access to mountains, etc
- There should be a TRAX connection
- More winter range/habitat for wildlife
- Keep Westfield Road as is
- Limit street parking
- More walking routes to schools
- Bring back bakery booth at Alpine Days
- I love bells at City Hall
- City needs to deal with some serious neighborhood issues
- Need better enforcement of pedestrian crossing lanes
- Great use of Youth Council / How about a Senior Council?
- Remove commercial trucks from lots in residential areas
- Enforce speed limit on Grove Drive
- No more annexations necessary
- Don’t allow more development in Fort Canyon
- Don’t expect citizens to pay for plumbing problems under streets
- Remove traffic circle / Family First
- Adult city-league sports
- Don’t assume you need to float bonds to raise capital for infrastructure – let developers develop and pay for improvements
- Create consistent look in community with standardized roads, sidewalks, signage, etc
- More historic preservation
- Replace fire hydrant on 770 North
- Adopt an owner occupied basement apartment ordinance similar to Lindon
- Maintain budgets and get out of debt
- Add noise ordinance / Limit heavy, noisy traffic
- Add restaurant(s)
- Raising taxes is not always bad if used to better the community
- More good hang-out places for kids
- Provide dumpsters throughout City during certain times of the year
- Remove commercialism/advertisements from Alpine Days
- “Downtown” should be Main Street (below 2nd North) and South to outskirts of Alpine
- Bring Alpine Pediatrics here
- Put more parking by soccer fields
- Improve look of some businesses (curb appeal of business South of roundabout
- Should require pre-approval of basement apartments by neighbors
- Sidewalks look nice
- Please clean up Fort Canyon

Appendix B

ALPINE CITY SURVEY RESULTS COMMENTARY

1. What is the main reason you decided to live Alpine?

Thirty-four percent (34%) picked small town/rural atmosphere, while 28% like the beauty and mountains. Eighteen percent (18%) liked the seclusion and 16% liked that Alpine was family-centered. The vision statement of the plan should include these items and the City should strive to maintain these qualities because they are important to the residents.

2. How long have you lived in Alpine?

Eight percent have lived in Alpine less than a year, while 29% have live here between 1-5 years. This means that a full 37%, or over 1/3 of all residents have lived here less than 5 years. The City may be struggling with an identity crisis as new people move in and may want to change thing. However, it appears that most people who live in Alpine choose to because of its unique characteristics. It would be expected that new move-in would be more likely to want to preserve Alpine than change it.

4. Our current ordinance allows for residential growth. How do you feel -- do you favor or oppose encouraging residential growth in the City?

Forty-two (42%) oppose, while 40% favor. This question is within the margin of error. It might be interesting to cross tab this question with length of residency to see if it makes a difference.

5. Our current ordinance allows for limited downtown commercial growth. How do you feel -- do you favor or oppose encouraging commercial growth in the City? (Also questions 6, 7, and 8.)

Fifty-eight (58%) percent favor commercial growth. The question is whether they support it for their own convenience and whether they will support it financially. Most people (59%) would like to see it occur south of the roundabout. Most people would like to see a dining establishment and/or a recreation center. Eighty-four (84%) oppose industrial growth. We typically look at commercial growth as convenience and industrial growth as jobs. It appears people are more concerned about convenience than jobs.

11. Some of the land surrounding Alpine is currently part of the unincorporated Utah County. It may be necessary to annex additional land into Alpine to accommodate future growth and to plan for future land uses. Do you favor or oppose future annexations of land into the City?

Fifty-three (53%) percent favor annexation. This is probably due to a desire to have land surrounding Alpine under the control of local officials and regulation. There may be some fear the unincorporated land may develop in the future. There is probably also a need to educate the public about the current annexation agreements with surrounding jurisdictions.

13. Do you feel there is a need in Alpine City for a retirement community?

Some Need 60%; 483 Great Need 14%; 115

14. Do you feel there is a need in Alpine City for Condos?

Some Need 35%; 283 Great Need 5%; 36

15. Do you feel there is a need in Alpine City for Twin homes?

Some Need 37%; 295 Great Need 3%; 23

16. Do you feel there is a need in Alpine City for Apartments?

Some Need 25%; 199 Great Need 3%; 23

These questions relate to non-single family housing. While the majority (74%) feels there is either great or some need for retirement housing, the vast majority are opposed to other forms of non-single family housing. This should not be construed to be opposition to affordable housing, but rather the types of housing permitted to keep the rural feel of Alpine.

19. Are you in favor of curb, gutter and sidewalk in existing residential areas where there is currently no curb, gutter and sidewalk:

Favor 65%; 516 Oppose 15%; 119 Undecided 19%; 150

20. Do you favor or oppose a Special Improvement District (Where individual property owners are responsible, not the City as a whole) to pay for the installation of curb, gutter and sidewalk?

Favor 28%; 226 Oppose 44%; 352 Undecided 25%; 197

Most people are in favor of curb, gutter, and sidewalk, but they do not want to pay for it themselves.

21. Bonding is one way that cities and towns pay for major improvements. Bonding is when the City borrows money and promises to pay back the loan with future tax dollars or user fees. Bonding may or may not require tax increases. Do you feel the City should bond for:

Protection of Open Space and Hillsides
Favor 56%; 446 Oppose 26%; 210 Undecided 14%; 115

Recreation Center/Swimming Pool
Favor 50%; 397 Oppose 36%; 285 Undecided 12%; 92

Skate Park
Favor 12%; 99 **Oppose 72%; 578** Undecided 12%; 99

Creation of City Library
Favor 57%; 453 Oppose 31%; 244 Undecided 10%; 81

Anytime that you have over fifty (50%) in favor of bonding with out knowing the costs, the City should investigate the issue further. The approach would be to list what could be done with three or four funding scenarios. This should be presented back to the public for comment. It is possible that the public is only willing to pay such a small amount that a project is not feasible. Two items to note in the above responses. First, the actual ballot results of protecting open space are opposite of the survey results. This probably means that the public is not necessarily opposed to bonding to protect open space, but was opposed as it was presented on the ballot. Second, the opposition to a skate park is different than the perception of most members of City Council, because youth often attend meetings requesting such a park. If the council went ahead to develop a park they may see opposition from the public at large and definitely from neighbors.

34. Where do you buy your goods and services?

Gasoline, dental, banking were rated high for Alpine in this question.

35. Do you favor or oppose trails in residential areas in Alpine City?

Favor	67%; 532	Oppose	18%; 143	Undecided	13%; 106

36. How often do you use the Alpine City Trails?

Twice a year	7%; 53	Three times a year	7%; 54
Once a month	19%; 155	Once a week or more	27%; 212

People favor trails and they use them.

41. Do you own or rent the home you live in?

Own	94%; 750	Rent	5%; 39

42. If you own your home is it paid off?

Yes	25%; 197	No	69%; 549

There is a high rate of home ownership in Alpine. Typically, one would expect about eighty (80%) percent owners verses twenty (20%) rentals. This also indicates high affordability for the people who live in the homes, because they must be affordable to qualify for a mortgage.

43. Do you have an accessory apartment?

Yes	10%; 82	No	86%; 686

44. If yes, Is your accessory apartment currently occupied?

Yes	5%; 36	No	21%; 168

There are accessory apartments in the community with nearly half being vacant. The City should seek to fill these existing apartments before adding new apartments.

47. Are you currently employed?

Yes	82%; 655	No	9%; 70	Retired	12%; 94

48. Where do you work?

Alpine City	16%; 128	Salt Lake County	32%; 255
North Utah Co.	22%; 171	Orem/Provo	19%; 152
Retired	11%; 91	Other	13%; 105

A high number of residents are employed and a third of the employed work in Salt Lake. The city is a city of commuters.

51. Please indicate your household income level. This information is important when applying for certain types of grants and funding for the City.

Under $30,000	5%; 39	$90,001-$100,000	9%; 70	$160,001-$170,000	1%, 9
$30,001-$40,000	4%; 33	$100,001-$110,000	6%; 50	$170,001-$180,000	1%; 7
$40,001-$50,000	7%; 57	$110,001-$120,000	5%; 42	$180,001-$190,000	1%; 8
$50,001-$60,000	6%; 51	$120,001-$130,000	4%; 34	$190,001-$200,000	2%; 15
$60,001-$70,000	6%; 45	$130,001-$140,000	2%; 14	Over $200,001	13%; 102
$70,001-$80,000	7%; 57	$140,001-$150,000	2%; 17		
$80,001-$90,000	8%; 63	$150,001-$160,000	3%; 26		

52. How many are working in your family to make the income listed above?

0	8%; 65	3	1%; 11
1	58%; 466	4	1%; 8
2	24%; 195	5+	0%; 1

The incomes are high, but the number of workers per household is low. Many similar size communities in Utah would be about equally split between one and two worker households.

53. Please figure the percent of your household income which goes towards housing costs. On the chart below, identify your yearly household income and the approximate amount you pay for housing (i.e. house payment or rent + utilities, taxes, etc.) per month. Please write the percentage category you fall into at the bottom. Example: If your yearly income is $55,000 and you pay $1,375 for housing --you are in the 30% category and you would fill in the 30% bubble. If you have no payment or rent, fill in the 0% bubble.

0%	9%; 71	25%	5%; 36
5%	3%; 22	30%	16%; 127
10%	12%; 94	35%	4%; 33
15%	7%; 56	40% or more	7%; 54
20%	22%; 179		

Only about eleven (11%) are living in unaffordable housing.

Appendix C

ALPINE CITY COMMUNITY VISIONING RESULTS

Community Vision—$240

Small town feel $110
Open space $60 (2)
Low taxes $50
Protected Mt ranges $20

Local parks (3)
Clean (2)
Friendly (2)
Safe (2)
Trails (2)
Walkable (2)
Warm people (2)

Attract people from all over
Bedroom Community
Closeness
Cohesive
Green streets
Heritage
High values
Interconnecting trails
Light commercial
Low density
Peaceful
Preserved hillsides
Protected wildlife
Residential
Tranquil
Unique

To provide and maintain Alpine's small town feel, while preserving open space and the mountain ranges and keeping taxes low. In addition, to maintain the City as a safe, clean, friendly place to live that is attractive and walkable with ample parks and trails.

Land Use—$210

Protect hills and mountains $90
No motorized vehicles in parks and open space $50
Open hillsides $50
Sidewalks $10
Low density $10

Open Space and Trails (8)
Parks (3)
Trails (2)

Central gathering place
Commercial
Infill of empty lots
Large lots
Limited retail
Local parks
Minimal commercial
Mostly Residential
Natural open space
Nice subdivisions
No business sprawl
No apartments
No multi-unit apartments
No large retail
Non-street connections between subdivisions
Open developments
Promote agricultural use
Variety of lot sizes

To protect and preserve the hillsides, mountains, parks and trails, while permitting a range of land uses that allow low impact residential and commercial development which are in harmony with the Alpine Community Vision Statement.

Circulation (Transportation)—$10

Trail heads at/to forest $10 (2)

Biking/Bicycle trails (6)
Circulation/Flow (5)
Trails (5)
Walkable/Walking (4)

Automobile
Bus service
Country roads
Good bus system to downtown
Hiking
Horse trails
More stop signs
No UTA
Public
Quick and efficient roads
Safe
Safe Sidewalks
Segway
Sidewalk loops
Sidewalk
Speed bumps

To provide a well-connected multi-modal transportation system, including bikes, pedestrians and trail users with a connections to the forest service.

Historic Preservation—$40

Alpine History $20
Downtown $10 (3)
Historic Lambert park $10 (2)

Hillsides (2)
Historic trails (2)
Moyle park (2)
Old historic/pioneer homes (2)
Relic hall (2)
Sliding rock (2)
Views (2)

Accessible creeks
Agrarian heritage
Alpine days
Benefits to preserve historic homes
Bowery
Burgess market building
Cemetery
Family centered
Lambert home site
Parks
Poppies
Spirit of Alpine
Tree tunnel trail
Update Alpine yesteryears

To preserve the history and heritage of Alpine and its residents through protection of the downtown area, Lambert park, historic homes and structures, and the views and hillsides.

Public Facilities—$140

Library $50 (6)
Rec. Center $50 (2)
No library $30
Community center $10

Restrooms/Improvements at Rodeo grounds (3)
Senior center (3)
Skate/Bike park (2)

Acquire more open space
Camping area
Do not compete with private sector
Larger cemetery
Limited basic services
More ballfields
Our own friendlier police force
Parks
Pool
Recreational parks for youth
Whitby park for recreation

To provide well-maintained and appropriate public facilities such as, a library, recreation center, community/senior center, and improvements to the rodeo grounds.

Housing—$10

Low density housing $10

Senior housing (2)

Accessory apartments
Apartments
Attached housing
Encourage basement apartments (rebate)
Family friendly neighborhoods
Low density
Multi-family downtown
No change
No condos
No “hotel” type
No apartments
No multiple housing
No ticky-tacky
No apartment buildings
No housing on hillsides
Planned developments
Preserve animal rights
Restrict size of houses
Set minimum standards
Single family
Traditional neighborhoods (porches, garages in back)

To provide affordable, safe, clean, well-planned and attractive housing opportunities to all residents of the community with special emphasis on opportunities for senior citizens.

Economic Development—$20

Grocery store $20 (2)

Small businesses (3)
Minimal economic development (2)

Basic services
Centralized business district
Commercial growth to blend
Commercial limited to present area
Controlled
Destination point
Light retail
Limited commercial
Limited
Money from taxes and impact fees
Needed services
No cheap developments
No industrial
One gas station
Tax break

To provide limited economic development within the existing downtown area targeted mainly at a small grocery store and other small low-impact businesses.

Environment—$60

Trustworthy $50
Recycle $10 (4)

Protect mountains (3)
Safe (3)
Clean (2)
Friendly (2)
Green (2)
Open Space (2)

Close
Inviting
Keep the elk and deer
Keep streams and creek clean
Know neighbors
Land rights for animals
No motorized vehicles in open space or parks
No fluoride in the water
Preserve animal paths
Protect recreation areas
Protect the poppies
Require more street/yard trees
Stricter erosion control for new dev & housing
Trees in park
Walkable
Wildlife

To provide a trustworthy environment that encourages recycling, protects the mountains and is safe, clean, and friendly with ample green open space.

Annexation—$20

Extend to forest boundary on east and north $20

Keep to current plan (3)
No (3)
Cove (2)

Low density (five acre +)
No further west
No further south
Protect hills
Purchase of more
Restrict use of roads
Stop Draper creep
Up to forest
West hillsides

To limit annexations to those that are consistent with the current annexation plan, while aligning the City boundaries with the forest service boundary on the east and north and including the cove area.

Appendix D

ALPINE CITY GENERAL PLAN METHODOLOGY

The Alpine City General Plan was prepared using a nine step rational model planning method. The rational model is widely used in the planning profession. Each of the nine steps are listed below with an explanation of how each step was used in the development of the plan.

Step 1: Identify Issues and Options

To be relevant, the planning process must not only look at contemporary issues, but also at emerging issues. Two procedures were used to identify current and emerging issues in Alpine. The first procedure used the Delphi method, or a panel of experts. The panel of experts in this case represented members of the City Council and Planning Commission. They were asked a series of forward-thinking questions on each of the elements of the General Plan. Their responses were written on index cards that were then placed on the wall of the Council Room. Each member of the panel received a $50, $20, and $10 note in play money. The members then ranked the various responses by attaching the money to the cards based on the most money going to their highest priorities. After the exercise, all of the cards and money was tabulated to identify issues and priorities. A complete listing of responses is found in Appendix A of this document.

The second procedure used was a community-wide survey. The ten-page survey was distributed by local Boy Scouts to every household in Alpine. Of the possible 2,200 surveys, 800 were returned and tabulated, which represents about a 40% return rate. The complete results of the survey are also included in Appendix A.

Step 2: State Goals, Objectives, and Policies

The goals were derived from the issues and options identified from the two tools used in Step 1 above. The goals were then broken down into objectives that were in turn assigned various policies to implement the objectives, and thus the goals.

Step 3: Collect and Interpret Data

Once the goals were drafted, data was collected and interpreted to determine if the goals were feasible. Data was collected on an assortment of issues, such as; housing, population, infrastructure, and purchasing habits. Some data was original data obtained in the community survey, while other data was collected from other reliable sources (i.e. US Census Bureau, Utah Governor’s Office of Planning and Budget, etc.).

Step 4: Prepare Plans

The visions, goals, objectives, policies, and data were synthesized together to create elements, or chapters, of the General Plan. These elements along with introductory text were combined together to create the General Plan document.

Step 5: Draft Programs for Implementing the Plan

The plan itself is a guide for growth and development of the community. It does not include a vehicle for implementation. The plan is implemented by the decisions of elected and appointed officials, developers, and private citizens. Implementation programs include zoning and subdivision ordinances, project review, community programs (e.g. recreation programs), capital improvement programs, and private development.

Step 6: Evaluate Potential Impacts of Plans and Implementation Programs

An analysis must be completed prior to adoption of the plan that evaluates impacts associated with implementing the plan. Will there be a need for additional funding, increased services, or new services. What changes will be necessary and does the City have the financial/political ability and/or desire to carry out the recommendations of the plan.

Step 7: Review and Adopt the Plan

State law 10-9a-300, et seq. UCA requires the adoption of the plan through the public hearing process. The City Council and Planning Commission must review the plan to ensure that they are comfortable with the plan recommendations prior to adoption. Once the plan is adopted, it becomes the official guide and policy of the City.

Step 8: Review and Adopt Plan Implementing Programs

Any time there is a change to an existing plan or adoption of a new plan, the City should review the above mentioned implementing programs to see if there are any changes needed to these programs.

Step 9: Administer Implementing Programs; Monitor Their Impacts

The rational planning method is a continual process in need of continuous monitoring and refining. Once a plan is adopted and implementing programs are in place, the groundwork for the next plan should be initiated.

The total General Plan process is the culmination of over 1,000 hours of work.

Appendix E

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: **Discussion Cont. – Limitations on Size of Lots and Structures in the City**

FOR CONSIDERATION ON: **2 June 2020**

PETITIONER: **Mayor and City Council**

ACTION REQUESTED BY PETITIONER: **Review the ordinance and discuss limiting the maximum size of lots and structures in the City.**

BACKGROUND INFORMATION:

Other than setback restrictions there is nothing in City ordinance to limit the maximum size of a structure (additions, main buildings, accessory buildings) or lot (plat amendments to combine 2 or more lots) in the City. Over the past few years some homes, accessory buildings and lots have been getting bigger. Planning Commission will continue discussion from previous meeting after having reviewed examples provided by staff.

STAFF RECOMMENDATION:
Discuss limitations for size of lot, home, accessory structure, and other buildings.

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: **Planning Commission Minutes May 19, 2020**

FOR CONSIDERATION ON: **2 June 2020**

PETITIONER: **Staff**

ACTION REQUESTED BY PETITIONER: **Approve Minutes**

BACKGROUND INFORMATION:

Minutes from the May 19, 2020 Planning Commission Meeting.

STAFF RECOMMENDATION:

Review and approve the Planning Commission Minutes.

ALPINE CITY PLANNING COMMISSION MEETING
Alpine City Hall, 20 North Main, Alpine, UT
May 5, 2020

I. GENERAL BUSINESS

A. Welcome and Roll Call: The meeting was called to order at 7:00 p.m. by Chairwoman Jane Griener. The following were present and constituted a quorum:

Chairman: Jane Griener
Commission Members: Ed Bush, Ethan Allen, John MacKay, Troy Slade
Excused: Sylvia Christiansen
Staff: Austin Roy, Jed Muhlestein, Marla Fox
Others: Kyle Spencer

B. Prayer/Opening Comments: John MacKay
C. Pledge of Allegiance: Jane Griener

II. PUBLIC COMMENT

Jane Griener introduced two new Planning Commission members: Ed Bush and Troy Slade. She asked each of them to introduce themselves.

Ed Bush said he had lived in Alpine for about four years and was a Physicist/Electrical Engineer and spent most of his career working in Aerospace. He said he retired here with his wife Judy and unfortunately, Judy passed away last February. He loved the beauty of Alpine and started the Nature Center which had an online presence with trail maps and hikes and documented the flora and blooming cycle in Lambert Park.

Troy Slade said he had lived in Alpine for seventeen years and had six children. He loved Alpine and the trails and enjoyed mountain biking and hiking. Professionally, he was a television producer for BYU. He produced a show called the Story Trek where he travelled the country and met many people. He said he was at a stage in his life where he had time to serve and was looking forward to working with the members of the Planning Commission.

III. ACTION ITEMS

A. Public Hearing – Road Grade Exception Request – The Ridge at Alpine

Jed Muhlestein said the Developer sought an exception to the City standard for road grades in an intersection. Specifically, five percent (5%) grades through the intersection of Dean Court and Oak View Drive in the Ridge at Alpine Subdivision. Development Code stated (4.07.090):

"Street intersections: Shall have a vertical alignment such that the grade shall not exceed three percent (3%) for a minimum distance of fifty feet (50') each way from the centerline of the intersection."

Jed Muhlestein said the final phases of the subdivision had not been approved yet. He said the City went through this about a month ago for Brookside Meadows where their current street maximum grade at an intersection was 3%, and they requested a 5% exception to that intersection design. The Planning Commission and City Council approved that exception based on the same reasons that the Planning Commission would discuss tonight on this exception request.

Jed Muhlestein said their ordinance gave three criteria to granting exceptions to road design standards:

1. Best interest of the City;
2. Generally accepted planning and engineering;
3. Exception cannot vary the zone, use, or lot size of the development.

Jed Muhlestein said at the time this letter was written, they had two phases of development that received final approval. At the last City Council meeting, Phase 3 of The Ridge at Alpine was also given final approval. He said Phases 1, 2 and 3 were all the lower half of the image on the packet, located from the bend in Grove Drive all the way down, and were all approved final phases of The Ridge at Alpine. So, as the Developer considered moving forward and they were analyzing their road designs and determined they could come up with a better road design for a future phase of development.

Jed Muhlestein showed on a map the area for which the Developer requested this exception. He said it affected a very large portion of the design of their development. AASHTO (American Association of State Highway Officials) was a standard by which most of the Nation followed and created their ordinances to follow road design standards. Chapter 9 of the AASHTO book specifically discussed intersections and grades at intersections. It stated the following: "At intersecting roads, it should be as flat as practical on those sections that are to be used for storage of stopped vehicles."

Jed Muhlestein said storage of stopped vehicles meant that any time there was a high frequency of traffic, there were vehicles stopped at the intersection waiting for other vehicles to come. Those vehicles were therefore "stored" at the intersection before they could safely enter the intersection and navigate their way down the road. He said the particular intersection at which the Developer requested the exception was at Dean Court and Elkview Drive.

Jed Muhlestein said this intersection design was more or less a secondary access route from The Ridge at Alpine to the Alpine Cove Subdivision. He said this connection was not meant to be made a thoroughfare. In other words, Staff did not anticipate a high volume of traffic to use this connection. The need for storage of vehicles at this intersection was actually very low. He said they did not anticipate the vehicles to have to wait for traffic at this intersection ever, really.

Jed Muhlestein said because they did not need to worry about storage for stopped vehicles. AASHTO went on to note the following: "Where conditions may make such designs too expensive, grades should not exceed about six percent, with a corresponding adjustment in specific geometric design elements." AASHTO gave an allowance to go above 3 % but they did not want a City going above 6%.

Jed Muhlestein said he was curious about what other cities did in their road design standards. He said Draper had 5% maximum, Park City had 2%, Lindon had 3%, and several other cities were unspecified. He said usually when a City was unspecified on their maximum designs, they referred the Design Engineer to AASHTO, and they would follow the same criteria in order to design their roads.

Jed Muhlestein referred back to the three reasons the Planning Commission could grant an exception. In reference to the "generally accepted engineering," he said this was considered generally excepted engineering for their area and allowed for a 5% grade when they did not anticipate high volumes of traffic.

Jed Muhlestein said he wanted to look specifically at what this exception did for this intersection. Exhibit B showed the effect on grading that this exception request would have. Jed Muhlestein showed on a map the amount of fill material and the width of fill material it was going to take to build the road at the currently approved design and that would be the 3% intersection design. He said that design was created such that the road was literally twelve feet higher than the existing grades at the time. If they were able to steepen the grade of the intersection, this was a no brainer exception. He said the Planning Commission either had a road design that had twelve feet of fill, which meant all the houses in the area were also going to have to build up their homes and foundations twelve feet tall and there would be a constant need for more material to be hauled in to the area to build up these lots. He said this seemed backwards and not the way they City should build a house.

Jed Muhlestein said on top of that, the City infrastructure with a road that was twelve feet high, a sewer was typically only nine feet deep. Builders would have to bring material in before they could lay their sewer pipes and then continue to build. He said it was not an effective way of constructing. He said he was in full support of this exception request. It made a much cleaner, more constructible development, and on top of all that, it met the criteria that was outlined in Alpine City code. He said it was generally accepted engineering as it did not change the use of the zone or any lot sizes, and it would serve the best interest of the City by reducing the amount of fill required to build the road.

Jed Muhlestein said based on the analysis of their exception request, their findings for a positive motion by granting the Developer up to a 5% grade would allow the road to be built at a much lower elevation, the maximum height of the road would be 4.1 feet vs 12.75 feet. He said it would allow all the associated utilities for homes to build at ground level or in the ground rather than on fill material. Both of the above items would qualify for serving the best interest of the City. As mentioned before, the intersection was not expected to have a high volume of traffic, therefore it was not anticipated to need a large flat area to store vehicles waiting to enter or exit the intersection. Without the need to store vehicles, the need for flatter slopes mentioned by AASHTO was minimized. Also, upon reviewing other surrounding City's codes, generally excepted planning and engineering did allow for the steeper grades as mentioned. Staff's recommendation would be to approve this exception request based on those findings.

Jane Griener opened the Public Hearing.

Mike and Cory Russon, Alpine residents, stated: "Regarding the North/South road to be built behind the Alpine Cove, the Developer was asking the City to make an exception on the road grade steepness claiming it will be too expensive to bring in fill to build up the road to the proper grade for recommended safety standards. Since the owner spent many years commercially selling the topsoil off this area and mining it for boulders, they thought this was a frivolous request. They needed to build up the road grade resulted from the removal and sell of topsoil and boulders in the first place which lowered the elevation from ten to twenty feet in some areas. Additionally, large sorted piles of soil and rock remained on site prepared for commercial offsite sales. This might provide the necessary material for bringing the road grade up to specifications."

Jane Griener closed the Public Hearing.

Kyle Spencer, the Developer, said the model they used to evaluate the roadway improvements by lowering the grade, they actually used the pre-graded surface that predated any of the import and export of this area. He said when they spot checked some of those excavation elevations in the proximity of being cored, there were no cut or fills that exceed two feet in this roadway section. He said he believed that what they modeled actually represented the actual roadway, pre-excavation and post excavation. The other item he said he wanted to point out was the previous design on Oakview Drive, the connection road from Alpine Cove Drive to Dean Court, if they were to keep the original 3% across the intersection, then he said he believed Oakview Drive, in addition, would maintain that higher elevation of roughly twelve feet of import required for that minor roadway connection. He said he believed the new design greatly improved the impact of that minor roadway.

Jane Griener asked if Oakview Road had been built and who was responsible for building it. Jed Muhlestein said it had not been built yet and he thought it was the Developer's responsibility to build it but was not sure. He said he would check on that.

Ed Bush said he walked up there yesterday and said there was a lot of excavating out of the hillside which made the roadside difficult to be the right height.

Kyle Spencer said he believed the excavation that Ed Bush saw with the crusher in operation was actually located where the future cul-de-sac would be which was North of this intersection by 300 or 400 feet. He said either way this roadway was designed, the cul-de-sac still would require that excavation down where they harvested the rocks and boulders. He said that did not dictate the requirement here of the roadway grade. He said it was mainly to improve the roadway import South of Oakview Drive and the connection to Dean Court which was pretty native and natural. He said they had not regraded that section.

Jane Griener asked what the rules were for Developers mining and selling rocks and boulders because it was a concern to people who watched it. She said it might be nice to clarify any of the City ordinances regarding that.

Jed Muhlestein said the City could not have a commercial operation in a residential zone and said they City discussed this with the Developer about this issue a few times. He said where they were digging was within that cul-de-sac area that would require them to excavate down to build that cul-de-sac. He said it was common practice in all developments when digging down and finding boulders, they needed to get rid of them somehow. He said this was the same thing with topsoil. When they removed topsoil to build the roadway, they had the right to get rid of that topsoil. He said it was done in every development in the City and it was not considered a commercial operation. He said they were not allowed to go outside the roadway area, however.

MOTION: Ethan Allen moved to recommend approval of the 5% design exception request based on the following:

1. The 5% design would serve the best interest of the City by reducing the amount of fill required to build the roads;
2. The request followed generally accepted planning and engineering;
3. The request did not vary the zone, use, or lot sizes within the development.

John MacKay seconded the motion. There were 5 Ayes and 0 Nays (recorded below). The motion passed unanimously.

Ayes:	**Nays:**
Ed Bush	None
Ethan Allen	
John MacKay	
Jane Griener	
Troy Slade	

B. Public Hearing – Ordinance 2020-09: Flood Plain Ordinance Update

Jed Muhlestein said in February the Planning Commission reviewed and made a recommendation to approve updates to the Flood Plain Ordinance to reference the new Flood Insurance Rate Map (FIRM). Additional changes were needed to be in compliance with the National Flood Insurance Program (NFIP), which were outlined in a Staff report.

Jed Muhlestein said the Planning Commission needed to pass this in order to be included in the National Flood Insurance Program. He said there were definitions that needed to be refined or added for Base Flood Elevation, Flood Insurance Study, Updated FIRM map name, an adoption date reference, and minor language revisions.

Jane Griener opened the Public Hearing. There were no comments. Jane Griener closed the Public Hearing.

MOTION: Ed Bush moved to recommend that Ordinance 2020-09 be approved as proposed. Ethan Allen seconded the motion. There were 5 Ayes and 0 Nays (recorded below). The motion passed unanimously.

Ayes:	**Nays:**
Ed Bush	None
Ethan Allen	
John MacKay	
Jane Griener	
Troy Slade	

C. Public Hearing – Ordinance 2020-10: Retaining Wall Irrigation

Jed Muhlestein said the Development Code required plantings on terraced retaining walls. Among the requirements were that the plants/shrubs needed to be watered via drip irrigation. Staff recommended additional language to clarify the responsibility of drip irrigation installation and operation.

Jed Muhlestein said Staff wrote a new ordinance that stated, "Shrubs shall be drip irrigated to minimize erosion. The responsibility of drip irrigation resides with the property owner on which the majority of the structure is built. If the majority of the structure is built on private or public open space, where no HOA is present, a pressurized irrigation service and drip irrigation system shall be installed by the Developer and Alpine City will be responsible for the drip irrigation maintenance and operation after the warranty period expires."

Jed Muhlestein said the warranty period was typically one year and the "one year" period started after the development was completed. This was also written clearly in the code.

Jane Griener opened the Public Hearing. There were no comments. Jane Griener closed the Public Hearing.

Ed Bush asked about walls next to the roadway, because of their proximity to open space. Jed Muhlestein said the City would not require this landscaping next to the road. It also had to do with visibility from the public roadways.

Ethan Allen asked how much maintenance the City was going to need in the future. He said the Developer put this in and then the City had to maintain it. Jed Muhlestein said the City would look for low maintenance requirements.

MOTION: John MacKay moved to recommend that Ordinance 2020-10 be approved as proposed. Troy Slade seconded the motion. There were 5 Ayes and 0 Nays (recorded below). The motion passed unanimously.

Ayes:	**Nays:**
Ed Bush	None
Ethan Allen	
John MacKay	
Jane Griener	
Troy Slade	

D. Public Hearing – Ordinance 2020-2011: Planter Strip Requirements

Jed Muhlestein said the Development Code needed to be updated according to the City's new Tree Guide with reference to what types of plants were permitted in park strips. The old language used to refer to a list kept by Staff; however, the City now had a new Tree Guide specifically for this purpose. He noted that the trees in the planter strip needed to be planted fifty feet apart and only include trees chosen from the official Tree Guide.

Jane Griener opened the Public Hearing. There were no comments. Jane Griener closed the Public Hearing.

Troy Slade asked where the Tree Guide could be found. Jed Muhlestein said it could be found on the front page of the City website. It would be later moved to a planning or building page. Jane Griener said it would be nice if there was a hyperlink that could take a resident right to that section.

MOTION: Troy Slade moved to recommend that Ordinance 2020-11 be approved as proposed.

John MacKay seconded the motion. There were 5 Ayes and 0 Nays (recorded below). The motion passed unanimously.

Ayes:	**Nays:**
Ed Bush	None
Ethan Allen	
John MacKay	
Jane Griener	
Troy Slade	

E. Discussion – Limitations on Size of Lots and Structures in the City.

Austin Roy said that other than setback restrictions, there was nothing in City ordinances to limit the maximum size of a structure (additions, main buildings, accessory buildings) or lot (plat amendments to combine two or more lots) in the City. Over the past few years some homes, accessory buildings, and lots have been increasing in size.

The Planning Commission would discuss the need to limit the maximum size of buildings and lots. Austin Roy said this issue was discussed in 2009 and decided to not make any changes. He said most cities did not limit the size of homes. Alpine City steered away from going to higher density but had not limited the size of homes.

Jane Griener asked if this had anything to do with finances and recession leaving large homes vacant. Ed Bush said the Mayor's main concern was when a new addition to a home caused the original home look smaller and was built with a small breezeway.

Austin Roy said an addition to a home was treated as part of the home and had setback and height restrictions. This was how the City controlled the size of the home.

Jed Muhlestein said the City also had an ordinance against moving too much dirt into a lot (for the purpose of raising their elevation to build a home, for example, but this had never happened to his knowledge).

Jane Griener said some people built up a lot to get a daylight basement. She asked if there was a restriction for limiting the grade of a newly constructed lot. Jed Muhlestein said the driveway would not be buildable if the lot was raised too high. Jane Griener said she did not have much of an appetite for telling people how big their home could be.

Ethan Allen said the Planning Commission could indicate that a person could not change the original elevation. He said this might open up the City to lawsuits.

Ed Bush said the Mayor had concerns about garage door space and how dominating it potentially looked. It was difficult to write out all ideas in a law/ordinance.

Jane Griener asked Austin Roy to send some examples to the Planning Commission so they could get an idea of what the Mayor was referring.

The Planning Commission had a short discussion about the look of garages on corner lots and if they should be limited.

IV. Communications

Austin Roy welcomed the new Planning Commission members and thanked them for their service.

V. APPROVAL OF PLANNING COMMISSION MINUTES: May 5, 2020

MOTION: Ethan Allen moved to approve the minutes for May 5, 2020 as written. John MacKay seconded the motion. There were 5 Ayes and 0 Nays (recorded below). The motion passed unanimously.

Ayes:	**Nays:**
Ed Bush	None
Ethan Allen	
John MacKay	
Jane Griener	
Troy Slade	

The meeting was adjourned at 8:25 p.m.